

HCM Unsignalized Intersection Capacity Analysis  
 1: Pulaski St & Greenwich Ave

2009 Weekday PM Peak Hour  
 5/5/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔			↔
Sign Control		Stop	Stop		Stop	
Volume (vph)	441	358	378	0	0	205
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	479	389	411	0	0	223
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total (vph)	868	411	223			
Volume Left (vph)	479	0	0			
Volume Right (vph)	0	0	223			
Hadj (s)	0.14	0.03	-0.57			
Departure Headway (s)	5.4	5.6	6.0			
Degree Utilization, x	1.30	0.64	0.37			
Capacity (veh/h)	663	625	579			
Control Delay (s)	165.2	17.8	12.5			
Approach Delay (s)	165.2	17.8	12.5			
Approach LOS	F	C	B			
Intersection Summary						
Delay			102.2			
HCM Level of Service			F			
Intersection Capacity Utilization			69.8%	ICU Level of Service	C	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis  
 2: Pulaski St & Pulaski Street

2009 Weekday PM Peak Hour  
 5/5/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	358	0	0	378	124	0	0	0	140	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	389	0	0	411	135	0	0	0	152	0	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	389	546	0	152
Volume Left (vph)	0	0	0	152
Volume Right (vph)	0	135	0	0
Hadj (s)	0.03	-0.11	0.00	0.23
Departure Headway (s)	5.1	4.8	6.6	6.3
Degree Utilization, x	0.56	0.73	0.00	0.27
Capacity (veh/h)	672	731	469	516
Control Delay (s)	14.4	19.9	9.6	11.7
Approach Delay (s)	14.4	19.9	0.0	11.7
Approach LOS	B	C	A	B

Intersection Summary			
Delay		16.8	
HCM Level of Service		C	
Intersection Capacity Utilization	41.9%		ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
 3: Greenwich Ave & Pulaski St

2009 Weekday PM Peak Hour  
 5/5/2010

	↑	↖	↙	↓	↘	↗
Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations	↑			↖		↗
Sign Control	Stop			Stop	Stop	
Volume (vph)	441	0	140	0	0	124
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	479	0	152	0	0	135
Direction, Lane #	NB 1	SB 1	NW 1			
Volume Total (vph)	479	152	135			
Volume Left (vph)	0	152	0			
Volume Right (vph)	0	0	135			
Hadj (s)	0.03	0.23	-0.57			
Departure Headway (s)	4.5	5.0	4.8			
Degree Utilization, x	0.60	0.21	0.18			
Capacity (veh/h)	790	681	670			
Control Delay (s)	13.8	9.4	8.8			
Approach Delay (s)	13.8	9.4	8.8			
Approach LOS	B	A	A			
Intersection Summary						
Delay			12.1			
HCM Level of Service			B			
Intersection Capacity Utilization			37.6%	ICU Level of Service	A	
Analysis Period (min)			15			

Queues  
4: First Stamford Place & Greenwich Ave

2009 Weekday PM Peak Hour  
5/5/2010



Lane Group	EBL	NBL	NBT	SBT	SBR	ø3	ø4	ø6
Lane Configurations								
Volume (vph)	360	20	480	290	60			
Lane Group Flow (vph)	445	0	544	322	58			
Turn Type		Perm			Perm			
Protected Phases	9		2	6 3 4		3	4	6
Permitted Phases		2			6 3 4			
Detector Phase	9	2	2	6 3 4	6 3 4			
Switch Phase								
Minimum Initial (s)	8.0	12.0	12.0			2.0	12.0	12.0
Minimum Split (s)	20.0	24.5	24.5			6.5	24.5	24.5
Total Split (s)	20.0	59.0	59.0	95.0	95.0	11.0	25.0	59.0
Total Split (%)	17.4%	51.3%	51.3%	82.6%	82.6%	10%	22%	51%
Yellow Time (s)	3.5	3.5	3.5			3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0			1.0	1.0	1.0
Lost Time Adjust (s)	-0.5	-0.5	-0.5	-0.5	-0.5			
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0			
Lead/Lag						Lead	Lag	
Lead-Lag Optimize?						Yes	Yes	
Recall Mode	Min	C-Min	C-Min			None	None	C-Min
v/c Ratio	0.90		0.63	0.23	0.05			
Control Delay	69.7		26.8	2.0	0.1			
Queue Delay	0.4		0.0	0.7	1.2			
Total Delay	70.1		26.8	2.6	1.3			
Queue Length 50th (ft)	165		291	12	0			
Queue Length 95th (ft)	#262		410	35	0			
Internal Link Dist (ft)	173		89	64				
Turn Bay Length (ft)								
Base Capacity (vph)	495		875	1401	1206			
Starvation Cap Reductn	0		0	742	1017			
Spillback Cap Reductn	3		1	0	0			
Storage Cap Reductn	0		0	0	0			
Reduced v/c Ratio	0.90		0.62	0.49	0.31			

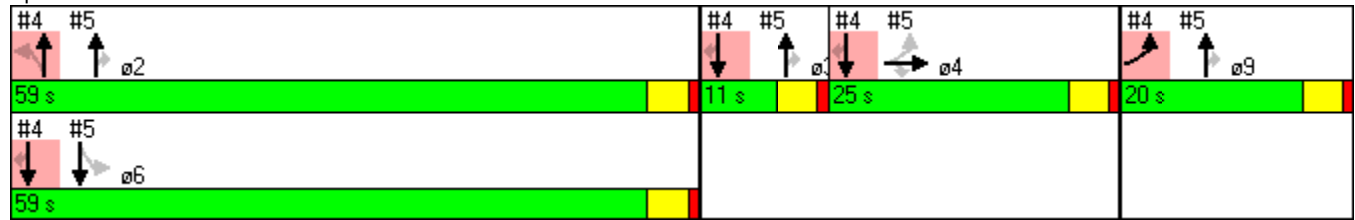
Intersection Summary

Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow  
 Natural Cycle: 80  
 Control Type: Actuated-Coordinated  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Queues  
 4: First Stamford Place & Greenwich Ave

2009 Weekday PM Peak Hour  
 5/5/2010

Splits and Phases: 4: First Stamford Place & Greenwich Ave



HCM Signalized Intersection Capacity Analysis  
4: First Stamford Place & Greenwich Ave

2009 Weekday PM Peak Hour

5/5/2010



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	360	50	20	480	290	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.97			1.00	0.95	0.95
Fr <sub>t</sub>	0.98			1.00	1.00	0.85
Fl <sub>t</sub> Protected	0.96			1.00	1.00	1.00
Satd. Flow (prot)	3399			1859	1764	1504
Fl <sub>t</sub> Permitted	0.96			0.98	1.00	1.00
Satd. Flow (perm)	3399			1823	1764	1504
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	391	54	22	522	315	65
RTOR Reduction (vph)	9	0	0	0	1	12
Lane Group Flow (vph)	436	0	0	544	321	46
Turn Type			Perm			Perm
Protected Phases	9			2	6 3 4	
Permitted Phases			2			6 3 4
Actuated Green, G (s)	15.9			53.9	90.1	90.1
Effective Green, g (s)	16.4			54.4	90.6	90.6
Actuated g/C Ratio	0.14			0.47	0.79	0.79
Clearance Time (s)	4.5			4.5		
Vehicle Extension (s)	3.0			3.5		
Lane Grp Cap (vph)	485			862	1390	1185
v/s Ratio Prot	c0.13				c0.18	
v/s Ratio Perm				c0.30		0.03
v/c Ratio	0.90			0.63	0.23	0.04
Uniform Delay, d <sub>1</sub>	48.5			22.8	3.2	2.7
Progression Factor	1.00			1.00	0.50	0.00
Incremental Delay, d <sub>2</sub>	19.0			3.5	0.1	0.0
Delay (s)	67.5			26.3	1.7	0.0
Level of Service	E			C	A	A
Approach Delay (s)	67.5			26.3	1.4	
Approach LOS	E			C	A	

Intersection Summary

HCM Average Control Delay	32.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Queues  
5: I-95 NB Off-Ramp & Greenwich Ave

2009 Weekday PM Peak Hour  
5/5/2010



Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT	ø2	ø3	ø9
Lane Configurations	↘	↑↑	↗	↑	↗	↘	↑↑			
Volume (vph)	150	380	100	350	490	50	250			
Lane Group Flow (vph)	163	413	109	380	533	54	272			
Turn Type	Perm		Perm		Perm	Perm				
Protected Phases		4		2 9 3			6	2	3	9
Permitted Phases	4		4		2 9 3	6				
Detector Phase	4	4	4	2 9 3	2 9 3	6	6			
Switch Phase										
Minimum Initial (s)	12.0	12.0	12.0			12.0	12.0	12.0	2.0	8.0
Minimum Split (s)	24.5	24.5	24.5			24.5	24.5	24.5	6.5	20.0
Total Split (s)	25.0	25.0	25.0	90.0	90.0	59.0	59.0	59.0	11.0	20.0
Total Split (%)	21.7%	21.7%	21.7%	78.3%	78.3%	51.3%	51.3%	51%	10%	17%
Yellow Time (s)	3.5	3.5	3.5			3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0			1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5			
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lag	Lag	Lag						Lead	
Lead-Lag Optimize?	Yes	Yes	Yes						Yes	
Recall Mode	None	None	None			C-Min	C-Min	C-Min	None	Min
v/c Ratio	0.52	0.65	0.29	0.27	0.44	0.83	0.16			
Control Delay	49.0	49.3	9.8	0.4	1.3	103.9	17.6			
Queue Delay	0.0	0.0	0.0	1.4	1.2	0.0	0.0			
Total Delay	49.0	49.3	9.8	1.8	2.6	103.9	17.6			
Queue Length 50th (ft)	110	150	0	1	11	33	57			
Queue Length 95th (ft)	180	204	49	m1	m30	#119	84			
Internal Link Dist (ft)		744		64			707			
Turn Bay Length (ft)	300		300			100				
Base Capacity (vph)	328	655	382	1401	1203	66	1698			
Starvation Cap Reductn	0	0	0	806	436	0	0			
Spillback Cap Reductn	0	0	1	0	0	0	47			
Storage Cap Reductn	0	0	0	0	0	0	0			
Reduced v/c Ratio	0.50	0.63	0.29	0.64	0.69	0.82	0.16			

Intersection Summary

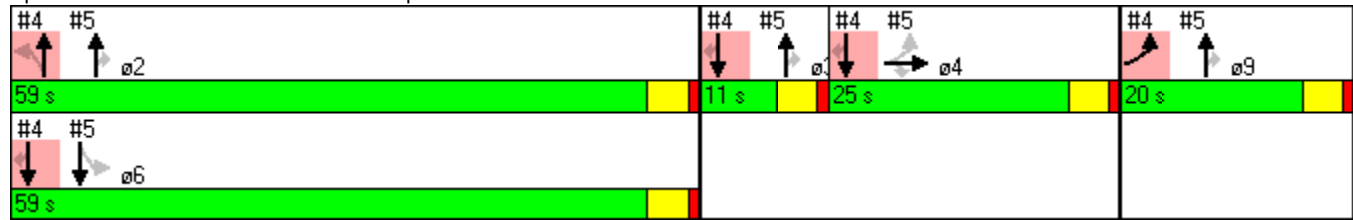
Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow  
 Natural Cycle: 80  
 Control Type: Actuated-Coordinated  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

Queues  
 5: I-95 NB Off-Ramp & Greenwich Ave

2009 Weekday PM Peak Hour

5/5/2010

Splits and Phases: 5: I-95 NB Off-Ramp & Greenwich Ave



HCM Signalized Intersection Capacity Analysis  
5: I-95 NB Off-Ramp & Greenwich Ave

2009 Weekday PM Peak Hour  
5/5/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑	↗					↑	↗	↘	↑↑	
Volume (vph)	150	380	100	0	0	0	0	350	490	50	250	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00					1.00	1.00	1.00	0.95	
Frt	1.00	1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583					1863	1583	1770	3539	
Flt Permitted	0.95	1.00	1.00					1.00	1.00	0.07	1.00	
Satd. Flow (perm)	1770	3539	1583					1863	1583	137	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	163	413	109	0	0	0	0	380	533	54	272	0
RTOR Reduction (vph)	0	0	90	0	0	0	0	0	13	0	0	0
Lane Group Flow (vph)	163	413	19	0	0	0	0	380	520	54	272	0
Turn Type	Perm		Perm						Perm	Perm		
Protected Phases		4						2 9 3			6	
Permitted Phases	4		4						2 9 3	6		
Actuated Green, G (s)	20.0	20.0	20.0					86.0	86.0	53.9	53.9	
Effective Green, g (s)	20.5	20.5	20.5					86.5	86.5	54.4	54.4	
Actuated g/C Ratio	0.18	0.18	0.18					0.75	0.75	0.47	0.47	
Clearance Time (s)	4.5	4.5	4.5							4.5	4.5	
Vehicle Extension (s)	4.0	4.0	4.0							3.5	3.5	
Lane Grp Cap (vph)	316	631	282					1401	1191	65	1674	
v/s Ratio Prot		c0.12						0.20			0.08	
v/s Ratio Perm	0.09		0.01						c0.33	c0.39		
v/c Ratio	0.52	0.65	0.07					0.27	0.44	0.83	0.16	
Uniform Delay, d1	42.8	44.0	39.3					4.4	5.3	26.3	17.3	
Progression Factor	1.00	1.00	1.00					0.01	0.11	1.00	1.00	
Incremental Delay, d2	1.9	2.7	0.1					0.1	0.2	70.6	0.2	
Delay (s)	44.6	46.7	39.5					0.1	0.8	96.9	17.5	
Level of Service	D	D	D					A	A	F	B	
Approach Delay (s)		45.0			0.0			0.5			30.7	
Approach LOS		D			A			A			C	

Intersection Summary

HCM Average Control Delay	21.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues  
6: North State St & Washington Blvd

2009 Weekday PM Peak Hour  
5/5/2010



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR
Lane Configurations							
Volume (vph)	150	250	550	300	870	820	630
Lane Group Flow (vph)	163	272	598	326	946	891	685
Turn Type	Perm		Perm	pm+pt			Perm
Protected Phases		8		5	2	6	
Permitted Phases	8		8	2			6
Detector Phase	8	8	8	5	2	6	6
Switch Phase							
Minimum Initial (s)	5.0	5.0	5.0	5.0	20.0	20.0	20.0
Minimum Split (s)	29.0	29.0	29.0	9.0	25.0	25.0	25.0
Total Split (s)	35.0	35.0	35.0	26.0	80.0	54.0	54.0
Total Split (%)	30.4%	30.4%	30.4%	22.6%	69.6%	47.0%	47.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	0.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag				Lead		Lag	Lag
Lead-Lag Optimize?				Yes		Yes	Yes
Recall Mode	None	None	None	Min	C-Max	C-Max	C-Max
v/c Ratio	0.39	0.62	0.89	0.83	0.46	0.60	0.82
Control Delay	37.5	42.7	53.7	36.9	9.4	24.8	25.6
Queue Delay	1.7	0.0	0.0	47.6	12.2	5.7	20.7
Total Delay	39.2	42.7	53.7	84.5	21.7	30.6	46.3
Queue Length 50th (ft)	78	135	173	202	139	254	280
Queue Length 95th (ft)	141	220	#347	m176	m61	343	#562
Internal Link Dist (ft)		134			155	253	
Turn Bay Length (ft)							
Base Capacity (vph)	429	452	699	438	2064	1490	833
Starvation Cap Reductn	0	0	0	135	1102	532	160
Spillback Cap Reductn	143	0	0	0	0	172	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.57	0.60	0.86	1.08	0.98	0.93	1.02

Intersection Summary

Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 39 (34%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow  
 Natural Cycle: 90  
 Control Type: Actuated-Coordinated  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: North State St & Washington Blvd



HCM Signalized Intersection Capacity Analysis  
6: North State St & Washington Blvd

2009 Weekday PM Peak Hour

5/5/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↖	↗	↖↗	↖	↗↗			↗↗	↖
Volume (vph)	0	0	0	150	250	550	300	870	0	0	820	630
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	13	10	11	11	11	11	12
Total Lost time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor				1.00	1.00	0.88	1.00	0.95			0.95	1.00
Frt				1.00	1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95	1.00	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				1593	1676	2592	1486	3079			3079	1425
Flt Permitted				0.95	1.00	1.00	0.21	1.00			1.00	1.00
Satd. Flow (perm)				1593	1676	2592	322	3079			3079	1425
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	163	272	598	326	946	0	0	891	685
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	143
Lane Group Flow (vph)	0	0	0	163	272	598	326	946	0	0	891	542
Turn Type				Perm		Perm	pm+pt					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8	2					6
Actuated Green, G (s)				28.9	28.9	28.9	76.1	76.1			54.7	54.7
Effective Green, g (s)				29.9	29.9	29.9	76.1	77.1			55.7	55.7
Actuated g/C Ratio				0.26	0.26	0.26	0.66	0.67			0.48	0.48
Clearance Time (s)				5.0	5.0	5.0	4.0	5.0			5.0	5.0
Vehicle Extension (s)				2.0	2.0	2.0	2.0	0.2			0.2	0.2
Lane Grp Cap (vph)				414	436	674	389	2064			1491	690
v/s Ratio Prot					0.16		c0.13	0.31			0.29	
v/s Ratio Perm				0.10		c0.23	c0.43					0.38
v/c Ratio				0.39	0.62	0.89	0.84	0.46			0.60	0.78
Uniform Delay, d1				35.1	37.6	40.9	14.2	9.0			21.5	24.7
Progression Factor				0.99	0.96	0.94	2.74	1.00			1.00	1.00
Incremental Delay, d2				0.2	1.9	12.4	1.5	0.1			1.8	8.7
Delay (s)				35.0	38.1	50.7	40.4	9.1			23.3	33.4
Level of Service				D	D	D	D	A			C	C
Approach Delay (s)		0.0			44.9			17.1			27.7	
Approach LOS		A			D			B			C	

Intersection Summary		
HCM Average Control Delay	28.8	HCM Level of Service C
HCM Volume to Capacity ratio	0.83	
Actuated Cycle Length (s)	115.0	Sum of lost time (s) 8.0
Intersection Capacity Utilization	125.2%	ICU Level of Service H
Analysis Period (min)	15	

c Critical Lane Group

Queues  
7: South State St & Washington Blvd

2009 Weekday PM Peak Hour  
5/5/2010



Lane Group	EBL	EBT	EBR	NBT	SBL	SBT	ø3
Lane Configurations	↖	↑	↘	↑↑↑	↘	↓↓	
Volume (vph)	350	550	120	820	520	450	
Lane Group Flow (vph)	380	598	130	1163	565	489	
Turn Type	Prot		custom		Prot		
Protected Phases	4			2	1	6	3
Permitted Phases		4	4				
Detector Phase	4	4	4	2	1	6	
Switch Phase							
Minimum Initial (s)	4.0	4.0	4.0	7.0	7.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	17.0	11.0	20.0	30.0
Total Split (s)	32.0	32.0	32.0	25.0	28.0	53.0	30.0
Total Split (%)	27.8%	27.8%	27.8%	21.7%	24.3%	46.1%	26%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	2.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lag	Lag	Lag	Lag	Lead		Lead
Lead-Lag Optimize?				Yes	Yes		
Recall Mode	None	None	None	C-Min	None	C-Min	Ped
v/c Ratio	0.65	0.96	0.22	1.36	1.82	0.37	
Control Delay	30.5	58.3	6.5	200.7	408.4	12.6	
Queue Delay	1.4	0.0	0.0	14.6	0.0	0.7	
Total Delay	31.9	58.3	6.5	215.3	408.4	13.4	
Queue Length 50th (ft)	206	415	19	~391	~609	47	
Queue Length 95th (ft)	m326	m#668	m60	#489	#834	60	
Internal Link Dist (ft)		350		225		155	
Turn Bay Length (ft)	150						
Base Capacity (vph)	589	620	588	855	310	1312	
Starvation Cap Reductn	0	0	0	8	0	492	
Spillback Cap Reductn	81	0	0	20	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.75	0.96	0.22	1.39	1.82	0.60	






Intersection Summary

Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 35 (30%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow  
 Natural Cycle: 150  
 Control Type: Actuated-Coordinated  
 ~ Volume exceeds capacity, queue is theoretically infinite.  
 Queue shown is maximum after two cycles.  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

Queues  
7: South State St & Washington Blvd

2009 Weekday PM Peak Hour  
5/5/2010

Splits and Phases: 7: South State St & Washington Blvd

 ø1	 ø2	 ø3	 ø4
28 s	25 s	30 s	32 s
 ø6			
53 s			



HCM Signalized Intersection Capacity Analysis  
7: South State St & Washington Blvd

2009 Weekday PM Peak Hour  
5/5/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	350	550	120	0	0	0	0	820	250	520	450	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	12	12	12	12	12	10	11	11
Total Lost time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00					0.91		1.00	0.95	
Frt	1.00	1.00	0.85					0.96		1.00	1.00	
Flt Protected	0.95	1.00	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1540	1621	1378					4416		1486	3079	
Flt Permitted	0.95	1.00	1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1540	1621	1378					4416		1486	3079	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	380	598	130	0	0	0	0	891	272	565	489	0
RTOR Reduction (vph)	0	0	61	0	0	0	0	48	0	0	0	0
Lane Group Flow (vph)	380	598	69	0	0	0	0	1115	0	565	489	0
Turn Type	Prot		custom							Prot		
Protected Phases	4							2		1	6	
Permitted Phases		4	4									
Actuated Green, G (s)	44.0	44.0	44.0					21.0		24.0	49.0	
Effective Green, g (s)	44.0	44.0	44.0					21.0		24.0	49.0	
Actuated g/C Ratio	0.38	0.38	0.38					0.18		0.21	0.43	
Clearance Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	589	620	527					806		310	1312	
v/s Ratio Prot	0.25							c0.25		c0.38	0.16	
v/s Ratio Perm		c0.37	0.05									
v/c Ratio	0.65	0.96	0.13					1.38		1.82	0.37	
Uniform Delay, d1	29.1	34.7	23.1					47.0		45.5	22.5	
Progression Factor	0.86	0.88	0.76					0.87		0.95	0.53	
Incremental Delay, d2	2.2	25.3	0.1					178.8		380.6	0.7	
Delay (s)	27.2	56.0	17.7					219.7		423.7	12.5	
Level of Service	C	E	B					F		F	B	
Approach Delay (s)		41.6			0.0			219.7			232.9	
Approach LOS		D			A			F			F	

Intersection Summary

HCM Average Control Delay	164.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.29		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	125.2%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Queues  
8: Station Place & Washington Blvd

2009 Weekday PM Peak Hour  
5/5/2010

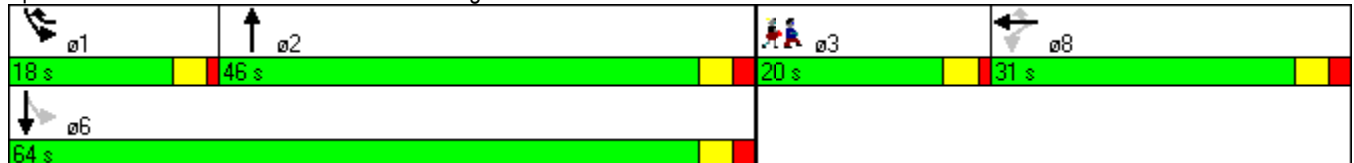


Lane Group	WBT	WBR	NBT	SBL	SBT	ø3
Lane Configurations	↔	↗	↕	↘	↕	
Volume (vph)	0	380	690	150	420	
Lane Group Flow (vph)	236	231	859	163	457	
Turn Type		pm+ov		pm+pt		
Protected Phases	8	1	2	1	6	3
Permitted Phases		8		6		
Detector Phase	8	1	2	1	6	
Switch Phase						
Minimum Initial (s)	9.0	7.0	15.0	7.0	15.0	4.0
Minimum Split (s)	14.0	11.0	20.0	11.0	20.0	20.0
Total Split (s)	31.0	18.0	46.0	18.0	64.0	20.0
Total Split (%)	27.0%	15.7%	40.0%	15.7%	55.7%	17%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	1.0	2.0	1.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	0.0	-1.0	
Total Lost Time (s)	4.0	3.0	4.0	4.0	4.0	
Lead/Lag		Lead	Lag	Lead		
Lead-Lag Optimize?		Yes	Yes	Yes		
Recall Mode	None	None	C-Max	None	C-Max	Ped
v/c Ratio	0.78	0.51	0.59	0.50	0.24	
Control Delay	52.1	25.7	25.0	11.0	4.6	
Queue Delay	0.0	0.0	1.8	0.7	0.3	
Total Delay	52.1	25.7	26.8	11.7	4.9	
Queue Length 50th (ft)	158	135	228	14	21	
Queue Length 95th (ft)	211	137	364	66	81	
Internal Link Dist (ft)	179		86		225	
Turn Bay Length (ft)						
Base Capacity (vph)	360	501	1463	371	1927	
Starvation Cap Reductn	0	0	421	57	868	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.66	0.46	0.82	0.52	0.43	

Intersection Summary

Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 60 (52%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow  
 Natural Cycle: 80  
 Control Type: Actuated-Coordinated

Splits and Phases: 8: Station Place & Washington Blvd



HCM Signalized Intersection Capacity Analysis  
8: Station Place & Washington Blvd

2009 Weekday PM Peak Hour  
5/5/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↔	↗		↕		↖	↕	
Volume (vph)	0	0	0	50	0	380	0	690	100	150	420	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	14	12	12	11	12	12	12	12
Total Lost time (s)					4.0	3.0		4.0		4.0	4.0	
Lane Util. Factor					0.95	0.95		0.95		1.00	0.95	
Frt					0.88	0.85		0.98		1.00	1.00	
Flt Protected					0.99	1.00		1.00		0.95	1.00	
Satd. Flow (prot)					1485	1354		3021		1593	3185	
Flt Permitted					0.99	1.00		1.00		0.22	1.00	
Satd. Flow (perm)					1485	1354		3021		363	3185	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	54	0	413	0	750	109	163	457	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	8	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	236	231	0	851	0	163	457	0
Turn Type				Perm		pm+ov				pm+pt		
Protected Phases					8	1		2		1	6	
Permitted Phases				8		8				6		
Actuated Green, G (s)					22.4	32.6		54.4		68.6	68.6	
Effective Green, g (s)					23.4	34.6		55.4		68.6	69.6	
Actuated g/C Ratio					0.20	0.30		0.48		0.60	0.61	
Clearance Time (s)					5.0	4.0		5.0		4.0	5.0	
Vehicle Extension (s)					2.0	2.0		2.0		2.0	2.0	
Lane Grp Cap (vph)					302	407		1455		326	1928	
v/s Ratio Prot						c0.06		c0.28		0.04	0.14	
v/s Ratio Perm					0.16	0.12				0.25		
v/c Ratio					0.78	0.57		0.58		0.50	0.24	
Uniform Delay, d1					43.4	33.9		21.5		12.9	10.5	
Progression Factor					0.81	0.74		1.00		0.52	0.38	
Incremental Delay, d2					11.4	1.1		1.7		0.4	0.3	
Delay (s)					46.4	26.3		23.2		7.1	4.2	
Level of Service					D	C		C		A	A	
Approach Delay (s)		0.0			36.5			23.2			5.0	
Approach LOS		A			D			C			A	

Intersection Summary

HCM Average Control Delay	20.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	55.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Queues  
9: North State St & Atlantic St

2009 Weekday PM Peak Hour  
5/5/2010

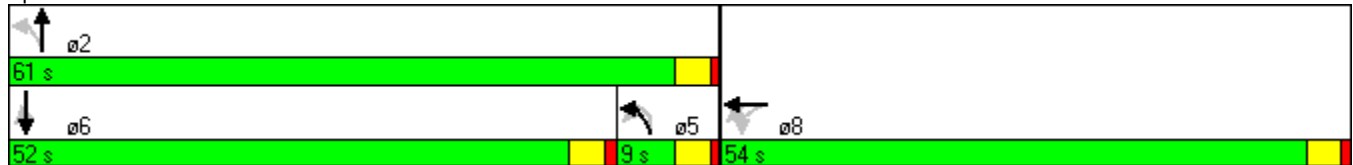


Lane Group	WBL	WBT	NBL2	NBL	NBT	SBT	SBR
Lane Configurations	↔↔	↕↕			↕↕	↕	↔
Volume (vph)	900	550	80	20	550	320	290
Lane Group Flow (vph)	1032	815	0	0	707	439	387
Turn Type	Perm		custom	pm+pt			Perm
Protected Phases		8		5	2	6	
Permitted Phases	8		5	2			6
Detector Phase	8	8	5	5	2	6	6
Switch Phase							
Minimum Initial (s)	12.0	12.0	5.0	5.0	15.0	15.0	15.0
Minimum Split (s)	26.0	26.0	9.0	9.0	22.0	22.0	22.0
Total Split (s)	54.0	54.0	9.0	9.0	61.0	52.0	52.0
Total Split (%)	47.0%	47.0%	7.8%	7.8%	53.0%	45.2%	45.2%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag			Lag	Lag		Lead	Lead
Lead-Lag Optimize?			Yes	Yes		Yes	Yes
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max
v/c Ratio	0.73	0.57			0.54	0.50	0.49
Control Delay	21.6	16.9			12.0	21.2	19.2
Queue Delay	0.4	0.0			2.5	9.2	4.7
Total Delay	22.0	16.9			14.5	30.4	23.9
Queue Length 50th (ft)	179	128			128	224	175
Queue Length 95th (ft)	211	152			142	324	269
Internal Link Dist (ft)		1065			128	237	
Turn Bay Length (ft)							
Base Capacity (vph)	1493	1510			1298	885	795
Starvation Cap Reductn	0	0			447	406	330
Spillback Cap Reductn	115	0			0	0	0
Storage Cap Reductn	0	0			0	0	0
Reduced v/c Ratio	0.75	0.54			0.83	0.92	0.83

Intersection Summary

Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 21 (18%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow  
 Natural Cycle: 60  
 Control Type: Actuated-Coordinated

Splits and Phases: 9: North State St & Atlantic St



HCM Signalized Intersection Capacity Analysis  
9: North State St & Atlantic St

2009 Weekday PM Peak Hour  
5/5/2010



Movement	WBL2	WBL	WBT	WBR	NBL2	NBL	NBT	SBT	SBR	SBR2
Lane Configurations		57	11				11	11	5	5
Volume (vph)	50	900	550	200	80	20	550	320	290	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0	4.0	
Lane Util. Factor		0.97	0.95				0.95	0.95	0.95	
Fr <sub>t</sub>		1.00	0.96				1.00	0.97	0.85	
Fl <sub>t</sub> Protected		0.95	1.00				0.99	1.00	1.00	
Satd. Flow (prot)		3433	3398				3512	1715	1504	
Fl <sub>t</sub> Permitted		0.95	1.00				0.71	1.00	1.00	
Satd. Flow (perm)		3433	3398				2518	1715	1504	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	978	598	217	87	22	598	348	315	163
RTOR Reduction (vph)	0	0	33	0	0	0	0	0	19	0
Lane Group Flow (vph)	0	1032	782	0	0	0	707	439	368	0
Turn Type	Perm	Perm			custom	pm+pt				Perm
Protected Phases			8			5	2	6		
Permitted Phases	8	8			5	2				6
Actuated Green, G (s)		47.7	47.7				59.3	59.3	59.3	
Effective Green, g (s)		47.7	47.7				59.3	59.3	59.3	
Actuated g/C Ratio		0.41	0.41				0.52	0.52	0.52	
Clearance Time (s)		4.0	4.0				4.0	4.0	4.0	
Vehicle Extension (s)		3.0	3.0				3.0	3.0	3.0	
Lane Grp Cap (vph)		1424	1409				1298	884	776	
v/s Ratio Prot			0.23					0.26		
v/s Ratio Perm		c0.30					c0.28		0.24	
v/c Ratio		0.72	0.55				0.54	0.50	0.47	
Uniform Delay, d1		28.2	25.6				18.8	18.1	17.9	
Progression Factor		0.68	0.67				0.54	1.00	1.00	
Incremental Delay, d2		1.4	0.4				0.4	2.0	2.1	
Delay (s)		20.6	17.4				10.5	20.1	19.9	
Level of Service		C	B				B	C	B	
Approach Delay (s)			19.2				10.5	20.0		
Approach LOS			B				B	C		

Intersection Summary

HCM Average Control Delay	17.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	80.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Queues  
10: South State St & Atlantic St

2009 Weekday PM Peak Hour  
5/5/2010

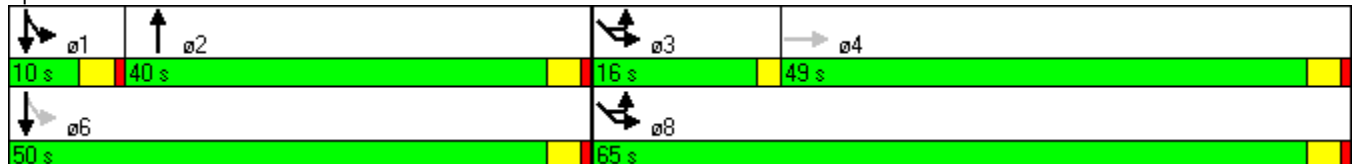


Lane Group	EBT	NBT	SBL	SBT	SEL2	SEL	ø3	ø6	ø8
Lane Configurations	↑↑	↑	↙↘	↑	↙	↘↙			
Volume (vph)	1070	250	170	200	400	800			
Lane Group Flow (vph)	1217	435	185	217	391	914			
Turn Type			pm+pt		Split				
Protected Phases		2	1	16	38	38	3	6	8
Permitted Phases	4		16						
Detector Phase	4	2	1	16	38	38			
Switch Phase									
Minimum Initial (s)	12.0	15.0	6.0				3.0	4.0	4.0
Minimum Split (s)	20.0	25.0	10.0				5.0	25.0	29.0
Total Split (s)	49.0	40.0	10.0	60.0	81.0	81.0	16.0	50.0	65.0
Total Split (%)	42.6%	34.8%	8.7%	52.2%	70.4%	70.4%	14%	43%	57%
Yellow Time (s)	3.0	3.0	3.0				2.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0				0.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	2.0	0.0			
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	2.0			
Lead/Lag	Lag	Lag	Lead				Lead		
Lead-Lag Optimize?	Yes	Yes	Yes				Yes		
Recall Mode	None	C-Max	None				None	C-Max	None
v/c Ratio	0.90	0.76	0.42	0.29	0.46	0.53			
Control Delay	26.3	43.0	25.8	24.7	19.3	18.2			
Queue Delay	0.0	104.8	1.0	4.3	0.0	0.0			
Total Delay	26.3	147.8	26.8	29.0	19.3	18.2			
Queue Length 50th (ft)	435	273	34	79	189	224			
Queue Length 95th (ft)	m322	398	m64	m145	278	282			
Internal Link Dist (ft)	392	25		128		750			
Turn Bay Length (ft)					250	250			
Base Capacity (vph)	1378	575	441	759	854	1765			
Starvation Cap Reductn	0	219	104	460	0	0			
Spillback Cap Reductn	0	105	0	0	0	0			
Storage Cap Reductn	0	0	0	0	0	0			
Reduced v/c Ratio	0.88	1.22	0.55	0.73	0.46	0.52			

Intersection Summary

Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 110 (96%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow  
 Natural Cycle: 75  
 Control Type: Actuated-Coordinated  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: South State St & Atlantic St



HCM Signalized Intersection Capacity Analysis  
 10: South State St & Atlantic St

2009 Weekday PM Peak Hour  
 5/5/2010



Movement	EBT	EBR	NBT	NBR	SBL	SBT	SEL2	SEL
Lane Configurations	↑↑		↑		↑↑	↑	↑	↑↑
Volume (vph)	1070	50	250	150	170	200	400	800
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0	4.0	4.0	2.0
Lane Util. Factor	0.95		1.00		0.97	1.00	0.91	0.91
Frt	0.99		0.95		1.00	1.00	1.00	1.00
Flt Protected	1.00		1.00		0.95	1.00	0.95	0.95
Satd. Flow (prot)	3516		1769		3433	1863	1610	3221
Flt Permitted	1.00		1.00		0.19	1.00	0.95	0.95
Satd. Flow (perm)	3516		1769		691	1863	1610	3221
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1163	54	272	163	185	217	435	870
RTOR Reduction (vph)	3	0	19	0	0	0	0	0
Lane Group Flow (vph)	1214	0	416	0	185	217	391	914
Turn Type					pm+pt		Split	
Protected Phases			2		1	1 6	3 8	3 8
Permitted Phases	4				1 6			
Actuated Green, G (s)	44.1		36.2		46.9	46.9	60.1	60.1
Effective Green, g (s)	44.1		36.2		46.9	46.9	58.1	60.1
Actuated g/C Ratio	0.38		0.31		0.41	0.41	0.51	0.52
Clearance Time (s)	4.0		4.0		4.0			
Vehicle Extension (s)	3.0		3.0		3.0			
Lane Grp Cap (vph)	1348		557		442	760	813	1683
v/s Ratio Prot			c0.24		c0.02	0.12	0.24	c0.28
v/s Ratio Perm	c0.35				0.15			
v/c Ratio	0.90		0.75		0.42	0.29	0.48	0.54
Uniform Delay, d1	33.4		35.3		24.4	22.8	18.6	18.3
Progression Factor	0.75		1.00		1.07	1.01	1.00	1.00
Incremental Delay, d2	0.9		8.9		0.6	0.2	0.5	0.4
Delay (s)	25.8		44.2		26.5	23.3	19.0	18.7
Level of Service	C		D		C	C	B	B
Approach Delay (s)	25.8		44.2			24.8		18.8
Approach LOS	C		D			C		B

**Intersection Summary**

HCM Average Control Delay	25.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	94.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Queues  
11: Station Place & Atlantic St

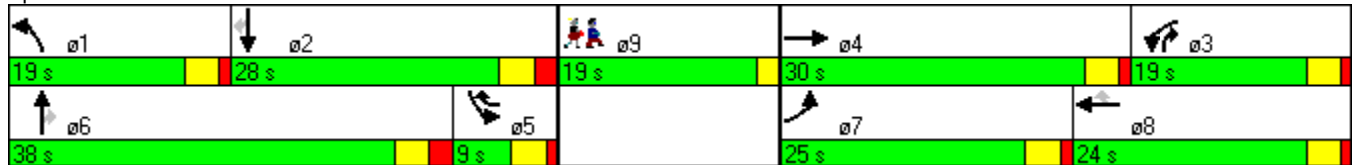
2009 Weekday PM Peak Hour  
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Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations												
Volume (vph)	150	140	90	100	70	50	180	70	20	110	120	
Lane Group Flow (vph)	163	217	98	109	76	54	196	76	22	120	130	
Turn Type	Prot		Prot		pm+ov	Prot		pm+ov	Prot		Perm	
Protected Phases	7	4	3	8	5	1	6	3	5	2		9
Permitted Phases					8			6				2
Detector Phase	7	4	3	8	5	1	6	3	5	2		2
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	15.0	15.0	5.0	5.0	15.0	15.0	7.0
Minimum Split (s)	21.0	21.0	9.0	20.0	9.0	19.0	21.0	9.0	9.0	21.0	21.0	19.0
Total Split (s)	25.0	30.0	19.0	24.0	9.0	19.0	38.0	19.0	9.0	28.0	28.0	19.0
Total Split (%)	21.7%	26.1%	16.5%	20.9%	7.8%	16.5%	33.0%	16.5%	7.8%	24.3%	24.3%	17%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	2.0	2.0	0.0
Lost Time Adjust (s)	-1.0	0.0	0.0	0.0	0.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0	
Total Lost Time (s)	3.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lead	Lag	Lag	Lag	Lead	Lead	Lag	Lag	Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None	C-Max	None	None	C-Max	C-Max	None
v/c Ratio	0.63	0.73	0.55	0.47	0.23	0.22	0.10	0.07	0.29	0.07	0.16	
Control Delay	44.2	42.4	59.9	52.7	6.3	42.9	17.0	2.6	62.9	23.4	6.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	44.2	42.4	59.9	52.7	6.3	42.9	17.0	2.6	62.9	23.4	6.2	
Queue Length 50th (ft)	91	111	70	76	0	37	40	0	16	25	0	
Queue Length 95th (ft)	157	184	122	127	20	77	93	24	44	65	51	
Internal Link Dist (ft)		765		481			121			95		
Turn Bay Length (ft)			150			100		100	50		50	
Base Capacity (vph)	339	415	234	324	328	246	1911	1086	77	1665	813	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.48	0.52	0.42	0.34	0.23	0.22	0.10	0.07	0.29	0.07	0.16	

Intersection Summary

Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 5 (4%), Referenced to phase 2:SBT and 6:NBT, Start of Green  
 Natural Cycle: 100  
 Control Type: Actuated-Coordinated
























Splits and Phases: 11: Station Place & Atlantic St





HCM Signalized Intersection Capacity Analysis  
 11: Station Place & Atlantic St

2009 Weekday PM Peak Hour  
 5/5/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	150	140	60	90	100	70	50	180	70	20	110	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.0		4.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1779		1770	1863	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1779		1770	1863	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	163	152	65	98	109	76	54	196	76	22	120	130
RTOR Reduction (vph)	0	14	0	0	0	64	0	0	30	0	0	72
Lane Group Flow (vph)	163	203	0	98	109	12	54	196	46	22	120	58
Turn Type	Prot			Prot		pm+ov	Prot		pm+ov	Prot		Perm
Protected Phases	7	4		3	8	5	1	6	3	5	2	
Permitted Phases						8			6			2
Actuated Green, G (s)	15.7	18.3		11.6	14.2	18.2	12.0	58.7	70.3	4.0	50.7	50.7
Effective Green, g (s)	16.7	18.3		11.6	14.2	18.2	13.0	59.7	70.3	4.0	51.7	51.7
Actuated g/C Ratio	0.15	0.16		0.10	0.12	0.16	0.11	0.52	0.61	0.03	0.45	0.45
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	257	283		179	230	251	200	1837	1023	62	1591	712
v/s Ratio Prot	0.09	c0.11		0.06	c0.06	0.00	c0.03	c0.06	0.00	c0.01	0.03	
v/s Ratio Perm						0.01			0.02			0.04
v/c Ratio	0.63	0.72		0.55	0.47	0.05	0.27	0.11	0.05	0.35	0.08	0.08
Uniform Delay, d1	46.3	45.9		49.2	46.9	41.1	46.7	14.1	8.9	54.2	18.0	18.1
Progression Factor	0.73	0.68		1.00	1.00	1.00	0.92	0.98	0.76	1.00	1.00	1.00
Incremental Delay, d2	4.8	8.0		3.4	1.5	0.1	0.7	0.1	0.0	3.5	0.1	0.2
Delay (s)	38.7	39.2		52.6	48.5	41.1	43.5	14.0	6.8	57.7	18.1	18.3
Level of Service	D	D		D	D	D	D	B	A	E	B	B
Approach Delay (s)		39.0			47.9			17.2			21.4	
Approach LOS		D			D			B			C	

Intersection Summary		
HCM Average Control Delay	31.6	HCM Level of Service C
HCM Volume to Capacity ratio	0.31	
Actuated Cycle Length (s)	115.0	Sum of lost time (s) 20.4
Intersection Capacity Utilization	42.6%	ICU Level of Service A
Analysis Period (min)	15	
c Critical Lane Group		

Queues  
12: Parking Garage & Atlantic St

2009 Weekday PM Peak Hour  
5/5/2010



Lane Group	EBL	NBL	NBT	SBT	SBR
Lane Configurations					
Volume (vph)	50	30	250	230	30
Lane Group Flow (vph)	76	0	305	250	33
Turn Type	pm+pt			Perm	
Protected Phases	4	5	2	6	
Permitted Phases		2			6
Detector Phase	4	5	2	6	6
Switch Phase					
Minimum Initial (s)	5.0	5.0	20.0	20.0	20.0
Minimum Split (s)	24.0	9.0	25.0	25.0	25.0
Total Split (s)	37.0	9.0	78.0	69.0	69.0
Total Split (%)	32.2%	7.8%	67.8%	60.0%	60.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag		
Lead-Lag Optimize?	Yes		Yes		
Recall Mode	None	Min	C-Max	C-Max	C-Max
v/c Ratio	0.46		0.20	0.17	0.03
Control Delay	46.2		2.8	3.3	0.9
Queue Delay	0.0		0.0	0.4	0.0
Total Delay	46.2		2.8	3.7	0.9
Queue Length 50th (ft)	42		31	45	1
Queue Length 95th (ft)	82		87	28	m2
Internal Link Dist (ft)	170		445	110	
Turn Bay Length (ft)					
Base Capacity (vph)	494		1500	1429	1222
Starvation Cap Reductn	0		0	769	0
Spillback Cap Reductn	0		0	0	0
Storage Cap Reductn	0		0	0	0
Reduced v/c Ratio	0.15		0.20	0.38	0.03

Intersection Summary

Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 85 (74%), Referenced to phase 2:NBT and 6:SBT, Start of Green  
 Natural Cycle: 60  
 Control Type: Actuated-Coordinated  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 12: Parking Garage & Atlantic St



HCM Signalized Intersection Capacity Analysis  
 12: Parking Garage & Atlantic St

2009 Weekday PM Peak Hour  
 5/5/2010



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	50	20	30	250	230	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	1.00			1.00	1.00	1.00
Fr <sub>t</sub>	0.96			1.00	1.00	0.85
Fl <sub>t</sub> Protected	0.97			0.99	1.00	1.00
Satd. Flow (prot)	1729			1853	1863	1583
Fl <sub>t</sub> Permitted	0.97			0.95	1.00	1.00
Satd. Flow (perm)	1729			1772	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	22	33	272	250	33
RTOR Reduction (vph)	17	0	0	0	0	8
Lane Group Flow (vph)	59	0	0	305	250	25
Turn Type			pm+pt			Perm
Protected Phases	4		5	2	6	
Permitted Phases			2			6
Actuated Green, G (s)	8.8			96.2	87.2	87.2
Effective Green, g (s)	8.8			96.2	87.2	87.2
Actuated g/C Ratio	0.08			0.84	0.76	0.76
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	2.0			0.2	0.2	0.2
Lane Grp Cap (vph)	132			1486	1413	1200
v/s Ratio Prot	c0.03			c0.01	0.13	
v/s Ratio Perm				c0.16		0.02
v/c Ratio	0.45			0.21	0.18	0.02
Uniform Delay, d <sub>1</sub>	50.8			1.9	3.9	3.4
Progression Factor	1.00			1.00	0.65	0.45
Incremental Delay, d <sub>2</sub>	0.9			0.0	0.3	0.0
Delay (s)	51.7			1.9	2.8	1.6
Level of Service	D			A	A	A
Approach Delay (s)	51.7			1.9	2.6	
Approach LOS	D			A	A	

Intersection Summary

HCM Average Control Delay	7.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	50.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues  
13: North State St & Canal St

2009 Weekday PM Peak Hour  
5/5/2010



Lane Group	WBT	NBL	NBT	SBT
Lane Configurations	←←←←	↖	↑↑	↑↑
Volume (vph)	950	400	500	550
Lane Group Flow (vph)	1577	435	543	815
Turn Type	pm+pt			
Protected Phases	8	5	2	6
Permitted Phases	2			
Detector Phase	8	5	2	6
Switch Phase				
Minimum Initial (s)	12.0	6.0	15.0	15.0
Minimum Split (s)	22.0	19.0	27.0	27.0
Total Split (s)	37.0	38.0	78.0	40.0
Total Split (%)	32.2%	33.0%	67.8%	34.8%
Yellow Time (s)	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0	5.0
Lead/Lag	Lead		Lag	
Lead-Lag Optimize?	Yes		Yes	
Recall Mode	None	None	C-Min	C-Min
v/c Ratio	0.71	0.90	0.27	0.74
Control Delay	34.1	63.3	10.3	38.7
Queue Delay	0.1	111.2	0.8	0.2
Total Delay	34.2	174.5	11.1	38.9
Queue Length 50th (ft)	278	284	80	275
Queue Length 95th (ft)	363	m372	m78	348
Internal Link Dist (ft)	377		118	106
Turn Bay Length (ft)				
Base Capacity (vph)	2216	596	2246	1105
Starvation Cap Reductn	0	244	1340	0
Spillback Cap Reductn	72	0	0	27
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.74	1.24	0.60	0.76

Intersection Summary

Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 101 (88%), Referenced to phase 2:NBT and 6:SBT, Start of Green  
 Natural Cycle: 70  
 Control Type: Actuated-Coordinated  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 13: North State St & Canal St



HCM Signalized Intersection Capacity Analysis  
13: North State St & Canal St

2009 Weekday PM Peak Hour

5/5/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					← ← ←		←	↑↑			↑↑	
Volume (vph)	0	0	0	250	950	250	400	500	0	0	550	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	5.0			5.0	
Lane Util. Factor					0.86		1.00	0.95			0.95	
Fr <sub>t</sub>					0.97		1.00	1.00			0.96	
Fl <sub>t</sub> Protected					0.99		0.95	1.00			1.00	
Satd. Flow (prot)					6189		1770	3539			3398	
Fl <sub>t</sub> Permitted					0.99		0.14	1.00			1.00	
Satd. Flow (perm)					6189		260	3539			3398	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	272	1033	272	435	543	0	0	598	217
RTOR Reduction (vph)	0	0	0	0	30	0	0	0	0	0	32	0
Lane Group Flow (vph)	0	0	0	0	1547	0	435	543	0	0	783	0
Turn Type				Perm			pm+pt					
Protected Phases					8		5	2			6	
Permitted Phases				8			2					
Actuated Green, G (s)					40.7		65.3	65.3			35.9	
Effective Green, g (s)					40.7		65.3	65.3			35.9	
Actuated g/C Ratio					0.35		0.57	0.57			0.31	
Clearance Time (s)					4.0		4.0	5.0			5.0	
Vehicle Extension (s)					5.0		1.0	0.2			0.2	
Lane Grp Cap (vph)					2190		481	2010			1061	
v/s Ratio Prot							c0.20	0.15			0.23	
v/s Ratio Perm					0.25		c0.31					
v/c Ratio					0.71		0.90	0.27			0.74	
Uniform Delay, d <sub>1</sub>					32.0		29.1	12.7			35.4	
Progression Factor					1.00		1.72	0.81			1.00	
Incremental Delay, d <sub>2</sub>					1.3		16.9	0.3			4.6	
Delay (s)					33.3		66.9	10.6			40.0	
Level of Service					C		E	B			D	
Approach Delay (s)		0.0			33.3			35.7			40.0	
Approach LOS		A			C			D			D	

Intersection Summary

HCM Average Control Delay	35.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	76.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Queues  
14: South State St & Canal St

2009 Weekday PM Peak Hour  
5/5/2010

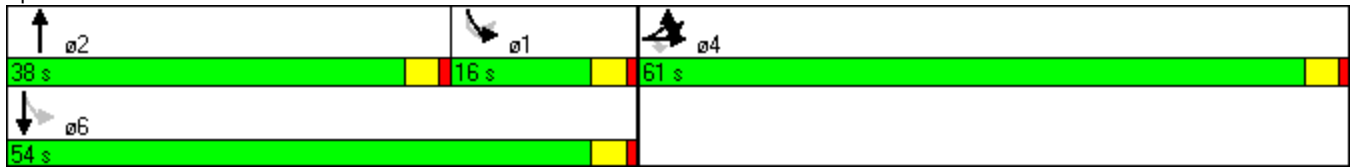


Lane Group	EBL2	EBL	EBT	EBR	NBT	SBL2	SBL	SBT
Lane Configurations								
Volume (vph)	250	860	710	400	650	200	100	500
Lane Group Flow (vph)	245	850	884	435	979	0	0	869
Turn Type	Split	Split		Perm		custom	pm+pt	
Protected Phases	4	4	4		2		1	6
Permitted Phases				4		1	6	
Detector Phase	4	4	4	4	2	1	1	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	25.0	5.0	5.0	25.0
Minimum Split (s)	29.0	29.0	29.0	29.0	29.0	16.0	16.0	29.0
Total Split (s)	61.0	61.0	61.0	61.0	38.0	16.0	16.0	54.0
Total Split (%)	53.0%	53.0%	53.0%	53.0%	33.0%	13.9%	13.9%	47.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag					Lead	Lag	Lag	
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	C-Min	None	None	C-Min
v/c Ratio	0.29	1.05	1.04	0.48	0.67			2.57dl
Control Delay	5.8	57.5	54.7	1.8	31.1			86.8
Queue Delay	0.2	94.7	0.0	0.1	3.0			87.2
Total Delay	6.0	152.2	54.7	1.9	34.1			174.0
Queue Length 50th (ft)	44	~765	~791	16	246			~380
Queue Length 95th (ft)	m55	m#1005	m#1034	m16	m325			#521
Internal Link Dist (ft)			1037		363			118
Turn Bay Length (ft)								
Base Capacity (vph)	846	811	849	913	1454			796
Starvation Cap Reductn	0	0	0	0	356			124
Spillback Cap Reductn	149	143	0	64	290			8
Storage Cap Reductn	0	0	0	0	0			0
Reduced v/c Ratio	0.35	1.27	1.04	0.51	0.89			1.29

Intersection Summary

Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 16 (14%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow  
 Natural Cycle: 120  
 Control Type: Actuated-Coordinated  
 ~ Volume exceeds capacity, queue is theoretically infinite.  
 Queue shown is maximum after two cycles.  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.  
 dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 14: South State St & Canal St



HCM Signalized Intersection Capacity Analysis  
 14: South State St & Canal St

2009 Weekday PM Peak Hour

5/5/2010



Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	250	860	710	400	650	150	100	200	100	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0					4.0
Lane Util. Factor	0.95	0.91	0.91	1.00	0.95					0.95
Frt	1.00	1.00	1.00	0.85	0.96					1.00
Flt Protected	0.95	0.95	0.99	1.00	1.00					0.98
Satd. Flow (prot)	1681	1610	1684	1583	3392					3474
Flt Permitted	0.95	0.95	0.99	1.00	1.00					0.52
Satd. Flow (perm)	1681	1610	1684	1583	3392					1828
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	272	935	772	435	707	163	109	217	109	543
RTOR Reduction (vph)	0	0	0	116	7	0	0	0	0	0
Lane Group Flow (vph)	245	850	884	319	972	0	0	0	0	869
Turn Type	Split	Split		Perm				custom	pm+pt	
Protected Phases	4	4	4		2				1	6
Permitted Phases				4				1	6	
Actuated Green, G (s)	57.9	57.9	57.9	57.9	49.1					49.1
Effective Green, g (s)	57.9	57.9	57.9	57.9	49.1					49.1
Actuated g/C Ratio	0.50	0.50	0.50	0.50	0.43					0.43
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0					4.0
Vehicle Extension (s)	3.5	3.5	3.5	3.5	0.2					0.2
Lane Grp Cap (vph)	846	811	848	797	1448					780
v/s Ratio Prot	0.15	c0.53	0.52		0.29					
v/s Ratio Perm				0.20						c0.48
v/c Ratio	0.29	1.05	1.04	0.40	0.67					2.57dl
Uniform Delay, d1	16.6	28.6	28.6	17.8	26.5					33.0
Progression Factor	0.30	0.48	0.48	0.06	1.13					0.68
Incremental Delay, d2	0.2	40.1	37.7	0.3	1.4					63.5
Delay (s)	5.2	53.9	51.5	1.4	31.3					86.0
Level of Service	A	D	D	A	C					F
Approach Delay (s)			38.6		31.3					86.0
Approach LOS			D		C					F

Intersection Summary

HCM Average Control Delay	46.6	HCM Level of Service	D
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	95.9%	ICU Level of Service	F
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group



Queues  
15: Dock Street & Canal St

2009 Weekday PM Peak Hour  
5/5/2010

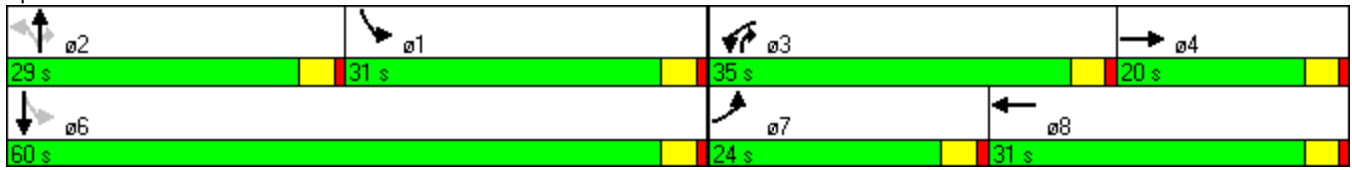


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↖	↗		↗	↗	↖	↗
Volume (vph)	230	430	419	395	20	495	456	530	471
Lane Group Flow (vph)	250	467	455	824	0	560	496	576	609
Turn Type	Prot		Prot		Perm		pm+ov	pm+pt	
Protected Phases	7	4	3	8		2	3	1	6
Permitted Phases					2		2	6	
Detector Phase	7	4	3	8	2	2	3	1	6
Switch Phase									
Minimum Initial (s)	10.0	10.0	5.0	10.0	10.0	10.0	5.0	5.0	10.0
Minimum Split (s)	14.0	20.0	14.0	20.0	21.0	21.0	14.0	15.0	15.0
Total Split (s)	24.0	20.0	35.0	31.0	29.0	29.0	35.0	31.0	60.0
Total Split (%)	20.9%	17.4%	30.4%	27.0%	25.2%	25.2%	30.4%	27.0%	52.2%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	None	C-Max	C-Max	None	None	C-Max
v/c Ratio	0.84	0.95	0.95	0.88		0.77	0.60	1.08	0.35
Control Delay	70.4	79.2	73.3	44.7		49.6	12.6	90.2	13.5
Queue Delay	0.0	0.0	0.0	1.1		0.0	0.0	363.9	0.0
Total Delay	70.4	79.2	73.3	45.8		49.6	12.6	454.1	13.5
Queue Length 50th (ft)	180	183	332	247		205	121	~408	121
Queue Length 95th (ft)	#312	#286	#536	#362		271	182	m#493	m141
Internal Link Dist (ft)		841		1377		257			363
Turn Bay Length (ft)			150				100		
Base Capacity (vph)	308	492	477	933		731	827	535	1726
Starvation Cap Reductn	0	0	0	0		0	0	232	0
Spillback Cap Reductn	0	0	0	25		0	0	0	0
Storage Cap Reductn	0	0	0	0		0	0	0	0
Reduced v/c Ratio	0.81	0.95	0.95	0.91		0.77	0.60	1.90	0.35

Intersection Summary

Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 17 (15%), Referenced to phase 2:NBT and 6:SBTL, Start of Green  
 Natural Cycle: 90  
 Control Type: Actuated-Coordinated  
 ~ Volume exceeds capacity, queue is theoretically infinite.  
 Queue shown is maximum after two cycles.  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 15: Dock Street & Canal St



HCM Signalized Intersection Capacity Analysis  
15: Dock Street & Canal St

2009 Weekday PM Peak Hour

5/5/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	230	430	0	419	395	363	20	495	456	530	471	89
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95	1.00	1.00	0.95	
Frt	1.00	1.00		1.00	0.93			1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539		1770	3285			3532	1583	1770	3455	
Flt Permitted	0.95	1.00		0.95	1.00			0.91	1.00	0.22	1.00	
Satd. Flow (perm)	1770	3539		1770	3285			3236	1583	414	3455	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	250	467	0	455	429	395	22	538	496	576	512	97
RTOR Reduction (vph)	0	0	0	0	144	0	0	0	29	0	14	0
Lane Group Flow (vph)	250	467	0	455	680	0	0	560	467	576	595	0
Turn Type	Prot			Prot			Perm		pm+ov	pm+pt		
Protected Phases	7	4		3	8			2	3	1	6	
Permitted Phases							2		2	6		
Actuated Green, G (s)	19.4	16.0		31.0	27.6			25.0	56.0	56.0	56.0	
Effective Green, g (s)	19.4	16.0		31.0	27.6			26.0	58.0	57.0	57.0	
Actuated g/C Ratio	0.17	0.14		0.27	0.24			0.23	0.50	0.50	0.50	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Vehicle Extension (s)	5.0	5.0		5.0	5.0			0.2	5.0	5.0	0.2	
Lane Grp Cap (vph)	299	492		477	788			732	798	535	1712	
v/s Ratio Prot	0.14	0.13		c0.26	c0.21				0.16	c0.26	0.17	
v/s Ratio Perm								0.17	0.13	c0.27		
v/c Ratio	0.84	0.95		0.95	0.86			0.77	0.59	1.08	0.35	
Uniform Delay, d1	46.3	49.1		41.3	41.9			41.6	20.0	35.3	17.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	0.91	0.77	
Incremental Delay, d2	19.8	28.6		30.2	10.4			7.5	1.7	55.8	0.4	
Delay (s)	66.0	77.7		71.5	52.3			49.1	21.8	88.0	14.0	
Level of Service	E	E		E	D			D	C	F	B	
Approach Delay (s)		73.6			59.1			36.3			50.0	
Approach LOS		E			E			D			D	

Intersection Summary

HCM Average Control Delay	53.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	92.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Queues  
16: North State St & Elm Street

2009 Weekday PM Peak Hour  
5/5/2010



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT
Lane Configurations						
Volume (vph)	255	264	424	488	664	1203
Lane Group Flow (vph)	277	513	235	530	722	1574
Turn Type	Perm		Perm	pm+pt		
Protected Phases		8		5	2	6
Permitted Phases	8		8	2		
Detector Phase	8	8	8	5	2	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	7.0	6.0	20.0	20.0
Minimum Split (s)	22.0	22.0	22.0	10.0	24.0	24.0
Total Split (s)	28.0	28.0	28.0	41.0	87.0	46.0
Total Split (%)	24.3%	24.3%	24.3%	35.7%	75.7%	40.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag				Lead		Lag
Lead-Lag Optimize?				Yes		Yes
Recall Mode	None	None	None	None	C-Min	C-Min
v/c Ratio	0.86	0.73	0.52	0.95	0.27	0.72
Control Delay	70.6	36.6	9.3	47.5	12.7	29.8
Queue Delay	2.5	0.0	0.0	147.2	1.8	0.1
Total Delay	73.0	36.6	9.3	194.6	14.5	29.9
Queue Length 50th (ft)	197	135	0	400	196	357
Queue Length 95th (ft)	#312	196	73	m454	m209	446
Internal Link Dist (ft)		759			227	555
Turn Bay Length (ft)	500		500			
Base Capacity (vph)	369	785	487	628	2651	2193
Starvation Cap Reductn	0	0	0	228	1714	0
Spillback Cap Reductn	31	0	0	0	0	89
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.82	0.65	0.48	1.32	0.77	0.75

Intersection Summary

Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 70 (61%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow  
 Natural Cycle: 80  
 Control Type: Actuated-Coordinated  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 16: North State St & Elm Street



HCM Signalized Intersection Capacity Analysis  
16: North State St & Elm Street

2009 Weekday PM Peak Hour  
5/5/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↖	↕	↗	↖	↕			↕	↗
Volume (vph)	0	0	0	255	264	424	488	664	0	0	1203	245
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0	4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor				1.00	0.91	0.91	1.00	0.95			0.91	
Frt				1.00	0.93	0.85	1.00	1.00			0.97	
Flt Protected				0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1770	3166	1441	1770	3539			4956	
Flt Permitted				0.95	1.00	1.00	0.07	1.00			1.00	
Satd. Flow (perm)				1770	3166	1441	137	3539			4956	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	277	287	461	530	722	0	0	1308	266
RTOR Reduction (vph)	0	0	0	0	128	192	0	0	0	0	24	0
Lane Group Flow (vph)	0	0	0	277	385	43	530	722	0	0	1550	0
Turn Type				Perm		Perm	pm+pt					
Protected Phases					8		5	2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)				20.9	20.9	20.9	86.1	86.1			50.3	
Effective Green, g (s)				20.9	20.9	20.9	86.1	86.1			50.3	
Actuated g/C Ratio				0.18	0.18	0.18	0.75	0.75			0.44	
Clearance Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)				1.0	1.0	1.0	1.0	0.2			0.2	
Lane Grp Cap (vph)				322	575	262	554	2650			2168	
v/s Ratio Prot					0.12		c0.26	0.20			0.31	
v/s Ratio Perm				c0.16		0.03	c0.45					
v/c Ratio				0.86	0.67	0.16	0.96	0.27			0.72	
Uniform Delay, d1				45.6	43.8	39.7	34.0	4.6			26.5	
Progression Factor				1.00	1.00	1.00	0.90	2.56			1.00	
Incremental Delay, d2				19.6	2.3	0.1	17.8	0.1			2.1	
Delay (s)				65.3	46.1	39.8	48.4	11.8			28.5	
Level of Service				E	D	D	D	B			C	
Approach Delay (s)		0.0			49.8			27.3			28.5	
Approach LOS		A			D			C			C	

Intersection Summary		
HCM Average Control Delay	33.8	HCM Level of Service C
HCM Volume to Capacity ratio	0.93	
Actuated Cycle Length (s)	115.0	Sum of lost time (s) 8.0
Intersection Capacity Utilization	79.9%	ICU Level of Service D
Analysis Period (min)	15	
c Critical Lane Group		

Queues  
 17: South State St & Elm Street I-95 NB on-ramp

2009 Weekday PM Peak Hour  
 5/5/2010



Lane Group	EBL2	EBT	NBT	SBL	SBT
Lane Configurations					
Volume (vph)	128	137	1023	136	956
Lane Group Flow (vph)	139	863	1452	546	1039
Turn Type	Perm			Prot	
Protected Phases		4	2	1	6
Permitted Phases	4				
Detector Phase	4	4	2	1	6
Switch Phase					
Minimum Initial (s)	12.0	12.0	15.0	6.0	15.0
Minimum Split (s)	22.0	22.0	22.0	10.0	22.0
Total Split (s)	33.0	33.0	58.0	24.0	82.0
Total Split (%)	28.7%	28.7%	50.4%	20.9%	71.3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0
Lead/Lag			Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	
Recall Mode	None	None	C-Min	None	C-Min
v/c Ratio	0.29	0.92	0.93	1.32dl	0.84
Control Delay	20.8	29.5	31.0	72.7	18.5
Queue Delay	0.1	0.0	18.2	2.8	12.7
Total Delay	20.8	29.5	49.1	75.5	31.2
Queue Length 50th (ft)	66	285	444	158	269
Queue Length 95th (ft)	m68	m277	m383	#296	375
Internal Link Dist (ft)		1681	420		227
Turn Bay Length (ft)					
Base Capacity (vph)	475	933	1606	597	1264
Starvation Cap Reductn	0	0	0	18	222
Spillback Cap Reductn	28	0	194	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.31	0.92	1.03	0.94	1.00

Intersection Summary

Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 100 (87%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow  
 Natural Cycle: 80  
 Control Type: Actuated-Coordinated  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.  
 dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Queues

17: South State St & Elm Street I-95 NB on-ramp

2009 Weekday PM Peak Hour

5/5/2010

Splits and Phases: 17: South State St & Elm Street I-95 NB on-ramp





HCM Signalized Intersection Capacity Analysis  
 17: South State St & Elm Street I-95 NB on-ramp

2009 Weekday PM Peak Hour  
 5/5/2010



Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	128	394	137	263	1023	253	60	366	136	956
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0				4.0	4.0
Lane Util. Factor	1.00		0.95		0.95				0.97	1.00
Frt	1.00		0.95		0.96				1.00	1.00
Flt Protected	0.95		0.98		1.00				0.95	1.00
Satd. Flow (prot)	1770		3282		3415				3433	1863
Flt Permitted	0.95		0.98		1.00				0.95	1.00
Satd. Flow (perm)	1770		3282		3415				3433	1863
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	139	428	149	286	1112	275	65	398	148	1039
RTOR Reduction (vph)	0	0	52	0	3	0	0	0	0	0
Lane Group Flow (vph)	139	0	811	0	1449	0	0	0	546	1039
Turn Type	Perm	Perm						Prot	Prot	
Protected Phases			4		2			1	1	6
Permitted Phases	4	4								
Actuated Green, G (s)	30.9		30.9		52.6				19.5	76.1
Effective Green, g (s)	30.9		30.9		52.6				19.5	76.1
Actuated g/C Ratio	0.27		0.27		0.46				0.17	0.66
Clearance Time (s)	4.0		4.0		4.0				4.0	4.0
Vehicle Extension (s)	5.0		5.0		0.2				1.0	0.2
Lane Grp Cap (vph)	476		882		1562				582	1233
v/s Ratio Prot					c0.42				c0.16	0.56
v/s Ratio Perm	0.08		0.25							
v/c Ratio	0.29		0.92		0.93				1.32dl	0.84
Uniform Delay, d1	33.4		40.8		29.4				47.2	14.9
Progression Factor	0.59		0.60		0.89				1.15	0.88
Incremental Delay, d2	0.2		4.5		4.5				17.1	4.9
Delay (s)	19.8		29.0		30.7				71.2	18.1
Level of Service	B		C		C				E	B
Approach Delay (s)			27.7		30.7					36.4
Approach LOS			C		C					D

Intersection Summary

HCM Average Control Delay	32.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 18: Cherry Street & Elm Street

2009 Weekday PM Peak Hour  
 5/5/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↔			↔			↔	
Volume (veh/h)	0	0	0	6	0	12	17	1090	5	15	1011	206
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	7	0	13	18	1185	5	16	1099	224
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (ft)							336			500		
pX, platoon unblocked	0.43	0.43	0.37	0.43	0.43	0.87	0.37			0.87		
vC, conflicting volume	1886	2471	1211	2468	2580	595	1323			1190		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1274	2635	709	2628	2889	240	1015			923		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	0	100	98	93			97		
cM capacity (veh/h)	48	9	138	5	6	663	248			641		

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	20	611	598	1339
Volume Left	7	18	0	16
Volume Right	13	0	5	224
cSH	14	248	1700	641
Volume to Capacity	1.44	0.07	0.35	0.03
Queue Length 95th (ft)	78	6	0	2
Control Delay (s)	792.4	2.9	0.0	1.3
Lane LOS	F	A		A
Approach Delay (s)	792.4	1.5		1.3
Approach LOS	F			

Intersection Summary			
Average Delay		7.4	
Intersection Capacity Utilization	88.0%		ICU Level of Service E
Analysis Period (min)		15	

Queues  
19: Jefferson St & Elm Street

2009 Weekday PM Peak Hour  
5/5/2010

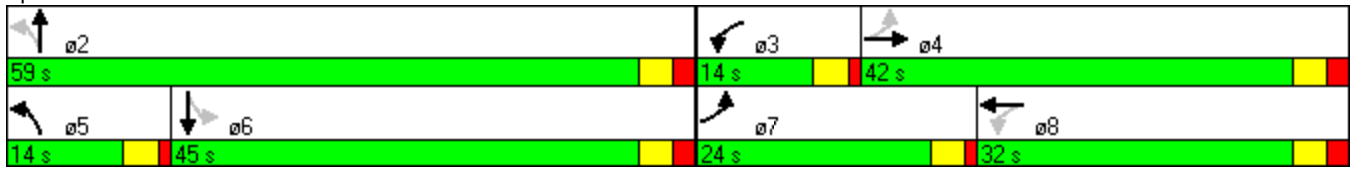


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↖	↗	↖	↗		↕		↕
Volume (vph)	431	560	106	495	147	540	106	737
Lane Group Flow (vph)	468	819	115	688	0	846	0	1103
Turn Type	pm+pt		pm+pt		pm+pt		Perm	
Protected Phases	7	4	3	8	5	2		6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	3	8	5	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0
Minimum Split (s)	9.0	21.0	14.0	21.0	14.0	21.0	21.0	21.0
Total Split (s)	24.0	42.0	14.0	32.0	14.0	59.0	45.0	45.0
Total Split (%)	20.9%	36.5%	12.2%	27.8%	12.2%	51.3%	39.1%	39.1%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	2.0	1.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	-1.0	0.0	-1.0	0.0	-1.0	0.0	-1.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead		Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	C-Max	C-Max
v/c Ratio	1.25	1.33	0.56	1.54		1.18dl		1.02
Control Delay	162.0	190.0	31.8	284.0		56.2		58.9
Queue Delay	0.0	152.0	0.0	0.0		0.0		0.0
Total Delay	162.0	341.9	31.8	284.0		56.2		58.9
Queue Length 50th (ft)	~382	~793	57	~712		310		~395
Queue Length 95th (ft)	#589	#1039	m78	m#794		#462		m#571
Internal Link Dist (ft)		290		495		389		256
Turn Bay Length (ft)	200		150					
Base Capacity (vph)	375	618	221	448		862		1081
Starvation Cap Reductn	0	126	0	0		0		0
Spillback Cap Reductn	0	0	0	0		0		0
Storage Cap Reductn	0	0	0	0		0		0
Reduced v/c Ratio	1.25	1.66	0.52	1.54		0.98		1.02

Intersection Summary

Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 20 (17%), Referenced to phase 2:NBT and 6:SBTL, Start of Green  
 Natural Cycle: 150  
 Control Type: Actuated-Coordinated  
 ~ Volume exceeds capacity, queue is theoretically infinite.  
 Queue shown is maximum after two cycles.  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.  
 dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 19: Jefferson St & Elm Street



HCM Signalized Intersection Capacity Analysis  
 19: Jefferson St & Elm Street

2009 Weekday PM Peak Hour  
 5/5/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	431	560	193	106	495	138	147	540	91	106	737	172
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frt	1.00	0.96		1.00	0.97			0.98			0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1770	1791		1770	1802			3445			3431	
Flt Permitted	0.13	1.00		0.15	1.00			0.51			0.65	
Satd. Flow (perm)	240	1791		276	1802			1785			2236	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	468	609	210	115	538	150	160	587	99	115	801	187
RTOR Reduction (vph)	0	11	0	0	9	0	0	9	0	0	12	0
Lane Group Flow (vph)	468	808	0	115	679	0	0	837	0	0	1091	0
Turn Type	pm+pt			pm+pt			pm+pt			Perm		
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	51.0	38.0		36.0	27.0			54.0			54.0	
Effective Green, g (s)	51.0	39.0		36.0	28.0			55.0			55.0	
Actuated g/C Ratio	0.44	0.34		0.31	0.24			0.48			0.48	
Clearance Time (s)	4.0	5.0		4.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	373	607		203	439			854			1069	
v/s Ratio Prot	c0.22	0.45		0.04	c0.38							
v/s Ratio Perm	0.34			0.13				0.47			c0.49	
v/c Ratio	1.25	1.33		0.57	1.55			1.18dl			1.02	
Uniform Delay, d1	34.3	38.0		31.5	43.5			29.5			30.0	
Progression Factor	1.00	1.00		1.09	1.12			1.00			1.15	
Incremental Delay, d2	134.8	160.4		3.0	255.2			25.9			25.4	
Delay (s)	169.1	198.4		37.3	304.0			55.3			59.9	
Level of Service	F	F		D	F			E			E	
Approach Delay (s)		187.8			265.8			55.3			59.9	
Approach LOS		F			F			E			E	

Intersection Summary

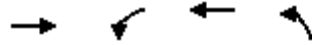
HCM Average Control Delay	140.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	122.7%	ICU Level of Service	H
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

Queues  
20: East Main Street & North State Street

2009 Weekday PM Peak Hour  
5/5/2010

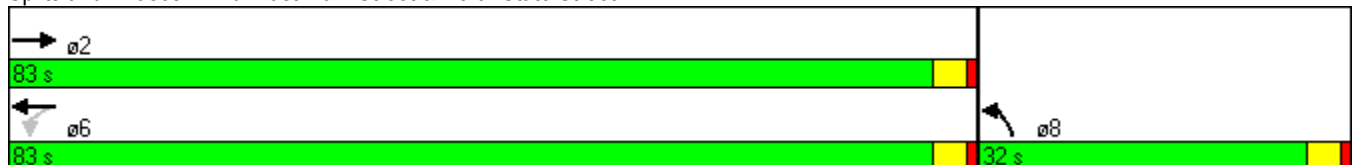


Lane Group	EBT	WBL	WBT	NBL
Lane Configurations	↑↑		↑↑	↑↓
Volume (vph)	1068	26	1002	15
Lane Group Flow (vph)	1194	0	1117	142
Turn Type	Perm			
Protected Phases	2		6	8
Permitted Phases		6		
Detector Phase	2	6	6	8
Switch Phase				
Minimum Initial (s)	5.0	5.0	5.0	7.0
Minimum Split (s)	20.0	20.0	20.0	22.0
Total Split (s)	83.0	83.0	83.0	32.0
Total Split (%)	72.2%	72.2%	72.2%	27.8%
Yellow Time (s)	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	C-Min	C-Min	C-Min	None
v/c Ratio	0.35		0.37	0.58
Control Delay	2.5		1.6	22.8
Queue Delay	0.0		0.2	0.0
Total Delay	2.5		1.8	22.8
Queue Length 50th (ft)	57		27	18
Queue Length 95th (ft)	143		63	76
Internal Link Dist (ft)	848		136	779
Turn Bay Length (ft)				
Base Capacity (vph)	3383		3032	485
Starvation Cap Reductn	0		901	0
Spillback Cap Reductn	53		0	1
Storage Cap Reductn	0		0	0
Reduced v/c Ratio	0.36		0.52	0.29

Intersection Summary

Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 85 (74%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow  
 Natural Cycle: 45  
 Control Type: Actuated-Coordinated

Splits and Phases: 20: East Main Street & North State Street



HCM Signalized Intersection Capacity Analysis  
 20: East Main Street & North State Street

2009 Weekday PM Peak Hour  
 5/5/2010



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↔	
Volume (vph)	1068	30	26	1002	15	116
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	16	12	12
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	0.95			0.95	1.00	
Frt	1.00			1.00	0.88	
Flt Protected	1.00			1.00	0.99	
Satd. Flow (prot)	3994			4006	1630	
Flt Permitted	1.00			0.89	0.99	
Satd. Flow (perm)	3994			3584	1630	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1161	33	28	1089	16	126
RTOR Reduction (vph)	1	0	0	0	107	0
Lane Group Flow (vph)	1193	0	0	1117	35	0
Turn Type			Perm			
Protected Phases	2			6	8	
Permitted Phases			6			
Actuated Green, G (s)	97.4			97.4	9.6	
Effective Green, g (s)	97.4			97.4	9.6	
Actuated g/C Ratio	0.85			0.85	0.08	
Clearance Time (s)	4.0			4.0	4.0	
Vehicle Extension (s)	0.2			0.2	3.0	
Lane Grp Cap (vph)	3383			3035	136	
v/s Ratio Prot	0.30				c0.02	
v/s Ratio Perm				c0.31		
v/c Ratio	0.35			0.37	0.26	
Uniform Delay, d1	1.9			2.0	49.4	
Progression Factor	1.00			0.57	1.00	
Incremental Delay, d2	0.3			0.3	1.0	
Delay (s)	2.2			1.4	50.4	
Level of Service	A			A	D	
Approach Delay (s)	2.2			1.4	50.4	
Approach LOS	A			A	D	

Intersection Summary

HCM Average Control Delay	4.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 21: East Main Street & Crystal Street

2009 Weekday PM Peak Hour  
 5/5/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			
Volume (veh/h)	5	1179	902	10	0	100
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	1282	980	11	0	109
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)		216	192			
pX, platoon unblocked	0.93				0.96	0.93
vC, conflicting volume	991				1638	496
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	829				1243	293
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				100	83
cM capacity (veh/h)	739				159	651

Direction, Lane #	EB 1	EB 2	WB 1	WB 2
Volume Total	433	854	654	338
Volume Left	5	0	0	0
Volume Right	0	0	0	11
cSH	739	1700	1700	1700
Volume to Capacity	0.01	0.50	0.38	0.20
Queue Length 95th (ft)	1	0	0	0
Control Delay (s)	0.2	0.0	0.0	0.0
Lane LOS	A			
Approach Delay (s)	0.1		0.0	
Approach LOS				

Intersection Summary			
Average Delay		Err	
Intersection Capacity Utilization		Err%	ICU Level of Service H
Analysis Period (min)		15	



Queues  
22: East Main Street & Myrtle Avenue

2009 Weekday PM Peak Hour  
5/5/2010



Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↑↑	↑	↑
Volume (vph)	946	77	713	225	168
Lane Group Flow (vph)	1292	0	859	245	183
Turn Type		Perm			Perm
Protected Phases	2		6	8	
Permitted Phases		6			8
Detector Phase	2	6	6	8	8
Switch Phase					
Minimum Initial (s)	7.0	5.0	5.0	7.0	7.0
Minimum Split (s)	22.0	20.0	20.0	22.0	22.0
Total Split (s)	79.0	79.0	79.0	36.0	36.0
Total Split (%)	68.7%	68.7%	68.7%	31.3%	31.3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	C-Min	C-Min	C-Min	None	None
v/c Ratio	0.50		0.48	0.75	0.45
Control Delay	5.8		7.8	33.9	4.5
Queue Delay	0.1		0.0	0.0	0.0
Total Delay	5.9		7.8	33.9	4.5
Queue Length 50th (ft)	175		92	136	9
Queue Length 95th (ft)	296		127	m127	m30
Internal Link Dist (ft)	112		226	1534	
Turn Bay Length (ft)				250	
Base Capacity (vph)	2573		1774	493	539
Starvation Cap Reductn	284		0	0	0
Spillback Cap Reductn	0		0	0	0
Storage Cap Reductn	0		0	0	0
Reduced v/c Ratio	0.56		0.48	0.50	0.34

Intersection Summary

Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 74 (64%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow  
 Natural Cycle: 50  
 Control Type: Actuated-Coordinated  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 22: East Main Street & Myrtle Avenue



HCM Signalized Intersection Capacity Analysis  
 22: East Main Street & Myrtle Avenue

2009 Weekday PM Peak Hour  
 5/5/2010



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↗	↘
Volume (vph)	946	243	77	713	225	168
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			0.95	1.00	1.00
Fr <sub>t</sub>	0.97			1.00	1.00	0.85
Fl <sub>t</sub> Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3431			3522	1770	1583
Fl <sub>t</sub> Permitted	1.00			0.67	0.95	1.00
Satd. Flow (perm)	3431			2379	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1028	264	84	775	245	183
RTOR Reduction (vph)	14	0	0	0	0	112
Lane Group Flow (vph)	1278	0	0	859	245	71
Turn Type			Perm			Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	85.8			85.8	21.2	21.2
Effective Green, g (s)	85.8			85.8	21.2	21.2
Actuated g/C Ratio	0.75			0.75	0.18	0.18
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	0.2			0.2	3.0	3.0
Lane Grp Cap (vph)	2560			1775	326	292
v/s Ratio Prot	c0.37				c0.14	
v/s Ratio Perm				0.36		0.05
v/c Ratio	0.50			0.48	0.75	0.24
Uniform Delay, d <sub>1</sub>	5.9			5.8	44.4	40.1
Progression Factor	0.81			1.04	0.74	0.36
Incremental Delay, d <sub>2</sub>	0.7			0.9	0.9	0.0
Delay (s)	5.5			6.9	33.9	14.6
Level of Service	A			A	C	B
Approach Delay (s)	5.5			6.9	25.7	
Approach LOS	A			A	C	

Intersection Summary			
HCM Average Control Delay	9.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis  
 23: East Main Street & Maple Avenue

2009 Weekday PM Peak Hour  
 5/5/2010



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑↑	
Volume (veh/h)	1069	45	35	756	34	35
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1162	49	38	822	37	38
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	306			405		
pX, platoon unblocked				0.87	0.90	0.87
vC, conflicting volume				1211	1673	605
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol				932	1178	232
tC, single (s)				4.1	6.8	6.9
tC, 2 stage (s)						
tF (s)				2.2	3.5	3.3
p0 queue free %				94	76	94
cM capacity (veh/h)				632	155	666

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	775	436	312	548	75
Volume Left	0	0	38	0	37
Volume Right	0	49	0	0	38
cSH	1700	1700	632	1700	254
Volume to Capacity	0.46	0.26	0.06	0.32	0.29
Queue Length 95th (ft)	0	0	5	0	30
Control Delay (s)	0.0	0.0	2.0	0.0	25.0
Lane LOS	A			C	
Approach Delay (s)	0.0		0.7	25.0	
Approach LOS				C	

Intersection Summary					
Average Delay			1.2		
Intersection Capacity Utilization	57.4%		ICU Level of Service		B
Analysis Period (min)	15				

Queues  
24: East Main Street & Lincoln Avenue

2009 Weekday PM Peak Hour  
5/5/2010



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Volume (vph)	63	881	228	573	151	20	21	34	21
Lane Group Flow (vph)	68	1132	248	646	0	186	23	0	133
Turn Type	pm+pt		pm+pt		Perm		Perm	Perm	
Protected Phases	5	2	1	6		8			4
Permitted Phases	2		6		8		8	4	
Detector Phase	5	2	1	6	8	8	8	4	4
Switch Phase									
Minimum Initial (s)	4.0	8.0	4.0	8.0	12.0	12.0	12.0	12.0	12.0
Minimum Split (s)	8.0	20.0	8.0	20.0	23.0	23.0	23.0	23.0	23.0
Total Split (s)	8.0	55.0	25.0	72.0	35.0	35.0	35.0	35.0	35.0
Total Split (%)	7.0%	47.8%	21.7%	62.6%	30.4%	30.4%	30.4%	30.4%	30.4%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lag					
Lead-Lag Optimize?	Yes	Yes	Yes	Yes					
Recall Mode	None	C-Min	None	C-Min	None	None	None	None	None
v/c Ratio	0.14	0.59	0.60	0.28		0.83	0.07		0.39
Control Delay	6.0	15.6	14.6	9.8		70.8	12.1		25.4
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Delay	6.0	15.6	14.6	9.8		70.8	12.1		25.4
Queue Length 50th (ft)	11	164	52	102		133	0		51
Queue Length 95th (ft)	27	467	136	161		200	20		99
Internal Link Dist (ft)		325		1546		1598			1086
Turn Bay Length (ft)	120		180						
Base Capacity (vph)	498	1929	481	2334		297	449		428
Starvation Cap Reductn	0	0	0	0		0	0		0
Spillback Cap Reductn	0	0	0	0		0	0		0
Storage Cap Reductn	0	0	0	0		0	0		0
Reduced v/c Ratio	0.14	0.59	0.52	0.28		0.63	0.05		0.31

Intersection Summary

Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 27 (23%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow  
 Natural Cycle: 60  
 Control Type: Actuated-Coordinated

Splits and Phases: 24: East Main Street & Lincoln Avenue



HCM Signalized Intersection Capacity Analysis  
24: East Main Street & Lincoln Avenue

2009 Weekday PM Peak Hour  
5/5/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	63	881	160	228	573	21	151	20	21	34	21	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	0.98		1.00	0.99			1.00	0.85		0.93	
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.99	
Satd. Flow (prot)	1770	3458		1770	3520			1784	1583		1701	
Flt Permitted	0.41	1.00		0.16	1.00			0.58	1.00		0.83	
Satd. Flow (perm)	757	3458		290	3520			1087	1583		1429	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	68	958	174	248	623	23	164	22	23	37	23	73
RTOR Reduction (vph)	0	10	0	0	2	0	0	0	18	0	41	0
Lane Group Flow (vph)	68	1122	0	248	644	0	0	186	5	0	92	0
Turn Type	pm+pt			pm+pt			Perm		Perm	Perm		
Protected Phases	5	2		1	6			8				4
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	67.7	63.3		83.2	74.8			23.8	23.8		23.8	
Effective Green, g (s)	67.7	63.3		83.2	74.8			23.8	23.8		23.8	
Actuated g/C Ratio	0.59	0.55		0.72	0.65			0.21	0.21		0.21	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)	2.0	0.2		2.0	0.2			3.0	3.0		3.0	
Lane Grp Cap (vph)	484	1903		414	2290			225	328		296	
v/s Ratio Prot	0.01	0.32		c0.08	0.18							
v/s Ratio Perm	0.08			c0.35				c0.17	0.00		0.06	
v/c Ratio	0.14	0.59		0.60	0.28			0.83	0.01		0.31	
Uniform Delay, d1	10.1	17.2		11.2	8.6			43.6	36.3		38.6	
Progression Factor	0.73	0.75		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.0	1.2		1.6	0.3			21.3	0.0		0.6	
Delay (s)	7.5	14.2		12.7	8.9			65.0	36.3		39.2	
Level of Service	A	B		B	A			E	D		D	
Approach Delay (s)		13.8			10.0			61.8			39.2	
Approach LOS		B			A			E			D	

Intersection Summary

HCM Average Control Delay	17.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			