

APPENDIX E

Synchro HCM Reports

APPENDICES

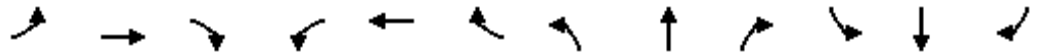
Truck Route Plan for the City of Sharon

AM Peak Period

HCM Signalized Intersection Capacity Analysis

1: U.S. 62 & Irvine Ave

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕	↕	↕	↑	↗		↗	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)		4.0		6.0	4.0	4.0	4.0	6.0	6.0		6.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	1.00	0.88		0.95	
Fr _t		0.95		1.00	1.00	0.85	1.00	1.00	0.85		0.98	
Fl _t Protected		0.98		0.95	0.95	1.00	0.95	1.00	1.00		1.00	
Satd. Flow (prot)		1442		1218	1232	1305	1459	1424	2092		2728	
Fl _t Permitted		0.98		0.95	0.95	1.00	0.69	1.00	1.00		1.00	
Satd. Flow (perm)		1442		1218	1232	1305	1053	1424	2092		2728	
Volume (vph)	10	10	10	410	10	10	10	70	520	0	75	10
Peak-hour factor, PHF	0.92	0.92	0.92	0.96	0.92	0.92	0.92	0.88	0.79	0.92	0.80	0.92
Adj. Flow (vph)	11	11	11	427	11	11	11	80	658	0	94	11
RTOR Reduction (vph)	0	10	0	0	0	0	0	0	0	0	9	0
Lane Group Flow (vph)	0	23	0	214	224	11	11	80	658	0	96	0
Heavy Vehicles (%)	2%	2%	2%	16%	2%	2%	2%	10%	12%	2%	8%	2%
Turn Type	Split			Split		Free	Perm		Free			
Protected Phases	4	4		8	8			2			6	
Permitted Phases						Free	2		Free			
Actuated Green, G (s)		4.0		49.0	49.0	80.0	12.0	12.0	80.0		12.0	
Effective Green, g (s)		5.0		48.0	50.0	80.0	13.0	11.0	80.0		11.0	
Actuated g/C Ratio		0.06		0.60	0.62	1.00	0.16	0.14	1.00		0.14	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0			5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		90		731	770	1305	171	196	2092		375	
v/s Ratio Prot		0.02		0.18	0.18			0.06			0.04	
v/s Ratio Perm						0.01	0.01		c0.31			
v/c Ratio		0.25		0.29	0.29	0.01	0.06	0.41	0.31		0.25	
Uniform Delay, d ₁		35.7		7.8	6.9	0.0	28.4	31.5	0.0		30.8	
Progression Factor		1.00		1.00	1.00	1.00	0.85	0.86	1.00		1.00	
Incremental Delay, d ₂		1.5		1.0	1.0	0.0	0.7	6.1	0.4		1.6	
Delay (s)		37.2		8.8	7.8	0.0	24.8	33.4	0.4		32.5	
Level of Service		D		A	A	A	C	C	A		C	
Approach Delay (s)		37.2			8.1			4.3			32.5	
Approach LOS		D			A			A			C	

Intersection Summary

HCM Average Control Delay	8.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	37.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

2: State St & Irvine Ave

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔			↕	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
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		1.00	1.00		1.00	1.00			1.00	
Fr _t	1.00	0.97		1.00	0.98		1.00	0.96			0.98	
Fl _t Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1390	1465		1378	1452		1378	1404			1460	
Fl _t Permitted	0.69	1.00		0.65	1.00		0.65	1.00			0.98	
Satd. Flow (perm)	1015	1465		937	1452		947	1404			1438	
Volume (vph)	15	120	20	40	75	5	25	55	30	10	90	20
Peak-hour factor, PHF	0.50	0.82	0.66	0.56	0.85	0.50	0.93	0.54	0.78	0.75	0.61	0.66
Adj. Flow (vph)	30	146	30	71	88	10	27	102	38	13	148	30
RTOR Reduction (vph)	0	12	0	0	6	0	0	22	0	0	11	0
Lane Group Flow (vph)	30	164	0	71	92	0	27	118	0	0	180	0
Heavy Vehicles (%)	7%	5%	0%	8%	5%	17%	8%	7%	7%	0%	6%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	25.0	25.0		25.0	25.0		25.0	25.0			25.0	
Effective Green, g (s)	26.0	26.0		26.0	26.0		26.0	26.0			26.0	
Actuated g/C Ratio	0.43	0.43		0.43	0.43		0.43	0.43			0.43	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0			5.0	
Lane Grp Cap (vph)	440	635		406	629		410	608			623	
v/s Ratio Prot		c0.11			0.06			0.08				
v/s Ratio Perm	0.03			0.08			0.03				c0.12	
v/c Ratio	0.07	0.26		0.17	0.15		0.07	0.19			0.29	
Uniform Delay, d ₁	9.9	10.8		10.4	10.3		9.9	10.5			11.0	
Progression Factor	1.00	1.00		0.88	0.87		1.00	1.00			1.00	
Incremental Delay, d ₂	0.3	1.0		0.9	0.5		0.3	0.7			1.2	
Delay (s)	10.2	11.8		10.1	9.4		10.2	11.2			12.2	
Level of Service	B	B		B	A		B	B			B	
Approach Delay (s)		11.6			9.7			11.1			12.2	
Approach LOS		B			A			B			B	

Intersection Summary

HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	41.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

3: State St & Water St

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕	↕		↕	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)		4.0			4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00			1.00			1.00	1.00		1.00	
Fr _t		0.96			0.97			1.00	0.85		0.99	
Fl _t Protected		1.00			0.99			0.99	1.00		0.99	
Satd. Flow (prot)		1462			1451			1456	1331		1487	
Fl _t Permitted		0.98			0.90			0.93	1.00		0.90	
Satd. Flow (perm)		1435			1327			1364	1331		1359	
Volume (vph)	5	110	40	50	95	40	15	90	30	55	180	10
Peak-hour factor, PHF	0.50	0.88	0.77	0.65	0.80	0.66	0.70	0.85	0.81	0.83	0.91	0.63
Adj. Flow (vph)	10	125	52	77	119	61	21	106	37	66	198	16
RTOR Reduction (vph)	0	23	0	0	19	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	164	0	0	238	0	0	127	37	0	276	0
Heavy Vehicles (%)	0%	3%	3%	2%	4%	2%	0%	8%	0%	2%	4%	0%
Turn Type	Perm			pm+pt			Perm		Free	Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2		Free	6		
Actuated Green, G (s)		17.0			30.0			20.0	60.0		20.0	
Effective Green, g (s)		18.0			31.0			21.0	60.0		21.0	
Actuated g/C Ratio		0.30			0.52			0.35	1.00		0.35	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Lane Grp Cap (vph)		431			704			477	1331		476	
v/s Ratio Prot					c0.05							
v/s Ratio Perm		0.11			c0.12			0.09	0.03		c0.20	
v/c Ratio		0.38			0.34			0.27	0.03		0.58	
Uniform Delay, d ₁		16.6			8.5			14.0	0.0		15.9	
Progression Factor		1.28			1.00			1.00	1.00		1.00	
Incremental Delay, d ₂		2.5			1.3			1.4	0.0		5.1	
Delay (s)		23.7			9.8			15.3	0.0		21.0	
Level of Service		C			A			B	A		C	
Approach Delay (s)		23.7			9.8			11.9			21.0	
Approach LOS		C			A			B			C	

Intersection Summary

HCM Average Control Delay	16.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

4: State St & Dock St

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗			↕	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)		4.0		4.0	4.0		4.0	6.0			6.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	1.00			1.00	
Fr _t		0.99		1.00	0.99		1.00	0.90			0.99	
Fl _t Protected		1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)		1348		1488	1491		1365	1301			1214	
Fl _t Permitted		1.00		0.69	1.00		0.74	1.00			0.95	
Satd. Flow (perm)		1348		1074	1491		1065	1301			1164	
Volume (vph)	0	60	5	55	180	5	10	40	75	10	50	5
Peak-hour factor, PHF	0.92	0.60	0.50	0.76	0.83	0.50	0.69	0.85	0.80	0.55	0.50	0.75
Adj. Flow (vph)	0	100	10	72	217	10	14	47	94	18	100	7
RTOR Reduction (vph)	0	5	0	0	2	0	0	64	0	0	3	0
Lane Group Flow (vph)	0	105	0	72	225	0	14	77	0	0	122	0
Heavy Vehicles (%)	0%	11%	50%	0%	3%	33%	9%	17%	4%	33%	28%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		37.0		37.0	37.0		23.0	23.0			23.0	
Effective Green, g (s)		38.0		38.0	38.0		24.0	22.0			22.0	
Actuated g/C Ratio		0.54		0.54	0.54		0.34	0.31			0.31	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0			5.0	
Lane Grp Cap (vph)		732		583	809		365	409			366	
v/s Ratio Prot		0.08			c0.15			0.06				
v/s Ratio Perm				0.07			0.01				c0.11	
v/c Ratio		0.14		0.12	0.28		0.04	0.19			0.33	
Uniform Delay, d ₁		7.9		7.8	8.6		15.3	17.5			18.4	
Progression Factor		1.00		0.77	0.80		1.00	1.00			1.00	
Incremental Delay, d ₂		0.4		0.4	0.8		0.2	1.0			2.4	
Delay (s)		8.3		6.5	7.7		15.5	18.5			20.8	
Level of Service		A		A	A		B	B			C	
Approach Delay (s)		8.3			7.4			18.2			20.8	
Approach LOS		A			A			B			C	

Intersection Summary

HCM Average Control Delay	12.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	30.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: Silver St & Sharpsville Ave

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↖	↗		↖	↗		↖	↗	
Ideal Flow (vphpl)	1900	1900	1900	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)				4.0	4.0		4.0	6.0		4.0	6.0	
Lane Util. Factor				1.00	1.00		1.00	1.00		1.00	1.00	
Flt				1.00	0.95		1.00	0.98		1.00	0.92	
Flt Protected				0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)				1488	1321		1488	1305		1488	1344	
Flt Permitted				0.95	1.00		0.57	1.00		0.64	1.00	
Satd. Flow (perm)				1488	1321		897	1305		1000	1344	
Volume (vph)	0	0	0	5	45	15	20	140	15	10	110	100
Peak-hour factor, PHF	0.92	0.92	0.92	0.50	0.72	0.50	0.79	0.86	0.58	0.55	0.84	0.65
Adj. Flow (vph)	0	0	0	10	62	30	25	163	26	18	131	154
RTOR Reduction (vph)	0	0	0	0	19	0	0	6	0	0	48	0
Lane Group Flow (vph)	0	0	0	10	73	0	25	183	0	18	237	0
Heavy Vehicles (%)	2%	2%	2%	0%	3%	33%	0%	17%	21%	0%	13%	2%
Turn Type				Perm			Perm			Perm		
Protected Phases				16			2 10			6		
Permitted Phases				16			2 10			6		
Actuated Green, G (s)				16.0	16.0		46.0	46.0		35.0	35.0	
Effective Green, g (s)				17.0	17.0		46.0	44.0		36.0	34.0	
Actuated g/C Ratio				0.24	0.24		0.65	0.62		0.51	0.48	
Clearance Time (s)				5.0	5.0					5.0	5.0	
Vehicle Extension (s)				3.0	3.0					3.0	3.0	
Lane Grp Cap (vph)				356	316		581	809		507	644	
v/s Ratio Prot				c0.06			c0.14			c0.18		
v/s Ratio Perm				0.01			0.03			0.02		
v/c Ratio				0.03	0.23		0.04	0.23		0.04	0.37	
Uniform Delay, d1				20.7	21.7		4.5	6.0		8.8	11.7	
Progression Factor				1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2				0.1	1.7		0.0	0.1		0.1	1.6	
Delay (s)				20.8	23.4		4.6	6.1		8.9	13.3	
Level of Service				C	C		A	A		A	B	
Approach Delay (s)		0.0			23.2			5.9			13.1	
Approach LOS		A			C			A			B	
Intersection Summary												
HCM Average Control Delay			12.3				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.29									
Actuated Cycle Length (s)			71.0				Sum of lost time (s)			10.0		
Intersection Capacity Utilization			36.2%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

7: State St & Sharpsville Ave

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)	4.0	4.0		4.0	4.0			6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99			0.96		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00			0.99		0.95	1.00	
Satd. Flow (prot)	1488	1362		1488	1471			1332		1488	1146	
Flt Permitted	0.62	1.00		0.61	1.00			0.95		0.69	1.00	
Satd. Flow (perm)	968	1362		950	1471			1269		1088	1146	
Volume (vph)	50	190	10	25	185	10	10	70	40	20	70	45
Peak-hour factor, PHF	0.83	0.85	0.58	0.69	0.89	0.60	0.50	0.89	0.86	0.69	0.70	0.88
Adj. Flow (vph)	60	224	17	36	208	17	20	79	47	29	100	51
RTOR Reduction (vph)	0	4	0	0	4	0	0	24	0	0	27	0
Lane Group Flow (vph)	60	237	0	36	221	0	0	122	0	29	125	0
Heavy Vehicles (%)	0%	11%	50%	0%	3%	33%	9%	17%	4%	0%	28%	33%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0			18.0		18.0	18.0	
Effective Green, g (s)	43.0	43.0		43.0	43.0			17.0		19.0	17.0	
Actuated g/C Ratio	0.61	0.61		0.61	0.61			0.24		0.27	0.24	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Grp Cap (vph)	595	837		584	904			308		295	278	
v/s Ratio Prot		c0.17			0.15						c0.11	
v/s Ratio Perm	0.06			0.04				0.10		0.03		
v/c Ratio	0.10	0.28		0.06	0.24			0.40		0.10	0.45	
Uniform Delay, d1	5.6	6.3		5.4	6.1			22.2		19.1	22.5	
Progression Factor	1.07	1.05		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.8		0.2	0.6			3.8		0.7	5.1	
Delay (s)	6.3	7.4		5.6	6.8			26.0		19.8	27.7	
Level of Service	A	A		A	A			C		B	C	
Approach Delay (s)		7.2			6.6			26.0			26.4	
Approach LOS		A			A			C			C	

Intersection Summary

HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	46.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

8: Columbia & Irvine Ave

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕			↕			↕	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)		4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor		1.00		1.00	1.00			1.00			1.00	
Fr _t		1.00		1.00	0.90			0.96			0.99	
Fl _t Protected		0.99		0.95	1.00			1.00			0.99	
Satd. Flow (prot)		1553		1365	1350			1374			1446	
Fl _t Permitted		0.96		0.72	1.00			0.98			0.89	
Satd. Flow (perm)		1504		1030	1350			1350			1302	
Volume (vph)	5	40	0	20	20	40	5	80	35	35	95	5
Peak-hour factor, PHF	0.50	0.77	0.92	0.61	0.71	0.75	0.50	0.71	0.77	0.71	0.76	0.50
Adj. Flow (vph)	10	52	0	33	28	53	10	113	45	49	125	10
RTOR Reduction (vph)	0	0	0	0	30	0	0	23	0	0	3	0
Lane Group Flow (vph)	0	62	0	33	51	0	0	145	0	0	181	0
Heavy Vehicles (%)	0%	0%	0%	9%	0%	7%	0%	13%	3%	0%	9%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.0		20.0	20.0			20.0			20.0	
Effective Green, g (s)		24.0		24.0	24.0			24.0			24.0	
Actuated g/C Ratio		0.43		0.43	0.43			0.43			0.43	
Clearance Time (s)		8.0		8.0	8.0			8.0			8.0	
Lane Grp Cap (vph)		645		441	579			579			558	
v/s Ratio Prot					0.04							
v/s Ratio Perm		c0.04		0.03				0.11			c0.14	
v/c Ratio		0.10		0.07	0.09			0.25			0.32	
Uniform Delay, d ₁		9.5		9.4	9.5			10.2			10.6	
Progression Factor		1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d ₂		0.3		0.3	0.3			1.0			1.5	
Delay (s)		9.8		9.8	9.8			11.3			12.2	
Level of Service		A		A	A			B			B	
Approach Delay (s)		9.8			9.8			11.3			12.2	
Approach LOS		A			A			B			B	

Intersection Summary

HCM Average Control Delay	11.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	56.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	30.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: Connelly Blvd & Dock St





















8/22/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)	4.0	6.0		6.0	6.0		6.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Fr _t	1.00	0.94		1.00	0.99		1.00	0.96		1.00	0.98	
Fl _t Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1063	1428		985	1500		1430	1229		1200	1318	
Fl _t Permitted	0.53	1.00		0.51	1.00		0.65	1.00		0.64	1.00	
Satd. Flow (perm)	596	1428		524	1500		972	1229		812	1318	
Volume (vph)	5	155	90	40	260	5	155	90	30	20	85	15
Peak-hour factor, PHF	0.63	0.79	0.74	0.62	0.92	0.50	0.79	0.69	0.58	0.50	0.55	0.67
Adj. Flow (vph)	8	196	122	65	283	10	196	130	52	40	155	22
RTOR Reduction (vph)	0	25	0	0	2	0	0	16	0	0	6	0
Lane Group Flow (vph)	8	293	0	65	291	0	196	166	0	40	171	0
Heavy Vehicles (%)	40%	3%	4%	51%	4%	0%	4%	8%	57%	24%	19%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		38.0	38.0		38.0	38.0	
Effective Green, g (s)	43.0	41.0		41.0	41.0		37.0	37.0		39.0	37.0	
Actuated g/C Ratio	0.48	0.46		0.46	0.46		0.41	0.41		0.43	0.41	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	285	651		239	683		400	505		352	542	
v/s Ratio Prot		c0.21			0.19			0.14			0.13	
v/s Ratio Perm	0.01			0.12			c0.20			0.05		
v/c Ratio	0.03	0.45		0.27	0.43		0.49	0.33		0.11	0.32	
Uniform Delay, d ₁	12.4	16.8		15.2	16.6		19.5	18.0		15.2	17.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d ₂	0.2	2.2		2.8	1.9		4.2	1.7		0.7	1.5	
Delay (s)	12.6	19.0		18.0	18.5		23.8	19.8		15.9	19.5	
Level of Service	B	B		B	B		C	B		B	B	
Approach Delay (s)		18.9			18.4			21.9			18.8	
Approach LOS		B			B			C			B	
Intersection Summary												
HCM Average Control Delay			19.6			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			56.1%			ICU Level of Service				B		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 11: Connelly Blvd & Sharpsville Ave

8/22/2007

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	0.97			1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00			0.98	1.00	0.95	1.00	
Satd. Flow (prot)	860	1347		1378	1463			1116	1268	1488	1166	
Flt Permitted	0.57	1.00		0.47	1.00			0.86	1.00	0.65	1.00	
Satd. Flow (perm)	516	1347		678	1463			975	1268	1013	1166	
Volume (vph)	10	150	25	240	230	40	45	80	265	15	55	10
Peak-hour factor, PHF	0.55	0.76	0.78	0.79	0.89	0.71	0.73	0.84	0.84	0.58	0.98	0.50
Adj. Flow (vph)	18	197	32	304	258	56	62	95	315	26	56	20
RTOR Reduction (vph)	0	6	0	0	8	0	0	0	214	0	13	0
Lane Group Flow (vph)	18	223	0	304	306	0	0	157	101	26	63	0
Heavy Vehicles (%)	73%	5%	68%	8%	4%	5%	57%	25%	5%	0%	18%	60%
Turn Type	Perm			pm+pt				Perm		Perm	Perm	
Protected Phases		4		3	8			2				6
Permitted Phases	4			8			2		2		6	
Actuated Green, G (s)	35.0	35.0		57.0	57.0			33.0	33.0	33.0	33.0	
Effective Green, g (s)	34.0	34.0		56.0	56.0			32.0	32.0	32.0	32.0	
Actuated g/C Ratio	0.34	0.34		0.56	0.56			0.32	0.32	0.32	0.32	
Clearance Time (s)	5.0	5.0		3.0	5.0			5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	175	458		492	819			312	406	324	373	
v/s Ratio Prot		0.17		c0.10	0.21							0.05
v/s Ratio Perm	0.03			c0.25				c0.16	0.08	0.03		
v/c Ratio	0.10	0.49		0.62	0.37			0.50	0.25	0.08	0.17	
Uniform Delay, d1	22.6	26.1		13.1	12.2			27.6	25.1	23.7	24.4	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.2	3.7		5.7	1.3			5.7	1.5	0.5	1.0	
Delay (s)	23.7	29.8		18.8	13.5			33.3	26.6	24.2	25.4	
Level of Service	C	C		B	B			C	C	C	C	
Approach Delay (s)		29.3			16.2			28.8			25.1	
Approach LOS		C			B			C			C	
Intersection Summary												
HCM Average Control Delay			23.2			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.56									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			56.2%			ICU Level of Service				B		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

13: Budd St & U.S. 62

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗		↖	↗		↕			↕	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)	4.0	4.0	4.0		6.0	6.0		6.0			6.0	
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00		0.95			0.95	
Flt	1.00	1.00	0.85		1.00	0.85		0.99			0.98	
Flt Protected	0.95	1.00	1.00		0.97	1.00		0.99			1.00	
Satd. Flow (prot)	1488	1253	1128		990	783		2600			2545	
Flt Permitted	0.74	1.00	1.00		0.81	1.00		0.79			0.85	
Satd. Flow (perm)	1152	1253	1128		823	783		2083			2181	
Volume (vph)	50	10	35	15	10	20	70	395	25	25	335	50
Peak-hour factor, PHF	0.86	0.75	0.61	0.75	0.75	0.63	0.64	0.72	0.55	0.55	0.92	0.67
Adj. Flow (vph)	58	13	57	20	13	32	109	549	45	45	364	75
RTOR Reduction (vph)	0	0	0	0	0	29	0	4	0	0	11	0
Lane Group Flow (vph)	58	13	57	0	33	3	0	699	0	0	473	0
Heavy Vehicles (%)	0%	25%	18%	67%	33%	70%	1%	11%	58%	25%	13%	10%
Turn Type	Perm		Free	Perm		Perm	Perm				Perm	
Protected Phases		4			8			2				6
Permitted Phases	4		Free	8		8	2			6		
Actuated Green, G (s)	7.9	7.9	69.5		7.9	7.9		51.6			51.6	
Effective Green, g (s)	8.9	8.9	69.5		6.9	6.9		50.6			50.6	
Actuated g/C Ratio	0.13	0.13	1.00		0.10	0.10		0.73			0.73	
Clearance Time (s)	5.0	5.0			5.0	5.0		5.0			5.0	
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	148	160	1128		82	78		1517			1588	
v/s Ratio Prot		0.01										
v/s Ratio Perm	c0.05		0.05		0.04	0.00		c0.34			0.22	
v/c Ratio	0.39	0.08	0.05		0.40	0.04		0.46			0.30	
Uniform Delay, d1	27.8	26.7	0.0		29.4	28.3		3.9			3.3	
Progression Factor	1.00	1.00	1.00		1.00	1.00		1.00			1.00	
Incremental Delay, d2	1.7	0.2	0.1		3.2	0.2		0.2			0.1	
Delay (s)	29.5	26.9	0.1		32.6	28.5		4.1			3.4	
Level of Service	C	C	A		C	C		A			A	
Approach Delay (s)		16.2			30.6			4.1			3.4	
Approach LOS		B			C			A			A	
Intersection Summary												
HCM Average Control Delay			6.2					HCM Level of Service			A	
HCM Volume to Capacity ratio			0.45									
Actuated Cycle Length (s)			69.5					Sum of lost time (s)		10.0		
Intersection Capacity Utilization			73.3%					ICU Level of Service		D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

14: Budd St & Irvine Ave

8/22/2007



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11
Total Lost time (s)	4.0		4.0			4.0
Lane Util. Factor	1.00		1.00			1.00
Fr _t	0.92		0.96			1.00
Fl _t Protected	0.98		1.00			0.99
Satd. Flow (prot)	1365		1355			1456
Fl _t Permitted	0.98		1.00			0.94
Satd. Flow (perm)	1365		1355			1378
Volume (vph)	15	20	85	40	25	70
Peak-hour factor, PHF	0.65	0.53	0.90	0.95	0.96	0.80
Adj. Flow (vph)	23	38	94	42	26	88
RTOR Reduction (vph)	25	0	20	0	0	0
Lane Group Flow (vph)	36	0	116	0	0	114
Heavy Vehicles (%)	0%	5%	12%	8%	4%	7%
Turn Type					Perm	
Protected Phases	8		2			6
Permitted Phases					6	
Actuated Green, G (s)	20.0		30.0			30.0
Effective Green, g (s)	21.0		31.0			31.0
Actuated g/C Ratio	0.35		0.52			0.52
Clearance Time (s)	5.0		5.0			5.0
Lane Grp Cap (vph)	478		700			712
v/s Ratio Prot	c0.03		c0.09			
v/s Ratio Perm						0.08
v/c Ratio	0.08		0.17			0.16
Uniform Delay, d ₁	13.0		7.7			7.6
Progression Factor	1.00		1.00			1.00
Incremental Delay, d ₂	0.3		0.5			0.5
Delay (s)	13.3		8.2			8.1
Level of Service	B		A			A
Approach Delay (s)	13.3		8.2			8.1
Approach LOS	B		A			A

Intersection Summary

HCM Average Control Delay	9.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.13		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	35.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

15: Addison Avenue & Irvine Ave

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↕		↗	↕	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.95			0.95		1.00	1.00		1.00	1.00	
Flt Protected		0.98			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1602			1602		1621	3241		1621	3231	
Flt Permitted		0.98			0.98		0.46	1.00		0.41	1.00	
Satd. Flow (perm)		1602			1602		779	3241		698	3231	
Volume (vph)	10	10	10	10	10	10	10	580	0	10	475	10
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)	11	11	11	11	11	11	11	630	0	11	516	11
RTOR Reduction (vph)	0	10	0	0	10	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	23	0	0	23	0	11	630	0	11	526	0
Turn Type	Split		Split				Perm		Perm			
Protected Phases	4	4		8	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)		4.0			4.0		59.0	59.0		59.0	59.0	
Effective Green, g (s)		4.0			4.0		60.0	60.0		60.0	60.0	
Actuated g/C Ratio		0.05			0.05		0.75	0.75		0.75	0.75	
Clearance Time (s)		4.0			4.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		80			80		584	2431		524	2423	
v/s Ratio Prot		c0.01			c0.01			c0.19			0.16	
v/s Ratio Perm							0.01			0.02		
v/c Ratio		0.28			0.28		0.02	0.26		0.02	0.22	
Uniform Delay, d1		36.6			36.6		2.5	3.1		2.5	3.0	
Progression Factor		1.00			1.00		1.00	1.00		0.39	0.33	
Incremental Delay, d2		1.9			1.9		0.1	0.3		0.1	0.2	
Delay (s)		38.5			38.5		2.6	3.4		1.1	1.2	
Level of Service		D			D		A	A		A	A	
Approach Delay (s)		38.5			38.5			3.3			1.2	
Approach LOS		D			D			A			A	

Intersection Summary

HCM Average Control Delay	4.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	31.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Midday Peak Period

HCM Signalized Intersection Capacity Analysis

1: U.S. 62 & Irvine Ave

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕		↖	↖	↖	↖	↕	↖↖		↕↕	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)		4.0		6.0	4.0	4.0	4.0	6.0	6.0		6.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	1.00	0.88		0.95	
Frt		0.95		1.00	1.00	0.85	1.00	1.00	0.85		0.99	
Flt Protected		0.98		0.95	0.95	1.00	0.95	1.00	1.00		1.00	
Satd. Flow (prot)		1442		1229	1239	1305	1459	1477	2092		2786	
Flt Permitted		0.98		0.95	0.95	1.00	0.65	1.00	1.00		1.00	
Satd. Flow (perm)		1442		1229	1239	1305	996	1477	2092		2786	
Volume (vph)	10	10	10	520	10	10	10	85	480	0	120	10
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.92	0.92	0.92	0.63	0.97	0.92	0.79	0.92
Adj. Flow (vph)	11	11	11	605	11	11	11	135	495	0	152	11
RTOR Reduction (vph)	0	10	0	0	0	0	0	0	0	0	7	0
Lane Group Flow (vph)	0	23	0	303	313	11	11	135	495	0	156	0
Heavy Vehicles (%)	2%	2%	2%	15%	2%	2%	2%	6%	12%	2%	6%	2%
Turn Type	Split		Split		Free	Perm	Free					
Protected Phases	4	4	8		8			2	6			
Permitted Phases					Free	2	Free					
Actuated Green, G (s)	4.0		49.0		49.0	80.0	12.0	12.0	80.0		12.0	
Effective Green, g (s)	5.0		48.0		50.0	80.0	13.0	11.0	80.0		11.0	
Actuated g/C Ratio	0.06		0.60		0.62	1.00	0.16	0.14	1.00		0.14	
Clearance Time (s)	5.0		5.0		5.0	5.0		5.0		5.0		
Vehicle Extension (s)	3.0		3.0		3.0	3.0		3.0		3.0		
Lane Grp Cap (vph)	90		737		774	1305	162	203	2092		383	
v/s Ratio Prot	0.02		0.25		c0.25			c0.09		0.06		
v/s Ratio Perm						0.01	0.01	c0.24				
v/c Ratio	0.25		0.41		0.40	0.01	0.07	0.67	0.24		0.41	
Uniform Delay, d1	35.7		8.5		7.5	0.0	28.4	32.8	0.0		31.5	
Progression Factor	1.00		1.00		1.00	1.00	0.84	0.87	1.00		1.00	
Incremental Delay, d2	1.5		1.7		1.6	0.0	0.8	15.7	0.3		3.2	
Delay (s)	37.2		10.2		9.1	0.0	24.7	44.4	0.3		34.7	
Level of Service	D		B		A	A	C	D	A		C	
Approach Delay (s)	37.2				9.5			10.0		34.7		
Approach LOS	D				A			A		C		

Intersection Summary

HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	41.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

2: State St & Irvine Ave

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔			↕	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
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		1.00	1.00		1.00	1.00			1.00	
Fr _t	1.00	0.98		1.00	0.98		1.00	0.93			0.94	
Fl _t Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1488	1530		1272	1502		1340	1335			1398	
Fl _t Permitted	0.66	1.00		0.64	1.00		0.73	1.00			0.99	
Satd. Flow (perm)	1038	1530		863	1502		1029	1335			1385	
Volume (vph)	20	130	20	30	110	10	30	50	45	5	45	35
Peak-hour factor, PHF	0.58	0.86	0.75	0.63	0.84	0.58	0.68	0.75	0.80	0.75	0.72	0.59
Adj. Flow (vph)	34	151	27	48	131	17	44	67	56	7	62	59
RTOR Reduction (vph)	0	11	0	0	8	0	0	32	0	0	33	0
Lane Group Flow (vph)	34	167	0	48	140	0	44	91	0	0	95	0
Heavy Vehicles (%)	0%	0%	0%	17%	1%	14%	11%	17%	0%	0%	7%	3%
Turn Type	Perm		Perm		Perm		Perm		Perm			
Protected Phases	4		8		8		2		2			6
Permitted Phases	4		8		8		2		6			
Actuated Green, G (s)	25.0	25.0		25.0	25.0		25.0	25.0			25.0	
Effective Green, g (s)	26.0	26.0		26.0	26.0		26.0	26.0			26.0	
Actuated g/C Ratio	0.43	0.43		0.43	0.43		0.43	0.43			0.43	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0			5.0	
Lane Grp Cap (vph)	450	663		374	651		446	579			600	
v/s Ratio Prot	c0.11		0.09		c0.07							
v/s Ratio Perm	0.03		0.06		0.04							0.07
v/c Ratio	0.08	0.25		0.13	0.22		0.10	0.16			0.16	
Uniform Delay, d ₁	10.0	10.8		10.2	10.6		10.1	10.3			10.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d ₂	0.3	0.9		0.7	0.8		0.4	0.6			0.6	
Delay (s)	10.3	11.7		10.9	11.4		10.5	10.9			10.9	
Level of Service	B	B		B	B		B	B			B	
Approach Delay (s)	11.5		11.3		10.8		10.9					
Approach LOS	B		B		B		B					

Intersection Summary

HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	38.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

4: State St & Dock St

8/22/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Fr _t	1.00	0.98		1.00	1.00		1.00	0.91			0.99	
Fl _t Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1317	1478		1317	1501		1488	1288			1287	
Fl _t Permitted	0.56	1.00		0.56	1.00		0.68	1.00			0.90	
Satd. Flow (perm)	781	1478		781	1501		1068	1288			1173	
Volume (vph)	10	230	30	40	245	5	25	30	55	25	65	5
Peak-hour factor, PHF	0.67	0.96	0.88	0.77	0.92	0.63	0.55	0.56	0.76	0.60	0.57	0.63
Adj. Flow (vph)	15	240	34	52	266	8	45	54	72	42	114	8
RTOR Reduction (vph)	0	7	0	0	1	0	0	49	0	0	3	0
Lane Group Flow (vph)	15	267	0	52	273	0	45	77	0	0	161	0
Heavy Vehicles (%)	13%	3%	11%	13%	4%	0%	0%	14%	9%	13%	23%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	37.0	37.0		37.0	37.0		23.0	23.0			23.0	
Effective Green, g (s)	38.0	38.0		38.0	38.0		24.0	22.0			22.0	
Actuated g/C Ratio	0.54	0.54		0.54	0.54		0.34	0.31			0.31	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0			5.0	
Lane Grp Cap (vph)	424	802		424	815		366	405			369	
v/s Ratio Prot		0.18			c0.18			0.06				
v/s Ratio Perm	0.02			0.07			0.04				c0.14	
v/c Ratio	0.04	0.33		0.12	0.33		0.12	0.19			0.44	
Uniform Delay, d ₁	7.5	8.9		7.8	8.9		15.8	17.5			19.1	
Progression Factor	1.00	1.00		0.68	0.67		1.00	1.00			1.00	
Incremental Delay, d ₂	0.2	1.1		0.5	1.0		0.7	1.0			3.7	
Delay (s)	7.6	10.0		5.8	7.0		16.5	18.5			22.8	
Level of Service	A	B		A	A		B	B			C	
Approach Delay (s)		9.9			6.8			18.0			22.8	
Approach LOS		A			A			B			C	
Intersection Summary												
HCM Average Control Delay			12.5			HCM Level of Service			B			
HCM Volume to Capacity ratio			0.37									
Actuated Cycle Length (s)			70.0			Sum of lost time (s)		10.0				
Intersection Capacity Utilization			49.0%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: Silver St & Sharpsville Ave

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↖	↗		↖	↗		↖	↗	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)				4.0	4.0		4.0	6.0		4.0	6.0	
Lane Util. Factor				1.00	1.00		1.00	1.00		1.00	1.00	
Fr _t				1.00	0.92		1.00	0.98		1.00	0.94	
Fl _t Protected				0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)				1488	1442		1378	1401		1488	1383	
Fl _t Permitted				0.95	1.00		0.57	1.00		0.62	1.00	
Satd. Flow (perm)				1488	1442		831	1401		969	1383	
Volume (vph)	0	0	0	10	25	25	15	175	20	25	140	70
Peak-hour factor, PHF	0.92	0.92	0.92	0.50	0.61	0.54	0.60	0.90	0.66	0.69	0.78	0.66
Adj. Flow (vph)	0	0	0	20	41	46	25	194	30	36	179	106
RTOR Reduction (vph)	0	0	0	0	35	0	0	6	0	0	24	0
Lane Group Flow (vph)	0	0	0	20	52	0	25	218	0	36	261	0
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	8%	11%	0%	0%	11%	0%
Turn Type				Perm			Perm			Perm		
Protected Phases				16			2 10			6		
Permitted Phases				16			2 10			6		
Actuated Green, G (s)				16.0	16.0		46.0	46.0		35.0	35.0	
Effective Green, g (s)				17.0	17.0		46.0	44.0		36.0	34.0	
Actuated g/C Ratio				0.24	0.24		0.65	0.62		0.51	0.48	
Clearance Time (s)				5.0	5.0					5.0	5.0	
Vehicle Extension (s)				3.0	3.0					3.0	3.0	
Lane Grp Cap (vph)				356	345		538	868		491	662	
v/s Ratio Prot				c0.04			c0.16			c0.19		
v/s Ratio Perm				0.01			0.03			0.04		
v/c Ratio				0.06	0.15		0.05	0.25		0.07	0.39	
Uniform Delay, d ₁				20.8	21.3		4.5	6.1		9.0	11.9	
Progression Factor				1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d ₂				0.3	0.9		0.0	0.2		0.3	1.8	
Delay (s)				21.1	22.2		4.6	6.2		9.2	13.6	
Level of Service				C	C		A	A		A	B	
Approach Delay (s)		0.0			22.0			6.1			13.2	
Approach LOS		A			C			A			B	
Intersection Summary												
HCM Average Control Delay			11.9				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.29									
Actuated Cycle Length (s)			71.0			Sum of lost time (s)			10.0			
Intersection Capacity Utilization			41.0%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

7: State St & Sharpsville Ave

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔			↕		↔	↔	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)	4.0	4.0		4.0	4.0			6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.98			0.96		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00			0.99		0.95	1.00	
Satd. Flow (prot)	1417	1507		1417	1483			1204		1403	1315	
Flt Permitted	0.51	1.00		0.53	1.00			0.95		0.65	1.00	
Satd. Flow (perm)	759	1507		795	1483			1153		962	1315	
Volume (vph)	55	290	5	40	290	25	10	75	30	70	75	60
Peak-hour factor, PHF	0.81	0.90	0.50	0.73	0.92	0.52	0.50	0.72	0.65	0.85	0.78	0.88
Adj. Flow (vph)	68	322	10	55	315	48	20	104	46	82	96	68
RTOR Reduction (vph)	0	2	0	0	8	0	0	19	0	0	36	0
Lane Group Flow (vph)	68	330	0	55	355	0	0	151	0	82	128	0
Heavy Vehicles (%)	5%	2%	50%	5%	4%	0%	13%	35%	6%	6%	15%	7%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases	4			8			2			6		
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0			18.0		18.0	18.0	
Effective Green, g (s)	43.0	43.0		43.0	43.0			17.0		19.0	17.0	
Actuated g/C Ratio	0.61	0.61		0.61	0.61			0.24		0.27	0.24	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Grp Cap (vph)	466	926		488	911			280		261	319	
v/s Ratio Prot		0.22		c0.24								0.10
v/s Ratio Perm	0.09			0.07				c0.13		0.09		
v/c Ratio	0.15	0.36		0.11	0.39			0.54		0.31	0.40	
Uniform Delay, d1	5.7	6.7		5.6	6.8			23.1		20.3	22.2	
Progression Factor	0.84	0.79		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.6	1.0		0.5	1.3			7.3		3.1	3.7	
Delay (s)	5.5	6.3		6.1	8.1			30.4		23.4	25.9	
Level of Service	A	A		A	A			C		C	C	
Approach Delay (s)		6.2			7.8			30.4			25.1	
Approach LOS		A			A			C			C	

Intersection Summary

HCM Average Control Delay	13.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

8: Columbia & Irvine Ave

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↗	↘			↕			↕	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)		4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor		1.00		1.00	1.00			1.00			1.00	
Fr _t		0.99		1.00	0.94			0.94			0.98	
Fl _t Protected		0.99		0.95	1.00			1.00			0.99	
Satd. Flow (prot)		1537		1317	1438			1359			1333	
Fl _t Permitted		0.97		0.71	1.00			0.98			0.93	
Satd. Flow (perm)		1495		980	1438			1338			1249	
Volume (vph)	5	45	5	65	45	30	5	70	60	25	90	15
Peak-hour factor, PHF	0.50	0.75	0.75	0.78	0.75	0.81	0.50	0.73	0.75	0.78	0.70	0.60
Adj. Flow (vph)	10	60	7	83	60	37	10	96	80	32	129	25
RTOR Reduction (vph)	0	4	0	0	21	0	0	46	0	0	10	0
Lane Group Flow (vph)	0	73	0	83	76	0	0	140	0	0	176	0
Heavy Vehicles (%)	0%	0%	0%	13%	0%	7%	67%	9%	0%	0%	11%	50%
Turn Type	Perm		Perm		Perm		Perm		Perm			
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.0		20.0	20.0			20.0			20.0	
Effective Green, g (s)		24.0		24.0	24.0			24.0			24.0	
Actuated g/C Ratio		0.43		0.43	0.43			0.43			0.43	
Clearance Time (s)		8.0		8.0	8.0			8.0			8.0	
Lane Grp Cap (vph)		641		420	616			573			535	
v/s Ratio Prot					0.05							
v/s Ratio Perm		0.05		c0.08				0.10			c0.14	
v/c Ratio		0.11		0.20	0.12			0.24			0.33	
Uniform Delay, d ₁		9.6		10.0	9.7			10.2			10.6	
Progression Factor		1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d ₂		0.4		1.1	0.4			1.0			1.6	
Delay (s)		10.0		11.0	10.1			11.2			12.3	
Level of Service		A		B	B			B			B	
Approach Delay (s)		10.0			10.5			11.2			12.3	
Approach LOS		A			B			B			B	





















Intersection Summary

HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	56.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	37.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: Connelly Blvd & Dock St





















8/22/2007

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)	4.0	6.0		6.0	6.0		6.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	0.99		1.00	0.93		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1352	1427		998	1441		1340	1134		1136	1376	
Flt Permitted	0.62	1.00		0.52	1.00		0.67	1.00		0.66	1.00	
Satd. Flow (perm)	884	1427		550	1441		946	1134		792	1376	
Volume (vph)	10	160	75	45	165	5	120	70	55	20	75	15
Peak-hour factor, PHF	0.50	0.84	0.68	0.87	0.83	0.50	0.73	0.85	0.82	0.65	0.69	0.57
Adj. Flow (vph)	20	190	110	52	199	10	164	82	67	31	109	26
RTOR Reduction (vph)	0	23	0	0	2	0	0	32	0	0	9	0
Lane Group Flow (vph)	20	277	0	52	207	0	164	117	0	31	126	0
Heavy Vehicles (%)	10%	3%	5%	49%	7%	25%	11%	4%	59%	31%	13%	0%
Turn Type	Perm		Perm		Perm		Perm		Perm		Perm	
Protected Phases	4		8		8		2		2		6	
Permitted Phases	4		8		8		2		2		6	
Actuated Green, G (s)	42.0	42.0		42.0	42.0		38.0	38.0		38.0	38.0	
Effective Green, g (s)	43.0	41.0		41.0	41.0		37.0	37.0		39.0	37.0	
Actuated g/C Ratio	0.48	0.46		0.46	0.46		0.41	0.41		0.43	0.41	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	422	650		251	656		389	466		343	566	
v/s Ratio Prot	c0.19				0.14		0.10				0.09	
v/s Ratio Perm	0.02		0.09		0.17		0.10		0.04			
v/c Ratio	0.05	0.43		0.21	0.32		0.42	0.25		0.09	0.22	
Uniform Delay, d1	12.6	16.5		14.7	15.6		18.9	17.4		15.0	17.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	2.0		1.9	1.3		3.3	1.3		0.5	0.9	
Delay (s)	12.8	18.6		16.6	16.8		22.2	18.7		15.6	18.1	
Level of Service	B		B		B		C		B		B	
Approach Delay (s)	18.2		16.8		20.5		17.6					
Approach LOS	B		B		C		B					
Intersection Summary												
HCM Average Control Delay	18.5		HCM Level of Service		B							
HCM Volume to Capacity ratio	0.42											
Actuated Cycle Length (s)	90.0		Sum of lost time (s)		12.0							
Intersection Capacity Utilization	58.1%		ICU Level of Service		B							
Analysis Period (min)	15											

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 11: Connelly Blvd & Sharpsville Ave

8/22/2007

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Fr _t	1.00	0.97		1.00	0.98			1.00	0.85	1.00	0.96	
Fl _t Protected	0.95	1.00		0.95	1.00			0.98	1.00	0.95	1.00	
Satd. Flow (prot)	870	1283		1378	1450			1094	1244	1488	1202	
Fl _t Permitted	0.61	1.00		0.43	1.00			0.82	1.00	0.64	1.00	
Satd. Flow (perm)	557	1283		618	1450			918	1244	997	1202	
Volume (vph)	15	165	30	255	170	30	50	75	260	20	80	20
Peak-hour factor, PHF	0.70	0.79	0.54	0.85	0.84	0.75	0.72	0.79	0.86	0.79	0.84	0.53
Adj. Flow (vph)	21	209	56	300	202	40	69	95	302	25	95	38
RTOR Reduction (vph)	0	10	0	0	7	0	0	0	205	0	14	0
Lane Group Flow (vph)	21	255	0	300	235	0	0	164	97	25	119	0
Heavy Vehicles (%)	71%	7%	60%	8%	5%	7%	61%	25%	7%	0%	11%	59%
Turn Type	Perm			pm+pt			Perm		Perm	Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	35.0	35.0		57.0	57.0			33.0	33.0	33.0	33.0	
Effective Green, g (s)	34.0	34.0		56.0	56.0			32.0	32.0	32.0	32.0	
Actuated g/C Ratio	0.34	0.34		0.56	0.56			0.32	0.32	0.32	0.32	
Clearance Time (s)	5.0	5.0		3.0	5.0			5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	189	436		468	812			294	398	319	385	
v/s Ratio Prot		0.20		c0.10	0.16						0.10	
v/s Ratio Perm	0.04			c0.26				c0.18	0.08	0.03		
v/c Ratio	0.11	0.59		0.64	0.29			0.56	0.24	0.08	0.31	
Uniform Delay, d ₁	22.6	27.2		13.4	11.6			28.1	25.1	23.7	25.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d ₂	1.2	5.7		6.6	0.9			7.4	1.4	0.5	2.1	
Delay (s)	23.8	32.8		20.0	12.5			35.6	26.5	24.2	27.7	
Level of Service	C	C		B	B			D	C	C	C	
Approach Delay (s)		32.2			16.6			29.7			27.2	
Approach LOS		C			B			C			C	
Intersection Summary												
HCM Average Control Delay			25.0			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			58.4%			ICU Level of Service				B		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

13: Budd St & U.S. 62

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗		↖	↗		↕			↕	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)	4.0	4.0	4.0		6.0	6.0		6.0			6.0	
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00		0.95			0.95	
Flt	1.00	1.00	0.85		1.00	0.85		0.99			0.98	
Flt Protected	0.95	1.00	1.00		0.97	1.00		0.99			1.00	
Satd. Flow (prot)	1444	1362	1292		1017	882		2502			2605	
Flt Permitted	0.70	1.00	1.00		0.79	1.00		0.85			0.90	
Satd. Flow (perm)	1067	1362	1292		825	882		2134			2362	
Volume (vph)	80	15	40	40	15	40	45	395	25	20	390	50
Peak-hour factor, PHF	0.67	0.50	0.54	0.73	0.50	0.66	0.72	0.85	0.69	0.63	0.91	0.72
Adj. Flow (vph)	119	30	74	55	30	61	62	465	36	32	429	69
RTOR Reduction (vph)	0	0	0	0	0	50	0	5	0	0	12	0
Lane Group Flow (vph)	119	30	74	0	85	11	0	558	0	0	518	0
Heavy Vehicles (%)	3%	15%	3%	76%	0%	51%	2%	14%	84%	50%	10%	4%
Turn Type	Perm		Free	Perm		Perm	Perm				Perm	
Protected Phases		4			8			2				6
Permitted Phases	4		Free	8		8	2			6		
Actuated Green, G (s)	12.3	12.3	65.2		12.3	12.3		42.9			42.9	
Effective Green, g (s)	13.3	13.3	65.2		11.3	11.3		41.9			41.9	
Actuated g/C Ratio	0.20	0.20	1.00		0.17	0.17		0.64			0.64	
Clearance Time (s)	5.0	5.0			5.0	5.0		5.0			5.0	
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	218	278	1292		143	153		1371			1518	
v/s Ratio Prot		0.02										
v/s Ratio Perm	c0.11		0.06		0.10	0.01		c0.26			0.22	
v/c Ratio	0.55	0.11	0.06		0.59	0.07		0.41			0.34	
Uniform Delay, d1	23.2	21.1	0.0		24.8	22.5		5.6			5.3	
Progression Factor	1.00	1.00	1.00		1.00	1.00		1.00			1.00	
Incremental Delay, d2	2.8	0.2	0.1		6.5	0.2		0.2			0.1	
Delay (s)	26.0	21.3	0.1		31.3	22.7		5.8			5.5	
Level of Service	C	C	A		C	C		A			A	
Approach Delay (s)		16.8			27.7			5.8			5.5	
Approach LOS		B			C			A			A	
Intersection Summary												
HCM Average Control Delay			9.6					HCM Level of Service			A	
HCM Volume to Capacity ratio			0.44									
Actuated Cycle Length (s)			65.2					Sum of lost time (s)		10.0		
Intersection Capacity Utilization			75.2%					ICU Level of Service		D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

14: Budd St & Irvine Ave

8/22/2007



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙		↔	↘	↙	↘
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11
Total Lost time (s)	4.0		4.0			4.0
Lane Util. Factor	1.00		1.00			1.00
Fr _t	0.92		0.96			1.00
Fl _t Protected	0.98		1.00			0.99
Satd. Flow (prot)	1386		1469			1515
Fl _t Permitted	0.98		1.00			0.93
Satd. Flow (perm)	1386		1469			1422
Volume (vph)	15	20	85	40	25	70
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	22	92	43	27	76
RTOR Reduction (vph)	14	0	21	0	0	0
Lane Group Flow (vph)	24	0	114	0	0	103
Turn Type					Perm	
Protected Phases	8		2			6
Permitted Phases					6	
Actuated Green, G (s)	20.0		30.0			30.0
Effective Green, g (s)	21.0		31.0			31.0
Actuated g/C Ratio	0.35		0.52			0.52
Clearance Time (s)	5.0		5.0			5.0
Lane Grp Cap (vph)	485		759			735
v/s Ratio Prot	c0.02		c0.08			
v/s Ratio Perm						0.07
v/c Ratio	0.05		0.15			0.14
Uniform Delay, d ₁	12.9		7.6			7.6
Progression Factor	1.00		1.00			1.00
Incremental Delay, d ₂	0.2		0.4			0.4
Delay (s)	13.1		8.0			8.0
Level of Service	B		A			A
Approach Delay (s)	13.1		8.0			8.0
Approach LOS	B		A			A

Intersection Summary

HCM Average Control Delay	8.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.11		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	35.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

15: Addison Avenue & Irvine Ave

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↕		↗	↕	↗
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.95			0.95		1.00	1.00		1.00	1.00	
Flt Protected		0.98			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1602			1602		1621	3241		1621	3233	
Flt Permitted		0.98			0.98		0.38	1.00		0.42	1.00	
Satd. Flow (perm)		1602			1602		648	3241		720	3233	
Volume (vph)	10	10	10	10	10	10	10	555	0	10	630	10
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)	11	11	11	11	11	11	11	603	0	11	685	11
RTOR Reduction (vph)	0	10	0	0	10	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	23	0	0	23	0	11	603	0	11	695	0
Turn Type	Split		Split				Perm		Perm			
Protected Phases	4	4	8				8		2		6	
Permitted Phases							2		6			
Actuated Green, G (s)	4.0		4.0				59.0		59.0		59.0	
Effective Green, g (s)	4.0		4.0				60.0		60.0		60.0	
Actuated g/C Ratio	0.05		0.05				0.75		0.75		0.75	
Clearance Time (s)	4.0		4.0				5.0		5.0		5.0	
Vehicle Extension (s)	3.0		3.0				3.0		3.0		3.0	
Lane Grp Cap (vph)	80		80				486		2431		540	
v/s Ratio Prot	c0.01		c0.01				0.19		0.19		c0.22	
v/s Ratio Perm							0.02		0.02		0.02	
v/c Ratio	0.28		0.28				0.02		0.25		0.02	
Uniform Delay, d1	36.6		36.6				2.5		3.1		2.5	
Progression Factor	1.00		1.00				1.00		1.00		0.56	
Incremental Delay, d2	1.9		1.9				0.1		0.2		0.1	
Delay (s)	38.5		38.5				2.6		3.3		1.5	
Level of Service	D		D				A		A		A	
Approach Delay (s)	38.5		38.5				3.3		3.3		1.8	
Approach LOS	D		D				A		A		A	

Intersection Summary

HCM Average Control Delay	4.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	33.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

APPENDICES





















Truck Route Plan for the City of Sharon

PM Peak Period

HCM Signalized Intersection Capacity Analysis

1: U.S. 62 & Irvine Ave

8/22/2007

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)		4.0		6.0	4.0	4.0	4.0	6.0	6.0		6.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	1.00	0.88		0.95	
Frt		0.95		1.00	1.00	0.85	1.00	1.00	0.85		0.99	
Flt Protected		0.98		0.95	0.95	1.00	0.95	1.00	1.00		1.00	
Satd. Flow (prot)		1442		1359	1365	1305	1459	1491	2210		2863	
Flt Permitted		0.98		0.95	0.95	1.00	0.64	1.00	1.00		1.00	
Satd. Flow (perm)		1442		1359	1365	1305	987	1491	2210		2863	
Volume (vph)	10	10	10	715	10	10	10	100	660	0	135	10
Peak-hour factor, PHF	0.92	0.92	0.92	0.90	0.92	0.92	0.92	0.92	0.95	0.92	0.84	0.92
Adj. Flow (vph)	11	11	11	794	11	11	11	109	695	0	161	11
RTOR Reduction (vph)	0	10	0	0	0	0	0	0	0	0	7	0
Lane Group Flow (vph)	0	23	0	397	408	11	11	109	695	0	165	0
Heavy Vehicles (%)	2%	2%	2%	4%	2%	2%	2%	5%	6%	2%	3%	2%
Turn Type	Split			Split			Free	Perm	Free			
Protected Phases	4	4		8	8				2			6
Permitted Phases							Free	2		Free		
Actuated Green, G (s)		4.0		49.0	49.0		80.0	12.0	12.0	80.0		12.0
Effective Green, g (s)		5.0		48.0	50.0		80.0	13.0	11.0	80.0		11.0
Actuated g/C Ratio		0.06		0.60	0.62		1.00	0.16	0.14	1.00		0.14
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0			5.0
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0			3.0
Lane Grp Cap (vph)		90		815	853		1305	160	205	2210		394
v/s Ratio Prot		0.02		0.29	c0.30				c0.07			0.06
v/s Ratio Perm							0.01	0.01		c0.31		
v/c Ratio		0.25		0.49	0.48		0.01	0.07	0.53	0.31		0.42
Uniform Delay, d1		35.7		9.0	8.0		0.0	28.4	32.1	0.0		31.6
Progression Factor		1.00		1.00	1.00		1.00	0.81	0.84	1.00		1.00
Incremental Delay, d2		1.5		2.1	1.9		0.0	0.8	9.3	0.4		3.3
Delay (s)		37.2		11.1	9.9		0.0	23.7	36.4	0.4		34.8
Level of Service		D		B	A		A	C	D	A		C
Approach Delay (s)		37.2			10.4				5.5			34.8
Approach LOS		D			B				A			C
Intersection Summary												
HCM Average Control Delay			11.0				HCM Level of Service				B	
HCM Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			80.0				Sum of lost time (s)				10.0	
Intersection Capacity Utilization			48.3%				ICU Level of Service				A	
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: State St & Irvine Ave

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
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		1.00	1.00		1.00	1.00			1.00	
Fr _t	1.00	0.97		1.00	0.99		1.00	0.93			0.95	
Fl _t Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1488	1483		1488	1555		1352	1415			1439	
Fl _t Permitted	0.65	1.00		0.60	1.00		0.67	1.00			0.97	
Satd. Flow (perm)	1023	1483		939	1555		948	1415			1398	
Volume (vph)	25	160	30	60	140	5	30	70	40	10	70	55
Peak-hour factor, PHF	0.69	0.88	0.73	0.73	0.90	0.63	0.70	0.81	0.59	0.50	0.70	0.92
Adj. Flow (vph)	36	182	41	82	156	8	43	86	68	20	100	60
RTOR Reduction (vph)	0	14	0	0	3	0	0	39	0	0	30	0
Lane Group Flow (vph)	36	209	0	82	161	0	43	115	0	0	150	0
Heavy Vehicles (%)	0%	1%	10%	0%	0%	0%	10%	6%	0%	0%	6%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	25.0	25.0		25.0	25.0		25.0	25.0			25.0	
Effective Green, g (s)	26.0	26.0		26.0	26.0		26.0	26.0			26.0	
Actuated g/C Ratio	0.43	0.43		0.43	0.43		0.43	0.43			0.43	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0			5.0	
Lane Grp Cap (vph)	443	643		407	674		411	613			606	
v/s Ratio Prot		c0.14			0.10			0.08				
v/s Ratio Perm	0.04			0.09			0.05				c0.11	
v/c Ratio	0.08	0.33		0.20	0.24		0.10	0.19			0.25	
Uniform Delay, d ₁	10.0	11.2		10.6	10.7		10.1	10.5			10.8	
Progression Factor	1.00	1.00		1.09	1.06		1.00	1.00			1.00	
Incremental Delay, d ₂	0.4	1.3		1.0	0.7		0.5	0.7			1.0	
Delay (s)	10.3	12.6		12.5	12.1		10.6	11.2			11.8	
Level of Service	B	B		B	B		B	B			B	
Approach Delay (s)		12.3			12.2			11.0			11.8	
Approach LOS		B			B			B			B	

Intersection Summary

HCM Average Control Delay	11.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	45.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

3: State St & Water St

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕	↗		↕	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)		4.0			4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00			1.00			1.00	1.00		1.00	
Fr _t		0.97			0.97			1.00	0.85		0.99	
Fl _t Protected		1.00			0.99			0.99	1.00		0.99	
Satd. Flow (prot)		1508			1493			1520	1256		1503	
Fl _t Permitted		0.97			0.89			0.91	1.00		0.86	
Satd. Flow (perm)		1460			1345			1399	1256		1309	
Volume (vph)	10	165	50	70	185	70	30	165	50	60	155	10
Peak-hour factor, PHF	0.58	0.88	0.71	0.89	0.91	0.83	0.73	0.83	0.78	0.79	0.78	0.58
Adj. Flow (vph)	17	188	70	79	203	84	41	199	64	76	199	17
RTOR Reduction (vph)	0	20	0	0	18	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	255	0	0	348	0	0	240	64	0	288	0
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	3%	2%	6%	0%	3%	0%
Turn Type	Perm			pm+pt			Perm		Free	Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2		Free	6		
Actuated Green, G (s)		17.0			30.0			20.0	60.0		20.0	
Effective Green, g (s)		18.0			31.0			21.0	60.0		21.0	
Actuated g/C Ratio		0.30			0.52			0.35	1.00		0.35	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Lane Grp Cap (vph)		438			717			490	1256		458	
v/s Ratio Prot					c0.07							
v/s Ratio Perm		c0.17			0.18			0.17	0.05		c0.22	
v/c Ratio		0.58			0.49			0.49	0.05		0.63	
Uniform Delay, d ₁		17.8			9.4			15.3	0.0		16.3	
Progression Factor		1.28			1.00			1.00	1.00		1.00	
Incremental Delay, d ₂		5.4			2.3			3.5	0.1		6.4	
Delay (s)		28.1			11.7			18.8	0.1		22.7	
Level of Service		C			B			B	A		C	
Approach Delay (s)		28.1			11.7			14.8			22.7	
Approach LOS		C			B			B			C	

Intersection Summary

HCM Average Control Delay	18.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

4: State St & Dock St

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Fr _t	1.00	0.99		1.00	0.99		1.00	0.90			0.98	
Fl _t Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1488	1516		1390	1538		1488	1359			1418	
Fl _t Permitted	0.47	1.00		0.43	1.00		0.67	1.00			0.93	
Satd. Flow (perm)	734	1516		624	1538		1057	1359			1330	
Volume (vph)	5	335	25	70	355	10	25	40	95	25	75	10
Peak-hour factor, PHF	0.50	0.85	0.61	0.74	0.96	0.69	0.64	0.79	0.92	0.82	0.63	0.50
Adj. Flow (vph)	10	394	41	95	370	14	39	51	103	30	119	20
RTOR Reduction (vph)	0	5	0	0	2	0	0	71	0	0	7	0
Lane Group Flow (vph)	10	430	0	95	382	0	39	83	0	0	162	0
Heavy Vehicles (%)	0%	2%	0%	7%	1%	9%	0%	5%	3%	0%	11%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	37.0	37.0		37.0	37.0		23.0	23.0			23.0	
Effective Green, g (s)	38.0	38.0		38.0	38.0		24.0	22.0			22.0	
Actuated g/C Ratio	0.54	0.54		0.54	0.54		0.34	0.31			0.31	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0			5.0	
Lane Grp Cap (vph)	398	823		339	835		362	427			418	
v/s Ratio Prot		c0.28			0.25			0.06				
v/s Ratio Perm	0.01			0.15			0.04				c0.12	
v/c Ratio	0.03	0.52		0.28	0.46		0.11	0.20			0.39	
Uniform Delay, d ₁	7.4	10.2		8.6	9.7		15.7	17.5			18.7	
Progression Factor	1.00	1.00		0.60	0.65		1.00	1.00			1.00	
Incremental Delay, d ₂	0.1	2.4		1.8	1.6		0.6	1.0			2.7	
Delay (s)	7.5	12.6		7.0	7.9		16.3	18.6			21.4	
Level of Service	A	B		A	A		B	B			C	
Approach Delay (s)		12.5			7.8			18.1			21.4	
Approach LOS		B			A			B			C	

Intersection Summary

HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	65.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: Silver St & Sharpsville Ave

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↖	↗		↖	↗		↖	↗	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)				4.0	4.0		4.0	6.0		4.0	6.0	
Lane Util. Factor				1.00	1.00		1.00	1.00		1.00	1.00	
Fr _t				1.00	0.93		1.00	0.98		1.00	0.95	
Fl _t Protected				0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)				1488	1380		1488	1488		1488	1397	
Fl _t Permitted				0.95	1.00		0.55	1.00		0.54	1.00	
Satd. Flow (perm)				1488	1380		862	1488		844	1397	
Volume (vph)	0	0	0	15	40	30	20	280	30	20	175	75
Peak-hour factor, PHF	0.92	0.92	0.92	0.58	0.77	0.58	0.68	0.88	0.81	0.75	0.81	0.80
Adj. Flow (vph)	0	0	0	26	52	52	29	318	37	27	216	94
RTOR Reduction (vph)	0	0	0	0	40	0	0	5	0	0	18	0
Lane Group Flow (vph)	0	0	0	26	64	0	29	350	0	27	292	0
Heavy Vehicles (%)	2%	2%	2%	0%	3%	7%	0%	4%	0%	0%	10%	0%
Turn Type				Perm			Perm			Perm		
Protected Phases				16			2 10			6		
Permitted Phases				16			2 10			6		
Actuated Green, G (s)				16.0	16.0		46.0	46.0		35.0	35.0	
Effective Green, g (s)				17.0	17.0		46.0	44.0		36.0	34.0	
Actuated g/C Ratio				0.24	0.24		0.65	0.62		0.51	0.48	
Clearance Time (s)				5.0	5.0					5.0	5.0	
Vehicle Extension (s)				3.0	3.0					3.0	3.0	
Lane Grp Cap (vph)				356	330		558	922		428	669	
v/s Ratio Prot				c0.05			c0.24			c0.21		
v/s Ratio Perm				0.02			0.03			0.03		
v/c Ratio				0.07	0.20		0.05	0.38		0.06	0.44	
Uniform Delay, d ₁				20.9	21.5		4.6	6.7		8.9	12.2	
Progression Factor				1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d ₂				0.4	1.3		0.0	0.3		0.3	2.1	
Delay (s)				21.3	22.9		4.6	7.0		9.2	14.3	
Level of Service				C	C		A	A		A	B	
Approach Delay (s)		0.0		22.5			6.8			13.9		
Approach LOS		A		C			A			B		
Intersection Summary												
HCM Average Control Delay			12.0	HCM Level of Service				B				
HCM Volume to Capacity ratio			0.34									
Actuated Cycle Length (s)			71.0	Sum of lost time (s)				10.0				
Intersection Capacity Utilization			36.2%	ICU Level of Service				A				
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

7: State St & Sharpsville Ave

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)	4.0	4.0		4.0	4.0			6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Fr _t	1.00	0.99		1.00	0.98			0.97		1.00	0.97	
Fl _t Protected	0.95	1.00		0.95	1.00			0.99		0.95	1.00	
Satd. Flow (prot)	1473	1503		1459	1528			1424		1430	1427	
Fl _t Permitted	0.46	1.00		0.50	1.00			0.93		0.51	1.00	
Satd. Flow (perm)	719	1503		765	1528			1338		765	1427	
Volume (vph)	100	320	10	60	300	30	15	115	50	70	160	45
Peak-hour factor, PHF	0.84	0.89	0.58	0.85	0.79	0.70	0.50	0.69	0.78	0.94	0.79	0.87
Adj. Flow (vph)	119	360	17	71	380	43	30	167	64	74	203	52
RTOR Reduction (vph)	0	2	0	0	6	0	0	17	0	0	13	0
Lane Group Flow (vph)	119	375	0	71	417	0	0	244	0	74	242	0
Heavy Vehicles (%)	1%	3%	14%	2%	1%	0%	8%	6%	4%	4%	7%	4%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0			18.0		18.0	18.0	
Effective Green, g (s)	43.0	43.0		43.0	43.0			17.0		19.0	17.0	
Actuated g/C Ratio	0.61	0.61		0.61	0.61			0.24		0.27	0.24	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Grp Cap (vph)	442	923		470	939			325		208	347	
v/s Ratio Prot		0.25			c0.27						0.17	
v/s Ratio Perm	0.17			0.09				c0.18		0.10		
v/c Ratio	0.27	0.41		0.15	0.44			0.75		0.36	0.70	
Uniform Delay, d ₁	6.2	6.9		5.7	7.2			24.5		20.6	24.2	
Progression Factor	0.63	0.58		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d ₂	1.3	1.2		0.7	1.5			14.8		4.7	11.1	
Delay (s)	5.3	5.2		6.4	8.7			39.4		25.3	35.2	
Level of Service	A	A		A	A			D		C	D	
Approach Delay (s)		5.2			8.4			39.4			33.0	
Approach LOS		A			A			D			C	

Intersection Summary

HCM Average Control Delay	17.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	70.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

8: Columbia & Irvine Ave

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕			↕	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)		4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor		1.00		1.00	1.00			1.00			1.00	
Fr _t		0.98		1.00	0.94			0.94			0.99	
Fl _t Protected		1.00		0.95	1.00			1.00			0.99	
Satd. Flow (prot)		1424		1317	1458			1389			1471	
Fl _t Permitted		1.00		0.71	1.00			0.98			0.90	
Satd. Flow (perm)		1424		983	1458			1370			1341	
Volume (vph)	0	55	5	65	65	40	5	100	70	25	105	10
Peak-hour factor, PHF	0.92	0.87	0.50	0.78	0.73	0.73	0.50	0.87	0.81	0.63	0.81	0.75
Adj. Flow (vph)	0	63	10	83	89	55	10	115	86	40	130	13
RTOR Reduction (vph)	0	6	0	0	31	0	0	44	0	0	5	0
Lane Group Flow (vph)	0	67	0	83	113	0	0	167	0	0	178	0
Heavy Vehicles (%)	0%	4%	33%	13%	2%	0%	0%	7%	6%	0%	6%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.0		20.0	20.0			20.0			20.0	
Effective Green, g (s)		24.0		24.0	24.0			24.0			24.0	
Actuated g/C Ratio		0.43		0.43	0.43			0.43			0.43	
Clearance Time (s)		8.0		8.0	8.0			8.0			8.0	
Lane Grp Cap (vph)		610		421	625			587			575	
v/s Ratio Prot		0.05			0.08							
v/s Ratio Perm				c0.08				0.12			c0.13	
v/c Ratio		0.11		0.20	0.18			0.28			0.31	
Uniform Delay, d ₁		9.6		10.0	9.9			10.4			10.5	
Progression Factor		1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d ₂		0.4		1.0	0.6			1.2			1.4	
Delay (s)		10.0		11.0	10.5			11.6			11.9	
Level of Service		A		B	B			B			B	
Approach Delay (s)		10.0			10.7			11.6			11.9	
Approach LOS		A			B			B			B	

Intersection Summary

HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	56.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	39.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: Connelly Blvd & Dock St





















8/22/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)	4.0	6.0		6.0	6.0		6.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	1.00		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1488	1428		1033	1486		1430	1328		1365	1432	
Flt Permitted	0.52	1.00		0.45	1.00		0.60	1.00		0.62	1.00	
Satd. Flow (perm)	819	1428		493	1486		911	1328		884	1432	
Volume (vph)	20	240	100	50	255	5	170	135	40	45	145	25
Peak-hour factor, PHF	0.50	0.96	0.83	0.78	0.87	0.50	0.66	0.85	0.85	0.65	0.81	0.72
Adj. Flow (vph)	40	250	120	64	293	10	258	159	47	69	179	35
RTOR Reduction (vph)	0	19	0	0	2	0	0	12	0	0	8	0
Lane Group Flow (vph)	40	351	0	64	301	0	258	194	0	69	206	0
Heavy Vehicles (%)	0%	3%	7%	44%	5%	0%	4%	7%	37%	9%	8%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		38.0	38.0		38.0	38.0	
Effective Green, g (s)	43.0	41.0		41.0	41.0		37.0	37.0		39.0	37.0	
Actuated g/C Ratio	0.48	0.46		0.46	0.46		0.41	0.41		0.43	0.41	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	391	651		225	677		375	546		383	589	
v/s Ratio Prot		c0.25			0.20			0.15			0.14	
v/s Ratio Perm	0.05			0.13			c0.28			0.08		
v/c Ratio	0.10	0.54		0.28	0.45		0.69	0.36		0.18	0.35	
Uniform Delay, d1	12.9	17.7		15.3	16.7		21.8	18.3		15.7	18.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	3.2		3.1	2.1		9.9	1.8		1.0	1.6	
Delay (s)	13.4	20.9		18.5	18.8		31.6	20.1		16.7	19.9	
Level of Service	B	C		B	B		C	C		B	B	
Approach Delay (s)		20.1			18.8			26.5			19.1	
Approach LOS		C			B			C			B	
Intersection Summary												
HCM Average Control Delay			21.6			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)		12.0				
Intersection Capacity Utilization			72.1%			ICU Level of Service				C		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 11: Connelly Blvd & Sharpsville Ave

8/22/2007

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Fr _t	1.00	0.96		1.00	0.97			1.00	0.85	1.00	0.99	
Fl _t Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	
Satd. Flow (prot)	1153	1383		1459	1487			1388	1280	1459	1465	
Fl _t Permitted	0.55	1.00		0.35	1.00			0.92	1.00	0.63	1.00	
Satd. Flow (perm)	672	1383		541	1487			1294	1280	968	1465	
Volume (vph)	10	240	55	340	230	45	20	120	355	55	130	10
Peak-hour factor, PHF	0.88	0.96	0.68	0.79	0.81	0.72	0.66	0.87	0.87	0.68	0.79	0.58
Adj. Flow (vph)	11	250	81	430	284	62	30	138	408	81	165	17
RTOR Reduction (vph)	0	12	0	0	8	0	0	0	277	0	3	0
Lane Group Flow (vph)	11	319	0	430	338	0	0	168	131	81	179	0
Heavy Vehicles (%)	29%	2%	31%	2%	3%	0%	48%	4%	4%	2%	3%	29%
Turn Type	Perm			pm+pt			Perm		Perm	Perm		
Protected Phases		4		3	8			2				6
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	35.0	35.0		57.0	57.0			33.0	33.0	33.0	33.0	
Effective Green, g (s)	34.0	34.0		56.0	56.0			32.0	32.0	32.0	32.0	
Actuated g/C Ratio	0.34	0.34		0.56	0.56			0.32	0.32	0.32	0.32	
Clearance Time (s)	5.0	5.0		3.0	5.0			5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	228	470		450	833			414	410	310	469	
v/s Ratio Prot		0.23		c0.15	0.23							0.12
v/s Ratio Perm	0.02			c0.38				c0.13	0.10	0.08		
v/c Ratio	0.05	0.68		0.96	0.41			0.41	0.32	0.26	0.38	
Uniform Delay, d ₁	22.1	28.3		17.7	12.5			26.6	25.7	25.2	26.3	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d ₂	0.4	7.7		32.7	1.5			2.9	2.0	2.0	2.3	
Delay (s)	22.5	36.0		50.4	14.0			29.5	27.8	27.3	28.7	
Level of Service	C	D		D	B			C	C	C	C	
Approach Delay (s)		35.6			34.2			28.3			28.2	
Approach LOS		D			C			C			C	
Intersection Summary												
HCM Average Control Delay			31.9			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			78.3%			ICU Level of Service				D		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

13: Budd St & U.S. 62

8/22/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗		↖	↗		↕			↕	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)	4.0	4.0	4.0		6.0	6.0		6.0			6.0	
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00		0.95			0.95	
Flt	1.00	1.00	0.85		1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00	1.00		0.98	1.00		0.99			1.00	
Satd. Flow (prot)	1459	1374	1178		1178	1001		2802			2728	
Flt Permitted	0.71	1.00	1.00		0.84	1.00		0.78			0.92	
Satd. Flow (perm)	1083	1374	1178		1012	1001		2184			2519	
Volume (vph)	95	10	55	25	25	45	65	560	15	20	595	90
Peak-hour factor, PHF	0.87	0.88	0.74	0.64	0.63	0.83	0.76	0.85	0.75	0.79	0.87	0.72
Adj. Flow (vph)	109	11	74	39	40	54	86	659	20	25	684	125
RTOR Reduction (vph)	0	0	0	0	0	45	0	2	0	0	14	0
Lane Group Flow (vph)	109	11	74	0	79	9	0	763	0	0	820	0
Heavy Vehicles (%)	2%	14%	13%	52%	8%	33%	3%	4%	53%	58%	5%	4%
Turn Type	Perm		Free	Perm		Perm	Perm				Perm	
Protected Phases		4			8			2				6
Permitted Phases	4		Free	8		8	2				6	
Actuated Green, G (s)	11.1	11.1	63.0		11.1	11.1		41.9			41.9	
Effective Green, g (s)	12.1	12.1	63.0		10.1	10.1		40.9			40.9	
Actuated g/C Ratio	0.19	0.19	1.00		0.16	0.16		0.65			0.65	
Clearance Time (s)	5.0	5.0			5.0	5.0		5.0			5.0	
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	208	264	1178		162	160		1418			1635	
v/s Ratio Prot		0.01										
v/s Ratio Perm	c0.10		0.06		0.08	0.01		c0.35			0.33	
v/c Ratio	0.52	0.04	0.06		0.49	0.05		0.54			0.50	
Uniform Delay, d1	22.9	20.7	0.0		24.1	22.4		6.0			5.7	
Progression Factor	1.00	1.00	1.00		1.00	1.00		1.00			1.00	
Incremental Delay, d2	2.4	0.1	0.1		2.3	0.1		0.4			0.2	
Delay (s)	25.2	20.8	0.1		26.4	22.5		6.4			6.0	
Level of Service	C	C	A		C	C		A			A	
Approach Delay (s)		15.4			24.8			6.4			6.0	
Approach LOS		B			C			A			A	
Intersection Summary												
HCM Average Control Delay			8.4					HCM Level of Service			A	
HCM Volume to Capacity ratio			0.54									
Actuated Cycle Length (s)			63.0					Sum of lost time (s)		10.0		
Intersection Capacity Utilization			76.2%					ICU Level of Service		D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

14: Budd St & Irvine Ave

8/22/2007



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙		↔	↘		↗
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Width	11	11	11	11	11	11
Total Lost time (s)	4.0		4.0			4.0
Lane Util. Factor	1.00		1.00			1.00
Fr _t	0.93		0.96			1.00
Fl _t Protected	0.98		1.00			0.99
Satd. Flow (prot)	1352		1433			1479
Fl _t Permitted	0.98		1.00			0.93
Satd. Flow (perm)	1352		1433			1385
Volume (vph)	45	35	130	50	25	140
Peak-hour factor, PHF	0.92	0.75	0.91	0.84	0.69	0.93
Adj. Flow (vph)	49	47	143	60	36	151
RTOR Reduction (vph)	31	0	25	0	0	0
Lane Group Flow (vph)	65	0	178	0	0	187
Heavy Vehicles (%)	5%	6%	7%	0%	0%	6%
Turn Type					Perm	
Protected Phases	8		2			6
Permitted Phases					6	
Actuated Green, G (s)	20.0		30.0			30.0
Effective Green, g (s)	21.0		31.0			31.0
Actuated g/C Ratio	0.35		0.52			0.52
Clearance Time (s)	5.0		5.0			5.0
Lane Grp Cap (vph)	473		740			716
v/s Ratio Prot	c0.05		0.12			
v/s Ratio Perm						c0.14
v/c Ratio	0.14		0.24			0.26
Uniform Delay, d ₁	13.3		8.0			8.1
Progression Factor	1.00		1.00			1.00
Incremental Delay, d ₂	0.6		0.8			0.9
Delay (s)	13.9		8.8			9.0
Level of Service	B		A			A
Approach Delay (s)	13.9		8.8			9.0
Approach LOS	B		A			A



















Intersection Summary			
HCM Average Control Delay	9.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	40.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

15: Addison Avenue & Irvine Ave

8/22/2007

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.95			0.95		1.00	1.00		1.00	1.00	
Flt Protected		0.98			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1750			1750		1770	3539		1770	3533	
Flt Permitted		0.98			0.98		0.29	1.00		0.33	1.00	
Satd. Flow (perm)		1750			1750		543	3539		617	3533	
Volume (vph)	10	10	10	10	10	10	10	750	0	10	840	10
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)	11	11	11	11	11	11	11	815	0	11	913	11
RTOR Reduction (vph)	0	10	0	0	10	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	23	0	0	23	0	11	815	0	11	924	0
Turn Type	Split		Split				Perm		Perm			
Protected Phases	4	4		8	8			2			6	
Permitted Phases							2				6	
Actuated Green, G (s)		4.0			4.0		59.0	59.0		59.0	59.0	
Effective Green, g (s)		4.0			4.0		60.0	60.0		60.0	60.0	
Actuated g/C Ratio		0.05			0.05		0.75	0.75		0.75	0.75	
Clearance Time (s)		4.0			4.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		88			88		407	2654		463	2650	
v/s Ratio Prot		c0.01			c0.01			0.23			c0.26	
v/s Ratio Perm							0.02			0.02		
v/c Ratio		0.26			0.26		0.03	0.31		0.02	0.35	
Uniform Delay, d1		36.6			36.6		2.6	3.2		2.5	3.4	
Progression Factor		1.00			1.00		1.00	1.00		0.47	0.38	
Incremental Delay, d2		1.5			1.5		0.1	0.3		0.1	0.3	
Delay (s)		38.1			38.1		2.7	3.5		1.3	1.6	
Level of Service		D			D		A	A		A	A	
Approach Delay (s)		38.1			38.1			3.5			1.6	
Approach LOS		D			D			A			A	
Intersection Summary												
HCM Average Control Delay			3.8				HCM Level of Service			A		
HCM Volume to Capacity ratio			0.34									
Actuated Cycle Length (s)			80.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			38.5%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												