HOWARD STEIN HUDSON

Engineers + Planners

Low Cost Signal Improvements

Medfield, MA, Main Street (Route 109) Corridor

Prepared for
Massachusetts Department of Transportation
Town of Medfield

Prepared by
Howard Stein Hudson

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Background

The Boston Region Metropolitan Planning Organization (MPO) has teamed with the Massachusetts Department of Transportation (MassDOT) to create and fund a program for the purpose of identifying low cost intersection improvements at congested intersections. The goal of this program is to reduce vehicle delay and traffic congestion and ensure that intersections comply with all current State and Federal regulations.

The MPO selected the intersections of Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27) and Main Street (Route 109)/South Street to investigate and identify any low cost recommendations that could improve traffic operations. The intersection of Main Street (Route 109)/Pleasant Street/North Street was later added to the study because it is part of the Main Street (Route 109) coordinated system. A locus map is provided in **Figure 1**.

This report documents the existing conditions of the intersections and traffic signal equipment. It provides low cost recommendations to improve traffic signal timing programs, using the existing traffic signal equipment, to optimize the efficiency of the intersection. With the approval of MassDOT and the Town of Medfield, these improvements will then be implemented through the program. This report also identifies additional improvements that the Town of Medfield could implement under their capital improvement program to further improve malfunctioning equipment, safety, or capacity.

Existing Conditions

Study Area

STUDY AREA INTERSECTION

The study area consists of the following signalized intersection:

1. Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27);
2. Main Street (Route 109)/Pleasant Street/North Street; and,
3. Main Street (Route 109)/South Street.

Roadway Descriptions

Main Street (Route 109) is a two-way urban principal arterial under local jurisdiction running east-west between Route 16 in Milford, Massachusetts to VFW Parkway in West Roxbury, Massachusetts. The posted speed limit within the project area is 25 miles per hour (mph). Within the project area, a 5- to 8-foot concrete sidewalk is provided on the north and south side of Main Street (Route 109). Parking is provided along the north and south side of Main Street (Route 109) within the project area between N. Meadows Road/Spring Street and South Street.

Spring Street (Route 27) /N. Meadows Road (Route 27) is a two-way urban principal arterial under local jurisdiction running north-south between Kingston, Massachusetts and Chelmsford, Massachusetts. The posted speed limit within the project area is 25 miles per hour (mph). Within the project area a 5-foot concrete sidewalk is provided on the east side of N. Meadows Road and a 5-foot sidewalk is provided on the east and west side of Spring Street. Parking is not permitted on either side of the street within the project area.

North Street is a two-way urban minor arterial under local jurisdiction running north-south between Centre Street in Dover, Massachusetts and Main Street (Route 109) in Medfield. The posted speed limit within the project area is 25 miles per hour (mph). Within the project area 8-foot concrete sidewalks are provided on the east and west side of North Street. Parking is permitted on the east and west side of the street within the project area.

Pleasant Street is a two-way local road running north-south between Main Street (Route 109) and Curve Street in Medfield. There is no posted speed limit within the project area; however, based on the Massachusetts General Laws, the statutory speed limit is 30 mph in a thickly settled or business district for a distance of 1/8 of a mile. Within the project area a 5-foot concrete sidewalk is provided on the east and west side of Pleasant Street. Parking is not permitted on either side of the street within the project area.

South Street is a two-way urban minor arterial under local jurisdiction running north-south between Main Street (Route 109) and Spring Street (Route 27) in Medfield. There is no posted speed limit within the project area; however, based on the Massachusetts General Laws, the statutory speed limit is 30 mph in a thickly settled or business district for a distance of 1/8 of a mile. Within the project area a 10-foot concrete sidewalk is provided on the east and west side of South Street. Parking is not permitted on either side of the street within the project area.

Figure 1. ***Locus Map***

Intersection Description

Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27), is a 4-legged signalized intersection with four approaches, owned and maintained by the Town of Medfield. The Main Street (Route 109) eastbound approach consists of a 13-foot exclusive left-turn lane with 130-feet of storage and a 13-foot shared through/right-turn lane. The Main Street (Route 109) westbound approach consists of an 11-foot exclusive left-turn lane with 130-feet of storage and a 12-foot shared through/right-turn lane. The Spring Street (Route 27) northbound approach consists of a 12-foot exclusive left-turn lane with 120-feet of storage and an 11-foot shared through/right-turn lane that widens along the approach to include a channelized right-turn lane. The N. Meadows Road (Route 27) southbound approach consists of a 12-foot exclusive left-turn lane with 250-feet of storage and a 12-foot shared through/right-turn lane that widens along the approach to include a channelized right-turn lane. All four legs of the intersection provide a 10- to 12-foot crosswalk with wheelchair ramps.

Main Street (Route 109)/Pleasant Street/North Street, is a 4-legged signalized intersection with four approaches, owned and maintained by the Town of Medfield. The Main Street (Route 109) eastbound approach consists of a 10-foot exclusive left-turn lane with 90-feet of storage and a 10-foot shared through/right-turn lane. The Main Street (Route 109) westbound approach consists of a 19-foot shared left-turn/through/right-turn lane. The Pleasant Street northbound approach consists of a 13-foot shared left-turn/through/right-turn lane. The North Street southbound approach consists of a 12-foot shared left-turn/through lane and a 14-foot exclusive left-turn lane with 180-feet of storage. All four legs of the intersection provide a 9-foot crosswalk with wheelchair ramps.

Main Street (Route 109)/South Street is a 3-legged signalized intersection with three approaches, owned and maintained by the Town of Medfield. The Main Street (Route 109) eastbound approach consists of a 14-foot shared through/right-turn lane. The Main Street (Route 109) westbound approach consists of a 9-foot exclusive left-turn lane with 100-feet of storage. The South Street northbound approach consists of a 14-foot shared left-turn/right-turn lane. The eastbound and northbound approaches of the intersection provide a 9-foot crosswalk with wheelchair ramps.

Photos of the intersection follow.

MAIN STREET (ROUTE 109)/SPRING STREET (ROUTE 27)/ N. MEADOWS ROAD (ROUTE 27)

Photo 1. Main Street (Route 109) looking east

Photo 2. Main Street (Route 109) looking west

Photo 3. Spring Street (Route 27) looking north

Photo 4. N. Meadows Road (Route 27) looking south

MAIN STREET (ROUTE 109)/PLEASANT STREET/NORTH STREET

Photo 5. Main Street (Route 109) looking east

Photo 6. Main Street (Route 109) looking west

Photo 7. Pleasant Street looking north

Photo 8. North Street looking south

MAIN STREET (ROUTE 109)/SOUTH STREET

Photo 9. Main Street (Route 109) looking east

Photo 10. Main Street (Route 109) looking west

Photo 11. South Street looking north

Traffic Signal Phasing

The three signalized intersections are coordinated and operate as a system along the Main Street (Route 109) corridor. The traffic signal phasing for each location is detailed below with existing phasing diagrams. The existing phasing diagrams are provided in **Figure 2.**

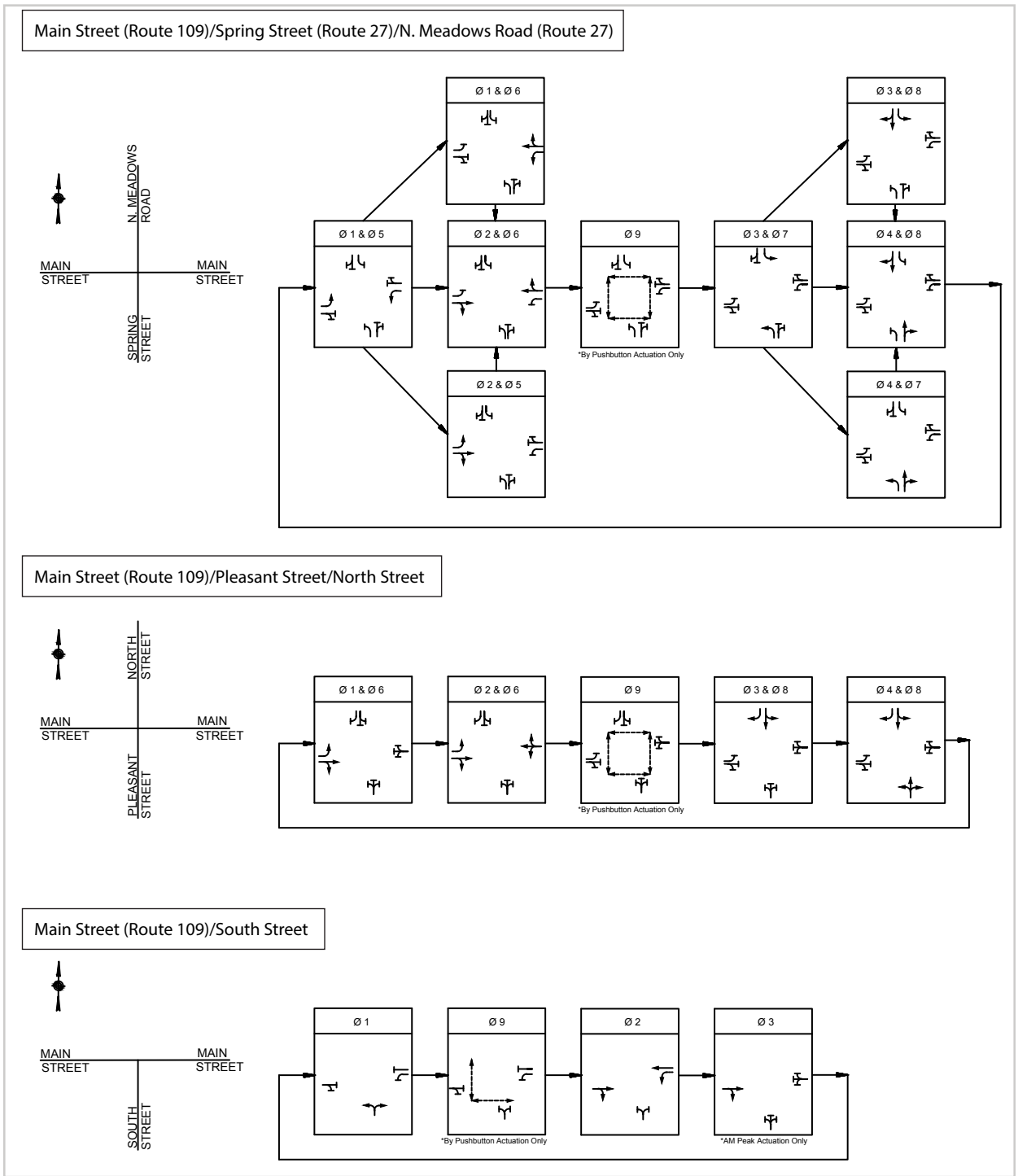
At the intersection of Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27), the traffic control signal is fully-actuated, operating with five phases. The first phase allows the mainline eastbound and westbound left-turn movements on Main Street (Route 109) to enter the intersection. The second phase allows the Main Street (Route 109) eastbound and westbound through movements to enter the intersection. The third phase is a push-button actuated exclusive pedestrian phase. The fourth phase allows the Spring Street northbound and N. Meadows Road southbound left-turn lanes to enter the intersection. The fifth phase allows the Spring Street northbound and N. Meadows Road southbound through movements to proceed through the intersection.

At the intersection of Main Street (Route 109)/Pleasant Street/North Street, the traffic control signal is fully-actuated, operating with five phases. The first phase is the Main Street (Route 109) eastbound lead phase, followed by the Main Street (Route 109) westbound approach. The third phase is a push-button actuated exclusive pedestrian phase. The fourth phase allows the North Street southbound approach lead phase to enter the intersection, followed by the Pleasant Street northbound approach phase to proceed through the intersection.

At the intersection of Main Street (Route 109)/South Street, the traffic control signal is semi-actuated, operating with three phases during the p.m. peak hour and four phases during the a.m.

peak hour. The first phase allows the South Street northbound approach to enter the intersection. The second phase is a push-button actuated exclusive pedestrian phase. The third phase allows the Main Street (Route 109) eastbound and westbound approaches to proceed through the intersection. During the a.m. peak hour, a fourth phase is included consisting of an eastbound approach lag-phase.

Figure 2. ***Existing Phasing Diagram***



PHASE TIMINGS

The traffic signals along the corridor currently operate on a 130-second cycle during the am peak hour and 150-seconds during the pm peak hour.

MAIN STREET (ROUTE 109)/SPRING STREET (ROUTE 27)/N. MEADOWS ROAD (ROUTE 27)

At the intersection of Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27), the exclusive left-turn lanes at each approach are equipped with loop detection. Therefore, if the left-turn movements gap out, the phase terminates due to a lack of vehicle calls within a specific period of time, and the remaining time will be allocated to the mainline through movements. **Table 1** summarizes the Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27) phase timings.

Table 1. Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27) Phase Timings

Phase Timings (Seconds)					
	ϕ1 EBL & ϕ5 WBL	ϕ2 EB T/R & ϕ6 WB T/R	ϕ3 NBL & ϕ7 SBL	ϕ2 NB T/R & ϕ6 SB T/R	ϕ9 PED.
a.m. peak hour	12	44	14	41	19
p.m Peak Hour	20	46	23	42	19

The pedestrian phase consists of a 7-second walk time and a 12-second flashing don't walk clearance time. The flashing don't walk clearance time does not meet the Manual on Uniform Traffic Control Devices (MUTCD) and MassDOT standards.

MAIN STREET (ROUTE 109)/PLEASANT STREET/NORTH STREET

At the intersection of Main Street (Route 109)/Pleasant Street/North Street, the Main Street (Route 109) eastbound approach provides a protected-permitted lead phase, followed by the Main Street (Route 109) westbound approach during the a.m. peak hour and p.m. peak hour.

Table 2 summarizes the Main Street (Route 109)/Pleasant Street/North Street phase timings.

Table 2. Main Street (Route 109)/Pleasant Street/North Street

Phase Timings (Seconds)					
	ϕ1& ϕ6 EB L/T/R[1]	ϕ2 WB L/T/R & ϕ6 EB L/T/R	ϕ3 & ϕ8 SB L/T/R[1]	ϕ4 NB L/T/R & ϕ8 SB L/T/R	ϕ9 PED.
a.m. peak hour	10	50	14	34	22
p.m Peak Hour	10	59	27	32	22

[1] *Lead Phase*

The North Street southbound approach has a protected-permitted lead phase, followed by the Pleasant Street northbound approach phase during the a.m. and p.m. peak hours.

The pedestrian phase consists of a 7-second walk time and a 15-second flashing don't walk clearance time. The flashing don't walk clearance time does not meet the Manual on Uniform Traffic Control Devices (MUTCD) and MassDOT standards.

MAIN STREET (ROUTE 109)/SOUTH STREET

At the intersection of Main Street (Route 109)/South Street, the initial South Street northbound phase is followed by the Main Street (Route 109) eastbound and westbound approaches simultaneously. During the a.m. peak hour the eastbound approach consists of a lag-phase. **Table 3** summarizes the Main Street (Route 109)/South Street phase timings.

Table 3. Main Street (Route 109)/South Street

Phase Timings (Seconds)				
	ϕ1 NB L/R	ϕ2 EB T/R & WB T/L	ϕ3 EB T/R[2]	ϕ9 PED.
a.m. peak hour	38	58	11	23
p.m Peak Hour	34	93	-	23

[2] *Lag Phase*

The pedestrian phase consists of a 7-second walk time and a 16-second flashing don't walk clearance time. The flashing don't walk clearance time does not meet the Manual on Uniform Traffic Control Devices (MUTCD) and MassDOT standards.

Clearance Intervals

MAIN STREET (ROUTE 109)/SPRING STREET (ROUTE 27)/N. MEADOWS ROAD (ROUTE 27)

The yellow clearance interval for all vehicular phases is 4-seconds. The all-red clearance interval for all vehicular phases is 2 seconds. The yellow and all-red clearance value for each phase meets the MUTCD and MassDOT minimum requirements.

MAIN STREET (ROUTE 109)/PLEASANT STREET/NORTH STREET

The yellow clearance interval for the Main Street (Route 109) through phases is 4-seconds, and the North Street southbound and Pleasant Street northbound phases is 3-seconds. The all-red clearance interval for all phases is 2 seconds. The yellow and all-red clearance value for each phase meets the MUTCD and MassDOT minimum requirements.

MAIN STREET (ROUTE 109)/SOUTH STREET

The yellow clearance interval for all vehicular phases is 4-seconds, and the all-red clearance interval for the Main Street (Route 109) through phases is 2 seconds, and the South Street northbound phase is 1 second. The yellow and all-red clearance value for each phase meets the MUTCD and MassDOT minimum requirements.

Signal Equipment Inventory

MAIN STREET (ROUTE 109)/SPRING STREET (ROUTE 27)/N. MEADOWS ROAD (ROUTE 27)

The existing vehicle indications are mounted on steel mast arms. A minimum of two traffic signal heads are provided for each approach. The signal indications at each approach are 3-section signal heads with 12-inch incandescent lamps; except for the 12-inch signal indications mounted for the left-turn lanes at each approach that are light emitting diodes (LED).

All signal indications are equipped with sun visors and the Main Street (Route 109) approaches are equipped with back plates.

The traffic signal head housings and vehicle indications are all in a fair condition.

Push buttons and pedestrian indications are provided across all four approaches. The pedestrian signals are vertical two-section signalized pedestrian heads, with an LED upraised hand and LED walking person. All pedestrian push-buttons are functioning and indications are well lit.

Emergency pre-emption is provided at the intersection, with receivers located at each approach. (**Photo 12**).

The signal control cabinet is in good condition and is located on the northeast corner of the intersection. (**Photo 13**).

Table 4 summarizes the signal inventory.

Photo 12. Emergency Pre-emption at Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27)

Traffic signal and pre-emption equipment (receiver and strobe) mounted on Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27)

Table 4. Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27) Signal Inventory

Item	Description	Condition
Controller	Siemens – m50	Good
Control Type	Fully-Actuated	-
Signal Posts	Aluminum	Good
Mast Arms	Steel	Good
Detection	Wire Loops	Good

Item	Description	Condition
Vehicle Signal Heads		
Red Indications	Incandescent Bulbs	Good
	LED	Good
Yellow Indications	Incandescent Bulbs	Good
	LED	Good
Green Indications	Incandescent Bulbs	Good
	LED	Good
Backplates	Yes	Good
Pedestrian Indications		
Eastern Crosswalk (across Main St. (Route 109))	2-Section Indication: Up Raised Hand – LED Walking Person – LED	Good
Western Crosswalk (across Main Street (Route 109))	2-Section Indication: Up Raised Hand – LED Walking Person – LED	Good
Northern Crosswalk (across N. Meadows Road (Route 27)	2-Section Indication: Up Raised Hand – LED Walking Person – LED	Good
Southern Crosswalk (across Spring Street (Route 27)	2-Section Indication: Up Raised Hand – LED Walking Person – LED	Good
Pedestrian Pushbuttons		
Eastern Crosswalk (across Main St. (Route 109))	2” Plunger	Good
Western Crosswalk (across Main Street (Route 109))	2” Plunger	Good
Northern Crosswalk (across N. Meadows Road (Route 27)	2” Plunger	Good
Southern Crosswalk (across Spring Street (Route 27)	2” Plunger	Good
Emergency Pre-Emption	Optical Receiver	Good

Photo 13. Traffic Signal Control Cabinet at Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27)

Photo 14. Siemens m50 Traffic Control System at Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27)

MAIN STREET (ROUTE 109)/PLEASANT STREET/NORTH STREET

The existing vehicle indications are mounted on steel mast arms. A minimum of two traffic signal heads are provided for each approach. The signal indications at each approach are 3-section signal heads with 12-inch incandescent lamps; except for the 4-section signal heads with 12-inch signal indications. The 4-section signal head is equipped a 12-inch bicolor (yellow/green) left-turn arrow indication mounted for the left-turn movements at the Main Street (Route 109) eastbound approach and North Street southbound approach.

All signal indications are equipped with sun visors and the Main Street (Route 109) approaches are equipped with back plates.

The traffic signal head housings and vehicle indications are all in a fair condition.

Push buttons and pedestrian indications are provided across all four approaches. The pedestrian signals are vertical two-section signalized pedestrian heads, with an LED upraised hand and LED walking person. All pedestrian push-buttons are functioning and indications are well lit.

Emergency pre-emption is provided at the intersection, with receivers located at each approach. (**Photo 15**).

The signal control cabinet is in good condition and is located on the southwest corner of the intersection. (**Photo 16**).

Table 5 summarizes the signal inventory.

Photo 15. Emergency Pre-emption at Main Street (Route 109)/Pleasant Street/North Street

Traffic signal and pre-emption equipment (receiver and strobe) mounted on Main Street (Route 109)/Pleasant Street/North Street.

Table 5. Main Street (Route 109)/Pleasant Street/North Street Signal Inventory

Item	Description	Condition
Controller	Siemens – m50	Good
Control Type	Fully-Actuated	-
Signal Posts	Aluminum	Good
Mast Arms	Steel	Good
Detection	Wire Loops	Good
Vehicle Signal Heads		
Red Indications	Incandescent Bulbs	Good
Yellow Indications	Incandescent Bulbs	Good
Green Indications	Incandescent Bulbs	Good
Backplates	Yes	Good
Pedestrian Indications		
Eastern Crosswalk (across Main St. (Route 109))	2-Section Indication: Up Raised Hand – LED Walking Person – LED	Good
Western Crosswalk (across Main Street (Route 109))	2-Section Indication: Up Raised Hand – LED Walking Person – LED	Good
Northern Crosswalk (across North Street)	2-Section Indication: Up Raised Hand – LED Walking Person – LED	Good
Southern Crosswalk (across Pleasant Street)	2-Section Indication: Up Raised Hand – LED Walking Person – LED	Good
Pedestrian Pushbuttons		
Eastern Crosswalk (across Main St. (Route 109))	2” Plunger	Good
Western Crosswalk (across Main Street (Route 109))	2” Plunger	Good
Northern Crosswalk (across North Street)	2” Plunger	Good

Item	Description	Condition
Southern Crosswalk (across Pleasant Street)	2" Plunger	Good
Emergency Pre-Emption	Optical Receiver	Good

Photo 16. Traffic Signal Control Cabinet at Main Street (Route 109)/Pleasant Street/North Street

Photo 17. Siemens m50 Traffic Control System at Main Street (Route 109)/Pleasant Street/North Street

MAIN STREET (ROUTE 109)/PLEASANT STREET/SOUTH STREET

The existing vehicle indications are mounted on steel mast arms. A minimum of two traffic signal heads are provided for each approach. The signal indications at each approach are 3-section signal heads with 12-inch incandescent lamps.

All signal indications are equipped with sun visors and the Main Street (Route 109) approaches are equipped with back plates.

The traffic signal head housings and vehicle indications are all in a fair condition.

Push buttons and pedestrian indications are provided across the Main Street (Route 109) eastbound approach and the South Street northbound approach. The pedestrian signals are vertical two-section signalized pedestrian heads, with an LED upraised hand and LED walking person. All pedestrian push-buttons are functioning and indications are well lit.

Emergency pre-emption is provided at the intersection, with receivers located at each approach. **(Photo 18**).

The signal control cabinet is in good condition and is located on the southeast corner of the intersection. (**Photo 19**). **Table 6** summarizes the signal inventory.

Photo 18. Traffic Signal Control Cabinet at Main Street (Route 109)/South Street

Traffic signal and pre-emption equipment (receiver and strobe) mounted on Main Street (Route 109)/ South Street.

Table 6. Main Street (Route 109)/South Street Signal Inventory

Item	Description	Condition
Controller	Siemens – m50	Good
Control Type	Fully-Actuated	-
Signal Posts	Aluminum	Good
Mast Arms	Steel	Good
Detection	Wire Loops	Good
Vehicle Signal Heads		
Red Indications	Incandescent Bulbs	Good
Yellow Indications	Incandescent Bulbs	Good
Green Indications	Incandescent Bulbs	Good
Backplates	Yes	Good
Pedestrian Indications		
Western Crosswalk (across Main Street (Route 109))	2-Section Indication: Up Raised Hand – LED Walking Person – LED	Good
Southern Crosswalk (across South Street)	2-Section Indication: Up Raised Hand – LED Walking Person – LED	Good
Pedestrian Pushbuttons		
Western Crosswalk (across Main Street (Route 109))	2” Plunger	Good
Southern Crosswalk (across South Street)	2” Plunger	Good
Emergency Pre-Emption	Optical Receiver	Good

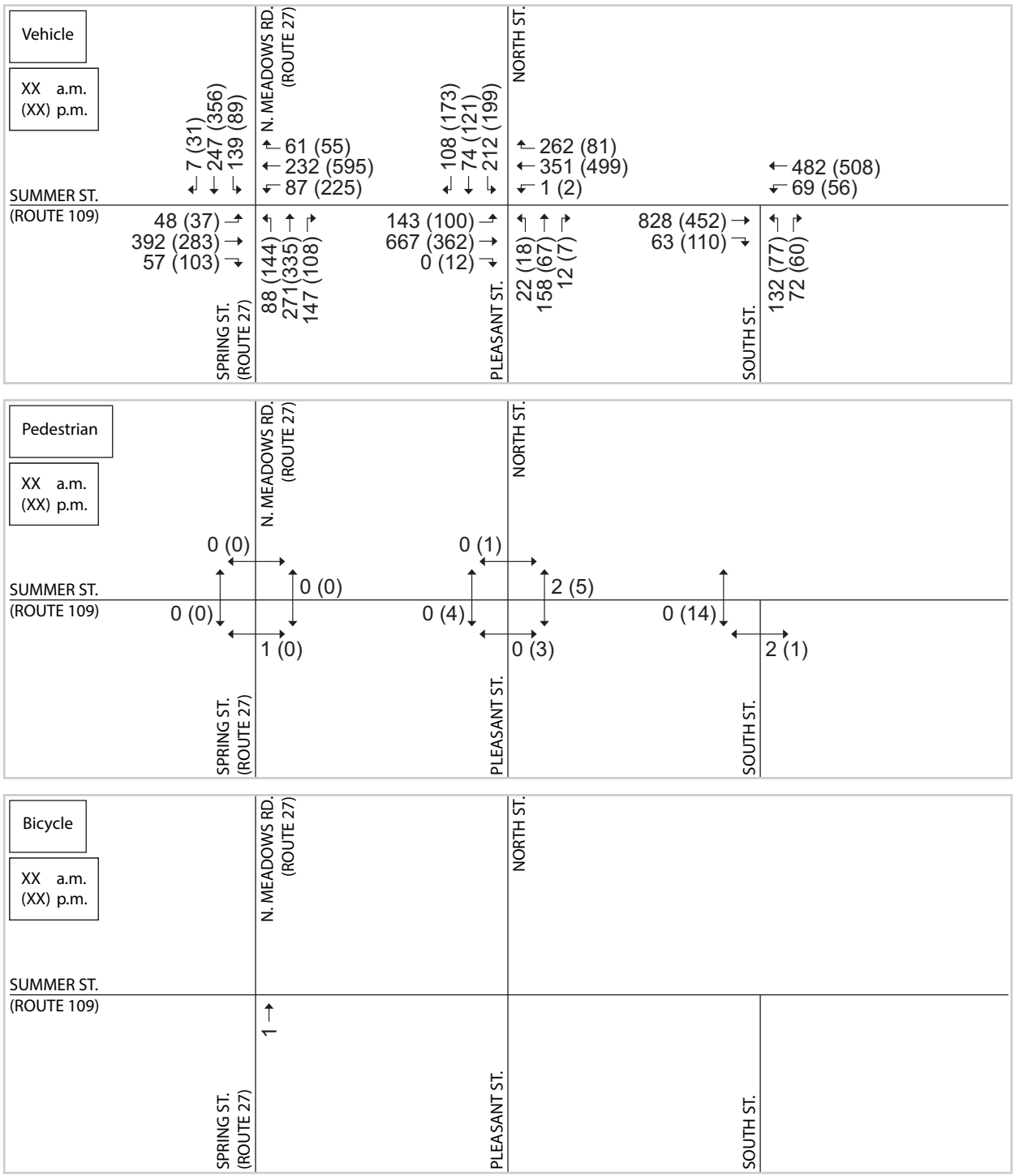
Photo 19. Traffic Signal Control Cabinet at Main Street (Route 109)/South Street

Photo 20. Siemens m50 Traffic Control System at Main Street (Route 109)/South Street

Traffic Volumes

Manual Turning Movement Counts (TMCs) were recorded during the morning peak hour (7:00 – 9:00 a.m.) on October 29, 2015 and the school/evening peak hour (2:00 – 6:00 p.m.) on December 10, 2015. The TMCs included vehicle, bicycle, and pedestrian counts at the study area intersections. The results of the counts indicate that the morning peak hour occurs between 7:00 and 8:00 a.m. and the evening peak hour between 5:00 and 6:00 p.m. The peak-hour vehicle and pedestrian volumes are shown in **Figure 3**

Figure 3. ***Existing Conditions (2015) Turning Movement Counts***



Existing Operations Analysis

Traffic operations are determined through an analysis of intersection Level of Service (LOS) calculations. LOS at the intersection was calculated using Synchro 9.0, which is based on the traffic operational analysis methodology of the Transportation Research Board's 2000 Highway Capacity Manual (HCM). The LOS and delay (in seconds) are based on intersection geometry and traffic volumes. **Table 7,** an excerpt from the HCM, provides LOS criteria for signalized intersections. LOS A defines the most favorable condition, with minimal traffic delay. LOS F represents the worst condition, with significant traffic delay. LOS D is generally considered acceptable.

Table 7. Level Of Service Criteria, Signalized Intersections

Level of Service	Average Stopped Delay (sec.)
A	0.0–10.0
B	10.1–20.0
C	20.1–35.0
D	35.1–55.0
E	55.1–80.0
F	>80.0

In accordance with MassDOT guidelines, the peak 15 minutes of data collected during the peak hour were isolated in order to calculate the peak-hour factors (PHFs) for each approach. The percentage of heavy vehicles was noted for each approach as well. All capacity analyses were checked against actual conditions in the field.

Table 8 summarizes the existing LOS, delay, volume to capacity ratio, and queue analysis for all signalized intersections during the morning and evening peak hours. Synchro reports are provided in **Appendix A**.

Table 8. Summary of Intersection Operations, Existing Conditions

Intersection/Movement	LOS	Delay (Seconds)	V/C Ratio	50th Percentile Queue Length (feet)	95th Percentile Queue Length (feet)
a.m. Peak Hour					
Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27)	**F**	**98.9**			
Main EB left	F	109.5	0.81	47	#122
Main EB thru/right	F	83.9	1.02	396	#755
Main WB left	F	219.1	1.22	~105	m#149
Main WB thru/right	C	31.1	0.53	132	m237
Spring NB left	F	117.8	0.91	83	#193
Spring NB thru/right	F	115.6	1.08	~419	#634
N. Meadows SB left	F	257.4	1.33	~159	#299
N. Meadows SB thru/right	D	44.1	0.61	197	293
Main Street (Route 109)/Pleasant Street/North Street	**E**	**78.5**			
Main EB left	D	39.8	0.75	70	m111
Main EB thru/right	D	49.3	0.97	478	m#801
Main WB left/thru/right	D	43.0	0.94	126	#861
Pleasant NB left/thru/right	E	61.3	0.81	231	235
North SB left/thru	F	249.4	1.41	~384	#490
North SB right	C	30.3	0.11	6	32
Main Street (Route 109)/South Street	**C**	**23.0**			
Main EB thru/right	B	10.3	0.79	266	m#876
Main WB left	D	53.5	0.74	43	#162
Main WB thru	C	21.6	0.67	279	#591
South NB left/right	E	63.3	0.78	187	235

Intersection/Movement	LOS	Delay (Seconds)	V/C Ratio	50th Percentile Queue Length (feet)	95th Percentile Queue Length (feet)
p.m. Peak Hour					
Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27)	**F**	**131.4**			
Main EB left	E	74.8	0.53	39	81
Main EB thru/right	E	66.5	0.88	355	#701
Main WB left	F	325.4	1.52	~331	#516
Main WB thru/right	F	110.8	1.05	644	#1217
Spring NB left	F	102.6	0.89	163	#277
Spring NB thru/right	F	166.7	1.20	~609	#825
N. Meadows SB left	E	74.9	0.64	92	153
N. Meadows SB thru/right	F	107.1	1.02	~434	#652
Main Street (Route 109)/Pleasant Street/North Street	**C**	**35.0**			
Main EB left	B	13.9	0.34	27	m54
Main EB thru/right	B	14.3	0.45	113	m194
Main WB left/thru/right	D	35.9	0.71	485	#867
Pleasant NB left/thru/right	E	59.8	0.50	102	147
North SB left/thru	D	54.9	0.79	261	367
North SB right	D	35.1	0.14	9	62
Main Street (Route 109)/South Street	**C**	**21.3**			
Main EB thru/right	A	5.9	0.45	107	261
Main WB left	A	8.1	0.21	13	61
Main WB thru	B	17.9	0.73	219	#729
South NB left/right	E	76.5	0.78	180	173

 # = 95th percentile volume exceeds capacity, queue may be longer.
~=Volume exceeds capacity, queue is theoretically infinite.

With existing volumes, geometry, and signal timings, the study intersection of Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27) operates at an overall LOS F during the a.m. and p.m. peak hours. The Main Street (Route 109) eastbound approach operates at a LOS F

during the a.m. peak hour and LOS E during the p.m. peak hour. The Main Street (Route 109) westbound left-turn lane operates at LOS F during the p.m. peak hour and the shared through/right-turn lane operates at LOS F during the a.m. and p.m. peak hour. The Spring Street (Route 109) northbound approach operates at a LOS F during the a.m. and p.m. peak hours. The N. Meadows southbound left-turn lane operates at LOS F during the a.m. peak hour and LOS E during the p.m. peak hour and the shared through/right-turn lane operates at LOS F. These poor values of LOS are due to the high volumes of traffic entering the intersection within the allotted green time.

The intersection of Main Street (Route 109)/Pleasant Street/North Street operates at an overall LOS E during the a.m. peak hour and LOS C during the p.m. peak hour. The Pleasant Street northbound approach operates at LOS E during the a.m. and p.m. peak hours, due to the volume of traffic entering the intersection within the allotted green time. The North Street southbound left-turn lane operates at LOS F during the a.m. peak hour, due to the high volume of traffic turning left being forced to wait for a gap in opposing traffic to turn in.

The intersection of Main Street (Route 109)/South Street operates at an overall LOS D or better during the a.m. and p.m. peak hours. However, the South Street northbound approach operates at LOS E during the a.m. and p.m. peak hour, due to the volume of traffic entering the intersection within the allotted green time.

Based on field observations, commuter traffic is heaviest in the eastbound direction during the a.m. peak hour and the westbound direction during the p.m. peak hour. During the a.m. peak hour the eastbound queues spill back between Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27) and Main Street (Route 109)/Pleasant Street/North Street. During the p.m. peak hour the westbound queues spill back between Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27) and Main Street (Route 109)/South Street.

Low Cost Signal Improvements

Improvements identified in this section consist solely of changes to timings and clearance intervals.

Phase Timings

The proposed cycle length for the a.m. and p.m. peak hours is 150-seconds. During the peak hours, the Main Street (Route 109) eastbound and westbound through movements will have an improved progression of traffic along the corridor.

The existing phasing at each location which includes an exclusive pedestrian phase will remain.

Clearance Intervals

All the approaches throughout the corridor currently receive a yellow clearance time of 4-seconds and an all-red clearance time of 2-seconds, except for the Pleasant Street northbound and North Street southbound approaches which receive a yellow clearance time of 3-seconds and a all-red clearance time of 2-seconds. Based on the minimum requirements set forth in the MassDOT memo titled *Guidance on Calculating Clearance Intervals at Traffic Signals* dated January 8, 2013, the yellow and red clearance interval for all approaches are acceptable and shall remain at 3- to 4-seconds and 2-seconds, respectively. Clearance interval calculations are provided in **Appendix B**.

The flashing don't walk times are calculated based on the 2009 *Manual on Uniform Traffic Control Devices* (MUTCD) and a recommended pedestrian walking speed of 3.5 feet per second. Based on the lengths of the crosswalks, the flashing don't walk interval at the intersections of Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27) will be increased from 12-seconds to 14-seconds. At Main Street (Route 109)/Pleasant Street/North Street the flashing don't walk interval will be increased from 15-seconds to 21-seconds, and at Main Street (Route 109)/South Street from 16-seconds to 17-seconds. Each intersection will maintain a 7-second pedestrian walk phase.

See **Appendix C** for a timing chart of the proposed timing improvements.

Operations Analysis

With the above improvements, operations during the a.m. and p.m. peak hours improve from the existing conditions at some locations, but remain below an acceptable level for the heaviest traffic movements. The proposed timings will cause a decrease in queue lengths for some traffic movements and a slight increase in queue lengths at others.

Table 9. Summary of Intersection Operations, Low Cost Improvement Conditions

Intersection/Movement	LOS	Delay (Seconds)	V/C Ratio	50th Percentile Queue Length (feet)	95th Percentile Queue Length (feet)
a.m. Peak Hour					
Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27)	**F**	**92.6**			
Main EB left	F	96.0	0.71	53	100
Main EB thru/right	F	91.6	1.02	468	#849
Main WB left	F	119.4	0.99	95	m#150
Main WB thru/right	D	40.6	0.53	297	m381
Spring NB left	F	91.6	0.77	94	#185
Spring NB thru/right	F	128.7	1.10	~494	#720
N. Meadows SB left	F	161.4	1.06	~156	#304
N. Meadows SB thru/right	D	50.0	0.61	230	332
Main Street (Route 109)/Pleasant Street/North Street	**E**	**71.1**			
Main EB left	D	43.7	0.83	66	m#143
Main EB thru/right	E	57.1	1.01	723	m#1008
Main WB left/thru/right	E	55.2	0.95	526	#760
Pleasant NB left/thru/right	E	67.0	0.80	268	264
North SB left/thru	F	163.6	1.20	~373	#457
North SB right	C	32.2	0.12	15	41
Main Street (Route 109)/South Street	**C**	**24.3**			
Main EB thru/right	B	11.4	0.77	232	m951
Main WB left	D	39.9	0.65	44	#161
Main WB thru	C	21.2	0.64	308	583
South NB left/right	E	74.3	0.81	221	268

Intersection/Movement	LOS	Delay (Seconds)	V/C Ratio	50th Percentile Queue Length (feet)	95th Percentile Queue Length (feet)
p.m. Peak Hour					
Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27)	**F**	**110.1**			
Main EB left	F	93.7	0.66	40	#90
Main EB thru/right	F	85.2	0.96	373	#758
Main WB left	F	149.5	1.14	~271	#459
Main WB thru/right	F	81.6	1.01	690	#1152
Spring NB left	F	111.0	0.92	164	#288
Spring NB thru/right	F	155.5	1.18	~605	#780
N. Meadows SB left	F	88.0	0.74	93	#178
N. Meadows SB thru/right	F	110.3	1.03	~434	#652
Main Street (Route 109)/Pleasant Street/North Street	**D**	**36.5**			
Main EB left	B	14.6	0.34	38	m91
Main EB thru/right	B	16.4	0.46	230	m335
Main WB left/thru/right	D	39.9	0.75	524	#982
Pleasant NB left/thru/right	E	57.1	0.44	101	141
North SB left/thru	D	54.3	0.79	262	354
North SB right	C	34.6	0.13	5	56
Main Street (Route 109)/South Street	**C**	**21.7**			
Main EB thru/right	A	7.4	0.45	201	414
Main WB left	A	8.2	0.21	13	63
Main WB thru	B	18.2	0.73	218	#746
South NB left/right	E	74.5	0.76	178	169

 # = 95th percentile volume exceeds capacity, queue may be longer.
~=Volume exceeds capacity, queue is theoretically infinite.

During the peak hours, increasing the cycle length improves operations and reduces the delay experienced along the eastbound and westbound through movements.

The overall level of service at the Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27) intersection is expected to remain a LOS F during the a.m. and p.m. peak hour, with a slight reduction in delay for the a.m. peak and approximately 20-seconds during the p.m. peak. The Main Street (Route 109) eastbound left-turn lane movement will remain LOS F during the a.m. peak hour, with a reduction in delay of approximately 15-seconds. The Main Street (Route 109) westbound left-turn lane movement will remain LOS F with a reduction in delay of approximately 100-seconds during the a.m. peak hour and 175-seconds during the p.m. peak hour; and the westbound shared through/right-turn lane movement will remain LOS F during the p.m. peak hour, with a reduction in delay of approximately 30-seconds. The Spring Street northbound left-turn lane will remain LOS F with a reduction in delay of approximately 25-seconds during the a.m. peak hour. The N. Meadows southbound left-turn lane will remain LOS F during the a.m. peak hour, with a reduction in delay of approximately 95-seconds, and worsen from LOS E to LOS F during the p.m. peak.

The overall level of service at the Main Street (Route 109)/Pleasant Street/North Street intersection is expected to remain at an overall LOS E during the a.m. peak hour and worsen to LOS D, approximately 1.5-seconds above the LOS D threshold in the p.m. peak hour. The Main Street (Route 109) eastbound shared though/right-turn movement is expected to worsen from LOS D to LOS E, approximately 2-seconds above the LOS D threshold in the a.m. peak hour. The Main Street (Route 109) westbound shared left-turn/though/right-turn movement is expected to worsen from LOS D to LOS E, approximately less than 1-second above the LOS D threshold in the a.m. peak hour. All movements during the p.m. peak hour are expected to maintain similar operating conditions as the existing conditions at LOS D or better; except for the Pleasant Street northbound approach expected to remain a LOS E during the a.m. and p.m. peak hour. The North Street southbound shared left-turn/through lane is expected to remain at LOS F during the a.m. peak hour, with a reduction in delay of approximately 85-soncods and remain LOS E during the p.m. peak hour.

The overall level of service at the Main Street (Route 109)/South Street intersection is expected to remain LOS C during the a.m. and p.m. peak hours. The South Street northbound approach is expected to remain LOS E during the a.m. and p.m. peak hours.

Additional Capital Improvements

Improvements identified in this section consist of changes to the intersection that are beyond the scope of the Low Cost Traffic Signal Improvement program and would require additional funds and consideration by the municipality. These changes include the installation of new traffic signal equipment and pedestrian accommodations.

Pavement Markings

Pavement markings and crosswalks at Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27) intersection are worn and barely visible.

The total cost to restripe the existing crosswalks and stop lines, and install pavement markings on at the intersection is approximately $1,200.

Signal Upgrades

It is recommended that the indications with incandescent bulbs be updated to all have LEDs. This upgrade will improve visibility as well as energy efficiency.

The existing pedestrian indications at each location are not MUTCD compliant. It is recommended that these indications be upgraded to indications with countdown timers. In addition, the pedestrian pushbuttons should be replaced with new Accessible Pedestrian Signals (APS) pushbuttons & signs.

MAIN STREET (ROUTE 109)/SPRING STREET (ROUTE 27)/N. MEADOWS ROAD (ROUTE 27)

Installation of new vehicle indications at the Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27) is approximately $16,000.

Installation of pedestrian indications at existing crosswalks is approximately $12,000. An additional $4,000 would be required for installing APS pushbutton, sign & saddle upgrades.

MAIN STREET (ROUTE 109)/PLEASANT STREET/NORTH STREET

It is recommended to install a 4-section signal head with flashing yellow left-turn arrow indication for the Main Street (Route 109) eastbound and North Street southbound approaches to indicate the protected/permissive left-turn movements. Installation of new vehicle indications at Main Street (Route 109)/Pleasant Street/North Street is approximately $16,400.

Installation of pedestrian indications at existing crosswalks is approximately $12,000. An additional $4,000 would be required for installing APS pushbutton, sign & saddle upgrades.

MAIN STREET (ROUTE 109)/PLEASANT STREET/SOUTH STREET

Installation of new vehicle indications at Main Street (Route 109)/South Street intersection is approximately $12,000.

Installation of pedestrian indications at existing crosswalks is approximately $6,000. An additional $3,000 would be required for installing APS pushbutton, sign & saddle upgrades.

Phasing

To further improve operations along the corridor, it is recommended that the phasing at the intersection be revised. The exclusive pedestrian phases at Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27) and Main Street (Route 109)/Pleasant Street/North Street could be removed to have concurrent pedestrian phases because there will be very few conflicting vehicle movements. This would provide more efficient signal operation and reduce delays for both pedestrians and vehicles.

The traffic control signal at Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27) and Main Street (Route 109)/Pleasant Street/North Street will operate similar to the existing phasing, however, without an exclusive pedestrian phase. The exclusive pedestrian phase will remain at Main Street (Route 109)/South Street and it is recommended the eastbound lag phase be removed.

With this improvement a cycle length of 130-seconds is proposed for the Main Street (Route 109) corridor. During the peak hours, the Main Street (Route 109) eastbound and westbound through movements will have an improved progression of traffic along the corridor.

MAIN STREET (ROUTE 109)/SPRING STREET (ROUTE 27)/N. MEADOWS ROAD (ROUTE 27)

At Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27) , the crosswalks across the Main Street (Route 109) eastbound and westbound approaches would be concurrent with the Spring Street (Route 27) and N. Meadows Road (Route 27) shared through/right-turn movement. The crosswalks across Spring Street (Route 27) and N. Meadows Road (Route 27) would be concurrent with the Main Street (Route 109) shared through/right-turn movement.

The total cost to update the signal timing and phasing is approximately $3,000.

MAIN STREET (ROUTE 109)/PLEASANT STREET/NORTH STREET

At Main Street (Route 109)/Pleasant Street/North Street, the crosswalks across Main Street (Route 109) eastbound and westbound approaches would be concurrent with the Pleasant Street and North Street through movements. The crosswalks across Pleasant Street and North Street would be concurrent with the Main Street (Route 109) through movements.

The total cost to update the signal timing and phasing is approximately $3,000.

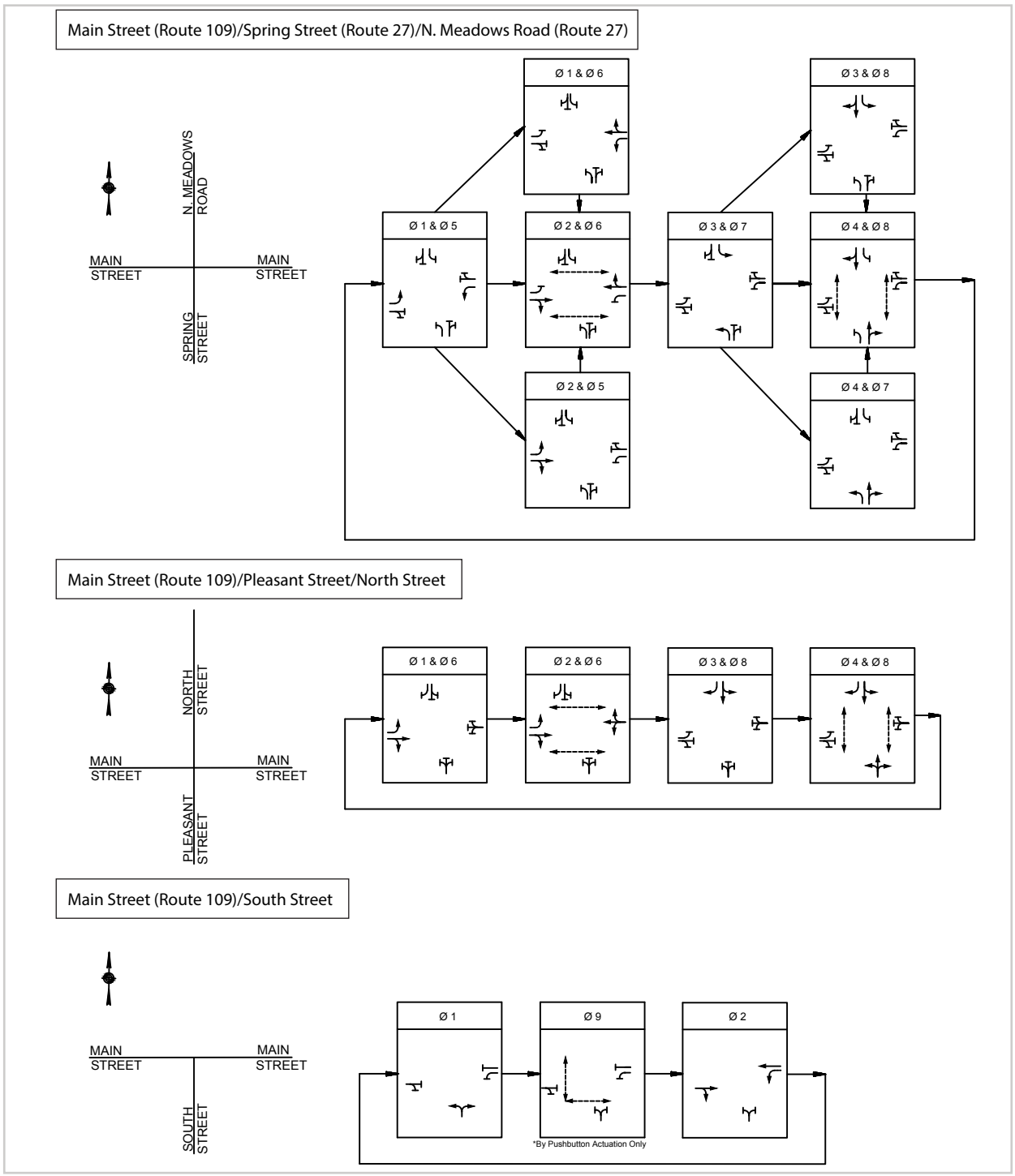
MAIN STREET (ROUTE 109)/PLEASANT STREET/SOUTH STREET

The exclusive pedestrian phase will remain at Main Street (Route 109)/South Street and it is recommended the eastbound lag phase be removed.

The total cost to update the signal timing and phasing is approximately $3,000.

The preferential phasing diagram is provided in **Figure 4**.

Figure 4. ***Preferential Phasing Diagram***



Operations Analysis

With the above improvements, operations are expected to improve significantly. The removal of the exclusive pedestrian phases to accommodate concurrent pedestrian phases, this alternative is expected to reduce the overall delay at the three intersections.

Table 10. Summary of Intersection Operations, Additional Capital Improvement Conditions

Intersection/Movement	LOS	Delay (Seconds)	V/C Ratio	50th Percentile Queue Length (feet)	95th Percentile Queue Length (feet)
a.m. Peak Hour					
Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27)	**F**	**83.0**			
Main EB left	D	50.4	0.30	39	85
Main EB thru/right	F	95.8	1.05	~462	#647
Main WB left	E	72.6	0.85	80	m#105
Main WB thru/right	D	53.8	0.67	258	m226
Spring NB left	D	48.4	0.36	73	140
Spring NB thru/right	F	90.0	1.00	~377	#606
N. Meadows SB left	F	163.3	1.09	~138	#278
N. Meadows SB thru/right	E	62.4	0.80	215	292
Main Street (Route 109)/Pleasant Street/North Street	**E**	**60.5**			
Main EB left	C	32.7	0.68	52	m55
Main EB thru/right	D	41.1	0.99	518	m509
Main WB left/thru/right	E	75.8	1.03	~491	#379
Pleasant NB left/thru/right	D	54.8	0.76	227	230
North SB left/thru	F	101.4	1.05	~256	#344
North SB right	C	25.0	0.09	0	24
Main Street (Route 109)/South Street	**C**	**21.0**			
Main EB thru/right	B	13.8	0.79	310	m#881
Main WB left	C	26.0	0.58	29	#137
Main WB thru	B	13.5	0.58	202	471
South NB left/right	E	64.5	0.79	187	237

Intersection/Movement	LOS	Delay (Seconds)	V/C Ratio	50th Percentile Queue Length (feet)	95th Percentile Queue Length (feet)
p.m. Peak Hour					
Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27)	**F**	**89.6**			
Main EB left	E	69.4	0.56	34	73
Main EB thru/right	F	92.4	1.01	345	#566
Main WB left	F	83.9	0.94	206	#376
Main WB thru/right	E	64.9	1.00	~437	#853
Spring NB left	F	115.5	0.97	142	#269
Spring NB thru/right	F	116.8	1.10	~484	#656
N. Meadows SB left	F	103.5	0.86	82	#187
N. Meadows SB thru/right	F	85.7	0.98	348	#564
Main Street (Route 109)/Pleasant Street/North Street	**C**	**26.2**			
Main EB left	B	10.2	0.29	18	m20
Main EB thru/right	A	7.6	0.43	86	m87
Main WB left/thru/right	C	22.6	0.67	430	347
Pleasant NB left/thru/right	E	55.1	0.55	95	125
North SB left/thru	D	47.5	0.78	224	#335
North SB right	C	29.9	0.12	0	48
Main Street (Route 109)/South Street	**C**	**23.2**			
Main EB thru/right	B	13.7	0.47	325	559
Main WB left	A	8.5	0.22	12	63
Main WB thru	B	19.3	0.76	198	#704
South NB left/right	E	63.5	0.74	150	145

 # = 95th percentile volume exceeds capacity, queue may be longer.
~=Volume exceeds capacity, queue is theoretically infinite.

With the additional capital improvements proposed at the intersections, operations improve to reduce the delay at the more heavily congested movements and increase delay at the less congested movements.

The overall level of service at the Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27) intersection is expected to remain a LOS F during the a.m. and p.m. peak hour, with a reduction in delay of approximately 15-seconds for the a.m. peak and approximately 40-seconds during the p.m. peak.

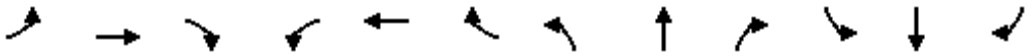
The Main Street (Route 109) eastbound left-turn lane is expected to improve from LOS F to LOS D during the a.m. peak hour and the shared through/right-turn lane movements is expected to worsen from LOS E to LOS F during the p.m. peak hour, due to allocating green-time to more heavily congested movements. The Main Street (Route 109) westbound left-turn lane movement is expected to remain LOS F with a reduction in delay of approximately 145-seconds during the a.m. peak hour and 240-seconds during the p.m. peak hour. The Main Street (Route 109) westbound shared through/right-turn lane movement is expected to improve from LOS F to LOS E during the p.m. peak hour. The Spring Street (Route 27) northbound left-turn lane movement is expected to improve from LOS F to LOS D during the a.m. peak hour. The Spring Street (Route 27) northbound shared through/right-turn lane movement is expected to remain a LOS F during the a.m. and p.m. peak hour with reduction in delay of approximately 25-seconds and 50-seconds, respectively. The N. Meadows Road southbound left-turn lane movement is expected to remain LOS F during the a.m. peak hour, with a reduction in delay of approximately 95-seconds and worsen from LOS E to LOS F during the p.m. peak hour, due to allocating green-time to more heavily congested movements. The N. Meadows Road southbound shared though/right-turn lane movement is expected to worsen from LOS D to LOS E during the a.m. peak hour and remain LOS F during the p.m. peak hour, with a reduction in delay of approximately 20-seconds. While the operations worsen for the left-turning movements, adjusting the timings to achieve added green-time for the Main Street (Route 109), Spring Street (Route 27), and N. Meadows Road (Route27) through movements benefits more vehicles.

The overall level of service at the Main Street (Route 109)/Pleasant Street/North Street intersection is expected to remain at an overall LOS E during the a.m. peak hour, with a reduction in delay of approximately 20-seconds; and LOS C during the p.m. peak hours. The Main Street (Route 109) eastbound shared through/right-turn lane movement is expected to worsen from LOS D to LOS E during the a.m. peak hour, due to allocating green-time to more heavily congested movements. The Pleasant Street northbound approach is expected to improve from LOS E to LOS D during the a.m. peak hour; and remain LOS E during the p.m. peak hour. The North Street southbound shared left-turn/through lane is expected to remain at LOS F with a reduction in delay of approximately 150-secoinds during the a.m. peak hour.

The overall level of service at the Main Street (Route 109)/South Street intersection is expected to remain LOS C or better during the a.m. and p.m. peak hours. The South Street northbound approach is expected to remain LOS E during the a.m. and p.m. peak hour.

With the improved timing changes, reducing the overall and movement delays at the intersections are achieved during the a.m. and p.m. peak hours; however with the increase in delay at some less congested movements.

Appendix A – Synchro Report



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	392	57	87	232	61	88	271	147	139	247	7
Future Volume (vph)	48	392	57	87	232	61	88	271	147	139	247	7
Ideal Flow (vphpl)	1500	1500	1500	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	13	13	11	12	12	12	11	12	12	12	12
Storage Length (ft)	130		0	120		0	120		0	250		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.981			0.969			0.947			0.996	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1274	1294	0	1525	1596	0	1547	1529	0	1593	1622	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1274	1294	0	1525	1596	0	1547	1529	0	1593	1622	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			10			21			1	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		372			1028			628			637	
Travel Time (s)		10.1			28.0			17.1			17.4	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.91	0.91	0.91	0.95	0.95	0.95
Heavy Vehicles (%)	4%	6%	4%	3%	3%	7%	5%	1%	5%	2%	4%	43%
Adj. Flow (vph)	55	451	66	100	267	70	97	298	162	146	260	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	55	517	0	100	337	0	97	460	0	146	267	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	10.0	11.0		10.0	11.0		10.0	11.0		10.0	11.0	
Total Split (s)	12.0	44.0		12.0	44.0		14.0	41.0		14.0	41.0	
Total Split (%)	9.2%	33.8%		9.2%	33.8%		10.8%	31.5%		10.8%	31.5%	
Maximum Green (s)	7.0	38.0		7.0	38.0		9.0	35.0		9.0	35.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	C-Min		None	C-Min		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	7.0	53.2		7.0	53.2		9.0	35.0		9.0	35.0	
Actuated g/C Ratio	0.05	0.41		0.05	0.41		0.07	0.27		0.07	0.27	
v/c Ratio	0.81	0.97		1.22	0.51		0.91	1.08		1.33	0.61	
Control Delay	125.0	70.1		204.5	30.6		124.3	108.7		242.2	48.4	

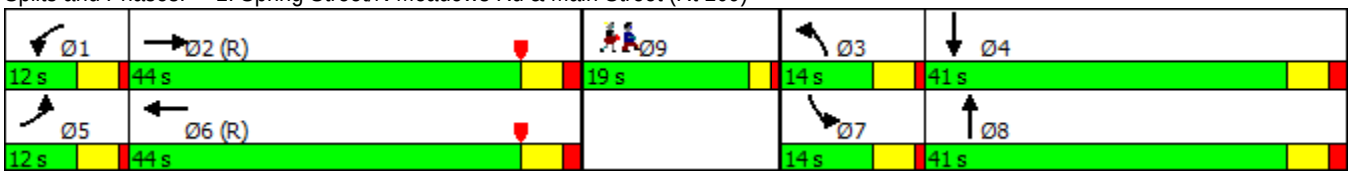
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	19.0
Total Split (s)	19.0
Total Split (%)	15%
Maximum Green (s)	16.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	9.0
Pedestrian Calls (#/hr)	1
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	125.0	70.1		204.5	30.6		124.3	108.7		242.2	48.4	
LOS	F	E		F	C		F	F		F	D	
Approach Delay		75.4			70.4			111.5			116.9	
Approach LOS		E			E			F			F	
Queue Length 50th (ft)	47	396		~105	132		83	~419		~159	197	
Queue Length 95th (ft)	#122	#755		m#149	m237		#193	#634		#299	293	
Internal Link Dist (ft)		292			948			548			557	
Turn Bay Length (ft)	130			120			120			250		
Base Capacity (vph)	68	532		82	659		107	427		110	437	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.81	0.97		1.22	0.51		0.91	1.08		1.33	0.61	

Intersection Summary

Area Type: CBD
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 2 (2%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.33
Intersection Signal Delay: 93.1 Intersection LOS: F
Intersection Capacity Utilization 92.0% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Spring Street/N Meadows Rd & Main Street (Rt 109)



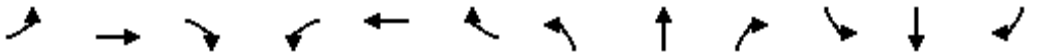
Lane Group	Ø9
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	392	57	87	232	61	88	271	147	139	247	7
Future Volume (vph)	48	392	57	87	232	61	88	271	147	139	247	7
Ideal Flow (vphpl)	1500	1500	1500	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	13	13	11	12	12	12	11	12	12	12	12
Total Lost time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.97		1.00	0.95		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1274	1294		1525	1596		1547	1529		1593	1622	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1274	1294		1525	1596		1547	1529		1593	1622	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.91	0.91	0.91	0.95	0.95	0.95
Adj. Flow (vph)	55	451	66	100	267	70	97	298	162	146	260	7
RTOR Reduction (vph)	0	4	0	0	6	0	0	15	0	0	1	0
Lane Group Flow (vph)	55	513	0	100	331	0	97	445	0	146	266	0
Heavy Vehicles (%)	4%	6%	4%	3%	3%	7%	5%	1%	5%	2%	4%	43%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	7.0	50.8		7.0	50.8		9.0	35.0		9.0	35.0	
Effective Green, g (s)	7.0	50.8		7.0	50.8		9.0	35.0		9.0	35.0	
Actuated g/C Ratio	0.05	0.39		0.05	0.39		0.07	0.27		0.07	0.27	
Clearance Time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	68	505		82	623		107	411		110	436	
v/s Ratio Prot	0.04	c0.40		c0.07	0.21		0.06	c0.29		c0.09	0.16	
v/s Ratio Perm												
v/c Ratio	0.81	1.02		1.22	0.53		0.91	1.08		1.33	0.61	
Uniform Delay, d1	60.8	39.6		61.5	30.4		60.1	47.5		60.5	41.5	
Progression Factor	1.00	1.00		1.11	0.95		1.00	1.00		1.00	1.00	
Incremental Delay, d2	48.6	44.3		150.7	2.1		57.8	68.1		196.9	2.5	
Delay (s)	109.5	83.9		219.1	31.1		117.8	115.6		257.4	44.1	
Level of Service	F	F		F	C		F	F		F	D	
Approach Delay (s)		86.3			74.1			116.0			119.5	
Approach LOS		F			E			F			F	

Intersection Summary			
HCM 2000 Control Delay	98.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	92.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	143	667	0	1	351	262	22	158	12	212	74	108
Future Volume (vph)	143	667	0	1	351	262	22	158	12	212	74	108
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	16	16	16	13	13	13	12	12	14
Storage Length (ft)	90		0	0		0	0		0	0		180
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.942			0.992				0.850
Flt Protected	0.950							0.994			0.964	
Satd. Flow (prot)	1378	1535	0	0	1715	0	0	1718	0	0	1570	1505
Flt Permitted	0.232				0.999			0.917			0.345	
Satd. Flow (perm)	337	1535	0	0	1714	0	0	1585	0	0	562	1505
Right Turn on Red			No			Yes			No			Yes
Satd. Flow (RTOR)					31							130
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1028			389			620			462	
Travel Time (s)		28.0			10.6			16.9			12.6	
Peak Hour Factor	0.84	0.84	0.84	0.82	0.82	0.82	0.67	0.67	0.67	0.77	0.77	0.77
Heavy Vehicles (%)	10%	4%	0%	0%	6%	7%	5%	1%	0%	5%	5%	3%
Adj. Flow (vph)	170	794	0	1	428	320	33	236	18	275	96	140
Shared Lane Traffic (%)												
Lane Group Flow (vph)	170	794	0	0	749	0	0	287	0	0	371	140
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		custom	NA	Prot
Protected Phases	1	6			2			4		3	3 8	3 8
Permitted Phases	6			2			4			8		
Detector Phase	1	6		2	2		4	4		3	3 8	3 8
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0		
Minimum Split (s)	9.0	11.0		11.0	11.0		10.0	10.0		9.0		
Total Split (s)	10.0	60.0		50.0	50.0		34.0	34.0		14.0		
Total Split (%)	7.7%	46.2%		38.5%	38.5%		26.2%	26.2%		10.8%		
Maximum Green (s)	6.0	54.0		44.0	44.0		29.0	29.0		10.0		
Yellow Time (s)	3.0	4.0		4.0	4.0		3.0	3.0		3.0		
All-Red Time (s)	1.0	2.0		2.0	2.0		2.0	2.0		1.0		
Lost Time Adjust (s)	0.0	0.0			0.0			0.0				
Total Lost Time (s)	4.0	6.0			6.0			5.0				
Lead/Lag	Lead			Lag	Lag		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0		
Recall Mode	None	C-Min		C-Min	C-Min		None	None		None		
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	73.6	71.6			61.6			29.0			44.0	44.0
Actuated g/C Ratio	0.57	0.55			0.47			0.22			0.34	0.34
v/c Ratio	0.71	0.94			0.90			0.81			1.39	0.24
Control Delay	32.9	42.5			42.4			66.8			228.5	7.1

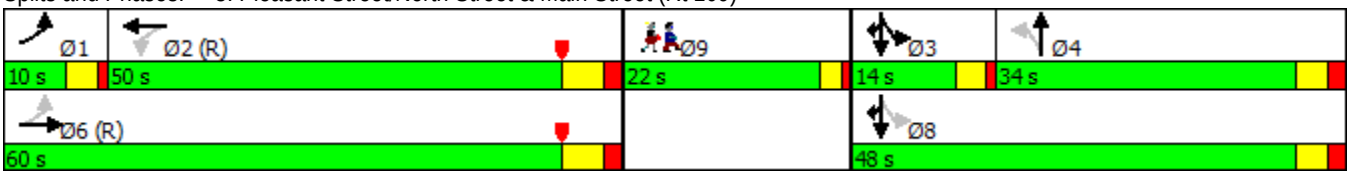
Lane Group	Ø8	Ø9
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Heavy Vehicles (%)		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	8	9
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	10.0	22.0
Total Split (s)	48.0	22.0
Total Split (%)	37%	17%
Maximum Green (s)	43.0	19.0
Yellow Time (s)	3.0	2.0
All-Red Time (s)	2.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Vehicle Extension (s)	3.0	3.0
Recall Mode	None	None
Walk Time (s)		7.0
Flash Dont Walk (s)		12.0
Pedestrian Calls (#/hr)		2
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	24.6			11.9			0.0			0.0	0.0
Total Delay	32.9	67.2			54.3			66.8			228.5	7.1
LOS	C	E			D			E			F	A
Approach Delay		61.1			54.3			66.8			167.8	
Approach LOS		E			D			E			F	
Queue Length 50th (ft)	70	478			127			231			~384	6
Queue Length 95th (ft)	m111	m#801			#863			235			#490	32
Internal Link Dist (ft)		948			309			540			382	
Turn Bay Length (ft)	90											180
Base Capacity (vph)	239	845			828			353			267	595
Starvation Cap Reductn	0	0			77			0			0	0
Spillback Cap Reductn	0	88			0			0			0	0
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	0.71	1.05			1.00			0.81			1.39	0.24

Intersection Summary			
Area Type:	CBD		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow, Master Intersection			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.39			
Intersection Signal Delay: 81.5		Intersection LOS: F	
Intersection Capacity Utilization 123.6%		ICU Level of Service H	
Analysis Period (min) 15			

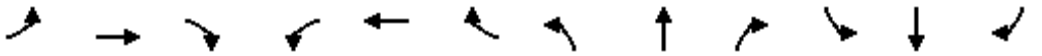
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Pleasant Street/North Street & Main Street (Rt 109)



Lane Group	Ø8	Ø9
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	143	667	0	1	351	262	22	158	12	212	74	108
Future Volume (vph)	143	667	0	1	351	262	22	158	12	212	74	108
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	16	16	16	13	13	13	12	12	14
Total Lost time (s)	4.0	6.0			6.0			5.0			4.0	4.0
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	1.00
Frt	1.00	1.00			0.94			0.99			1.00	0.85
Flt Protected	0.95	1.00			1.00			0.99			0.96	1.00
Satd. Flow (prot)	1378	1535			1716			1718			1570	1505
Flt Permitted	0.23	1.00			1.00			0.92			0.34	1.00
Satd. Flow (perm)	337	1535			1715			1584			561	1505
Peak-hour factor, PHF	0.84	0.84	0.84	0.82	0.82	0.82	0.67	0.67	0.67	0.77	0.77	0.77
Adj. Flow (vph)	170	794	0	1	428	320	33	236	18	275	96	140
RTOR Reduction (vph)	0	0	0	0	17	0	0	0	0	0	0	87
Lane Group Flow (vph)	170	794	0	0	732	0	0	287	0	0	371	53
Heavy Vehicles (%)	10%	4%	0%	0%	6%	7%	5%	1%	0%	5%	5%	3%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		custom	NA	Prot
Protected Phases	1	6			2			4		3	3 8	3 8
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	69.2	69.2			59.2			29.0			43.0	43.0
Effective Green, g (s)	69.2	69.2			59.2			29.0			43.0	43.0
Actuated g/C Ratio	0.53	0.53			0.46			0.22			0.33	0.33
Clearance Time (s)	4.0	6.0			6.0			5.0				
Vehicle Extension (s)	3.0	3.0			3.0			3.0				
Lane Grp Cap (vph)	227	817			780			353			263	497
v/s Ratio Prot	0.03	c0.52									c0.11	0.04
v/s Ratio Perm	0.36				0.43			0.18			c0.36	
v/c Ratio	0.75	0.97			0.94			0.81			1.41	0.11
Uniform Delay, d1	26.9	29.5			33.7			47.9			43.5	30.2
Progression Factor	1.22	1.10			0.96			1.00			1.00	1.00
Incremental Delay, d2	6.9	16.9			16.9			13.3			205.9	0.1
Delay (s)	39.8	49.3			49.2			61.3			249.4	30.3
Level of Service	D	D			D			E			F	C
Approach Delay (s)		47.6			49.2			61.3			189.4	
Approach LOS		D			D			E			F	

Intersection Summary			
HCM 2000 Control Delay	78.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	123.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

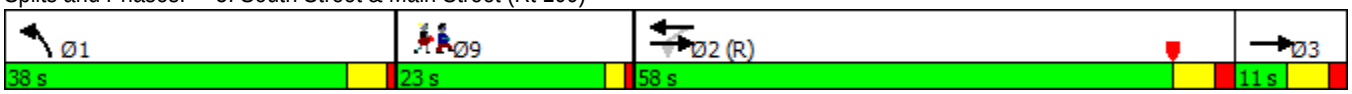
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø3	Ø9
Lane Configurations								
Traffic Volume (vph)	828	63	69	482	132	72		
Future Volume (vph)	828	63	69	482	132	72		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	14	14	9	10	14	14		
Storage Length (ft)		0	100		0	0		
Storage Lanes		0	1		1	0		
Taper Length (ft)			25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		
Frt	0.990				0.952			
Flt Protected			0.950		0.969			
Satd. Flow (prot)	1728	0	1160	1535	1634	0		
Flt Permitted			0.162		0.969			
Satd. Flow (perm)	1728	0	198	1535	1634	0		
Right Turn on Red		No				Yes		
Satd. Flow (RTOR)					20			
Link Speed (mph)	25			25	25			
Link Distance (ft)	389			379	438			
Travel Time (s)	10.6			10.3	11.9			
Peak Hour Factor	0.96	0.96	0.79	0.79	0.82	0.82		
Heavy Vehicles (%)	4%	11%	26%	4%	3%	3%		
Adj. Flow (vph)	863	66	87	610	161	88		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	929	0	87	610	249	0		
Turn Type	NA		Perm	NA	Prot			
Protected Phases	2 3			2	1		3	9
Permitted Phases			2					
Detector Phase	2 3		2	2	1			
Switch Phase								
Minimum Initial (s)			10.0	10.0	5.0		5.0	10.0
Minimum Split (s)			16.0	16.0	10.0		11.0	23.0
Total Split (s)			58.0	58.0	38.0		11.0	23.0
Total Split (%)			44.6%	44.6%	29.2%		8%	18%
Maximum Green (s)			52.0	52.0	33.0		5.0	20.0
Yellow Time (s)			4.0	4.0	4.0		4.0	2.0
All-Red Time (s)			2.0	2.0	1.0		2.0	1.0
Lost Time Adjust (s)			0.0	0.0	0.0			
Total Lost Time (s)			6.0	6.0	5.0			
Lead/Lag			Lead	Lead			Lag	
Lead-Lag Optimize?			Yes	Yes			Yes	
Vehicle Extension (s)			3.0	3.0	3.0		3.0	3.0
Recall Mode			C-Min	C-Min	None		None	None
Walk Time (s)								7.0
Flash Dont Walk (s)								13.0
Pedestrian Calls (#/hr)								2
Act Effct Green (s)	90.7		79.7	79.7	23.7			
Actuated g/C Ratio	0.70		0.61	0.61	0.18			
v/c Ratio	0.77		0.72	0.65	0.80			
Control Delay	13.1		57.5	23.6	64.3			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø3	Ø9
Queue Delay	11.7		0.0	0.1	1.0			
Total Delay	24.7		57.5	23.8	65.4			
LOS	C		E	C	E			
Approach Delay	24.7			28.0	65.4			
Approach LOS	C			C	E			
Queue Length 50th (ft)	266		43	279	187			
Queue Length 95th (ft)	m#876		#162	#591	235			
Internal Link Dist (ft)	309			299	358			
Turn Bay Length (ft)			100					
Base Capacity (vph)	1206		121	941	429			
Starvation Cap Reductn	264		0	0	0			
Spillback Cap Reductn	0		0	28	53			
Storage Cap Reductn	0		0	0	0			
Reduced v/c Ratio	0.99		0.72	0.67	0.66			

Intersection Summary			
Area Type:	CBD		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 9 (7%), Referenced to phase 2:EBWB, Start of Yellow			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 31.3		Intersection LOS: C	
Intersection Capacity Utilization 85.9%		ICU Level of Service E	
Analysis Period (min) 15			

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

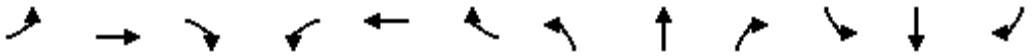
Splits and Phases: 5: South Street & Main Street (Rt 109)



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	828	63	69	482	132	72
Future Volume (vph)	828	63	69	482	132	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	14	14	9	10	14	14
Total Lost time (s)	6.0		6.0	6.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.99		1.00	1.00	0.95	
Flt Protected	1.00		0.95	1.00	0.97	
Satd. Flow (prot)	1729		1160	1535	1634	
Flt Permitted	1.00		0.16	1.00	0.97	
Satd. Flow (perm)	1729		198	1535	1634	
Peak-hour factor, PHF	0.96	0.96	0.79	0.79	0.82	0.82
Adj. Flow (vph)	862	66	87	610	161	88
RTOR Reduction (vph)	0	0	0	0	16	0
Lane Group Flow (vph)	929	0	87	610	233	0
Heavy Vehicles (%)	4%	11%	26%	4%	3%	3%
Turn Type	NA		Perm	NA	Prot	
Protected Phases	2 3			2	1	
Permitted Phases			2			
Actuated Green, G (s)	88.3		77.3	77.3	23.7	
Effective Green, g (s)	88.3		77.3	77.3	23.7	
Actuated g/C Ratio	0.68		0.59	0.59	0.18	
Clearance Time (s)			6.0	6.0	5.0	
Vehicle Extension (s)			3.0	3.0	3.0	
Lane Grp Cap (vph)	1174		117	912	297	
v/s Ratio Prot	c0.54			0.40	c0.14	
v/s Ratio Perm			0.44			
v/c Ratio	0.79		0.74	0.67	0.78	
Uniform Delay, d1	14.5		19.1	17.7	50.7	
Progression Factor	0.69		1.00	1.00	1.00	
Incremental Delay, d2	0.3		34.4	3.9	12.6	
Delay (s)	10.3		53.5	21.6	63.3	
Level of Service	B		D	C	E	
Approach Delay (s)	10.3			25.6	63.3	
Approach LOS	B			C	E	

Intersection Summary			
HCM 2000 Control Delay	23.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	85.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group



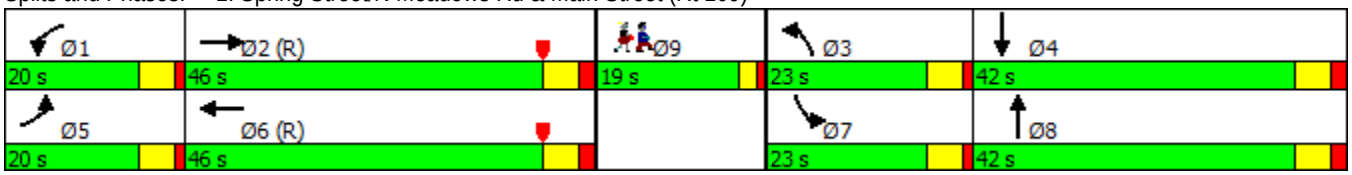
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	283	103	225	595	55	144	335	108	89	356	31
Future Volume (vph)	37	283	103	225	595	55	144	335	108	89	356	31
Ideal Flow (vphpl)	1500	1500	1500	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	13	13	11	12	12	12	11	12	12	12	12
Storage Length (ft)	130		0	120		0	120		0	250		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor											1.00	
Frt		0.960			0.987			0.963			0.988	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1325	1339	0	1570	1672	0	1608	1580	0	1624	1667	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1325	1339	0	1570	1672	0	1608	1580	0	1624	1667	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			3			10			3	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		372			1028			628			637	
Travel Time (s)		10.1			28.0			17.1			17.4	
Confl. Bikes (#/hr)												1
Peak Hour Factor	0.91	0.91	0.91	0.94	0.94	0.94	0.86	0.86	0.86	0.93	0.93	0.93
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	1%	1%	0%	0%	1%	3%
Adj. Flow (vph)	41	311	113	239	633	59	167	390	126	96	383	33
Shared Lane Traffic (%)												
Lane Group Flow (vph)	41	424	0	239	692	0	167	516	0	96	416	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	10.0	11.0		10.0	11.0		10.0	11.0		10.0	11.0	
Total Split (s)	20.0	46.0		20.0	46.0		23.0	42.0		23.0	42.0	
Total Split (%)	13.3%	30.7%		13.3%	30.7%		15.3%	28.0%		15.3%	28.0%	
Maximum Green (s)	15.0	40.0		15.0	40.0		18.0	36.0		18.0	36.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	C-Min		None	C-Min		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	10.0	55.2		15.0	62.3		17.5	40.2		13.8	36.5	
Actuated g/C Ratio	0.07	0.37		0.10	0.42		0.12	0.27		0.09	0.24	

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	19.0
Total Split (s)	19.0
Total Split (%)	13%
Maximum Green (s)	16.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	9.0
Pedestrian Calls (#/hr)	4
Act Effct Green (s)	
Actuated g/C Ratio	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.47	0.85		1.52	0.99		0.90	1.20		0.64	1.02	
Control Delay	83.1	59.0		302.8	87.0		107.8	155.4		84.7	104.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	83.1	59.0		302.8	87.0		107.8	155.4		84.7	104.2	
LOS	F	E		F	F		F	F		F	F	
Approach Delay		61.1			142.4			143.8			100.5	
Approach LOS		E			F			F			F	

Intersection Summary			
Area Type:	CBD		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 112 (75%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.52			
Intersection Signal Delay: 119.9		Intersection LOS: F	
Intersection Capacity Utilization 94.3%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 1: Spring Street/N Meadows Rd & Main Street (Rt 109)



Lane Group	Ø9
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	283	103	225	595	55	144	335	108	89	356	31
Future Volume (vph)	37	283	103	225	595	55	144	335	108	89	356	31
Ideal Flow (vphpl)	1500	1500	1500	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	13	13	11	12	12	12	11	12	12	12	12
Total Lost time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.99		1.00	0.96		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1325	1339		1570	1673		1608	1581		1624	1667	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1325	1339		1570	1673		1608	1581		1624	1667	
Peak-hour factor, PHF	0.91	0.91	0.91	0.94	0.94	0.94	0.86	0.86	0.86	0.93	0.93	0.93
Adj. Flow (vph)	41	311	113	239	633	59	167	390	126	96	383	33
RTOR Reduction (vph)	0	8	0	0	2	0	0	7	0	0	2	0
Lane Group Flow (vph)	41	416	0	239	690	0	167	509	0	96	414	0
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	1%	1%	0%	0%	1%	3%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	8.9	52.8		15.0	58.9		17.5	40.2		13.8	36.5	
Effective Green, g (s)	8.9	52.8		15.0	58.9		17.5	40.2		13.8	36.5	
Actuated g/C Ratio	0.06	0.35		0.10	0.39		0.12	0.27		0.09	0.24	
Clearance Time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	78	471		157	656		187	423		149	405	
v/s Ratio Prot	0.03	0.31		c0.15	c0.41		c0.10	c0.32		0.06	0.25	
v/s Ratio Perm												
v/c Ratio	0.53	0.88		1.52	1.05		0.89	1.20		0.64	1.02	
Uniform Delay, d1	68.5	45.7		67.5	45.5		65.3	54.9		65.7	56.8	
Progression Factor	1.00	1.00		0.94	1.38		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.3	20.8		262.1	47.9		37.3	111.8		9.2	50.3	
Delay (s)	74.8	66.5		325.4	110.8		102.6	166.7		74.9	107.1	
Level of Service	E	E		F	F		F	F		E	F	
Approach Delay (s)		67.2			165.9			151.0			101.0	
Approach LOS		E			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	131.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	94.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

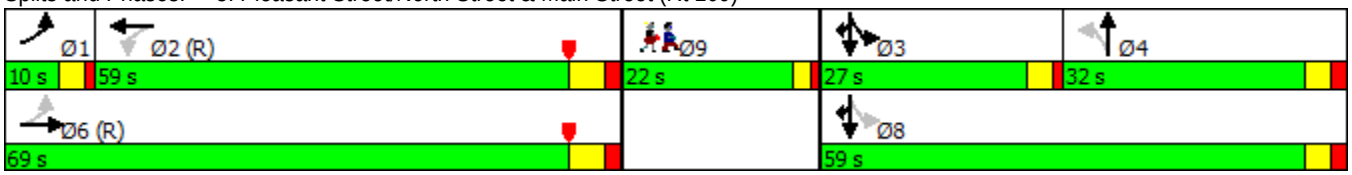
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	362	12	2	499	81	18	67	7	199	121	173
Future Volume (vph)	100	362	12	2	499	81	18	67	7	199	121	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	16	16	16	13	13	13	12	12	14
Storage Length (ft)	90		0	0		0	0		0	0		180
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.995			0.981			0.990				0.850
Flt Protected	0.950							0.990			0.970	
Satd. Flow (prot)	1516	1573	0	0	1885	0	0	1732	0	0	1648	1535
Flt Permitted	0.292				0.999			0.875			0.564	
Satd. Flow (perm)	466	1573	0	0	1883	0	0	1531	0	0	958	1535
Right Turn on Red			No			Yes			No			Yes
Satd. Flow (RTOR)					6							168
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1028			389			620			462	
Travel Time (s)		28.0			10.6			16.9			12.6	
Confl. Bikes (#/hr)												1
Peak Hour Factor	0.96	0.96	0.96	0.92	0.92	0.92	0.80	0.80	0.80	0.95	0.95	0.95
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	1%	0%	1%
Adj. Flow (vph)	104	377	13	2	542	88	23	84	9	209	127	182
Shared Lane Traffic (%)												
Lane Group Flow (vph)	104	390	0	0	632	0	0	116	0	0	336	182
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		custom	NA	Prot
Protected Phases	1	6			2			4		3	3 8	3 8
Permitted Phases	6			2			4			8		
Detector Phase	1	6		2	2		4	4		3	3 8	3 8
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0		
Minimum Split (s)	9.0	11.0		11.0	11.0		10.0	10.0		9.0		
Total Split (s)	10.0	69.0		59.0	59.0		32.0	32.0		27.0		
Total Split (%)	6.7%	46.0%		39.3%	39.3%		21.3%	21.3%		18.0%		
Maximum Green (s)	6.0	63.0		53.0	53.0		27.0	27.0		23.0		
Yellow Time (s)	3.0	4.0		4.0	4.0		3.0	3.0		3.0		
All-Red Time (s)	1.0	2.0		2.0	2.0		2.0	2.0		1.0		
Lost Time Adjust (s)	0.0	0.0			0.0			0.0				
Total Lost Time (s)	4.0	6.0			6.0			5.0				
Lead/Lag	Lead			Lag	Lag		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0		
Recall Mode	None	C-Min		C-Min	C-Min		None	None		None		
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	86.6	84.6			73.4			23.0			51.0	51.0
Actuated g/C Ratio	0.58	0.56			0.49			0.15			0.34	0.34

Lane Group	Ø8	Ø9
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Ped Bike Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Bikes (#/hr)		
Peak Hour Factor		
Heavy Vehicles (%)		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	8	9
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	10.0	22.0
Total Split (s)	59.0	22.0
Total Split (%)	39%	15%
Maximum Green (s)	54.0	19.0
Yellow Time (s)	3.0	2.0
All-Red Time (s)	2.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Vehicle Extension (s)	3.0	3.0
Recall Mode	None	None
Walk Time (s)		7.0
Flash Dont Walk (s)		12.0
Pedestrian Calls (#/hr)		2
Act Effct Green (s)		
Actuated g/C Ratio		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.33	0.44			0.68			0.50			0.78	0.29
Control Delay	14.0	15.3			35.9			64.5			54.4	6.8
Queue Delay	0.0	0.0			28.2			0.2			0.2	0.0
Total Delay	14.0	15.3			64.1			64.6			54.6	6.8
LOS	B	B			E			E			D	A
Approach Delay		15.1			64.1			64.6			37.8	
Approach LOS		B			E			E			D	

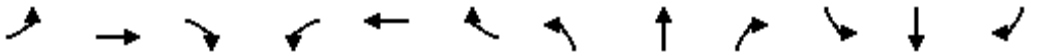
Intersection Summary			
Area Type:	CBD		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow, Master Intersection			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 42.6		Intersection LOS: D	
Intersection Capacity Utilization 96.1%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 3: Pleasant Street/North Street & Main Street (Rt 109)



Lane Group	Ø8	Ø9
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	362	12	2	499	81	18	67	7	199	121	173
Future Volume (vph)	100	362	12	2	499	81	18	67	7	199	121	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	16	16	16	13	13	13	12	12	14
Total Lost time (s)	4.0	6.0			6.0			5.0			4.0	4.0
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00			1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00			1.00			1.00	1.00
Frt	1.00	0.99			0.98			0.99			1.00	0.85
Flt Protected	0.95	1.00			1.00			0.99			0.97	1.00
Satd. Flow (prot)	1516	1573			1885			1731			1648	1535
Flt Permitted	0.29	1.00			1.00			0.88			0.56	1.00
Satd. Flow (perm)	466	1573			1884			1531			958	1535
Peak-hour factor, PHF	0.96	0.96	0.96	0.92	0.92	0.92	0.80	0.80	0.80	0.95	0.95	0.95
Adj. Flow (vph)	104	377	12	2	542	88	22	84	9	209	127	182
RTOR Reduction (vph)	0	0	0	0	3	0	0	0	0	0	0	112
Lane Group Flow (vph)	104	390	0	0	629	0	0	116	0	0	336	70
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	1%	0%	1%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		custom	NA	Prot
Protected Phases	1	6			2			4		3	3 8	3 8
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	82.2	82.2			71.0			23.0			50.0	50.0
Effective Green, g (s)	82.2	82.2			71.0			23.0			50.0	50.0
Actuated g/C Ratio	0.55	0.55			0.47			0.15			0.33	0.33
Clearance Time (s)	4.0	6.0			6.0			5.0				
Vehicle Extension (s)	3.0	3.0			3.0			3.0				
Lane Grp Cap (vph)	305	862			891			234			425	511
v/s Ratio Prot	0.02	c0.25									c0.12	0.05
v/s Ratio Perm	0.17				c0.33			0.08			c0.14	
v/c Ratio	0.34	0.45			0.71			0.50			0.79	0.14
Uniform Delay, d1	19.5	20.4			31.2			58.2			45.3	34.9
Progression Factor	0.70	0.66			1.04			1.00			1.00	1.00
Incremental Delay, d2	0.3	0.8			3.3			1.7			9.7	0.1
Delay (s)	13.9	14.3			35.9			59.8			54.9	35.1
Level of Service	B	B			D			E			D	D
Approach Delay (s)		14.2			35.9			59.8			47.9	
Approach LOS		B			D			E			D	

Intersection Summary			
HCM 2000 Control Delay	35.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	96.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø9
Lane Configurations							
Traffic Volume (vph)	452	110	56	508	77	60	
Future Volume (vph)	452	110	56	508	77	60	
Ideal Flow (vphpl)	1900	1900	1200	1200	1900	1900	
Lane Width (ft)	14	14	9	10	14	14	
Storage Length (ft)		0	100		0	0	
Storage Lanes		0	1		1	0	
Taper Length (ft)			25		25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	0.974				0.941		
Flt Protected			0.950		0.973		
Satd. Flow (prot)	1777	0	923	998	1670	0	
Flt Permitted			0.390		0.973		
Satd. Flow (perm)	1777	0	379	998	1670	0	
Right Turn on Red		No				Yes	
Satd. Flow (RTOR)					23		
Link Speed (mph)	25			25	25		
Link Distance (ft)	389			379	438		
Travel Time (s)	10.6			10.3	11.9		
Peak Hour Factor	0.96	0.96	0.95	0.95	0.65	0.65	
Heavy Vehicles (%)	0%	0%	0%	1%	0%	0%	
Adj. Flow (vph)	471	115	59	535	118	92	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	586	0	59	535	210	0	
Turn Type	NA		Perm	NA	Prot		
Protected Phases	2			2	1		9
Permitted Phases			2				
Detector Phase	2		2	2	1		
Switch Phase							
Minimum Initial (s)	10.0		10.0	10.0	5.0		10.0
Minimum Split (s)	16.0		16.0	16.0	10.0		23.0
Total Split (s)	93.0		93.0	93.0	34.0		23.0
Total Split (%)	62.0%		62.0%	62.0%	22.7%		15%
Maximum Green (s)	87.0		87.0	87.0	29.0		20.0
Yellow Time (s)	4.0		4.0	4.0	4.0		2.0
All-Red Time (s)	2.0		2.0	2.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	6.0		6.0	6.0	5.0		
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	C-Min		C-Min	C-Min	None		None
Walk Time (s)							7.0
Flash Dont Walk (s)							13.0
Pedestrian Calls (#/hr)							3
Act Effct Green (s)	112.4		112.4	112.4	22.0		
Actuated g/C Ratio	0.75		0.75	0.75	0.15		
v/c Ratio	0.44		0.21	0.72	0.80		
Control Delay	6.8		11.2	20.4	75.9		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø9
Queue Delay	0.8		0.0	53.4	0.2		
Total Delay	7.5		11.2	73.9	76.1		
LOS	A		B	E	E		
Approach Delay	7.5			67.6	76.1		
Approach LOS	A			E	E		

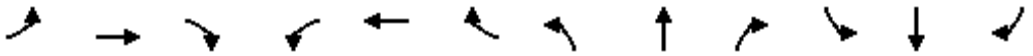
Intersection Summary			
Area Type:	CBD		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 135 (90%), Referenced to phase 2:EBWB, Start of Yellow			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 43.6		Intersection LOS: D	
Intersection Capacity Utilization 65.2%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 5: South Street & Main Street (Rt 109)

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	452	110	56	508	77	60
Future Volume (vph)	452	110	56	508	77	60
Ideal Flow (vphpl)	1900	1900	1200	1200	1900	1900
Lane Width	14	14	9	10	14	14
Total Lost time (s)	6.0		6.0	6.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.97		1.00	1.00	0.94	
Flt Protected	1.00		0.95	1.00	0.97	
Satd. Flow (prot)	1776		923	998	1669	
Flt Permitted	1.00		0.39	1.00	0.97	
Satd. Flow (perm)	1776		379	998	1669	
Peak-hour factor, PHF	0.96	0.96	0.95	0.95	0.65	0.65
Adj. Flow (vph)	471	115	59	535	118	92
RTOR Reduction (vph)	0	0	0	0	20	0
Lane Group Flow (vph)	586	0	59	535	190	0
Heavy Vehicles (%)	0%	0%	0%	1%	0%	0%
Turn Type	NA		Perm	NA	Prot	
Protected Phases	2			2	1	
Permitted Phases			2			
Actuated Green, G (s)	110.0		110.0	110.0	22.0	
Effective Green, g (s)	110.0		110.0	110.0	22.0	
Actuated g/C Ratio	0.73		0.73	0.73	0.15	
Clearance Time (s)	6.0		6.0	6.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1302		277	731	244	
v/s Ratio Prot	0.33			c0.54	c0.11	
v/s Ratio Perm			0.16			
v/c Ratio	0.45		0.21	0.73	0.78	
Uniform Delay, d1	8.0		6.3	11.5	61.7	
Progression Factor	0.62		1.00	1.00	1.00	
Incremental Delay, d2	1.0		1.8	6.4	14.8	
Delay (s)	5.9		8.1	17.9	76.5	
Level of Service	A		A	B	E	
Approach Delay (s)	5.9			16.9	76.5	
Approach LOS	A			B	E	

Intersection Summary			
HCM 2000 Control Delay	21.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	392	57	87	232	61	88	271	147	139	247	7
Future Volume (vph)	48	392	57	87	232	61	88	271	147	139	247	7
Ideal Flow (vphpl)	1500	1500	1500	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	13	13	11	12	12	12	11	12	12	12	12
Storage Length (ft)	130		0	120		0	120		0	250		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.981			0.969			0.947			0.996	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1274	1294	0	1525	1596	0	1547	1529	0	1593	1622	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1274	1294	0	1525	1596	0	1547	1529	0	1593	1622	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			9			18			1	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		372			1028			628			637	
Travel Time (s)		10.1			28.0			17.1			17.4	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.91	0.91	0.91	0.95	0.95	0.95
Heavy Vehicles (%)	4%	6%	4%	3%	3%	7%	5%	1%	5%	2%	4%	43%
Adj. Flow (vph)	55	451	66	100	267	70	97	298	162	146	260	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	55	517	0	100	337	0	97	460	0	146	267	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	10.0	11.0		10.0	11.0		10.0	11.0		10.0	11.0	
Total Split (s)	17.0	50.0		15.0	48.0		18.0	46.0		18.0	46.0	
Total Split (%)	11.3%	33.3%		10.0%	32.0%		12.0%	30.7%		12.0%	30.7%	
Maximum Green (s)	12.0	44.0		10.0	42.0		13.0	40.0		13.0	40.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	C-Min		None	C-Min		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	10.4	60.8		10.0	62.7		12.3	40.0		13.0	40.7	
Actuated g/C Ratio	0.07	0.41		0.07	0.42		0.08	0.27		0.09	0.27	
v/c Ratio	0.63	0.98		0.99	0.50		0.77	1.10		1.06	0.61	
Control Delay	97.5	77.7		121.3	40.6		102.4	120.3		155.8	54.5	

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	14%
Maximum Green (s)	18.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	1
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	97.5	77.7		121.3	40.6		102.4	120.3		155.8	54.5	
LOS	F	E		F	D		F	F		F	D	
Approach Delay		79.6			59.0			117.2			90.3	
Approach LOS		E			E			F			F	
Queue Length 50th (ft)	53	468		95	297		94	~494		~156	230	
Queue Length 95th (ft)	100	#849		m#150	m381		#185	#720		#304	332	
Internal Link Dist (ft)		292			948			548			557	
Turn Bay Length (ft)	130			120			120			250		
Base Capacity (vph)	101	527		101	672		134	420		138	441	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.54	0.98		0.99	0.50		0.72	1.10		1.06	0.61	

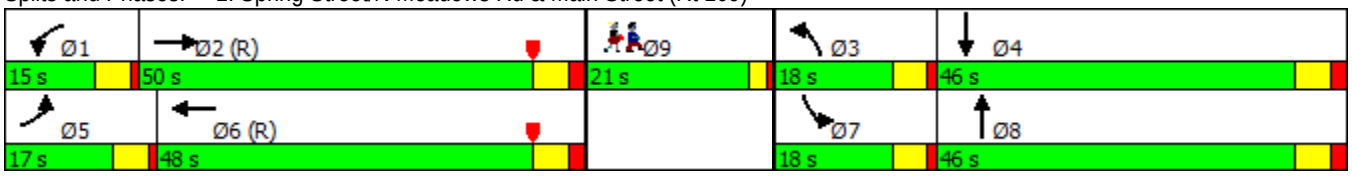
Intersection Summary			
Area Type:	CBD		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 82 (55%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.10			
Intersection Signal Delay: 87.9		Intersection LOS: F	
Intersection Capacity Utilization 92.0%		ICU Level of Service F	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

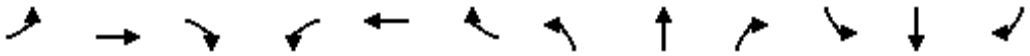
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Spring Street/N Meadows Rd & Main Street (Rt 109)



Lane Group	Ø9
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

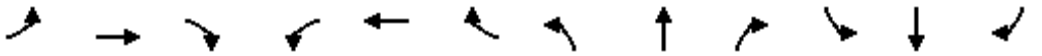
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	392	57	87	232	61	88	271	147	139	247	7
Future Volume (vph)	48	392	57	87	232	61	88	271	147	139	247	7
Ideal Flow (vphpl)	1500	1500	1500	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	13	13	11	12	12	12	11	12	12	12	12
Total Lost time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.97		1.00	0.95		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1274	1294		1525	1596		1547	1529		1593	1622	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1274	1294		1525	1596		1547	1529		1593	1622	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.91	0.91	0.91	0.95	0.95	0.95
Adj. Flow (vph)	55	451	66	100	267	70	97	298	162	146	260	7
RTOR Reduction (vph)	0	3	0	0	5	0	0	13	0	0	1	0
Lane Group Flow (vph)	55	514	0	100	332	0	97	447	0	146	266	0
Heavy Vehicles (%)	4%	6%	4%	3%	3%	7%	5%	1%	5%	2%	4%	43%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	9.1	58.4		10.0	59.3		12.3	40.0		13.0	40.7	
Effective Green, g (s)	9.1	58.4		10.0	59.3		12.3	40.0		13.0	40.7	
Actuated g/C Ratio	0.06	0.39		0.07	0.40		0.08	0.27		0.09	0.27	
Clearance Time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	77	503		101	630		126	407		138	440	
v/s Ratio Prot	0.04	c0.40		c0.07	0.21		0.06	c0.29		c0.09	0.16	
v/s Ratio Perm												
v/c Ratio	0.71	1.02		0.99	0.53		0.77	1.10		1.06	0.61	
Uniform Delay, d1	69.2	45.8		70.0	34.6		67.5	55.0		68.5	47.6	
Progression Factor	1.00	1.00		0.72	1.11		1.00	1.00		1.00	1.00	
Incremental Delay, d2	26.8	45.8		68.7	2.0		24.2	73.7		92.9	2.4	
Delay (s)	96.0	91.6		119.4	40.6		91.6	128.7		161.4	50.0	
Level of Service	F	F		F	D		F	F		F	D	
Approach Delay (s)		92.0			58.6			122.2			89.4	
Approach LOS		F			E			F			F	

Intersection Summary			
HCM 2000 Control Delay	92.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	92.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	143	667	0	1	351	262	22	158	12	212	74	108
Future Volume (vph)	143	667	0	1	351	262	22	158	12	212	74	108
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	16	16	16	13	13	13	12	12	14
Storage Length (ft)	90		0	0		0	0		0	0		180
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.942			0.992				0.850
Flt Protected	0.950							0.994			0.964	
Satd. Flow (prot)	1378	1535	0	0	1715	0	0	1718	0	0	1570	1505
Flt Permitted	0.230				0.999			0.916			0.347	
Satd. Flow (perm)	334	1535	0	0	1714	0	0	1583	0	0	565	1505
Right Turn on Red			No			Yes			No			Yes
Satd. Flow (RTOR)					26							117
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1028			389			620			462	
Travel Time (s)		28.0			10.6			16.9			12.6	
Peak Hour Factor	0.84	0.84	0.84	0.82	0.82	0.82	0.67	0.67	0.67	0.77	0.77	0.77
Heavy Vehicles (%)	10%	4%	0%	0%	6%	7%	5%	1%	0%	5%	5%	3%
Adj. Flow (vph)	170	794	0	1	428	320	33	236	18	275	96	140
Shared Lane Traffic (%)												
Lane Group Flow (vph)	170	794	0	0	749	0	0	287	0	0	371	140
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		custom	NA	Prot
Protected Phases	1	6			2			4		3	3 8	3 8
Permitted Phases	6			2			4			8		
Detector Phase	1	6		2	2		4	4		3	3 8	3 8
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0		
Minimum Split (s)	9.0	11.0		11.0	11.0		10.0	10.0		9.0		
Total Split (s)	9.0	63.0		54.0	54.0		39.0	39.0		20.0		
Total Split (%)	6.0%	42.0%		36.0%	36.0%		26.0%	26.0%		13.3%		
Maximum Green (s)	5.0	57.0		48.0	48.0		34.0	34.0		16.0		
Yellow Time (s)	3.0	4.0		4.0	4.0		3.0	3.0		3.0		
All-Red Time (s)	1.0	2.0		2.0	2.0		2.0	2.0		1.0		
Lost Time Adjust (s)	0.0	0.0			0.0			0.0				
Total Lost Time (s)	4.0	6.0			6.0			5.0				
Lead/Lag	Lead			Lag	Lag		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0		
Recall Mode	None	C-Min		C-Min	C-Min		None	None		None		
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	81.4	79.4			70.4			34.0			55.0	55.0
Actuated g/C Ratio	0.54	0.53			0.47			0.23			0.37	0.37
v/c Ratio	0.79	0.98			0.92			0.80			1.18	0.22
Control Delay	37.0	48.7			47.8			72.4			146.6	8.7

Lane Group	Ø8	Ø9
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Heavy Vehicles (%)		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	8	9
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	10.0	28.0
Total Split (s)	59.0	28.0
Total Split (%)	39%	19%
Maximum Green (s)	54.0	25.0
Yellow Time (s)	3.0	2.0
All-Red Time (s)	2.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Vehicle Extension (s)	3.0	3.0
Recall Mode	None	None
Walk Time (s)		7.0
Flash Dont Walk (s)		18.0
Pedestrian Calls (#/hr)		2
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	39.4			9.7			1.0			0.2	0.0
Total Delay	37.0	88.1			57.5			73.4			146.7	8.7
LOS	D	F			E			E			F	A
Approach Delay		79.1			57.5			73.4			108.9	
Approach LOS		E			E			E			F	
Queue Length 50th (ft)	66	723			526			268			~373	15
Queue Length 95th (ft)	m#143	m#1008			#760			264			#457	41
Internal Link Dist (ft)		948			309			540			382	
Turn Bay Length (ft)	90											180
Base Capacity (vph)	216	812			818			358			314	625
Starvation Cap Reductn	0	0			62			0			0	0
Spillback Cap Reductn	0	102			0			10			4	0
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	0.79	1.12			0.99			0.82			1.20	0.22

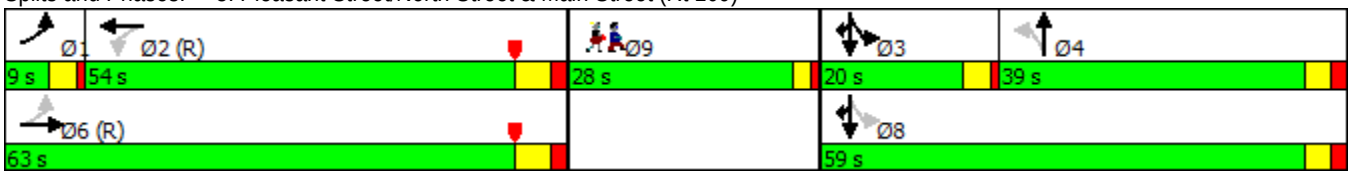
Intersection Summary			
Area Type:	CBD		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow, Master Intersection			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.18			
Intersection Signal Delay: 78.0		Intersection LOS: E	
Intersection Capacity Utilization 123.6%		ICU Level of Service H	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

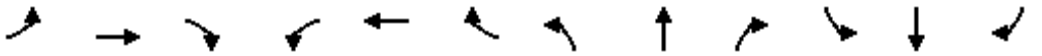
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Pleasant Street/North Street & Main Street (Rt 109)



Lane Group	Ø8	Ø9
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	143	667	0	1	351	262	22	158	12	212	74	108
Future Volume (vph)	143	667	0	1	351	262	22	158	12	212	74	108
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	16	16	16	13	13	13	12	12	14
Total Lost time (s)	4.0	6.0			6.0			5.0			4.0	4.0
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	1.00
Frt	1.00	1.00			0.94			0.99			1.00	0.85
Flt Protected	0.95	1.00			1.00			0.99			0.96	1.00
Satd. Flow (prot)	1378	1535			1716			1718			1570	1505
Flt Permitted	0.23	1.00			1.00			0.92			0.35	1.00
Satd. Flow (perm)	334	1535			1715			1583			566	1505
Peak-hour factor, PHF	0.84	0.84	0.84	0.82	0.82	0.82	0.67	0.67	0.67	0.77	0.77	0.77
Adj. Flow (vph)	170	794	0	1	428	320	33	236	18	275	96	140
RTOR Reduction (vph)	0	0	0	0	14	0	0	0	0	0	0	75
Lane Group Flow (vph)	170	794	0	0	735	0	0	287	0	0	371	65
Heavy Vehicles (%)	10%	4%	0%	0%	6%	7%	5%	1%	0%	5%	5%	3%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		custom	NA	Prot
Protected Phases	1	6			2			4		3	3 8	3 8
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	77.0	77.0			68.0			34.0			54.0	54.0
Effective Green, g (s)	77.0	77.0			68.0			34.0			54.0	54.0
Actuated g/C Ratio	0.51	0.51			0.45			0.23			0.36	0.36
Clearance Time (s)	4.0	6.0			6.0			5.0				
Vehicle Extension (s)	3.0	3.0			3.0			3.0				
Lane Grp Cap (vph)	206	787			777			358			310	541
v/s Ratio Prot	0.03	c0.52									c0.13	0.04
v/s Ratio Perm	0.40				0.43			0.18			c0.30	
v/c Ratio	0.83	1.01			0.95			0.80			1.20	0.12
Uniform Delay, d1	38.1	36.5			39.2			54.8			48.0	32.1
Progression Factor	0.77	0.84			0.94			1.00			1.00	1.00
Incremental Delay, d2	14.2	26.4			18.3			12.2			115.6	0.1
Delay (s)	43.7	57.1			55.2			67.0			163.6	32.2
Level of Service	D	E			E			E			F	C
Approach Delay (s)		54.7			55.2			67.0			127.6	
Approach LOS		D			E			E			F	

Intersection Summary			
HCM 2000 Control Delay	71.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	123.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

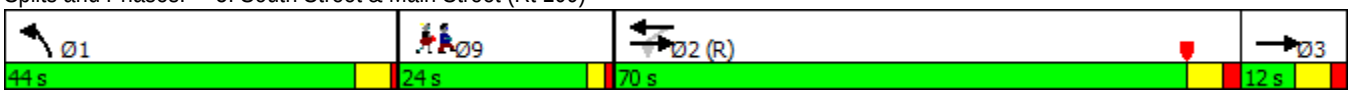
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø3	Ø9
Lane Configurations								
Traffic Volume (vph)	828	63	69	482	132	72		
Future Volume (vph)	828	63	69	482	132	72		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	14	14	9	10	14	14		
Storage Length (ft)		0	100		0	0		
Storage Lanes		0	1		1	0		
Taper Length (ft)			25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		
Frt	0.990				0.952			
Flt Protected			0.950		0.969			
Satd. Flow (prot)	1728	0	1160	1535	1634	0		
Flt Permitted			0.177		0.969			
Satd. Flow (perm)	1728	0	216	1535	1634	0		
Right Turn on Red		No				Yes		
Satd. Flow (RTOR)					18			
Link Speed (mph)	25			25	25			
Link Distance (ft)	389			379	438			
Travel Time (s)	10.6			10.3	11.9			
Peak Hour Factor	0.96	0.96	0.79	0.79	0.82	0.82		
Heavy Vehicles (%)	4%	11%	26%	4%	3%	3%		
Adj. Flow (vph)	863	66	87	610	161	88		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	929	0	87	610	249	0		
Turn Type	NA		Perm	NA	Prot			
Protected Phases	2 3			2	1		3	9
Permitted Phases			2					
Detector Phase	2 3		2	2	1			
Switch Phase								
Minimum Initial (s)			10.0	10.0	5.0		5.0	10.0
Minimum Split (s)			16.0	16.0	10.0		11.0	24.0
Total Split (s)			70.0	70.0	44.0		12.0	24.0
Total Split (%)			46.7%	46.7%	29.3%		8%	16%
Maximum Green (s)			64.0	64.0	39.0		6.0	21.0
Yellow Time (s)			4.0	4.0	4.0		4.0	2.0
All-Red Time (s)			2.0	2.0	1.0		2.0	1.0
Lost Time Adjust (s)			0.0	0.0	0.0			
Total Lost Time (s)			6.0	6.0	5.0			
Lead/Lag			Lead	Lead			Lag	
Lead-Lag Optimize?			Yes	Yes			Yes	
Vehicle Extension (s)			3.0	3.0	3.0		3.0	3.0
Recall Mode			C-Min	C-Min	None		None	None
Walk Time (s)								7.0
Flash Dont Walk (s)								14.0
Pedestrian Calls (#/hr)								2
Act Effct Green (s)	107.5		95.5	95.5	26.7			
Actuated g/C Ratio	0.72		0.64	0.64	0.18			
v/c Ratio	0.75		0.64	0.62	0.82			
Control Delay	13.9		46.0	23.5	74.8			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø3	Ø9
Queue Delay	14.9		0.0	0.4	0.8			
Total Delay	28.8		46.0	23.9	75.6			
LOS	C		D	C	E			
Approach Delay	28.8			26.7	75.6			
Approach LOS	C			C	E			
Queue Length 50th (ft)	232		44	308	221			
Queue Length 95th (ft)	m951		#161	583	268			
Internal Link Dist (ft)	309			299	358			
Turn Bay Length (ft)			100					
Base Capacity (vph)	1237		137	976	438			
Starvation Cap Reductn	308		0	0	0			
Spillback Cap Reductn	0		0	93	50			
Storage Cap Reductn	0		0	0	0			
Reduced v/c Ratio	1.00		0.64	0.69	0.64			

Intersection Summary			
Area Type:	CBD		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 26 (17%), Referenced to phase 2:EBWB, Start of Yellow			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.82			
Intersection Signal Delay: 34.2		Intersection LOS: C	
Intersection Capacity Utilization 85.9%		ICU Level of Service E	
Analysis Period (min) 15			

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: South Street & Main Street (Rt 109)



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	828	63	69	482	132	72
Future Volume (vph)	828	63	69	482	132	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	14	14	9	10	14	14
Total Lost time (s)	6.0		6.0	6.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.99		1.00	1.00	0.95	
Flt Protected	1.00		0.95	1.00	0.97	
Satd. Flow (prot)	1729		1160	1535	1634	
Flt Permitted	1.00		0.18	1.00	0.97	
Satd. Flow (perm)	1729		216	1535	1634	
Peak-hour factor, PHF	0.96	0.96	0.79	0.79	0.82	0.82
Adj. Flow (vph)	862	66	87	610	161	88
RTOR Reduction (vph)	0	0	0	0	15	0
Lane Group Flow (vph)	929	0	87	610	234	0
Heavy Vehicles (%)	4%	11%	26%	4%	3%	3%
Turn Type	NA		Perm	NA	Prot	
Protected Phases	2 3			2	1	
Permitted Phases			2			
Actuated Green, G (s)	105.1		93.1	93.1	26.7	
Effective Green, g (s)	105.1		93.1	93.1	26.7	
Actuated g/C Ratio	0.70		0.62	0.62	0.18	
Clearance Time (s)			6.0	6.0	5.0	
Vehicle Extension (s)			3.0	3.0	3.0	
Lane Grp Cap (vph)	1211		134	952	290	
v/s Ratio Prot	c0.54			0.40	c0.14	
v/s Ratio Perm			0.40			
v/c Ratio	0.77		0.65	0.64	0.81	
Uniform Delay, d1	14.5		18.1	17.9	59.2	
Progression Factor	0.76		1.00	1.00	1.00	
Incremental Delay, d2	0.3		21.8	3.3	15.1	
Delay (s)	11.4		39.9	21.2	74.3	
Level of Service	B		D	C	E	
Approach Delay (s)	11.4			23.6	74.3	
Approach LOS	B			C	E	

Intersection Summary			
HCM 2000 Control Delay	24.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	85.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	283	103	225	595	55	144	335	108	89	356	31
Future Volume (vph)	37	283	103	225	595	55	144	335	108	89	356	31
Ideal Flow (vphpl)	1500	1500	1500	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	13	13	11	12	12	12	11	12	12	12	12
Storage Length (ft)	130		0	120		0	120		0	250		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor											1.00	
Frt		0.960			0.987			0.963			0.988	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1325	1339	0	1570	1672	0	1608	1580	0	1624	1667	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1325	1339	0	1570	1672	0	1608	1580	0	1624	1667	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11			3			11			3	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		372			1028			628			637	
Travel Time (s)		10.1			28.0			17.1			17.4	
Confl. Bikes (#/hr)												1
Peak Hour Factor	0.91	0.91	0.91	0.94	0.94	0.94	0.86	0.86	0.86	0.93	0.93	0.93
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	1%	1%	0%	0%	1%	3%
Adj. Flow (vph)	41	311	113	239	633	59	167	390	126	96	383	33
Shared Lane Traffic (%)												
Lane Group Flow (vph)	41	424	0	239	692	0	167	516	0	96	416	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	10.0	11.0		10.0	11.0		10.0	11.0		10.0	11.0	
Total Split (s)	14.0	40.0		25.0	51.0		22.0	46.0		18.0	42.0	
Total Split (%)	9.3%	26.7%		16.7%	34.0%		14.7%	30.7%		12.0%	28.0%	
Maximum Green (s)	9.0	34.0		20.0	45.0		17.0	40.0		13.0	36.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	C-Min		None	C-Min		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	8.2	50.8		20.0	64.7		16.9	41.0		12.0	36.1	
Actuated g/C Ratio	0.05	0.34		0.13	0.43		0.11	0.27		0.08	0.24	

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	14%
Maximum Green (s)	18.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	4
Act Effct Green (s)	
Actuated g/C Ratio	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.57	0.92		1.14	0.96		0.92	1.18		0.74	1.03	
Control Delay	98.3	72.2		145.6	65.6		114.3	146.3		98.2	107.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	98.3	72.2		145.6	65.6		114.3	146.3		98.2	107.5	
LOS	F	E		F	E		F	F		F	F	
Approach Delay		74.5			86.1			138.5			105.8	
Approach LOS		E			F			F			F	
Queue Length 50th (ft)	40	373		~271	690		164	~605		93	~434	
Queue Length 95th (ft)	#90	#758		#459	#1152		#288	#780		#178	#652	
Internal Link Dist (ft)		292			948			548			557	
Turn Bay Length (ft)	130			120			120			250		
Base Capacity (vph)	79	460		209	723		182	439		140	403	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.52	0.92		1.14	0.96		0.92	1.18		0.69	1.03	

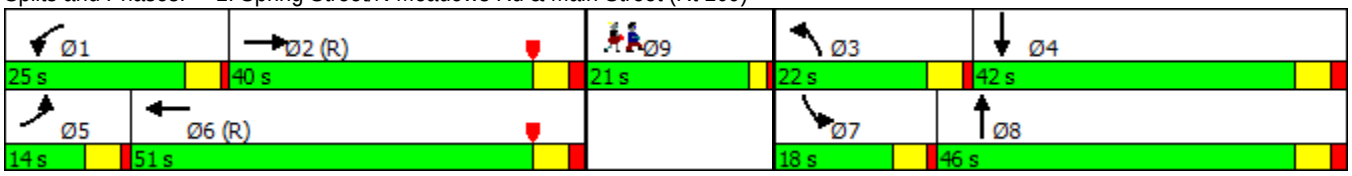
Intersection Summary

Area Type: CBD
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 70 (47%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.18
Intersection Signal Delay: 101.7 Intersection LOS: F
Intersection Capacity Utilization 94.3% ICU Level of Service F
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Splits and Phases: 1: Spring Street/N Meadows Rd & Main Street (Rt 109)

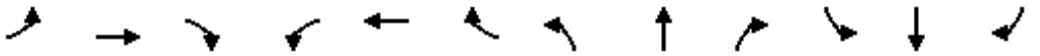


Lane Group	Ø9
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	283	103	225	595	55	144	335	108	89	356	31
Future Volume (vph)	37	283	103	225	595	55	144	335	108	89	356	31
Ideal Flow (vphpl)	1500	1500	1500	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	13	13	11	12	12	12	11	12	12	12	12
Total Lost time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.99		1.00	0.96		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1325	1339		1570	1673		1608	1581		1624	1667	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1325	1339		1570	1673		1608	1581		1624	1667	
Peak-hour factor, PHF	0.91	0.91	0.91	0.94	0.94	0.94	0.86	0.86	0.86	0.93	0.93	0.93
Adj. Flow (vph)	41	311	113	239	633	59	167	390	126	96	383	33
RTOR Reduction (vph)	0	7	0	0	2	0	0	8	0	0	2	0
Lane Group Flow (vph)	41	417	0	239	690	0	167	508	0	96	414	0
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	1%	1%	0%	0%	1%	3%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	7.1	48.4		20.0	61.3		16.9	41.0		12.0	36.1	
Effective Green, g (s)	7.1	48.4		20.0	61.3		16.9	41.0		12.0	36.1	
Actuated g/C Ratio	0.05	0.32		0.13	0.41		0.11	0.27		0.08	0.24	
Clearance Time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	62	432		209	683		181	432		129	401	
v/s Ratio Prot	0.03	0.31		c0.15	c0.41		c0.10	c0.32		0.06	0.25	
v/s Ratio Perm												
v/c Ratio	0.66	0.96		1.14	1.01		0.92	1.18		0.74	1.03	
Uniform Delay, d1	70.3	49.9		65.0	44.4		65.9	54.5		67.5	57.0	
Progression Factor	1.00	1.00		0.72	1.05		1.00	1.00		1.00	1.00	
Incremental Delay, d2	23.4	35.2		103.0	35.2		45.1	101.0		20.5	53.3	
Delay (s)	93.7	85.2		149.5	81.6		111.0	155.5		88.0	110.3	
Level of Service	F	F		F	F		F	F		F	F	
Approach Delay (s)		85.9			99.0			144.6			106.1	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	110.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	94.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	362	12	2	499	81	18	67	7	199	121	173
Future Volume (vph)	100	362	12	2	499	81	18	67	7	199	121	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	16	16	16	13	13	13	12	12	14
Storage Length (ft)	90		0	0		0	0		0	0		180
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.995			0.981			0.990				0.850
Flt Protected	0.950							0.990			0.970	
Satd. Flow (prot)	1516	1573	0	0	1885	0	0	1732	0	0	1648	1535
Flt Permitted	0.275				0.999			0.879			0.584	
Satd. Flow (perm)	439	1573	0	0	1883	0	0	1538	0	0	992	1535
Right Turn on Red			No			Yes			No			Yes
Satd. Flow (RTOR)					5							174
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1028			389			620			462	
Travel Time (s)		28.0			10.6			16.9			12.6	
Confl. Bikes (#/hr)												1
Peak Hour Factor	0.96	0.96	0.96	0.92	0.92	0.92	0.80	0.80	0.80	0.95	0.95	0.95
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	1%	0%	1%
Adj. Flow (vph)	104	377	13	2	542	88	23	84	9	209	127	182
Shared Lane Traffic (%)												
Lane Group Flow (vph)	104	390	0	0	632	0	0	116	0	0	336	182
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		custom	NA	Prot
Protected Phases	1	6			2			4		3	3 8	3 8
Permitted Phases	6			2			4			8		
Detector Phase	1	6		2	2		4	4		3	3 8	3 8
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0		
Minimum Split (s)	9.0	11.0		11.0	11.0		10.0	10.0		9.0		
Total Split (s)	12.0	60.0		48.0	48.0		37.0	37.0		25.0		
Total Split (%)	8.0%	40.0%		32.0%	32.0%		24.7%	24.7%		16.7%		
Maximum Green (s)	8.0	54.0		42.0	42.0		32.0	32.0		21.0		
Yellow Time (s)	3.0	4.0		4.0	4.0		3.0	3.0		3.0		
All-Red Time (s)	1.0	2.0		2.0	2.0		2.0	2.0		1.0		
Lost Time Adjust (s)	0.0	0.0			0.0			0.0				
Total Lost Time (s)	4.0	6.0			6.0			5.0				
Lead/Lag	Lead			Lag	Lag		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0		
Recall Mode	None	C-Min		C-Min	C-Min		None	None		None		
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	84.9	82.9			69.5			25.5			51.5	51.5
Actuated g/C Ratio	0.57	0.55			0.46			0.17			0.34	0.34

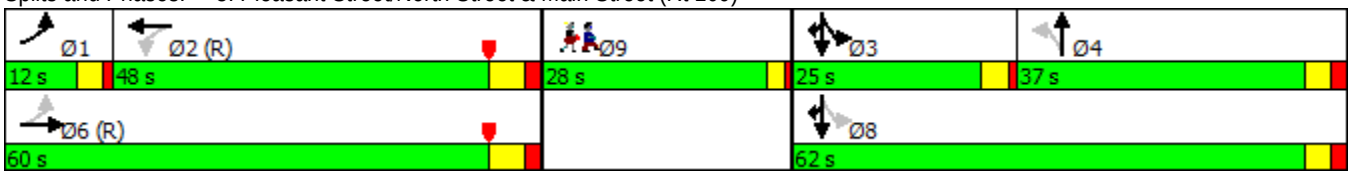
Lane Group	Ø8	Ø9
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Ped Bike Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Bikes (#/hr)		
Peak Hour Factor		
Heavy Vehicles (%)		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	8	9
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	10.0	28.0
Total Split (s)	62.0	28.0
Total Split (%)	41%	19%
Maximum Green (s)	57.0	25.0
Yellow Time (s)	3.0	2.0
All-Red Time (s)	2.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Vehicle Extension (s)	3.0	3.0
Recall Mode	None	None
Walk Time (s)		7.0
Flash Dont Walk (s)		18.0
Pedestrian Calls (#/hr)		2
Act Effct Green (s)		
Actuated g/C Ratio		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.33	0.45			0.72			0.44			0.78	0.28
Control Delay	14.9	18.6			39.3			59.6			53.6	5.8
Queue Delay	0.0	0.1			13.0			0.0			0.0	0.0
Total Delay	14.9	18.6			52.4			59.6			53.6	5.8
LOS	B	B			D			E			D	A
Approach Delay		17.9			52.4			59.6			36.8	
Approach LOS		B			D			E			D	
Queue Length 50th (ft)	38	230			524			101			262	5
Queue Length 95th (ft)	m91	m335			#982			141			354	56
Internal Link Dist (ft)		948			309			540			382	
Turn Bay Length (ft)	90											180
Base Capacity (vph)	316	869			874			328			475	700
Starvation Cap Reductn	0	0			227			0			0	0
Spillback Cap Reductn	0	36			0			0			0	0
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	0.33	0.47			0.98			0.35			0.71	0.26

Intersection Summary			
Area Type:	CBD		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow, Master Intersection			
Natural Cycle: 110			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 38.6		Intersection LOS: D	
Intersection Capacity Utilization 96.1%		ICU Level of Service F	
Analysis Period (min) 15			

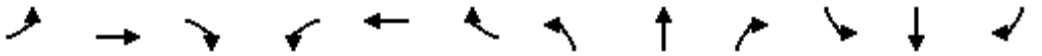
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Pleasant Street/North Street & Main Street (Rt 109)



Lane Group	Ø8	Ø9
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	362	12	2	499	81	18	67	7	199	121	173
Future Volume (vph)	100	362	12	2	499	81	18	67	7	199	121	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	16	16	16	13	13	13	12	12	14
Total Lost time (s)	4.0	6.0			6.0			5.0			4.0	4.0
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00			1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00			1.00			1.00	1.00
Frt	1.00	0.99			0.98			0.99			1.00	0.85
Flt Protected	0.95	1.00			1.00			0.99			0.97	1.00
Satd. Flow (prot)	1516	1573			1885			1731			1648	1535
Flt Permitted	0.27	1.00			1.00			0.88			0.58	1.00
Satd. Flow (perm)	439	1573			1884			1537			993	1535
Peak-hour factor, PHF	0.96	0.96	0.96	0.92	0.92	0.92	0.80	0.80	0.80	0.95	0.95	0.95
Adj. Flow (vph)	104	377	12	2	542	88	22	84	9	209	127	182
RTOR Reduction (vph)	0	0	0	0	3	0	0	0	0	0	0	115
Lane Group Flow (vph)	104	390	0	0	629	0	0	116	0	0	336	67
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	1%	0%	1%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		custom	NA	Prot
Protected Phases	1	6			2			4		3	3 8	3 8
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	80.5	80.5			67.0			25.5			50.5	50.5
Effective Green, g (s)	80.5	80.5			67.0			25.5			50.5	50.5
Actuated g/C Ratio	0.54	0.54			0.45			0.17			0.34	0.34
Clearance Time (s)	4.0	6.0			6.0			5.0				
Vehicle Extension (s)	3.0	3.0			3.0			3.0				
Lane Grp Cap (vph)	303	844			841			261			426	516
v/s Ratio Prot	0.02	c0.25									c0.11	0.04
v/s Ratio Perm	0.16				c0.33			0.08			c0.16	
v/c Ratio	0.34	0.46			0.75			0.44			0.79	0.13
Uniform Delay, d1	20.7	21.4			34.5			55.9			44.9	34.5
Progression Factor	0.69	0.74			1.03			1.00			1.00	1.00
Incremental Delay, d2	0.2	0.6			4.5			1.2			9.4	0.1
Delay (s)	14.6	16.4			39.9			57.1			54.3	34.6
Level of Service	B	B			D			E			D	C
Approach Delay (s)		16.0			39.9			57.1			47.4	
Approach LOS		B			D			E			D	

Intersection Summary			
HCM 2000 Control Delay	36.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	96.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

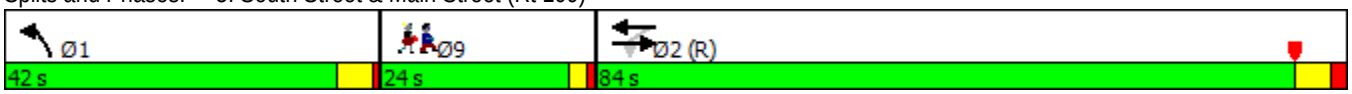
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø9
Lane Configurations							
Traffic Volume (vph)	452	110	56	508	77	60	
Future Volume (vph)	452	110	56	508	77	60	
Ideal Flow (vphpl)	1900	1900	1200	1200	1900	1900	
Lane Width (ft)	14	14	9	10	14	14	
Storage Length (ft)		0	100		0	0	
Storage Lanes		0	1		1	0	
Taper Length (ft)			25		25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	0.974				0.941		
Flt Protected			0.950		0.973		
Satd. Flow (prot)	1777	0	923	998	1670	0	
Flt Permitted			0.389		0.973		
Satd. Flow (perm)	1777	0	378	998	1670	0	
Right Turn on Red		No				Yes	
Satd. Flow (RTOR)					25		
Link Speed (mph)	25			25	25		
Link Distance (ft)	389			379	438		
Travel Time (s)	10.6			10.3	11.9		
Peak Hour Factor	0.96	0.96	0.95	0.95	0.65	0.65	
Heavy Vehicles (%)	0%	0%	0%	1%	0%	0%	
Adj. Flow (vph)	471	115	59	535	118	92	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	586	0	59	535	210	0	
Turn Type	NA		Perm	NA	Prot		
Protected Phases	2			2	1		9
Permitted Phases			2				
Detector Phase	2		2	2	1		
Switch Phase							
Minimum Initial (s)	10.0		10.0	10.0	5.0		10.0
Minimum Split (s)	16.0		16.0	16.0	10.0		24.0
Total Split (s)	84.0		84.0	84.0	42.0		24.0
Total Split (%)	56.0%		56.0%	56.0%	28.0%		16%
Maximum Green (s)	78.0		78.0	78.0	37.0		21.0
Yellow Time (s)	4.0		4.0	4.0	4.0		2.0
All-Red Time (s)	2.0		2.0	2.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	6.0		6.0	6.0	5.0		
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	C-Min		C-Min	C-Min	None		None
Walk Time (s)							7.0
Flash Dont Walk (s)							14.0
Pedestrian Calls (#/hr)							3
Act Effct Green (s)	112.0		112.0	112.0	22.2		
Actuated g/C Ratio	0.75		0.75	0.75	0.15		
v/c Ratio	0.44		0.21	0.72	0.78		
Control Delay	8.7		11.8	20.9	73.3		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø9
Queue Delay	0.5		0.0	24.6	2.9		
Total Delay	9.3		11.8	45.5	76.3		
LOS	A		B	D	E		
Approach Delay	9.3			42.2	76.3		
Approach LOS	A			D	E		
Queue Length 50th (ft)	201		13	218	178		
Queue Length 95th (ft)	414		63	#746	169		
Internal Link Dist (ft)	309			299	358		
Turn Bay Length (ft)			100				
Base Capacity (vph)	1326		282	745	430		
Starvation Cap Reductn	356		0	0	0		
Spillback Cap Reductn	0		0	220	131		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.60		0.21	1.02	0.70		

Intersection Summary			
Area Type:	CBD		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 29 (19%), Referenced to phase 2:EBWB, Start of Yellow			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 33.5		Intersection LOS: C	
Intersection Capacity Utilization 65.2%		ICU Level of Service C	
Analysis Period (min) 15			

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

Splits and Phases: 5: South Street & Main Street (Rt 109)



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	452	110	56	508	77	60
Future Volume (vph)	452	110	56	508	77	60
Ideal Flow (vphpl)	1900	1900	1200	1200	1900	1900
Lane Width	14	14	9	10	14	14
Total Lost time (s)	6.0		6.0	6.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.97		1.00	1.00	0.94	
Flt Protected	1.00		0.95	1.00	0.97	
Satd. Flow (prot)	1776		923	998	1669	
Flt Permitted	1.00		0.39	1.00	0.97	
Satd. Flow (perm)	1776		378	998	1669	
Peak-hour factor, PHF	0.96	0.96	0.95	0.95	0.65	0.65
Adj. Flow (vph)	471	115	59	535	118	92
RTOR Reduction (vph)	0	0	0	0	21	0
Lane Group Flow (vph)	586	0	59	535	189	0
Heavy Vehicles (%)	0%	0%	0%	1%	0%	0%
Turn Type	NA		Perm	NA	Prot	
Protected Phases	2			2	1	
Permitted Phases			2			
Actuated Green, G (s)	109.6		109.6	109.6	22.2	
Effective Green, g (s)	109.6		109.6	109.6	22.2	
Actuated g/C Ratio	0.73		0.73	0.73	0.15	
Clearance Time (s)	6.0		6.0	6.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1297		276	729	247	
v/s Ratio Prot	0.33			c0.54	c0.11	
v/s Ratio Perm			0.16			
v/c Ratio	0.45		0.21	0.73	0.76	
Uniform Delay, d1	8.1		6.4	11.7	61.4	
Progression Factor	0.79		1.00	1.00	1.00	
Incremental Delay, d2	1.0		1.8	6.5	13.1	
Delay (s)	7.4		8.2	18.2	74.5	
Level of Service	A		A	B	E	
Approach Delay (s)	7.4			17.2	74.5	
Approach LOS	A			B	E	

Intersection Summary			
HCM 2000 Control Delay	21.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	392	57	87	232	61	88	271	147	139	247	7
Future Volume (vph)	48	392	57	87	232	61	88	271	147	139	247	7
Ideal Flow (vphpl)	1500	1500	1500	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	13	13	11	12	12	12	11	12	12	12	12
Storage Length (ft)	130		0	120		0	120		0	250		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor								0.99				
Frt		0.981			0.969			0.947			0.996	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1274	1294	0	1525	1596	0	1547	1517	0	1593	1622	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1274	1294	0	1525	1596	0	1547	1517	0	1593	1622	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			11			21			1	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		372			1028			628			637	
Travel Time (s)		10.1			28.0			17.1			17.4	
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.91	0.91	0.91	0.95	0.95	0.95
Heavy Vehicles (%)	4%	6%	4%	3%	3%	7%	5%	1%	5%	2%	4%	43%
Adj. Flow (vph)	55	451	66	100	267	70	97	298	162	146	260	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	55	517	0	100	337	0	97	460	0	146	267	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	14.0	25.0		14.0	25.0		14.0	25.0		14.0	25.0	
Total Split (s)	17.0	56.0		14.0	53.0		17.0	44.0		16.0	43.0	
Total Split (%)	13.1%	43.1%		10.8%	40.8%		13.1%	33.8%		12.3%	33.1%	
Maximum Green (s)	12.0	50.0		9.0	47.0		12.0	38.0		11.0	37.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	
Lead/Lag	Lag	Lead		Lag	Lead		Lag	Lead		Lag	Lead	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	C-Min		None	C-Min		None	None		None	None	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		8.0			8.0			8.0			8.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	20.2	50.0		9.0	41.0		22.4	38.0		11.0	26.6	
Actuated g/C Ratio	0.16	0.38		0.07	0.32		0.17	0.29		0.08	0.20	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.28	1.03		0.95	0.66		0.36	1.00		1.09	0.80	
Control Delay	51.9	87.1		102.1	54.1		54.8	87.0		158.1	66.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	51.9	87.1		102.1	54.1		54.8	87.0		158.1	66.5	
LOS	D	F		F	D		D	F		F	E	
Approach Delay		83.7			65.0			81.4			98.9	
Approach LOS		F			E			F			F	
Queue Length 50th (ft)	39	~462		80	258		73	~377		~138	215	
Queue Length 95th (ft)	85	#647		m#105	m226		140	#606		#278	292	
Internal Link Dist (ft)		292			948			548			557	
Turn Bay Length (ft)	130			120			120			250		
Base Capacity (vph)	209	502		105	625		266	458		134	462	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.26	1.03		0.95	0.54		0.36	1.00		1.09	0.58	

Intersection Summary

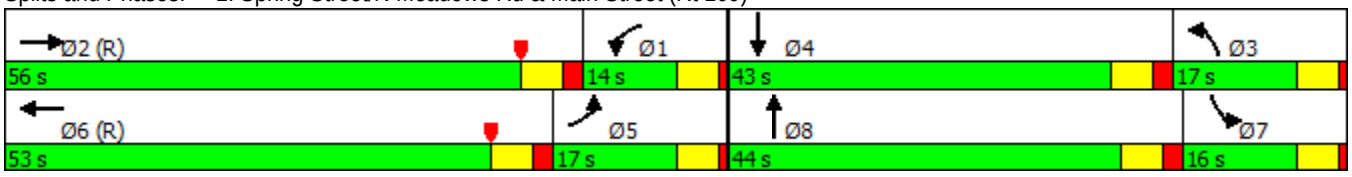
Area Type: CBD
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 126 (97%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.09
Intersection Signal Delay: 82.1 Intersection LOS: F
Intersection Capacity Utilization 92.0% ICU Level of Service F
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

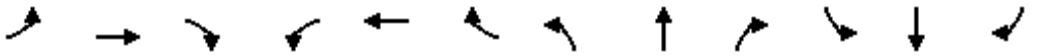
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Spring Street/N Meadows Rd & Main Street (Rt 109)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	392	57	87	232	61	88	271	147	139	247	7
Future Volume (vph)	48	392	57	87	232	61	88	271	147	139	247	7
Ideal Flow (vphpl)	1500	1500	1500	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	13	13	11	12	12	12	11	12	12	12	12
Total Lost time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.97		1.00	0.95		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1274	1294		1525	1596		1547	1517		1593	1622	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1274	1294		1525	1596		1547	1517		1593	1622	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.91	0.91	0.91	0.95	0.95	0.95
Adj. Flow (vph)	55	451	66	100	267	70	97	298	162	146	260	7
RTOR Reduction (vph)	0	4	0	0	8	0	0	15	0	0	1	0
Lane Group Flow (vph)	55	513	0	100	329	0	97	445	0	146	266	0
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	4%	6%	4%	3%	3%	7%	5%	1%	5%	2%	4%	43%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	19.0	49.0		10.0	40.0		22.4	38.0		11.0	26.6	
Effective Green, g (s)	19.0	49.0		10.0	40.0		22.4	38.0		11.0	26.6	
Actuated g/C Ratio	0.15	0.38		0.08	0.31		0.17	0.29		0.08	0.20	
Clearance Time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	186	487		117	491		266	443		134	331	
v/s Ratio Prot	0.04	c0.40		c0.07	0.21		0.06	c0.29		c0.09	0.16	
v/s Ratio Perm												
v/c Ratio	0.30	1.05		0.85	0.67		0.36	1.00		1.09	0.80	
Uniform Delay, d1	49.5	40.5		59.3	39.3		47.5	46.0		59.5	49.2	
Progression Factor	1.00	1.00		0.78	1.27		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	55.3		26.4	3.9		0.9	44.0		103.8	13.2	
Delay (s)	50.4	95.8		72.6	53.8		48.4	90.0		163.3	62.4	
Level of Service	D	F		E	D		D	F		F	E	
Approach Delay (s)		91.5			58.1			82.7			98.1	
Approach LOS		F			E			F			F	

Intersection Summary			
HCM 2000 Control Delay	83.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	92.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	143	667	0	1	351	262	22	158	12	212	74	108
Future Volume (vph)	143	667	0	1	351	262	22	158	12	212	74	108
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	16	16	16	13	13	13	12	12	14
Storage Length (ft)	90		0	0		0	0		0	0		180
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor								1.00				
Frt					0.942			0.992				0.850
Flt Protected	0.950							0.994			0.964	
Satd. Flow (prot)	1378	1535	0	0	1715	0	0	1715	0	0	1570	1505
Flt Permitted	0.234				0.992			0.918			0.367	
Satd. Flow (perm)	340	1535	0	0	1702	0	0	1584	0	0	598	1505
Right Turn on Red			No			Yes			No			Yes
Satd. Flow (RTOR)					35							140
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1028			389			620			462	
Travel Time (s)		28.0			10.6			16.9			12.6	
Confl. Peds. (#/hr)									2	2		
Peak Hour Factor	0.84	0.84	0.84	0.82	0.82	0.82	0.67	0.67	0.67	0.77	0.77	0.77
Heavy Vehicles (%)	10%	4%	0%	0%	6%	7%	5%	1%	0%	5%	5%	3%
Adj. Flow (vph)	170	794	0	1	428	320	33	236	18	275	96	140
Shared Lane Traffic (%)												
Lane Group Flow (vph)	170	794	0	0	749	0	0	287	0	0	371	140
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		custom	NA	Prot
Protected Phases	1	6			2			4		3	3 8	3 8
Permitted Phases	6			2			4			8		
Detector Phase	1	6		2	2		4	4		3	3 8	3 8
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0		
Minimum Split (s)	13.0	11.0		28.0	28.0		22.0	22.0		13.0		
Total Split (s)	14.0	74.0		60.0	60.0		36.0	36.0		20.0		
Total Split (%)	10.8%	56.9%		46.2%	46.2%		27.7%	27.7%		15.4%		
Maximum Green (s)	9.0	68.0		54.0	54.0		31.0	31.0		16.0		
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	3.0		3.0		
All-Red Time (s)	1.0	2.0		2.0	2.0		2.0	2.0		1.0		
Lost Time Adjust (s)	0.0	0.0			0.0			0.0				
Total Lost Time (s)	5.0	6.0			6.0			5.0				
Lead/Lag	Lag			Lead	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0		
Recall Mode	None	C-Min		C-Min	C-Min		None	None		None		
Walk Time (s)				7.0	7.0		7.0	7.0				
Flash Dont Walk (s)				15.0	15.0		10.0	10.0				
Pedestrian Calls (#/hr)				0	0		0	0				
Act Effct Green (s)	69.0	68.0			54.0			31.0			52.0	52.0
Actuated g/C Ratio	0.53	0.52			0.42			0.24			0.40	0.40

Lane Group	Ø8
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	8
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	10.0
Total Split (s)	56.0
Total Split (%)	43%
Maximum Green (s)	51.0
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.67	0.99			1.03			0.76			1.04	0.20
Control Delay	29.5	42.8			73.5			60.4			91.0	4.6
Queue Delay	0.0	18.7			25.9			62.2			25.4	0.0
Total Delay	29.5	61.5			99.4			122.6			116.4	4.6
LOS	C	E			F			F			F	A
Approach Delay		55.8			99.4			122.6			85.8	
Approach LOS		E			F			F			F	
Queue Length 50th (ft)	52	518			~491			227			~256	0
Queue Length 95th (ft)	m55	m509			#379			230			#344	24
Internal Link Dist (ft)		948			309			540			382	
Turn Bay Length (ft)	90											180
Base Capacity (vph)	252	802			727			377			358	686
Starvation Cap Reductn	0	0			48			0			0	0
Spillback Cap Reductn	0	48			0			191			90	0
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	0.67	1.05			1.10			1.54			1.38	0.20

Intersection Summary

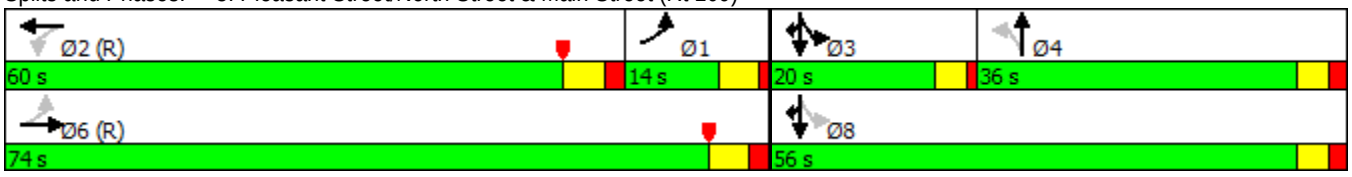
Area Type: CBD
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow, Master Intersection
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.04
Intersection Signal Delay: 82.5 Intersection LOS: F
Intersection Capacity Utilization 123.8% ICU Level of Service H
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

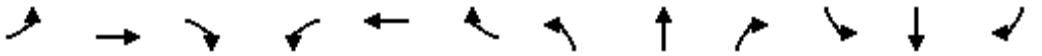
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Pleasant Street/North Street & Main Street (Rt 109)



Lane Group	Ø8
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	143	667	0	1	351	262	22	158	12	212	74	108
Future Volume (vph)	143	667	0	1	351	262	22	158	12	212	74	108
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	16	16	16	13	13	13	12	12	14
Total Lost time (s)	5.0	6.0			6.0			5.0			4.0	4.0
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00			1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00			1.00			1.00	1.00
Frt	1.00	1.00			0.94			0.99			1.00	0.85
Flt Protected	0.95	1.00			1.00			0.99			0.96	1.00
Satd. Flow (prot)	1378	1535			1716			1715			1570	1505
Flt Permitted	0.23	1.00			0.99			0.92			0.37	1.00
Satd. Flow (perm)	339	1535			1703			1584			597	1505
Peak-hour factor, PHF	0.84	0.84	0.84	0.82	0.82	0.82	0.67	0.67	0.67	0.77	0.77	0.77
Adj. Flow (vph)	170	794	0	1	428	320	33	236	18	275	96	140
RTOR Reduction (vph)	0	0	0	0	20	0	0	0	0	0	0	85
Lane Group Flow (vph)	170	794	0	0	729	0	0	287	0	0	371	55
Confl. Peds. (#/hr)									2	2		
Heavy Vehicles (%)	10%	4%	0%	0%	6%	7%	5%	1%	0%	5%	5%	3%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		custom	NA	Prot
Protected Phases	1	6			2			4		3	3 8	3 8
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	69.0	68.0			54.0			31.0			51.0	51.0
Effective Green, g (s)	69.0	68.0			54.0			31.0			51.0	51.0
Actuated g/C Ratio	0.53	0.52			0.42			0.24			0.39	0.39
Clearance Time (s)	5.0	6.0			6.0			5.0				
Vehicle Extension (s)	3.0	3.0			3.0			3.0				
Lane Grp Cap (vph)	251	802			707			377			353	590
v/s Ratio Prot	0.05	c0.52									c0.13	0.04
v/s Ratio Perm	0.31				0.43			0.18			c0.28	
v/c Ratio	0.68	0.99			1.03			0.76			1.05	0.09
Uniform Delay, d1	41.8	30.7			38.0			46.1			39.5	24.9
Progression Factor	0.69	0.64			0.98			1.00			1.00	1.00
Incremental Delay, d2	4.0	21.4			38.7			8.8			61.9	0.1
Delay (s)	32.7	41.1			75.8			54.8			101.4	25.0
Level of Service	C	D			E			D			F	C
Approach Delay (s)		39.6			75.8			54.8			80.5	
Approach LOS		D			E			D			F	

Intersection Summary			
HCM 2000 Control Delay	60.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	123.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

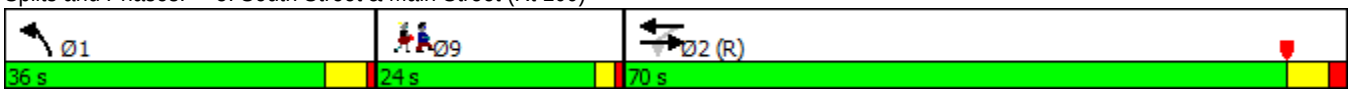
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø9
Lane Configurations							
Traffic Volume (vph)	828	63	69	482	132	72	
Future Volume (vph)	828	63	69	482	132	72	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	14	14	9	10	14	14	
Storage Length (ft)		0	100		0	0	
Storage Lanes		0	1		1	0	
Taper Length (ft)			25		25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor	1.00		1.00				
Frt	0.990				0.952		
Flt Protected			0.950		0.969		
Satd. Flow (prot)	1725	0	1160	1535	1634	0	
Flt Permitted			0.182		0.969		
Satd. Flow (perm)	1725	0	222	1535	1634	0	
Right Turn on Red		No				Yes	
Satd. Flow (RTOR)					20		
Link Speed (mph)	25			25	25		
Link Distance (ft)	389			379	438		
Travel Time (s)	10.6			10.3	11.9		
Confl. Peds. (#/hr)		2	2				
Peak Hour Factor	0.96	0.96	0.79	0.79	0.82	0.82	
Heavy Vehicles (%)	4%	11%	26%	4%	3%	3%	
Adj. Flow (vph)	863	66	87	610	161	88	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	929	0	87	610	249	0	
Turn Type	NA		Perm	NA	Prot		
Protected Phases	2			2	1		9
Permitted Phases			2				
Detector Phase	2		2	2	1		
Switch Phase							
Minimum Initial (s)	10.0		10.0	10.0	5.0		5.0
Minimum Split (s)	28.0		28.0	28.0	24.0		24.0
Total Split (s)	70.0		70.0	70.0	36.0		24.0
Total Split (%)	53.8%		53.8%	53.8%	27.7%		18%
Maximum Green (s)	64.0		64.0	64.0	31.0		21.0
Yellow Time (s)	4.0		4.0	4.0	4.0		2.0
All-Red Time (s)	2.0		2.0	2.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	6.0		6.0	6.0	5.0		
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	C-Min		C-Min	C-Min	None		None
Walk Time (s)							7.0
Flash Dont Walk (s)							14.0
Pedestrian Calls (#/hr)							3
Act Effct Green (s)	90.8		90.8	90.8	23.4		
Actuated g/C Ratio	0.70		0.70	0.70	0.18		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø9
v/c Ratio	0.77		0.56	0.57	0.80		
Control Delay	16.2		33.3	16.1	65.4		
Queue Delay	17.2		0.0	0.2	1.1		
Total Delay	33.3		33.3	16.3	66.4		
LOS	C		C	B	E		
Approach Delay	33.3			18.4	66.4		
Approach LOS	C			B	E		
Queue Length 50th (ft)	310		29	202	187		
Queue Length 95th (ft)	m#881		#137	471	237		
Internal Link Dist (ft)	309			299	358		
Turn Bay Length (ft)			100				
Base Capacity (vph)	1204		154	1071	404		
Starvation Cap Reductn	284		0	0	0		
Spillback Cap Reductn	0		0	84	41		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	1.01		0.56	0.62	0.69		

Intersection Summary	
Area Type:	CBD
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 8 (6%), Referenced to phase 2:EBWB, Start of Yellow	
Natural Cycle: 130	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.80	
Intersection Signal Delay: 32.2	Intersection LOS: C
Intersection Capacity Utilization 85.9%	ICU Level of Service E
Analysis Period (min) 15	

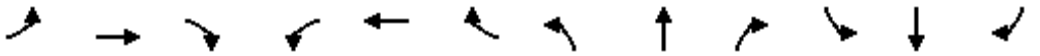
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: South Street & Main Street (Rt 109)



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	828	63	69	482	132	72
Future Volume (vph)	828	63	69	482	132	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	14	14	9	10	14	14
Total Lost time (s)	6.0		6.0	6.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frpb, ped/bikes	1.00		1.00	1.00	1.00	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.99		1.00	1.00	0.95	
Flt Protected	1.00		0.95	1.00	0.97	
Satd. Flow (prot)	1726		1160	1535	1634	
Flt Permitted	1.00		0.18	1.00	0.97	
Satd. Flow (perm)	1726		223	1535	1634	
Peak-hour factor, PHF	0.96	0.96	0.79	0.79	0.82	0.82
Adj. Flow (vph)	862	66	87	610	161	88
RTOR Reduction (vph)	0	0	0	0	16	0
Lane Group Flow (vph)	929	0	87	610	233	0
Confl. Peds. (#/hr)		2	2			
Heavy Vehicles (%)	4%	11%	26%	4%	3%	3%
Turn Type	NA		Perm	NA	Prot	
Protected Phases	2			2	1	
Permitted Phases			2			
Actuated Green, G (s)	88.4		88.4	88.4	23.4	
Effective Green, g (s)	88.4		88.4	88.4	23.4	
Actuated g/C Ratio	0.68		0.68	0.68	0.18	
Clearance Time (s)	6.0		6.0	6.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1173		151	1043	294	
v/s Ratio Prot	c0.54			0.40	c0.14	
v/s Ratio Perm			0.39			
v/c Ratio	0.79		0.58	0.58	0.79	
Uniform Delay, d1	14.4		10.9	11.1	51.0	
Progression Factor	0.87		1.00	1.00	1.00	
Incremental Delay, d2	1.3		15.0	2.4	13.5	
Delay (s)	13.8		26.0	13.5	64.5	
Level of Service	B		C	B	E	
Approach Delay (s)	13.8			15.0	64.5	
Approach LOS	B			B	E	

Intersection Summary			
HCM 2000 Control Delay	21.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	85.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

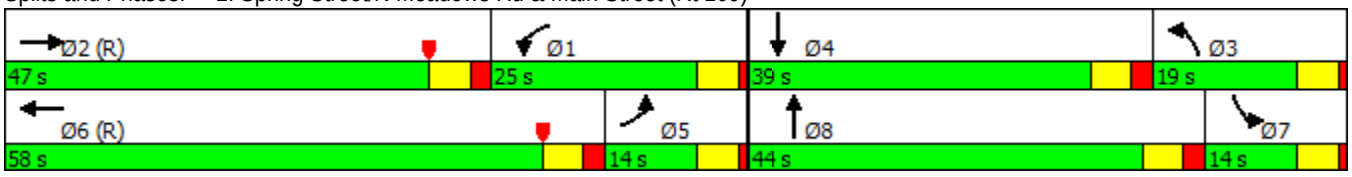


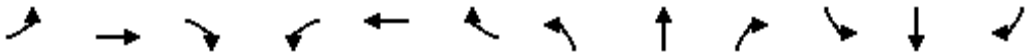
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	283	103	225	595	55	144	335	108	89	356	31
Future Volume (vph)	37	283	103	225	595	55	144	335	108	89	356	31
Ideal Flow (vphpl)	1500	1500	1500	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	13	13	11	12	12	12	11	12	12	12	12
Storage Length (ft)	130		0	120		0	120		0	250		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99		1.00							1.00	
Frt		0.960			0.987			0.963			0.988	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1325	1331	0	1570	1672	0	1608	1580	0	1624	1667	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1325	1331	0	1567	1672	0	1608	1580	0	1624	1667	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			4			13			3	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		372			1028			628			637	
Travel Time (s)		10.1			28.0			17.1			17.4	
Confl. Peds. (#/hr)			1	1								
Confl. Bikes (#/hr)												1
Peak Hour Factor	0.91	0.91	0.91	0.94	0.94	0.94	0.86	0.86	0.86	0.93	0.93	0.93
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	1%	1%	0%	0%	1%	3%
Adj. Flow (vph)	41	311	113	239	633	59	167	390	126	96	383	33
Shared Lane Traffic (%)												
Lane Group Flow (vph)	41	424	0	239	692	0	167	516	0	96	416	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	14.0	21.0		14.0	21.0		14.0	21.0		14.0	21.0	
Total Split (s)	14.0	47.0		25.0	58.0		19.0	44.0		14.0	39.0	
Total Split (%)	10.8%	36.2%		19.2%	44.6%		14.6%	33.8%		10.8%	30.0%	
Maximum Green (s)	9.0	41.0		20.0	52.0		14.0	38.0		9.0	33.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	
Lead/Lag	Lag	Lead		Lag	Lead		Lag	Lead		Lag	Lead	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	C-Min		None	C-Min		None	None		None	None	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		8.0			8.0			8.0			8.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	8.3	41.0		20.0	54.8		14.0	38.0		9.0	33.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.06	0.32		0.15	0.42		0.11	0.29		0.07	0.25	
v/c Ratio	0.49	0.99		0.99	0.98		0.97	1.10		0.86	0.98	
Control Delay	77.9	83.0		100.1	61.2		117.5	112.0		112.7	86.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	77.9	83.0		100.1	61.2		117.5	112.0		112.7	86.6	
LOS	E	F		F	E		F	F		F	F	
Approach Delay		82.5			71.2			113.3			91.5	
Approach LOS		F			E			F			F	
Queue Length 50th (ft)	34	345		206	~429		142	~484		82	348	
Queue Length 95th (ft)	73	#566		#375	#853		#269	#656		#187	#564	
Internal Link Dist (ft)		292			948			548			557	
Turn Bay Length (ft)	130			120			120			250		
Base Capacity (vph)	91	430		241	707		173	471		112	425	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.45	0.99		0.99	0.98		0.97	1.10		0.86	0.98	

Intersection Summary			
Area Type:	CBD		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 103 (79%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.10			
Intersection Signal Delay: 88.3		Intersection LOS: F	
Intersection Capacity Utilization 94.4%		ICU Level of Service F	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: Spring Street/N Meadows Rd & Main Street (Rt 109)

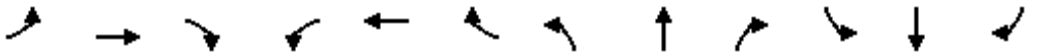




Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	283	103	225	595	55	144	335	108	89	356	31
Future Volume (vph)	37	283	103	225	595	55	144	335	108	89	356	31
Ideal Flow (vphpl)	1500	1500	1500	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	13	13	11	12	12	12	11	12	12	12	12
Total Lost time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.99		1.00	0.96		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1325	1331		1570	1673		1608	1581		1624	1667	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1325	1331		1570	1673		1608	1581		1624	1667	
Peak-hour factor, PHF	0.91	0.91	0.91	0.94	0.94	0.94	0.86	0.86	0.86	0.93	0.93	0.93
Adj. Flow (vph)	41	311	113	239	633	59	167	390	126	96	383	33
RTOR Reduction (vph)	0	10	0	0	2	0	0	9	0	0	2	0
Lane Group Flow (vph)	41	414	0	239	690	0	167	507	0	96	414	0
Confl. Peds. (#/hr)			1	1								
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	1%	1%	0%	0%	1%	3%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	7.2	40.0		21.0	53.8		14.0	38.0		9.0	33.0	
Effective Green, g (s)	7.2	40.0		21.0	53.8		14.0	38.0		9.0	33.0	
Actuated g/C Ratio	0.06	0.31		0.16	0.41		0.11	0.29		0.07	0.25	
Clearance Time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	73	409		253	692		173	462		112	423	
v/s Ratio Prot	0.03	0.31		c0.15	c0.41		c0.10	c0.32		0.06	0.25	
v/s Ratio Perm												
v/c Ratio	0.56	1.01		0.94	1.00		0.97	1.10		0.86	0.98	
Uniform Delay, d1	59.9	45.0		53.9	38.0		57.8	46.0		59.9	48.1	
Progression Factor	1.00	1.00		0.83	0.87		1.00	1.00		1.00	1.00	
Incremental Delay, d2	9.5	47.4		39.0	31.8		57.7	70.8		43.6	37.6	
Delay (s)	69.4	92.4		83.9	64.8		115.5	116.8		103.5	85.7	
Level of Service	E	F		F	E		F	F		F	F	
Approach Delay (s)		90.3			69.7			116.5			89.1	
Approach LOS		F			E			F			F	

Intersection Summary			
HCM 2000 Control Delay	89.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	94.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



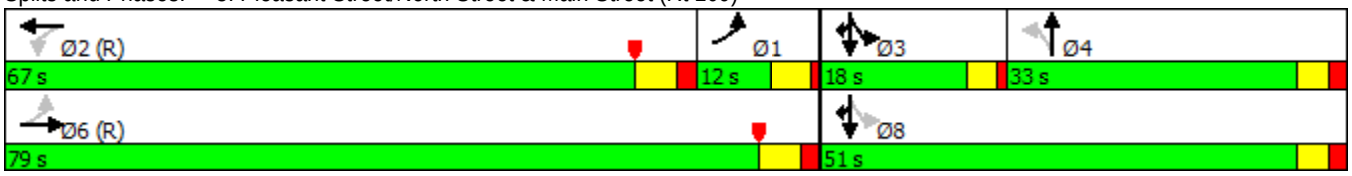
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	3	12	2	499	81	18	67	7	199	121	173
Future Volume (vph)	100	3	12	2	499	81	18	67	7	199	121	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	16	16	16	13	13	13	12	12	14
Storage Length (ft)	90		0	0		0	0		0	0		180
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00	0.98			1.00			1.00			0.99	
Frt		0.878			0.981			0.990				0.850
Flt Protected	0.950							0.990			0.970	
Satd. Flow (prot)	1516	1373	0	0	1879	0	0	1727	0	0	1648	1535
Flt Permitted	0.335							0.871			0.551	
Satd. Flow (perm)	534	1373	0	0	1879	0	0	1516	0	0	930	1535
Right Turn on Red			No			Yes			No			Yes
Satd. Flow (RTOR)					8							182
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1028			389			620			462	
Travel Time (s)		28.0			10.6			16.9			12.6	
Confl. Peds. (#/hr)	1		3	3		1	4		5	5		4
Confl. Bikes (#/hr)												1
Peak Hour Factor	0.96	0.96	0.96	0.92	0.92	0.92	0.80	0.80	0.80	0.95	0.95	0.95
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	1%	0%	1%
Adj. Flow (vph)	104	3	13	2	542	88	23	84	9	209	127	182
Shared Lane Traffic (%)												
Lane Group Flow (vph)	104	16	0	0	632	0	0	116	0	0	336	182
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		custom	NA	Prot
Protected Phases	1	6			2			4		3	3 8	3 8
Permitted Phases	6			2			4			8		
Detector Phase	1	6		2	2		4	4		3	3 8	3 8
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0		
Minimum Split (s)	12.0	11.0		28.0	28.0		22.0	22.0		13.0		
Total Split (s)	12.0	79.0		67.0	67.0		33.0	33.0		18.0		
Total Split (%)	9.2%	60.8%		51.5%	51.5%		25.4%	25.4%		13.8%		
Maximum Green (s)	7.0	73.0		61.0	61.0		28.0	28.0		14.0		
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	3.0		3.0		
All-Red Time (s)	1.0	2.0		2.0	2.0		2.0	2.0		1.0		
Lost Time Adjust (s)	0.0	0.0			0.0			0.0				
Total Lost Time (s)	5.0	6.0			6.0			5.0				
Lead/Lag	Lag			Lead	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0		
Recall Mode	None	C-Min		C-Min	C-Min		None	None		None		
Walk Time (s)				7.0	7.0		7.0	7.0				
Flash Dont Walk (s)				15.0	15.0		10.0	10.0				
Pedestrian Calls (#/hr)				0	0		0	0				
Act Effct Green (s)	76.3	75.3			64.8			18.0			44.7	44.7

Lane Group	Ø8
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	8
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	10.0
Total Split (s)	51.0
Total Split (%)	39%
Maximum Green (s)	46.0
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.59	0.58			0.50			0.14			0.34	0.34
v/c Ratio	0.29	0.02			0.67			0.55			0.77	0.28
Control Delay	7.3	5.4			23.9			60.3			47.6	4.8
Queue Delay	0.0	0.0			6.9			7.4			8.9	0.0
Total Delay	7.3	5.4			30.8			67.7			56.5	4.8
LOS	A	A			C			E			E	A
Approach Delay		7.1			30.8			67.7			38.3	
Approach LOS		A			C			E			D	
Queue Length 50th (ft)	18	3			428			95			224	0
Queue Length 95th (ft)	m20	m3			346			125			#336	48
Internal Link Dist (ft)		948			309			540			382	
Turn Bay Length (ft)	90											180
Base Capacity (vph)	372	809			950			326			465	685
Starvation Cap Reductn	0	0			268			0			0	0
Spillback Cap Reductn	0	0			0			166			97	0
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	0.28	0.02			0.93			0.72			0.91	0.27

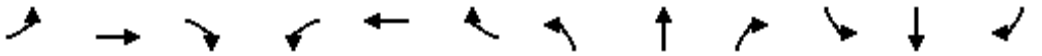
Intersection Summary			
Area Type:	CBD		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow, Master Intersection			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.77			
Intersection Signal Delay: 34.7		Intersection LOS: C	
Intersection Capacity Utilization 80.3%		ICU Level of Service D	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 3: Pleasant Street/North Street & Main Street (Rt 109)



Lane Group	Ø8
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	3	12	2	499	81	18	67	7	199	121	173
Future Volume (vph)	100	3	12	2	499	81	18	67	7	199	121	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	16	16	16	13	13	13	12	12	14
Total Lost time (s)	5.0	6.0			6.0			5.0			4.0	4.0
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	1.00
Frpb, ped/bikes	1.00	0.98			1.00			1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00			1.00			1.00	1.00
Frt	1.00	0.88			0.98			0.99			1.00	0.85
Flt Protected	0.95	1.00			1.00			0.99			0.97	1.00
Satd. Flow (prot)	1516	1373			1879			1723			1642	1535
Flt Permitted	0.33	1.00			1.00			0.87			0.55	1.00
Satd. Flow (perm)	534	1373			1879			1516			934	1535
Peak-hour factor, PHF	0.96	0.96	0.96	0.92	0.92	0.92	0.80	0.80	0.80	0.95	0.95	0.95
Adj. Flow (vph)	104	3	12	2	542	88	22	84	9	209	127	182
RTOR Reduction (vph)	0	0	0	0	4	0	0	0	0	0	0	121
Lane Group Flow (vph)	104	16	0	0	628	0	0	116	0	0	336	61
Confl. Peds. (#/hr)	1		3	3		1	4		5	5		4
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	1%	0%	1%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		custom	NA	Prot
Protected Phases	1	6			2			4		3	3 8	3 8
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	76.3	75.3			64.8			18.0			43.7	43.7
Effective Green, g (s)	76.3	75.3			64.8			18.0			43.7	43.7
Actuated g/C Ratio	0.59	0.58			0.50			0.14			0.34	0.34
Clearance Time (s)	5.0	6.0			6.0			5.0				
Vehicle Extension (s)	3.0	3.0			3.0			3.0				
Lane Grp Cap (vph)	354	795			936			209			432	515
v/s Ratio Prot	c0.01	0.01									c0.13	0.04
v/s Ratio Perm	0.16				0.33			0.08			c0.13	
v/c Ratio	0.29	0.02			0.67			0.56			0.78	0.12
Uniform Delay, d1	24.1	11.6			24.6			52.3			38.8	29.8
Progression Factor	0.42	0.39			0.81			1.00			1.00	1.00
Incremental Delay, d2	0.1	0.0			2.7			3.2			8.6	0.1
Delay (s)	10.2	4.6			22.6			55.4			47.4	29.9
Level of Service	B	A			C			E			D	C
Approach Delay (s)		9.5			22.6			55.4			41.2	
Approach LOS		A			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	31.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	80.3%	ICU Level of Service	D
Analysis Period (min)	15		

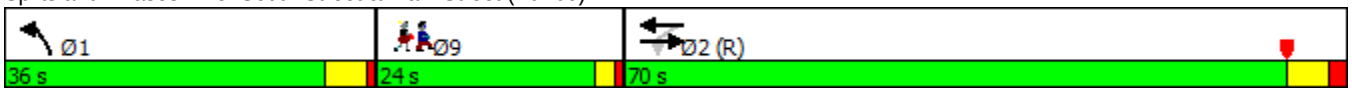
c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø9
Lane Configurations							
Traffic Volume (vph)	452	110	56	508	77	60	
Future Volume (vph)	452	110	56	508	77	60	
Ideal Flow (vphpl)	1900	1900	1200	1200	1900	1900	
Lane Width (ft)	14	14	9	10	14	14	
Storage Length (ft)		0	100		0	0	
Storage Lanes		0	1		1	0	
Taper Length (ft)			25		25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor	1.00		1.00		0.98		
Frt	0.974				0.941		
Flt Protected			0.950		0.973		
Satd. Flow (prot)	1769	0	923	998	1670	0	
Flt Permitted			0.384		0.973		
Satd. Flow (perm)	1769	0	373	998	1642	0	
Right Turn on Red		No				Yes	
Satd. Flow (RTOR)					28		
Link Speed (mph)	25			25	25		
Link Distance (ft)	389			379	438		
Travel Time (s)	10.6			10.3	11.9		
Confl. Peds. (#/hr)		1	1		14		
Peak Hour Factor	0.96	0.96	0.95	0.95	0.65	0.65	
Heavy Vehicles (%)	0%	0%	0%	1%	0%	0%	
Adj. Flow (vph)	471	115	59	535	118	92	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	586	0	59	535	210	0	
Turn Type	NA		Perm	NA	Prot		
Protected Phases	2			2	1		9
Permitted Phases			2				
Detector Phase	2		2	2	1		
Switch Phase							
Minimum Initial (s)	10.0		10.0	10.0	5.0		5.0
Minimum Split (s)	28.0		28.0	28.0	24.0		24.0
Total Split (s)	70.0		70.0	70.0	36.0		24.0
Total Split (%)	53.8%		53.8%	53.8%	27.7%		18%
Maximum Green (s)	64.0		64.0	64.0	31.0		21.0
Yellow Time (s)	4.0		4.0	4.0	4.0		2.0
All-Red Time (s)	2.0		2.0	2.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	6.0		6.0	6.0	5.0		
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	C-Min		C-Min	C-Min	None		None
Walk Time (s)							7.0
Flash Dont Walk (s)							14.0
Pedestrian Calls (#/hr)							3
Act Effct Green (s)	94.5		94.5	94.5	19.7		
Actuated g/C Ratio	0.73		0.73	0.73	0.15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø9
v/c Ratio	0.46		0.22	0.74	0.76		
Control Delay	16.8		12.7	22.0	62.7		
Queue Delay	13.8		0.0	2.7	0.0		
Total Delay	30.6		12.7	24.7	62.7		
LOS	C		B	C	E		
Approach Delay	30.6			23.5	62.7		
Approach LOS	C			C	E		
Queue Length 50th (ft)	325		12	198	150		
Queue Length 95th (ft)	559		63	#704	145		
Internal Link Dist (ft)	309			299	358		
Turn Bay Length (ft)			100				
Base Capacity (vph)	1286		271	725	419		
Starvation Cap Reductn	682		0	0	0		
Spillback Cap Reductn	0		0	100	2		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.97		0.22	0.86	0.50		

Intersection Summary			
Area Type:	CBD		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 3 (2%), Referenced to phase 2:EBWB, Start of Yellow			
Natural Cycle: 110			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.76			
Intersection Signal Delay: 32.4		Intersection LOS: C	
Intersection Capacity Utilization 65.2%		ICU Level of Service C	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 5: South Street & Main Street (Rt 109)



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	452	110	56	508	77	60
Future Volume (vph)	452	110	56	508	77	60
Ideal Flow (vphpl)	1900	1900	1200	1200	1900	1900
Lane Width	14	14	9	10	14	14
Total Lost time (s)	6.0		6.0	6.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frpb, ped/bikes	1.00		1.00	1.00	1.00	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.97		1.00	1.00	0.94	
Flt Protected	1.00		0.95	1.00	0.97	
Satd. Flow (prot)	1768		923	998	1669	
Flt Permitted	1.00		0.38	1.00	0.97	
Satd. Flow (perm)	1768		373	998	1669	
Peak-hour factor, PHF	0.96	0.96	0.95	0.95	0.65	0.65
Adj. Flow (vph)	471	115	59	535	118	92
RTOR Reduction (vph)	0	0	0	0	24	0
Lane Group Flow (vph)	586	0	59	535	186	0
Confl. Peds. (#/hr)		1	1		14	
Heavy Vehicles (%)	0%	0%	0%	1%	0%	0%
Turn Type	NA		Perm	NA	Prot	
Protected Phases	2			2	1	
Permitted Phases			2			
Actuated Green, G (s)	92.1		92.1	92.1	19.7	
Effective Green, g (s)	92.1		92.1	92.1	19.7	
Actuated g/C Ratio	0.71		0.71	0.71	0.15	
Clearance Time (s)	6.0		6.0	6.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1252		264	707	252	
v/s Ratio Prot	0.33			c0.54	c0.11	
v/s Ratio Perm			0.16			
v/c Ratio	0.47		0.22	0.76	0.74	
Uniform Delay, d1	8.3		6.6	11.9	52.7	
Progression Factor	1.51		1.00	1.00	1.00	
Incremental Delay, d2	1.2		2.0	7.4	10.8	
Delay (s)	13.7		8.5	19.3	63.5	
Level of Service	B		A	B	E	
Approach Delay (s)	13.7			18.3	63.5	
Approach LOS	B			B	E	

Intersection Summary			
HCM 2000 Control Delay	23.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

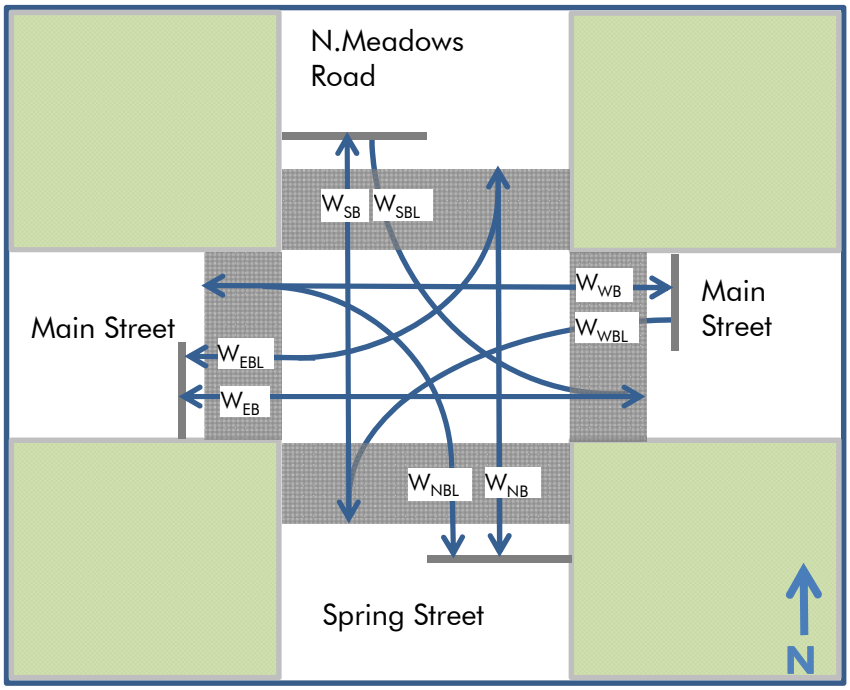
Appendix B – Calculations

Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING ®

Project: Low Cost Signal Improvements Date: 12/22/2015

Intersection: Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27) Engineer: JDH

Vehicle Clearance Calculator Worksheet



Equations:

$$Y = t + \frac{1.47V}{2a + 64.4g}$$

$$R = \frac{W + L}{1.47V} - 1$$

Assumptions:

t = 1 s
a = 10 ft/s^2
L= 20 ft

Inputs (fill in blue shaded boxes):

W_{NB} =	100 ft	W_{NBL} =	90 ft	W_{EB} =	95 ft	W_{EBL} =	85 ft
W_{SB} =	100 ft	W_{SBL} =	100 ft	W_{WB} =	95 ft	W_{WBL} =	75 ft

☐ Measured 85% Speed ☐ Estimate V using Posted Speed Limit

V_{NB} =	32 mph	V_{NBL} =	20 mph	V_{EB} =	32 mph	V_{EBL} =	20 mph
V_{SB} =	32 mph	V_{SBL} =	20 mph	V_{WB} =	32 mph	V_{WBL} =	20 mph

g_{NB} =	%	g_{EB} =	%
g_{SB} =	%	g_{WB} =	%

Outputs:

Yellow Clearances:

Y_{NB} =	3.4 s	Y_{NBL} =	2.5 s	Y_{EB} =	3.4 s	Y_{EBL} =	2.5 s
Y_{SB} =	3.4 s	Y_{SBL} =	2.5 s	Y_{WB} =	3.4 s	Y_{WBL} =	2.5 s

All Red Clearances:

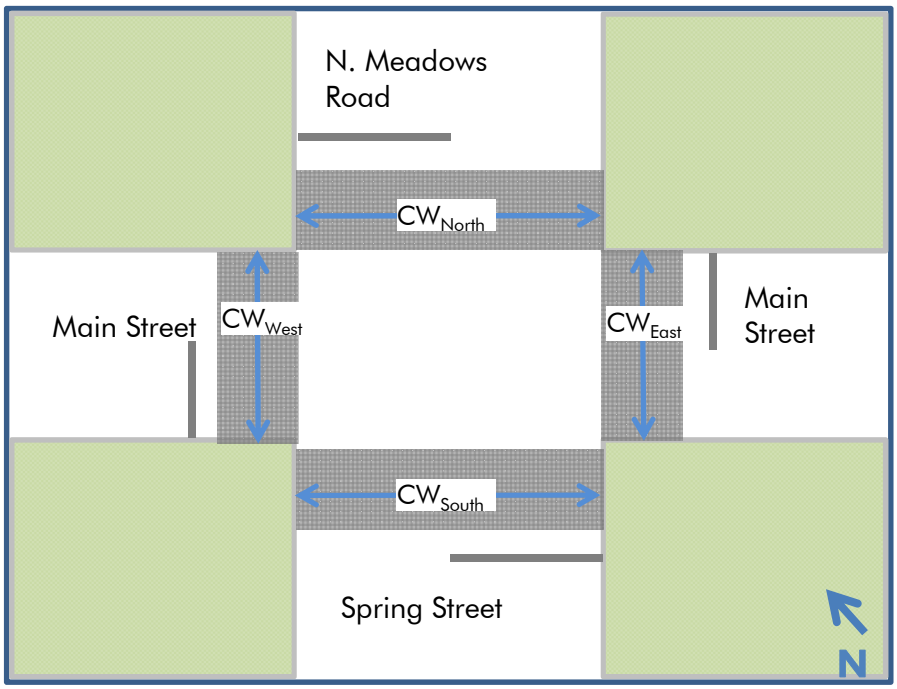
R_{NB} =	1.6 s	R_{NBL} =	2.7 s	R_{EB} =	1.4 s	R_{EBL} =	2.6 s
R_{SB} =	1.6 s	R_{SBL} =	3.1 s	R_{WB} =	1.4 s	R_{WBL} =	2.2 s

Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING ®

Project: Low Cost Signal Improvements Date: 12/22/2015

Intersection: Main Street (Route 109)/Spring Street (Route 27)/N. Meadows Road (Route 27) Engineer: JDH

Pedestrian Clearance Calculator Worksheet



$$FDW = \frac{CW_{length}}{Walking\ Speed}$$

OR

$$W + FDW = \frac{D_{PB}}{3\ ft/s}$$

CW = length of crosswalk from curb to curb

D = distance from pushbutton to curb at far side of crosswalk

Inputs (fill in blue shaded boxes):

CW_{North} =	47	ft	CW_{East} =	50	ft	Walking Speed:	3.5 ft/s
CW_{South} =	48	ft	CW_{West} =	44	ft		

$D_{N\ (E\ to\ W)}$ =		ft	$D_{S\ (E\ to\ W)}$ =		ft	$D_{E\ (N\ to\ S)}$ =		ft	$D_{W\ (N\ to\ S)}$ =		ft
$D_{N\ (W\ to\ E)}$ =		ft	$D_{S\ (W\ to\ E)}$ =		ft	$D_{E\ (S\ to\ N)}$ =		ft	$D_{W\ (S\ to\ N)}$ =		ft

Outputs:

FDW Clearances:

FDW_{North} =	13.4	s	FDW_{East} =	14.3	s
FDW_{South} =	13.7	s	FDW_{West} =	12.6	s

Total W + FDW (minimum):

**Total W plus FDW must be greater than or equal to values below

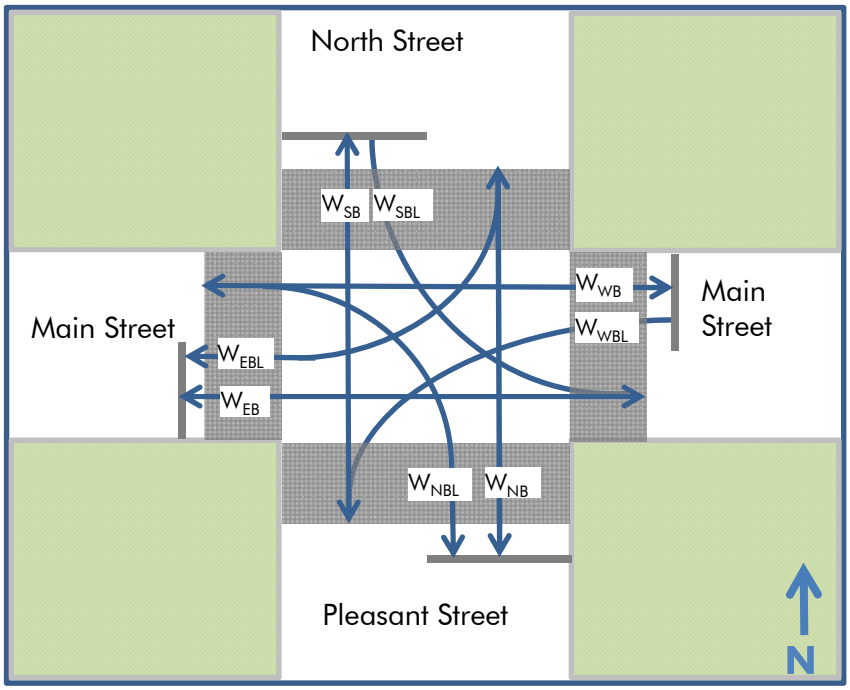
$N_{(E\ to\ W)}$ =		s	$S_{(E\ to\ W)}$ =		s	$E_{(N\ to\ S)}$ =		s	$W_{(N\ to\ S)}$ =		s
$N_{(W\ to\ E)}$ =		s	$S_{(W\ to\ E)}$ =		s	$E_{(S\ to\ N)}$ =		s	$W_{(S\ to\ N)}$ =		s

Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING ®

Project: Low Cost Signal Improvements Date: 12/22/2015

Intersection: Main Street (Route 109)/Pleasant Street/North Street Engineer: JDH

Vehicle Clearance Calculator Worksheet



Equations:

$$Y = t + \frac{1.47V}{2a + 64.4g}$$

$$R = \frac{W + L}{1.47V} - 1$$

Assumptions:

t = 1 s
a = 10 ft/s^2
L= 20 ft

Inputs (fill in blue shaded boxes):

W_{NB} =	98 ft	W_{NBL} =	138 ft	W_{EB} =	120 ft	W_{EBL} =	100 ft
W_{SB} =	100 ft	W_{SBL} =	100 ft	W_{WB} =	130 ft	W_{WBL} =	75 ft

☐ Measured 85% Speed ☐ Estimate V using Posted Speed Limit

V_{NB} =	32 mph	V_{NBL} =	20 mph	V_{EB} =	32 mph	V_{EBL} =	20 mph
V_{SB} =	32 mph	V_{SBL} =	20 mph	V_{WB} =	32 mph	V_{WBL} =	20 mph

g_{NB} =	%	g_{EB} =	%
g_{SB} =	%	g_{WB} =	%

Outputs:

Yellow Clearances:

Y_{NB} =	3.4 s	Y_{NBL} =	2.5 s	Y_{EB} =	3.4 s	Y_{EBL} =	2.5 s
Y_{SB} =	3.4 s	Y_{SBL} =	2.5 s	Y_{WB} =	3.4 s	Y_{WBL} =	2.5 s

All Red Clearances:

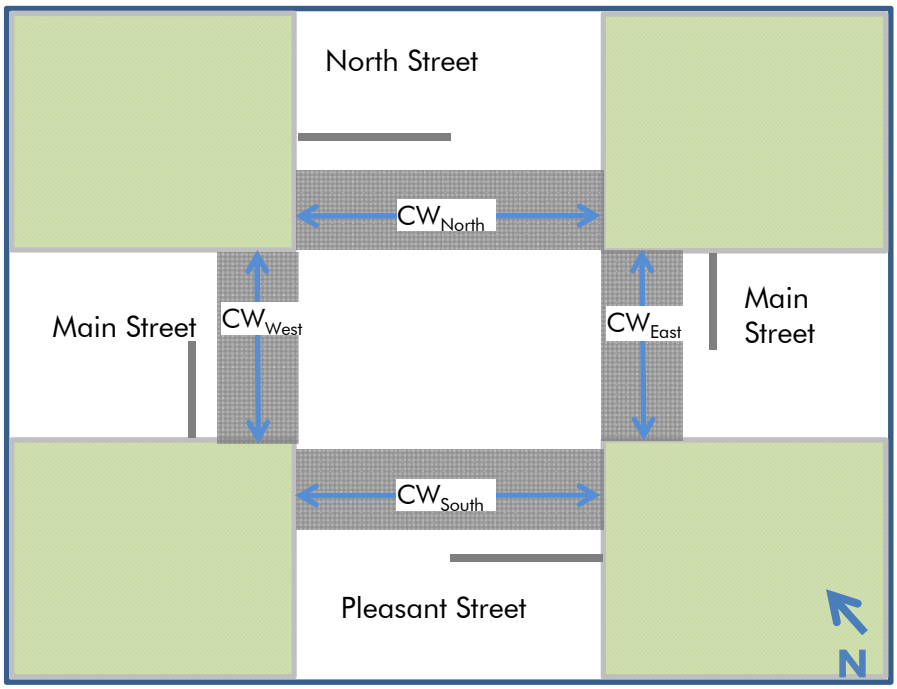
R_{NB} =	1.5 s	R_{NBL} =	4.4 s	R_{EB} =	2.0 s	R_{EBL} =	3.1 s
R_{SB} =	1.6 s	R_{SBL} =	3.1 s	R_{WB} =	2.2 s	R_{WBL} =	2.2 s

Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING ®

Project: Low Cost Signal Improvements Date: 12/22/2015

Intersection: Main Street (Route 109)/Pleasant Street/North Street Engineer: JDH

Pedestrian Clearance Calculator Worksheet



$$FDW = \frac{CW_{length}}{Walking\ Speed}$$

OR

$$W + FDW = \frac{D_{PB}}{3\ ft/s}$$

CW = length of crosswalk from curb to curb

D = distance from pushbutton to curb at far side of crosswalk

Inputs (fill in blue shaded boxes):

CW_{North} =	74 ft	CW_{East} =	53 ft	Walking Speed:	3.5 ft/s		
CW_{South} =	30 ft	CW_{West} =	50 ft				

$D_{N\ (E\ to\ W)}$ =	ft	$D_{S\ (E\ to\ W)}$ =	ft	$D_{E\ (N\ to\ S)}$ =	ft	$D_{W\ (N\ to\ S)}$ =	ft
$D_{N\ (W\ to\ E)}$ =	ft	$D_{S\ (W\ to\ E)}$ =	ft	$D_{E\ (S\ to\ N)}$ =	ft	$D_{W\ (S\ to\ N)}$ =	ft

Outputs:

FDW Clearances:

FDW_{North} =	21.1 s	FDW_{East} =	15.1 s
FDW_{South} =	8.6 s	FDW_{West} =	14.3 s

Total W + FDW (minimum):

**Total W plus FDW must be greater than or equal to values below

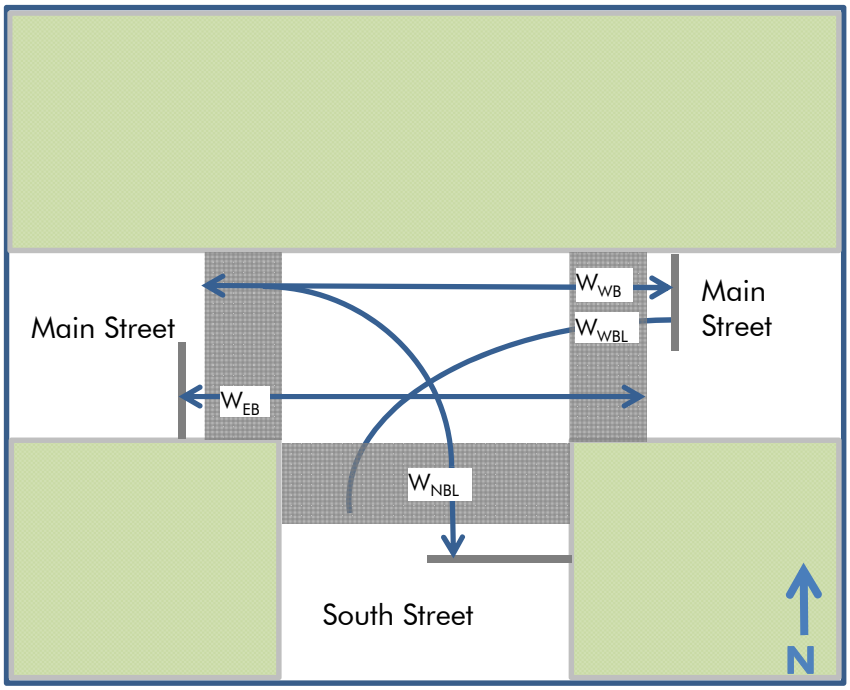
$N_{(E\ to\ W)}$ =	s	$S_{(E\ to\ W)}$ =	s	$E_{(N\ to\ S)}$ =	s	$W_{(N\ to\ S)}$ =	s
$N_{(W\ to\ E)}$ =	s	$S_{(W\ to\ E)}$ =	s	$E_{(S\ to\ N)}$ =	s	$W_{(S\ to\ N)}$ =	s

Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING ®

Project: Low Cost Signal Improvements Date: 12/22/2015

Intersection: Main Street (Route 109)/South Street Engineer: JDH

Vehicle Clearance Calculator Worksheet



Equations:

$$Y = t + \frac{1.47V}{2a + 64.4g}$$

$$R = \frac{W + L}{1.47V} - 1$$

Assumptions:

t = 1 s
a = 10 ft/s^2
L= 20 ft

Inputs (fill in blue shaded boxes):

W_{NB} =		ft	W_{NBL} =	90	ft	W_{EB} =	90	ft	W_{EBL} =	0	ft
W_{SB} =	0	ft	W_{SBL} =	0	ft	W_{WB} =	84	ft	W_{WBL} =	72	ft

☐ Measured 85% Speed ☐ Estimate V using Posted Speed Limit

V_{NB} =	0	mph	V_{NBL} =	20	mph	V_{EB} =	32	mph	V_{EBL} =	0	mph
V_{SB} =	0	mph	V_{SBL} =	0	mph	V_{WB} =	32	mph	V_{WBL} =	20	mph

g_{NB} =		%	g_{EB} =		%
g_{SB} =		%	g_{WB} =		%

Outputs:

Yellow Clearances:

Y_{NB} =		s	Y_{NBL} =	2.5	s	Y_{EB} =	3.4	s	Y_{EBL} =		s
Y_{SB} =		s	Y_{SBL} =		s	Y_{WB} =	3.4	s	Y_{WBL} =	2.5	s

All Red Clearances:

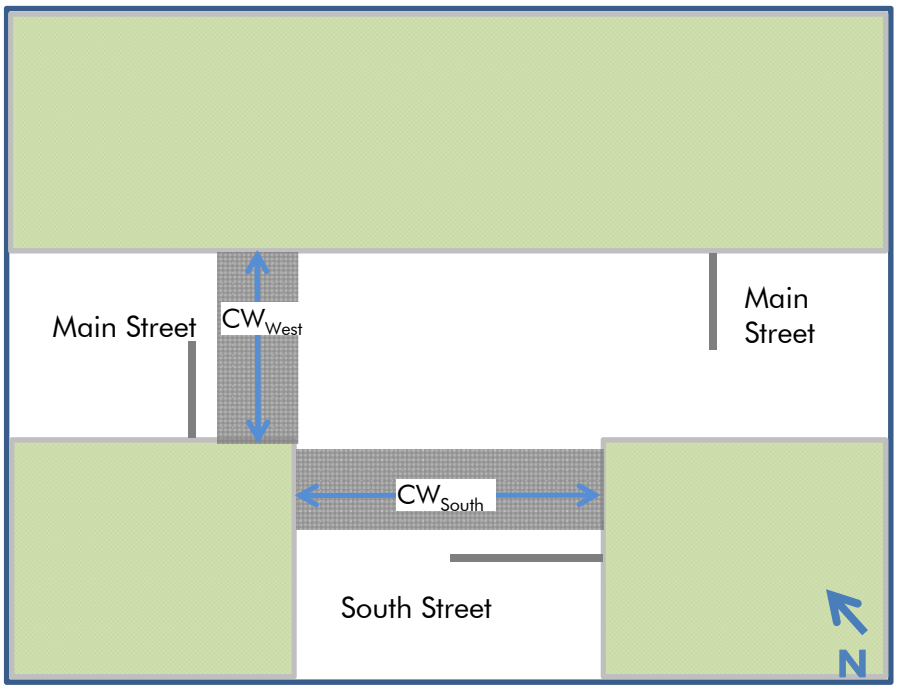
R_{NB} =		s	R_{NBL} =	2.7	s	R_{EB} =	1.3	s	R_{EBL} =		s
R_{SB} =		s	R_{SBL} =		s	R_{WB} =	1.2	s	R_{WBL} =	2.1	s

Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING ®

Project: Low Cost Signal Improvements Date: 12/22/2015

Intersection: Main Street (Route 109)/South Street Engineer: JDH

Pedestrian Clearance Calculator Worksheet



$$FDW = \frac{CW_{length}}{Walking\ Speed}$$

OR

$$W + FDW = \frac{D_{PB}}{3\ ft/s}$$

CW = length of crosswalk from curb to curb

D = distance from pushbutton to curb at far side of crosswalk

Inputs (fill in blue shaded boxes):

CW_{North} =	0	ft	CW_{East} =	0	ft	Walking Speed:	3.5 ft/s
CW_{South} =	60	ft	CW_{West} =	44	ft		

$D_{N\ (E\ to\ W)}$ =		ft	$D_{S\ (E\ to\ W)}$ =		ft	$D_{E\ (N\ to\ S)}$ =		ft	$D_{W\ (N\ to\ S)}$ =		ft
$D_{N\ (W\ to\ E)}$ =		ft	$D_{S\ (W\ to\ E)}$ =		ft	$D_{E\ (S\ to\ N)}$ =		ft	$D_{W\ (S\ to\ N)}$ =		ft

Outputs:

FDW Clearances:

FDW_{North} =		s	FDW_{East} =		s
FDW_{South} =	17.1	s	FDW_{West} =	12.6	s

Total W + FDW (minimum):

**Total W plus FDW must be greater than or equal to values below

$N_{(E\ to\ W)}$ =		s	$S_{(E\ to\ W)}$ =		s	$E_{(N\ to\ S)}$ =		s	$W_{(N\ to\ S)}$ =		s
$N_{(W\ to\ E)}$ =		s	$S_{(W\ to\ E)}$ =		s	$E_{(S\ to\ N)}$ =		s	$W_{(S\ to\ N)}$ =		s

Appendix C – Timing Chart

TOWN OF MEDFIELD - TRAFFIC SIGNALS

OPERATION SCHEDULE

LOCATION: Main Street (Route109)/Spring Street (Route 27)/N.Meadows Road (Route 27)

CLEARANCE TABLE

FROM \ TO	G	R	-	-	-	-	-
G	G	Y	-	-	-	-	-
R	-	R	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

STREET	DIR	Ø1			Ø2			Ø3			Ø4			Ø5			Ø6			Ø7			Ø8			Ø9			FLASH OPERATION
MAIN STREET	EBL	R	R	R	R	R	R	R	R	R	R	R	R	GL	YL	RL	R	R	R	R	R	R	R	R	R	R	R	R	FRL
MAIN STREET	EB	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	FY
MAIN STREET	WBL	GL	YL	RL	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	FRL
MAIN STREET	WB	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	FY
SPRING STREET	NBL	R	R	R	R	R	R	GL	YL	RL	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	FRL
SPRING STREET	NB	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	FR
N. MEADOWS ROAD	SBL	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	GL	YL	RL	R	R	R	R	R	R	FRL
N. MEADOWS ROAD	SB	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	FR
TIMING IN SECONDS																													
MINIMUM GREEN		5			5			5			5			5			5			5			5			-			
EXTENSION		3			3			3			3			3			3			3			3			-			
MAXIMUM 1		~~12~~ 14			~~40~~ 38			~~12~~ 14			30 35			~~12~~ 11			~~40~~ 41			~~12~~			~~30~~ 36			-			
MAXIMUM 2		~~15~~ 20			~~41~~ 44			~~18~~ 17			36 40			~~15~~ 12			~~41~~ 45			~~18~~ 12			~~36~~ 40			-			
MAXIMUM 3		-			-			-			-			-			-			-			-			-			
YELLOW CLEARANCE			4			4			4			4			4			4			4			4					
RED CLEARANCE				1			2			1			2			1			2			1			2			
WALK INTERVAL																										7			
PEDESTRIAN CLEARANCE																											~~12~~ 14		
MEMORY		-			-			-			-			-			-			-			-			-			
RECALL		OFF			MIN			OFF			OFF			OFF			MIN			OFF			OFF			OFF			

COORDINATION PHASE TIMING

TIMING PLAN	CYCLE LENGTH	REF/OFFSET	SEC.	SEC.	SEC.	SEC.	SEC.	SEC.	SEC.	SEC.	SEC.
TP 1 (6AM-9AM)	~~130~~ 150	~~46~~ 82	~~12~~ 15	~~44~~ 50	~~14~~ 18	~~41~~ 46	~~12~~ 17	~~44~~ 48	~~14~~ 18	~~41~~ 46	~~19~~ 21
TP 2 (3PM-9PM)	150	~~19~~ 70	~~20~~ 25	~~46~~ 40	~~23~~ 22	~~42~~ 42	~~20~~ 14	~~46~~ 51	~~23~~ 18	~~42~~ 46	~~19~~ 21

TOWN OF MEDFIELD - TRAFFIC SIGNALS

OPERATION SCHEDULE

LOCATION: Main Street (Route109)/Pleasant Street/North Street

CLEARANCE TABLE

FROM \ TO	G	R	-	-	-	-	-
G	G	Y	-	-	-	-	-
R	-	R	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

STREET	DIR	Ø1			Ø2			Ø3			Ø4			Ø6			Ø8			Ø9			FLASH OPERATION
MAIN STREET	EBL	GL	YL	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FRL
MAIN STREET	EB	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FY
MAIN STREET	WB	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	FY
PLEASANT STREET	NB	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	FR
NORTH STREET	SBL	R	R	R	R	R	R	GL	YL	R	R	R	R	R	R	R	G	Y	R	R	R	R	FRL
NORTH STREET	SB	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	G	Y	R	R	R	R	FR
TIMING IN SECONDS																							
MINIMUM GREEN		5			5			5			5			5			5			-			
EXTENSION		3			3			3			3			3			3			-			
MAXIMUM 1		~~9~~ 6			~~36~~ 44			~~15~~ 18			~~14~~ 31			~~45~~ 54			~~33~~ 52			-			
MAXIMUM 2		~~15~~ 8			~~41~~ 48			~~18~~ 21			~~36~~ 34			~~15~~ 57			~~41~~ 57			-			
MAXIMUM 3		-			-			-			-			-			-			-			
YELLOW CLEARANCE			3			4			3			3			4			3					
RED CLEARANCE				1			2			1			2			2			2				
WALK INTERVAL																				7			
PEDESTRIAN CLEARANCE																					~~15~~ 15	21	
MEMORY		-			-			-			-			-			-			-			
RECALL		OFF			MIN			OFF			OFF			MIN			OFF			OFF			

COORDINATION PHASE TIMING

TIMING PLAN	CYCLE LENGTH	REF/OFFSET	SEC.	SEC.	SEC.	SEC.	SEC.	SEC.	SEC.
TP 1 (6AM-9AM)	~~130~~ 150	0	~~10~~ 9	~~50~~ 54	~~14~~ 20	~~34~~ 39	~~60~~ 63	~~48~~ 59	~~22~~ 28
TP 2 (3PM-9PM)	150	0	~~10~~ 12	~~59~~ 48	~~27~~ 25	~~32~~ 37	~~69~~ 60	~~59~~ 62	~~22~~ 28

TOWN OF MEDFIELD - TRAFFIC SIGNALS

OPERATION SCHEDULE

LOCATION: Main Street (Route109)/South Street

CLEARANCE TABLE								
		TO						
		G	R	-	-	-	-	-
FROM	G	G	Y	-	-	-	-	-
	R	-	R	-	-	-	-	-
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-

STREET	DIR	Ø1			Ø2			Ø3			Ø4			FLASH OPERATION
MAIN STREET	EB	R	R	R	G	Y	R	G	Y	R	R	R	R	FY
MAIN STREET	WBL	R	R	R	G	Y	R	R	R	R	R	R	R	FY
MAIN STREET	WB	R	R	R	G	Y	R	R	R	R	R	R	R	FY
SOUTH STREET	NB	G	Y	R	R	R	R	R	R	R	R	R	R	FR
TIMING IN SECONDS														
MINIMUM GREEN		5			10			~~10~~	6		-			
EXTENSION		3			3			3			-			
MAXIMUM 1		~~20~~	27		~~40~~	61		~~10~~	6		-			
MAXIMUM 2		~~33~~	39		~~88~~	78		~~15~~	6		-			
MAXIMUM 3		-			-			-			-			
YELLOW CLEARANCE			4			4			4					
RED CLEARANCE				1			2			2				
WALK INTERVAL											7			
PEDESTRIAN CLEARANCE												~~16~~	17	
MEMORY		-			-			-			-			
RECALL		OFF			MIN			OFF			OFF			

COORDINATION PHASE TIMING						
TIMING PLAN	CYCLE LENGTH	REF/OFFSET	SEC.	SEC.	SEC.	SEC.
TP 1 (6AM-9AM)	~~130~~ 150	~~9~~ 26	~~38~~ 44	~~69~~ 70	~~17~~ 12	~~23~~ 24
TP 2 (3PM-9PM)	150	~~135~~ 29	~~34~~ 42	~~59~~ 84	-	~~23~~ 24

HOWARD STEIN HUDSON

11 Beacon Street, Suite 1010
Boston, Massachusetts 02108
617.482.7080

www.hshassoc.com