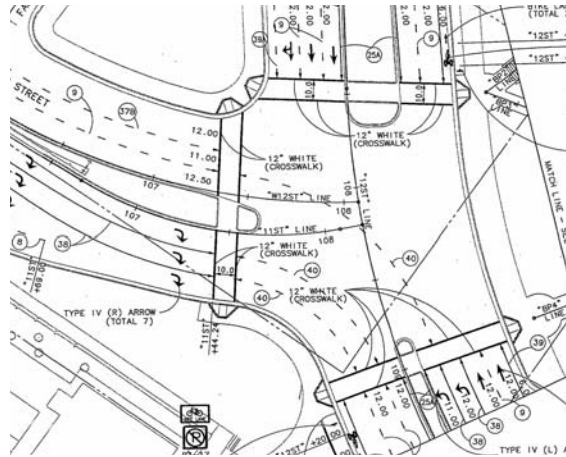
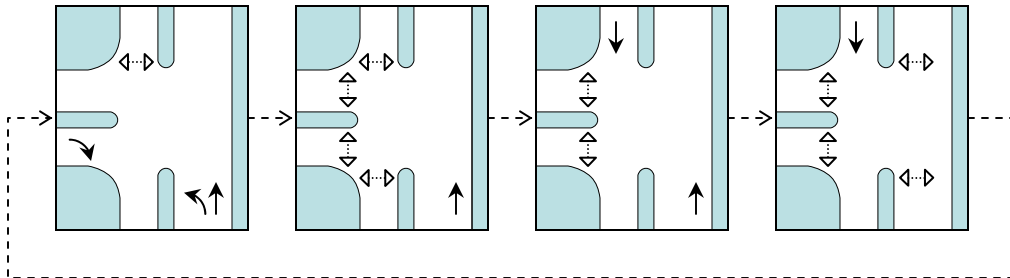


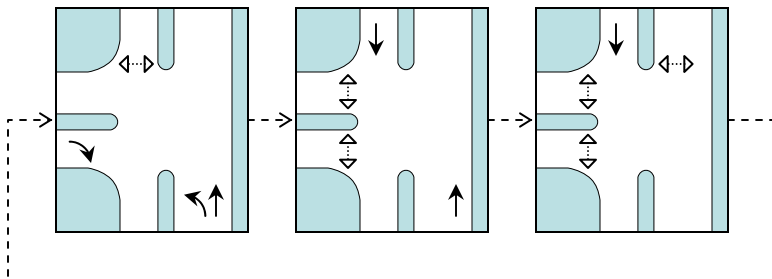
11th-12th/14th Street Intersection



Signal Phasing Sequence With South Crosswalk



Signal Phasing Sequence Without South Crosswalk



KEY

- ↘ Vehicle signal phase
- ↔ Pedestrian signal phase

HCM Signalized Intersection Capacity Analysis

54: 11th-12th St #1#2 & 14th St

12/12/2007



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↑↑↑	↑↑	↑↑	↑↑↑	
Volume (vph)	0	414	1805	1780	828	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		0.76	0.97	0.95	0.91	
Frbp, ped/bikes		1.00	1.00	1.00	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00	
Frt		0.85	1.00	1.00	1.00	
Flt Protected		1.00	0.95	1.00	1.00	
Satd. Flow (prot)		3474	3367	3254	4988	
Flt Permitted		1.00	0.95	1.00	1.00	
Satd. Flow (perm)		3474	3367	3254	4988	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	450	1962	1935	900	0
RTOR Reduction (vph)	0	176	0	0	0	0
Lane Group Flow (vph)	0	274	1962	1935	900	0
Confl. Peds. (#/hr)		70				70
Confl. Bikes (#/hr)		16				16
Heavy Vehicles (%)	2%	6%	4%	4%	4%	2%
Parking (#/hr)				5		
Turn Type		Over	Prot			
Protected Phases		5	5	2	6	
Permitted Phases						
Actuated Green, G (s)		60.9	60.9	83.0	26.3	
Effective Green, g (s)		60.9	60.9	83.0	26.3	
Actuated g/C Ratio		0.61	0.61	0.83	0.26	
Clearance Time (s)		4.0	4.0	4.0	4.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)		2116	2051	2701	1312	
v/s Ratio Prot		0.08	c0.58	c0.59	c0.18	
v/s Ratio Perm						
v/c Ratio		0.13	0.96	0.72	0.69	
Uniform Delay, d1		8.3	18.3	3.6	33.1	
Progression Factor		1.00	0.68	0.84	0.92	
Incremental Delay, d2		0.0	5.8	0.7	2.9	
Delay (s)		8.3	18.3	3.7	33.4	
Level of Service		A	B	A	C	
Approach Delay (s)	8.3			11.1	33.4	
Approach LOS	A			B	C	

Intersection Summary

HCM Average Control Delay	14.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	89.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

54: 11th-12th St #1#2 & 14th St

12/12/2007



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↑↑↑	↑↑	↑↑	↑↑↑	
Volume (vph)	0	1253	824	620	2133	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		0.76	0.97	0.95	0.91	
Frbp, ped/bikes		1.00	1.00	1.00	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00	
Frt		0.85	1.00	1.00	1.00	
Flt Protected		1.00	0.95	1.00	1.00	
Satd. Flow (prot)		3474	3367	3254	4988	
Flt Permitted		1.00	0.95	1.00	1.00	
Satd. Flow (perm)		3474	3367	3254	4988	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1362	896	674	2318	0
RTOR Reduction (vph)	0	800	0	0	0	0
Lane Group Flow (vph)	0	562	896	674	2318	0
Confl. Peds. (#/hr)		70				70
Confl. Bikes (#/hr)		16				16
Heavy Vehicles (%)	2%	6%	4%	4%	4%	2%
Parking (#/hr)				5		
Turn Type		Over	Prot			
Protected Phases		5	5	2	6	
Permitted Phases						
Actuated Green, G (s)		13.0	13.0	37.2	21.4	
Effective Green, g (s)		13.0	13.0	37.2	21.4	
Actuated g/C Ratio		0.26	0.26	0.74	0.43	
Clearance Time (s)		4.0	4.0	4.0	4.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)		903	875	2421	2135	
v/s Ratio Prot		0.16	c0.27	c0.21	c0.46	
v/s Ratio Perm						
v/c Ratio		0.62	1.02	0.28	1.09	
Uniform Delay, d1		16.3	18.5	2.1	14.3	
Progression Factor		1.00	0.88	0.52	0.81	
Incremental Delay, d2		1.0	35.9	0.3	43.4	
Delay (s)		17.3	52.2	1.3	54.9	
Level of Service		B	D	A	D	
Approach Delay (s)	17.3			30.4	54.9	
Approach LOS	B			C	D	
Intersection Summary						
HCM Average Control Delay			37.8		HCM Level of Service	D
HCM Volume to Capacity ratio			0.92			
Actuated Cycle Length (s)			50.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			87.1%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

54: 11th-12th St #1#2 & 14th St

12/12/2007



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↑↑↑	↑↑	↑↑	↑↑↑	
Volume (vph)	0	1253	824	620	2133	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		0.76	0.97	0.95	0.91	
Frbp, ped/bikes		1.00	1.00	1.00	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00	
Frt		0.85	1.00	1.00	1.00	
Flt Protected		1.00	0.95	1.00	1.00	
Satd. Flow (prot)		3474	3367	3254	4988	
Flt Permitted		1.00	0.95	1.00	1.00	
Satd. Flow (perm)		3474	3367	3254	4988	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1362	896	674	2318	0
RTOR Reduction (vph)	0	458	0	0	0	0
Lane Group Flow (vph)	0	904	896	674	2318	0
Confl. Peds. (#/hr)		70				70
Confl. Bikes (#/hr)		16				16
Heavy Vehicles (%)	2%	6%	4%	4%	4%	2%
Parking (#/hr)				5		
Turn Type		Over	Prot			
Protected Phases		5	5	2	6	
Permitted Phases						
Actuated Green, G (s)		31.6	31.6	83.8	50.0	
Effective Green, g (s)		31.6	31.6	83.8	50.0	
Actuated g/C Ratio		0.32	0.32	0.84	0.50	
Clearance Time (s)		4.0	4.0	4.0	4.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)		1098	1064	2727	2494	
v/s Ratio Prot		0.26	c0.27	c0.21	c0.46	
v/s Ratio Perm						
v/c Ratio		0.82	0.84	0.25	0.93	
Uniform Delay, d1		31.6	31.9	1.7	23.4	
Progression Factor		1.00	1.08	1.01	0.95	
Incremental Delay, d2		4.9	5.7	0.2	4.2	
Delay (s)		36.5	40.0	1.9	26.5	
Level of Service		D	D	A	C	
Approach Delay (s)	36.5			23.6	26.5	
Approach LOS	D			C	C	

Intersection Summary			
HCM Average Control Delay	28.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	87.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

54: 11th-12th St #1#2 & 14th St

12/12/2007



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗↘	↖↗	↕↕	↕↕↕	
Volume (vph)	0	414	1805	1780	828	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		0.88	0.97	0.95	0.91	
Frbp, ped/bikes		1.00	1.00	1.00	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00	
Frt		0.85	1.00	1.00	1.00	
Flt Protected		1.00	0.95	1.00	1.00	
Satd. Flow (prot)		2787	3367	3254	4988	
Flt Permitted		1.00	0.95	1.00	1.00	
Satd. Flow (perm)		2787	3367	3254	4988	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	100%	94%	100%	100%	100%	100%
Adj. Flow (vph)	0	423	1962	1935	900	0
RTOR Reduction (vph)	0	165	0	0	0	0
Lane Group Flow (vph)	0	258	1962	1935	900	0
Confl. Peds. (#/hr)		70				70
Confl. Bikes (#/hr)		16				16
Heavy Vehicles (%)	2%	2%	4%	4%	4%	2%
Parking (#/hr)				5		
Turn Type		Over	Prot			
Protected Phases		5	5	2	6	
Permitted Phases						
Actuated Green, G (s)		60.9	60.9	87.2	23.5	
Effective Green, g (s)		60.9	60.9	87.2	23.5	
Actuated g/C Ratio		0.61	0.61	0.87	0.24	
Clearance Time (s)		4.0	4.0	4.0	4.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)		1697	2051	2837	1172	
v/s Ratio Prot		0.09	c0.58	c0.59	c0.18	
v/s Ratio Perm						
v/c Ratio		0.15	0.96	0.68	0.77	
Uniform Delay, d1		8.4	18.3	2.0	35.7	
Progression Factor		1.00	0.68	0.87	0.93	
Incremental Delay, d2		0.0	5.8	0.6	4.8	
Delay (s)		8.4	18.3	2.3	37.9	
Level of Service		A	B	A	D	
Approach Delay (s)	8.4			10.4	37.9	
Approach LOS	A			B	D	

Intersection Summary			
HCM Average Control Delay	14.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

54: 11th-12th St #1#2 & 14th St

12/12/2007



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗↘	↗↘	↑↑	↑↑↑	
Volume (vph)	0	1253	824	620	2133	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		0.88	0.97	0.95	0.91	
Frbp, ped/bikes		1.00	1.00	1.00	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00	
Frt		0.85	1.00	1.00	1.00	
Flt Protected		1.00	0.95	1.00	1.00	
Satd. Flow (prot)		2787	3367	3254	4988	
Flt Permitted		1.00	0.95	1.00	1.00	
Satd. Flow (perm)		2787	3367	3254	4988	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	100%	94%	100%	100%	100%	100%
Adj. Flow (vph)	0	1280	896	674	2318	0
RTOR Reduction (vph)	0	341	0	0	0	0
Lane Group Flow (vph)	0	939	896	674	2318	0
Confl. Peds. (#/hr)		70				70
Confl. Bikes (#/hr)		16				16
Heavy Vehicles (%)	2%	2%	4%	4%	4%	2%
Parking (#/hr)				5		
Turn Type		Over	Prot			
Protected Phases		5	5	2	6	
Permitted Phases						
Actuated Green, G (s)		34.0	34.0	87.2	50.4	
Effective Green, g (s)		34.0	34.0	87.2	50.4	
Actuated g/C Ratio		0.34	0.34	0.87	0.50	
Clearance Time (s)		4.0	4.0	4.0	4.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)		948	1145	2837	2514	
v/s Ratio Prot		c0.34	0.27	c0.21	c0.46	
v/s Ratio Perm						
v/c Ratio		0.99	0.78	0.24	0.92	
Uniform Delay, d1		32.8	29.7	1.0	23.0	
Progression Factor		1.00	1.07	0.95	0.94	
Incremental Delay, d2		26.7	3.1	0.2	3.9	
Delay (s)		59.6	35.0	1.2	25.5	
Level of Service		E	C	A	C	
Approach Delay (s)	59.6			20.5	25.5	
Approach LOS	E			C	C	

Intersection Summary			
HCM Average Control Delay	32.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	94.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

54: 11th-12th St #1#2 & 14th St

12/12/2007



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗↗	↙↙	↑↑	↑↑↑	
Volume (vph)	0	414	1805	1780	828	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		0.88	0.97	0.95	0.91	
Frbp, ped/bikes		1.00	1.00	1.00	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00	
Frt		0.85	1.00	1.00	1.00	
Flt Protected		1.00	0.95	1.00	1.00	
Satd. Flow (prot)		2787	3367	3254	4988	
Flt Permitted		1.00	0.95	1.00	1.00	
Satd. Flow (perm)		2787	3367	3254	4988	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	100%	94%	100%	100%	100%	100%
Adj. Flow (vph)	0	423	1962	1935	900	0
RTOR Reduction (vph)	0	2	0	0	0	0
Lane Group Flow (vph)	0	421	1962	1935	900	0
Confl. Peds. (#/hr)		70				70
Confl. Bikes (#/hr)		16				16
Heavy Vehicles (%)	2%	2%	4%	4%	4%	2%
Parking (#/hr)				5		
Turn Type		Over	Prot			
Protected Phases		5	5	2	6	
Permitted Phases						
Actuated Green, G (s)		65.7	65.7	87.4	26.3	
Effective Green, g (s)		65.7	65.7	87.4	26.3	
Actuated g/C Ratio		0.66	0.66	0.87	0.26	
Clearance Time (s)		4.0	4.0	4.0	4.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)		1831	2212	2844	1312	
v/s Ratio Prot		0.15	c0.58	c0.59	c0.18	
v/s Ratio Perm						
v/c Ratio		0.23	0.89	0.68	0.69	
Uniform Delay, d1		6.9	14.1	2.0	33.1	
Progression Factor		1.00	1.39	1.89	1.03	
Incremental Delay, d2		0.0	2.1	0.6	2.9	
Delay (s)		7.0	21.7	4.3	37.2	
Level of Service		A	C	A	D	
Approach Delay (s)	7.0			13.0	37.2	
Approach LOS	A			B	D	

Intersection Summary			
HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	95.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

54: 11th-12th St #1#2 & 14th St

12/12/2007



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↔↔	↔↔	↑↑	↑↑↑	
Volume (vph)	0	1253	824	620	2133	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		0.88	0.97	0.95	0.91	
Frbp, ped/bikes		1.00	1.00	1.00	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00	
Frt		0.85	1.00	1.00	1.00	
Flt Protected		1.00	0.95	1.00	1.00	
Satd. Flow (prot)		2787	3367	3254	4988	
Flt Permitted		1.00	0.95	1.00	1.00	
Satd. Flow (perm)		2787	3367	3254	4988	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	100%	94%	100%	100%	100%	100%
Adj. Flow (vph)	0	1280	896	674	2318	0
RTOR Reduction (vph)	0	1	0	0	0	0
Lane Group Flow (vph)	0	1279	896	674	2318	0
Confl. Peds. (#/hr)		70				70
Confl. Bikes (#/hr)		16				16
Heavy Vehicles (%)	2%	2%	4%	4%	4%	2%
Parking (#/hr)				5		
Turn Type		Over	Prot			
Protected Phases		5	5	2	6	
Permitted Phases						
Actuated Green, G (s)		45.0	45.0	87.4	47.0	
Effective Green, g (s)		45.0	45.0	87.4	47.0	
Actuated g/C Ratio		0.45	0.45	0.87	0.47	
Clearance Time (s)		4.0	4.0	4.0	4.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)		1254	1515	2844	2344	
v/s Ratio Prot		c0.46	0.27	0.21	c0.46	
v/s Ratio Perm						
v/c Ratio		1.02	0.59	0.24	0.99	
Uniform Delay, d1		27.5	20.6	1.0	26.2	
Progression Factor		1.00	1.15	0.75	0.91	
Incremental Delay, d2		30.6	0.4	0.2	10.9	
Delay (s)		58.1	24.2	0.9	34.8	
Level of Service		E	C	A	C	
Approach Delay (s)	58.1			14.2	34.8	
Approach LOS	E			B	C	

Intersection Summary

HCM Average Control Delay	34.3	HCM Level of Service	C
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	94.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: MacArthur Blvd & Lakeshore Av

1/15/2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↗	↔↕↗						↕↗		↗	↕↗	
Volume (vph)	231	559	140	0	0	0	0	405	509	508	760	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0						4.0		3.5	4.0	
Lane Util. Factor	0.86	0.86						0.95		1.00	0.95	
Frbp, ped/bikes	1.00	0.99						0.97		1.00	1.00	
Flpb, ped/bikes	1.00	1.00						1.00		1.00	1.00	
Frt	1.00	0.97						0.92		1.00	1.00	
Flt Protected	0.95	1.00						1.00		0.95	1.00	
Satd. Flow (prot)	1516	4597						2951		1770	3539	
Flt Permitted	0.95	1.00						1.00		0.12	1.00	
Satd. Flow (perm)	1516	4597						2951		216	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	251	608	152	0	0	0	0	440	553	552	826	0
RTOR Reduction (vph)	0	34	0	0	0	0	0	60	0	0	0	0
Lane Group Flow (vph)	226	751	0	0	0	0	0	933	0	552	826	0
Confl. Peds. (#/hr)	3		46						21	21		
Confl. Bikes (#/hr)			2						7			
Parking (#/hr)					0			5				
Turn Type	Perm									pm+pt		
Protected Phases		4						2		1	6	
Permitted Phases	4									6		
Actuated Green, G (s)	31.0	31.0						31.0		66.0	66.0	
Effective Green, g (s)	31.0	31.0						31.0		66.0	66.0	
Actuated g/C Ratio	0.29	0.29						0.29		0.62	0.62	
Clearance Time (s)	5.0	5.0						4.0		3.5	4.0	
Lane Grp Cap (vph)	443	1344						863		596	2204	
v/s Ratio Prot								c0.32		c0.28	0.23	
v/s Ratio Perm	0.15	0.16								0.30		
v/c Ratio	0.51	0.56						1.20dr		0.93	0.37	
Uniform Delay, d1	31.2	31.7						37.5		28.8	9.8	
Progression Factor	1.12	1.13						1.00		1.00	1.00	
Incremental Delay, d2	2.8	1.1						54.9		22.6	0.5	
Delay (s)	37.9	37.1						92.4		51.3	10.3	
Level of Service	D	D						F		D	B	
Approach Delay (s)		37.2			0.0			92.4			26.8	
Approach LOS		D			A			F			C	

Intersection Summary

HCM Average Control Delay	49.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	106.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	89.3%	ICU Level of Service	E
Analysis Period (min)	15		
dr Defacto Right Lane. Recode with 1 though lane as a right lane.			
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

29: Embarcadero & 5th Av

1/15/2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↗	↗↘		↗	↗↘		↗	↘		↗↘	↘	
Volume (vph)	174	91	196	342	119	36	347	429	10	119	118	251
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		0.97	1.00	
Frbp, ped/bikes	1.00	0.90		1.00	0.98		1.00	1.00		1.00	0.95	
Flpb, ped/bikes	0.95	1.00		0.93	1.00		0.97	1.00		0.96	1.00	
Frt	1.00	0.90		1.00	0.97		1.00	1.00		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1674	2720		1639	3180		1717	1668		3289	1426	
Flt Permitted	0.65	1.00		0.56	1.00		0.43	1.00		0.36	1.00	
Satd. Flow (perm)	1138	2720		970	3180		774	1668		1246	1426	
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)	189	99	213	372	129	39	377	466	11	129	128	273
RTOR Reduction (vph)	0	128	0	0	23	0	0	1	0	0	118	0
Lane Group Flow (vph)	189	184	0	372	145	0	377	476	0	129	283	0
Confl. Peds. (#/hr)	70		70	70		70	70		70	70		70
Confl. Bikes (#/hr)			16			16			16			16
Parking (#/hr)		0			0			0			0	
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	26.0	26.0		26.0	26.0		31.0	31.0		31.0	31.0	
Effective Green, g (s)	26.0	26.0		26.0	26.0		31.0	31.0		31.0	31.0	
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.48	0.48		0.48	0.48	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	455	1088		388	1272		369	796		594	680	
v/s Ratio Prot		0.07			0.05			0.29			0.20	
v/s Ratio Perm	0.17			0.38			0.49			0.10		
v/c Ratio	0.42	0.17		0.96	0.11		1.02	0.60		0.22	0.42	
Uniform Delay, d1	14.0	12.5		19.0	12.3		17.0	12.4		9.9	11.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.84	0.80	
Incremental Delay, d2	2.8	0.3		36.4	0.2		52.5	3.3		0.7	1.7	
Delay (s)	16.8	12.9		55.4	12.4		69.5	15.7		9.1	10.6	
Level of Service	B	B		E	B		E	B		A	B	
Approach Delay (s)		14.4			42.0			39.5			10.2	
Approach LOS		B			D			D			B	

Intersection Summary

HCM Average Control Delay	28.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	93.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

30: Harrison St & 27th St

1/15/2008



Movement	NBL2	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	SEL	SET	SER	SER2
Lane Configurations		↔↔	↕↔		↔	↕↔			↔↔	↔		↔
Volume (vph)	12	487	620	47	163	1145	155	90	81	141	132	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		4.0	5.0			4.0	5.0		5.0
Lane Util. Factor		0.97	0.95		1.00	0.95			0.97	0.95		0.95
Frbp, ped/bikes		1.00	0.99		1.00	0.95			1.00	0.89		0.88
Flpb, ped/bikes		1.00	1.00		1.00	1.00			1.00	1.00		1.00
Frt		1.00	0.99		1.00	0.97			1.00	0.93		0.85
Flt Protected		0.95	1.00		0.95	1.00			0.95	1.00		1.00
Satd. Flow (prot)		3433	3253		1770	3059			3433	1275		1320
Flt Permitted		0.95	1.00		0.95	1.00			0.95	1.00		1.00
Satd. Flow (perm)		3433	3253		1770	3059			3433	1275		1320
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)	13	529	674	51	177	1245	168	98	88	153	143	39
RTOR Reduction (vph)	0	0	4	0	0	3	0	0	0	0	0	25
Lane Group Flow (vph)	0	542	721	0	177	1508	0	0	88	300	0	10
Confl. Peds. (#/hr)				70	70		70	70	70		70	70
Confl. Bikes (#/hr)				16			16	16			16	16
Parking (#/hr)			5			5				5		
Turn Type	Prot	Prot			Prot				Prot			Perm
Protected Phases	5	5	2		1	6			7	4		
Permitted Phases												4
Actuated Green, G (s)		22.0	71.4		18.6	67.0			7.4	32.0		32.0
Effective Green, g (s)		22.0	71.4		18.6	67.0			7.4	32.0		32.0
Actuated g/C Ratio		0.15	0.48		0.12	0.45			0.05	0.21		0.21
Clearance Time (s)		5.0	5.0		4.0	5.0			4.0	5.0		5.0
Vehicle Extension (s)		2.0	2.0		2.0	2.0			2.0	2.0		2.0
Lane Grp Cap (vph)		504	1548		219	1366			169	272		282
v/s Ratio Prot		c0.16	c0.22		0.10	c0.49			0.03	c0.24		
v/s Ratio Perm												0.01
v/c Ratio		1.08	0.47		0.81	1.10			0.52	1.10		0.03
Uniform Delay, d1		64.0	26.5		64.0	41.5			69.6	59.0		46.8
Progression Factor		1.00	1.00		1.00	1.00			1.00	1.00		1.00
Incremental Delay, d2		61.9	1.0		18.3	58.0			1.3	85.0		0.0
Delay (s)		125.9	27.5		82.3	99.5			70.9	144.0		46.8
Level of Service		F	C		F	F			E	F		D
Approach Delay (s)			69.6			97.7				120.7		
Approach LOS			E			F				F		

Intersection Summary

HCM Average Control Delay	88.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	29.0
Intersection Capacity Utilization	102.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

30: Harrison St & 27th St

1/15/2008



Movement	NWL2	NWL	NWT	NWR
Lane Configurations				
Volume (vph)	84	31	200	177
Ideal Flow (vphpl)	1900	1900	1900	1900
Total Lost time (s)		4.0	5.0	5.0
Lane Util. Factor		1.00	1.00	1.00
Frbp, ped/bikes		1.00	1.00	0.88
Flpb, ped/bikes		1.00	1.00	1.00
Frt		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00
Satd. Flow (prot)		1770	1863	1391
Flt Permitted		0.95	1.00	1.00
Satd. Flow (perm)		1770	1863	1391
Peak-hour factor, PHF	0.92	0.92	0.92	0.92
Adj. Flow (vph)	91	34	217	192
RTOR Reduction (vph)	0	0	0	148
Lane Group Flow (vph)	0	125	217	44
Confl. Peds. (#/hr)	70	70		70
Confl. Bikes (#/hr)				16
Parking (#/hr)				
Turn Type	Prot	Prot		Perm
Protected Phases	3	3	8	
Permitted Phases				8
Actuated Green, G (s)		10.0	34.6	34.6
Effective Green, g (s)		10.0	34.6	34.6
Actuated g/C Ratio		0.07	0.23	0.23
Clearance Time (s)		4.0	5.0	5.0
Vehicle Extension (s)		2.0	2.0	2.0
Lane Grp Cap (vph)		118	430	321
v/s Ratio Prot		c0.07	c0.12	
v/s Ratio Perm				0.03
v/c Ratio		1.06	0.50	0.14
Uniform Delay, d1		70.0	50.2	45.8
Progression Factor		1.00	1.00	1.00
Incremental Delay, d2		99.7	0.3	0.1
Delay (s)		169.7	50.6	45.9
Level of Service		F	D	D
Approach Delay (s)			76.8	
Approach LOS			E	
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

31: Grand Av & Harrison St

1/15/2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↕↔		↔↔	↕↔			↕↕↕	↕		↕↕↔	
Volume (vph)	116	257	100	618	834	116	265	1193	347	48	1283	294
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor	0.97	0.95		0.97	0.95			0.91	1.00		0.91	
Frbp, ped/bikes	1.00	0.97		1.00	0.98			1.00	0.93		0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	0.96		1.00	0.98			1.00	0.85		0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)	3433	3246		3400	3384			4999	1456		4609	
Flt Permitted	0.95	1.00		0.95	1.00			0.67	1.00		0.74	
Satd. Flow (perm)	3433	3246		3400	3384			3380	1456		3418	
Peak-hour factor, PHF	0.98	0.98	0.98	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	118	262	102	672	907	126	288	1297	377	52	1395	320
RTOR Reduction (vph)	0	3	0	0	9	0	0	0	222	0	37	0
Lane Group Flow (vph)	118	361	0	672	1024	0	0	1585	155	0	1730	0
Confl. Peds. (#/hr)	124		81	81		124	84		53	53		84
Confl. Bikes (#/hr)			7			12			5			4
Heavy Vehicles (%)	2%	4%	2%	3%	3%	2%	2%	3%	3%	2%	3%	2%
Parking (#/hr)												5
Turn Type	Prot			Prot			Perm		Perm	Perm		
Protected Phases	1	6		5	2			4				4
Permitted Phases							4		4	4		
Actuated Green, G (s)	5.0	16.5		24.5	37.0			39.0	39.0		39.0	
Effective Green, g (s)	5.0	16.5		24.5	37.0			39.0	39.0		39.0	
Actuated g/C Ratio	0.05	0.17		0.26	0.39			0.41	0.41		0.41	
Clearance Time (s)	4.0	5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)	181	564		877	1318			1388	598		1403	
v/s Ratio Prot	0.03	c0.11		0.20	c0.30							
v/s Ratio Perm								0.47	0.11		c0.51	
v/c Ratio	0.65	0.64		0.77	0.78			3.65dl	0.26		1.23	
Uniform Delay, d1	44.1	36.5		32.6	25.4			28.0	18.5		28.0	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	6.3	1.8		3.6	4.5			73.0	0.1		111.2	
Delay (s)	50.4	38.2		36.2	29.9			101.0	18.6		139.2	
Level of Service	D	D		D	C			F	B		F	
Approach Delay (s)		41.2			32.4			85.2			139.2	
Approach LOS		D			C			F			F	

Intersection Summary

HCM Average Control Delay	82.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	117.8%	ICU Level of Service	H
Analysis Period (min)	15		

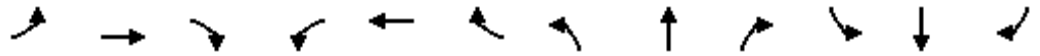
dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: MacArthur Blvd & Lakeshore Av

1/15/2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↗	↖↗↘						↖↗		↗	↖↗	
Volume (vph)	259	1711	168	0	0	0	0	470	929	476	597	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0						4.0		3.5	4.0	
Lane Util. Factor	0.86	0.86						0.95		1.00	0.95	
Frbp, ped/bikes	1.00	1.00						0.92		1.00	1.00	
Flpb, ped/bikes	0.93	1.00						1.00		1.00	1.00	
Frt	1.00	0.99						0.90		1.00	1.00	
Flt Protected	0.95	1.00						1.00		0.95	1.00	
Satd. Flow (prot)	1411	4714						2749		1770	3539	
Flt Permitted	0.95	1.00						1.00		0.10	1.00	
Satd. Flow (perm)	1411	4714						2749		180	3539	
Peak-hour factor, PHF	0.94	0.94	0.94	0.92	0.92	0.92	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	276	1820	179	0	0	0	0	495	978	517	649	0
RTOR Reduction (vph)	0	12	0	0	0	0	0	3	0	0	0	0
Lane Group Flow (vph)	248	2015	0	0	0	0	0	1470	0	517	649	0
Confl. Peds. (#/hr)	70		33						70	70		
Confl. Bikes (#/hr)			4						12			
Parking (#/hr)					0			5				
Turn Type	Perm									pm+pt		
Protected Phases		4						2		1	6	
Permitted Phases	4									6		
Actuated Green, G (s)	28.0	28.0						38.0		53.0	53.0	
Effective Green, g (s)	28.0	28.0						38.0		53.0	53.0	
Actuated g/C Ratio	0.31	0.31						0.42		0.59	0.59	
Clearance Time (s)	5.0	5.0						4.0		3.5	4.0	
Lane Grp Cap (vph)	439	1467						1161		309	2084	
v/s Ratio Prot								0.53		c0.21	0.18	
v/s Ratio Perm	0.18	0.43								c0.77		
v/c Ratio	0.56	1.37						1.77dr		1.67	0.31	
Uniform Delay, d1	25.9	31.0						26.0		27.3	9.3	
Progression Factor	1.14	1.10						1.00		1.00	1.00	
Incremental Delay, d2	0.5	168.6						126.6		316.8	0.4	
Delay (s)	29.9	202.8						152.6		344.0	9.7	
Level of Service	C	F						F		F	A	
Approach Delay (s)		183.9			0.0			152.6			157.9	
Approach LOS		F			A			F			F	

Intersection Summary

HCM Average Control Delay	168.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.54		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.5
Intersection Capacity Utilization	117.2%	ICU Level of Service	H
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

29: Embarcadero & 5th Av

1/15/2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↗	↑↗		↗	↑↗		↗	↗		↗↗	↗	
Volume (vph)	340	146	307	468	337	25	326	134	58	73	469	321
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		0.97	1.00	
Frbp, ped/bikes	1.00	0.90		1.00	0.99		1.00	0.98		1.00	0.97	
Flpb, ped/bikes	0.96	1.00		0.95	1.00		1.00	1.00		0.93	1.00	
Frt	1.00	0.90		1.00	0.99		1.00	0.95		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1702	2724		1675	3308		1770	1564		3181	1525	
Flt Permitted	0.50	1.00		0.42	1.00		0.12	1.00		0.62	1.00	
Satd. Flow (perm)	887	2724		741	3308		233	1564		2077	1525	
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)	370	159	334	509	366	27	354	146	63	79	510	349
RTOR Reduction (vph)	0	119	0	0	9	0	0	24	0	0	38	0
Lane Group Flow (vph)	370	374	0	509	384	0	354	185	0	79	821	0
Confl. Peds. (#/hr)	70		70	70		70	70		70	70		70
Confl. Bikes (#/hr)			16			16			16			16
Parking (#/hr)		0			0			0			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		32.0	32.0		32.0	32.0	
Effective Green, g (s)	25.0	25.0		25.0	25.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.38	0.38		0.38	0.38		0.49	0.49		0.49	0.49	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	341	1048		285	1272		115	770		1023	751	
v/s Ratio Prot		0.14			0.12			0.12			0.54	
v/s Ratio Perm	0.42			c0.69			c1.52			0.04		
v/c Ratio	1.09	0.36		1.79	0.30		3.08	0.24		0.08	1.09	
Uniform Delay, d1	20.0	14.3		20.0	13.9		16.5	9.5		8.7	16.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.99	0.99	
Incremental Delay, d2	73.4	0.9		367.5	0.6		957.9	0.7		0.1	55.8	
Delay (s)	93.4	15.2		387.5	14.5		974.4	10.2		8.8	72.1	
Level of Service	F	B		F	B		F	B		A	E	
Approach Delay (s)		48.7			225.0			616.4			66.8	
Approach LOS		D			F			F			E	

Intersection Summary

HCM Average Control Delay	200.5	HCM Level of Service	F
HCM Volume to Capacity ratio	2.52		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	120.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

30: Harrison St & 27th St

1/15/2008



Movement	NBL2	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	SEL	SET	SER	SER2
Lane Configurations		↔↔	↕↔		↔	↕↔			↔↔	↔		↔
Volume (vph)	10	243	1369	62	180	584	53	83	196	333	154	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		4.0	5.0			4.0	5.0		5.0
Lane Util. Factor		0.97	0.95		1.00	0.95			0.97	0.95		0.95
Frbp, ped/bikes		1.00	0.99		1.00	0.94			1.00	0.93		0.88
Flpb, ped/bikes		1.00	1.00		1.00	1.00			1.00	1.00		1.00
Frt		1.00	0.99		1.00	0.97			1.00	0.95		0.85
Flt Protected		0.95	1.00		0.95	1.00			0.95	1.00		1.00
Satd. Flow (prot)		3433	3278		1770	3040			3433	1371		1327
Flt Permitted		0.95	1.00		0.95	1.00			0.95	1.00		1.00
Satd. Flow (perm)		3433	3278		1770	3040			3433	1371		1327
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	264	1488	67	196	635	58	90	213	362	167	20
RTOR Reduction (vph)	0	0	2	0	0	6	0	0	0	0	0	7
Lane Group Flow (vph)	0	275	1553	0	196	777	0	0	213	531	0	11
Confl. Peds. (#/hr)				70	70		70	70	70		70	70
Confl. Bikes (#/hr)				16			16	16			16	16
Parking (#/hr)			5			5				5		
Turn Type	Prot	Prot			Prot				Prot			Perm
Protected Phases	5	5	2		1	6			7	4		
Permitted Phases												4
Actuated Green, G (s)		15.7	65.0		14.0	62.3			13.1	49.0		49.0
Effective Green, g (s)		15.7	65.0		14.0	62.3			13.1	49.0		49.0
Actuated g/C Ratio		0.10	0.43		0.09	0.42			0.09	0.33		0.33
Clearance Time (s)		5.0	5.0		4.0	5.0			4.0	5.0		5.0
Vehicle Extension (s)		2.0	2.0		2.0	2.0			2.0	2.0		2.0
Lane Grp Cap (vph)		359	1420		165	1263			300	448		433
v/s Ratio Prot		0.08	c0.47		c0.11	0.26			0.06	c0.39		
v/s Ratio Perm												0.01
v/c Ratio		0.77	1.09		1.19	0.61			0.71	1.19		0.02
Uniform Delay, d1		65.4	42.5		68.0	34.4			66.6	50.5		34.3
Progression Factor		1.00	1.00		1.00	1.00			1.00	1.00		1.00
Incremental Delay, d2		8.5	53.7		129.6	2.2			6.2	104.0		0.0
Delay (s)		73.9	96.2		197.6	36.7			72.8	154.5		34.3
Level of Service		E	F		F	D			E	F		C
Approach Delay (s)			92.8			68.9				128.8		
Approach LOS			F			E				F		

Intersection Summary

HCM Average Control Delay	93.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	99.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

30: Harrison St & 27th St

1/15/2008



Movement	NWL2	NWL	NWT	NWR
Lane Configurations				
Volume (vph)	42	19	137	188
Ideal Flow (vphpl)	1900	1900	1900	1900
Total Lost time (s)		4.0	5.0	5.0
Lane Util. Factor		1.00	1.00	1.00
Frbp, ped/bikes		1.00	1.00	0.88
Flpb, ped/bikes		1.00	1.00	1.00
Frt		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00
Satd. Flow (prot)		1770	1863	1394
Flt Permitted		0.95	1.00	1.00
Satd. Flow (perm)		1770	1863	1394
Peak-hour factor, PHF	0.92	0.92	0.92	0.92
Adj. Flow (vph)	46	21	149	204
RTOR Reduction (vph)	0	0	0	141
Lane Group Flow (vph)	0	67	149	63
Confl. Peds. (#/hr)	70	70		70
Confl. Bikes (#/hr)				16
Parking (#/hr)				
Turn Type	Prot	Prot		Perm
Protected Phases	3	3	8	
Permitted Phases				8
Actuated Green, G (s)		4.0	39.9	39.9
Effective Green, g (s)		4.0	39.9	39.9
Actuated g/C Ratio		0.03	0.27	0.27
Clearance Time (s)		4.0	5.0	5.0
Vehicle Extension (s)		2.0	2.0	2.0
Lane Grp Cap (vph)		47	496	371
v/s Ratio Prot		c0.04	0.08	
v/s Ratio Perm				0.05
v/c Ratio		1.43	0.30	0.17
Uniform Delay, d1		73.0	43.9	42.3
Progression Factor		1.00	1.00	1.00
Incremental Delay, d2		279.4	0.1	0.1
Delay (s)		352.4	44.0	42.4
Level of Service		F	D	D
Approach Delay (s)			92.4	
Approach LOS			F	
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

31: Grand Av & Harrison St

1/15/2008



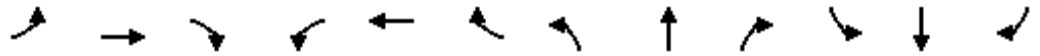
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↑↔		↔↔	↑↔			↑↑↑	↔		↔↔↔	
Volume (vph)	383	723	163	269	519	52	0	1428	793	0	630	218
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor	0.97	0.95		0.97	0.95			0.91	1.00		0.91	
Frbp, ped/bikes	1.00	0.98		1.00	0.99			1.00	0.94		0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	0.97		1.00	0.99			1.00	0.85		0.96	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)	3433	3321		3400	3432			5036	1475		4540	
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (perm)	3433	3321		3400	3432			5036	1475		4540	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.92	0.92	0.92
Adj. Flow (vph)	416	786	177	292	564	57	0	1535	853	0	685	237
RTOR Reduction (vph)	0	21	0	0	6	0	0	0	386	0	65	0
Lane Group Flow (vph)	416	942	0	292	615	0	0	1535	467	0	857	0
Confl. Peds. (#/hr)	68		84	84		68			41			76
Confl. Bikes (#/hr)			13			10			5			1
Heavy Vehicles (%)	2%	4%	2%	3%	3%	2%	2%	3%	3%	2%	3%	2%
Parking (#/hr)												5
Turn Type	Prot			Prot					Perm		Perm	
Protected Phases	1	6		5	2			4				4
Permitted Phases									4		4	
Actuated Green, G (s)	14.1	28.8		24.3	40.0			26.0	26.0		26.0	
Effective Green, g (s)	14.1	28.8		24.3	40.0			26.0	26.0		26.0	
Actuated g/C Ratio	0.15	0.31		0.26	0.43			0.28	0.28		0.28	
Clearance Time (s)	4.0	5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)	514	1016		878	1459			1391	408		1254	
v/s Ratio Prot	0.12	c0.28		0.09	c0.18			0.30			0.19	
v/s Ratio Perm									c0.32			
v/c Ratio	0.81	0.93		0.33	0.42			1.10	1.15		0.68	
Uniform Delay, d1	38.7	31.6		28.3	18.9			34.0	34.0		30.4	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	8.6	13.7		0.1	0.9			57.7	90.5		1.2	
Delay (s)	47.3	45.3		28.4	19.8			91.8	124.5		31.6	
Level of Service	D	D		C	B			F	F		C	
Approach Delay (s)		45.9			22.6			103.5			31.6	
Approach LOS		D			C			F			C	

Intersection Summary

HCM Average Control Delay	64.3	HCM Level of Service	E
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	94.1	Sum of lost time (s)	10.0
Intersection Capacity Utilization	112.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
6: MacArthur Blvd & Lakeshore Av

1/15/2008



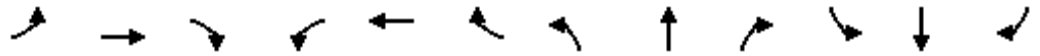
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗						↖↗		↖	↖↗	
Volume (vph)	220	589	140	0	0	0	0	375	323	739	516	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0						4.0		3.5	4.0	
Lane Util. Factor	0.86	0.86						0.95		1.00	0.95	
Frbp, ped/bikes	1.00	0.99						0.98		1.00	1.00	
Flpb, ped/bikes	1.00	1.00						1.00		1.00	1.00	
Frt	1.00	0.97						0.93		1.00	1.00	
Flt Protected	0.95	1.00						1.00		0.95	1.00	
Satd. Flow (prot)	1516	4605						3012		1770	3539	
Flt Permitted	0.95	1.00						1.00		0.14	1.00	
Satd. Flow (perm)	1516	4605						3012		267	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	239	640	152	0	0	0	0	408	351	803	561	0
RTOR Reduction (vph)	0	31	0	0	0	0	0	30	0	0	0	0
Lane Group Flow (vph)	215	785	0	0	0	0	0	729	0	803	561	0
Confl. Peds. (#/hr)	3		46							21	21	
Confl. Bikes (#/hr)			2							7		
Parking (#/hr)					0			5				
Turn Type	Perm									pm+pt		
Protected Phases		4						2		1	6	
Permitted Phases	4									6		
Actuated Green, G (s)	31.0	31.0						31.0		66.0	66.0	
Effective Green, g (s)	31.0	31.0						31.0		66.0	66.0	
Actuated g/C Ratio	0.29	0.29						0.29		0.62	0.62	
Clearance Time (s)	5.0	5.0						4.0		3.5	4.0	
Lane Grp Cap (vph)	443	1347						881		613	2204	
v/s Ratio Prot								0.24		c0.39	0.16	
v/s Ratio Perm	0.14	0.17								c0.43		
v/c Ratio	0.49	0.58						0.83		1.31	0.25	
Uniform Delay, d1	30.9	32.0						35.0		28.4	9.0	
Progression Factor	1.01	1.00						1.00		1.00	1.00	
Incremental Delay, d2	2.6	1.3						8.8		150.9	0.3	
Delay (s)	33.8	33.2						43.8		179.3	9.2	
Level of Service	C	C						D		F	A	
Approach Delay (s)		33.3			0.0			43.8			109.4	
Approach LOS		C			A			D			F	

Intersection Summary		
HCM Average Control Delay	68.7	HCM Level of Service E
HCM Volume to Capacity ratio	1.06	
Actuated Cycle Length (s)	106.0	Sum of lost time (s) 8.5
Intersection Capacity Utilization	95.1%	ICU Level of Service F
Analysis Period (min)	15	
c Critical Lane Group		

HCM Signalized Intersection Capacity Analysis

29: Embarcadero & 5th Av

1/15/2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	↖
Volume (vph)	174	91	196	342	119	36	347	429	10	119	118	251
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		0.97	1.00	
Frbp, ped/bikes	1.00	0.90		1.00	0.98		1.00	1.00		1.00	0.95	
Flpb, ped/bikes	0.95	1.00		0.93	1.00		0.97	1.00		0.96	1.00	
Frt	1.00	0.90		1.00	0.97		1.00	1.00		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1674	2720		1639	3180		1717	1668		3289	1426	
Flt Permitted	0.65	1.00		0.56	1.00		0.43	1.00		0.36	1.00	
Satd. Flow (perm)	1138	2720		970	3180		774	1668		1246	1426	
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)	189	99	213	372	129	39	377	466	11	129	128	273
RTOR Reduction (vph)	0	128	0	0	23	0	0	1	0	0	118	0
Lane Group Flow (vph)	189	184	0	372	145	0	377	476	0	129	283	0
Confl. Peds. (#/hr)	70		70	70		70	70		70	70		70
Confl. Bikes (#/hr)			16			16			16			16
Parking (#/hr)		0			0			0			0	
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	26.0	26.0		26.0	26.0		31.0	31.0		31.0	31.0	
Effective Green, g (s)	26.0	26.0		26.0	26.0		31.0	31.0		31.0	31.0	
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.48	0.48		0.48	0.48	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	455	1088		388	1272		369	796		594	680	
v/s Ratio Prot		0.07			0.05			0.29			0.20	
v/s Ratio Perm	0.17			0.38			0.49			0.10		
v/c Ratio	0.42	0.17		0.96	0.11		1.02	0.60		0.22	0.42	
Uniform Delay, d1	14.0	12.5		19.0	12.3		17.0	12.4		9.9	11.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.95	1.12	
Incremental Delay, d2	2.8	0.3		36.4	0.2		52.5	3.3		0.7	1.7	
Delay (s)	16.8	12.9		55.4	12.4		69.5	15.7		10.1	14.1	
Level of Service	B	B		E	B		E	B		B	B	
Approach Delay (s)		14.4			42.0			39.5			13.1	
Approach LOS		B			D			D			B	

Intersection Summary

HCM Average Control Delay	29.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	93.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

30: Harrison St & 27th St

1/15/2008



Movement	NBL2	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	SEL	SET	SER	SER2
Lane Configurations		↔↔	↕↔		↔	↕↔			↔↔	↔		↔
Volume (vph)	12	487	620	47	163	1145	155	90	81	141	32	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		4.0	5.0			4.0	5.0		5.0
Lane Util. Factor		0.97	0.95		1.00	0.95			0.97	0.95		0.95
Frbp, ped/bikes		1.00	0.99		1.00	0.95			1.00	0.95		0.88
Flpb, ped/bikes		1.00	1.00		1.00	1.00			1.00	1.00		1.00
Frt		1.00	0.99		1.00	0.97			1.00	0.97		0.85
Flt Protected		0.95	1.00		0.95	1.00			0.95	1.00		1.00
Satd. Flow (prot)		3433	3254		1770	3068			3433	1433		1322
Flt Permitted		0.95	1.00		0.95	1.00			0.95	1.00		1.00
Satd. Flow (perm)		3433	3254		1770	3068			3433	1433		1322
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)	13	529	674	51	177	1245	168	98	88	153	35	39
RTOR Reduction (vph)	0	0	3	0	0	3	0	0	0	1	0	29
Lane Group Flow (vph)	0	542	722	0	177	1508	0	0	88	191	0	6
Confl. Peds. (#/hr)				70	70		70	70	70		70	70
Confl. Bikes (#/hr)				16			16	16			16	16
Parking (#/hr)			5			5				5		
Turn Type	Prot	Prot			Prot				Prot			Perm
Protected Phases	5	5	2		1	6			7	4		
Permitted Phases												4
Actuated Green, G (s)		22.1	72.3		18.0	67.2			7.3	23.7		23.7
Effective Green, g (s)		22.1	72.3		18.0	67.2			7.3	23.7		23.7
Actuated g/C Ratio		0.16	0.51		0.13	0.47			0.05	0.17		0.17
Clearance Time (s)		5.0	5.0		4.0	5.0			4.0	5.0		5.0
Vehicle Extension (s)		2.0	2.0		2.0	2.0			2.0	2.0		2.0
Lane Grp Cap (vph)		534	1657		224	1452			176	239		221
v/s Ratio Prot		c0.16	0.22		0.10	c0.49			0.03	c0.13		
v/s Ratio Perm												0.00
v/c Ratio		1.01	0.44		0.79	1.04			0.50	0.80		0.03
Uniform Delay, d1		59.9	22.0		60.2	37.4			65.6	56.9		49.5
Progression Factor		1.00	1.00		1.00	1.00			1.00	1.00		1.00
Incremental Delay, d2		42.8	0.8		16.0	34.2			0.8	15.9		0.0
Delay (s)		102.7	22.8		76.2	71.6			66.4	72.7		49.5
Level of Service		F	C		E	E			E	E		D
Approach Delay (s)			57.0			72.1				68.4		
Approach LOS			E			E				E		

Intersection Summary

HCM Average Control Delay	67.1	HCM Level of Service	E
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	142.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	101.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

30: Harrison St & 27th St

1/15/2008

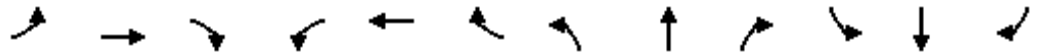


Movement	NWL2	NWL	NWT	NWR
Lane Configurations				
Volume (vph)	84	31	200	177
Ideal Flow (vphpl)	1900	1900	1900	1900
Total Lost time (s)		4.0	5.0	5.0
Lane Util. Factor		1.00	1.00	1.00
Frbp, ped/bikes		1.00	1.00	0.88
Flpb, ped/bikes		1.00	1.00	1.00
Frt		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00
Satd. Flow (prot)		1770	1863	1394
Flt Permitted		0.95	1.00	1.00
Satd. Flow (perm)		1770	1863	1394
Peak-hour factor, PHF	0.92	0.92	0.92	0.92
Adj. Flow (vph)	91	34	217	192
RTOR Reduction (vph)	0	0	0	156
Lane Group Flow (vph)	0	125	217	36
Confl. Peds. (#/hr)	70	70		70
Confl. Bikes (#/hr)				16
Parking (#/hr)				
Turn Type	Prot	Prot		Perm
Protected Phases	3	3	8	
Permitted Phases				8
Actuated Green, G (s)		10.0	26.4	26.4
Effective Green, g (s)		10.0	26.4	26.4
Actuated g/C Ratio		0.07	0.19	0.19
Clearance Time (s)		4.0	5.0	5.0
Vehicle Extension (s)		2.0	2.0	2.0
Lane Grp Cap (vph)		125	346	259
v/s Ratio Prot		c0.07	c0.12	
v/s Ratio Perm				0.03
v/c Ratio		1.00	0.63	0.14
Uniform Delay, d1		66.0	53.3	48.3
Progression Factor		1.00	1.00	1.00
Incremental Delay, d2		80.5	2.6	0.1
Delay (s)		146.5	55.8	48.4
Level of Service		F	E	D
Approach Delay (s)			74.4	
Approach LOS			E	
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

31: Grand Av & Harrison St

1/15/2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↕↕		↔↔	↕↕			↕↕↕	↕		↕↕↕	
Volume (vph)	116	257	100	618	834	116	265	1023	347	48	1183	294
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor	0.97	0.95		0.97	0.95			0.91	1.00		0.91	
Frbp, ped/bikes	1.00	0.97		1.00	0.98			1.00	0.93		0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	0.96		1.00	0.98			1.00	0.85		0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)	3433	3246		3400	3384			4989	1456		4594	
Flt Permitted	0.95	1.00		0.95	1.00			0.67	1.00		0.77	
Satd. Flow (perm)	3433	3246		3400	3384			3387	1456		3533	
Peak-hour factor, PHF	0.98	0.98	0.98	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	118	262	102	672	907	126	288	1112	377	52	1286	320
RTOR Reduction (vph)	0	5	0	0	12	0	0	0	222	0	42	0
Lane Group Flow (vph)	118	359	0	672	1021	0	0	1400	155	0	1616	0
Confl. Peds. (#/hr)	124		81	81		124	84		53	53		84
Confl. Bikes (#/hr)			7			12			5			4
Heavy Vehicles (%)	2%	4%	2%	3%	3%	2%	2%	3%	3%	2%	3%	2%
Parking (#/hr)												5
Turn Type	Prot			Prot			Perm		Perm	Perm		
Protected Phases	1	6		5	2			4				4
Permitted Phases							4		4	4		
Actuated Green, G (s)	5.0	16.5		24.5	37.0			39.0	39.0		39.0	
Effective Green, g (s)	5.0	16.5		24.5	37.0			39.0	39.0		39.0	
Actuated g/C Ratio	0.05	0.17		0.26	0.39			0.41	0.41		0.41	
Clearance Time (s)	4.0	5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)	181	564		877	1318			1390	598		1450	
v/s Ratio Prot	0.03	c0.11		0.20	c0.30							
v/s Ratio Perm								0.41	0.11		c0.46	
v/c Ratio	0.65	0.64		0.77	0.77			3.65dl	0.26		1.11	
Uniform Delay, d1	44.1	36.5		32.6	25.4			28.0	18.5		28.0	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	6.3	1.7		3.6	4.5			25.9	0.1		61.5	
Delay (s)	50.4	38.2		36.2	29.9			53.9	18.6		89.5	
Level of Service	D	D		D	C			D	B		F	
Approach Delay (s)		41.2			32.4			46.4			89.5	
Approach LOS		D			C			D			F	

Intersection Summary

HCM Average Control Delay	54.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	112.7%	ICU Level of Service	H
Analysis Period (min)	15		

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

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: MacArthur Blvd & Lakeshore Av

1/15/2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↔↕↗						↕↗		↘	↕↗	
Volume (vph)	298	1944	168	0	0	0	0	353	880	575	307	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0						4.0		3.5	4.0	
Lane Util. Factor	0.86	0.86						0.95		1.00	0.95	
Frbp, ped/bikes	1.00	1.00						0.91		1.00	1.00	
Flpb, ped/bikes	0.93	1.00						1.00		1.00	1.00	
Frt	1.00	0.99						0.89		1.00	1.00	
Flt Protected	0.95	1.00						1.00		0.95	1.00	
Satd. Flow (prot)	1411	4723						2709		1770	3539	
Flt Permitted	0.95	1.00						1.00		0.10	1.00	
Satd. Flow (perm)	1411	4723						2709		180	3539	
Peak-hour factor, PHF	0.94	0.94	0.94	0.92	0.92	0.92	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	317	2068	179	0	0	0	0	372	926	625	334	0
RTOR Reduction (vph)	0	10	0	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	285	2269	0	0	0	0	0	1297	0	625	334	0
Confl. Peds. (#/hr)	70		33						70	70		
Confl. Bikes (#/hr)			4						12			
Parking (#/hr)					0			5				
Turn Type	Perm									pm+pt		
Protected Phases		4						2		1	6	
Permitted Phases	4									6		
Actuated Green, G (s)	28.0	28.0						38.0		53.0	53.0	
Effective Green, g (s)	28.0	28.0						38.0		53.0	53.0	
Actuated g/C Ratio	0.31	0.31						0.42		0.59	0.59	
Clearance Time (s)	5.0	5.0						4.0		3.5	4.0	
Lane Grp Cap (vph)	439	1469						1144		309	2084	
v/s Ratio Prot								0.48		c0.26	0.09	
v/s Ratio Perm	0.20	0.48								c0.93		
v/c Ratio	0.65	1.54						1.70dr		2.02	0.16	
Uniform Delay, d1	26.8	31.0						26.0		26.4	8.4	
Progression Factor	1.15	1.13						1.00		1.00	1.00	
Incremental Delay, d2	0.7	245.3						71.4		471.4	0.2	
Delay (s)	31.4	280.2						97.4		497.9	8.6	
Level of Service	C	F						F		F	A	
Approach Delay (s)		252.5			0.0			97.4			327.5	
Approach LOS		F			A			F			F	

Intersection Summary

HCM Average Control Delay	225.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.82		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.5
Intersection Capacity Utilization	122.6%	ICU Level of Service	H
Analysis Period (min)	15		

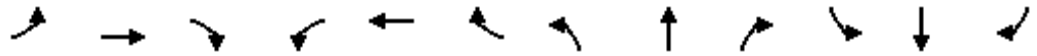
dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

29: Embarcadero & 5th Av

1/15/2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↗	↑↗		↗	↑↗		↗	↗		↗↗	↗	
Volume (vph)	340	146	307	468	337	25	326	134	58	73	469	321
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		0.97	1.00	
Frbp, ped/bikes	1.00	0.90		1.00	0.99		1.00	0.98		1.00	0.97	
Flpb, ped/bikes	0.96	1.00		0.95	1.00		1.00	1.00		0.93	1.00	
Frt	1.00	0.90		1.00	0.99		1.00	0.95		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1702	2724		1675	3308		1770	1564		3181	1525	
Flt Permitted	0.50	1.00		0.42	1.00		0.12	1.00		0.62	1.00	
Satd. Flow (perm)	887	2724		741	3308		233	1564		2077	1525	
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)	370	159	334	509	366	27	354	146	63	79	510	349
RTOR Reduction (vph)	0	119	0	0	9	0	0	24	0	0	38	0
Lane Group Flow (vph)	370	374	0	509	384	0	354	185	0	79	821	0
Confl. Peds. (#/hr)	70		70	70		70	70		70	70		70
Confl. Bikes (#/hr)			16			16			16			16
Parking (#/hr)		0			0			0			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		32.0	32.0		32.0	32.0	
Effective Green, g (s)	25.0	25.0		25.0	25.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.38	0.38		0.38	0.38		0.49	0.49		0.49	0.49	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	341	1048		285	1272		115	770		1023	751	
v/s Ratio Prot		0.14			0.12			0.12			0.54	
v/s Ratio Perm	0.42			c0.69			c1.52			0.04		
v/c Ratio	1.09	0.36		1.79	0.30		3.08	0.24		0.08	1.09	
Uniform Delay, d1	20.0	14.3		20.0	13.9		16.5	9.5		8.7	16.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.97	1.04	
Incremental Delay, d2	73.4	0.9		367.5	0.6		957.9	0.7		0.1	55.3	
Delay (s)	93.4	15.2		387.5	14.5		974.4	10.2		8.5	72.5	
Level of Service	F	B		F	B		F	B		A	E	
Approach Delay (s)		48.7			225.0			616.4			67.1	
Approach LOS		D			F			F			E	

Intersection Summary

HCM Average Control Delay	200.5	HCM Level of Service	F
HCM Volume to Capacity ratio	2.52		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	120.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

30: Harrison St & 27th St

1/15/2008



Movement	NBL2	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	SEL	SET	SER	SER2
Lane Configurations		↔↔	↕↔		↔	↕↔			↔↔	↔		↔
Volume (vph)	10	243	1369	62	180	584	53	83	196	333	51	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		4.0	5.0			4.0	5.0		5.0
Lane Util. Factor		0.97	0.95		1.00	0.95			0.97	0.95		0.95
Frbp, ped/bikes		1.00	0.99		1.00	0.94			1.00	0.97		0.88
Flpb, ped/bikes		1.00	1.00		1.00	1.00			1.00	1.00		1.00
Frt		1.00	0.99		1.00	0.97			1.00	0.98		0.85
Flt Protected		0.95	1.00		0.95	1.00			0.95	1.00		1.00
Satd. Flow (prot)		3433	3278		1770	3041			3433	1471		1325
Flt Permitted		0.95	1.00		0.95	1.00			0.95	1.00		1.00
Satd. Flow (perm)		3433	3278		1770	3041			3433	1471		1325
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	264	1488	67	196	635	58	90	213	362	55	20
RTOR Reduction (vph)	0	0	2	0	0	7	0	0	0	0	0	9
Lane Group Flow (vph)	0	275	1553	0	196	776	0	0	213	419	0	9
Confl. Peds. (#/hr)				70	70		70	70	70		70	70
Confl. Bikes (#/hr)				16			16	16			16	16
Parking (#/hr)			5			5				5		
Turn Type	Prot	Prot			Prot				Prot			Perm
Protected Phases	5	5	2		1	6			7	4		
Permitted Phases												4
Actuated Green, G (s)		15.7	69.0		16.0	68.3			13.1	41.0		41.0
Effective Green, g (s)		15.7	69.0		16.0	68.3			13.1	41.0		41.0
Actuated g/C Ratio		0.10	0.46		0.11	0.46			0.09	0.27		0.27
Clearance Time (s)		5.0	5.0		4.0	5.0			4.0	5.0		5.0
Vehicle Extension (s)		2.0	2.0		2.0	2.0			2.0	2.0		2.0
Lane Grp Cap (vph)		359	1508		189	1385			300	402		362
v/s Ratio Prot		0.08	c0.47		c0.11	0.26			0.06	c0.28		
v/s Ratio Perm												0.01
v/c Ratio		0.77	1.03		1.04	0.56			0.71	1.04		0.02
Uniform Delay, d1		65.4	40.5		67.0	29.9			66.6	54.5		39.9
Progression Factor		1.00	1.00		1.00	1.00			1.00	1.00		1.00
Incremental Delay, d2		8.5	31.1		75.5	1.6			6.2	56.3		0.0
Delay (s)		73.9	71.6		142.5	31.5			72.8	110.8		39.9
Level of Service		E	E		F	C			E	F		D
Approach Delay (s)			72.0			53.7				96.4		
Approach LOS			E			D				F		

Intersection Summary		
HCM Average Control Delay	70.7	HCM Level of Service E
HCM Volume to Capacity ratio	0.99	
Actuated Cycle Length (s)	150.0	Sum of lost time (s) 13.0
Intersection Capacity Utilization	97.8%	ICU Level of Service F
Analysis Period (min)	15	

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

30: Harrison St & 27th St

1/15/2008



Movement	NWL2	NWL	NWT	NWR
Lane Configurations				
Volume (vph)	42	19	137	188
Ideal Flow (vphpl)	1900	1900	1900	1900
Total Lost time (s)		4.0	5.0	5.0
Lane Util. Factor		1.00	1.00	1.00
Frbp, ped/bikes		1.00	1.00	0.88
Flpb, ped/bikes		1.00	1.00	1.00
Frt		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00
Satd. Flow (prot)		1770	1863	1391
Flt Permitted		0.95	1.00	1.00
Satd. Flow (perm)		1770	1863	1391
Peak-hour factor, PHF	0.92	0.92	0.92	0.92
Adj. Flow (vph)	46	21	149	204
RTOR Reduction (vph)	0	0	0	156
Lane Group Flow (vph)	0	67	149	48
Confl. Peds. (#/hr)	70	70		70
Confl. Bikes (#/hr)				16
Parking (#/hr)				
Turn Type	Prot	Prot		Perm
Protected Phases	3	3	8	
Permitted Phases				8
Actuated Green, G (s)		6.0	33.9	33.9
Effective Green, g (s)		6.0	33.9	33.9
Actuated g/C Ratio		0.04	0.23	0.23
Clearance Time (s)		4.0	5.0	5.0
Vehicle Extension (s)		2.0	2.0	2.0
Lane Grp Cap (vph)		71	421	314
v/s Ratio Prot		c0.04	0.08	
v/s Ratio Perm				0.03
v/c Ratio		0.94	0.35	0.15
Uniform Delay, d1		71.8	48.8	46.6
Progression Factor		1.00	1.00	1.00
Incremental Delay, d2		86.1	0.2	0.1
Delay (s)		158.0	49.0	46.6
Level of Service		F	D	D
Approach Delay (s)			65.2	
Approach LOS			E	
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

31: Grand Av & Harrison St

1/15/2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↑↔		↔↔	↑↔			↑↑↑	↔		↔↔↔	
Volume (vph)	383	723	163	269	519	52	0	1428	793	0	575	218
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor	0.97	0.95		0.97	0.95			0.91	1.00		0.91	
Frbp, ped/bikes	1.00	0.98		1.00	0.99			1.00	0.94		0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	0.97		1.00	0.99			1.00	0.85		0.96	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)	3433	3321		3400	3432			5036	1475		4520	
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (perm)	3433	3321		3400	3432			5036	1475		4520	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.92	0.92	0.92
Adj. Flow (vph)	416	786	177	292	564	57	0	1535	853	0	625	237
RTOR Reduction (vph)	0	21	0	0	6	0	0	0	386	0	72	0
Lane Group Flow (vph)	416	942	0	292	615	0	0	1535	467	0	790	0
Confl. Peds. (#/hr)	68		84	84		68			41			76
Confl. Bikes (#/hr)			13			10			5			1
Heavy Vehicles (%)	2%	4%	2%	3%	3%	2%	2%	3%	3%	2%	3%	2%
Parking (#/hr)												5
Turn Type	Prot			Prot					Perm		Perm	
Protected Phases	1	6		5	2			4				4
Permitted Phases									4		4	
Actuated Green, G (s)	14.1	28.8		24.3	40.0			26.0	26.0		26.0	
Effective Green, g (s)	14.1	28.8		24.3	40.0			26.0	26.0		26.0	
Actuated g/C Ratio	0.15	0.31		0.26	0.43			0.28	0.28		0.28	
Clearance Time (s)	4.0	5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)	514	1016		878	1459			1391	408		1249	
v/s Ratio Prot	0.12	c0.28		0.09	c0.18			0.30			0.17	
v/s Ratio Perm									c0.32			
v/c Ratio	0.81	0.93		0.33	0.42			1.10	1.15		0.63	
Uniform Delay, d1	38.7	31.6		28.3	18.9			34.0	34.0		29.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	8.6	13.7		0.1	0.9			57.7	90.5		0.8	
Delay (s)	47.3	45.3		28.4	19.8			91.8	124.5		30.6	
Level of Service	D	D		C	B			F	F		C	
Approach Delay (s)		45.9			22.6			103.5			30.6	
Approach LOS		D			C			F			C	

Intersection Summary

HCM Average Control Delay	64.5	HCM Level of Service	E
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	94.1	Sum of lost time (s)	10.0
Intersection Capacity Utilization	112.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

6: MacArthur Blvd & Lakeshore Av

1/15/2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↵	↑↑↑						↑↑		↵	↵↑	
Volume (vph)	220	589	140	0	0	0	0	375	323	739	516	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0						4.0		3.5	3.5	
Lane Util. Factor	1.00	0.91						0.95		0.91	0.91	
Frbp, ped/bikes	1.00	0.99						0.98		1.00	1.00	
Flpb, ped/bikes	1.00	1.00						1.00		1.00	1.00	
Frt	1.00	0.97						0.93		1.00	1.00	
Flt Protected	0.95	1.00						1.00		0.95	0.98	
Satd. Flow (prot)	1763	4874						3012		1610	3326	
Flt Permitted	0.95	1.00						1.00		0.95	0.98	
Satd. Flow (perm)	1763	4874						3012		1610	3326	
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)	239	640	152	0	0	0	0	408	351	803	561	0
RTOR Reduction (vph)	0	38	0	0	0	0	0	25	0	0	0	0
Lane Group Flow (vph)	239	754	0	0	0	0	0	734	0	450	914	0
Confl. Peds. (#/hr)	3		46							21	21	
Confl. Bikes (#/hr)			2							7		
Parking (#/hr)					0			5				
Turn Type	Perm									Split		
Protected Phases		4						2		1	1	
Permitted Phases	4											
Actuated Green, G (s)	26.0	26.0						31.0		36.5	36.5	
Effective Green, g (s)	26.0	26.0						31.0		36.5	36.5	
Actuated g/C Ratio	0.25	0.25						0.29		0.34	0.34	
Clearance Time (s)	5.0	5.0						4.0		3.5	3.5	
Lane Grp Cap (vph)	432	1196						881		554	1145	
v/s Ratio Prot		c0.15						c0.24		c0.28	0.27	
v/s Ratio Perm	0.14											
v/c Ratio	0.55	0.63						0.83		0.81	0.80	
Uniform Delay, d1	34.9	35.7						35.1		31.6	31.4	
Progression Factor	0.61	0.59						1.00		1.00	1.00	
Incremental Delay, d2	3.4	1.7						9.1		12.3	5.8	
Delay (s)	24.6	22.7						44.1		43.9	37.3	
Level of Service	C	C						D		D	D	
Approach Delay (s)		23.1			0.0			44.1			39.5	
Approach LOS		C			A			D			D	
Intersection Summary												
HCM Average Control Delay			35.3								HCM Level of Service	D
HCM Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			106.0							Sum of lost time (s)	12.5	
Intersection Capacity Utilization			78.0%								ICU Level of Service	D
Analysis Period (min)			15									
c	Critical Lane Group											

HCM Signalized Intersection Capacity Analysis

29: Embarcadero & 5th Av

1/15/2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↗	↕		↖	↕		↗	↕		↖	↕	↗
Volume (vph)	174	91	196	342	119	36	347	429	10	119	118	251
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		0.97	1.00	
Frbp, ped/bikes	1.00	0.90		1.00	0.98		1.00	1.00		1.00	0.95	
Flpb, ped/bikes	0.95	1.00		0.93	1.00		0.97	1.00		0.96	1.00	
Frt	1.00	0.90		1.00	0.97		1.00	1.00		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1674	2720		1639	3180		1717	1668		3289	1426	
Flt Permitted	0.65	1.00		0.56	1.00		0.43	1.00		0.36	1.00	
Satd. Flow (perm)	1138	2720		970	3180		774	1668		1246	1426	
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)	189	99	213	372	129	39	377	466	11	129	128	273
RTOR Reduction (vph)	0	128	0	0	23	0	0	1	0	0	118	0
Lane Group Flow (vph)	189	184	0	372	145	0	377	476	0	129	283	0
Confl. Peds. (#/hr)	70		70	70		70	70		70	70		70
Confl. Bikes (#/hr)			16			16			16			16
Parking (#/hr)		0			0			0			0	
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	26.0	26.0		26.0	26.0		31.0	31.0		31.0	31.0	
Effective Green, g (s)	26.0	26.0		26.0	26.0		31.0	31.0		31.0	31.0	
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.48	0.48		0.48	0.48	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	455	1088		388	1272		369	796		594	680	
v/s Ratio Prot		0.07			0.05			0.29			0.20	
v/s Ratio Perm	0.17			0.38			0.49			0.10		
v/c Ratio	0.42	0.17		0.96	0.11		1.02	0.60		0.22	0.42	
Uniform Delay, d1	14.0	12.5		19.0	12.3		17.0	12.4		9.9	11.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.95	1.12	
Incremental Delay, d2	2.8	0.3		36.4	0.2		52.5	3.3		0.7	1.7	
Delay (s)	16.8	12.9		55.4	12.4		69.5	15.7		10.1	14.1	
Level of Service	B	B		E	B		E	B		B	B	
Approach Delay (s)		14.4			42.0			39.5			13.1	
Approach LOS		B			D			D			B	

Intersection Summary

HCM Average Control Delay	29.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	93.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

30: Harrison St & 27th St

1/15/2008



Movement	NBL2	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	SEL	SET	SER	SER2
Lane Configurations		↔↔	↕↔		↔	↕↔			↔↔	↔		↔
Volume (vph)	12	487	620	47	163	1145	155	90	81	141	32	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		4.0	5.0			4.0	5.0		5.0
Lane Util. Factor		0.97	0.95		1.00	0.95			0.97	0.95		0.95
Frbp, ped/bikes		1.00	0.99		1.00	0.95			1.00	0.95		0.88
Flpb, ped/bikes		1.00	1.00		1.00	1.00			1.00	1.00		1.00
Frt		1.00	0.99		1.00	0.97			1.00	0.97		0.85
Flt Protected		0.95	1.00		0.95	1.00			0.95	1.00		1.00
Satd. Flow (prot)		3433	3254		1770	3068			3433	1433		1322
Flt Permitted		0.95	1.00		0.95	1.00			0.95	1.00		1.00
Satd. Flow (perm)		3433	3254		1770	3068			3433	1433		1322
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)	13	529	674	51	177	1245	168	98	88	153	35	39
RTOR Reduction (vph)	0	0	3	0	0	3	0	0	0	1	0	29
Lane Group Flow (vph)	0	542	722	0	177	1508	0	0	88	191	0	6
Confl. Peds. (#/hr)				70	70		70	70	70		70	70
Confl. Bikes (#/hr)				16			16	16			16	16
Parking (#/hr)			5			5				5		
Turn Type	Prot	Prot			Prot				Prot			Perm
Protected Phases	5	5	2		1	6			7	4		
Permitted Phases												4
Actuated Green, G (s)		22.1	72.3		18.0	67.2			7.3	23.7		23.7
Effective Green, g (s)		22.1	72.3		18.0	67.2			7.3	23.7		23.7
Actuated g/C Ratio		0.16	0.51		0.13	0.47			0.05	0.17		0.17
Clearance Time (s)		5.0	5.0		4.0	5.0			4.0	5.0		5.0
Vehicle Extension (s)		2.0	2.0		2.0	2.0			2.0	2.0		2.0
Lane Grp Cap (vph)		534	1657		224	1452			176	239		221
v/s Ratio Prot		c0.16	0.22		0.10	c0.49			0.03	c0.13		
v/s Ratio Perm												0.00
v/c Ratio		1.01	0.44		0.79	1.04			0.50	0.80		0.03
Uniform Delay, d1		59.9	22.0		60.2	37.4			65.6	56.9		49.5
Progression Factor		1.00	1.00		1.00	1.00			1.00	1.00		1.00
Incremental Delay, d2		42.8	0.8		16.0	34.2			0.8	15.9		0.0
Delay (s)		102.7	22.8		76.2	71.6			66.4	72.7		49.5
Level of Service		F	C		E	E			E	E		D
Approach Delay (s)			57.0			72.1				68.4		
Approach LOS			E			E				E		

Intersection Summary

HCM Average Control Delay	67.1	HCM Level of Service	E
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	142.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	101.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

30: Harrison St & 27th St

1/15/2008



Movement	NWL2	NWL	NWT	NWR
Lane Configurations				
Volume (vph)	84	31	200	177
Ideal Flow (vphpl)	1900	1900	1900	1900
Total Lost time (s)		4.0	5.0	5.0
Lane Util. Factor		1.00	1.00	1.00
Frbp, ped/bikes		1.00	1.00	0.88
Flpb, ped/bikes		1.00	1.00	1.00
Frt		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00
Satd. Flow (prot)		1770	1863	1394
Flt Permitted		0.95	1.00	1.00
Satd. Flow (perm)		1770	1863	1394
Peak-hour factor, PHF	0.92	0.92	0.92	0.92
Adj. Flow (vph)	91	34	217	192
RTOR Reduction (vph)	0	0	0	156
Lane Group Flow (vph)	0	125	217	36
Confl. Peds. (#/hr)	70	70		70
Confl. Bikes (#/hr)				16
Parking (#/hr)				
Turn Type	Prot	Prot		Perm
Protected Phases	3	3	8	
Permitted Phases				8
Actuated Green, G (s)		10.0	26.4	26.4
Effective Green, g (s)		10.0	26.4	26.4
Actuated g/C Ratio		0.07	0.19	0.19
Clearance Time (s)		4.0	5.0	5.0
Vehicle Extension (s)		2.0	2.0	2.0
Lane Grp Cap (vph)		125	346	259
v/s Ratio Prot		c0.07	c0.12	
v/s Ratio Perm				0.03
v/c Ratio		1.00	0.63	0.14
Uniform Delay, d1		66.0	53.3	48.3
Progression Factor		1.00	1.00	1.00
Incremental Delay, d2		80.5	2.6	0.1
Delay (s)		146.5	55.8	48.4
Level of Service		F	E	D
Approach Delay (s)			74.4	
Approach LOS			E	
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

31: Grand Av & Harrison St

1/15/2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↕↔		↔↔	↕↔			↕↕↕	↕		↕↕↔	
Volume (vph)	116	257	100	618	834	116	265	1023	347	48	1183	294
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor	0.97	0.95		0.97	0.95			0.91	1.00		0.91	
Frbp, ped/bikes	1.00	0.97		1.00	0.98			1.00	0.93		0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	0.96		1.00	0.98			1.00	0.85		0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)	3433	3246		3400	3384			4989	1456		4594	
Flt Permitted	0.95	1.00		0.95	1.00			0.67	1.00		0.77	
Satd. Flow (perm)	3433	3246		3400	3384			3387	1456		3533	
Peak-hour factor, PHF	0.98	0.98	0.98	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	118	262	102	672	907	126	288	1112	377	52	1286	320
RTOR Reduction (vph)	0	5	0	0	12	0	0	0	222	0	42	0
Lane Group Flow (vph)	118	359	0	672	1021	0	0	1400	155	0	1616	0
Confl. Peds. (#/hr)	124		81	81		124	84		53	53		84
Confl. Bikes (#/hr)			7			12			5			4
Heavy Vehicles (%)	2%	4%	2%	3%	3%	2%	2%	3%	3%	2%	3%	2%
Parking (#/hr)												5
Turn Type	Prot			Prot			Perm		Perm	Perm		
Protected Phases	1	6		5	2			4				4
Permitted Phases							4		4	4		
Actuated Green, G (s)	5.0	16.5		24.5	37.0			39.0	39.0		39.0	
Effective Green, g (s)	5.0	16.5		24.5	37.0			39.0	39.0		39.0	
Actuated g/C Ratio	0.05	0.17		0.26	0.39			0.41	0.41		0.41	
Clearance Time (s)	4.0	5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)	181	564		877	1318			1390	598		1450	
v/s Ratio Prot	0.03	c0.11		0.20	c0.30							
v/s Ratio Perm								0.41	0.11		c0.46	
v/c Ratio	0.65	0.64		0.77	0.77			3.65dl	0.26		1.11	
Uniform Delay, d1	44.1	36.5		32.6	25.4			28.0	18.5		28.0	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	6.3	1.7		3.6	4.5			25.9	0.1		61.5	
Delay (s)	50.4	38.2		36.2	29.9			53.9	18.6		89.5	
Level of Service	D	D		D	C			D	B		F	
Approach Delay (s)		41.2			32.4			46.4			89.5	
Approach LOS		D			C			D			F	

Intersection Summary

HCM Average Control Delay	54.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	112.7%	ICU Level of Service	H
Analysis Period (min)	15		

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

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: MacArthur Blvd & Lakeshore Av

1/15/2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↗	↑↑↑						↑↑		↗	↖↑	
Volume (vph)	298	1944	168	0	0	0	0	353	880	575	307	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0						4.0		4.0	4.0	
Lane Util. Factor	1.00	0.91						0.95		0.91	0.91	
Frbp, ped/bikes	1.00	1.00						0.91		1.00	1.00	
Flpb, ped/bikes	0.93	1.00						1.00		1.00	1.00	
Frt	1.00	0.99						0.89		1.00	1.00	
Flt Protected	0.95	1.00						1.00		0.95	0.98	
Satd. Flow (prot)	1641	5005						2706		1610	3310	
Flt Permitted	0.95	1.00						1.00		0.95	0.98	
Satd. Flow (perm)	1641	5005						2706		1610	3310	
Peak-hour factor, PHF	0.94	0.94	0.94	0.92	0.92	0.92	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	317	2068	179	0	0	0	0	372	926	625	334	0
RTOR Reduction (vph)	0	11	0	0	0	0	0	4	0	0	0	0
Lane Group Flow (vph)	317	2236	0	0	0	0	0	1294	0	312	647	0
Confl. Peds. (#/hr)	70		33						70	70		
Confl. Bikes (#/hr)			4						12			
Parking (#/hr)					0			5				
Turn Type	Perm									Split		
Protected Phases		4						2		1	1	
Permitted Phases	4											
Actuated Green, G (s)	30.0	30.0						29.0		18.0	18.0	
Effective Green, g (s)	30.0	30.0						29.0		18.0	18.0	
Actuated g/C Ratio	0.33	0.33						0.32		0.20	0.20	
Clearance Time (s)	5.0	5.0						4.0		4.0	4.0	
Lane Grp Cap (vph)	547	1668						872		322	662	
v/s Ratio Prot		c0.45						c0.48		0.19	c0.20	
v/s Ratio Perm	0.19											
v/c Ratio	0.58	1.34						2.21dr		0.97	0.98	
Uniform Delay, d1	24.8	30.0						30.5		35.7	35.8	
Progression Factor	0.78	0.80						1.00		1.00	1.00	
Incremental Delay, d2	1.2	154.2						223.9		42.9	29.9	
Delay (s)	20.6	178.3						254.4		78.6	65.7	
Level of Service	C	F						F		E	E	
Approach Delay (s)		158.8			0.0			254.4			69.9	
Approach LOS		F			A			F			E	

Intersection Summary

HCM Average Control Delay	166.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.31		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	110.9%	ICU Level of Service	H
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

29: Embarcadero & 5th Av

1/15/2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↗	↗↘		↗	↗↘		↗	↘		↗↘	↘	
Volume (vph)	340	146	307	468	337	25	326	134	58	73	469	321
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		0.97	1.00	
Frbp, ped/bikes	1.00	0.90		1.00	0.99		1.00	0.98		1.00	0.97	
Flpb, ped/bikes	0.96	1.00		0.95	1.00		1.00	1.00		0.93	1.00	
Frt	1.00	0.90		1.00	0.99		1.00	0.95		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1702	2724		1675	3308		1770	1564		3181	1525	
Flt Permitted	0.50	1.00		0.42	1.00		0.12	1.00		0.62	1.00	
Satd. Flow (perm)	887	2724		741	3308		233	1564		2077	1525	
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)	370	159	334	509	366	27	354	146	63	79	510	349
RTOR Reduction (vph)	0	119	0	0	9	0	0	24	0	0	38	0
Lane Group Flow (vph)	370	374	0	509	384	0	354	185	0	79	821	0
Confl. Peds. (#/hr)	70		70	70		70	70		70	70		70
Confl. Bikes (#/hr)			16			16			16			16
Parking (#/hr)		0			0			0			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		32.0	32.0		32.0	32.0	
Effective Green, g (s)	25.0	25.0		25.0	25.0		32.0	32.0		32.0	32.0	
Actuated g/C Ratio	0.38	0.38		0.38	0.38		0.49	0.49		0.49	0.49	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	341	1048		285	1272		115	770		1023	751	
v/s Ratio Prot		0.14			0.12			0.12			0.54	
v/s Ratio Perm	0.42			c0.69			c1.52			0.04		
v/c Ratio	1.09	0.36		1.79	0.30		3.08	0.24		0.08	1.09	
Uniform Delay, d1	20.0	14.3		20.0	13.9		16.5	9.5		8.7	16.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.97	1.04	
Incremental Delay, d2	73.4	0.9		367.5	0.6		957.9	0.7		0.1	55.3	
Delay (s)	93.4	15.2		387.5	14.5		974.4	10.2		8.5	72.5	
Level of Service	F	B		F	B		F	B		A	E	
Approach Delay (s)		48.7			225.0			616.4			67.1	
Approach LOS		D			F			F			E	

Intersection Summary

HCM Average Control Delay	200.5	HCM Level of Service	F
HCM Volume to Capacity ratio	2.52		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	120.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

30: Harrison St & 27th St

1/15/2008



Movement	NBL2	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	SEL	SET	SER	SER2
Lane Configurations		↔↔	↕↔		↔	↕↔			↔↔	↔		↔
Volume (vph)	10	243	1369	62	180	584	53	83	196	333	51	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		4.0	5.0			4.0	5.0		5.0
Lane Util. Factor		0.97	0.95		1.00	0.95			0.97	0.95		0.95
Frbp, ped/bikes		1.00	0.99		1.00	0.94			1.00	0.97		0.88
Flpb, ped/bikes		1.00	1.00		1.00	1.00			1.00	1.00		1.00
Frt		1.00	0.99		1.00	0.97			1.00	0.98		0.85
Flt Protected		0.95	1.00		0.95	1.00			0.95	1.00		1.00
Satd. Flow (prot)		3433	3278		1770	3041			3433	1471		1325
Flt Permitted		0.95	1.00		0.95	1.00			0.95	1.00		1.00
Satd. Flow (perm)		3433	3278		1770	3041			3433	1471		1325
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	264	1488	67	196	635	58	90	213	362	55	20
RTOR Reduction (vph)	0	0	2	0	0	7	0	0	0	0	0	9
Lane Group Flow (vph)	0	275	1553	0	196	776	0	0	213	419	0	9
Confl. Peds. (#/hr)				70	70		70	70	70		70	70
Confl. Bikes (#/hr)				16			16	16			16	16
Parking (#/hr)			5			5				5		
Turn Type	Prot	Prot			Prot				Prot			Perm
Protected Phases	5	5	2		1	6			7	4		
Permitted Phases												4
Actuated Green, G (s)		15.7	69.0		16.0	68.3			13.1	41.0		41.0
Effective Green, g (s)		15.7	69.0		16.0	68.3			13.1	41.0		41.0
Actuated g/C Ratio		0.10	0.46		0.11	0.46			0.09	0.27		0.27
Clearance Time (s)		5.0	5.0		4.0	5.0			4.0	5.0		5.0
Vehicle Extension (s)		2.0	2.0		2.0	2.0			2.0	2.0		2.0
Lane Grp Cap (vph)		359	1508		189	1385			300	402		362
v/s Ratio Prot		0.08	c0.47		c0.11	0.26			0.06	c0.28		
v/s Ratio Perm												0.01
v/c Ratio		0.77	1.03		1.04	0.56			0.71	1.04		0.02
Uniform Delay, d1		65.4	40.5		67.0	29.9			66.6	54.5		39.9
Progression Factor		1.00	1.00		1.00	1.00			1.00	1.00		1.00
Incremental Delay, d2		8.5	31.1		75.5	1.6			6.2	56.3		0.0
Delay (s)		73.9	71.6		142.5	31.5			72.8	110.8		39.9
Level of Service		E	E		F	C			E	F		D
Approach Delay (s)			72.0			53.7				96.4		
Approach LOS			E			D				F		
Intersection Summary												
HCM Average Control Delay			70.7									HCM Level of Service E
HCM Volume to Capacity ratio			0.99									
Actuated Cycle Length (s)			150.0									Sum of lost time (s) 13.0
Intersection Capacity Utilization			97.8%									ICU Level of Service F
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

30: Harrison St & 27th St

1/15/2008



Movement	NWL2	NWL	NWT	NWR
Lane Configurations				
Volume (vph)	42	19	137	188
Ideal Flow (vphpl)	1900	1900	1900	1900
Total Lost time (s)		4.0	5.0	5.0
Lane Util. Factor		1.00	1.00	1.00
Frbp, ped/bikes		1.00	1.00	0.88
Flpb, ped/bikes		1.00	1.00	1.00
Frt		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00
Satd. Flow (prot)		1770	1863	1391
Flt Permitted		0.95	1.00	1.00
Satd. Flow (perm)		1770	1863	1391
Peak-hour factor, PHF	0.92	0.92	0.92	0.92
Adj. Flow (vph)	46	21	149	204
RTOR Reduction (vph)	0	0	0	156
Lane Group Flow (vph)	0	67	149	48
Confl. Peds. (#/hr)	70	70		70
Confl. Bikes (#/hr)				16
Parking (#/hr)				
Turn Type	Prot	Prot		Perm
Protected Phases	3	3	8	
Permitted Phases				8
Actuated Green, G (s)		6.0	33.9	33.9
Effective Green, g (s)		6.0	33.9	33.9
Actuated g/C Ratio		0.04	0.23	0.23
Clearance Time (s)		4.0	5.0	5.0
Vehicle Extension (s)		2.0	2.0	2.0
Lane Grp Cap (vph)		71	421	314
v/s Ratio Prot		c0.04	0.08	
v/s Ratio Perm				0.03
v/c Ratio		0.94	0.35	0.15
Uniform Delay, d1		71.8	48.8	46.6
Progression Factor		1.00	1.00	1.00
Incremental Delay, d2		86.1	0.2	0.1
Delay (s)		158.0	49.0	46.6
Level of Service		F	D	D
Approach Delay (s)			65.2	
Approach LOS			E	
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

31: Grand Av & Harrison St

1/15/2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↑↔		↔↔	↑↔			↑↑↑	↔		↔↔↔	
Volume (vph)	383	723	163	269	519	52	0	1428	793	0	575	218
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor	0.97	0.95		0.97	0.95			0.91	1.00		0.91	
Frbp, ped/bikes	1.00	0.98		1.00	0.99			1.00	0.94		0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	0.97		1.00	0.99			1.00	0.85		0.96	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)	3433	3321		3400	3432			5036	1475		4520	
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (perm)	3433	3321		3400	3432			5036	1475		4520	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.92	0.92	0.92
Adj. Flow (vph)	416	786	177	292	564	57	0	1535	853	0	625	237
RTOR Reduction (vph)	0	21	0	0	6	0	0	0	386	0	72	0
Lane Group Flow (vph)	416	942	0	292	615	0	0	1535	467	0	790	0
Confl. Peds. (#/hr)	68		84	84		68			41			76
Confl. Bikes (#/hr)			13			10			5			1
Heavy Vehicles (%)	2%	4%	2%	3%	3%	2%	2%	3%	3%	2%	3%	2%
Parking (#/hr)												5
Turn Type	Prot			Prot					Perm		Perm	
Protected Phases	1	6		5	2			4				4
Permitted Phases									4		4	
Actuated Green, G (s)	14.1	28.8		24.3	40.0			26.0	26.0		26.0	
Effective Green, g (s)	14.1	28.8		24.3	40.0			26.0	26.0		26.0	
Actuated g/C Ratio	0.15	0.31		0.26	0.43			0.28	0.28		0.28	
Clearance Time (s)	4.0	5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)	514	1016		878	1459			1391	408		1249	
v/s Ratio Prot	0.12	c0.28		0.09	c0.18			0.30			0.17	
v/s Ratio Perm									c0.32			
v/c Ratio	0.81	0.93		0.33	0.42			1.10	1.15		0.63	
Uniform Delay, d1	38.7	31.6		28.3	18.9			34.0	34.0		29.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	8.6	13.7		0.1	0.9			57.7	90.5		0.8	
Delay (s)	47.3	45.3		28.4	19.8			91.8	124.5		30.6	
Level of Service	D	D		C	B			F	F		C	
Approach Delay (s)		45.9			22.6			103.5			30.6	
Approach LOS		D			C			F			C	

Intersection Summary

HCM Average Control Delay	64.5	HCM Level of Service	E
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	94.1	Sum of lost time (s)	10.0
Intersection Capacity Utilization	112.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			