

## **APPENDIX B**

### **Synchro 6.0 Analysis Reports: Base Year (2004) AM and PM Peak Hour Intersection Capacity Analyses**

1. Washington Street at Norman/New Derby Street
2. Washington Street at Canal Street/Mill Street
3. Margin Street at Mill Street
4. Essex Street at North/Summer Street
5. Derby Street at Congress Street/Hawthorne Boulevard
6. Essex Street at Hawthorne Boulevard/Washington Square West
7. Lafayette Street at Washington Street
8. Lafayette Street at Harbor Street
9. Lafayette Street at Derby Street
10. Bridge Street at Washington Street
11. Washington Street at Essex Street

Washington St @ Norman/New Derby St  
AM Peak Hour

Existing Conditions



Lane Group	EBL	EBT	EBR	WBLT	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗		↕		↖	↑↑	↗	↖	↑	↗
Volume (vph)	32	282	326	49	232	88	224	612	172	132	229	169
Confl. Peds. (#/hr)	10		18	18		10	12		8	8		12
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												40
Mid-Block Traffic (%)		0%			0%			0%			0%	
Turn Type	Perm		Perm	pm+pt			Prot		Perm	Prot		Perm
Protected Phases		2		1	6		3	8		7	4	
Permitted Phases	2		2	6					8			4
Detector Phases	2	2	2	1	6		3	8	8	7	4	4
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	21.0	9.0	21.0		9.5	21.0	21.0	9.0	21.0	21.0
Total Split (s)	35.0	35.0	35.0	20.0	55.0	0.0	35.0	44.0	44.0	24.0	33.0	33.0
Total Split (%)	23.3%	23.3%	23.3%	13.3%	36.7%	0.0%	23.3%	29.3%	29.3%	16.0%	22.0%	22.0%
Yellow Time (s)	5.0	5.0	5.0	3.0	5.0		4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	None	None	None	None	None
Act Effct Green (s)	26.9	26.9	26.9		26.9		21.1	30.8	30.8	13.9	19.3	19.3
Actuated g/C Ratio	0.30	0.30	0.30		0.30		0.24	0.34	0.34	0.15	0.22	0.22
v/c Ratio	0.13	0.60	0.53		0.64		0.70	0.59	0.31	0.58	0.68	0.51
Control Delay	32.7	35.2	6.3		33.7		42.4	32.2	6.7	48.1	42.3	10.3
Queue Delay	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.7	35.2	6.3		33.7		42.4	32.2	6.7	48.1	42.3	10.3
LOS	C	D	A		C		D	C	A	D	D	B
Approach Delay		20.3			33.7			30.1			33.5	
Approach LOS		C			C			C			C	

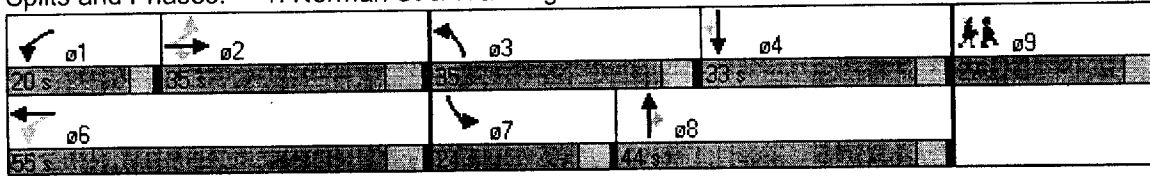
Intersection Summary

Cycle Length: 150  
 Actuated Cycle Length: 89.3  
 Natural Cycle: 100  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.70  
 Intersection Signal Delay: 28.9  
 Intersection Capacity Utilization 71.0%  
 Analysis Period (min) 15  
 Intersection LOS: C  
 ICU Level of Service C

Washington St @ Norman/New Derby St  
AM Peak Hour

Existing Conditions

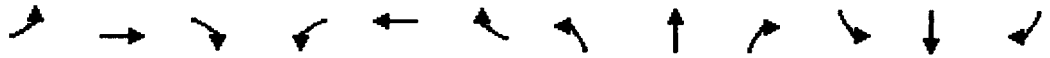
Splits and Phases: 1: Norman St & Washington St



<b>Lane Group</b>		09
<b>Lane Configurations</b>		
Volume (vph)		
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Peak Hour Factor		
Growth Factor		
Heavy Vehicles (%)		
Bus Blockages (#/hr)		
Parking (#/hr)		
Mid-Block Traffic (%)		
Turn Type		
Protected Phases	9	
Permitted Phases		
Detector Phases		
Minimum Initial (s)	4.0	
Minimum Split (s)	27.0	
Total Split (s)	27.0	
Total Split (%)	18%	
Yellow Time (s)	4.0	
All-Red Time (s)	1.0	
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
<b>Intersection Summary</b>		

Washington St. @ Norman/New Derby St.  
PM Peak Hour

Existing Conditions



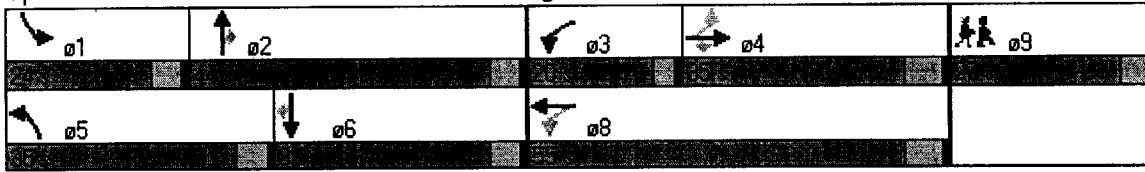
Lane	1	2	3	4	5	6	7	8	9	10	11	12
Lane Configurations	↘	↑	↗	↔	↔	↔	↗	↗	↗	↘	↑	↗
Volume (vph)	39	237	436	59	335	135	242	503	208	136	260	158
Confl. Peds. (#/hr)	25		15	15		25	15		10	10		15
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												40
Mid-Block Traffic (%)		0%			0%			0%			0%	
Turn Type	Perm		Perm pm+pt				Prot		Perm	Prot		Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4		4	8					2			6
Detector Phases	4	4	4	3	8		5	2	2	1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	10.0	22.5		10.0	21.0	21.0	10.0	21.0	21.0
Total Split (s)	35.0	35.0	35.0	20.0	55.0	0.0	35.0	44.0	44.0	24.0	33.0	33.0
Total Split (%)	23.3%	23.3%	23.3%	13.3%	36.7%	0.0%	23.3%	29.3%	29.3%	16.0%	22.0%	22.0%
Yellow Time (s)	5.0	5.0	5.0	3.0	5.0		4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	None	None	None	None	None
Act Effct Green (s)	33.0	33.0	33.0		33.0		23.4	35.2	35.2	14.5	21.8	21.8
Actuated g/C Ratio	0.33	0.33	0.33		0.33		0.23	0.35	0.35	0.14	0.22	0.22
v/c Ratio	0.17	0.45	0.60		0.80		0.75	0.47	0.35	0.63	0.74	0.49
Control Delay	32.2	32.6	6.1		36.8		48.4	34.5	6.8	54.5	48.3	11.1
Queue Delay	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.2	32.6	6.2		36.8		48.4	34.5	6.8	54.5	48.3	11.1
LOS	C	C	A		D		D	C	A	D	D	B
Approach Delay		16.4			36.8			32.0				39.2
Approach LOS		B			D			C				D

Cycle Length: 150  
 Actuated Cycle Length: 100.2  
 Natural Cycle: 100  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.80  
 Intersection Signal Delay: 30.3  
 Intersection LOS: C  
 Intersection Capacity Utilization 76.5%  
 ICU Level of Service D  
 Analysis Period (min) 15

Washington St. @ Norman/New Derby St.  
PM Peak Hour

Existing Conditions

Splits and Phases: 1: Norman St & Washington St



Land Configurations

Volume (vph)

Confl. Peds. (#/hr)

Confl. Bikes (#/hr)

Peak Hour Factor

Growth Factor

Heavy Vehicles (%)

Bus Blockages (#/hr)

Parking (#/hr)

Mid-Block Traffic (%)

Turn Type

Protected Phases 9

Permitted Phases

Detector Phases

Minimum Initial (s) 4.0

Minimum Split (s) 27.0

Total Split (s) 27.0

Total Split (%) 18%

Yellow Time (s) 4.0

All-Red Time (s) 1.0

Lead/Lag

Lead-Lag Optimize?

Recall Mode None

Act Effct Green (s)

Actuated g/C Ratio

v/c Ratio

Control Delay

Queue Delay

Total Delay

LOS

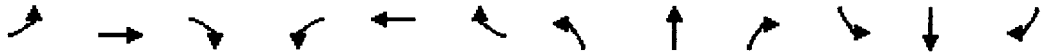
Approach Delay

Approach LOS

Mid-Block

Washington St @ Canal/Mill St  
AM Peak Hour

Existing Conditions



Lane Group	EB	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗		↖	↗		↕		↖	↑	↗
Volume (vph)	158	252	230	12	188	334	198	546	42	208	362	34
Confl. Peds. (#/hr)	5		12	12		5	4		6	6		4
Confl. Bikes (#/hr)						2						1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	3%	3%	3%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)						0		0	0			
Mid-Block Traffic (%)		0%			0%			0%			0%	
Turn Type	pm+pt		Perm	Perm		Perm	Perm			pm+pt		Perm
Protected Phases	7	4			8			2		1	6	
Permitted Phases	4		4	8		8	2			6		6
Detector Phases	7	4	4	8	8	8	2	2		1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	8.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0		8.0	20.0	20.0
Total Split (s)	16.0	50.0	50.0	34.0	34.0	34.0	55.0	55.0	0.0	20.0	75.0	75.0
Total Split (%)	11.0%	34.5%	34.5%	23.4%	23.4%	23.4%	37.9%	37.9%	0.0%	13.8%	51.7%	51.7%
Yellow Time (s)	3.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0		3.0	4.0	4.0
All-Red Time (s)	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		0.0	1.0	1.0
Lead/Lag	Lead			Lag	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?	Yes			Yes	Yes	Yes	Yes	Yes		Yes		
Recall Mode	None	None	None	None	None	None	None	None		None	None	None
Act Effct Green (s)	37.4	37.4	37.4		22.0	22.0		51.8		70.4	70.4	70.4
Actuated g/C Ratio	0.31	0.31	0.31		0.18	0.18		0.43		0.59	0.59	0.59
v/c Ratio	0.62	0.51	0.41		0.71	0.68		1.00		0.81	0.39	0.04
Control Delay	42.8	37.0	5.8		52.6	9.9		65.0		41.7	16.9	5.2
Queue Delay	0.0	0.0	0.0		0.0	0.0		0.0		0.0	0.5	0.0
Total Delay	42.8	37.0	5.8		52.6	9.9		65.0		41.7	17.3	5.2
LOS	D	D	A		D	A		E		D	B	A
Approach Delay		27.2			25.9			65.0			25.0	
Approach LOS		C			C			E			C	

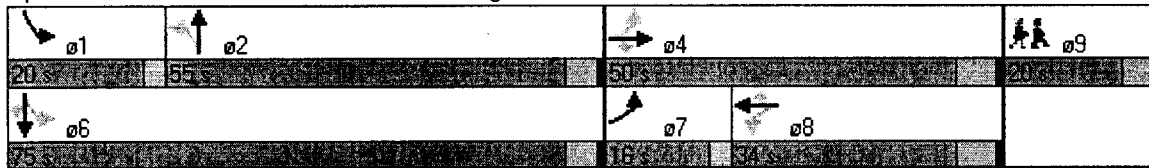
Intersection Summary

Cycle Length: 145  
 Actuated Cycle Length: 119.2  
 Natural Cycle: 120  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 1.00  
 Intersection Signal Delay: 38.0  
 Intersection Capacity Utilization 85.9%  
 Analysis Period (min) 15  
 Intersection LOS: D  
 ICU Level of Service E

Washington St @ Canal/Mill St  
 AM Peak Hour

Existing Conditions

Splits and Phases: 2: Mill St & Washington St



Lane Group	
Lane Configurations	
Volume (vph)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	20.0
Total Split (s)	20.0
Total Split (%)	14%
Yellow Time (s)	4.0
All-Red Time (s)	1.0
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Washington St. @ Canal St./Mill St.  
PM Peak Hour

Existing Conditions

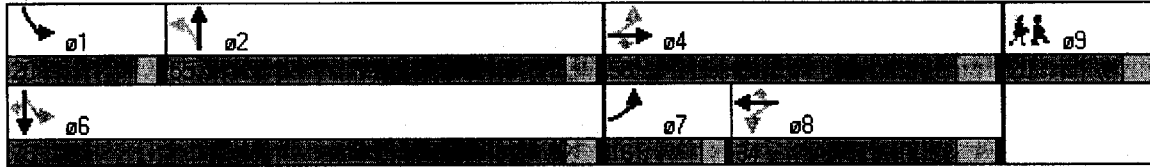


Parameter	1	2	3	4	5	6	7	8	9	10	11	12
Lane Configurations	↖	↑	↗		↖	↗		↕		↖	↑	↗
Volume (vph)	164	219	382	11	185	306	168	526	45	228	465	72
Confl. Peds. (#/hr)	10		15	15		10	7		7	7		7
Confl. Bikes (#/hr)						2						1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)						0		0	0			
Mid-Block Traffic (%)		0%			0%			0%			0%	
Turn Type	pm+pt		Perm	Perm		Perm	Perm			pm+pt		Perm
Protected Phases	7	4				8		2		1	6	
Permitted Phases	4		4	8		8	2			6		6
Detector Phases	7	4	4	8	8	8	2	2		1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	8.0	20.0	20.0	20.0	20.0	20.0	21.0	21.0		8.0	21.0	21.0
Total Split (s)	16.0	50.0	50.0	34.0	34.0	34.0	55.0	55.0	0.0	20.0	75.0	75.0
Total Split (%)	11.0%	34.5%	34.5%	23.4%	23.4%	23.4%	37.9%	37.9%	0.0%	13.8%	51.7%	51.7%
Yellow Time (s)	3.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0		3.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lead/Lag	Lead			Lag	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	None		None	None	None
Act Effct Green (s)	38.0	38.0	38.0		22.2	22.2		52.0		71.4	71.4	71.4
Actuated g/C Ratio	0.31	0.31	0.31		0.18	0.18		0.42		0.57	0.57	0.57
v/c Ratio	0.63	0.45	0.57		0.71	0.66		1.00		0.81	0.51	0.09
Control Delay	45.9	38.1	6.3		55.4	10.2		69.9		41.6	21.6	4.4
Queue Delay	0.0	0.0	0.0		0.0	0.0		0.0		0.0	0.9	0.0
Total Delay	45.9	38.1	6.3		55.4	10.2		69.9		41.6	22.5	4.4
LOS	D	D	A		E	B		E		D	C	A
Approach Delay		23.9			27.9			69.9			26.5	
Approach LOS		C			C			E			C	

Cycle Length: 145  
 Actuated Cycle Length: 124.4  
 Natural Cycle: 120  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 1.00  
 Intersection Signal Delay: 37.6  
 Intersection LOS: D  
 Intersection Capacity Utilization 88.8%  
 ICU Level of Service E  
 Analysis Period (min) 15



Splits and Phases: 2: Mill St & Washington St



Lamp Configurations

Volume (vph)

Confl. Peds. (#/hr)

Confl. Bikes (#/hr)

Peak Hour Factor

Growth Factor

Heavy Vehicles (%)

Bus Blockages (#/hr)

Parking (#/hr)

Mid-Block Traffic (%)

Turn Type

Protected Phases 9

Permitted Phases

Detector Phases

Minimum Initial (s) 4.0

Minimum Split (s) 20.0

Total Split (s) 20.0

Total Split (%) 14%

Yellow Time (s) 4.0

All-Red Time (s) 1.0

Lead/Lag

Lead-Lag Optimize?

Recall Mode None

Act Effct Green (s)

Actuated g/C Ratio

v/c Ratio

Control Delay

Queue Delay

Total Delay

LOS

Approach Delay

Approach LOS

Intersection Summary

Margin St. @ Mill St.  
AM Peak Hour

Existing Conditions



Lane Configurations	↙	↘	↑	↙	↘	↑
Sign/Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	420	0	0	0	330	306
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Flow Rate (vph)	447	0	0	0	331	326
Pedestrians	3					2
Width (ft)	12.0					12.0
Walking Speed (ft/s)	4.0					4.0
Blockage	0					0
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Platoon signal (ft)						
pX, platoon unblocked						
vC1, stage 1 conf vol	1031	5				
vC2, stage 2 conf vol						
vCu, unblocked vol	1031	5			3	
tC, 2 stage (s)	6.4	6.2				
p0 queue free %	3.5	3.0				
	0	100			78	
Capacity (veh/h)	202	1615			1700	
Volume Total	447	351	0			
Volume Left	447	351	0			
Volume Right	0	0	0			
cSH	202	1615	1700			
Volume to Capacity	2.22	0.22	0.19			
Queue Length 95th (ft)	884	21	0			
Control Delay (s)	600.4	7.8	10.0			
Lane LOS	F	A				
Approach Delay (s)	600.4	4.1				
Approach LOS	F					
Average Delay	241.3					
Intersection Capacity Utilization	76.2%					
ICU Level of Service	D					
Analysis Period (min)	15					



Lane Configurations	↵		↑		↑	
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Volume (veh/h)	425	0	0	0	363	345
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	447	0	0	0	382	363
Pedestrians	3					4
Lane Width (ft)	12.0					12.0
Walking Speed (ft/s)	4.0					4.0
Percent Blockage	0					0
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1130	7			3	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1130	7			3	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	100			76	
cM capacity (veh/h)	172	1669			1622	

Volume Total	447	382	363
Volume Left	447	382	0
Volume Right	0	0	0
cSH	172	1622	1700
Volume to Capacity	2.61	0.24	0.21
Queue Length 95th (ft)	970	23	0
Control Delay (s)	78.0	7.9	0.0
Lane LOS	F	A	
Approach Delay (s)	78.0	4.1	
Approach LOS	F		

Average Delay	295.5		
Intersection Capacity Utilization	84.9%	ICU Level of Service	E
Analysis Period (min)	15		

North/Summer St @ Essex St  
AM Peak Hour

Existing Conditions

Lane Group	EB	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗					↖		↙	↖	
Volume (vph)	238	48	113	0	0	0	0	578	40	198	751	74
Confl. Peds. (#/hr)	20		28	28		20	5		12	12		5
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	2%	2%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)	0	0	0						0			
Mid-Block Traffic (%)		0%			0%			0%			0%	
Turn Type	Perm		Perm							pm+pt		
Protected Phases		4						2		1	6	
Permitted Phases	4		4					2		6		
Detector Phases	4	4	4					2		1	6	
Minimum Initial (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0	20.0					20.0		9.0	20.0	
Total Split (s)	38.0	38.0	38.0	0.0	0.0	0.0	0.0	65.0	0.0	28.0	93.0	0.0
Total Split (%)	25.3%	25.3%	25.3%	0.0%	0.0%	0.0%	0.0%	43.3%	0.0%	18.7%	62.0%	0.0%
Yellow Time (s)	4.0	4.0	4.0					4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0					1.0		1.0	1.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None	None	None					None		None	None	
Act Effct Green (s)		30.4	30.4					53.4		72.8	72.8	
Actuated g/C Ratio		0.26	0.26					0.45		0.62	0.62	
v/c Ratio		0.83	0.35					0.88		0.77	0.87	
Control Delay		56.8	29.4					40.5		34.0	27.6	
Queue Delay		0.0	0.0					0.0		0.0	0.0	
Total Delay		56.8	29.4					40.5		34.0	27.6	
LOS		E	C					D		C	C	
Approach Delay		49.0						40.5			28.8	
Approach LOS		D						D			C	

**Intersection Summary**






Cycle Length: 150  
 Actuated Cycle Length: 117.9  
 Natural Cycle: 100  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.88  
 Intersection Signal Delay: 36.3  
 Intersection Capacity Utilization 82.9%  
 Analysis Period (min) 15

Intersection LOS: D  
 ICU Level of Service E

North/Summer St @ Essex St  
 AM Peak Hour

Existing Conditions

Splits and Phases: 14: Essex St & North St

 01	 02	 04	 09
 06			

Lane Group

Lane Configurations	
Volume (vph)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	19.0
Total Split (s)	19.0
Total Split (%)	13%
Yellow Time (s)	4.0
All-Red Time (s)	1.0
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

North/Summer St. @ Essex St.  
PM Peak Hour

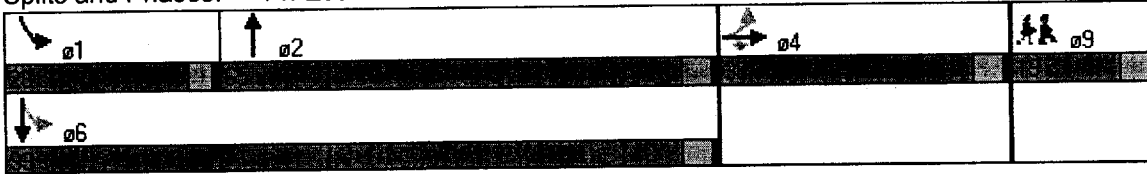
Existing Conditions



Lane Configurations	↖	↗	↖	↗	↖	↗	↖	↗	↖	↗	↖	↗
Volume (vph)	233	66	93	0	0	0	0	602	63	192	786	60
Confl. Peds. (#/hr)	40		24	24			40	6	12	12		6
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)	0	0	0						0			
Mid-Block Traffic (%)		0%			0%			0%				0%
Turn Type	Perm		Perm							pm+pt		
Protected Phases		4						2		1	6	
Permitted Phases	4		4					2		6		
Detector Phases	4	4	4					2		1	6	
Minimum Initial (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0	20.0					20.0		9.0	20.0	
Total Split (s)	38.0	38.0	38.0	0.0	0.0	0.0	0.0	65.0	0.0	28.0	93.0	0.0
Total Split (%)	25.3%	25.3%	25.3%	0.0%	0.0%	0.0%	0.0%	43.3%	0.0%	18.7%	62.0%	0.0%
Yellow Time (s)	4.0	4.0	4.0					4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0					1.0		1.0	1.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None	None	None					None		None	None	
Act Effct Green (s)		34.4	34.4					62.0		82.4	82.4	
Actuated g/C Ratio		0.26	0.26					0.47		0.63	0.63	
v/c Ratio		0.87	0.28					0.89		0.80	0.85	
Control Delay		72.1	29.4					48.4		42.8	29.1	
Queue Delay		0.0	0.0					0.0		0.0	0.0	
Total Delay		72.1	29.4					48.4		42.8	29.1	
LOS		E	C					D		D	C	
Approach Delay		62.0						48.4			31.7	
Approach LOS		E						D			C	

Cycle Length: 150  
 Actuated Cycle Length: 131.6  
 Natural Cycle: 120  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.89  
 Intersection Signal Delay: 42.6  
 Intersection Capacity Utilization 86.2%  
 Analysis Period (min) 15  
 Intersection LOS: D  
 ICU Level of Service E

Splits and Phases: 14: Essex St & North St



Lane Configurations

Volume (vph)

Confl. Peds. (#/hr)

Confl. Bikes (#/hr)

Peak Hour Factor

Growth Factor

Heavy Vehicles (%)

Bus Blockages (#/hr)

Parking (#/hr)

Mid-Block Traffic (%)

Turn Type

Protected Phases 9

Permitted Phases

Detector Phases

Minimum Initial (s) 4.0

Minimum Split (s) 19.0

Total Split (s) 19.0

Total Split (%) 13%

Yellow Time (s) 4.0

All-Red Time (s) 1.0

Lead/Lag

Lead-Lag Optimize?

Recall Mode None

Act Effct Green (s)

Actuated g/C Ratio

v/c Ratio

Control Delay

Queue Delay

Total Delay

LOS

Approach Delay

Approach LOS

Intersection Summary

Derby St @ Congress St/Hawthorne Blvd  
AM Peak Hour

Existing Conditions



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR	
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Sign Control	Stop			Stop			Stop			Stop		
Volume (vph)	398	236	115	78	63	15	40	102	90	12	239	570
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	423	251	122	83	67	16	43	109	96	13	254	606

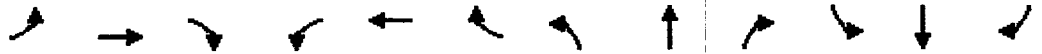
Direction / Lane	EB 2	EB 1	WB 2	WB 1	NB 2	NB 1	SB 1	SB 2
Volume Total (vph)	423	373	150	16	151	96	267	606
Volume Left (vph)	423	0	83	0	43	0	13	0
Volume Right (vph)	0	122	0	16	0	96	0	606
Hadj (s)	0.57	0.16	0.29	-0.68	0.21	-0.63	0.07	-0.65
Departure Headway (s)	8.2	7.5	9.0	8.1	8.8	8.0	7.8	7.1
Degree Utilization, x	0.97	0.78	0.38	0.04	0.37	0.21	0.58	1.20
Capacity (veh/h)	434	472	374	422	386	432	450	510
Control Delay (s)	62.8	31.0	16.1	10.2	15.7	11.9	20.0	129.9
Approach Delay (s)	47.9		15.5		14.2		96.3	
Approach LOS	E		C		B		F	

Delay	61.6		
HCM Level of Service	F		
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		



Derby St @ Congress St/Hawhtorne Blvd  
PM Peak Hour

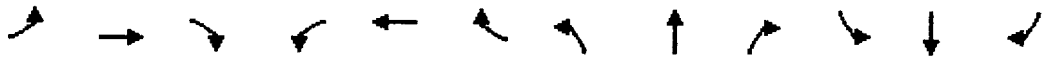
Existing Conditions



Lane Configurations	↖ ↗		↖ ↗		↖ ↗		↖ ↗		↖ ↗		↖ ↗		
Sign Control	Stop		Stop		Stop		Stop		Stop		Stop		
Volume (vph)	372	281	46	27	78	16	127	228	153	20	150	545	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Hourly flow rate (vph)	392	296	48	28	82	17	134	240	161	21	158	574	
Volume Total (vph)	392	344	111	17	374	161	179	574					
Volume Left (vph)	392	0	28	0	134	0	21	0					
Volume Right (vph)	0	48	0	17	0	161	0	574					
Hadj (s)	0.53	0.06	0.15	0.68	0.21	0.67	0.09	0.67					
Departure Headway (s)	8.6	8.0	9.4	8.6	8.6	7.7	8.3	7.6					
Degree Utilization x	0.93	0.77	0.29	0.04	0.89	0.35	0.41	1.21					
Capacity (veh/h)	412	442	354	388	408	457	422	481					
Control Delay (s)	57.5	31.6	15.0	10.8	49.3	13.5	15.9	134.6					
Approach Delay (s)	45.4		14.4		38.5		106.3						
Approach LOS	E		B		E		F						
Delay	63.2												
HCM Level of Service	F												
Intersection Capacity Utilization	77.5%						ICU Level of Service						D
Analysis Period (min)	15												

Hawthorne Blvd @ Essex  
AM Peak Hour

Existing Conditions

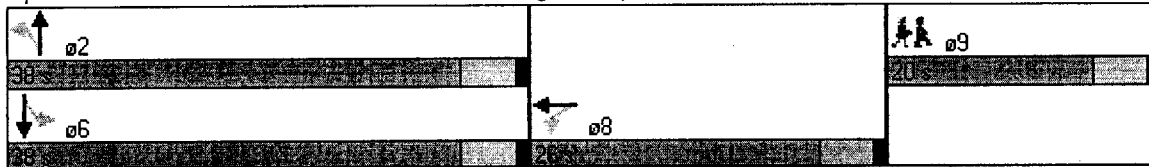


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕			↕			↕	
Volume (vph)	0	0	0	258	18	44	23	448	49	14	552	4
Confl. Peds. (#/hr)	30		10	10		30	8		7	7		8
Confl. Bikes (#/hr)									1			1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	3%	3%	3%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)				0	0	0	0	0	0	0	0	0
Mid-Block Traffic (%)		0%			0%			0%			0%	
Turn Type				Perm			Perm			Perm		
Protected Phases					8			2			6	
Permitted Phases				8			2	2		6		6
Detector Phases				8	8		2	2		6		6
Minimum Initial (s)				4.0	4.0		4.0	4.0		4.0		4.0
Minimum Split (s)				20.0	20.0		20.0	20.0		20.0		20.0
Total Split (s)	0.0	0.0	0.0	26.0	26.0	0.0	38.0	38.0	0.0	38.0	38.0	0.0
Total Split (%)	0.0%	0.0%	0.0%	31.0%	31.0%	0.0%	45.2%	45.2%	0.0%	45.2%	45.2%	0.0%
Yellow Time (s)				4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)				1.0	1.0		1.0	1.0		1.0	1.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode				None	None		None	None		None	None	
Act Effct Green (s)					20.8			34.5			34.5	
Actuated g/C Ratio					0.31			0.52			0.52	
v/c Ratio					0.77			0.75			0.80	
Control Delay					33.4			23.4			26.0	
Queue Delay					0.0			0.0			0.0	
Total Delay					33.4			23.4			26.0	
LOS					C			C			C	
Approach Delay					33.4			23.4			26.0	
Approach LOS					C			C			C	

Intersection Summary

Cycle Length: 84  
 Actuated Cycle Length: 66.6  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.80  
 Intersection Signal Delay: 26.7  
 Intersection Capacity Utilization 75.5%  
 Analysis Period (min) 15  
 Intersection LOS: C  
 ICU Level of Service D

Splits and Phases: 11: Essex St & Washington Sq W



Lane Group	09
Lane Configurations	
Volume (vph)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	20.0
Total Split (s)	20.0
Total Split (%)	24%
Yellow Time (s)	4.0
All-Red Time (s)	1.0
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
<b>Intersection Summary</b>	

Hawthorne Blvd @ Essex St  
PM Peak Hour

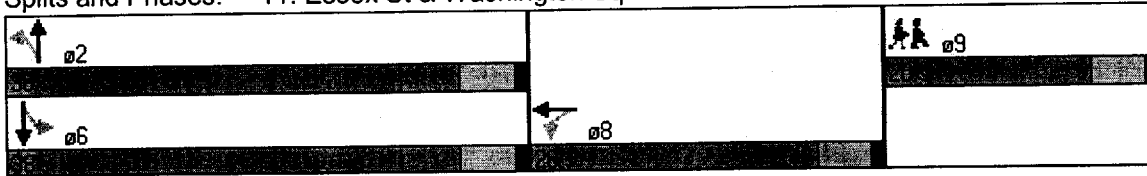
Existing Conditions



Lane Configurations												
	S1				N1				S2			
Volume (vph)	0	0	0	167	14	41	21	535	69	30	524	16
Confl. Peds. (#/hr)	54		24	24		54	9		7	7		9
Confl. Bikes (#/hr)									1			1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	1%	0%	1%	0%	2%	2%	2%	2%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)				0	0	0	0	0	0	0	0	0
Mid-Block Traffic (%)		0%			0%			0%			0%	
Turn Type				Perm		Perm		Perm		Perm		
Protected Phases				8		2		6				
Permitted Phases				8		2	2	6		6		
Detector Phases				8	8	2	2	6		6		
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)				20.0	20.0	20.0	20.0	20.0		20.0	20.0	
Total Split (s)	0.0	0.0	0.0	26.0	26.0	0.0	38.0	38.0	0.0	38.0	38.0	0.0
Total Split (%)	0.0%	0.0%	0.0%	31.0%	31.0%	0.0%	45.2%	45.2%	0.0%	45.2%	45.2%	0.0%
Yellow Time (s)				4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)				1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode				None	None	None	None	None		None	None	
Act Effect Green (s)					16.4		35.8			35.8		
Actuated g/C Ratio					0.23		0.51			0.51		
v/c Ratio					0.72		0.90			0.84		
Control Delay					31.5		39.8			34.5		
Queue Delay					0.0		0.0			0.0		
Total Delay					31.5		39.8			34.5		
LOS					C		D			C		
Approach Delay					31.5		39.8			34.5		
Approach LOS					C		D			C		

Cycle Length: 84  
 Actuated Cycle Length: 70.8  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.90  
 Intersection Signal Delay: 36.4  
 Intersection LOS: D  
 Intersection Capacity Utilization 73.7%  
 ICU Level of Service D  
 Analysis Period (min) 15

Splits and Phases: 11: Essex St & Washington Sq W



Lane Configurations

Volume (vph)

Confl. Peds. (#/hr)

Confl. Bikes (#/hr)

Peak Hour Factor

Growth Factor

Heavy Vehicles (%)

Bus Blockages (#/hr)

Parking (#/hr)

Mid-Block Traffic (%)

Turn Type

Protected Phases 9

Permitted Phases

Detector Phases

Minimum Initial (s) 4.0

Minimum Split (s) 20.0

Total Split (s) 20.0

Total Split (%) 24%

Yellow Time (s) 4.0

All-Red Time (s) 1.0

Lead/Lag

Lead-Lag Optimize?

Recall Mode None

Act Effct Green (s)

Actuated g/C Ratio

v/c Ratio

Control Delay

Queue Delay

Total Delay

LOS

Approach Delay

Approach LOS

01:15:00 Summary

Lafayette St. @ Washington St.  
AM Peak Hour

Existing Conditions



Lane Configurations		←		→		↓		↑			
Sign Control	Stop	Free				Free		Stop			
Grade	0%	0%				0%		0%			
Volume (veh/h)	0	0	421	509	45	26	495	0	6	6	350
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly Flow rate (vph)	0	0	448	541	48	28	527	0	6	6	372
Pedestrians	19										
Walking Speed (ft/s)	4.0										
Right turn flare (veh)	None										
Median storage (veh)	None										
Unsaturated (s)	1.65										
pX, platoon unblocked	0.80	0.80	0.80					0.80	0.80	0.80	
vC, platoon volume	2438	2062	527					2019	2086	527	
vC1, stage 1 conf vol											
vCu, unblocked vol	2803	2332	406					608	2278	2362	406
tC, 2 stage (s)	7.1	6.5	4.1					7.1	6.5	6.2	
p0 queue free %	100	100	51					97	54	55	28
q0 queue (veh)	1	15	919					980	14	14	514
Volume Left	448	0	28	0	6	0					
Volume Right	0	48	0	0	0	0					
cSH	919	1700	980	1700	14	514					
Volume to Capacity	0.49	0.35	0.03	0.31	0.9	0.72					
Queue Length 95th (ft)	68	0	2	0	53	148					
Control Delay (s)	12.6	0.0	8.8	0.0	56.7	28.3					
Lane LOS	B	A		F		D					
Approach Delay (s)	5.4	0.4		46.1							
Approach LOS	E										
Average Delay	12.0										
Intersection Capacity Utilization	62.7%										
ICU Level of Service	B										
Analysis Period (min)	15										

Lafayette St. @ Washington St.  
PM Peak Hour

Existing Conditions



Lane Configurations	↙		↑		↘		↓		↙		↘	
Sign Control	Stop		Free		Free		Free		Stop		Stop	
Grade	0%		0%		0%		0%		0%		0%	
Volume (veh/h)	0	0	351	490	51	46	596	0	4	4	364	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Hourly flow rate (vph)	0	0	369	516	54	48	627	0	4	4	383	
Pedestrians	38											
Lane Width (ft)	0.0											
Walking Speed (ft/s)	4.0											
Percent Blockage	0											
Right turn flare (veh)												
Median type	None								None			
Median storage (veh)												
Upstream signal (ft)							176					
pX, platoon unblocked	0.77	0.77	0.77						0.77	0.77	0.77	
vC, conflicting volume	2429	2044	627			607			1979	2071	627	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2865	2363	514			607			2278	2398	514	
tC, single (s)	7.1	6.5	4.1			4.1			7.1	6.5	6.2	
tC, 2 stage (s)												
tF (s)	3.5	4.0	2.2			2.2			3.5	4.0	3.3	
p0 queue free %	100	100	54			95			69	68	11	
cM capacity (veh/h)	0	14	810			976			14	13	431	
Volume Total	369	569	48	102	8	383						
Volume Left	369	0	48	0	4	0						
Volume Right	0	54	0	0	0	383						
cSH	810	1700	976	1700	13	431						
Volume to Capacity	0.46	0.33	0.05	0.17	0.63	0.89						
Queue Length 95th (ft)	60	0	4	0	37	234						
Control Delay (s)	13.1	0.0	8.9	0.0	46.8	51.3						
Lane LOS	B		A		F	F						
Approach Delay (s)	5.2		0.6		60.4							
Approach LOS					F							
Average Delay			14.4									
Intersection Capacity Utilization			64.1%		ICU Level of Service				C			
Analysis Period (min)			15									

Lafayette St. @ Harbor St.  
AM Peak Hour

Existing Conditions



Lane Configurations	↕		↕		↗		↑		↘		↘	
Sign Control	Stop		Stop		Free		Free		Free		Free	
Grade	0%		0%		0%		0%		0%		0%	
Volume (veh/h)	93	30	42	32	76	39	11	504	0	0	119	33
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	99	30	45	34	81	41	12	536	0	0	127	35
Pedestrians	22		20		5		21					
Lane Width (ft)	12.0		12.0		12.0		12.0					
Walking Speed (ft/s)	4.0		4.0		4.0		4.0					
Percent Blockage	2		2		0		0					
Right turn flare (veh)												
Median type	None		None									
Median storage (veh)												
Upstream signal (ft)							253				670	
pX, platoon unblocked	0.82	0.82	0.97	0.82	0.82	0.81	0.97			0.81		
vC, conflicting volume	1179	1096	521	1123	1116	577	534			653		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1163	1062	507	1096	1084	475	519			449		
tC, single (s)	7.1	6.5	5.2	6.7	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2					
p0 queue free %	0	100	92	75	53	91	99			100		
cM capacity (veh/h)	76	176	537	138	171	461	997			881		
Volume Total	144		171		1700		1700				1700	
Volume Left	99	34	12	0	0							
Volume Right	45	41	0	0	35							
cSH	103	192	997	1700	1700							
Volume to Capacity	1.40	0.61	0.01	0.32	0.39							
Queue Length 95th (ft)	258	144	1	0	0							
Control Delay (s)	303.8	74.7	8.2	0.0	0.0							
Lane LOS	F	F	A									
Approach Delay (s)	303.8	74.7	8.2	0.0								
Approach LOS	F	F										
Average Delay	40.8											
Intersection Capacity Utilization	47.7%		IGU Level of Service		A							
Analysis Period (min)	15											



Lafayette St. @ Harbor St.  
PM Peak Hour

Existing Conditions



Lane Configurations	←				→				↔			
Sign Control	Stop				Stop				Free			
Grade	0%				0%				0%			
Volume (veh/h)	84	0	22	51	96	67	10	484	0	0	573	57
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	88	0	23	54	101	71	11	509	0	0	603	60
Pedestrians	38				44				15			
Lane Width (ft)	12.0				12.0				12.0			
Walking Speed (ft/s)	4.0				4.0				4.0			
Percent Blockage	3				4				1			
Right turn flare (veh)	None				None				None			
Median type	None				None				None			
Median storage (veh)	None				None				None			
Upstream signal (s)	None				None				253			
pX, platoon unblocked	0.91	0.91	0.89	0.91	0.91	0.86	0.89	0.86				
vC, conflicting volume	1364	1246	686	1246	1276	592	70	553				
vC1, stage 1 conf vol	None				None				None			
vC2, stage 2 conf vol	None				None				None			
vCu, unblocked vol	1225	1095	649	1096	1128	527	666	479				
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1	4.1				
tC, 2 stage (s)	None				None				None			
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2	2.2				
p0 queue free %	0	100	94	63	41	84	99	100				
cM capacity (veh)	36	180	403	147	172	241	80	699				
Volume Total	132	225	11	509	663							
Volume Left	88	54	11	0	0							
Volume Right	23	71	0	0	60							
cSH	69	202	804	1700	1700							
Volume to Capacity	1.63	1.11	0.01	0.30	0.39							
Queue Length 95th (ft)	242	268	1	0	0							
Control Delay (s)	440.4	146.1	9.5	0.0	0.0							
Lane LOS	F	F	A									
Approach Delay (s)	440.4	146.1	0.2									
Approach LOS	F	F										
Average Delay	54.0											
Intersection Capacity Utilization	57.2%											
ICU Level of Service	B											
Analysis Period (min)	15											

Lafayette St @ Derby St  
AM Peak Hour

Existing Conditions



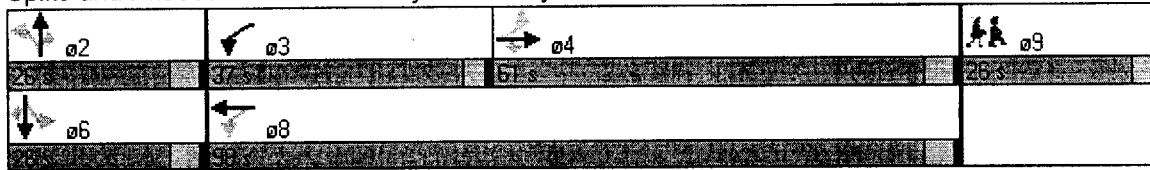
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗	↖	↖	↗		↕	↗		↕	↗
Volume (vph)	14	379	167	375	276	22	101	44	368	2	6	17
Confl. Peds. (#/hr)	3		14	14		3	6		16	16		6
Confl. Bikes (#/hr)			1									1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		0	0		0	0			30			0
Mid-Block Traffic (%)		0%			0%			0%			0%	
Turn Type	Perm		Perm	pm+pt			Perm		Perm	Perm		Perm
Protected Phases		4		3	8			2				6
Permitted Phases	4	4	4	8			2		2	6		6
Detector Phases	4	4	4	3	8		2	2	2	6	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	9.0	20.0		20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	61.0	61.0	61.0	37.0	98.0	0.0	26.0	26.0	26.0	26.0	26.0	26.0
Total Split (%)	40.7%	40.7%	40.7%	24.7%	65.3%	0.0%	17.3%	17.3%	17.3%	17.3%	17.3%	17.3%
Yellow Time (s)	4.0	4.0	4.0	3.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lag	Lag	Lag	Lead								
Lead-Lag Optimize?	Yes	Yes	Yes	Yes								
Recall Mode	None	None	None	None	None		None	None	None	None	None	None
Act Effct Green (s)		27.6	27.6	48.6	48.6			16.6	16.6			16.6
Actuated g/C Ratio		0.36	0.36	0.63	0.63			0.21	0.21			0.21
v/c Ratio		0.80	0.32	0.77	0.34			0.56	0.72			0.02
Control Delay		27.8	4.9	13.9	8.5			39.9	10.6			39.0
Queue Delay		0.0	0.0	0.0	0.0			0.0	0.0			0.0
Total Delay		27.9	4.9	13.9	8.5			39.9	10.6			39.0
LOS		C	A	B	A			D	B			D
Approach Delay		21.0			11.5			18.8				25.6
Approach LOS		C			B			B				C

**Intersection Summary:**

Cycle Length: 150  
 Actuated Cycle Length: 77.7  
 Natural Cycle: 100  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.80  
 Intersection Signal Delay: 16.8  
 Intersection Capacity Utilization 71.6%  
 Analysis Period (min) 15

Intersection LOS: B  
 ICU Level of Service C

Splits and Phases: 8: New Derby St & Lafayette St



Lane Group: 09

- Lane Configurations
- Volume (vph)
- Confl. Peds. (#/hr)
- Confl. Bikes (#/hr)
- Peak Hour Factor
- Growth Factor
- Heavy Vehicles (%)
- Bus Blockages (#/hr)
- Parking (#/hr)
- Mid-Block Traffic (%)
- Turn Type
- Protected Phases 9
- Permitted Phases
- Detector Phases
- Minimum Initial (s) 4.0
- Minimum Split (s) 26.0
- Total Split (s) 26.0
- Total Split (%) 17%
- Yellow Time (s) 3.5
- All-Red Time (s) 0.5
- Lead/Lag
- Lead-Lag Optimize?
- Recall Mode None
- Act Effct Green (s)
- Actuated g/C Ratio
- v/c Ratio
- Control Delay
- Queue Delay
- Total Delay
- LOS
- Approach Delay
- Approach LOS

Intersection Summary

Lafayette St. @ Derby St.  
PM Peak Hour

Existing Conditions



Lane Configurations	↖	↗	↘	↙	↖	↗	↘	↙	↖	↗	↘	↙
Volume (vph)	10	367	182	372	354	23	158	55	327	5	22	25
Confl. Peds. (#/hr)	14		23	23		14	9		13	13		9
Confl. Bikes (#/hr)			1									1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		0	0		0	0			30			0
Mid-Block Traffic (%)		0%			0%			0%				0%
Turn Type	Perm		Perm	pm+pt		Perm		Perm	Perm		Perm	
Protected Phases		4		3	8			2				6
Permitted Phases	4	4	4	8		2		2	2	6		6
Detector Phases	4	4	4	3	8	2		2	2	6		6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0
Minimum Split (s)	20.0	20.0	20.0	9.0	20.0	20.0		20.0	20.0	20.0		20.0
Total Split (s)	61.0	61.0	61.0	37.0	98.0	0.0	26.0	26.0	26.0	26.0		26.0
Total Split (%)	40.7%	40.7%	40.7%	24.7%	65.3%	0.0%	17.3%	17.3%	17.3%	17.3%		17.3%
Yellow Time (s)	4.0	4.0	4.0	3.0	4.0		4.0	4.0	4.0	4.0		4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0
Lead/Lag	Lag	Lag	Lag	Lead								
Lead-Lag Optimize?	Yes	Yes	Yes	Yes								
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)		30.8	30.8	54.4	54.4			25.4	25.4			25.4
Actuated g/C Ratio		0.32	0.32	0.57	0.57			0.26	0.26			0.26
v/c Ratio		0.82	0.37	0.79	0.47			0.67	0.62			0.68
Control Delay		34.7	5.2	17.9	13.2			51.6	11.3			44.2
Queue Delay		0.1	0.0	0.0	0.0			0.0	0.0			0.0
Total Delay		34.8	5.2	17.9	13.2			51.6	11.3			44.2
LOS		C	A	B	B			D	B			D
Approach Delay		25.1			15.6			27.2				32.1
Approach LOS		C			B			C				C

Cycle Length: 150  
 Actuated Cycle Length: 95.9  
 Natural Cycle: 100  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.82  
 Intersection Signal Delay: 22.1  
 Intersection LOS: C  
 Intersection Capacity Utilization 74.6%  
 ICU Level of Service D  
 Analysis Period (min) 15

Splits and Phases: 8: New Derby St & Lafayette St

02	03	04	09
06	08		

<b>Lane Configurations</b>	
<b>Volume (vph)</b>	
<b>Confl. Peds. (#/hr)</b>	
<b>Confl. Bikes (#/hr)</b>	
<b>Peak Hour Factor</b>	
<b>Growth Factor</b>	
<b>Heavy Vehicles (%)</b>	
<b>Bus Blockages (#/hr)</b>	
<b>Parking (#/hr)</b>	
<b>Mid-Block Traffic (%)</b>	
<b>Turn Type</b>	
<b>Protected Phases</b>	9
<b>Permitted Phases</b>	
<b>Detector Phases</b>	
<b>Minimum Initial (s)</b>	4.0
<b>Minimum Split (s)</b>	26.0
<b>Total Split (s)</b>	26.0
<b>Total Split (%)</b>	17%
<b>Yellow Time (s)</b>	4.0
<b>All-Red Time (s)</b>	1.0
<b>Lead/Lag</b>	
<b>Lead-Lag Optimize?</b>	
<b>Recall Mode</b>	None
<b>Act Effect Green (s)</b>	
<b>Actuated g/C Ratio</b>	
<b>v/c Ratio</b>	
<b>Control Delay</b>	
<b>Queue Delay</b>	
<b>Total Delay</b>	
<b>LOS</b>	
<b>Approach Delay</b>	
<b>Approach LOS</b>	

**Intersection Summary:**

Bridge St. @ Washington St.  
AM Peak Hour

Existing Conditions



Lane Configurations	↑	↗	↖	↑	↘	↙
Sign Control	Yield			Yield	Yield	
Volume (vph)	695	505	105	745	355	165
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	739	537	112	793	378	176
Volume Total (vph)	739	537	112	793	378	176
Volume Left (vph)	0	0	112	0	378	0
Volume Right (vph)	0	537	0	0	0	176
Hadj (s)	0.03	0.67	0.53	0.03	0.53	0.67
Departure Headway (s)	7.7	7.0	8.6	8.1	8.6	7.4
Degree Utilization, x	1.57	1.04	0.27	1.79	0.90	0.36
Capacity (veh/h)	482	523	406	449	408	479
Control Delay (s)	287.1	75.3	13.5	384.1	57.8	13.4
Approach Delay (s)	198.0		335.7		39.6	
Approach LOS	F		F		E	
Delay			21.5			
HCM Level of Service			F			
Intersection Capacity Utilization			79.0%		ICU Level of Service	D
Analysis Period (min)			15			

Bridge St. @ Washington St.  
PM Peak Hour

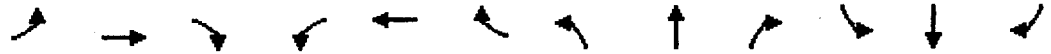
Existing Conditions



Lane Configurations	↑	↗	↖	↑	↖	↗
Sign Control	Yield			Yield	Yield	
Volume (vph)	665	400	160	910	340	155
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	700	421	168	958	358	163
Volume Total (vph)	700	421	168	958	358	163
Volume Left (vph)	0	0	168	0	358	0
Volume Right (vph)	0	421	0	0	0	163
Head (s)	0.02	0.68	0.52	0.02	0.52	0.68
Departure Headway (s)	7.6	6.9	8.4	7.9	8.6	7.4
Degree Utilization (%)	1.48	0.81	0.39	2.09	0.85	0.34
Capacity (veh/h)	481	513	420	466	414	477
Control Delay (s)	246.9	31.8	15.4	514.9	43.8	12.9
Approach Delay (s)	166.1		440.2		34.1	
Approach LOS	F		F		D	
Delay			252.8			
HCM Level of Service			F			
Intersection Capacity Utilization			80.8%		ICU Level of Service	D
Analysis Period (min)			15			

Washington St @ Essex St  
AM Peak Hour

Existing Conditions



Movement	WBL	WBT	WBR	WLB	WLT	WLR	WB	WBT	WBR	WB	WBT	WBR
Lane Configurations	↙		↗		↖		↑	↑		↑		↑
Sign Control	Stop		Stop		Stop		Free	Free		Free		Free
Grade	0%		0%		0%		0%	0%		0%		0%
Volume (veh/h)	65	0	167	0	0	7	0	812	0	0	363	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	69	0	178	0	0	7	0	864	0	0	386	0
Pedestrians	50							33		40		
Lane Width (ft)	12.0							12.0		12.0		
Walking Speed (ft/s)	4.0							4.0		4.0		
Percent Blockage	4							3		3		
Right turn flare (veh)			3									
Median type	None							None				
Median storage veh												
Upstream signal (ft)								606		717		
pX, platoon unblocked	0.73	0.73		0.73	0.73	0.73					0.73	
vC, conflicting volume	1347	1300	469	1372	1300	904	436				864	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1477	1412	469	1510	1412	868	436				813	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	0	100	68	100	100	97	100				100	
cM capacity (veh/h)	66	96	554	46	96	248	1077				595	

Direction	WBL	WBT	WBR	WLB	WLT	WLR	WB	WBT	WBR	WB	WBT	WBR
Volume Total	247	7	864	386								
Volume Left	69	0	0	0								
Volume Right	178	7	0	0								
cSH	214	248	1700	1700								
Volume to Capacity	1.16	0.03	0.51	0.23								
Queue Length 95th (ft)	298	2	0	0								
Control Delay (s)	156.8	20.0	0.0	0.0								
Lane LOS	F	C										
Approach Delay (s)	156.8	20.0	0.0	0.0								
Approach LOS	F	C										

Intersection Summary	
Average Delay	25.8
Intersection Capacity Utilization	72.3%
Analysis Period (min)	15
ICU Level of Service	C



Washington St. @ Essex St.  
PM Peak Hour

Existing Conditions



	EB	EB	WB	WB	EB	WB	EB	WB	EB	WB	EB	WB
Lane Configurations	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Volume (veh/h)	50	0	177	0	0	8	0	757	0	0	367	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	53	0	186	0	0	8	0	797	0	0	386	0
Pedestrians	65	65	150	150	78	78	110	110	110	110	110	110
Lane Width (ft)	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Walking Speed (ft/s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Percent Blockage	5	5	12	12	6	6	9	9	9	9	9	9
Right turn flare (veh)			3	3								
Median type	None	None	None	None	None	None	None	None	None	None	None	None
Median storage veh												
Upstream signal (ft)								606	606	735	735	735
pX, platoon unblocked	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
vC, conflicting volume	1367	1398	529	1504	1398	1057	451	947	947	947	947	947
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1453	1492	529	1623	1492	1070	451	934	934	934	934	934
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1	4.1	4.1	4.1	4.1	4.1
tC, 2 stage (s)												
tE (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2	2.2	2.2	2.2	2.2	2.2
p0 queue free %	16	100	62	100	100	95	100	100	100	100	100	100
cM capacity (veh/h)	62	83	488	29	83	174	1054	522	522	522	522	522
Volume Total	239	8	797	386	239	8	797	386	239	8	797	386
Volume Left	53	0	0	0	53	0	0	0	53	0	0	0
Volume Right	186	8	0	0	186	8	0	0	186	8	0	0
cSH	261	174	1700	1700	261	174	1700	1700	261	174	1700	1700
Volume to Capacity	0.91	0.05	0.47	0.23	0.91	0.05	0.47	0.23	0.91	0.05	0.47	0.23
Queue Length 95th (ft)	204	4	0	0	204	4	0	0	204	4	0	0
Control Delay (s)	77.1	26.8	0.0	0.0	77.1	26.8	0.0	0.0	77.1	26.8	0.0	0.0
Lane LOS	F	D			F	D			F	D		
Approach Delay (s)	77.1	26.8	0.0	0.0	77.1	26.8	0.0	0.0	77.1	26.8	0.0	0.0
Approach LOS	F	D			F	D			F	D		
Average Delay			13.0	13.0								
Intersection Capacity Utilization			70.8%	70.8%								
ICU Level of Service			C	C								
Analysis Period (min)			15	15								