

APPENDIX G

TRANSPORTATION OUTPUTS, FEHR & PEERS, 2017

HCM 2010 Signalized Intersection Summary

1: Bruce Rd & SR 32

Existing
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	230	99	54	104	265	40	88	331	47	20	403	353
Future Volume (veh/h)	230	99	54	104	265	40	88	331	47	20	403	353
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.98	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	274	118	13	124	315	43	105	394	16	24	480	252
Adj No. of Lanes	1	1	1	1	1	0	1	1	1	1	1	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	326	622	529	174	398	54	134	659	548	44	565	741
Arrive On Green	0.19	0.34	0.34	0.10	0.25	0.22	0.08	0.36	0.36	0.03	0.31	0.29
Sat Flow, veh/h	1757	1845	1568	1757	1587	217	1757	1845	1535	1757	1845	1527
Grp Volume(v), veh/h	274	118	13	124	0	358	105	394	16	24	480	252
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	0	1803	1757	1845	1535	1757	1845	1527
Q Serve(g_s), s	13.3	4.0	0.5	6.0	0.0	16.4	5.2	15.4	0.6	1.2	21.5	9.1
Cycle Q Clear(g_c), s	13.3	4.0	0.5	6.0	0.0	16.4	5.2	15.4	0.6	1.2	21.5	9.1
Prop In Lane	1.00		1.00	1.00		0.12	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	326	622	529	174	0	452	134	659	548	44	565	741
V/C Ratio(X)	0.84	0.19	0.02	0.71	0.00	0.79	0.79	0.60	0.03	0.54	0.85	0.34
Avail Cap(c_a), veh/h	796	899	764	398	0	879	398	669	557	398	773	914
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.7	20.7	19.5	38.5	0.0	31.1	40.1	23.2	18.4	42.5	28.7	14.3
Incr Delay (d2), s/veh	2.3	0.1	0.0	2.0	0.0	1.2	3.8	1.0	0.0	3.8	5.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.7	2.0	0.2	3.0	0.0	8.3	2.6	8.0	0.3	0.6	11.7	3.8
LnGrp Delay(d),s/veh	36.9	20.8	19.5	40.6	0.0	32.3	43.9	24.2	18.4	46.3	33.8	14.4
LnGrp LOS	D	C	B	D		C	D	C	B	D	C	B
Approach Vol, veh/h	405				482			515			756	
Approach Delay, s/veh	31.7				34.4			28.0			27.7	
Approach LOS	C				C			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.7	33.8	10.7	31.0	20.4	26.1	6.2	35.5				
Change Period (Y+Rc), s	* 5	7.0	* 4	* 6	* 5	7.0	* 4	* 6				
Max Green Setting (Gmax), s	* 19	40.0	* 20	* 35	* 39	40.0	* 20	* 30				
Max Q Clear Time (g_c+I1), s	8.0	6.0	7.2	23.5	15.3	18.4	3.2	17.4				
Green Ext Time (p_c), s	0.1	0.8	0.1	1.5	0.1	0.7	0.0	1.5				
Intersection Summary												
HCM 2010 Ctrl Delay			30.0									
HCM 2010 LOS			C									
Notes												

HCM 2010 Signalized Intersection Summary

2: SR 99 SB Ramps & E 20th St

Existing
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑	↑↑	↑↑					↑	↑	↑↑
Traffic Volume (veh/h)	0	426	53	114	325	0	0	0	0	555	1	327
Future Volume (veh/h)	0	426	53	114	325	0	0	0	0	555	1	327
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	1845	1845	0				1845	1845	1845
Adj Flow Rate, veh/h	0	507	11	136	387	0				662	0	81
Adj No. of Lanes	0	2	1	2	2	0				2	0	2
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84				0.84	0.84	0.84
Percent Heavy Veh, %	0	3	3	3	3	0				3	3	3
Cap, veh/h	0	993	436	194	1660	0				911	0	813
Arrive On Green	0.00	0.28	0.28	0.06	0.47	0.00				0.26	0.00	0.26
Sat Flow, veh/h	0	3597	1537	3408	3597	0				3514	0	3136
Grp Volume(v), veh/h	0	507	11	136	387	0				662	0	81
Grp Sat Flow(s),veh/h/ln	0	1752	1537	1704	1752	0				1757	0	1568
Q Serve(g_s), s	0.0	3.6	0.2	1.2	2.0	0.0				5.2	0.0	0.6
Cycle Q Clear(g_c), s	0.0	3.6	0.2	1.2	2.0	0.0				5.2	0.0	0.6
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	993	436	194	1660	0				911	0	813
V/C Ratio(X)	0.00	0.51	0.03	0.70	0.23	0.00				0.73	0.00	0.10
Avail Cap(c_a), veh/h	0	4104	1800	2786	4104	0				3528	0	3149
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	9.0	7.8	13.9	4.7	0.0				10.1	0.0	8.4
Incr Delay (d2), s/veh	0.0	0.2	0.0	1.7	0.0	0.0				0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	1.7	0.1	0.6	0.9	0.0				2.5	0.0	0.2
LnGrp Delay(d),s/veh	0.0	9.2	7.8	15.6	4.7	0.0				10.5	0.0	8.5
LnGrp LOS		A	A	B	A					B		A
Approach Vol, veh/h		518			523						743	
Approach Delay, s/veh		9.1			7.5						10.3	
Approach LOS		A			A						B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	5.7	12.5		11.8		18.2						
Change Period (Y+Rc), s	3.5	4.6		4.1		4.6						
Max Green Setting (Gmax), s	25.0	34.5		30.0		34.5						
Max Q Clear Time (g_c+I1), s	3.2	5.6		7.2		4.0						
Green Ext Time (p_c), s	0.1	2.3		0.5		2.3						
Intersection Summary												
HCM 2010 Ctrl Delay			9.2									
HCM 2010 LOS			A									
Notes												

HCM 2010 Signalized Intersection Summary

3: SR 99 NB Ramps & E 20th St

Existing
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	159	822	0	0	396	397	43	0	135	0	0	0
Future Volume (veh/h)	159	822	0	0	396	397	43	0	135	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1845	1845	0	0	1845	1845	1845	1845	1845			
Adj Flow Rate, veh/h	189	979	0	0	471	46	51	0	13			
Adj No. of Lanes	2	2	0	0	2	1	2	0	1			
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84			
Percent Heavy Veh, %	3	3	0	0	3	3	3	3	3			
Cap, veh/h	1716	2796	0	0	744	328	133	0	59			
Arrive On Green	0.50	0.80	0.00	0.00	0.21	0.21	0.04	0.00	0.04			
Sat Flow, veh/h	3408	3597	0	0	3597	1546	3514	0	1568			
Grp Volume(v), veh/h	189	979	0	0	471	46	51	0	13			
Grp Sat Flow(s),veh/h/ln	1704	1752	0	0	1752	1546	1757	0	1568			
Q Serve(g_s), s	1.4	3.8	0.0	0.0	6.0	1.2	0.7	0.0	0.4			
Cycle Q Clear(g_c), s	1.4	3.8	0.0	0.0	6.0	1.2	0.7	0.0	0.4			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	1716	2796	0	0	744	328	133	0	59			
V/C Ratio(X)	0.11	0.35	0.00	0.00	0.63	0.14	0.38	0.00	0.22			
Avail Cap(c_a), veh/h	1716	2796	0	0	2593	1144	2173	0	970			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	6.4	1.4	0.0	0.0	17.4	15.6	22.9	0.0	22.7			
Incr Delay (d2), s/veh	0.1	0.0	0.0	0.0	0.3	0.1	0.7	0.0	0.7			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.7	1.8	0.0	0.0	2.9	0.5	0.3	0.0	0.2			
LnGrp Delay(d),s/veh	6.5	1.4	0.0	0.0	17.8	15.6	23.5	0.0	23.4			
LnGrp LOS	A	A			B	B	C		C			
Approach Vol, veh/h	1168				517			64				
Approach Delay, s/veh	2.2				17.6			23.5				
Approach LOS	A				B			C				
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2				5			8				
Phs Duration (G+Y+Rc), s	42.8				28.5			5.8				
Change Period (Y+Rc), s	* 5				3.5			4.1				
Max Green Setting (Gmax), s	* 35				25.0			30.0				
Max Q Clear Time (g_c+l1), s	5.8				3.4			2.7				
Green Ext Time (p_c), s	4.2				0.3			0.1				
Intersection Summary												
HCM 2010 Ctrl Delay			7.5									
HCM 2010 LOS			A									
Notes												

HCM 2010 Signalized Intersection Summary

4: E 20th St & Chico Mall

Existing
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	49	604	27	32	658	15	98	8	8	9	3	34
Future Volume (veh/h)	49	604	27	32	658	15	98	8	8	9	3	34
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1900	1900	1845	1845
Adj Flow Rate, veh/h	58	719	30	38	783	17	128	0	0	11	4	0
Adj No. of Lanes	2	2	0	1	2	0	2	1	0	0	1	2
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	160	1591	66	32	1528	33	358	188	0	25	9	53
Arrive On Green	0.05	0.46	0.46	0.02	0.44	0.43	0.10	0.00	0.00	0.02	0.02	0.00
Sat Flow, veh/h	3408	3425	143	1757	3506	76	3514	1845	0	1305	475	2760
Grp Volume(v), veh/h	58	368	381	38	391	409	128	0	0	15	0	0
Grp Sat Flow(s),veh/h/ln	1704	1752	1816	1757	1752	1830	1757	1845	0	1779	0	1380
Q Serve(g_s), s	0.7	5.7	5.8	0.7	6.6	6.6	1.4	0.0	0.0	0.3	0.0	0.0
Cycle Q Clear(g_c), s	0.7	5.7	5.8	0.7	6.6	6.6	1.4	0.0	0.0	0.3	0.0	0.0
Prop In Lane	1.00		0.08	1.00		0.04	1.00		0.00	0.73		1.00
Lane Grp Cap(c), veh/h	160	814	843	32	764	798	358	188	0	34	0	53
V/C Ratio(X)	0.36	0.45	0.45	1.19	0.51	0.51	0.36	0.00	0.00	0.44	0.00	0.00
Avail Cap(c_a), veh/h	1645	1523	1577	826	1523	1590	2174	1142	0	1101	0	1708
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	18.7	7.3	7.3	19.8	8.3	8.3	16.9	0.0	0.0	19.6	0.0	0.0
Incr Delay (d2), s/veh	0.5	0.3	0.3	107.0	0.4	0.4	0.2	0.0	0.0	3.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	2.8	2.9	1.3	3.2	3.4	0.7	0.0	0.0	0.2	0.0	0.0
LnGrp Delay(d),s/veh	19.2	7.6	7.6	132.1	8.7	8.7	17.1	0.0	0.0	22.9	0.0	0.0
LnGrp LOS	B	A	A	F	A	A	B			C		
Approach Vol, veh/h	807					838		128		15		
Approach Delay, s/veh	8.4					14.3		17.1		22.9		
Approach LOS	A					B		B		C		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	4.7	22.8			4.8	5.9	21.6	8.1				
Change Period (Y+Rc), s	3.0	4.1			4.0	3.5	4.1	4.0				
Max Green Setting (Gmax), s	20.0	35.0			25.0	20.0	35.0	25.0				
Max Q Clear Time (g_c+l1), s	2.7	7.8			2.3	2.7	8.6	3.4				
Green Ext Time (p_c), s	0.0	9.0			0.0	0.1	9.0	0.2				
Intersection Summary												
HCM 2010 Ctrl Delay			11.9									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

5: Forest Ave & E 20th St

Existing
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	134	257	208	42	332	140	158	84	19	88	185	206
Future Volume (veh/h)	134	257	208	42	332	140	158	84	19	88	185	206
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1845	1845	1845	1845	1845	1845	1900
Adj Flow Rate, veh/h	160	306	10	50	395	43	188	100	2	105	220	0
Adj No. of Lanes	1	2	0	1	2	1	1	2	1	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	176	1268	41	324	1645	725	208	583	255	113	394	0
Arrive On Green	0.10	0.37	0.36	0.18	0.47	0.47	0.12	0.17	0.17	0.06	0.11	0.00
Sat Flow, veh/h	1757	3463	113	1757	3505	1545	1757	3505	1534	1757	3597	0
Grp Volume(v), veh/h	160	154	162	50	395	43	188	100	2	105	220	0
Grp Sat Flow(s),veh/h/ln	1757	1752	1823	1757	1752	1545	1757	1752	1534	1757	1752	0
Q Serve(g_s), s	7.2	4.9	4.9	1.9	5.4	1.2	8.5	2.0	0.1	4.8	4.8	0.0
Cycle Q Clear(g_c), s	7.2	4.9	4.9	1.9	5.4	1.2	8.5	2.0	0.1	4.8	4.8	0.0
Prop In Lane	1.00		0.06	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	176	642	668	324	1645	725	208	583	255	113	394	0
V/C Ratio(X)	0.91	0.24	0.24	0.15	0.24	0.06	0.90	0.17	0.01	0.93	0.56	0.00
Avail Cap(c_a), veh/h	231	642	668	324	1645	725	417	1073	470	253	767	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.93	0.93	0.93	0.97	0.97	0.97	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	35.6	17.6	17.6	27.4	12.7	11.6	34.8	28.6	10.8	37.2	33.6	0.0
Incr Delay (d2), s/veh	25.9	0.1	0.1	0.1	0.3	0.2	5.8	0.1	0.0	12.1	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.8	2.4	2.5	0.9	2.7	0.5	4.4	0.9	0.0	2.7	2.3	0.0
LnGrp Delay(d),s/veh	61.5	17.7	17.7	27.5	13.0	11.7	40.6	28.7	10.8	49.3	34.1	0.0
LnGrp LOS	E	B	B	C	B	B	D	C	B	D	C	
Approach Vol, veh/h	476				488		290				325	
Approach Delay, s/veh	32.4				14.4		36.3				39.0	
Approach LOS	C				B		D				D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.0	41.6	9.1	17.3	20.2	33.3	13.5	13.0				
Change Period (Y+Rc), s	3.0	4.5	3.0	4.5	4.5	* 4.5	3.0	4.5				
Max Green Setting (Gmax), s	11.5	16.5	12.5	24.0	8.5	* 19	20.0	17.0				
Max Q Clear Time (g_c+l1), s	9.2	7.4	6.8	4.0	3.9	6.9	10.5	6.8				
Green Ext Time (p_c), s	0.0	1.3	0.1	1.2	0.8	0.8	0.2	0.9				
Intersection Summary												
HCM 2010 Ctrl Delay			28.9									
HCM 2010 LOS			C									
Notes												

HCM 2010 Signalized Intersection Summary

6: Huntington Dr & E 20th St

Existing
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	77	236	18	15	408	53	68	6	6	15	2	7
Future Volume (veh/h)	77	236	18	15	408	53	68	6	6	15	2	7
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.98	0.99		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1900	1845	1900	1900	1845	1845
Adj Flow Rate, veh/h	92	281	15	18	486	49	81	7	3	18	2	0
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	0	1	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	164	1437	76	58	1170	117	404	29	6	421	33	253
Arrive On Green	0.09	0.43	0.39	0.03	0.36	0.33	0.12	0.12	0.16	0.12	0.12	0.00
Sat Flow, veh/h	1757	3380	179	1757	3207	322	1175	233	48	1304	268	1568
Grp Volume(v), veh/h	92	145	151	18	265	270	91	0	0	20	0	0
Grp Sat Flow(s),veh/h/ln	1757	1752	1807	1757	1752	1776	1455	0	0	1573	0	1568
Q Serve(g_s), s	1.3	1.4	1.4	0.3	3.0	3.0	1.2	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	1.3	1.4	1.4	0.3	3.0	3.0	1.5	0.0	0.0	0.3	0.0	0.0
Prop In Lane	1.00		0.10	1.00		0.18	0.89		0.03	0.90		1.00
Lane Grp Cap(c), veh/h	164	745	768	58	639	648	439	0	0	454	0	253
V/C Ratio(X)	0.56	0.19	0.20	0.31	0.41	0.42	0.21	0.00	0.00	0.04	0.00	0.00
Avail Cap(c_a), veh/h	1003	2735	2820	1338	2735	2772	1293	0	0	1300	0	1194
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	11.4	4.7	4.8	12.4	6.2	6.3	10.7	0.0	0.0	10.2	0.0	0.0
Incr Delay (d2), s/veh	1.1	0.0	0.0	1.1	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.7	0.7	0.1	1.4	1.5	0.6	0.0	0.0	0.1	0.0	0.0
LnGrp Delay(d),s/veh	12.5	4.8	4.8	13.5	6.4	6.5	10.8	0.0	0.0	10.2	0.0	0.0
LnGrp LOS	B	A	A	B	A	A	B			B		
Approach Vol, veh/h	388				553		91				20	
Approach Delay, s/veh	6.6				6.7		10.8				10.2	
Approach LOS	A				A		B				B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	3.9	15.2			7.2	5.4	13.6	7.2				
Change Period (Y+Rc), s	3.0	5.0			3.0	3.0	5.0	3.0				
Max Green Setting (Gmax), s	20.0	40.0			20.0	15.0	40.0	20.0				
Max Q Clear Time (g_c+l1), s	2.3	3.4			2.3	3.3	5.0	3.5				
Green Ext Time (p_c), s	0.0	3.3			0.3	0.0	3.3	0.3				
Intersection Summary												
HCM 2010 Ctrl Delay			7.1									
HCM 2010 LOS			A									
Notes												

Intersection						
Int Delay, s/veh	5.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↑	↑	↑	↑
Traffic Vol, veh/h	193	65	66	349	127	40
Future Vol, veh/h	193	65	66	349	127	40
Conflicting Peds, #/hr	0	2	0	0	0	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	100	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	230	77	79	415	151	48
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	309	0	843	161
Stage 1	-	-	-	-	270	-
Stage 2	-	-	-	-	573	-
Critical Hdwy	-	-	4.145	-	6.645	6.945
Critical Hdwy Stg 1	-	-	-	-	5.845	-
Critical Hdwy Stg 2	-	-	-	-	5.445	-
Follow-up Hdwy	-	-	2.2285	-	3.5285	3.3285
Pot Cap-1 Maneuver	-	-	1244	-	316	853
Stage 1	-	-	-	-	749	-
Stage 2	-	-	-	-	561	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1239	-	295	848
Mov Cap-2 Maneuver	-	-	-	-	295	-
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	525	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		1.3		24.6	
HCM LOS					C	
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	295	848	-	-	1239	-
HCM Lane V/C Ratio	0.513	0.056	-	-	0.063	-
HCM Control Delay (s)	29.4	9.5	-	-	8.1	-
HCM Lane LOS	D	A	-	-	A	-
HCM 95th %tile Q(veh)	2.7	0.2	-	-	0.2	-

HCM 2010 Signalized Intersection Summary

8: Bruce Rd & E 20th St

Existing
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	79	35	27	40	146	40	92	261	21	20	363	192
Future Volume (veh/h)	79	35	27	40	146	40	92	261	21	20	363	192
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.97	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1900	1845	1845	1845
Adj Flow Rate, veh/h	94	42	2	48	174	38	110	311	23	24	432	74
Adj No. of Lanes	1	1	1	1	1	0	1	1	0	1	1	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	165	347	295	114	233	51	175	738	55	68	689	585
Arrive On Green	0.09	0.19	0.19	0.06	0.16	0.16	0.10	0.43	0.42	0.04	0.37	0.37
Sat Flow, veh/h	1757	1845	1568	1757	1459	319	1757	1697	126	1757	1845	1566
Grp Volume(v), veh/h	94	42	2	48	0	212	110	0	334	24	432	74
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	0	1778	1757	0	1823	1757	1845	1566
Q Serve(g_s), s	3.0	1.1	0.1	1.5	0.0	6.7	3.5	0.0	7.4	0.8	11.2	1.8
Cycle Q Clear(g_c), s	3.0	1.1	0.1	1.5	0.0	6.7	3.5	0.0	7.4	0.8	11.2	1.8
Prop In Lane	1.00		1.00	1.00		0.18	1.00		0.07	1.00		1.00
Lane Grp Cap(c), veh/h	165	347	295	114	0	284	175	0	792	68	689	585
V/C Ratio(X)	0.57	0.12	0.01	0.42	0.00	0.75	0.63	0.00	0.42	0.35	0.63	0.13
Avail Cap(c_a), veh/h	601	1293	1099	601	0	608	601	0	1278	601	1293	1098
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.4	19.7	19.3	26.3	0.0	23.5	25.3	0.0	11.5	27.4	15.0	12.0
Incr Delay (d2), s/veh	1.2	0.1	0.0	0.9	0.0	1.5	1.4	0.0	0.5	1.2	1.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.6	0.0	0.8	0.0	3.4	1.8	0.0	3.8	0.4	5.9	0.8
LnGrp Delay(d),s/veh	26.5	19.8	19.3	27.2	0.0	24.9	26.7	0.0	12.0	28.6	16.3	12.2
LnGrp LOS	C	B	B	C		C	C		B	C	B	B
Approach Vol, veh/h	138			260			444			530		
Approach Delay, s/veh	24.4			25.4			15.6			16.3		
Approach LOS	C			C			B			B		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	6.3	29.4	7.8	15.0	9.8	25.8	9.5	13.3				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	20.0	40.0	20.0	41.0	20.0	40.0	20.0	20.0				
Max Q Clear Time (g_c+l1), s	2.8	9.4	3.5	3.1	5.5	13.2	5.0	8.7				
Green Ext Time (p_c), s	0.0	8.0	0.0	1.1	0.0	7.6	0.0	0.7				
Intersection Summary												
HCM 2010 Ctrl Delay	18.6											
HCM 2010 LOS	B											

HCM 2010 TWSC
9: Notre Dame Blvd & Parkhurst St

Existing
AM Peak Hour

Intersection

Int Delay, s/veh 1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	27	136	0	7	121
Future Vol, veh/h	5	27	136	0	7	121
Conflicting Peds, #/hr	0	1	0	1	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	32	162	0	8	144

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	324	164	0	0	163	0
Stage 1	163	-	-	-	-	-
Stage 2	161	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	670	881	-	-	1416	-
Stage 1	866	-	-	-	-	-
Stage 2	868	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	665	880	-	-	1415	-
Mov Cap-2 Maneuver	698	-	-	-	-	-
Stage 1	865	-	-	-	-	-
Stage 2	863	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	9.5		0		0.4
HCM LOS	A				

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 846	1415	-
HCM Lane V/C Ratio	-	- 0.045	0.006	-
HCM Control Delay (s)	-	- 9.5	7.6	0
HCM Lane LOS	-	- A	A	A
HCM 95th %tile Q(veh)	-	- 0.1	0	-

HCM 2010 TWSC
10: Notre Dame Blvd & Jasper Dr

Existing
AM Peak Hour

Intersection

Int Delay, s/veh 0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	12	11	123	2	2	124
Future Vol, veh/h	12	11	123	2	2	124
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	14	13	146	2	2	148

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	300	148	0	0	149	0
Stage 1	148	-	-	-	-	-
Stage 2	152	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	691	899	-	-	1432	-
Stage 1	880	-	-	-	-	-
Stage 2	876	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	690	899	-	-	1432	-
Mov Cap-2 Maneuver	715	-	-	-	-	-
Stage 1	880	-	-	-	-	-
Stage 2	875	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	9.7		0		0.1
HCM LOS	A				

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 793	1432	-
HCM Lane V/C Ratio	-	- 0.035	0.002	-
HCM Control Delay (s)	-	- 9.7	7.5	-
HCM Lane LOS	-	- A	A	-
HCM 95th %tile Q(veh)	-	- 0.1	0	-

HCM 2010 TWSC
11: Notre Dame Blvd & Webster Dr

Existing
AM Peak Hour

Intersection

Int Delay, s/veh 2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	35	22	106	9	14	143
Future Vol, veh/h	35	22	106	9	14	143
Conflicting Peds, #/hr	0	2	0	2	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	42	26	126	11	17	170

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	338	136	0	0	139	0
Stage 1	134	-	-	-	-	-
Stage 2	204	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	658	913	-	-	1445	-
Stage 1	892	-	-	-	-	-
Stage 2	830	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	649	910	-	-	1443	-
Mov Cap-2 Maneuver	684	-	-	-	-	-
Stage 1	891	-	-	-	-	-
Stage 2	820	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	10.2		0		0.7
HCM LOS	B				

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 757	1443	-
HCM Lane V/C Ratio	-	- 0.09	0.012	-
HCM Control Delay (s)	-	- 10.2	7.5	-
HCM Lane LOS	-	- B	A	-
HCM 95th %tile Q(veh)	-	- 0.3	0	-

HCM 2010 Signalized Intersection Summary

12: Notre Dame Blvd & Forest Ave

Existing
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	32	181	23	64	15	190	104	36	19	141	13
Future Volume (veh/h)	6	32	181	23	64	15	190	104	36	19	141	13
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	7	38	11	27	76	10	226	124	17	23	168	8
Adj No. of Lanes	1	1	2	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	23	289	423	82	303	40	303	1123	151	71	688	33
Arrive On Green	0.01	0.16	0.16	0.05	0.19	0.19	0.17	0.36	0.36	0.04	0.20	0.20
Sat Flow, veh/h	1774	1863	2726	1774	1612	212	1774	3125	420	1774	3438	163
Grp Volume(v), veh/h	7	38	11	27	0	86	226	69	72	23	86	90
Grp Sat Flow(s),veh/h/ln	1774	1863	1363	1774	0	1824	1774	1770	1775	1774	1770	1831
Q Serve(g_s), s	0.1	0.6	0.1	0.5	0.0	1.4	4.2	0.9	0.9	0.4	1.4	1.5
Cycle Q Clear(g_c), s	0.1	0.6	0.1	0.5	0.0	1.4	4.2	0.9	0.9	0.4	1.4	1.5
Prop In Lane	1.00		1.00	1.00		0.12	1.00		0.24	1.00		0.09
Lane Grp Cap(c), veh/h	23	289	423	82	0	343	303	636	638	71	354	366
V/C Ratio(X)	0.30	0.13	0.03	0.33	0.00	0.25	0.74	0.11	0.11	0.32	0.24	0.25
Avail Cap(c_a), veh/h	1113	1434	2098	860	0	1248	1315	1614	1619	860	1362	1409
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.1	12.8	12.6	16.2	0.0	12.1	13.8	7.5	7.5	16.4	11.8	11.8
Incr Delay (d2), s/veh	2.6	0.1	0.0	0.9	0.0	0.1	1.4	0.1	0.1	1.0	0.4	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.3	0.0	0.3	0.0	0.7	2.2	0.5	0.5	0.2	0.7	0.8
LnGrp Delay(d),s/veh	19.8	12.9	12.6	17.1	0.0	12.3	15.2	7.6	7.6	17.3	12.1	12.1
LnGrp LOS	B	B	B	B		B	B	A	A	B	B	B
Approach Vol, veh/h	56				113			367			199	
Approach Delay, s/veh	13.7				13.4			12.3			12.7	
Approach LOS	B				B			B			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	3.5	10.6	4.4	16.6	4.6	9.4	10.0	11.0				
Change Period (Y+Rc), s	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0				
Max Green Setting (Gmax), s	22.0	24.0	17.0	32.0	17.0	27.0	27.0	27.0				
Max Q Clear Time (g_c+l1), s	2.1	3.4	2.4	2.9	2.5	2.6	6.2	3.5				
Green Ext Time (p_c), s	0.0	0.4	0.0	1.9	0.0	0.4	0.1	1.8				
Intersection Summary												
HCM 2010 Ctrl Delay	12.7											
HCM 2010 LOS	B											
Notes												

HCM 2010 TWSC
13: Bruce Rd & Raley Blvd

Existing
AM Peak Hour

Intersection

Int Delay, s/veh 2.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	28	36	81	346	363	67
Future Vol, veh/h	28	36	81	346	363	67
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	43	96	412	432	80

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1077	472	512	0	-	0
Stage 1	472	-	-	-	-	-
Stage 2	605	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	242	592	1053	-	-	-
Stage 1	628	-	-	-	-	-
Stage 2	545	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	220	592	1053	-	-	-
Mov Cap-2 Maneuver	220	-	-	-	-	-
Stage 1	628	-	-	-	-	-
Stage 2	495	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18.6	1.7	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1053	-	340	-	-
HCM Lane V/C Ratio	0.092	-	0.224	-	-
HCM Control Delay (s)	8.8	-	18.6	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0.3	-	0.8	-	-

HCM 2010 Signalized Intersection Summary

14: SR 99 SB Ramps & Skyway Rd

Existing
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗		↑↑	↗				↖↖		↗
Traffic Volume (veh/h)	0	647	145	0	742	183	0	0	0	912	0	561
Future Volume (veh/h)	0	647	145	0	742	183	0	0	0	912	0	561
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	0	1845	1845				1845	0	1845
Adj Flow Rate, veh/h	0	770	0	0	883	0				1086	0	601
Adj No. of Lanes	0	2	1	0	2	1				2	0	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84				0.84	0.84	0.84
Percent Heavy Veh, %	0	3	3	0	3	3				3	0	3
Cap, veh/h	0	1265	566	0	1265	566				1516	0	697
Arrive On Green	0.00	0.36	0.00	0.00	0.36	0.00				0.44	0.00	0.44
Sat Flow, veh/h	0	3597	1568	0	3597	1568				3408	0	1568
Grp Volume(v), veh/h	0	770	0	0	883	0				1086	0	601
Grp Sat Flow(s),veh/h/ln	0	1752	1568	0	1752	1568				1704	0	1568
Q Serve(g_s), s	0.0	7.4	0.0	0.0	8.9	0.0				10.7	0.0	14.2
Cycle Q Clear(g_c), s	0.0	7.4	0.0	0.0	8.9	0.0				10.7	0.0	14.2
Prop In Lane	0.00		1.00	0.00		1.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1265	566	0	1265	566				1516	0	697
V/C Ratio(X)	0.00	0.61	0.00	0.00	0.70	0.00				0.72	0.00	0.86
Avail Cap(c_a), veh/h	0	4339	1941	0	4339	1941				2978	0	1370
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	10.8	0.0	0.0	11.2	0.0				9.3	0.0	10.3
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.3	0.0				0.2	0.0	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	3.6	0.0	0.0	4.2	0.0				5.0	0.0	6.3
LnGrp Delay(d),s/veh	0.0	11.0	0.0	0.0	11.5	0.0				9.6	0.0	11.6
LnGrp LOS		B			B					A		B
Approach Vol, veh/h		770			883						1687	
Approach Delay, s/veh		11.0			11.5						10.3	
Approach LOS		B			B						B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		18.9		22.3		18.9						
Change Period (Y+Rc), s		* 5		* 5		* 5						
Max Green Setting (Gmax), s		* 50		* 35		* 50						
Max Q Clear Time (g_c+I1), s		9.4		16.2		10.9						
Green Ext Time (p_c), s		2.9		1.1		2.9						
Intersection Summary												
HCM 2010 Ctrl Delay			10.8									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

15: SR 99 NB Ramps & Skyway Rd

Existing
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕	↗		↕↕	↗	↗↗		↗			
Traffic Volume (veh/h)	0	1299	260	0	770	1025	155	0	203	0	0	0
Future Volume (veh/h)	0	1299	260	0	770	1025	155	0	203	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1845	1845	0	1845	1845	1845	0	1845			
Adj Flow Rate, veh/h	0	1546	0	0	917	0	185	0	210			
Adj No. of Lanes	0	2	1	0	2	1	2	0	1			
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84			
Percent Heavy Veh, %	0	3	3	0	3	3	3	0	3			
Cap, veh/h	0	2151	962	0	2151	962	617	0	284			
Arrive On Green	0.00	0.61	0.00	0.00	0.61	0.00	0.18	0.00	0.18			
Sat Flow, veh/h	0	3597	1568	0	3597	1568	3408	0	1568			
Grp Volume(v), veh/h	0	1546	0	0	917	0	185	0	210			
Grp Sat Flow(s),veh/h/ln	0	1752	1568	0	1752	1568	1704	0	1568			
Q Serve(g_s), s	0.0	11.9	0.0	0.0	5.3	0.0	1.8	0.0	4.9			
Cycle Q Clear(g_c), s	0.0	11.9	0.0	0.0	5.3	0.0	1.8	0.0	4.9			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2151	962	0	2151	962	617	0	284			
V/C Ratio(X)	0.00	0.72	0.00	0.00	0.43	0.00	0.30	0.00	0.74			
Avail Cap(c_a), veh/h	0	4589	2053	0	4589	2053	2188	0	1006			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	5.2	0.0	0.0	3.9	0.0	13.8	0.0	15.1			
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	1.4			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	5.6	0.0	0.0	2.6	0.0	0.9	0.0	2.2			
LnGrp Delay(d),s/veh	0.0	5.4	0.0	0.0	4.0	0.0	13.9	0.0	16.5			
LnGrp LOS		A			A		B		B			
Approach Vol, veh/h	1546			917			395					
Approach Delay, s/veh	5.4			4.0			15.3					
Approach LOS	A			A			B					
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2						6	8				
Phs Duration (G+Y+Rc), s	27.9						27.9	11.0				
Change Period (Y+Rc), s	* 5						* 5	4.0				
Max Green Setting (Gmax), s	* 50						* 50	25.0				
Max Q Clear Time (g_c+I1), s	13.9						7.3	6.9				
Green Ext Time (p_c), s	9.0						9.2	0.2				
Intersection Summary												
HCM 2010 Ctrl Delay			6.3									
HCM 2010 LOS			A									
Notes												

HCM 2010 Signalized Intersection Summary

16: Notre Dame Blvd & Skyway Rd

Existing
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (veh/h)	402	755	345	9	66	1273	49	258	62	45	1	58
Future Volume (veh/h)	402	755	345	9	66	1273	49	258	62	45	1	58
Number	5	2	12		1	6	16	3	8	18		7
Initial Q (Qb), veh	0	0	0		0	0	0	0	0	0		0
Ped-Bike Adj(A_pbT)	1.00		1.00		1.00		1.00	1.00		0.99		1.00
Parking Bus, Adj	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845		1845	1845	1845	1845	1845	1900		1845
Adj Flow Rate, veh/h	479	899	231		79	1515	16	307	74	30		69
Adj No. of Lanes	2	3	1		1	3	1	2	1	0		1
Peak Hour Factor	0.84	0.84	0.84		0.84	0.84	0.84	0.84	0.84	0.84		0.84
Percent Heavy Veh, %	3	3	3		3	3	3	3	3	3		3
Cap, veh/h	585	2613	1002		122	2099	652	453	166	67		160
Arrive On Green	0.17	0.52	0.51		0.07	0.42	0.42	0.13	0.13	0.14		0.09
Sat Flow, veh/h	3408	5036	1568		1757	5036	1565	3408	1246	505		1757
Grp Volume(v), veh/h	479	899	231		79	1515	16	307	0	104		69
Grp Sat Flow(s),veh/h/ln	1704	1679	1568		1757	1679	1565	1704	0	1752		1757
Q Serve(g_s), s	11.6	8.9	5.3		3.7	21.4	0.5	7.3	0.0	4.7		3.2
Cycle Q Clear(g_c), s	11.6	8.9	5.3		3.7	21.4	0.5	7.3	0.0	4.7		3.2
Prop In Lane	1.00		1.00		1.00		1.00	1.00		0.29		1.00
Lane Grp Cap(c), veh/h	585	2613	1002		122	2099	652	453	0	233		160
V/C Ratio(X)	0.82	0.34	0.23		0.65	0.72	0.02	0.68	0.00	0.45		0.43
Avail Cap(c_a), veh/h	986	2613	1002		515	2408	748	1186	0	610		611
HCM Platoon Ratio	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00
Upstream Filter(I)	1.00	1.00	1.00		1.00	1.00	1.00	1.00	0.00	1.00		1.00
Uniform Delay (d), s/veh	34.1	12.0	6.5		38.7	20.8	14.7	35.2	0.0	34.1		36.7
Incr Delay (d2), s/veh	2.9	0.1	0.1		5.7	0.9	0.0	1.8	0.0	1.3		1.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0
%ile BackOfQ(50%),veh/ln	5.7	4.1	3.2		2.0	10.0	0.2	3.6	0.0	2.3		1.6
LnGrp Delay(d),s/veh	37.0	12.1	6.6		44.4	21.7	14.7	37.0	0.0	35.4		38.5
LnGrp LOS	D	B	A		D	C	B	D		D		D
Approach Vol, veh/h	1609			1610			411					
Approach Delay, s/veh	18.7			22.7			36.6					
Approach LOS	B			C			D					
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.9	48.3		11.8	18.6	39.6		15.4				
Change Period (Y+Rc), s	4.0	4.8		3.7	3.7	4.8		3.7				
Max Green Setting (Gmax), s	25.0	40.0		30.0	25.0	40.0		30.0				
Max Q Clear Time (g_c+I1), s	5.7	10.9		6.7	13.6	23.4		9.3				
Green Ext Time (p_c), s	0.1	21.9		1.4	1.4	11.3		1.7				
Intersection Summary												
HCM 2010 Ctrl Delay				23.3								
HCM 2010 LOS				C								
Notes												

HCM 2010 Signalized Intersection Summary

16: Notre Dame Blvd & Skyway Rd

Existing
AM Peak Hour

	↓	↙
Movement	SBT	SBR
Lane Configurations	↑	↑↑
Traffic Volume (veh/h)	65	264
Future Volume (veh/h)	65	264
Number	4	14
Initial Q (Qb), veh	0	0
Ped-Bike Adj(A_pbT)		0.98
Parking Bus, Adj	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845
Adj Flow Rate, veh/h	77	212
Adj No. of Lanes	1	2
Peak Hour Factor	0.84	0.84
Percent Heavy Veh, %	3	3
Cap, veh/h	168	818
Arrive On Green	0.09	0.09
Sat Flow, veh/h	1845	3068
Grp Volume(v), veh/h	77	212
Grp Sat Flow(s),veh/h/ln	1845	1534
Q Serve(g_s), s	3.4	4.7
Cycle Q Clear(g_c), s	3.4	4.7
Prop In Lane		1.00
Lane Grp Cap(c), veh/h	168	818
V/C Ratio(X)	0.46	0.26
Avail Cap(c_a), veh/h	642	1606
HCM Platoon Ratio	1.00	1.00
Upstream Filter(l)	1.00	1.00
Uniform Delay (d), s/veh	36.8	24.9
Incr Delay (d2), s/veh	1.9	0.2
Initial Q Delay(d3),s/veh	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	2.0
LnGrp Delay(d),s/veh	38.7	25.1
LnGrp LOS	D	C
Approach Vol, veh/h	358	
Approach Delay, s/veh	30.6	
Approach LOS	C	
Timer		

HCM 2010 TWSC
17: Skyway Rd & Forest Ave

Existing
AM Peak Hour

Intersection															
Int Delay, s/veh	2.8														
Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations															
Traffic Vol, veh/h	3	100	570	94	2	29	1285	47	7	0	12	8	1	40	
Future Vol, veh/h	3	100	570	94	2	29	1285	47	7	0	12	8	1	40	
Conflicting Peds, #/hr	0	0	0	4	0	0	0	0	0	0	0	0	0	0	
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	
RT Channelized	-	-	-	None	-	-	-	None	-	-	None	-	-	None	
Storage Length	-	250	-	-	-	150	-	-	-	-	-	100	-	-	
Veh in Median Storage, #	-	-	0	-	-	-	0	-	-	0	-	-	0	-	
Grade, %	-	-	0	-	-	-	0	-	-	0	-	-	0	-	
Peak Hour Factor	84	84	84	84	84	84	84	84	84	84	84	84	84	84	
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
Mvmt Flow	4	119	679	112	2	35	1530	56	8	0	14	10	1	48	

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1156	1586	0	0	576	794	0	0	1823	2644	399	2217 2672 793
Stage 1	-	-	-	-	-	-	-	-	984	984	-	1632 1632 -
Stage 2	-	-	-	-	-	-	-	-	839	1660	-	585 1040 -
Critical Hdwy	6.46	4.16	-	-	6.46	4.16	-	-	7.56	6.56	6.96	7.56 6.56 6.96
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	6.56	5.56	-	6.56 5.56 -
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	6.56	5.56	-	6.56 5.56 -
Follow-up Hdwy	2.53	2.23	-	-	2.53	2.23	-	-	3.53	4.03	3.33	3.53 4.03 3.33
Pot Cap-1 Maneuver	261	406	-	-	616	817	-	-	48	23	598	24 22 329
Stage 1	-	-	-	-	-	-	-	-	265	322	-	104 156 -
Stage 2	-	-	-	-	-	-	-	-	324	151	-	462 303 -
Platoon blocked, %			-	-			-	-				
Mov Cap-1 Maneuver	397	397	-	-	799	799	-	-	39	23	596	23 22 329
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	39	23	-	23 22 -
Stage 1	-	-	-	-	-	-	-	-	265	321	-	104 156 -
Stage 2	-	-	-	-	-	-	-	-	275	151	-	451 302 -

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.4	0.2	54.4	59.6
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	95	397	-	-	799	-	-	23	245
HCM Lane V/C Ratio	0.238	0.309	-	-	0.046	-	-	0.414	0.199
HCM Control Delay (s)	54.4	18.1	-	-	9.7	-	-	245.4	23.3
HCM Lane LOS	F	C	-	-	A	-	-	F	C
HCM 95th %tile Q(veh)	0.9	1.3	-	-	0.1	-	-	1.2	0.7

HCM 2010 Signalized Intersection Summary

18: Skyway Rd & Bruce Rd

Existing
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	85	470	29	33	1269	328	27	18	10	173	57	162
Future Volume (veh/h)	85	470	29	33	1269	328	27	18	10	173	57	162
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1845	1845	1845	1900	1845	1845	1845
Adj Flow Rate, veh/h	101	560	30	39	1511	227	32	21	0	137	165	0
Adj No. of Lanes	2	2	0	1	2	1	1	1	0	1	1	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	235	1906	102	68	1868	962	122	128	0	200	210	179
Arrive On Green	0.07	0.56	0.54	0.04	0.53	0.50	0.07	0.07	0.00	0.11	0.11	0.00
Sat Flow, veh/h	3408	3384	181	1757	3505	1568	1757	1845	0	1757	1845	1568
Grp Volume(v), veh/h	101	290	300	39	1511	227	32	21	0	137	165	0
Grp Sat Flow(s),veh/h/ln	1704	1752	1813	1757	1752	1568	1757	1845	0	1757	1845	1568
Q Serve(g_s), s	2.1	6.4	6.5	1.6	26.4	4.9	1.3	0.8	0.0	5.6	6.5	0.0
Cycle Q Clear(g_c), s	2.1	6.4	6.5	1.6	26.4	4.9	1.3	0.8	0.0	5.6	6.5	0.0
Prop In Lane	1.00		0.10	1.00		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	235	987	1021	68	1868	962	122	128	0	200	210	179
V/C Ratio(X)	0.43	0.29	0.29	0.57	0.81	0.24	0.26	0.16	0.00	0.68	0.79	0.00
Avail Cap(c_a), veh/h	641	988	1022	260	1977	1010	318	334	0	460	483	411
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	33.3	8.5	8.6	35.2	14.3	6.5	32.8	32.6	0.0	31.7	32.1	0.0
Incr Delay (d2), s/veh	0.5	0.2	0.2	2.8	2.5	0.1	0.4	0.2	0.0	1.5	2.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	3.1	3.2	0.8	13.2	2.7	0.6	0.4	0.0	2.8	3.4	0.0
LnGrp Delay(d),s/veh	33.7	8.7	8.7	38.0	16.8	6.6	33.3	32.8	0.0	33.3	34.6	0.0
LnGrp LOS	C	A	A	D	B	A	C	C		C	C	
Approach Vol, veh/h	691		1777				53			302		
Approach Delay, s/veh	12.4		15.9				33.1			34.0		
Approach LOS	B		B				C			C		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	6.9	45.9			12.5	9.1	43.7	9.2				
Change Period (Y+Rc), s	3.0	6.0			3.5	3.0	6.0	4.5				
Max Green Setting (Gmax), s	12.0	40.0			20.0	15.0	40.0	13.0				
Max Q Clear Time (g_c+l1), s	3.6	8.5			8.5	4.1	28.4	3.3				
Green Ext Time (p_c), s	0.0	19.7			0.5	0.0	9.3	0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			17.3									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

1: Bruce Rd & SR 32

Existing
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	314	249	107	57	135	21	61	428	145	30	357	276
Future Volume (veh/h)	314	249	107	57	135	21	61	428	145	30	357	276
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	334	265	32	61	144	18	65	455	67	32	380	155
Adj No. of Lanes	1	1	1	1	1	0	1	1	1	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	380	544	453	77	196	25	94	528	449	59	492	748
Arrive On Green	0.22	0.30	0.30	0.04	0.12	0.12	0.05	0.29	0.29	0.03	0.27	0.27
Sat Flow, veh/h	1757	1845	1535	1757	1605	201	1757	1845	1568	1757	1845	1532
Grp Volume(v), veh/h	334	265	32	61	0	162	65	455	67	32	380	155
Grp Sat Flow(s),veh/h/ln	1757	1845	1535	1757	0	1806	1757	1845	1568	1757	1845	1532
Q Serve(g_s), s	11.9	7.6	1.0	2.2	0.0	5.6	2.3	15.1	2.1	1.2	12.3	3.8
Cycle Q Clear(g_c), s	11.9	7.6	1.0	2.2	0.0	5.6	2.3	15.1	2.1	1.2	12.3	3.8
Prop In Lane	1.00		1.00	1.00		0.11	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	380	544	453	77	0	221	94	528	449	59	492	748
V/C Ratio(X)	0.88	0.49	0.07	0.79	0.00	0.73	0.69	0.86	0.15	0.54	0.77	0.21
Avail Cap(c_a), veh/h	1061	1143	951	517	0	1119	544	857	729	544	1000	1170
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.5	18.7	16.4	30.6	0.0	27.3	30.0	21.8	17.2	30.7	21.8	9.6
Incr Delay (d2), s/veh	2.6	0.3	0.0	6.6	0.0	1.8	3.4	2.8	0.1	2.8	1.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.0	3.9	0.4	1.2	0.0	2.9	1.2	8.0	0.9	0.6	6.4	1.6
LnGrp Delay(d),s/veh	27.1	19.0	16.4	37.2	0.0	29.1	33.4	24.6	17.2	33.5	22.8	9.6
LnGrp LOS	C	B	B	D		C	C	C	B	C	C	A
Approach Vol, veh/h	631				223			587			567	
Approach Delay, s/veh	23.1				31.3			24.7			19.8	
Approach LOS	C				C			C			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.8	26.0	7.4	23.2	19.0	14.9	6.2	24.5				
Change Period (Y+Rc), s	* 5	7.0	* 4	* 6	* 5	7.0	* 4	* 6				
Max Green Setting (Gmax), s	* 19	40.0	* 20	* 35	* 39	40.0	* 20	* 30				
Max Q Clear Time (g_c+l1), s	4.2	9.6	4.3	14.3	13.9	7.6	3.2	17.1				
Green Ext Time (p_c), s	0.0	0.8	0.0	1.5	0.1	0.8	0.0	1.4				
Intersection Summary												
HCM 2010 Ctrl Delay			23.6									
HCM 2010 LOS			C									
Notes												

HCM 2010 Signalized Intersection Summary

2: SR 99 SB Ramps & E 20th St

Existing
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑	↑↑	↑↑					↑	↑	↑↑
Traffic Volume (veh/h)	0	1154	98	157	648	0	0	0	0	850	5	539
Future Volume (veh/h)	0	1154	98	157	648	0	0	0	0	850	5	539
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	1845	1845	0				1845	1845	1845
Adj Flow Rate, veh/h	0	1228	74	167	689	0				908	0	259
Adj No. of Lanes	0	2	1	2	2	0				2	0	2
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	3	3	3	3	0				3	3	3
Cap, veh/h	0	1496	660	264	1970	0				1033	0	922
Arrive On Green	0.00	0.43	0.43	0.08	0.56	0.00				0.29	0.00	0.29
Sat Flow, veh/h	0	3597	1546	3408	3597	0				3514	0	3136
Grp Volume(v), veh/h	0	1228	74	167	689	0				908	0	259
Grp Sat Flow(s),veh/h/ln	0	1752	1546	1704	1752	0				1757	0	1568
Q Serve(g_s), s	0.0	18.7	1.7	2.9	6.5	0.0				14.9	0.0	3.8
Cycle Q Clear(g_c), s	0.0	18.7	1.7	2.9	6.5	0.0				14.9	0.0	3.8
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1496	660	264	1970	0				1033	0	922
V/C Ratio(X)	0.00	0.82	0.11	0.63	0.35	0.00				0.88	0.00	0.28
Avail Cap(c_a), veh/h	0	2002	883	1411	2002	0				1746	0	1558
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	15.3	10.4	27.0	7.2	0.0				20.3	0.0	16.4
Incr Delay (d2), s/veh	0.0	1.6	0.0	0.9	0.0	0.0				1.4	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	9.2	0.7	1.4	3.1	0.0				7.4	0.0	1.7
LnGrp Delay(d),s/veh	0.0	16.8	10.4	28.0	7.2	0.0				21.7	0.0	16.5
LnGrp LOS		B	B	C	A					C		B
Approach Vol, veh/h		1302			856						1167	
Approach Delay, s/veh		16.5			11.3						20.6	
Approach LOS		B			B						C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	8.2	30.4		21.8		38.5						
Change Period (Y+Rc), s	3.5	4.6		4.1		4.6						
Max Green Setting (Gmax), s	25.0	34.5		30.0		34.5						
Max Q Clear Time (g_c+I1), s	4.9	20.7		16.9		8.5						
Green Ext Time (p_c), s	0.1	5.1		0.9		6.1						
Intersection Summary												
HCM 2010 Ctrl Delay			16.6									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

3: SR 99 NB Ramps & E 20th St

Existing
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	455	1549	0	0	707	787	98	3	219	0	0	0
Future Volume (veh/h)	455	1549	0	0	707	787	98	3	219	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1845	1845	0	0	1845	1845	1845	1845	1845			
Adj Flow Rate, veh/h	484	1648	0	0	752	391	106	0	182			
Adj No. of Lanes	2	2	0	0	2	1	2	0	1			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94			
Percent Heavy Veh, %	3	3	0	0	3	3	3	3	3			
Cap, veh/h	1232	2528	0	0	1085	474	517	0	231			
Arrive On Green	0.36	0.72	0.00	0.00	0.31	0.31	0.15	0.00	0.15			
Sat Flow, veh/h	3408	3597	0	0	3597	1531	3514	0	1568			
Grp Volume(v), veh/h	484	1648	0	0	752	391	106	0	182			
Grp Sat Flow(s),veh/h/ln	1704	1752	0	0	1752	1531	1757	0	1568			
Q Serve(g_s), s	7.3	17.1	0.0	0.0	13.1	16.4	1.8	0.0	7.7			
Cycle Q Clear(g_c), s	7.3	17.1	0.0	0.0	13.1	16.4	1.8	0.0	7.7			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	1232	2528	0	0	1085	474	517	0	231			
V/C Ratio(X)	0.39	0.65	0.00	0.00	0.69	0.83	0.21	0.00	0.79			
Avail Cap(c_a), veh/h	1232	2528	0	0	1773	774	1524	0	680			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	16.4	5.1	0.0	0.0	21.0	22.2	25.9	0.0	28.5			
Incr Delay (d2), s/veh	0.9	0.5	0.0	0.0	0.3	1.6	0.1	0.0	2.3			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	3.6	8.2	0.0	0.0	6.3	7.0	0.9	0.0	3.5			
LnGrp Delay(d),s/veh	17.4	5.5	0.0	0.0	21.3	23.7	26.0	0.0	30.8			
LnGrp LOS	B	A			C	C	C		C			
Approach Vol, veh/h	2132				1143				288			
Approach Delay, s/veh	8.2				22.1				29.0			
Approach LOS	A				C				C			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2				5		6		8			
Phs Duration (G+Y+Rc), s	54.9				28.5		26.4		14.3			
Change Period (Y+Rc), s	* 5				3.5		* 5		4.1			
Max Green Setting (Gmax), s	* 35				25.0		* 35		30.0			
Max Q Clear Time (g_c+I1), s	19.1				9.3		18.4		9.7			
Green Ext Time (p_c), s	7.6				0.9		3.0		0.5			
Intersection Summary												
HCM 2010 Ctrl Delay			14.4									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

4: E 20th St & Chico Mall

Existing
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	324	885	74	47	863	51	378	40	22	75	24	252
Future Volume (veh/h)	324	885	74	47	863	51	378	40	22	75	24	252
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1900	1900	1845	1845
Adj Flow Rate, veh/h	345	941	75	50	918	51	451	0	0	80	26	15
Adj No. of Lanes	2	2	0	1	2	0	2	1	0	0	1	2
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	452	1600	128	77	1322	73	615	323	0	111	36	223
Arrive On Green	0.13	0.49	0.49	0.04	0.39	0.39	0.17	0.00	0.00	0.08	0.08	0.08
Sat Flow, veh/h	3408	3282	262	1757	3373	187	3514	1845	0	1342	436	2692
Grp Volume(v), veh/h	345	502	514	50	477	492	451	0	0	106	0	15
Grp Sat Flow(s),veh/h/ln	1704	1752	1791	1757	1752	1808	1757	1845	0	1778	0	1346
Q Serve(g_s), s	7.0	14.8	14.8	2.0	16.3	16.3	8.7	0.0	0.0	4.2	0.0	0.4
Cycle Q Clear(g_c), s	7.0	14.8	14.8	2.0	16.3	16.3	8.7	0.0	0.0	4.2	0.0	0.4
Prop In Lane	1.00		0.15	1.00		0.10	1.00		0.00	0.75		1.00
Lane Grp Cap(c), veh/h	452	854	873	77	687	708	615	323	0	147	0	223
V/C Ratio(X)	0.76	0.59	0.59	0.65	0.69	0.69	0.73	0.00	0.00	0.72	0.00	0.07
Avail Cap(c_a), veh/h	951	856	875	490	856	883	1226	644	0	620	0	939
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	30.0	13.2	13.2	33.7	18.2	18.2	28.0	0.0	0.0	32.0	0.0	30.3
Incr Delay (d2), s/veh	1.0	0.9	0.9	3.4	1.5	1.5	0.6	0.0	0.0	2.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.4	7.3	7.5	1.0	8.1	8.4	4.3	0.0	0.0	2.1	0.0	0.1
LnGrp Delay(d),s/veh	31.0	14.1	14.1	37.1	19.7	19.7	28.6	0.0	0.0	34.5	0.0	30.3
LnGrp LOS	C	B	B	D	B	B	C			C		C
Approach Vol, veh/h	1361			1019			451			121		
Approach Delay, s/veh	18.4			20.5			28.6			34.0		
Approach LOS	B			C			C			C		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	4		5	6	8					
Phs Duration (G+Y+Rc), s	6.2	39.0	9.9		13.0	32.2	16.5					
Change Period (Y+Rc), s	3.0	4.1	4.0		3.5	4.1	4.0					
Max Green Setting (Gmax), s	20.0	35.0	25.0		20.0	35.0	25.0					
Max Q Clear Time (g_c+l1), s	4.0	16.8	6.2		9.0	18.3	10.7					
Green Ext Time (p_c), s	0.0	10.3	0.4		0.5	9.8	0.8					
Intersection Summary												
HCM 2010 Ctrl Delay			21.3									
HCM 2010 LOS			C									
Notes												

HCM 2010 Signalized Intersection Summary

5: Forest Ave & E 20th St

Existing
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	280	472	220	75	406	124	401	316	62	96	231	165
Future Volume (veh/h)	280	472	220	75	406	124	401	316	62	96	231	165
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.98	1.00		0.98	1.00		0.94
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1845	1845	1845	1845	1845	1845	1900
Adj Flow Rate, veh/h	298	502	162	80	432	19	427	336	17	102	246	16
Adj No. of Lanes	1	2	0	1	2	1	1	2	1	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	253	759	243	211	1009	442	439	1075	471	130	435	28
Arrive On Green	0.14	0.29	0.29	0.12	0.29	0.29	0.25	0.31	0.31	0.07	0.13	0.13
Sat Flow, veh/h	1757	2591	831	1757	3505	1536	1757	3505	1536	1757	3329	215
Grp Volume(v), veh/h	298	338	326	80	432	19	427	336	17	102	129	133
Grp Sat Flow(s),veh/h/ln	1757	1752	1670	1757	1752	1536	1757	1752	1536	1757	1752	1791
Q Serve(g_s), s	11.5	13.5	13.7	3.4	8.0	0.7	19.3	5.9	0.4	4.6	5.5	5.6
Cycle Q Clear(g_c), s	11.5	13.5	13.7	3.4	8.0	0.7	19.3	5.9	0.4	4.6	5.5	5.6
Prop In Lane	1.00		0.50	1.00		1.00	1.00		1.00	1.00		0.12
Lane Grp Cap(c), veh/h	253	513	489	211	1009	442	439	1075	471	130	229	234
V/C Ratio(X)	1.18	0.66	0.67	0.38	0.43	0.04	0.97	0.31	0.04	0.78	0.56	0.57
Avail Cap(c_a), veh/h	253	513	489	211	1009	442	439	1075	471	275	372	381
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.72	0.72	0.72	0.98	0.98	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.3	24.8	24.8	32.4	23.1	20.5	29.7	21.3	8.6	36.4	32.6	32.7
Incr Delay (d2), s/veh	106.6	1.8	2.0	0.4	1.3	0.2	35.5	0.1	0.0	3.9	0.8	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.0	6.7	6.6	1.6	4.0	0.3	13.6	2.9	0.2	2.3	2.7	2.8
LnGrp Delay(d),s/veh	140.8	26.6	26.8	32.9	24.4	20.7	65.2	21.3	8.6	40.3	33.4	33.5
LnGrp LOS	F	C	C	C	C	C	E	C	A	D	C	C
Approach Vol, veh/h	962			531			780			364		
Approach Delay, s/veh	62.1			25.6			45.1			35.4		
Approach LOS	E			C			D			D		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	14.5	27.5	8.9	29.0	14.1	27.9	23.0	15.0				
Change Period (Y+Rc), s	3.0	4.5	3.0	4.5	4.5	* 4.5	3.0	4.5				
Max Green Setting (Gmax), s	11.5	16.5	12.5	24.0	8.5	* 19	20.0	17.0				
Max Q Clear Time (g_c+l1), s	13.5	10.0	6.6	7.9	5.4	15.7	21.3	7.6				
Green Ext Time (p_c), s	0.0	1.1	0.1	2.2	0.7	0.8	0.0	1.0				
Intersection Summary												
HCM 2010 Ctrl Delay				46.0								
HCM 2010 LOS				D								
Notes												

HCM 2010 Signalized Intersection Summary

6: Huntington Dr & E 20th St

Existing
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	63	433	55	22	361	47	42	8	12	106	6	75
Future Volume (veh/h)	63	433	55	22	361	47	42	8	12	106	6	75
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.97	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1900	1845	1900	1900	1845	1845
Adj Flow Rate, veh/h	67	461	47	23	384	35	45	9	3	113	6	16
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	128	1109	112	72	1019	92	412	69	14	553	23	333
Arrive On Green	0.07	0.35	0.35	0.04	0.31	0.31	0.22	0.22	0.22	0.22	0.22	0.22
Sat Flow, veh/h	1757	3202	325	1757	3242	294	832	320	64	1391	107	1548
Grp Volume(v), veh/h	67	251	257	23	207	212	57	0	0	119	0	16
Grp Sat Flow(s),veh/h/ln	1757	1752	1775	1757	1752	1783	1216	0	0	1498	0	1548
Q Serve(g_s), s	1.0	3.0	3.1	0.4	2.5	2.6	0.3	0.0	0.0	0.0	0.0	0.2
Cycle Q Clear(g_c), s	1.0	3.0	3.1	0.4	2.5	2.6	1.9	0.0	0.0	1.6	0.0	0.2
Prop In Lane	1.00		0.18	1.00		0.16	0.79		0.05	0.95		1.00
Lane Grp Cap(c), veh/h	128	607	614	72	551	561	495	0	0	576	0	333
V/C Ratio(X)	0.52	0.41	0.42	0.32	0.37	0.38	0.12	0.00	0.00	0.21	0.00	0.05
Avail Cap(c_a), veh/h	952	2533	2565	1269	2533	2577	1223	0	0	1279	0	1118
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.4	6.9	6.9	12.9	7.4	7.4	9.0	0.0	0.0	9.1	0.0	8.6
Incr Delay (d2), s/veh	1.2	0.2	0.2	0.9	0.2	0.2	0.0	0.0	0.0	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	1.4	1.5	0.2	1.2	1.3	0.4	0.0	0.0	0.8	0.0	0.1
LnGrp Delay(d),s/veh	13.6	7.1	7.1	13.8	7.5	7.5	9.1	0.0	0.0	9.2	0.0	8.6
LnGrp LOS	B	A	A	B	A	A	A			A		A
Approach Vol, veh/h	575				442				57		135	
Approach Delay, s/veh	7.8				7.9				9.1		9.1	
Approach LOS	A				A				A		A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	4.1	14.6			9.0	5.0	13.7	9.0				
Change Period (Y+Rc), s	3.0	5.0			3.0	3.0	5.0	3.0				
Max Green Setting (Gmax), s	20.0	40.0			20.0	15.0	40.0	20.0				
Max Q Clear Time (g_c+l1), s	2.4	5.1			3.6	3.0	4.6	3.9				
Green Ext Time (p_c), s	0.0	3.7			0.6	0.0	3.7	0.6				
Intersection Summary												
HCM 2010 Ctrl Delay			8.1									
HCM 2010 LOS			A									
Notes												

Intersection

Int Delay, s/veh 8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↑	↑	↑	↑
Traffic Vol, veh/h	388	162	50	227	189	89
Future Vol, veh/h	388	162	50	227	189	89
Conflicting Peds, #/hr	0	1	0	0	0	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	100	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	413	172	53	241	201	95

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	848
Stage 1	-	-	500
Stage 2	-	-	348
Critical Hdwy	-	4.145	6.645
Critical Hdwy Stg 1	-	-	5.845
Critical Hdwy Stg 2	-	-	5.445
Follow-up Hdwy	-	2.2285	3.5285
Pot Cap-1 Maneuver	-	981	314
Stage 1	-	-	573
Stage 2	-	-	711
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	980	297
Mov Cap-2 Maneuver	-	-	297
Stage 1	-	-	573
Stage 2	-	-	673

Approach	EB	WB	NB
HCM Control Delay, s	0	1.6	30.2
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	297	698	-	-	980	-
HCM Lane V/C Ratio	0.677	0.136	-	-	0.054	-
HCM Control Delay (s)	39.2	11	-	-	8.9	-
HCM Lane LOS	E	B	-	-	A	-
HCM 95th %tile Q(veh)	4.6	0.5	-	-	0.2	-

HCM 2010 Signalized Intersection Summary

8: Bruce Rd & E 20th St

Existing
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	267	91	119	18	52	26	52	387	49	33	349	146
Future Volume (veh/h)	267	91	119	18	52	26	52	387	49	33	349	146
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.97	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1900	1845	1845	1845
Adj Flow Rate, veh/h	284	97	39	19	55	10	55	412	49	35	371	101
Adj No. of Lanes	1	1	1	1	1	0	1	1	0	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	332	497	422	55	169	31	121	605	72	90	656	557
Arrive On Green	0.19	0.27	0.27	0.03	0.11	0.11	0.07	0.37	0.37	0.05	0.36	0.36
Sat Flow, veh/h	1757	1845	1568	1757	1510	275	1757	1618	192	1757	1845	1568
Grp Volume(v), veh/h	284	97	39	19	0	65	55	0	461	35	371	101
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	0	1785	1757	0	1811	1757	1845	1568
Q Serve(g_s), s	9.7	2.5	1.2	0.7	0.0	2.1	1.9	0.0	13.3	1.2	10.1	2.7
Cycle Q Clear(g_c), s	9.7	2.5	1.2	0.7	0.0	2.1	1.9	0.0	13.3	1.2	10.1	2.7
Prop In Lane	1.00		1.00	1.00		0.15	1.00		0.11	1.00		1.00
Lane Grp Cap(c), veh/h	332	497	422	55	0	200	121	0	676	90	656	557
V/C Ratio(X)	0.86	0.20	0.09	0.34	0.00	0.32	0.45	0.00	0.68	0.39	0.57	0.18
Avail Cap(c_a), veh/h	567	1221	1038	567	0	576	567	0	1169	567	1191	1012
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.3	17.5	17.0	29.4	0.0	25.3	27.7	0.0	16.3	28.5	16.1	13.7
Incr Delay (d2), s/veh	2.5	0.1	0.0	1.4	0.0	0.3	1.0	0.0	1.7	1.0	1.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.9	1.3	0.5	0.3	0.0	1.0	0.9	0.0	6.9	0.6	5.2	1.2
LnGrp Delay(d),s/veh	26.9	17.5	17.0	30.7	0.0	25.7	28.7	0.0	18.0	29.5	17.2	14.0
LnGrp LOS	C	B	B	C		C	C		B	C	B	B
Approach Vol, veh/h	420				84			516			507	
Approach Delay, s/veh	23.8				26.8			19.2			17.4	
Approach LOS	C				C			B			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.2	28.1	6.0	20.7	8.3	27.0	15.7	10.9				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	20.0	40.0	20.0	41.0	20.0	40.0	20.0	20.0				
Max Q Clear Time (g_c+l1), s	3.2	15.3	2.7	4.5	3.9	12.1	11.7	4.1				
Green Ext Time (p_c), s	0.0	7.9	0.0	0.5	0.0	8.2	0.1	0.4				
Intersection Summary												
HCM 2010 Ctrl Delay	20.3											
HCM 2010 LOS	C											

HCM 2010 TWSC
9: Notre Dame Blvd & Parkhurst St

Existing
PM Peak Hour

Intersection						
Int Delay, s/veh	1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	23	240	6	28	164
Future Vol, veh/h	3	23	240	6	28	164
Conflicting Peds, #/hr	0	1	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	24	255	6	30	174
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	493	260	0	0	262	0
Stage 1	259	-	-	-	-	-
Stage 2	234	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	535	779	-	-	1302	-
Stage 1	784	-	-	-	-	-
Stage 2	805	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	521	778	-	-	1301	-
Mov Cap-2 Maneuver	596	-	-	-	-	-
Stage 1	784	-	-	-	-	-
Stage 2	784	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	10		0		1.1	
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 752	1301	-		
HCM Lane V/C Ratio	-	- 0.037	0.023	-		
HCM Control Delay (s)	-	- 10	7.8	0		
HCM Lane LOS	-	- B	A	A		
HCM 95th %tile Q(veh)	-	- 0.1	0.1	-		

HCM 2010 TWSC
10: Notre Dame Blvd & Jasper Dr

Existing
PM Peak Hour

Intersection

Int Delay, s/veh 0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	5	251	13	11	157
Future Vol, veh/h	6	5	251	13	11	157
Conflicting Peds, #/hr	0	0	0	1	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	5	267	14	12	167

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	465	275	0	0	282	0
Stage 1	275	-	-	-	-	-
Stage 2	190	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	556	764	-	-	1280	-
Stage 1	771	-	-	-	-	-
Stage 2	842	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	550	763	-	-	1280	-
Mov Cap-2 Maneuver	615	-	-	-	-	-
Stage 1	770	-	-	-	-	-
Stage 2	834	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	10.4		0		0.5
HCM LOS	B				

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 674	1280	-
HCM Lane V/C Ratio	-	- 0.017	0.009	-
HCM Control Delay (s)	-	- 10.4	7.8	-
HCM Lane LOS	-	- B	A	-
HCM 95th %tile Q(veh)	-	- 0.1	0	-

HCM 2010 TWSC
11: Notre Dame Blvd & Webster Dr

Existing
PM Peak Hour

Intersection

Int Delay, s/veh 1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	15	276	28	25	159
Future Vol, veh/h	25	15	276	28	25	159
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	27	16	294	30	27	169

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	531	309	0	0	323	0
Stage 1	309	-	-	-	-	-
Stage 2	222	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	509	731	-	-	1237	-
Stage 1	745	-	-	-	-	-
Stage 2	815	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	498	731	-	-	1237	-
Mov Cap-2 Maneuver	578	-	-	-	-	-
Stage 1	745	-	-	-	-	-
Stage 2	797	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.2	0	1.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 627	1237	-
HCM Lane V/C Ratio	-	- 0.068	0.022	-
HCM Control Delay (s)	-	- 11.2	8	-
HCM Lane LOS	-	- B	A	-
HCM 95th %tile Q(veh)	-	- 0.2	0.1	-

HCM 2010 Signalized Intersection Summary

12: Notre Dame Blvd & Forest Ave

Existing
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	83	472	33	54	41	375	230	23	18	157	20
Future Volume (veh/h)	32	83	472	33	54	41	375	230	23	18	157	20
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	34	88	58	35	57	16	399	245	20	19	167	11
Adj No. of Lanes	1	1	2	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	97	313	455	99	235	66	469	1356	110	59	601	39
Arrive On Green	0.05	0.17	0.17	0.06	0.17	0.17	0.26	0.41	0.41	0.03	0.18	0.18
Sat Flow, veh/h	1774	1863	2706	1774	1388	390	1774	3309	268	1774	3373	220
Grp Volume(v), veh/h	34	88	58	35	0	73	399	130	135	19	87	91
Grp Sat Flow(s),veh/h/ln	1774	1863	1353	1774	0	1778	1774	1770	1807	1774	1770	1823
Q Serve(g_s), s	0.8	1.7	0.8	0.8	0.0	1.5	9.0	2.0	2.0	0.4	1.8	1.8
Cycle Q Clear(g_c), s	0.8	1.7	0.8	0.8	0.0	1.5	9.0	2.0	2.0	0.4	1.8	1.8
Prop In Lane	1.00		1.00	1.00		0.22	1.00		0.15	1.00		0.12
Lane Grp Cap(c), veh/h	97	313	455	99	0	301	469	725	741	59	316	325
V/C Ratio(X)	0.35	0.28	0.13	0.35	0.00	0.24	0.85	0.18	0.18	0.32	0.28	0.28
Avail Cap(c_a), veh/h	928	1196	1738	717	0	1015	1139	1347	1376	717	1137	1171
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.2	15.3	14.9	19.1	0.0	15.1	14.7	7.9	7.9	19.9	14.9	14.9
Incr Delay (d2), s/veh	0.8	0.2	0.0	0.8	0.0	0.2	1.7	0.1	0.1	1.2	0.5	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.9	0.3	0.4	0.0	0.7	4.5	1.0	1.0	0.2	0.9	1.0
LnGrp Delay(d),s/veh	20.0	15.4	14.9	19.9	0.0	15.3	16.4	8.0	8.0	21.0	15.4	15.4
LnGrp LOS	B	B	B	B		B	B	A	A	C	B	B
Approach Vol, veh/h	180			108			664			197		
Approach Delay, s/veh	16.1			16.8			13.0			15.9		
Approach LOS	B			B			B			B		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	5.3	11.1	4.4	21.2	5.3	11.1	14.1	11.5				
Change Period (Y+Rc), s	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0				
Max Green Setting (Gmax), s	22.0	24.0	17.0	32.0	17.0	27.0	27.0	27.0				
Max Q Clear Time (g_c+I1), s	2.8	3.5	2.4	4.0	2.8	3.7	11.0	3.8				
Green Ext Time (p_c), s	0.0	0.6	0.0	2.7	0.0	0.7	0.2	2.6				
Intersection Summary												
HCM 2010 Ctrl Delay				14.4								
HCM 2010 LOS	B											
Notes												

HCM 2010 TWSC
13: Bruce Rd & Raley Blvd

Existing
PM Peak Hour

Intersection

Int Delay, s/veh 9.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	127	153	26	359	438	49
Future Vol, veh/h	127	153	26	359	438	49
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	135	163	28	382	466	52

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	929	492	518	0	-	0
Stage 1	492	-	-	-	-	-
Stage 2	437	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	297	577	1048	-	-	-
Stage 1	615	-	-	-	-	-
Stage 2	651	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	289	577	1048	-	-	-
Mov Cap-2 Maneuver	289	-	-	-	-	-
Stage 1	615	-	-	-	-	-
Stage 2	634	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	36.7	0.6	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1048	-	397	-	-
HCM Lane V/C Ratio	0.026	-	0.75	-	-
HCM Control Delay (s)	8.5	-	36.7	-	-
HCM Lane LOS	A	-	E	-	-
HCM 95th %tile Q(veh)	0.1	-	6.1	-	-

HCM 2010 Signalized Intersection Summary

14: SR 99 SB Ramps & Skyway Rd

Existing
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑		↑↑	↑				↑↑		↑
Traffic Volume (veh/h)	0	1399	233	0	754	239	0	0	0	949	0	301
Future Volume (veh/h)	0	1399	233	0	754	239	0	0	0	949	0	301
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	0	1845	1845				1845	0	1845
Adj Flow Rate, veh/h	0	1488	0	0	802	0				1010	0	220
Adj No. of Lanes	0	2	1	0	2	1				2	0	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	3	3	0	3	3				3	0	3
Cap, veh/h	0	1726	772	0	1726	772				1129	0	519
Arrive On Green	0.00	0.49	0.00	0.00	0.49	0.00				0.33	0.00	0.33
Sat Flow, veh/h	0	3597	1568	0	3597	1568				3408	0	1568
Grp Volume(v), veh/h	0	1488	0	0	802	0				1010	0	220
Grp Sat Flow(s),veh/h/ln	0	1752	1568	0	1752	1568				1704	0	1568
Q Serve(g_s), s	0.0	21.2	0.0	0.0	8.5	0.0				16.0	0.0	6.2
Cycle Q Clear(g_c), s	0.0	21.2	0.0	0.0	8.5	0.0				16.0	0.0	6.2
Prop In Lane	0.00		1.00	0.00		1.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1726	772	0	1726	772				1129	0	519
V/C Ratio(X)	0.00	0.86	0.00	0.00	0.46	0.00				0.89	0.00	0.42
Avail Cap(c_a), veh/h	0	3090	1382	0	3090	1382				2103	0	968
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	12.7	0.0	0.0	9.5	0.0				18.0	0.0	14.8
Incr Delay (d2), s/veh	0.0	0.5	0.0	0.0	0.1	0.0				1.1	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	10.3	0.0	0.0	4.1	0.0				7.6	0.0	2.7
LnGrp Delay(d),s/veh	0.0	13.2	0.0	0.0	9.5	0.0				19.1	0.0	15.0
LnGrp LOS		B			A					B		B
Approach Vol, veh/h		1488			802						1230	
Approach Delay, s/veh		13.2			9.5						18.4	
Approach LOS		B			A						B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		32.9		23.8		32.9						
Change Period (Y+Rc), s		* 5		* 5		* 5						
Max Green Setting (Gmax), s		* 50		* 35		* 50						
Max Q Clear Time (g_c+I1), s		23.2		18.0		10.5						
Green Ext Time (p_c), s		4.7		0.8		4.8						
Intersection Summary												
HCM 2010 Ctrl Delay			14.2									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

15: SR 99 NB Ramps & Skyway Rd

Existing
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗		↑↑	↗	↗↗		↗			
Traffic Volume (veh/h)	0	1798	550	0	836	1017	157	0	285	0	0	0
Future Volume (veh/h)	0	1798	550	0	836	1017	157	0	285	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1845	1845	0	1845	1845	1845	0	1845			
Adj Flow Rate, veh/h	0	1913	0	0	889	0	167	0	282			
Adj No. of Lanes	0	2	1	0	2	1	2	0	1			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94			
Percent Heavy Veh, %	0	3	3	0	3	3	3	0	3			
Cap, veh/h	0	2235	1000	0	2235	1000	718	0	330			
Arrive On Green	0.00	0.64	0.00	0.00	0.64	0.00	0.21	0.00	0.21			
Sat Flow, veh/h	0	3597	1568	0	3597	1568	3408	0	1568			
Grp Volume(v), veh/h	0	1913	0	0	889	0	167	0	282			
Grp Sat Flow(s),veh/h/ln	0	1752	1568	0	1752	1568	1704	0	1568			
Q Serve(g_s), s	0.0	25.8	0.0	0.0	7.3	0.0	2.4	0.0	10.3			
Cycle Q Clear(g_c), s	0.0	25.8	0.0	0.0	7.3	0.0	2.4	0.0	10.3			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2235	1000	0	2235	1000	718	0	330			
V/C Ratio(X)	0.00	0.86	0.00	0.00	0.40	0.00	0.23	0.00	0.85			
Avail Cap(c_a), veh/h	0	2953	1321	0	2953	1321	1436	0	661			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	8.6	0.0	0.0	5.2	0.0	19.4	0.0	22.5			
Incr Delay (d2), s/veh	0.0	1.6	0.0	0.0	0.0	0.0	0.1	0.0	2.5			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	12.7	0.0	0.0	3.5	0.0	1.1	0.0	4.6			
LnGrp Delay(d),s/veh	0.0	10.2	0.0	0.0	5.3	0.0	19.5	0.0	25.0			
LnGrp LOS		B			A		B		C			
Approach Vol, veh/h		1913			889			449				
Approach Delay, s/veh		10.2			5.3			23.0				
Approach LOS		B			A			C				
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2				6		8				
Phs Duration (G+Y+Rc), s		42.8				42.8		16.5				
Change Period (Y+Rc), s		* 5				* 5		4.0				
Max Green Setting (Gmax), s		* 50				* 50		25.0				
Max Q Clear Time (g_c+I1), s		27.8				9.3		12.3				
Green Ext Time (p_c), s		10.0				12.0		0.2				
Intersection Summary												
HCM 2010 Ctrl Delay			10.6									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

16: Notre Dame Blvd & Skyway Rd

Existing
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (veh/h)	580	1210	293	2	51	942	111	346	130	64	135	86
Future Volume (veh/h)	580	1210	293	2	51	942	111	346	130	64	135	86
Number	5	2	12		1	6	16	3	8	18	7	4
Initial Q (Qb), veh	0	0	0		0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97		1.00		0.98	1.00		0.98	1.00	
Parking Bus, Adj	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845		1845	1845	1845	1845	1845	1900	1845	1845
Adj Flow Rate, veh/h	617	1287	222		54	1002	46	368	138	54	118	128
Adj No. of Lanes	2	3	1		1	3	1	2	1	0	1	1
Peak Hour Factor	0.94	0.94	0.94		0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3		3	3	3	3	3	3	3	3
Cap, veh/h	708	2243	926		96	1487	455	534	196	77	317	333
Arrive On Green	0.21	0.45	0.45		0.05	0.30	0.30	0.16	0.16	0.16	0.18	0.18
Sat Flow, veh/h	3408	5036	1528		1757	5036	1542	3408	1254	491	1757	1845
Grp Volume(v), veh/h	617	1287	222		54	1002	46	368	0	192	118	128
Grp Sat Flow(s),veh/h/ln	1704	1679	1528		1757	1679	1542	1704	0	1745	1757	1845
Q Serve(g_s), s	17.4	18.9	6.7		3.0	17.4	2.2	10.1	0.0	10.4	5.9	6.1
Cycle Q Clear(g_c), s	17.4	18.9	6.7		3.0	17.4	2.2	10.1	0.0	10.4	5.9	6.1
Prop In Lane	1.00		1.00		1.00		1.00	1.00		0.28	1.00	
Lane Grp Cap(c), veh/h	708	2243	926		96	1487	455	534	0	273	317	333
V/C Ratio(X)	0.87	0.57	0.24		0.56	0.67	0.10	0.69	0.00	0.70	0.37	0.38
Avail Cap(c_a), veh/h	858	2243	926		442	2028	621	1029	0	527	531	557
HCM Platoon Ratio	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00		1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.1	20.5	9.2		45.8	30.8	25.4	39.6	0.0	39.7	35.8	35.9
Incr Delay (d2), s/veh	8.4	0.4	0.1		5.1	0.5	0.1	1.6	0.0	3.3	0.7	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.0	8.8	4.0		1.6	8.1	0.9	4.9	0.0	5.3	2.9	3.2
LnGrp Delay(d),s/veh	46.5	20.9	9.3		50.9	31.3	25.5	41.2	0.0	43.0	36.5	36.6
LnGrp LOS	D	C	A		D	C	C	D		D	D	D
Approach Vol, veh/h	2126			1102			560			786		
Approach Delay, s/veh	27.1			32.0			41.8			27.1		
Approach LOS	C			C			D			C		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	4		5	6	8					
Phs Duration (G+Y+Rc), s	9.4	49.0	21.6		24.3	34.1	19.3					
Change Period (Y+Rc), s	4.0	4.8	3.7		3.7	4.8	3.7					
Max Green Setting (Gmax), s	25.0	40.0	30.0		25.0	40.0	30.0					
Max Q Clear Time (g_c+l1), s	5.0	20.9	14.9		19.4	19.4	12.4					
Green Ext Time (p_c), s	0.1	15.1	3.0		1.2	9.9	2.4					
Intersection Summary												
HCM 2010 Ctrl Delay				30.1								
HCM 2010 LOS	C											
Notes												

Existing
PM Peak Hour

Synchro 9
08/31/2017

HCM 2010 TWSC
17: Skyway Rd & Forest Ave

Existing
PM Peak Hour

Intersection													
Int Delay, s/veh	15.3												
Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔		↔	↔			↔		↔	↔	
Traffic Vol, veh/h	13	98	1267	61	8	811	32	31	3	17	22	2	114
Future Vol, veh/h	13	98	1267	61	8	811	32	31	3	17	22	2	114
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	250	-	-	150	-	-	-	-	-	100	-	-
Veh in Median Storage, #	-	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	14	104	1348	65	9	863	34	33	3	18	23	2	121

Major/Minor	Major1				Major2			Minor1			Minor2		
Conflicting Flow All	654	898	0	0	1413	0	0	2065	2531	706	1810	2547	449
Stage 1	-	-	-	-	-	-	-	1616	1616	-	898	898	-
Stage 2	-	-	-	-	-	-	-	449	915	-	912	1649	-
Critical Hdwy	6.46	4.16	-	-	4.16	-	-	7.56	6.56	6.96	7.56	6.56	6.96
Critical Hdwy Stg 1	-	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Follow-up Hdwy	2.53	2.23	-	-	2.23	-	-	3.53	4.03	3.33	3.53	4.03	3.33
Pot Cap-1 Maneuver	549	746	-	-	473	-	-	~ 31	27	376	49	26	555
Stage 1	-	-	-	-	-	-	-	107	159	-	299	354	-
Stage 2	-	-	-	-	-	-	-	556	347	-	293	153	-
Platoon blocked, %			-	-		-	-						
Mov Cap-1 Maneuver	689	689	-	-	473	-	-	~ 22	26	376	42	25	555
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	~ 22	26	-	42	25	-
Stage 1	-	-	-	-	-	-	-	107	159	-	299	347	-
Stage 2	-	-	-	-	-	-	-	424	340	-	273	153	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.9	0.1	\$ 606.1	41.7
HCM LOS			F	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	32	689	-	-	473	-	-	42	406
HCM Lane V/C Ratio	1.695	0.171	-	-	0.018	-	-	0.557	0.304
HCM Control Delay (s)	\$ 606.1	11.3	-	-	12.8	-	-	168.3	17.7
HCM Lane LOS	F	B	-	-	B	-	-	F	C
HCM 95th %tile Q(veh)	6.1	0.6	-	-	0.1	-	-	2	1.3

Notes			
~: Volume exceeds capacity	\$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

HCM 2010 Signalized Intersection Summary

18: Skyway Rd & Bruce Rd

Existing
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	146	1108	37	17	623	191	75	50	46	466	31	107
Future Volume (veh/h)	146	1108	37	17	623	191	75	50	46	466	31	107
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1845	1845	1845	1900	1845	1845	1845
Adj Flow Rate, veh/h	155	1179	37	18	663	108	80	53	16	520	0	20
Adj No. of Lanes	2	2	0	1	2	1	1	1	0	2	0	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	315	1602	50	52	1397	910	162	125	38	638	0	284
Arrive On Green	0.09	0.46	0.46	0.03	0.40	0.40	0.09	0.09	0.09	0.18	0.00	0.18
Sat Flow, veh/h	3408	3469	109	1757	3505	1568	1757	1356	409	3514	0	1563
Grp Volume(v), veh/h	155	595	621	18	663	108	80	0	69	520	0	20
Grp Sat Flow(s),veh/h/ln	1704	1752	1825	1757	1752	1568	1757	0	1765	1757	0	1563
Q Serve(g_s), s	3.1	20.0	20.0	0.7	10.1	2.2	3.1	0.0	2.7	10.3	0.0	0.8
Cycle Q Clear(g_c), s	3.1	20.0	20.0	0.7	10.1	2.2	3.1	0.0	2.7	10.3	0.0	0.8
Prop In Lane	1.00		0.06	1.00		1.00	1.00		0.23	1.00		1.00
Lane Grp Cap(c), veh/h	315	809	843	52	1397	910	162	0	162	638	0	284
V/C Ratio(X)	0.49	0.74	0.74	0.35	0.47	0.12	0.50	0.00	0.43	0.81	0.00	0.07
Avail Cap(c_a), veh/h	707	970	1010	292	1939	1152	316	0	317	972	0	432
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	31.2	15.9	15.9	34.4	16.1	6.8	31.2	0.0	31.0	28.4	0.0	24.5
Incr Delay (d2), s/veh	0.4	2.4	2.3	1.5	0.3	0.1	0.9	0.0	0.7	1.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	10.1	10.5	0.4	4.9	1.4	1.6	0.0	1.3	5.1	0.0	0.3
LnGrp Delay(d),s/veh	31.6	18.3	18.2	35.9	16.4	6.9	32.1	0.0	31.7	30.2	0.0	24.6
LnGrp LOS	C	B	B	D	B	A	C		C	C		C
Approach Vol, veh/h	1371				789				149		540	
Approach Delay, s/veh	19.7				15.5				31.9		30.0	
Approach LOS	B				B				C		C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	5.1	39.4			16.6	9.7	34.8	11.1				
Change Period (Y+Rc), s	3.0	6.0			3.5	3.0	6.0	4.5				
Max Green Setting (Gmax), s	12.0	40.0			20.0	15.0	40.0	13.0				
Max Q Clear Time (g_c+l1), s	2.7	22.0			12.3	5.1	12.1	5.1				
Green Ext Time (p_c), s	0.0	11.3			0.7	0.0	14.8	0.2				
Intersection Summary												
HCM 2010 Ctrl Delay			21.1									
HCM 2010 LOS			C									
Notes												

Queuing and Blocking Report
Existing

08/31/2017

Intersection: 2: SR 99 SB Ramps & E 20th St

Movement	EB	EB	EB	WB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	R	L	L	T	T	L	LT	R	R
Maximum Queue (ft)	179	134	28	58	75	122	141	164	175	58	50
Average Queue (ft)	109	46	9	22	48	64	87	88	114	34	22
95th Queue (ft)	187	125	27	61	78	139	149	166	182	61	50
Link Distance (ft)	379	379				987	987		1959		
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)			110	280	280			490		425	425
Storage Blk Time (%)		1									
Queuing Penalty (veh)		0									

Queuing and Blocking Report
Existing

08/31/2017

Intersection: 3: SR 99 NB Ramps & E 20th St

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	L	L	T	T	T	T	R	L	LT	R
Maximum Queue (ft)	67	114	237	265	152	140	178	25	61	110
Average Queue (ft)	26	48	92	115	90	74	99	7	30	54
95th Queue (ft)	70	134	242	265	160	142	182	27	62	109
Link Distance (ft)			987	987	393	393			1956	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	260	260					200	550		550
Storage Blk Time (%)		0	1			0	1			
Queuing Penalty (veh)		0	1			0	1			

Queuing and Blocking Report
Existing

08/31/2017

Intersection: 14: SR 99 SB Ramps & Skyway Rd

Movement	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	T	T	T	T	R	L	L	R
Maximum Queue (ft)	137	180	210	233	125	227	219	247
Average Queue (ft)	73	102	137	144	56	151	154	168
95th Queue (ft)	139	183	211	237	156	233	226	264
Link Distance (ft)	629	629	1030	1030			1970	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)					100	440		360
Storage Blk Time (%)				13	0			0
Queuing Penalty (veh)				28	1			0

Queuing and Blocking Report
Existing

08/31/2017

Intersection: 15: SR 99 NB Ramps & Skyway Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	T	T	R	T	T	R	L	L	R
Maximum Queue (ft)	162	192	49	59	315	522	44	86	127
Average Queue (ft)	93	109	9	20	72	121	22	48	74
95th Queue (ft)	164	196	49	60	397	613	49	91	123
Link Distance (ft)	1030	1030		856	856	856		1886	
Upstream Blk Time (%)					0	1			
Queuing Penalty (veh)					1	4			
Storage Bay Dist (ft)			100				320		225
Storage Blk Time (%)		4	0						
Queuing Penalty (veh)		13	0						

Queuing and Blocking Report
Existing

08/31/2017

Intersection: 2: SR 99 SB Ramps & E 20th St

Movement	EB	EB	EB	WB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	R	L	L	T	T	L	LT	R	R
Maximum Queue (ft)	425	403	122	66	86	206	224	261	283	94	97
Average Queue (ft)	366	305	42	34	59	125	147	189	212	49	57
95th Queue (ft)	479	478	129	74	90	237	252	274	296	92	102
Link Distance (ft)	379	379				987	987		2575		
Upstream Blk Time (%)	29	9									
Queuing Penalty (veh)	0	0									
Storage Bay Dist (ft)			110	280	280			490		425	425
Storage Blk Time (%)		19	0			0					
Queuing Penalty (veh)		19	1			0					

Queuing and Blocking Report
Existing

08/31/2017

Intersection: 3: SR 99 NB Ramps & E 20th St

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	L	L	T	T	T	T	R	L	LT	R
Maximum Queue (ft)	155	171	224	285	203	399	275	53	84	167
Average Queue (ft)	100	107	113	164	141	269	254	19	43	110
95th Queue (ft)	164	177	219	291	212	474	326	53	85	179
Link Distance (ft)			987	987	393	393			1956	
Upstream Blk Time (%)						3				
Queuing Penalty (veh)						20				
Storage Bay Dist (ft)	260	260					200	550		550
Storage Blk Time (%)			0			0	37			
Queuing Penalty (veh)			1			3	141			

Queuing and Blocking Report
Existing

08/31/2017

Intersection: 14: SR 99 SB Ramps & Skyway Rd

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	T	T	R	T	T	R	L	L	R
Maximum Queue (ft)	555	611	367	182	220	135	249	253	139
Average Queue (ft)	375	458	157	114	127	51	176	180	86
95th Queue (ft)	690	719	554	197	227	166	252	257	144
Link Distance (ft)	629	629		1030	1030			2092	
Upstream Blk Time (%)	4	10							
Queuing Penalty (veh)	0	0							
Storage Bay Dist (ft)			500			100	440		360
Storage Blk Time (%)		12	0		9				
Queuing Penalty (veh)		30	1		23				

Queuing and Blocking Report
Existing

08/31/2017

Intersection: 15: SR 99 NB Ramps & Skyway Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	T	T	R	T	T	R	L	L	R
Maximum Queue (ft)	564	606	120	67	166	263	62	95	183
Average Queue (ft)	332	342	59	18	51	62	26	60	110
95th Queue (ft)	602	662	148	72	292	429	65	100	188
Link Distance (ft)	1030	1030		856	856	856			1886
Upstream Blk Time (%)					0	0			
Queuing Penalty (veh)					0	1			
Storage Bay Dist (ft)			100				320	320	
Storage Blk Time (%)		15	0						
Queuing Penalty (veh)		86	3						

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	South of Skyway Road
Alternative	Existing Conditions
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	1,445	vph
Peak-hour factor, PHF	0.83	
Peak 15-min volume, v_{15}	435	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	1,798	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	899	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.38	
Density, D	13.8	pcpmpl
Level of service, LOS	B	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	1,445	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	349	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	1,445	349		vph
Peak-hour factor, PHF	0.83	0.85		
Peak 15-min volume, v_{15}	435	103		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	1,798	417		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	1,798	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	1,798	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	1,382	pcph	4,700	pcph	No
Ramp volume, v_R	417	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, v_{12A} =	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	Actual		Maximum		Violation?
v_{12A}	1,798	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.41	
Density, D_R	18.8	pcpmpl
Level of service for ramp-freeway junction area of influence	B	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.336	
Space mean speed in ramp influence area, S_R	57.3	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.3	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Between Skyway Road Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	1,096	vph
Peak-hour factor, PHF	0.83	
Peak 15-min volume, v_{15}	330	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	1,364	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	Actual		Maximum		Violation?
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	682	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.29	
Density, D	10.5	pcpmpl
Level of service, LOS	A	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	1,096	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25	mph
Volume on ramp	254	vph
Length of acceleration lane(s)	250	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	1,096	254		vph
Peak-hour factor, PHF	0.83	0.85		
Peak 15-min volume, v_{15}	330	75		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	1,364	303		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	1,364	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	1,364	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	1,667	pcph	4,700	pcph	No
Ramp volume, v_R	303	pcph	1,900	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	1,667	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.36	pcpmpl
Density, D_R	16.8	
Level of service for ramp-freeway junction area of influence	B	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.329	
Space mean speed in ramp influence area, S_R	57.4	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.4	mph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road On Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	1,350	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	1,057	vph
Length of acceleration lane(s)	350	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	1,350	1,057		vph
Peak-hour factor, PHF	0.83	0.85		
Peak 15-min volume, v_{15}	407	311		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	1,680	1,262		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road On Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	1,680	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	1,680	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,942	pcph	4,700	pcph	No
Ramp volume, v_R	1,262	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	2,942	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.64	pcpmpl
Density, D_R	25.7	
Level of service for ramp-freeway junction area of influence	C	

Speed Estimation

Intermediate speed variable, M_s or D_s	0.363	
Space mean speed in ramp influence area, S_R	56.6	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	56.6	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	South of E 20th Street
Alternative	Existing Conditions
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,407	vph
Peak-hour factor, PHF	0.83	
Peak 15-min volume, v_{15}	725	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	2,996	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,498	pcphpl
Average passenger-car speed, S	64.9	mph
Volume-to-capacity ratio, v/c	0.64	
Density, D	23.1	pcpmpl
Level of service, LOS	C	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	E 20th Street Off Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,407	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	155	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,407	155		vph
Peak-hour factor, PHF	0.83	0.73		
Peak 15-min volume, v_{15}	725	53		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	2,996	216		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	E 20th Street Off Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	2,996	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	2,996	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,780	pcph	4,700	pcph	No
Ramp volume, v_R	216	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{12A}	2,996	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.68	pcpmpl
Density, D_R	29.1	
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.317	
Space mean speed in ramp influence area, S_R	57.7	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.7	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Between E 20th Street Ramps
Alternative	Existing Conditions
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,252	vph
Peak-hour factor, PHF	0.83	
Peak 15-min volume, v_{15}	678	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	2,803	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,401	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.60	
Density, D	21.6	pcpmpl
Level of service, LOS	C	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	E 20th Street On Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,252	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	532	vph
Length of acceleration lane(s)	300	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,252	532		vph
Peak-hour factor, PHF	0.83	0.73		
Peak 15-min volume, v_{15}	678	182		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	2,803	740		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	E 20th Street On Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	2,803	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	2,803	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,542	pcph	4,700	pcph	No
Ramp volume, v_R	740	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	Actual		Maximum		Violation?
v_{R12}	3,542	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.77	
Density, D_R	30.9	pcpmpl
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.429	
Space mean speed in ramp influence area, S_R	55.1	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	55.1	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	North of E 20th Street
Alternative	Existing Conditions
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,784	vph
Peak-hour factor, PHF	0.83	
Peak 15-min volume, v_{15}	839	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,465	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,732	pcphpl
Average passenger-car speed, S	63.4	mph
Volume-to-capacity ratio, v/c	0.74	
Density, D	27.3	pcpmpl
Level of service, LOS	D	

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	North of E 20th Street
Alternative	Existing Conditions
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,646	vph
Peak-hour factor, PHF	0.87	
Peak 15-min volume, v_{15}	1,048	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	4,329	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	2,165	pcphpl
Average passenger-car speed, S	56.7	mph
Volume-to-capacity ratio, v/c	0.92	
Density, D	38.2	pcpmpl
Level of service, LOS	E	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	E 20th Street Off Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	3,646	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	784	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	3,646	784		vph
Peak-hour factor, PHF	0.87	0.73		
Peak 15-min volume, v_{15}	1,048	268		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	4,329	1,090		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	E 20th Street Off Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	4,329	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	4,329	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,239	pcph	4,700	pcph	No
Ramp volume, v_R	1,090	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, v_{12A} =	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	Actual		Maximum		Violation?
v_{12A}	4,329	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.98	
Density, D_R	40.6	pcpmpl
Level of service for ramp-freeway junction area of influence	E	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.396	
Space mean speed in ramp influence area, S_R	55.9	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	55.9	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Between E 20th Street Ramps
Alternative	Existing Conditions
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,862	vph
Peak-hour factor, PHF	0.87	
Peak 15-min volume, v_{15}	822	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,398	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,699	pcphpl
Average passenger-car speed, S	63.7	mph
Volume-to-capacity ratio, v/c	0.72	
Density, D	26.7	pcpmpl
Level of service, LOS	D	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	E 20th Street On Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,862	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	195	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,862	195		vph
Peak-hour factor, PHF	0.87	0.73		
Peak 15-min volume, v_{15}	822	67		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,398	271		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	E 20th Street On Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	3,398	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	3,398	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,669	pcph	4,700	pcph	No
Ramp volume, v_R	271	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	Actual		Maximum		Violation?
v_{R12}	3,669	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.80	
Density, D_R	31.5	pcpmpl
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.438	
Space mean speed in ramp influence area, S_R	54.9	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	54.9	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	North of Skyway Road Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,057	vph
Peak-hour factor, PHF	0.86	
Peak 15-min volume, v_{15}	889	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,672	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,836	pcphpl
Average passenger-car speed, S	62.3	mph
Volume-to-capacity ratio, v/c	0.78	
Density, D	29.5	pcpmpl
Level of service, LOS	D	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	3,057	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	1,372	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	3,057	1,372		vph
Peak-hour factor, PHF	0.85	0.82		
Peak 15-min volume, v_{15}	899	418		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,715	1,698		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	3,715	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	3,715	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,017	pcph	4,700	pcph	No
Ramp volume, v_R	1,698	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	Actual		Maximum		Violation?
v_{12A}	3,715	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.84	
Density, D_R	35.3	pcpmpl
Level of service for ramp-freeway junction area of influence	E	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.451	
Space mean speed in ramp influence area, S_R	54.6	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	54.6	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Between Skyway Road Ramps
Alternative	Existing Conditions
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	1,685	vph
Peak-hour factor, PHF	0.85	
Peak 15-min volume, v_{15}	496	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	2,048	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,024	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.44	
Density, D	15.8	pcpmpl
Level of service, LOS	B	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	1,685	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25	mph
Volume on ramp	199	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	Upstream		Downstream	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

Junction Components	Freeway	Ramp	Adj. Ramp	
Volume, V	1,685	199		vph
Peak-hour factor, PHF	0.85	0.82		
Peak 15-min volume, v_{15}	496	61		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	2,048	246		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	2,048	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	2,048	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,294	pcph	4,700	pcph	No
Ramp volume, v_R	246	pcph	1,900	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	2,294	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.50	pcpmpl
Density, D_R	20.7	
Level of service for ramp-freeway junction area of influence	C	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.340	
Space mean speed in ramp influence area, S_R	57.2	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.2	mph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road On Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	1,884	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	144	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	1,884	144		vph
Peak-hour factor, PHF	0.85	0.82		
Peak 15-min volume, v_{15}	554	44		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	2,290	178		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road On Ramp
Alternative	Existing Conditions
Time period	AM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	2,290	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	2,290	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,468	pcph	4,700	pcph	No
Ramp volume, v_R	178	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	2,468	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.54	pcpmpl
Density, D_R	22.1	
Level of service for ramp-freeway junction area of influence	C	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.331	
Space mean speed in ramp influence area, S_R	57.4	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.4	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	South of Skyway Road
Alternative	Existing Conditions
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,028	vph
Peak-hour factor, PHF	0.85	
Peak 15-min volume, v_{15}	596	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	2,465	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,232	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.52	
Density, D	19.0	pcpmpl
Level of service, LOS	C	

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	South of Skyway Road
Alternative	Existing Conditions
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	1,946	vph
Peak-hour factor, PHF	0.89	
Peak 15-min volume, v_{15}	547	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	2,259	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,129	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.48	
Density, D	17.4	pcpmpl
Level of service, LOS	B	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	1,946	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	442	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	1,946	442		vph
Peak-hour factor, PHF	0.89	0.95		
Peak 15-min volume, v_{15}	547	116		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	2,259	472		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	2,259	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	2,259	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	1,786	pcph	4,700	pcph	No
Ramp volume, v_R	472	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{12A}	2,259	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.51	pcpmpl
Density, D_R	22.8	
Level of service for ramp-freeway junction area of influence	C	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.341	
Space mean speed in ramp influence area, S_R	57.2	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.2	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Between Skyway Road Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	1,504	vph
Peak-hour factor, PHF	0.89	
Peak 15-min volume, v_{15}	422	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	1,746	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	873	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.37	
Density, D	13.4	pcpmpl
Level of service, LOS	B	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	1,504	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25	mph
Volume on ramp	550	vph
Length of acceleration lane(s)	250	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	1,504	550		vph
Peak-hour factor, PHF	0.89	0.95		
Peak 15-min volume, v_{15}	422	145		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	1,746	588		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	1,746	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	1,746	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,333	pcph	4,700	pcph	No
Ramp volume, v_R	588	pcph	1,900	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	2,333	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.51	
Density, D_R	21.8	pcpmpl
Level of service for ramp-freeway junction area of influence	C	

Speed Estimation

Intermediate speed variable, M_s or D_s	0.349	
Space mean speed in ramp influence area, S_R	57.0	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.0	mph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road On Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,054	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	1,017	vph
Length of acceleration lane(s)	350	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,054	1,017		vph
Peak-hour factor, PHF	0.89	0.95		
Peak 15-min volume, v_{15}	577	268		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	2,384	1,087		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road On Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	2,384	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	2,384	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,471	pcph	4,700	pcph	No
Ramp volume, v_R	1,087	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	Actual		Maximum		Violation?
v_{R12}	3,471	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.75	pcpmpl
Density, D_R	29.9	
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.415	
Space mean speed in ramp influence area, S_R	55.5	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	55.5	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	South of E 20th Street
Alternative	Existing Conditions
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,071	vph
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v_{15}	835	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,448	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,724	pcphpl
Average passenger-car speed, S	63.5	mph
Volume-to-capacity ratio, v/c	0.73	
Density, D	27.1	pcpmpl
Level of service, LOS	D	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	E 20th Street Off Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	3,071	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	320	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	3,071	320		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v_{15}	800	83		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,305	338		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	E 20th Street Off Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	3,305	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	3,305	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,966	pcph	4,700	pcph	No
Ramp volume, v_R	338	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	Actual		Maximum		Violation?
v_{12A}	3,305	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.75	
Density, D_R	31.8	pcpmpl
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.328	
Space mean speed in ramp influence area, S_R	57.4	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.4	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Between E 20th Street Ramps
Alternative	Existing Conditions
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,751	vph
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v_{15}	716	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	2,960	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,480	pcphpl
Average passenger-car speed, S	64.9	mph
Volume-to-capacity ratio, v/c	0.63	
Density, D	22.8	pcpmpl
Level of service, LOS	C	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	E 20th Street On Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,751	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	1,245	vph
Length of acceleration lane(s)	300	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,751	1,245		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v_{15}	716	324		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	2,960	1,316		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	E 20th Street On Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	2,960	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	2,960	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	4,277	pcph	4,700	pcph	No
Ramp volume, v_R	1,316	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	Actual		Maximum		Violation?
v_{R12}	4,277	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.93	
Density, D_R	36.3	pcpmpl
Level of service for ramp-freeway junction area of influence	E	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.575	
Space mean speed in ramp influence area, S_R	51.8	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	51.8	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	North of E 20th Street
Alternative	Existing Conditions
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,996	vph
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v_{15}	1,041	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	4,300	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	2,150	pcphpl
Average passenger-car speed, S	57.0	mph
Volume-to-capacity ratio, v/c	0.91	
Density, D	37.7	pcpmpl
Level of service, LOS	E	

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	North of E 20th Street
Alternative	Existing Conditions
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,705	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	1,029	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	4,253	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	2,126	pcphpl
Average passenger-car speed, S	57.5	mph
Volume-to-capacity ratio, v/c	0.90	
Density, D	37.0	pcpmpl
Level of service, LOS	E	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	E 20th Street Off Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	3,705	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	1,394	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	3,705	1,394		vph
Peak-hour factor, PHF	0.90	0.96		
Peak 15-min volume, v_{15}	1,029	363		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	4,253	1,474		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	E 20th Street Off Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	4,253	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	4,253	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,779	pcph	4,700	pcph	No
Ramp volume, v_R	1,474	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, v_{12A} =	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	Actual		Maximum		Violation?
v_{12A}	4,253	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.97	
Density, D_R	39.9	pcpmpl
Level of service for ramp-freeway junction area of influence	E	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.431	
Space mean speed in ramp influence area, S_R	55.1	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	55.1	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Between E 20th Street Ramps
Alternative	Existing Conditions
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,311	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	642	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	2,653	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,326	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.56	
Density, D	20.4	pcpmpl
Level of service, LOS	C	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	E 20th Street On Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,311	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	260	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,311	260		vph
Peak-hour factor, PHF	0.90	0.96		
Peak 15-min volume, v_{15}	642	68		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	2,653	275		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	E 20th Street On Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	2,653	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	2,653	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,927	pcph	4,700	pcph	No
Ramp volume, v_R	275	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	Actual		Maximum		Violation?
v_{R12}	2,927	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.64	
Density, D_R	25.7	pcpmpl
Level of service for ramp-freeway junction area of influence	C	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.358	
Space mean speed in ramp influence area, S_R	56.8	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	56.8	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	North of Skyway Road Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,571	vph
Peak-hour factor, PHF	0.89	
Peak 15-min volume, v_{15}	722	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	2,984	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,492	pcphpl
Average passenger-car speed, S	64.9	mph
Volume-to-capacity ratio, v/c	0.63	
Density, D	23.0	pcpmpl
Level of service, LOS	C	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,571	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	1,250	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,571	1,250		vph
Peak-hour factor, PHF	0.88	0.95		
Peak 15-min volume, v_{15}	730	329		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,018	1,336		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	3,018	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	3,018	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	1,682	pcph	4,700	pcph	No
Ramp volume, v_R	1,336	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{12A}	3,018	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.69	pcpmpl
Density, D_R	29.3	
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.418	
Space mean speed in ramp influence area, S_R	55.4	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	55.4	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Between Skyway Road Ramps
Alternative	Existing Conditions
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	1,321	vph
Peak-hour factor, PHF	0.88	
Peak 15-min volume, v_{15}	375	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	1,551	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	775	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.33	
Density, D	11.9	pcpmpl
Level of service, LOS	B	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	1,321	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25	mph
Volume on ramp	239	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	1,321	239		vph
Peak-hour factor, PHF	0.88	0.95		
Peak 15-min volume, v_{15}	375	63		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	1,551	255		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Estimation of Volume in Merge Area

L_{EQ}	=		ft	(Equation 13-6 or 13-7)
P_{FM}	=	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12}	=	1,551	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	1,551	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	1,806	pcph	4,700	pcph	No
Ramp volume, v_R	255	pcph	1,900	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	Actual		Maximum		Violation?
v_{R12}	1,806	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.39	
Density, D_R	16.9	pcpmpl
Level of service for ramp-freeway junction area of influence	B	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.325	
Space mean speed in ramp influence area, S_R	57.5	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.5	mph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road On Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	1,560	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	233	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	1,560	233		vph
Peak-hour factor, PHF	0.88	0.95		
Peak 15-min volume, v_{15}	443	61		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	1,831	249		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road On Ramp
Alternative	Existing Conditions
Time period	PM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	1,831	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	1,831	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,080	pcph	4,700	pcph	No
Ramp volume, v_R	249	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	2,080	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.45	
Density, D_R	19.1	pcpmpl
Level of service for ramp-freeway junction area of influence	B	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.316	
Space mean speed in ramp influence area, S_R	57.7	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.7	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	South of Skyway Road
Alternative	Existing Conditions
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	1,793	vph
Peak-hour factor, PHF	0.88	
Peak 15-min volume, v_{15}	509	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	2,105	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,052	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.45	
Density, D	16.2	pcpmpl
Level of service, LOS	B	

HCM 2010 Signalized Intersection Summary

1: Bruce Rd & SR 32

Existing Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	226	96	70	100	265	40	99	345	50	20	427	351
Future Volume (veh/h)	226	96	70	100	265	40	99	345	50	20	427	351
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.98	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	269	114	14	119	315	43	118	411	16	24	508	263
Adj No. of Lanes	1	1	1	1	1	0	1	1	1	1	1	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	301	568	483	148	351	48	147	657	547	43	548	722
Arrive On Green	0.17	0.31	0.31	0.08	0.22	0.22	0.08	0.36	0.36	0.02	0.30	0.30
Sat Flow, veh/h	1757	1845	1568	1757	1587	217	1757	1845	1535	1757	1845	1527
Grp Volume(v), veh/h	269	114	14	119	0	358	118	411	16	24	508	263
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	0	1803	1757	1845	1535	1757	1845	1527
Q Serve(g_s), s	14.5	4.4	0.6	6.5	0.0	18.7	6.4	17.9	0.7	1.3	25.9	10.7
Cycle Q Clear(g_c), s	14.5	4.4	0.6	6.5	0.0	18.7	6.4	17.9	0.7	1.3	25.9	10.7
Prop In Lane	1.00		1.00	1.00		0.12	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	301	568	483	148	0	399	147	657	547	43	548	722
V/C Ratio(X)	0.89	0.20	0.03	0.80	0.00	0.90	0.80	0.63	0.03	0.56	0.93	0.36
Avail Cap(c_a), veh/h	706	760	646	344	0	743	362	657	547	362	665	820
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	39.3	24.8	23.4	43.6	0.0	36.7	43.6	25.9	20.3	46.8	33.1	16.6
Incr Delay (d2), s/veh	3.7	0.1	0.0	3.8	0.0	3.0	3.8	1.4	0.0	4.1	16.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.3	2.3	0.3	3.3	0.0	9.7	3.3	9.4	0.3	0.7	15.6	4.5
LnGrp Delay(d),s/veh	43.0	24.8	23.4	47.4	0.0	39.7	47.4	27.3	20.3	50.9	49.1	16.7
LnGrp LOS	D	C	C	D		D	D	C	C	D	D	B
Approach Vol, veh/h	397			477			545			795		
Approach Delay, s/veh	37.1			41.6			31.4			38.4		
Approach LOS	D			D			C			D		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	13.2	36.9	12.1	34.8	21.6	28.4	6.4	40.6				
Change Period (Y+Rc), s	* 5	7.0	* 4	* 6	* 5	7.0	* 4	* 6				
Max Green Setting (Gmax), s	* 19	40.0	* 20	* 35	* 39	40.0	* 20	* 30				
Max Q Clear Time (g_c+l1), s	8.5	6.4	8.4	27.9	16.5	20.7	3.3	19.9				
Green Ext Time (p_c), s	0.1	0.7	0.1	0.9	0.1	0.7	0.0	1.5				
Intersection Summary												
HCM 2010 Ctrl Delay				37.2								
HCM 2010 LOS				D								
Notes												

HCM 2010 Signalized Intersection Summary

2: SR 99 SB Ramps & E 20th St

Existing Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑	↑↑	↑↑					↑	↑	↑↑
Traffic Volume (veh/h)	0	450	55	111	354	0	0	0	0	597	1	308
Future Volume (veh/h)	0	450	55	111	354	0	0	0	0	597	1	308
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	1845	1845	0				1845	1845	1845
Adj Flow Rate, veh/h	0	536	9	132	421	0				712	0	81
Adj No. of Lanes	0	2	1	2	2	0				2	0	2
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84				0.84	0.84	0.84
Percent Heavy Veh, %	0	3	3	3	3	0				3	3	3
Cap, veh/h	0	958	420	241	1597	0				941	0	840
Arrive On Green	0.00	0.27	0.27	0.07	0.46	0.00				0.27	0.00	0.27
Sat Flow, veh/h	0	3597	1537	3408	3597	0				3514	0	3136
Grp Volume(v), veh/h	0	536	9	132	421	0				712	0	81
Grp Sat Flow(s),veh/h/ln	0	1752	1537	1704	1752	0				1757	0	1568
Q Serve(g_s), s	0.0	4.1	0.1	1.2	2.3	0.0				5.9	0.0	0.6
Cycle Q Clear(g_c), s	0.0	4.1	0.1	1.2	2.3	0.0				5.9	0.0	0.6
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	958	420	241	1597	0				941	0	840
V/C Ratio(X)	0.00	0.56	0.02	0.55	0.26	0.00				0.76	0.00	0.10
Avail Cap(c_a), veh/h	0	3845	1686	2709	3845	0				3352	0	2992
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	9.8	8.3	14.1	5.3	0.0				10.6	0.0	8.7
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.7	0.0	0.0				0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.0	0.1	0.6	1.1	0.0				2.8	0.0	0.3
LnGrp Delay(d),s/veh	0.0	10.0	8.4	14.8	5.3	0.0				11.0	0.0	8.7
LnGrp LOS		A	A	B	A					B		A
Approach Vol, veh/h		545			553						793	
Approach Delay, s/veh		10.0			7.6						10.8	
Approach LOS		A			A						B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	5.7	13.2		12.5		18.9						
Change Period (Y+Rc), s	3.5	4.6		4.1		4.6						
Max Green Setting (Gmax), s	25.0	34.5		30.0		34.5						
Max Q Clear Time (g_c+I1), s	3.2	6.1		7.9		4.3						
Green Ext Time (p_c), s	0.1	2.4		0.6		2.4						
Intersection Summary												
HCM 2010 Ctrl Delay			9.6									
HCM 2010 LOS			A									
Notes												

HCM 2010 Signalized Intersection Summary

3: SR 99 NB Ramps & E 20th St

Existing Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	154	893	0	0	423	450	42	0	134	0	0	0
Future Volume (veh/h)	154	893	0	0	423	450	42	0	134	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1845	1845	0	0	1845	1845	1845	1845	1845			
Adj Flow Rate, veh/h	183	1063	0	0	504	46	50	0	42			
Adj No. of Lanes	2	2	0	0	2	1	2	0	1			
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84			
Percent Heavy Veh, %	3	3	0	0	3	3	3	3	3			
Cap, veh/h	1693	2697	0	0	713	314	174	0	78			
Arrive On Green	0.50	0.77	0.00	0.00	0.20	0.20	0.05	0.00	0.05			
Sat Flow, veh/h	3408	3597	0	0	3597	1546	3514	0	1568			
Grp Volume(v), veh/h	183	1063	0	0	504	46	50	0	42			
Grp Sat Flow(s),veh/h/ln	1704	1752	0	0	1752	1546	1757	0	1568			
Q Serve(g_s), s	1.4	5.0	0.0	0.0	6.7	1.2	0.7	0.0	1.3			
Cycle Q Clear(g_c), s	1.4	5.0	0.0	0.0	6.7	1.2	0.7	0.0	1.3			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	1693	2697	0	0	713	314	174	0	78			
V/C Ratio(X)	0.11	0.39	0.00	0.00	0.71	0.15	0.29	0.00	0.54			
Avail Cap(c_a), veh/h	1693	2697	0	0	2437	1075	2094	0	934			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	6.7	1.9	0.0	0.0	18.7	16.5	23.1	0.0	23.4			
Incr Delay (d2), s/veh	0.1	0.0	0.0	0.0	0.5	0.1	0.3	0.0	2.2			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.7	2.4	0.0	0.0	3.3	0.5	0.3	0.0	0.6			
LnGrp Delay(d),s/veh	6.9	2.0	0.0	0.0	19.1	16.5	23.4	0.0	25.5			
LnGrp LOS	A	A			B	B	C		C			
Approach Vol, veh/h	1246				550				92			
Approach Delay, s/veh	2.7				18.9				24.4			
Approach LOS	A				B				C			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2				5				8			
Phs Duration (G+Y+Rc), s	43.7				28.5				6.6			
Change Period (Y+Rc), s	* 5				3.5				4.1			
Max Green Setting (Gmax), s	* 35				25.0				* 35			
Max Q Clear Time (g_c+l1), s	7.0				3.4				8.7			
Green Ext Time (p_c), s	4.6				0.3				1.5			
Intersection Summary												
HCM 2010 Ctrl Delay	8.5											
HCM 2010 LOS	A											
Notes												

HCM 2010 Signalized Intersection Summary

4: E 20th St & Chico Mall

Existing Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	37	695	19	32	749	27	94	6	8	17	1	27
Future Volume (veh/h)	37	695	19	32	749	27	94	6	8	17	1	27
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1900	1900	1845	1845
Adj Flow Rate, veh/h	44	827	22	38	892	30	120	0	0	20	1	0
Adj No. of Lanes	2	2	0	1	2	0	2	1	0	0	1	2
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	162	1702	45	74	1632	55	336	177	0	43	2	71
Arrive On Green	0.05	0.49	0.49	0.04	0.47	0.47	0.10	0.00	0.00	0.03	0.03	0.00
Sat Flow, veh/h	3408	3485	93	1757	3458	116	3514	1845	0	1677	84	2760
Grp Volume(v), veh/h	44	416	433	38	452	470	120	0	0	21	0	0
Grp Sat Flow(s),veh/h/ln	1704	1752	1826	1757	1752	1822	1757	1845	0	1761	0	1380
Q Serve(g_s), s	0.5	6.9	6.9	0.9	8.0	8.0	1.4	0.0	0.0	0.5	0.0	0.0
Cycle Q Clear(g_c), s	0.5	6.9	6.9	0.9	8.0	8.0	1.4	0.0	0.0	0.5	0.0	0.0
Prop In Lane	1.00		0.05	1.00		0.06	1.00		0.00	0.95		1.00
Lane Grp Cap(c), veh/h	162	856	892	74	827	860	336	177	0	45	0	71
V/C Ratio(X)	0.27	0.49	0.49	0.51	0.55	0.55	0.36	0.00	0.00	0.46	0.00	0.00
Avail Cap(c_a), veh/h	1570	1413	1472	809	1413	1469	2023	1062	0	1014	0	1589
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	20.0	7.4	7.5	20.4	8.2	8.2	18.4	0.0	0.0	20.9	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.3	0.3	2.0	0.4	0.4	0.2	0.0	0.0	2.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	3.3	3.4	0.5	3.9	4.0	0.7	0.0	0.0	0.3	0.0	0.0
LnGrp Delay(d),s/veh	20.3	7.8	7.8	22.4	8.6	8.6	18.6	0.0	0.0	23.6	0.0	0.0
LnGrp LOS	C	A	A	C	A	A	B			C		
Approach Vol, veh/h	893		960			120			21			
Approach Delay, s/veh	8.4		9.1			18.6			23.6			
Approach LOS	A		A			B			C			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	4		5	6	8					
Phs Duration (G+Y+Rc), s	4.8	25.3	5.1		5.6	24.6	8.2					
Change Period (Y+Rc), s	3.0	4.1	4.0		3.5	4.1	4.0					
Max Green Setting (Gmax), s	20.0	35.0	25.0		20.0	35.0	25.0					
Max Q Clear Time (g_c+l1), s	2.9	8.9	2.5		2.5	10.0	3.4					
Green Ext Time (p_c), s	0.0	10.7	0.0		0.0	10.5	0.2					
Intersection Summary												
HCM 2010 Ctrl Delay			9.5									
HCM 2010 LOS			A									
Notes												

HCM 2010 Signalized Intersection Summary

5: Forest Ave & E 20th St

Existing Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	127	369	201	55	453	165	156	73	26	121	186	189
Future Volume (veh/h)	127	369	201	55	453	165	156	73	26	121	186	189
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1845	1845	1845	1845	1845	1845	1900
Adj Flow Rate, veh/h	151	439	128	65	539	50	186	87	0	144	221	0
Adj No. of Lanes	1	2	0	1	2	1	1	2	1	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	186	1139	329	235	1655	729	225	466	208	179	372	0
Arrive On Green	0.11	0.43	0.43	0.13	0.47	0.47	0.13	0.13	0.00	0.10	0.11	0.00
Sat Flow, veh/h	1757	2676	773	1757	3505	1545	1757	3505	1568	1757	3597	0
Grp Volume(v), veh/h	151	286	281	65	539	50	186	87	0	144	221	0
Grp Sat Flow(s),veh/h/ln	1757	1752	1696	1757	1752	1545	1757	1752	1568	1757	1752	0
Q Serve(g_s), s	6.7	9.0	9.1	2.7	7.7	1.4	8.3	1.8	0.0	6.4	4.8	0.0
Cycle Q Clear(g_c), s	6.7	9.0	9.1	2.7	7.7	1.4	8.3	1.8	0.0	6.4	4.8	0.0
Prop In Lane	1.00		0.46	1.00		1.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	186	746	722	235	1655	729	225	466	208	179	372	0
V/C Ratio(X)	0.81	0.38	0.39	0.28	0.33	0.07	0.83	0.19	0.00	0.81	0.59	0.00
Avail Cap(c_a), veh/h	253	746	722	235	1655	729	439	1051	470	275	745	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.91	0.91	0.91	0.91	0.91	0.91	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	35.0	15.8	15.8	31.2	13.2	11.5	34.0	30.8	0.0	35.2	34.1	0.0
Incr Delay (d2), s/veh	9.0	0.1	0.1	0.2	0.5	0.2	2.9	0.1	0.0	5.0	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	4.3	4.2	1.3	3.8	0.6	4.2	0.9	0.0	3.4	2.4	0.0
LnGrp Delay(d),s/veh	43.9	15.9	15.9	31.4	13.7	11.7	36.9	30.9	0.0	40.1	34.7	0.0
LnGrp LOS	D	B	B	C	B	B	D	C		D	C	
Approach Vol, veh/h	718			654			273			365		
Approach Delay, s/veh	21.8			15.3			35.0			36.8		
Approach LOS	C			B			D			D		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.5	42.3	11.1	15.1	15.2	38.5	13.3	13.0				
Change Period (Y+Rc), s	3.0	4.5	3.0	4.5	4.5	* 4.5	3.0	4.5				
Max Green Setting (Gmax), s	11.5	16.5	12.5	24.0	8.5	* 19	20.0	17.0				
Max Q Clear Time (g_c+l1), s	8.7	9.7	8.4	3.8	4.7	11.1	10.3	6.8				
Green Ext Time (p_c), s	0.1	1.5	0.1	1.2	1.0	1.4	0.2	0.9				
Intersection Summary												
HCM 2010 Ctrl Delay				24.2								
HCM 2010 LOS				C								
Notes												

HCM 2010 Signalized Intersection Summary

6: Huntington Dr & E 20th St

Existing Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	77	401	6	31	577	53	59	6	24	15	2	7
Future Volume (veh/h)	77	401	6	31	577	53	59	6	24	15	2	7
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.98	0.99		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1900	1845	1900	1900	1845	1845
Adj Flow Rate, veh/h	92	477	6	37	687	53	70	7	11	18	2	1
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	0	1	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	156	1518	19	108	1322	102	365	41	28	418	35	237
Arrive On Green	0.09	0.43	0.43	0.06	0.40	0.40	0.15	0.15	0.15	0.15	0.15	0.15
Sat Flow, veh/h	1757	3543	45	1757	3290	254	1021	269	184	1292	232	1566
Grp Volume(v), veh/h	92	236	247	37	366	374	88	0	0	20	0	1
Grp Sat Flow(s),veh/h/ln	1757	1752	1835	1757	1752	1791	1475	0	0	1524	0	1566
Q Serve(g_s), s	1.5	2.7	2.7	0.6	4.8	4.9	1.1	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	1.5	2.7	2.7	0.6	4.8	4.9	1.6	0.0	0.0	0.3	0.0	0.0
Prop In Lane	1.00		0.02	1.00		0.14	0.80		0.12	0.90		1.00
Lane Grp Cap(c), veh/h	156	751	787	108	704	720	434	0	0	453	0	237
V/C Ratio(X)	0.59	0.31	0.31	0.34	0.52	0.52	0.20	0.00	0.00	0.04	0.00	0.00
Avail Cap(c_a), veh/h	859	2284	2393	1145	2284	2335	1153	0	0	1155	0	1021
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.4	5.8	5.8	13.8	6.9	6.9	11.7	0.0	0.0	11.2	0.0	11.1
Incr Delay (d2), s/veh	1.3	0.1	0.1	0.7	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	1.3	1.4	0.3	2.3	2.3	0.7	0.0	0.0	0.1	0.0	0.0
LnGrp Delay(d),s/veh	14.8	5.9	5.9	14.5	7.2	7.2	11.8	0.0	0.0	11.2	0.0	11.1
LnGrp LOS	B	A	A	B	A	A	B			B		B
Approach Vol, veh/h	575				777		88				21	
Approach Delay, s/veh	7.3				7.5		11.8				11.2	
Approach LOS	A				A		B				B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	4.9	18.1			7.6	5.7	17.3	7.6				
Change Period (Y+Rc), s	3.0	5.0			3.0	3.0	5.0	3.0				
Max Green Setting (Gmax), s	20.0	40.0			20.0	15.0	40.0	20.0				
Max Q Clear Time (g_c+l1), s	2.6	4.7			2.3	3.5	6.9	3.6				
Green Ext Time (p_c), s	0.0	5.2			0.3	0.0	5.2	0.3				
Intersection Summary												
HCM 2010 Ctrl Delay			7.7									
HCM 2010 LOS			A									
Notes												

Intersection

Int Delay, s/veh 10.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↑	↑	↑	↑
Traffic Vol, veh/h	372	69	30	520	139	36
Future Vol, veh/h	372	69	30	520	139	36
Conflicting Peds, #/hr	0	2	0	0	0	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	100	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	443	82	36	619	165	43

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1176
Stage 1	-	-	486
Stage 2	-	-	690
Critical Hdwy	-	4.145	6.645
Critical Hdwy Stg 1	-	-	5.845
Critical Hdwy Stg 2	-	-	5.445
Follow-up Hdwy	-	2.2285	3.5285
Pot Cap-1 Maneuver	-	1032	196
Stage 1	-	-	583
Stage 2	-	-	494
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	1028	189
Mov Cap-2 Maneuver	-	-	189
Stage 1	-	-	582
Stage 2	-	-	477

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	71.3
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	189	722	-	-	1028	-
HCM Lane V/C Ratio	0.876	0.059	-	-	0.035	-
HCM Control Delay (s)	87.1	10.3	-	-	8.6	-
HCM Lane LOS	F	B	-	-	A	-
HCM 95th %tile Q(veh)	6.5	0.2	-	-	0.1	-

HCM 2010 Signalized Intersection Summary
7B: Notre Dame Blvd & E 20th St

Existing Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	372	69	30	520	0	139	0	36	0	0	0
Future Volume (veh/h)	0	372	69	30	520	0	139	0	36	0	0	0
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	0	443	67	36	619	0	165	0	8	0	0	0
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	1	1	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	6	1078	162	106	1900	0	299	314	265	6	6	5
Arrive On Green	0.00	0.35	0.35	0.06	0.54	0.00	0.17	0.00	0.17	0.00	0.00	0.00
Sat Flow, veh/h	1757	3045	457	1757	3597	0	1757	1845	1557	1757	1845	1568
Grp Volume(v), veh/h	0	254	256	36	619	0	165	0	8	0	0	0
Grp Sat Flow(s),veh/h/ln	1757	1752	1750	1757	1752	0	1757	1845	1557	1757	1845	1568
Q Serve(g_s), s	0.0	3.4	3.5	0.6	3.1	0.0	2.7	0.0	0.1	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	3.4	3.5	0.6	3.1	0.0	2.7	0.0	0.1	0.0	0.0	0.0
Prop In Lane	1.00		0.26	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	6	621	620	106	1900	0	299	314	265	6	6	5
V/C Ratio(X)	0.00	0.41	0.41	0.34	0.33	0.00	0.55	0.00	0.03	0.00	0.00	0.00
Avail Cap(c_a), veh/h	842	2240	2236	842	4479	0	1123	1414	1194	842	1414	1202
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	7.6	7.6	14.1	4.0	0.0	11.9	0.0	10.8	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.2	0.7	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	1.6	1.7	0.3	1.5	0.0	1.3	0.0	0.1	0.0	0.0	0.0
LnGrp Delay(d),s/veh	0.0	7.8	7.8	14.8	4.0	0.0	12.5	0.0	10.8	0.0	0.0	0.0
LnGrp LOS		A	A	B	A		B		B			
Approach Vol, veh/h		510			655			173			0	
Approach Delay, s/veh		7.8			4.6			12.4			0.0	
Approach LOS		A			A			B				
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	5.9	16.1	9.3	0.0	0.0	22.0	0.0	9.3				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	15.0	40.0	20.0	24.0	15.0	40.0	15.0	24.0				
Max Q Clear Time (g_c+I1), s	2.6	5.5	4.7	0.0	0.0	5.1	0.0	2.1				
Green Ext Time (p_c), s	0.0	5.6	0.2	0.0	0.0	5.6	0.0	0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			6.8									
HCM 2010 LOS			A									

HCM 2010 Signalized Intersection Summary

8: Bruce Rd & E 20th St

Existing Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	92	43	81	42	169	42	256	277	21	22	463	139
Future Volume (veh/h)	92	43	81	42	169	42	256	277	21	22	463	139
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1900	1845	1845	1845
Adj Flow Rate, veh/h	110	51	6	50	201	42	305	330	24	26	551	77
Adj No. of Lanes	1	1	1	1	1	0	1	1	0	1	1	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	139	342	291	101	242	50	340	877	64	67	665	564
Arrive On Green	0.08	0.19	0.19	0.06	0.16	0.16	0.19	0.52	0.52	0.04	0.36	0.36
Sat Flow, veh/h	1757	1845	1568	1757	1476	308	1757	1699	124	1757	1845	1566
Grp Volume(v), veh/h	110	51	6	50	0	243	305	0	354	26	551	77
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	0	1784	1757	0	1823	1757	1845	1566
Q Serve(g_s), s	5.1	1.9	0.3	2.3	0.0	11.0	14.2	0.0	9.8	1.2	22.8	2.8
Cycle Q Clear(g_c), s	5.1	1.9	0.3	2.3	0.0	11.0	14.2	0.0	9.8	1.2	22.8	2.8
Prop In Lane	1.00		1.00	1.00		0.17	1.00		0.07	1.00		1.00
Lane Grp Cap(c), veh/h	139	342	291	101	0	292	340	0	941	67	665	564
V/C Ratio(X)	0.79	0.15	0.02	0.50	0.00	0.83	0.90	0.00	0.38	0.39	0.83	0.14
Avail Cap(c_a), veh/h	420	904	768	420	0	426	420	0	941	420	882	748
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.9	28.6	27.9	38.3	0.0	33.9	32.9	0.0	12.2	39.3	24.4	18.0
Incr Delay (d2), s/veh	3.8	0.1	0.0	1.4	0.0	5.9	16.7	0.0	0.4	1.4	5.9	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	1.0	0.1	1.2	0.0	5.9	8.4	0.0	5.0	0.6	12.7	1.2
LnGrp Delay(d),s/veh	41.6	28.6	27.9	39.7	0.0	39.8	49.6	0.0	12.5	40.7	30.3	18.2
LnGrp LOS	D	C	C	D		D	D		B	D	C	B
Approach Vol, veh/h	167				293				659			
Approach Delay, s/veh	37.2				39.8				29.7			
Approach LOS	D				D				C			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.2	48.2	8.8	19.5	20.2	35.2	10.6	17.7				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	20.0	40.0	20.0	41.0	20.0	40.0	20.0	20.0				
Max Q Clear Time (g_c+I1), s	3.2	11.8	4.3	3.9	16.2	24.8	7.1	13.0				
Green Ext Time (p_c), s	0.0	9.6	0.0	1.2	0.1	5.4	0.0	0.7				
Intersection Summary												
HCM 2010 Ctrl Delay			31.9									
HCM 2010 LOS			C									

HCM 2010 Signalized Intersection Summary
8B: Bruce Rd & E 20th St

Existing Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	92	43	81	42	169	42	256	277	21	22	463	139
Future Volume (veh/h)	92	43	81	42	169	42	256	277	21	22	463	139
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	110	51	15	50	201	42	305	330	8	26	551	29
Adj No. of Lanes	2	1	1	2	1	0	2	2	1	1	2	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	333	392	334	224	267	56	414	1397	625	72	1114	498
Arrive On Green	0.10	0.21	0.21	0.07	0.18	0.18	0.12	0.40	0.40	0.04	0.32	0.32
Sat Flow, veh/h	3408	1845	1568	3408	1476	308	3408	3505	1568	1757	3505	1565
Grp Volume(v), veh/h	110	51	15	50	0	243	305	330	8	26	551	29
Grp Sat Flow(s),veh/h/ln	1704	1845	1568	1704	0	1784	1704	1752	1568	1757	1752	1565
Q Serve(g_s), s	1.8	1.3	0.5	0.8	0.0	7.8	5.2	3.8	0.2	0.9	7.7	0.8
Cycle Q Clear(g_c), s	1.8	1.3	0.5	0.8	0.0	7.8	5.2	3.8	0.2	0.9	7.7	0.8
Prop In Lane	1.00		1.00	1.00		0.17	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	333	392	334	224	0	323	414	1397	625	72	1114	498
V/C Ratio(X)	0.33	0.13	0.04	0.22	0.00	0.75	0.74	0.24	0.01	0.36	0.49	0.06
Avail Cap(c_a), veh/h	1130	1254	1066	1130	0	917	1130	2325	1040	583	2325	1038
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.4	19.2	18.9	26.7	0.0	23.4	25.6	12.0	11.0	28.1	16.6	14.3
Incr Delay (d2), s/veh	0.2	0.1	0.0	0.2	0.0	1.3	1.0	0.1	0.0	1.1	0.5	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.7	0.2	0.4	0.0	4.0	2.5	1.8	0.1	0.4	3.7	0.3
LnGrp Delay(d),s/veh	25.6	19.3	18.9	26.9	0.0	24.8	26.5	12.2	11.0	29.3	17.1	14.4
LnGrp LOS	C	B	B	C		C	C	B	B	C	B	B
Approach Vol, veh/h	176				293			643			606	
Approach Delay, s/veh	23.2				25.1			19.0			17.5	
Approach LOS	C				C			B			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	6.5	29.0	8.0	16.8	11.3	24.2	9.9	14.9				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	20.0	40.0	20.0	41.0	20.0	40.0	20.0	31.0				
Max Q Clear Time (g_c+I1), s	2.9	5.8	2.8	3.3	7.2	9.7	3.8	9.8				
Green Ext Time (p_c), s	0.0	9.8	0.0	1.3	0.2	9.4	0.1	1.1				
Intersection Summary												
HCM 2010 Ctrl Delay	19.9											
HCM 2010 LOS	B											

HCM 2010 Signalized Intersection Summary

8C: Bruce Rd & E 20th St

Existing Plus Project
AM Peak Hour

																
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Volume (veh/h)	92	43	81	42	169	42	256	277	21	22	463	139				
Future Volume (veh/h)	92	43	81	42	169	42	256	277	21	22	463	139				
Number	7	4	14	3	8	18	5	2	12	1	6	16				
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0				
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00				
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1845	1845	1845	1845				
Adj Flow Rate, veh/h	110	51	6	50	201	27	305	330	10	26	551	35				
Adj No. of Lanes	2	1	1	1	2	0	2	2	1	1	2	1				
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84				
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3				
Cap, veh/h	353	299	254	119	392	52	429	1471	658	73	1176	525				
Arrive On Green	0.10	0.16	0.16	0.07	0.13	0.13	0.13	0.42	0.42	0.04	0.34	0.34				
Sat Flow, veh/h	3408	1845	1568	1757	3105	411	3408	3505	1568	1757	3505	1566				
Grp Volume(v), veh/h	110	51	6	50	112	116	305	330	10	26	551	35				
Grp Sat Flow(s),veh/h/ln	1704	1845	1568	1757	1752	1764	1704	1752	1568	1757	1752	1566				
Q Serve(g_s), s	1.6	1.3	0.2	1.5	3.3	3.4	4.7	3.3	0.2	0.8	6.8	0.8				
Cycle Q Clear(g_c), s	1.6	1.3	0.2	1.5	3.3	3.4	4.7	3.3	0.2	0.8	6.8	0.8				
Prop In Lane	1.00		1.00	1.00		0.23	1.00		1.00	1.00		1.00				
Lane Grp Cap(c), veh/h	353	299	254	119	221	223	429	1471	658	73	1176	525				
V/C Ratio(X)	0.31	0.17	0.02	0.42	0.51	0.52	0.71	0.22	0.02	0.35	0.47	0.07				
Avail Cap(c_a), veh/h	1238	1374	1168	638	987	993	1238	2546	1139	638	2546	1137				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Uniform Delay (d), s/veh	22.9	19.9	19.4	24.6	22.4	22.5	23.1	10.2	9.3	25.7	14.4	12.4				
Incr Delay (d2), s/veh	0.2	0.1	0.0	0.9	0.7	0.7	0.8	0.1	0.0	1.1	0.4	0.1				
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
%ile BackOfQ(50%),veh/ln	0.8	0.7	0.1	0.8	1.6	1.7	2.3	1.6	0.1	0.4	3.4	0.4				
LnGrp Delay(d),s/veh	23.0	20.0	19.4	25.5	23.1	23.2	23.9	10.3	9.3	26.7	14.8	12.5				
LnGrp LOS	C	B	B	C	C	C	C	B	A	C	B	B				
Approach Vol, veh/h	167				278				645							
Approach Delay, s/veh	22.0				23.6				16.7							
Approach LOS	C				C				B							
Timer	1	2	3	4	5	6	7	8								
Assigned Phs	1	2	3	4	5	6	7	8								
Phs Duration (G+Y+Rc), s	6.3	28.1	7.7	12.9	10.9	23.5	9.7	11.0								
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0								
Max Green Setting (Gmax), s	20.0	40.0	20.0	41.0	20.0	40.0	20.0	31.0								
Max Q Clear Time (g_c+I1), s	2.8	5.3	3.5	3.3	6.7	8.8	3.6	5.4								
Green Ext Time (p_c), s	0.0	9.9	0.0	1.1	0.2	9.6	0.1	1.1								
Intersection Summary																
HCM 2010 Ctrl Delay	17.8															
HCM 2010 LOS	B															

Intersection						
Int Delay, s/veh	1.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	26	144	0	7	89
Future Vol, veh/h	5	26	144	0	7	89
Conflicting Peds, #/hr	0	1	0	1	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	31	171	0	8	106
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	295	173	0	0	172	0
Stage 1	172	-	-	-	-	-
Stage 2	123	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	696	871	-	-	1405	-
Stage 1	858	-	-	-	-	-
Stage 2	902	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	691	870	-	-	1404	-
Mov Cap-2 Maneuver	715	-	-	-	-	-
Stage 1	857	-	-	-	-	-
Stage 2	897	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	9.5		0		0.6	
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 841	1404	-		
HCM Lane V/C Ratio	-	- 0.044	0.006	-		
HCM Control Delay (s)	-	- 9.5	7.6	0		
HCM Lane LOS	-	- A	A	A		
HCM 95th %tile Q(veh)	-	- 0.1	0	-		

Intersection

Int Delay, s/veh 1.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	21	27	116	12	6	84
Future Vol, veh/h	21	27	116	12	6	84
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	25	32	138	14	7	100

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	259	145	0	0	152	0
Stage 1	145	-	-	-	-	-
Stage 2	114	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	730	902	-	-	1429	-
Stage 1	882	-	-	-	-	-
Stage 2	911	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	726	902	-	-	1429	-
Mov Cap-2 Maneuver	739	-	-	-	-	-
Stage 1	882	-	-	-	-	-
Stage 2	907	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	9.7		0		0.5
HCM LOS	A				

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 823	1429	-
HCM Lane V/C Ratio	-	- 0.069	0.005	-
HCM Control Delay (s)	-	- 9.7	7.5	-
HCM Lane LOS	-	- A	A	-
HCM 95th %tile Q(veh)	-	- 0.2	0	-

Intersection

Int Delay, s/veh 3.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	88	23	108	35	11	118
Future Vol, veh/h	88	23	108	35	11	118
Conflicting Peds, #/hr	0	2	0	2	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	105	27	129	42	13	140

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	318	153	0	0	172	0
Stage 1	151	-	-	-	-	-
Stage 2	167	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	675	893	-	-	1405	-
Stage 1	877	-	-	-	-	-
Stage 2	863	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	668	890	-	-	1403	-
Mov Cap-2 Maneuver	700	-	-	-	-	-
Stage 1	876	-	-	-	-	-
Stage 2	855	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	11		0		0.6
HCM LOS	B				

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 732	1403	-
HCM Lane V/C Ratio	-	- 0.181	0.009	-
HCM Control Delay (s)	-	- 11	7.6	-
HCM Lane LOS	-	- B	A	-
HCM 95th %tile Q(veh)	-	- 0.7	0	-

HCM 2010 Signalized Intersection Summary

12: Notre Dame Blvd & Forest Ave

Existing Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	34	35	159	22	81	12	156	106	35	12	156	33
Future Volume (veh/h)	34	35	159	22	81	12	156	106	35	12	156	33
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	40	42	18	26	96	8	186	126	15	14	186	21
Adj No. of Lanes	1	1	2	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	113	349	511	79	285	24	339	1146	134	45	622	69
Arrive On Green	0.06	0.19	0.19	0.04	0.17	0.17	0.19	0.36	0.36	0.03	0.19	0.19
Sat Flow, veh/h	1774	1863	2726	1774	1696	141	1774	3182	372	1774	3205	357
Grp Volume(v), veh/h	40	42	18	26	0	104	186	69	72	14	102	105
Grp Sat Flow(s),veh/h/ln	1774	1863	1363	1774	0	1837	1774	1770	1785	1774	1770	1792
Q Serve(g_s), s	0.8	0.7	0.2	0.5	0.0	1.8	3.5	1.0	1.0	0.3	1.8	1.8
Cycle Q Clear(g_c), s	0.8	0.7	0.2	0.5	0.0	1.8	3.5	1.0	1.0	0.3	1.8	1.8
Prop In Lane	1.00		1.00	1.00		0.08	1.00		0.21	1.00		0.20
Lane Grp Cap(c), veh/h	113	349	511	79	0	309	339	637	643	45	344	348
V/C Ratio(X)	0.35	0.12	0.04	0.33	0.00	0.34	0.55	0.11	0.11	0.31	0.30	0.30
Avail Cap(c_a), veh/h	1067	1374	2011	824	0	1205	1309	1547	1561	824	1306	1323
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.4	12.4	12.2	17.0	0.0	13.4	13.4	7.8	7.8	17.5	12.6	12.6
Incr Delay (d2), s/veh	0.7	0.1	0.0	0.9	0.0	0.2	0.5	0.1	0.1	1.4	0.5	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.4	0.1	0.3	0.0	0.9	1.7	0.5	0.5	0.2	0.9	1.0
LnGrp Delay(d),s/veh	17.1	12.4	12.2	17.9	0.0	13.7	13.9	7.9	7.9	19.0	13.1	13.1
LnGrp LOS	B	B	B	B		B	B	A	A	B	B	B
Approach Vol, veh/h	100				130				327			
Approach Delay, s/veh	14.2				14.5				11.3			
Approach LOS	B				B				B			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	5.3	10.2	3.9	17.2	4.6	10.9	10.0	11.1				
Change Period (Y+Rc), s	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0				
Max Green Setting (Gmax), s	22.0	24.0	17.0	32.0	17.0	27.0	27.0	27.0				
Max Q Clear Time (g_c+l1), s	2.8	3.8	2.3	3.0	2.5	2.7	5.5	3.8				
Green Ext Time (p_c), s	0.0	0.5	0.0	2.1	0.0	0.5	0.1	2.0				
Intersection Summary												
HCM 2010 Ctrl Delay	12.8											
HCM 2010 LOS	B											
Notes												

HCM 2010 TWSC
13: Bruce Rd & Raley Blvd

Existing Plus Project
AM Peak Hour

Intersection												
Int Delay, s/veh	126											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	33	24	35	107	30	35	80	429	136	74	439	76
Future Vol, veh/h	33	24	35	107	30	35	80	429	136	74	439	76
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	84	84	84	84	84	84	84	84	84
Heavy Vehicles, %	2	3	2	3	3	3	2	2	3	3	2	2
Mvmt Flow	39	29	42	127	36	42	95	511	162	88	523	90
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1565	1607	568	1561	1571	592	613	0	0	673	0	0
Stage 1	744	744	-	782	782	-	-	-	-	-	-	-
Stage 2	821	863	-	779	789	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.53	6.22	7.13	6.53	6.23	4.12	-	-	4.13	-	-
Critical Hdwy Stg 1	6.12	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.027	3.318	3.527	4.027	3.327	2.218	-	-	2.227	-	-
Pot Cap-1 Maneuver	90	104	522	~ 91	110	504	966	-	-	913	-	-
Stage 1	407	420	-	386	403	-	-	-	-	-	-	-
Stage 2	369	370	-	387	401	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	49	85	522	~ 54	90	504	966	-	-	913	-	-
Mov Cap-2 Maneuver	49	85	-	~ 54	90	-	-	-	-	-	-	-
Stage 1	367	380	-	348	363	-	-	-	-	-	-	-
Stage 2	275	334	-	298	362	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	249.7			\$ 955.8			1.1			1.2		
HCM LOS	F			F								
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	966	-	-	90	72	913	-	-				
HCM Lane V/C Ratio	0.099	-	-	1.217	2.844	0.096	-	-				
HCM Control Delay (s)	9.1	-	-	249.7	\$ 955.8	9.4	-	-				
HCM Lane LOS	A	-	-	F	F	A	-	-				
HCM 95th %tile Q(veh)	0.3	-	-	7.7	20.4	0.3	-	-				
Notes												
~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon												

HCM 2010 Signalized Intersection Summary

13B: Bruce Rd & Raley Blvd

Existing Plus Project
AM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (veh/h)	33	24	35	107	30	35	80	429	136	74	439	76	
Future Volume (veh/h)	33	24	35	107	30	35	80	429	136	74	439	76	
Number	7	4	14	3	8	18	5	2	12	1	6	16	
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Adj Sat Flow, veh/h/ln	1900	1858	1900	1900	1845	1900	1863	1858	1900	1845	1863	1900	
Adj Flow Rate, veh/h	39	29	0	127	36	0	95	511	150	88	523	84	
Adj No. of Lanes	0	1	0	0	1	0	1	1	0	1	1	0	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	
Percent Heavy Veh, %	3	3	3	3	3	3	2	2	2	3	2	2	
Cap, veh/h	53	39	0	177	50	0	123	626	184	113	703	113	
Arrive On Green	0.05	0.05	0.00	0.13	0.13	0.00	0.07	0.45	0.45	0.06	0.45	0.45	
Sat Flow, veh/h	1036	770	0	1383	392	0	1774	1381	405	1757	1567	252	
Grp Volume(v), veh/h	68	0	0	163	0	0	95	0	661	88	0	607	
Grp Sat Flow(s),veh/h/ln	1806	0	0	1775	0	0	1774	0	1787	1757	0	1818	
Q Serve(g_s), s	2.1	0.0	0.0	4.9	0.0	0.0	2.9	0.0	18.0	2.8	0.0	15.5	
Cycle Q Clear(g_c), s	2.1	0.0	0.0	4.9	0.0	0.0	2.9	0.0	18.0	2.8	0.0	15.5	
Prop In Lane	0.57		0.00	0.78		0.00	1.00		0.23	1.00		0.14	
Lane Grp Cap(c), veh/h	92	0	0	227	0	0	123	0	810	113	0	815	
V/C Ratio(X)	0.74	0.00	0.00	0.72	0.00	0.00	0.77	0.00	0.82	0.78	0.00	0.74	
Avail Cap(c_a), veh/h	807	0	0	793	0	0	349	0	958	345	0	975	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	
Uniform Delay (d), s/veh	26.2	0.0	0.0	23.5	0.0	0.0	25.6	0.0	13.3	25.8	0.0	12.8	
Incr Delay (d2), s/veh	11.1	0.0	0.0	4.3	0.0	0.0	9.7	0.0	4.8	10.8	0.0	2.6	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	1.3	0.0	0.0	2.7	0.0	0.0	1.8	0.0	9.7	1.7	0.0	8.2	
LnGrp Delay(d),s/veh	37.3	0.0	0.0	27.7	0.0	0.0	35.4	0.0	18.1	36.6	0.0	15.3	
LnGrp LOS	D			C			D		B	D		B	
Approach Vol, veh/h	68				163				756				695
Approach Delay, s/veh	37.3				27.7				20.2				18.0
Approach LOS	D				C				C				B
Timer	1	2	3	4	5	6	7	8					
Assigned Phs	1	2	4		5	6	8						
Phs Duration (G+Y+Rc), s	7.6	30.4	6.8		7.9	30.1	11.1						
Change Period (Y+Rc), s	4.0	5.0	4.0		4.0	5.0	4.0						
Max Green Setting (Gmax), s	11.0	30.0	25.0		11.0	30.0	25.0						
Max Q Clear Time (g_c+l1), s	4.8	20.0	4.1		4.9	17.5	6.9						
Green Ext Time (p_c), s	0.1	5.4	0.3		0.1	6.3	0.8						
Intersection Summary													
HCM 2010 Ctrl Delay			20.7										
HCM 2010 LOS			C										

HCM 2010 Signalized Intersection Summary

14: SR 99 SB Ramps & Skyway Rd

Existing Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑		↑↑	↑				↑↑		↑
Traffic Volume (veh/h)	0	676	145	0	758	207	0	0	0	915	0	567
Future Volume (veh/h)	0	676	145	0	758	207	0	0	0	915	0	567
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	0	1845	1845				1845	0	1845
Adj Flow Rate, veh/h	0	805	0	0	902	0				1089	0	614
Adj No. of Lanes	0	2	1	0	2	1				2	0	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84				0.84	0.84	0.84
Percent Heavy Veh, %	0	3	3	0	3	3				3	0	3
Cap, veh/h	0	1200	537	0	1200	537				1479	0	681
Arrive On Green	0.00	0.34	0.00	0.00	0.34	0.00				0.43	0.00	0.43
Sat Flow, veh/h	0	3597	1568	0	3597	1568				3408	0	1568
Grp Volume(v), veh/h	0	805	0	0	902	0				1089	0	614
Grp Sat Flow(s),veh/h/ln	0	1752	1568	0	1752	1568				1704	0	1568
Q Serve(g_s), s	0.0	8.8	0.0	0.0	10.2	0.0				11.9	0.0	16.3
Cycle Q Clear(g_c), s	0.0	8.8	0.0	0.0	10.2	0.0				11.9	0.0	16.3
Prop In Lane	0.00		1.00	0.00		1.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1200	537	0	1200	537				1479	0	681
V/C Ratio(X)	0.00	0.67	0.00	0.00	0.75	0.00				0.74	0.00	0.90
Avail Cap(c_a), veh/h	0	3919	1753	0	3919	1753				2668	0	1227
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	12.6	0.0	0.0	13.0	0.0				10.5	0.0	11.8
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.4	0.0				0.3	0.0	1.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.2	0.0	0.0	4.9	0.0				5.5	0.0	7.3
LnGrp Delay(d),s/veh	0.0	12.8	0.0	0.0	13.4	0.0				10.8	0.0	13.7
LnGrp LOS		B			B					B		B
Approach Vol, veh/h		805			902						1703	
Approach Delay, s/veh		12.8			13.4						11.8	
Approach LOS		B			B						B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		20.3		24.4		20.3						
Change Period (Y+Rc), s		* 5		* 5		* 5						
Max Green Setting (Gmax), s		* 50		* 35		* 50						
Max Q Clear Time (g_c+I1), s		10.8		18.3		12.2						
Green Ext Time (p_c), s		3.0		1.1		3.0						
Intersection Summary												
HCM 2010 Ctrl Delay			12.5									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

15: SR 99 NB Ramps & Skyway Rd

Existing Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕	↗		↕↕	↗	↗↗		↗			
Traffic Volume (veh/h)	0	1333	258	0	813	1052	152	0	239	0	0	0
Future Volume (veh/h)	0	1333	258	0	813	1052	152	0	239	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1845	1845	0	1845	1845	1845	0	1845			
Adj Flow Rate, veh/h	0	1587	0	0	968	0	181	0	258			
Adj No. of Lanes	0	2	1	0	2	1	2	0	1			
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84			
Percent Heavy Veh, %	0	3	3	0	3	3	3	0	3			
Cap, veh/h	0	2079	930	0	2079	930	701	0	322			
Arrive On Green	0.00	0.59	0.00	0.00	0.59	0.00	0.21	0.00	0.21			
Sat Flow, veh/h	0	3597	1568	0	3597	1568	3408	0	1568			
Grp Volume(v), veh/h	0	1587	0	0	968	0	181	0	258			
Grp Sat Flow(s),veh/h/ln	0	1752	1568	0	1752	1568	1704	0	1568			
Q Serve(g_s), s	0.0	15.1	0.0	0.0	6.9	0.0	2.0	0.0	7.0			
Cycle Q Clear(g_c), s	0.0	15.1	0.0	0.0	6.9	0.0	2.0	0.0	7.0			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2079	930	0	2079	930	701	0	322			
V/C Ratio(X)	0.00	0.76	0.00	0.00	0.47	0.00	0.26	0.00	0.80			
Avail Cap(c_a), veh/h	0	3917	1752	0	3917	1752	1905	0	876			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	6.8	0.0	0.0	5.1	0.0	14.9	0.0	16.9			
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.1	0.0	0.1	0.0	1.8			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	7.1	0.0	0.0	3.2	0.0	0.9	0.0	3.2			
LnGrp Delay(d),s/veh	0.0	7.0	0.0	0.0	5.2	0.0	15.0	0.0	18.7			
LnGrp LOS		A			A		B		B			
Approach Vol, veh/h	1587			968			439					
Approach Delay, s/veh	7.0			5.2			17.1					
Approach LOS	A			A			B					
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2						6	8				
Phs Duration (G+Y+Rc), s	31.5						31.5	13.2				
Change Period (Y+Rc), s	* 5						* 5	4.0				
Max Green Setting (Gmax), s	* 50						* 50	25.0				
Max Q Clear Time (g_c+I1), s	17.1						8.9	9.0				
Green Ext Time (p_c), s	9.5						9.8	0.2				
Intersection Summary												
HCM 2010 Ctrl Delay			7.9									
HCM 2010 LOS			A									
Notes												

HCM 2010 Signalized Intersection Summary

16: Notre Dame Blvd & Skyway Rd

Existing Plus Project
AM Peak Hour

																
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Volume (veh/h)	364	875	333	66	1373	60	251	58	45	68	71	241				
Future Volume (veh/h)	364	875	333	66	1373	60	251	58	45	68	71	241				
Number	5	2	12	1	6	16	3	8	18	7	4	14				
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0				
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.98				
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1845	1845	1900	1845	1845	1845				
Adj Flow Rate, veh/h	433	1042	242	79	1635	26	299	69	29	81	85	176				
Adj No. of Lanes	2	3	1	1	3	1	2	1	0	1	1	2				
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84				
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3				
Cap, veh/h	550	2600	1020	123	2159	671	457	165	69	151	158	769				
Arrive On Green	0.16	0.52	0.52	0.07	0.43	0.43	0.13	0.13	0.13	0.09	0.09	0.09				
Sat Flow, veh/h	3408	5036	1568	1757	5036	1565	3408	1232	518	1757	1845	3066				
Grp Volume(v), veh/h	433	1042	242	79	1635	26	299	0	98	81	85	176				
Grp Sat Flow(s),veh/h/ln	1704	1679	1568	1757	1679	1565	1704	0	1749	1757	1845	1533				
Q Serve(g_s), s	10.2	10.6	5.3	3.7	23.0	0.8	7.0	0.0	4.3	3.7	3.7	3.8				
Cycle Q Clear(g_c), s	10.2	10.6	5.3	3.7	23.0	0.8	7.0	0.0	4.3	3.7	3.7	3.8				
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.30	1.00		1.00				
Lane Grp Cap(c), veh/h	550	2600	1020	123	2159	671	457	0	235	151	158	769				
V/C Ratio(X)	0.79	0.40	0.24	0.64	0.76	0.04	0.65	0.00	0.42	0.54	0.54	0.23				
Avail Cap(c_a), veh/h	1018	2600	1020	524	2405	747	1221	0	627	629	661	1604				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00				
Uniform Delay (d), s/veh	33.7	12.4	6.1	37.9	20.2	13.9	34.4	0.0	33.2	36.7	36.7	25.2				
Incr Delay (d2), s/veh	2.6	0.1	0.1	5.4	1.3	0.0	1.6	0.0	1.2	3.0	2.8	0.2				
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
%ile BackOfQ(50%),veh/ln	5.0	4.8	3.2	2.0	10.9	0.4	3.4	0.0	2.1	1.9	2.0	1.6				
LnGrp Delay(d),s/veh	36.3	12.5	6.2	43.3	21.5	13.9	36.0	0.0	34.4	39.6	39.5	25.3				
LnGrp LOS	D	B	A	D	C	B	D		C	D	D	C				
Approach Vol, veh/h	1717			1740			397			342						
Approach Delay, s/veh	17.6			22.4			35.6			32.2						
Approach LOS	B			C			D			C						
Timer	1	2	3	4	5	6	7	8								
Assigned Phs	1	2			4	5	6	8								
Phs Duration (G+Y+Rc), s	9.9	48.0			10.9	17.2	40.7	14.9								
Change Period (Y+Rc), s	4.0	4.8			3.7	3.7	4.8	3.7								
Max Green Setting (Gmax), s	25.0	40.0			30.0	25.0	40.0	30.0								
Max Q Clear Time (g_c+l1), s	5.7	12.6			5.8	12.2	25.0	9.0								
Green Ext Time (p_c), s	0.2	22.6			1.3	1.3	10.9	1.6								
Intersection Summary																
HCM 2010 Ctrl Delay				22.5												
HCM 2010 LOS				C												
Notes																

Intersection

Int Delay, s/veh 10.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	94	718	82	49	1406	41	3	5	26	2	5	36
Future Vol, veh/h	94	718	82	49	1406	41	3	5	26	2	5	36
Conflicting Peds, #/hr	0	0	4	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	250	-	-	150	-	-	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	84	84	84	84	84	84	84	84	84
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	112	855	98	58	1674	49	4	6	31	2	6	43

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1723	0	0	956	0	0	2088	2970	480	2469	2995	861
Stage 1	-	-	-	-	-	-	1131	1131	-	1815	1815	-
Stage 2	-	-	-	-	-	-	957	1839	-	654	1180	-
Critical Hdwy	4.16	-	-	4.16	-	-	7.56	6.56	6.96	7.56	6.56	6.96
Critical Hdwy Stg 1	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Follow-up Hdwy	2.23	-	-	2.23	-	-	3.53	4.03	3.33	3.53	4.03	3.33
Pot Cap-1 Maneuver	359	-	-	709	-	-	30	14	529	15	13	297
Stage 1	-	-	-	-	-	-	215	275	-	80	127	-
Stage 2	-	-	-	-	-	-	275	123	-	420	260	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	359	-	-	709	-	-	8	9	527	5	8	297
Mov Cap-2 Maneuver	-	-	-	-	-	-	8	9	-	5	8	-
Stage 1	-	-	-	-	-	-	147	189	-	55	117	-
Stage 2	-	-	-	-	-	-	205	113	-	263	178	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.1	0.3	\$ 377.1	246.4
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	35	359	-	-	709	-	-	5	55
HCM Lane V/C Ratio	1.156	0.312	-	-	0.082	-	-	0.476	0.887
HCM Control Delay (s)	\$ 377.1	19.5	-	-	10.5	-	-	\$ 1017.2	208.8
HCM Lane LOS	F	C	-	-	B	-	-	F	F
HCM 95th %tile Q(veh)	4.3	1.3	-	-	0.3	-	-	0.8	3.9

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 2010 Signalized Intersection Summary
17B: Skyway Rd & Forest Ave

Existing Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	94	718	82	49	1406	41	3	5	26	2	5	36
Future Volume (veh/h)	94	718	82	49	1406	41	3	5	26	2	5	36
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1900	1845	1900	1845	1845	1900
Adj Flow Rate, veh/h	112	855	91	58	1674	48	4	6	0	2	6	0
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	1	1	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	174	2014	214	166	2175	62	1	2	0	3	27	0
Arrive On Green	0.10	0.63	0.61	0.09	0.63	0.61	0.02	0.00	0.00	0.00	0.01	0.00
Sat Flow, veh/h	1757	3196	340	1757	3478	99	723	1085	0	1757	1845	0
Grp Volume(v), veh/h	112	469	477	58	841	881	10	0	0	2	6	0
Grp Sat Flow(s),veh/h/ln	1757	1752	1783	1757	1752	1825	1808	0	0	1757	1845	0
Q Serve(g_s), s	3.3	7.2	7.3	1.7	18.5	18.7	0.1	0.0	0.0	0.1	0.2	0.0
Cycle Q Clear(g_c), s	3.3	7.2	7.3	1.7	18.5	18.7	0.1	0.0	0.0	0.1	0.2	0.0
Prop In Lane	1.00		0.19	1.00		0.05	0.40		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	174	1104	1124	166	1096	1141	3	0	0	3	27	0
V/C Ratio(X)	0.64	0.42	0.42	0.35	0.77	0.77	2.96	0.00	0.00	0.61	0.22	0.00
Avail Cap(c_a), veh/h	394	1342	1366	394	1342	1397	878	0	0	853	930	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	23.2	5.0	5.1	22.7	7.2	7.3	26.6	0.0	0.0	26.8	26.1	0.0
Incr Delay (d2), s/veh	1.5	0.1	0.1	0.5	1.7	1.7	942.6	0.0	0.0	52.8	1.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	146.7	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	3.4	3.5	0.8	9.1	9.6	0.9	0.0	0.0	0.1	0.1	0.0
LnGrp Delay(d),s/veh	24.7	5.1	5.2	23.2	8.9	9.0	1115.9	0.0	0.0	79.6	27.6	0.0
LnGrp LOS	C	A	A	C	A	A	F			E	C	
Approach Vol, veh/h	1058			1780			10			8		
Approach Delay, s/veh	7.2			9.4			1115.9			40.6		
Approach LOS	A			A			F			D		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		4.0	8.0	37.7		3.8	8.3	37.5				
Change Period (Y+Rc), s		3.0	4.0	5.0		3.0	4.0	5.0				
Max Green Setting (Gmax), s		27.0	11.0	40.0		27.0	11.0	40.0				
Max Q Clear Time (g_c+l1), s		2.1	3.7	9.3		2.2	5.3	20.7				
Green Ext Time (p_c), s		0.0	0.0	15.2		0.0	0.0	11.7				
Intersection Summary												
HCM 2010 Ctrl Delay				12.5								
HCM 2010 LOS				B								

HCM 2010 Signalized Intersection Summary

18: Skyway Rd & Bruce Rd

Existing Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	252	463	25	30	1260	368	26	28	9	186	79	308
Future Volume (veh/h)	252	463	25	30	1260	368	26	28	9	186	79	308
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1845	1845	1845	1900	1845	1845	1845
Adj Flow Rate, veh/h	300	551	26	36	1500	240	31	33	-1	158	183	6
Adj No. of Lanes	2	2	0	1	2	1	1	1	0	1	1	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	380	1849	87	85	1680	953	116	122	0	226	237	201
Arrive On Green	0.11	0.54	0.54	0.05	0.48	0.48	0.07	0.07	0.00	0.13	0.13	0.13
Sat Flow, veh/h	3408	3408	161	1757	3505	1568	1757	1845	0	1757	1845	1568
Grp Volume(v), veh/h	300	283	294	36	1500	240	31	32	0	158	183	6
Grp Sat Flow(s),veh/h/ln	1704	1752	1816	1757	1752	1568	1757	1845	0	1757	1845	1568
Q Serve(g_s), s	6.8	7.0	7.0	1.6	30.9	5.6	1.3	1.3	0.0	6.8	7.6	0.3
Cycle Q Clear(g_c), s	6.8	7.0	7.0	1.6	30.9	5.6	1.3	1.3	0.0	6.8	7.6	0.3
Prop In Lane	1.00		0.09	1.00		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	380	951	985	85	1680	953	116	122	0	226	237	201
V/C Ratio(X)	0.79	0.30	0.30	0.42	0.89	0.25	0.27	0.26	0.00	0.70	0.77	0.03
Avail Cap(c_a), veh/h	645	951	985	266	1769	993	288	303	0	443	465	396
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.3	9.9	9.9	36.6	18.8	7.2	35.2	35.2	0.0	33.1	33.4	30.2
Incr Delay (d2), s/veh	1.4	0.2	0.2	1.2	6.1	0.1	0.4	0.4	0.0	1.5	2.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	3.4	3.6	0.8	16.2	3.2	0.7	0.7	0.0	3.4	4.0	0.1
LnGrp Delay(d),s/veh	35.7	10.1	10.1	37.9	24.8	7.3	35.6	35.6	0.0	34.6	35.4	30.2
LnGrp LOS	D	B	B	D	C	A	D	D		C	D	C
Approach Vol, veh/h	877					1776			63		347	
Approach Delay, s/veh	18.8					22.7			35.6		34.9	
Approach LOS	B					C			D		C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	6.8	49.0			13.7	11.8	44.0	9.8				
Change Period (Y+Rc), s	3.0	6.0			3.5	3.0	6.0	4.5				
Max Green Setting (Gmax), s	12.0	40.0			20.0	15.0	40.0	13.0				
Max Q Clear Time (g_c+l1), s	3.6	9.0			9.6	8.8	32.9	3.3				
Green Ext Time (p_c), s	0.0	19.3			0.6	0.1	5.1	0.1				
Intersection Summary												
HCM 2010 Ctrl Delay				23.3								
HCM 2010 LOS				C								
Notes												

HCM 2010 Signalized Intersection Summary
19: Bruce Rd & Webster Dr/Street G

Existing Plus Project
AM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (veh/h)	18	3	8	6	6	6	4	505	2	2	568	36	
Future Volume (veh/h)	18	3	8	6	6	6	4	505	2	2	568	36	
Number	7	4	14	3	8	18	5	2	12	1	6	16	
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	0.97		0.94	0.97		0.94	1.00		0.97	1.00		0.97	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Adj Sat Flow, veh/h/ln	1900	1845	1900	1900	1845	1900	1845	1845	1900	1845	1845	1900	
Adj Flow Rate, veh/h	21	4	10	7	7	7	5	601	2	2	676	43	
Adj No. of Lanes	0	1	0	0	1	0	1	1	0	1	1	0	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3	
Cap, veh/h	225	16	33	166	49	42	10	1033	3	5	957	61	
Arrive On Green	0.08	0.08	0.08	0.08	0.08	0.08	0.01	0.56	0.56	0.00	0.56	0.56	
Sat Flow, veh/h	847	203	420	436	619	527	1757	1837	6	1757	1713	109	
Grp Volume(v), veh/h	35	0	0	21	0	0	5	0	603	2	0	719	
Grp Sat Flow(s),veh/h/ln	1470	0	0	1582	0	0	1757	0	1843	1757	0	1822	
Q Serve(g_s), s	0.3	0.0	0.0	0.0	0.0	0.0	0.1	0.0	7.8	0.0	0.0	10.5	
Cycle Q Clear(g_c), s	0.7	0.0	0.0	0.4	0.0	0.0	0.1	0.0	7.8	0.0	0.0	10.5	
Prop In Lane	0.60		0.29	0.33		0.33	1.00		0.00	1.00		0.06	
Lane Grp Cap(c), veh/h	275	0	0	257	0	0	10	0	1036	5	0	1018	
V/C Ratio(X)	0.13	0.00	0.00	0.08	0.00	0.00	0.53	0.00	0.58	0.42	0.00	0.71	
Avail Cap(c_a), veh/h	1175	0	0	1224	0	0	529	0	1515	529	0	1497	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	
Uniform Delay (d), s/veh	15.8	0.0	0.0	15.7	0.0	0.0	18.1	0.0	5.2	18.2	0.0	5.9	
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.1	0.0	0.0	38.3	0.0	0.5	48.5	0.0	0.9	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.0	0.2	0.0	0.0	0.1	0.0	4.0	0.1	0.0	5.5	
LnGrp Delay(d),s/veh	16.0	0.0	0.0	15.8	0.0	0.0	56.5	0.0	5.7	66.7	0.0	6.8	
LnGrp LOS	B			B			E		A	E		A	
Approach Vol, veh/h	35				21				608				721
Approach Delay, s/veh	16.0				15.8				6.1				6.9
Approach LOS	B				B				A				A
Timer	1	2	3	4	5	6	7	8					
Assigned Phs	1	2			4	5	6	8					
Phs Duration (G+Y+Rc), s	4.1	25.5			6.9	4.2	25.4	6.9					
Change Period (Y+Rc), s	4.0	5.0			4.0	4.0	5.0	4.0					
Max Green Setting (Gmax), s	11.0	30.0			26.0	11.0	30.0	26.0					
Max Q Clear Time (g_c+I1), s	2.0	9.8			2.7	2.1	12.5	2.4					
Green Ext Time (p_c), s	0.0	8.5			0.2	0.0	7.9	0.2					
Intersection Summary													
HCM 2010 Ctrl Delay			7.0										
HCM 2010 LOS			A										

HCM 2010 Signalized Intersection Summary

1: Bruce Rd & SR 32

Existing Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	326	261	125	62	130	20	79	455	134	29	381	259
Future Volume (veh/h)	326	261	125	62	130	20	79	455	134	29	381	259
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	347	278	37	66	138	17	84	484	58	31	405	149
Adj No. of Lanes	1	1	1	1	1	0	1	1	1	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	391	540	449	84	189	23	108	554	471	57	500	765
Arrive On Green	0.22	0.29	0.29	0.05	0.12	0.12	0.06	0.30	0.30	0.03	0.27	0.27
Sat Flow, veh/h	1757	1845	1535	1757	1608	198	1757	1845	1568	1757	1845	1532
Grp Volume(v), veh/h	347	278	37	66	0	155	84	484	58	31	405	149
Grp Sat Flow(s),veh/h/ln	1757	1845	1535	1757	0	1806	1757	1845	1568	1757	1845	1532
Q Serve(g_s), s	12.9	8.5	1.2	2.5	0.0	5.6	3.2	16.8	1.8	1.2	13.8	3.7
Cycle Q Clear(g_c), s	12.9	8.5	1.2	2.5	0.0	5.6	3.2	16.8	1.8	1.2	13.8	3.7
Prop In Lane	1.00		1.00	1.00		0.11	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	391	540	449	84	0	212	108	554	471	57	500	765
V/C Ratio(X)	0.89	0.52	0.08	0.78	0.00	0.73	0.78	0.87	0.12	0.54	0.81	0.19
Avail Cap(c_a), veh/h	1018	1096	912	496	0	1073	522	822	699	522	959	1146
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.3	19.8	17.3	31.7	0.0	28.7	31.1	22.4	17.1	32.1	22.9	9.5
Incr Delay (d2), s/veh	2.7	0.3	0.0	5.9	0.0	1.8	4.4	5.0	0.0	2.9	1.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.6	4.3	0.5	1.3	0.0	2.9	1.7	9.2	0.8	0.6	7.1	1.5
LnGrp Delay(d),s/veh	28.1	20.1	17.3	37.6	0.0	30.5	35.5	27.4	17.2	35.0	24.1	9.6
LnGrp LOS	C	C	B	D		C	D	C	B	C	C	A
Approach Vol, veh/h	662				221				626			
Approach Delay, s/veh	24.1				32.6				27.5			
Approach LOS	C				C				C			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.2	26.7	8.2	24.3	20.0	14.9	6.2	26.2				
Change Period (Y+Rc), s	* 5	7.0	* 4	* 6	* 5	7.0	* 4	* 6				
Max Green Setting (Gmax), s	* 19	40.0	* 20	* 35	* 39	40.0	* 20	* 30				
Max Q Clear Time (g_c+I1), s	4.5	10.5	5.2	15.8	14.9	7.6	3.2	18.8				
Green Ext Time (p_c), s	0.0	0.8	0.1	1.6	0.1	0.8	0.0	1.5				
Intersection Summary												
HCM 2010 Ctrl Delay			25.2									
HCM 2010 LOS			C									
Notes												
* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 2010 Signalized Intersection Summary

2: SR 99 SB Ramps & E 20th St

Existing Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗	↖↖	↑↑					↖	↗	↖↖
Traffic Volume (veh/h)	0	1167	103	155	686	0	0	0	0	912	5	532
Future Volume (veh/h)	0	1167	103	155	686	0	0	0	0	912	5	532
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	1845	1845	0				1845	1845	1845
Adj Flow Rate, veh/h	0	1241	79	165	730	0				974	0	283
Adj No. of Lanes	0	2	1	2	2	0				2	0	2
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	3	3	3	3	0				3	3	3
Cap, veh/h	0	1507	665	233	1968	0				1097	0	979
Arrive On Green	0.00	0.43	0.43	0.07	0.56	0.00				0.31	0.00	0.31
Sat Flow, veh/h	0	3597	1546	3408	3597	0				3514	0	3136
Grp Volume(v), veh/h	0	1241	79	165	730	0				974	0	283
Grp Sat Flow(s),veh/h/ln	0	1752	1546	1704	1752	0				1757	0	1568
Q Serve(g_s), s	0.0	19.8	1.9	3.0	7.3	0.0				16.7	0.0	4.3
Cycle Q Clear(g_c), s	0.0	19.8	1.9	3.0	7.3	0.0				16.7	0.0	4.3
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1507	665	233	1968	0				1097	0	979
V/C Ratio(X)	0.00	0.82	0.12	0.71	0.37	0.00				0.89	0.00	0.29
Avail Cap(c_a), veh/h	0	1944	857	1319	1968	0				1671	0	1491
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	15.9	10.8	28.9	7.7	0.0				20.7	0.0	16.5
Incr Delay (d2), s/veh	0.0	1.8	0.0	1.5	0.0	0.0				2.9	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	9.9	0.8	1.4	3.5	0.0				8.4	0.0	1.9
LnGrp Delay(d),s/veh	0.0	17.7	10.9	30.4	7.7	0.0				23.6	0.0	16.5
LnGrp LOS		B	B	C	A					C		B
Approach Vol, veh/h	1320					895					1257	
Approach Delay, s/veh	17.3					11.9					22.0	
Approach LOS	B					B					C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	4			6						
Phs Duration (G+Y+Rc), s	8.3	31.2	23.8			39.5						
Change Period (Y+Rc), s	3.5	4.6	4.1			4.6						
Max Green Setting (Gmax), s	25.0	34.5	30.0			34.5						
Max Q Clear Time (g_c+I1), s	5.0	21.8	18.7			9.3						
Green Ext Time (p_c), s	0.1	4.8	1.0			6.3						
Intersection Summary												
HCM 2010 Ctrl Delay			17.6									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

3: SR 99 NB Ramps & E 20th St

Existing Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	408	1671	0	0	739	874	102	3	214	0	0	0
Future Volume (veh/h)	408	1671	0	0	739	874	102	3	214	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1845	1845	0	0	1845	1845	1845	1845	1845			
Adj Flow Rate, veh/h	434	1778	0	0	786	532	111	0	176			
Adj No. of Lanes	2	2	0	0	2	1	2	0	1			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94			
Percent Heavy Veh, %	3	3	0	0	3	3	3	3	3			
Cap, veh/h	1073	2650	0	0	1367	598	496	0	221			
Arrive On Green	0.31	0.76	0.00	0.00	0.39	0.39	0.14	0.00	0.14			
Sat Flow, veh/h	3408	3597	0	0	3597	1534	3514	0	1568			
Grp Volume(v), veh/h	434	1778	0	0	786	532	111	0	176			
Grp Sat Flow(s),veh/h/ln	1704	1752	0	0	1752	1534	1757	0	1568			
Q Serve(g_s), s	7.8	19.6	0.0	0.0	13.7	25.2	2.2	0.0	8.5			
Cycle Q Clear(g_c), s	7.8	19.6	0.0	0.0	13.7	25.2	2.2	0.0	8.5			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	1073	2650	0	0	1367	598	496	0	221			
V/C Ratio(X)	0.40	0.67	0.00	0.00	0.58	0.89	0.22	0.00	0.79			
Avail Cap(c_a), veh/h	1073	2650	0	0	1621	710	1359	0	606			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	20.9	4.7	0.0	0.0	18.7	22.2	29.6	0.0	32.3			
Incr Delay (d2), s/veh	1.1	0.5	0.0	0.0	0.1	10.7	0.1	0.0	2.5			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	3.8	9.3	0.0	0.0	6.6	12.4	1.1	0.0	3.8			
LnGrp Delay(d),s/veh	22.1	5.2	0.0	0.0	18.8	32.9	29.7	0.0	34.8			
LnGrp LOS	C	A			B	C	C		C			
Approach Vol, veh/h	2212			1318			287					
Approach Delay, s/veh	8.6			24.5			32.8					
Approach LOS	A			C			C					
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2			5			8					
Phs Duration (G+Y+Rc), s	62.9			28.5			15.0					
Change Period (Y+Rc), s	* 5			3.5			4.1					
Max Green Setting (Gmax), s	* 35			25.0			30.0					
Max Q Clear Time (g_c+l1), s	21.6			9.8			10.5					
Green Ext Time (p_c), s	7.6			0.7			0.5					
Intersection Summary												
HCM 2010 Ctrl Delay				15.9								
HCM 2010 LOS	B											
Notes												

HCM 2010 Signalized Intersection Summary

4: E 20th St & Chico Mall

Existing Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	304	1031	64	47	1018	74	367	36	22	99	20	227
Future Volume (veh/h)	304	1031	64	47	1018	74	367	36	22	99	20	227
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1900	1900	1845	1845
Adj Flow Rate, veh/h	323	1097	65	50	1083	75	436	0	0	105	21	15
Adj No. of Lanes	2	2	0	1	2	0	2	1	0	0	1	2
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	404	1653	98	52	1342	93	593	311	0	142	28	259
Arrive On Green	0.12	0.49	0.49	0.03	0.40	0.40	0.17	0.00	0.00	0.10	0.10	0.10
Sat Flow, veh/h	3408	3357	199	1757	3322	230	3514	1845	0	1476	295	2694
Grp Volume(v), veh/h	323	572	590	50	571	587	436	0	0	126	0	15
Grp Sat Flow(s),veh/h/ln	1704	1752	1804	1757	1752	1800	1757	1845	0	1771	0	1347
Q Serve(g_s), s	6.9	18.5	18.5	2.1	21.7	21.7	8.9	0.0	0.0	5.2	0.0	0.4
Cycle Q Clear(g_c), s	6.9	18.5	18.5	2.1	21.7	21.7	8.9	0.0	0.0	5.2	0.0	0.4
Prop In Lane	1.00		0.11	1.00		0.13	1.00		0.00	0.83		1.00
Lane Grp Cap(c), veh/h	404	863	888	52	708	727	593	311	0	170	0	259
V/C Ratio(X)	0.80	0.66	0.66	0.96	0.81	0.81	0.74	0.00	0.00	0.74	0.00	0.06
Avail Cap(c_a), veh/h	884	863	888	444	818	840	1169	614	0	589	0	896
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	32.3	14.4	14.4	36.4	19.8	19.8	29.7	0.0	0.0	33.1	0.0	30.9
Incr Delay (d2), s/veh	1.4	1.8	1.7	25.8	5.0	4.9	0.7	0.0	0.0	2.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.4	9.3	9.6	1.4	11.4	11.7	4.4	0.0	0.0	2.7	0.0	0.1
LnGrp Delay(d),s/veh	33.7	16.1	16.1	62.2	24.8	24.7	30.3	0.0	0.0	35.4	0.0	30.9
LnGrp LOS	C	B	B	E	C	C	C			D		C
Approach Vol, veh/h	1485					1208		436		141		
Approach Delay, s/veh	19.9					26.3		30.3		34.9		
Approach LOS	B					C		C		C		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	6.2	41.0			11.2	12.9	34.4	16.7				
Change Period (Y+Rc), s	3.0	4.1			4.0	3.5	4.1	4.0				
Max Green Setting (Gmax), s	20.0	35.0			25.0	20.0	35.0	25.0				
Max Q Clear Time (g_c+l1), s	4.1	20.5			7.2	8.9	23.7	10.9				
Green Ext Time (p_c), s	0.0	10.3			0.4	0.5	6.6	0.8				
Intersection Summary												
HCM 2010 Ctrl Delay				24.3								
HCM 2010 LOS				C								
Notes												

HCM 2010 Signalized Intersection Summary

5: Forest Ave & E 20th St

Existing Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	267	660	215	95	605	171	398	342	88	132	217	147
Future Volume (veh/h)	267	660	215	95	605	171	398	342	88	132	217	147
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.98	1.00		0.98	1.00		0.94
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1845	1845	1845	1845	1845	1845	1900
Adj Flow Rate, veh/h	284	702	191	101	644	30	423	364	21	140	231	13
Adj No. of Lanes	1	2	0	1	2	1	1	2	1	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	231	850	231	154	1013	444	417	1023	448	154	478	27
Arrive On Green	0.13	0.31	0.31	0.09	0.29	0.29	0.24	0.29	0.29	0.09	0.14	0.14
Sat Flow, veh/h	1757	2707	736	1757	3505	1536	1757	3505	1535	1757	3363	188
Grp Volume(v), veh/h	284	454	439	101	644	30	423	364	21	140	120	124
Grp Sat Flow(s),veh/h/ln	1757	1752	1690	1757	1752	1536	1757	1752	1535	1757	1752	1798
Q Serve(g_s), s	10.5	19.2	19.2	4.5	12.8	1.1	19.0	6.6	0.5	6.3	5.0	5.1
Cycle Q Clear(g_c), s	10.5	19.2	19.2	4.5	12.8	1.1	19.0	6.6	0.5	6.3	5.0	5.1
Prop In Lane	1.00		0.44	1.00		1.00	1.00		1.00	1.00		0.10
Lane Grp Cap(c), veh/h	231	550	531	154	1013	444	417	1023	448	154	249	256
V/C Ratio(X)	1.23	0.83	0.83	0.66	0.64	0.07	1.01	0.36	0.05	0.91	0.48	0.49
Avail Cap(c_a), veh/h	231	550	531	165	1013	444	417	1073	470	253	383	393
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.64	0.64	0.64	0.94	0.94	0.94	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.7	25.4	25.5	35.3	24.8	20.6	30.5	22.4	9.7	36.2	31.6	31.7
Incr Delay (d2), s/veh	126.2	6.2	6.5	5.9	2.9	0.3	47.6	0.1	0.0	15.4	0.5	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.1	10.2	9.9	2.4	6.6	0.5	14.7	3.2	0.2	3.7	2.5	2.6
LnGrp Delay(d),s/veh	161.0	31.6	32.0	41.2	27.6	20.9	78.1	22.5	9.7	51.6	32.1	32.2
LnGrp LOS	F	C	C	D	C	C	F	C	A	D	C	C
Approach Vol, veh/h	1177			775			808			384		
Approach Delay, s/veh	63.0			29.1			51.3			39.2		
Approach LOS	E			C			D			D		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	14.5	27.1	11.0	27.4	12.5	29.1	23.0	15.4				
Change Period (Y+Rc), s	3.0	4.5	3.0	4.5	4.5	* 4.5	3.0	4.5				
Max Green Setting (Gmax), s	11.5	16.5	12.5	24.0	8.5	* 19	20.0	17.0				
Max Q Clear Time (g_c+l1), s	12.5	14.8	8.3	8.6	6.5	21.2	21.0	7.1				
Green Ext Time (p_c), s	0.0	0.6	0.1	2.2	0.7	0.0	0.0	1.8				
Intersection Summary												
HCM 2010 Ctrl Delay				48.7								
HCM 2010 LOS				D								
Notes												

HCM 2010 Signalized Intersection Summary

6: Huntington Dr & E 20th St

Existing Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	63	704	36	57	649	47	19	8	44	106	6	75
Future Volume (veh/h)	63	704	36	57	649	47	19	8	44	106	6	75
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.97	0.98		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1900	1845	1900	1900	1845	1845
Adj Flow Rate, veh/h	67	749	34	61	690	44	20	9	7	113	6	11
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	70	1525	69	107	1564	100	233	91	40	413	17	234
Arrive On Green	0.04	0.45	0.42	0.06	0.47	0.44	0.15	0.15	0.18	0.15	0.15	0.15
Sat Flow, veh/h	1757	3410	155	1757	3340	213	489	600	263	1415	112	1547
Grp Volume(v), veh/h	67	385	398	61	362	372	36	0	0	119	0	11
Grp Sat Flow(s),veh/h/ln	1757	1752	1812	1757	1752	1801	1352	0	0	1527	0	1547
Q Serve(g_s), s	1.3	5.5	5.5	1.2	4.9	4.9	0.0	0.0	0.0	0.0	0.0	0.2
Cycle Q Clear(g_c), s	1.3	5.5	5.5	1.2	4.9	4.9	2.2	0.0	0.0	2.2	0.0	0.2
Prop In Lane	1.00		0.09	1.00		0.12	0.56		0.19	0.95		1.00
Lane Grp Cap(c), veh/h	70	784	810	107	821	843	363	0	0	430	0	234
V/C Ratio(X)	0.96	0.49	0.49	0.57	0.44	0.44	0.10	0.00	0.00	0.28	0.00	0.05
Avail Cap(c_a), veh/h	698	2040	2110	948	2040	2097	946	0	0	964	0	835
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.9	6.9	6.9	16.1	6.3	6.3	12.9	0.0	0.0	13.6	0.0	12.8
Incr Delay (d2), s/veh	21.6	0.2	0.2	1.8	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	2.6	2.7	0.6	2.3	2.4	0.3	0.0	0.0	1.1	0.0	0.1
LnGrp Delay(d),s/veh	38.4	7.1	7.1	17.9	6.4	6.5	12.9	0.0	0.0	13.7	0.0	12.8
LnGrp LOS	D	A	A	B	A	A	B			B		B
Approach Vol, veh/h	850				795		36				130	
Approach Delay, s/veh	9.6				7.3		12.9				13.7	
Approach LOS	A				A		B				B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	6.1	19.7			9.3	5.4	20.5	9.3				
Change Period (Y+Rc), s	3.0	5.0			3.0	3.0	5.0	3.0				
Max Green Setting (Gmax), s	20.0	40.0			20.0	15.0	40.0	20.0				
Max Q Clear Time (g_c+I1), s	3.2	7.5			4.2	3.3	6.9	4.2				
Green Ext Time (p_c), s	0.0	7.0			0.5	0.0	7.0	0.5				
Intersection Summary												
HCM 2010 Ctrl Delay			8.9									
HCM 2010 LOS			A									
Notes												

Intersection

Int Delay, s/veh 51.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↑	↑	↑	↑
Traffic Vol, veh/h	681	171	46	548	191	24
Future Vol, veh/h	681	171	46	548	191	24
Conflicting Peds, #/hr	0	1	0	0	0	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	100	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	724	182	49	583	203	26

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1497
Stage 1	-	-	816
Stage 2	-	-	681
Critical Hdwy	-	4.145	6.645
Critical Hdwy Stg 1	-	-	5.845
Critical Hdwy Stg 2	-	-	5.445
Follow-up Hdwy	-	2.2285	3.5285
Pot Cap-1 Maneuver	-	743	~ 123
Stage 1	-	-	394
Stage 2	-	-	499
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	742	~ 115
Mov Cap-2 Maneuver	-	-	~ 115
Stage 1	-	-	394
Stage 2	-	-	466

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	\$ 394.6
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	115	550	-	-	742	-
HCM Lane V/C Ratio	1.767	0.046	-	-	0.066	-
HCM Control Delay (s)	\$ 442.7	11.9	-	-	10.2	-
HCM Lane LOS	F	B	-	-	B	-
HCM 95th %tile Q(veh)	15.8	0.1	-	-	0.2	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 2010 Signalized Intersection Summary
7B: Notre Dame Blvd & E 20th St

Existing Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	681	171	46	548	0	191	0	24	0	0	0
Future Volume (veh/h)	0	681	171	46	548	0	191	0	24	0	0	0
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	0	724	163	49	583	0	203	0	8	0	0	0
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	4	1227	276	130	2138	0	280	294	250	4	5	4
Arrive On Green	0.00	0.43	0.43	0.07	0.61	0.00	0.16	0.00	0.16	0.00	0.00	0.00
Sat Flow, veh/h	1757	2830	637	1757	3597	0	1757	1845	1565	1757	1845	1568
Grp Volume(v), veh/h	0	448	439	49	583	0	203	0	8	0	0	0
Grp Sat Flow(s),veh/h/ln	1757	1752	1714	1757	1752	0	1757	1845	1565	1757	1845	1568
Q Serve(g_s), s	0.0	7.6	7.6	1.0	3.0	0.0	4.3	0.0	0.2	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	7.6	7.6	1.0	3.0	0.0	4.3	0.0	0.2	0.0	0.0	0.0
Prop In Lane	1.00		0.37	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	4	760	744	130	2138	0	280	294	250	4	5	4
V/C Ratio(X)	0.00	0.59	0.59	0.38	0.27	0.00	0.72	0.00	0.03	0.00	0.00	0.00
Avail Cap(c_a), veh/h	675	1795	1756	675	3590	0	900	1134	962	675	1134	964
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	8.4	8.4	17.2	3.6	0.0	15.6	0.0	13.9	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.3	0.7	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	3.7	3.6	0.5	1.5	0.0	2.2	0.0	0.1	0.0	0.0	0.0
LnGrp Delay(d),s/veh	0.0	8.7	8.7	17.9	3.6	0.0	16.9	0.0	13.9	0.0	0.0	0.0
LnGrp LOS		A	A	B	A		B		B			
Approach Vol, veh/h	887		632				211		0			
Approach Delay, s/veh	8.7		4.7				16.8		0.0			
Approach LOS	A		A				B					
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	6.9	21.9	10.2	0.0	0.0	28.8	0.0	10.2				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	15.0	40.0	20.0	24.0	15.0	40.0	15.0	24.0				
Max Q Clear Time (g_c+I1), s	3.0	9.6	6.3	0.0	0.0	5.0	0.0	2.2				
Green Ext Time (p_c), s	0.0	7.3	0.2	0.0	0.0	7.4	0.0	0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			8.2									
HCM 2010 LOS			A									

HCM 2010 Signalized Intersection Summary

8: Bruce Rd & E 20th St

Existing Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	308	117	242	19	58	27	374	389	49	34	409	137
Future Volume (veh/h)	308	117	242	19	58	27	374	389	49	34	409	137
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.96	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1900	1845	1845	1845
Adj Flow Rate, veh/h	328	124	66	20	62	13	398	414	49	36	435	95
Adj No. of Lanes	1	1	1	1	1	0	1	1	0	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	361	470	400	54	118	25	395	790	93	81	570	485
Arrive On Green	0.21	0.26	0.26	0.03	0.08	0.08	0.23	0.49	0.48	0.05	0.31	0.31
Sat Flow, veh/h	1757	1845	1568	1757	1468	308	1757	1619	192	1757	1845	1568
Grp Volume(v), veh/h	328	124	66	20	0	75	398	0	463	36	435	95
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	0	1775	1757	0	1811	1757	1845	1568
Q Serve(g_s), s	16.2	4.8	2.9	1.0	0.0	3.6	20.0	0.0	15.7	1.8	18.9	4.0
Cycle Q Clear(g_c), s	16.2	4.8	2.9	1.0	0.0	3.6	20.0	0.0	15.7	1.8	18.9	4.0
Prop In Lane	1.00		1.00	1.00		0.17	1.00		0.11	1.00		1.00
Lane Grp Cap(c), veh/h	361	470	400	54	0	143	395	0	883	81	570	485
V/C Ratio(X)	0.91	0.26	0.17	0.37	0.00	0.53	1.01	0.00	0.52	0.44	0.76	0.20
Avail Cap(c_a), veh/h	395	851	724	395	0	400	395	0	883	395	851	724
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.5	26.4	25.7	42.2	0.0	39.2	34.4	0.0	15.7	41.2	27.8	22.6
Incr Delay (d2), s/veh	22.2	0.1	0.1	1.6	0.0	1.1	46.9	0.0	0.8	1.4	3.2	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.1	2.4	1.3	0.5	0.0	1.8	14.7	0.0	7.9	0.9	10.2	1.7
LnGrp Delay(d),s/veh	56.7	26.5	25.8	43.8	0.0	40.3	81.3	0.0	16.5	42.6	30.9	22.9
LnGrp LOS	E	C	C	D		D	F		B	D	C	C
Approach Vol, veh/h	518				95				861			
Approach Delay, s/veh	45.6				41.1				46.4			
Approach LOS	D				D				D			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.1	47.3	6.7	26.7	24.0	31.5	22.2	11.1				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	20.0	40.0	20.0	41.0	20.0	40.0	20.0	20.0				
Max Q Clear Time (g_c+I1), s	3.8	17.7	3.0	6.8	22.0	20.9	18.2	5.6				
Green Ext Time (p_c), s	0.0	8.2	0.0	0.7	0.0	5.5	0.0	0.6				
Intersection Summary												
HCM 2010 Ctrl Delay	41.5											
HCM 2010 LOS	D											

HCM 2010 Signalized Intersection Summary
8B: Bruce Rd & E 20th St

Existing Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	308	117	242	19	58	27	374	389	49	34	409	137
Future Volume (veh/h)	308	117	242	19	58	27	374	389	49	34	409	137
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	328	124	58	20	62	13	398	414	19	36	435	36
Adj No. of Lanes	2	1	1	2	1	0	2	2	1	1	2	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	446	413	351	114	186	39	516	1418	607	94	1075	481
Arrive On Green	0.13	0.22	0.22	0.03	0.13	0.13	0.15	0.40	0.39	0.05	0.31	0.31
Sat Flow, veh/h	3408	1845	1568	3408	1474	309	3408	3505	1568	1757	3505	1568
Grp Volume(v), veh/h	328	124	58	20	0	75	398	414	19	36	435	36
Grp Sat Flow(s),veh/h/ln	1704	1845	1568	1704	0	1783	1704	1752	1568	1757	1752	1568
Q Serve(g_s), s	5.2	3.1	1.7	0.3	0.0	2.2	6.3	4.5	0.4	1.1	5.5	0.9
Cycle Q Clear(g_c), s	5.2	3.1	1.7	0.3	0.0	2.2	6.3	4.5	0.4	1.1	5.5	0.9
Prop In Lane	1.00		1.00	1.00		0.17	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	446	413	351	114	0	225	516	1418	607	94	1075	481
V/C Ratio(X)	0.74	0.30	0.17	0.18	0.00	0.33	0.77	0.29	0.03	0.38	0.40	0.07
Avail Cap(c_a), veh/h	1213	1345	1144	1213	0	983	1213	2556	1116	625	2556	1144
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.5	18.2	17.6	26.4	0.0	22.4	22.9	11.3	10.7	25.7	15.4	13.8
Incr Delay (d2), s/veh	0.9	0.2	0.1	0.3	0.0	0.3	0.9	0.2	0.0	0.9	0.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	1.6	0.7	0.2	0.0	1.1	3.0	2.2	0.2	0.6	2.7	0.4
LnGrp Delay(d),s/veh	24.4	18.3	17.7	26.7	0.0	22.7	23.8	11.5	10.7	26.6	15.8	13.9
LnGrp LOS	C	B	B	C		C	C	B	B	C	B	B
Approach Vol, veh/h	510				95			831			507	
Approach Delay, s/veh	22.1				23.6			17.4			16.4	
Approach LOS	C				C			B			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.0	26.7	5.9	16.6	12.5	21.2	11.4	11.1				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	20.0	40.0	20.0	41.0	20.0	40.0	20.0	31.0				
Max Q Clear Time (g_c+I1), s	3.1	6.5	2.3	5.1	8.3	7.5	7.2	4.2				
Green Ext Time (p_c), s	0.0	8.8	0.0	0.7	0.2	8.7	0.2	0.7				
Intersection Summary												
HCM 2010 Ctrl Delay	18.7											
HCM 2010 LOS	B											

HCM 2010 Signalized Intersection Summary

8C: Bruce Rd & E 20th St

Existing Plus Project
PM Peak Hour

																
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Volume (veh/h)	308	117	242	19	58	27	374	389	49	34	409	137				
Future Volume (veh/h)	308	117	242	19	58	27	374	389	49	34	409	137				
Number	7	4	14	3	8	18	5	2	12	1	6	16				
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0				
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00				
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1845	1845	1845	1845				
Adj Flow Rate, veh/h	328	124	57	20	62	2	398	414	19	36	435	36				
Adj No. of Lanes	2	1	1	1	2	0	2	2	1	1	2	1				
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94				
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3				
Cap, veh/h	446	412	350	59	436	14	516	1419	607	94	1075	481				
Arrive On Green	0.13	0.22	0.22	0.03	0.13	0.13	0.15	0.40	0.39	0.05	0.31	0.31				
Sat Flow, veh/h	3408	1845	1568	1757	3464	111	3408	3505	1568	1757	3505	1568				
Grp Volume(v), veh/h	328	124	57	20	31	33	398	414	19	36	435	36				
Grp Sat Flow(s),veh/h/ln	1704	1845	1568	1757	1752	1822	1704	1752	1568	1757	1752	1568				
Q Serve(g_s), s	5.2	3.1	1.6	0.6	0.9	0.9	6.3	4.5	0.4	1.1	5.5	0.9				
Cycle Q Clear(g_c), s	5.2	3.1	1.6	0.6	0.9	0.9	6.3	4.5	0.4	1.1	5.5	0.9				
Prop In Lane	1.00		1.00	1.00		0.06	1.00		1.00	1.00		1.00				
Lane Grp Cap(c), veh/h	446	412	350	59	221	230	516	1419	607	94	1075	481				
V/C Ratio(X)	0.74	0.30	0.16	0.34	0.14	0.14	0.77	0.29	0.03	0.38	0.40	0.07				
Avail Cap(c_a), veh/h	1213	1346	1144	625	967	1006	1213	2558	1116	625	2558	1144				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Uniform Delay (d), s/veh	23.5	18.2	17.6	26.5	21.8	21.9	22.9	11.3	10.7	25.7	15.4	13.8				
Incr Delay (d2), s/veh	0.9	0.2	0.1	1.3	0.1	0.1	0.9	0.2	0.0	0.9	0.3	0.1				
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
%ile BackOfQ(50%),veh/ln	2.5	1.6	0.7	0.3	0.4	0.5	3.0	2.2	0.2	0.6	2.7	0.4				
LnGrp Delay(d),s/veh	24.4	18.3	17.7	27.8	22.0	22.0	23.8	11.4	10.7	26.6	15.8	13.9				
LnGrp LOS	C	B	B	C	C	C	C	B	B	C	B	B				
Approach Vol, veh/h	509				84				831							
Approach Delay, s/veh	22.1				23.3				17.4							
Approach LOS	C				C				B							
Timer	1	2	3	4	5	6	7	8								
Assigned Phs	1	2	3	4	5	6	7	8								
Phs Duration (G+Y+Rc), s	7.0	26.7	5.9	16.6	12.5	21.2	11.4	11.1								
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0								
Max Green Setting (Gmax), s	20.0	40.0	20.0	41.0	20.0	40.0	20.0	31.0								
Max Q Clear Time (g_c+I1), s	3.1	6.5	2.6	5.1	8.3	7.5	7.2	2.9								
Green Ext Time (p_c), s	0.0	8.8	0.0	0.6	0.2	8.7	0.2	0.6								
Intersection Summary																
HCM 2010 Ctrl Delay	18.6															
HCM 2010 LOS	B															

Intersection						
Int Delay, s/veh	1.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	23	177	6	27	170
Future Vol, veh/h	3	23	177	6	27	170
Conflicting Peds, #/hr	0	1	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	24	188	6	29	181
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	429	192	0	0	195	0
Stage 1	191	-	-	-	-	-
Stage 2	238	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	583	850	-	-	1378	-
Stage 1	841	-	-	-	-	-
Stage 2	802	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	570	849	-	-	1377	-
Mov Cap-2 Maneuver	629	-	-	-	-	-
Stage 1	841	-	-	-	-	-
Stage 2	784	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	9.6		0		1.1	
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 816	1377	-		
HCM Lane V/C Ratio	-	- 0.034	0.021	-		
HCM Control Delay (s)	-	- 9.6	7.7	0		
HCM Lane LOS	-	- A	A	A		
HCM 95th %tile Q(veh)	-	- 0.1	0.1	-		

Intersection						
Int Delay, s/veh	1.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	34	9	178	38	26	146
Future Vol, veh/h	34	9	178	38	26	146
Conflicting Peds, #/hr	0	0	0	1	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	10	189	40	28	155
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	422	211	0	0	231	0
Stage 1	211	-	-	-	-	-
Stage 2	211	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	588	829	-	-	1337	-
Stage 1	824	-	-	-	-	-
Stage 2	824	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	575	828	-	-	1337	-
Mov Cap-2 Maneuver	634	-	-	-	-	-
Stage 1	823	-	-	-	-	-
Stage 2	807	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	10.8		0		1.2	
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 667	1337	-		
HCM Lane V/C Ratio	-	- 0.069	0.021	-		
HCM Control Delay (s)	-	- 10.8	7.7	-		
HCM Lane LOS	-	- B	A	-		
HCM 95th %tile Q(veh)	-	- 0.2	0.1	-		

Intersection						
Int Delay, s/veh	1.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	35	12	241	59	25	173
Future Vol, veh/h	35	12	241	59	25	173
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	37	13	256	63	27	184
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	525	288	0	0	319	0
Stage 1	288	-	-	-	-	-
Stage 2	237	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	513	751	-	-	1241	-
Stage 1	761	-	-	-	-	-
Stage 2	802	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	502	751	-	-	1241	-
Mov Cap-2 Maneuver	582	-	-	-	-	-
Stage 1	761	-	-	-	-	-
Stage 2	785	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	11.3		0		1	
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 617	1241	-		
HCM Lane V/C Ratio	-	- 0.081	0.021	-		
HCM Control Delay (s)	-	- 11.3	8	-		
HCM Lane LOS	-	- B	A	-		
HCM 95th %tile Q(veh)	-	- 0.3	0.1	-		

HCM 2010 Signalized Intersection Summary

12: Notre Dame Blvd & Forest Ave

Existing Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	21	110	425	31	76	34	341	244	21	14	165	39
Future Volume (veh/h)	21	110	425	31	76	34	341	244	21	14	165	39
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	22	117	64	33	81	21	363	260	18	15	176	22
Adj No. of Lanes	1	1	2	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	24	325	473	52	270	70	402	1361	94	5	576	71
Arrive On Green	0.01	0.17	0.17	0.03	0.19	0.19	0.23	0.41	0.41	0.00	0.18	0.18
Sat Flow, veh/h	1774	1863	2707	1774	1416	367	1774	3354	231	1774	3171	391
Grp Volume(v), veh/h	22	117	64	33	0	102	363	136	142	15	97	101
Grp Sat Flow(s),veh/h/ln	1774	1863	1354	1774	0	1784	1774	1770	1815	1774	1770	1793
Q Serve(g_s), s	0.5	2.3	0.8	0.8	0.0	2.0	8.2	2.0	2.1	0.1	2.0	2.0
Cycle Q Clear(g_c), s	0.5	2.3	0.8	0.8	0.0	2.0	8.2	2.0	2.1	0.1	2.0	2.0
Prop In Lane	1.00		1.00	1.00		0.21	1.00		0.13	1.00		0.22
Lane Grp Cap(c), veh/h	24	325	473	52	0	340	402	718	736	5	321	326
V/C Ratio(X)	0.91	0.36	0.14	0.64	0.00	0.30	0.90	0.19	0.19	3.31	0.30	0.31
Avail Cap(c_a), veh/h	903	1219	1772	688	0	1038	1118	1373	1408	688	1158	1173
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.3	15.0	14.4	19.8	0.0	14.3	15.5	7.9	7.9	20.6	14.6	14.6
Incr Delay (d2), s/veh	33.9	0.2	0.0	4.7	0.0	0.2	3.1	0.1	0.1	1081.4	0.5	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	1.2	0.3	0.4	0.0	1.0	4.3	1.0	1.0	1.4	1.0	1.0
LnGrp Delay(d),s/veh	54.2	15.2	14.4	24.6	0.0	14.5	18.6	8.0	8.0	1103.0	15.1	15.2
LnGrp LOS	D	B	B	C		B	B	A	A	F	B	B
Approach Vol, veh/h	203					135		641		213		
Approach Delay, s/veh	19.2					17.0		14.0		91.8		
Approach LOS	B					B		B		F		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	4.6	11.9	4.1	20.7	5.2	11.2	13.3	11.5				
Change Period (Y+Rc), s	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0				
Max Green Setting (Gmax), s	22.0	24.0	17.0	32.0	17.0	27.0	27.0	27.0				
Max Q Clear Time (g_c+l1), s	2.5	4.0	2.1	4.1	2.8	4.3	10.2	4.0				
Green Ext Time (p_c), s	0.0	0.9	0.0	2.9	0.0	0.9	0.1	2.8				
Intersection Summary												
HCM 2010 Ctrl Delay			29.1									
HCM 2010 LOS			C									
Notes												

Intersection												
Int Delay, s/veh	1326											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	142	55	151	266	50	127	24	454	220	85	572	59
Future Vol, veh/h	142	55	151	266	50	127	24	454	220	85	572	59
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	3	2	3	3	3	2	2	3	3	2	2
Mvmt Flow	151	59	161	283	53	135	26	483	234	90	609	63
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1566	1589	640	1581	1503	600	671	0	0	717	0	0
Stage 1	821	821	-	651	651	-	-	-	-	-	-	-
Stage 2	745	768	-	930	852	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.53	6.22	7.13	6.53	6.23	4.12	-	-	4.13	-	-
Critical Hdwy Stg 1	6.12	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.027	3.318	3.527	4.027	3.327	2.218	-	-	2.227	-	-
Pot Cap-1 Maneuver	~ 90	107	475	~ 88	121	499	919	-	-	879	-	-
Stage 1	369	387	-	456	463	-	-	-	-	-	-	-
Stage 2	406	409	-	319	375	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 36	93	475	~ 26	106	499	919	-	-	879	-	-
Mov Cap-2 Maneuver	~ 36	93	-	~ 26	106	-	-	-	-	-	-	-
Stage 1	359	347	-	443	450	-	-	-	-	-	-	-
Stage 2	254	397	-	~ 158	337	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	\$ 1979			\$ 5043.3			0.3			1.1		
HCM LOS	F			F								
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	919	-	-	72	40	879	-	-				
HCM Lane V/C Ratio	0.028	-	-	5.142	11.782	0.103	-	-				
HCM Control Delay (s)	9	-	-	\$ 1979	\$ 5043.3	9.6	-	-				
HCM Lane LOS	A	-	-	F	F	A	-	-				
HCM 95th %tile Q(veh)	0.1	-	-	40.7	57	0.3	-	-				
Notes												
~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon												

HCM 2010 Signalized Intersection Summary

13B: Bruce Rd & Raley Blvd

Existing Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	142	55	151	266	50	127	24	454	220	85	572	59
Future Volume (veh/h)	142	55	151	266	50	127	24	454	220	85	572	59
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1860	1900	1900	1845	1900	1863	1857	1900	1845	1863	1900
Adj Flow Rate, veh/h	151	59	29	283	53	17	26	483	215	90	609	59
Adj No. of Lanes	0	1	0	0	1	0	1	1	0	1	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	2	2	2	3	2	2
Cap, veh/h	175	69	34	321	60	19	35	487	217	113	743	72
Arrive On Green	0.16	0.16	0.16	0.23	0.23	0.23	0.02	0.40	0.40	0.06	0.44	0.44
Sat Flow, veh/h	1116	436	214	1410	264	85	1774	1219	542	1757	1672	162
Grp Volume(v), veh/h	239	0	0	353	0	0	26	0	698	90	0	668
Grp Sat Flow(s),veh/h/ln	1766	0	0	1759	0	0	1774	0	1761	1757	0	1834
Q Serve(g_s), s	14.8	0.0	0.0	21.8	0.0	0.0	1.6	0.0	44.4	5.7	0.0	35.8
Cycle Q Clear(g_c), s	14.8	0.0	0.0	21.8	0.0	0.0	1.6	0.0	44.4	5.7	0.0	35.8
Prop In Lane	0.63		0.12	0.80		0.05	1.00		0.31	1.00		0.09
Lane Grp Cap(c), veh/h	278	0	0	400	0	0	35	0	704	113	0	815
V/C Ratio(X)	0.86	0.00	0.00	0.88	0.00	0.00	0.74	0.00	0.99	0.79	0.00	0.82
Avail Cap(c_a), veh/h	392	0	0	563	0	0	173	0	704	172	0	815
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	46.2	0.0	0.0	42.0	0.0	0.0	54.9	0.0	33.6	51.9	0.0	27.3
Incr Delay (d2), s/veh	12.9	0.0	0.0	11.5	0.0	0.0	26.0	0.0	31.7	13.5	0.0	6.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.2	0.0	0.0	11.9	0.0	0.0	1.1	0.0	27.7	3.2	0.0	19.5
LnGrp Delay(d),s/veh	59.2	0.0	0.0	53.5	0.0	0.0	80.8	0.0	65.3	65.4	0.0	33.9
LnGrp LOS	E			D			F		E	E		C
Approach Vol, veh/h	239				353				724		758	
Approach Delay, s/veh	59.2				53.5				65.8		37.7	
Approach LOS	E				D				E		D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	4		5	6	8					
Phs Duration (G+Y+Rc), s	11.3	50.0	21.7		6.2	55.0	29.6					
Change Period (Y+Rc), s	4.0	5.0	4.0		4.0	5.0	4.0					
Max Green Setting (Gmax), s	11.0	45.0	25.0		11.0	45.0	36.0					
Max Q Clear Time (g_c+I1), s	7.7	46.4	16.8		3.6	37.8	23.8					
Green Ext Time (p_c), s	0.0	0.0	0.8		0.0	4.5	1.8					
Intersection Summary												
HCM 2010 Ctrl Delay			52.7									
HCM 2010 LOS			D									

HCM 2010 Signalized Intersection Summary

14: SR 99 SB Ramps & Skyway Rd

Existing Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑		↑↑	↑				↑↑		↑
Traffic Volume (veh/h)	0	1470	231	0	805	288	0	0	0	981	0	296
Future Volume (veh/h)	0	1470	231	0	805	288	0	0	0	981	0	296
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	0	1845	1845				1845	0	1845
Adj Flow Rate, veh/h	0	1564	0	0	856	0				1044	0	227
Adj No. of Lanes	0	2	1	0	2	1				2	0	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	3	3	0	3	3				3	0	3
Cap, veh/h	0	1821	814	0	1821	814				1192	0	548
Arrive On Green	0.00	0.52	0.00	0.00	0.52	0.00				0.35	0.00	0.35
Sat Flow, veh/h	0	3597	1568	0	3597	1568				3408	0	1568
Grp Volume(v), veh/h	0	1564	0	0	856	0				1044	0	227
Grp Sat Flow(s),veh/h/ln	0	1752	1568	0	1752	1568				1704	0	1568
Q Serve(g_s), s	0.0	23.7	0.0	0.0	9.5	0.0				17.6	0.0	6.7
Cycle Q Clear(g_c), s	0.0	23.7	0.0	0.0	9.5	0.0				17.6	0.0	6.7
Prop In Lane	0.00		1.00	0.00		1.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1821	814	0	1821	814				1192	0	548
V/C Ratio(X)	0.00	0.86	0.00	0.00	0.47	0.00				0.88	0.00	0.41
Avail Cap(c_a), veh/h	0	2922	1307	0	2922	1307				2005	0	923
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	12.8	0.0	0.0	9.3	0.0				18.6	0.0	15.1
Incr Delay (d2), s/veh	0.0	0.9	0.0	0.0	0.1	0.0				1.2	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	11.5	0.0	0.0	4.5	0.0				8.3	0.0	2.9
LnGrp Delay(d),s/veh	0.0	13.6	0.0	0.0	9.4	0.0				19.9	0.0	15.3
LnGrp LOS		B			A					B		B
Approach Vol, veh/h		1564			856						1271	
Approach Delay, s/veh		13.6			9.4						19.1	
Approach LOS		B			A						B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		35.8		25.4		35.8						
Change Period (Y+Rc), s		* 5		* 5		* 5						
Max Green Setting (Gmax), s		* 50		* 35		* 50						
Max Q Clear Time (g_c+I1), s		25.7		19.6		11.5						
Green Ext Time (p_c), s		5.1		0.8		5.2						
Intersection Summary												
HCM 2010 Ctrl Delay			14.5									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

15: SR 99 NB Ramps & Skyway Rd

Existing Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗		↑↑	↗	↗↗		↗			
Traffic Volume (veh/h)	0	1879	572	0	937	1049	156	0	314	0	0	0
Future Volume (veh/h)	0	1879	572	0	937	1049	156	0	314	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1845	1845	0	1845	1845	1845	0	1845			
Adj Flow Rate, veh/h	0	1999	0	0	997	0	166	0	314			
Adj No. of Lanes	0	2	1	0	2	1	2	0	1			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94			
Percent Heavy Veh, %	0	3	3	0	3	3	3	0	3			
Cap, veh/h	0	2287	1023	0	2287	1023	774	0	356			
Arrive On Green	0.00	0.65	0.00	0.00	0.65	0.00	0.23	0.00	0.23			
Sat Flow, veh/h	0	3597	1568	0	3597	1568	3408	0	1568			
Grp Volume(v), veh/h	0	1999	0	0	997	0	166	0	314			
Grp Sat Flow(s),veh/h/ln	0	1752	1568	0	1752	1568	1704	0	1568			
Q Serve(g_s), s	0.0	30.7	0.0	0.0	9.2	0.0	2.6	0.0	12.9			
Cycle Q Clear(g_c), s	0.0	30.7	0.0	0.0	9.2	0.0	2.6	0.0	12.9			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2287	1023	0	2287	1023	774	0	356			
V/C Ratio(X)	0.00	0.87	0.00	0.00	0.44	0.00	0.21	0.00	0.88			
Avail Cap(c_a), veh/h	0	2690	1203	0	2690	1203	1282	0	590			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	9.3	0.0	0.0	5.6	0.0	20.9	0.0	24.8			
Incr Delay (d2), s/veh	0.0	2.8	0.0	0.0	0.0	0.0	0.1	0.0	4.8			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	15.3	0.0	0.0	4.3	0.0	1.2	0.0	6.1			
LnGrp Delay(d),s/veh	0.0	12.1	0.0	0.0	5.7	0.0	20.9	0.0	29.6			
LnGrp LOS		B			A		C		C			
Approach Vol, veh/h		1999			997			480				
Approach Delay, s/veh		12.1			5.7			26.6				
Approach LOS		B			A			C				
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2				6		8				
Phs Duration (G+Y+Rc), s		47.4				47.4		19.1				
Change Period (Y+Rc), s		* 5				* 5		4.0				
Max Green Setting (Gmax), s		* 50				* 50		25.0				
Max Q Clear Time (g_c+I1), s		32.7				11.2		14.9				
Green Ext Time (p_c), s		9.7				13.6		0.2				
Intersection Summary												
HCM 2010 Ctrl Delay			12.3									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

16: Notre Dame Blvd & Skyway Rd

Existing Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	550	1367	276	51	1154	135	319	119	64	163	74	513
Future Volume (veh/h)	550	1367	276	51	1154	135	319	119	64	163	74	513
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.98	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1845	1845	1900	1845	1845	1845
Adj Flow Rate, veh/h	585	1454	220	54	1228	77	339	127	53	126	145	477
Adj No. of Lanes	2	3	1	1	3	1	2	1	0	1	1	2
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	672	2367	932	97	1651	506	501	181	75	289	303	1125
Arrive On Green	0.20	0.47	0.46	0.06	0.33	0.33	0.15	0.15	0.15	0.16	0.16	0.16
Sat Flow, veh/h	3408	5036	1528	1757	5036	1543	3408	1228	512	1757	1845	3086
Grp Volume(v), veh/h	585	1454	220	54	1228	77	339	0	180	126	145	477
Grp Sat Flow(s),veh/h/ln	1704	1679	1528	1757	1679	1543	1704	0	1740	1757	1845	1543
Q Serve(g_s), s	16.3	21.0	6.5	2.9	21.2	3.5	9.2	0.0	9.6	6.3	7.0	11.4
Cycle Q Clear(g_c), s	16.3	21.0	6.5	2.9	21.2	3.5	9.2	0.0	9.6	6.3	7.0	11.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.29	1.00		1.00
Lane Grp Cap(c), veh/h	672	2367	932	97	1651	506	501	0	256	289	303	1125
V/C Ratio(X)	0.87	0.61	0.24	0.56	0.74	0.15	0.68	0.00	0.70	0.44	0.48	0.42
Avail Cap(c_a), veh/h	860	2367	932	449	2100	643	1035	0	528	533	560	1555
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.1	19.3	8.9	45.1	29.2	23.3	39.5	0.0	39.6	36.8	37.1	23.6
Incr Delay (d2), s/veh	7.9	0.5	0.1	5.0	1.1	0.1	1.6	0.0	3.5	1.0	1.2	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.4	9.8	3.8	1.6	9.9	1.5	4.4	0.0	4.9	3.2	3.6	4.9
LnGrp Delay(d),s/veh	46.0	19.8	9.0	50.0	30.3	23.4	41.1	0.0	43.1	37.8	38.2	23.8
LnGrp LOS	D	B	A	D	C	C	D		D	D	D	C
Approach Vol, veh/h	2259		1359			519			748			
Approach Delay, s/veh	25.5		30.7			41.8			29.0			
Approach LOS	C		C			D			C			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	9.4	50.0			20.1	23.3	36.1	18.4				
Change Period (Y+Rc), s	4.0	4.8			3.7	3.7	4.8	3.7				
Max Green Setting (Gmax), s	25.0	40.0			30.0	25.0	40.0	30.0				
Max Q Clear Time (g_c+l1), s	4.9	23.0			13.4	18.3	23.2	11.6				
Green Ext Time (p_c), s	0.1	14.9			3.0	1.3	8.1	2.3				
Intersection Summary												
HCM 2010 Ctrl Delay			29.2									
HCM 2010 LOS			C									
Notes												

Intersection												
Int Delay, s/veh	54.5											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	90	1469	51	47	1077	27	13	5	63	18	5	102
Future Vol, veh/h	90	1469	51	47	1077	27	13	5	63	18	5	102
Conflicting Peds, #/hr	0	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	250	-	-	150	-	-	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	96	1563	54	50	1146	29	14	5	67	19	5	109

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1175	0	0	1617	0	0	2457	3056	809	2237	3070	588
Stage 1	-	-	-	-	-	-	1781	1781	-	1261	1261	-
Stage 2	-	-	-	-	-	-	676	1275	-	976	1809	-
Critical Hdwy	4.16	-	-	4.16	-	-	7.56	6.56	6.96	7.56	6.56	6.96
Critical Hdwy Stg 1	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Follow-up Hdwy	2.23	-	-	2.23	-	-	3.53	4.03	3.33	3.53	4.03	3.33
Pot Cap-1 Maneuver	585	-	-	394	-	-	16	12	321	23	12	450
Stage 1	-	-	-	-	-	-	84	132	-	179	238	-
Stage 2	-	-	-	-	-	-	407	234	-	268	128	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	585	-	-	394	-	-	~ 5	9	321	~ 8	9	450
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 5	9	-	~ 8	9	-
Stage 1	-	-	-	-	-	-	70	110	-	150	208	-
Stage 2	-	-	-	-	-	-	263	204	-	169	107	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.7	0.6	\$ 1500.8	\$ 305.7
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	24	585	-	-	394	-	-	8	137
HCM Lane V/C Ratio	3.59	0.164	-	-	0.127	-	-	2.394	0.831
HCM Control Delay (s)	\$ 1500.8	12.4	-	-	15.5	-	-	\$ 1532.1	99.4
HCM Lane LOS	F	B	-	-	C	-	-	F	F
HCM 95th %tile Q(veh)	10.8	0.6	-	-	0.4	-	-	3.5	5.2

Notes												
~: Volume exceeds capacity	\$: Delay exceeds 300s	+: Computation Not Defined					*: All major volume in platoon					

HCM 2010 Signalized Intersection Summary

17B: Skyway Rd & Forest Ave

Existing Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	90	1469	51	47	1077	27	13	5	63	18	5	102
Future Volume (veh/h)	90	1469	51	47	1077	27	13	5	63	18	5	102
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1900	1845	1900	1845	1845	1900
Adj Flow Rate, veh/h	96	1563	52	50	1146	27	14	5	1	19	5	9
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	1	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	152	2087	69	149	2104	50	19	7	1	57	19	35
Arrive On Green	0.09	0.60	0.59	0.08	0.60	0.58	0.03	0.02	0.03	0.03	0.03	0.05
Sat Flow, veh/h	1757	3462	115	1757	3500	82	1237	442	88	1757	592	1065
Grp Volume(v), veh/h	96	789	826	50	574	599	20	0	0	19	0	14
Grp Sat Flow(s),veh/h/ln	1757	1752	1824	1757	1752	1830	1767	0	0	1757	0	1657
Q Serve(g_s), s	3.0	18.5	18.7	1.5	11.0	11.0	0.6	0.0	0.0	0.6	0.0	0.5
Cycle Q Clear(g_c), s	3.0	18.5	18.7	1.5	11.0	11.0	0.6	0.0	0.0	0.6	0.0	0.5
Prop In Lane	1.00		0.06	1.00		0.05	0.70		0.05	1.00		0.64
Lane Grp Cap(c), veh/h	152	1056	1100	149	1054	1100	28	0	0	57	0	54
V/C Ratio(X)	0.63	0.75	0.75	0.34	0.54	0.54	0.72	0.00	0.00	0.33	0.00	0.26
Avail Cap(c_a), veh/h	371	1297	1350	371	1266	1322	809	0	0	805	0	759
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.1	8.2	8.2	24.5	6.7	6.7	27.4	0.0	0.0	26.9	0.0	26.5
Incr Delay (d2), s/veh	1.6	1.4	1.4	0.5	0.2	0.2	12.1	0.0	0.0	1.3	0.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	9.2	9.6	0.8	5.3	5.5	0.4	0.0	0.0	0.3	0.0	0.2
LnGrp Delay(d),s/veh	26.7	9.5	9.6	25.0	6.9	6.9	39.6	0.0	0.0	28.1	0.0	27.4
LnGrp LOS	C	A	A	C	A	A	D			C		C
Approach Vol, veh/h	1711			1223			20			33		
Approach Delay, s/veh	10.5			7.6			39.6			27.8		
Approach LOS	B			A			D			C		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2		3	4	5		6	7	8			
Phs Duration (G+Y+Rc), s	4.9		7.8	38.2	5.8		7.9	38.1				
Change Period (Y+Rc), s	3.0		4.0	* 5	3.0		4.0	5.0				
Max Green Setting (Gmax), s	27.0		11.0	* 41	27.0		11.0	40.0				
Max Q Clear Time (g_c+I1), s	2.6		3.5	20.7	2.6		5.0	13.0				
Green Ext Time (p_c), s	0.0		0.0	12.5	0.0		0.0	14.8				
Intersection Summary												
HCM 2010 Ctrl Delay				9.7								
HCM 2010 LOS	A											
Notes												

HCM 2010 Signalized Intersection Summary

18: Skyway Rd & Bruce Rd

Existing Plus Project
PM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (veh/h)	399	1102	33	17	611	213	69	86	44	517	55	425	
Future Volume (veh/h)	399	1102	33	17	611	213	69	86	44	517	55	425	
Number	5	2	12	1	6	16	3	8	18	7	4	14	
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1845	1845	1845	1900	1845	1845	1845	
Adj Flow Rate, veh/h	424	1172	33	18	650	109	73	91	29	592	0	138	
Adj No. of Lanes	2	2	0	1	2	1	1	1	0	2	0	1	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3	
Cap, veh/h	464	1709	48	29	1301	836	174	132	42	679	0	302	
Arrive On Green	0.14	0.49	0.47	0.02	0.37	0.34	0.10	0.10	0.09	0.19	0.00	0.19	
Sat Flow, veh/h	3408	3481	98	1757	3505	1568	1757	1336	426	3514	0	1563	
Grp Volume(v), veh/h	424	590	615	18	650	109	73	0	120	592	0	138	
Grp Sat Flow(s),veh/h/ln	1704	1752	1827	1757	1752	1568	1757	0	1762	1757	0	1563	
Q Serve(g_s), s	9.8	20.6	20.7	0.8	11.4	2.8	3.1	0.0	5.3	13.1	0.0	6.2	
Cycle Q Clear(g_c), s	9.8	20.6	20.7	0.8	11.4	2.8	3.1	0.0	5.3	13.1	0.0	6.2	
Prop In Lane	1.00		0.05	1.00		1.00	1.00		0.24	1.00		1.00	
Lane Grp Cap(c), veh/h	464	860	897	29	1301	836	174	0	175	679	0	302	
V/C Ratio(X)	0.91	0.69	0.69	0.63	0.50	0.13	0.42	0.00	0.69	0.87	0.00	0.46	
Avail Cap(c_a), veh/h	597	922	961	242	1843	1079	297	0	298	858	0	382	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	
Uniform Delay (d), s/veh	34.0	15.6	15.6	39.0	19.4	9.3	33.8	0.0	34.8	31.3	0.0	28.5	
Incr Delay (d2), s/veh	14.1	2.0	1.9	8.1	0.3	0.1	0.6	0.0	1.8	6.9	0.0	0.4	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	5.5	10.3	10.7	0.5	5.6	1.7	1.5	0.0	2.7	7.0	0.0	2.7	
LnGrp Delay(d),s/veh	48.2	17.6	17.5	47.1	19.7	9.4	34.4	0.0	36.6	38.2	0.0	28.9	
LnGrp LOS	D	B	B	D	B	A	C		D	D		C	
Approach Vol, veh/h	1629				777				193				730
Approach Delay, s/veh	25.5				18.9				35.8				36.4
Approach LOS	C				B				D				D
Timer	1	2	3	4	5	6	7	8					
Assigned Phs	1	2			4	5	6	8					
Phs Duration (G+Y+Rc), s	5.3	43.2			19.4	14.9	33.7	11.9					
Change Period (Y+Rc), s	3.0	6.0			3.5	3.0	6.0	4.5					
Max Green Setting (Gmax), s	12.0	40.0			20.0	15.0	40.0	13.0					
Max Q Clear Time (g_c+l1), s	2.8	22.7			15.1	11.8	13.4	7.3					
Green Ext Time (p_c), s	0.0	10.9			0.8	0.1	14.2	0.3					
Intersection Summary													
HCM 2010 Ctrl Delay			27.0										
HCM 2010 LOS			C										
Notes													

HCM 2010 Signalized Intersection Summary

19: Bruce Rd & Webster Dr/Street G

Existing Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	24	4	5	2	1	2	10	701	6	5	726	10
Future Volume (veh/h)	24	4	5	2	1	2	10	701	6	5	726	10
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.96		0.94	0.97		0.94	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1845	1900	1900	1845	1900	1845	1845	1900	1845	1845	1900
Adj Flow Rate, veh/h	26	4	5	2	1	2	11	746	6	5	772	11
Adj No. of Lanes	0	1	0	0	1	0	1	1	0	1	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	233	11	14	164	30	43	20	1084	9	10	1065	15
Arrive On Green	0.07	0.07	0.07	0.07	0.07	0.07	0.01	0.59	0.59	0.01	0.59	0.59
Sat Flow, veh/h	1054	162	203	504	432	624	1757	1827	15	1757	1813	26
Grp Volume(v), veh/h	35	0	0	5	0	0	11	0	752	5	0	783
Grp Sat Flow(s),veh/h/ln	1419	0	0	1560	0	0	1757	0	1842	1757	0	1839
Q Serve(g_s), s	0.8	0.0	0.0	0.0	0.0	0.0	0.2	0.0	11.0	0.1	0.0	12.0
Cycle Q Clear(g_c), s	0.9	0.0	0.0	0.1	0.0	0.0	0.2	0.0	11.0	0.1	0.0	12.0
Prop In Lane	0.74		0.14	0.40		0.40	1.00		0.01	1.00		0.01
Lane Grp Cap(c), veh/h	258	0	0	236	0	0	20	0	1092	10	0	1080
V/C Ratio(X)	0.14	0.00	0.00	0.02	0.00	0.00	0.54	0.00	0.69	0.53	0.00	0.73
Avail Cap(c_a), veh/h	1097	0	0	1117	0	0	495	0	1415	495	0	1413
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.4	0.0	0.0	17.0	0.0	0.0	19.2	0.0	5.5	19.4	0.0	5.8
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.0	0.0	0.0	20.8	0.0	1.0	38.5	0.0	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.0	0.1	0.0	0.0	0.2	0.0	5.7	0.2	0.0	6.3
LnGrp Delay(d),s/veh	17.6	0.0	0.0	17.0	0.0	0.0	40.0	0.0	6.4	57.9	0.0	7.1
LnGrp LOS	B			B			D		A	E		A
Approach Vol, veh/h	35				5				763		788	
Approach Delay, s/veh	17.6				17.0				6.9		7.4	
Approach LOS	B				B				A		A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	4		5	6	8					
Phs Duration (G+Y+Rc), s	4.2	28.2	6.7		4.4	27.9	6.7					
Change Period (Y+Rc), s	4.0	5.0	4.0		4.0	5.0	4.0					
Max Green Setting (Gmax), s	11.0	30.0	26.0		11.0	30.0	26.0					
Max Q Clear Time (g_c+I1), s	2.1	13.0	2.9		2.2	14.0	2.1					
Green Ext Time (p_c), s	0.0	9.3	0.1		0.0	9.0	0.1					
Intersection Summary												
HCM 2010 Ctrl Delay			7.4									
HCM 2010 LOS			A									

Queuing and Blocking Report
Existing Plus Project

08/31/2017

Intersection: 2: SR 99 SB Ramps & E 20th St

Movement	EB	EB	EB	WB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	R	L	L	T	T	L	LT	R	R
Maximum Queue (ft)	170	90	17	51	72	120	136	160	188	59	40
Average Queue (ft)	106	39	7	18	49	65	84	101	130	34	17
95th Queue (ft)	184	97	21	53	83	120	138	183	202	64	43
Link Distance (ft)	379	379				987	987		1959		
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)			110	280	280			490		425	425
Storage Blk Time (%)		0									
Queuing Penalty (veh)		0									

Queuing and Blocking Report
Existing Plus Project

08/31/2017

Intersection: 3: SR 99 NB Ramps & E 20th St

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	L	L	T	T	T	T	R	L	LT	R
Maximum Queue (ft)	54	60	278	314	140	124	207	23	58	98
Average Queue (ft)	25	30	133	159	95	79	121	5	24	50
95th Queue (ft)	59	65	280	313	144	136	209	23	60	93
Link Distance (ft)			987	987	393	393			1956	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	260	260					200	550		550
Storage Blk Time (%)			1				1			
Queuing Penalty (veh)			2				2			

Intersection: 14: SR 99 SB Ramps & Skyway Rd

Movement	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	T	T	T	T	R	L	L	R
Maximum Queue (ft)	200	280	233	270	150	193	180	214
Average Queue (ft)	104	163	164	178	76	132	126	151
95th Queue (ft)	206	303	254	291	198	193	186	230
Link Distance (ft)	629	629	1030	1030			1546	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)					100	440		360
Storage Blk Time (%)		0		19				
Queuing Penalty (veh)		0		46				

Intersection: 15: SR 99 NB Ramps & Skyway Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	T	T	R	T	T	R	L	L	R
Maximum Queue (ft)	196	258	77	75	256	528	46	101	143
Average Queue (ft)	115	139	19	21	58	124	17	53	80
95th Queue (ft)	196	265	76	67	296	627	47	104	148
Link Distance (ft)	1030	1030		856	856	856		1886	
Upstream Blk Time (%)					0	1			
Queuing Penalty (veh)					1	4			
Storage Bay Dist (ft)			100				320		225
Storage Blk Time (%)		8	0						0
Queuing Penalty (veh)		24	0						0

Intersection: 2: SR 99 SB Ramps & E 20th St

Movement	EB	EB	EB	WB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	R	L	L	T	T	L	LT	R	R
Maximum Queue (ft)	400	395	135	88	112	189	213	273	305	98	102
Average Queue (ft)	362	310	68	43	68	96	119	207	237	61	55
95th Queue (ft)	473	472	169	92	112	214	230	286	314	105	108
Link Distance (ft)	379	379				987	987		1959		
Upstream Blk Time (%)	23	6									
Queuing Penalty (veh)	0	0									
Storage Bay Dist (ft)			110	280	280			490		425	425
Storage Blk Time (%)		24	0								
Queuing Penalty (veh)		26	1								

Queuing and Blocking Report
Existing Plus Project

08/31/2017

Intersection: 3: SR 99 NB Ramps & E 20th St

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	L	L	T	T	T	T	R	L	LT	R
Maximum Queue (ft)	148	197	340	355	260	404	225	57	75	188
Average Queue (ft)	91	103	132	175	162	351	222	25	45	110
95th Queue (ft)	157	202	354	383	255	502	242	60	80	196
Link Distance (ft)			987	987	393	393			1956	
Upstream Blk Time (%)						8				
Queuing Penalty (veh)						69				
Storage Bay Dist (ft)	260	260					200	550		550
Storage Blk Time (%)			2			2	50			
Queuing Penalty (veh)			7			15	198			

Intersection: 14: SR 99 SB Ramps & Skyway Rd

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	T	T	R	T	T	R	L	L	R
Maximum Queue (ft)	524	585	420	202	242	111	394	555	278
Average Queue (ft)	311	396	120	127	146	52	302	346	141
95th Queue (ft)	613	711	483	214	249	149	448	706	342
Link Distance (ft)	629	629		1030	1030			1546	
Upstream Blk Time (%)	3	8							
Queuing Penalty (veh)	0	0							
Storage Bay Dist (ft)			500			100	440		360
Storage Blk Time (%)		9	0		11	0	1	7	0
Queuing Penalty (veh)		23	1		34	1	5	57	2

Intersection: 15: SR 99 NB Ramps & Skyway Rd

Movement	EB	EB	EB	WB	WB	NB	NB	NB
Directions Served	T	T	R	T	T	L	L	R
Maximum Queue (ft)	811	841	109	93	108	53	96	208
Average Queue (ft)	535	541	57	39	48	24	60	128
95th Queue (ft)	1054	1088	151	109	116	54	99	219
Link Distance (ft)	1030	1030		856	856			1886
Upstream Blk Time (%)	0	0						
Queuing Penalty (veh)	2	5						
Storage Bay Dist (ft)			100			320	320	
Storage Blk Time (%)		18	0					0
Queuing Penalty (veh)		109	5					0

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	South of Skyway Road
Alternative	Existing Plus Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	1,482	vph
Peak-hour factor, PHF	0.83	
Peak 15-min volume, v_{15}	446	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	1,844	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	922	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.39	
Density, D	14.2	pcpmpl
Level of service, LOS	B	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	1,482	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	382	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	1,482	382		vph
Peak-hour factor, PHF	0.83	0.85		
Peak 15-min volume, v_{15}	446	112		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	1,844	456		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	1,844	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	1,844	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	1,388	pcph	4,700	pcph	No
Ramp volume, v_R	456	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{12A}	1,844	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.42	
Density, D_R	19.2	pcpmpl
Level of service for ramp-freeway junction area of influence	B	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.339	
Space mean speed in ramp influence area, S_R	57.2	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.2	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Between Skyway Road Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	1,100	vph
Peak-hour factor, PHF	0.83	
Peak 15-min volume, v_{15}	331	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	1,369	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	685	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.29	
Density, D	10.5	pcpmpl
Level of service, LOS	A	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	1,100	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25	mph
Volume on ramp	252	vph
Length of acceleration lane(s)	250	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	1,100	252		vph
Peak-hour factor, PHF	0.83	0.85		
Peak 15-min volume, v_{15}	331	74		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	1,369	301		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	1,369	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	1,369	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	1,670	pcph	4,700	pcph	No
Ramp volume, v_R	301	pcph	1,900	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	1,670	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.36	pcpmpl
Density, D_R	16.8	
Level of service for ramp-freeway junction area of influence	B	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.329	
Space mean speed in ramp influence area, S_R	57.4	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.4	mph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road On Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	1,352	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	1,085	vph
Length of acceleration lane(s)	350	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	1,352	1,085		vph
Peak-hour factor, PHF	0.83	0.85		
Peak 15-min volume, v_{15}	407	319		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	1,683	1,296		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road On Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	1,683	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	1,683	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,978	pcph	4,700	pcph	No
Ramp volume, v_R	1,296	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	2,978	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.65	pcpmpl
Density, D_R	25.9	
Level of service for ramp-freeway junction area of influence	C	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.366	
Space mean speed in ramp influence area, S_R	56.6	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	56.6	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	South of E 20th Street
Alternative	Existing Plus Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,437	vph
Peak-hour factor, PHF	0.83	
Peak 15-min volume, v_{15}	734	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,033	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,517	pcphpl
Average passenger-car speed, S	64.8	mph
Volume-to-capacity ratio, v/c	0.65	
Density, D	23.4	pcpmpl
Level of service, LOS	C	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	E 20th Street Off Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,437	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	153	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,437	153		vph
Peak-hour factor, PHF	0.83	0.73		
Peak 15-min volume, v_{15}	734	52		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,033	213		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	E 20th Street Off Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	3,033	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	3,033	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,820	pcph	4,700	pcph	No
Ramp volume, v_R	213	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	Actual		Maximum		Violation?
v_{12A}	3,033	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.69	
Density, D_R	29.4	pcpmpl
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.317	
Space mean speed in ramp influence area, S_R	57.7	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.7	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Between E 20th Street Ramps
Alternative	Existing Plus Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,284	vph
Peak-hour factor, PHF	0.83	
Peak 15-min volume, v_{15}	688	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	2,843	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,421	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.60	
Density, D	21.9	pcpmpl
Level of service, LOS	C	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	E 20th Street On Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,284	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	581	vph
Length of acceleration lane(s)	300	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,284	581		vph
Peak-hour factor, PHF	0.83	0.73		
Peak 15-min volume, v_{15}	688	199		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	2,843	808		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	E 20th Street On Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	2,843	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	2,843	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,650	pcph	4,700	pcph	No
Ramp volume, v_R	808	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	Actual		Maximum		Violation?
v_{R12}	3,650	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.79	
Density, D_R	31.7	pcpmpl
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.444	
Space mean speed in ramp influence area, S_R	54.8	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	54.8	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	North of E 20th Street
Alternative	Existing Plus Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,865	vph
Peak-hour factor, PHF	0.83	
Peak 15-min volume, v_{15}	863	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,566	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,783	pcphpl
Average passenger-car speed, S	62.9	mph
Volume-to-capacity ratio, v/c	0.76	
Density, D	28.3	pcpmpl
Level of service, LOS	D	

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	North of E 20th Street
Alternative	Existing Plus Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,684	vph
Peak-hour factor, PHF	0.87	
Peak 15-min volume, v_{15}	1,059	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	4,374	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	2,187	pcphpl
Average passenger-car speed, S	56.2	mph
Volume-to-capacity ratio, v/c	0.93	
Density, D	38.9	pcpmpl
Level of service, LOS	E	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	E 20th Street Off Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	3,684	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	804	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	3,684	804		vph
Peak-hour factor, PHF	0.87	0.73		
Peak 15-min volume, v_{15}	1,059	275		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	4,374	1,118		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	E 20th Street Off Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	4,374	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	4,374	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,256	pcph	4,700	pcph	No
Ramp volume, v_R	1,118	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, v_{12A} =	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	Actual		Maximum		Violation?
v_{12A}	4,374	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.99	
Density, D_R	41.0	pcpmpl
Level of service for ramp-freeway junction area of influence	E	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.399	
Space mean speed in ramp influence area, S_R	55.8	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	55.8	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Between E 20th Street Ramps
Alternative	Existing Plus Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,880	vph
Peak-hour factor, PHF	0.87	
Peak 15-min volume, v_{15}	828	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,420	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,710	pcphpl
Average passenger-car speed, S	63.6	mph
Volume-to-capacity ratio, v/c	0.73	
Density, D	26.9	pcpmpl
Level of service, LOS	D	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	E 20th Street On Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,880	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	193	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,880	193		vph
Peak-hour factor, PHF	0.87	0.73		
Peak 15-min volume, v_{15}	828	66		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,420	268		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	E 20th Street On Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	3,420	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	3,420	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,688	pcph	4,700	pcph	No
Ramp volume, v_R	268	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	3,688	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.80	pcpmpl
Density, D_R	31.6	
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_s or D_s	0.441	
Space mean speed in ramp influence area, S_R	54.9	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	54.9	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	North of Skyway Road Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,073	vph
Peak-hour factor, PHF	0.86	
Peak 15-min volume, v_{15}	893	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,691	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,846	pcphpl
Average passenger-car speed, S	62.2	mph
Volume-to-capacity ratio, v/c	0.79	
Density, D	29.7	pcpmpl
Level of service, LOS	D	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	3,073	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	1,384	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	3,073	1,384		vph
Peak-hour factor, PHF	0.85	0.82		
Peak 15-min volume, v_{15}	904	422		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,735	1,713		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	3,735	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	3,735	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,021	pcph	4,700	pcph	No
Ramp volume, v_R	1,713	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	Actual		Maximum		Violation?
v_{12A}	3,735	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.85	
Density, D_R	35.5	pcpmpl
Level of service for ramp-freeway junction area of influence	E	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.452	
Space mean speed in ramp influence area, S_R	54.6	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	54.6	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Between Skyway Road Ramps
Alternative	Existing Plus Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	1,689	vph
Peak-hour factor, PHF	0.85	
Peak 15-min volume, v_{15}	497	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	2,053	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,026	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.44	
Density, D	15.8	pcpmpl
Level of service, LOS	B	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	1,689	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25	mph
Volume on ramp	223	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	1,689	223		vph
Peak-hour factor, PHF	0.85	0.82		
Peak 15-min volume, v_{15}	497	68		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	2,053	276		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	2,053	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	2,053	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,329	pcph	4,700	pcph	No
Ramp volume, v_R	276	pcph	1,900	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	2,329	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.51	
Density, D_R	21.0	pcpmpl
Level of service for ramp-freeway junction area of influence	C	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.341	
Space mean speed in ramp influence area, S_R	57.2	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.2	mph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road On Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	1,912	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	144	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	1,912	144		vph
Peak-hour factor, PHF	0.85	0.82		
Peak 15-min volume, v_{15}	562	44		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	2,324	178		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road On Ramp
Alternative	Existing Plus Project
Time period	AM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	2,324	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	2,324	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,502	pcph	4,700	pcph	No
Ramp volume, v_R	178	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	Actual		Maximum		Violation?
v_{R12}	2,502	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.54	
Density, D_R	22.4	pcpmpl
Level of service for ramp-freeway junction area of influence	C	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.333	
Space mean speed in ramp influence area, S_R	57.4	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.4	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	South of Skyway Road
Alternative	Existing Plus Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,056	vph
Peak-hour factor, PHF	0.85	
Peak 15-min volume, v_{15}	605	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	2,499	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,249	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.53	
Density, D	19.2	pcpmpl
Level of service, LOS	C	

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	South of Skyway Road
Alternative	Existing Plus Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	1,963	vph
Peak-hour factor, PHF	0.89	
Peak 15-min volume, v_{15}	551	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	2,278	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,139	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.48	
Density, D	17.5	pcpmpl
Level of service, LOS	B	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	1,963	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	470	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	1,963	470		vph
Peak-hour factor, PHF	0.89	0.95		
Peak 15-min volume, v_{15}	551	124		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	2,278	502		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	2,278	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	2,278	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	1,776	pcph	4,700	pcph	No
Ramp volume, v_R	502	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	Actual		Maximum		Violation?
v_{12A}	2,278	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.52	
Density, D_R	22.9	pcpmpl
Level of service for ramp-freeway junction area of influence	C	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.343	
Space mean speed in ramp influence area, S_R	57.1	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.1	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Between Skyway Road Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	1,493	vph
Peak-hour factor, PHF	0.89	
Peak 15-min volume, v_{15}	419	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	1,733	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	866	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.37	
Density, D	13.3	pcpmpl
Level of service, LOS	B	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	1,493	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25	mph
Volume on ramp	572	vph
Length of acceleration lane(s)	250	ft

Adjacent Ramp Data

	Upstream		Downstream	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

Junction Components	Freeway	Ramp	Adj. Ramp	
Volume, V	1,493	572		vph
Peak-hour factor, PHF	0.89	0.95		
Peak 15-min volume, v_{15}	419	151		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	1,733	611		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	1,733	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	1,733	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,344	pcph	4,700	pcph	No
Ramp volume, v_R	611	pcph	1,900	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	2,344	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.51	pcpmpl
Density, D_R	21.9	
Level of service for ramp-freeway junction area of influence	C	

Speed Estimation

Intermediate speed variable, M_s or D_s	0.349	
Space mean speed in ramp influence area, S_R	57.0	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.0	mph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road On Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,065	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	1,050	vph
Length of acceleration lane(s)	350	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,065	1,050		vph
Peak-hour factor, PHF	0.89	0.95		
Peak 15-min volume, v_{15}	580	276		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	2,397	1,122		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road On Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	2,397	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	2,397	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,519	pcph	4,700	pcph	No
Ramp volume, v_R	1,122	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	3,519	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.76	pcpmpl
Density, D_R	30.2	
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.421	
Space mean speed in ramp influence area, S_R	55.3	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	55.3	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	South of E 20th Street
Alternative	Existing Plus Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,115	vph
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v_{15}	846	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,498	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,749	pcphpl
Average passenger-car speed, S	63.3	mph
Volume-to-capacity ratio, v/c	0.74	
Density, D	27.6	pcpmpl
Level of service, LOS	D	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	E 20th Street Off Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	3,115	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	319	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	3,115	319		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v_{15}	811	83		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,352	337		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	E 20th Street Off Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	3,352	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	3,352	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,015	pcph	4,700	pcph	No
Ramp volume, v_R	337	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	Actual		Maximum		Violation?
v_{12A}	3,352	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.76	
Density, D_R	32.2	pcpmpl
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.328	
Space mean speed in ramp influence area, S_R	57.4	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.4	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Between E 20th Street Ramps
Alternative	Existing Plus Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,796	vph
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v_{15}	728	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,009	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,504	pcphpl
Average passenger-car speed, S	64.8	mph
Volume-to-capacity ratio, v/c	0.64	
Density, D	23.2	pcpmpl
Level of service, LOS	C	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	E 20th Street On Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,796	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	1,285	vph
Length of acceleration lane(s)	300	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,796	1,285		vph
Peak-hour factor, PHF	0.96	0.96		
Peak 15-min volume, v_{15}	728	335		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,009	1,359		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	E 20th Street On Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	3,009	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	3,009	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	4,367	pcph	4,700	pcph	No
Ramp volume, v_R	1,359	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	Actual		Maximum		Violation?
v_{R12}	4,367	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.95	
Density, D_R	37.0	pcpmpl
Level of service for ramp-freeway junction area of influence	E	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.601	
Space mean speed in ramp influence area, S_R	51.2	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	51.2	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	North of E 20th Street
Alternative	Existing Plus Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	4,081	vph
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v_{15}	1,063	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	4,391	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	2,196	pcphpl
Average passenger-car speed, S	56.0	mph
Volume-to-capacity ratio, v/c	0.93	
Density, D	39.2	pcpmpl
Level of service, LOS	E	

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	North of E 20th Street
Alternative	Existing Plus Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,782	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	1,051	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	4,341	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	2,170	pcphpl
Average passenger-car speed, S	56.6	mph
Volume-to-capacity ratio, v/c	0.92	
Density, D	38.4	pcpmpl
Level of service, LOS	E	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	E 20th Street Off Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	3,782	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	1,447	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	3,782	1,447		vph
Peak-hour factor, PHF	0.90	0.96		
Peak 15-min volume, v_{15}	1,051	377		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	4,341	1,530		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	E 20th Street Off Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	4,341	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	4,341	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,811	pcph	4,700	pcph	No
Ramp volume, v_R	1,530	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, v_{12A} =	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	Actual		Maximum		Violation?
v_{12A}	4,341	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.99	
Density, D_R	40.7	pcpmpl
Level of service for ramp-freeway junction area of influence	E	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.436	
Space mean speed in ramp influence area, S_R	55.0	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	55.0	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Between E 20th Street Ramps
Alternative	Existing Plus Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,335	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	649	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	2,680	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,340	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.57	
Density, D	20.6	pcpmpl
Level of service, LOS	C	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	E 20th Street On Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,335	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	262	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,335	262		vph
Peak-hour factor, PHF	0.90	0.96		
Peak 15-min volume, v_{15}	649	68		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	2,680	277		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	E 20th Street On Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	2,680	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	2,680	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,957	pcph	4,700	pcph	No
Ramp volume, v_R	277	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	2,957	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.64	pcpmpl
Density, D_R	25.9	
Level of service for ramp-freeway junction area of influence	C	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.360	
Space mean speed in ramp influence area, S_R	56.7	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	56.7	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	North of Skyway Road Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,597	vph
Peak-hour factor, PHF	0.89	
Peak 15-min volume, v_{15}	729	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,014	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,507	pcphpl
Average passenger-car speed, S	64.8	mph
Volume-to-capacity ratio, v/c	0.64	
Density, D	23.2	pcpmpl
Level of service, LOS	C	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,597	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	1,279	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,597	1,279		vph
Peak-hour factor, PHF	0.88	0.95		
Peak 15-min volume, v_{15}	738	337		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,049	1,367		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	3,049	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	3,049	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	1,682	pcph	4,700	pcph	No
Ramp volume, v_R	1,367	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	Actual		Maximum		Violation?
v_{12A}	3,049	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.69	pcpmpl
Density, D_R	29.6	
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.421	
Space mean speed in ramp influence area, S_R	55.3	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	55.3	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Between Skyway Road Ramps
Alternative	Existing Plus Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	1,318	vph
Peak-hour factor, PHF	0.88	
Peak 15-min volume, v_{15}	374	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	1,547	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	774	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.33	
Density, D	11.9	pcpmpl
Level of service, LOS	B	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	1,318	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25	mph
Volume on ramp	288	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	1,318	288		vph
Peak-hour factor, PHF	0.88	0.95		
Peak 15-min volume, v_{15}	374	76		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	1,547	308		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	1,547	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	1,547	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	1,855	pcph	4,700	pcph	No
Ramp volume, v_R	308	pcph	1,900	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	1,855	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.40	pcpmpl
Density, D_R	17.3	
Level of service for ramp-freeway junction area of influence	B	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.326	
Space mean speed in ramp influence area, S_R	57.5	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.5	mph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road On Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	1,606	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	231	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	1,606	231		vph
Peak-hour factor, PHF	0.88	0.95		
Peak 15-min volume, v_{15}	456	61		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	1,885	247		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road On Ramp
Alternative	Existing Plus Project
Time period	PM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	1,885	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	1,885	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,132	pcph	4,700	pcph	No
Ramp volume, v_R	247	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	2,132	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.46	
Density, D_R	19.5	pcpmpl
Level of service for ramp-freeway junction area of influence	B	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.318	
Space mean speed in ramp influence area, S_R	57.7	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.7	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	South of Skyway Road
Alternative	Existing Plus Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	1,837	vph
Peak-hour factor, PHF	0.88	
Peak 15-min volume, v_{15}	522	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	2,156	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,078	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.46	
Density, D	16.6	pcpmpl
Level of service, LOS	B	

HCM 2010 Signalized Intersection Summary

1: Bruce Rd & SR 32

Cumulative No Project
AM Peak Hour

																
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Volume (veh/h)	280	240	210	180	580	120	260	540	130	70	660	470				
Future Volume (veh/h)	280	240	210	180	580	120	260	540	130	70	660	470				
Number	5	2	12	1	6	16	3	8	18	7	4	14				
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0				
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.99	1.00		0.98				
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1900	1845	1845	1845				
Adj Flow Rate, veh/h	333	286	86	214	690	124	310	643	134	83	786	480				
Adj No. of Lanes	1	2	0	1	2	0	1	2	0	1	2	1				
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84				
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3				
Cap, veh/h	321	836	247	229	773	139	306	1031	215	105	853	648				
Arrive On Green	0.18	0.31	0.31	0.13	0.26	0.23	0.17	0.36	0.36	0.06	0.24	0.23				
Sat Flow, veh/h	1757	2670	788	1757	2963	532	1757	2882	600	1757	3505	1542				
Grp Volume(v), veh/h	333	186	186	214	408	406	310	391	386	83	786	480				
Grp Sat Flow(s),veh/h/ln	1757	1752	1706	1757	1752	1743	1757	1752	1730	1757	1752	1542				
Q Serve(g_s), s	21.0	9.4	9.7	13.9	25.8	25.9	20.0	21.2	21.3	5.4	25.2	27.0				
Cycle Q Clear(g_c), s	21.0	9.4	9.7	13.9	25.8	25.9	20.0	21.2	21.3	5.4	25.2	27.0				
Prop In Lane	1.00		0.46	1.00		0.31	1.00		0.35	1.00		1.00				
Lane Grp Cap(c), veh/h	321	549	534	229	457	455	306	627	619	105	853	648				
V/C Ratio(X)	1.04	0.34	0.35	0.93	0.89	0.89	1.01	0.62	0.62	0.79	0.92	0.74				
Avail Cap(c_a), veh/h	321	549	534	229	457	455	306	627	619	183	853	648				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Uniform Delay (d), s/veh	47.0	30.4	30.5	49.5	40.9	41.4	47.5	30.5	30.6	53.4	42.4	28.3				
Incr Delay (d2), s/veh	60.5	0.1	0.1	41.0	18.8	19.1	55.3	1.4	1.5	4.9	14.8	4.0				
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0				
%ile BackOfQ(50%),veh/ln	15.5	4.6	4.6	9.3	14.9	14.8	14.4	10.4	10.3	2.7	13.9	13.5				
LnGrp Delay(d),s/veh	107.5	30.5	30.6	90.5	59.8	60.5	102.8	32.0	32.0	58.3	57.3	32.3				
LnGrp LOS	F	C	C	F	E	E	F	C	C	E	E	C				
Approach Vol, veh/h	705		1028				1087		1349							
Approach Delay, s/veh	66.9		66.5				52.2		48.5							
Approach LOS	E		E				D		D							
Timer	1	2	3	4	5	6	7	8								
Assigned Phs	1	2	3	4	5	6	7	8								
Phs Duration (G+Y+Rc), s	19.0	40.0	24.0	32.0	25.0	34.0	10.9	45.1								
Change Period (Y+Rc), s	* 5	7.0	* 4	* 6	* 5	7.0	* 4	* 6								
Max Green Setting (Gmax), s	* 14	33.0	* 20	* 26	* 20	27.0	* 12	* 34								
Max Q Clear Time (g_c+I1), s	15.9	11.7	22.0	29.0	23.0	27.9	7.4	23.3								
Green Ext Time (p_c), s	0.0	2.1	0.0	0.0	0.0	0.0	0.0	3.1								
Intersection Summary																
HCM 2010 Ctrl Delay	57.0															
HCM 2010 LOS	E															
Notes																
User approved ignoring U-Turning movement.																

HCM 2010 Signalized Intersection Summary

2: SR 99 SB Ramps & E 20th St

Cumulative No Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑	↑↑	↑↑					↑	↑	↑↑
Traffic Volume (veh/h)	0	520	90	210	680	0	0	0	0	670	10	380
Future Volume (veh/h)	0	520	90	210	680	0	0	0	0	670	10	380
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	1845	1845	0				1845	1845	1845
Adj Flow Rate, veh/h	0	619	25	250	810	0				807	0	185
Adj No. of Lanes	0	2	1	2	2	0				2	0	2
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84				0.84	0.84	0.84
Percent Heavy Veh, %	0	3	3	3	3	0				3	3	3
Cap, veh/h	0	1098	482	356	1813	0				998	0	891
Arrive On Green	0.00	0.31	0.31	0.10	0.52	0.00				0.28	0.00	0.28
Sat Flow, veh/h	0	3597	1538	3408	3597	0				3514	0	3136
Grp Volume(v), veh/h	0	619	25	250	810	0				807	0	185
Grp Sat Flow(s),veh/h/ln	0	1752	1538	1704	1752	0				1757	0	1568
Q Serve(g_s), s	0.0	5.9	0.5	2.9	5.8	0.0				8.6	0.0	1.8
Cycle Q Clear(g_c), s	0.0	5.9	0.5	2.9	5.8	0.0				8.6	0.0	1.8
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1098	482	356	1813	0				998	0	891
V/C Ratio(X)	0.00	0.56	0.05	0.70	0.45	0.00				0.81	0.00	0.21
Avail Cap(c_a), veh/h	0	3055	1341	2074	3055	0				2627	0	2344
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	11.5	9.7	17.4	6.1	0.0				13.4	0.0	11.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.9	0.1	0.0				0.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.9	0.2	1.4	2.8	0.0				4.2	0.0	0.8
LnGrp Delay(d),s/veh	0.0	11.7	9.7	18.4	6.2	0.0				14.0	0.0	11.0
LnGrp LOS		B	A	B	A					B		B
Approach Vol, veh/h		644			1060						992	
Approach Delay, s/veh		11.6			9.0						13.4	
Approach LOS		B			A						B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	8.2	16.6		15.4		24.8						
Change Period (Y+Rc), s	3.5	4.6		4.1		4.6						
Max Green Setting (Gmax), s	25.0	34.5		30.0		34.5						
Max Q Clear Time (g_c+I1), s	4.9	7.9		10.6		7.8						
Green Ext Time (p_c), s	0.2	4.0		0.7		4.0						
Intersection Summary												
HCM 2010 Ctrl Delay			11.3									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

3: SR 99 NB Ramps & E 20th St

Cumulative No Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	200	990	0	0	780	650	110	10	310	0	0	0
Future Volume (veh/h)	200	990	0	0	780	650	110	10	310	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1845	1845	0	0	1845	1845	1845	1845	1845			
Adj Flow Rate, veh/h	238	1179	0	0	929	219	140	0	287			
Adj No. of Lanes	2	2	0	0	2	1	2	0	1			
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84			
Percent Heavy Veh, %	3	3	0	0	3	3	3	3	3			
Cap, veh/h	1071	2402	0	0	1121	495	745	0	333			
Arrive On Green	0.31	0.69	0.00	0.00	0.32	0.32	0.21	0.00	0.21			
Sat Flow, veh/h	3408	3597	0	0	3597	1547	3514	0	1568			
Grp Volume(v), veh/h	238	1179	0	0	929	219	140	0	287			
Grp Sat Flow(s),veh/h/ln	1704	1752	0	0	1752	1547	1757	0	1568			
Q Serve(g_s), s	4.0	12.4	0.0	0.0	19.1	8.7	2.5	0.0	13.8			
Cycle Q Clear(g_c), s	4.0	12.4	0.0	0.0	19.1	8.7	2.5	0.0	13.8			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	1071	2402	0	0	1121	495	745	0	333			
V/C Ratio(X)	0.22	0.49	0.00	0.00	0.83	0.44	0.19	0.00	0.86			
Avail Cap(c_a), veh/h	1071	2402	0	0	1618	714	1356	0	605			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	19.7	5.8	0.0	0.0	24.5	21.0	25.2	0.0	29.6			
Incr Delay (d2), s/veh	0.5	0.1	0.0	0.0	1.6	0.2	0.0	0.0	2.6			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.0	5.9	0.0	0.0	9.4	3.7	1.2	0.0	6.2			
LnGrp Delay(d),s/veh	20.2	5.9	0.0	0.0	26.2	21.2	25.2	0.0	32.2			
LnGrp LOS	C	A			C	C	C		C			
Approach Vol, veh/h	1417				1148			427				
Approach Delay, s/veh	8.3				25.3			30.0				
Approach LOS	A				C			C				
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2				5			8				
Phs Duration (G+Y+Rc), s	57.4				28.5			20.5				
Change Period (Y+Rc), s	* 5				3.5			4.1				
Max Green Setting (Gmax), s	* 35				25.0			30.0				
Max Q Clear Time (g_c+I1), s	14.4				6.0			15.8				
Green Ext Time (p_c), s	6.7				0.4			0.7				
Intersection Summary												
HCM 2010 Ctrl Delay			17.9									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

4: E 20th St & Chico Mall

Cumulative No Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	950	40	30	1300	70	100	10	10	30	10	20
Future Volume (veh/h)	20	950	40	30	1300	70	100	10	10	30	10	20
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1900	1900	1845	1845
Adj Flow Rate, veh/h	24	1131	46	36	1548	81	132	0	0	36	12	0
Adj No. of Lanes	2	2	0	1	2	0	2	1	0	0	1	2
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	65	1965	80	36	1946	101	293	154	0	62	21	128
Arrive On Green	0.02	0.57	0.57	0.02	0.57	0.57	0.08	0.00	0.00	0.05	0.05	0.00
Sat Flow, veh/h	3408	3429	139	1757	3387	176	3514	1845	0	1333	444	2760
Grp Volume(v), veh/h	24	578	599	36	798	831	132	0	0	48	0	0
Grp Sat Flow(s),veh/h/ln	1704	1752	1816	1757	1752	1811	1757	1845	0	1778	0	1380
Q Serve(g_s), s	0.4	12.2	12.2	1.2	20.6	20.9	2.1	0.0	0.0	1.5	0.0	0.0
Cycle Q Clear(g_c), s	0.4	12.2	12.2	1.2	20.6	20.9	2.1	0.0	0.0	1.5	0.0	0.0
Prop In Lane	1.00		0.08	1.00		0.10	1.00		0.00	0.75		1.00
Lane Grp Cap(c), veh/h	65	1004	1041	36	1007	1041	293	154	0	83	0	128
V/C Ratio(X)	0.37	0.58	0.58	0.99	0.79	0.80	0.45	0.00	0.00	0.58	0.00	0.00
Avail Cap(c_a), veh/h	1148	1063	1102	577	1063	1098	1518	797	0	768	0	1192
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	28.0	7.9	7.9	28.3	9.6	9.7	25.3	0.0	0.0	27.0	0.0	0.0
Incr Delay (d2), s/veh	1.3	0.6	0.5	40.1	3.8	3.9	0.4	0.0	0.0	2.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	5.9	6.2	1.0	10.8	11.3	1.0	0.0	0.0	0.8	0.0	0.0
LnGrp Delay(d),s/veh	29.3	8.4	8.4	68.4	13.4	13.6	25.7	0.0	0.0	29.4	0.0	0.0
LnGrp LOS	C	A	A	E	B	B	C			C		
Approach Vol, veh/h	1201			1665			132			48		
Approach Delay, s/veh	8.9			14.7			25.7			29.4		
Approach LOS	A			B			C			C		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	4		5	6	8					
Phs Duration (G+Y+Rc), s	5.2	37.2	6.7		5.1	37.3	8.8					
Change Period (Y+Rc), s	3.0	4.1	4.0		3.5	4.1	4.0					
Max Green Setting (Gmax), s	20.0	35.0	25.0		20.0	35.0	25.0					
Max Q Clear Time (g_c+l1), s	3.2	14.2	3.5		2.4	22.9	4.1					
Green Ext Time (p_c), s	0.0	16.2	0.1		0.0	10.3	0.2					
Intersection Summary												
HCM 2010 Ctrl Delay			13.1									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

5: Forest Ave & E 20th St

Cumulative No Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	250	570	150	90	860	110	150	120	40	80	310	390
Future Volume (veh/h)	250	570	150	90	860	110	150	120	40	80	310	390
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1845	1845	1845	1845	1845	1845	1900
Adj Flow Rate, veh/h	298	679	146	107	1024	7	179	143	8	95	369	131
Adj No. of Lanes	1	2	0	1	2	1	1	2	1	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	303	821	176	319	1101	485	195	908	399	100	520	182
Arrive On Green	0.17	0.29	0.28	0.18	0.31	0.31	0.11	0.26	0.26	0.06	0.21	0.20
Sat Flow, veh/h	1757	2863	615	1757	3505	1543	1757	3505	1539	1757	2532	885
Grp Volume(v), veh/h	298	415	410	107	1024	7	179	143	8	95	254	246
Grp Sat Flow(s),veh/h/ln	1757	1752	1726	1757	1752	1543	1757	1752	1539	1757	1752	1665
Q Serve(g_s), s	13.7	18.0	18.0	4.3	23.0	0.3	8.2	2.6	0.2	4.4	10.9	11.2
Cycle Q Clear(g_c), s	13.7	18.0	18.0	4.3	23.0	0.3	8.2	2.6	0.2	4.4	10.9	11.2
Prop In Lane	1.00		0.36	1.00		1.00	1.00		1.00	1.00		0.53
Lane Grp Cap(c), veh/h	303	503	495	319	1101	485	195	908	399	100	360	342
V/C Ratio(X)	0.98	0.83	0.83	0.34	0.93	0.01	0.92	0.16	0.02	0.95	0.70	0.72
Avail Cap(c_a), veh/h	303	680	670	319	1101	485	195	1188	522	152	551	523
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	33.5	27.0	27.1	29.0	27.0	19.2	35.7	23.2	7.6	38.1	30.0	30.2
Incr Delay (d2), s/veh	46.8	4.6	4.7	0.2	14.8	0.1	41.6	0.0	0.0	38.3	1.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.6	9.3	9.2	2.1	13.4	0.1	6.2	1.2	0.1	3.2	5.4	5.2
LnGrp Delay(d),s/veh	80.3	31.6	31.8	29.2	41.7	19.2	77.3	23.3	7.6	76.4	30.9	31.3
LnGrp LOS	F	C	C	C	D	B	E	C	A	E	C	C
Approach Vol, veh/h	1123		1138			330			595			
Approach Delay, s/veh	44.6		40.4			52.2			38.3			
Approach LOS	D		D			D			D			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	18.0	29.5	8.6	25.0	20.2	27.3	13.0	20.7				
Change Period (Y+Rc), s	3.0	4.5	3.0	4.5	4.5	* 4.5	3.0	4.5				
Max Green Setting (Gmax), s	15.0	25.0	8.0	27.0	9.0	* 31	10.0	25.0				
Max Q Clear Time (g_c+l1), s	15.7	25.0	6.4	4.6	6.3	20.0	10.2	13.2				
Green Ext Time (p_c), s	0.0	0.0	0.0	2.5	1.4	2.6	0.0	2.1				
Intersection Summary												
HCM 2010 Ctrl Delay			42.7									
HCM 2010 LOS			D									
Notes												

HCM 2010 Signalized Intersection Summary

6: Huntington Dr & E 20th St

Cumulative No Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	80	610	10	80	990	50	30	10	70	20	10	10
Future Volume (veh/h)	80	610	10	80	990	50	30	10	70	20	10	10
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		1.00	0.99		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1900	1845	1900	1900	1845	1845
Adj Flow Rate, veh/h	95	726	11	95	1179	55	36	12	0	24	12	0
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	0	1	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	99	1851	28	156	1895	88	242	57	0	220	76	147
Arrive On Green	0.06	0.52	0.50	0.09	0.56	0.53	0.09	0.09	0.00	0.09	0.09	0.00
Sat Flow, veh/h	1757	3532	54	1757	3405	159	933	609	0	777	810	1568
Grp Volume(v), veh/h	95	360	377	95	606	628	48	0	0	36	0	0
Grp Sat Flow(s),veh/h/ln	1757	1752	1833	1757	1752	1812	1541	0	0	1587	0	1568
Q Serve(g_s), s	2.2	5.0	5.0	2.1	9.6	9.6	0.3	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	2.2	5.0	5.0	2.1	9.6	9.6	1.1	0.0	0.0	0.7	0.0	0.0
Prop In Lane	1.00		0.03	1.00		0.09	0.75		0.00	0.67		1.00
Lane Grp Cap(c), veh/h	99	918	961	156	975	1008	299	0	0	296	0	147
V/C Ratio(X)	0.96	0.39	0.39	0.61	0.62	0.62	0.16	0.00	0.00	0.12	0.00	0.00
Avail Cap(c_a), veh/h	601	1757	1838	816	1757	1816	844	0	0	850	0	728
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	19.3	5.8	5.8	18.0	6.2	6.2	17.2	0.0	0.0	17.1	0.0	0.0
Incr Delay (d2), s/veh	17.9	0.1	0.1	1.4	0.2	0.2	0.1	0.0	0.0	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	2.4	2.5	1.1	4.6	4.8	0.5	0.0	0.0	0.4	0.0	0.0
LnGrp Delay(d),s/veh	37.1	5.9	5.9	19.4	6.4	6.4	17.3	0.0	0.0	17.2	0.0	0.0
LnGrp LOS	D	A	A	B	A	A	B			B		
Approach Vol, veh/h	832		1329				48			36		
Approach Delay, s/veh	9.5		7.3				17.3			17.2		
Approach LOS	A		A				B			B		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	4		5	6	8					
Phs Duration (G+Y+Rc), s	7.6	25.4	7.8		6.3	26.8	7.8					
Change Period (Y+Rc), s	3.0	5.0	3.0		3.0	5.0	3.0					
Max Green Setting (Gmax), s	20.0	40.0	20.0		15.0	40.0	20.0					
Max Q Clear Time (g_c+l1), s	4.1	7.0	2.7		4.2	11.6	3.1					
Green Ext Time (p_c), s	0.0	10.5	0.2		0.0	10.1	0.2					
Intersection Summary												
HCM 2010 Ctrl Delay			8.5									
HCM 2010 LOS			A									
Notes												

HCM 2010 Signalized Intersection Summary

7: Notre Dame Blvd & E 20th St

Cumulative No Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	610	60	130	980	160	120	20	140	110	40	30
Future Volume (veh/h)	30	610	60	130	980	160	120	20	140	110	40	30
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.97	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	36	726	64	155	1167	179	143	24	0	131	48	0
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	1	1	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	91	1430	126	196	1517	232	183	139	118	177	132	113
Arrive On Green	0.05	0.44	0.44	0.11	0.50	0.50	0.10	0.08	0.00	0.10	0.07	0.00
Sat Flow, veh/h	1757	3252	286	1757	3037	464	1757	1845	1568	1757	1845	1568
Grp Volume(v), veh/h	36	391	399	155	671	675	143	24	0	131	48	0
Grp Sat Flow(s),veh/h/ln	1757	1752	1786	1757	1752	1748	1757	1845	1568	1757	1845	1568
Q Serve(g_s), s	1.2	10.0	10.1	5.4	19.4	19.6	5.0	0.8	0.0	4.5	1.5	0.0
Cycle Q Clear(g_c), s	1.2	10.0	10.1	5.4	19.4	19.6	5.0	0.8	0.0	4.5	1.5	0.0
Prop In Lane	1.00		0.16	1.00		0.27	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	91	771	785	196	875	873	183	139	118	177	132	113
V/C Ratio(X)	0.39	0.51	0.51	0.79	0.77	0.77	0.78	0.17	0.00	0.74	0.36	0.00
Avail Cap(c_a), veh/h	422	1123	1145	422	1123	1121	563	709	603	422	709	603
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	28.6	12.6	12.6	27.0	12.7	12.7	27.3	27.0	0.0	27.3	27.6	0.0
Incr Delay (d2), s/veh	1.0	0.2	0.2	2.7	1.7	1.8	2.7	0.2	0.0	2.3	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	4.8	4.9	2.7	9.7	9.8	2.5	0.4	0.0	2.3	0.8	0.0
LnGrp Delay(d),s/veh	29.6	12.8	12.8	29.7	14.4	14.6	30.0	27.2	0.0	29.6	28.2	0.0
LnGrp LOS	C	B	B	C	B	B	C	C		C	C	
Approach Vol, veh/h	826				1501				167			
Approach Delay, s/veh	13.5				16.1				29.6		29.2	
Approach LOS	B				B				C		C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.0	32.4	10.5	8.5	7.2	36.2	10.3	8.7				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	15.0	40.0	20.0	24.0	15.0	40.0	15.0	24.0				
Max Q Clear Time (g_c+I1), s	7.4	12.1	7.0	3.5	3.2	21.6	6.5	2.8				
Green Ext Time (p_c), s	0.1	11.6	0.1	0.2	0.0	9.5	0.1	0.2				
Intersection Summary												
HCM 2010 Ctrl Delay			17.0									
HCM 2010 LOS			B									

HCM 2010 Signalized Intersection Summary

8: Bruce Rd & E 20th St

Cumulative No Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	170	210	230	150	610	100	260	460	50	70	800	300
Future Volume (veh/h)	170	210	230	150	610	100	260	460	50	70	800	300
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1900	1845	1845	1900
Adj Flow Rate, veh/h	202	250	48	179	726	114	310	548	53	83	952	324
Adj No. of Lanes	1	1	1	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	165	589	501	202	529	83	242	1262	122	103	801	271
Arrive On Green	0.09	0.32	0.32	0.12	0.34	0.34	0.14	0.39	0.38	0.06	0.31	0.31
Sat Flow, veh/h	1757	1845	1568	1757	1554	244	1757	3230	312	1757	2572	870
Grp Volume(v), veh/h	202	250	48	179	0	840	310	297	304	83	647	629
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	0	1798	1757	1752	1790	1757	1752	1690
Q Serve(g_s), s	13.0	14.7	3.0	13.9	0.0	47.0	19.0	17.1	17.3	6.4	43.0	43.0
Cycle Q Clear(g_c), s	13.0	14.7	3.0	13.9	0.0	47.0	19.0	17.1	17.3	6.4	43.0	43.0
Prop In Lane	1.00		1.00	1.00		0.14	1.00		0.17	1.00		0.52
Lane Grp Cap(c), veh/h	165	589	501	202	0	612	242	684	699	103	546	527
V/C Ratio(X)	1.22	0.42	0.10	0.88	0.00	1.37	1.28	0.43	0.44	0.80	1.18	1.19
Avail Cap(c_a), veh/h	165	589	501	356	0	612	242	684	699	165	546	527
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	62.5	37.0	33.0	60.1	0.0	45.5	59.5	30.8	30.9	64.2	47.5	47.5
Incr Delay (d2), s/veh	141.5	0.2	0.0	5.2	0.0	177.7	154.5	0.6	0.6	5.6	100.6	105.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.8	7.5	1.3	7.0	0.0	53.5	19.6	8.4	8.7	3.3	36.0	35.4
LnGrp Delay(d),s/veh	204.0	37.1	33.0	65.3	0.0	223.2	214.0	31.5	31.6	69.8	148.1	152.5
LnGrp LOS	F	D	C	E		F	F	C	C	E	F	F
Approach Vol, veh/h	500				1019				911			
Approach Delay, s/veh	104.1				195.4				93.6			
Approach LOS	F				F				F			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.1	57.9	19.9	48.1	23.0	47.0	17.0	51.0				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	13.0	48.0	28.0	32.0	19.0	42.0	13.0	47.0				
Max Q Clear Time (g_c+I1), s	8.4	19.3	15.9	16.7	21.0	45.0	15.0	49.0				
Green Ext Time (p_c), s	0.0	20.4	0.1	5.1	0.0	0.0	0.0	0.0				
Intersection Summary												
HCM 2010 Ctrl Delay	141.0											
HCM 2010 LOS	F											

HCM 2010 Signalized Intersection Summary

8B: Bruce Rd & E 20th St

Cumulative No Project
AM Peak Hour

																
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Volume (veh/h)	170	210	230	150	610	100	260	460	50	70	800	300				
Future Volume (veh/h)	170	210	230	150	610	100	260	460	50	70	800	300				
Number	7	4	14	3	8	18	5	2	12	1	6	16				
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0				
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00	1.00		1.00				
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1845	1845	1845	1845				
Adj Flow Rate, veh/h	202	250	93	179	726	113	310	548	10	83	952	184				
Adj No. of Lanes	2	1	1	2	1	0	2	2	1	1	2	1				
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84				
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3				
Cap, veh/h	199	781	664	233	674	105	312	1106	482	104	993	444				
Arrive On Green	0.06	0.42	0.42	0.07	0.43	0.43	0.09	0.32	0.31	0.06	0.28	0.28				
Sat Flow, veh/h	3408	1845	1568	3408	1556	242	3408	3505	1568	1757	3505	1566				
Grp Volume(v), veh/h	202	250	93	179	0	839	310	548	10	83	952	184				
Grp Sat Flow(s),veh/h/ln	1704	1845	1568	1704	0	1798	1704	1752	1568	1757	1752	1566				
Q Serve(g_s), s	7.0	10.9	4.4	6.2	0.0	52.0	10.9	15.2	0.5	5.6	32.1	11.4				
Cycle Q Clear(g_c), s	7.0	10.9	4.4	6.2	0.0	52.0	10.9	15.2	0.5	5.6	32.1	11.4				
Prop In Lane	1.00		1.00	1.00		0.13	1.00		1.00	1.00		1.00				
Lane Grp Cap(c), veh/h	199	781	664	233	0	779	312	1106	482	104	993	444				
V/C Ratio(X)	1.02	0.32	0.14	0.77	0.00	1.08	0.99	0.50	0.02	0.80	0.96	0.41				
Avail Cap(c_a), veh/h	199	781	664	312	0	779	312	1106	482	176	993	444				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Uniform Delay (d), s/veh	56.5	23.1	21.2	55.0	0.0	34.0	54.5	33.3	29.0	55.7	42.3	34.9				
Incr Delay (d2), s/veh	68.0	0.1	0.0	5.2	0.0	54.9	48.6	0.5	0.0	5.1	19.4	0.9				
Initial Q Delay(d3),s/veh	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
%ile BackOfQ(50%),veh/ln	5.2	5.6	1.9	3.1	0.0	37.6	7.2	7.5	0.2	2.9	18.1	5.1				
LnGrp Delay(d),s/veh	124.7	23.2	21.3	60.1	0.0	88.9	103.1	33.8	29.0	60.8	61.7	35.8				
LnGrp LOS	F	C	C	E		F	F	C	C	E	E	D				
Approach Vol, veh/h	545				1018				868							
Approach Delay, s/veh	60.5				83.9				58.5							
Approach LOS	E				F				E							
Timer	1	2	3	4	5	6	7	8								
Assigned Phs	1	2	3	4	5	6	7	8								
Phs Duration (G+Y+Rc), s	11.1	41.9	12.2	54.8	15.0	38.0	11.0	56.0								
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0								
Max Green Setting (Gmax), s	12.0	32.0	11.0	48.0	11.0	33.0	7.0	52.0								
Max Q Clear Time (g_c+I1), s	7.6	17.2	8.2	12.9	12.9	34.1	9.0	54.0								
Green Ext Time (p_c), s	0.0	11.1	0.0	6.5	0.0	0.0	0.0	0.0								
Intersection Summary																
HCM 2010 Ctrl Delay	65.6															
HCM 2010 LOS	E															

HCM 2010 Signalized Intersection Summary

8C: Bruce Rd & E 20th St

Cumulative No Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	170	210	230	150	610	100	260	460	50	70	800	300
Future Volume (veh/h)	170	210	230	150	610	100	260	460	50	70	800	300
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	202	250	38	179	726	106	310	548	17	83	952	167
Adj No. of Lanes	2	1	1	1	2	0	2	2	1	1	2	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	267	449	381	210	872	127	375	1452	634	111	1288	576
Arrive On Green	0.08	0.24	0.24	0.12	0.28	0.28	0.11	0.41	0.40	0.06	0.37	0.37
Sat Flow, veh/h	3408	1845	1568	1757	3064	447	3408	3505	1568	1757	3505	1567
Grp Volume(v), veh/h	202	250	38	179	415	417	310	548	17	83	952	167
Grp Sat Flow(s),veh/h/ln	1704	1845	1568	1757	1752	1758	1704	1752	1568	1757	1752	1567
Q Serve(g_s), s	5.8	11.9	1.9	10.0	22.2	22.3	8.9	10.9	0.7	4.7	23.6	7.6
Cycle Q Clear(g_c), s	5.8	11.9	1.9	10.0	22.2	22.3	8.9	10.9	0.7	4.7	23.6	7.6
Prop In Lane	1.00		1.00	1.00		0.25	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	267	449	381	210	499	500	375	1452	634	111	1288	576
V/C Ratio(X)	0.76	0.56	0.10	0.85	0.83	0.83	0.83	0.38	0.03	0.75	0.74	0.29
Avail Cap(c_a), veh/h	374	571	485	316	665	667	511	1505	658	211	1400	626
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.2	33.2	29.4	43.2	33.6	33.6	43.6	20.3	18.0	46.1	27.5	22.4
Incr Delay (d2), s/veh	3.1	0.4	0.0	8.9	5.2	5.2	5.9	0.2	0.0	3.8	2.2	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	6.1	0.8	5.4	11.4	11.5	4.5	5.3	0.3	2.4	11.8	3.3
LnGrp Delay(d),s/veh	48.3	33.6	29.4	52.1	38.8	38.8	49.5	20.6	18.0	49.9	29.7	22.8
LnGrp LOS	D	C	C	D	D	D	D	C	B	D	C	C
Approach Vol, veh/h	490				1011				875			
Approach Delay, s/veh	39.3				41.1				30.8			
Approach LOS	D				D				C			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	10.3	45.5	16.0	28.4	15.0	40.8	11.8	32.5				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	12.0	42.0	18.0	31.0	15.0	39.0	11.0	38.0				
Max Q Clear Time (g_c+I1), s	6.7	12.9	12.0	13.9	10.9	25.6	7.8	24.3				
Green Ext Time (p_c), s	0.0	18.1	0.0	4.6	0.1	10.2	0.0	4.2				
Intersection Summary												
HCM 2010 Ctrl Delay	34.7											
HCM 2010 LOS	C											

Intersection						
Int Delay, s/veh	0.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	30	240	10	10	220
Future Vol, veh/h	10	30	240	10	10	220
Conflicting Peds, #/hr	0	1	0	1	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	36	286	12	12	262
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	579	294	0	0	299	0
Stage 1	293	-	-	-	-	-
Stage 2	286	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	477	745	-	-	1262	-
Stage 1	757	-	-	-	-	-
Stage 2	763	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	471	744	-	-	1261	-
Mov Cap-2 Maneuver	560	-	-	-	-	-
Stage 1	756	-	-	-	-	-
Stage 2	755	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	10.6		0		0.3	
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 688	1261	-		
HCM Lane V/C Ratio	-	- 0.069	0.009	-		
HCM Control Delay (s)	-	- 10.6	7.9	0		
HCM Lane LOS	-	- B	A	A		
HCM 95th %tile Q(veh)	-	- 0.2	0	-		

Intersection

Int Delay, s/veh 0.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	10	220	10	10	210
Future Vol, veh/h	10	10	220	10	10	210
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	12	262	12	12	250

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	542	268	0	0	274	0
Stage 1	268	-	-	-	-	-
Stage 2	274	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	501	771	-	-	1289	-
Stage 1	777	-	-	-	-	-
Stage 2	772	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	496	771	-	-	1289	-
Mov Cap-2 Maneuver	578	-	-	-	-	-
Stage 1	777	-	-	-	-	-
Stage 2	765	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	10.7		0		0.4
HCM LOS	B				

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 661	1289	-
HCM Lane V/C Ratio	-	- 0.036	0.009	-
HCM Control Delay (s)	-	- 10.7	7.8	-
HCM Lane LOS	-	- B	A	-
HCM 95th %tile Q(veh)	-	- 0.1	0	-

Intersection

Int Delay, s/veh 1.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	30	20	190	10	20	220
Future Vol, veh/h	30	20	190	10	20	220
Conflicting Peds, #/hr	0	2	0	2	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	24	226	12	24	262

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	544	236	0	0	240	0
Stage 1	234	-	-	-	-	-
Stage 2	310	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	500	803	-	-	1327	-
Stage 1	805	-	-	-	-	-
Stage 2	744	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	490	800	-	-	1325	-
Mov Cap-2 Maneuver	572	-	-	-	-	-
Stage 1	804	-	-	-	-	-
Stage 2	731	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	11.1		0		0.6
HCM LOS	B				

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 646	1325	-
HCM Lane V/C Ratio	-	- 0.092	0.018	-
HCM Control Delay (s)	-	- 11.1	7.8	-
HCM Lane LOS	-	- B	A	-
HCM 95th %tile Q(veh)	-	- 0.3	0.1	-

HCM 2010 Signalized Intersection Summary

12: Notre Dame Blvd & Forest Ave

Cumulative No Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	70	250	20	130	20	330	120	40	30	200	30
Future Volume (veh/h)	70	70	250	20	130	20	330	120	40	30	200	30
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	83	83	30	24	155	18	393	143	22	36	238	23
Adj No. of Lanes	1	1	2	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	139	402	588	32	255	30	428	1164	175	61	560	54
Arrive On Green	0.08	0.22	0.22	0.02	0.16	0.16	0.24	0.38	0.38	0.03	0.17	0.17
Sat Flow, veh/h	1774	1863	2726	1774	1638	190	1774	3073	463	1774	3259	312
Grp Volume(v), veh/h	83	83	30	24	0	173	393	81	84	36	128	133
Grp Sat Flow(s),veh/h/ln	1774	1863	1363	1774	0	1828	1774	1770	1766	1774	1770	1801
Q Serve(g_s), s	2.0	1.7	0.4	0.6	0.0	4.0	9.8	1.4	1.4	0.9	2.9	3.0
Cycle Q Clear(g_c), s	2.0	1.7	0.4	0.6	0.0	4.0	9.8	1.4	1.4	0.9	2.9	3.0
Prop In Lane	1.00		1.00	1.00		0.10	1.00		0.26	1.00		0.17
Lane Grp Cap(c), veh/h	139	402	588	32	0	285	428	670	669	61	304	309
V/C Ratio(X)	0.60	0.21	0.05	0.74	0.00	0.61	0.92	0.12	0.13	0.59	0.42	0.43
Avail Cap(c_a), veh/h	822	1110	1625	627	0	968	1018	1250	1248	627	1055	1074
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.2	14.6	14.1	22.1	0.0	17.8	16.7	9.2	9.2	21.6	16.8	16.8
Incr Delay (d2), s/veh	1.5	0.1	0.0	11.7	0.0	0.8	3.4	0.1	0.1	3.4	0.9	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.9	0.1	0.4	0.0	2.1	5.1	0.7	0.7	0.5	1.5	1.6
LnGrp Delay(d),s/veh	21.7	14.7	14.1	33.8	0.0	18.6	20.2	9.2	9.3	25.0	17.7	17.7
LnGrp LOS	C	B	B	C		B	C	A	A	C	B	B
Approach Vol, veh/h	196				197			558			297	
Approach Delay, s/veh	17.6				20.5			17.0			18.6	
Approach LOS	B				C			B			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.5	11.1	5.5	21.2	4.8	13.8	14.9	11.8				
Change Period (Y+Rc), s	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0				
Max Green Setting (Gmax), s	22.0	24.0	17.0	32.0	17.0	27.0	27.0	27.0				
Max Q Clear Time (g_c+l1), s	4.0	6.0	2.9	3.4	2.6	3.7	11.8	5.0				
Green Ext Time (p_c), s	0.0	0.9	0.0	2.6	0.0	1.0	0.2	2.5				
Intersection Summary												
HCM 2010 Ctrl Delay	18.0											
HCM 2010 LOS	B											
Notes												

Intersection						
Int Delay, s/veh	3.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	30	30	70	700	970	50
Future Vol, veh/h	30	30	70	700	970	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	36	83	833	1155	60
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1768	607	1214	0	-	0
Stage 1	1185	-	-	-	-	-
Stage 2	583	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	75	439	570	-	-	-
Stage 1	253	-	-	-	-	-
Stage 2	521	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	64	439	570	-	-	-
Mov Cap-2 Maneuver	64	-	-	-	-	-
Stage 1	253	-	-	-	-	-
Stage 2	445	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	81.6	1.1		0		
HCM LOS	F					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	570	-	112	-	-	
HCM Lane V/C Ratio	0.146	-	0.638	-	-	
HCM Control Delay (s)	12.4	-	81.6	-	-	
HCM Lane LOS	B	-	F	-	-	
HCM 95th %tile Q(veh)	0.5	-	3.2	-	-	

HCM 2010 Signalized Intersection Summary

14: SR 99 SB Ramps & Skyway Rd

Cumulative No Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗		↑↑	↗				↖↖		↗
Traffic Volume (veh/h)	0	570	160	0	880	210	0	0	0	930	0	560
Future Volume (veh/h)	0	570	160	0	880	210	0	0	0	930	0	560
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	0	1845	1845				1845	0	1845
Adj Flow Rate, veh/h	0	679	0	0	1048	0				1107	0	622
Adj No. of Lanes	0	2	1	0	2	1				2	0	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84				0.84	0.84	0.84
Percent Heavy Veh, %	0	3	3	0	3	3				3	0	3
Cap, veh/h	0	1358	608	0	1358	608				1527	0	702
Arrive On Green	0.00	0.39	0.00	0.00	0.39	0.00				0.45	0.00	0.45
Sat Flow, veh/h	0	3597	1568	0	3597	1568				3408	0	1568
Grp Volume(v), veh/h	0	679	0	0	1048	0				1107	0	622
Grp Sat Flow(s),veh/h/ln	0	1752	1568	0	1752	1568				1704	0	1568
Q Serve(g_s), s	0.0	7.2	0.0	0.0	12.7	0.0				12.9	0.0	17.7
Cycle Q Clear(g_c), s	0.0	7.2	0.0	0.0	12.7	0.0				12.9	0.0	17.7
Prop In Lane	0.00		1.00	0.00		1.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1358	608	0	1358	608				1527	0	702
V/C Ratio(X)	0.00	0.50	0.00	0.00	0.77	0.00				0.72	0.00	0.89
Avail Cap(c_a), veh/h	0	3675	1644	0	3675	1644				2522	0	1160
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	11.3	0.0	0.0	13.0	0.0				11.0	0.0	12.3
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	0.4	0.0				0.2	0.0	2.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	3.4	0.0	0.0	6.2	0.0				6.0	0.0	8.0
LnGrp Delay(d),s/veh	0.0	11.4	0.0	0.0	13.4	0.0				11.2	0.0	15.0
LnGrp LOS		B			B					B		B
Approach Vol, veh/h		679			1048						1729	
Approach Delay, s/veh		11.4			13.4						12.6	
Approach LOS		B			B						B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		22.8		25.8		22.8						
Change Period (Y+Rc), s		* 5		* 5		* 5						
Max Green Setting (Gmax), s		* 50		* 35		* 50						
Max Q Clear Time (g_c+I1), s		9.2		19.7		14.7						
Green Ext Time (p_c), s		3.1		1.1		3.1						
Intersection Summary												
HCM 2010 Ctrl Delay			12.6									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

15: SR 99 NB Ramps & Skyway Rd

Cumulative No Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕	↗		↕↕	↗	↗↗		↗			
Traffic Volume (veh/h)	0	1310	190	0	940	880	150	0	260	0	0	0
Future Volume (veh/h)	0	1310	190	0	940	880	150	0	260	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1845	1845	0	1845	1845	1845	0	1845			
Adj Flow Rate, veh/h	0	1560	0	0	1119	0	179	0	280			
Adj No. of Lanes	0	2	1	0	2	1	2	0	1			
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84			
Percent Heavy Veh, %	0	3	3	0	3	3	3	0	3			
Cap, veh/h	0	2126	951	0	2126	951	744	0	342			
Arrive On Green	0.00	0.61	0.00	0.00	0.61	0.00	0.22	0.00	0.22			
Sat Flow, veh/h	0	3597	1568	0	3597	1568	3408	0	1568			
Grp Volume(v), veh/h	0	1560	0	0	1119	0	179	0	280			
Grp Sat Flow(s),veh/h/ln	0	1752	1568	0	1752	1568	1704	0	1568			
Q Serve(g_s), s	0.0	14.4	0.0	0.0	8.4	0.0	2.0	0.0	7.8			
Cycle Q Clear(g_c), s	0.0	14.4	0.0	0.0	8.4	0.0	2.0	0.0	7.8			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2126	951	0	2126	951	744	0	342			
V/C Ratio(X)	0.00	0.73	0.00	0.00	0.53	0.00	0.24	0.00	0.82			
Avail Cap(c_a), veh/h	0	3911	1750	0	3911	1750	1864	0	858			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	6.4	0.0	0.0	5.2	0.0	14.7	0.0	17.0			
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.1	0.0	0.1	0.0	1.8			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	6.8	0.0	0.0	3.9	0.0	0.9	0.0	3.5			
LnGrp Delay(d),s/veh	0.0	6.6	0.0	0.0	5.3	0.0	14.8	0.0	18.8			
LnGrp LOS		A			A		B		B			
Approach Vol, veh/h	1560			1119			459					
Approach Delay, s/veh	6.6			5.3			17.3					
Approach LOS	A			A			B					
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2						6	8				
Phs Duration (G+Y+Rc), s	31.7						31.7	14.0				
Change Period (Y+Rc), s	* 5						* 5	4.0				
Max Green Setting (Gmax), s	* 50						* 50	25.0				
Max Q Clear Time (g_c+I1), s	16.4						10.4	9.8				
Green Ext Time (p_c), s	10.3						10.6	0.2				
Intersection Summary												
HCM 2010 Ctrl Delay			7.7									
HCM 2010 LOS			A									
Notes												

HCM 2010 Signalized Intersection Summary

16: Notre Dame Blvd & Skyway Rd

Cumulative No Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	550	750	270	70	1240	50	230	60	50	60	70	350
Future Volume (veh/h)	550	750	270	70	1240	50	230	60	50	60	70	350
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1845	1845	1900	1845	1845	1845
Adj Flow Rate, veh/h	655	893	192	83	1476	16	274	71	33	71	83	297
Adj No. of Lanes	2	3	1	1	3	1	2	1	0	1	1	2
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	750	2642	993	119	1875	582	411	144	67	194	203	1029
Arrive On Green	0.22	0.52	0.51	0.07	0.37	0.37	0.12	0.12	0.12	0.11	0.11	0.11
Sat Flow, veh/h	3408	5036	1568	1757	5036	1564	3408	1189	553	1757	1845	3073
Grp Volume(v), veh/h	655	893	192	83	1476	16	274	0	104	71	83	297
Grp Sat Flow(s),veh/h/ln	1704	1679	1568	1757	1679	1564	1704	0	1742	1757	1845	1537
Q Serve(g_s), s	16.8	9.3	4.6	4.2	23.6	0.6	7.0	0.0	5.1	3.4	3.8	6.5
Cycle Q Clear(g_c), s	16.8	9.3	4.6	4.2	23.6	0.6	7.0	0.0	5.1	3.4	3.8	6.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.32	1.00		1.00
Lane Grp Cap(c), veh/h	750	2642	993	119	1875	582	411	0	210	194	203	1029
V/C Ratio(X)	0.87	0.34	0.19	0.70	0.79	0.03	0.67	0.00	0.49	0.37	0.41	0.29
Avail Cap(c_a), veh/h	930	2642	993	485	2269	705	1118	0	571	576	605	1698
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.1	12.4	6.9	41.3	25.2	18.0	38.1	0.0	37.2	37.4	37.5	22.5
Incr Delay (d2), s/veh	7.8	0.1	0.1	7.2	1.6	0.0	1.9	0.0	1.8	1.2	1.3	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.7	4.3	2.7	2.3	11.2	0.3	3.4	0.0	2.5	1.7	2.0	2.8
LnGrp Delay(d),s/veh	41.9	12.5	7.0	48.5	26.8	18.0	39.9	0.0	39.0	38.5	38.8	22.6
LnGrp LOS	D	B	A	D	C	B	D		D	D	D	C
Approach Vol, veh/h	1740				1575				378		451	
Approach Delay, s/veh	23.0				27.9				39.7		28.1	
Approach LOS	C				C				D		C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	10.1	51.5			14.0	23.9	37.7	14.9				
Change Period (Y+Rc), s	4.0	4.8			3.7	3.7	4.8	3.7				
Max Green Setting (Gmax), s	25.0	40.0			30.0	25.0	40.0	30.0				
Max Q Clear Time (g_c+I1), s	6.2	11.3			8.5	18.8	25.6	9.0				
Green Ext Time (p_c), s	0.2	21.1			1.8	1.4	7.4	1.6				
Intersection Summary												
HCM 2010 Ctrl Delay			26.9									
HCM 2010 LOS			C									
Notes												

HCM 2010 TWSC
17: Skyway Rd & Forest Ave

Cumulative No Project
AM Peak Hour

Intersection

Int Delay, s/veh 218.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	190	500	70	70	1180	100	10	4	30	60	4	120
Future Vol, veh/h	190	500	70	70	1180	100	10	4	30	60	4	120
Conflicting Peds, #/hr	0	0	4	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	250	-	-	150	-	-	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	84	84	84	84	84	84	84	84	84
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	226	595	83	83	1405	119	12	5	36	71	5	143

Major/Minor	Major1		Major2		Minor1		Minor2					
Conflicting Flow All	1524	0	0	683	0	0	1964	2783	343	2383	2766	762
Stage 1	-	-	-	-	-	-	1093	1093	-	1631	1631	-
Stage 2	-	-	-	-	-	-	871	1690	-	752	1135	-
Critical Hdwy	4.16	-	-	4.16	-	-	7.56	6.56	6.96	7.56	6.56	6.96
Critical Hdwy Stg 1	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Follow-up Hdwy	2.23	-	-	2.23	-	-	3.53	4.03	3.33	3.53	4.03	3.33
Pot Cap-1 Maneuver	429	-	-	899	-	-	37	18	650	~18	19	345
Stage 1	-	-	-	-	-	-	227	286	-	105	157	-
Stage 2	-	-	-	-	-	-	310	146	-	366	273	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	429	-	-	899	-	-	~7	8	648	~5	8	345
Mov Cap-2 Maneuver	-	-	-	-	-	-	~7	8	-	~5	8	-
Stage 1	-	-	-	-	-	-	107	135	-	~50	143	-
Stage 2	-	-	-	-	-	-	159	133	-	158	129	-

Approach	EB		WB		NB		SB
HCM Control Delay, s	5.6		0.5		\$ 1000.8		\$ 2505.2
HCM LOS					F		F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	22	429	-	-	899	-	-	5	146
HCM Lane V/C Ratio	2.381	0.527	-	-	0.093	-	-	14.286	1.011
HCM Control Delay (s)	\$ 1000.8	22.4	-	-	9.4	-	-	\$ 7397.3	138.1
HCM Lane LOS	F	C	-	-	A	-	-	F	F
HCM 95th %tile Q(veh)	6.7	3	-	-	0.3	-	-	10.8	7.5

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 2010 Signalized Intersection Summary
17B: Skyway Rd & Forest Ave

Cumulative No Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	190	500	70	70	1180	100	10	10	30	60	10	120
Future Volume (veh/h)	190	500	70	70	1180	100	10	10	30	60	10	120
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1900	1845	1900	1845	1845	1900
Adj Flow Rate, veh/h	226	595	76	83	1405	114	12	12	0	71	12	0
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	1	1	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	274	1956	249	107	1741	141	20	20	0	101	106	0
Arrive On Green	0.16	0.63	0.63	0.06	0.53	0.53	0.02	0.02	0.00	0.06	0.06	0.00
Sat Flow, veh/h	1757	3127	399	1757	3279	265	900	900	0	1757	1845	0
Grp Volume(v), veh/h	226	333	338	83	748	771	24	0	0	71	12	0
Grp Sat Flow(s),veh/h/ln	1757	1752	1773	1757	1752	1791	1800	0	0	1757	1845	0
Q Serve(g_s), s	8.0	5.6	5.6	3.0	22.3	22.7	0.8	0.0	0.0	2.5	0.4	0.0
Cycle Q Clear(g_c), s	8.0	5.6	5.6	3.0	22.3	22.7	0.8	0.0	0.0	2.5	0.4	0.0
Prop In Lane	1.00		0.22	1.00		0.15	0.50		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	274	1096	1109	107	930	951	39	0	0	101	106	0
V/C Ratio(X)	0.83	0.30	0.30	0.77	0.80	0.81	0.61	0.00	0.00	0.71	0.11	0.00
Avail Cap(c_a), veh/h	357	1096	1109	357	1041	1064	759	0	0	741	778	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	26.2	5.5	5.5	29.6	12.3	12.4	31.0	0.0	0.0	29.6	28.6	0.0
Incr Delay (d2), s/veh	11.5	0.2	0.2	11.2	4.2	4.4	14.6	0.0	0.0	8.7	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.7	2.7	2.8	1.8	11.7	12.3	0.6	0.0	0.0	1.5	0.2	0.0
LnGrp Delay(d),s/veh	37.7	5.7	5.7	40.8	16.5	16.8	45.7	0.0	0.0	38.3	29.1	0.0
LnGrp LOS	D	A	A	D	B	B	D			D	C	
Approach Vol, veh/h	897		1602			24			83			
Approach Delay, s/veh	13.8		17.9			45.7			37.0			
Approach LOS	B		B			D			D			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2		3	4	6		7	8				
Phs Duration (G+Y+Rc), s	4.4		7.9	45.0	6.7		14.0	39.0				
Change Period (Y+Rc), s	3.0		4.0	5.0	3.0		4.0	5.0				
Max Green Setting (Gmax), s	27.0		13.0	38.0	27.0		13.0	38.0				
Max Q Clear Time (g_c+I1), s	2.8		5.0	7.6	4.5		10.0	24.7				
Green Ext Time (p_c), s	0.1		0.1	18.1	0.2		0.2	9.3				
Intersection Summary												
HCM 2010 Ctrl Delay	17.3											
HCM 2010 LOS	B											

HCM 2010 Signalized Intersection Summary

18: Skyway Rd & Bruce Rd

Cumulative No Project
AM Peak Hour

																
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Volume (veh/h)	100	460	20	60	1110	640	20	30	20	600	80	320				
Future Volume (veh/h)	100	460	20	60	1110	640	20	30	20	600	80	320				
Number	5	2	12	1	6	16	3	8	18	7	4	14				
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0				
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00				
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1845	1845	1845	1900	1845	1845	1845				
Adj Flow Rate, veh/h	119	548	20	71	1321	519	24	36	0	782	0	30				
Adj No. of Lanes	2	2	0	1	2	1	1	1	0	2	0	1				
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84				
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3				
Cap, veh/h	219	1625	59	96	1617	1029	118	124	0	786	0	351				
Arrive On Green	0.06	0.47	0.45	0.05	0.46	0.43	0.07	0.07	0.00	0.22	0.00	0.22				
Sat Flow, veh/h	3408	3449	126	1757	3505	1568	1757	1845	0	3514	0	1568				
Grp Volume(v), veh/h	119	278	290	71	1321	519	24	36	0	782	0	30				
Grp Sat Flow(s),veh/h/ln	1704	1752	1822	1757	1752	1568	1757	1845	0	1757	0	1568				
Q Serve(g_s), s	3.0	8.7	8.7	3.5	28.4	14.8	1.1	1.6	0.0	19.4	0.0	1.3				
Cycle Q Clear(g_c), s	3.0	8.7	8.7	3.5	28.4	14.8	1.1	1.6	0.0	19.4	0.0	1.3				
Prop In Lane	1.00		0.07	1.00		1.00	1.00		0.00	1.00		1.00				
Lane Grp Cap(c), veh/h	219	826	859	96	1617	1029	118	124	0	786	0	351				
V/C Ratio(X)	0.54	0.34	0.34	0.74	0.82	0.50	0.20	0.29	0.00	1.00	0.00	0.09				
Avail Cap(c_a), veh/h	547	844	878	222	1688	1061	272	286	0	786	0	351				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00				
Uniform Delay (d), s/veh	39.5	14.5	14.5	40.6	20.3	7.7	38.5	38.7	0.0	33.8	0.0	26.8				
Incr Delay (d2), s/veh	0.8	0.2	0.2	4.2	3.2	0.4	0.3	0.5	0.0	30.8	0.0	0.0				
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
%ile BackOfQ(50%),veh/ln	1.4	4.2	4.4	1.8	14.3	10.6	0.6	0.8	0.0	12.7	0.0	0.6				
LnGrp Delay(d),s/veh	40.3	14.7	14.8	44.8	23.5	8.1	38.8	39.2	0.0	64.6	0.0	26.8				
LnGrp LOS	D	B	B	D	C	A	D	D		E		C				
Approach Vol, veh/h	687			1911			60			812						
Approach Delay, s/veh	19.2			20.1			39.0			63.2						
Approach LOS	B			C			D			E						
Timer	1	2	3	4	5	6	7	8								
Assigned Phs	1	2			4	5	6	8								
Phs Duration (G+Y+Rc), s	8.7	45.1			23.5	9.6	44.2	9.9								
Change Period (Y+Rc), s	3.0	6.0			3.5	3.0	6.0	4.5								
Max Green Setting (Gmax), s	12.0	40.0			20.0	15.0	40.0	13.0								
Max Q Clear Time (g_c+l1), s	5.5	10.7			21.4	5.0	30.4	3.6								
Green Ext Time (p_c), s	0.0	18.3			0.0	0.0	7.8	0.1								
Intersection Summary																
HCM 2010 Ctrl Delay				30.3												
HCM 2010 LOS				C												
Notes																

HCM 2010 Signalized Intersection Summary

1: Bruce Rd & SR 32

Cumulative No Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	400	560	290	170	290	90	210	740	260	90	620	320
Future Volume (veh/h)	400	560	290	170	290	90	210	740	260	90	620	320
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1900	1845	1845	1845
Adj Flow Rate, veh/h	426	596	243	181	309	66	223	787	245	96	660	238
Adj No. of Lanes	1	2	0	1	2	0	1	2	0	1	2	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	465	752	306	227	502	106	242	880	274	121	930	810
Arrive On Green	0.26	0.31	0.31	0.13	0.17	0.15	0.14	0.33	0.33	0.07	0.27	0.26
Sat Flow, veh/h	1757	2422	986	1757	2874	605	1757	2633	820	1757	3505	1546
Grp Volume(v), veh/h	426	431	408	181	187	188	223	524	508	96	660	238
Grp Sat Flow(s),veh/h/ln	1757	1752	1656	1757	1752	1727	1757	1752	1700	1757	1752	1546
Q Serve(g_s), s	23.9	22.9	22.9	10.2	10.0	10.3	12.7	28.8	28.9	5.5	17.3	8.9
Cycle Q Clear(g_c), s	23.9	22.9	22.9	10.2	10.0	10.3	12.7	28.8	28.9	5.5	17.3	8.9
Prop In Lane	1.00		0.60	1.00		0.35	1.00		0.48	1.00		1.00
Lane Grp Cap(c), veh/h	465	544	514	227	306	302	242	586	568	121	930	810
V/C Ratio(X)	0.92	0.79	0.79	0.80	0.61	0.62	0.92	0.89	0.89	0.80	0.71	0.29
Avail Cap(c_a), veh/h	467	724	684	259	517	510	242	603	585	121	965	826
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.3	32.1	32.1	43.0	38.7	39.4	43.3	32.1	32.1	46.6	33.8	13.8
Incr Delay (d2), s/veh	22.2	3.1	3.4	12.2	0.7	0.8	36.8	14.9	15.3	27.8	2.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	14.5	11.5	10.9	5.7	4.9	5.0	8.7	16.4	16.0	3.6	8.6	3.8
LnGrp Delay(d),s/veh	58.5	35.2	35.4	55.2	39.5	40.2	80.1	47.0	47.5	74.4	35.8	13.9
LnGrp LOS	E	D	D	E	D	D	F	D	D	E	D	B
Approach Vol, veh/h	1265		556				1255		994			
Approach Delay, s/veh	43.1		44.8				53.1		34.3			
Approach LOS	D		D				D		C			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	17.1	35.6	18.0	31.0	30.9	21.8	11.0	38.0				
Change Period (Y+Rc), s	* 5	7.0	* 4	* 6	* 5	7.0	* 4	* 6				
Max Green Setting (Gmax), s	* 14	39.0	* 14	* 26	* 26	27.0	* 7	* 33				
Max Q Clear Time (g_c+I1), s	12.2	24.9	14.7	19.3	25.9	12.3	7.5	30.9				
Green Ext Time (p_c), s	0.0	2.4	0.0	2.6	0.0	2.4	0.0	1.1				
Intersection Summary												
HCM 2010 Ctrl Delay			44.3									
HCM 2010 LOS			D									
Notes												
* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 2010 Signalized Intersection Summary

2: SR 99 SB Ramps & E 20th St

Cumulative No Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑	↑↑	↑↑					↑	↑	↑↑
Traffic Volume (veh/h)	0	1410	190	340	790	0	0	0	0	990	10	560
Future Volume (veh/h)	0	1410	190	340	790	0	0	0	0	990	10	560
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	1845	1845	0				1845	1845	1845
Adj Flow Rate, veh/h	0	1500	153	362	840	0				1061	0	366
Adj No. of Lanes	0	2	1	2	2	0				2	0	2
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	3	3	3	3	0				3	3	3
Cap, veh/h	0	1439	635	424	2039	0				1141	0	1018
Arrive On Green	0.00	0.41	0.41	0.12	0.58	0.00				0.32	0.00	0.32
Sat Flow, veh/h	0	3597	1545	3408	3597	0				3514	0	3136
Grp Volume(v), veh/h	0	1500	153	362	840	0				1061	0	366
Grp Sat Flow(s),veh/h/ln	0	1752	1545	1704	1752	0				1757	0	1568
Q Serve(g_s), s	0.0	35.1	5.5	8.9	11.3	0.0				25.0	0.0	7.6
Cycle Q Clear(g_c), s	0.0	35.1	5.5	8.9	11.3	0.0				25.0	0.0	7.6
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1439	635	424	2039	0				1141	0	1018
V/C Ratio(X)	0.00	1.04	0.24	0.85	0.41	0.00				0.93	0.00	0.36
Avail Cap(c_a), veh/h	0	1439	635	977	2039	0				1238	0	1104
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	25.2	16.5	36.7	9.8	0.0				27.9	0.0	22.1
Incr Delay (d2), s/veh	0.0	35.5	0.1	1.9	0.0	0.0				11.4	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	23.9	2.4	4.3	5.4	0.0				13.9	0.0	3.3
LnGrp Delay(d),s/veh	0.0	60.6	16.5	38.6	9.9	0.0				39.3	0.0	22.1
LnGrp LOS		F	B	D	A					D		C
Approach Vol, veh/h		1653			1202						1427	
Approach Delay, s/veh		56.6			18.5						34.9	
Approach LOS		E			B						C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	14.6	39.1		31.7		53.7						
Change Period (Y+Rc), s	3.5	4.6		4.1		4.6						
Max Green Setting (Gmax), s	25.0	34.5		30.0		34.5						
Max Q Clear Time (g_c+I1), s	10.9	37.1		27.0		13.3						
Green Ext Time (p_c), s	0.2	0.0		0.7		7.9						
Intersection Summary												
HCM 2010 Ctrl Delay			38.7									
HCM 2010 LOS			D									
Notes												

HCM 2010 Signalized Intersection Summary

3: SR 99 NB Ramps & E 20th St

Cumulative No Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	440	1960	0	0	1000	880	130	10	340	0	0	0
Future Volume (veh/h)	440	1960	0	0	1000	880	130	10	340	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1845	1845	0	0	1845	1845	1845	1845	1845			
Adj Flow Rate, veh/h	468	2085	0	0	1064	537	146	0	315			
Adj No. of Lanes	2	2	0	0	2	1	2	0	1			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94			
Percent Heavy Veh, %	3	3	0	0	3	3	3	3	3			
Cap, veh/h	910	2411	0	0	1322	578	791	0	353			
Arrive On Green	0.27	0.69	0.00	0.00	0.38	0.38	0.22	0.00	0.22			
Sat Flow, veh/h	3408	3597	0	0	3597	1534	3514	0	1568			
Grp Volume(v), veh/h	468	2085	0	0	1064	537	146	0	315			
Grp Sat Flow(s),veh/h/ln	1704	1752	0	0	1752	1534	1757	0	1568			
Q Serve(g_s), s	10.7	42.1	0.0	0.0	24.9	30.8	3.1	0.0	17.9			
Cycle Q Clear(g_c), s	10.7	42.1	0.0	0.0	24.9	30.8	3.1	0.0	17.9			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	910	2411	0	0	1322	578	791	0	353			
V/C Ratio(X)	0.51	0.86	0.00	0.00	0.81	0.93	0.18	0.00	0.89			
Avail Cap(c_a), veh/h	910	2411	0	0	1376	602	1153	0	515			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	28.6	11.0	0.0	0.0	25.6	27.4	28.7	0.0	34.5			
Incr Delay (d2), s/veh	2.1	3.4	0.0	0.0	3.2	20.0	0.0	0.0	10.1			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	5.3	21.1	0.0	0.0	12.6	16.2	1.5	0.0	8.7			
LnGrp Delay(d),s/veh	30.6	14.4	0.0	0.0	28.7	47.3	28.8	0.0	44.6			
LnGrp LOS	C	B			C	D	C		D			
Approach Vol, veh/h	2553			1601			461					
Approach Delay, s/veh	17.4			35.0			39.6					
Approach LOS	B			C			D					
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2			5			8					
Phs Duration (G+Y+Rc), s	67.1			28.5			24.6					
Change Period (Y+Rc), s	* 5			3.5			4.1					
Max Green Setting (Gmax), s	* 35			25.0			30.0					
Max Q Clear Time (g_c+l1), s	44.1			12.7			19.9					
Green Ext Time (p_c), s	0.0			0.8			0.7					
Intersection Summary												
HCM 2010 Ctrl Delay				25.7								
HCM 2010 LOS	C											
Notes												

HCM 2010 Signalized Intersection Summary

4: E 20th St & Chico Mall

Cumulative No Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	280	1460	80	50	1290	110	400	20	20	180	10	180
Future Volume (veh/h)	280	1460	80	50	1290	110	400	20	20	180	10	180
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1900	1900	1845	1845
Adj Flow Rate, veh/h	298	1553	82	53	1372	113	458	0	0	191	11	21
Adj No. of Lanes	2	2	0	1	2	0	2	1	0	0	1	2
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	366	1618	85	53	1314	108	589	309	0	235	14	381
Arrive On Green	0.11	0.48	0.48	0.03	0.40	0.40	0.17	0.00	0.00	0.14	0.14	0.14
Sat Flow, veh/h	3408	3383	178	1757	3276	269	3514	1845	0	1665	96	2697
Grp Volume(v), veh/h	298	801	834	53	731	754	458	0	0	202	0	21
Grp Sat Flow(s),veh/h/ln	1704	1752	1808	1757	1752	1792	1757	1845	0	1761	0	1349
Q Serve(g_s), s	7.5	38.4	39.1	2.6	35.1	35.1	10.9	0.0	0.0	9.7	0.0	0.6
Cycle Q Clear(g_c), s	7.5	38.4	39.1	2.6	35.1	35.1	10.9	0.0	0.0	9.7	0.0	0.6
Prop In Lane	1.00		0.10	1.00		0.15	1.00		0.00	0.95		1.00
Lane Grp Cap(c), veh/h	366	838	865	53	703	719	589	309	0	249	0	381
V/C Ratio(X)	0.81	0.96	0.96	1.01	1.04	1.05	0.78	0.00	0.00	0.81	0.00	0.06
Avail Cap(c_a), veh/h	759	838	865	381	703	719	1004	527	0	503	0	770
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	38.2	21.9	22.1	42.5	26.2	26.2	34.9	0.0	0.0	36.5	0.0	32.5
Incr Delay (d2), s/veh	1.7	20.9	22.2	36.9	45.0	47.1	0.8	0.0	0.0	2.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.6	23.3	24.6	1.8	25.6	26.6	5.3	0.0	0.0	4.9	0.0	0.2
LnGrp Delay(d),s/veh	39.9	42.8	44.3	79.4	71.2	73.3	35.7	0.0	0.0	38.9	0.0	32.6
LnGrp LOS	D	D	D	F	F	F	D			D		C
Approach Vol, veh/h	1933		1538			458			223			
Approach Delay, s/veh	43.0		72.5			35.7			38.3			
Approach LOS	D		E			D			D			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	4		5	6	8					
Phs Duration (G+Y+Rc), s	6.6	45.9	16.4		13.4	39.1	18.7					
Change Period (Y+Rc), s	3.0	4.1	4.0		3.5	4.1	4.0					
Max Green Setting (Gmax), s	20.0	35.0	25.0		20.0	35.0	25.0					
Max Q Clear Time (g_c+l1), s	4.6	41.1	11.7		9.5	37.1	12.9					
Green Ext Time (p_c), s	0.0	0.0	0.7		0.4	0.0	0.8					
Intersection Summary												
HCM 2010 Ctrl Delay			52.9									
HCM 2010 LOS			D									
Notes												

HCM 2010 Signalized Intersection Summary

5: Forest Ave & E 20th St

Cumulative No Project
PM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (veh/h)	490	1000	170	110	760	120	380	380	140	90	250	320	
Future Volume (veh/h)	490	1000	170	110	760	120	380	380	140	90	250	320	
Number	1	6	16	5	2	12	7	4	14	3	8	18	
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.95	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1845	1845	1845	1845	1845	1845	1900	
Adj Flow Rate, veh/h	521	1064	164	117	809	19	404	404	33	96	266	37	
Adj No. of Lanes	1	2	0	1	2	1	1	2	1	1	2	0	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3	
Cap, veh/h	438	1152	177	193	890	390	344	1031	452	105	486	67	
Arrive On Green	0.25	0.38	0.38	0.11	0.25	0.25	0.20	0.29	0.29	0.06	0.16	0.15	
Sat Flow, veh/h	1757	3034	467	1757	3505	1535	1757	3505	1535	1757	3074	421	
Grp Volume(v), veh/h	521	614	614	117	809	19	404	404	33	96	150	153	
Grp Sat Flow(s),veh/h/ln	1757	1752	1749	1757	1752	1535	1757	1752	1535	1757	1752	1743	
Q Serve(g_s), s	28.0	37.5	37.7	7.1	25.1	1.0	22.0	10.3	1.2	6.1	8.8	9.1	
Cycle Q Clear(g_c), s	28.0	37.5	37.7	7.1	25.1	1.0	22.0	10.3	1.2	6.1	8.8	9.1	
Prop In Lane	1.00		0.27	1.00		1.00	1.00		1.00	1.00		0.24	
Lane Grp Cap(c), veh/h	438	666	664	193	890	390	344	1031	452	105	277	276	
V/C Ratio(X)	1.19	0.92	0.93	0.60	0.91	0.05	1.17	0.39	0.07	0.91	0.54	0.56	
Avail Cap(c_a), veh/h	438	702	701	193	890	390	344	1077	472	203	398	396	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Uniform Delay (d), s/veh	42.1	33.2	33.3	47.6	40.6	31.6	45.1	31.6	14.5	52.5	43.5	43.7	
Incr Delay (d2), s/veh	105.8	16.6	17.2	3.8	14.9	0.2	104.5	0.1	0.0	10.9	0.6	0.7	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	26.4	21.1	21.3	3.6	14.0	0.5	20.6	5.0	0.7	3.3	4.3	4.4	
LnGrp Delay(d),s/veh	147.9	49.8	50.5	51.4	55.5	31.9	149.6	31.7	14.5	63.4	44.1	44.3	
LnGrp LOS	F	D	D	D	E	C	F	C	B	E	D	D	
Approach Vol, veh/h	1749				945				841				399
Approach Delay, s/veh	79.3				54.5				87.7				48.8
Approach LOS	E				D				F				D
Timer	1	2	3	4	5	6	7	8					
Assigned Phs	1	2	3	4	5	6	7	8					
Phs Duration (G+Y+Rc), s	32.0	32.5	10.7	37.0	17.9	46.6	26.0	21.8					
Change Period (Y+Rc), s	3.0	4.5	3.0	4.5	4.5	* 4.5	3.0	4.5					
Max Green Setting (Gmax), s	29.0	28.0	14.0	34.0	12.5	* 45	23.0	25.0					
Max Q Clear Time (g_c+l1), s	30.0	27.1	8.1	12.3	9.1	39.7	24.0	11.1					
Green Ext Time (p_c), s	0.0	0.4	0.0	2.9	1.4	2.4	0.0	2.6					
Intersection Summary													
HCM 2010 Ctrl Delay			72.0										
HCM 2010 LOS			E										
Notes													

HCM 2010 Signalized Intersection Summary

6: Huntington Dr & E 20th St

Cumulative No Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	1100	10	120	830	50	10	10	120	110	10	80
Future Volume (veh/h)	60	1100	10	120	830	50	10	10	120	110	10	80
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.98	1.00		0.96	0.98		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1900	1845	1900	1900	1845	1845
Adj Flow Rate, veh/h	64	1170	11	128	883	49	11	11	15	117	11	11
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	68	1858	17	173	1961	109	125	94	83	324	23	201
Arrive On Green	0.04	0.52	0.50	0.10	0.58	0.56	0.13	0.13	0.15	0.13	0.13	0.13
Sat Flow, veh/h	1757	3557	33	1757	3372	187	215	725	641	1396	175	1547
Grp Volume(v), veh/h	64	576	605	128	459	473	37	0	0	128	0	11
Grp Sat Flow(s),veh/h/ln	1757	1752	1838	1757	1752	1806	1580	0	0	1571	0	1547
Q Serve(g_s), s	1.7	11.3	11.3	3.4	7.1	7.2	0.0	0.0	0.0	0.0	0.0	0.3
Cycle Q Clear(g_c), s	1.7	11.3	11.3	3.4	7.1	7.2	3.3	0.0	0.0	3.3	0.0	0.3
Prop In Lane	1.00		0.02	1.00		0.10	0.30		0.41	0.91		1.00
Lane Grp Cap(c), veh/h	68	915	960	173	1020	1051	302	0	0	347	0	201
V/C Ratio(X)	0.94	0.63	0.63	0.74	0.45	0.45	0.12	0.00	0.00	0.37	0.00	0.05
Avail Cap(c_a), veh/h	512	1495	1567	694	1495	1541	713	0	0	712	0	611
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	23.0	8.2	8.2	21.1	5.7	5.7	18.4	0.0	0.0	19.6	0.0	18.3
Incr Delay (d2), s/veh	18.5	0.3	0.3	2.3	0.1	0.1	0.1	0.0	0.0	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	5.4	5.6	1.7	3.5	3.6	0.4	0.0	0.0	1.6	0.0	0.1
LnGrp Delay(d),s/veh	41.6	8.4	8.4	23.4	5.8	5.8	18.5	0.0	0.0	19.9	0.0	18.4
LnGrp LOS	D	A	A	C	A	A	B			B		B
Approach Vol, veh/h	1245		1060			37			139			
Approach Delay, s/veh	10.1		7.9			18.5			19.8			
Approach LOS	B		A			B			B			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	4		5	6	8					
Phs Duration (G+Y+Rc), s	8.7	29.1	10.2		5.9	32.0	10.2					
Change Period (Y+Rc), s	3.0	5.0	3.0		3.0	5.0	3.0					
Max Green Setting (Gmax), s	20.0	40.0	20.0		15.0	40.0	20.0					
Max Q Clear Time (g_c+I1), s	5.4	13.3	5.3		3.7	9.2	5.3					
Green Ext Time (p_c), s	0.0	10.8	0.5		0.0	11.4	0.5					
Intersection Summary												
HCM 2010 Ctrl Delay			9.9									
HCM 2010 LOS			A									
Notes												

HCM 2010 Signalized Intersection Summary

7: Notre Dame Blvd & E 20th St

Cumulative No Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	1130	150	140	750	110	190	60	160	150	40	40
Future Volume (veh/h)	40	1130	150	140	750	110	190	60	160	150	40	40
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.97	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	43	1202	151	149	798	110	202	64	14	160	43	2
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	97	1466	183	186	1602	221	244	158	131	198	110	93
Arrive On Green	0.06	0.47	0.47	0.11	0.52	0.52	0.14	0.09	0.09	0.11	0.06	0.06
Sat Flow, veh/h	1757	3126	391	1757	3084	425	1757	1845	1526	1757	1845	1563
Grp Volume(v), veh/h	43	672	681	149	453	455	202	64	14	160	43	2
Grp Sat Flow(s),veh/h/ln	1757	1752	1765	1757	1752	1757	1757	1845	1526	1757	1845	1563
Q Serve(g_s), s	1.8	24.8	25.1	6.2	12.6	12.6	8.4	2.5	0.6	6.7	1.7	0.1
Cycle Q Clear(g_c), s	1.8	24.8	25.1	6.2	12.6	12.6	8.4	2.5	0.6	6.7	1.7	0.1
Prop In Lane	1.00		0.22	1.00		0.24	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	97	822	827	186	910	913	244	158	131	198	110	93
V/C Ratio(X)	0.44	0.82	0.82	0.80	0.50	0.50	0.83	0.40	0.11	0.81	0.39	0.02
Avail Cap(c_a), veh/h	351	934	941	351	934	936	468	590	488	351	590	500
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.3	17.2	17.2	32.8	11.7	11.7	31.4	32.5	31.6	32.5	34.0	33.2
Incr Delay (d2), s/veh	1.2	4.5	4.7	3.0	0.2	0.2	2.7	0.6	0.1	2.9	0.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	13.0	13.2	3.2	6.1	6.1	4.2	1.3	0.3	3.4	0.9	0.0
LnGrp Delay(d),s/veh	35.5	21.7	21.9	35.8	11.8	11.8	34.1	33.1	31.8	35.4	34.8	33.3
LnGrp LOS	D	C	C	D	B	B	C	C	C	D	C	C
Approach Vol, veh/h	1396			1057			280			205		
Approach Delay, s/veh	22.2			15.2			33.8			35.3		
Approach LOS	C			B			C			D		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.9	40.2	14.4	8.5	8.1	44.0	12.5	10.4				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	15.0	40.0	20.0	24.0	15.0	40.0	15.0	24.0				
Max Q Clear Time (g_c+I1), s	8.2	27.1	10.4	3.7	3.8	14.6	8.7	4.5				
Green Ext Time (p_c), s	0.1	8.1	0.2	0.3	0.0	12.0	0.1	0.3				
Intersection Summary												
HCM 2010 Ctrl Delay			21.7									
HCM 2010 LOS			C									

HCM 2010 Signalized Intersection Summary

8: Bruce Rd & E 20th St

Cumulative No Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	460	560	310	40	210	100	280	780	140	140	560	290
Future Volume (veh/h)	460	560	310	40	210	100	280	780	140	140	560	290
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1900	1845	1845	1900
Adj Flow Rate, veh/h	489	596	165	43	223	93	298	830	138	149	596	258
Adj No. of Lanes	1	1	1	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	484	754	641	72	214	89	293	1011	168	172	637	276
Arrive On Green	0.28	0.41	0.41	0.04	0.17	0.17	0.17	0.34	0.33	0.10	0.27	0.27
Sat Flow, veh/h	1757	1845	1568	1757	1230	513	1757	3009	500	1757	2384	1031
Grp Volume(v), veh/h	489	596	165	43	0	316	298	483	485	149	438	416
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	0	1743	1757	1752	1756	1757	1752	1663
Q Serve(g_s), s	38.0	38.9	9.6	3.3	0.0	24.0	23.0	34.9	34.9	11.5	33.6	33.7
Cycle Q Clear(g_c), s	38.0	38.9	9.6	3.3	0.0	24.0	23.0	34.9	34.9	11.5	33.6	33.7
Prop In Lane	1.00		1.00	1.00		0.29	1.00		0.28	1.00		0.62
Lane Grp Cap(c), veh/h	484	754	641	72	0	304	293	589	590	172	468	444
V/C Ratio(X)	1.01	0.79	0.26	0.60	0.00	1.04	1.02	0.82	0.82	0.87	0.94	0.94
Avail Cap(c_a), veh/h	484	754	641	89	0	304	293	589	590	242	470	446
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.9	35.6	26.9	65.0	0.0	56.9	57.4	41.9	42.1	61.3	49.3	49.4
Incr Delay (d2), s/veh	43.3	5.2	0.1	2.9	0.0	62.7	56.8	9.4	9.4	15.6	26.3	27.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	24.1	20.8	4.2	1.7	0.0	16.8	15.7	18.5	18.5	6.3	19.7	18.9
LnGrp Delay(d),s/veh	93.3	40.8	27.0	67.9	0.0	119.6	114.4	51.4	51.5	76.9	75.7	76.9
LnGrp LOS	F	D	C	E		F	F	D	D	E	E	E
Approach Vol, veh/h	1250				359				1266			
Approach Delay, s/veh	59.5				113.4				66.2			
Approach LOS	E				F				E			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	17.5	50.3	9.7	60.3	27.0	40.8	42.0	28.0				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	19.0	40.0	7.0	55.0	23.0	36.0	38.0	24.0				
Max Q Clear Time (g_c+l1), s	13.5	36.9	5.3	40.9	25.0	35.7	40.0	26.0				
Green Ext Time (p_c), s	0.0	2.8	0.0	3.2	0.0	0.1	0.0	0.0				
Intersection Summary												
HCM 2010 Ctrl Delay	71.1											
HCM 2010 LOS	E											

HCM 2010 Signalized Intersection Summary

8B: Bruce Rd & E 20th St

Cumulative No Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	460	560	310	40	210	100	280	780	140	140	560	290
Future Volume (veh/h)	460	560	310	40	210	100	280	780	140	140	560	290
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	489	596	117	43	223	90	298	830	38	149	596	79
Adj No. of Lanes	2	1	1	2	1	0	2	2	1	1	2	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	555	662	562	167	305	123	365	1150	498	179	1132	506
Arrive On Green	0.16	0.36	0.36	0.05	0.24	0.24	0.11	0.33	0.32	0.10	0.32	0.32
Sat Flow, veh/h	3408	1845	1568	3408	1244	502	3408	3505	1568	1757	3505	1568
Grp Volume(v), veh/h	489	596	117	43	0	313	298	830	38	149	596	79
Grp Sat Flow(s),veh/h/ln	1704	1845	1568	1704	0	1746	1704	1752	1568	1757	1752	1568
Q Serve(g_s), s	13.8	30.2	5.1	1.2	0.0	16.3	8.4	20.6	1.7	8.2	13.7	3.5
Cycle Q Clear(g_c), s	13.8	30.2	5.1	1.2	0.0	16.3	8.4	20.6	1.7	8.2	13.7	3.5
Prop In Lane	1.00		1.00	1.00		0.29	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	555	662	562	167	0	428	365	1150	498	179	1132	506
V/C Ratio(X)	0.88	0.90	0.21	0.26	0.00	0.73	0.82	0.72	0.08	0.83	0.53	0.16
Avail Cap(c_a), veh/h	725	879	747	242	0	584	587	1279	556	249	1172	524
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	40.4	30.0	21.9	45.2	0.0	34.3	43.1	29.2	23.5	43.5	27.2	23.8
Incr Delay (d2), s/veh	8.3	8.5	0.1	0.3	0.0	1.7	2.0	2.1	0.1	11.2	0.6	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.2	17.0	2.2	0.6	0.0	8.0	4.1	10.2	0.7	4.5	6.7	1.6
LnGrp Delay(d),s/veh	48.7	38.4	22.0	45.5	0.0	35.9	45.1	31.2	23.6	54.7	27.8	24.0
LnGrp LOS	D	D	C	D		D	D	C	C	D	C	C
Approach Vol, veh/h	1202				356			1166			824	
Approach Delay, s/veh	41.0				37.1			34.5			32.3	
Approach LOS	D				D			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	14.1	36.4	8.8	39.4	14.6	35.9	20.1	28.2				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	14.0	35.0	7.0	47.0	17.0	32.0	21.0	33.0				
Max Q Clear Time (g_c+I1), s	10.2	22.6	3.2	32.2	10.4	15.7	15.8	18.3				
Green Ext Time (p_c), s	0.0	8.8	0.0	3.2	0.1	10.8	0.2	3.2				
Intersection Summary												
HCM 2010 Ctrl Delay	36.5											
HCM 2010 LOS	D											

HCM 2010 Signalized Intersection Summary

8C: Bruce Rd & E 20th St

Cumulative No Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	460	560	310	40	210	100	280	780	140	140	560	290
Future Volume (veh/h)	460	560	310	40	210	100	280	780	140	140	560	290
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	489	596	113	43	223	53	298	830	39	149	596	81
Adj No. of Lanes	2	1	1	1	2	0	2	2	1	1	2	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	555	660	561	86	687	160	365	1152	499	179	1134	507
Arrive On Green	0.16	0.36	0.36	0.05	0.24	0.24	0.11	0.33	0.32	0.10	0.32	0.32
Sat Flow, veh/h	3408	1845	1568	1757	2815	654	3408	3505	1568	1757	3505	1568
Grp Volume(v), veh/h	489	596	113	43	137	139	298	830	39	149	596	81
Grp Sat Flow(s),veh/h/ln	1704	1845	1568	1757	1752	1717	1704	1752	1568	1757	1752	1568
Q Serve(g_s), s	13.8	30.2	4.9	2.3	6.3	6.6	8.4	20.5	1.7	8.2	13.6	3.6
Cycle Q Clear(g_c), s	13.8	30.2	4.9	2.3	6.3	6.6	8.4	20.5	1.7	8.2	13.6	3.6
Prop In Lane	1.00		1.00	1.00		0.38	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	555	660	561	86	428	419	365	1152	499	179	1134	507
V/C Ratio(X)	0.88	0.90	0.20	0.50	0.32	0.33	0.82	0.72	0.08	0.83	0.53	0.16
Avail Cap(c_a), veh/h	727	881	749	125	587	575	589	1282	557	250	1175	526
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	40.3	30.0	21.9	45.6	30.5	30.6	43.0	29.1	23.4	43.4	27.1	23.8
Incr Delay (d2), s/veh	8.3	8.6	0.1	1.6	0.2	0.2	2.0	2.0	0.1	11.1	0.6	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.2	17.0	2.1	1.2	3.1	3.1	4.1	10.2	0.8	4.5	6.7	1.6
LnGrp Delay(d),s/veh	48.5	38.6	21.9	47.3	30.7	30.8	45.0	31.1	23.5	54.5	27.7	24.0
LnGrp LOS	D	D	C	D	C	C	D	C	C	D	C	C
Approach Vol, veh/h	1198				319			1167			826	
Approach Delay, s/veh	41.1				33.0			34.4			32.2	
Approach LOS	D				C			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	14.0	36.3	8.8	39.2	14.5	35.8	20.0	28.0				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	14.0	35.0	7.0	47.0	17.0	32.0	21.0	33.0				
Max Q Clear Time (g_c+I1), s	10.2	22.5	4.3	32.2	10.4	15.6	15.8	8.6				
Green Ext Time (p_c), s	0.0	8.8	0.0	3.0	0.1	10.9	0.2	3.4				
Intersection Summary												
HCM 2010 Ctrl Delay	36.0											
HCM 2010 LOS	D											

Intersection						
Int Delay, s/veh	1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	30	360	10	30	270
Future Vol, veh/h	10	30	360	10	30	270
Conflicting Peds, #/hr	0	1	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	32	383	11	32	287
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	739	389	0	0	394	0
Stage 1	388	-	-	-	-	-
Stage 2	351	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	385	659	-	-	1165	-
Stage 1	686	-	-	-	-	-
Stage 2	713	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	372	658	-	-	1164	-
Mov Cap-2 Maneuver	484	-	-	-	-	-
Stage 1	686	-	-	-	-	-
Stage 2	689	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	11.4		0		0.8	
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 604	1164	-		
HCM Lane V/C Ratio	-	- 0.07	0.027	-		
HCM Control Delay (s)	-	- 11.4	8.2	0		
HCM Lane LOS	-	- B	A	A		
HCM 95th %tile Q(veh)	-	- 0.2	0.1	-		

Intersection						
Int Delay, s/veh	0.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	10	360	10	10	250
Future Vol, veh/h	10	10	360	10	10	250
Conflicting Peds, #/hr	0	0	0	1	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	11	383	11	11	266
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	676	389	0	0	395	0
Stage 1	389	-	-	-	-	-
Stage 2	287	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	419	659	-	-	1164	-
Stage 1	685	-	-	-	-	-
Stage 2	762	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	415	658	-	-	1164	-
Mov Cap-2 Maneuver	516	-	-	-	-	-
Stage 1	684	-	-	-	-	-
Stage 2	755	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	11.5		0		0.3	
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 578	1164	-		
HCM Lane V/C Ratio	-	- 0.037	0.009	-		
HCM Control Delay (s)	-	- 11.5	8.1	-		
HCM Lane LOS	-	- B	A	-		
HCM 95th %tile Q(veh)	-	- 0.1	0	-		

Intersection						
Int Delay, s/veh	1.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	30	20	370	30	20	240
Future Vol, veh/h	30	20	370	30	20	240
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	32	21	394	32	21	255
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	708	410	0	0	426	0
Stage 1	410	-	-	-	-	-
Stage 2	298	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	401	642	-	-	1133	-
Stage 1	670	-	-	-	-	-
Stage 2	753	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	394	642	-	-	1133	-
Mov Cap-2 Maneuver	500	-	-	-	-	-
Stage 1	670	-	-	-	-	-
Stage 2	739	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	12.3		0		0.6	
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 549	1133	-		
HCM Lane V/C Ratio	-	- 0.097	0.019	-		
HCM Control Delay (s)	-	- 12.3	8.2	-		
HCM Lane LOS	-	- B	A	-		
HCM 95th %tile Q(veh)	-	- 0.3	0.1	-		

HCM 2010 Signalized Intersection Summary

12: Notre Dame Blvd & Forest Ave

Cumulative No Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	120	420	30	80	50	380	320	20	20	200	50
Future Volume (veh/h)	40	120	420	30	80	50	380	320	20	20	200	50
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	43	128	63	32	85	31	404	340	18	21	213	32
Adj No. of Lanes	1	1	2	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	75	325	472	52	208	76	439	1465	77	24	604	89
Arrive On Green	0.04	0.17	0.17	0.03	0.16	0.16	0.25	0.43	0.43	0.01	0.20	0.20
Sat Flow, veh/h	1774	1863	2707	1774	1290	470	1774	3415	180	1774	3093	458
Grp Volume(v), veh/h	43	128	63	32	0	116	404	176	182	21	121	124
Grp Sat Flow(s),veh/h/ln	1774	1863	1354	1774	0	1760	1774	1770	1825	1774	1770	1781
Q Serve(g_s), s	1.1	2.8	0.9	0.8	0.0	2.7	10.0	2.8	2.9	0.5	2.7	2.7
Cycle Q Clear(g_c), s	1.1	2.8	0.9	0.8	0.0	2.7	10.0	2.8	2.9	0.5	2.7	2.7
Prop In Lane	1.00		1.00	1.00		0.27	1.00		0.10	1.00		0.26
Lane Grp Cap(c), veh/h	75	325	472	52	0	283	439	759	783	24	345	348
V/C Ratio(X)	0.57	0.39	0.13	0.62	0.00	0.41	0.92	0.23	0.23	0.86	0.35	0.36
Avail Cap(c_a), veh/h	824	1112	1616	628	0	934	1020	1252	1292	628	1057	1063
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	21.2	16.5	15.8	21.7	0.0	17.0	16.6	8.2	8.2	22.3	15.7	15.7
Incr Delay (d2), s/veh	2.5	0.3	0.0	4.4	0.0	0.4	3.5	0.2	0.2	25.6	0.6	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	1.4	0.3	0.5	0.0	1.3	5.2	1.4	1.5	0.4	1.3	1.4
LnGrp Delay(d),s/veh	23.8	16.8	15.8	26.1	0.0	17.4	20.0	8.3	8.3	47.8	16.3	16.4
LnGrp LOS	C	B	B	C		B	C	A	A	D	B	B
Approach Vol, veh/h	234			148			762			266		
Approach Delay, s/veh	17.8			19.3			14.5			18.8		
Approach LOS	B			B			B			B		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	5.9	11.3	4.6	23.4	5.3	11.9	15.2	12.8				
Change Period (Y+Rc), s	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0				
Max Green Setting (Gmax), s	22.0	24.0	17.0	32.0	17.0	27.0	27.0	27.0				
Max Q Clear Time (g_c+l1), s	3.1	4.7	2.5	4.9	2.8	4.8	12.0	4.7				
Green Ext Time (p_c), s	0.0	1.0	0.0	3.7	0.0	1.0	0.2	3.6				
Intersection Summary												
HCM 2010 Ctrl Delay				16.4								
HCM 2010 LOS	B											
Notes												

HCM 2010 TWSC
13: Bruce Rd & Raley Blvd

Cumulative No Project
PM Peak Hour

Intersection						
Int Delay, s/veh	35					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	120	140	20	1010	870	40
Future Vol, veh/h	120	140	20	1010	870	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	128	149	21	1074	926	43
Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1527	484	968	0	-	0
Stage 1	947	-	-	-	-	-
Stage 2	580	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	~ 108	529	707	-	-	-
Stage 1	337	-	-	-	-	-
Stage 2	523	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 105	529	707	-	-	-
Mov Cap-2 Maneuver	~ 105	-	-	-	-	-
Stage 1	337	-	-	-	-	-
Stage 2	507	-	-	-	-	-
Approach	EB		NB		SB	
HCM Control Delay, s	295.6		0.2		0	
HCM LOS	F					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	707	-	185	-	-	
HCM Lane V/C Ratio	0.03	-	1.495	-	-	
HCM Control Delay (s)	10.2	-	295.6	-	-	
HCM Lane LOS	B	-	F	-	-	
HCM 95th %tile Q(veh)	0.1	-	17.4	-	-	
Notes						
~: Volume exceeds capacity	\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon	

HCM 2010 Signalized Intersection Summary 14: SR 99 SB Ramps & Skyway Rd

Cumulative No Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑		↑↑	↑				↑↑		↑
Traffic Volume (veh/h)	0	1560	300	0	730	200	0	0	0	840	0	280
Future Volume (veh/h)	0	1560	300	0	730	200	0	0	0	840	0	280
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	0	1845	1845				1845	0	1845
Adj Flow Rate, veh/h	0	1660	0	0	777	0				894	0	185
Adj No. of Lanes	0	2	1	0	2	1				2	0	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	3	3	0	3	3				3	0	3
Cap, veh/h	0	1926	862	0	1926	862				1057	0	486
Arrive On Green	0.00	0.55	0.00	0.00	0.55	0.00				0.31	0.00	0.31
Sat Flow, veh/h	0	3597	1568	0	3597	1568				3408	0	1568
Grp Volume(v), veh/h	0	1660	0	0	777	0				894	0	185
Grp Sat Flow(s),veh/h/ln	0	1752	1568	0	1752	1568				1704	0	1568
Q Serve(g_s), s	0.0	23.1	0.0	0.0	7.3	0.0				14.0	0.0	5.3
Cycle Q Clear(g_c), s	0.0	23.1	0.0	0.0	7.3	0.0				14.0	0.0	5.3
Prop In Lane	0.00		1.00	0.00		1.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1926	862	0	1926	862				1057	0	486
V/C Ratio(X)	0.00	0.86	0.00	0.00	0.40	0.00				0.85	0.00	0.38
Avail Cap(c_a), veh/h	0	3135	1402	0	3135	1402				2152	0	990
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	11.0	0.0	0.0	7.4	0.0				18.4	0.0	15.4
Incr Delay (d2), s/veh	0.0	0.8	0.0	0.0	0.1	0.0				0.7	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	11.0	0.0	0.0	3.5	0.0				6.7	0.0	2.3
LnGrp Delay(d),s/veh	0.0	11.8	0.0	0.0	7.5	0.0				19.1	0.0	15.6
LnGrp LOS		B			A					B		B
Approach Vol, veh/h		1660			777						1079	
Approach Delay, s/veh		11.8			7.5						18.5	
Approach LOS		B			A						B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		35.3		21.7		35.3						
Change Period (Y+Rc), s		* 5		* 5		* 5						
Max Green Setting (Gmax), s		* 50		* 35		* 50						
Max Q Clear Time (g_c+I1), s		25.1		16.0		9.3						
Green Ext Time (p_c), s		5.2		0.7		5.4						
Intersection Summary												
HCM 2010 Ctrl Delay			12.9									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

15: SR 99 NB Ramps & Skyway Rd

Cumulative No Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕	↗		↕↕	↗	↗↗		↗			
Traffic Volume (veh/h)	0	1770	630	0	780	1100	150	0	250	0	0	0
Future Volume (veh/h)	0	1770	630	0	780	1100	150	0	250	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1845	1845	0	1845	1845	1845	0	1845			
Adj Flow Rate, veh/h	0	1883	0	0	830	0	160	0	245			
Adj No. of Lanes	0	2	1	0	2	1	2	0	1			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94			
Percent Heavy Veh, %	0	3	3	0	3	3	3	0	3			
Cap, veh/h	0	2296	1027	0	2296	1027	653	0	300			
Arrive On Green	0.00	0.66	0.00	0.00	0.66	0.00	0.19	0.00	0.19			
Sat Flow, veh/h	0	3597	1568	0	3597	1568	3408	0	1568			
Grp Volume(v), veh/h	0	1883	0	0	830	0	160	0	245			
Grp Sat Flow(s),veh/h/ln	0	1752	1568	0	1752	1568	1704	0	1568			
Q Serve(g_s), s	0.0	20.9	0.0	0.0	5.6	0.0	2.1	0.0	7.8			
Cycle Q Clear(g_c), s	0.0	20.9	0.0	0.0	5.6	0.0	2.1	0.0	7.8			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2296	1027	0	2296	1027	653	0	300			
V/C Ratio(X)	0.00	0.82	0.00	0.00	0.36	0.00	0.24	0.00	0.82			
Avail Cap(c_a), veh/h	0	3427	1533	0	3427	1533	1633	0	751			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	6.7	0.0	0.0	4.1	0.0	17.9	0.0	20.2			
Incr Delay (d2), s/veh	0.0	0.6	0.0	0.0	0.0	0.0	0.1	0.0	2.1			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	9.9	0.0	0.0	2.7	0.0	1.0	0.0	3.5			
LnGrp Delay(d),s/veh	0.0	7.3	0.0	0.0	4.1	0.0	18.0	0.0	22.3			
LnGrp LOS		A			A		B		C			
Approach Vol, veh/h	1883			830			405					
Approach Delay, s/veh	7.3			4.1			20.6					
Approach LOS	A			A			C					
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2						6	8				
Phs Duration (G+Y+Rc), s	38.2						38.2	14.0				
Change Period (Y+Rc), s	* 5						* 5	4.0				
Max Green Setting (Gmax), s	* 50						* 50	25.0				
Max Q Clear Time (g_c+I1), s	22.9						7.6	9.8				
Green Ext Time (p_c), s	10.3						11.4	0.2				
Intersection Summary												
HCM 2010 Ctrl Delay	8.2											
HCM 2010 LOS	A											
Notes												

HCM 2010 Signalized Intersection Summary

16: Notre Dame Blvd & Skyway Rd

Cumulative No Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	630	1150	240	50	1220	120	220	130	60	150	170	440
Future Volume (veh/h)	630	1150	240	50	1220	120	220	130	60	150	170	440
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.98	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1845	1845	1900	1845	1845	1845
Adj Flow Rate, veh/h	670	1223	173	53	1298	71	234	138	50	160	181	340
Adj No. of Lanes	2	3	1	1	3	1	2	1	0	1	1	2
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	750	2488	970	96	1656	507	503	190	69	245	257	1120
Arrive On Green	0.22	0.49	0.48	0.05	0.33	0.33	0.15	0.15	0.15	0.14	0.14	0.14
Sat Flow, veh/h	3408	5036	1529	1757	5036	1543	3408	1284	465	1757	1845	3083
Grp Volume(v), veh/h	670	1223	173	53	1298	71	234	0	188	160	181	340
Grp Sat Flow(s),veh/h/ln	1704	1679	1529	1757	1679	1543	1704	0	1750	1757	1845	1542
Q Serve(g_s), s	18.6	15.8	4.6	2.9	22.7	3.2	6.1	0.0	10.0	8.4	9.1	7.7
Cycle Q Clear(g_c), s	18.6	15.8	4.6	2.9	22.7	3.2	6.1	0.0	10.0	8.4	9.1	7.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.27	1.00		1.00
Lane Grp Cap(c), veh/h	750	2488	970	96	1656	507	503	0	258	245	257	1120
V/C Ratio(X)	0.89	0.49	0.18	0.55	0.78	0.14	0.47	0.00	0.73	0.65	0.70	0.30
Avail Cap(c_a), veh/h	864	2488	970	451	2108	646	1039	0	533	535	562	1630
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.9	16.5	7.5	44.9	29.6	23.0	38.0	0.0	39.6	39.7	40.0	22.5
Incr Delay (d2), s/veh	10.7	0.2	0.1	4.9	1.5	0.1	0.7	0.0	3.9	2.9	3.5	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.9	7.3	2.7	1.5	10.7	1.4	2.9	0.0	5.1	4.3	4.9	3.3
LnGrp Delay(d),s/veh	47.6	16.6	7.6	49.8	31.1	23.1	38.7	0.0	43.5	42.6	43.5	22.6
LnGrp LOS	D	B	A	D	C	C	D		D	D	D	C
Approach Vol, veh/h	2066				1422				422		681	
Approach Delay, s/veh	25.9				31.4				40.8		32.9	
Approach LOS	C				C				D		C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	9.3	52.2			17.6	25.5	36.0	18.4				
Change Period (Y+Rc), s	4.0	4.8			3.7	3.7	4.8	3.7				
Max Green Setting (Gmax), s	25.0	40.0			30.0	25.0	40.0	30.0				
Max Q Clear Time (g_c+l1), s	4.9	17.8			11.1	20.6	24.7	12.0				
Green Ext Time (p_c), s	0.1	18.1			2.8	1.2	6.5	1.9				
Intersection Summary												
HCM 2010 Ctrl Delay			30.0									
HCM 2010 LOS			C									
Notes												

HCM 2010 TWSC
17: Skyway Rd & Forest Ave

Cumulative No Project
PM Peak Hour

Intersection

Int Delay, s/veh 234.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	110	1220	50	60	1120	80	10	6	90	80	6	110
Future Vol, veh/h	110	1220	50	60	1120	80	10	6	90	80	6	110
Conflicting Peds, #/hr	0	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	250	-	-	150	-	-	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	117	1298	53	64	1191	85	11	6	96	85	6	117

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1278	0	0	1351	0	0	2286	2964	676	2249	2948	639
Stage 1	-	-	-	-	-	-	1559	1559	-	1363	1363	-
Stage 2	-	-	-	-	-	-	727	1405	-	886	1585	-
Critical Hdwy	4.16	-	-	4.16	-	-	7.56	6.56	6.96	7.56	6.56	6.96
Critical Hdwy Stg 1	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Follow-up Hdwy	2.23	-	-	2.23	-	-	3.53	4.03	3.33	3.53	4.03	3.33
Pot Cap-1 Maneuver	534	-	-	500	-	-	21	14	394	~ 22	14	416
Stage 1	-	-	-	-	-	-	116	170	-	154	212	-
Stage 2	-	-	-	-	-	-	379	202	-	304	165	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	534	-	-	500	-	-	~ 6	10	394	~ 6	10	416
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 6	10	-	~ 6	10	-
Stage 1	-	-	-	-	-	-	91	133	-	120	185	-
Stage 2	-	-	-	-	-	-	229	176	-	171	129	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0.6	\$ 967.1	\$ 2980
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	42	534	-	-	500	-	-	6	134
HCM Lane V/C Ratio	2.685	0.219	-	-	0.128	-	-	14.184	0.921
HCM Control Delay (s)	\$ 967.1	13.6	-	-	13.3	-	-	\$ 7125.3	121.1
HCM Lane LOS	F	B	-	-	B	-	-	F	F
HCM 95th %tile Q(veh)	12.3	0.8	-	-	0.4	-	-	12.5	6.2

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 2010 Signalized Intersection Summary

17B: Skyway Rd & Forest Ave

Cumulative No Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	110	1220	50	60	1120	80	10	10	90	80	10	110
Future Volume (veh/h)	110	1220	50	60	1120	80	10	10	90	80	10	110
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1900	1845	1900	1845	1845	1900
Adj Flow Rate, veh/h	117	1298	51	64	1191	82	11	11	6	85	11	8
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	1	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	152	2073	81	81	1872	129	17	17	9	124	70	51
Arrive On Green	0.09	0.60	0.60	0.05	0.56	0.56	0.02	0.02	0.02	0.07	0.07	0.07
Sat Flow, veh/h	1757	3438	135	1757	3328	229	685	685	374	1757	994	723
Grp Volume(v), veh/h	117	661	688	64	627	646	28	0	0	85	0	19
Grp Sat Flow(s),veh/h/ln	1757	1752	1821	1757	1752	1804	1744	0	0	1757	0	1717
Q Serve(g_s), s	3.8	14.1	14.2	2.1	14.3	14.3	0.9	0.0	0.0	2.8	0.0	0.6
Cycle Q Clear(g_c), s	3.8	14.1	14.2	2.1	14.3	14.3	0.9	0.0	0.0	2.8	0.0	0.6
Prop In Lane	1.00		0.07	1.00		0.13	0.39		0.21	1.00		0.42
Lane Grp Cap(c), veh/h	152	1057	1098	81	986	1015	44	0	0	124	0	121
V/C Ratio(X)	0.77	0.63	0.63	0.79	0.64	0.64	0.64	0.00	0.00	0.69	0.00	0.16
Avail Cap(c_a), veh/h	389	1134	1178	389	1134	1168	802	0	0	808	0	790
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	26.2	7.4	7.4	27.7	8.7	8.8	28.4	0.0	0.0	26.7	0.0	25.7
Incr Delay (d2), s/veh	8.0	1.0	1.0	15.5	0.9	0.9	14.7	0.0	0.0	6.6	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	6.9	7.4	1.4	7.0	7.3	0.6	0.0	0.0	1.6	0.0	0.3
LnGrp Delay(d),s/veh	34.2	8.4	8.4	43.2	9.7	9.7	43.1	0.0	0.0	33.2	0.0	26.3
LnGrp LOS	C	A	A	D	A	A	D			C		C
Approach Vol, veh/h	1466				1337		28				104	
Approach Delay, s/veh	10.5				11.3		43.1				32.0	
Approach LOS	B				B		D				C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2		3	4	6		7	8				
Phs Duration (G+Y+Rc), s	4.5		6.7	40.4	7.1		9.1	38.0				
Change Period (Y+Rc), s	3.0		4.0	5.0	3.0		4.0	5.0				
Max Green Setting (Gmax), s	27.0		13.0	38.0	27.0		13.0	38.0				
Max Q Clear Time (g_c+I1), s	2.9		4.1	16.2	4.8		5.8	16.3				
Green Ext Time (p_c), s	0.1		0.1	16.8	0.3		0.1	16.7				
Intersection Summary												
HCM 2010 Ctrl Delay	11.9											
HCM 2010 LOS	B											

HCM 2010 Signalized Intersection Summary

18: Skyway Rd & Bruce Rd

Cumulative No Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	340	1020	30	40	920	610	60	80	90	720	50	240
Future Volume (veh/h)	340	1020	30	40	920	610	60	80	90	720	50	240
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1845	1845	1845	1900	1845	1845	1845
Adj Flow Rate, veh/h	362	1085	30	43	979	529	64	85	56	804	0	42
Adj No. of Lanes	2	2	0	1	2	1	1	1	0	2	0	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	396	1643	45	70	1385	905	190	112	74	734	0	327
Arrive On Green	0.12	0.47	0.45	0.04	0.40	0.37	0.11	0.11	0.10	0.21	0.00	0.21
Sat Flow, veh/h	3408	3483	96	1757	3505	1568	1757	1033	680	3514	0	1563
Grp Volume(v), veh/h	362	546	569	43	979	529	64	0	141	804	0	42
Grp Sat Flow(s),veh/h/ln	1704	1752	1827	1757	1752	1568	1757	0	1713	1757	0	1563
Q Serve(g_s), s	9.8	22.3	22.3	2.2	21.9	20.1	3.1	0.0	7.5	19.5	0.0	2.0
Cycle Q Clear(g_c), s	9.8	22.3	22.3	2.2	21.9	20.1	3.1	0.0	7.5	19.5	0.0	2.0
Prop In Lane	1.00		0.05	1.00		1.00	1.00		0.40	1.00		1.00
Lane Grp Cap(c), veh/h	396	827	862	70	1385	905	190	0	186	734	0	327
V/C Ratio(X)	0.91	0.66	0.66	0.62	0.71	0.58	0.34	0.00	0.76	1.10	0.00	0.13
Avail Cap(c_a), veh/h	511	827	862	207	1577	991	254	0	248	734	0	327
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	40.8	18.9	19.0	44.1	23.7	12.6	38.5	0.0	40.5	36.9	0.0	30.0
Incr Delay (d2), s/veh	15.8	2.0	1.9	3.3	1.3	0.8	0.4	0.0	6.0	62.4	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.5	11.2	11.7	1.2	10.8	13.1	1.5	0.0	3.8	15.7	0.0	0.9
LnGrp Delay(d),s/veh	56.6	20.9	20.9	47.4	25.0	13.3	38.9	0.0	46.5	99.3	0.0	30.1
LnGrp LOS	E	C	C	D	C	B	D		D	F		C
Approach Vol, veh/h	1477				1551		205				846	
Approach Delay, s/veh	29.6				21.6		44.2				95.9	
Approach LOS	C				C		D				F	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	7.7	48.0			23.5	14.9	40.9	14.1				
Change Period (Y+Rc), s	3.0	6.0			3.5	3.0	6.0	4.5				
Max Green Setting (Gmax), s	12.0	40.0			20.0	15.0	40.0	13.0				
Max Q Clear Time (g_c+l1), s	4.2	24.3			21.5	11.8	23.9	9.5				
Green Ext Time (p_c), s	0.0	12.3			0.0	0.1	11.0	0.2				
Intersection Summary												
HCM 2010 Ctrl Delay			41.1									
HCM 2010 LOS			D									
Notes												

Queuing and Blocking Report
Cumulative No Project

08/31/2017

Intersection: 2: SR 99 SB Ramps & E 20th St

Movement	EB	EB	EB	WB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	R	L	L	T	T	L	LT	R	R
Maximum Queue (ft)	245	161	43	92	112	236	270	221	234	86	80
Average Queue (ft)	162	77	15	50	71	136	162	141	161	50	42
95th Queue (ft)	251	167	45	101	116	252	282	230	243	88	80
Link Distance (ft)	379	379				987	987		1959		
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)			110	280	280			490		425	425
Storage Blk Time (%)		1				0					
Queuing Penalty (veh)		1				0					

Queuing and Blocking Report
Cumulative No Project

08/31/2017

Intersection: 3: SR 99 NB Ramps & E 20th St

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	L	L	T	T	T	T	R	L	LT	R
Maximum Queue (ft)	115	119	240	282	308	345	225	64	92	225
Average Queue (ft)	67	71	129	152	204	218	190	27	61	133
95th Queue (ft)	122	129	265	299	312	363	263	64	108	242
Link Distance (ft)			987	987	393	393			1956	
Upstream Blk Time (%)						0				
Queuing Penalty (veh)						3				
Storage Bay Dist (ft)	260	260					200	550		550
Storage Blk Time (%)			1			2	8			
Queuing Penalty (veh)			2			15	35			

Queuing and Blocking Report
Cumulative No Project

08/31/2017

Intersection: 14: SR 99 SB Ramps & Skyway Rd

Movement	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	T	T	T	T	R	L	L	R
Maximum Queue (ft)	123	135	278	306	125	289	294	284
Average Queue (ft)	70	75	170	183	65	179	169	191
95th Queue (ft)	129	138	279	309	166	299	317	323
Link Distance (ft)	629	629	1030	1030			1546	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)					100	440		360
Storage Blk Time (%)				15	0			1
Queuing Penalty (veh)				38	2			11

Queuing and Blocking Report
Cumulative No Project

08/31/2017

Intersection: 15: SR 99 NB Ramps & Skyway Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	T	T	R	T	T	R	L	L	R
Maximum Queue (ft)	214	183	25	106	135	181	43	105	177
Average Queue (ft)	110	99	4	36	39	26	22	55	102
95th Queue (ft)	218	190	35	113	132	267	49	116	175
Link Distance (ft)	1030	1030		856	856	856		1886	
Upstream Blk Time (%)						0			
Queuing Penalty (veh)						0			
Storage Bay Dist (ft)			100				320		225
Storage Blk Time (%)		4	0						0
Queuing Penalty (veh)		9	0						0

Queuing and Blocking Report
Cumulative No Project

08/31/2017

Intersection: 2: SR 99 SB Ramps & E 20th St

Movement	EB	EB	EB	WB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	R	L	L	T	T	L	LT	R	R
Maximum Queue (ft)	420	408	135	141	155	240	258	414	609	255	106
Average Queue (ft)	401	393	87	84	106	126	150	312	342	104	64
95th Queue (ft)	417	420	182	152	165	262	282	464	716	286	113
Link Distance (ft)	379	379				987	987		1959		
Upstream Blk Time (%)	64	35							0		
Queuing Penalty (veh)	0	0							0		
Storage Bay Dist (ft)			110	280	280			490		425	425
Storage Blk Time (%)		46	0			1		0	2	0	
Queuing Penalty (veh)		93	2			2		0	26	1	

Queuing and Blocking Report
Cumulative No Project

08/31/2017

Intersection: 3: SR 99 NB Ramps & E 20th St

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	L	L	T	T	T	T	R	L	LT	R
Maximum Queue (ft)	168	264	822	827	362	409	225	71	228	422
Average Queue (ft)	110	175	550	563	278	352	219	28	78	256
95th Queue (ft)	178	324	1023	1013	400	477	255	67	287	457
Link Distance (ft)			987	987	393	393			1956	
Upstream Blk Time (%)			2	1	0	5				
Queuing Penalty (veh)			22	18	4	51				
Storage Bay Dist (ft)	260	260					200	550		550
Storage Blk Time (%)		0	24			6	35			2
Queuing Penalty (veh)		1	111			54	185			3

Intersection: 14: SR 99 SB Ramps & Skyway Rd

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	T	T	R	T	T	R	L	L	R
Maximum Queue (ft)	526	582	315	182	218	124	322	310	194
Average Queue (ft)	279	360	52	87	100	29	241	228	98
95th Queue (ft)	512	642	311	172	199	114	353	346	227
Link Distance (ft)	629	629		1030	1030			1546	
Upstream Blk Time (%)	1	4							
Queuing Penalty (veh)	0	0							
Storage Bay Dist (ft)			500			100	440		360
Storage Blk Time (%)		4	0		6	0		1	0
Queuing Penalty (veh)		14	1		13	0		5	0

Queuing and Blocking Report
Cumulative No Project

08/31/2017

Intersection: 15: SR 99 NB Ramps & Skyway Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	T	T	R	T	T	R	L	L	R
Maximum Queue (ft)	725	785	122	64	341	260	55	98	189
Average Queue (ft)	459	449	53	16	51	38	17	59	113
95th Queue (ft)	970	1001	143	65	293	327	46	102	196
Link Distance (ft)	1030	1030		856	856	856			1886
Upstream Blk Time (%)	0	0			0	0			
Queuing Penalty (veh)	4	6			0	1			
Storage Bay Dist (ft)			100				320	320	
Storage Blk Time (%)		13	0						
Queuing Penalty (veh)		88	3						

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	South of Skyway Road
Alternative	Cumulative No Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,950	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	819	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,386	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,693	pcphpl
Average passenger-car speed, S	63.8	mph
Volume-to-capacity ratio, v/c	0.72	
Density, D	26.5	pcpmpl
Level of service, LOS	D	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Cumulative No Project
Time period	AM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,950	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	410	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,950	410		vph
Peak-hour factor, PHF	0.90	0.85		
Peak 15-min volume, v_{15}	819	121		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,386	490		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Cumulative No Project
Time period	AM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	3,386	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	3,386	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,896	pcph	4,700	pcph	No
Ramp volume, v_R	490	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, v_{12A} =	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	Actual		Maximum		Violation?
v_{12A}	3,386	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.77	
Density, D_R	32.5	pcpmpl
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.342	
Space mean speed in ramp influence area, S_R	57.1	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.1	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Between Skyway Road Ramps
Alternative	Cumulative No Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,540	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	706	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	2,915	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,458	pcphpl
Average passenger-car speed, S	65.0	mph
Volume-to-capacity ratio, v/c	0.62	
Density, D	22.4	pcpmpl
Level of service, LOS	C	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Cumulative No Project
Time period	AM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,540	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25	mph
Volume on ramp	180	vph
Length of acceleration lane(s)	250	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,540	180		vph
Peak-hour factor, PHF	0.90	0.85		
Peak 15-min volume, v_{15}	706	53		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	2,915	215		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Cumulative No Project
Time period	AM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	2,915	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	2,915	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,130	pcph	4,700	pcph	No
Ramp volume, v_R	215	pcph	1,900	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	3,130	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.68	pcpmpl
Density, D_R	28.2	
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.398	
Space mean speed in ramp influence area, S_R	55.9	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	55.9	mph

Leisch Method for Weaving Analysis

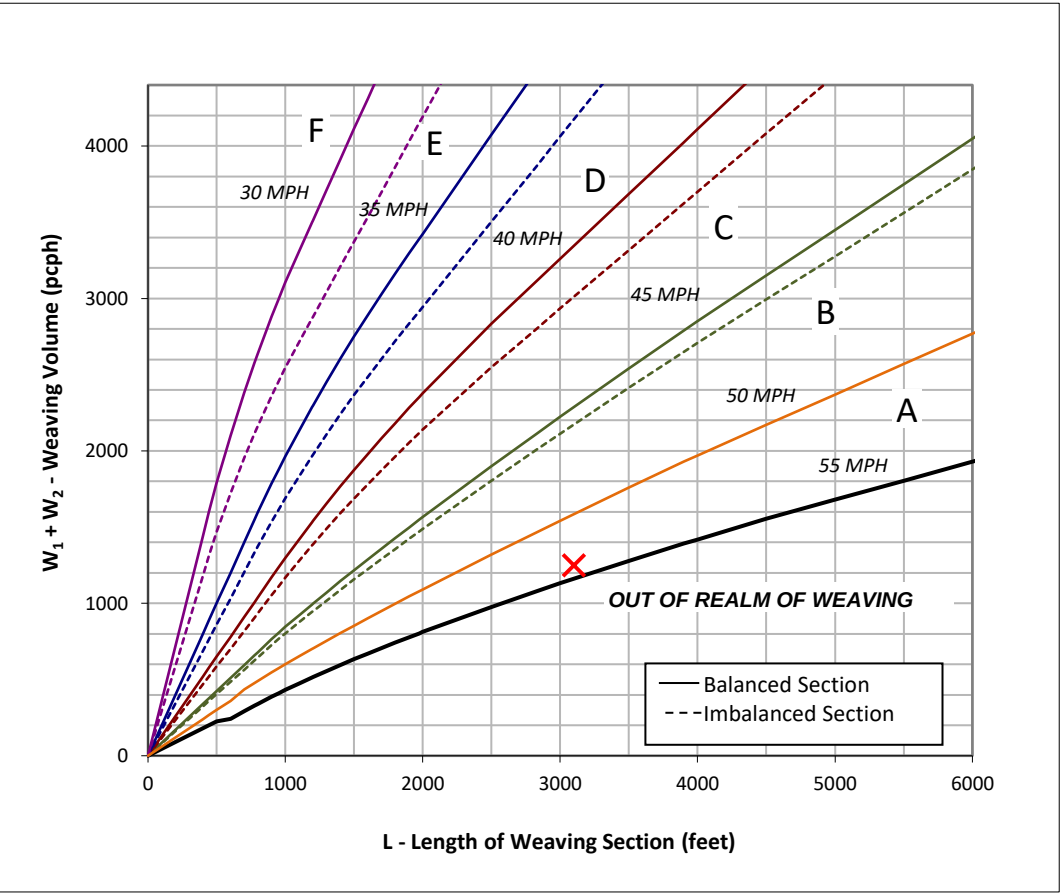
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,100

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative No Project - AM
Freeway	SR 99 NB
On-ramp	Skyway Road
Off-ramp	E 20th Street

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	3,630	Volume (vph)*	870	Volume (vph)*	360
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	3,750	Volume (pcph)	883	Volume (pcph)	365

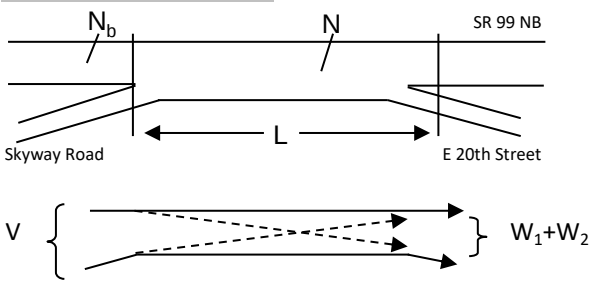


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections* , Jack E. Leisch & Associates, September 1983 and *Highway Design Manual* , California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
<i>If optional exit lane, then "Y". Otherwise "N".</i>	
2. In the chart to the left, which two speed curves is the red "x" between?	
	50 MPH and 55 MPH
<i>If left of the 30 MPH curve, LOS is F. Select "-".</i>	
<i>If below the 55 MPH curve, out of the realm of weaving.</i>	
3. Interpolated Weaving Speed (S_w , mph)	54.0
4. Weaving Intensity Factor (k)	1.00
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,250
6. Level of Service (LOS)	C

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Between E 20th Street Ramps
Alternative	Cumulative No Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,230	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	897	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,707	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,854	pcphpl
Average passenger-car speed, S	62.1	mph
Volume-to-capacity ratio, v/c	0.79	
Density, D	29.9	pcpmpl
Level of service, LOS	D	

Leisch Method for Weaving Analysis

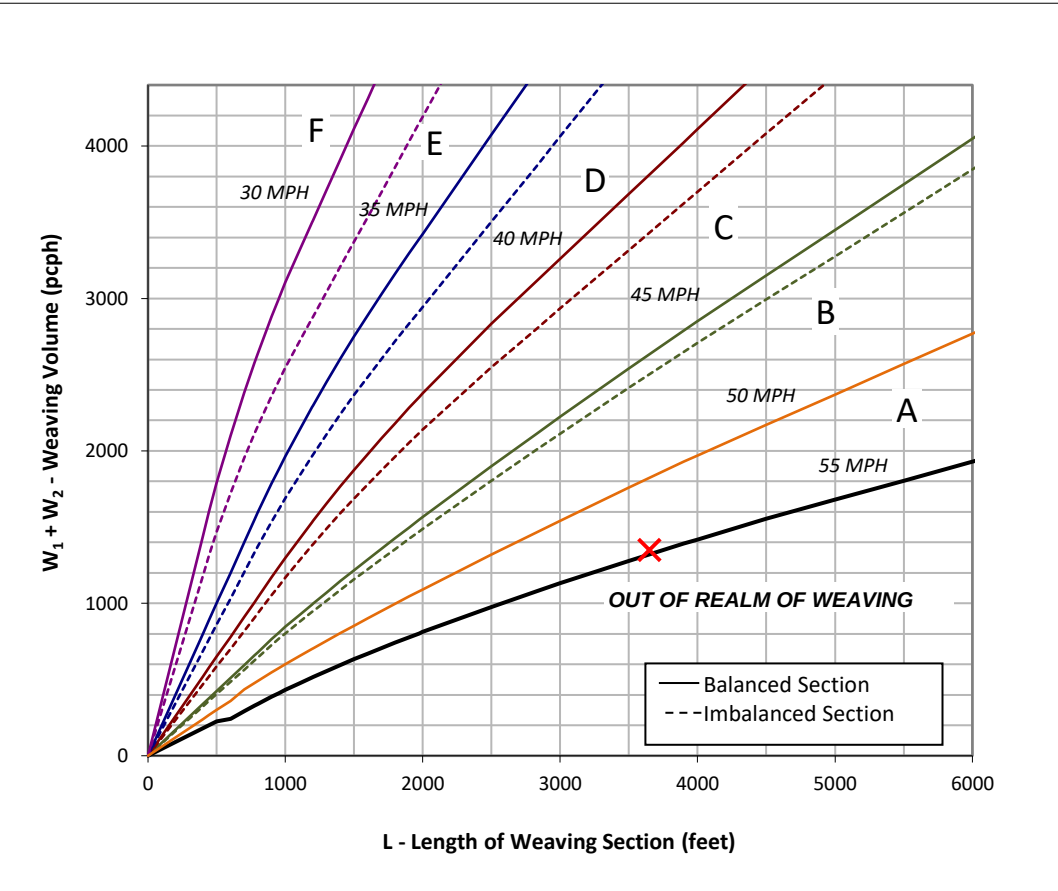
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,650

Project Information

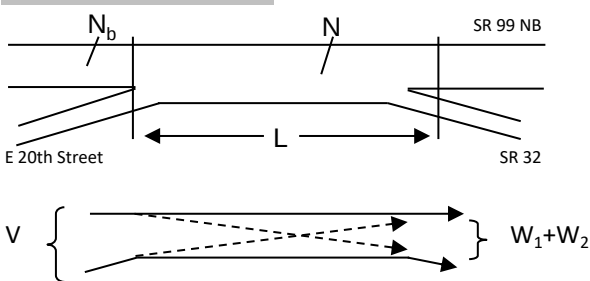
Project	Stonegate VTSM EIR
Scenario	Cumulative No Project - AM
Freeway	SR 99 NB
On-ramp	E 20th Street
Off-ramp	SR 32

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,060	Volume (vph)*	790	Volume (vph)*	540
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	4,194	Volume (pcph)	802	Volume (pcph)	548



The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.
* Note: **Do not adjust by a Peak Hour Factor (PHF)**. The methodology incorporates the PHF in the Service Volume tables.
Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983 and *Highway Design Manual*, California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
<i>If optional exit lane, then "Y". Otherwise "N".</i>	
2. In the chart to the left, which two speed curves is the red "x" between?	
	50 MPH and 55 MPH
<i>If left of the 30 MPH curve, LOS is F. Select "-".</i>	
<i>If below the 55 MPH curve, out of the realm of weaving.</i>	
3. Interpolated Weaving Speed (S_w , mph)	54.7
4. Weaving Intensity Factor (k)	1.00
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,398
6. Level of Service (LOS)	D

Leisch Method for Weaving Analysis

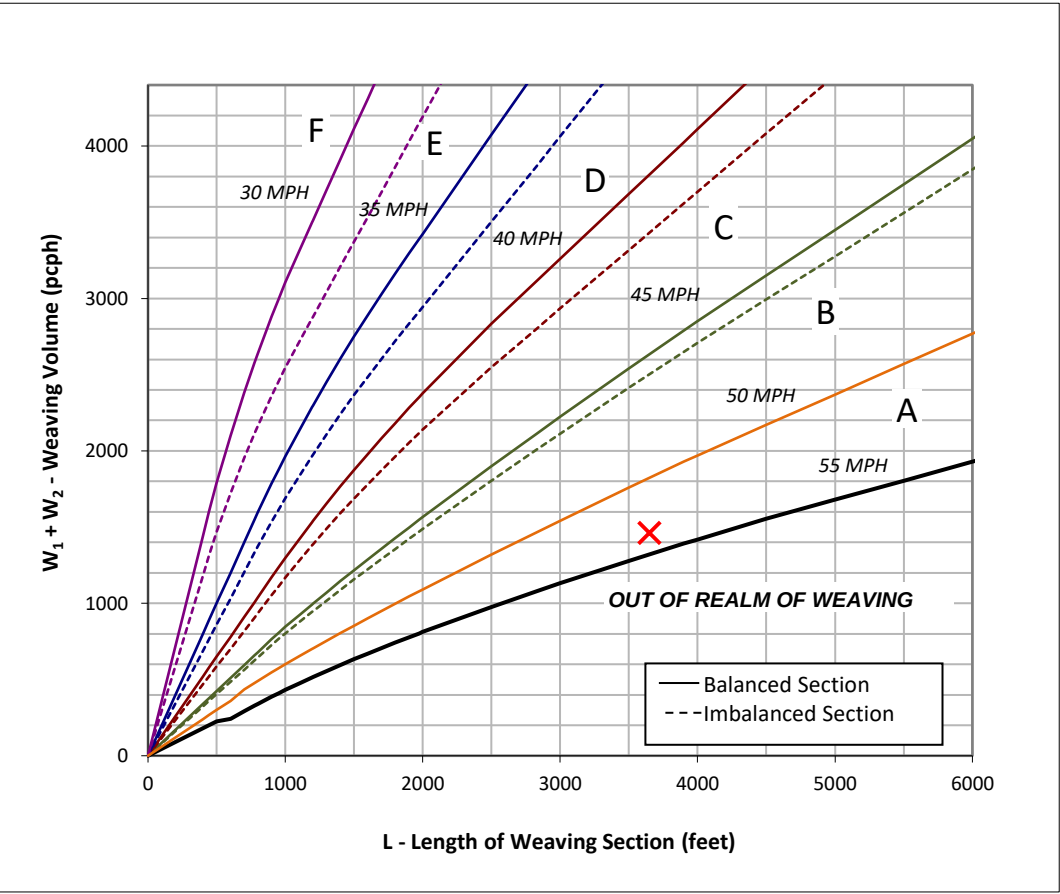
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,650

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative No Project - AM
Freeway	SR 99 SB
On-ramp	SR 32
Off-ramp	E 20th Street

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,940	Volume (vph)*	540	Volume (vph)*	900
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	5,103	Volume (pcph)	548	Volume (pcph)	914

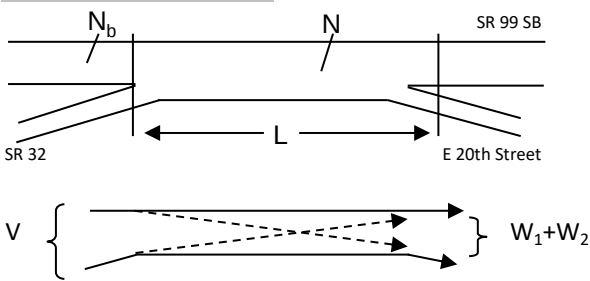


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections* , Jack E. Leisch & Associates, September 1983 and *Highway Design Manual* , California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	
	50 MPH and 55 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	53.6
4. Weaving Intensity Factor (k)	1.00
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,701
6. Level of Service (LOS)	E

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Between E 20th Street Ramps
Alternative	Cumulative No Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,990	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	1,108	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	4,580	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	2,290	pcphpl
Average passenger-car speed, S	53.8	mph
Volume-to-capacity ratio, v/c	0.97	
Density, D	42.6	pcpmpl
Level of service, LOS	E	

Leisch Method for Weaving Analysis

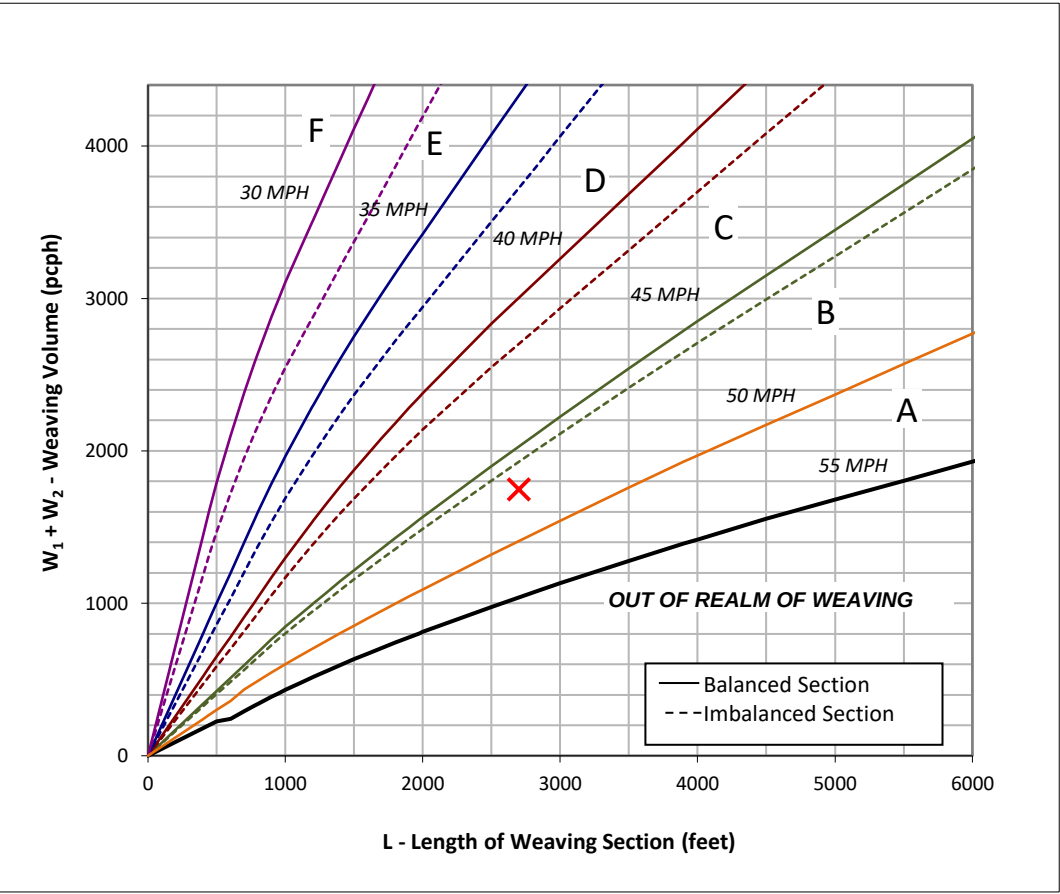
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	2,700

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative No Project - AM
Freeway	SR 99 SB
On-ramp	E 20th Street
Off-ramp	Skyway Road

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,320	Volume (vph)*	330	Volume (vph)*	1,390
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	4,463	Volume (pcph)	335	Volume (pcph)	1,411

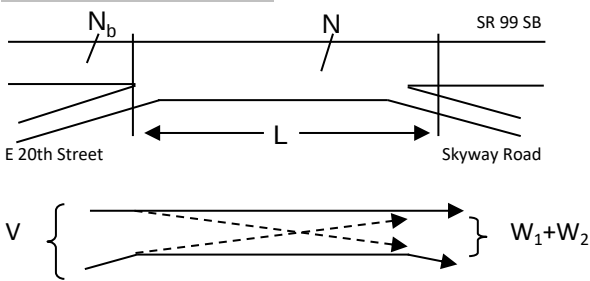


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections* , Jack E. Leisch & Associates, September 1983 and *Highway Design Manual* , California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
<i>If optional exit lane, then "Y". Otherwise "N".</i>	
2. In the chart to the left, which two speed curves is the red "x" between?	
	45 MPH and 50 MPH
<i>If left of the 30 MPH curve, LOS is F. Select "-".</i>	
<i>If below the 55 MPH curve, out of the realm of weaving.</i>	
3. Interpolated Weaving Speed (S_w , mph)	46.8
4. Weaving Intensity Factor (k)	2.18
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,620
6. Level of Service (LOS)	E

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Between Skyway Road Ramps
Alternative	Cumulative No Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,930	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	814	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,363	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,681	pcphpl
Average passenger-car speed, S	63.9	mph
Volume-to-capacity ratio, v/c	0.72	
Density, D	26.3	pcpmpl
Level of service, LOS	D	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Cumulative No Project
Time period	AM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,930	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25	mph
Volume on ramp	220	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,930	220		vph
Peak-hour factor, PHF	0.90	0.82		
Peak 15-min volume, v_{15}	814	67		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,363	272		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Cumulative No Project
Time period	AM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	3,363	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	3,363	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,635	pcph	4,700	pcph	No
Ramp volume, v_R	272	pcph	1,900	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	3,635	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.79	pcpmpl
Density, D_R	31.2	
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.449	
Space mean speed in ramp influence area, S_R	54.7	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	54.7	mph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road On Ramp
Alternative	Cumulative No Project
Time period	AM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	3,150	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	160	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	3,150	160		vph
Peak-hour factor, PHF	0.90	0.82		
Peak 15-min volume, v_{15}	875	49		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,616	198		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road On Ramp
Alternative	Cumulative No Project
Time period	AM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	3,616	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	3,616	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,814	pcph	4,700	pcph	No
Ramp volume, v_R	198	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	3,814	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.83	pcpmpl
Density, D_R	32.6	
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.462	
Space mean speed in ramp influence area, S_R	54.4	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	54.4	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	South of Skyway Road
Alternative	Cumulative No Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,310	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	919	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,799	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,900	pcphpl
Average passenger-car speed, S	61.5	mph
Volume-to-capacity ratio, v/c	0.81	
Density, D	30.9	pcpmpl
Level of service, LOS	D	

Leisch Method for Weaving Analysis

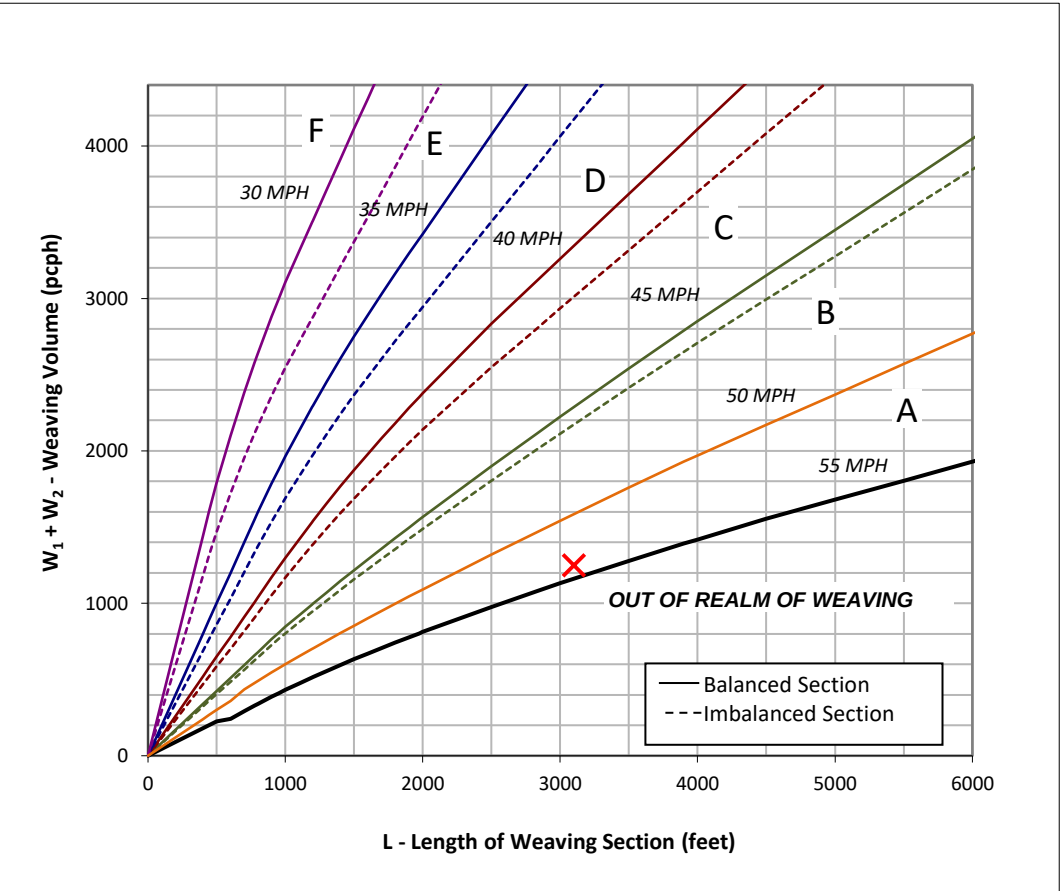
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,100

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative No Project - AM
Freeway	SR 99 NB
On-ramp	Skyway Road
Off-ramp	E 20th Street

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	3,630	Volume (vph)*	870	Volume (vph)*	360
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	3,750	Volume (pcph)	883	Volume (pcph)	365

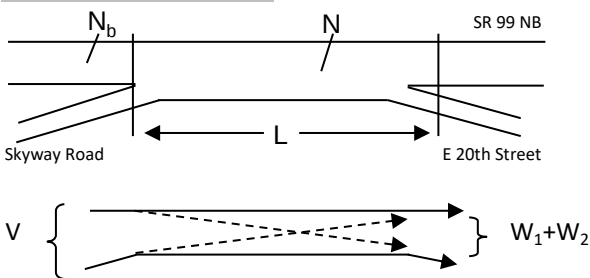


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections* , Jack E. Leisch & Associates, September 1983 and *Highway Design Manual* , California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	
	50 MPH and 55 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	54.0
4. Weaving Intensity Factor (k)	1.00
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,250
6. Level of Service (LOS)	C

Leisch Method for Weaving Analysis

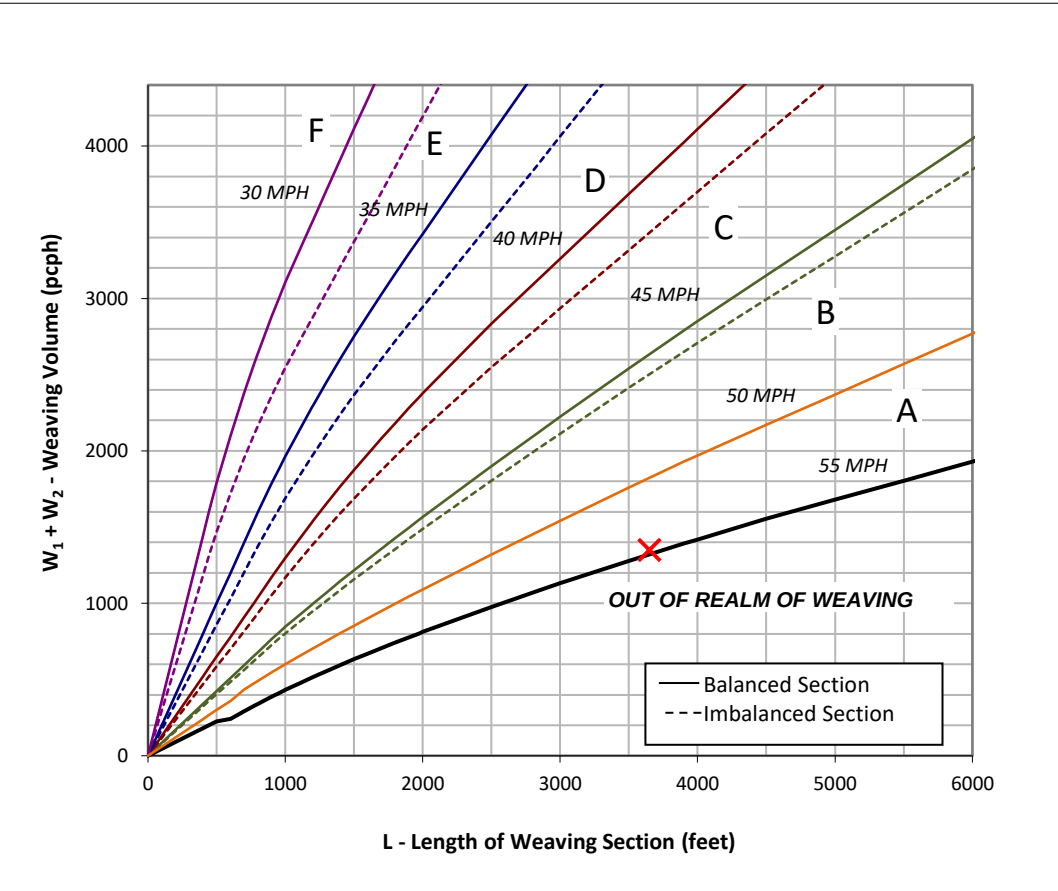
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,650

Project Information

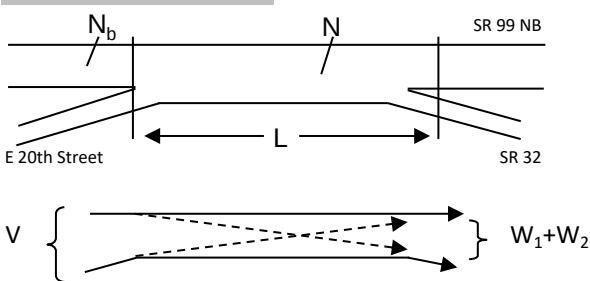
Project	Stonegate VTSM EIR
Scenario	Cumulative No Project - AM
Freeway	SR 99 NB
On-ramp	E 20th Street
Off-ramp	SR 32

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,060	Volume (vph)*	790	Volume (vph)*	540
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	4,194	Volume (pcph)	802	Volume (pcph)	548



The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.
* Note: **Do not adjust by a Peak Hour Factor (PHF)**. The methodology incorporates the PHF in the Service Volume tables.
Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983 and *Highway Design Manual*, California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	50 MPH and 55 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	54.7
4. Weaving Intensity Factor (k)	1.00
5. Service Volume (SV, pcph)	SV = $(1/N) * [V + (k - 1) * \min(W_1, W_2)]$
6. Level of Service (LOS)	D

Leisch Method for Weaving Analysis

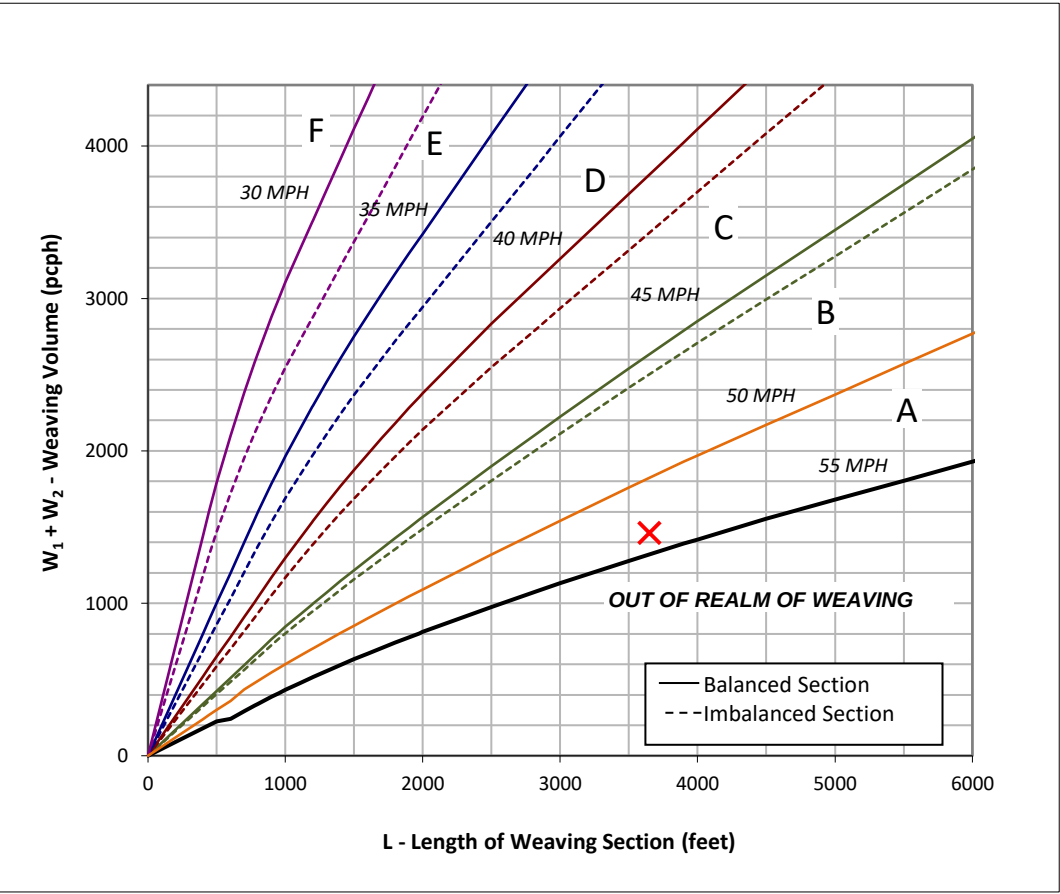
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,650

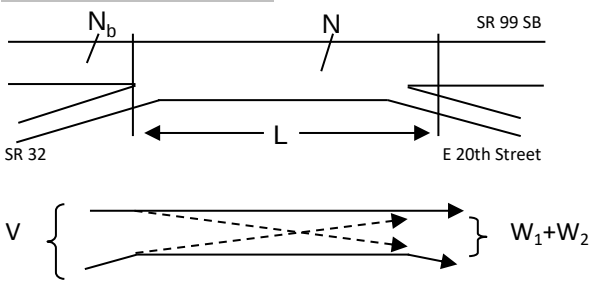
Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative No Project - AM
Freeway	SR 99 SB
On-ramp	SR 32
Off-ramp	E 20th Street

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,940	Volume (vph)*	540	Volume (vph)*	900
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	5,103	Volume (pcph)	548	Volume (pcph)	914



Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	50 MPH and 55 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	53.6
4. Weaving Intensity Factor (k)	1.00
5. Service Volume (SV, pcph)	SV = $(1/N) * [V + (k - 1) * \min(W_1, W_2)]$
6. Level of Service (LOS)	E

The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983 and *Highway Design Manual*, California Department of Transportation, 2014

Leisch Method for Weaving Analysis

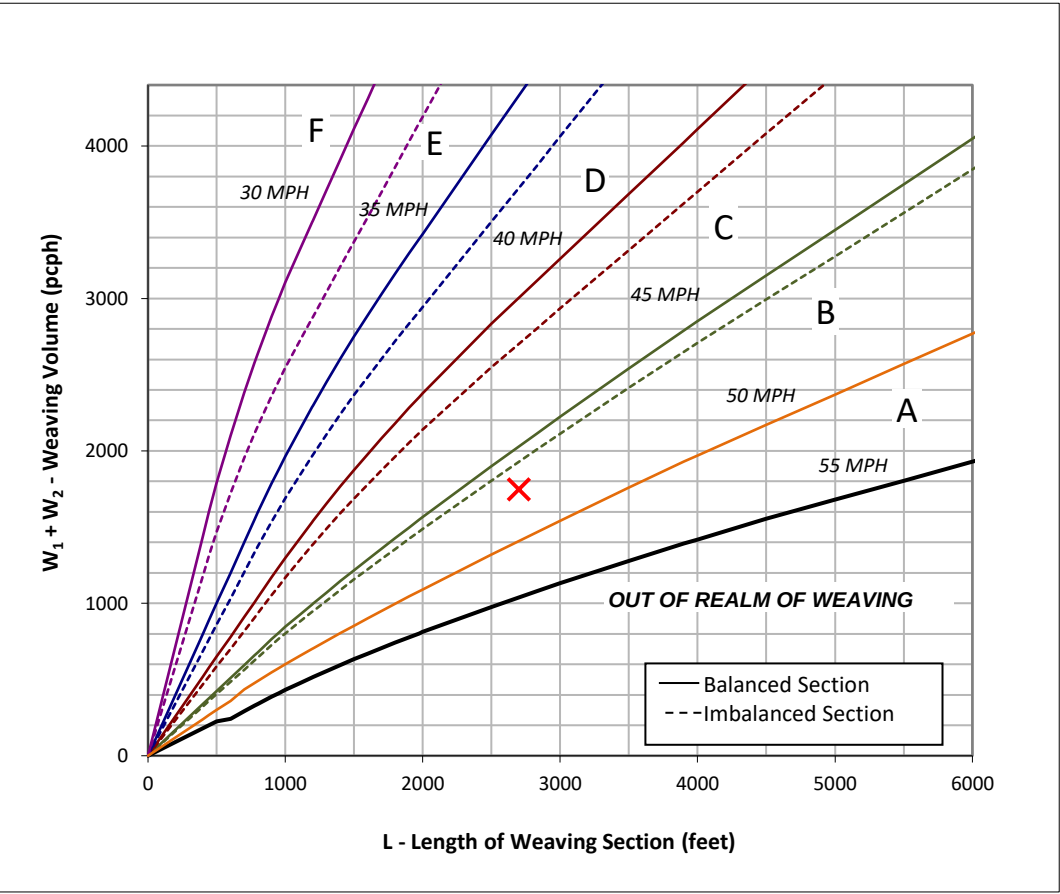
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	2,700

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative No Project - AM
Freeway	SR 99 SB
On-ramp	E 20th Street
Off-ramp	Skyway Road

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,320	Volume (vph)*	330	Volume (vph)*	1,390
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	4,463	Volume (pcph)	335	Volume (pcph)	1,411

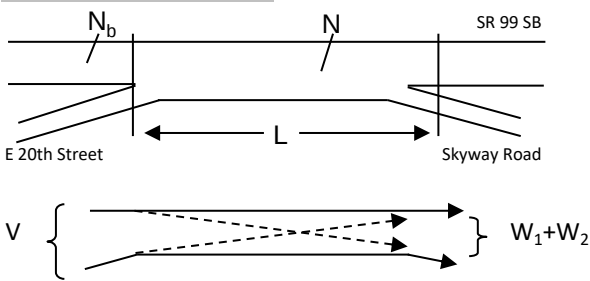


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections* , Jack E. Leisch & Associates, September 1983 and *Highway Design Manual* , California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	
	45 MPH and 50 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	46.8
4. Weaving Intensity Factor (k)	2.18
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,620
6. Level of Service (LOS)	E

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	South of Skyway Road
Alternative	Cumulative No Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,060	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	850	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,512	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,756	pcphpl
Average passenger-car speed, S	63.2	mph
Volume-to-capacity ratio, v/c	0.75	
Density, D	27.8	pcpmpl
Level of service, LOS	D	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Cumulative No Project
Time period	PM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	3,060	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	400	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	3,060	400		vph
Peak-hour factor, PHF	0.90	0.95		
Peak 15-min volume, v_{15}	850	105		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,512	427		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Cumulative No Project
Time period	PM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	3,512	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	3,512	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,085	pcph	4,700	pcph	No
Ramp volume, v_R	427	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	Actual		Maximum		Violation?
v_{12A}	3,512	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.80	
Density, D_R	33.6	pcpmpl
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.336	
Space mean speed in ramp influence area, S_R	57.3	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.3	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Between Skyway Road Ramps
Alternative	Cumulative No Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,660	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	739	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,053	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,527	pcphpl
Average passenger-car speed, S	64.8	mph
Volume-to-capacity ratio, v/c	0.65	
Density, D	23.6	pcpmpl
Level of service, LOS	C	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Cumulative No Project
Time period	PM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,660	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25	mph
Volume on ramp	630	vph
Length of acceleration lane(s)	250	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,660	630		vph
Peak-hour factor, PHF	0.90	0.95		
Peak 15-min volume, v_{15}	739	166		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,053	673		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Cumulative No Project
Time period	PM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	3,053	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	3,053	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,726	pcph	4,700	pcph	No
Ramp volume, v_R	673	pcph	1,900	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	3,726	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.81	
Density, D_R	32.7	pcpmpl
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.470	
Space mean speed in ramp influence area, S_R	54.2	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	54.2	mph

Leisch Method for Weaving Analysis

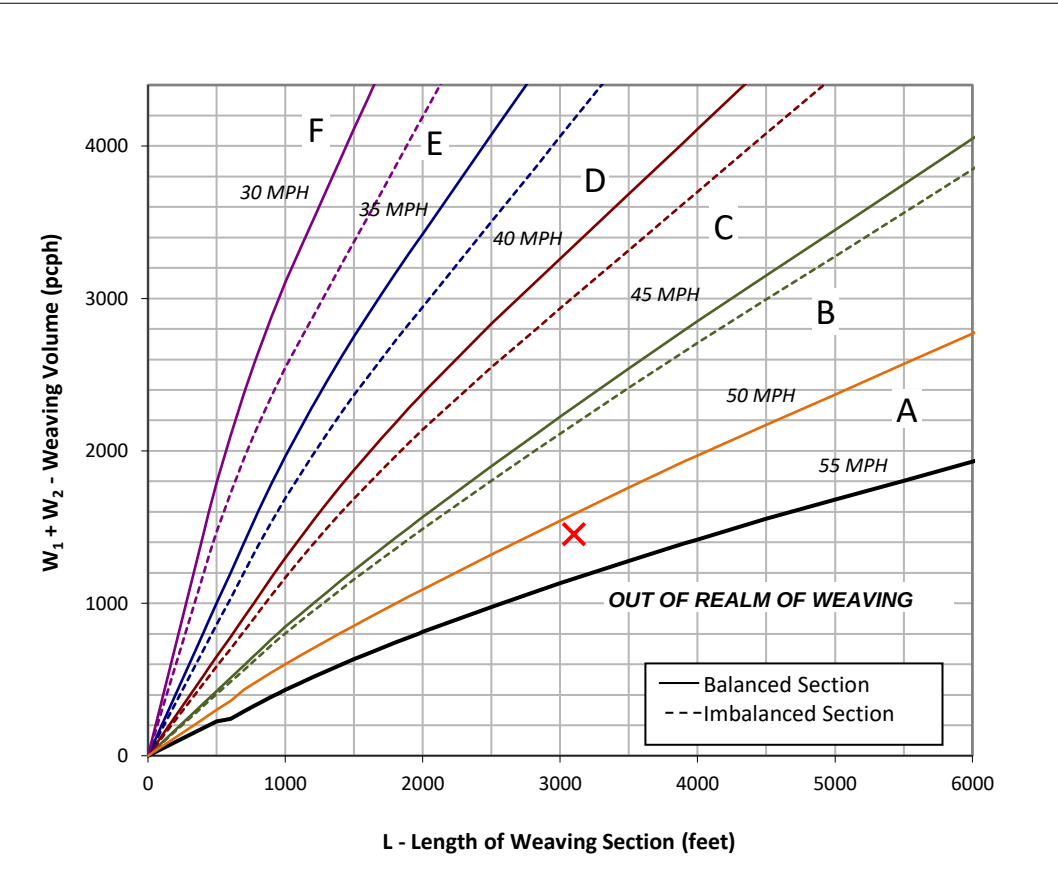
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,100

Project Information

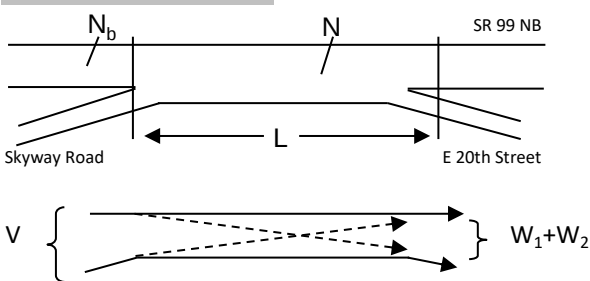
Project	Stonegate VTSM EIR
Scenario	Cumulative No Project - PM
Freeway	SR 99 NB
On-ramp	Skyway Road
Off-ramp	E 20th Street

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,390	Volume (vph)*	1,030	Volume (vph)*	400
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	4,535	Volume (pcph)	1,045	Volume (pcph)	406



The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.
* Note: **Do not adjust by a Peak Hour Factor (PHF)**. The methodology incorporates the PHF in the Service Volume tables.
Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983 and *Highway Design Manual*, California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	50 MPH and 55 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	51.6
4. Weaving Intensity Factor (k)	1.00
5. Service Volume (SV, pcph)	1,512
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
6. Level of Service (LOS)	D

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Between E 20th Street Ramps
Alternative	Cumulative No Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,920	vph
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v_{15}	1,021	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	4,218	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	2,109	pcphpl
Average passenger-car speed, S	57.9	mph
Volume-to-capacity ratio, v/c	0.90	
Density, D	36.4	pcpmpl
Level of service, LOS	E	

Leisch Method for Weaving Analysis

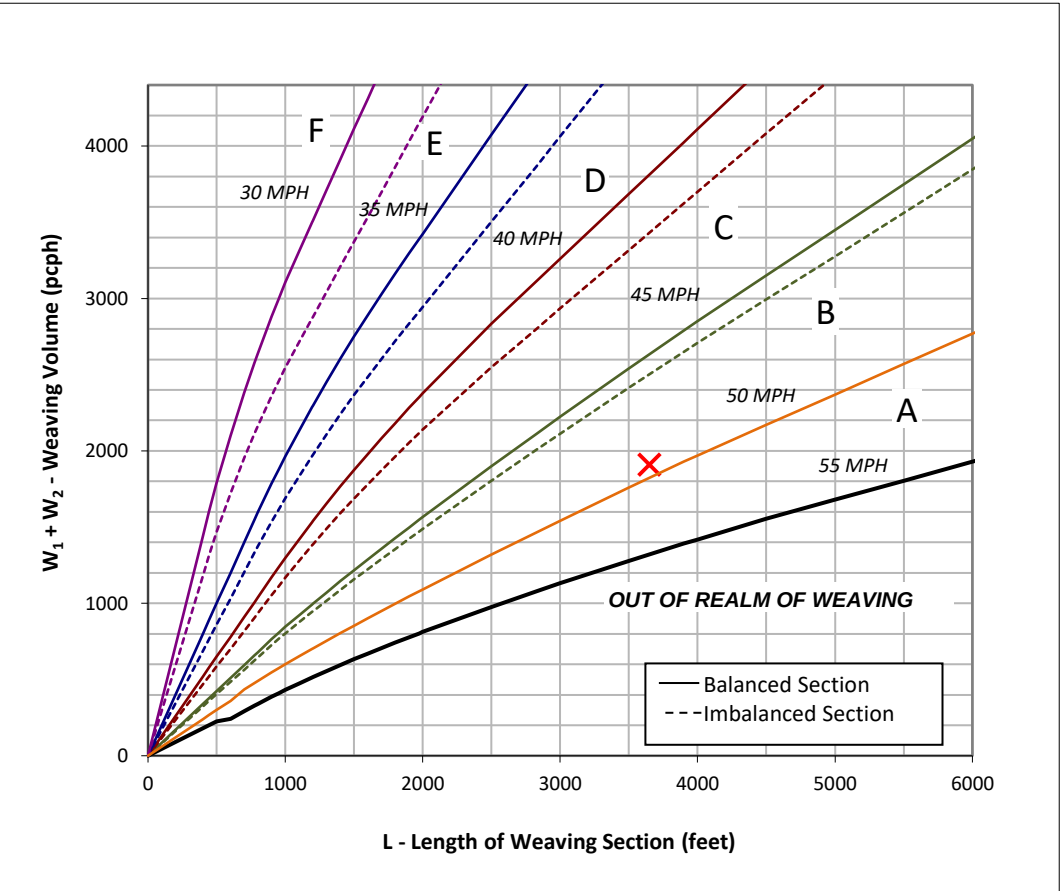
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,650

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative No Project - PM
Freeway	SR 99 NB
On-ramp	E 20th Street
Off-ramp	SR 32

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	5,250	Volume (vph)*	1,230	Volume (vph)*	650
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	5,423	Volume (pcph)	1,248	Volume (pcph)	660

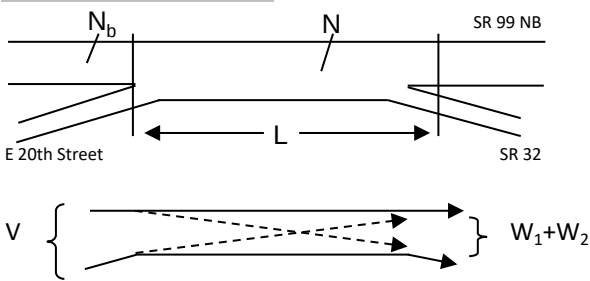


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983 and *Highway Design Manual*, California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	45 MPH and 50 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	49.4
4. Weaving Intensity Factor (k)	1.04
5. Service Volume (SV, pcph)	1,817
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
6. Level of Service (LOS)	E

Leisch Method for Weaving Analysis

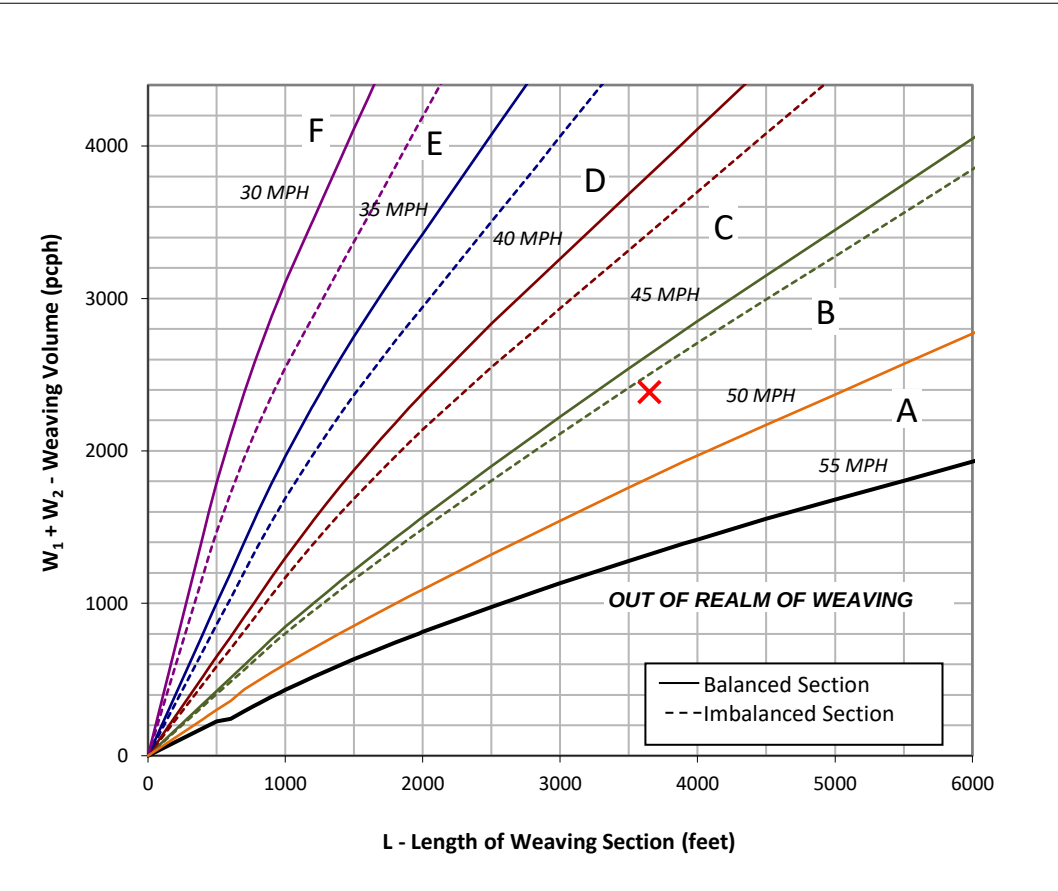
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,650

Project Information

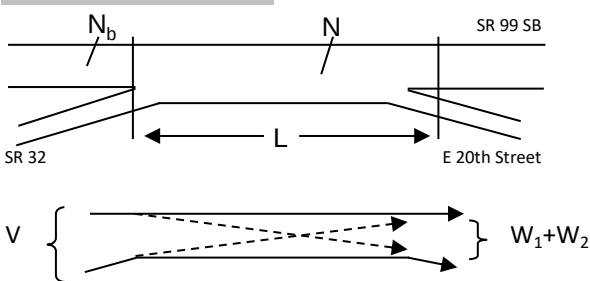
Project	Stonegate VTSM EIR
Scenario	Cumulative No Project - PM
Freeway	SR 99 SB
On-ramp	SR 32
Off-ramp	E 20th Street

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	5,050	Volume (vph)*	840	Volume (vph)*	1,510
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	5,217	Volume (pcph)	853	Volume (pcph)	1,533



The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.
* Note: **Do not adjust by a Peak Hour Factor (PHF)**. The methodology incorporates the PHF in the Service Volume tables.
Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections* , Jack E. Leisch & Associates, September 1983 and *Highway Design Manual* , California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
<i>If optional exit lane, then "Y". Otherwise "N".</i>	
2. In the chart to the left, which two speed curves is the red "x" between?	
	45 MPH and 50 MPH
<i>If left of the 30 MPH curve, LOS is F. Select "-".</i>	
<i>If below the 55 MPH curve, out of the realm of weaving.</i>	
3. Interpolated Weaving Speed (S_w , mph)	45.9
4. Weaving Intensity Factor (k)	1.63
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,918
6. Level of Service (LOS)	F

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Between E 20th Street Ramps
Alternative	Cumulative No Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,490	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	969	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	4,006	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	2,003	pcphpl
Average passenger-car speed, S	59.8	mph
Volume-to-capacity ratio, v/c	0.85	
Density, D	33.5	pcpmpl
Level of service, LOS	D	

Leisch Method for Weaving Analysis

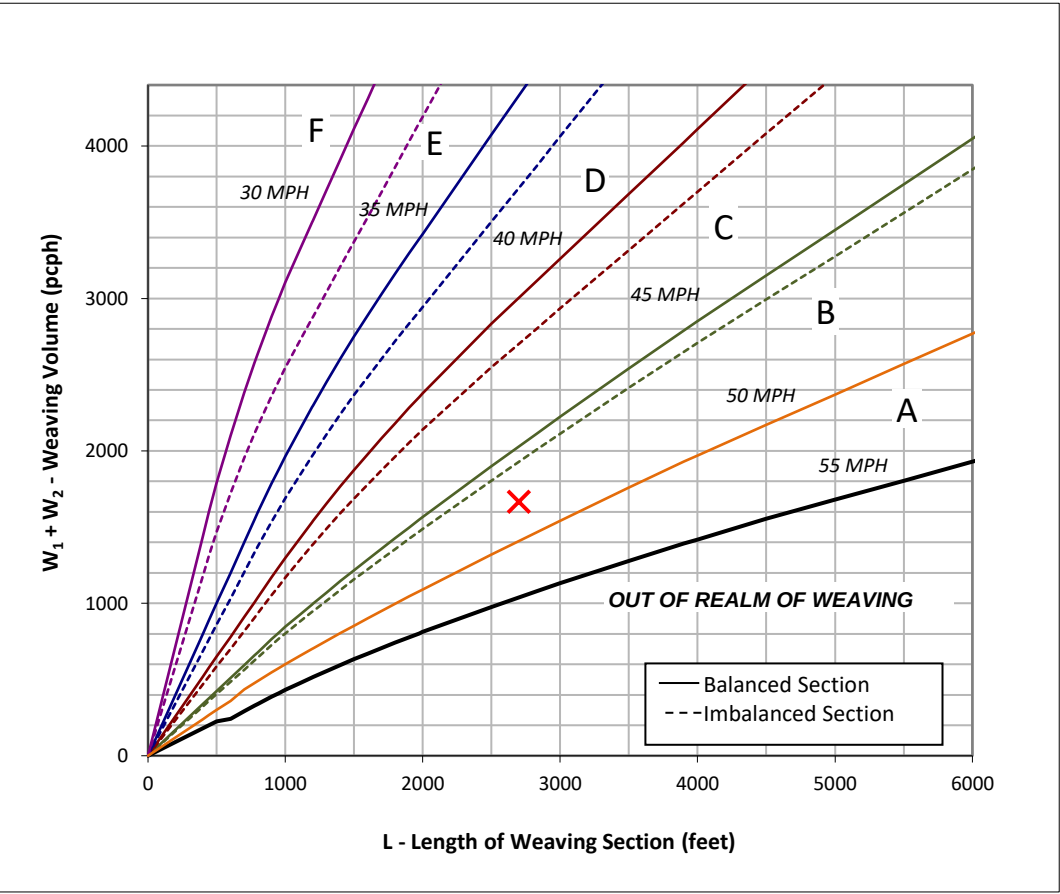
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	2,700

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative No Project - PM
Freeway	SR 99 SB
On-ramp	E 20th Street
Off-ramp	Skyway Road

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,020	Volume (vph)*	530	Volume (vph)*	1,110
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	4,153	Volume (pcph)	538	Volume (pcph)	1,127

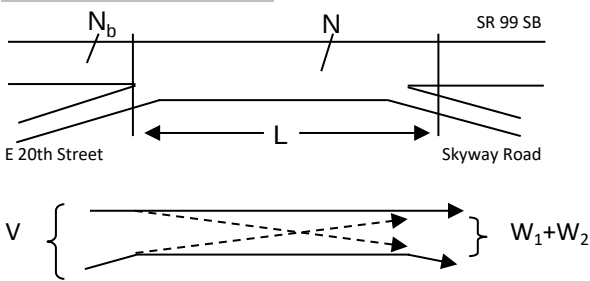


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983 and *Highway Design Manual*, California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	45 MPH and 50 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	47.5
4. Weaving Intensity Factor (k)	1.32
5. Service Volume (SV, pcph)	1,442
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
6. Level of Service (LOS)	D

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Between Skyway Road Ramps
Alternative	Cumulative No Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,910	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	808	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,340	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,670	pcphpl
Average passenger-car speed, S	64.0	mph
Volume-to-capacity ratio, v/c	0.71	
Density, D	26.1	pcpmpl
Level of service, LOS	D	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Cumulative No Project
Time period	PM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,910	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25	mph
Volume on ramp	200	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,910	200		vph
Peak-hour factor, PHF	0.90	0.95		
Peak 15-min volume, v_{15}	808	53		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,340	214		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Cumulative No Project
Time period	PM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	3,340	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	3,340	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,554	pcph	4,700	pcph	No
Ramp volume, v_R	214	pcph	1,900	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	3,554	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.77	pcpmpl
Density, D_R	30.6	
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.437	
Space mean speed in ramp influence area, S_R	54.9	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	54.9	mph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road On Ramp
Alternative	Cumulative No Project
Time period	PM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	3,110	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	300	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	3,110	300		vph
Peak-hour factor, PHF	0.90	0.95		
Peak 15-min volume, v_{15}	864	79		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,570	321		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road On Ramp
Alternative	Cumulative No Project
Time period	PM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	3,570	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	3,570	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,890	pcph	4,700	pcph	No
Ramp volume, v_R	321	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	3,890	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.85	pcpmpl
Density, D_R	33.2	
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.476	
Space mean speed in ramp influence area, S_R	54.1	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	54.1	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	South of Skyway Road
Alternative	Cumulative No Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,410	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	947	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,914	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,957	pcphpl
Average passenger-car speed, S	60.6	mph
Volume-to-capacity ratio, v/c	0.83	
Density, D	32.3	pcpmpl
Level of service, LOS	D	

Leisch Method for Weaving Analysis

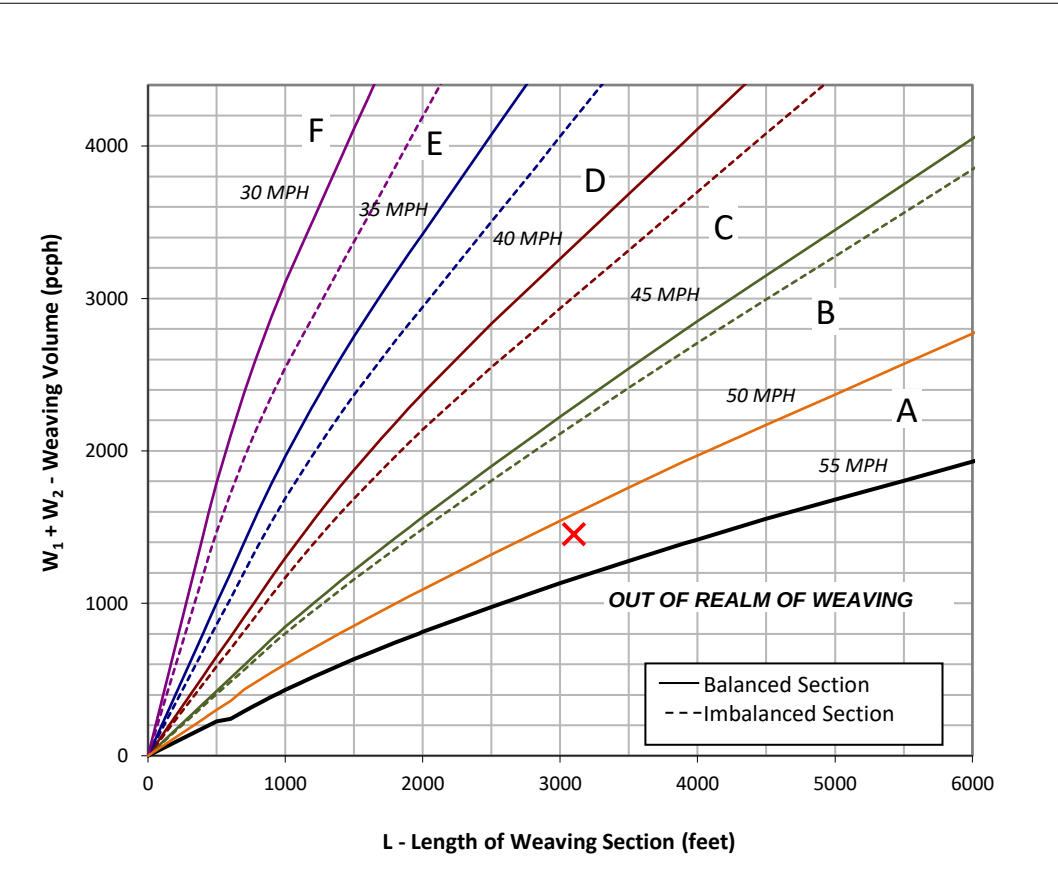
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,100

Project Information

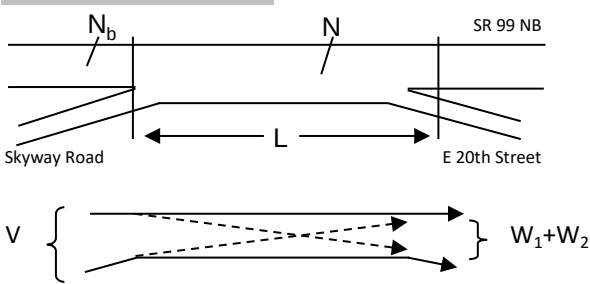
Project	Stonegate VTSM EIR
Scenario	Cumulative No Project - PM
Freeway	SR 99 NB
On-ramp	Skyway Road
Off-ramp	E 20th Street

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,390	Volume (vph)*	1,030	Volume (vph)*	400
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	4,535	Volume (pcph)	1,045	Volume (pcph)	406



The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.
* Note: **Do not adjust by a Peak Hour Factor (PHF)**. The methodology incorporates the PHF in the Service Volume tables.
Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983 and *Highway Design Manual*, California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
<i>If optional exit lane, then "Y". Otherwise "N".</i>	
2. In the chart to the left, which two speed curves is the red "x" between?	50 MPH and 55 MPH
<i>If left of the 30 MPH curve, LOS is F. Select "-".</i>	
<i>If below the 55 MPH curve, out of the realm of weaving.</i>	
3. Interpolated Weaving Speed (S_w , mph)	51.6
4. Weaving Intensity Factor (k)	1.00
5. Service Volume (SV, pcph) $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	1,512
6. Level of Service (LOS)	D

Leisch Method for Weaving Analysis

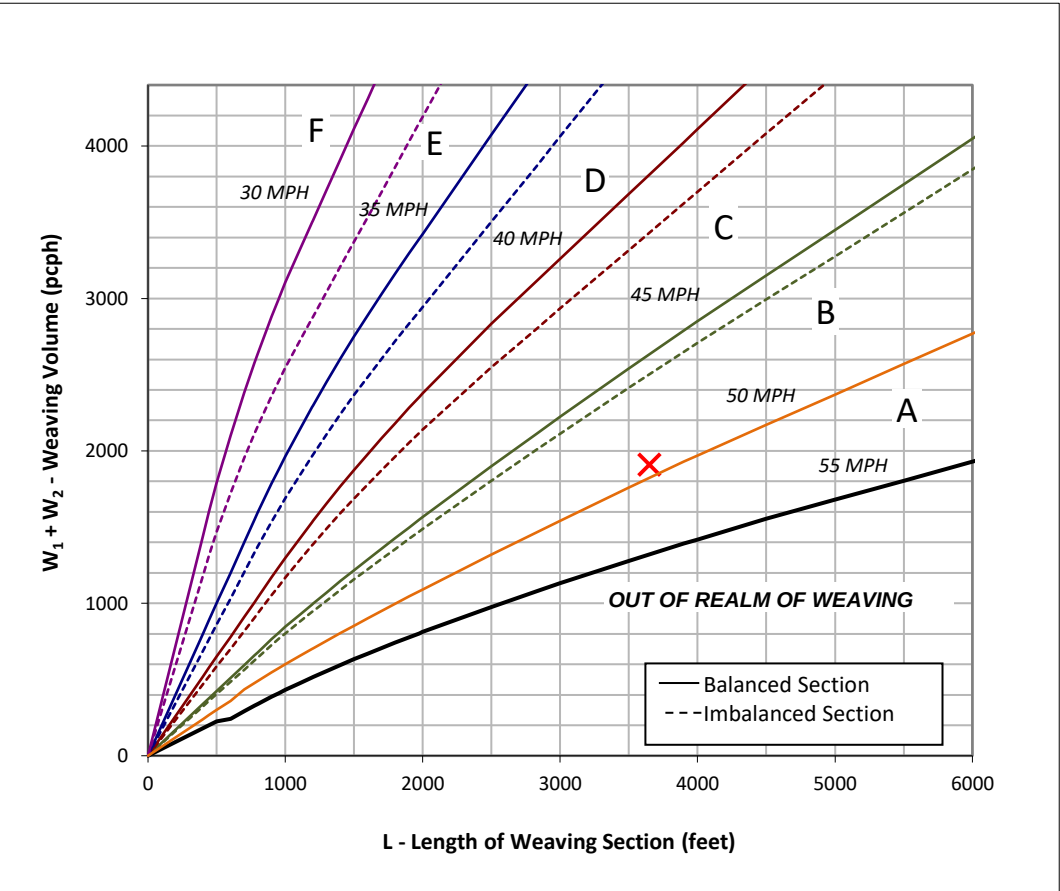
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,650

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative No Project - PM
Freeway	SR 99 NB
On-ramp	E 20th Street
Off-ramp	SR 32

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	5,250	Volume (vph)*	1,230	Volume (vph)*	650
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	5,423	Volume (pcph)	1,248	Volume (pcph)	660

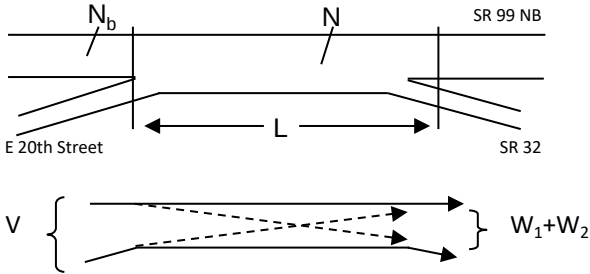


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983 and *Highway Design Manual*, California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	
	45 MPH and 50 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	49.4
4. Weaving Intensity Factor (k)	1.04
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,817
6. Level of Service (LOS)	E

Leisch Method for Weaving Analysis

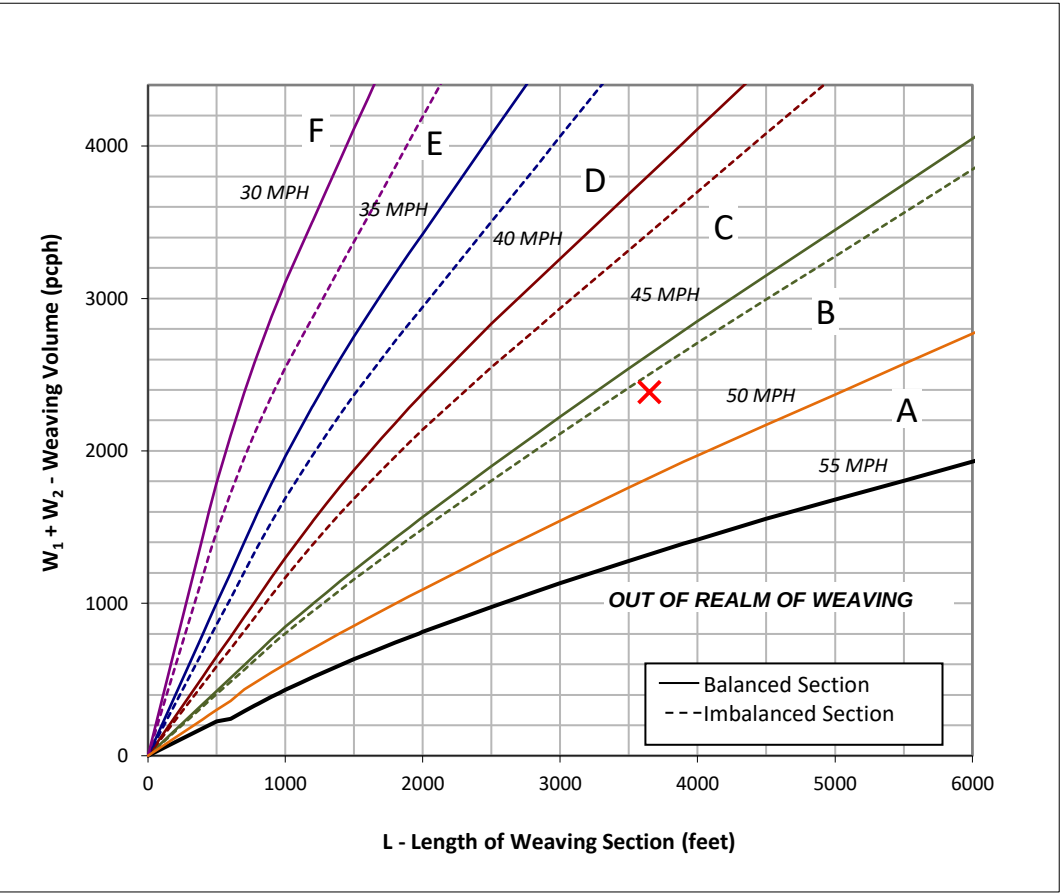
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,650

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative No Project - PM
Freeway	SR 99 SB
On-ramp	SR 32
Off-ramp	E 20th Street

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	5,050	Volume (vph)*	840	Volume (vph)*	1,510
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	5,217	Volume (pcph)	853	Volume (pcph)	1,533

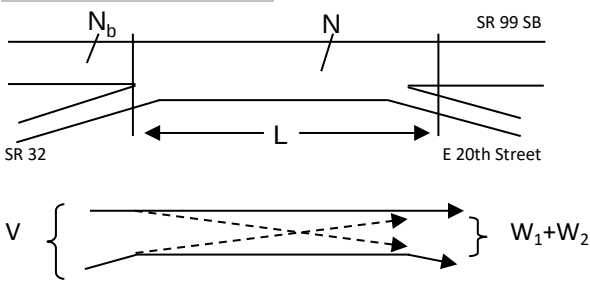


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections* , Jack E. Leisch & Associates, September 1983 and *Highway Design Manual* , California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	
	45 MPH and 50 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	45.9
4. Weaving Intensity Factor (k)	1.63
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,918
6. Level of Service (LOS)	F

Leisch Method for Weaving Analysis

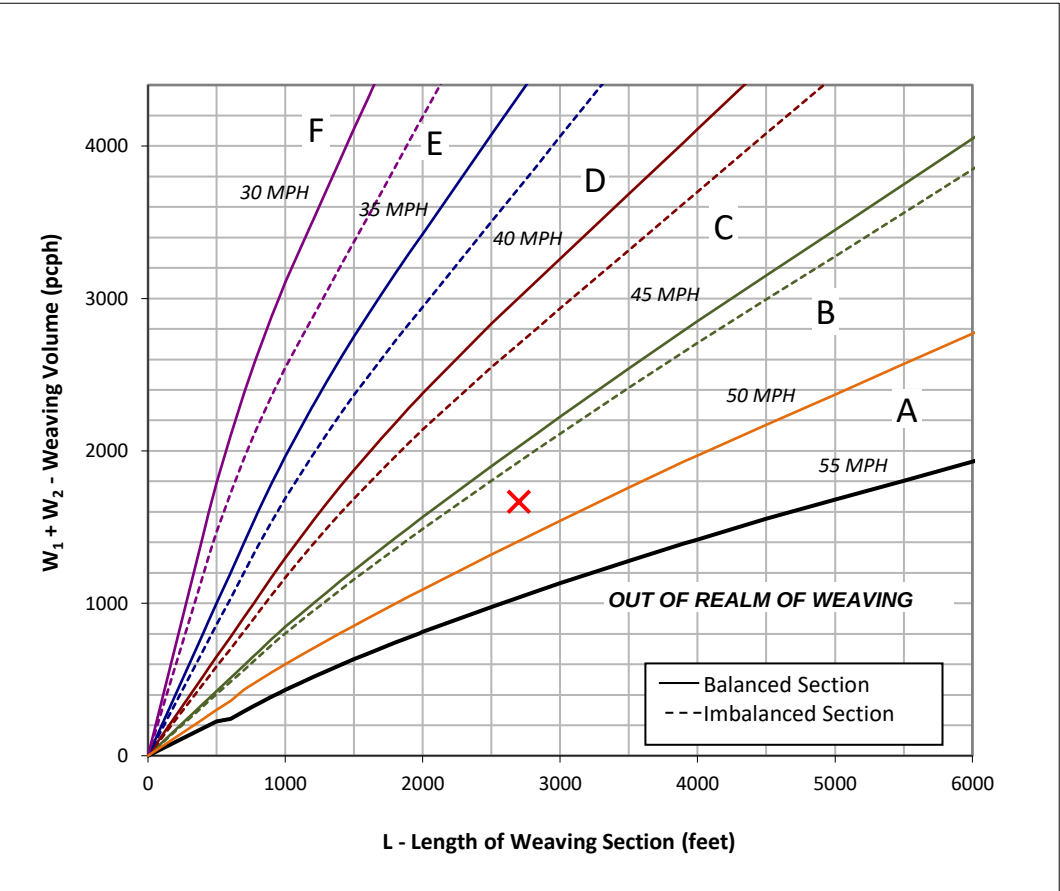
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	2,700

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative No Project - PM
Freeway	SR 99 SB
On-ramp	E 20th Street
Off-ramp	Skyway Road

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,020	Volume (vph)*	530	Volume (vph)*	1,110
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	4,153	Volume (pcph)	538	Volume (pcph)	1,127

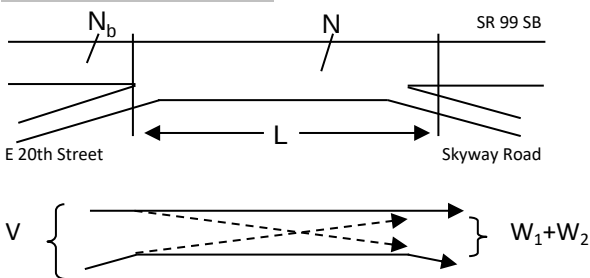


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983 and *Highway Design Manual*, California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	
	45 MPH and 50 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	47.5
4. Weaving Intensity Factor (k)	1.32
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,442
6. Level of Service (LOS)	D

HCM 2010 Signalized Intersection Summary

1: Bruce Rd & SR 32

Cumulative Plus Project
AM Peak Hour

																
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Volume (veh/h)	270	230	230	180	580	120	280	530	130	70	660	470				
Future Volume (veh/h)	270	230	230	180	580	120	280	530	130	70	660	470				
Number	5	2	12	1	6	16	3	8	18	7	4	14				
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0				
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.99	1.00		0.98				
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1900	1845	1845	1845				
Adj Flow Rate, veh/h	321	274	84	214	690	125	333	631	134	83	786	480				
Adj No. of Lanes	1	2	0	1	2	0	1	2	0	1	2	1				
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84				
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3				
Cap, veh/h	306	851	256	214	793	144	306	1029	218	105	855	636				
Arrive On Green	0.17	0.32	0.32	0.12	0.27	0.24	0.17	0.36	0.36	0.06	0.24	0.24				
Sat Flow, veh/h	1757	2658	798	1757	2959	536	1757	2872	609	1757	3505	1542				
Grp Volume(v), veh/h	321	179	179	214	408	407	333	385	380	83	786	480				
Grp Sat Flow(s),veh/h/ln	1757	1752	1704	1757	1752	1742	1757	1752	1728	1757	1752	1542				
Q Serve(g_s), s	20.0	8.9	9.2	14.0	25.5	25.6	20.0	20.7	20.8	5.4	25.1	27.0				
Cycle Q Clear(g_c), s	20.0	8.9	9.2	14.0	25.5	25.6	20.0	20.7	20.8	5.4	25.1	27.0				
Prop In Lane	1.00		0.47	1.00		0.31	1.00		0.35	1.00		1.00				
Lane Grp Cap(c), veh/h	306	561	546	214	470	467	306	628	619	105	855	636				
V/C Ratio(X)	1.05	0.32	0.33	1.00	0.87	0.87	1.09	0.61	0.61	0.79	0.92	0.75				
Avail Cap(c_a), veh/h	306	565	549	214	473	471	306	628	619	184	855	636				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Uniform Delay (d), s/veh	47.4	29.5	29.6	50.4	40.1	40.6	47.4	30.3	30.3	53.2	42.3	29.1				
Incr Delay (d2), s/veh	64.7	0.1	0.1	61.0	15.2	15.4	76.9	1.3	1.3	4.9	14.6	4.6				
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
%ile BackOfQ(50%),veh/ln	15.1	4.3	4.4	10.4	14.3	14.3	16.1	10.3	10.2	2.7	13.8	13.8				
LnGrp Delay(d),s/veh	112.1	29.6	29.8	111.4	55.2	55.9	124.3	31.5	31.6	58.2	56.8	33.6				
LnGrp LOS	F	C	C	F	E	E	F	C	C	E	E	C				
Approach Vol, veh/h	679				1029				1098							
Approach Delay, s/veh	68.6				67.2				59.7							
Approach LOS	E				E				E							
Timer	1	2	3	4	5	6	7	8								
Assigned Phs	1	2	3	4	5	6	7	8								
Phs Duration (G+Y+Rc), s	18.0	40.8	24.0	32.0	24.0	34.8	10.9	45.1								
Change Period (Y+Rc), s	* 5	7.0	* 4	* 6	* 5	7.0	* 4	* 6								
Max Green Setting (Gmax), s	* 13	34.0	* 20	* 26	* 19	28.0	* 12	* 34								
Max Q Clear Time (g_c+I1), s	16.0	11.2	22.0	29.0	22.0	27.6	7.4	22.8								
Green Ext Time (p_c), s	0.0	2.0	0.0	0.0	0.0	0.1	0.0	3.1								
Intersection Summary																
HCM 2010 Ctrl Delay	59.4															
HCM 2010 LOS	E															
Notes																
User approved ignoring U-Turning movement.																

HCM 2010 Signalized Intersection Summary

2: SR 99 SB Ramps & E 20th St

Cumulative Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑	↑↑	↑↑					↑	↑	↑↑
Traffic Volume (veh/h)	0	540	100	200	710	0	0	0	0	700	10	360
Future Volume (veh/h)	0	540	100	200	710	0	0	0	0	700	10	360
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	1845	1845	0				1845	1845	1845
Adj Flow Rate, veh/h	0	643	31	238	845	0				842	0	187
Adj No. of Lanes	0	2	1	2	2	0				2	0	2
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84				0.84	0.84	0.84
Percent Heavy Veh, %	0	3	3	3	3	0				3	3	3
Cap, veh/h	0	1118	491	340	1805	0				1027	0	917
Arrive On Green	0.00	0.32	0.32	0.10	0.52	0.00				0.29	0.00	0.29
Sat Flow, veh/h	0	3597	1539	3408	3597	0				3514	0	3136
Grp Volume(v), veh/h	0	643	31	238	845	0				842	0	187
Grp Sat Flow(s),veh/h/ln	0	1752	1539	1704	1752	0				1757	0	1568
Q Serve(g_s), s	0.0	6.4	0.6	2.8	6.4	0.0				9.3	0.0	1.9
Cycle Q Clear(g_c), s	0.0	6.4	0.6	2.8	6.4	0.0				9.3	0.0	1.9
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1118	491	340	1805	0				1027	0	917
V/C Ratio(X)	0.00	0.57	0.06	0.70	0.47	0.00				0.82	0.00	0.20
Avail Cap(c_a), veh/h	0	2962	1300	2010	2962	0				2546	0	2272
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	11.8	9.8	18.1	6.4	0.0				13.7	0.0	11.1
Incr Delay (d2), s/veh	0.0	0.2	0.0	1.0	0.1	0.0				0.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	3.1	0.2	1.4	3.1	0.0				4.5	0.0	0.8
LnGrp Delay(d),s/veh	0.0	12.0	9.8	19.1	6.5	0.0				14.3	0.0	11.1
LnGrp LOS		B	A	B	A					B		B
Approach Vol, veh/h		674			1083						1029	
Approach Delay, s/veh		11.9			9.3						13.7	
Approach LOS		B			A						B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	8.1	17.3		16.1		25.4						
Change Period (Y+Rc), s	3.5	4.6		4.1		4.6						
Max Green Setting (Gmax), s	25.0	34.5		30.0		34.5						
Max Q Clear Time (g_c+I1), s	4.8	8.4		11.3		8.4						
Green Ext Time (p_c), s	0.2	4.2		0.8		4.2						
Intersection Summary												
HCM 2010 Ctrl Delay			11.5									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

3: SR 99 NB Ramps & E 20th St

Cumulative Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 			 			 				
Traffic Volume (veh/h)	200	1040	0	0	800	680	110	10	310	0	0	0
Future Volume (veh/h)	200	1040	0	0	800	680	110	10	310	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1845	1845	0	0	1845	1845	1845	1845	1845			
Adj Flow Rate, veh/h	238	1238	0	0	952	258	140	0	298			
Adj No. of Lanes	2	2	0	0	2	1	2	0	1			
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84			
Percent Heavy Veh, %	3	3	0	0	3	3	3	3	3			
Cap, veh/h	1045	2389	0	0	1139	503	767	0	342			
Arrive On Green	0.31	0.68	0.00	0.00	0.32	0.32	0.22	0.00	0.22			
Sat Flow, veh/h	3408	3597	0	0	3597	1547	3514	0	1568			
Grp Volume(v), veh/h	238	1238	0	0	952	258	140	0	298			
Grp Sat Flow(s),veh/h/ln	1704	1752	0	0	1752	1547	1757	0	1568			
Q Serve(g_s), s	4.2	13.9	0.0	0.0	20.1	10.8	2.6	0.0	14.7			
Cycle Q Clear(g_c), s	4.2	13.9	0.0	0.0	20.1	10.8	2.6	0.0	14.7			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	1045	2389	0	0	1139	503	767	0	342			
V/C Ratio(X)	0.23	0.52	0.00	0.00	0.84	0.51	0.18	0.00	0.87			
Avail Cap(c_a), veh/h	1045	2389	0	0	1579	697	1323	0	591			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	20.7	6.3	0.0	0.0	25.0	21.9	25.4	0.0	30.1			
Incr Delay (d2), s/veh	0.5	0.1	0.0	0.0	2.1	0.3	0.0	0.0	3.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.0	6.6	0.0	0.0	10.0	4.6	1.3	0.0	6.6			
LnGrp Delay(d),s/veh	21.2	6.4	0.0	0.0	27.1	22.2	25.5	0.0	33.1			
LnGrp LOS	C	A			C	C	C		C			
Approach Vol, veh/h	1476				1210				438			
Approach Delay, s/veh	8.7				26.1				30.7			
Approach LOS	A				C				C			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2				5				8			
Phs Duration (G+Y+Rc), s	58.5				28.5				21.4			
Change Period (Y+Rc), s	* 5				3.5				4.1			
Max Green Setting (Gmax), s	* 35				25.0				30.0			
Max Q Clear Time (g_c+l1), s	15.9				6.2				16.7			
Green Ext Time (p_c), s	6.9				0.4				0.7			
Intersection Summary												
HCM 2010 Ctrl Delay	18.5											
HCM 2010 LOS	B											
Notes												

HCM 2010 Signalized Intersection Summary

4: E 20th St & Chico Mall

Cumulative Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	1020	40	30	1360	80	100	10	10	30	10	20
Future Volume (veh/h)	20	1020	40	30	1360	80	100	10	10	30	10	20
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1900	1900	1845	1845
Adj Flow Rate, veh/h	24	1214	47	36	1619	93	132	0	0	36	12	0
Adj No. of Lanes	2	2	0	1	2	0	2	1	0	0	1	2
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	65	1986	77	37	1952	111	290	152	0	62	21	128
Arrive On Green	0.02	0.58	0.58	0.02	0.58	0.58	0.08	0.00	0.00	0.05	0.05	0.00
Sat Flow, veh/h	3408	3437	133	1757	3368	192	3514	1845	0	1333	444	2760
Grp Volume(v), veh/h	24	619	642	36	838	874	132	0	0	48	0	0
Grp Sat Flow(s),veh/h/ln	1704	1752	1818	1757	1752	1808	1757	1845	0	1778	0	1380
Q Serve(g_s), s	0.4	13.5	13.6	1.2	22.6	23.1	2.1	0.0	0.0	1.6	0.0	0.0
Cycle Q Clear(g_c), s	0.4	13.5	13.6	1.2	22.6	23.1	2.1	0.0	0.0	1.6	0.0	0.0
Prop In Lane	1.00		0.07	1.00		0.11	1.00		0.00	0.75		1.00
Lane Grp Cap(c), veh/h	65	1013	1050	37	1016	1048	290	152	0	82	0	128
V/C Ratio(X)	0.37	0.61	0.61	0.99	0.82	0.83	0.45	0.00	0.00	0.58	0.00	0.00
Avail Cap(c_a), veh/h	1132	1048	1086	568	1048	1081	1496	785	0	757	0	1175
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	28.5	8.1	8.1	28.7	9.9	10.1	25.7	0.0	0.0	27.4	0.0	0.0
Incr Delay (d2), s/veh	1.3	0.9	0.8	38.8	5.2	5.5	0.4	0.0	0.0	2.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	6.6	6.8	1.0	12.2	12.8	1.0	0.0	0.0	0.8	0.0	0.0
LnGrp Delay(d),s/veh	29.7	9.0	8.9	67.6	15.1	15.5	26.1	0.0	0.0	29.9	0.0	0.0
LnGrp LOS	C	A	A	E	B	B	C			C		
Approach Vol, veh/h	1285			1748			132			48		
Approach Delay, s/veh	9.3			16.4			26.1			29.9		
Approach LOS	A			B			C			C		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	4		5	6	8					
Phs Duration (G+Y+Rc), s	5.2	37.9	6.7		5.1	38.0	8.9					
Change Period (Y+Rc), s	3.0	4.1	4.0		3.5	4.1	4.0					
Max Green Setting (Gmax), s	20.0	35.0	25.0		20.0	35.0	25.0					
Max Q Clear Time (g_c+l1), s	3.2	15.6	3.6		2.4	25.1	4.1					
Green Ext Time (p_c), s	0.0	16.0	0.1		0.0	8.8	0.2					
Intersection Summary												
HCM 2010 Ctrl Delay			14.2									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

5: Forest Ave & E 20th St

Cumulative Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	250	640	140	100	910	110	140	110	40	90	300	400
Future Volume (veh/h)	250	640	140	100	910	110	140	110	40	90	300	400
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1845	1845	1845	1845	1845	1845	1900
Adj Flow Rate, veh/h	298	762	142	119	1083	7	167	131	6	107	357	122
Adj No. of Lanes	1	2	0	1	2	1	1	2	1	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	305	904	168	311	1153	508	174	817	359	115	511	172
Arrive On Green	0.17	0.31	0.30	0.18	0.33	0.33	0.10	0.23	0.23	0.07	0.20	0.19
Sat Flow, veh/h	1757	2943	548	1757	3505	1543	1757	3505	1538	1757	2561	861
Grp Volume(v), veh/h	298	454	450	119	1083	7	167	131	6	107	242	237
Grp Sat Flow(s),veh/h/ln	1757	1752	1739	1757	1752	1543	1757	1752	1538	1757	1752	1669
Q Serve(g_s), s	13.6	19.5	19.5	4.8	24.2	0.2	7.6	2.4	0.1	4.9	10.4	10.7
Cycle Q Clear(g_c), s	13.6	19.5	19.5	4.8	24.2	0.2	7.6	2.4	0.1	4.9	10.4	10.7
Prop In Lane	1.00		0.32	1.00		1.00	1.00		1.00	1.00		0.52
Lane Grp Cap(c), veh/h	305	538	534	311	1153	508	174	817	359	115	349	333
V/C Ratio(X)	0.98	0.84	0.84	0.38	0.94	0.01	0.96	0.16	0.02	0.93	0.69	0.71
Avail Cap(c_a), veh/h	305	679	673	311	1153	508	174	1109	487	174	555	528
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	33.1	26.1	26.2	29.3	26.2	18.2	36.1	24.6	8.5	37.5	30.0	30.2
Incr Delay (d2), s/veh	44.7	6.4	6.5	0.3	15.4	0.0	55.1	0.0	0.0	30.5	0.9	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.3	10.4	10.3	2.4	14.1	0.1	6.3	1.2	0.1	3.3	5.1	5.0
LnGrp Delay(d),s/veh	77.8	32.5	32.7	29.5	41.7	18.3	91.2	24.6	8.5	68.0	30.9	31.3
LnGrp LOS	E	C	C	C	D	B	F	C	A	E	C	C
Approach Vol, veh/h	1202					1209		304		586		
Approach Delay, s/veh	43.8					40.4		60.9		37.8		
Approach LOS	D					D		E		D		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	18.0	30.5	9.3	22.8	19.8	28.7	12.0	20.1				
Change Period (Y+Rc), s	3.0	4.5	3.0	4.5	4.5	* 4.5	3.0	4.5				
Max Green Setting (Gmax), s	15.0	26.0	9.0	25.0	10.3	* 31	9.0	25.0				
Max Q Clear Time (g_c+l1), s	15.6	26.2	6.9	4.4	6.8	21.5	9.6	12.7				
Green Ext Time (p_c), s	0.0	0.0	0.0	2.3	1.9	2.7	0.0	2.0				
Intersection Summary												
HCM 2010 Ctrl Delay			43.0									
HCM 2010 LOS			D									
Notes												

HCM 2010 Signalized Intersection Summary

6: Huntington Dr & E 20th St

Cumulative Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	80	700	10	90	1060	50	20	10	80	20	10	10
Future Volume (veh/h)	80	700	10	90	1060	50	20	10	80	20	10	10
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		1.00	0.98		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1900	1845	1900	1900	1845	1845
Adj Flow Rate, veh/h	95	833	11	107	1262	55	24	12	0	24	12	0
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	0	1	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	98	1923	25	165	1988	87	204	69	0	203	69	132
Arrive On Green	0.06	0.54	0.52	0.09	0.58	0.56	0.08	0.08	0.00	0.08	0.08	0.00
Sat Flow, veh/h	1757	3541	47	1757	3417	149	764	822	0	757	819	1568
Grp Volume(v), veh/h	95	412	432	107	646	671	36	0	0	36	0	0
Grp Sat Flow(s),veh/h/ln	1757	1752	1835	1757	1752	1814	1586	0	0	1576	0	1568
Q Serve(g_s), s	2.3	6.0	6.1	2.5	10.5	10.6	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	2.3	6.0	6.1	2.5	10.5	10.6	0.8	0.0	0.0	0.8	0.0	0.0
Prop In Lane	1.00		0.03	1.00		0.08	0.67		0.00	0.67		1.00
Lane Grp Cap(c), veh/h	98	952	997	165	1019	1055	273	0	0	272	0	132
V/C Ratio(X)	0.97	0.43	0.43	0.65	0.63	0.64	0.13	0.00	0.00	0.13	0.00	0.00
Avail Cap(c_a), veh/h	571	1669	1748	775	1669	1728	811	0	0	805	0	692
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	20.3	5.9	5.9	18.8	6.0	6.0	18.4	0.0	0.0	18.4	0.0	0.0
Incr Delay (d2), s/veh	19.9	0.1	0.1	1.6	0.2	0.2	0.1	0.0	0.0	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.6	2.9	3.0	1.3	5.1	5.3	0.4	0.0	0.0	0.4	0.0	0.0
LnGrp Delay(d),s/veh	40.2	6.0	6.0	20.4	6.2	6.2	18.5	0.0	0.0	18.5	0.0	0.0
LnGrp LOS	D	A	A	C	A	A	B			B		
Approach Vol, veh/h	939			1424			36			36		
Approach Delay, s/veh	9.5			7.3			18.5			18.5		
Approach LOS	A			A			B			B		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	4		5	6	8					
Phs Duration (G+Y+Rc), s	8.1	27.4	7.6		6.4	29.0	7.6					
Change Period (Y+Rc), s	3.0	5.0	3.0		3.0	5.0	3.0					
Max Green Setting (Gmax), s	20.0	40.0	20.0		15.0	40.0	20.0					
Max Q Clear Time (g_c+l1), s	4.5	8.1	2.8		4.3	12.6	2.8					
Green Ext Time (p_c), s	0.0	12.1	0.2		0.0	11.4	0.2					
Intersection Summary												
HCM 2010 Ctrl Delay	8.5											
HCM 2010 LOS	A											
Notes												

HCM 2010 Signalized Intersection Summary

7: Notre Dame Blvd & E 20th St

Cumulative Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	710	60	110	1040	170	130	20	130	120	40	30
Future Volume (veh/h)	30	710	60	110	1040	170	130	20	130	120	40	30
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.97	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	36	845	65	131	1238	191	155	24	0	143	48	0
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	1	1	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	90	1538	118	168	1554	238	196	145	123	181	129	110
Arrive On Green	0.05	0.47	0.47	0.10	0.51	0.51	0.11	0.08	0.00	0.10	0.07	0.00
Sat Flow, veh/h	1757	3292	253	1757	3035	465	1757	1845	1568	1757	1845	1568
Grp Volume(v), veh/h	36	450	460	131	711	718	155	24	0	143	48	0
Grp Sat Flow(s),veh/h/ln	1757	1752	1793	1757	1752	1748	1757	1845	1568	1757	1845	1568
Q Serve(g_s), s	1.3	12.3	12.3	4.9	22.2	22.7	5.7	0.8	0.0	5.3	1.7	0.0
Cycle Q Clear(g_c), s	1.3	12.3	12.3	4.9	22.2	22.7	5.7	0.8	0.0	5.3	1.7	0.0
Prop In Lane	1.00		0.14	1.00		0.27	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	90	819	838	168	897	895	196	145	123	181	129	110
V/C Ratio(X)	0.40	0.55	0.55	0.78	0.79	0.80	0.79	0.17	0.00	0.79	0.37	0.00
Avail Cap(c_a), veh/h	395	1052	1076	395	1052	1049	527	664	565	395	664	565
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	30.6	12.7	12.7	29.4	13.4	13.5	28.8	28.7	0.0	29.2	29.6	0.0
Incr Delay (d2), s/veh	1.1	0.2	0.2	2.9	3.0	3.3	2.7	0.2	0.0	2.9	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	5.9	6.1	2.5	11.4	11.6	2.9	0.4	0.0	2.7	0.9	0.0
LnGrp Delay(d),s/veh	31.7	12.9	12.9	32.4	16.4	16.8	31.5	28.9	0.0	32.1	30.2	0.0
LnGrp LOS	C	B	B	C	B	B	C	C		C	C	
Approach Vol, veh/h	946				1560				179			
Approach Delay, s/veh	13.6				17.9				31.2			
Approach LOS	B				B				C			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	10.4	36.1	11.4	8.7	7.4	39.1	10.9	9.2				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	15.0	40.0	20.0	24.0	15.0	40.0	15.0	24.0				
Max Q Clear Time (g_c+I1), s	6.9	14.3	7.7	3.7	3.3	24.7	7.3	2.8				
Green Ext Time (p_c), s	0.1	12.7	0.2	0.2	0.0	9.5	0.1	0.2				
Intersection Summary												
HCM 2010 Ctrl Delay			18.2									
HCM 2010 LOS			B									

HCM 2010 Signalized Intersection Summary

8: Bruce Rd & E 20th St

Cumulative Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	180	220	280	170	620	110	410	480	50	70	870	260
Future Volume (veh/h)	180	220	280	170	620	110	410	480	50	70	870	260
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1900	1845	1845	1900
Adj Flow Rate, veh/h	214	262	45	202	738	126	488	571	54	83	1036	287
Adj No. of Lanes	1	1	1	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	152	516	438	223	490	84	316	1387	131	102	833	229
Arrive On Green	0.09	0.28	0.28	0.13	0.32	0.32	0.18	0.43	0.42	0.06	0.31	0.31
Sat Flow, veh/h	1757	1845	1568	1757	1532	262	1757	3238	306	1757	2716	748
Grp Volume(v), veh/h	214	262	45	202	0	864	488	309	316	83	666	657
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	0	1794	1757	1752	1791	1757	1752	1712
Q Serve(g_s), s	13.0	17.9	3.2	17.0	0.0	48.0	27.0	18.3	18.4	7.0	46.0	46.0
Cycle Q Clear(g_c), s	13.0	17.9	3.2	17.0	0.0	48.0	27.0	18.3	18.4	7.0	46.0	46.0
Prop In Lane	1.00		1.00	1.00		0.15	1.00		0.17	1.00		0.44
Lane Grp Cap(c), veh/h	152	516	438	223	0	574	316	751	767	102	537	525
V/C Ratio(X)	1.41	0.51	0.10	0.90	0.00	1.50	1.54	0.41	0.41	0.81	1.24	1.25
Avail Cap(c_a), veh/h	152	516	438	305	0	574	316	751	767	152	537	525
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	68.5	45.4	40.1	64.6	0.0	51.0	61.5	29.7	29.8	69.8	52.0	52.0
Incr Delay (d2), s/veh	216.9	0.3	0.0	19.9	0.0	236.2	259.7	0.5	0.5	11.0	123.0	128.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	15.5	9.1	1.4	9.5	0.0	61.4	35.9	8.9	9.3	3.7	40.6	40.4
LnGrp Delay(d),s/veh	285.4	45.7	40.1	84.5	0.0	287.2	321.2	30.2	30.3	80.8	175.0	180.1
LnGrp LOS	F	D	D	F		F	F	C	C	F	F	F
Approach Vol, veh/h	521				1066				1113			
Approach Delay, s/veh	143.7				248.8				157.8			
Approach LOS	F				F				F			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.7	68.3	23.1	45.9	31.0	50.0	17.0	52.0				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	13.0	59.0	26.0	35.0	27.0	45.0	13.0	48.0				
Max Q Clear Time (g_c+I1), s	9.0	20.4	19.0	19.9	29.0	48.0	15.0	50.0				
Green Ext Time (p_c), s	0.0	26.0	0.1	5.3	0.0	0.0	0.0	0.0				
Intersection Summary												
HCM 2010 Ctrl Delay	184.4											
HCM 2010 LOS	F											

HCM 2010 Signalized Intersection Summary

8B: Bruce Rd & E 20th St

Cumulative Plus Project
AM Peak Hour

																
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Volume (veh/h)	180	220	280	170	620	110	410	480	50	70	870	260				
Future Volume (veh/h)	180	220	280	170	620	110	410	480	50	70	870	260				
Number	7	4	14	3	8	18	5	2	12	1	6	16				
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0				
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00	1.00		1.00				
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1845	1845	1845	1845				
Adj Flow Rate, veh/h	214	262	140	202	738	125	488	571	12	83	1036	153				
Adj No. of Lanes	2	1	1	2	1	0	2	2	1	1	2	1				
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84				
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3				
Cap, veh/h	199	707	601	256	614	104	398	1223	534	104	1022	457				
Arrive On Green	0.06	0.38	0.38	0.08	0.40	0.40	0.12	0.35	0.34	0.06	0.29	0.29				
Sat Flow, veh/h	3408	1845	1568	3408	1535	260	3408	3505	1568	1757	3505	1566				
Grp Volume(v), veh/h	214	262	140	202	0	863	488	571	12	83	1036	153				
Grp Sat Flow(s),veh/h/ln	1704	1845	1568	1704	0	1795	1704	1752	1568	1757	1752	1566				
Q Serve(g_s), s	7.0	12.3	7.3	7.0	0.0	48.0	14.0	15.2	0.6	5.6	35.0	9.2				
Cycle Q Clear(g_c), s	7.0	12.3	7.3	7.0	0.0	48.0	14.0	15.2	0.6	5.6	35.0	9.2				
Prop In Lane	1.00		1.00	1.00		0.14	1.00		1.00	1.00		1.00				
Lane Grp Cap(c), veh/h	199	707	601	256	0	718	398	1223	534	104	1022	457				
V/C Ratio(X)	1.08	0.37	0.23	0.79	0.00	1.20	1.23	0.47	0.02	0.80	1.01	0.33				
Avail Cap(c_a), veh/h	199	707	601	341	0	718	398	1223	534	176	1022	457				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Uniform Delay (d), s/veh	56.5	26.6	25.1	54.5	0.0	36.0	53.0	30.4	26.3	55.7	42.5	33.4				
Incr Delay (d2), s/veh	85.6	0.1	0.1	6.1	0.0	104.1	122.7	0.4	0.0	5.1	31.5	0.6				
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
%ile BackOfQ(50%),veh/ln	5.6	6.3	3.2	3.5	0.0	44.5	13.3	7.4	0.3	2.9	21.4	4.1				
LnGrp Delay(d),s/veh	142.1	26.7	25.1	60.7	0.0	140.1	175.7	30.8	26.3	60.8	74.0	34.0				
LnGrp LOS	F	C	C	E		F	F	C	C	E	F	C				
Approach Vol, veh/h	616				1065				1071							
Approach Delay, s/veh	66.5				125.0				96.7							
Approach LOS	E				F				F							
Timer	1	2	3	4	5	6	7	8								
Assigned Phs	1	2	3	4	5	6	7	8								
Phs Duration (G+Y+Rc), s	11.1	45.9	13.0	50.0	18.0	39.0	11.0	52.0								
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0								
Max Green Setting (Gmax), s	12.0	36.0	12.0	43.0	14.0	34.0	7.0	48.0								
Max Q Clear Time (g_c+I1), s	7.6	17.2	9.0	14.3	16.0	37.0	9.0	50.0								
Green Ext Time (p_c), s	0.0	13.9	0.1	6.8	0.0	0.0	0.0	0.0								
Intersection Summary																
HCM 2010 Ctrl Delay	90.6															
HCM 2010 LOS	F															

HCM 2010 Signalized Intersection Summary

8C: Bruce Rd & E 20th St

Cumulative Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	180	220	280	170	620	110	410	480	50	70	870	260
Future Volume (veh/h)	180	220	280	170	620	110	410	480	50	70	870	260
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	214	262	83	202	738	117	488	571	18	83	1036	137
Adj No. of Lanes	2	1	1	1	2	0	2	2	1	1	2	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	272	427	363	230	855	136	542	1518	665	105	1170	523
Arrive On Green	0.08	0.23	0.23	0.13	0.28	0.28	0.16	0.43	0.42	0.06	0.33	0.33
Sat Flow, veh/h	3408	1845	1568	1757	3025	479	3408	3505	1568	1757	3505	1567
Grp Volume(v), veh/h	214	262	83	202	427	428	488	571	18	83	1036	137
Grp Sat Flow(s),veh/h/ln	1704	1845	1568	1757	1752	1752	1704	1752	1568	1757	1752	1567
Q Serve(g_s), s	6.8	14.1	4.8	12.5	25.6	25.6	15.5	12.2	0.7	5.2	30.9	7.1
Cycle Q Clear(g_c), s	6.8	14.1	4.8	12.5	25.6	25.6	15.5	12.2	0.7	5.2	30.9	7.1
Prop In Lane	1.00		1.00	1.00		0.27	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	272	427	363	230	496	495	542	1518	665	105	1170	523
V/C Ratio(X)	0.79	0.61	0.23	0.88	0.86	0.86	0.90	0.38	0.03	0.79	0.89	0.26
Avail Cap(c_a), veh/h	308	517	439	254	586	586	555	1518	665	191	1236	552
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	50.0	38.1	34.5	47.2	37.6	37.6	45.7	21.2	18.6	51.3	34.8	26.9
Incr Delay (d2), s/veh	9.7	0.6	0.1	24.4	9.9	9.9	17.1	0.2	0.0	4.9	8.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.6	7.2	2.1	7.6	13.7	13.7	8.6	5.9	0.3	2.7	16.3	3.1
LnGrp Delay(d),s/veh	59.7	38.7	34.6	71.6	47.5	47.6	62.7	21.5	18.6	56.2	42.8	27.3
LnGrp LOS	E	D	C	E	D	D	E	C	B	E	D	C
Approach Vol, veh/h	559				1057				1077			
Approach Delay, s/veh	46.1				52.1				40.1			
Approach LOS	D				D				D			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	10.6	51.9	18.5	29.6	21.6	40.9	12.8	35.3				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	12.0	44.0	16.0	31.0	18.0	38.0	10.0	37.0				
Max Q Clear Time (g_c+I1), s	7.2	14.2	14.5	16.1	17.5	32.9	8.8	27.6				
Green Ext Time (p_c), s	0.0	19.4	0.0	4.6	0.0	3.0	0.0	3.7				
Intersection Summary												
HCM 2010 Ctrl Delay	44.8											
HCM 2010 LOS	D											

Intersection						
Int Delay, s/veh	1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	30	240	10	10	200
Future Vol, veh/h	10	30	240	10	10	200
Conflicting Peds, #/hr	0	1	0	1	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	36	286	12	12	238
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	555	294	0	0	299	0
Stage 1	293	-	-	-	-	-
Stage 2	262	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	493	745	-	-	1262	-
Stage 1	757	-	-	-	-	-
Stage 2	782	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	487	744	-	-	1261	-
Mov Cap-2 Maneuver	571	-	-	-	-	-
Stage 1	756	-	-	-	-	-
Stage 2	773	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	10.6		0		0.4	
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 692	1261	-		
HCM Lane V/C Ratio	-	- 0.069	0.009	-		
HCM Control Delay (s)	-	- 10.6	7.9	0		
HCM Lane LOS	-	- B	A	A		
HCM 95th %tile Q(veh)	-	- 0.2	0	-		

Intersection						
Int Delay, s/veh	0.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	20	210	10	10	190
Future Vol, veh/h	10	20	210	10	10	190
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	24	250	12	12	226
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	506	256	0	0	262	0
Stage 1	256	-	-	-	-	-
Stage 2	250	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	526	783	-	-	1302	-
Stage 1	787	-	-	-	-	-
Stage 2	792	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	521	783	-	-	1302	-
Mov Cap-2 Maneuver	597	-	-	-	-	-
Stage 1	787	-	-	-	-	-
Stage 2	785	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	10.3		0		0.4	
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 709	1302	-		
HCM Lane V/C Ratio	-	- 0.05	0.009	-		
HCM Control Delay (s)	-	- 10.3	7.8	-		
HCM Lane LOS	-	- B	A	-		
HCM 95th %tile Q(veh)	-	- 0.2	0	-		

Intersection

Int Delay, s/veh 2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	60	20	190	20	10	210
Future Vol, veh/h	60	20	190	20	10	210
Conflicting Peds, #/hr	0	2	0	2	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	71	24	226	24	12	250

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	514	242	0	0	252	0
Stage 1	240	-	-	-	-	-
Stage 2	274	-	-	-	-	-
Critical Hdwy	7.12	6.22	-	-	4.12	-
Critical Hdwy Stg 1	6.12	-	-	-	-	-
Critical Hdwy Stg 2	6.12	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	471	797	-	-	1313	-
Stage 1	763	-	-	-	-	-
Stage 2	732	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	467	794	-	-	1311	-
Mov Cap-2 Maneuver	552	-	-	-	-	-
Stage 1	763	-	-	-	-	-
Stage 2	725	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	12.2		0		0.4
HCM LOS	B				

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 598	1311	-
HCM Lane V/C Ratio	-	- 0.159	0.009	-
HCM Control Delay (s)	-	- 12.2	7.8	-
HCM Lane LOS	-	- B	A	-
HCM 95th %tile Q(veh)	-	- 0.6	0	-

HCM 2010 Signalized Intersection Summary

12: Notre Dame Blvd & Forest Ave

Cumulative Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	90	80	240	20	140	10	310	120	40	10	200	50
Future Volume (veh/h)	90	80	240	20	140	10	310	120	40	10	200	50
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	107	95	34	24	167	10	369	143	23	12	238	36
Adj No. of Lanes	1	1	2	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	163	428	627	33	273	16	404	1233	194	4	543	81
Arrive On Green	0.09	0.23	0.23	0.02	0.16	0.16	0.23	0.40	0.40	0.00	0.18	0.18
Sat Flow, veh/h	1774	1863	2726	1774	1739	104	1774	3052	480	1774	3082	459
Grp Volume(v), veh/h	107	95	34	24	0	177	369	82	84	12	135	139
Grp Sat Flow(s),veh/h/ln	1774	1863	1363	1774	0	1844	1774	1770	1763	1774	1770	1772
Q Serve(g_s), s	2.7	1.9	0.4	0.6	0.0	4.1	9.3	1.3	1.4	0.1	3.1	3.2
Cycle Q Clear(g_c), s	2.7	1.9	0.4	0.6	0.0	4.1	9.3	1.3	1.4	0.1	3.1	3.2
Prop In Lane	1.00		1.00	1.00		0.06	1.00		0.27	1.00		0.26
Lane Grp Cap(c), veh/h	163	428	627	33	0	289	404	715	712	4	312	312
V/C Ratio(X)	0.66	0.22	0.05	0.73	0.00	0.61	0.91	0.11	0.12	3.11	0.43	0.44
Avail Cap(c_a), veh/h	810	1093	1600	617	0	962	1003	1231	1226	617	1039	1040
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.2	14.4	13.8	22.5	0.0	18.1	17.3	8.6	8.6	23.0	16.9	16.9
Incr Delay (d2), s/veh	1.7	0.1	0.0	11.1	0.0	0.8	3.5	0.1	0.1	1002.5	1.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.9	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	1.0	0.2	0.4	0.0	2.1	4.9	0.6	0.7	1.8	1.6	1.7
LnGrp Delay(d),s/veh	21.9	14.5	13.8	33.5	0.0	18.9	20.8	8.6	8.7	1059.3	17.9	17.9
LnGrp LOS	C	B	B	C		B	C	A	A	F	B	B
Approach Vol, veh/h	236			201			535			286		
Approach Delay, s/veh	17.7			20.6			17.0			61.6		
Approach LOS	B			C			B			E		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.2	11.2	4.0	22.6	4.8	14.6	14.5	12.1				
Change Period (Y+Rc), s	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0				
Max Green Setting (Gmax), s	22.0	24.0	17.0	32.0	17.0	27.0	27.0	27.0				
Max Q Clear Time (g_c+l1), s	4.7	6.1	2.1	3.4	2.6	3.9	11.3	5.2				
Green Ext Time (p_c), s	0.0	1.0	0.0	2.7	0.0	1.1	0.1	2.6				
Intersection Summary												
HCM 2010 Ctrl Delay			27.9									
HCM 2010 LOS			C									
Notes												

Intersection

Int Delay, s/veh 336.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↙	↕		↙	↕	
Traffic Vol, veh/h	30	20	40	110	14	30	80	770	140	80	990	50
Future Vol, veh/h	30	20	40	110	14	30	80	770	140	80	990	50
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	84	84	84	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	36	24	48	131	17	36	95	917	167	95	1179	60

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	2056	2673	619	1982	2619	542	1238	0	0	1083	0	0
Stage 1	1399	1399	-	1190	1190	-	-	-	-	-	-	-
Stage 2	657	1274	-	792	1429	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	~ 32	~ 22	432	~ 36	24	485	558	-	-	640	-	-
Stage 1	148	206	-	199	259	-	-	-	-	-	-	-
Stage 2	420	236	-	349	199	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 2	~ 16	432	-	17	485	558	-	-	640	-	-
Mov Cap-2 Maneuver	~ 2	~ 16	-	-	17	-	-	-	-	-	-	-
Stage 1	123	175	-	165	215	-	-	-	-	-	-	-
Stage 2	298	196	-	228	169	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, \$ 8780.5			1	0.8
HCM LOS	F	-		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	558	-	-	6	640	-	-
HCM Lane V/C Ratio	0.171	-	-	17.857	0.149	-	-
HCM Control Delay (s)	12.8	-	-	\$ 8780.5	11.6	-	-
HCM Lane LOS	B	-	-	F	B	-	-
HCM 95th %tile Q(veh)	0.6	-	-	15.3	0.5	-	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 2010 Signalized Intersection Summary

13B: Bruce Rd & Raley Blvd

Cumulative Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	20	40	110	20	30	80	770	140	80	990	50
Future Volume (veh/h)	30	20	40	110	20	30	80	770	140	80	990	50
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	36	24	11	131	24	26	95	917	154	95	1179	56
Adj No. of Lanes	0	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	48	32	15	178	33	35	123	1386	233	123	1572	75
Arrive On Green	0.05	0.05	0.05	0.14	0.14	0.14	0.07	0.46	0.46	0.07	0.46	0.46
Sat Flow, veh/h	897	598	274	1270	233	252	1774	3033	509	1774	3440	163
Grp Volume(v), veh/h	71	0	0	181	0	0	95	535	536	95	606	629
Grp Sat Flow(s),veh/h/ln	1770	0	0	1755	0	0	1774	1770	1773	1774	1770	1834
Q Serve(g_s), s	2.4	0.0	0.0	6.0	0.0	0.0	3.2	14.3	14.3	3.2	17.2	17.2
Cycle Q Clear(g_c), s	2.4	0.0	0.0	6.0	0.0	0.0	3.2	14.3	14.3	3.2	17.2	17.2
Prop In Lane	0.51		0.15	0.72		0.14	1.00		0.29	1.00		0.09
Lane Grp Cap(c), veh/h	96	0	0	246	0	0	123	809	810	123	809	838
V/C Ratio(X)	0.74	0.00	0.00	0.74	0.00	0.00	0.77	0.66	0.66	0.77	0.75	0.75
Avail Cap(c_a), veh/h	727	0	0	721	0	0	321	872	874	321	872	904
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.4	0.0	0.0	25.1	0.0	0.0	27.8	12.9	12.9	27.8	13.6	13.6
Incr Delay (d2), s/veh	10.8	0.0	0.0	4.3	0.0	0.0	9.7	1.7	1.7	9.7	3.4	3.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	0.0	3.2	0.0	0.0	1.9	7.4	7.4	1.9	9.0	9.3
LnGrp Delay(d),s/veh	39.1	0.0	0.0	29.4	0.0	0.0	37.6	14.5	14.5	37.6	17.0	16.9
LnGrp LOS	D			C			D	B	B	D	B	B
Approach Vol, veh/h	71				181		1166				1330	
Approach Delay, s/veh	39.1				29.4		16.4				18.4	
Approach LOS	D				C		B				B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	4		5	6	8					
Phs Duration (G+Y+Rc), s	8.2	32.8	7.3		8.2	32.8	12.5					
Change Period (Y+Rc), s	4.0	5.0	4.0		4.0	5.0	4.0					
Max Green Setting (Gmax), s	11.0	30.0	25.0		11.0	30.0	25.0					
Max Q Clear Time (g_c+l1), s	5.2	16.3	4.4		5.2	19.2	8.0					
Green Ext Time (p_c), s	0.1	10.5	0.3		0.1	8.6	0.9					
Intersection Summary												
HCM 2010 Ctrl Delay			18.8									
HCM 2010 LOS			B									

HCM 2010 Signalized Intersection Summary

14: SR 99 SB Ramps & Skyway Rd

Cumulative Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗		↑↑	↗				↖↖		↗
Traffic Volume (veh/h)	0	580	160	0	880	220	0	0	0	950	0	570
Future Volume (veh/h)	0	580	160	0	880	220	0	0	0	950	0	570
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	0	1845	1845				1845	0	1845
Adj Flow Rate, veh/h	0	690	0	0	1048	0				1131	0	634
Adj No. of Lanes	0	2	1	0	2	1				2	0	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84				0.84	0.84	0.84
Percent Heavy Veh, %	0	3	3	0	3	3				3	0	3
Cap, veh/h	0	1351	605	0	1351	605				1548	0	712
Arrive On Green	0.00	0.39	0.00	0.00	0.39	0.00				0.45	0.00	0.45
Sat Flow, veh/h	0	3597	1568	0	3597	1568				3408	0	1568
Grp Volume(v), veh/h	0	690	0	0	1048	0				1131	0	634
Grp Sat Flow(s),veh/h/ln	0	1752	1568	0	1752	1568				1704	0	1568
Q Serve(g_s), s	0.0	7.5	0.0	0.0	13.1	0.0				13.5	0.0	18.5
Cycle Q Clear(g_c), s	0.0	7.5	0.0	0.0	13.1	0.0				13.5	0.0	18.5
Prop In Lane	0.00		1.00	0.00		1.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1351	605	0	1351	605				1548	0	712
V/C Ratio(X)	0.00	0.51	0.00	0.00	0.78	0.00				0.73	0.00	0.89
Avail Cap(c_a), veh/h	0	3583	1603	0	3583	1603				2459	0	1131
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	11.7	0.0	0.0	13.4	0.0				11.1	0.0	12.5
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	0.4	0.0				0.3	0.0	3.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	3.6	0.0	0.0	6.3	0.0				6.3	0.0	8.6
LnGrp Delay(d),s/veh	0.0	11.8	0.0	0.0	13.8	0.0				11.4	0.0	16.1
LnGrp LOS		B			B					B		B
Approach Vol, veh/h		690			1048						1765	
Approach Delay, s/veh		11.8			13.8						13.1	
Approach LOS		B			B						B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		23.2		26.7		23.2						
Change Period (Y+Rc), s		* 5		* 5		* 5						
Max Green Setting (Gmax), s		* 50		* 35		* 50						
Max Q Clear Time (g_c+I1), s		9.5		20.5		15.1						
Green Ext Time (p_c), s		3.1		1.2		3.1						
Intersection Summary												
HCM 2010 Ctrl Delay			13.1									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

15: SR 99 NB Ramps & Skyway Rd

Cumulative Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕	↗		↕↕	↗	↗↗		↗			
Traffic Volume (veh/h)	0	1340	190	0	950	880	150	0	290	0	0	0
Future Volume (veh/h)	0	1340	190	0	950	880	150	0	290	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1845	1845	0	1845	1845	1845	0	1845			
Adj Flow Rate, veh/h	0	1595	0	0	1131	0	179	0	319			
Adj No. of Lanes	0	2	1	0	2	1	2	0	1			
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84			
Percent Heavy Veh, %	0	3	3	0	3	3	3	0	3			
Cap, veh/h	0	2108	943	0	2108	943	815	0	375			
Arrive On Green	0.00	0.60	0.00	0.00	0.60	0.00	0.24	0.00	0.24			
Sat Flow, veh/h	0	3597	1568	0	3597	1568	3408	0	1568			
Grp Volume(v), veh/h	0	1595	0	0	1131	0	179	0	319			
Grp Sat Flow(s),veh/h/ln	0	1752	1568	0	1752	1568	1704	0	1568			
Q Serve(g_s), s	0.0	16.7	0.0	0.0	9.5	0.0	2.1	0.0	9.7			
Cycle Q Clear(g_c), s	0.0	16.7	0.0	0.0	9.5	0.0	2.1	0.0	9.7			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2108	943	0	2108	943	815	0	375			
V/C Ratio(X)	0.00	0.76	0.00	0.00	0.54	0.00	0.22	0.00	0.85			
Avail Cap(c_a), veh/h	0	3563	1594	0	3563	1594	1699	0	781			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	7.3	0.0	0.0	5.9	0.0	15.3	0.0	18.2			
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	2.1			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	7.8	0.0	0.0	4.6	0.0	1.0	0.0	4.4			
LnGrp Delay(d),s/veh	0.0	7.5	0.0	0.0	6.0	0.0	15.4	0.0	20.3			
LnGrp LOS		A			A		B		C			
Approach Vol, veh/h	1595			1131			498					
Approach Delay, s/veh	7.5			6.0			18.6					
Approach LOS	A			A			B					
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2						6	8				
Phs Duration (G+Y+Rc), s	34.2						34.2	16.0				
Change Period (Y+Rc), s	* 5						* 5	4.0				
Max Green Setting (Gmax), s	* 50						* 50	25.0				
Max Q Clear Time (g_c+I1), s	18.7						11.5	11.7				
Green Ext Time (p_c), s	10.5						10.9	0.3				
Intersection Summary												
HCM 2010 Ctrl Delay			8.7									
HCM 2010 LOS			A									
Notes												

HCM 2010 Signalized Intersection Summary

16: Notre Dame Blvd & Skyway Rd

Cumulative Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	530	840	260	70	1260	60	230	60	50	70	70	340
Future Volume (veh/h)	530	840	260	70	1260	60	230	60	50	70	70	340
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1845	1845	1900	1845	1845	1845
Adj Flow Rate, veh/h	631	1000	189	83	1500	25	274	71	33	83	83	285
Adj No. of Lanes	2	3	1	1	3	1	2	1	0	1	1	2
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	729	2642	993	120	1908	593	412	144	67	190	199	1003
Arrive On Green	0.21	0.52	0.51	0.07	0.38	0.38	0.12	0.12	0.12	0.11	0.11	0.11
Sat Flow, veh/h	3408	5036	1568	1757	5036	1564	3408	1189	553	1757	1845	3073
Grp Volume(v), veh/h	631	1000	189	83	1500	25	274	0	104	83	83	285
Grp Sat Flow(s),veh/h/ln	1704	1679	1568	1757	1679	1564	1704	0	1742	1757	1845	1536
Q Serve(g_s), s	16.0	10.6	4.5	4.1	23.7	0.9	6.9	0.0	5.0	4.0	3.8	6.2
Cycle Q Clear(g_c), s	16.0	10.6	4.5	4.1	23.7	0.9	6.9	0.0	5.0	4.0	3.8	6.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.32	1.00		1.00
Lane Grp Cap(c), veh/h	729	2642	993	120	1908	593	412	0	211	190	199	1003
V/C Ratio(X)	0.87	0.38	0.19	0.69	0.79	0.04	0.66	0.00	0.49	0.44	0.42	0.28
Avail Cap(c_a), veh/h	937	2642	993	489	2288	711	1127	0	576	581	610	1687
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.1	12.7	6.9	40.9	24.7	17.6	37.7	0.0	36.9	37.5	37.4	22.7
Incr Delay (d2), s/veh	7.0	0.1	0.1	7.0	1.6	0.0	1.8	0.0	1.8	1.6	1.4	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.2	4.9	2.6	2.2	11.2	0.4	3.3	0.0	2.5	2.0	2.0	2.7
LnGrp Delay(d),s/veh	41.0	12.8	7.0	47.9	26.2	17.6	39.6	0.0	38.6	39.1	38.8	22.9
LnGrp LOS	D	B	A	D	C	B	D		D	D	D	C
Approach Vol, veh/h	1820				1608				378		451	
Approach Delay, s/veh	21.9				27.2				39.3		28.8	
Approach LOS	C				C				D		C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	10.1	51.1			13.7	23.2	38.0	14.9				
Change Period (Y+Rc), s	4.0	4.8			3.7	3.7	4.8	3.7				
Max Green Setting (Gmax), s	25.0	40.0			30.0	25.0	40.0	30.0				
Max Q Clear Time (g_c+I1), s	6.1	12.6			8.2	18.0	25.7	8.9				
Green Ext Time (p_c), s	0.2	21.3			1.8	1.5	7.6	1.6				
Intersection Summary												
HCM 2010 Ctrl Delay			26.2									
HCM 2010 LOS			C									
Notes												

Intersection

Int Delay, s/veh 259.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	190	610	70	80	1210	100	10	4	40	50	10	120
Future Vol, veh/h	190	610	70	80	1210	100	10	4	40	50	10	120
Conflicting Peds, #/hr	0	0	4	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	250	-	-	150	-	-	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	84	84	84	84	84	84	84	84	84
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	226	726	83	95	1440	119	12	5	48	60	12	143

Major/Minor	Major1		Major2		Minor1		Minor2					
Conflicting Flow All	1560	0	0	814	0	0	2141	2974	409	2508	2956	780
Stage 1	-	-	-	-	-	-	1224	1224	-	1690	1690	-
Stage 2	-	-	-	-	-	-	917	1750	-	818	1266	-
Critical Hdwy	4.16	-	-	4.16	-	-	7.56	6.56	6.96	7.56	6.56	6.96
Critical Hdwy Stg 1	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Follow-up Hdwy	2.23	-	-	2.23	-	-	3.53	4.03	3.33	3.53	4.03	3.33
Pot Cap-1 Maneuver	415	-	-	802	-	-	27	14	589	~14	14	336
Stage 1	-	-	-	-	-	-	188	248	-	96	146	-
Stage 2	-	-	-	-	-	-	291	137	-	334	236	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	415	-	-	802	-	-	-	6	587	~3	~6	336
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	6	-	~3	~6	-
Stage 1	-	-	-	-	-	-	85	113	-	~44	129	-
Stage 2	-	-	-	-	-	-	134	121	-	134	107	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	5.2	0.6		\$ 3566.4
HCM LOS			-	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	-	415	-	-	802	-	-	3	64
HCM Lane V/C Ratio	-	0.545	-	-	0.119	-	-	19.841	2.418
HCM Control Delay (s)	-	23.6	-	-	10.1	-	-	\$ 10800.2	\$ 784.1
HCM Lane LOS	-	C	-	-	B	-	-	F	F
HCM 95th %tile Q(veh)	-	3.2	-	-	0.4	-	-	9.4	15.2

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 2010 Signalized Intersection Summary
17B: Skyway Rd & Forest Ave

Cumulative Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	190	610	70	80	1210	100	10	10	40	50	10	120
Future Volume (veh/h)	190	610	70	80	1210	100	10	10	40	50	10	120
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1900	1845	1900	1845	1845	1900
Adj Flow Rate, veh/h	226	726	77	95	1440	114	12	12	0	60	12	0
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	1	1	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	274	1986	211	123	1758	138	20	20	0	86	90	0
Arrive On Green	0.16	0.62	0.62	0.07	0.54	0.54	0.02	0.02	0.00	0.05	0.05	0.00
Sat Flow, veh/h	1757	3197	339	1757	3286	259	900	900	0	1757	1845	0
Grp Volume(v), veh/h	226	398	405	95	764	790	24	0	0	60	12	0
Grp Sat Flow(s),veh/h/ln	1757	1752	1784	1757	1752	1793	1800	0	0	1757	1845	0
Q Serve(g_s), s	7.8	7.0	7.0	3.3	22.7	23.1	0.8	0.0	0.0	2.1	0.4	0.0
Cycle Q Clear(g_c), s	7.8	7.0	7.0	3.3	22.7	23.1	0.8	0.0	0.0	2.1	0.4	0.0
Prop In Lane	1.00		0.19	1.00		0.14	0.50		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	274	1089	1108	123	938	959	39	0	0	86	90	0
V/C Ratio(X)	0.82	0.37	0.37	0.77	0.82	0.82	0.61	0.00	0.00	0.70	0.13	0.00
Avail Cap(c_a), veh/h	363	1089	1108	363	1029	1053	800	0	0	753	791	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	25.7	5.8	5.9	28.8	12.1	12.2	30.6	0.0	0.0	29.5	28.7	0.0
Incr Delay (d2), s/veh	11.0	0.2	0.2	9.7	4.8	5.0	14.5	0.0	0.0	9.8	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.6	3.4	3.4	1.9	12.1	12.5	0.6	0.0	0.0	1.3	0.2	0.0
LnGrp Delay(d),s/veh	36.8	6.1	6.1	38.5	16.8	17.2	45.0	0.0	0.0	39.3	29.3	0.0
LnGrp LOS	D	A	A	D	B	B	D			D	C	
Approach Vol, veh/h	1029				1649			24		72		
Approach Delay, s/veh	12.8				18.3			45.0		37.7		
Approach LOS	B				B			D		D		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		4.4	8.4	44.1		6.1	13.8	38.7				
Change Period (Y+Rc), s		3.0	4.0	5.0		3.0	4.0	5.0				
Max Green Setting (Gmax), s		28.0	13.0	37.0		27.0	13.0	37.0				
Max Q Clear Time (g_c+I1), s		2.8	5.3	9.0		4.1	9.8	25.1				
Green Ext Time (p_c), s		0.1	0.1	18.6		0.2	0.2	8.6				
Intersection Summary												
HCM 2010 Ctrl Delay	17.0											
HCM 2010 LOS	B											

HCM 2010 Signalized Intersection Summary

18: Skyway Rd & Bruce Rd

Cumulative Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	240	440	20	60	1070	720	20	30	20	650	100	390
Future Volume (veh/h)	240	440	20	60	1070	720	20	30	20	650	100	390
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1845	1845	1845	1900	1845	1845	1845
Adj Flow Rate, veh/h	286	524	20	71	1274	662	24	36	0	859	0	109
Adj No. of Lanes	2	2	0	1	2	1	1	1	0	2	0	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	322	1670	64	94	1557	993	116	122	0	763	0	340
Arrive On Green	0.09	0.49	0.46	0.05	0.44	0.42	0.07	0.07	0.00	0.22	0.00	0.22
Sat Flow, veh/h	3408	3443	131	1757	3505	1568	1757	1845	0	3514	0	1568
Grp Volume(v), veh/h	286	266	278	71	1274	662	24	36	0	859	0	109
Grp Sat Flow(s),veh/h/ln	1704	1752	1822	1757	1752	1568	1757	1845	0	1757	0	1568
Q Serve(g_s), s	7.4	8.3	8.3	3.6	28.5	24.1	1.2	1.7	0.0	19.5	0.0	5.3
Cycle Q Clear(g_c), s	7.4	8.3	8.3	3.6	28.5	24.1	1.2	1.7	0.0	19.5	0.0	5.3
Prop In Lane	1.00		0.07	1.00		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	322	850	884	94	1557	993	116	122	0	763	0	340
V/C Ratio(X)	0.89	0.31	0.31	0.75	0.82	0.67	0.21	0.30	0.00	1.13	0.00	0.32
Avail Cap(c_a), veh/h	531	850	884	215	1639	1030	264	277	0	763	0	340
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	40.2	14.0	14.1	41.9	21.8	10.4	39.7	40.0	0.0	35.2	0.0	29.6
Incr Delay (d2), s/veh	5.9	0.2	0.2	4.5	3.3	1.6	0.3	0.5	0.0	73.1	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.8	4.0	4.2	1.9	14.3	16.6	0.6	0.9	0.0	17.1	0.0	2.3
LnGrp Delay(d),s/veh	46.1	14.2	14.3	46.4	25.1	12.0	40.0	40.4	0.0	108.3	0.0	29.8
LnGrp LOS	D	B	B	D	C	B	D	D		F		C
Approach Vol, veh/h	830			2007			60			968		
Approach Delay, s/veh	25.2			21.5			40.3			99.4		
Approach LOS	C			C			D			F		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	8.8	47.6			23.5	12.5	43.9	9.9				
Change Period (Y+Rc), s	3.0	6.0			3.5	3.0	6.0	4.5				
Max Green Setting (Gmax), s	12.0	40.0			20.0	15.0	40.0	13.0				
Max Q Clear Time (g_c+l1), s	5.6	10.3			21.5	9.4	30.5	3.7				
Green Ext Time (p_c), s	0.0	18.7			0.0	0.1	7.4	0.1				
Intersection Summary												
HCM 2010 Ctrl Delay				42.1								
HCM 2010 LOS				D								
Notes												

HCM 2010 Signalized Intersection Summary

19: Bruce Rd & Webster Dr/Street G

Cumulative Plus Project
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	10	20	10	10	10	10	890	10	10	1250	30
Future Volume (veh/h)	10	10	20	10	10	10	10	890	10	10	1250	30
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	0.99		1.00	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1845	1900	1900	1845	1900	1845	1845	1900	1845	1845	1900
Adj Flow Rate, veh/h	12	12	0	12	12	0	12	1060	11	12	1488	34
Adj No. of Lanes	0	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	162	113	0	162	113	0	38	2173	23	38	2142	49
Arrive On Green	0.10	0.10	0.00	0.10	0.10	0.00	0.02	0.61	0.61	0.02	0.61	0.61
Sat Flow, veh/h	518	1144	0	518	1144	0	1757	3553	37	1757	3501	80
Grp Volume(v), veh/h	24	0	0	24	0	0	12	523	548	12	744	778
Grp Sat Flow(s),veh/h/ln	1662	0	0	1662	0	0	1757	1752	1837	1757	1752	1828
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.3	8.0	8.0	0.3	13.9	13.9
Cycle Q Clear(g_c), s	0.6	0.0	0.0	0.6	0.0	0.0	0.3	8.0	8.0	0.3	13.9	13.9
Prop In Lane	0.50		0.00	0.50		0.00	1.00		0.02	1.00		0.04
Lane Grp Cap(c), veh/h	275	0	0	275	0	0	38	1072	1124	38	1072	1118
V/C Ratio(X)	0.09	0.00	0.00	0.09	0.00	0.00	0.32	0.49	0.49	0.32	0.69	0.70
Avail Cap(c_a), veh/h	930	0	0	930	0	0	254	1627	1706	254	1627	1697
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.0	0.0	0.0	20.0	0.0	0.0	23.4	5.2	5.2	23.4	6.3	6.4
Incr Delay (d2), s/veh	0.1	0.0	0.0	0.1	0.0	0.0	1.8	0.1	0.1	1.8	0.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.0	0.3	0.0	0.0	0.2	3.8	4.0	0.2	6.7	7.0
LnGrp Delay(d),s/veh	20.0	0.0	0.0	20.0	0.0	0.0	25.1	5.3	5.3	25.1	6.6	6.7
LnGrp LOS	C			C			C	A	A	C	A	A
Approach Vol, veh/h	24				24		1083				1534	
Approach Delay, s/veh	20.0				20.0		5.5				6.8	
Approach LOS	C				C		A				A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	4		5	6	8					
Phs Duration (G+Y+Rc), s	5.0	34.6	8.8		5.0	34.6	8.8					
Change Period (Y+Rc), s	4.0	5.0	4.0		4.0	5.0	4.0					
Max Green Setting (Gmax), s	7.0	45.0	25.0		7.0	45.0	25.0					
Max Q Clear Time (g_c+l1), s	2.3	10.0	2.6		2.3	15.9	2.6					
Green Ext Time (p_c), s	0.0	14.8	0.1		0.0	13.7	0.1					
Intersection Summary												
HCM 2010 Ctrl Delay			6.5									
HCM 2010 LOS			A									

HCM 2010 Signalized Intersection Summary

1: Bruce Rd & SR 32

Cumulative Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	390	540	320	180	290	90	220	770	280	90	630	310
Future Volume (veh/h)	390	540	320	180	290	90	220	770	280	90	630	310
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1900	1845	1845	1845
Adj Flow Rate, veh/h	415	574	256	191	309	66	234	819	265	96	670	224
Adj No. of Lanes	1	2	0	1	2	0	1	2	0	1	2	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	457	709	316	239	511	108	265	857	277	121	865	774
Arrive On Green	0.26	0.30	0.30	0.14	0.18	0.15	0.15	0.33	0.33	0.07	0.25	0.24
Sat Flow, veh/h	1757	2350	1046	1757	2875	605	1757	2606	843	1757	3505	1546
Grp Volume(v), veh/h	415	428	402	191	187	188	234	551	533	96	670	224
Grp Sat Flow(s),veh/h/ln	1757	1752	1644	1757	1752	1727	1757	1752	1696	1757	1752	1546
Q Serve(g_s), s	22.3	22.0	22.0	10.3	9.5	9.9	12.7	29.9	30.0	5.2	17.3	8.3
Cycle Q Clear(g_c), s	22.3	22.0	22.0	10.3	9.5	9.9	12.7	29.9	30.0	5.2	17.3	8.3
Prop In Lane	1.00		0.64	1.00		0.35	1.00		0.50	1.00		1.00
Lane Grp Cap(c), veh/h	457	529	496	239	312	307	265	576	557	121	865	774
V/C Ratio(X)	0.91	0.81	0.81	0.80	0.60	0.61	0.88	0.96	0.96	0.79	0.77	0.29
Avail Cap(c_a), veh/h	469	720	676	289	540	532	271	576	557	199	1008	836
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.9	31.4	31.4	40.8	36.8	37.4	40.5	32.0	32.0	44.6	34.1	14.4
Incr Delay (d2), s/veh	20.6	3.5	3.8	10.1	0.7	0.7	25.8	26.6	27.4	4.3	2.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.4	11.1	10.5	5.7	4.7	4.7	8.1	18.6	18.2	2.7	8.7	3.6
LnGrp Delay(d),s/veh	55.5	34.9	35.2	50.9	37.5	38.2	66.3	58.6	59.4	48.9	36.8	14.5
LnGrp LOS	E	C	D	D	D	D	E	E	E	D	D	B
Approach Vol, veh/h	1245		566				1318		990			
Approach Delay, s/veh	41.9		42.2				60.3		32.9			
Approach LOS	D		D				E		C			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	17.3	33.4	18.7	28.0	29.3	21.3	10.7	36.0				
Change Period (Y+Rc), s	* 5	7.0	* 4	* 6	* 5	7.0	* 4	* 6				
Max Green Setting (Gmax), s	* 15	37.0	* 15	* 26	* 25	27.0	* 11	* 30				
Max Q Clear Time (g_c+I1), s	12.3	24.0	14.7	19.3	24.3	11.9	7.2	32.0				
Green Ext Time (p_c), s	0.1	2.4	0.0	2.7	0.0	2.4	0.0	0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			45.7									
HCM 2010 LOS			D									
Notes												
* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 2010 Signalized Intersection Summary

2: SR 99 SB Ramps & E 20th St

Cumulative Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑	↑↑	↑↑					↑	↑	↑↑
Traffic Volume (veh/h)	0	1400	190	360	800	0	0	0	0	1020	10	560
Future Volume (veh/h)	0	1400	190	360	800	0	0	0	0	1020	10	560
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	1845	1845	0				1845	1845	1845
Adj Flow Rate, veh/h	0	1489	153	383	851	0				1093	0	370
Adj No. of Lanes	0	2	1	2	2	0				2	0	2
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	3	3	3	3	0				3	3	3
Cap, veh/h	0	1407	621	443	2024	0				1163	0	1038
Arrive On Green	0.00	0.40	0.40	0.13	0.58	0.00				0.33	0.00	0.33
Sat Flow, veh/h	0	3597	1545	3408	3597	0				3514	0	3136
Grp Volume(v), veh/h	0	1489	153	383	851	0				1093	0	370
Grp Sat Flow(s),veh/h/ln	0	1752	1545	1704	1752	0				1757	0	1568
Q Serve(g_s), s	0.0	35.1	5.7	9.6	11.8	0.0				26.4	0.0	7.8
Cycle Q Clear(g_c), s	0.0	35.1	5.7	9.6	11.8	0.0				26.4	0.0	7.8
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1407	621	443	2024	0				1163	0	1038
V/C Ratio(X)	0.00	1.06	0.25	0.86	0.42	0.00				0.94	0.00	0.36
Avail Cap(c_a), veh/h	0	1407	621	955	2024	0				1210	0	1080
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	26.2	17.4	37.3	10.3	0.0				28.4	0.0	22.2
Incr Delay (d2), s/veh	0.0	40.9	0.1	2.0	0.1	0.0				13.3	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	24.8	2.5	4.6	5.7	0.0				14.9	0.0	3.4
LnGrp Delay(d),s/veh	0.0	67.1	17.4	39.3	10.4	0.0				41.7	0.0	22.2
LnGrp LOS		F	B	D	B					D		C
Approach Vol, veh/h		1642			1234						1463	
Approach Delay, s/veh		62.5			19.3						36.8	
Approach LOS		E			B						D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	15.4	39.1		32.9		54.5						
Change Period (Y+Rc), s	3.5	4.6		4.1		4.6						
Max Green Setting (Gmax), s	25.0	34.5		30.0		34.5						
Max Q Clear Time (g_c+I1), s	11.6	37.1		28.4		13.8						
Green Ext Time (p_c), s	0.2	0.0		0.4		7.8						
Intersection Summary												
HCM 2010 Ctrl Delay			41.5									
HCM 2010 LOS			D									
Notes												

HCM 2010 Signalized Intersection Summary

3: SR 99 NB Ramps & E 20th St

Cumulative Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	430	1990	0	0	1030	910	130	10	340	0	0	0
Future Volume (veh/h)	430	1990	0	0	1030	910	130	10	340	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1845	1845	0	0	1845	1845	1845	1845	1845			
Adj Flow Rate, veh/h	457	2117	0	0	1096	568	146	0	315			
Adj No. of Lanes	2	2	0	0	2	1	2	0	1			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94			
Percent Heavy Veh, %	3	3	0	0	3	3	3	3	3			
Cap, veh/h	893	2418	0	0	1350	591	789	0	352			
Arrive On Green	0.26	0.69	0.00	0.00	0.39	0.39	0.22	0.00	0.22			
Sat Flow, veh/h	3408	3597	0	0	3597	1534	3514	0	1568			
Grp Volume(v), veh/h	457	2117	0	0	1096	568	146	0	315			
Grp Sat Flow(s),veh/h/ln	1704	1752	0	0	1752	1534	1757	0	1568			
Q Serve(g_s), s	10.7	44.2	0.0	0.0	26.2	33.8	3.1	0.0	18.2			
Cycle Q Clear(g_c), s	10.7	44.2	0.0	0.0	26.2	33.8	3.1	0.0	18.2			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	893	2418	0	0	1350	591	789	0	352			
V/C Ratio(X)	0.51	0.88	0.00	0.00	0.81	0.96	0.19	0.00	0.90			
Avail Cap(c_a), veh/h	893	2418	0	0	1350	591	1131	0	505			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	29.4	11.3	0.0	0.0	25.7	28.1	29.3	0.0	35.2			
Incr Delay (d2), s/veh	2.1	3.8	0.0	0.0	3.6	27.4	0.0	0.0	10.9			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	5.3	22.1	0.0	0.0	13.3	18.7	1.5	0.0	8.9			
LnGrp Delay(d),s/veh	31.5	15.1	0.0	0.0	29.3	55.4	29.4	0.0	46.1			
LnGrp LOS	C	B			C	E	C		D			
Approach Vol, veh/h	2574				1664				461			
Approach Delay, s/veh	18.0				38.2				40.8			
Approach LOS	B				D				D			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2				5		6		8			
Phs Duration (G+Y+Rc), s	68.5				28.5		40.0		25.0			
Change Period (Y+Rc), s	* 5				3.5		* 5		4.1			
Max Green Setting (Gmax), s	* 35				25.0		* 35		30.0			
Max Q Clear Time (g_c+l1), s	46.2				12.7		35.8		20.2			
Green Ext Time (p_c), s	0.0				0.7		0.0		0.7			
Intersection Summary												
HCM 2010 Ctrl Delay			27.4									
HCM 2010 LOS			C									
Notes												

HCM 2010 Signalized Intersection Summary

4: E 20th St & Chico Mall

Cumulative Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	270	1500	70	50	1380	120	390	40	20	190	10	170
Future Volume (veh/h)	270	1500	70	50	1380	120	390	40	20	190	10	170
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1900	1900	1845	1845
Adj Flow Rate, veh/h	287	1596	72	53	1468	123	462	0	0	202	11	20
Adj No. of Lanes	2	2	0	1	2	0	2	1	0	0	1	2
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	354	1612	72	53	1304	109	592	311	0	246	13	398
Arrive On Green	0.10	0.47	0.47	0.03	0.40	0.40	0.17	0.00	0.00	0.15	0.15	0.15
Sat Flow, veh/h	3408	3412	153	1757	3271	272	3514	1845	0	1670	91	2697
Grp Volume(v), veh/h	287	816	852	53	782	809	462	0	0	213	0	20
Grp Sat Flow(s),veh/h/ln	1704	1752	1813	1757	1752	1791	1757	1845	0	1761	0	1349
Q Serve(g_s), s	7.3	40.5	41.2	2.6	35.1	35.1	11.1	0.0	0.0	10.3	0.0	0.6
Cycle Q Clear(g_c), s	7.3	40.5	41.2	2.6	35.1	35.1	11.1	0.0	0.0	10.3	0.0	0.6
Prop In Lane	1.00		0.08	1.00		0.15	1.00		0.00	0.95		1.00
Lane Grp Cap(c), veh/h	354	828	857	53	698	714	592	311	0	260	0	398
V/C Ratio(X)	0.81	0.99	0.99	1.01	1.12	1.13	0.78	0.00	0.00	0.82	0.00	0.05
Avail Cap(c_a), veh/h	755	828	857	379	698	714	997	524	0	500	0	766
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	38.6	22.9	23.1	42.7	26.5	26.5	35.1	0.0	0.0	36.4	0.0	32.2
Incr Delay (d2), s/veh	1.7	27.6	29.2	37.5	72.0	76.7	0.9	0.0	0.0	2.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.5	25.8	27.3	1.8	30.8	32.5	5.5	0.0	0.0	5.2	0.0	0.2
LnGrp Delay(d),s/veh	40.3	50.5	52.4	80.2	98.5	103.2	35.9	0.0	0.0	38.9	0.0	32.3
LnGrp LOS	D	D	D	F	F	F	D			D		C
Approach Vol, veh/h	1955			1644			462			233		
Approach Delay, s/veh	49.8			100.2			35.9			38.3		
Approach LOS	D			F			D			D		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	6.6	45.6			17.0	13.2	39.1	18.8				
Change Period (Y+Rc), s	3.0	4.1			4.0	3.5	4.1	4.0				
Max Green Setting (Gmax), s	20.0	35.0			25.0	20.0	35.0	25.0				
Max Q Clear Time (g_c+l1), s	4.6	43.2			12.3	9.3	37.1	13.1				
Green Ext Time (p_c), s	0.0	0.0			0.7	0.4	0.0	0.8				
Intersection Summary												
HCM 2010 Ctrl Delay				67.0								
HCM 2010 LOS				E								
Notes												

HCM 2010 Signalized Intersection Summary

5: Forest Ave & E 20th St

Cumulative Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	450	1100	160	120	910	140	380	370	150	100	240	270
Future Volume (veh/h)	450	1100	160	120	910	140	380	370	150	100	240	270
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1845	1845	1845	1845	1845	1845	1900
Adj Flow Rate, veh/h	479	1170	156	128	968	28	404	394	34	106	255	30
Adj No. of Lanes	1	2	0	1	2	1	1	2	1	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	393	1233	164	166	988	433	346	998	437	117	486	56
Arrive On Green	0.22	0.40	0.39	0.09	0.28	0.28	0.20	0.28	0.28	0.07	0.15	0.15
Sat Flow, veh/h	1757	3101	412	1757	3505	1536	1757	3505	1535	1757	3144	365
Grp Volume(v), veh/h	479	660	666	128	968	28	404	394	34	106	141	144
Grp Sat Flow(s),veh/h/ln	1757	1752	1760	1757	1752	1536	1757	1752	1535	1757	1752	1756
Q Serve(g_s), s	25.0	40.6	41.0	8.0	30.6	1.5	22.0	10.1	1.3	6.7	8.2	8.5
Cycle Q Clear(g_c), s	25.0	40.6	41.0	8.0	30.6	1.5	22.0	10.1	1.3	6.7	8.2	8.5
Prop In Lane	1.00		0.23	1.00		1.00	1.00		1.00	1.00		0.21
Lane Grp Cap(c), veh/h	393	697	700	166	988	433	346	998	437	117	271	271
V/C Ratio(X)	1.22	0.95	0.95	0.77	0.98	0.06	1.17	0.39	0.08	0.91	0.52	0.53
Avail Cap(c_a), veh/h	393	706	709	181	988	433	346	1051	460	220	400	401
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.4	32.5	32.7	49.4	39.8	29.4	44.9	32.2	15.9	51.8	43.4	43.6
Incr Delay (d2), s/veh	119.5	21.3	22.3	14.9	24.2	0.3	102.4	0.1	0.0	9.8	0.6	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	25.1	23.7	24.2	4.6	18.1	0.7	20.4	4.9	0.7	3.6	4.0	4.1
LnGrp Delay(d),s/veh	162.9	53.8	55.0	64.3	64.0	29.6	147.3	32.3	15.9	61.6	44.0	44.2
LnGrp LOS	F	D	D	E	E	C	F	C	B	E	D	D
Approach Vol, veh/h	1805		1124				832				391	
Approach Delay, s/veh	83.2		63.2				87.5				48.9	
Approach LOS	F		E				F				D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	29.0	35.5	11.4	35.8	16.0	48.5	26.0	21.3				
Change Period (Y+Rc), s	3.0	4.5	3.0	4.5	4.5	* 4.5	3.0	4.5				
Max Green Setting (Gmax), s	26.0	31.0	15.0	33.0	12.5	* 45	23.0	25.0				
Max Q Clear Time (g_c+l1), s	27.0	32.6	8.7	12.1	10.0	43.0	24.0	10.5				
Green Ext Time (p_c), s	0.0	0.0	0.1	2.7	1.3	0.9	0.0	2.5				
Intersection Summary												
HCM 2010 Ctrl Delay			75.4									
HCM 2010 LOS			E									
Notes												

HCM 2010 Signalized Intersection Summary

6: Huntington Dr & E 20th St

Cumulative Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	1220	10	130	1010	50	10	10	130	110	10	80
Future Volume (veh/h)	60	1220	10	130	1010	50	10	10	130	110	10	80
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.98	1.00		0.96	0.98		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1900	1845	1900	1900	1845	1845
Adj Flow Rate, veh/h	64	1298	11	138	1074	50	11	11	23	117	11	14
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	68	1972	17	169	2081	97	104	76	99	307	18	191
Arrive On Green	0.04	0.55	0.53	0.10	0.61	0.59	0.12	0.12	0.14	0.12	0.12	0.12
Sat Flow, veh/h	1757	3561	30	1757	3406	159	153	613	800	1430	148	1547
Grp Volume(v), veh/h	64	639	670	138	552	572	45	0	0	128	0	14
Grp Sat Flow(s),veh/h/ln	1757	1752	1838	1757	1752	1812	1565	0	0	1579	0	1547
Q Serve(g_s), s	1.9	13.5	13.5	4.1	9.5	9.5	0.0	0.0	0.0	0.0	0.0	0.4
Cycle Q Clear(g_c), s	1.9	13.5	13.5	4.1	9.5	9.5	3.9	0.0	0.0	3.7	0.0	0.4
Prop In Lane	1.00		0.02	1.00		0.09	0.24		0.51	0.91		1.00
Lane Grp Cap(c), veh/h	68	970	1018	169	1071	1107	278	0	0	325	0	191
V/C Ratio(X)	0.94	0.66	0.66	0.82	0.52	0.52	0.16	0.00	0.00	0.39	0.00	0.07
Avail Cap(c_a), veh/h	465	1358	1425	631	1358	1405	641	0	0	647	0	556
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.4	8.3	8.3	23.5	5.8	5.9	20.7	0.0	0.0	21.9	0.0	20.5
Incr Delay (d2), s/veh	19.5	0.3	0.3	3.7	0.1	0.1	0.1	0.0	0.0	0.3	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	6.5	6.8	2.1	4.5	4.7	0.6	0.0	0.0	1.8	0.0	0.2
LnGrp Delay(d),s/veh	44.9	8.6	8.6	27.1	6.0	6.0	20.8	0.0	0.0	22.2	0.0	20.6
LnGrp LOS	D	A	A	C	A	A	C			C		C
Approach Vol, veh/h	1373		1262			45			142			
Approach Delay, s/veh	10.3		8.3			20.8			22.1			
Approach LOS	B		A			C			C			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	4		5	6	8					
Phs Duration (G+Y+Rc), s	9.1	33.3	10.5		6.0	36.3	10.5					
Change Period (Y+Rc), s	3.0	5.0	3.0		3.0	5.0	3.0					
Max Green Setting (Gmax), s	20.0	40.0	20.0		15.0	40.0	20.0					
Max Q Clear Time (g_c+l1), s	6.1	15.5	5.7		3.9	11.5	5.9					
Green Ext Time (p_c), s	0.0	12.7	0.6		0.0	13.7	0.6					
Intersection Summary												
HCM 2010 Ctrl Delay			10.1									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

7: Notre Dame Blvd & E 20th St

Cumulative Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	1260	160	120	950	140	190	50	140	180	40	30
Future Volume (veh/h)	40	1260	160	120	950	140	190	50	140	180	40	30
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.97	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	43	1340	163	128	1011	142	202	53	11	191	43	1
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	96	1531	185	162	1615	227	243	129	107	230	116	98
Arrive On Green	0.05	0.49	0.49	0.09	0.53	0.53	0.14	0.07	0.07	0.13	0.06	0.06
Sat Flow, veh/h	1757	3140	379	1757	3076	432	1757	1845	1525	1757	1845	1563
Grp Volume(v), veh/h	43	744	759	128	576	577	202	53	11	191	43	1
Grp Sat Flow(s),veh/h/ln	1757	1752	1767	1757	1752	1755	1757	1845	1525	1757	1845	1563
Q Serve(g_s), s	1.8	29.3	30.0	5.5	18.0	18.1	8.7	2.1	0.5	8.2	1.7	0.0
Cycle Q Clear(g_c), s	1.8	29.3	30.0	5.5	18.0	18.1	8.7	2.1	0.5	8.2	1.7	0.0
Prop In Lane	1.00		0.21	1.00		0.25	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	96	854	862	162	920	922	243	129	107	230	116	98
V/C Ratio(X)	0.45	0.87	0.88	0.79	0.63	0.63	0.83	0.41	0.10	0.83	0.37	0.01
Avail Cap(c_a), veh/h	340	904	911	340	920	922	453	571	472	340	571	484
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.5	17.7	17.9	34.5	13.0	13.0	32.5	34.5	33.8	32.9	34.9	34.1
Incr Delay (d2), s/veh	1.2	8.3	9.2	3.3	1.0	1.0	2.8	0.8	0.2	6.8	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	16.0	16.8	2.8	8.9	8.9	4.4	1.1	0.2	4.4	0.9	0.0
LnGrp Delay(d),s/veh	36.8	26.0	27.0	37.8	14.0	14.1	35.3	35.3	33.9	39.6	35.6	34.1
LnGrp LOS	D	C	C	D	B	B	D	D	C	D	D	C
Approach Vol, veh/h	1546					1281		266		235		
Approach Delay, s/veh	26.8					16.4		35.3		38.9		
Approach LOS	C					B		D		D		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.1	42.8	14.7	8.9	8.2	45.7	14.2	9.4				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	15.0	40.0	20.0	24.0	15.0	40.0	15.0	24.0				
Max Q Clear Time (g_c+I1), s	7.5	32.0	10.7	3.7	3.8	20.1	10.2	4.1				
Green Ext Time (p_c), s	0.1	5.9	0.2	0.3	0.0	12.9	0.1	0.3				
Intersection Summary												
HCM 2010 Ctrl Delay			24.3									
HCM 2010 LOS			C									

HCM 2010 Signalized Intersection Summary

8: Bruce Rd & E 20th St

Cumulative Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	550	580	410	50	210	110	580	790	150	130	650	270
Future Volume (veh/h)	550	580	410	50	210	110	580	790	150	130	650	270
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1900	1845	1845	1900
Adj Flow Rate, veh/h	585	617	227	53	223	105	617	840	145	138	691	253
Adj No. of Lanes	1	1	1	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	414	631	536	77	177	83	439	1222	211	161	629	230
Arrive On Green	0.24	0.34	0.34	0.04	0.15	0.15	0.25	0.41	0.40	0.09	0.25	0.25
Sat Flow, veh/h	1757	1845	1568	1757	1179	555	1757	2990	516	1757	2514	920
Grp Volume(v), veh/h	585	617	227	53	0	328	617	492	493	138	482	462
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	0	1734	1757	1752	1754	1757	1752	1682
Q Serve(g_s), s	33.0	46.3	15.6	4.2	0.0	21.0	35.0	32.3	32.4	10.8	35.0	35.0
Cycle Q Clear(g_c), s	33.0	46.3	15.6	4.2	0.0	21.0	35.0	32.3	32.4	10.8	35.0	35.0
Prop In Lane	1.00		1.00	1.00		0.32	1.00		0.29	1.00		0.55
Lane Grp Cap(c), veh/h	414	631	536	77	0	260	439	716	717	161	438	421
V/C Ratio(X)	1.41	0.98	0.42	0.69	0.00	1.26	1.40	0.69	0.69	0.86	1.10	1.10
Avail Cap(c_a), veh/h	414	631	536	88	0	260	439	716	717	176	438	421
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.5	45.5	35.4	66.0	0.0	59.5	52.5	34.0	34.2	62.7	52.5	52.5
Incr Delay (d2), s/veh	199.6	30.1	0.2	13.0	0.0	144.5	195.4	3.1	3.1	28.6	72.7	73.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	38.9	28.9	6.8	2.3	0.0	20.5	40.8	16.2	16.2	6.6	25.8	24.8
LnGrp Delay(d),s/veh	253.1	75.6	35.6	79.0	0.0	204.0	247.9	37.1	37.2	91.4	125.2	126.0
LnGrp LOS	F	E	D	E		F	F	D	D	F	F	F
Approach Vol, veh/h	1429				381				1602			
Approach Delay, s/veh	141.9				186.6				118.3			
Approach LOS	F				F				F			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	16.8	61.2	10.1	51.9	39.0	39.0	37.0	25.0				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	14.0	55.0	7.0	47.0	35.0	34.0	33.0	21.0				
Max Q Clear Time (g_c+I1), s	12.8	34.4	6.2	48.3	37.0	37.0	35.0	23.0				
Green Ext Time (p_c), s	0.0	15.3	0.0	0.0	0.0	0.0	0.0	0.0				
Intersection Summary												
HCM 2010 Ctrl Delay	132.3											
HCM 2010 LOS	F											

HCM 2010 Signalized Intersection Summary

8B: Bruce Rd & E 20th St

Cumulative Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	550	580	410	50	210	110	580	790	150	130	650	270
Future Volume (veh/h)	550	580	410	50	210	110	580	790	150	130	650	270
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	585	617	163	53	223	100	617	840	45	138	691	61
Adj No. of Lanes	2	1	1	2	1	0	2	2	1	1	2	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	639	669	569	174	272	122	671	1216	530	165	856	383
Arrive On Green	0.19	0.36	0.36	0.05	0.23	0.23	0.20	0.35	0.34	0.09	0.24	0.24
Sat Flow, veh/h	3408	1845	1568	3408	1201	538	3408	3505	1568	1757	3505	1568
Grp Volume(v), veh/h	585	617	163	53	0	323	617	840	45	138	691	61
Grp Sat Flow(s),veh/h/ln	1704	1845	1568	1704	0	1739	1704	1752	1568	1757	1752	1568
Q Serve(g_s), s	18.6	35.3	8.2	1.7	0.0	19.5	19.6	22.7	2.2	8.5	20.5	3.4
Cycle Q Clear(g_c), s	18.6	35.3	8.2	1.7	0.0	19.5	19.6	22.7	2.2	8.5	20.5	3.4
Prop In Lane	1.00		1.00	1.00		0.31	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	639	669	569	174	0	394	671	1216	530	165	856	383
V/C Ratio(X)	0.92	0.92	0.29	0.31	0.00	0.82	0.92	0.69	0.08	0.83	0.81	0.16
Avail Cap(c_a), veh/h	680	769	654	216	0	489	711	1216	530	207	890	398
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.9	33.6	25.0	50.4	0.0	40.5	43.4	30.9	24.9	49.1	39.2	32.8
Incr Delay (d2), s/veh	15.9	14.3	0.1	0.4	0.0	7.2	16.1	1.9	0.1	17.3	5.7	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.1	20.7	3.6	0.8	0.0	10.1	10.7	11.3	1.0	4.9	10.6	1.5
LnGrp Delay(d),s/veh	59.9	47.9	25.1	50.8	0.0	47.8	59.6	32.8	25.0	66.4	44.9	33.0
LnGrp LOS	E	D	C	D		D	E	C	C	E	D	C
Approach Vol, veh/h	1365				376			1502			890	
Approach Delay, s/veh	50.3				48.2			43.6			47.4	
Approach LOS	D				D			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	14.4	42.3	9.6	44.0	25.7	30.9	24.7	29.0				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	13.0	37.0	7.0	46.0	23.0	27.0	22.0	31.0				
Max Q Clear Time (g_c+I1), s	10.5	24.7	3.7	37.3	21.6	22.5	20.6	21.5				
Green Ext Time (p_c), s	0.0	9.1	0.0	2.7	0.1	3.5	0.1	2.8				
Intersection Summary												
HCM 2010 Ctrl Delay	47.0											
HCM 2010 LOS	D											

HCM 2010 Signalized Intersection Summary

8C: Bruce Rd & E 20th St

Cumulative Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	550	580	410	50	210	110	580	790	150	130	650	270
Future Volume (veh/h)	550	580	410	50	210	110	580	790	150	130	650	270
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1900	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	585	617	158	53	223	54	617	840	46	138	691	63
Adj No. of Lanes	2	1	1	1	2	0	2	2	1	1	2	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	639	668	568	90	632	150	671	1218	531	165	858	384
Arrive On Green	0.19	0.36	0.36	0.05	0.23	0.23	0.20	0.35	0.34	0.09	0.24	0.24
Sat Flow, veh/h	3408	1845	1568	1757	2804	664	3408	3505	1568	1757	3505	1568
Grp Volume(v), veh/h	585	617	158	53	137	140	617	840	46	138	691	63
Grp Sat Flow(s),veh/h/ln	1704	1845	1568	1757	1752	1715	1704	1752	1568	1757	1752	1568
Q Serve(g_s), s	18.5	35.3	7.9	3.3	7.3	7.6	19.5	22.6	2.2	8.5	20.4	3.5
Cycle Q Clear(g_c), s	18.5	35.3	7.9	3.3	7.3	7.6	19.5	22.6	2.2	8.5	20.4	3.5
Prop In Lane	1.00		1.00	1.00		0.39	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	639	668	568	90	395	387	671	1218	531	165	858	384
V/C Ratio(X)	0.91	0.92	0.28	0.59	0.35	0.36	0.92	0.69	0.09	0.83	0.81	0.16
Avail Cap(c_a), veh/h	681	771	655	112	493	483	712	1218	531	207	891	399
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.9	33.7	24.9	51.1	35.8	35.9	43.4	30.8	24.8	49.0	39.1	32.7
Incr Delay (d2), s/veh	15.9	14.5	0.1	2.3	0.2	0.2	16.1	1.9	0.1	17.2	5.6	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.1	20.7	3.4	1.6	3.5	3.6	10.7	11.3	1.0	4.9	10.6	1.5
LnGrp Delay(d),s/veh	59.7	48.2	25.0	53.4	36.0	36.2	59.4	32.7	24.9	66.2	44.7	33.0
LnGrp LOS	E	D	C	D	D	D	E	C	C	E	D	C
Approach Vol, veh/h	1360				330				1503			
Approach Delay, s/veh	50.4				38.9				43.4			
Approach LOS	D				D				D			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	14.4	42.3	9.6	43.9	25.7	30.9	24.7	28.8				
Change Period (Y+Rc), s	4.0	5.0	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	13.0	37.0	7.0	46.0	23.0	27.0	22.0	31.0				
Max Q Clear Time (g_c+I1), s	10.5	24.6	5.3	37.3	21.5	22.4	20.5	9.6				
Green Ext Time (p_c), s	0.0	9.2	0.0	2.6	0.1	3.5	0.1	3.5				
Intersection Summary												
HCM 2010 Ctrl Delay	46.2											
HCM 2010 LOS	D											

Intersection						
Int Delay, s/veh	0.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	20	340	10	30	270
Future Vol, veh/h	10	20	340	10	30	270
Conflicting Peds, #/hr	0	1	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	21	362	11	32	287
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	718	368	0	0	372	0
Stage 1	367	-	-	-	-	-
Stage 2	351	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	396	677	-	-	1186	-
Stage 1	701	-	-	-	-	-
Stage 2	713	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	383	676	-	-	1185	-
Mov Cap-2 Maneuver	492	-	-	-	-	-
Stage 1	701	-	-	-	-	-
Stage 2	690	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	11.3		0		0.8	
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 601	1185	-		
HCM Lane V/C Ratio	-	- 0.053	0.027	-		
HCM Control Delay (s)	-	- 11.3	8.1	0		
HCM Lane LOS	-	- B	A	A		
HCM 95th %tile Q(veh)	-	- 0.2	0.1	-		

Intersection						
Int Delay, s/veh	0.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	10	340	20	20	240
Future Vol, veh/h	20	10	340	20	20	240
Conflicting Peds, #/hr	0	0	0	1	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	11	362	21	21	255
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	671	373	0	0	384	0
Stage 1	373	-	-	-	-	-
Stage 2	298	-	-	-	-	-
Critical Hdwy	7.12	6.22	-	-	4.12	-
Critical Hdwy Stg 1	6.12	-	-	-	-	-
Critical Hdwy Stg 2	6.12	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	370	673	-	-	1174	-
Stage 1	648	-	-	-	-	-
Stage 2	711	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	365	672	-	-	1174	-
Mov Cap-2 Maneuver	473	-	-	-	-	-
Stage 1	648	-	-	-	-	-
Stage 2	698	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	12.3		0		0.6	
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 525	1174	-		
HCM Lane V/C Ratio	-	- 0.061	0.018	-		
HCM Control Delay (s)	-	- 12.3	8.1	-		
HCM Lane LOS	-	- B	A	-		
HCM 95th %tile Q(veh)	-	- 0.2	0.1	-		

Intersection

Int Delay, s/veh 0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	30	10	360	50	20	240
Future Vol, veh/h	30	10	360	50	20	240
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	32	11	383	53	21	255

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	708	410	0	0	436	0
Stage 1	410	-	-	-	-	-
Stage 2	298	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	401	642	-	-	1124	-
Stage 1	670	-	-	-	-	-
Stage 2	753	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	394	642	-	-	1124	-
Mov Cap-2 Maneuver	500	-	-	-	-	-
Stage 1	670	-	-	-	-	-
Stage 2	739	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.4	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	529	1124
HCM Lane V/C Ratio	-	-	0.08	0.019
HCM Control Delay (s)	-	-	12.4	8.3
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1

HCM 2010 Signalized Intersection Summary

12: Notre Dame Blvd & Forest Ave

Cumulative Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	140	400	30	90	40	370	320	20	20	200	60
Future Volume (veh/h)	50	140	400	30	90	40	370	320	20	20	200	60
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	53	149	63	32	96	27	394	340	18	21	213	37
Adj No. of Lanes	1	1	2	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	94	342	498	52	222	62	429	1446	76	25	592	101
Arrive On Green	0.05	0.18	0.18	0.03	0.16	0.16	0.24	0.42	0.42	0.01	0.20	0.20
Sat Flow, veh/h	1774	1863	2708	1774	1387	390	1774	3415	180	1774	3023	517
Grp Volume(v), veh/h	53	149	63	32	0	123	394	176	182	21	123	127
Grp Sat Flow(s),veh/h/ln	1774	1863	1354	1774	0	1777	1774	1770	1825	1774	1770	1771
Q Serve(g_s), s	1.3	3.2	0.9	0.8	0.0	2.9	9.9	2.9	2.9	0.5	2.8	2.8
Cycle Q Clear(g_c), s	1.3	3.2	0.9	0.8	0.0	2.9	9.9	2.9	2.9	0.5	2.8	2.8
Prop In Lane	1.00		1.00	1.00		0.22	1.00		0.10	1.00		0.29
Lane Grp Cap(c), veh/h	94	342	498	52	0	284	429	750	773	25	347	347
V/C Ratio(X)	0.56	0.44	0.13	0.62	0.00	0.43	0.92	0.23	0.24	0.85	0.36	0.37
Avail Cap(c_a), veh/h	814	1098	1597	620	0	932	1007	1237	1276	620	1044	1044
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	21.2	16.6	15.6	22.0	0.0	17.4	16.9	8.4	8.5	22.5	15.9	15.9
Incr Delay (d2), s/veh	1.9	0.3	0.0	4.3	0.0	0.4	3.5	0.2	0.2	23.7	0.6	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	1.7	0.3	0.5	0.0	1.4	5.2	1.4	1.5	0.4	1.4	1.4
LnGrp Delay(d),s/veh	23.1	16.9	15.7	26.3	0.0	17.7	20.4	8.6	8.6	46.2	16.5	16.6
LnGrp LOS	C	B	B	C		B	C	A	A	D	B	B
Approach Vol, veh/h	265				155				752			
Approach Delay, s/veh	17.8				19.5				14.8			
Approach LOS	B				B				B			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	6.4	11.3	4.6	23.4	5.3	12.4	15.1	13.0				
Change Period (Y+Rc), s	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0				
Max Green Setting (Gmax), s	22.0	24.0	17.0	32.0	17.0	27.0	27.0	27.0				
Max Q Clear Time (g_c+l1), s	3.3	4.9	2.5	4.9	2.8	5.2	11.9	4.8				
Green Ext Time (p_c), s	0.0	1.1	0.0	3.8	0.0	1.1	0.2	3.6				
Intersection Summary												
HCM 2010 Ctrl Delay	16.6											
HCM 2010 LOS	B											
Notes												

Intersection

Int Delay, s/veh 6071.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↙	↕		↙	↕	
Traffic Vol, veh/h	110	15	150	270	30	140	30	1070	220	90	960	40
Future Vol, veh/h	110	15	150	270	30	140	30	1070	220	90	960	40
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	3	2	3	3	3	2	2	3	3	2	2
Mvmt Flow	117	16	160	287	32	149	32	1138	234	96	1021	43

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1883	2670	532	2029	2574	686	1064	0	0	1372	0	0
Stage 1	1234	1234	-	1319	1319	-	-	-	-	-	-	-
Stage 2	649	1436	-	710	1255	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.56	6.94	7.56	6.56	6.96	4.14	-	-	4.16	-	-
Critical Hdwy Stg 1	6.54	5.56	-	6.56	5.56	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.56	-	6.56	5.56	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.03	3.32	3.53	4.03	3.33	2.22	-	-	2.23	-	-
Pot Cap-1 Maneuver	~ 43	22	492	~ 33	~ 25	388	651	-	-	491	-	-
Stage 1	187	245	-	~ 164	223	-	-	-	-	-	-	-
Stage 2	425	195	-	388	239	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	17	492	~ 3	~ 19	388	651	-	-	491	-	-
Mov Cap-2 Maneuver	-	17	-	~ 3	~ 19	-	-	-	-	-	-	-
Stage 1	178	197	-	~ 156	212	-	-	-	-	-	-	-
Stage 2	212	185	-	~ 194	192	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s		\$ 43118.2	0.2	1.2
HCM LOS	-	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	651	-	-	- 5	491	-	-
HCM Lane V/C Ratio	0.049	-	-	- 93.617	0.195	-	-
HCM Control Delay (s)	10.8	-	-	\$ 43118.2	14.1	-	-
HCM Lane LOS	B	-	-	F	B	-	-
HCM 95th %tile Q(veh)	0.2	-	-	60.8	0.7	-	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 2010 Signalized Intersection Summary

13B: Bruce Rd & Raley Blvd

Cumulative Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	110	30	150	270	30	140	30	1070	220	90	960	40
Future Volume (veh/h)	110	30	150	270	30	140	30	1070	220	90	960	40
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1861	1900	1900	1845	1900	1863	1860	1900	1845	1863	1900
Adj Flow Rate, veh/h	117	32	131	287	32	136	32	1138	221	96	1021	41
Adj No. of Lanes	0	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	2	2	2	3	2	2
Cap, veh/h	122	33	136	275	31	130	41	1176	227	97	1493	60
Arrive On Green	0.17	0.17	0.17	0.26	0.26	0.26	0.02	0.40	0.40	0.06	0.43	0.43
Sat Flow, veh/h	705	193	789	1073	120	509	1774	2955	571	1757	3468	139
Grp Volume(v), veh/h	280	0	0	455	0	0	32	678	681	96	521	541
Grp Sat Flow(s),veh/h/ln	1686	0	0	1701	0	0	1774	1767	1759	1757	1770	1838
Q Serve(g_s), s	23.8	0.0	0.0	37.0	0.0	0.0	2.6	54.2	55.0	7.9	34.3	34.3
Cycle Q Clear(g_c), s	23.8	0.0	0.0	37.0	0.0	0.0	2.6	54.2	55.0	7.9	34.3	34.3
Prop In Lane	0.42		0.47	0.63		0.30	1.00		0.32	1.00		0.08
Lane Grp Cap(c), veh/h	292	0	0	436	0	0	41	703	700	97	761	791
V/C Ratio(X)	0.96	0.00	0.00	1.04	0.00	0.00	0.78	0.96	0.97	0.99	0.68	0.68
Avail Cap(c_a), veh/h	292	0	0	436	0	0	86	709	706	97	761	791
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	59.3	0.0	0.0	53.8	0.0	0.0	70.2	42.5	42.7	68.2	33.2	33.2
Incr Delay (d2), s/veh	41.7	0.0	0.0	55.2	0.0	0.0	27.0	25.2	27.0	86.9	2.5	2.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	14.5	0.0	0.0	24.0	0.0	0.0	1.6	31.3	31.9	6.2	17.3	18.0
LnGrp Delay(d),s/veh	101.0	0.0	0.0	109.0	0.0	0.0	97.2	67.7	69.8	155.1	35.8	35.7
LnGrp LOS	F			F			F	E	E	F	D	D
Approach Vol, veh/h	280			455			1391			1158		
Approach Delay, s/veh	101.0			109.0			69.4			45.6		
Approach LOS	F			F			E			D		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.0	62.5		29.0	7.3	67.2		41.0				
Change Period (Y+Rc), s	4.0	5.0		4.0	4.0	5.0		4.0				
Max Green Setting (Gmax), s	8.0	58.0		25.0	7.0	59.0		37.0				
Max Q Clear Time (g_c+I1), s	9.9	57.0		25.8	4.6	36.3		39.0				
Green Ext Time (p_c), s	0.0	0.6		0.0	0.0	16.2		0.0				
Intersection Summary												
HCM 2010 Ctrl Delay				69.2								
HCM 2010 LOS				E								

HCM 2010 Signalized Intersection Summary

14: SR 99 SB Ramps & Skyway Rd

Cumulative Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑		↑↑	↑				↑↑		↑
Traffic Volume (veh/h)	0	1580	300	0	760	220	0	0	0	860	0	270
Future Volume (veh/h)	0	1580	300	0	760	220	0	0	0	860	0	270
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	0	1845	1845				1845	0	1845
Adj Flow Rate, veh/h	0	1681	0	0	809	0				915	0	184
Adj No. of Lanes	0	2	1	0	2	1				2	0	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	3	3	0	3	3				3	0	3
Cap, veh/h	0	1936	866	0	1936	866				1070	0	492
Arrive On Green	0.00	0.55	0.00	0.00	0.55	0.00				0.31	0.00	0.31
Sat Flow, veh/h	0	3597	1568	0	3597	1568				3408	0	1568
Grp Volume(v), veh/h	0	1681	0	0	809	0				915	0	184
Grp Sat Flow(s),veh/h/ln	0	1752	1568	0	1752	1568				1704	0	1568
Q Serve(g_s), s	0.0	24.7	0.0	0.0	8.0	0.0				15.1	0.0	5.5
Cycle Q Clear(g_c), s	0.0	24.7	0.0	0.0	8.0	0.0				15.1	0.0	5.5
Prop In Lane	0.00		1.00	0.00		1.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1936	866	0	1936	866				1070	0	492
V/C Ratio(X)	0.00	0.87	0.00	0.00	0.42	0.00				0.86	0.00	0.37
Avail Cap(c_a), veh/h	0	2989	1337	0	2989	1337				2052	0	944
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	11.5	0.0	0.0	7.8	0.0				19.2	0.0	15.9
Incr Delay (d2), s/veh	0.0	1.2	0.0	0.0	0.1	0.0				0.8	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	12.0	0.0	0.0	3.8	0.0				7.1	0.0	2.4
LnGrp Delay(d),s/veh	0.0	12.7	0.0	0.0	7.8	0.0				20.0	0.0	16.1
LnGrp LOS		B			A					C		B
Approach Vol, veh/h		1681			809						1099	
Approach Delay, s/veh		12.7			7.8						19.4	
Approach LOS		B			A						B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		37.0		22.8		37.0						
Change Period (Y+Rc), s		* 5		* 5		* 5						
Max Green Setting (Gmax), s		* 50		* 35		* 50						
Max Q Clear Time (g_c+I1), s		26.7		17.1		10.0						
Green Ext Time (p_c), s		5.4		0.7		5.6						
Intersection Summary												
HCM 2010 Ctrl Delay			13.6									
HCM 2010 LOS			B									
Notes												

HCM 2010 Signalized Intersection Summary

15: SR 99 NB Ramps & Skyway Rd

Cumulative Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕	↗		↕↕	↗	↗↗		↗			
Traffic Volume (veh/h)	0	1820	620	0	830	1120	150	0	270	0	0	0
Future Volume (veh/h)	0	1820	620	0	830	1120	150	0	270	0	0	0
Number	5	2	12	1	6	16	3	8	18			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	0	1845	1845	0	1845	1845	1845	0	1845			
Adj Flow Rate, veh/h	0	1936	0	0	883	0	160	0	266			
Adj No. of Lanes	0	2	1	0	2	1	2	0	1			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94			
Percent Heavy Veh, %	0	3	3	0	3	3	3	0	3			
Cap, veh/h	0	2306	1032	0	2306	1032	688	0	316			
Arrive On Green	0.00	0.66	0.00	0.00	0.66	0.00	0.20	0.00	0.20			
Sat Flow, veh/h	0	3597	1568	0	3597	1568	3408	0	1568			
Grp Volume(v), veh/h	0	1936	0	0	883	0	160	0	266			
Grp Sat Flow(s),veh/h/ln	0	1752	1568	0	1752	1568	1704	0	1568			
Q Serve(g_s), s	0.0	24.1	0.0	0.0	6.6	0.0	2.2	0.0	9.3			
Cycle Q Clear(g_c), s	0.0	24.1	0.0	0.0	6.6	0.0	2.2	0.0	9.3			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2306	1032	0	2306	1032	688	0	316			
V/C Ratio(X)	0.00	0.84	0.00	0.00	0.38	0.00	0.23	0.00	0.84			
Avail Cap(c_a), veh/h	0	3134	1402	0	3134	1402	1494	0	687			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	7.5	0.0	0.0	4.5	0.0	19.1	0.0	21.9			
Incr Delay (d2), s/veh	0.0	1.2	0.0	0.0	0.0	0.0	0.1	0.0	2.3			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.0	11.7	0.0	0.0	3.1	0.0	1.1	0.0	4.2			
LnGrp Delay(d),s/veh	0.0	8.6	0.0	0.0	4.5	0.0	19.1	0.0	24.2			
LnGrp LOS		A			A		B		C			
Approach Vol, veh/h	1936			883			426					
Approach Delay, s/veh	8.6			4.5			22.3					
Approach LOS	A			A			C					
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2						6	8				
Phs Duration (G+Y+Rc), s	41.5						41.5	15.5				
Change Period (Y+Rc), s	* 5						* 5	4.0				
Max Green Setting (Gmax), s	* 50						* 50	25.0				
Max Q Clear Time (g_c+I1), s	26.1						8.6	11.3				
Green Ext Time (p_c), s	10.4						12.2	0.2				
Intersection Summary												
HCM 2010 Ctrl Delay			9.3									
HCM 2010 LOS			A									
Notes												

HCM 2010 Signalized Intersection Summary

16: Notre Dame Blvd & Skyway Rd

Cumulative Plus Project
PM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (veh/h)	610	1250	230	50	1320	140	210	140	60	170	170	420	
Future Volume (veh/h)	610	1250	230	50	1320	140	210	140	60	170	170	420	
Number	5	2	12	1	6	16	3	8	18	7	4	14	
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.98	1.00		0.98	1.00		0.98	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1845	1845	1900	1845	1845	1845	
Adj Flow Rate, veh/h	649	1330	174	53	1404	88	223	149	51	181	181	309	
Adj No. of Lanes	2	3	1	1	3	1	2	1	0	1	1	2	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3	
Cap, veh/h	724	2498	980	94	1697	520	518	199	68	248	261	1102	
Arrive On Green	0.21	0.50	0.49	0.05	0.34	0.34	0.15	0.15	0.15	0.14	0.14	0.14	
Sat Flow, veh/h	3408	5036	1529	1757	5036	1543	3408	1306	447	1757	1845	3084	
Grp Volume(v), veh/h	649	1330	174	53	1404	88	223	0	200	181	181	309	
Grp Sat Flow(s),veh/h/ln	1704	1679	1529	1757	1679	1543	1704	0	1754	1757	1845	1542	
Q Serve(g_s), s	18.9	18.4	4.7	3.0	26.1	4.1	6.0	0.0	11.1	10.0	9.5	7.3	
Cycle Q Clear(g_c), s	18.9	18.4	4.7	3.0	26.1	4.1	6.0	0.0	11.1	10.0	9.5	7.3	
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.25	1.00		1.00	
Lane Grp Cap(c), veh/h	724	2498	980	94	1697	520	518	0	266	248	261	1102	
V/C Ratio(X)	0.90	0.53	0.18	0.56	0.83	0.17	0.43	0.00	0.75	0.73	0.69	0.28	
Avail Cap(c_a), veh/h	827	2498	980	432	2019	619	995	0	512	513	538	1566	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	
Uniform Delay (d), s/veh	39.0	17.6	7.6	47.0	31.0	23.7	39.2	0.0	41.3	41.8	41.6	23.6	
Incr Delay (d2), s/veh	11.5	0.2	0.1	5.2	2.6	0.2	0.6	0.0	4.2	4.1	3.3	0.1	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	10.0	8.5	2.9	1.6	12.5	1.8	2.9	0.0	5.7	5.2	5.1	3.1	
LnGrp Delay(d),s/veh	50.5	17.8	7.6	52.3	33.6	23.9	39.7	0.0	45.5	45.9	44.9	23.8	
LnGrp LOS	D	B	A	D	C	C	D		D	D	D	C	
Approach Vol, veh/h	2153				1545				423				671
Approach Delay, s/veh	26.8				33.7				42.5				35.4
Approach LOS	C				C				D				D
Timer	1	2	3	4	5	6	7	8					
Assigned Phs	1	2	4		5	6	8						
Phs Duration (G+Y+Rc), s	9.4	54.5	18.4		25.6	38.3	19.5						
Change Period (Y+Rc), s	4.0	4.8	3.7		3.7	4.8	3.7						
Max Green Setting (Gmax), s	25.0	40.0	30.0		25.0	40.0	30.0						
Max Q Clear Time (g_c+l1), s	5.0	20.4	12.0		20.9	28.1	13.1						
Green Ext Time (p_c), s	0.1	17.1	2.7		1.1	5.4	1.9						
Intersection Summary													
HCM 2010 Ctrl Delay			31.6										
HCM 2010 LOS			C										
Notes													

Intersection

Int Delay, s/veh 556.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	110	1350	50	80	1240	70	10	4	120	70	4	110
Future Vol, veh/h	110	1350	50	80	1240	70	10	4	120	70	4	110
Conflicting Peds, #/hr	0	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	250	-	-	150	-	-	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	117	1436	53	85	1319	74	11	4	128	74	4	117

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1395	0	0	1489	0	0	2529	3262	745	2482	3251	698
Stage 1	-	-	-	-	-	-	1697	1697	-	1528	1528	-
Stage 2	-	-	-	-	-	-	832	1565	-	954	1723	-
Critical Hdwy	4.16	-	-	4.16	-	-	7.56	6.56	6.96	7.56	6.56	6.96
Critical Hdwy Stg 1	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Follow-up Hdwy	2.23	-	-	2.23	-	-	3.53	4.03	3.33	3.53	4.03	3.33
Pot Cap-1 Maneuver	481	-	-	442	-	-	14	9	354	~ 15	9	381
Stage 1	-	-	-	-	-	-	95	145	-	122	176	-
Stage 2	-	-	-	-	-	-	328	169	-	276	141	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	481	-	-	442	-	-	~ 2	5	354	~ 2	5	381
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 2	5	-	~ 2	5	-
Stage 1	-	-	-	-	-	-	72	110	-	92	142	-
Stage 2	-	-	-	-	-	-	178	136	-	128	107	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0.9	\$ 2814.8	\$ 7659.3
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	22	481	-	-	442	-	-	2	105
HCM Lane V/C Ratio	6.48	0.243	-	-	0.193	-	-	37.234	1.155
HCM Control Delay (s)	\$ 2814.8	14.9	-	-	15.1	-	-	\$ 19787.5	212.1
HCM Lane LOS	F	B	-	-	C	-	-	F	F
HCM 95th %tile Q(veh)	18	0.9	-	-	0.7	-	-	11.5	7.8

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 2010 Signalized Intersection Summary

17B: Skyway Rd & Forest Ave

Cumulative Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	110	1350	50	80	1240	70	10	10	120	70	10	110
Future Volume (veh/h)	110	1350	50	80	1240	70	10	10	120	70	10	110
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1900	1845	1900	1845	1845	1900
Adj Flow Rate, veh/h	117	1436	52	85	1319	71	11	11	7	74	11	8
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	1	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	150	1996	72	110	1879	101	39	39	25	131	74	54
Arrive On Green	0.09	0.58	0.58	0.06	0.56	0.56	0.06	0.06	0.06	0.07	0.07	0.07
Sat Flow, veh/h	1757	3450	125	1757	3383	182	659	659	419	1757	994	723
Grp Volume(v), veh/h	117	728	760	85	682	708	29	0	0	74	0	19
Grp Sat Flow(s),veh/h/ln	1757	1752	1823	1757	1752	1812	1738	0	0	1757	0	1717
Q Serve(g_s), s	4.4	20.0	20.1	3.2	18.9	19.0	1.1	0.0	0.0	2.7	0.0	0.7
Cycle Q Clear(g_c), s	4.4	20.0	20.1	3.2	18.9	19.0	1.1	0.0	0.0	2.7	0.0	0.7
Prop In Lane	1.00		0.07	1.00		0.10	0.38		0.24	1.00		0.42
Lane Grp Cap(c), veh/h	150	1014	1054	110	973	1006	104	0	0	131	0	128
V/C Ratio(X)	0.78	0.72	0.72	0.78	0.70	0.70	0.28	0.00	0.00	0.57	0.00	0.15
Avail Cap(c_a), veh/h	289	1076	1119	289	1050	1086	703	0	0	711	0	694
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	29.9	10.1	10.2	30.8	10.8	10.8	30.0	0.0	0.0	29.9	0.0	28.9
Incr Delay (d2), s/veh	8.4	2.2	2.1	11.0	1.9	1.9	1.4	0.0	0.0	3.8	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	10.1	10.5	1.9	9.4	10.0	0.5	0.0	0.0	1.5	0.0	0.3
LnGrp Delay(d),s/veh	38.3	12.3	12.3	41.9	12.7	12.7	31.4	0.0	0.0	33.6	0.0	29.4
LnGrp LOS	D	B	B	D	B	B	C			C		C
Approach Vol, veh/h	1605				1475				29		93	
Approach Delay, s/veh	14.2				14.4				31.4		32.8	
Approach LOS	B				B				C		C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2		3	4	6		7	8				
Phs Duration (G+Y+Rc), s	7.0		8.2	43.6	8.0		9.7	42.1				
Change Period (Y+Rc), s	3.0		4.0	* 5	3.0		4.0	5.0				
Max Green Setting (Gmax), s	27.0		11.0	* 41	27.0		11.0	40.0				
Max Q Clear Time (g_c+I1), s	3.1		5.2	22.1	4.7		6.4	21.0				
Green Ext Time (p_c), s	0.1		0.1	16.0	0.3		0.1	16.1				
Intersection Summary												
HCM 2010 Ctrl Delay	15.0											
HCM 2010 LOS	B											
Notes												
* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 2010 Signalized Intersection Summary

18: Skyway Rd & Bruce Rd

Cumulative Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	530	960	30	40	840	680	60	110	90	870	60	450
Future Volume (veh/h)	530	960	30	40	840	680	60	110	90	870	60	450
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1845	1845	1845	1900	1845	1845	1845
Adj Flow Rate, veh/h	564	1021	31	43	894	599	64	117	74	972	0	205
Adj No. of Lanes	2	2	0	1	2	1	1	1	0	2	0	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	586	1461	44	60	991	875	232	139	88	1032	0	460
Arrive On Green	0.17	0.42	0.41	0.03	0.28	0.26	0.13	0.13	0.13	0.29	0.00	0.29
Sat Flow, veh/h	3408	3473	105	1757	3505	1568	1757	1051	665	3514	0	1565
Grp Volume(v), veh/h	564	515	537	43	894	599	64	0	191	972	0	205
Grp Sat Flow(s),veh/h/ln	1704	1752	1826	1757	1752	1568	1757	0	1716	1757	0	1565
Q Serve(g_s), s	22.0	32.3	32.3	3.2	32.9	35.4	4.4	0.0	14.6	36.2	0.0	14.3
Cycle Q Clear(g_c), s	22.0	32.3	32.3	3.2	32.9	35.4	4.4	0.0	14.6	36.2	0.0	14.3
Prop In Lane	1.00		0.06	1.00		1.00	1.00		0.39	1.00		1.00
Lane Grp Cap(c), veh/h	586	737	768	60	991	875	232	0	226	1032	0	460
V/C Ratio(X)	0.96	0.70	0.70	0.71	0.90	0.68	0.28	0.00	0.84	0.94	0.00	0.45
Avail Cap(c_a), veh/h	611	737	768	79	991	875	361	0	352	1170	0	521
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	55.0	31.9	31.9	64.0	46.2	20.9	52.4	0.0	56.9	46.2	0.0	38.4
Incr Delay (d2), s/veh	26.4	2.9	2.8	11.4	11.2	2.2	0.2	0.0	6.2	13.0	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.5	16.2	16.9	1.8	17.4	22.7	2.1	0.0	7.3	19.4	0.0	6.2
LnGrp Delay(d),s/veh	81.4	34.8	34.7	75.5	57.5	23.1	52.6	0.0	63.1	59.2	0.0	38.7
LnGrp LOS	F	C	C	E	E	C	D		E	E		D
Approach Vol, veh/h	1616				1536				255		1177	
Approach Delay, s/veh	51.0				44.6				60.5		55.6	
Approach LOS	D				D				E		E	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	8.6	60.4			43.4	27.0	41.9	21.7				
Change Period (Y+Rc), s	3.0	6.0			3.5	3.0	6.0	4.5				
Max Green Setting (Gmax), s	7.0	53.9			45.1	25.0	35.9	27.0				
Max Q Clear Time (g_c+I1), s	5.2	34.3			38.2	24.0	37.4	16.6				
Green Ext Time (p_c), s	0.0	14.1			1.7	0.0	0.0	0.6				
Intersection Summary												
HCM 2010 Ctrl Delay			50.6									
HCM 2010 LOS			D									
Notes												

HCM 2010 Signalized Intersection Summary

19: Bruce Rd & Webster Dr/Street G

Cumulative Plus Project
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	10	10	10	10	10	10	1380	10	20	1110	20
Future Volume (veh/h)	20	10	10	10	10	10	10	1380	10	20	1110	20
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	0.99		1.00	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1845	1900	1900	1845	1900	1845	1845	1900	1845	1845	1900
Adj Flow Rate, veh/h	21	11	0	11	11	0	11	1468	11	21	1181	20
Adj No. of Lanes	0	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	201	79	0	162	116	0	35	2149	16	62	2180	37
Arrive On Green	0.10	0.10	0.00	0.10	0.10	0.00	0.02	0.60	0.60	0.04	0.62	0.62
Sat Flow, veh/h	797	768	0	532	1127	0	1757	3565	27	1757	3525	60
Grp Volume(v), veh/h	32	0	0	22	0	0	11	721	758	21	587	614
Grp Sat Flow(s),veh/h/ln	1565	0	0	1658	0	0	1757	1752	1839	1757	1752	1832
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.3	14.0	14.0	0.6	9.7	9.7
Cycle Q Clear(g_c), s	0.8	0.0	0.0	0.5	0.0	0.0	0.3	14.0	14.0	0.6	9.7	9.7
Prop In Lane	0.66		0.00	0.50		0.00	1.00		0.01	1.00		0.03
Lane Grp Cap(c), veh/h	280	0	0	278	0	0	35	1056	1109	62	1084	1133
V/C Ratio(X)	0.11	0.00	0.00	0.08	0.00	0.00	0.32	0.68	0.68	0.34	0.54	0.54
Avail Cap(c_a), veh/h	872	0	0	898	0	0	245	1570	1648	245	1570	1642
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.6	0.0	0.0	20.5	0.0	0.0	24.3	6.7	6.7	23.6	5.5	5.5
Incr Delay (d2), s/veh	0.1	0.0	0.0	0.0	0.0	0.0	1.9	0.3	0.3	1.2	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.0	0.3	0.0	0.0	0.2	6.7	7.0	0.3	4.6	4.8
LnGrp Delay(d),s/veh	20.6	0.0	0.0	20.5	0.0	0.0	26.2	7.0	7.0	24.8	5.7	5.6
LnGrp LOS	C			C			C	A	A	C	A	A
Approach Vol, veh/h	32		22				1490			1222		
Approach Delay, s/veh	20.6		20.5				7.2			6.0		
Approach LOS	C		C				A			A		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	4		5	6	8					
Phs Duration (G+Y+Rc), s	5.8	35.3	9.2		5.0	36.1	9.2					
Change Period (Y+Rc), s	4.0	5.0	4.0		4.0	5.0	4.0					
Max Green Setting (Gmax), s	7.0	45.0	25.0		7.0	45.0	25.0					
Max Q Clear Time (g_c+l1), s	2.6	16.0	2.8		2.3	11.7	2.5					
Green Ext Time (p_c), s	0.0	14.3	0.1		0.0	15.2	0.1					
Intersection Summary												
HCM 2010 Ctrl Delay			6.9									
HCM 2010 LOS			A									

Intersection: 2: SR 99 SB Ramps & E 20th St

Movement	EB	EB	EB	WB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	R	L	L	T	T	L	LT	R	R
Maximum Queue (ft)	264	181	56	75	126	264	256	215	234	76	68
Average Queue (ft)	165	84	19	40	71	143	159	140	160	48	33
95th Queue (ft)	263	181	63	80	133	270	274	218	246	82	71
Link Distance (ft)	379	379				987	987		1959		
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)			110	280	280			490		425	425
Storage Blk Time (%)		2	0			0					
Queuing Penalty (veh)		2	0			1					

Intersection: 3: SR 99 NB Ramps & E 20th St

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	L	L	T	T	T	T	R	L	LT	R
Maximum Queue (ft)	102	103	183	225	275	339	224	73	86	211
Average Queue (ft)	54	61	101	134	191	198	179	31	54	129
95th Queue (ft)	112	111	198	247	299	363	262	75	92	220
Link Distance (ft)			987	987	393	393			1956	
Upstream Blk Time (%)						0				
Queuing Penalty (veh)						1				
Storage Bay Dist (ft)	260	260					200	550		550
Storage Blk Time (%)			0			2	7			
Queuing Penalty (veh)			0			17	35			

Intersection: 14: SR 99 SB Ramps & Skyway Rd

Movement	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	T	T	T	T	R	L	L	R
Maximum Queue (ft)	136	152	217	222	112	238	208	239
Average Queue (ft)	81	81	155	151	53	175	142	170
95th Queue (ft)	144	156	243	242	153	247	218	255
Link Distance (ft)	629	629	1030	1030			1546	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)					100	440		360
Storage Blk Time (%)				14	0			
Queuing Penalty (veh)				36	1			

Intersection: 15: SR 99 NB Ramps & Skyway Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	T	T	R	T	T	R	L	L	R
Maximum Queue (ft)	270	226	78	116	150	162	60	113	207
Average Queue (ft)	156	131	16	35	53	23	23	54	134
95th Queue (ft)	303	253	72	112	152	248	61	111	223
Link Distance (ft)	1030	1030		856	856	856		1886	
Upstream Blk Time (%)						0			
Queuing Penalty (veh)						0			
Storage Bay Dist (ft)			100				320		225
Storage Blk Time (%)		7	0						0
Queuing Penalty (veh)		15	0						1

Queuing and Blocking Report
Cumulative Plus Project

08/31/2017

Intersection: 2: SR 99 SB Ramps & E 20th St

Movement	EB	EB	EB	WB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	R	L	L	T	T	L	LT	R	R
Maximum Queue (ft)	422	415	135	142	168	256	284	460	946	344	105
Average Queue (ft)	402	394	88	89	109	137	162	328	434	142	62
95th Queue (ft)	421	439	181	158	181	289	309	494	1044	409	112
Link Distance (ft)	379	379				987	987		1959		
Upstream Blk Time (%)	64	34							2		
Queuing Penalty (veh)	0	0							0		
Storage Bay Dist (ft)			110	280	280			490		425	425
Storage Blk Time (%)		47	0			1		1	6	0	
Queuing Penalty (veh)		95	2			3		6	72	3	

Intersection: 3: SR 99 NB Ramps & E 20th St

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	L	L	T	T	T	T	R	L	LT	R
Maximum Queue (ft)	165	284	972	983	367	397	225	64	870	518
Average Queue (ft)	116	213	727	717	285	316	216	24	495	411
95th Queue (ft)	168	350	1133	1111	405	453	256	66	1566	669
Link Distance (ft)			987	987	393	393			1956	
Upstream Blk Time (%)			1	1	0	1			6	
Queuing Penalty (veh)			15	17	3	15			0	
Storage Bay Dist (ft)	260	260					200	550		550
Storage Blk Time (%)		0	32			6	25		1	28
Queuing Penalty (veh)		0	145			55	139		5	42

Intersection: 14: SR 99 SB Ramps & Skyway Rd

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	T	T	R	T	T	R	L	L	R
Maximum Queue (ft)	417	505	157	153	183	98	307	279	132
Average Queue (ft)	230	308	22	90	96	20	226	206	81
95th Queue (ft)	404	536	197	162	178	94	301	289	137
Link Distance (ft)	629	629		1030	1030			1546	
Upstream Blk Time (%)	0	1							
Queuing Penalty (veh)	0	0							
Storage Bay Dist (ft)			500			100	440		360
Storage Blk Time (%)		1	0		5	0		0	
Queuing Penalty (veh)		3	0		13	0		0	

Intersection: 15: SR 99 NB Ramps & Skyway Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	T	T	R	T	T	R	L	L	R
Maximum Queue (ft)	589	630	122	47	156	262	49	94	185
Average Queue (ft)	340	332	61	12	36	49	19	55	111
95th Queue (ft)	689	683	153	49	202	374	52	96	195
Link Distance (ft)	1030	1030		856	856	856			1886
Upstream Blk Time (%)	1	1				0			
Queuing Penalty (veh)	8	8				1			
Storage Bay Dist (ft)			100				320	320	
Storage Blk Time (%)		11	0						0
Queuing Penalty (veh)		73	4						0

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	South of Skyway Road
Alternative	Cumulative Plus Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,980	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	828	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,420	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,710	pcphpl
Average passenger-car speed, S	63.6	mph
Volume-to-capacity ratio, v/c	0.73	
Density, D	26.9	pcpmpl
Level of service, LOS	D	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Cumulative Plus Project
Time period	AM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,980	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	430	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>
Does adjacent ramp exist?	No		No
Volume on adjacent ramp		vph	
Type of adjacent ramp			
Distance to adjacent ramp		ft	

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,980	430		vph
Peak-hour factor, PHF	0.90	0.85		
Peak 15-min volume, v_{15}	828	126		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,420	513		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Cumulative Plus Project
Time period	AM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	3,420	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	3,420	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	2,907	pcph	4,700	pcph	No
Ramp volume, v_R	513	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	Actual		Maximum		Violation?
v_{12A}	3,420	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.78	
Density, D_R	32.8	pcpmpl
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.344	
Space mean speed in ramp influence area, S_R	57.1	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.1	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Between Skyway Road Ramps
Alternative	Cumulative Plus Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,550	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	708	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	2,927	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,463	pcphpl
Average passenger-car speed, S	64.9	mph
Volume-to-capacity ratio, v/c	0.62	
Density, D	22.5	pcpmpl
Level of service, LOS	C	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Cumulative Plus Project
Time period	AM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,550	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25	mph
Volume on ramp	180	vph
Length of acceleration lane(s)	250	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,550	180		vph
Peak-hour factor, PHF	0.90	0.85		
Peak 15-min volume, v_{15}	708	53		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	2,927	215		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Cumulative Plus Project
Time period	AM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	2,927	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	2,927	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,142	pcph	4,700	pcph	No
Ramp volume, v_R	215	pcph	1,900	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	3,142	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.68	pcpmpl
Density, D_R	28.3	
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.399	
Space mean speed in ramp influence area, S_R	55.8	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	55.8	mph

Leisch Method for Weaving Analysis

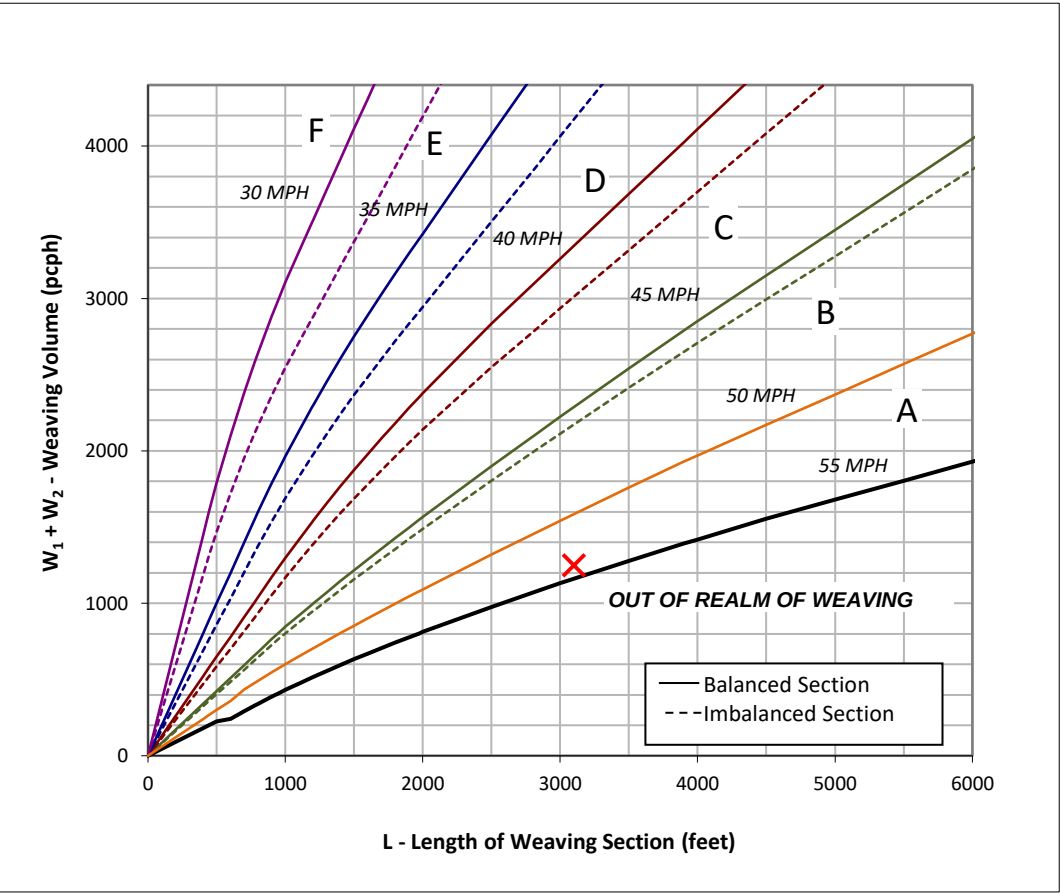
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,100

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative Plus Project - AM
Freeway	SR 99 NB
On-ramp	Skyway Road
Off-ramp	E 20th Street

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	3,640	Volume (vph)*	870	Volume (vph)*	360
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	3,760	Volume (pcph)	883	Volume (pcph)	365

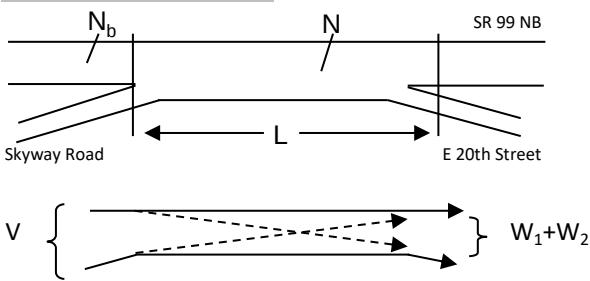


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF)**. The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections* , Jack E. Leisch & Associates, September 1983 and *Highway Design Manual* , California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	
	50 MPH and 55 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	54.0
4. Weaving Intensity Factor (k)	1.00
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,253
6. Level of Service (LOS)	D

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Between E 20th Street Ramps
Alternative	Cumulative Plus Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,240	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	900	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,719	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,859	pcphpl
Average passenger-car speed, S	62.0	mph
Volume-to-capacity ratio, v/c	0.79	
Density, D	30.0	pcpmpl
Level of service, LOS	D	

Leisch Method for Weaving Analysis

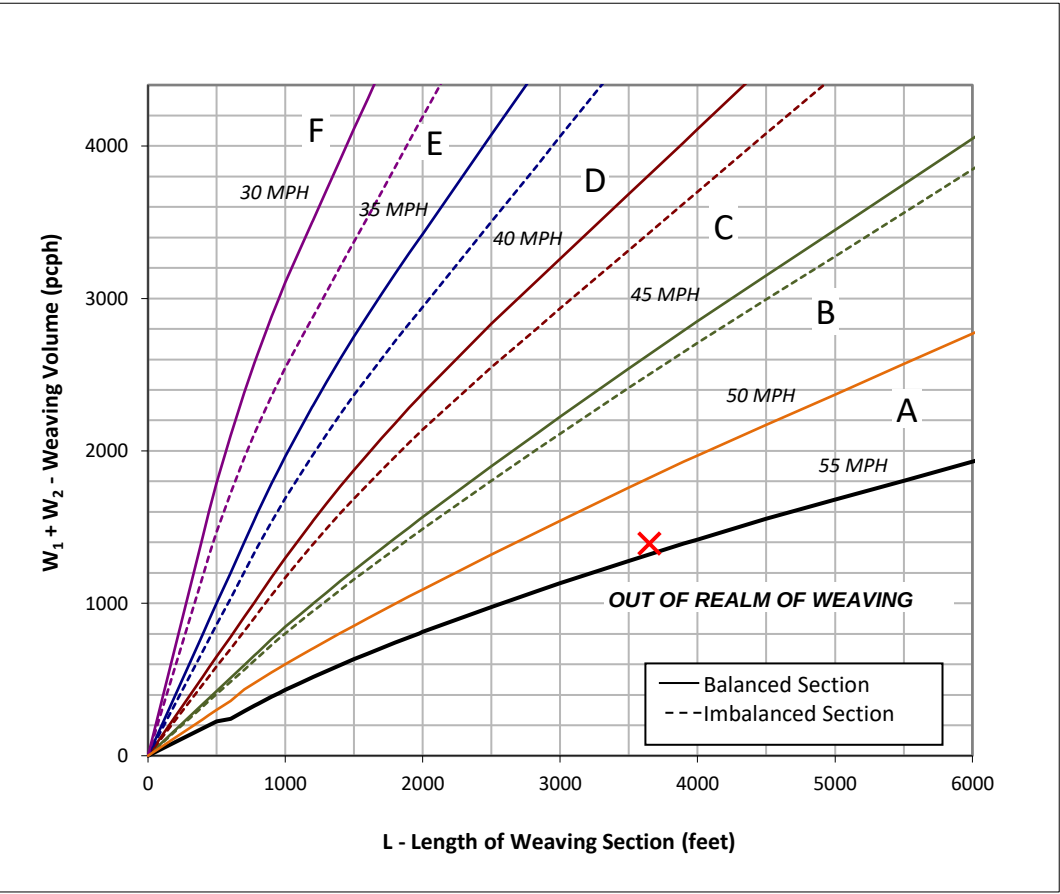
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,650

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative Plus Project - AM
Freeway	SR 99 NB
On-ramp	E 20th Street
Off-ramp	SR 32

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,100	Volume (vph)*	820	Volume (vph)*	550
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	4,235	Volume (pcph)	832	Volume (pcph)	558

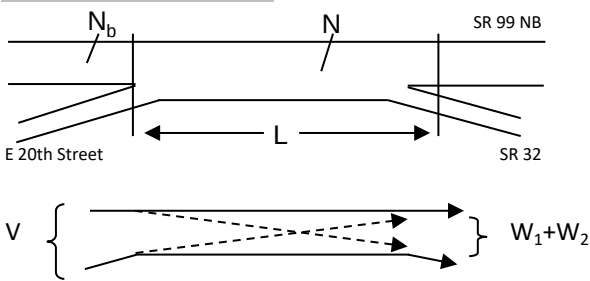


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections* , Jack E. Leisch & Associates, September 1983 and *Highway Design Manual* , California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	50 MPH and 55 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	54.3
4. Weaving Intensity Factor (k)	1.00
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,412
6. Level of Service (LOS)	D

Leisch Method for Weaving Analysis

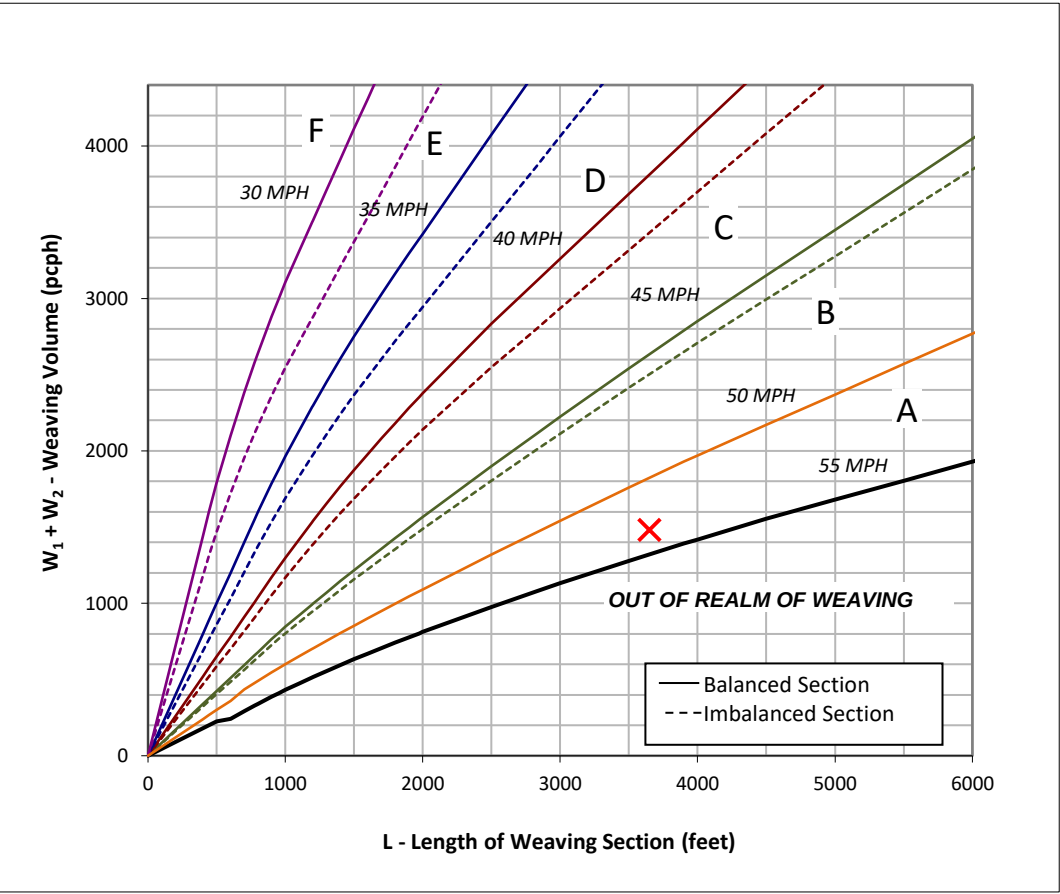
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,650

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative Plus Project - AM
Freeway	SR 99 SB
On-ramp	SR 32
Off-ramp	E 20th Street

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,970	Volume (vph)*	550	Volume (vph)*	910
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	5,134	Volume (pcph)	558	Volume (pcph)	924

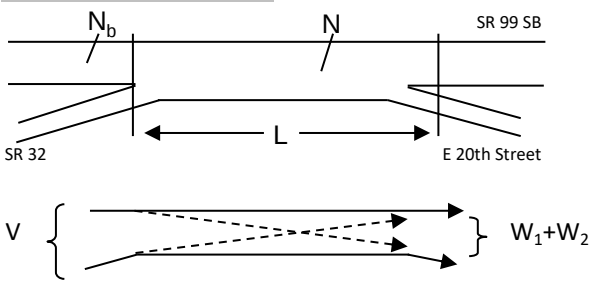


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections* , Jack E. Leisch & Associates, September 1983 and *Highway Design Manual* , California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	50 MPH and 55 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	53.4
4. Weaving Intensity Factor (k)	1.00
5. Service Volume (SV, pcph)	SV = $(1/N) * [V + (k - 1) * \min(W_1, W_2)]$
6. Level of Service (LOS)	E

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Between E 20th Street Ramps
Alternative	Cumulative Plus Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	4,010	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	1,114	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	4,603	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	2,301	pcphpl
Average passenger-car speed, S	53.5	mph
Volume-to-capacity ratio, v/c	0.98	
Density, D	43.0	pcpmpl
Level of service, LOS	E	

Leisch Method for Weaving Analysis

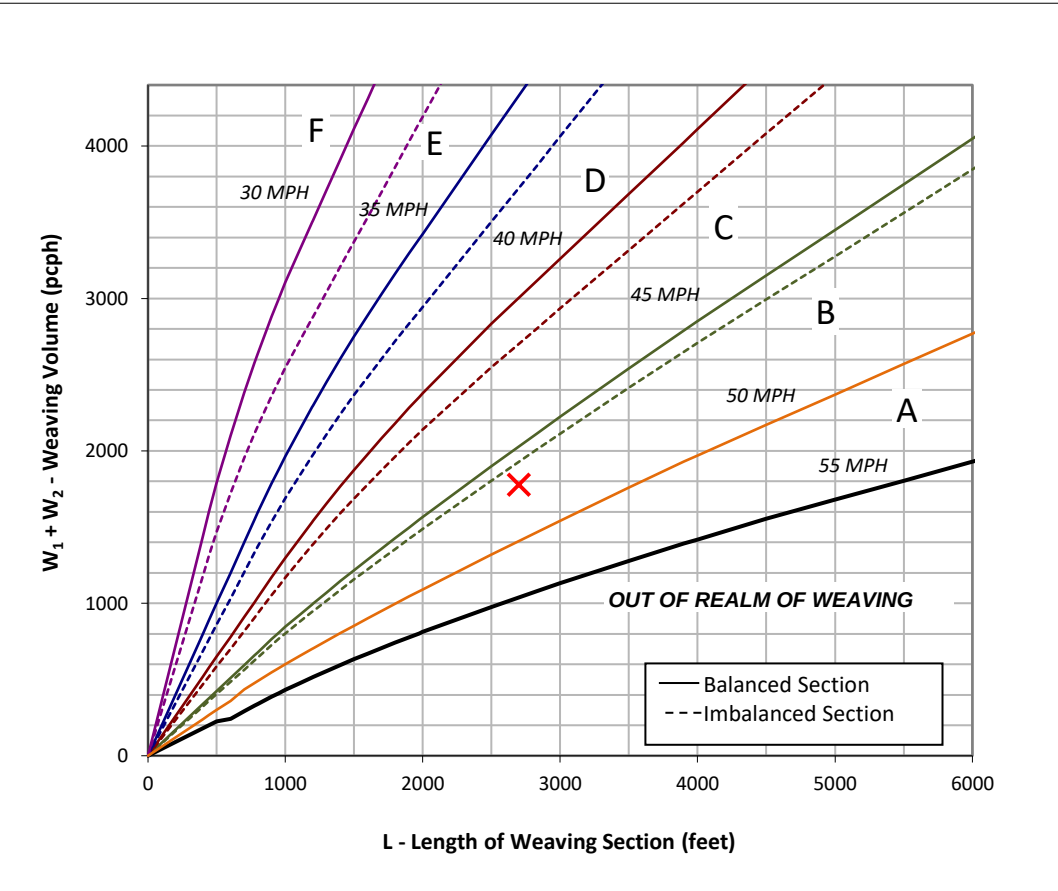
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	2,700

Project Information

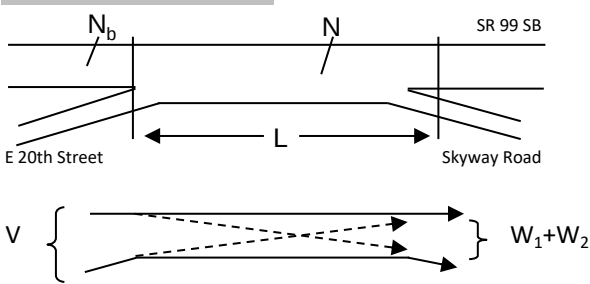
Project	Stonegate VTSM EIR
Scenario	Cumulative Plus Project - AM
Freeway	SR 99 SB
On-ramp	E 20th Street
Off-ramp	Skyway Road

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,340	Volume (vph)*	330	Volume (vph)*	1,420
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	4,483	Volume (pcph)	335	Volume (pcph)	1,441



The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.
* Note: **Do not adjust by a Peak Hour Factor (PHF)**. The methodology incorporates the PHF in the Service Volume tables.
Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections* , Jack E. Leisch & Associates, September 1983 and *Highway Design Manual* , California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	45 MPH and 50 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	46.5
4. Weaving Intensity Factor (k)	2.27
5. Service Volume (SV, pcph) $SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	1,636
6. Level of Service (LOS)	E

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Between Skyway Road Ramps
Alternative	Cumulative Plus Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,920	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	811	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,352	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,676	pcphpl
Average passenger-car speed, S	63.9	mph
Volume-to-capacity ratio, v/c	0.71	
Density, D	26.2	pcpmpl
Level of service, LOS	D	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Cumulative Plus Project
Time period	AM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,920	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25	mph
Volume on ramp	230	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,920	230		vph
Peak-hour factor, PHF	0.90	0.82		
Peak 15-min volume, v_{15}	811	70		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,352	285		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Cumulative Plus Project
Time period	AM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	3,352	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	3,352	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,636	pcph	4,700	pcph	No
Ramp volume, v_R	285	pcph	1,900	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	3,636	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.79	pcpmpl
Density, D_R	31.2	
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.449	
Space mean speed in ramp influence area, S_R	54.7	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	54.7	mph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road On Ramp
Alternative	Cumulative Plus Project
Time period	AM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	3,150	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	160	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	3,150	160		vph
Peak-hour factor, PHF	0.90	0.82		
Peak 15-min volume, v_{15}	875	49		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,616	198		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road On Ramp
Alternative	Cumulative Plus Project
Time period	AM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	3,616	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	3,616	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,814	pcph	4,700	pcph	No
Ramp volume, v_R	198	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	3,814	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.83	pcpmpl
Density, D_R	32.6	
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.462	
Space mean speed in ramp influence area, S_R	54.4	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	54.4	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	South of Skyway Road
Alternative	Cumulative Plus Project
Time period	AM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,310	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	919	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,799	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,900	pcphpl
Average passenger-car speed, S	61.5	mph
Volume-to-capacity ratio, v/c	0.81	
Density, D	30.9	pcpmpl
Level of service, LOS	D	

Leisch Method for Weaving Analysis

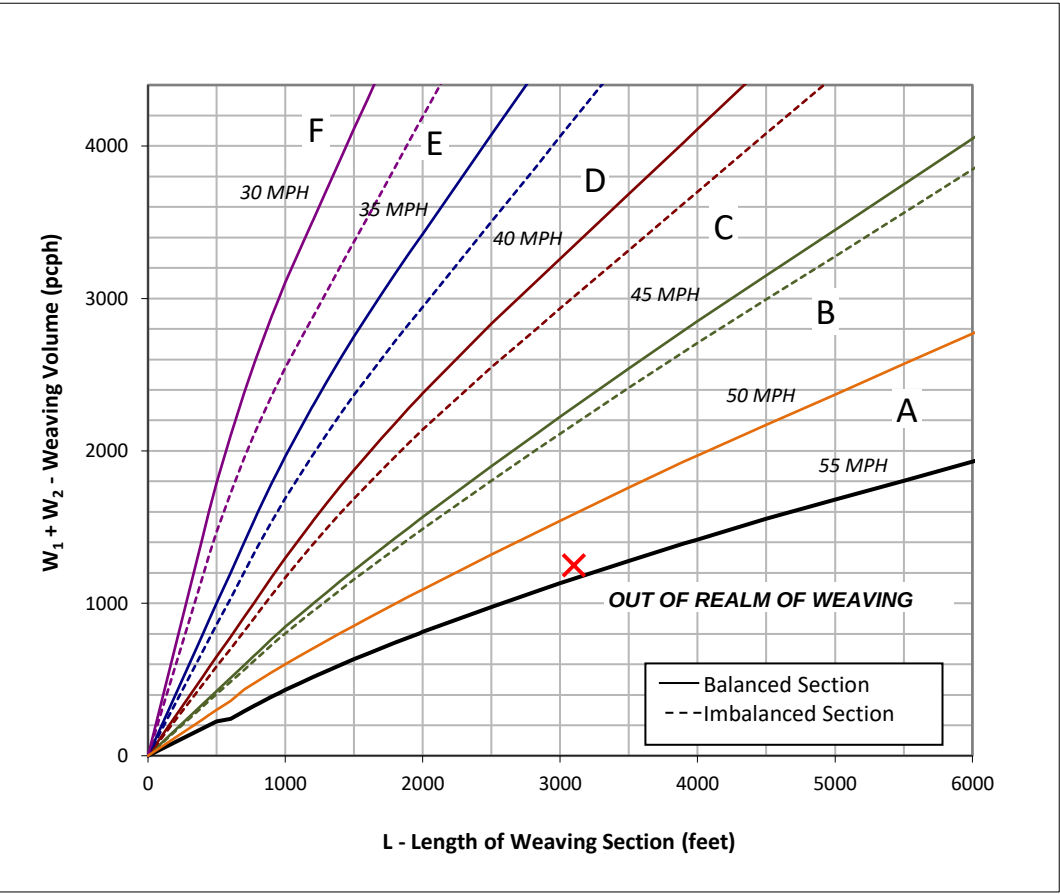
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,100

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative Plus Project - AM
Freeway	SR 99 NB
On-ramp	Skyway Road
Off-ramp	E 20th Street

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	3,640	Volume (vph)*	870	Volume (vph)*	360
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	3,760	Volume (pcph)	883	Volume (pcph)	365

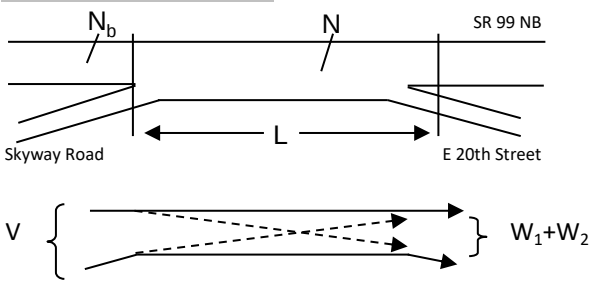


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983 and *Highway Design Manual*, California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	
	50 MPH and 55 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	54.0
4. Weaving Intensity Factor (k)	1.00
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,253
6. Level of Service (LOS)	D

Leisch Method for Weaving Analysis

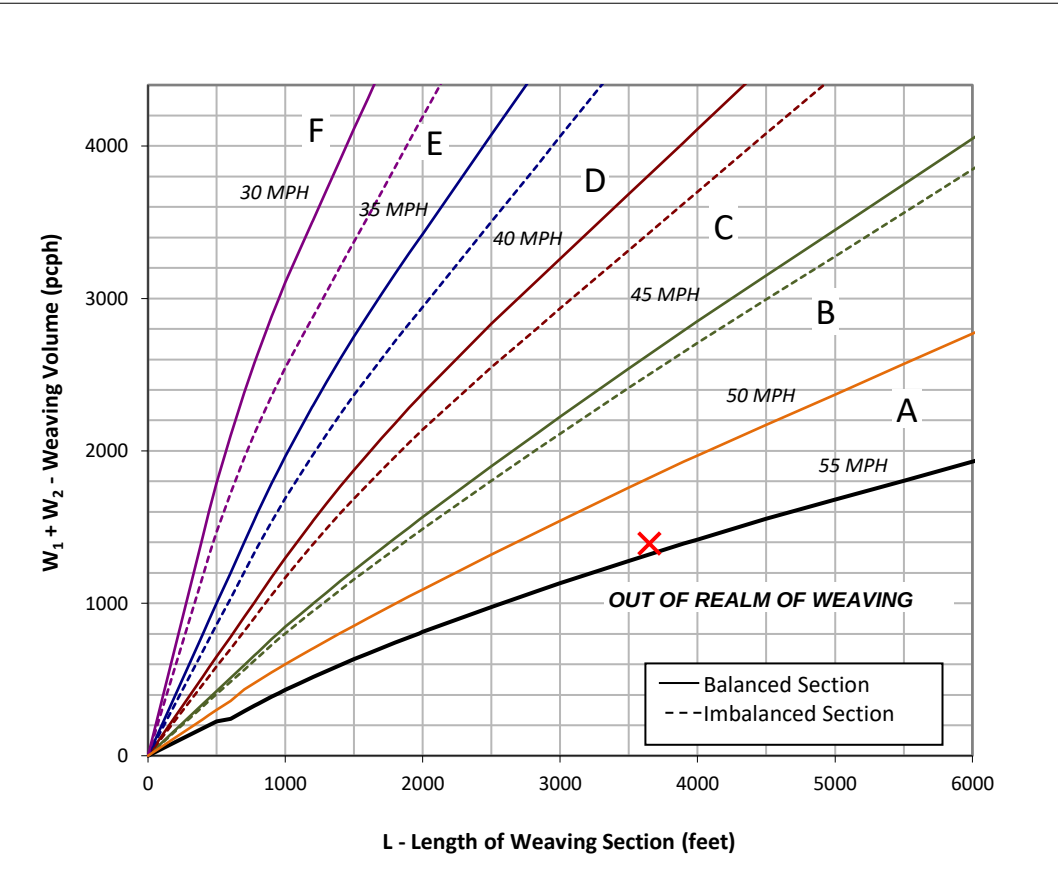
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,650

Project Information

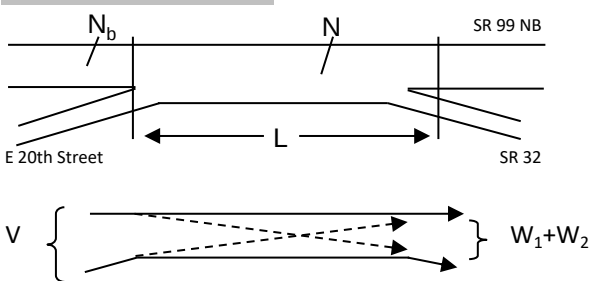
Project	Stonegate VTSM EIR
Scenario	Cumulative Plus Project - AM
Freeway	SR 99 NB
On-ramp	E 20th Street
Off-ramp	SR 32

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,100	Volume (vph)*	820	Volume (vph)*	550
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	4,235	Volume (pcph)	832	Volume (pcph)	558



The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.
* Note: **Do not adjust by a Peak Hour Factor (PHF)**. The methodology incorporates the PHF in the Service Volume tables.
Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections* , Jack E. Leisch & Associates, September 1983 and *Highway Design Manual* , California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	50 MPH and 55 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	54.3
4. Weaving Intensity Factor (k)	1.00
5. Service Volume (SV, pcph)	1,412
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
6. Level of Service (LOS)	D

Leisch Method for Weaving Analysis

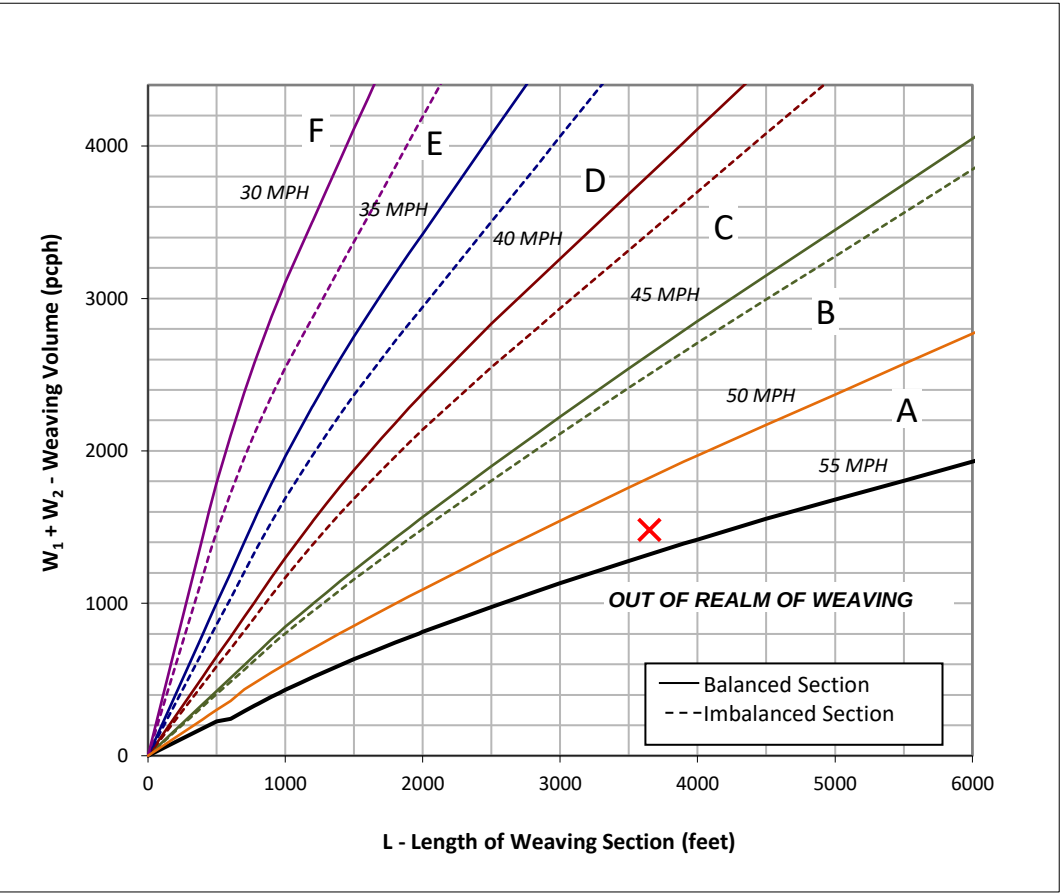
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,650

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative Plus Project - AM
Freeway	SR 99 SB
On-ramp	SR 32
Off-ramp	E 20th Street

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,970	Volume (vph)*	550	Volume (vph)*	910
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	5,134	Volume (pcph)	558	Volume (pcph)	924

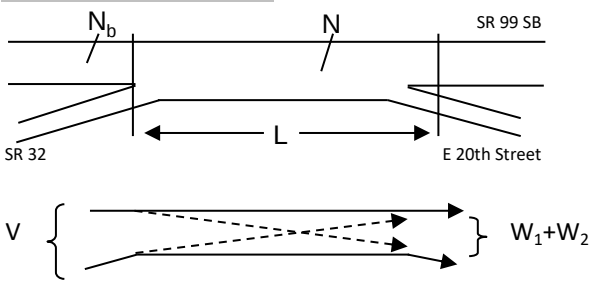


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections* , Jack E. Leisch & Associates, September 1983 and *Highway Design Manual* , California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	
	50 MPH and 55 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	53.4
4. Weaving Intensity Factor (k)	1.00
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,711
6. Level of Service (LOS)	E

Leisch Method for Weaving Analysis

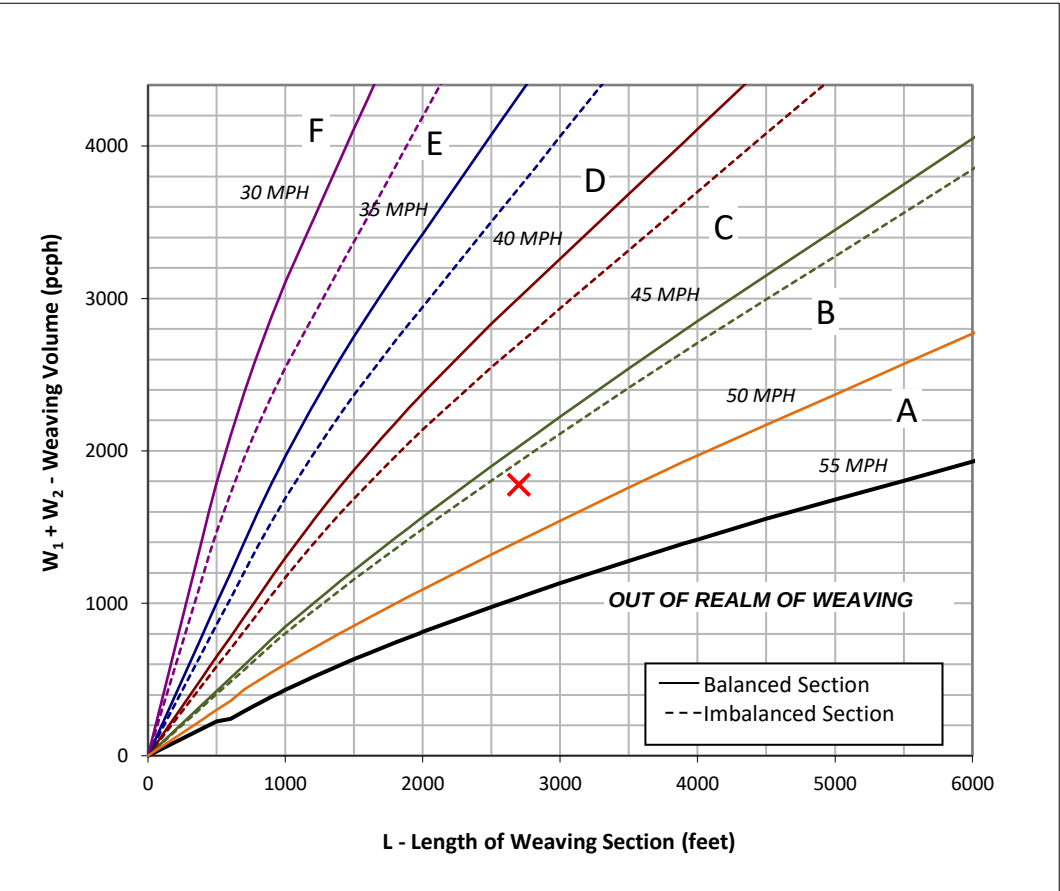
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	2,700

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative Plus Project - AM
Freeway	SR 99 SB
On-ramp	E 20th Street
Off-ramp	Skyway Road

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,340	Volume (vph)*	330	Volume (vph)*	1,420
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	4,483	Volume (pcph)	335	Volume (pcph)	1,441

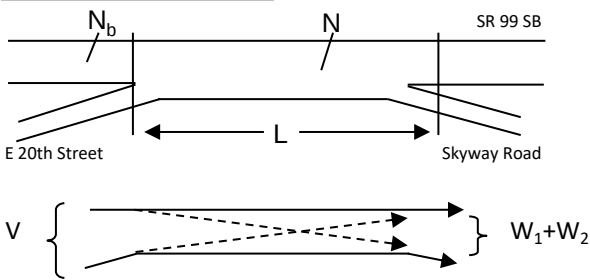


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983 and *Highway Design Manual*, California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	
	45 MPH and 50 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	46.5
4. Weaving Intensity Factor (k)	2.27
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,636
6. Level of Service (LOS)	E

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	South of Skyway Road
Alternative	Cumulative Plus Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,080	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	856	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,535	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,768	pcphpl
Average passenger-car speed, S	63.1	mph
Volume-to-capacity ratio, v/c	0.75	
Density, D	28.0	pcpmpl
Level of service, LOS	D	

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Cumulative Plus Project
Time period	PM Peak Hour

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	3,080	vph

Off Ramp Data

Type of diverge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	410	vph
Length of deceleration lane(s)	100	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	3,080	410		vph
Peak-hour factor, PHF	0.90	0.95		
Peak 15-min volume, v_{15}	856	108		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,535	438		pcph

HCM 2010: Freeway Diverge Segment

Diverge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Off Ramp
Alternative	Cumulative Plus Project
Time period	PM Peak Hour

Estimation of Volume in Diverge Area

L_{EQ} =		ft	(Equation 13-12 or 13-13)
P_{FM} =	1.000		(Equation 13-9, 13-10, or 13-11)
v_{12} =	3,535	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	3,535	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,097	pcph	4,700	pcph	No
Ramp volume, v_R	438	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, v_{12A} =	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Diverge Influence Area

	Actual		Maximum		Violation?
v_{12A}	3,535	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.80	
Density, D_R	33.8	pcpmpl
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.337	
Space mean speed in ramp influence area, S_R	57.2	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	57.2	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Between Skyway Road Ramps
Alternative	Cumulative Plus Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,670	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	742	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,065	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,532	pcphpl
Average passenger-car speed, S	64.8	mph
Volume-to-capacity ratio, v/c	0.65	
Density, D	23.7	pcpmpl
Level of service, LOS	C	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Cumulative Plus Project
Time period	PM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,670	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25	mph
Volume on ramp	620	vph
Length of acceleration lane(s)	250	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,670	620		vph
Peak-hour factor, PHF	0.90	0.95		
Peak 15-min volume, v_{15}	742	163		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,065	662		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Cumulative Plus Project
Time period	PM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	3,065	pcph	

Capacity Checks

	Actual		Maximum		LOS F?
Entering freeway volume, v_{Fi}	3,065	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,727	pcph	4,700	pcph	No
Ramp volume, v_R	662	pcph	1,900	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	Actual		Maximum		Violation?
v_{R12}	3,727	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.81	pcpmpl
Density, D_R	32.7	
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.471	
Space mean speed in ramp influence area, S_R	54.2	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	54.2	mph

Leisch Method for Weaving Analysis

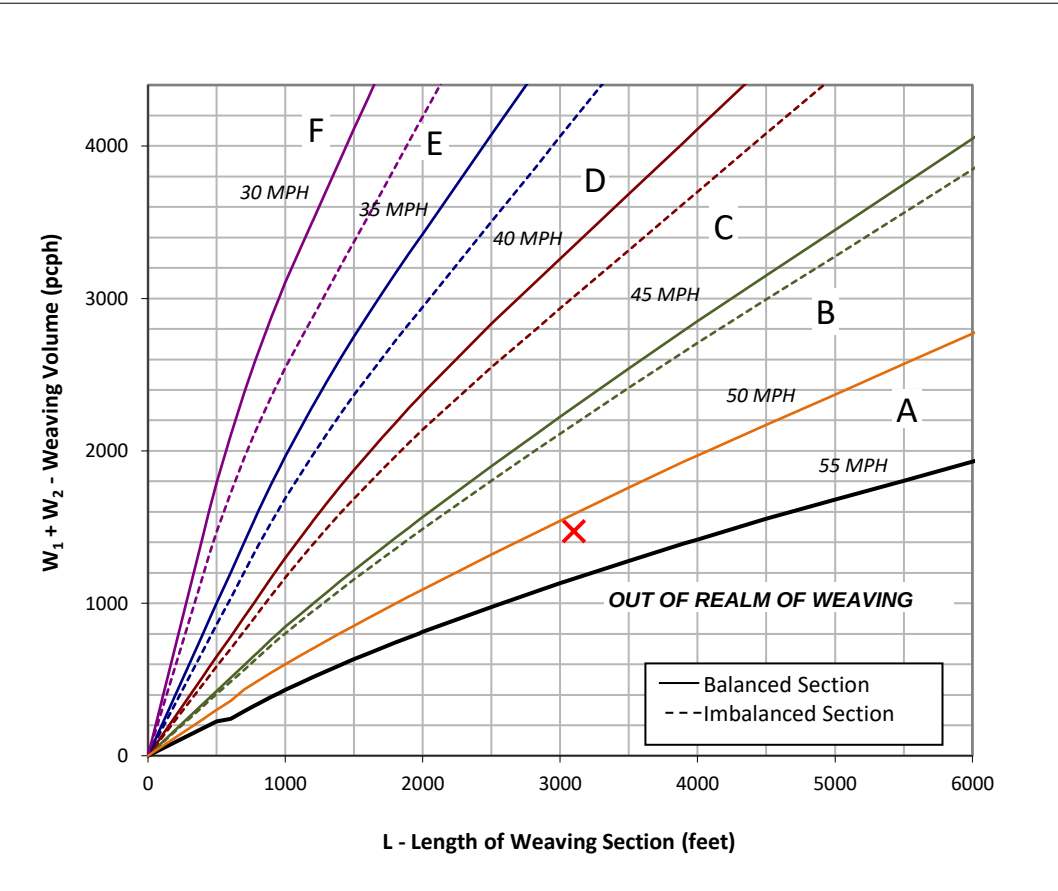
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,100

Project Information

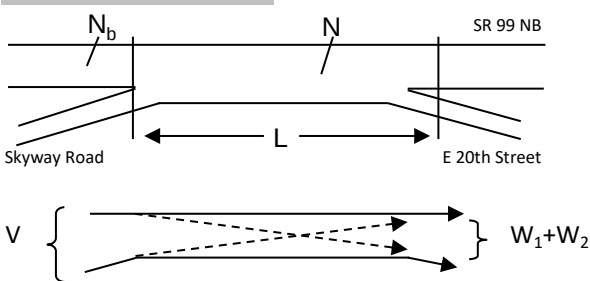
Project	Stonegate VTSM EIR
Scenario	Cumulative Plus Project - PM
Freeway	SR 99 NB
On-ramp	Skyway Road
Off-ramp	E 20th Street

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,410	Volume (vph)*	1,050	Volume (vph)*	400
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	4,556	Volume (pcph)	1,066	Volume (pcph)	406



The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.
* Note: **Do not adjust by a Peak Hour Factor (PHF)**. The methodology incorporates the PHF in the Service Volume tables.
Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983 and *Highway Design Manual*, California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	50 MPH and 55 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	51.3
4. Weaving Intensity Factor (k)	1.00
5. Service Volume (SV, pcph)	1,519
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
6. Level of Service (LOS)	D

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Northbound SR 99
Segment	Between E 20th Street Ramps
Alternative	Cumulative Plus Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,940	vph
Peak-hour factor, PHF	0.96	
Peak 15-min volume, v_{15}	1,026	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	4,240	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	2,120	pcphpl
Average passenger-car speed, S	57.7	mph
Volume-to-capacity ratio, v/c	0.90	
Density, D	36.8	pcpmpl
Level of service, LOS	E	

Leisch Method for Weaving Analysis

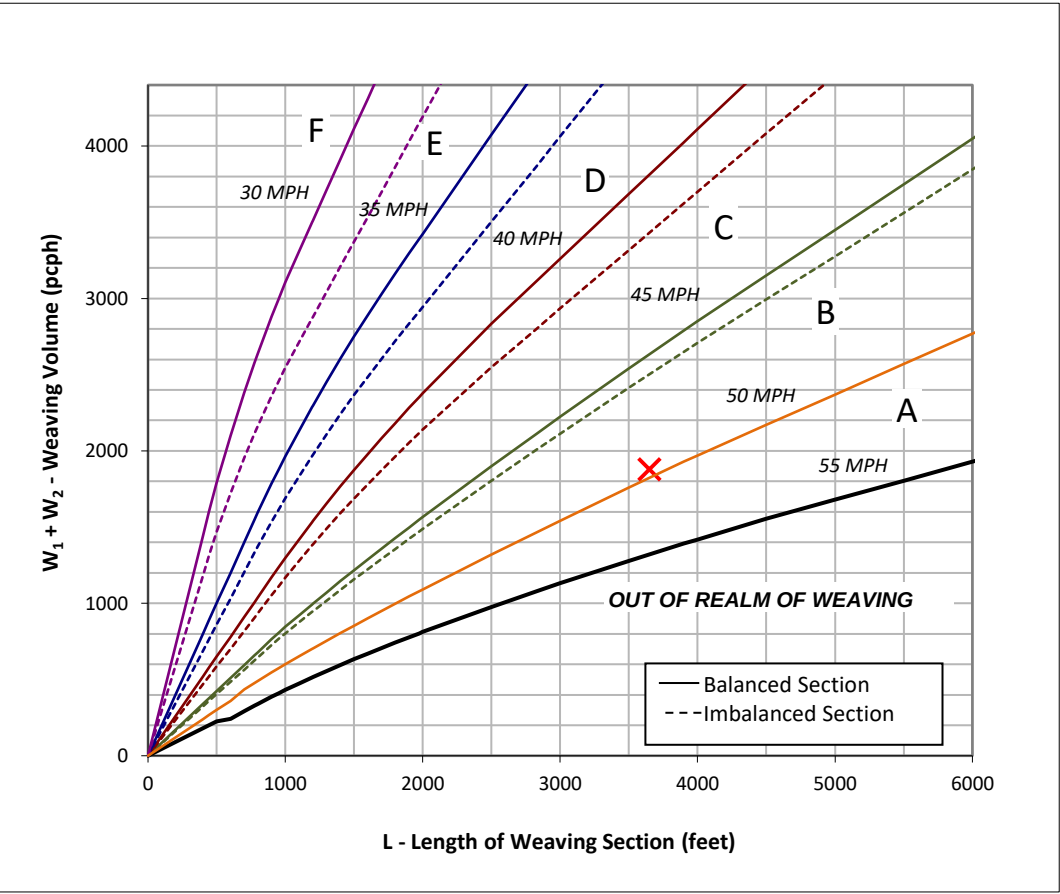
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,650

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative Plus Project - PM
Freeway	SR 99 NB
On-ramp	E 20th Street
Off-ramp	SR 32

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	5,290	Volume (vph)*	1,250	Volume (vph)*	600
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	5,465	Volume (pcph)	1,269	Volume (pcph)	609

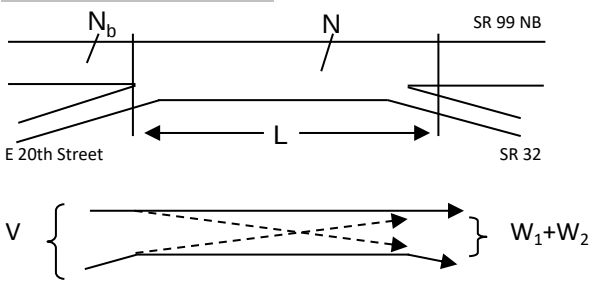


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF)**. The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983 and *Highway Design Manual*, California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	
	45 MPH and 50 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	49.6
4. Weaving Intensity Factor (k)	1.02
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,825
6. Level of Service (LOS)	E

Leisch Method for Weaving Analysis

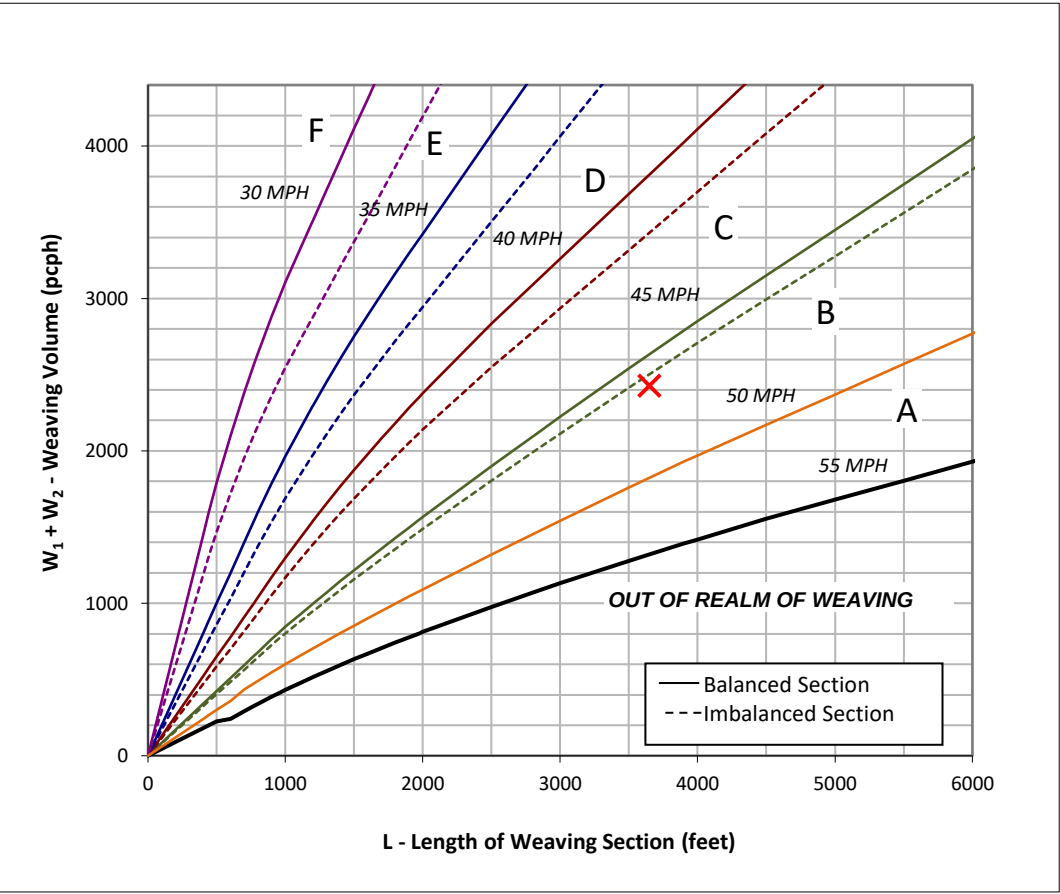
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,650

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative Plus Project - PM
Freeway	SR 99 SB
On-ramp	SR 32
Off-ramp	E 20th Street

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	5,110	Volume (vph)*	850	Volume (vph)*	1,540
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	5,279	Volume (pcph)	863	Volume (pcph)	1,563

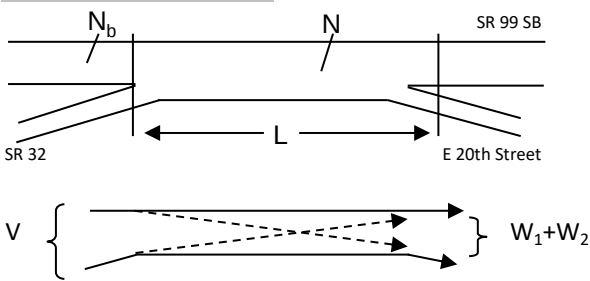


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections* , Jack E. Leisch & Associates, September 1983 and *Highway Design Manual* , California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
<i>If optional exit lane, then "Y". Otherwise "N".</i>	
2. In the chart to the left, which two speed curves is the red "x" between?	
	45 MPH and 50 MPH
<i>If left of the 30 MPH curve, LOS is F. Select "-".</i>	
<i>If below the 55 MPH curve, out of the realm of weaving.</i>	
3. Interpolated Weaving Speed (S_w , mph)	45.6
4. Weaving Intensity Factor (k)	1.69
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,959
6. Level of Service (LOS)	F

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Between E 20th Street Ramps
Alternative	Cumulative Plus Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,520	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	978	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	4,040	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	2,020	pcphpl
Average passenger-car speed, S	59.5	mph
Volume-to-capacity ratio, v/c	0.86	
Density, D	33.9	pcpmpl
Level of service, LOS	D	

Leisch Method for Weaving Analysis

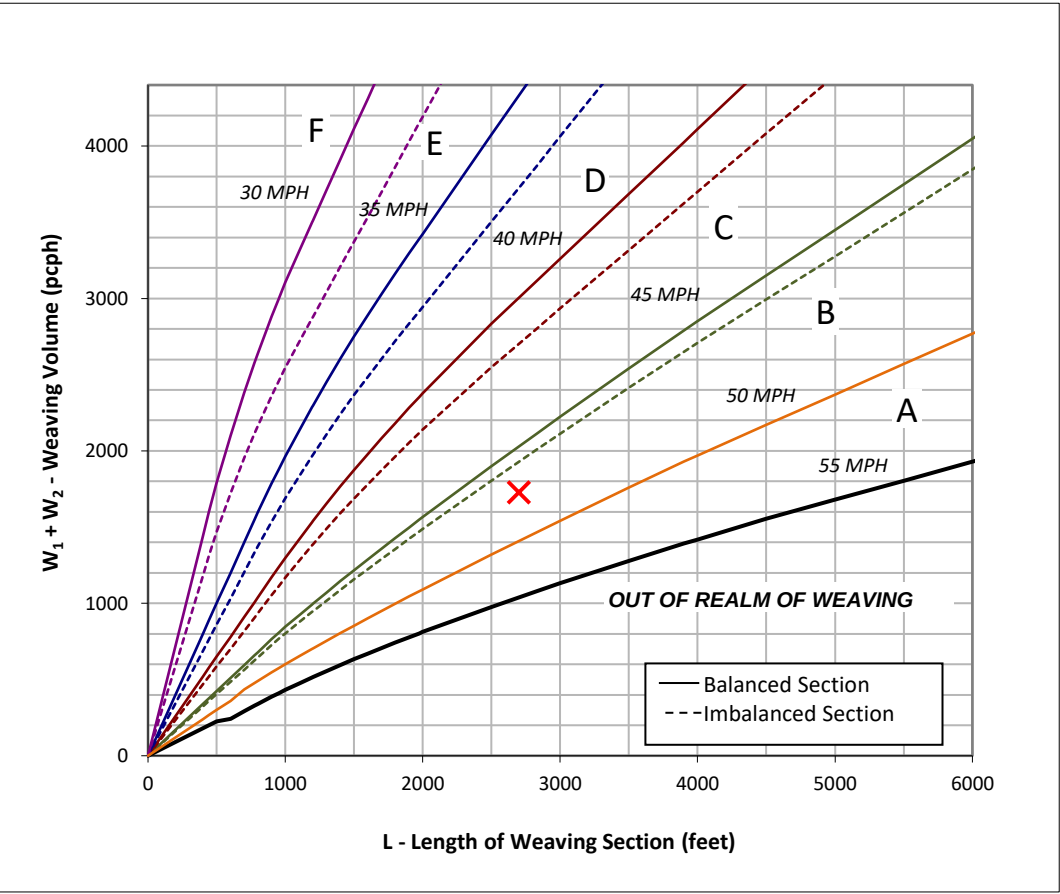
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	2,700

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative Plus Project - PM
Freeway	SR 99 SB
On-ramp	E 20th Street
Off-ramp	Skyway Road

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,080	Volume (vph)*	560	Volume (vph)*	1,140
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	4,215	Volume (pcph)	568	Volume (pcph)	1,157

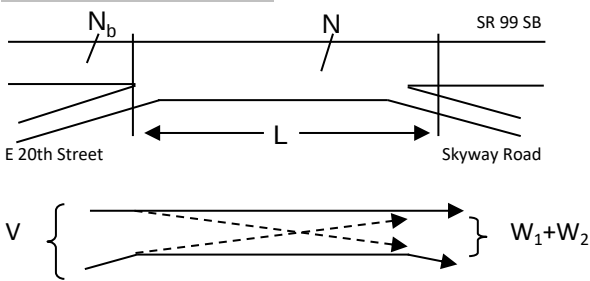


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983 and *Highway Design Manual*, California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	
	45 MPH and 50 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	47.0
4. Weaving Intensity Factor (k)	1.41
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,483
6. Level of Service (LOS)	D

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Between Skyway Road Ramps
Alternative	Cumulative Plus Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	2,940	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	817	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,374	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	5.0	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.6	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	74.8	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,687	pcphpl
Average passenger-car speed, S	63.8	mph
Volume-to-capacity ratio, v/c	0.72	
Density, D	26.4	pcpmpl
Level of service, LOS	D	

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Cumulative Plus Project
Time period	PM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	2,940	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25	mph
Volume on ramp	220	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	2,940	220		vph
Peak-hour factor, PHF	0.90	0.95		
Peak 15-min volume, v_{15}	817	58		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,374	235		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road Loop On Ramp
Alternative	Cumulative Plus Project
Time period	PM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	3,374	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	3,374	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,610	pcph	4,700	pcph	No
Ramp volume, v_R	235	pcph	1,900	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	3,610	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.78	pcpmpl
Density, D_R	31.0	
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.445	
Space mean speed in ramp influence area, S_R	54.8	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	54.8	mph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road On Ramp
Alternative	Cumulative Plus Project
Time period	PM Peak Hour

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65	mph
Volume on freeway	3,160	vph

On Ramp Data

Type of merge	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45	mph
Volume on ramp	300	vph
Length of acceleration lane(s)	400	ft

Adjacent Ramp Data

	<u>Upstream</u>		<u>Downstream</u>	
Does adjacent ramp exist?	No		No	
Volume on adjacent ramp		vph		vph
Type of adjacent ramp				
Distance to adjacent ramp		ft		ft

Conversion to pcph Under Base Conditions

<u>Junction Components</u>	<u>Freeway</u>	<u>Ramp</u>	<u>Adj. Ramp</u>	
Volume, V	3,160	300		vph
Peak-hour factor, PHF	0.90	0.95		
Peak 15-min volume, v_{15}	878	79		veh
Trucks and buses	6.6%	3.0%		
Recreational vehicles	0.0%	0.0%		
Terrain type	Level	Level		
Grade				
Length				mi
Trucks and buses PCE, E_T	1.5	1.5		
Recreational vehicle PCE, E_R	1.2	1.2		
Heavy vehicle adjustment, f_{HV}	0.968	0.985		
Driver population factor, f_p	1.00	1.00		
Flow rate, v_p	3,627	321		pcph

HCM 2010: Freeway Merge Segment

Merge Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	Skyway Road On Ramp
Alternative	Cumulative Plus Project
Time period	PM Peak Hour

Estimation of Volume in Merge Area

L_{EQ} =		ft	(Equation 13-6 or 13-7)
P_{FM} =	1.000		(Equation 13-3, 13-4, or 13-5)
v_{12} =	3,627	pcph	

Capacity Checks

	<u>Actual</u>		<u>Maximum</u>		<u>LOS F?</u>
Entering freeway volume, v_{Fi}	3,627	pcph	4,700	pcph	No
Exiting freeway volume, v_{FO}	3,948	pcph	4,700	pcph	No
Ramp volume, v_R	321	pcph	2,100	pcph	No
Outer lanes volume, v_3 or v_{av34}	#VALUE!	pcph	(Equation 13-14 or 13-17)		
Is v_3 or $v_{av34} > 2,700$ pcph?	#VALUE!				
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$?	#VALUE!				
If yes, $v_{12A} =$	#VALUE!	pcph	(Equation 13-15, 13-16, 13-18, or 13-19)		

Flow Entering Merge Influence Area

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
v_{R12}	3,948	pcph	4,600	pcph	No

Level of Service Determination

Volume-to-capacity ratio, v/c	0.86	pcpmpl
Density, D_R	33.6	
Level of service for ramp-freeway junction area of influence	D	

Speed Estimation

Intermediate speed variable, M_S or D_S	0.487	
Space mean speed in ramp influence area, S_R	53.8	mph
Space mean speed in outer lanes, S_O		mph
Space mean speed for all vehicles, S	53.8	mph

HCM 2010: Freeway Basic Segment

Basic Operational Analysis

Project	Stonegate VTSM EIR
Freeway	Southbound SR 99
Segment	South of Skyway Road
Alternative	Cumulative Plus Project
Time period	PM Peak Hour

Flow Inputs and Adjustments

Volume, V	3,460	vph
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v_{15}	961	veh
Trucks and buses	6.6%	
Recreational vehicles	0.0%	
Terrain type	Level	
Grade		
Length		mi
Trucks and buses PCE, E_T	1.5	
Recreational vehicle PCE, E_R	1.2	
Heavy vehicle adjustment, f_{HV}	0.968	
Driver population factor, f_p	1.00	
Flow rate, v_p	3,971	pcph
Number of lanes, N	2	

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	>6	ft
Total ramp density, TRD	0.00	ramps/mi
Lane width adjustment, f_{LW}	0.0	mph
Lateral clearance adjustment, f_{LC}	0.0	mph
TRD adjustment	0.0	mph
Calculated free-flow speed, FFS	75.4	mph
Measured free-flow speed, FFS	65.0	mph
Free-flow speed curve	65	mph

Capacity Checks for Segments with Ramps

	<u>Actual</u>		<u>Maximum</u>		<u>Violation?</u>
Entering freeway volume		pcph		pcph	
Exiting freeway volume		pcph		pcph	
On-ramp volume		pcph		pcph	
Off-ramp volume		pcph		pcph	

LOS and Performance Measures

Flow rate, v_p	1,986	pcphpl
Average passenger-car speed, S	60.1	mph
Volume-to-capacity ratio, v/c	0.84	
Density, D	33.0	pcpmpl
Level of service, LOS	D	

Leisch Method for Weaving Analysis

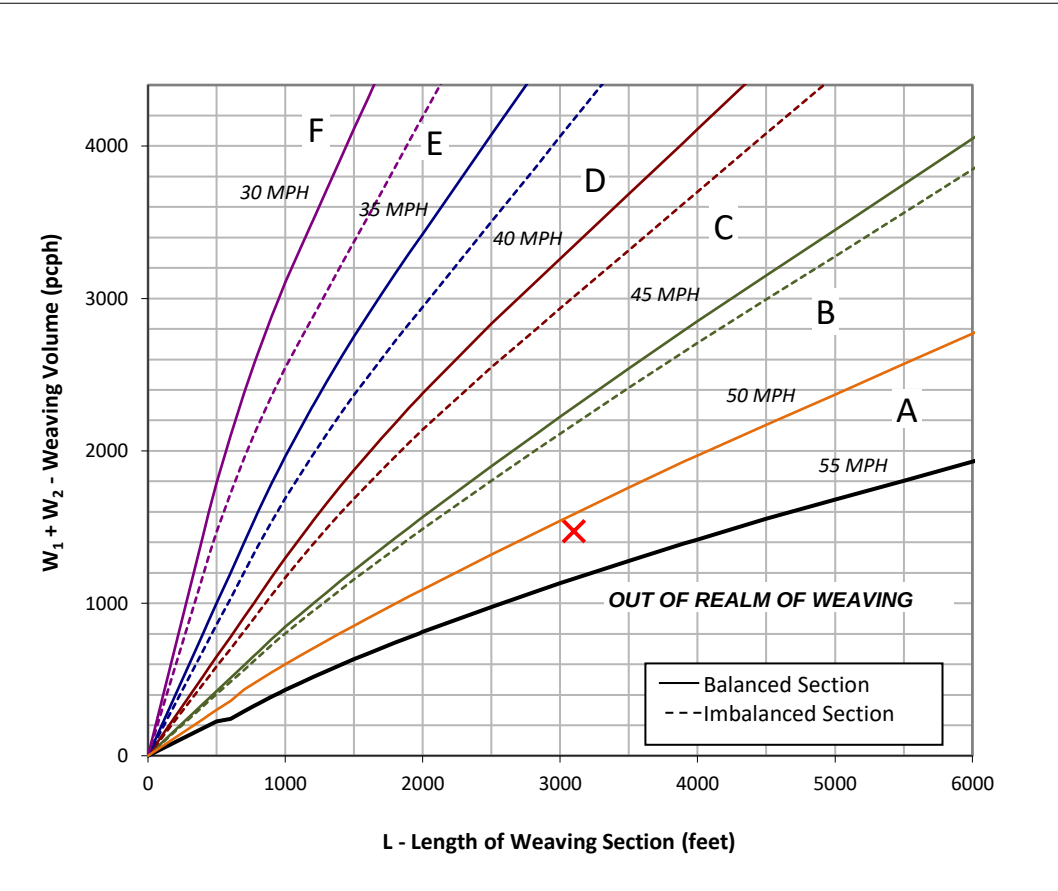
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,100

Project Information

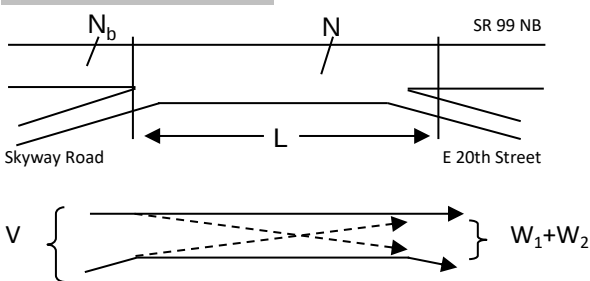
Project	Stonegate VTSM EIR
Scenario	Cumulative Plus Project - PM
Freeway	SR 99 NB
On-ramp	Skyway Road
Off-ramp	E 20th Street

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,410	Volume (vph)*	1,050	Volume (vph)*	400
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	4,556	Volume (pcph)	1,066	Volume (pcph)	406



The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.
* Note: **Do not adjust by a Peak Hour Factor (PHF)**. The methodology incorporates the PHF in the Service Volume tables.
Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections* , Jack E. Leisch & Associates, September 1983 and *Highway Design Manual* , California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	
	50 MPH and 55 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	51.3
4. Weaving Intensity Factor (k)	1.00
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,519
6. Level of Service (LOS)	D

Leisch Method for Weaving Analysis

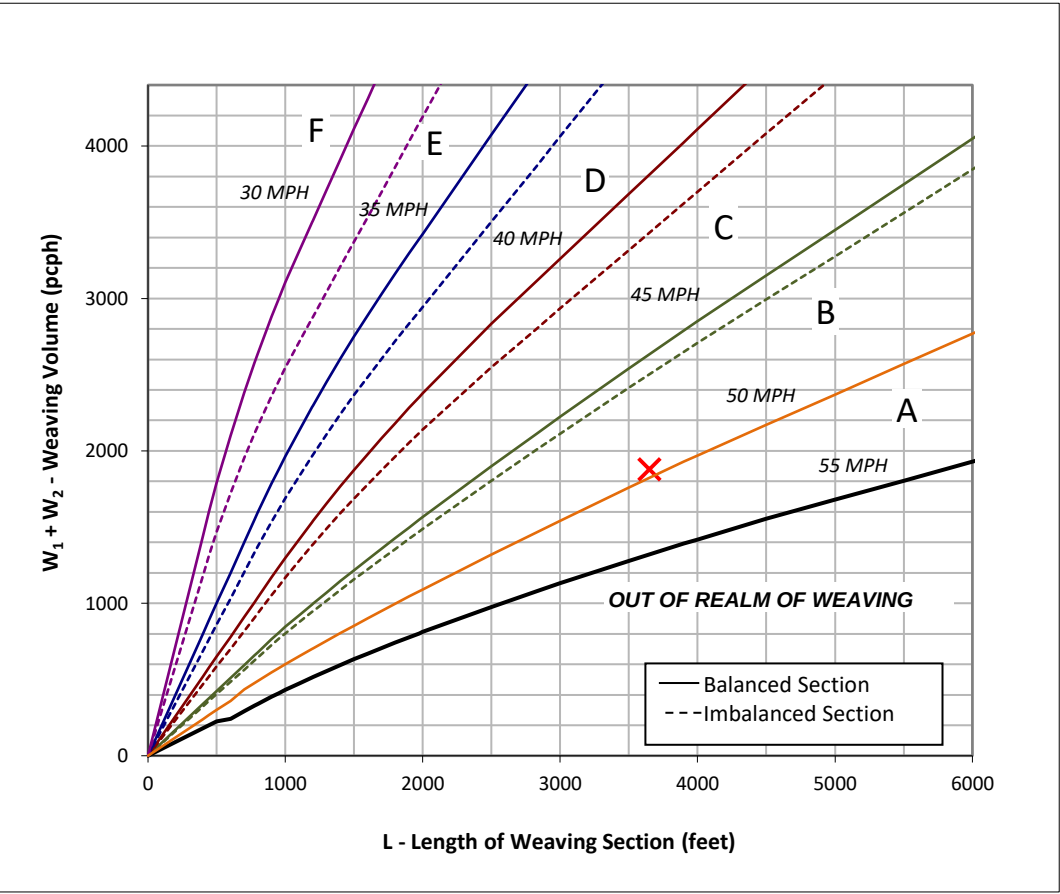
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,650

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative Plus Project - PM
Freeway	SR 99 NB
On-ramp	E 20th Street
Off-ramp	SR 32

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	5,290	Volume (vph)*	1,250	Volume (vph)*	600
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	5,465	Volume (pcph)	1,269	Volume (pcph)	609

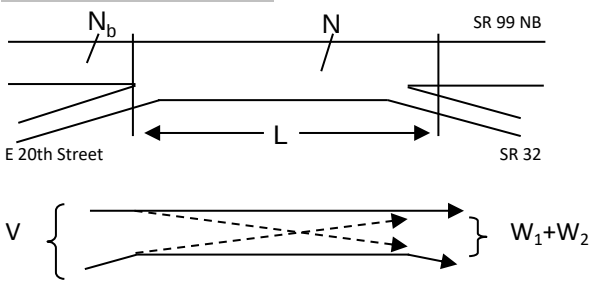


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections*, Jack E. Leisch & Associates, September 1983 and *Highway Design Manual*, California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	45 MPH and 50 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	49.6
4. Weaving Intensity Factor (k)	1.02
5. Service Volume (SV, pcph)	1,825
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
6. Level of Service (LOS)	E

Leisch Method for Weaving Analysis

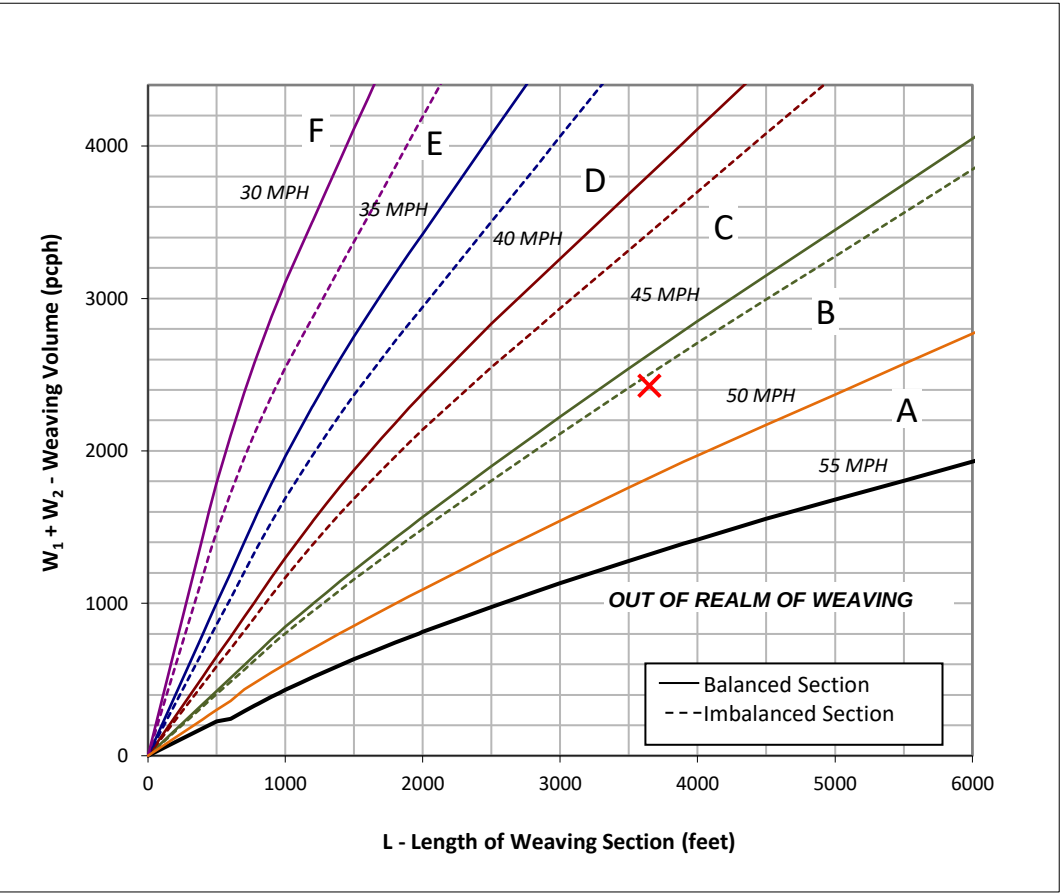
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	3,650

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative Plus Project - PM
Freeway	SR 99 SB
On-ramp	SR 32
Off-ramp	E 20th Street

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	5,110	Volume (vph)*	850	Volume (vph)*	1,540
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	5,279	Volume (pcph)	863	Volume (pcph)	1,563

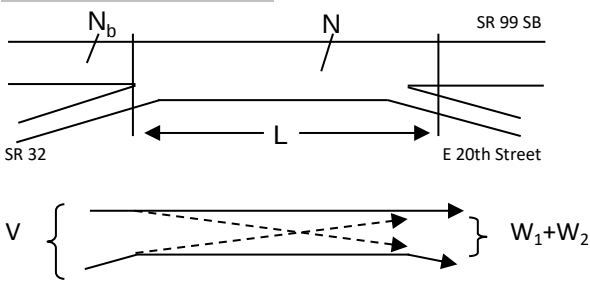


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF)**. The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections* , Jack E. Leisch & Associates, September 1983 and *Highway Design Manual* , California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
If optional exit lane, then "Y". Otherwise "N".	
2. In the chart to the left, which two speed curves is the red "x" between?	45 MPH and 50 MPH
If left of the 30 MPH curve, LOS is F. Select "-".	
If below the 55 MPH curve, out of the realm of weaving.	
3. Interpolated Weaving Speed (S_w , mph)	45.6
4. Weaving Intensity Factor (k)	1.69
5. Service Volume (SV, pcph)	1,959
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
6. Level of Service (LOS)	F

Leisch Method for Weaving Analysis

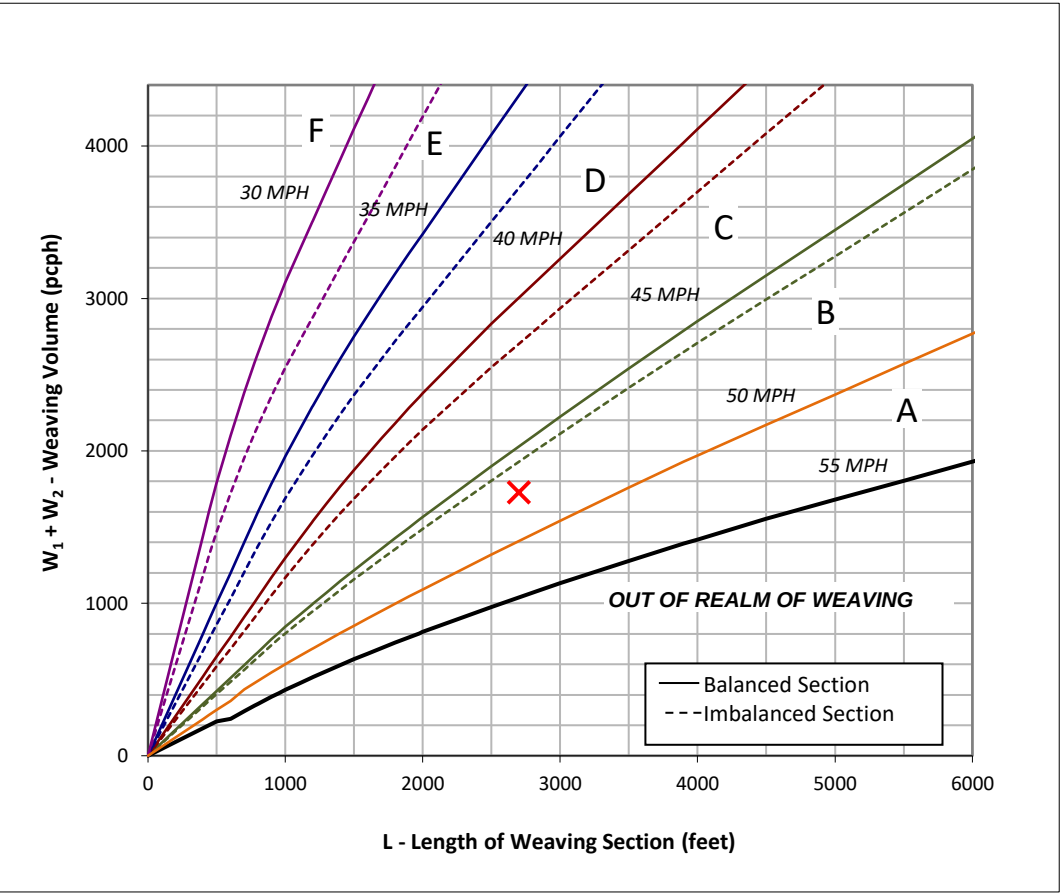
Data Input

Number of Entering Mainline Lanes	N_b	2
Number of Lanes in Weaving Section	N	3
Length of Weaving Section (feet)	L	2,700

Project Information

Project	Stonegate VTSM EIR
Scenario	Cumulative Plus Project - PM
Freeway	SR 99 SB
On-ramp	E 20th Street
Off-ramp	Skyway Road

Total Weaving Section (V)		On-ramp to Mainline (W_1)		Mainline to Off-ramp (W_2)	
Volume (vph)*	4,080	Volume (vph)*	560	Volume (vph)*	1,140
Truck Percentage	7%	Truck Percentage	3%	Truck Percentage	3%
PCE for Trucks	1.5	PCE for Trucks	1.5	PCE for Trucks	1.5
Volume (pcph)	4,215	Volume (pcph)	568	Volume (pcph)	1,157

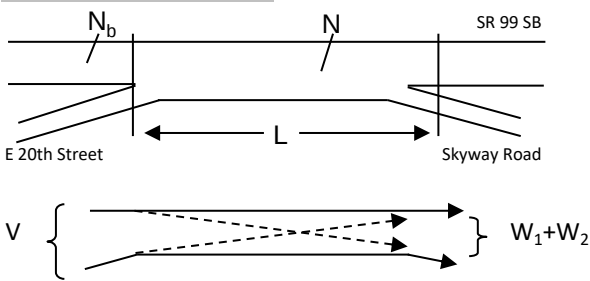


The LOS in the chart above refers to the capacity of weaving traffic only; through and ramp to ramp traffic is not included.

* Note: **Do not adjust by a Peak Hour Factor (PHF).** The methodology incorporates the PHF in the Service Volume tables.

Sources: *Completion of Procedures for Analysis and Design of Traffic Weaving Sections* , Jack E. Leisch & Associates, September 1983 and *Highway Design Manual* , California Department of Transportation, 2014

Figure



Capacity Analysis

1. Is the weaving section balanced (Y / N)?	N
<i>If optional exit lane, then "Y". Otherwise "N".</i>	
2. In the chart to the left, which two speed curves is the red "x" between?	
	45 MPH and 50 MPH
<i>If left of the 30 MPH curve, LOS is F. Select "-".</i>	
<i>If below the 55 MPH curve, out of the realm of weaving.</i>	
3. Interpolated Weaving Speed (S_w , mph)	47.0
4. Weaving Intensity Factor (k)	1.41
5. Service Volume (SV, pcph)	
$SV = (1/N) * [V + (k - 1) * \min(W_1, W_2)]$	
	1,483
6. Level of Service (LOS)	D