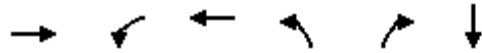


# Queues

## 7: N. Delaware Ave & Shackamaxon Ave

05/18/2007



Lane Group	EBT	WBL	WBT	NBL	NBR	SBT
Lane Group Flow (vph)	2326	344	614	61	208	87
v/c Ratio	0.82	0.64	0.16	0.40	0.25	0.32
Control Delay	18.1	41.2	2.4	45.1	23.2	22.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.1	41.2	2.4	45.1	23.2	22.2
Queue Length 50th (ft)	502	95	23	33	47	20
Queue Length 95th (ft)	556	34	30	72	78	37
Internal Link Dist (ft)	690		321			1237
Turn Bay Length (ft)		200				
Base Capacity (vph)	2848	537	3897	152	848	270
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.82	0.64	0.16	0.40	0.25	0.32

### Intersection Summary

\* In the Synchro Analysis for this intersection, Delaware Avenue is layed out as an east-west roadway.

# HCM Signalized Intersection Capacity Analysis

## 7: N. Delaware Ave & Shackamaxon Ave

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑		↑↑	↑↑↑		↑		↑↑		↑	
Volume (vph)	0	2069	39	86	540	0	56	0	191	23	0	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	12	13	11	12	12	12	12	12	16	16	16
Total Lost time (s)		4.0		4.0	4.0		4.0		6.0		4.0	
Lane Util. Factor		0.91		0.97	0.91		1.00		0.88		1.00	
Frt		1.00		1.00	1.00		1.00		0.85		0.92	
Flt Protected		1.00		0.95	1.00		0.95		1.00		0.98	
Satd. Flow (prot)		4923		3224	4940		1719		2707		1854	
Flt Permitted		1.00		0.95	1.00		0.69		1.00		0.98	
Satd. Flow (perm)		4923		3224	4940		1242		2707		1854	
Peak-hour factor, PHF	0.91	0.91	0.75	0.25	0.88	0.88	0.92	0.92	0.92	0.61	0.65	0.65
Adj. Flow (vph)	0	2274	52	344	614	0	61	0	208	38	0	49
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	6	0	43	0
Lane Group Flow (vph)	0	2323	0	344	614	0	61	0	202	0	44	0
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Parking (#/hr)			10			10				10		10
Turn Type				Prot		custom		custom		Perm		
Protected Phases				3	8				2 3		6	
Permitted Phases		4					2			6		
Actuated Green, G (s)		51.0		14.0	70.0		9.0		28.0		9.0	
Effective Green, g (s)		52.0		15.0	71.0		11.0		23.0		11.0	
Actuated g/C Ratio		0.58		0.17	0.79		0.12		0.26		0.12	
Clearance Time (s)		5.0		5.0	5.0		6.0				6.0	
Lane Grp Cap (vph)		2844		537	3897		152		692		227	
v/s Ratio Prot				c0.11	0.12				0.07			
v/s Ratio Perm		c0.47					c0.05				0.02	
v/c Ratio		0.82		0.64	0.16		0.40		0.29		0.19	
Uniform Delay, d1		15.2		35.0	2.3		36.5		26.9		35.5	
Progression Factor		1.01		1.00	1.00		1.00		1.00		1.00	
Incremental Delay, d2		2.4		5.8	0.1		7.7		1.1		1.9	
Delay (s)		17.8		40.8	2.4		44.2		28.0		37.4	
Level of Service		B		D	A		D		C		D	
Approach Delay (s)		17.8			16.2			31.7			37.4	
Approach LOS		B			B			C			D	

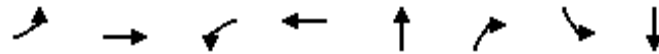
### Intersection Summary

HCM Average Control Delay	18.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

# Queues

## 8: N. Delaware Ave & Frankford Ave

05/18/2007



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	392	1886	70	598	4	32	131	219
v/c Ratio	0.72	0.60	0.72	0.23	0.02	0.08	0.47	0.44
Control Delay	19.6	16.0	58.8	9.4	26.2	13.9	35.6	9.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.6	16.0	58.8	9.4	26.2	13.9	35.6	9.5
Queue Length 50th (ft)	141	311	23	47	2	3	67	14
Queue Length 95th (ft)	m190	365	#114	63	10	26	100	42
Internal Link Dist (ft)		1382		690	35			19
Turn Bay Length (ft)	320		100					
Base Capacity (vph)	545	3124	97	2549	198	378	279	502
Starvation Cap Reductn	0	0	0	0	0	0	0	0
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	0.72	0.60	0.72	0.23	0.02	0.08	0.47	0.44

### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

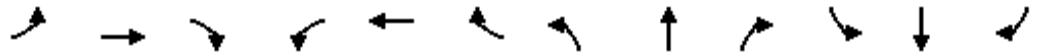
m Volume for 95th percentile queue is metered by upstream signal.

\* In the Synchro Analysis for this intersection, Delaware Avenue is layed out as an east-west roadway.

# HCM Signalized Intersection Capacity Analysis

## 8: N. Delaware Ave & Frankford Ave

05/18/2007



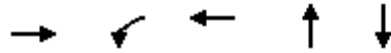
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↗	↑↑↑		↗	↑↑↑			↑	↗	↗	↑	↗
Volume (vph)	341	1697	19	64	480	68	4	0	29	108	12	156
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	13	12	15
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0	5.0	4.0	4.0	
Lane Util. Factor	1.00	0.91		1.00	0.91			1.00	1.00	0.95	0.95	
Frt	1.00	1.00		1.00	0.98			1.00	0.85	1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1719	4685		1719	4832			1719	1538	1434	1493	
Flt Permitted	0.36	1.00		0.10	1.00			0.45	1.00	0.76	0.98	
Satd. Flow (perm)	658	4685		187	4832			810	1538	1140	1474	
Peak-hour factor, PHF	0.87	0.91	0.91	0.92	0.94	0.78	0.92	0.92	0.92	0.74	0.74	0.83
Adj. Flow (vph)	392	1865	21	70	511	87	4	0	32	146	16	188
RTOR Reduction (vph)	0	1	0	0	26	0	0	0	19	0	142	0
Lane Group Flow (vph)	392	1885	0	70	572	0	0	4	13	131	77	0
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Parking (#/hr)		10								10		10
Turn Type	pm+pt			Perm			Perm		Perm	Perm		
Protected Phases	7	4			8			2				6
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	58.0	58.0		45.0	45.0			21.0	21.0	20.0	20.0	
Effective Green, g (s)	57.0	60.0		47.0	47.0			22.0	21.0	22.0	22.0	
Actuated g/C Ratio	0.63	0.67		0.52	0.52			0.24	0.23	0.24	0.24	
Clearance Time (s)	3.0	6.0		6.0	6.0			5.0	5.0	6.0	6.0	
Lane Grp Cap (vph)	523	3123		98	2523			198	359	279	360	
v/s Ratio Prot	c0.07	0.40			0.12							
v/s Ratio Perm	c0.40			0.37				0.00	0.01	c0.11	0.05	
v/c Ratio	0.75	0.60		0.71	0.23			0.02	0.04	0.47	0.21	
Uniform Delay, d1	8.6	8.4		16.4	11.7			25.8	26.7	29.0	27.1	
Progression Factor	2.03	1.83		0.88	0.87			1.00	1.00	1.00	1.00	
Incremental Delay, d2	5.2	0.5		35.6	0.2			0.2	0.2	5.6	1.4	
Delay (s)	22.7	15.7		50.0	10.3			26.0	26.9	34.6	28.5	
Level of Service	C	B		D	B			C	C	C	C	
Approach Delay (s)		16.9			14.5			26.8			30.8	
Approach LOS		B			B			C			C	

Intersection Summary		
HCM Average Control Delay	18.0	HCM Level of Service
HCM Volume to Capacity ratio	0.64	B
Actuated Cycle Length (s)	90.0	Sum of lost time (s)
Intersection Capacity Utilization	61.5%	8.0
Analysis Period (min)	15	ICU Level of Service
c Critical Lane Group		B

# Queues

## 9: N. Delaware Ave & Columbia Ave

05/18/2007



Lane Group	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	2202	15	797	112	203
v/c Ratio	1.03	0.19	0.37	0.30	0.52
Control Delay	34.1	11.8	7.0	25.8	29.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	34.1	11.8	7.0	25.8	29.8
Queue Length 50th (ft)	~739	3	81	46	86
Queue Length 95th (ft)	#857	m10	101	84	140
Internal Link Dist (ft)	288		577	81	623
Turn Bay Length (ft)		105			
Base Capacity (vph)	2139	80	2139	374	388
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	1.03	0.19	0.37	0.30	0.52

### Intersection Summary

~ 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.

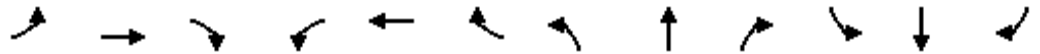
m Volume for 95th percentile queue is metered by upstream signal.

\* In the Synchro Analysis for this intersection, Delaware Avenue is layed out as an east-west roadway.

# HCM Signalized Intersection Capacity Analysis

## 9: N. Delaware Ave & Columbia Ave

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑			↕			↕	
Volume (vph)	0	2044	4	13	693	0	62	0	32	115	8	45
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	
Lane Util. Factor		0.95		1.00	0.95			1.00			1.00	
Frt		1.00		1.00	1.00			0.95			0.96	
Flt Protected		1.00		0.95	1.00			0.97			0.97	
Satd. Flow (prot)		3437		1719	3438			1671			1687	
Flt Permitted		1.00		0.07	1.00			0.74			0.74	
Satd. Flow (perm)		3437		129	3438			1276			1293	
Peak-hour factor, PHF	0.93	0.93	0.93	0.87	0.87	0.87	0.84	0.84	0.84	0.83	0.83	0.83
Adj. Flow (vph)	0	2198	4	15	797	0	74	0	38	139	10	54
RTOR Reduction (vph)	0	0	0	0	0	0	0	6	0	0	14	0
Lane Group Flow (vph)	0	2202	0	15	797	0	0	106	0	0	189	0
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Turn Type				Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases				8			2			6		
Actuated Green, G (s)		55.0		55.0	55.0			24.0			24.0	
Effective Green, g (s)		56.0		56.0	56.0			26.0			26.0	
Actuated g/C Ratio		0.62		0.62	0.62			0.29			0.29	
Clearance Time (s)		5.0		5.0	5.0			6.0			6.0	
Lane Grp Cap (vph)		2139		80	2139			369			374	
v/s Ratio Prot		c0.64			0.23							
v/s Ratio Perm				0.12				0.08			c0.15	
v/c Ratio		1.03		0.19	0.37			0.29			0.50	
Uniform Delay, d1		17.0		7.3	8.4			24.8			26.6	
Progression Factor		0.41		0.75	0.76			1.00			1.00	
Incremental Delay, d2		24.3		5.1	0.5			2.0			4.8	
Delay (s)		31.2		10.6	6.9			26.8			31.4	
Level of Service		C		B	A			C			C	
Approach Delay (s)		31.2			7.0			26.8			31.4	
Approach LOS		C			A			C			C	

### Intersection Summary

HCM Average Control Delay	25.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# Queues

## 10: Richmond St & N. Delaware Ave

05/18/2007



Lane Group	WBL	NET	SWT
Lane Group Flow (vph)	270	2088	476
v/c Ratio	0.64	0.75	0.17
Control Delay	44.8	13.5	2.5
Queue Delay	0.0	0.0	0.0
Total Delay	44.8	13.5	2.5
Queue Length 50th (ft)	75	532	26
Queue Length 95th (ft)	94	m525	34
Internal Link Dist (ft)	285	551	107
Turn Bay Length (ft)	180		
Base Capacity (vph)	422	2792	2792
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.64	0.75	0.17

### Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

# HCM Signalized Intersection Capacity Analysis

## 10: Richmond St & N. Delaware Ave

05/18/2007



Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Volume (vph)	196	7	2046	0	0	405
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0			4.0
Lane Util. Factor	0.97		0.95			0.95
Frt	1.00		1.00			1.00
Flt Protected	0.95		1.00			1.00
Satd. Flow (prot)	3430		3539			3539
Flt Permitted	0.95		1.00			1.00
Satd. Flow (perm)	3430		3539			3539
Peak-hour factor, PHF	0.75	0.75	0.98	0.98	0.85	0.85
Adj. Flow (vph)	261	9	2088	0	0	476
RTOR Reduction (vph)	3	0	0	0	0	0
Lane Group Flow (vph)	267	0	2088	0	0	476
Turn Type						
Protected Phases	8		2			6
Permitted Phases						
Actuated Green, G (s)	9.0		70.0			70.0
Effective Green, g (s)	11.0		71.0			71.0
Actuated g/C Ratio	0.12		0.79			0.79
Clearance Time (s)	6.0		5.0			5.0
Lane Grp Cap (vph)	419		2792			2792
v/s Ratio Prot	c0.08		c0.59			0.13
v/s Ratio Perm						
v/c Ratio	0.64		0.75			0.17
Uniform Delay, d1	37.6		4.9			2.3
Progression Factor	1.00		2.43			1.00
Incremental Delay, d2	7.3		0.9			0.1
Delay (s)	44.9		12.8			2.4
Level of Service	D		B			A
Approach Delay (s)	44.9		12.8			2.4
Approach LOS	D		B			A

### Intersection Summary

HCM Average Control Delay	14.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

# Queues

## 11: Penn St & N. Delaware Ave

05/18/2007



Lane Group	WBL	NBT	SBL	SBT
Lane Group Flow (vph)	243	2732	54	754
v/c Ratio	0.59	0.84	0.68	0.23
Control Delay	37.9	12.8	55.7	4.1
Queue Delay	0.0	2.0	0.0	0.0
Total Delay	37.9	14.8	55.7	4.1
Queue Length 50th (ft)	122	349	9	39
Queue Length 95th (ft)	85	425	#91	46
Internal Link Dist (ft)	171	483		1382
Turn Bay Length (ft)			95	
Base Capacity (vph)	410	3264	80	3285
Starvation Cap Reductn	0	373	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.59	0.95	0.68	0.23

### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

## 11: Penn St & N. Delaware Ave

05/18/2007



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		↑↑↑		W	↑↑↑
Volume (vph)	84	23	2355	158	49	686
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	12	12	12	12	12
Total Lost time (s)	4.0		4.0		4.0	4.0
Lane Util. Factor	1.00		0.91		1.00	0.91
Frt	0.97		0.99		1.00	1.00
Flt Protected	0.96		1.00		0.95	1.00
Satd. Flow (prot)	1916		4649		1719	4693
Flt Permitted	0.96		1.00		0.06	1.00
Satd. Flow (perm)	1916		4649		115	4693
Peak-hour factor, PHF	0.44	0.44	0.92	0.92	0.91	0.91
Adj. Flow (vph)	191	52	2560	172	54	754
RTOR Reduction (vph)	6	0	8	0	0	0
Lane Group Flow (vph)	237	0	2724	0	54	754
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%
Parking (#/hr)		10	10	10		10
Turn Type					Perm	
Protected Phases	8		2			6
Permitted Phases					6	
Actuated Green, G (s)	17.0		61.0		61.0	61.0
Effective Green, g (s)	19.0		63.0		63.0	63.0
Actuated g/C Ratio	0.21		0.70		0.70	0.70
Clearance Time (s)	6.0		6.0		6.0	6.0
Lane Grp Cap (vph)	404		3254		81	3285
v/s Ratio Prot	c0.12		c0.59			0.16
v/s Ratio Perm					0.47	
v/c Ratio	0.59		0.84		0.67	0.23
Uniform Delay, d1	32.0		9.8		7.6	4.8
Progression Factor	1.00		1.00		1.20	0.82
Incremental Delay, d2	6.2		2.7		35.3	0.2
Delay (s)	38.1		12.5		44.4	4.1
Level of Service	D		B		D	A
Approach Delay (s)	38.1		12.5			6.8
Approach LOS	D		B			A

### Intersection Summary

HCM Average Control Delay	12.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues

12: Spring Garden St. & N. Delaware Ave

05/18/2007



Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Group Flow (vph)	991	423	384	1832	949
v/c Ratio	0.80	0.39	0.79	0.66	0.80
Control Delay	31.1	6.8	42.6	15.5	33.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	31.1	6.8	42.6	15.5	33.8
Queue Length 50th (ft)	254	83	201	255	164
Queue Length 95th (ft)	331	131	#338	305	190
Internal Link Dist (ft)				1261	483
Turn Bay Length (ft)	160		215		
Base Capacity (vph)	1285	1113	507	2785	1213
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.77	0.38	0.76	0.66	0.78

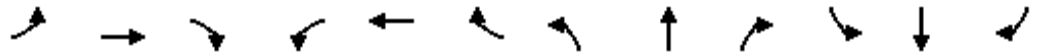
Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

## 12: Spring Garden St. & N. Delaware Ave

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗		↖				↖	↑↑↑		↖	↑↑↑	
Volume (vph)	932	0	398	0	0	0	357	1704	0	0	528	260
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	
Lane Util. Factor	0.97		1.00				1.00	0.91			0.91	
Frt	1.00		0.85				1.00	1.00			0.95	
Flt Protected	0.95		1.00				0.95	1.00			1.00	
Satd. Flow (prot)	3433		1583				1770	5085			4834	
Flt Permitted	0.95		1.00				0.95	1.00			1.00	
Satd. Flow (perm)	3433		1583				1770	5085			4834	
Peak-hour factor, PHF	0.94	0.94	0.94	0.92	0.92	0.92	0.93	0.93	0.93	0.83	0.83	0.83
Adj. Flow (vph)	991	0	423	0	0	0	384	1832	0	0	636	313
RTOR Reduction (vph)	0	0	7	0	0	0	0	0	0	0	98	0
Lane Group Flow (vph)	991	0	416	0	0	0	384	1832	0	0	851	0
Turn Type	custom		custom				Prot			Prot		
Protected Phases			4 5				5	2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	29.0		56.9				21.9	45.3			17.4	
Effective Green, g (s)	31.0		58.9				23.9	47.3			19.4	
Actuated g/C Ratio	0.36		0.68				0.28	0.55			0.22	
Clearance Time (s)	6.0						6.0	6.0			6.0	
Vehicle Extension (s)	3.0						3.0	3.0			3.0	
Lane Grp Cap (vph)	1233		1080				490	2787			1087	
v/s Ratio Prot			0.26				c0.22	0.36			c0.18	
v/s Ratio Perm	c0.29											
v/c Ratio	0.80		0.39				0.78	0.66			0.78	
Uniform Delay, d1	24.9		5.9				28.8	13.8			31.5	
Progression Factor	1.00		1.00				1.00	1.00			1.00	
Incremental Delay, d2	3.9		0.2				8.0	1.2			3.7	
Delay (s)	28.8		6.1				36.8	15.0			35.2	
Level of Service	C		A				D	B			D	
Approach Delay (s)		22.0			0.0			18.8			35.2	
Approach LOS		C			A			B			D	

### Intersection Summary

HCM Average Control Delay	23.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	86.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Queues

13: Callowhill St. & Columbus Blvd

05/18/2007



Lane Group	EBL	EBR	NBT	SBT
Lane Group Flow (vph)	35	91	2685	990
v/c Ratio	0.15	0.31	0.68	0.25
Control Delay	36.3	11.3	5.8	2.9
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	36.3	11.3	5.8	2.9
Queue Length 50th (ft)	18	0	203	43
Queue Length 95th (ft)	38	27	241	54
Internal Link Dist (ft)	147		1206	1261
Turn Bay Length (ft)				
Base Capacity (vph)	236	290	3955	3955
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.15	0.31	0.68	0.25

Intersection Summary

# HCM Signalized Intersection Capacity Analysis

## 13: Callowhill St. & Columbus Blvd

05/18/2007



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	26	68	0	2470	921	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.91	0.91	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		5085	5085	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	1770	1583		5085	5085	
Peak-hour factor, PHF	0.75	0.75	0.92	0.92	0.93	0.93
Adj. Flow (vph)	35	91	0	2685	990	0
RTOR Reduction (vph)	0	79	0	0	0	0
Lane Group Flow (vph)	35	12	0	2685	990	0
Turn Type	Perm					
Protected Phases	4			2	6	
Permitted Phases	4					
Actuated Green, G (s)	10.0	10.0		68.0	68.0	
Effective Green, g (s)	12.0	12.0		70.0	70.0	
Actuated g/C Ratio	0.13	0.13		0.78	0.78	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	236	211		3955	3955	
v/s Ratio Prot	c0.02			c0.53		0.19
v/s Ratio Perm	0.01					
v/c Ratio	0.15	0.06		0.68	0.25	
Uniform Delay, d1	34.5	34.1		4.7	2.8	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.3	0.5		1.0	0.2	
Delay (s)	35.8	34.6		5.7	2.9	
Level of Service	D	C		A	A	
Approach Delay (s)	34.9			5.7		2.9
Approach LOS	C			A		A

### Intersection Summary

HCM Average Control Delay	5.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Queues

14: Race St & Columbus Blvd

05/18/2007



Lane Group	EBL	EBT	EBR	WBT	NBT	SBT
Lane Group Flow (vph)	279	2	186	2	2172	1065
v/c Ratio	0.77	0.01	0.42	0.02	0.63	0.31
Control Delay	48.8	31.0	8.6	42.5	9.6	6.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.8	31.0	8.6	42.5	9.6	6.5
Queue Length 50th (ft)	138	1	0	1	193	68
Queue Length 95th (ft)	#304	7	58	8	367	136
Internal Link Dist (ft)		497		85	1197	1206
Turn Bay Length (ft)						
Base Capacity (vph)	369	346	445	187	3438	3438
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.76	0.01	0.42	0.01	0.63	0.31

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

## 14: Race St & Columbus Blvd

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	257	2	171	2	0	0	0	1998	0	0	980	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	6.0		6.0			4.0			4.0	
Lane Util. Factor	1.00	1.00	1.00		1.00			0.91			0.91	
Frt	1.00	1.00	0.85		1.00			1.00			1.00	
Flt Protected	0.95	1.00	1.00		0.95			1.00			1.00	
Satd. Flow (prot)	1770	1863	1583		1770			5085			5085	
Flt Permitted	0.95	1.00	1.00		1.00			1.00			1.00	
Satd. Flow (perm)	1770	1863	1583		1863			5085			5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	279	2	186	2	0	0	0	2172	0	0	1065	0
RTOR Reduction (vph)	0	0	154	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	279	2	32	0	2	0	0	2172	0	0	1065	0
Turn Type	Split		Perm	Perm								
Protected Phases	4	4			8			2			6	
Permitted Phases			4	8								
Actuated Green, G (s)	15.7	15.7	15.7		1.1			56.2			56.2	
Effective Green, g (s)	17.7	15.7	15.7		1.1			58.2			58.2	
Actuated g/C Ratio	0.19	0.17	0.17		0.01			0.64			0.64	
Clearance Time (s)	6.0	6.0	6.0		6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0			3.0			3.0	
Lane Grp Cap (vph)	344	321	273		23			3252			3252	
v/s Ratio Prot	c0.16	0.00						c0.43			0.21	
v/s Ratio Perm			0.02		c0.00							
v/c Ratio	0.81	0.01	0.12		0.09			0.67			0.33	
Uniform Delay, d1	35.1	31.2	31.8		44.5			10.3			7.5	
Progression Factor	1.00	1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2	13.5	0.0	0.2		1.6			1.1			0.3	
Delay (s)	48.5	31.2	32.0		46.1			11.4			7.7	
Level of Service	D	C	C		D			B			A	
Approach Delay (s)		41.9			46.1			11.4			7.7	
Approach LOS		D			D			B			A	

### Intersection Summary

HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	91.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	60.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues

15: Penn's Landing & Columbus Blvd

05/18/2007



Lane Group	WBL	NBT	SBL	SBT
Lane Group Flow (vph)	337	1856	8	1212
v/c Ratio	0.64	0.70	0.07	0.39
Control Delay	26.4	18.0	40.9	8.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	26.4	18.0	40.9	8.5
Queue Length 50th (ft)	119	275	4	110
Queue Length 95th (ft)	156	330	18	136
Internal Link Dist (ft)	281	402		1197
Turn Bay Length (ft)			200	
Base Capacity (vph)	527	2653	118	3113
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.64	0.70	0.07	0.39

Intersection Summary

# HCM Signalized Intersection Capacity Analysis

## 15: Penn's Landing & Columbus Blvd

05/18/2007



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↑↑↑		↔	↑↑↑
Volume (vph)	48	205	1664	6	7	1127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0	4.0
Lane Util. Factor	1.00		0.91		1.00	0.91
Frt	0.89		1.00		1.00	1.00
Flt Protected	0.99		1.00		0.95	1.00
Satd. Flow (prot)	1643		5082		1770	4916
Flt Permitted	0.99		1.00		0.95	1.00
Satd. Flow (perm)	1643		5082		1770	4916
Peak-hour factor, PHF	0.75	0.75	0.90	0.90	0.93	0.93
Adj. Flow (vph)	64	273	1849	7	8	1212
RTOR Reduction (vph)	70	0	0	0	0	0
Lane Group Flow (vph)	267	0	1856	0	8	1212
Parking (#/hr)						0
Turn Type					Prot	
Protected Phases	8		2		1	6
Permitted Phases						
Actuated Green, G (s)	23.0		45.0		4.0	55.0
Effective Green, g (s)	25.0		47.0		6.0	57.0
Actuated g/C Ratio	0.28		0.52		0.07	0.63
Clearance Time (s)	6.0		6.0		6.0	6.0
Lane Grp Cap (vph)	456		2654		118	3113
v/s Ratio Prot	c0.16		c0.37		0.00	c0.25
v/s Ratio Perm						
v/c Ratio	0.59		0.70		0.07	0.39
Uniform Delay, d1	28.0		16.2		39.4	8.0
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	5.4		1.6		1.1	0.4
Delay (s)	33.4		17.7		40.5	8.4
Level of Service	C		B		D	A
Approach Delay (s)	33.4		17.7			8.6
Approach LOS	C		B			A

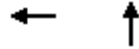
### Intersection Summary

HCM Average Control Delay	16.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	54.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues

16: Callowhill St. & 3rd St.

05/18/2007



Lane Group	WBT	NBT
Lane Group Flow (vph)	2294	428
v/c Ratio	0.51	0.39
Control Delay	10.8	25.3
Queue Delay	0.0	0.0
Total Delay	10.8	25.3
Queue Length 50th (ft)	169	98
Queue Length 95th (ft)	193	134
Internal Link Dist (ft)	309	280
Turn Bay Length (ft)		
Base Capacity (vph)	4515	1093
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.51	0.39

Intersection Summary

# HCM Signalized Intersection Capacity Analysis

## 16: Callowhill St. & 3rd St.

05/18/2007

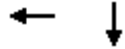


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations								↑↑				
Volume (vph)	0	0	0	0	2097	36	79	293	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0			4.0				
Lane Util. Factor					0.81			0.95				
Frt					1.00			1.00				
Flt Protected					1.00			0.99				
Satd. Flow (prot)					7525			3502				
Flt Permitted					1.00			0.99				
Satd. Flow (perm)					7525			3502				
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	2255	39	91	337	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	3	0	0	4	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	2291	0	0	424	0	0	0	0
Turn Type								Perm				
Protected Phases					6			8				
Permitted Phases							8					
Actuated Green, G (s)					52.0			26.0				
Effective Green, g (s)					54.0			28.0				
Actuated g/C Ratio					0.60			0.31				
Clearance Time (s)					6.0			6.0				
Lane Grp Cap (vph)					4515			1090				
v/s Ratio Prot					c0.30							
v/s Ratio Perm								0.12				
v/c Ratio					0.51			0.39				
Uniform Delay, d1					10.4			24.3				
Progression Factor					1.00			1.00				
Incremental Delay, d2					0.4			1.0				
Delay (s)					10.8			25.3				
Level of Service					B			C				
Approach Delay (s)		0.0			10.8			25.3			0.0	
Approach LOS		A			B			C			A	

### Intersection Summary

HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	41.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Lane Group	WBT	SBT
Lane Group Flow (vph)	2431	474
v/c Ratio	0.54	0.45
Control Delay	4.7	26.2
Queue Delay	0.0	0.0
Total Delay	4.7	26.2
Queue Length 50th (ft)	55	111
Queue Length 95th (ft)	60	132
Internal Link Dist (ft)	367	1136
Turn Bay Length (ft)		
Base Capacity (vph)	4525	1048
Starvation Cap Reductn	11	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.54	0.45
<b>Intersection Summary</b>		

# HCM Signalized Intersection Capacity Analysis

17: 4th St &

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					←←←←						↑↑	
Volume (vph)	0	0	0	135	2126	0	0	0	0	0	242	128
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0						4.0	
Lane Util. Factor					0.81						0.95	
Frt					1.00						0.95	
Flt Protected					1.00						1.00	
Satd. Flow (prot)					7522						3356	
Flt Permitted					1.00						1.00	
Satd. Flow (perm)					7522						3356	
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.92	0.92	0.92	0.78	0.78	0.78
Adj. Flow (vph)	0	0	0	145	2286	0	0	0	0	0	310	164
RTOR Reduction (vph)	0	0	0	0	13	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	0	0	0	2418	0	0	0	0	0	470	0
Turn Type					Perm							
Protected Phases						8						6
Permitted Phases					8							
Actuated Green, G (s)						52.0						26.0
Effective Green, g (s)						54.0						28.0
Actuated g/C Ratio						0.60						0.31
Clearance Time (s)						6.0						6.0
Lane Grp Cap (vph)						4513						1044
v/s Ratio Prot												c0.14
v/s Ratio Perm						0.32						
v/c Ratio						0.54						0.45
Uniform Delay, d1						10.6						24.8
Progression Factor						0.41						1.00
Incremental Delay, d2						0.4						1.4
Delay (s)						4.7						26.2
Level of Service						A						C
Approach Delay (s)		0.0				4.7		0.0				26.2
Approach LOS		A				A		A				C

## Intersection Summary

HCM Average Control Delay	8.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Queues

18: Callowhill St. & 5th St.

05/18/2007



Lane Group	WBT	NBL	NBT
Lane Group Flow (vph)	2600	81	904
v/c Ratio	0.59	0.15	0.82
Control Delay	14.2	21.6	36.2
Queue Delay	0.8	0.0	0.0
Total Delay	15.0	21.6	36.2
Queue Length 50th (ft)	318	30	248
Queue Length 95th (ft)	359	65	324
Internal Link Dist (ft)	369		252
Turn Bay Length (ft)			
Base Capacity (vph)	4435	555	1101
Starvation Cap Reductn	1385	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.85	0.15	0.82

Intersection Summary

# HCM Signalized Intersection Capacity Analysis

## 18: Callowhill St. & 5th St.

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations							↖	↑↑				
Volume (vph)	0	0	0	0	2067	351	73	814	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0				
Lane Util. Factor					0.81		1.00	0.95				
Fr <sub>t</sub>					0.98		1.00	1.00				
Fl <sub>t</sub> Protected					1.00		0.95	1.00				
Satd. Flow (prot)					7380		1770	3539				
Fl <sub>t</sub> Permitted					1.00		0.95	1.00				
Satd. Flow (perm)					7380		1770	3539				
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.90	0.90	0.90	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	2223	377	81	904	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	8	0	4	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	2592	0	77	904	0	0	0	0
Turn Type							Perm					
Protected Phases					8			2				
Permitted Phases							2					
Actuated Green, G (s)					52.0		26.0	26.0				
Effective Green, g (s)					54.0		28.0	28.0				
Actuated g/C Ratio					0.60		0.31	0.31				
Clearance Time (s)					6.0		6.0	6.0				
Lane Grp Cap (vph)					4428		551	1101				
v/s Ratio Prot					c0.35			c0.26				
v/s Ratio Perm							0.04					
v/c Ratio					0.59		0.14	0.82				
Uniform Delay, d <sub>1</sub>					11.1		22.3	28.7				
Progression Factor					1.23		1.00	1.00				
Incremental Delay, d <sub>2</sub>					0.5		0.5	6.9				
Delay (s)					14.2		22.9	35.6				
Level of Service					B		C	D				
Approach Delay (s)		0.0			14.2			34.5			0.0	
Approach LOS		A			B			C			A	

### Intersection Summary

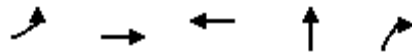
HCM Average Control Delay	19.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Queues

19: Spring Garden St. & 5th St

05/18/2007



Lane Group	EBL	EBT	WBT	NBT	NBR
Lane Group Flow (vph)	153	1063	892	1068	316
v/c Ratio	0.66	0.56	0.58	0.92	0.60
Control Delay	25.4	10.8	5.3	33.7	18.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	25.4	10.8	5.3	33.7	18.9
Queue Length 50th (ft)	26	122	54	191	71
Queue Length 95th (ft)	#69	171	77	#308	145
Internal Link Dist (ft)		356	392	1122	
Turn Bay Length (ft)	155				30
Base Capacity (vph)	233	1887	1525	1166	529
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.66	0.56	0.58	0.92	0.60

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

## 19: Spring Garden St. & 5th St

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑			↑↑			↑↑	↘			
Volume (vph)	150	1042	0	0	774	91	249	766	300	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0	6.0			
Lane Util. Factor	1.00	0.95			0.95			0.95	1.00			
Frt	1.00	1.00			0.98			1.00	0.85			
Flt Protected	0.95	1.00			1.00			0.99	1.00			
Satd. Flow (prot)	1770	3539			3483			3496	1583			
Flt Permitted	0.19	1.00			1.00			0.99	1.00			
Satd. Flow (perm)	348	3539			3483			3496	1583			
Peak-hour factor, PHF	0.98	0.98	0.98	0.97	0.97	0.97	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	153	1063	0	0	798	94	262	806	316	0	0	0
RTOR Reduction (vph)	0	0	0	0	15	0	0	0	54	0	0	0
Lane Group Flow (vph)	153	1063	0	0	877	0	0	1068	262	0	0	0
Turn Type	pm+pt							Split		Perm		
Protected Phases	7	4			8		2	2				
Permitted Phases	4								2			
Actuated Green, G (s)	30.0	30.0			24.0			18.0	18.0			
Effective Green, g (s)	31.0	32.0			26.0			20.0	18.0			
Actuated g/C Ratio	0.52	0.53			0.43			0.33	0.30			
Clearance Time (s)	5.0	6.0			6.0			6.0	6.0			
Lane Grp Cap (vph)	227	1887			1509			1165	475			
v/s Ratio Prot	0.02	c0.30			0.25			c0.31				
v/s Ratio Perm	c0.33								0.17			
v/c Ratio	0.67	0.56			0.58			0.92	0.55			
Uniform Delay, d1	11.5	9.3			12.9			19.2	17.6			
Progression Factor	1.00	1.00			0.29			1.00	1.00			
Incremental Delay, d2	14.9	1.2			1.5			12.7	4.6			
Delay (s)	26.4	10.6			5.3			31.9	22.2			
Level of Service	C	B			A			C	C			
Approach Delay (s)		12.6			5.3			29.7			0.0	
Approach LOS		B			A			C			A	

### Intersection Summary

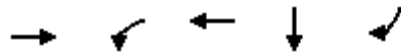
HCM Average Control Delay	17.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Queues

20: Spring Garden St. & 4th St

05/18/2007



Lane Group	EBT	WBL	WBT	SBT	SBR
Lane Group Flow (vph)	1588	59	875	280	79
v/c Ratio	0.90	0.31	0.41	0.57	0.19
Control Delay	20.4	10.7	4.1	24.4	9.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	20.4	10.7	4.1	24.4	9.8
Queue Length 50th (ft)	187	6	43	87	6
Queue Length 95th (ft)	#388	m16	56	154	35
Internal Link Dist (ft)	392		378	276	
Turn Bay Length (ft)		170			40
Base Capacity (vph)	1761	191	2123	491	413
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.90	0.31	0.41	0.57	0.19

Intersection Summary

# 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.

# HCM Signalized Intersection Capacity Analysis

## 20: Spring Garden St. & 4th St

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑						↖	↖
Volume (vph)	0	1378	83	54	805	0	0	0	0	55	202	73
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	6.0
Lane Util. Factor		0.95		1.00	0.95						1.00	1.00
Frt		0.99		1.00	1.00						1.00	0.85
Flt Protected		1.00		0.95	1.00						0.99	1.00
Satd. Flow (prot)		3509		1770	3539						1843	1583
Flt Permitted		1.00		0.12	1.00						0.99	1.00
Satd. Flow (perm)		3509		233	3539						1843	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1498	90	59	875	0	0	0	0	60	220	79
RTOR Reduction (vph)	0	7	0	0	0	0	0	0	0	0	0	44
Lane Group Flow (vph)	0	1581	0	59	875	0	0	0	0	0	280	35
Turn Type				pm+pt						Perm		Perm
Protected Phases		4		3	8						6	
Permitted Phases				8						6		6
Actuated Green, G (s)		28.0		34.0	34.0						14.0	14.0
Effective Green, g (s)		30.0		34.0	36.0						16.0	14.0
Actuated g/C Ratio		0.50		0.57	0.60						0.27	0.23
Clearance Time (s)		6.0		4.0	6.0						6.0	6.0
Lane Grp Cap (vph)		1755		183	2123						491	369
v/s Ratio Prot		c0.45		0.01	c0.25							
v/s Ratio Perm				0.17							0.15	0.02
v/c Ratio		0.90		0.32	0.41						0.57	0.10
Uniform Delay, d1		13.6		11.7	6.4						19.0	18.0
Progression Factor		0.88		1.38	0.55						1.00	1.00
Incremental Delay, d2		7.1		4.0	0.5						4.7	0.5
Delay (s)		19.1		20.3	4.0						23.8	18.6
Level of Service		B		C	A						C	B
Approach Delay (s)		19.1			5.1			0.0			22.6	
Approach LOS		B			A			A			C	

### Intersection Summary

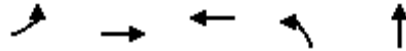
HCM Average Control Delay	15.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	67.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

# Queues

## 21: Spring Garden St. & 3rd St.

05/18/2007



Lane Group	EBL	EBT	WBT	NBL	NBT
Lane Group Flow (vph)	161	1276	909	105	417
v/c Ratio	0.64	0.64	0.55	0.20	0.74
Control Delay	19.1	10.4	8.3	16.9	26.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	19.1	10.4	8.3	16.9	26.5
Queue Length 50th (ft)	27	114	65	28	117
Queue Length 95th (ft)	m27	m115	86	60	#241
Internal Link Dist (ft)		378	448		1140
Turn Bay Length (ft)	126				
Base Capacity (vph)	251	2005	1641	531	563
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.64	0.64	0.55	0.20	0.74

### Intersection Summary

# 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.

# HCM Signalized Intersection Capacity Analysis

## 21: Spring Garden St. & 3rd St.

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗↗			↖↖		↖	↗				
Volume (vph)	148	1174	0	0	752	85	97	241	143	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0				
Lane Util. Factor	1.00	0.95			0.95		1.00	1.00				
Frt	1.00	1.00			0.98		1.00	0.94				
Flt Protected	0.95	1.00			1.00		0.95	1.00				
Satd. Flow (prot)	1770	3539			3485		1770	1759				
Flt Permitted	0.19	1.00			1.00		0.95	1.00				
Satd. Flow (perm)	359	3539			3485		1770	1759				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	161	1276	0	0	817	92	105	262	155	0	0	0
RTOR Reduction (vph)	0	0	0	0	14	0	0	36	0	0	0	0
Lane Group Flow (vph)	161	1276	0	0	895	0	105	381	0	0	0	0
Turn Type	pm+pt						Split					
Protected Phases	7	4			8		2	2				
Permitted Phases	4											
Actuated Green, G (s)	32.0	32.0			26.0		16.0	16.0				
Effective Green, g (s)	32.0	34.0			28.0		18.0	18.0				
Actuated g/C Ratio	0.53	0.57			0.47		0.30	0.30				
Clearance Time (s)	4.0	6.0			6.0		6.0	6.0				
Lane Grp Cap (vph)	239	2005			1626		531	528				
v/s Ratio Prot	0.02	c0.36			0.26		0.06	c0.22				
v/s Ratio Perm	0.34											
v/c Ratio	0.67	0.64			0.55		0.20	0.72				
Uniform Delay, d1	11.0	8.8			11.5		15.6	18.8				
Progression Factor	1.46	1.07			0.62		1.00	1.00				
Incremental Delay, d2	6.4	0.7			1.3		0.8	8.3				
Delay (s)	22.6	10.1			8.3		16.5	27.1				
Level of Service	C	B			A		B	C				
Approach Delay (s)		11.5			8.3		24.9				0.0	
Approach LOS		B			A		C				A	

### Intersection Summary

HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Queues

22: Spring Garden St. & 2nd St.

05/18/2007



Lane Group	EBT	WBL	WBT	SBT
Lane Group Flow (vph)	1600	82	696	756
v/c Ratio	0.97	0.43	0.35	0.72
Control Delay	29.6	13.4	7.6	21.7
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	29.6	13.4	7.6	21.7
Queue Length 50th (ft)	143	12	63	116
Queue Length 95th (ft)	#425	27	92	172
Internal Link Dist (ft)	448		1146	338
Turn Bay Length (ft)		67		
Base Capacity (vph)	1644	191	2005	1057
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.97	0.43	0.35	0.72

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

## 22: Spring Garden St. & 2nd St.

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↑	↑↑						↑↑	
Volume (vph)	0	1378	94	75	640	0	0	0	0	157	390	148
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0						4.0	
Lane Util. Factor		0.95		1.00	0.95						0.95	
Frt		0.99		1.00	1.00						0.97	
Flt Protected		1.00		0.95	1.00						0.99	
Satd. Flow (prot)		3505		1770	3539						3388	
Flt Permitted		1.00		0.13	1.00						0.99	
Satd. Flow (perm)		3505		248	3539						3388	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1498	102	82	696	0	0	0	0	171	424	161
RTOR Reduction (vph)	0	9	0	0	0	0	0	0	0	0	41	0
Lane Group Flow (vph)	0	1591	0	82	696	0	0	0	0	0	715	0
Turn Type				pm+pt						Split		
Protected Phases		4		3	8					6	6	
Permitted Phases				8								
Actuated Green, G (s)		26.0		32.0	32.0						16.0	
Effective Green, g (s)		28.0		32.0	34.0						18.0	
Actuated g/C Ratio		0.47		0.53	0.57						0.30	
Clearance Time (s)		6.0		4.0	6.0						6.0	
Lane Grp Cap (vph)		1636		183	2005						1016	
v/s Ratio Prot		c0.45		0.01	c0.20						c0.21	
v/s Ratio Perm				0.22								
v/c Ratio		0.97		0.45	0.35						0.70	
Uniform Delay, d1		15.6		13.6	7.0						18.6	
Progression Factor		0.81		1.00	1.00						1.00	
Incremental Delay, d2		14.7		7.7	0.5						4.1	
Delay (s)		27.3		21.3	7.5						22.7	
Level of Service		C		C	A						C	
Approach Delay (s)		27.3			8.9			0.0			22.7	
Approach LOS		C			A			A			C	

### Intersection Summary

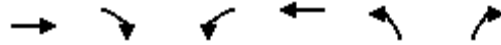
HCM Average Control Delay	21.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

# HCM Unsignalized Intersection Capacity Analysis

## 23: Richmond St & Schirra Dr

05/18/2007



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩		↩	↩	↩	↩
Volume (veh/h)	958	4	2	394	11	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.50	0.50	0.96	0.69	0.63
Hourly flow rate (vph)	998	8	4	410	16	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1006	1420	1002	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1006	1420	1002	
tC, single (s)			4.1	6.4	6.2	
tC, 2 stage (s)						
tF (s)			2.2	3.5	3.3	
p0 queue free %			99	89	95	
cM capacity (veh/h)			689	149	294	

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	1006	4	410	32
Volume Left	0	4	0	16
Volume Right	8	0	0	16
cSH	1700	689	1700	198
Volume to Capacity	0.59	0.01	0.24	0.16
Queue Length 95th (ft)	0	0	0	14
Control Delay (s)	0.0	10.3	0.0	26.6
Lane LOS		B		D
Approach Delay (s)	0.0	0.1		26.6
Approach LOS				D

Intersection Summary			
Average Delay		0.6	
Intersection Capacity Utilization		60.7%	ICU Level of Service B
Analysis Period (min)		15	

# HCM Unsignalized Intersection Capacity Analysis

## 31: Laurel Ave & Frankford Ave

05/18/2007



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	6	67	0	409	276	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.42	0.85	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	79	0	445	300	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				99		
pX, platoon unblocked	0.90					
vC, conflicting volume	745	150	300			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	657	150	300			
tC, single (s)	6.9	7.0	4.2			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.2			
p0 queue free %	96	91	100			
cM capacity (veh/h)	350	860	1237			

Direction, Lane #	EB 1	NB 1	SB 1	SB 2
Volume Total	93	445	200	100
Volume Left	14	0	0	0
Volume Right	79	0	0	0
cSH	703	1237	1700	1700
Volume to Capacity	0.13	0.00	0.12	0.06
Queue Length 95th (ft)	11	0	0	0
Control Delay (s)	10.9	0.0	0.0	0.0
Lane LOS	B			
Approach Delay (s)	10.9	0.0	0.0	
Approach LOS	B			

Intersection Summary			
Average Delay		1.2	
Intersection Capacity Utilization		32.7%	ICU Level of Service
Analysis Period (min)		15	A