

MOVEMENT SUMMARY

Site: New Site - 1

Greenwich Avenue at Pulaski Street
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Pulaski Street											
5	T	463	2.0	0.763	15.3	LOS B	11.0	78.1	1.00	1.15	42.1
6	R	84	2.0	0.766	21.4	LOS C	11.0	78.1	1.00	1.15	39.8
Approach		547	2.0	0.763	16.2	LOS C	11.0	78.1	1.00	1.15	41.7
North: Greenwich Avenue											
7	L	389	2.0	0.936	20.1	LOS C	26.6	189.0	1.00	1.21	38.0
9	R	621	2.0	0.937	26.0	LOS C	26.6	189.0	1.00	1.21	36.4
Approach		1011	2.0	0.937	23.7	LOS C	26.6	189.0	1.00	1.21	37.0
West: Greenwich Avenue											
10	L	400	2.0	0.539	5.9	LOS A	5.7	40.5	0.38	0.49	49.9
11	T	337	2.0	0.539	4.9	LOS A	5.7	40.5	0.38	0.42	50.3
Approach		737	2.0	0.539	5.4	LOS A	5.7	40.5	0.38	0.46	50.1
All Vehicles		2295	2.0	0.937	16.0	LOS B	26.6	189.0	0.80	0.96	41.5

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Roundabout LOS Method: Same as Signalised Intersections.

Roundabout Capacity Model: SIDRA Standard.

DETAILED OUTPUT

Greenwich Avenue at Pulaski Street
Roundabout

Roundabouts

Roundabout Basic Parameters Site: New Site - 1

Intersection ID: 1
Roundabout

Cent Island Diam m	Circ Width m	Insc Diam. m	No.of Circ. Lanes	No.of Entry Lanes	Av.Ent Lane Width m	Circulating/Exiting Stream					O-D Factor
						Flow veh/h	%HV	Adjust. Flow pcu/h	%Exit Incl.	Cap. Constr. Effect	
East: Pulaski Street											
Environment Factor: 1.00			Entry/Circulating Flow Adjustment: Medium								
30	10	50	2	1	4.00	621	2.0	621	0	N	0.816
North: Greenwich Avenue											
Environment Factor: 1.00			Entry/Circulating Flow Adjustment: Medium								
30	10	50	2	1	4.00	337	2.0	337	0	N	0.970
West: Greenwich Avenue											
Environment Factor: 1.00			Entry/Circulating Flow Adjustment: Medium								
30	10	50	2	1	4.00	84	2.0	84	0	N	0.978
Roundabout Capacity Model: SIDRA Standard											

Roundabout Gap Acceptance Parameters Site: New Site - 1

Intersection ID: 1
Roundabout

Turn No.	Lane Type	Flow Rate pcu/h	Circulating/Exiting Stream				Critical Gap		Follow-up Headway sec
			Aver Speed km/h	Aver Dist m	In-Bnch Headway sec	Prop Bunched	Hdwy sec	Dist m	
East: Pulaski Street									
Environment Factor: 1.00			Entry/Circulating Flow Adjustment: Medium						
Thru	1 Dominant	621	24.1	38.8	2.00	0.537	3.72	24.9	2.51
Right	1 Dominant	621	24.1	38.8	2.00	0.537	3.72	24.9	2.51
North: Greenwich Avenue									
Environment Factor: 1.00			Entry/Circulating Flow Adjustment: Medium						
Left	1 Dominant	337	39.1	116.1	2.00	0.336	3.90	42.4	2.49
Right	1 Dominant	337	39.1	116.1	2.00	0.336	3.90	42.4	2.49
West: Greenwich Avenue									
Environment Factor: 1.00			Entry/Circulating Flow Adjustment: Medium						
Left	1 Dominant	84	24.1	286.1	2.00	0.097	3.98	26.6	2.41
Thru	1 Dominant	84	24.1	286.1	2.00	0.097	3.98	26.6	2.41

Roundabout Capacity Model: SIDRA Standard

P Priority sharing is implied for some movements (Follow-up Headway plus Intra-bunch Headway is larger than the Critical Gap). The O-D Factor (Roundabout Basic Parameters table) allows for priority sharing and priority emphasis.

Dist (Distance): Spacing, i.e. distance between the front ends of two successive vehicles across all lanes in the circulating or exiting stream

Movements

Movement Capacity Parameters Site:New Site - 1

Intersection ID: 1
Roundabout

Mov ID	Demand Flow veh/h	HV %	Opposing Movement Flow veh/h	HV %	Adjust. Flow pcu/h	Total Cap. veh/h	Prac. Deg. Satn xp	Prac. Spare Cap. %	Lane Util %	Deg. Satn x
East: Pulaski Street										
5 T	463	2.0	621	2.0	621	607	0.85	11	100	0.763
6 R	84	2.0	621	2.0	621	110	0.85	11	100	0.766
North: Greenwich Avenue										
7 L	389	2.0	337	2.0	337	416	0.85	-9	100	0.936
9 R	621	2.0	337	2.0	337	663	0.85	-9	100	0.937*
West: Greenwich Avenue										
10 L	400	2.0	84	2.0	84	742	0.85	58	100	0.539
11 T	337	2.0	84	2.0	84	625	0.85	58	100	0.539

* Maximum degree of saturation

Movement Performance Site:New Site - 1

Intersection ID: 1
Roundabout

Mov ID	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Eff. Stop Rate	Total Stops	Perf. Index	Tot.Trav. Distance (veh-km/h)	Tot.Trav. Time (veh-h/h)	Aver. Speed (km/h)
East: Pulaski Street									
5 T	1.96	2.36	15.3	1.15	533.8	12.81	281.7	6.7	42.1
6 R	0.50	0.60	21.4	1.15	97.2	2.53	54.6	1.4	39.8
North: Greenwich Avenue									
7 L	2.18	2.61	20.1	1.21	471.9	12.53	236.6	6.2	38.0
9 R	4.48	5.37	26.0	1.21	752.5	21.41	402.7	11.1	36.4
West: Greenwich Avenue									
10 L	0.65	0.78	5.9	0.49	196.5	6.82	243.0	4.9	49.9
11 T	0.46	0.55	4.9	0.42	142.0	5.55	206.1	4.1	50.3

Fuel Consumption, Emissions and Cost (Total) Site:New Site - 1

Intersection ID: 1
Roundabout

Mov ID	Cost Total \$/h	Fuel Total L/h	CO2 Total kg/h	CO Total kg/h	HC Total kg/h	NOX Total kg/h
East: Pulaski Street						
5 T	218.42	35.1	87.9	7.16	0.147	0.214
6 R	45.13	6.8	17.1	1.34	0.029	0.040
	263.55	42.0	105.0	8.50	0.176	0.255

North: Greenwich Avenue						
7 L	199.62	31.2	78.0	6.54	0.134	0.190
9 R	357.43	53.1	132.8	10.74	0.228	0.313
	557.05	84.2	210.8	17.29	0.363	0.502
West: Greenwich Avenue						
10 L	161.43	26.7	66.8	4.97	0.106	0.158
11 T	133.84	21.8	54.6	3.88	0.086	0.127
	295.27	48.5	121.4	8.84	0.192	0.285
INTERSECTION:	1115.87	174.7	437.2	34.63	0.731	1.042

Fuel Consumption, Emissions and Cost (Rate)
Site: New Site - 1

Intersection ID: 1
Roundabout

Mov ID	Cost Rate \$/km	Fuel Rate L/100km	CO2 Rate g/km	CO Rate g/km	HC Rate g/km	NOX Rate g/km
East: Pulaski Street						
5 T	0.78	12.5	312.1	25.41	0.523	0.761
6 R	0.83	12.5	313.8	24.56	0.527	0.738
	0.78	12.5	312.4	25.27	0.524	0.757
North: Greenwich Avenue						
7 L	0.84	13.2	329.7	27.66	0.568	0.802
9 R	0.89	13.2	329.7	26.68	0.567	0.776
	0.87	13.2	329.7	27.04	0.567	0.786
West: Greenwich Avenue						
10 L	0.66	11.0	274.8	20.45	0.438	0.652
11 T	0.65	10.6	264.9	18.81	0.416	0.616
	0.66	10.8	270.2	19.69	0.428	0.635
INTERSECTION:	0.78	12.3	306.9	24.31	0.513	0.732

Intersection Negotiation Data
Site: New Site - 1

Intersection ID: 1
Roundabout

From Approach	To Approach	Turn	Negn Radius m	Negn Speed km/h	Negn Dist. m	Appr. Dist. m	Downstream m	Distance User Spec?
East: Pulaski Street								
	North	Right	16.0	24.1	62.7	500	140	No
	West	Thru	43.1	35.1	36.2	500	114	No
North: Greenwich Avenue								
	East	Left	39.0	33.8	19.3	500	119	No
	West	Right	16.0	24.1	62.7	500	147	No
West: Greenwich Avenue								
	East	Thru	57.3	39.1	47.1	500	120	No
	North	Left	39.0	33.8	19.3	500	106	No

Maximum Negotiation (Design) Speed = 50.0 km/h

Downstream distance is distance travelled from the stopline until exit cruise speed is reached (includes negotiation distance). Acceleration distance is weighted for light and heavy vehicles. The same distance applies for both stopped and unstopped vehicles.

Movement Speeds and Geometric Delay

Site: New Site - 1

Intersection ID: 1
Roundabout

Mov ID	App. Speeds		Exit Speeds		Queue Move-up		Av. Section Spd		Geom Delay sec
	Cruise	Negn	Negn	Cruise	1st Grn	2nd Grn	Running	Overall	
East: Pulaski Street									
5 T	60.0	35.1	35.1	60.0	20.1		43.2	42.1	5.1
6 R	60.0	24.1	24.1	60.0	20.1		43.2	39.8	11.2
North: Greenwich Avenue									
7 L	60.0	33.8	33.8	60.0	24.8		40.3	38.0	5.4
9 R	60.0	24.1	24.1	60.0	24.8		39.7	36.4	11.2
West: Greenwich Avenue									
10 L	60.0	33.8	33.8	60.0			49.9	49.9	5.4
11 T	60.0	39.1	39.1	60.0			50.3	50.3	4.4

"Running Speed" is the average speed excluding stopped periods.

Lanes

Lane Performance

Site: New Site - 1

Intersection ID: 1
Roundabout

Lane No.	Flow veh/h	Cap veh/h	Deg. Satn x	Aver. Delay sec	Eff. Stop Rate	Queue		Lane Length m
						95% Back veh	m	
East: Pulaski Street								
1 TR	547	717	0.763	16.2	1.15	11.0	78.1	500.0
North: Greenwich Avenue								
1 LR	1011	1078	0.937	23.7	1.21	26.6	189.0	500.0
West: Greenwich Avenue								
1 LT	737	1367	0.539	5.4	0.46	5.7	40.5	500.0

Lane Flow and Capacity Information

Site: New Site - 1

Intersection ID: 1
Roundabout

Lane	Dem Flow (veh/h)	Min	Tot	Deg. Lane
------	------------------	-----	-----	-----------

No.	Lef	Thru	Rig	Tot	Cap veh/h	Cap veh/h	Satn x	Util %

East: Pulaski Street								
1 TR	0	463	84	547	150	717	0.763	100

North: Greenwich Avenue								
1 LR	389	0	621	1011	150	1078	0.937	100

West: Greenwich Avenue								
1 LT	400	337	0	737	150	1367	0.539	100

The capacity value for priority and continuous movements is obtained by adjusting the basic saturation flow for heavy vehicle and turning vehicle effects. Saturation flow scale applies if specified.

Lane, Approach and Intersection Performance Site: New Site - 1

Intersection ID: 1
Roundabout

Lane No.	Demand Flow (veh/h)				%HV	Adj. Basic Satf.	Eff Grn (sec) 1st 2nd	Deg Sat x	Aver. Delay sec	Longest Queue m	Shrt Lane m
	L	T	R	Tot							

East: Pulaski Street											
1 TR		463	84	547	2			0.763	16.2	78	500
	0	463	84	547	2			0.763	16.2	78	

North: Greenwich Avenue											
1 LR	389		621	1011	2			0.937	23.7	189	500
	389	0	621	1011	2			0.937	23.7	189	

West: Greenwich Avenue											
1 LT	400	337		737	2			0.539	5.4	40	500
	400	337	0	737	2			0.539	5.4	40	
=====											
ALL VEHICLES				Total Flow	% HV			Max X	Aver. Delay	Max Queue	
				2295	2			0.937	16.0	189	
=====											

Peak flow period = 30 minutes.

Queue values in this table are 95% queue (metres)

Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

Driver Characteristics Site: New Site - 1

Intersection ID: 1
Roundabout

Lane No.	Satn Speed km/h	Satn Flow veh/h	Satn Hdwy sec	Satn Spacing m	Average	Driver
					Queue Space m	Response Time sec

East: Pulaski Street						
1 TR	33.4	1435	2.51	23.28	7.12	1.74

North: Greenwich Avenue						
1 LR	27.8	1443	2.49	19.29	7.12	1.57

 West: Greenwich Avenue
 1 LT 36.2 1492 2.41 24.28 7.12 1.70

Saturation Flow and Saturation Headway are derived from follow-up headway.

Lane Delays
 Site:New Site - 1

Intersection ID: 1
 Roundabout

Lane No.	Deg. Satn x	Delay (seconds/veh)								
		Stop-line			Acc. Dec.	Queuing		Stopd		
		1st d1	2nd d2	Total dSL	dn	Total dq	MvUp dqm	(Idle) di	Geom dig	Control dic

East: Pulaski Street										
1 TR	0.763	4.7	5.4	10.1	5.6	4.5	2.8	1.8	6.1	16.2

North: Greenwich Avenue										
1 LR	0.937	4.2	10.5	14.7	4.6	10.1	5.5	4.6	9.0	23.7

West: Greenwich Avenue										
1 LT	0.539	0.5	0.0	0.5	2.4	0.0	0.0	0.0	4.9	5.4

dn is average stop-start delay for all vehicles queued and unqueued										

Lane Queues (Vehicles)
 Site:New Site - 1

Intersection ID: 1
 Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (veh)				Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue	
			Nb1	Nb2	Nb	95%				Nc	95%

East: Pulaski Street											
1 TR	0.763	0.8	2.6	1.1	3.8	11.0	0.16	0.0	100.0	1.5	3.7

North: Greenwich Avenue											
1 LR	0.937	2.9	4.7	5.1	9.8	26.6	0.38	0.0	100.0	4.1	9.3

West: Greenwich Avenue											
1 LT	0.539	0.0	1.9	0.0	1.9	5.7	0.08	0.0	100.0	0.1	0.3

Lane Queues (Distance)
 Site:New Site - 1

Intersection ID: 1
 Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (m)				Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue	
			Nb1	Nb2	Nb	95%				Nc	95%

East: Pulaski Street											
1 TR	0.763	6.0	18.8	8.1	26.8	78.1	0.16	0.0	100.0	11.0	26.4

North: Greenwich Avenue											
1 LR	0.937	20.8	33.5	36.5	70.0	189.0	0.38	0.0	100.0	29.4	66.1

```

-----
West: Greenwich Avenue
1 LT 0.539 0.0 13.5 0.0 13.5 40.5 0.08 0.0 100.0 0.7 1.8
-----

```

Lane Queue Percentiles (Vehicles)
Site:New Site - 1

Intersection ID: 1
Roundabout

```

-----
Lane      Deg.          Percentile (veh)
No.      Satn
         x
-----
East: Pulaski Street
1 TR 0.763 3.8 5.0 7.5 8.9 11.0 12.6
-----
North: Greenwich Avenue
1 LR 0.937 9.8 12.9 18.7 22.0 26.6 30.0
-----
West: Greenwich Avenue
1 LT 0.539 1.9 2.5 3.8 4.6 5.7 6.6
-----

```

Lane Queue Percentiles (Distance)
Site:New Site - 1

Intersection ID: 1
Roundabout

```

-----
Lane      Deg.          Percentile (metres)
No.      Satn
         x
-----
East: Pulaski Street
1 TR 0.763 26.9 35.6 53.1 63.6 78.1 89.5
-----
North: Greenwich Avenue
1 LR 0.937 70.1 91.8 133.2 157.0 189.0 213.6
-----
West: Greenwich Avenue
1 LT 0.539 13.5 18.0 27.1 32.7 40.5 46.7
-----

```

Lane Stops
Site:New Site - 1

Intersection ID: 1
Roundabout

```

-----
Lane      Deg.  -- Effective Stop Rate --  Total  Queue  Total
No.      Satn  he1 he2  hig  h  H  Move-up  Queue  Prop.
         x  he1 he2  hig  h  H  Rate  Move-ups  Queued
         x  he1 he2  hig  h  H  hqm  Hqm  pq
-----
East: Pulaski Street
1 TR 0.763 0.98 0.17 0.00 1.15 630.9 0.42 227.7 1.00
-----
North: Greenwich Avenue
1 LR 0.937 0.85 0.36 0.00 1.21 1224.4 0.75 754.1 1.00
-----

```

West: Greenwich Avenue
 1 LT 0.539 0.19 0.00 0.27 0.46 338.5 0.00 0.0 0.38

hig is the average value for all movements in a shared lane
 hqm is average queue move-up rate for all vehicles queued and unqueued

Flow Rates and Demand Analysis

Movement Definitions and Flow Rates (O-D)

Site:New Site - 1

Intersection ID: 1
 Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate		Flow Scale		Peak Flow Factor
				LV	HV	Fixed	Var	
East: Pulaski Street								
	North	6	Right	83	2	1.00	1.00	0.95
	West	5	Thru	454	9	1.00	1.00	0.95
North: Greenwich Avenue								
	East	7	Left	382	8	1.00	1.00	0.95
	West	9	Right	609	12	1.00	1.00	0.95
West: Greenwich Avenue								
	East	11	Thru	330	7	1.00	1.00	0.95
	North	10	Left	392	8	1.00	1.00	0.95

Unit Time for Volumes = 60 minutes
 Peak Flow Period = 30 minutes
 Flow Rates include effects of Flow Scale and Peak Flow Factor

Flow Rates (Separate Light and Heavy Vehicles)

Site:New Site - 1

Intersection ID: 1
 Roundabout

Mov ID	Left		Through		Right	
	LV	HV	LV	HV	LV	HV
Demand flows in veh/h as used by the program						
East: Pulaski Street						
5 T	0	0	454	9	0	0
6 R	0	0	0	0	83	2
North: Greenwich Avenue						
7 L	382	8	0	0	0	0
9 R	0	0	0	0	609	12
West: Greenwich Avenue						
10 L	392	8	0	0	0	0
11 T	0	0	330	7	0	0

Unit Time for Volumes = 60 minutes
 Peak Flow Period = 30 minutes
 Flow Rates include effects of Flow Scale and Peak Flow Factor

Flow Rates (Total Vehicles and Percent Heavy)

Site:New Site - 1

Intersection ID: 1
Roundabout

Mov ID	Left		Through		Right	
	Total	%HV	Total	%HV	Total	%HV

Demand flows in veh/h as used by the program

East: Pulaski Street

5 T	0	0.0	463	2.0	0	0.0
6 R	0	0.0	0	0.0	84	2.0

North: Greenwich Avenue

7 L	389	2.0	0	0.0	0	0.0
9 R	0	0.0	0	0.0	621	2.0

West: Greenwich Avenue

10 L	400	2.0	0	0.0	0	0.0
11 T	0	0.0	337	2.0	0	0.0

Unit Time for Volumes = 60 minutes

Peak Flow Period = 30 minutes

Flow Rates include effects of Flow Scale and Peak Flow Factor

Other

Model Settings

Site:New Site - 1

Intersection ID: 1
Roundabout

* Basic Parameters:

Intersection Type: Roundabout
Driving on the left-hand side of the road
Input data specified in Metric units
Model Defaults: Standard Left
Peak Flow Period (for performance): 30 minutes
Unit time (for volumes): 60 minutes.
SIDRA Standard Delay model used
SIDRA Standard Queue model used
Level of Service based on: Delay (HCM method)
Queue percentile: 95%

Parameters Used in Cost Calculations

Site:New Site - 1

Intersection ID: 1
Roundabout

Pump price of fuel (\$/L)	=	1.200
Fuel resource cost factor	=	0.50
Ratio of running cost to fuel cost	=	3.0
Average income (\$/h)	=	32.00
Time value factor	=	0.60
Light vehicle mass (1000 kg)	=	1.4
Heavy vehicle mass (1000 kg)	=	11.0
Light vehicle idle fuel rate (L/h)	=	1.350
Heavy vehicle idle fuel rate (L/h)	=	2.000

Diagnostics

Site:New Site - 1

Processed: Monday, May 17, 2010 3:12:46 PM
SIDRA INTERSECTION 4.0.18.1102

Project: J:\41468.03\tech\Sidra\2029 AM.sip
8000997, VANASSE HANGEN BRUSTLIN INC., FLOATING

Copyright ©2000-2010 Akcelik & Associates Pty Ltd
www.sidrasolutions.com



Queues
4: First Stamford Place & Greenwich Ave

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Lane Group	EBL	NBL	NBT	SBT	ø1	ø2	ø4	ø6
Lane Configurations								
Volume (vph)	240	70	390	890				
Lane Group Flow (vph)	337	0	500	1358				
Turn Type	D.P+P							
Protected Phases	9	5	2 4 5	6 4	1	2	4	6
Permitted Phases	4 6							
Detector Phase	9	5	2 4 5	6 4				
Switch Phase								
Minimum Initial (s)	8.0	4.0			4.0	12.0	12.0	12.0
Minimum Split (s)	20.0	8.0			8.0	24.5	24.5	24.5
Total Split (s)	14.0	6.0	88.0	85.0	9.0	20.0	62.0	23.0
Total Split (%)	13.3%	5.7%	83.8%	81.0%	9%	19%	59%	22%
Yellow Time (s)	3.5	3.0			3.0	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				
Total Lost Time (s)	4.0	3.5	4.0	4.0				
Lead/Lag		Lead			Lead	Lag		Lag
Lead-Lag Optimize?		Yes			Yes	Yes		Yes
Recall Mode	Min	None			None	C-Min	None	C-Min
v/c Ratio	0.97		0.18	0.51				
Control Delay	86.5		2.3	4.7				
Queue Delay	28.7		0.0	1.4				
Total Delay	115.3		2.3	6.2				
Queue Length 50th (ft)	108		16	330				
Queue Length 95th (ft)	#201		22	374				
Internal Link Dist (ft)	174		106	89				
Turn Bay Length (ft)								
Base Capacity (vph)	346		2782	2654				
Starvation Cap Reductn	0		0	1028				
Spillback Cap Reductn	32		162	0				
Storage Cap Reductn	0		0	0				
Reduced v/c Ratio	1.07		0.19	0.84				

Intersection Summary

Cycle Length: 105
 Actuated Cycle Length: 105
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:NBSB, Start of Yellow
 Natural Cycle: 110
 Control Type: Actuated-Coordinated
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

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

#5 ø1 9 s	#4 #5 ø2 20 s	#4 #5 ø4 62 s	#4 #5 ø3 14 s
#4 ø1 6 s	#4 #5 ø6 23 s		

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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	240	70	70	390	890	360
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	0.97			0.91	0.95	
Fr _t	0.97			1.00	0.96	
Fl _t Protected	0.96			0.99	1.00	
Satd. Flow (prot)	3361			5047	3386	
Fl _t Permitted	0.96			0.71	1.00	
Satd. Flow (perm)	3361			3618	3386	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	261	76	76	424	967	391
RTOR Reduction (vph)	26	0	0	0	41	0
Lane Group Flow (vph)	311	0	0	500	1317	0
Turn Type		D.P+P				
Protected Phases	9		5	2 4 5	6 4	
Permitted Phases			4 6			
Actuated Green, G (s)	9.5			79.5	80.5	
Effective Green, g (s)	10.0			80.5	81.0	
Actuated g/C Ratio	0.10			0.77	0.77	
Clearance Time (s)	4.5					
Vehicle Extension (s)	3.0					
Lane Grp Cap (vph)	320			2808	2612	
v/s Ratio Prot	c0.09			c0.00	c0.39	
v/s Ratio Perm				0.13		
v/c Ratio	0.97			0.18	0.50	
Uniform Delay, d ₁	47.4			3.3	4.5	
Progression Factor	1.00			1.00	1.11	
Incremental Delay, d ₂	42.3			0.0	0.1	
Delay (s)	89.7			3.4	5.1	
Level of Service	F			A	A	
Approach Delay (s)	89.7			3.4	5.1	
Approach LOS	F			A	A	

Intersection Summary

HCM Average Control Delay	17.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT	ø2	ø5	ø6	ø9
Lane Configurations	↘	↑↑	↗	↑↑	↗	↘	↑↑				
Volume (vph)	478	1692	560	330	300	180	690				
Lane Group Flow (vph)	503	1781	589	347	316	189	726				
Turn Type	Split		Prot		Perm	custom					
Protected Phases	4	4	4	2 9			1 16	2	5	6	9
Permitted Phases					2 9	6					
Detector Phase	4	4	4	2 9	2 9	1	1 6				
Switch Phase											
Minimum Initial (s)	12.0	12.0	12.0			4.0		12.0	4.0	12.0	8.0
Minimum Split (s)	24.5	24.5	24.5			8.0		24.5	8.0	24.5	20.0
Total Split (s)	62.0	62.0	62.0	34.0	34.0	9.0	32.0	20.0	6.0	23.0	14.0
Total Split (%)	59.0%	59.0%	59.0%	32.4%	32.4%	8.6%	30.5%	19%	6%	22%	13%
Yellow Time (s)	3.5	3.5	3.5			3.0		3.5	3.0	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	3.5	3.5				
Lead/Lag						Lead		Lag	Lead	Lag	
Lead-Lag Optimize?						Yes		Yes	Yes	Yes	
Recall Mode	None	None	None			None		C-Min	None	C-Min	Min
v/c Ratio	0.51	0.91	0.56	0.40	0.78	0.94	0.86				
Control Delay	17.0	29.7	6.7	17.8	33.8	83.1	48.8				
Queue Delay	0.0	0.0	0.0	1.7	39.0	0.0	25.3				
Total Delay	17.0	29.7	6.7	19.6	72.9	83.1	74.1				
Queue Length 50th (ft)	200	537	63	53	87	108	245				
Queue Length 95th (ft)	291	#675	155	m66	m137	#246	#344				
Internal Link Dist (ft)		744		89			157				
Turn Bay Length (ft)	300		300			100					
Base Capacity (vph)	978	1955	1051	876	405	202	843				
Starvation Cap Reductn	0	0	0	361	105	0	0				
Spillback Cap Reductn	0	0	18	0	0	0	143				
Storage Cap Reductn	0	0	0	0	0	0	0				
Reduced v/c Ratio	0.51	0.91	0.57	0.67	1.05	0.94	1.04				

Intersection Summary












Cycle Length: 105
 Actuated Cycle Length: 105
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:NBSB, Start of Yellow
 Natural Cycle: 110
 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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011

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

#5  ø1	#4 #5   ø2	#4 #5    ø4	#4 #5   ø3	
9 s	20 s	62 s		14 s
#4  ø1	#4 #5   ø6			
6 s	23 s			

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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	478	1692	560	0	0	0	0	330	300	180	690	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	3.5	3.5	
Lane Util. Factor	1.00	0.95	1.00					0.95	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					3539	1583	1770	3539	
Flt Permitted	0.95	1.00	1.00					1.00	1.00	0.32	1.00	
Satd. Flow (perm)	1770	3539	1583					3539	1583	590	3539	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	503	1781	589	0	0	0	0	347	316	189	726	0
RTOR Reduction (vph)	0	0	177	0	0	0	0	0	13	0	0	0
Lane Group Flow (vph)	503	1781	412	0	0	0	0	347	303	189	726	0
Turn Type	Split		Prot						Perm	custom		
Protected Phases	4	4	4					2 9		1	1 6	
Permitted Phases									2 9	6		
Actuated Green, G (s)	57.5	57.5	57.5					25.0	25.0	23.5	23.5	
Effective Green, g (s)	58.0	58.0	58.0					26.0	26.0	24.5	24.5	
Actuated g/C Ratio	0.55	0.55	0.55					0.25	0.25	0.23	0.23	
Clearance Time (s)	4.5	4.5	4.5							4.0		
Vehicle Extension (s)	4.0	4.0	4.0							3.0		
Lane Grp Cap (vph)	978	1955	874					876	392	199	826	
v/s Ratio Prot	0.28	c0.50	0.26					0.10		c0.05	c0.21	
v/s Ratio Perm									c0.19	c0.17		
v/c Ratio	0.51	0.91	0.47					0.40	0.77	0.95	0.88	
Uniform Delay, d1	14.7	21.2	14.2					33.0	36.8	38.7	38.8	
Progression Factor	1.00	1.00	1.00					0.69	0.70	1.00	1.00	
Incremental Delay, d2	0.6	7.0	0.6					0.3	8.2	45.1	9.3	
Delay (s)	15.3	28.2	14.8					22.9	33.9	83.8	48.2	
Level of Service	B	C	B					C	C	F	D	
Approach Delay (s)		23.2			0.0			28.1			55.5	
Approach LOS		C			A			C			E	

Intersection Summary

HCM Average Control Delay	30.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	85.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Queues
6: North State St & Washington Blvd

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR
Lane Configurations	↖	↑	↗↗	↖	↑↑	↑↑	↗
Volume (vph)	360	120	900	350	1030	1160	730
Lane Group Flow (vph)	379	126	947	368	1084	1221	768
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)	39.0	39.0	39.0	23.0	66.0	43.0	43.0
Total Split (%)	37.1%	37.1%	37.1%	21.9%	62.9%	41.0%	41.0%
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				Lag		Lead	Lead
Lead-Lag Optimize?				Yes		Yes	Yes
Recall Mode	None	None	None	Min	C-Max	C-Max	C-Max
v/c Ratio	0.71	0.23	1.10	1.12	0.60	1.07	0.92
Control Delay	46.0	37.5	90.9	93.9	12.6	79.4	30.0
Queue Delay	0.0	0.0	0.0	609.1	84.0	139.3	15.8
Total Delay	46.0	37.5	90.9	703.1	96.7	218.8	45.8
Queue Length 50th (ft)	262	82	~422	~238	155	~479	216
Queue Length 95th (ft)	m226	m73	m327	m165	m127	#613	#506
Internal Link Dist (ft)		134			155	253	
Turn Bay Length (ft)							
Base Capacity (vph)	531	559	864	329	1818	1144	832
Starvation Cap Reductn	0	0	0	235	899	263	77
Spillback Cap Reductn	0	0	0	0	0	6	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.23	1.10	3.91	1.18	1.39	1.02

Intersection Summary

Cycle Length: 105

Actuated Cycle Length: 105

Offset: 10 (10%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow

Natural Cycle: 100

Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.

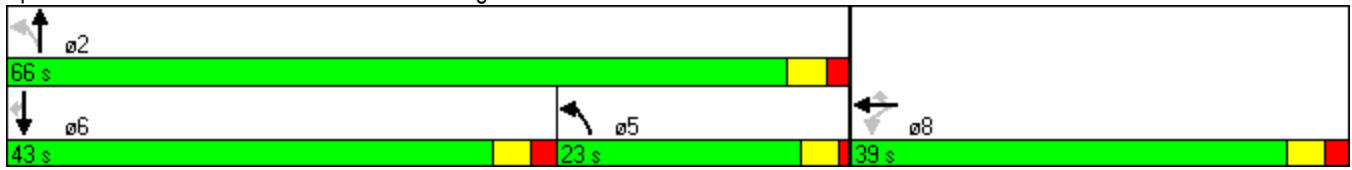
Queue shown is maximum after two cycles.

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: 6: North State St & Washington Blvd



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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↖	↗	↖↗	↖	↗↗			↗↗	↖
Volume (vph)	0	0	0	360	120	900	350	1030	0	0	1160	730
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	0.09	1.00			1.00	1.00
Satd. Flow (perm)				1593	1676	2592	146	3079			3079	1425
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	379	126	947	368	1084	0	0	1221	768
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	303
Lane Group Flow (vph)	0	0	0	379	126	947	368	1084	0	0	1221	465
Turn Type				Perm		Perm	pm+pt					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8	2					6
Actuated Green, G (s)				34.0	34.0	34.0	62.0	61.0			38.0	38.0
Effective Green, g (s)				35.0	35.0	35.0	62.0	62.0			39.0	39.0
Actuated g/C Ratio				0.33	0.33	0.33	0.59	0.59			0.37	0.37
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)				531	559	864	329	1818			1144	529
v/s Ratio Prot					0.08		c0.20	0.35			0.40	
v/s Ratio Perm				0.24		c0.37	c0.46					0.33
v/c Ratio				0.71	0.23	1.10	1.12	0.60			1.07	0.88
Uniform Delay, d1				30.6	25.2	35.0	37.1	13.6			33.0	30.8
Progression Factor				1.44	1.46	1.41	1.00	0.90			1.00	1.00
Incremental Delay, d2				0.3	0.0	45.3	57.6	0.1			46.5	18.5
Delay (s)				44.3	36.7	94.7	94.8	12.4			79.5	49.3
Level of Service				D	D	F	F	B			E	D
Approach Delay (s)		0.0			76.5			33.3			67.8	
Approach LOS		A			E			C			E	

Intersection Summary

HCM Average Control Delay	60.2	HCM Level of Service	E
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	162.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Queues
7: South State St & Washington Blvd

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Lane Group	EBL	EBT	NBT	SBL	SBT	ø3
Lane Configurations						
Volume (vph)	708	934	880	440	1080	
Lane Group Flow (vph)	745	1541	1179	463	1137	
Turn Type	Prot			Prot		
Protected Phases	4		2	1	6	3
Permitted Phases		4				
Detector Phase	4	4	2	1	6	
Switch Phase						
Minimum Initial (s)	4.0	4.0	7.0	7.0	4.0	4.0
Minimum Split (s)	20.0	20.0	17.0	11.0	20.0	30.0
Total Split (s)	37.0	37.0	23.0	15.0	38.0	30.0
Total Split (%)	35.2%	35.2%	21.9%	14.3%	36.2%	29%
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	0.0
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	Lag	Lag	Lead		Lead
Lead-Lag Optimize?			Yes	Yes		
Recall Mode	None	None	C-Min	None	C-Min	Ped
v/c Ratio	1.06	1.11	1.39	1.53	1.14	
Control Delay	61.4	73.4	218.3	286.0	96.0	
Queue Delay	11.9	16.0	9.7	0.0	102.2	
Total Delay	73.3	89.4	228.0	286.0	198.2	
Queue Length 50th (ft)	~541	~261	~388	~234	~456	
Queue Length 95th (ft)	m#662	m#707	m#359	m#242	m#447	
Internal Link Dist (ft)		808	225		155	
Turn Bay Length (ft)	150					
Base Capacity (vph)	704	1391	848	302	997	
Starvation Cap Reductn	0	0	0	0	168	
Spillback Cap Reductn	20	45	13	0	64	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	1.09	1.14	1.41	1.53	1.37	

Intersection Summary

Cycle Length: 105
 Actuated Cycle Length: 105
 Offset: 0 (0%), 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

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

 ø1	 ø2	 ø3	 ø4
15 s	23 s	30 s	37 s
 ø6			
38 s			

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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	708	934	530	0	0	0	0	880	240	440	1080	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	
Lane Util. Factor	1.00	0.95						0.91		0.97	0.95	
Frt	1.00	0.95						0.97		1.00	1.00	
Flt Protected	0.95	1.00						1.00		0.95	1.00	
Satd. Flow (prot)	1540	2912						4429		2884	3079	
Flt Permitted	0.95	1.00						1.00		0.95	1.00	
Satd. Flow (perm)	1540	2912						4429		2884	3079	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	745	983	558	0	0	0	0	926	253	463	1137	0
RTOR Reduction (vph)	0	60	0	0	0	0	0	47	0	0	0	0
Lane Group Flow (vph)	745	1481	0	0	0	0	0	1132	0	463	1137	0
Turn Type	Prot						Prot					
Protected Phases	4						2		1		6	
Permitted Phases	4											
Actuated Green, G (s)	48.0	48.0						19.0		11.0	34.0	
Effective Green, g (s)	48.0	48.0						19.0		11.0	34.0	
Actuated g/C Ratio	0.46	0.46						0.18		0.10	0.32	
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)	704	1331						801		302	997	
v/s Ratio Prot	0.48						c0.26		c0.16		0.37	
v/s Ratio Perm	c0.51											
v/c Ratio	1.06	1.11						1.41		1.53	1.14	
Uniform Delay, d1	28.5	28.5						43.0		47.0	35.5	
Progression Factor	0.68	0.66						1.35		1.41	0.82	
Incremental Delay, d2	39.3	55.9						188.8		244.2	66.8	
Delay (s)	58.8	74.7						246.6		310.4	95.9	
Level of Service	E						F		F		F	
Approach Delay (s)	69.5				0.0		246.6				158.0	
Approach LOS	E				A		F				F	

Intersection Summary

HCM Average Control Delay	138.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.25		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	27.0
Intersection Capacity Utilization	162.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Queues
8: Station Place & Washington Blvd

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Lane Group	WBT	WBR	NBT	SBL	SBT	ø3
Lane Configurations	↔	↗	↕↔	↖	↕↔	
Volume (vph)	0	270	850	700	910	
Lane Group Flow (vph)	205	193	989	714	929	
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)	15.0	36.0	34.0	36.0	70.0	20.0
Total Split (%)	14.3%	34.3%	32.4%	34.3%	66.7%	19%
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	0.82	0.28	1.13	1.30	0.46	
Control Delay	68.4	15.8	108.7	152.0	7.2	
Queue Delay	96.9	0.3	23.5	73.2	13.8	
Total Delay	165.3	16.1	132.1	225.3	20.9	
Queue Length 50th (ft)	142	73	~405	~550	86	
Queue Length 95th (ft)	#271	124	#536	m#435	m76	
Internal Link Dist (ft)	179		86		225	
Turn Bay Length (ft)						
Base Capacity (vph)	251	696	874	551	2002	
Starvation Cap Reductn	0	0	26	62	1064	
Spillback Cap Reductn	80	185	40	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	1.20	0.38	1.19	1.46	0.99	


Intersection Summary

Cycle Length: 105
 Actuated Cycle Length: 105
 Offset: 36 (34%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow
 Natural Cycle: 140
 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

8: Station Place & Washington Blvd

Splits and Phases: 8: Station Place & Washington Blvd

 ø1	 ø2	 ø3	 ø8
36 s	34 s	20 s	15 s
 ø6			
70 s			

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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↔	↗		↕		↖	↕	
Volume (vph)	0	0	0	120	0	270	0	850	120	700	910	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					0.94	0.85		0.98		1.00	1.00	
Flt Protected					0.97	1.00		1.00		0.95	1.00	
Satd. Flow (prot)					1550	1354		3022		1593	3185	
Flt Permitted					0.97	1.00		1.00		0.12	1.00	
Satd. Flow (perm)					1550	1354		3022		203	3185	
Peak-hour factor, PHF	0.95	0.95	0.95	0.98	1.00	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	0	0	122	0	276	0	867	122	714	929	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	11	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	205	193	0	978	0	714	929	0
Turn Type				Perm		pm+ov				pm+pt		
Protected Phases					8	1		2		1	6	
Permitted Phases				8		8				6		
Actuated Green, G (s)					16.0	48.0		29.0		65.0	65.0	
Effective Green, g (s)					17.0	50.0		30.0		65.0	66.0	
Actuated g/C Ratio					0.16	0.48		0.29		0.62	0.63	
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)					251	645		863		549	2002	
v/s Ratio Prot						0.09		0.32		c0.40	0.29	
v/s Ratio Perm					0.13	0.05				c0.41		
v/c Ratio					0.82	0.30		1.13		1.30	0.46	
Uniform Delay, d1					42.5	16.8		37.5		29.7	10.2	
Progression Factor					1.00	1.00		1.00		0.41	0.68	
Incremental Delay, d2					17.4	0.1		74.4		136.5	0.1	
Delay (s)					59.9	16.9		111.9		148.6	7.0	
Level of Service					E	B		F		F	A	
Approach Delay (s)		0.0			39.0			111.9			68.6	
Approach LOS		A			D			F			E	

Intersection Summary

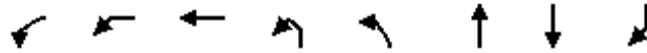
HCM Average Control Delay	78.8	HCM Level of Service	E
HCM Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	97.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Queues
9: North State St & Atlantic St

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011

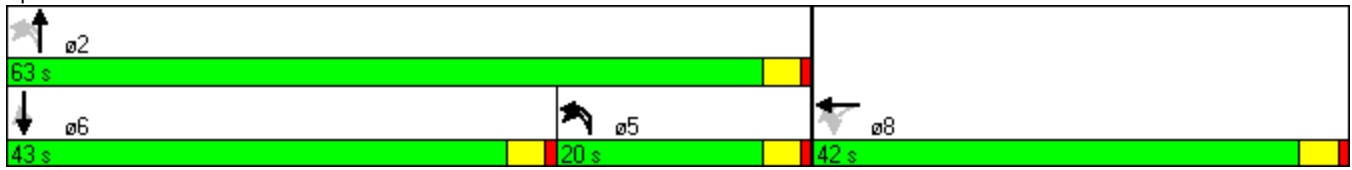


Lane Group	WBL2	WBL	WBT	NBL2	NBL	NBT	SBT	SBR
Lane Configurations								
Volume (vph)	490	1020	1170	350	130	1010	550	350
Lane Group Flow (vph)	516	1074	1548	0	0	1568	627	541
Turn Type	Perm	Perm		pm+pt	pm+pt			Perm
Protected Phases			8	5	5	2	6	
Permitted Phases	8	8		2	2			6
Detector Phase	8	8	8	5	5	2	6	6
Switch Phase								
Minimum Initial (s)	12.0	12.0	12.0	5.0	5.0	15.0	15.0	15.0
Minimum Split (s)	26.0	26.0	26.0	9.0	9.0	22.0	22.0	22.0
Total Split (s)	42.0	42.0	42.0	20.0	20.0	63.0	43.0	43.0
Total Split (%)	40.0%	40.0%	40.0%	19.0%	19.0%	60.0%	41.0%	41.0%
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				Lag	Lag		Lead	Lead
Lead-Lag Optimize?				Yes	Yes		Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	C-Max	C-Max
v/c Ratio	0.80	1.68	1.23			1.89dl	0.64	0.63
Control Delay	27.0	328.7	128.8			227.6	19.4	18.4
Queue Delay	0.0	0.0	0.0			67.7	49.7	21.1
Total Delay	27.0	328.7	128.8			295.3	69.2	39.4
Queue Length 50th (ft)	240	~1054	~660			~756	286	227
Queue Length 95th (ft)	m233	m#1016	m#632			#893	412	348
Internal Link Dist (ft)			1065			128	237	
Turn Bay Length (ft)								
Base Capacity (vph)	641	641	1263			1088	983	862
Starvation Cap Reductn	0	0	0			103	409	323
Spillback Cap Reductn	0	0	0			0	0	0
Storage Cap Reductn	0	0	0			0	0	0
Reduced v/c Ratio	0.80	1.68	1.23			1.59	1.09	1.00

Intersection Summary

Cycle Length: 105
 Actuated Cycle Length: 105
 Offset: 35 (33%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
 Natural Cycle: 110
 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: 9: North State St & Atlantic St



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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Movement	WBL2	WBL	WBT	WBR	NBL2	NBL	NBT	SBT	SBR	SBR2
Lane Configurations										
Volume (vph)	490	1020	1170	300	350	130	1010	550	350	210
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	1.00	1.00	0.95				0.95	0.95	0.95	
Frt	1.00	1.00	0.97				1.00	0.99	0.85	
Flt Protected	0.95	0.95	1.00				0.98	1.00	1.00	
Satd. Flow (prot)	1770	1770	3431				3483	1749	1504	
Flt Permitted	0.95	0.95	1.00				0.55	1.00	1.00	
Satd. Flow (perm)	1770	1770	3431				1936	1749	1504	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	516	1074	1232	316	368	137	1063	579	368	221
RTOR Reduction (vph)	0	0	22	0	0	0	0	0	17	0
Lane Group Flow (vph)	516	1074	1526	0	0	0	1568	627	524	0
Turn Type	Perm	Perm			pm+pt	pm+pt			Perm	
Protected Phases			8		5	5	2	6		
Permitted Phases	8	8			2	2			6	
Actuated Green, G (s)	38.0	38.0	38.0				59.0	59.0	59.0	
Effective Green, g (s)	38.0	38.0	38.0				59.0	59.0	59.0	
Actuated g/C Ratio	0.36	0.36	0.36				0.56	0.56	0.56	
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)	641	641	1242				1088	983	845	
v/s Ratio Prot			0.44					0.36		
v/s Ratio Perm	0.29	c0.61					c0.81		0.35	
v/c Ratio	0.80	1.68	1.23				1.89dl	0.64	0.62	
Uniform Delay, d1	30.2	33.5	33.5				23.0	15.7	15.5	
Progression Factor	0.83	0.81	0.81				1.00	1.00	1.00	
Incremental Delay, d2	0.7	304.6	103.7				203.8	3.2	3.4	
Delay (s)	25.7	331.8	130.7				226.8	18.9	18.9	
Level of Service	C	F	F				F	B	B	
Approach Delay (s)			182.3				226.8	18.9		
Approach LOS			F				F	B		

Intersection Summary

HCM Average Control Delay	161.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.53		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	148.0%	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
10: South State St & Atlantic St

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011

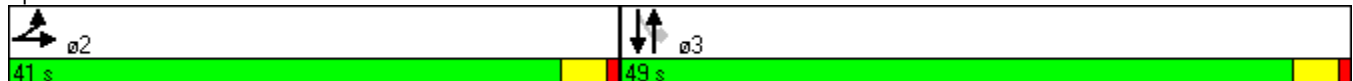


Lane Group	EBL	EBT	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	624	420	450	340	210	830
Lane Group Flow (vph)	657	853	474	358	221	874
Turn Type	Split			Perm	Perm	
Protected Phases	2	2	3			3
Permitted Phases				3	3	
Detector Phase	2	2	3	3	3	3
Switch Phase						
Minimum Initial (s)	15.0	15.0	4.0	4.0	4.0	4.0
Minimum Split (s)	25.0	25.0	25.0	25.0	25.0	25.0
Total Split (s)	41.0	41.0	49.0	49.0	49.0	49.0
Total Split (%)	45.6%	45.6%	54.4%	54.4%	54.4%	54.4%
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 Optimize?						
Recall Mode	C-Max	C-Max	None	None	None	None
v/c Ratio	0.90	0.42	0.27	0.39	0.28	0.94
Control Delay	42.3	17.0	13.6	4.9	14.3	41.4
Queue Delay	0.0	0.0	0.6	0.9	0.8	228.5
Total Delay	42.3	17.0	14.2	5.8	15.1	269.9
Queue Length 50th (ft)	341	106	77	26	35	446
Queue Length 95th (ft)	#560	141	109	75	59	#715
Internal Link Dist (ft)		1031	40			128
Turn Bay Length (ft)	300					
Base Capacity (vph)	732	2014	1770	926	806	932
Starvation Cap Reductn	0	0	891	319	341	356
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.90	0.42	0.54	0.59	0.48	1.52

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 0 (0%), Referenced to phase 2:EBTL and 6:, Start of Yellow
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

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



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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	624	420	390	0	0	0	0	450	340	210	830	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	
Lane Util. Factor	1.00	0.91						0.95	1.00	0.97	1.00	
Frt	1.00	0.93						1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00						1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	4718						3539	1583	3433	1863	
Flt Permitted	0.95	1.00						1.00	1.00	0.45	1.00	
Satd. Flow (perm)	1770	4718						3539	1583	1610	1863	
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	657	442	411	0	0	0	0	474	358	221	874	0
RTOR Reduction (vph)	0	63	0	0	0	0	0	0	135	0	0	0
Lane Group Flow (vph)	657	790	0	0	0	0	0	474	223	221	874	0
Turn Type	Split						Perm			Perm		
Protected Phases	2	2						3			3	
Permitted Phases									3	3		
Actuated Green, G (s)	37.2	37.2						44.8	44.8	44.8	44.8	
Effective Green, g (s)	37.2	37.2						44.8	44.8	44.8	44.8	
Actuated g/C Ratio	0.41	0.41						0.50	0.50	0.50	0.50	
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)	732	1950						1762	788	801	927	
v/s Ratio Prot	c0.37	0.17						0.13			c0.47	
v/s Ratio Perm									0.14	0.14		
v/c Ratio	0.90	0.40						0.27	0.28	0.28	0.94	
Uniform Delay, d1	24.6	18.6						13.1	13.2	13.2	21.4	
Progression Factor	1.00	1.00						1.00	1.00	1.00	1.00	
Incremental Delay, d2	16.0	0.6						0.1	0.2	0.2	17.3	
Delay (s)	40.6	19.2						13.2	13.4	13.3	38.7	
Level of Service	D	B						B	B	B	D	
Approach Delay (s)		28.5			0.0			13.3			33.6	
Approach LOS		C			A			B			C	

Intersection Summary

HCM Average Control Delay	26.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	84.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Queues

11: Station Place & Atlantic St

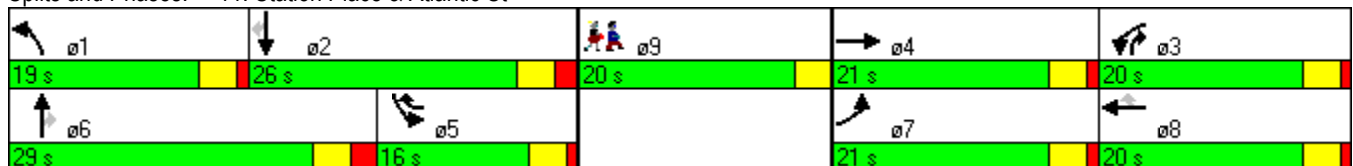


Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations												
Volume (vph)	70	120	260	240	150	80	570	170	100	720	360	
Lane Group Flow (vph)	74	200	274	253	158	84	600	179	105	758	379	
Turn Type	Prot		Prot		pm+ov	Prot		pm+ov	Prot		Perm	
Protected Phases	7	4	3	8	5	1	6	3	5	2		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	20.0
Total Split (s)	21.0	21.0	20.0	20.0	16.0	19.0	29.0	20.0	16.0	26.0	26.0	20.0
Total Split (%)	19.8%	19.8%	18.9%	18.9%	15.1%	17.9%	27.4%	18.9%	15.1%	24.5%	24.5%	19%
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	3.0
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	0.41	0.75	0.72	0.48	0.22	0.31	0.50	0.18	0.53	0.61	0.60	
Control Delay	50.7	55.3	51.6	37.1	2.9	43.8	31.0	3.4	54.6	34.5	27.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	1.8	1.4	
Total Delay	50.7	55.3	51.6	37.1	2.9	43.8	31.6	3.4	54.6	36.3	28.3	
Queue Length 50th (ft)	48	115	169	140	0	51	166	3	68	232	148	
Queue Length 95th (ft)	90	192	#363	#275	24	99	261	45	125	#412	#351	
Internal Link Dist (ft)		748		474			88			114		
Turn Bay Length (ft)			150			100		100	70			50
Base Capacity (vph)	301	307	381	526	732	267	1211	1010	200	1238	633	
Starvation Cap Reductn	0	0	0	0	0	0	294	0	0	306	108	
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	0.25	0.65	0.72	0.48	0.22	0.31	0.65	0.18	0.53	0.81	0.72	

Intersection Summary

Cycle Length: 106
 Actuated Cycle Length: 106
 Offset: 59 (56%), Referenced to phase 2:SBT and 6:NBT, Start of Green
 Natural Cycle: 105
 Control Type: Actuated-Coordinated
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
























Splits and Phases: 11: Station Place & Atlantic St



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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	120	70	260	240	150	80	570	170	100	720	360
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	0.94		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	1759		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	1759		1770	1863	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	74	126	74	274	253	158	84	600	179	105	758	379
RTOR Reduction (vph)	0	21	0	0	0	94	0	0	81	0	0	84
Lane Group Flow (vph)	74	179	0	274	253	64	84	600	98	105	758	295
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)	8.6	14.9		23.6	29.9	42.7	12.0	31.3	54.9	12.8	32.1	32.1
Effective Green, g (s)	9.6	14.9		23.6	29.9	42.7	13.0	32.3	54.9	12.8	33.1	33.1
Actuated g/C Ratio	0.09	0.14		0.22	0.28	0.40	0.12	0.30	0.52	0.12	0.31	0.31
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)	160	247		394	526	638	217	1078	880	214	1105	494
v/s Ratio Prot	0.04	c0.10		c0.15	0.14	0.01	0.05	c0.17	0.02	0.06	c0.21	
v/s Ratio Perm						0.03			0.04			0.19
v/c Ratio	0.46	0.73		0.70	0.48	0.10	0.39	0.56	0.11	0.49	0.69	0.60
Uniform Delay, d1	45.8	43.6		37.9	31.6	19.7	42.8	30.9	13.1	43.6	31.9	30.8
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.1	10.1		5.3	0.7	0.1	1.1	2.1	0.1	1.8	3.5	5.3
Delay (s)	47.9	53.7		43.2	32.3	19.8	44.0	32.9	13.1	45.3	35.4	36.1
Level of Service	D	D		D	C	B	D	C	B	D	D	D
Approach Delay (s)		52.2			33.8			29.9			36.4	
Approach LOS		D			C			C			D	

Intersection Summary		
HCM Average Control Delay	35.4	HCM Level of Service D
HCM Volume to Capacity ratio	0.69	
Actuated Cycle Length (s)	106.0	Sum of lost time (s) 22.4
Intersection Capacity Utilization	70.7%	ICU Level of Service C
Analysis Period (min)	15	
c Critical Lane Group		

Queues
12: Parking Garage & Atlantic St

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Lane Group	EBL	NBL	NBT	SBT	SBR
Lane Configurations					
Volume (vph)	60	40	760	920	130
Lane Group Flow (vph)	84	0	842	968	137
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)	24.0	9.0	81.0	72.0	72.0
Total Split (%)	22.9%	8.6%	77.1%	68.6%	68.6%
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	0.47		0.62	0.70	0.11
Control Delay	44.4		6.9	12.7	1.3
Queue Delay	0.0		1.9	14.5	0.0
Total Delay	44.4		8.8	27.2	1.3
Queue Length 50th (ft)	46		136	304	0
Queue Length 95th (ft)	85		354	655	21
Internal Link Dist (ft)	170		445	110	
Turn Bay Length (ft)					
Base Capacity (vph)	325		1363	1384	1211
Starvation Cap Reductn	0		348	414	0
Spillback Cap Reductn	0		0	0	0
Storage Cap Reductn	0		0	0	0
Reduced v/c Ratio	0.26		0.83	1.00	0.11

Intersection Summary

Cycle Length: 105
 Actuated Cycle Length: 105
 Offset: 44 (42%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated

Splits and Phases: 12: Parking Garage & Atlantic St





Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	60	20	40	760	920	130
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 _t	0.97			1.00	1.00	0.85
Fl _t Protected	0.96			1.00	1.00	1.00
Satd. Flow (prot)	1735			1858	1863	1583
Fl _t Permitted	0.96			0.88	1.00	1.00
Satd. Flow (perm)	1735			1635	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	63	21	42	800	968	137
RTOR Reduction (vph)	13	0	0	0	0	37
Lane Group Flow (vph)	71	0	0	842	968	100
Turn Type			pm+pt			Perm
Protected Phases	4		5	2	6	
Permitted Phases			2			6
Actuated Green, G (s)	9.0			86.0	77.0	77.0
Effective Green, g (s)	9.0			86.0	77.0	77.0
Actuated g/C Ratio	0.09			0.82	0.73	0.73
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)	149			1350	1366	1161
v/s Ratio Prot	c0.04			c0.03	c0.52	
v/s Ratio Perm				0.48		0.06
v/c Ratio	0.48			0.62	0.71	0.09
Uniform Delay, d ₁	45.8			3.5	7.8	4.0
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d ₂	0.9			0.7	3.1	0.1
Delay (s)	46.6			4.2	10.9	4.1
Level of Service	D			A	B	A
Approach Delay (s)	46.6			4.2	10.1	
Approach LOS	D			A	B	

Intersection Summary

HCM Average Control Delay	9.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	85.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Queues
13: North State St & Canal St

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Lane Group	WBT	NBL	NBT	SBT
Lane Configurations	←←←←	↖	↑↑	↑↑
Volume (vph)	2400	480	670	820
Lane Group Flow (vph)	3143	490	684	1051
Turn Type		pm+pt		
Protected Phases	3	5	2	6
Permitted Phases		2		
Detector Phase	3	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)	57.0	29.0	48.0	19.0
Total Split (%)	54.3%	27.6%	45.7%	18.1%
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	0.99	0.99	0.47	2.19
Control Delay	39.1	66.4	24.0	568.0
Queue Delay	0.0	272.6	143.6	0.0
Total Delay	39.1	339.0	167.6	568.0
Queue Length 50th (ft)	577	273	173	~599
Queue Length 95th (ft)	#700	#489	226	#732
Internal Link Dist (ft)	377		118	492
Turn Bay Length (ft)				
Base Capacity (vph)	3184	496	1449	479
Starvation Cap Reductn	0	197	927	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.99	1.64	1.31	2.19

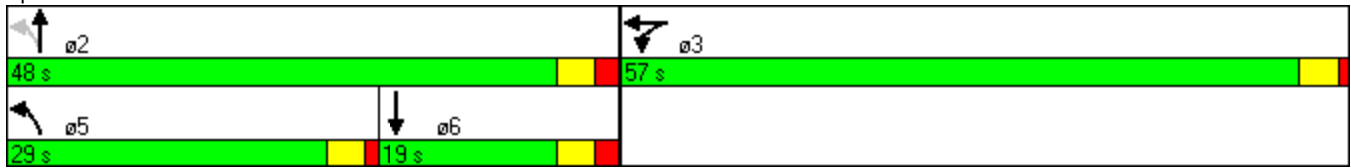
Intersection Summary

Cycle Length: 105
 Actuated Cycle Length: 105
 Offset: 17 (16%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 130
 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.

Queues

13: North State St & Canal St

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



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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					← ↑ ↑ ↑		←	↑↑			↑↑	
Volume (vph)	0	0	0	380	2400	300	480	670	0	0	820	210
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	
Flt					0.99		1.00	1.00			0.97	
Flt Protected					0.99		0.95	1.00			1.00	
Satd. Flow (prot)					6276		1770	3539			3431	
Flt Permitted					0.99		0.22	1.00			1.00	
Satd. Flow (perm)					6276		414	3539			3431	
Peak-hour factor, PHF	0.92	0.92	0.92	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	0	0	388	2449	306	490	684	0	0	837	214
RTOR Reduction (vph)	0	0	0	0	17	0	0	0	0	0	22	0
Lane Group Flow (vph)	0	0	0	0	3126	0	490	684	0	0	1029	0
Turn Type				Split		pm+pt						
Protected Phases				3	3	5	2				6	
Permitted Phases						2						
Actuated Green, G (s)					53.0	43.0	43.0				14.0	
Effective Green, g (s)					53.0	43.0	43.0				14.0	
Actuated g/C Ratio					0.50	0.41	0.41				0.13	
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)					3168	492	1449				457	
v/s Ratio Prot					c0.50	c0.24	0.19				c0.30	
v/s Ratio Perm						0.17						
v/c Ratio					0.99	1.00	0.47				2.25	
Uniform Delay, d1					25.7	28.9	22.7				45.5	
Progression Factor					1.00	1.00	1.00				1.00	
Incremental Delay, d2					13.0	39.2	1.1				570.6	
Delay (s)					38.7	68.1	23.8				616.1	
Level of Service					D	E	C				F	
Approach Delay (s)		0.0			38.7		42.3				616.1	
Approach LOS		A			D		D				F	















Intersection Summary

HCM Average Control Delay	152.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	112.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Queues
14: South State St & Canal St

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011

								
Lane Group	NBT	NBR	SBL2	SBL	SBT	NEL	NET	NER
Lane Configurations								
Volume (vph)	720	220	220	120	860	430	780	280
Lane Group Flow (vph)	758	274	0	0	1263	453	821	884
Turn Type		Perm	pm+pt	pm+pt		Split		Prot
Protected Phases	4		3	3	7	2	2	2
Permitted Phases		4	7	7				
Detector Phase	4	4	3	3	7	2	2	2
Switch Phase								
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	15.0	15.0	15.0
Minimum Split (s)	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Total Split (s)	25.0	25.0	25.0	25.0	50.0	40.0	40.0	40.0
Total Split (%)	27.8%	27.8%	27.8%	27.8%	55.6%	44.4%	44.4%	44.4%
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	Lag	Lag	Lead	Lead				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	None	None	None	None	C-Max	C-Max	C-Max
v/c Ratio	0.47	0.38			1.17	0.64	1.10	0.74
Control Delay	21.0	20.8			111.6	32.6	83.0	31.0
Queue Delay	0.0	0.0			195.7	0.9	0.0	0.0
Total Delay	21.0	20.8			307.3	33.5	83.0	31.0
Queue Length 50th (ft)	134	84			~478	268	~488	273
Queue Length 95th (ft)	#331	#251			#407	367	#671	348
Internal Link Dist (ft)	363				118		395	
Turn Bay Length (ft)		150						
Base Capacity (vph)	1612	726			1075	708	745	1189
Starvation Cap Reductn	0	0			292	82	0	5
Spillback Cap Reductn	0	0			0	0	0	0
Storage Cap Reductn	0	0			0	0	0	0
Reduced v/c Ratio	0.47	0.38			1.61	0.72	1.10	0.75

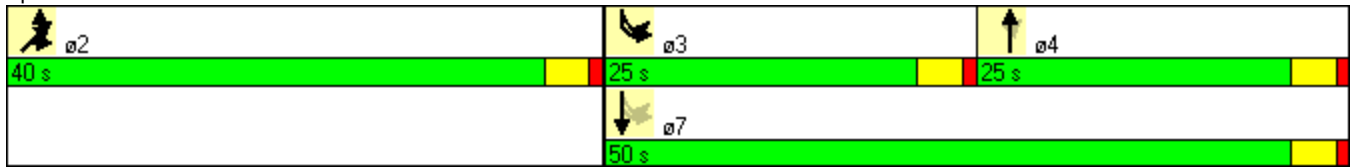
Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 0 (0%), Referenced to phase 2:NETL and 6:, Start of Yellow
 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.

Queues

14: South State St & Canal St

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



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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011

	↑	↖	↗	↘	↙	↓	↖	↗	↘	↙
Movement	NBT	NBR	NBR2	SBL2	SBL	SBT	NEL	NET	NER	NER2
Lane Configurations	↑↑	↖				↖↑	↗	↑	↖↗	
Volume (vph)	720	220	40	220	120	860	430	780	280	560
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	1.00				0.95	1.00	1.00	0.88	
Frt	1.00	0.85				1.00	1.00	1.00	0.85	
Flt Protected	1.00	1.00				0.99	0.95	1.00	1.00	
Satd. Flow (prot)	3539	1583				3490	1770	1863	2787	
Flt Permitted	1.00	1.00				0.56	0.95	1.00	1.00	
Satd. Flow (perm)	3539	1583				1966	1770	1863	2787	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	758	232	42	232	126	905	453	821	295	589
RTOR Reduction (vph)	0	5	0	0	0	0	0	0	78	0
Lane Group Flow (vph)	758	269	0	0	0	1263	453	821	806	0
Turn Type		Perm		pm+pt	pm+pt		Split		Prot	
Protected Phases	4			3	3	7	2	2	2	
Permitted Phases		4		7	7					
Actuated Green, G (s)	41.0	41.0				49.2	32.8	32.8	32.8	
Effective Green, g (s)	41.0	41.0				49.2	32.8	32.8	32.8	
Actuated g/C Ratio	0.46	0.46				0.55	0.36	0.36	0.36	
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)	1612	721				1146	645	679	1016	
v/s Ratio Prot	0.21					c0.05	0.26	c0.44	0.29	
v/s Ratio Perm		0.17				c0.55				
v/c Ratio	0.47	0.37				1.10	0.70	1.21	0.79	
Uniform Delay, d1	17.0	16.1				20.4	24.4	28.6	25.6	
Progression Factor	1.00	1.00				1.00	1.29	0.60	1.37	
Incremental Delay, d2	0.2	0.3				59.1	5.4	107.0	5.4	
Delay (s)	17.2	16.4				79.5	36.8	124.3	40.4	
Level of Service	B	B				E	D	F	D	
Approach Delay (s)	17.0					79.5		71.5		
Approach LOS	B					E		E		

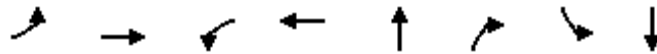
Intersection Summary

HCM Average Control Delay	61.2	HCM Level of Service	E
HCM Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	104.6%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Queues
15: Dock Street & Canal St

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011

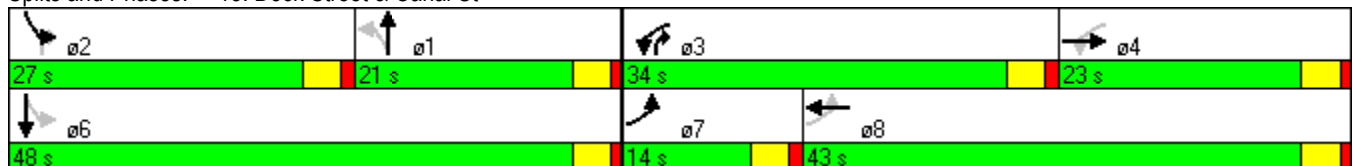


Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↖	↗	↖	↗	↖	↗
Volume (vph)	50	320	400	700	410	240	450	820
Lane Group Flow (vph)	53	337	421	1284	432	253	474	1021
Turn Type	D.P+P		D.P+P		custom		pm+pt	
Protected Phases	7	4	3	8	1	3	2	6
Permitted Phases	8		4			2	6	
Detector Phase	7	4	3	8	1	3	2	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	14.0	20.0	14.0	20.0	21.0	14.0	21.0	15.0
Total Split (s)	14.0	23.0	34.0	43.0	21.0	34.0	27.0	48.0
Total Split (%)	13.3%	21.9%	32.4%	41.0%	20.0%	32.4%	25.7%	45.7%
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	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None	C-Max	C-Max
v/c Ratio	0.22	0.45	0.71	0.93	0.71	0.28	0.93	0.66
Control Delay	15.8	39.0	25.4	39.0	48.4	1.6	53.8	25.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8
Total Delay	15.8	39.0	25.4	39.0	48.4	1.6	53.8	27.0
Queue Length 50th (ft)	18	103	176	380	145	0	263	278
Queue Length 95th (ft)	38	155	260	#533	201	17	#477	352
Internal Link Dist (ft)		843		1340	257			363
Turn Bay Length (ft)			150			100	150	
Base Capacity (vph)	236	745	655	1386	607	973	510	1557
Starvation Cap Reductn	0	0	0	0	0	0	0	357
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.45	0.64	0.93	0.71	0.26	0.93	0.85

Intersection Summary

Cycle Length: 105
 Actuated Cycle Length: 105
 Offset: 23 (22%), Referenced to phase 2:SBL and 6:SBTL, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 15: Dock Street & Canal St



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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	320	0	400	700	520	0	410	240	450	820	150
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	0.94			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	3313			3539	1583	1770	3457	
Flt Permitted	0.10	1.00		0.43	1.00			1.00	1.00	0.20	1.00	
Satd. Flow (perm)	187	3539		800	3313			3539	1583	374	3457	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	53	337	0	421	737	547	0	432	253	474	863	158
RTOR Reduction (vph)	0	0	0	0	126	0	0	0	130	0	14	0
Lane Group Flow (vph)	53	337	0	421	1158	0	0	432	123	474	1007	0
Turn Type	D.P+P			D.P+P			Perm		custom	pm+pt		
Protected Phases	7	4		3	8			1	3	2	6	
Permitted Phases	8			4			1		2	6		
Actuated Green, G (s)	47.9	22.9		47.9	39.9			17.0	49.1	45.1	45.1	
Effective Green, g (s)	47.9	22.9		47.9	39.9			18.0	51.1	46.1	46.1	
Actuated g/C Ratio	0.46	0.22		0.46	0.38			0.17	0.49	0.44	0.44	
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	0.2	0.2	
Lane Grp Cap (vph)	206	772		596	1259			607	770	498	1518	
v/s Ratio Prot	0.02	0.10		c0.17	c0.35			0.12	0.04	c0.23	0.29	
v/s Ratio Perm	0.10			0.15					0.04	c0.19		
v/c Ratio	0.26	0.44		0.71	0.92			0.71	0.16	0.95	0.66	
Uniform Delay, d1	22.1	35.5		20.6	31.0			41.1	15.0	27.4	23.3	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.4	0.8		4.8	11.4			3.3	0.2	30.0	2.3	
Delay (s)	23.5	36.3		25.3	42.4			44.3	15.2	57.4	25.6	
Level of Service	C	D		C	D			D	B	E	C	
Approach Delay (s)		34.6			38.2			33.6			35.7	
Approach LOS		C			D			C			D	

Intersection Summary

HCM Average Control Delay	36.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	96.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Queues
16: North State St & Elm Street

2029 AM Peak - Alt B (5-Bridge Scenario)
2/8/2011



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT
Lane Configurations	↶	↶↷	↶	↶	↷↷	↷↷↷
Volume (vph)	300	650	740	430	920	1120
Lane Group Flow (vph)	316	1011	452	453	968	1516
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)	38.0	38.0	38.0	30.0	67.0	37.0
Total Split (%)	36.2%	36.2%	36.2%	28.6%	63.8%	35.2%
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	0.56	0.94	0.83	0.96	0.45	0.88
Control Delay	34.2	49.8	37.7	69.7	19.1	38.6
Queue Delay	0.3	0.0	0.0	118.3	5.1	0.1
Total Delay	34.5	49.8	37.7	188.0	24.2	38.7
Queue Length 50th (ft)	174	336	224	308	225	349
Queue Length 95th (ft)	263	#473	#414	#448	297	#453
Internal Link Dist (ft)		759			227	555
Turn Bay Length (ft)	500		500			
Base Capacity (vph)	573	1093	555	505	2148	1731
Starvation Cap Reductn	0	0	0	147	1098	0
Spillback Cap Reductn	35	0	0	0	0	9
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.92	0.81	1.27	0.92	0.88

Intersection Summary

Cycle Length: 105
 Actuated Cycle Length: 105
 Offset: 5 (5%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
 Natural Cycle: 65
 Control Type: Actuated-Coordinated
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

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



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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↕	↗	↙	↕			↕	↗
Volume (vph)	0	0	0	300	650	740	430	920	0	0	1120	320
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	0.95	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	3226	1441	1770	3539			4916	
Flt Permitted				0.95	1.00	1.00	0.10	1.00			1.00	
Satd. Flow (perm)				1770	3226	1441	187	3539			4916	
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	316	684	779	453	968	0	0	1179	337
RTOR Reduction (vph)	0	0	0	0	50	89	0	0	0	0	47	0
Lane Group Flow (vph)	0	0	0	316	961	363	453	968	0	0	1469	0
Turn Type				Perm		Perm	pm+pt					
Protected Phases					8		5	2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)				33.3	33.3	33.3	63.7	63.7			35.9	
Effective Green, g (s)				33.3	33.3	33.3	63.7	63.7			35.9	
Actuated g/C Ratio				0.32	0.32	0.32	0.61	0.61			0.34	
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)				561	1023	457	472	2147			1681	
v/s Ratio Prot					c0.30		c0.22	0.27			0.30	
v/s Ratio Perm				0.18		0.25	c0.37					
v/c Ratio				0.56	0.94	0.79	0.96	0.45			0.87	
Uniform Delay, d1				29.8	34.9	32.7	31.1	11.2			32.4	
Progression Factor				1.00	1.00	1.00	1.49	1.63			1.00	
Incremental Delay, d2				0.8	15.3	8.6	26.1	0.5			6.6	
Delay (s)				30.6	50.2	41.4	72.4	18.7			39.1	
Level of Service				C	D	D	E	B			D	
Approach Delay (s)		0.0			44.5			35.8			39.1	
Approach LOS		A			D			D			D	

Intersection Summary

HCM Average Control Delay	40.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	88.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Lane Group	EBL2	EBT	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	180	260	1170	250	220	940
Lane Group Flow (vph)	189	779	1232	400	506	989
Turn Type	Perm			Perm	Prot	
Protected Phases		4	2		1	6
Permitted Phases	4			2		
Detector Phase	4	4	2	2	1	6
Switch Phase						
Minimum Initial (s)	12.0	12.0	15.0	15.0	6.0	15.0
Minimum Split (s)	22.0	22.0	22.0	22.0	10.0	22.0
Total Split (s)	27.0	27.0	58.0	58.0	20.0	78.0
Total Split (%)	25.7%	25.7%	55.2%	55.2%	19.0%	74.3%
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			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	C-Min	C-Min	None	C-Min
v/c Ratio	0.37	0.78	0.79	0.55	1.01dl	0.84
Control Delay	34.1	39.9	28.4	22.5	88.7	14.6
Queue Delay	0.9	0.0	0.5	0.3	0.0	1.5
Total Delay	35.0	39.9	28.9	22.8	88.7	16.1
Queue Length 50th (ft)	97	228	321	143	189	156
Queue Length 95th (ft)	182	#400	283	m152	m#249	m295
Internal Link Dist (ft)		1687	420			227
Turn Bay Length (ft)				200		
Base Capacity (vph)	511	997	1820	832	528	1313
Starvation Cap Reductn	0	0	213	93	0	163
Spillback Cap Reductn	138	0	127	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.78	0.77	0.54	0.96	0.86

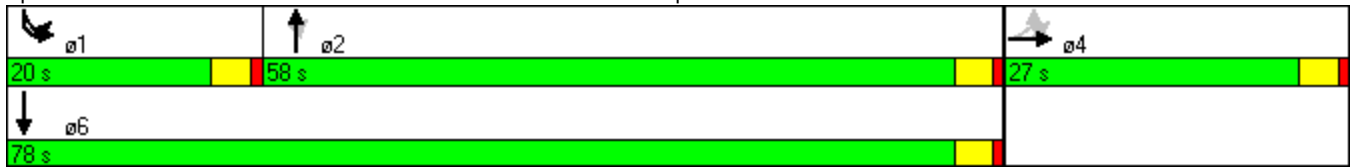
Intersection Summary

Cycle Length: 105
 Actuated Cycle Length: 105
 Offset: 36 (34%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
 Natural Cycle: 65
 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

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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	180	270	260	210	1170	250	130	260	220	940
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	1.00		0.95		0.95	1.00			0.97	1.00
Frt	1.00		0.96		1.00	0.85			1.00	1.00
Flt Protected	0.95		0.98		1.00	1.00			0.95	1.00
Satd. Flow (prot)	1770		3328		3539	1583			3433	1863
Flt Permitted	0.95		0.98		1.00	1.00			0.95	1.00
Satd. Flow (perm)	1770		3328		3539	1583			3433	1863
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	189	284	274	221	1232	263	137	274	232	989
RTOR Reduction (vph)	0	0	36	0	0	21	0	0	0	0
Lane Group Flow (vph)	189	0	743	0	1232	379	0	0	506	989
Turn Type	Perm	Perm				Perm		Prot	Prot	
Protected Phases			4		2			1	1	6
Permitted Phases	4	4				2				
Actuated Green, G (s)	30.3		30.3		46.6	46.6			16.1	66.7
Effective Green, g (s)	30.3		30.3		46.6	46.6			16.1	66.7
Actuated g/C Ratio	0.29		0.29		0.44	0.44			0.15	0.64
Clearance Time (s)	4.0		4.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)	5.0		5.0		0.2	0.2			1.0	0.2
Lane Grp Cap (vph)	511		960		1571	703			526	1183
v/s Ratio Prot					0.35				c0.15	c0.53
v/s Ratio Perm	0.11		0.22			0.24				
v/c Ratio	0.37		0.77		0.78	0.54			1.01dl	0.84
Uniform Delay, d1	29.7		34.2		24.9	21.4			44.1	14.9
Progression Factor	1.00		1.00		1.06	1.10			1.57	0.71
Incremental Delay, d2	0.9		4.6		2.4	1.8			20.5	4.1
Delay (s)	30.7		38.8		28.7	25.2			89.7	14.7
Level of Service	C		D		C	C			F	B
Approach Delay (s)			37.2		27.8					40.1
Approach LOS			D		C					D

Intersection Summary

HCM Average Control Delay	34.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	77.9%	ICU Level of Service	D
Analysis Period (min)	15		

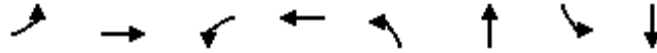
dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

Queues
18: Cherry Street & Elm Street

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations		↕		↕		↕		↕
Volume (vph)	150	90	10	20	50	1550	20	850
Lane Group Flow (vph)	0	316	0	43	0	1696	0	1158
Turn Type	Perm		Perm		Perm		Perm	
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	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)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	31.0	31.0	31.0	31.0	74.0	74.0	74.0	74.0
Total Split (%)	29.5%	29.5%	29.5%	29.5%	70.5%	70.5%	70.5%	70.5%
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)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max
v/c Ratio		0.84		0.11		0.80		0.53
Control Delay		56.5		24.1		4.7		4.5
Queue Delay		0.0		0.0		2.1		0.5
Total Delay		56.5		24.1		6.8		5.0
Queue Length 50th (ft)		189		16		78		88
Queue Length 95th (ft)		#319		44		m78		151
Internal Link Dist (ft)		565		410		256		420
Turn Bay Length (ft)								
Base Capacity (vph)		414		449		2132		2167
Starvation Cap Reductn		0		0		289		535
Spillback Cap Reductn		0		0		0		0
Storage Cap Reductn		0		0		0		0
Reduced v/c Ratio		0.76		0.10		0.92		0.71

Intersection Summary

Cycle Length: 105
 Actuated Cycle Length: 105
 Offset: 86 (82%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
 Natural Cycle: 60
 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
18: Cherry Street & Elm Street

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011

Splits and Phases: 18: Cherry Street & Elm Street



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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	150	90	60	10	20	10	50	1550	10	20	850	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0			3.0			3.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.97			0.97			1.00			0.97	
Flt Protected		0.98			0.99			1.00			1.00	
Satd. Flow (prot)		1768			1776			3530			3425	
Flt Permitted		0.84			0.92			0.86			0.89	
Satd. Flow (perm)		1520			1654			3036			3058	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	158	95	63	11	21	11	53	1632	11	21	895	242
RTOR Reduction (vph)	0	9	0	0	8	0	0	0	0	0	21	0
Lane Group Flow (vph)	0	307	0	0	35	0	0	1696	0	0	1137	0
Turn Type	Perm		Perm		Perm		Perm		Perm		Perm	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		24.3			24.3			72.7			72.7	
Effective Green, g (s)		25.3			25.3			73.7			73.7	
Actuated g/C Ratio		0.24			0.24			0.70			0.70	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		366			399			2131			2146	
v/s Ratio Prot												
v/s Ratio Perm		c0.20			0.02			c0.56			0.37	
v/c Ratio		0.84			0.09			0.80			0.53	
Uniform Delay, d1		37.9			30.9			10.6			7.4	
Progression Factor		1.00			1.00			0.33			0.52	
Incremental Delay, d2		15.3			0.1			0.8			0.6	
Delay (s)		53.3			31.0			4.3			4.4	
Level of Service		D			C			A			A	
Approach Delay (s)		53.3			31.0			4.3			4.4	
Approach LOS		D			C			A			A	

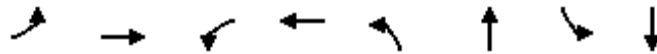
Intersection Summary

HCM Average Control Delay	9.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	109.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Queues
19: Jefferson St & Elm Street

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	420	390	10	650	280	1060	60	550
Lane Group Flow (vph)	429	490	10	796	286	1133	61	877
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)	19.0	48.0	14.0	43.0	14.0	43.0	29.0	29.0
Total Split (%)	18.1%	45.7%	13.3%	41.0%	13.3%	41.0%	27.6%	27.6%
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	1.34	0.50	0.02	1.17	1.14	0.87	0.74	1.01
Control Delay	200.6	18.3	12.5	119.0	127.3	38.9	77.7	61.1
Queue Delay	0.0	4.5	0.0	0.0	0.0	0.0	0.0	16.6
Total Delay	200.6	22.8	12.5	119.0	127.3	38.9	77.7	77.7
Queue Length 50th (ft)	~332	185	3	~633	~164	365	35	~148
Queue Length 95th (ft)	#528	339	m6	m#769	#334	#458	m#98	#375
Internal Link Dist (ft)		290		495		389		256
Turn Bay Length (ft)	200		150		250		225	
Base Capacity (vph)	320	971	499	681	251	1308	82	871
Starvation Cap Reductn	0	397	0	0	0	0	0	42
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.34	0.85	0.02	1.17	1.14	0.87	0.74	1.06

Intersection Summary

Cycle Length: 105

Actuated Cycle Length: 105

Offset: 25 (24%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Natural Cycle: 100

Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.

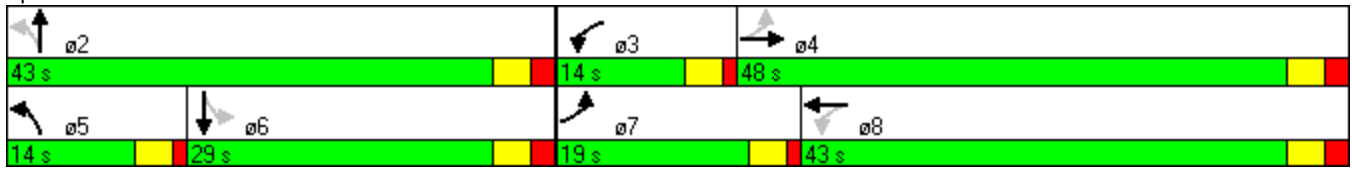
Queue shown is maximum after two cycles.

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: 19: Jefferson St & Elm Street



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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	420	390	90	10	650	130	280	1060	50	60	550	310
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		5.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Fr _t	1.00	0.97		1.00	0.97		1.00	0.99		1.00	0.95	
Fl _t Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1810		1770	1816		1770	3515		1770	3348	
Fl _t Permitted	0.09	1.00		0.48	1.00		0.16	1.00		0.19	1.00	
Satd. Flow (perm)	165	1810		888	1816		300	3515		358	3348	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	429	398	92	10	663	133	286	1082	51	61	561	316
RTOR Reduction (vph)	0	7	0	0	7	0	0	3	0	0	77	0
Lane Group Flow (vph)	429	483	0	10	789	0	286	1130	0	61	800	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)	60.2	54.9		42.5	41.2		34.8	34.8		20.8	20.8	
Effective Green, g (s)	60.2	55.9		42.5	42.2		34.8	35.8		20.8	21.8	
Actuated g/C Ratio	0.57	0.53		0.40	0.40		0.33	0.34		0.20	0.21	
Clearance Time (s)	4.0	5.0		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		3.0	3.0	
Lane Grp Cap (vph)	324	964		370	730		239	1198		71	695	
v/s Ratio Prot	c0.19	0.27		0.00	0.43		c0.11	0.32			0.24	
v/s Ratio Perm	c0.57			0.01			c0.28			0.17		
v/c Ratio	1.32	0.50		0.03	1.08		1.20	0.94		0.86	1.15	
Uniform Delay, d ₁	33.1	15.7		18.7	31.4		30.9	33.6		40.7	41.6	
Progression Factor	1.00	1.00		1.08	0.96		1.00	1.00		0.88	0.85	
Incremental Delay, d ₂	165.8	0.4		0.0	54.2		121.8	15.5		64.8	82.0	
Delay (s)	198.9	16.1		20.2	84.4		152.7	49.1		100.5	117.2	
Level of Service	F	B		C	F		F	D		F	F	
Approach Delay (s)		101.4			83.6			70.0			116.1	
Approach LOS		F			F			E			F	

Intersection Summary

HCM Average Control Delay	90.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.22		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	119.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Queues
20: East Main Street & North State Street

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑↑	↑	↑
Volume (vph)	1071	28	1347	11	85
Lane Group Flow (vph)	1139	29	1418	12	89
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)	5.0	5.0	5.0	7.0	7.0
Minimum Split (s)	20.0	20.0	20.0	22.0	22.0
Total Split (s)	80.0	80.0	80.0	25.0	25.0
Total Split (%)	76.2%	76.2%	76.2%	23.8%	23.8%
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	0.33	0.07	0.41	0.08	0.41
Control Delay	2.3	2.2	2.4	48.0	18.9
Queue Delay	0.0	0.0	0.7	0.0	0.0
Total Delay	2.3	2.2	3.1	48.0	18.9
Queue Length 50th (ft)	52	2	74	6	9
Queue Length 95th (ft)	136	m5	m166	m7	m15
Internal Link Dist (ft)	848		136	779	
Turn Bay Length (ft)					
Base Capacity (vph)	3467	437	3473	354	388
Starvation Cap Reductn	0	0	1554	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.33	0.07	0.74	0.03	0.23

Intersection Summary

Cycle Length: 105
 Actuated Cycle Length: 105
 Offset: 34 (32%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow
 Natural Cycle: 45
 Control Type: Actuated-Coordinated
 m Volume for 95th percentile queue is metered by upstream signal.

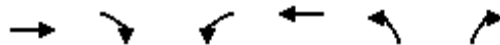
Splits and Phases: 20: East Main Street & North State Street



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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



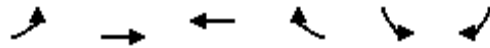
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↵	↑↑	↵	↵
Volume (vph)	1071	11	28	1347	11	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	16	12	12
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	4005		2006	4011	1770	1583
Flt Permitted	1.00		0.24	1.00	0.95	1.00
Satd. Flow (perm)	4005		504	4011	1770	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1127	12	29	1418	12	89
RTOR Reduction (vph)	0	0	0	0	0	82
Lane Group Flow (vph)	1139	0	29	1418	12	7
Turn Type			Perm			Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	89.3		89.3	89.3	7.7	7.7
Effective Green, g (s)	89.3		89.3	89.3	7.7	7.7
Actuated g/C Ratio	0.85		0.85	0.85	0.07	0.07
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	0.2		0.2	0.2	3.0	3.0
Lane Grp Cap (vph)	3406		429	3411	130	116
v/s Ratio Prot	0.28			c0.35	c0.01	
v/s Ratio Perm			0.06			0.00
v/c Ratio	0.33		0.07	0.42	0.09	0.06
Uniform Delay, d1	1.6		1.2	1.8	45.4	45.3
Progression Factor	1.00		0.97	0.98	1.13	1.67
Incremental Delay, d2	0.3		0.2	0.2	0.2	0.1
Delay (s)	1.9		1.4	2.0	51.7	75.7
Level of Service	A		A	A	D	E
Approach Delay (s)	1.9			2.0	72.8	
Approach LOS	A			A	E	

Intersection Summary

HCM Average Control Delay	4.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis 2029 AM Peak - Alt B (5-Bridge Scenario)
 21: East Main Street & Crystal Street 2/8/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↕			↕
Volume (veh/h)	5	1156	1412	5	0	90
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	1257	1535	5	0	98
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	0.85				0.89	0.85
vC, conflicting volume	1540				2177	770
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1287				1728	383
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	81
cM capacity (veh/h)	456				70	524

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	424	838	1023	517	98
Volume Left	5	0	0	0	0
Volume Right	0	0	0	5	98
cSH	456	1700	1700	1700	524
Volume to Capacity	0.01	0.49	0.60	0.30	0.19
Queue Length 95th (ft)	1	0	0	0	17
Control Delay (s)	0.4	0.0	0.0	0.0	13.4
Lane LOS	A				B
Approach Delay (s)	0.1		0.0		13.4
Approach LOS					B

Intersection Summary					
Average Delay			0.5		
Intersection Capacity Utilization			51.4%	ICU Level of Service	A
Analysis Period (min)			15		

Queues
22: East Main Street & Myrtle Avenue

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↑↑	↑	↑
Volume (vph)	941	297	941	335	189
Lane Group Flow (vph)	1329	0	1304	353	199
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)	80.0	80.0	80.0	25.0	25.0
Total Split (%)	76.2%	76.2%	76.2%	23.8%	23.8%
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	0.53		1.39dl	1.00	0.43
Control Delay	6.0		34.0	79.5	7.0
Queue Delay	0.1		12.1	0.0	0.0
Total Delay	6.1		46.1	79.5	7.0
Queue Length 50th (ft)	183		454	243	24
Queue Length 95th (ft)	63		#634	m#406	m28
Internal Link Dist (ft)	112		226	1534	
Turn Bay Length (ft)				250	
Base Capacity (vph)	2497		1309	354	461
Starvation Cap Reductn	272		52	0	0
Spillback Cap Reductn	0		0	0	0
Storage Cap Reductn	0		0	0	0
Reduced v/c Ratio	0.60		1.04	1.00	0.43

Intersection Summary

Cycle Length: 105
 Actuated Cycle Length: 105
 Offset: 89 (85%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow
 Natural Cycle: 100
 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
22: East Main Street & Myrtle Avenue

2029 AM Peak - Alt B (5-Bridge Scenario)
2/8/2011

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



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

2029 AM Peak - Alt B (5-Bridge Scenario)
 2/8/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↵	↵
Volume (vph)	941	321	297	941	335	189
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 _t	0.96			1.00	1.00	0.85
Fl _t Protected	1.00			0.99	0.95	1.00
Satd. Flow (prot)	3404			3497	1770	1583
Fl _t Permitted	1.00			0.51	0.95	1.00
Satd. Flow (perm)	3404			1807	1770	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	991	338	313	991	353	199
RTOR Reduction (vph)	32	0	0	0	0	145
Lane Group Flow (vph)	1297	0	0	1304	353	54
Turn Type			Perm			Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	76.0			76.0	21.0	21.0
Effective Green, g (s)	76.0			76.0	21.0	21.0
Actuated g/C Ratio	0.72			0.72	0.20	0.20
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)	2464			1308	354	317
v/s Ratio Prot	0.38				c0.20	
v/s Ratio Perm				c0.72		0.03
v/c Ratio	0.53			1.39dl	1.00	0.17
Uniform Delay, d ₁	6.5			14.4	42.0	34.8
Progression Factor	0.88			0.76	0.80	0.61
Incremental Delay, d ₂	0.8			21.3	43.3	0.2
Delay (s)	6.5			32.3	76.7	21.3
Level of Service	A			C	E	C
Approach Delay (s)	6.5			32.3	56.8	
Approach LOS	A			C	E	

Intersection Summary

HCM Average Control Delay	25.8	HCM Level of Service	C
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	99.5%	ICU Level of Service	F
Analysis Period (min)	15		

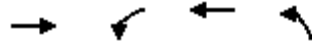
dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

Queues
23: East Main Street & Maple Avenue

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Lane Group	EBT	WBL	WBT	NBL
Lane Configurations	↑↑		↑↑	↘
Volume (vph)	1067	58	1180	58
Lane Group Flow (vph)	1230	0	1346	130
Turn Type	Perm			
Protected Phases	2		6	8
Permitted Phases		6		
Detector Phase	2	6	6	8
Switch Phase				
Minimum Initial (s)	15.0	15.0	15.0	5.0
Minimum Split (s)	20.0	20.0	20.0	20.0
Total Split (s)	83.0	83.0	83.0	22.0
Total Split (%)	79.0%	79.0%	79.0%	21.0%
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-Max	None	None	Max
v/c Ratio	0.47		0.63	0.40
Control Delay	4.1		7.2	29.4
Queue Delay	0.2		0.7	0.1
Total Delay	4.2		7.9	29.5
Queue Length 50th (ft)	94		77	51
Queue Length 95th (ft)	108		120	109
Internal Link Dist (ft)	226		325	1016
Turn Bay Length (ft)				
Base Capacity (vph)	2643		2135	326
Starvation Cap Reductn	481		128	0
Spillback Cap Reductn	156		430	7
Storage Cap Reductn	0		0	0
Reduced v/c Ratio	0.57		0.79	0.41

Intersection Summary

Cycle Length: 105
 Actuated Cycle Length: 105
 Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green
 Natural Cycle: 55
 Control Type: Actuated-Coordinated

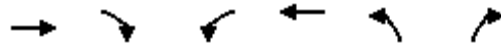
Splits and Phases: 23: East Main Street & Maple Avenue



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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↔	
Volume (vph)	1067	64	58	1180	58	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	0.95			0.95	1.00	
Fr _t	0.99			1.00	0.93	
Fl _t Protected	1.00			1.00	0.98	
Satd. Flow (prot)	3509			3531	1692	
Fl _t Permitted	1.00			0.80	0.98	
Satd. Flow (perm)	3509			2840	1692	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1160	70	63	1283	63	67
RTOR Reduction (vph)	4	0	0	0	36	0
Lane Group Flow (vph)	1226	0	0	1346	94	0
Turn Type			Perm			
Protected Phases	2			6	8	
Permitted Phases			6			
Actuated Green, G (s)	79.0			79.0	18.0	
Effective Green, g (s)	79.0			79.0	18.0	
Actuated g/C Ratio	0.75			0.75	0.17	
Clearance Time (s)	4.0			4.0	4.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	2640			2137	290	
v/s Ratio Prot	0.35				c0.06	
v/s Ratio Perm				c0.47		
v/c Ratio	0.46			0.63	0.32	
Uniform Delay, d ₁	4.9			6.1	38.2	
Progression Factor	0.72			0.93	1.00	
Incremental Delay, d ₂	0.5			0.5	2.9	
Delay (s)	4.1			6.2	41.1	
Level of Service	A			A	D	
Approach Delay (s)	4.1			6.2	41.1	
Approach LOS	A			A	D	

Intersection Summary

HCM Average Control Delay	6.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Queues
24: East Main Street & Lincoln Avenue

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Volume (vph)	74	931	212	918	204	21	244	58	31
Lane Group Flow (vph)	78	1109	223	991	0	237	257	0	217
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)	10.0	45.0	20.0	55.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	9.5%	42.9%	19.0%	52.4%	38.1%	38.1%	38.1%	38.1%	38.1%
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	0.24	0.66	0.63	0.49		0.89	0.41		0.53
Control Delay	8.9	18.5	19.9	16.3		69.4	5.3		25.3
Queue Delay	0.0	0.2	0.0	0.0		0.0	0.0		0.0
Total Delay	8.9	18.7	19.9	16.3		69.4	5.3		25.3
Queue Length 50th (ft)	15	217	58	214		150	0		82
Queue Length 95th (ft)	22	438	137	304		#255	53		145
Internal Link Dist (ft)		325		1546		1598			1086
Turn Bay Length (ft)	120		180						
Base Capacity (vph)	333	1691	394	2015		331	712		493
Starvation Cap Reductn	0	122	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	0.23	0.71	0.57	0.49		0.72	0.36		0.44

Intersection Summary

Cycle Length: 105
 Actuated Cycle Length: 105
 Offset: 70 (67%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

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



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

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	74	931	123	212	918	24	204	21	244	58	31	117
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	1.00			1.00	0.85		0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.99	
Satd. Flow (prot)	1770	3477		1770	3526			1782	1583		1696	
Flt Permitted	0.25	1.00		0.14	1.00			0.52	1.00		0.76	
Satd. Flow (perm)	472	3477		252	3526			964	1583		1308	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	78	980	129	223	966	25	215	22	257	61	33	123
RTOR Reduction (vph)	0	8	0	0	1	0	0	0	186	0	49	0
Lane Group Flow (vph)	78	1101	0	223	990	0	0	237	71	0	168	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)	55.7	50.8		68.1	59.2			28.9	28.9		28.9	
Effective Green, g (s)	55.7	50.8		68.1	59.2			28.9	28.9		28.9	
Actuated g/C Ratio	0.53	0.48		0.65	0.56			0.28	0.28		0.28	
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)	311	1682		356	1988			265	436		360	
v/s Ratio Prot	0.01	0.32		c0.08	0.28							
v/s Ratio Perm	0.12			c0.33				c0.25	0.04		0.13	
v/c Ratio	0.25	0.65		0.63	0.50			0.89	0.16		0.47	
Uniform Delay, d1	12.3	20.5		13.4	13.9			36.6	28.9		31.6	
Progression Factor	0.77	0.74		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.1	1.8		2.5	0.9			29.3	0.2		1.0	
Delay (s)	9.7	16.9		15.9	14.8			65.9	29.0		32.6	
Level of Service	A	B		B	B			E	C		C	
Approach Delay (s)		16.5			15.0			46.7			32.6	
Approach LOS		B			B			D			C	

Intersection Summary

HCM Average Control Delay	21.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	79.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Queues
 25: Relocated I-95 NB Off-Ramp & South State St

Lane Group	EBL	NET
Lane Configurations		
Volume (vph)	1080	970
Lane Group Flow (vph)	1174	1054
Turn Type		
Protected Phases	1	2
Permitted Phases		
Detector Phase	1	2
Switch Phase		
Minimum Initial (s)	4.0	15.0
Minimum Split (s)	25.0	25.0
Total Split (s)	57.0	33.0
Total Split (%)	63.3%	36.7%
Yellow Time (s)	3.0	3.0
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)	0.0	0.0
Total Lost Time (s)	4.0	4.0
Lead/Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes
Recall Mode	None	C-Max
v/c Ratio	0.75	0.36
Control Delay	23.1	15.4
Queue Delay	0.0	0.0
Total Delay	23.1	15.4
Queue Length 50th (ft)	271	95
Queue Length 95th (ft)	284	135
Internal Link Dist (ft)	388	567
Turn Bay Length (ft)		
Base Capacity (vph)	2032	2961
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	78
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.58	0.37

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 0 (0%), Referenced to phase 2:NET and 6:, Start of Yellow
 Natural Cycle: 50
 Control Type: Actuated-Coordinated

Splits and Phases: 25: Relocated I-95 NB Off-Ramp & South State St



HCM Signalized Intersection Capacity Analysis
 25: Relocated I-95 NB Off-Ramp & South State St

2029 AM Peak - Alt B (5-Bridge Scenario)

2/8/2011



Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Volume (vph)	1080	0	0	970	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0		
Lane Util. Factor	0.97			0.86		
Fr _t	1.00			1.00		
Fl _t Protected	0.95			1.00		
Satd. Flow (prot)	3433			6408		
Fl _t Permitted	0.95			1.00		
Satd. Flow (perm)	3433			6408		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1174	0	0	1054	0	0
RTOR Reduction (vph)	13	0	0	0	0	0
Lane Group Flow (vph)	1161	0	0	1054	0	0
Turn Type						
Protected Phases	1			2		
Permitted Phases						
Actuated Green, G (s)	40.4			41.6		
Effective Green, g (s)	40.4			41.6		
Actuated g/C Ratio	0.45			0.46		
Clearance Time (s)	4.0			4.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	1541			2962		
v/s Ratio Prot	c0.34			c0.16		
v/s Ratio Perm						
v/c Ratio	0.75			0.36		
Uniform Delay, d ₁	20.6			15.6		
Progression Factor	1.00			0.90		
Incremental Delay, d ₂	2.1			0.3		
Delay (s)	22.8			14.4		
Level of Service	C			B		
Approach Delay (s)	22.8			14.4		0.0
Approach LOS	C			B		A

Intersection Summary

HCM Average Control Delay	18.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			