

Submitted to:

Maine Department of Transportation



Route 26 (Shaker Road) & Libby Hill Road; Gray, Maine
Short Term Intersection Operational Improvements

Traffic Analysis Report

WIN #18765.00



Submitted by:



Louis Berger

December, 2016

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1.0 Introduction

This report documents the traffic analysis completed by Louis Berger to evaluate proposed short term capacity improvements to the intersection of Route 26 (Shaker Road) and Libby Hill Road in Gray, Maine.

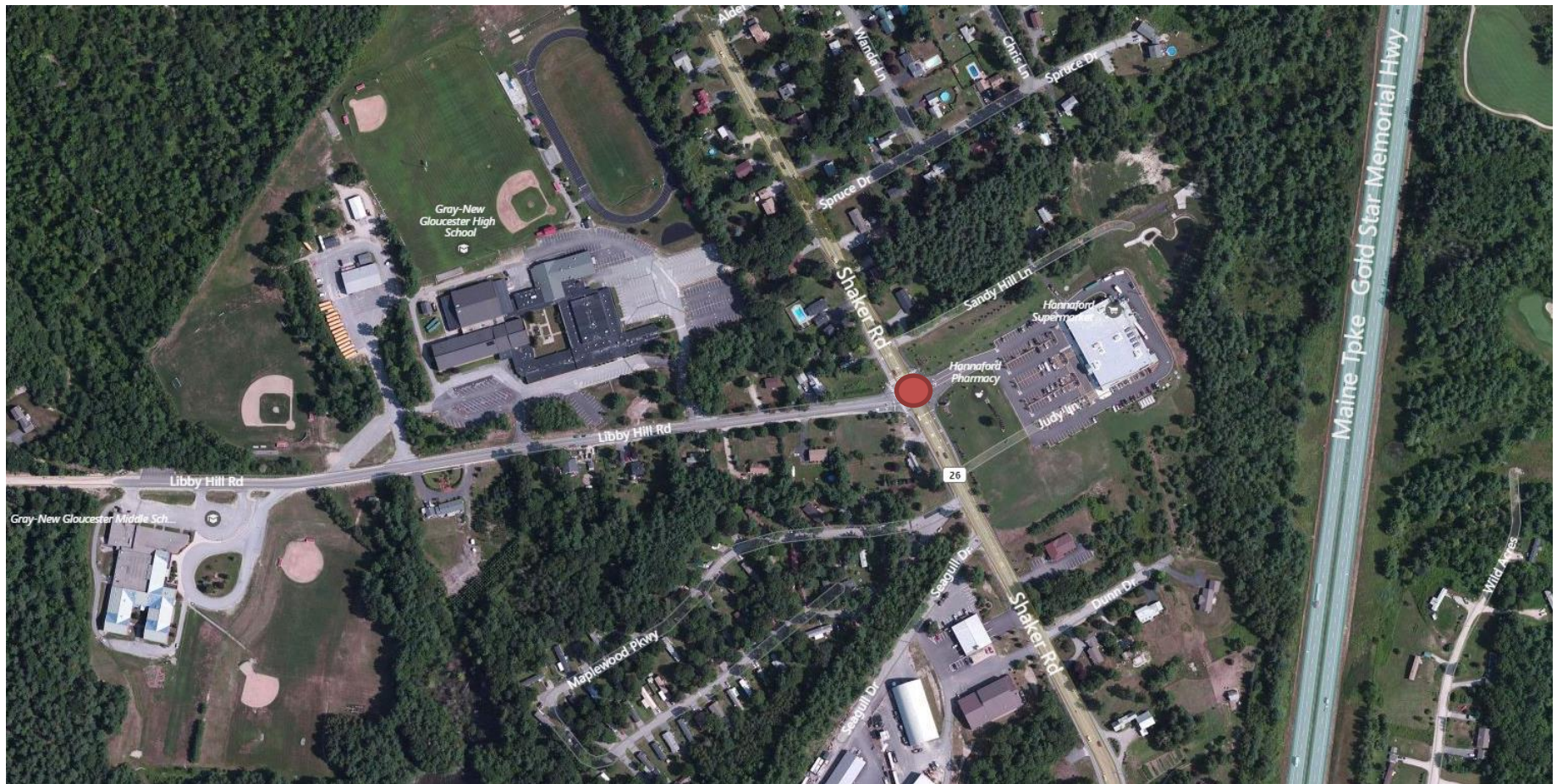
The improvements considered were originally proposed in the Route 26 Corridor Study created by TY Lin for Maine Department of Transportation (MaineDOT) in August 2014. The intersection has been scoped by MaineDOT as a Highway Safety and Spot Improvements program area.

1.1 Site Description

The location of the project is the intersection of Libby Hill Road, the Hannaford Driveway and Route 26 in Gray, Maine. The project extents are limited to the existing turning lane storage areas (approximately 200 feet per direction of each approach). A map showing the site area is shown as Figure 1.



Figure 1: Site Location Map



1.2 Existing and Proposed Traffic Volumes

Route 26 is a heavy commuter roadway, classified as Group II by MaineDOT, which defines the roadway as an arterial. The definition of an arterial road is a high-capacity urban road with the primary function of delivering traffic from collector roads to freeways or expressways. Route 26 is also classified as a part of the National Highway System¹. The most recent available AADT (Annual Average Daily Traffic) data from 2013 shows daily traffic volumes of 16,980 just south of Libby Hill Road and 15,180 just north of Libby Hill Road². The speed limit on Route 26 in the immediate area is 35 mph. Libby Hill Road is a local road with no signed speed limit; for the purposes of this study 25 mph was assumed.

There are significant traffic generators at the intersection: to the west on Libby Hill Road are the Gray-New Gloucester Middle School, High School and associated sports complexes; to the east is a local chain supermarket (Hannaford).

As expected on an arterial roadway the AM and PM peak hour volumes are high due to commuter traffic traveling to and from the greater Portland region. During the AM peak hour this is intensified by students accessing the schools on Libby Hill Road. The most recent available counts at the intersection show 1,654 vehicles passing through during the AM peak hour (6:45-7:45 AM) and 1,850 vehicles during the PM peak hour (4:30-5:30 PM). By seasonally adjusting these volumes which were taken in September 2013 to the peak season (using a MaineDOT calculated factor of 1.10) and inflating to 2016 volumes using a 0.50% annual non-compounded growth rate the 2016 peak hour volumes at the intersection are 1,847 and 2,066, respectively. The 0.50% annual growth rate was also used to produce 2017 peak hour volumes to evaluate the proposed condition.

Diagrams of all peak hour volumes considered including turning movements, truck percentages, peak hour factor and pedestrian counts can be found in Appendix A.

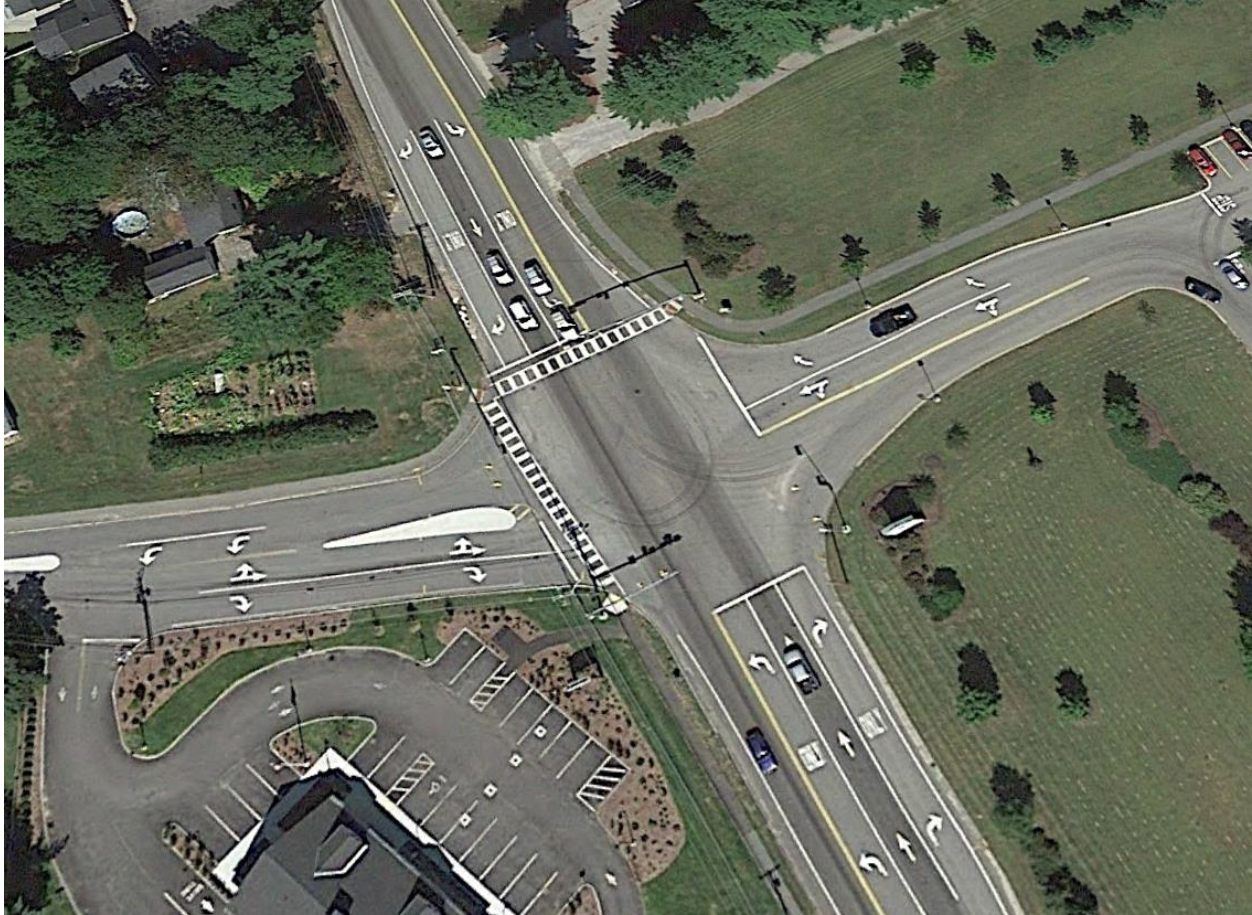
1.3 Existing and Proposed Site Conditions

The existing lane arrangement on both of the minor streets of Libby Hill Road and the Hannaford Supermarket driveway are currently a shared left/thru and a dedicated right turn lane as shown in Figure 2. This shared left/thru configuration is serviced using “split phasing”. Split phasing allows one approach to be served at a time which is generally thought to be safer in the sense that there are no “yield on green ball” type conflicts. However, this timing is less efficient due to a greater amount of lost time (yellow and red transitions) which are needed within a single cycle of the signal.

¹ http://www.fhwa.dot.gov/planning/national_highway_system/nhs_maps/maine/me_maine.pdf

² <http://www.maine.gov/mdot/traffic/yc/>

Figure 2: Existing Site Conditions



The proposed site condition is a change in lane usage for the minor street approaches. Both Libby Hill Road and the Hannaford Supermarket driveway approaches will become a dedicated left turn lane with a shared thru/right. This is shown in Figure 3. The proposed arrangement will allow for concurrent left turn phasing from the minor streets and eliminate the need for split phasing.

This traffic analysis evaluates the 2016 existing condition in comparison to the 2017 proposed condition.

Figure 3: Proposed Site Conditions



2.0 Traffic Operations Analysis

Trafficware's Synchro 8/SimTraffic software was used to perform the traffic analysis. This program implements the methods outlined in the Highway Capacity Manual (HCM) and provides delay/vehicle and queue length results. For easy reference the results are reported as Level of Service (LOS), which is a system similar to letter grades of A through F, with A being the best and F being the worst.

The Highway Capacity Manual lists the following definitions for each grade:

- A= Free flow
- B= Reasonably free flow
- C= Stable flow
- D= Approaching unstable flow
- E= Unstable flow
- F= Forced flow, volume is greater than capacity

The level of service assignments for signalized intersections as compared to delay values are shown in Table 1.

Table 1: LOS Criteria for Signalized Intersections	
Level of Service	Delay per Vehicle (sec) Signalized
A	0 to 10
B	>10 to 20
C	>20 to 35
D	>35 to 55
E	>55 to 80
F	>80

2.1 Assumptions

The following assumptions have been adopted for the purpose of this traffic analysis.

- For interpretation of results, Route 26 is the North-South corridor and the major street.
- Calculated heavy vehicle percentages were used; because it is a percentage the volumes will increase proportionately with the increase in overall volume by year.
- Calculated peak hour factors (PHF) were used.
- For pedestrians, a walking speed of 3.5 feet/second is used. Two pedestrians per crossing are expected during each peak hour. The crossings will be “concurrent” meaning pedestrians will have a walk signal while a non-conflicting traffic movement has a green condition. The pedestrian clearance times are greater than the optimized concurrent vehicle phase green times and will be “held” only when the push button is activated.
- To facilitate the concurrent protected left turn phases from the minor approach streets a truck turning movement analysis was necessary. It was found that two buses can make the opposing left turn movements at the same time without conflict. Two WB-67 tractor trailers can also make this turn simultaneously but there is some encroachment on adjacent lanes. The illustration of both scenarios can be found in Appendix B.
- The existing signal analysis was completed using current signal timings as recorded during a field walk on Tuesday, August 30th, 2016.
- The proposed signal analysis was completed using calculated yellow, red and pedestrian clearance times based on measured conditions. This information is shown in Appendix C.

2.2 Signalized Intersection Capacity Analysis

The results of the analysis at each intersection for 2016 Existing and 2017 Proposed AM and PM peak hours are documented in this section. The proposed scenario is based on the lane configuration change described in Section 1.3. In both scenarios the traffic signal is modeled as “actuated” even though the existing detection has been reported by the Town to be unreliable. An average of five SimTraffic microsimulation runs provide delay and 95th percentile queue length³. The full print out of the Synchro results are located in Appendix D and the SimTraffic results are documented in Appendix E.

► 2.2.1 Route 26, Libby Hill Road & Hannaford Driveway

The results for the signalized intersection of Route 26, Libby Hill Road and the Hannaford Driveway are presented in Tables 2 and 3 for the AM and PM peak conditions respectively.

Table 2: Analysis Results –AM Peak Hour								
Approach	2016 Existing				2017 Proposed			
	Lane Group	Delay ¹	LOS	Queue Length ²	Lane Group	Delay ¹	LOS	Queue Length ²
EB Libby Hill Road	LT	54.2	D	125	L	60.3	E	106
	R	23.7	C	134	TR	64.1	E	197
WB Hannaford Driveway	LT	48.2	D	81	L	70.6	E	46
	R	4.9	A	28	TR	68.1	E	71
NB Route 26	L	344.6	F	617	L	56.5	E	334
	T	126.1	F	2,094	T	8.9	A	320
	R	120.9	F	38	R	4.6	A	29
SB Route 26	L	78.4	E	59	L	90.7	F	89
	T	50.3	D	1,024	T	47.1	D	931
	R	40.4	D	176	R	34.4	C	167

Overall	2016 Existing		2017 Proposed	
	Delay ¹	LOS	Delay ¹	LOS
Libby Hill Road/Route 26/Hannaford Driveway	109.0	F	40.6	D

¹ Delay is shown in seconds per vehicle.

² Queue length is shown in feet.

³ The 95th-percentile queue is defined to be the queue length (in feet) that has a 5-percent probability of being exceeded during the analysis time period.

Table 3: Analysis Results –PM Peak Hour

Approach	2016 Existing				2017 Proposed			
	Lane Group	Delay ¹	LOS	Queue Length ²	Lane Group	Delay ¹	LOS	Queue Length ²
EB Libby Hill Road	LT	54.6	D	113	L	48.0	D	97
	R	10.3	B	57	TR	52.9	D	107
WB Hannaford Driveway	LT	46.7	D	121	L	45.4	D	105
	R	24.6	C	116	TR	43.8	D	127
NB Route 26	L	60.4	E	283	L	55.2	E	277
	T	34.2	C	831	T	26.0	C	632
	R	23.2	C	182	R	17.0	B	186
SB Route 26	L	59.5	E	97	L	54.4	D	71
	T	18.4	B	327	T	16.6	B	286
	R	6.8	A	109	R	5.1	A	107

Overall	2016 Existing		2017 Proposed	
	Delay ¹	LOS	Delay ¹	LOS
Libby Hill Road/Route 26/ Hannaford Driveway	30.0	C	26.0	C

¹ Delay is shown in seconds per vehicle.

² Queue length is shown in feet.

In the existing condition the highest queues occur during the AM peak hour on the northbound approach. This is due to a high volume of vehicles needing to turn left on to Libby Hill Road. These left turning vehicles also experience substantial average delays of nearly 6 minutes. The queue length exceeds the turning pocket as well as the two-way left turn lane which together measure 500 feet. This queue then blocks the through movement. These findings reflect reports that drivers choose to turn right into the Hannaford driveway and cross Route 26 to Libby Hill Road rather than waiting to turn left through multiple signal cycles.

Due to the proposed lane arrangement change there is a measurable improvement in the overall operation of the signalized intersection. During the AM peak hour the change is significant; delay is reduced by a full minute.

During the PM peak hour the improvement is much less dramatic. By changing the lane approach configuration and updating the signal timing a small decrease in delay is achieved.

3.0 Recommendations

Louis Berger has completed a traffic analysis for the proposed improvement to the signalized intersection of Libby Hill Road, Route 26 and the Hannaford Driveway and reached the following conclusions:

1. The proposed change to the Libby Hill and Hannaford Driveway approaches should be implemented. This change will have a significant impact to delay during the AM peak hour – a reduction of nearly a full minute per vehicle is expected.
2. The detection at the signalized intersection should be replaced; false calls and skipped calls have been routinely reported to the Town.
3. The traffic controller should be replaced; it is outdated and does not have the ability to adjust to daylight savings time automatically.
4. The two way left turn lane on the northbound approach should be reconfigured as a left turn only lane.

These recommendations are meant to be implemented as soon as possible; it is preferred that the proposed changes be in place prior to Memorial Day, 2017 to accommodate the summer traffic season when volumes are historically higher than during the school year. The exception is recommendation #4, restriping, which should be completed in conjunction with the next planned resurfacing contract. Longer term improvements are also necessary to ensure a passing level of service during the peak hours. Page 12 of the Route 26 Corridor Study referenced in the Introduction to this report recommends that the capacity of the intersection be increased prior to the year 2035 by adding lanes to the southbound and northbound approaches. Additional consideration would need to be given to the options for increasing capacity at this intersection by MaineDOT in conjunction with the Town of Gray with consideration given to the entire corridor.

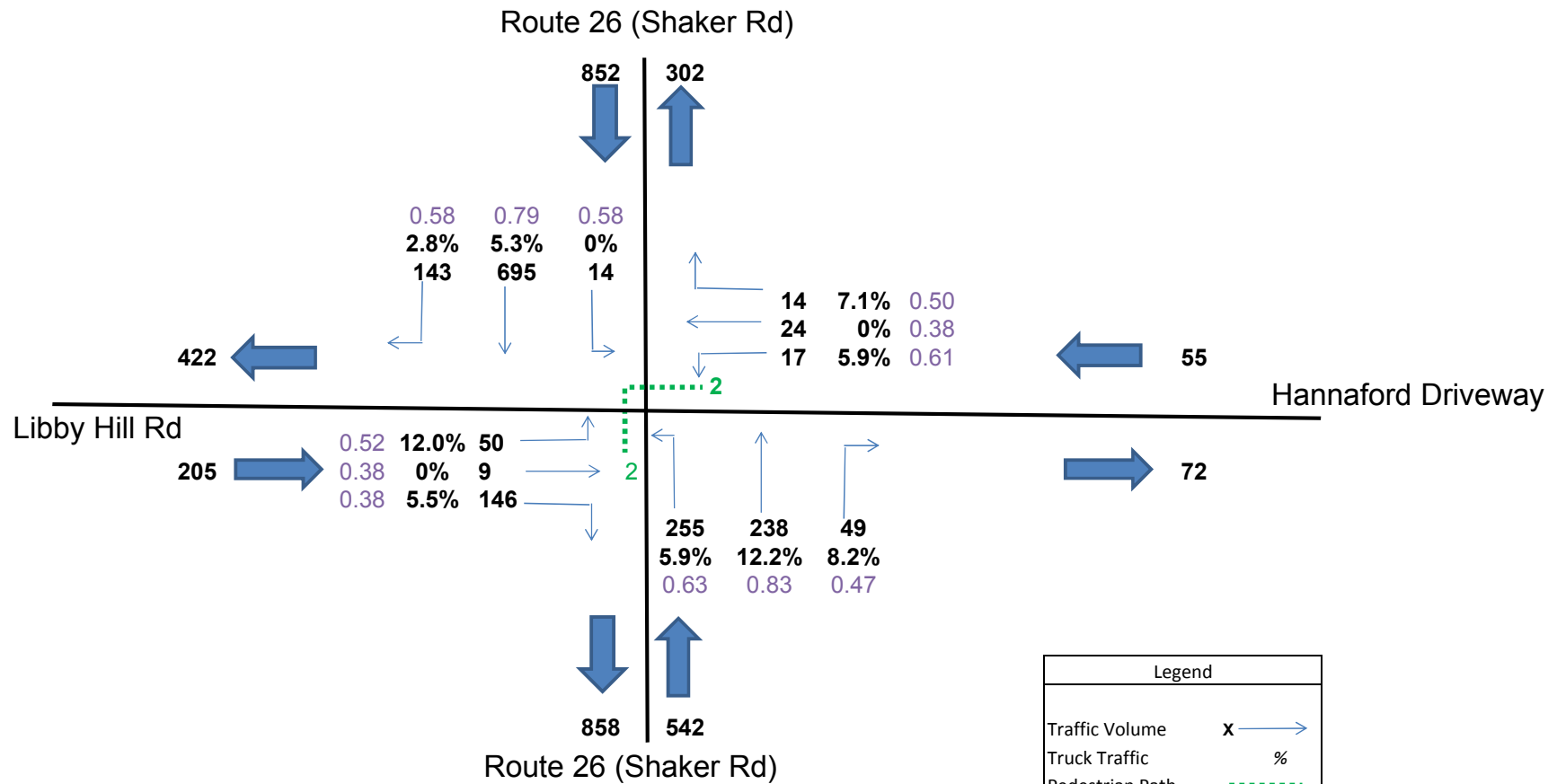
Appendix A

Traffic Volumes

Traffic Volumes 2013

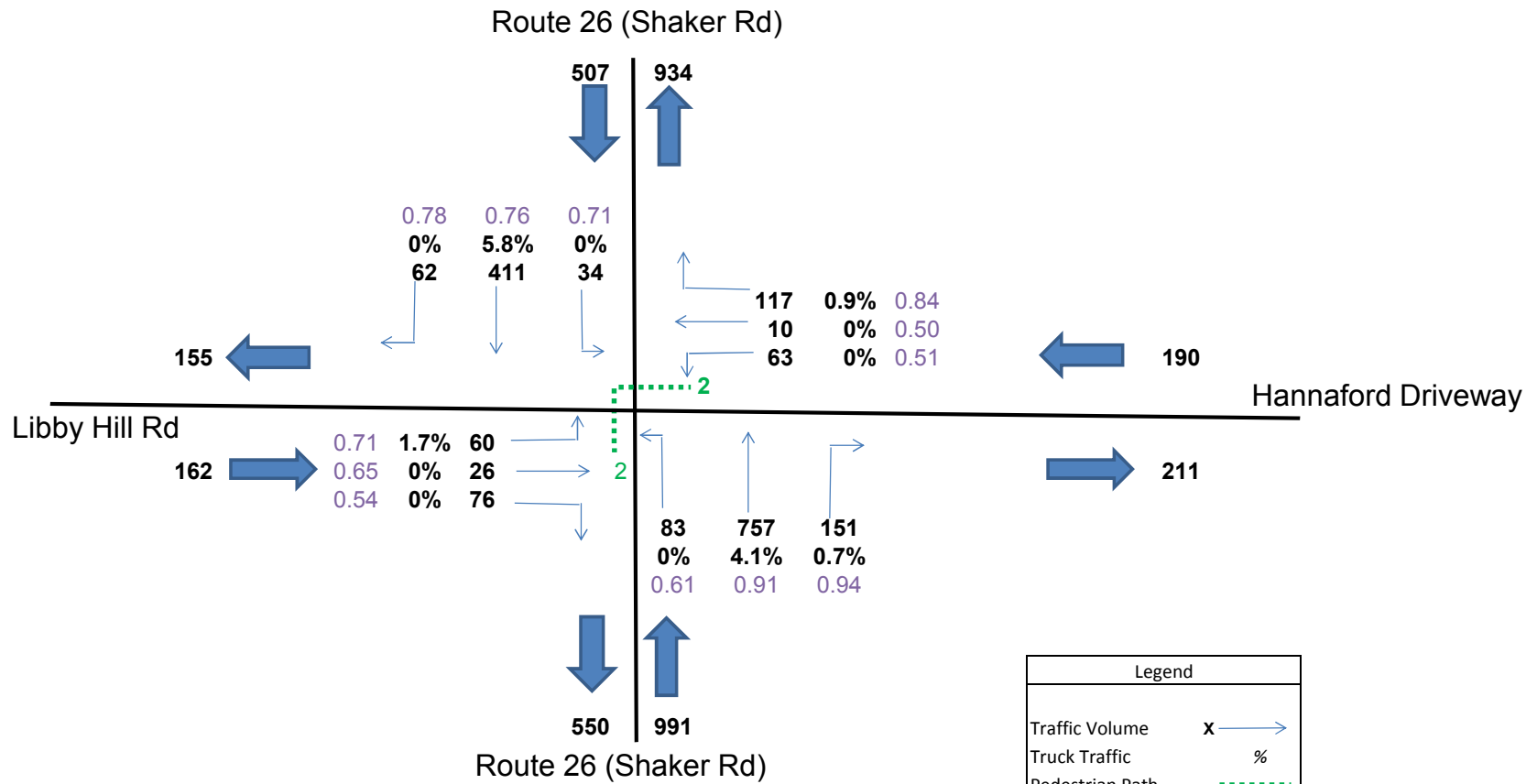
AM Peak Hour 6:45 AM-7:45 AM

Raw Volumes



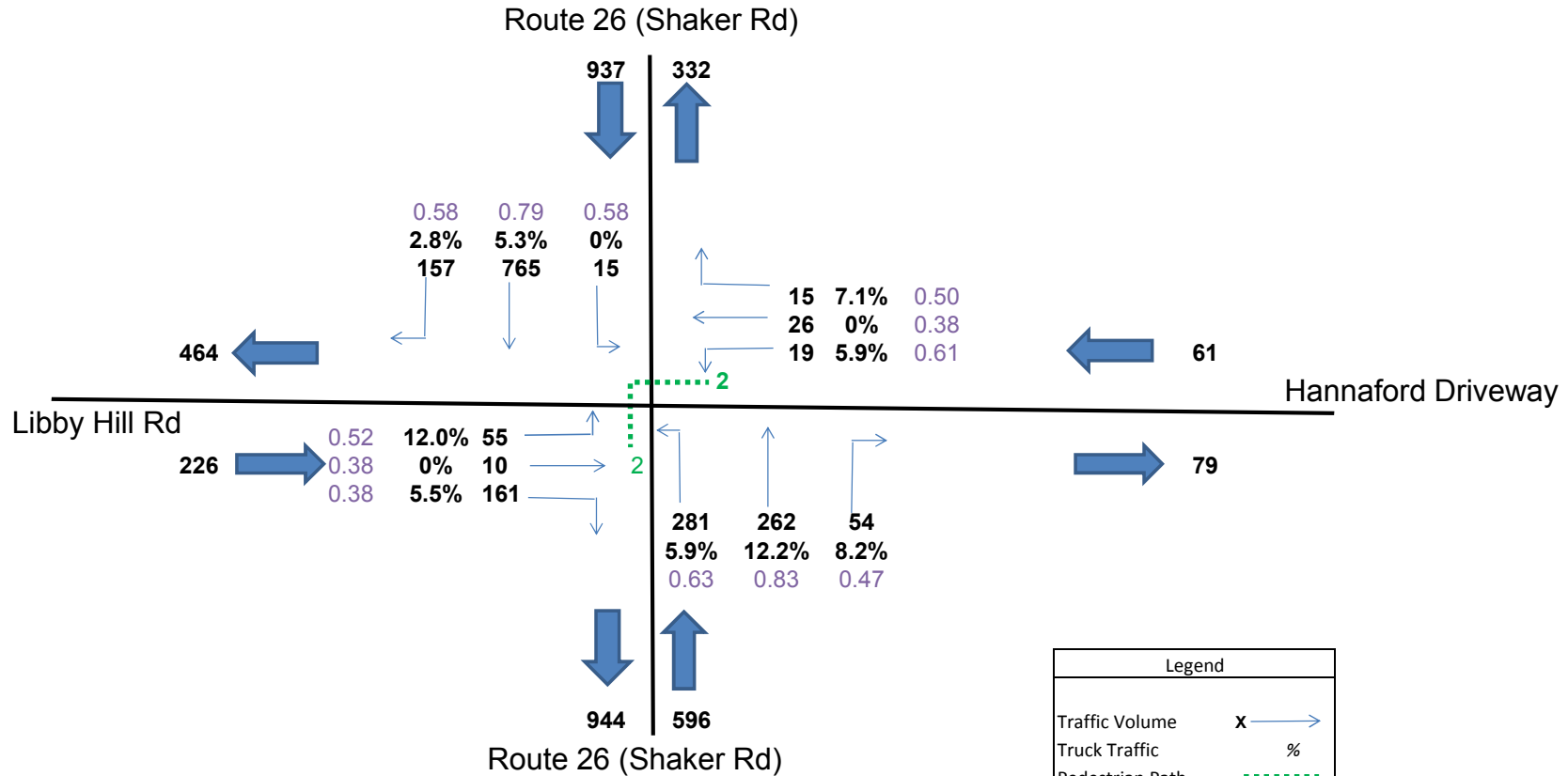
Traffic Volumes 2013

PM Peak Hour 4:30 PM-5:30 PM
Raw Volumes



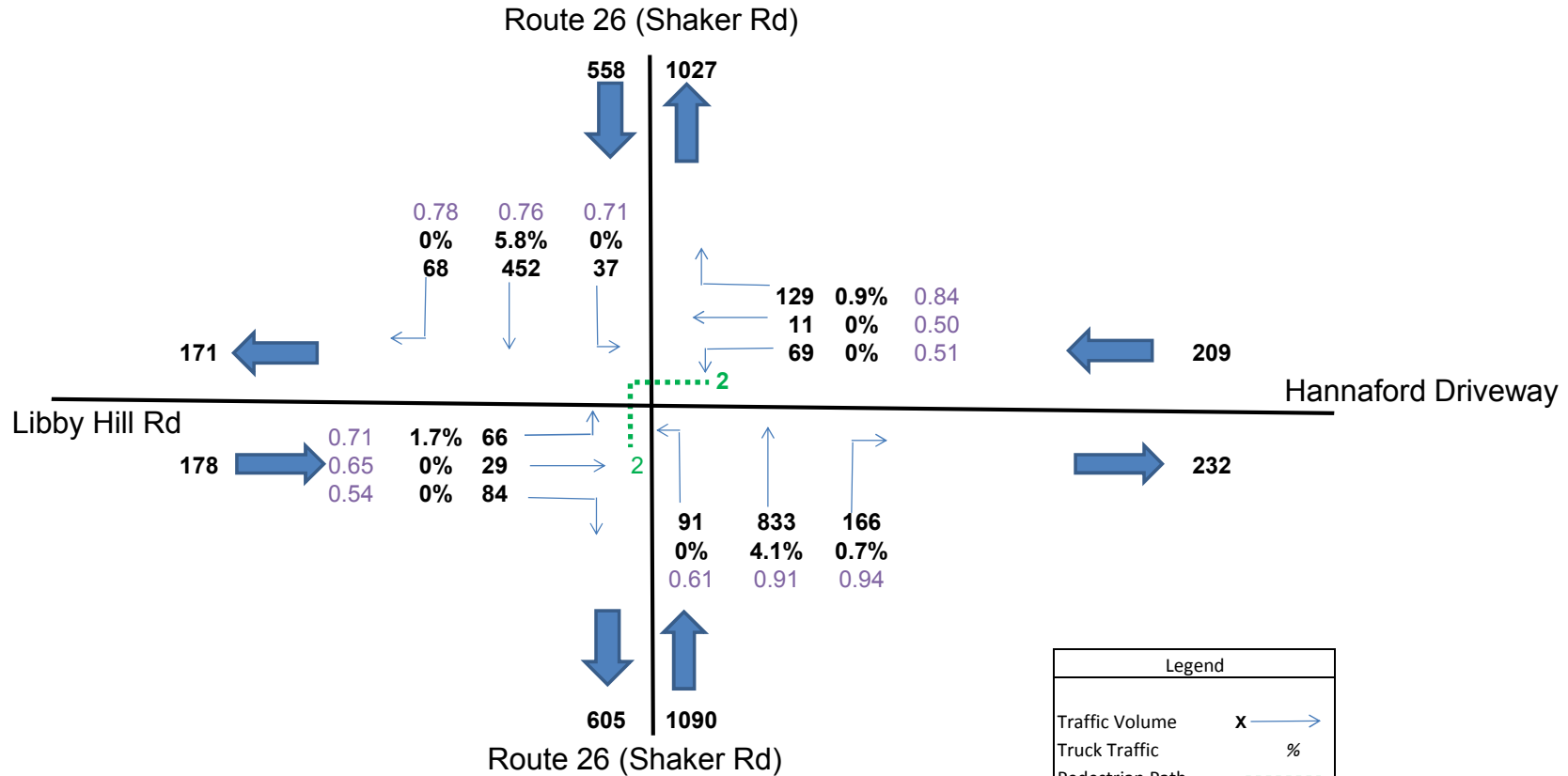
Traffic Volumes 2013

AM Peak Hour 6:45 AM-7:45 AM
Seasonally Adjusted Volumes



Traffic Volumes 2013

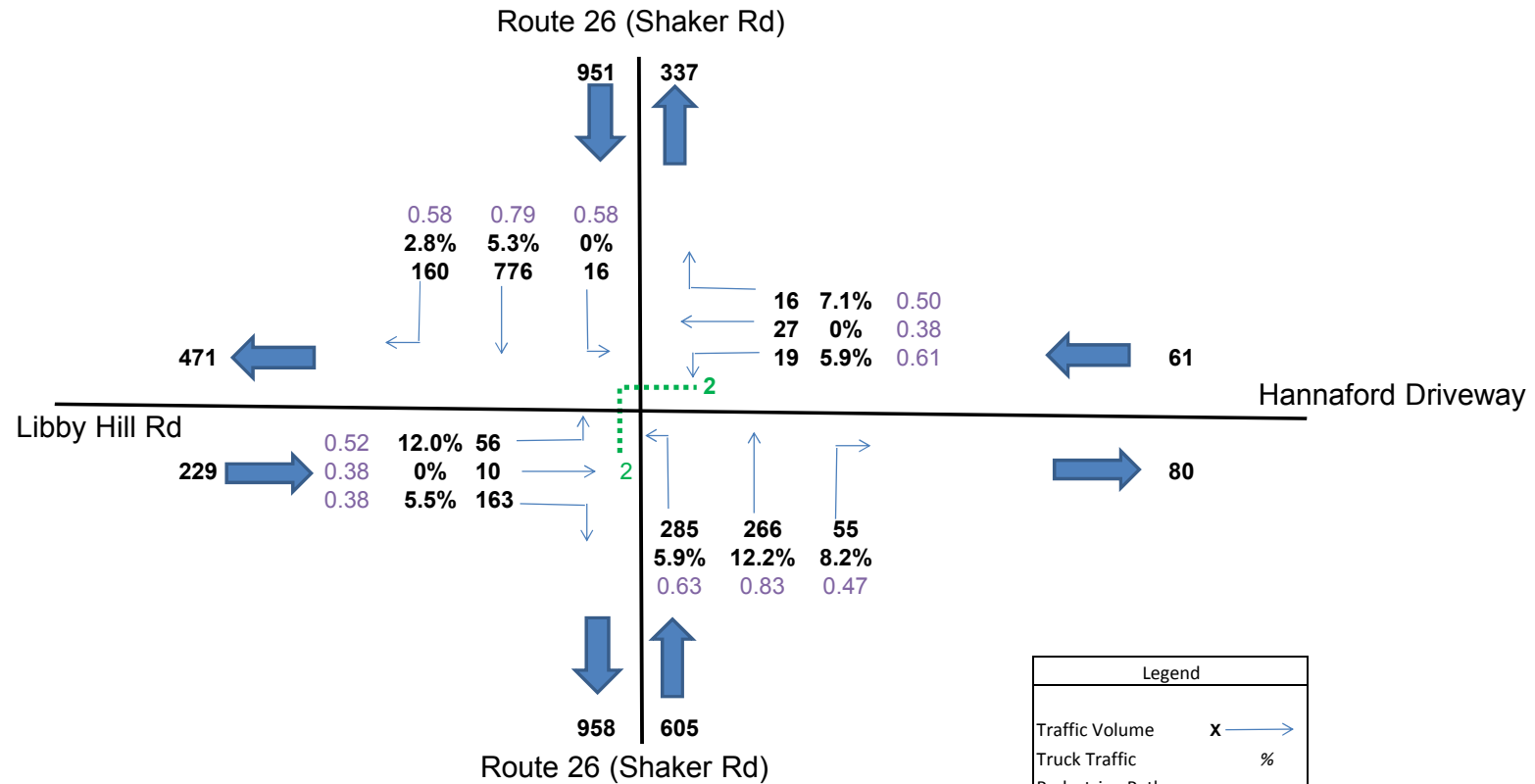
PM Peak Hour 4:30 PM-5:30 PM
Seasonally Adjusted Volumes



Legend	
Traffic Volume	x
Truck Traffic	%
Pedestrian Path
Pedestrian Volume	x
Peak Hour Factor	.XX
Traffic Flow	→

Traffic Volumes 2016

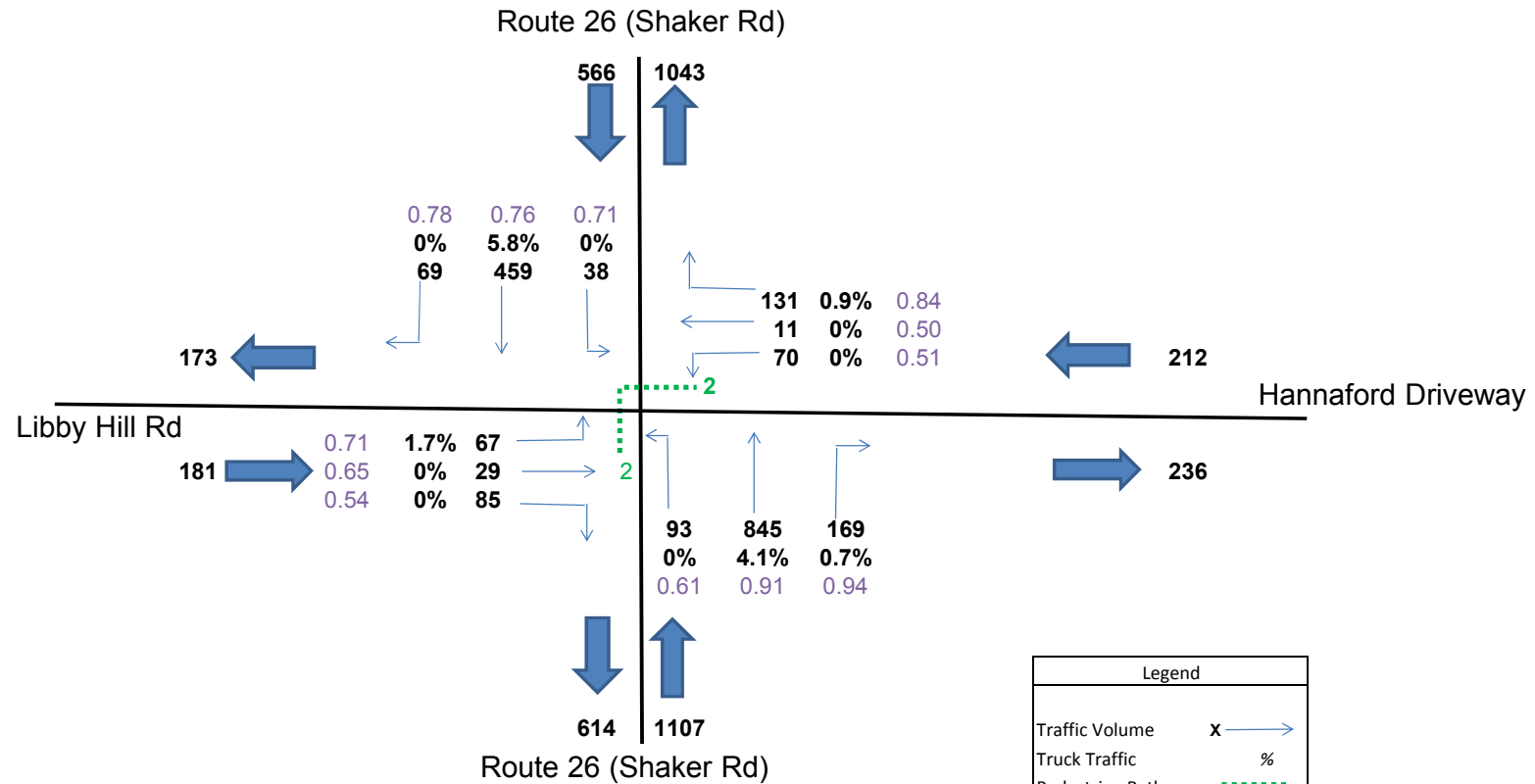
AM Peak Hour 6:45 AM-7:45 AM



Legend	
Traffic Volume	x
Truck Traffic	%
Pedestrian Path
Pedestrian Volume	x
Peak Hour Factor	.XX
Traffic Flow	→

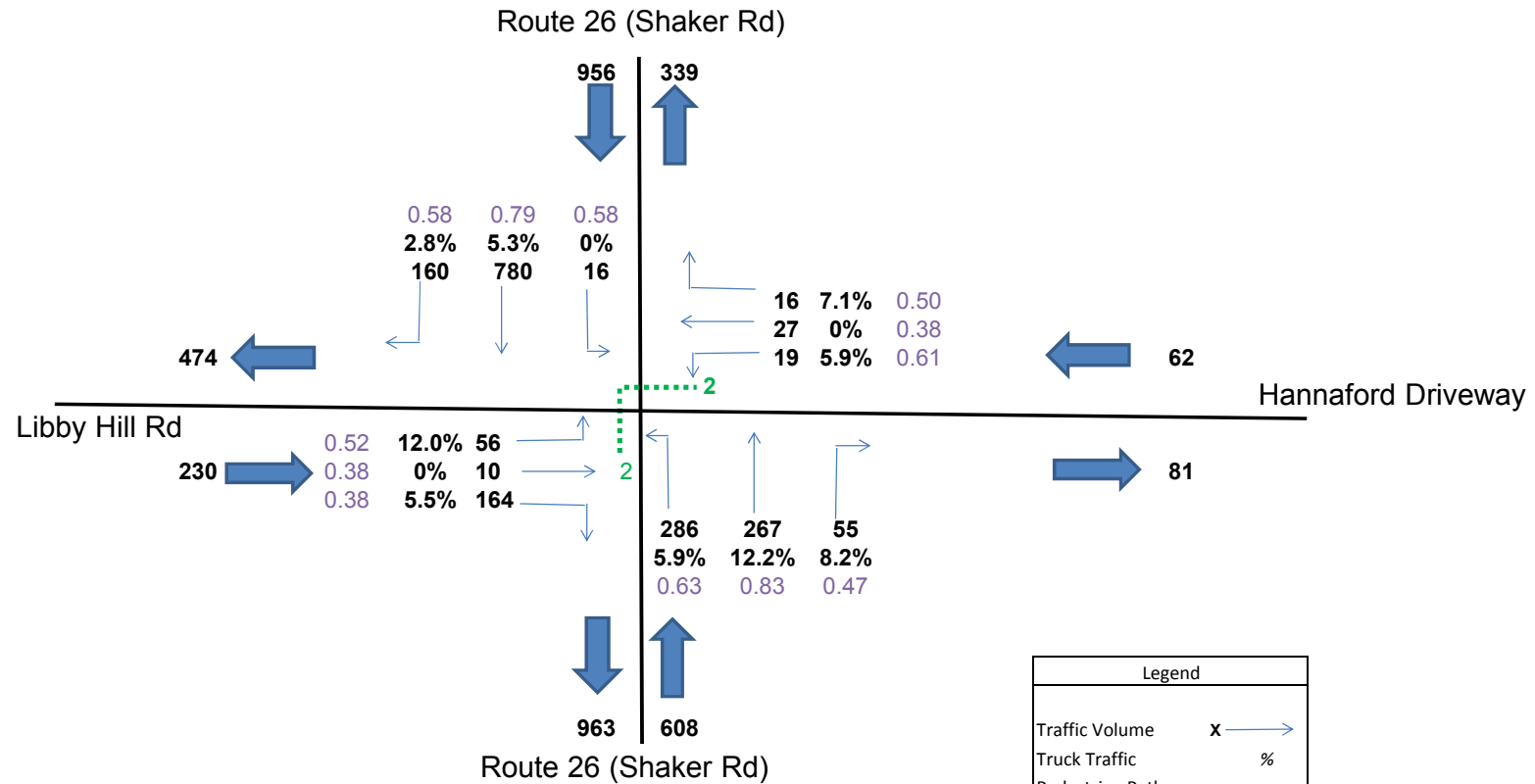
Traffic Volumes 2016

PM Peak Hour 4:30 PM-5:30 PM



Traffic Volumes 2017

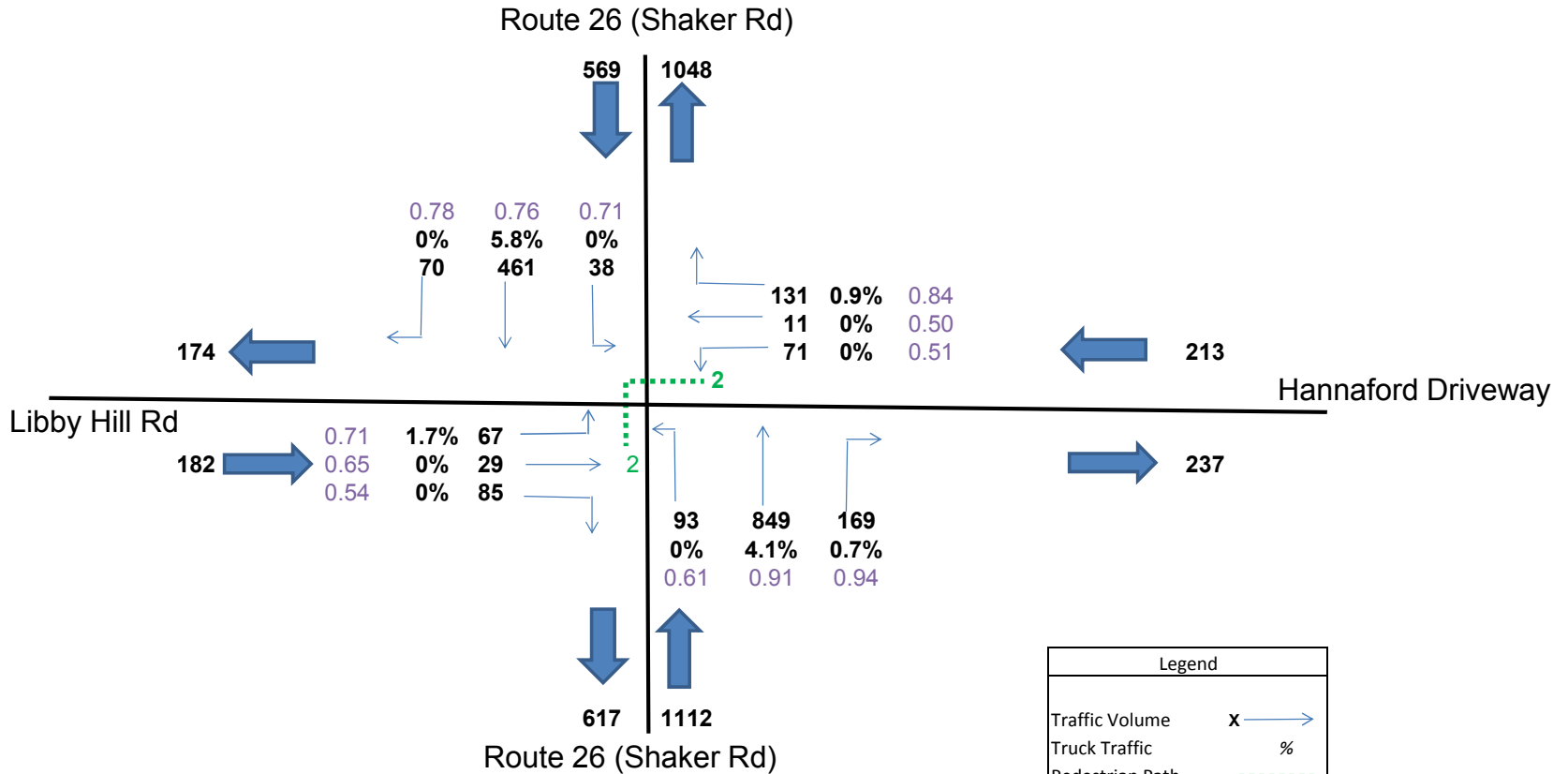
AM Peak Hour 6:45 AM-7:45 AM



Legend	
Traffic Volume	x →
Truck Traffic	%
Pedestrian Path
Pedestrian Volume	x
Peak Hour Factor	.XX
Traffic Flow	→

Traffic Volumes 2017

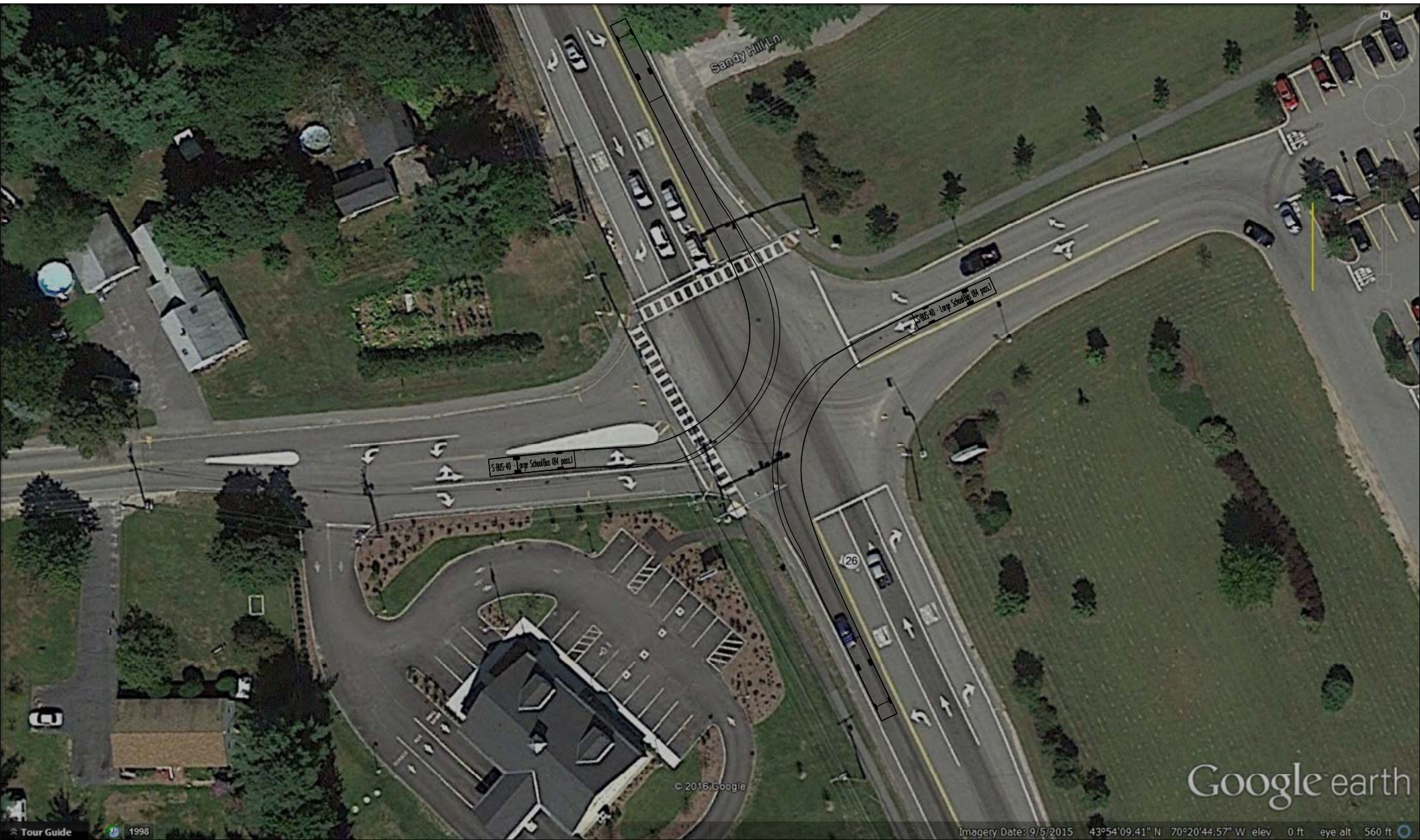
PM Peak Hour 4:30 PM-5:30 PM



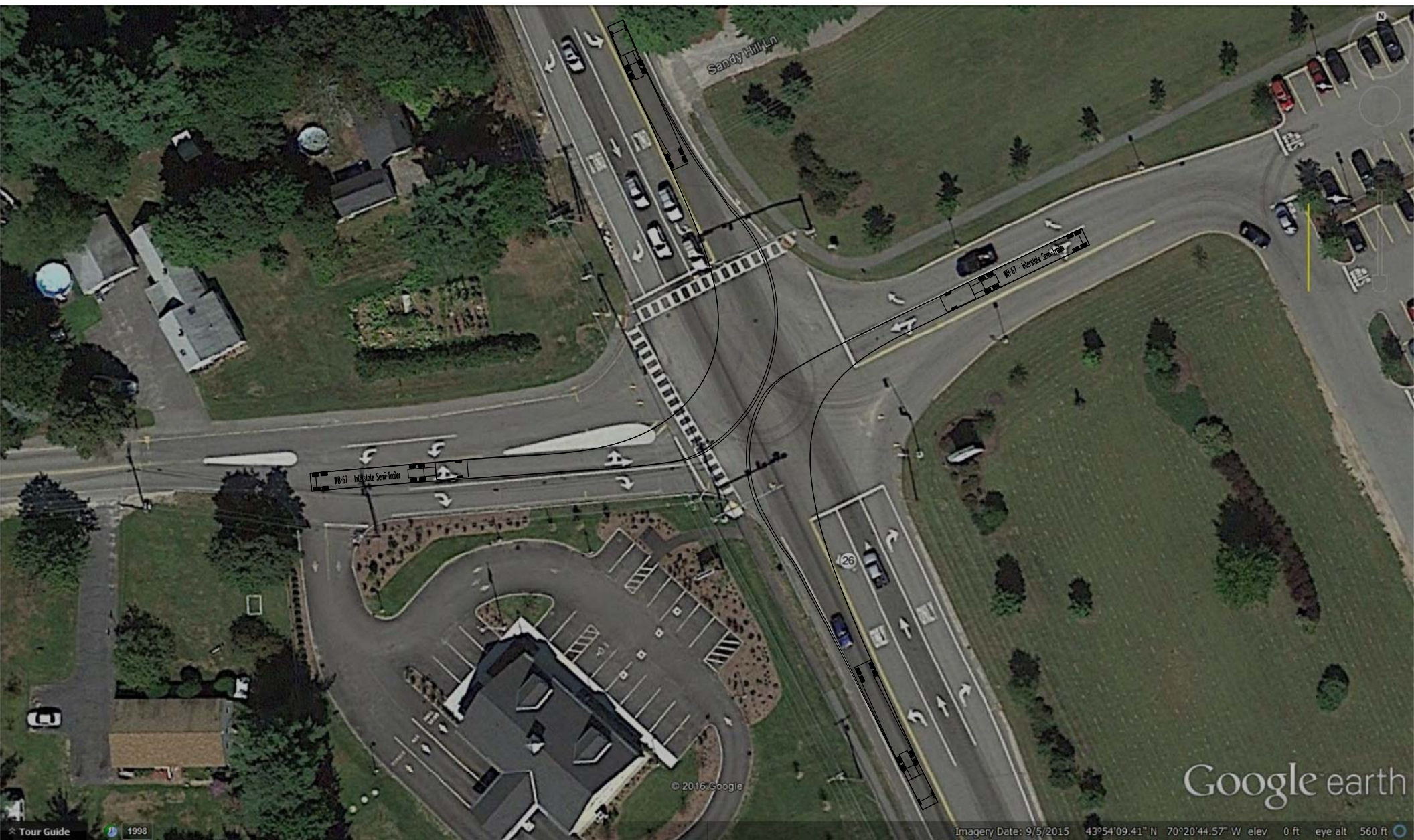
Appendix B

Truck Turning Movements

S-BUS-40 Large School Bus Turning Movements



WB-67 Interstate Semi-Trailer Turning Movements



Appendix C

Clearance Interval Calculations



The Louis Berger Group, Inc.

INTERSECTION CLEARANCE INTERVALS & PEDESTRIAN CLEARANCE CALCULATION**INTERSECTION: Route 26 & Libby Hill Road; Gray, ME**

$$Y = t + \frac{1.47v}{2a + 2Gg}$$

$$R \text{ (All Red Interval)} = \frac{(W+L)}{1.47v}$$

$$\text{Pedestrian Clearance} = \frac{C}{w}$$

Where:

Given/Typical Values:

Y = yellow change interval [s]
 t = driver perception-reaction time (typically 1.0 s)
 v = approach speed limit [mph]
 a = deceleration rate (typically 10.0 ft/s²)
 G = grade of approach (percent/100, downhill is negative)
 g = acceleration due to gravity [ft/s²]

t = 1.0

a = 10.0

g = 32.2

R = all-red clearance interval [s]
 W = travel width, from stop bar to far side no-conflict point [ft]
 L = length of vehicle (typically 20 ft)

L = 20

C = length of crosswalk [ft]
 w = pedestrian walking speed (2009 MUTCD - 3.5 ft/s)

w = 3.5

**Northbound
RTE 26**

v = 35

G = 0.00%

W = 120

C = 0

Yellow (Y) = 3.57 s

All Red (AR) = 2.72 s

Clearance Interval (Y+AR) = 6.29 s <=== Recommended Minimum

Pedestrian Clearance = 0.00 s <=== Recommended Minimum

Use		
Y =	3.5	s
AR =	3.0	s

**Southbound
RTE 26**

v = 35

G = 0.00%

W = 105

C = 0

Yellow (Y) = 3.57 s

All Red (AR) = 2.43 s

Clearance Interval (Y+AR) = 6.00 s <=== Recommended Minimum

Pedestrian Clearance = 0.00 s <=== Recommended Minimum

Use		
Y =	3.5	s
AR =	2.5	s

**Eastbound
Libby Hill Road**

v = 25

G = 0.00%

W = 75

C = 0

Yellow (Y) = 2.84 s

All Red (AR) = 2.59 s

Clearance Interval (Y+AR) = 5.42 s <=== Recommended Minimum

Pedestrian Clearance = 0.00 s <=== Recommended Minimum

Use		
Y =	3.0	s
AR =	2.5	s

**Westbound
Hannaford**

v = 20

G = 0.00%

W = 85

C = 0

Yellow (Y) = 2.47 s

All Red (AR) = 3.57 s

Clearance Interval (Y+AR) = 6.04 s <=== Recommended Minimum

Pedestrian Clearance = 0.00 s <=== Recommended Minimum

Use		
Y =	2.5	s
AR =	3.5	s



Louis Berger
482 Congress Street Suite 401
Portland, ME 04101

PROJECT NAME: **Libby Hill & Route 26**

PROJECT NO.: **WIN 18756.00**

SHEET NO.: **1** of **1**

CALCULATED BY: **LBF**

DATE: **9/23/16**

CHECKED BY: **DGB**

DATE: **9/23/16**

SUBJECT: **Pedestrian Timing Calculations**

SCALE: **N/A**

Intersection: Libby Hill & Route 26

TOWN: Gray

State: Maine

Lenth of Crosswalk (ft)	A	69.0 ft	From curb to far side of traveled way - measured from NE curb to NW travelway
Distance from pedestrian button to curb (ft)	B	13.0 ft	If no pedestrian button, use 6 ft - measured from NE ped button to NE curb
Pedstrian speed (ft/s)	C	3.5 ft/s	If higher, than 3.5 ft/s, explain:
Yellow Change Interval (s)	D	3.5 sec	
Red Clearance Interval (s)	E	2.5 sec	
Buffer Interval (s)	F	6.0 sec	= D + E (shall be at least 3.0 s)
Pedestrian Clearance Time (s)	G	19.7 sec	= A / C
Pedestrian Change Interval (s)	H	13.8 sec	= G - F (roundup to nearest 0.1 s)
Pusbutton Check	I	27.4	= (A + B) / 3
	J	7.6	= I - (F + H) (roundup to nearest 0.1 s)
Walk Interval (s)	K	7.6	= Max (7.0 or J) if lower than 7.0, explain:
Pedestrian Phase (s)	L	27.4	= F + H + K
Minimum Concurrent Phase Split (s)	M	28.4	= L + 1 (roundup to nearest 1.0 s)

CHECK THE FOLLOWING (if NOT met, revise the above):

Pedestrian Clearance 19.8 > 19.7

CROSSING ROUTE 26

Pedestrian Phase 28.4 > 27.4



Louis Berger
482 Congress Street Suite 401
Portland, ME 04101

PROJECT NAME: **Libby Hill & Route 26**

PROJECT NO.: **WIN 18756.00**

SHEET NO.: **1** of **1**

CALCULATED BY: **LBF**

DATE: **9/23/16**

CHECKED BY: **DGB**

DATE: **9/23/16**

SUBJECT: **Pedestrian Timing Calculations**

SCALE: **N/A**

Intersection: Libby Hill & Route 26

TOWN: Gray

State: Maine

Lenth of Crosswalk (ft)	A	90.0 ft	From curb to far side of traveled way - measured from NW curb to SW travelway
Distance from pedestrian button to curb (ft)	B	10.0 ft	If no pedestrian button, use 6 ft - measured from NW ped button to NW curb
Pedstrian speed (ft/s)	C	3.5 ft/s	If higher, than 3.5 ft/s, explain:
Yellow Change Interval (s)	D	3.0 sec	
Red Clearance Interval (s)	E	2.5 sec	
Buffer Interval (s)	F	5.5 sec	= D + E (shall be at least 3.0 s)
Pedestrian Clearance Time (s)	G	25.7 sec	= A / C
Pedestrian Change Interval (s)	H	20.3 sec	= G - F (roundup to nearest 0.1 s)
Pusbutton Check	I	33.4	= (A + B) / 3
	J	7.6	= I - (F + H) (roundup to nearest 0.1 s)
Walk Interval (s)	K	7.6	= Max (7.0 or J) if lower than 7.0, explain:
Pedestrian Phase (s)	L	33.4	= F + H + K
Minimum Concurent Phase Split (s)	M	34.4	= L + 1 (roundup to nearest 1.0 s)

CHECK THE FOLLOWING (if NOT met, revise the above):

Pedestrian Clearance 25.8 > 25.7

CROSSING LIBBY HILL ROAD























Pedestrian Phase 34.4 > 33.4

Appendix D

Synchro Results













Lanes, Volumes, Timings
1: Route 26 & Libby Hill/Hannafor

10/4/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	56	10	163	19	27	16	285	266	55	16	776	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		130	0		125	300		125	120		120
Storage Lanes	0		1	0		1	1		1	1		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			0.850			0.850			0.850			0.850
Flt Protected		0.961			0.985		0.950			0.950		
Satd. Flow (prot)	0	1665	1524	0	1838	1509	1703	1696	1495	1805	1810	1568
Flt Permitted		0.961			0.985		0.950			0.950		
Satd. Flow (perm)	0	1665	1524	0	1838	1509	1703	1696	1495	1805	1810	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			293			136			127			127
Link Speed (mph)		25			20			35			35	
Link Distance (ft)		1455			440			2078			1006	
Travel Time (s)		39.7			15.0			40.5			19.6	
Peak Hour Factor	0.52	0.38	0.38	0.61	0.38	0.50	0.63	0.83	0.47	0.58	0.79	0.58
Heavy Vehicles (%)	12%	0%	6%	6%	0%	7%	6%	12%	8%	0%	5%	3%
Adj. Flow (vph)	108	26	429	31	71	32	452	320	117	28	982	276
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	134	429	0	102	32	452	320	117	28	982	276
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	8	8		4	4		5	2		1	6	
Permitted Phases			8			4			2			6

Lanes, Volumes, Timings
1: Route 26 & Libby Hill/Hannafor

10/4/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	8	8	8	4	4	4	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	10.0	10.0	4.0	10.0	10.0
Minimum Split (s)	10.0	10.0	10.0	10.0	10.0	10.0	9.0	17.0	17.0	9.0	17.0	17.0
Total Split (s)	18.0	18.0	18.0	17.0	17.0	17.0	20.0	70.0	70.0	15.0	65.0	65.0
Total Split (%)	15.0%	15.0%	15.0%	14.2%	14.2%	14.2%	16.7%	58.3%	58.3%	12.5%	54.2%	54.2%
Maximum Green (s)	12.0	12.0	12.0	11.0	11.0	11.0	15.0	63.0	63.0	10.0	59.0	59.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0	3.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.0	6.0		6.0	6.0	5.0	7.0	7.0	5.0	6.0	6.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	4.0
Recall Mode	None	None	None	None	None	None	None	Min	Min	None	Min	Min
Walk Time (s)				4.0	4.0	4.0					4.0	4.0
Flash Dont Walk (s)				19.0	19.0	19.0					22.0	22.0
Pedestrian Calls (#/hr)				2	2	2					2	2
Act Effect Green (s)		12.0	12.0		12.3	12.3	15.0	70.2	70.2	7.4	59.1	59.1
Actuated g/C Ratio		0.10	0.10		0.10	0.10	0.12	0.58	0.58	0.06	0.49	0.49
v/c Ratio		0.82	1.04		0.55	0.12	2.15	0.33	0.13	0.25	1.12	0.33
Control Delay		89.2	71.2		62.8	0.9	560.5	16.7	2.8	61.2	98.2	11.7
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		89.2	71.2		62.8	0.9	560.5	16.7	2.8	61.2	98.2	11.7
LOS		F	E		E	A	F	B	A	E	F	B
Approach Delay		75.4			48.0			291.4			78.8	
Approach LOS		E			D			F			E	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 121.5

Natural Cycle: 150

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 2.15

Intersection Signal Delay: 142.5

Intersection LOS: F

Intersection Capacity Utilization 81.1%

ICU Level of Service D























Analysis Period (min) 15

Splits and Phases: 1: Route 26 & Libby Hill/Hannafor



Lanes, Volumes, Timings
1: Route 26 & Libby Hill/Hannafor













10/4/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	67	29	85	70	11	131	93	845	169	38	459	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		130	0		125	300		125	120		120
Storage Lanes	0		1	0		1	1		1	1		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			0.850			0.850			0.850			0.850
Flt Protected		0.967			0.959		0.950			0.950		
Satd. Flow (prot)	0	1813	1615	0	1822	1599	1805	1827	1599	1805	1792	1615
Flt Permitted		0.967			0.959		0.950			0.950		
Satd. Flow (perm)	0	1813	1615	0	1822	1599	1805	1827	1599	1805	1792	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			157			156			114			114
Link Speed (mph)		25			20			35			35	
Link Distance (ft)		1455			440			1026			1006	
Travel Time (s)		39.7			15.0			20.0			19.6	
Peak Hour Factor	0.71	0.65	0.54	0.51	0.50	0.84	0.61	0.91	0.94	0.71	0.76	0.78
Heavy Vehicles (%)	2%	0%	0%	0%	0%	1%	0%	4%	1%	0%	6%	0%
Adj. Flow (vph)	94	45	157	137	22	156	152	929	180	54	604	88
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	139	157	0	159	156	152	929	180	54	604	88
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	8	8		4	4		5	2		1	6	
Permitted Phases			8			4			2			6

Lanes, Volumes, Timings

1: Route 26 & Libby Hill/Hannafor

10/4/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	8	8	8	4	4	4	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	10.0	10.0	4.0	10.0	10.0
Minimum Split (s)	10.0	10.0	10.0	10.0	10.0	10.0	9.0	17.0	17.0	9.0	17.0	17.0
Total Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	20.0	72.0	72.0	20.0	72.0	72.0
Total Split (%)	15.7%	15.7%	15.7%	15.7%	15.7%	15.7%	14.9%	53.7%	53.7%	14.9%	53.7%	53.7%
Maximum Green (s)	15.0	15.0	15.0	15.0	15.0	15.0	15.0	65.0	65.0	15.0	65.0	65.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.0	6.0		6.0	6.0	5.0	7.0	7.0	5.0	7.0	7.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	4.0
Recall Mode	None	None	None	None	None	None	None	Min	Min	None	Min	Min
Walk Time (s)				4.0	4.0	4.0					4.0	4.0
Flash Dont Walk (s)				19.0	19.0	19.0					22.0	22.0
Pedestrian Calls (#/hr)				2	2	2					2	2
Act Effect Green (s)		13.3	13.3		15.4	15.4	13.7	66.0	66.0	9.2	58.8	58.8
Actuated g/C Ratio		0.11	0.11		0.12	0.12	0.11	0.53	0.53	0.07	0.47	0.47
v/c Ratio		0.72	0.50		0.71	0.47	0.77	0.97	0.20	0.41	0.72	0.11
Control Delay		77.6	14.4		72.4	12.7	81.1	53.3	8.0	67.8	33.7	2.0
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		77.6	14.4		72.4	12.7	81.1	53.3	8.0	67.8	33.7	2.0
LOS		E	B		E	B	F	D	A	E	C	A
Approach Delay		44.1			42.8			50.2			32.4	
Approach LOS		D			D			D			C	

Intersection Summary

Area Type: Other

Cycle Length: 134

Actuated Cycle Length: 125.5

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 43.6


Intersection LOS: D

Intersection Capacity Utilization 74.7%

ICU Level of Service D























Analysis Period (min) 15

Splits and Phases: 1: Route 26 & Libby Hill/Hannafor

			
ø1	ø2	ø4	ø8
20 s	72 s	21 s	21 s
			
ø5	ø6		
20 s	72 s		

Lanes, Volumes, Timings
1: Route 26 & Libby Hill/Hannafor













12/14/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	56	10	164	19	27	16	286	267	55	16	780	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	130		130	125		125	300		125	120		120
Storage Lanes	1		0	1		0	1		1	1		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		0.859			0.953				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1612	1545	0	1703	1772	0	1703	1696	1495	1805	1810	1568
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1612	1545	0	1703	1772	0	1703	1696	1495	1805	1810	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		365			11				117			113
Link Speed (mph)		25			20			35			35	
Link Distance (ft)		1455			440			2078			1006	
Travel Time (s)		39.7			15.0			40.5			19.6	
Peak Hour Factor	0.52	0.38	0.38	0.61	0.38	0.50	0.63	0.83	0.47	0.58	0.79	0.58
Heavy Vehicles (%)	12%	0%	6%	6%	0%	7%	6%	12%	8%	0%	5%	3%
Adj. Flow (vph)	108	26	432	31	71	32	454	322	117	28	987	276
Shared Lane Traffic (%)												
Lane Group Flow (vph)	108	458	0	31	103	0	454	322	117	28	987	276
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	3	8		7	4		5	2	7	1	6	3
Permitted Phases									2			6

Lanes, Volumes, Timings

1: Route 26 & Libby Hill/Hannafor

12/14/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	3	8		7	4		5	2	7	1	6	3
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	10.0	4.0	4.0	10.0	4.0
Minimum Split (s)	11.0	10.0		11.0	11.0		10.5	17.0	11.0	10.0	34.0	11.0
Total Split (s)	16.0	15.0		13.0	12.0		41.0	111.0	13.0	11.0	81.0	16.0
Total Split (%)	10.7%	10.0%		8.7%	8.0%		27.3%	74.0%	8.7%	7.3%	54.0%	10.7%
Maximum Green (s)	10.5	9.5		7.0	6.0		34.5	104.5	7.0	5.0	75.0	10.5
Yellow Time (s)	3.0	3.0		2.5	2.5		3.5	3.5	2.5	3.5	3.5	3.0
All-Red Time (s)	2.5	2.5		3.5	3.5		3.0	3.0	3.5	2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		6.0	6.0		6.5	6.5	6.0	6.0	6.0	5.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	4.0	3.0	3.0	4.0	3.0
Recall Mode	None	None		None	None		None	Min	None	None	Min	None
Walk Time (s)	8.0			8.0	8.0				8.0		8.0	8.0
Flash Dont Walk (s)	20.0			20.0	20.0				20.0		20.0	20.0
Pedestrian Calls (#/hr)	2			2	2				2		2	2
Act Effect Green (s)	13.5	13.0		10.2	9.7		34.8	110.0	126.8	5.0	75.7	95.2
Actuated g/C Ratio	0.09	0.08		0.06	0.06		0.22	0.70	0.80	0.03	0.48	0.60
v/c Ratio	0.79	0.99		0.28	0.87		1.21	0.27	0.10	0.49	1.14	0.28
Control Delay	106.4	55.4		76.6	115.6		167.3	12.4	1.1	104.1	113.8	9.7
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	106.4	55.4		76.6	115.6		167.3	12.4	1.1	104.1	113.8	9.7
LOS	F	E		E	F		F	B	A	F	F	A
Approach Delay		65.1			106.6			89.7			91.3	
Approach LOS		E			F			F			F	

Intersection Summary

Area Type: Other

Cycle Length: 150

Actuated Cycle Length: 157.9

Natural Cycle: 150

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.21

Intersection Signal Delay: 86.4

Intersection LOS: F

Intersection Capacity Utilization 88.1%

ICU Level of Service E























Analysis Period (min) 15

Splits and Phases: 1: Route 26 & Libby Hill/Hannafor



Lanes, Volumes, Timings
1: Route 26 & Libby Hill/Hannafor













2017 PM Proposed
12/14/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	67	29	85	71	11	131	93	849	169	38	461	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	130		130	125		125	300		125	120		120
Storage Lanes	1		0	1		0	1		1	1		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		0.883			0.869				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1678	0	1805	1637	0	1805	1827	1599	1805	1792	1615
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	1678	0	1805	1637	0	1805	1827	1599	1805	1792	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		114			156				134			141
Link Speed (mph)		25			20			35			35	
Link Distance (ft)		1455			440			2078			1006	
Travel Time (s)		39.7			15.0			40.5			19.6	
Peak Hour Factor	0.71	0.65	0.54	0.51	0.50	0.84	0.61	0.91	0.94	0.71	0.76	0.78
Heavy Vehicles (%)	2%	0%	0%	0%	0%	1%	0%	4%	1%	0%	6%	0%
Adj. Flow (vph)	94	45	157	139	22	156	152	933	180	54	607	90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	94	202	0	139	178	0	152	933	180	54	607	90
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	3	8		7	4		5	2	7	1	6	3
Permitted Phases									2			6

Lanes, Volumes, Timings
1: Route 26 & Libby Hill/Hannafor

2017 PM Proposed

12/14/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	3	8		7	4		5	2	7	1	6	3
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	10.0	4.0	4.0	10.0	4.0
Minimum Split (s)	11.0	10.0		11.0	11.0		10.5	17.0	11.0	10.0	34.0	11.0
Total Split (s)	16.0	15.0		18.0	17.0		18.0	77.0	18.0	10.0	69.0	16.0
Total Split (%)	13.3%	12.5%		15.0%	14.2%		15.0%	64.2%	15.0%	8.3%	57.5%	13.3%
Maximum Green (s)	10.5	9.5		12.0	11.0		11.5	70.5	12.0	4.0	63.0	10.5
Yellow Time (s)	3.0	3.0		2.5	2.5		3.5	3.5	2.5	3.5	3.5	3.0
All-Red Time (s)	2.5	2.5		3.5	3.5		3.0	3.0	3.5	2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		6.0	6.0		6.5	6.5	6.0	6.0	6.0	5.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	4.0	3.0	3.0	4.0	3.0
Recall Mode	None	None		None	None		None	Min	None	None	Min	None
Walk Time (s)	8.0			8.0	8.0				8.0		8.0	8.0
Flash Dont Walk (s)	20.0			20.0	20.0				20.0		20.0	20.0
Pedestrian Calls (#/hr)	2			2	2				2		2	2
Act Effect Green (s)	12.3	12.0		14.0	13.7		11.7	62.1	82.8	4.1	54.5	73.1
Actuated g/C Ratio	0.11	0.10		0.12	0.12		0.10	0.53	0.71	0.04	0.47	0.62
v/c Ratio	0.51	0.74		0.64	0.54		0.85	0.96	0.15	0.86	0.73	0.08
Control Delay	62.2	40.8		66.2	17.9		91.7	48.8	2.2	136.5	33.0	0.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.2	40.8		66.2	17.9		91.7	48.8	2.2	136.5	33.0	0.4
LOS	E	D		E	B		F	D	A	F	C	A
Approach Delay		47.6			39.1			47.4			36.5	
Approach LOS		D			D			D			D	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 117.1

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 43.3

Intersection LOS: D

Intersection Capacity Utilization 80.4%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: Route 26 & Libby Hill/Hannafor



Appendix E

SimTraffic Results

1: Route 26 & Libby Hill/Hannafor Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.4	0.4	2.4	0.2	0.2	4.1	2.3	1.1	2.4	9.2	9.8	13.1
Total Del/Veh (s)	48.7	54.2	23.7	43.2	48.2	4.9	344.6	126.1	120.9	78.4	50.3	40.4

1: Route 26 & Libby Hill/Hannafor Performance by movement

Movement	All
Denied Del/Veh (s)	6.2
Total Del/Veh (s)	106.7

Total Network Performance

Denied Del/Veh (s)	6.2
Total Del/Veh (s)	109.0

Intersection: 1: Route 26 & Libby Hill/Hannaford

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	R	L	T	R
Maximum Queue (ft)	208	150	109	40	525	1800	73	87	952	145
Average Queue (ft)	49	73	35	8	501	1136	7	19	571	76
95th Queue (ft)	125	134	81	28	617	2094	38	59	1024	176
Link Distance (ft)	1399		390			2042			964	
Upstream Blk Time (%)						1			8	
Queuing Penalty (veh)						0			0	
Storage Bay Dist (ft)		130		125	500		125	120		120
Storage Blk Time (%)	1	2	0		69	0			36	0
Queuing Penalty (veh)	2	1	0		222	2			64	1

Network Summary

Network wide Queuing Penalty: 291

1: Route 26 & Libby Hill/Hannafor Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.4	0.3	2.7	0.5	0.5	3.8	3.2	2.0	3.3	3.3	0.7	3.2
Total Del/Veh (s)	46.7	54.6	10.3	45.7	46.7	24.6	60.4	34.2	23.2	59.5	18.4	6.8

1: Route 26 & Libby Hill/Hannafor Performance by movement

Movement	All
Denied Del/Veh (s)	1.9
Total Del/Veh (s)	30.0

Total Network Performance

Denied Del/Veh (s)	1.9
Total Del/Veh (s)	32.5

Intersection: 1: Route 26 & Libby Hill/Hannafor

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	R	L	T	R
Maximum Queue (ft)	132	81	156	142	324	922	150	144	386	143
Average Queue (ft)	61	27	58	59	115	471	77	36	182	33
95th Queue (ft)	113	57	121	116	283	831	182	97	327	109
Link Distance (ft)	1399		390			990			964	
Upstream Blk Time (%)						1				
Queuing Penalty (veh)						0				
Storage Bay Dist (ft)		130		125	300		125	120		120
Storage Blk Time (%)	1	0	1	1	0	29	0		15	0
Queuing Penalty (veh)	1	0	1	1	0	77	1		16	0

Network Summary

Network wide Queuing Penalty: 97

1: Route 26 & Libby Hill/Hannafor Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.0	0.4	0.3	4.2	0.2	0.1	2.0	0.8	2.2	3.6	2.1	3.9
Total Del/Veh (s)	60.3	64.1	31.8	70.6	68.1	16.1	56.5	8.9	4.6	90.7	47.1	34.4

1: Route 26 & Libby Hill/Hannafor Performance by movement

Movement	All
Denied Del/Veh (s)	1.9
Total Del/Veh (s)	40.6

Total Network Performance

Denied Del/Veh (s)	1.9
Total Del/Veh (s)	44.0

Intersection: 1: Route 26 & Libby Hill/Hannafor

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	140	243	63	90	323	487	43	144	937	145
Average Queue (ft)	48	99	17	29	221	95	7	25	573	60
95th Queue (ft)	106	197	46	71	334	320	29	89	931	167
Link Distance (ft)		1397		390		2040			958	
Upstream Blk Time (%)									4	
Queuing Penalty (veh)									0	
Storage Bay Dist (ft)	130		125		300		125	120		120
Storage Blk Time (%)	0	6			5	1		0	38	0
Queuing Penalty (veh)	1	3			15	2		0	66	0

Network Summary

Network wide Queuing Penalty: 89

1: Route 26 & Libby Hill/Hannafor Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	2.4	0.3	0.3	3.8	0.3	0.4	2.1	1.5	2.2	3.2	0.6	3.2
Total Del/Veh (s)	48.0	52.9	21.1	45.4	43.8	26.3	55.2	26.0	17.0	54.4	16.6	5.1

1: Route 26 & Libby Hill/Hannafor Performance by movement

Movement	All
Denied Del/Veh (s)	1.4
Total Del/Veh (s)	26.0

Total Network Performance

Movement	All
Denied Del/Veh (s)	1.4
Total Del/Veh (s)	28.8

Intersection: 1: Route 26 & Libby Hill/Hannafor

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	132	131	132	146	324	754	150	96	353	143
Average Queue (ft)	49	51	49	64	108	352	77	27	160	31
95th Queue (ft)	97	107	105	127	277	632	186	71	286	107
Link Distance (ft)		1397		390		2040			958	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	130		125		300		125	120		120
Storage Blk Time (%)	0	1	1	2		23	0		12	0
Queuing Penalty (veh)	0	1	1	1		60	1		13	0

Network Summary

Network wide Queuing Penalty: 77