



January 4, 2020

Mr. Glen R. Trematore
CEO/Partner
Church Development Services, LLC
708 South Rosemont Road, #101
Virginia Beach, VA 23452

**Re: Traffic Study
Proposed New Church
Woodrow Drive
East Lyme, Connecticut
SLR #6928-01-04**

Dear Mr. Trematore:

At your request, we have undertaken this study to evaluate the traffic impact associated with the relocation of Harvest Christian Fellowship Church in East Lyme from 5 Freedom Way to a new proposed building to be located at the end of Woodrow Drive. Figure 1 shows the site location and surrounding roadway network. The work comprising the study consisted of a number of tasks including field reconnaissance, data collection, review of roadway and traffic conditions, estimation of site-development-generated traffic volumes, and assessment of future traffic operations near the site.

EXISTING CONDITIONS

The key intersection analyzed in this study is Woodrow Drive at North Bridebrook Road, which is an existing unsignalized intersection.

North Bridebrook Road – North Bridebrook Road is a two-lane road with one travel lane in each direction that runs approximately north/south. In the vicinity of the site, there are no shoulders or sidewalks on either side of the road and land use is primarily residential. North Bridebrook Road intersects Boston Post Road to the north of the site and West Main Street (Route 156) to the south. The posted speed limit on North Bridebrook Road is 25 miles per hour (mph).

Travel speed data was collected by SLR International Corporation (SLR) for North Bridebrook Road from Sunday, October 13 to Sunday, October 20, 2019. The 85th percentile speed during this time period was found to be 42 mph for vehicles traveling in either direction along North Bridebrook Road. The 85th percentile speed is the speed at which or below 85% of the motorists were recorded to travel.

Woodrow Drive – Woodrow Drive is a small residential cul-de-sac that intersects with North Bridebrook Road at an unsignalized t-intersection, where traffic egressing Woodrow Drive is stop-controlled, while traffic along North Bridebrook Road flows freely. There are six single-family houses currently located off Woodrow Drive.

Crash Data – Data on traffic crashes near the site for the recent 3-year period of March 1, 2017, to February 29, 2020 (pre-COVID-19), was obtained via the Connecticut Crash Data Repository. During the 3-year period, no crashes were reported at the study intersection or along North Bridebrook Road in the vicinity of the site. Crash history following the COVID-19 outbreak was separately investigated; no crashes were reported during this period.

Sight Distance – Although an intersection of two public Town roads, existing sight lines were reviewed from the point of view of a driver egressing Woodrow Drive onto North Bridebrook Road since all the church traffic will traverse this intersection. The sight distance looking left extends well above the Connecticut Department of Transportation (CTDOT) guidelines for both the posted speed limit of 25 mph and the 85th percentile speed of 42 mph. Looking right, drivers 10 feet back from the edge of the travel way can easily see the 280 feet required for the posted speed limit. In order to see much farther than that distance, a raised embankment slope in the Town right-of-way that limits egressing motorists' visibility would need to be regraded and one or two trees removed. After the slope is regraded, the sight line would be around 450 feet before having to look over private property. Note, however, that from a practical standpoint, the achievable sight line is slightly longer and sufficient to meet the guideline for the 85th percentile speed of 42 mph. In addition, as always, the Town should maintain clearing of branches and brush that may obstruct visibility. It should furthermore be noted that Woodrow Drive is an existing road used by residents, there is no history of accidents along this portion of North Bridebrook Road, and the stopping sight distance (SSD) for southbound motorists on North Bridebrook Road approaching Woodrow Drive does meet State guidelines for the 85th percentile speed. SSD is essentially the minimum guideline that should be met at all points along a roadway.

In summary, the existing visibility here has proved to be adequate and meets reasonable criteria. However, the sight distance to the north can be improved. The Town should make a judgement if higher guidelines for improved visibility justifies the tree removal. If so, the church should consider implementing the regrading and tree removal.

Baseline Traffic Volumes – Traffic counts were conducted on Sunday, October 13, 2019, from 10:00 a.m. to 1:00 p.m. at the existing church during the most attended weekly service to determine the analysis peak hours for church-related activity. The most vehicle activity occurred from 10:00 a.m. to 11:00 a.m. and 12:00 p.m. to 1:00 p.m.; these peak-hour volumes capture vehicle traffic associated with attendees' arrival to and departure from the service and were used in further analysis.

Turning movement counts were conducted at the same time at the study intersection of North Bridebrook Road at Woodrow Drive in order to capture existing roadway volumes near the proposed site that coincide with the weekly church service. Traffic volumes at this intersection are relatively low, approximately 65 and 94 total vehicles during the Sunday morning and afternoon church peak hours, respectively. **Figure 2** shows the existing traffic volumes at the study intersection during the church peak hours.

PROPOSED DEVELOPMENT – ANTICIPATED SITE TRAFFIC

The site is located at the end of Woodrow Drive and is currently undeveloped. Site access will be provided via a new driveway, which will connect to the cul-de-sac at the end of Woodrow Drive. The proposed church building will have 226 seats.

The most-attended weekly service at the existing church is currently attended by 30 to 35 families weekly, which is consistent with the vehicle activity captured on Sunday, October 13, 2019. The new proposed church will be larger than the existing facility and is therefore anticipated to generate higher traffic volumes. Table 1 summarizes the site-generated traffic estimates for the proposed church, expanded to 226 seats, during the study peak hours.

TABLE 1
Site Development Traffic Estimates

LAND USE	NUMBER OF VEHICLE TRIPS					
	SUNDAY MORNING PEAK HOUR			SUNDAY AFTERNOON PEAK HOUR		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Church, 226 seats	60	0	60	0	64	64

The geographic distribution of the proposed site-generated traffic through the study intersection was estimated based on the demographics of the existing church and review of the roadway traffic patterns in the vicinity of the site. In general, approximately 50% of the site traffic is expected to be oriented to/from the north and 50% to/from the south on North Bridebrook Road. **Figure 2** shows the estimated site-generated traffic at the study intersection based on the estimated distribution for the Sunday morning and afternoon peak hours.

FUTURE TRAFFIC VOLUMES

Future roadway traffic volumes were estimated both with and without the proposed church in place in order to determine possible traffic impacts. The proposed church is anticipated to open in 2021.

The background traffic scenario is reflective of future conditions before the new church is built and was estimated by including traffic through the study intersection associated with other expected upcoming nearby developments and applying general traffic growth to the existing traffic volumes. The baseline traffic volumes were expanded to the estimated opening year of 2021 using an annual traffic growth rate of 1.25%, per input from CTDOT. Correspondence with the Town of East Lyme and CTDOT finds that there is a 100-unit affordable housing development proposed near 90 North Bridebrook Road, approximately 1.5 miles south of the proposed new church, which is expected to add some traffic through the study intersection. It is anticipated that the entire development will be built in phases and will take several years to complete. Although the entire development will not be finished by 2021, the anticipated site traffic for

the 100-unit housing development was included in the analysis in order to be conservative. The housing-development-generated volumes were added to the expanded 2021 volumes; the resultant estimated volumes reflect conditions just before the proposed development would open and can be seen on **Figure 3** as the background traffic volumes.

The combined traffic scenario is reflective of future conditions after the proposed church is built and opened and was estimated by adding the estimated new traffic generated by the new church to the future background traffic. The resultant estimated 2021 future combined traffic volumes are shown on **Figure 4**.

INTERSECTION CAPACITY ANALYSIS

The future background and combined traffic scenarios were evaluated by means of capacity analysis techniques. These analyses were used to determine the quality of operations at the study intersections, and a comparison of background versus combined traffic operations allows for a determination of possible traffic impacts from the proposed church. The quality of operations is measured and expressed as a level of service (LOS). LOS is defined as a measure of inconvenience that motorists experience. The levels are expressed with letter designations of A through F. A more detailed explanation of LOS and the analysis worksheets are provided in the Appendix. Table 2 summarizes the results of the capacity analysis.

TABLE 2
Capacity Analysis Summary

MOVEMENTS	SUNDAY MORNING PEAK HOUR		SUNDAY AFTERNOON PEAK HOUR	
	BACKGROUND	COMBINED	BACKGROUND	COMBINED
North Bridebrook Road at Woodrow Drive				
Westbound Left	A	A	A	A
Southbound Left	A	A	A	A

As can be seen, traffic conditions between the background and combined scenarios are expected to remain excellent at LOS A during both study peak hours. The proposed church is not anticipated to have any impact on the study intersection.

SUMMARY

This study was conducted to assess the traffic impact of the proposed relocation of Harvest Christian Fellowship Church to Woodrow Drive in East Lyme. To determine a profile of existing conditions, detailed field reconnaissance and data assembly efforts were undertaken. Traffic generated by the proposed church was estimated based on current and anticipated future church activity, and intersection capacity analyses were performed, comparing existing and future conditions adjacent to the site. Analysis of the

estimated traffic added to the adjacent roadway from the proposed church finds that the additional traffic can be accommodated, and no perceptible traffic impact is expected to be caused by the development.

Sight lines were reviewed at the intersection of Woodrow Drive at North Bridebrook Road, two Town roads. We found that sight distances meet Intersection Sight Distance (ISD) guidelines for the posted speed limit. The ISD looking left also meets the guideline for the 85th percentile speed on North Bridebrook Road, 42 mph. Looking right, however, the ISD does not meet the longer desirable ISD guideline primarily due to a treed embankment, although it does meet the SSD guideline for the 85th percentile speed and, again, the ISD for the posted speed limit. Further, there is no identifiable crash pattern at this existing intersection. That said, since this is an intersection of two Town roads, the Town should consider whether the regrading of the embankment within the right-of-way to lengthen the ISD to the north justifies the tree removal. The church should consider executing this improvement when the equipment is on site for constructing the church, should the Town wish to pursue this improvement.

We hope this report is useful to you and the Town of East Lyme. If you have any questions or need anything further, please do not hesitate to contact either of the undersigned.

Sincerely,

SLR International Corporation

A handwritten signature in black ink, appearing to read "David A. Sullivan".

David G. Sullivan, PE
Manager of Traffic & Transportation Planning

A handwritten signature in blue ink, appearing to read "Neil C. Olinski".

Neil C. Olinski, MS, PTP
Senior Transportation Planner

Enclosures

6928-01-04-j421-ltr

HARVEST CHRISTIAN FELLOWSHIP CHURCH
WOODROW DRIVE
EAST LYME, CT

SITE LOCATION MAP

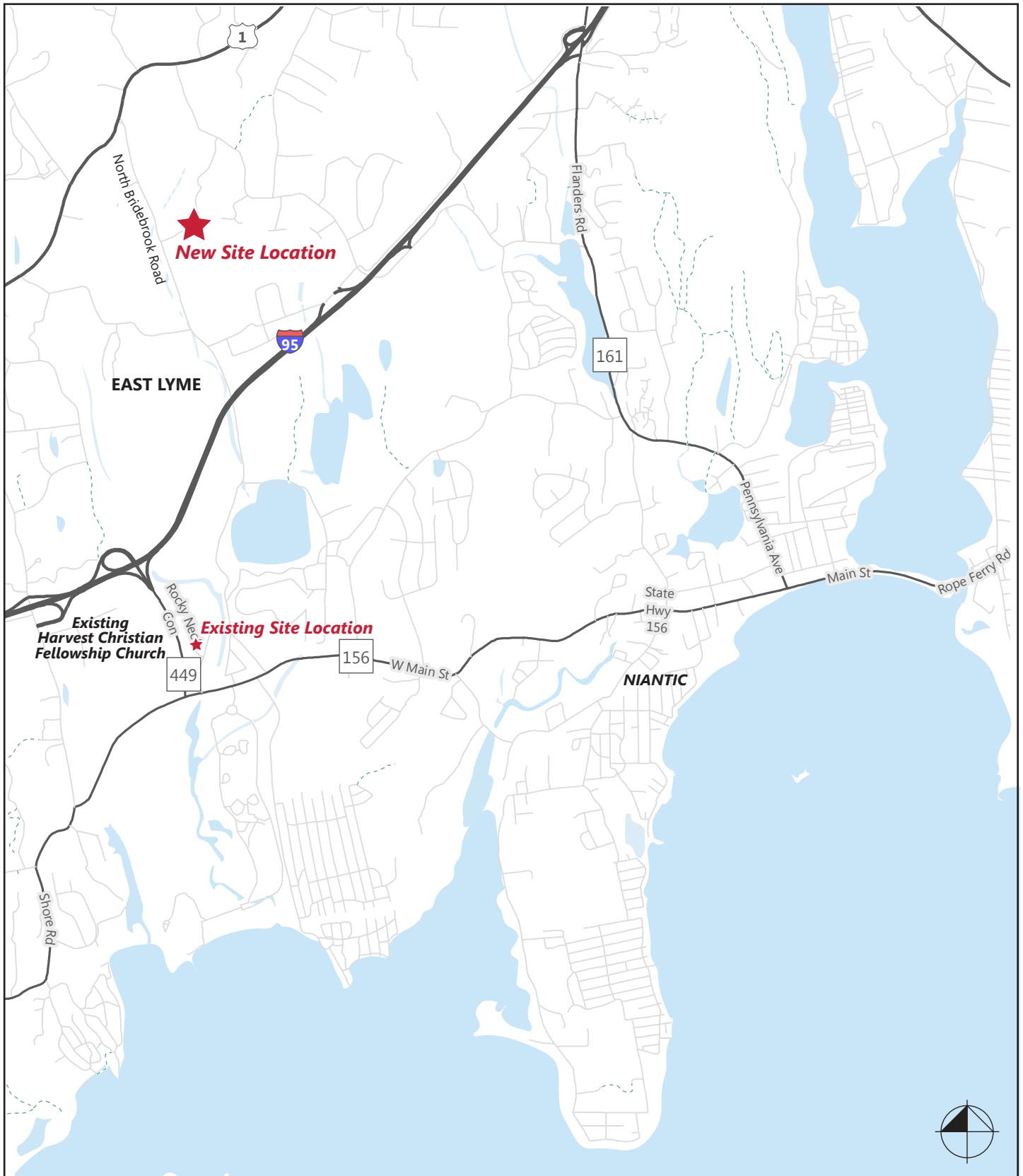


FIGURE 1

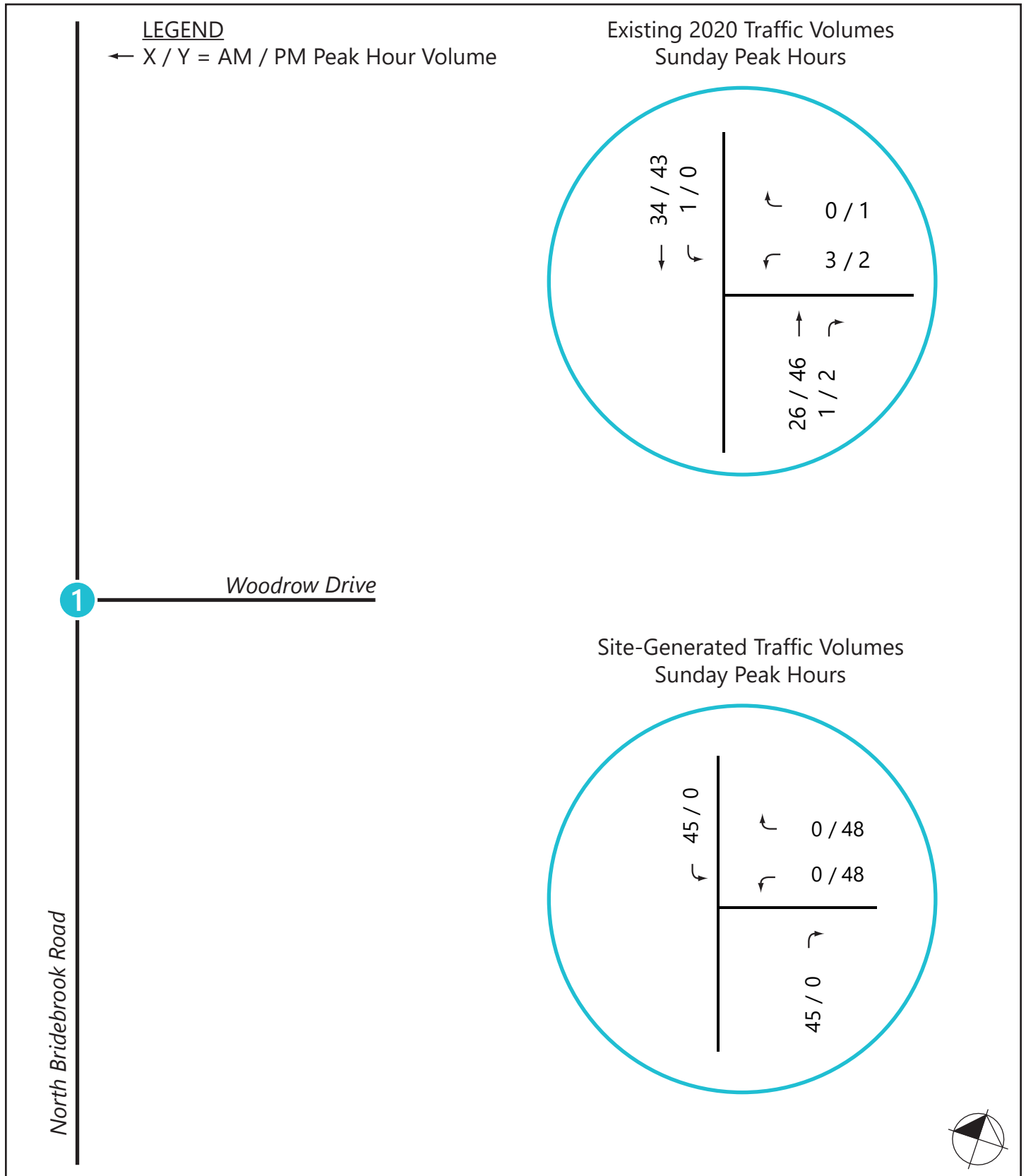


FIGURE 2

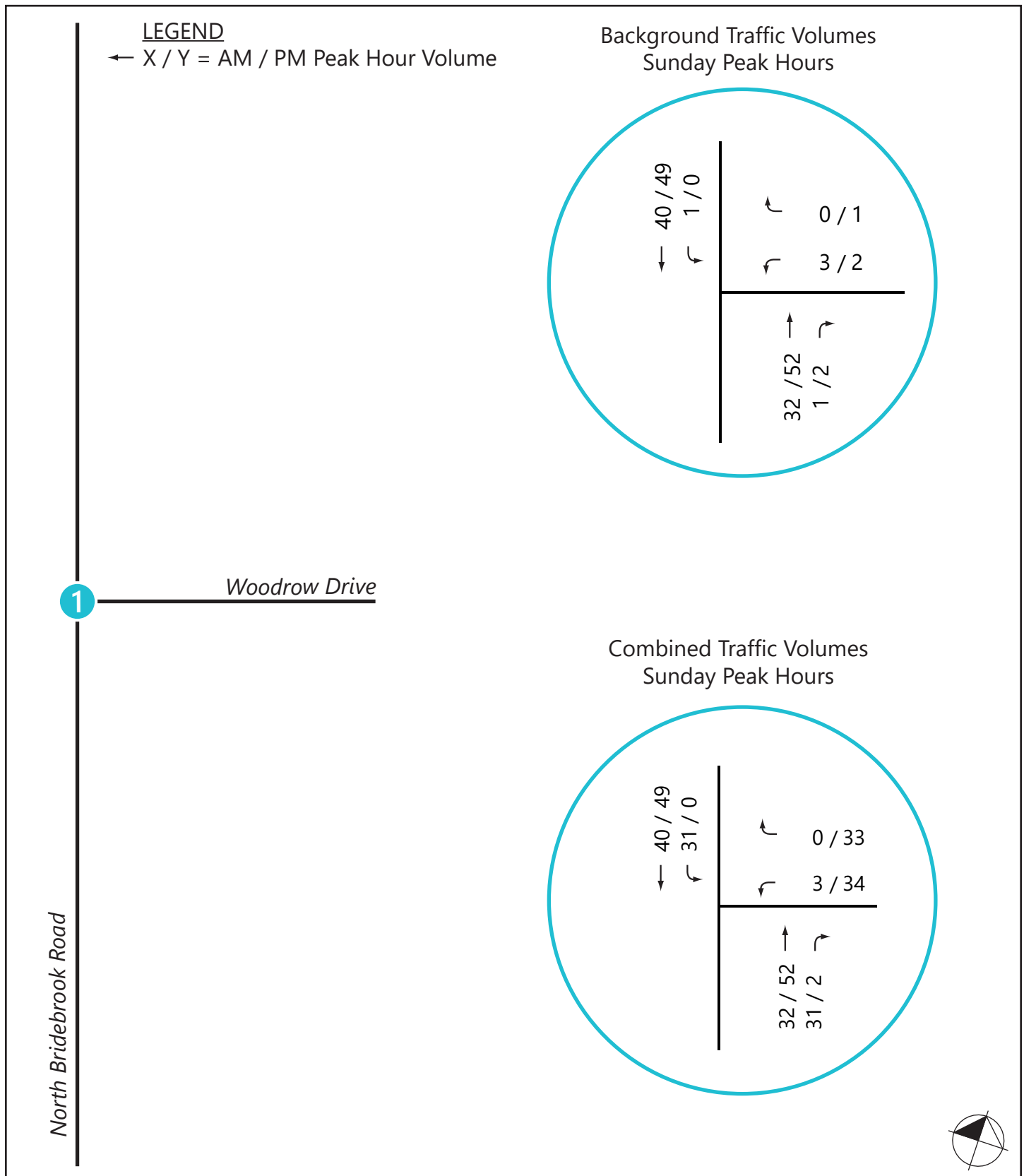


FIGURE 3

APPENDIX

LEVEL OF SERVICE

FOR TWO-WAY

STOP SIGN CONTROLLED INTERSECTIONS

The level of service for a TWSC (two-way stop controlled) intersection is determined by the computed or measured control delay and is defined for each minor movement. Level of service is not defined for the intersection as a whole. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. LOS criteria are given in the Table. LOS criteria are given below:

LEVEL-OF SERVICE CRITERIA FOR AWSC INTERSECTIONS	
LOS¹	CONTROL DELAY (s/veh)
A	≤ 10
B	$> 10 \text{ AND } \leq 15$
C	$> 15 \text{ AND } \leq 25$
D	$> 25 \text{ AND } \leq 35$
E	$> 35 \text{ AND } \leq 50$
F	> 50

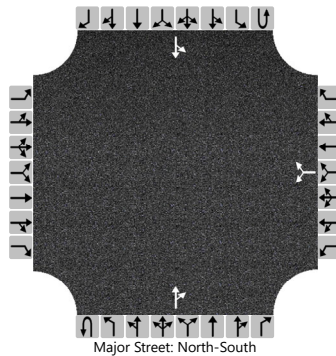
Note: LOS criteria apply to each lane on a given approach and to each approach on the minor street.
 LOS is not calculated for major-street approaches or for the intersection as a whole.
 LOS F is assigned to a movement if the volume-to-capacity ratio exceeds 1.0, regardless of the control delay

Reference: Highway Capacity Manual Version 6.0, Transportation Research Board, 2016.

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	FMF			Intersection	N Bridebrook at Woodrow		
Agency/Co.	Milone & MacBroom			Jurisdiction			
Date Performed	12/15/2020			East/West Street	Woodrow Drive		
Analysis Year	2021			North/South Street	N Bridebrook Road		
Time Analyzed	AM			Peak Hour Factor	0.71		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	Sunday AM Peak Background						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						3		0			32	1		1	40	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type Storage						Undivided										

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2							4.1	
Critical Headway (sec)						6.43		6.23							4.13	
Base Follow-Up Headway (sec)						3.5		3.3							2.2	
Follow-Up Headway (sec)						3.53		3.33							2.23	

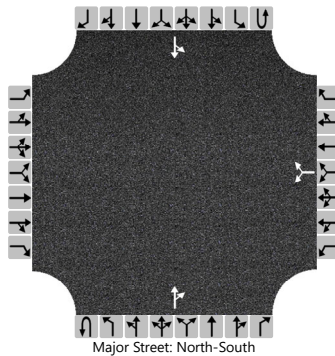
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						4									1		
Capacity, c (veh/h)						890									1555		
v/c Ratio						0.00									0.00		
95% Queue Length, Q ₉₅ (veh)						0.0									0.0		
Control Delay (s/veh)						9.1									7.3		
Level of Service (LOS)						A									A		
Approach Delay (s/veh)						9.1								0.2			
Approach LOS						A											

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	FMF			Intersection	N Bridebrook at Woodrow		
Agency/Co.	Milone & MacBroom			Jurisdiction			
Date Performed	12/15/2020			East/West Street	Woodrow Drive		
Analysis Year	2021			North/South Street	N Bridebrook Road		
Time Analyzed	AM			Peak Hour Factor	0.71		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	Sunday AM Peak Combined						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						3		0			32	31		31	40	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2							4.1	
Critical Headway (sec)						6.43		6.23							4.13	
Base Follow-Up Headway (sec)						3.5		3.3							2.2	
Follow-Up Headway (sec)						3.53		3.33							2.23	

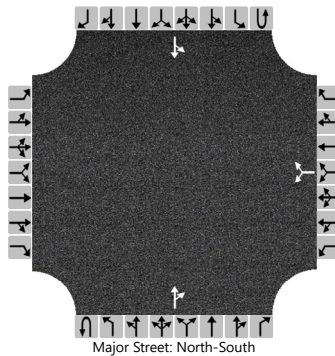
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						4								44		
Capacity, c (veh/h)						752								1501		
v/c Ratio						0.01								0.03		
95% Queue Length, Q ₉₅ (veh)						0.0								0.1		
Control Delay (s/veh)						9.8								7.5		
Level of Service (LOS)						A								A		
Approach Delay (s/veh)		9.8										3.4				
Approach LOS		A														

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	FMF			Intersection	N Bridebrook at Woodrow		
Agency/Co.	Milone & MacBroom			Jurisdiction			
Date Performed	12/15/2020			East/West Street	Woodrow Drive		
Analysis Year	2021			North/South Street	N Bridebrook Road		
Time Analyzed	PM			Peak Hour Factor	0.76		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	Sunday PM Peak Background						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)							2				52	2			0	49
Percent Heavy Vehicles (%)							3								3	
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)							7.1		6.2							4.1	
Critical Headway (sec)							6.43		6.23							4.13	
Base Follow-Up Headway (sec)							3.5		3.3							2.2	
Follow-Up Headway (sec)							3.53		3.33							2.23	

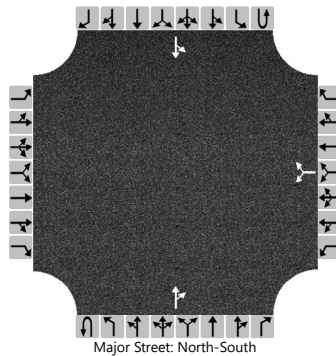
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							4									0	
Capacity, c (veh/h)							897									1523	
v/c Ratio							0.00									0.00	
95% Queue Length, Q ₉₅ (veh)							0.0									0.0	
Control Delay (s/veh)							9.0									7.4	
Level of Service (LOS)							A									A	
Approach Delay (s/veh)					9.0								0.0				
Approach LOS					A												

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	FMF			Intersection	N Bridebrook at Woodrow		
Agency/Co.	Milone & MacBroom			Jurisdiction			
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Time Analyzed	PM			Peak Hour Factor	0.76		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	Sunday PM Peak Combined						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						34		33			52	2		0	49	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2							4.1		
Critical Headway (sec)						6.43		6.23							4.13		
Base Follow-Up Headway (sec)						3.5		3.3							2.2		
Follow-Up Headway (sec)						3.53		3.33							2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						88									0		
Capacity, c (veh/h)						918									1523		
v/c Ratio						0.10									0.00		
95% Queue Length, Q ₉₅ (veh)						0.3									0.0		
Control Delay (s/veh)						9.3									7.4		
Level of Service (LOS)						A									A		
Approach Delay (s/veh)					9.3								0.0				
Approach LOS					A												