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Traffic Impact and Access Study

River Stone Condominiums
Hingham, Massachusetts

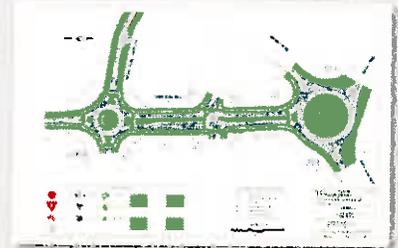
Prepared for:

River Stone LLC
293 Washington Street
Norwell, MA 02061

April 11, 2016



Quality



Accuracy



Integrity





Traffic Impact and Access Study

To: Mr. Brian Murphy
River Stone, LLC
293 Washington Street
Norwell, MA 02061

Reg: River Stone Condominiums
Viking Lane at Ward Street
Hingham, MA

From: Ron Müller, P.E., Principal

Date: April 11, 2016
Project #: 16001

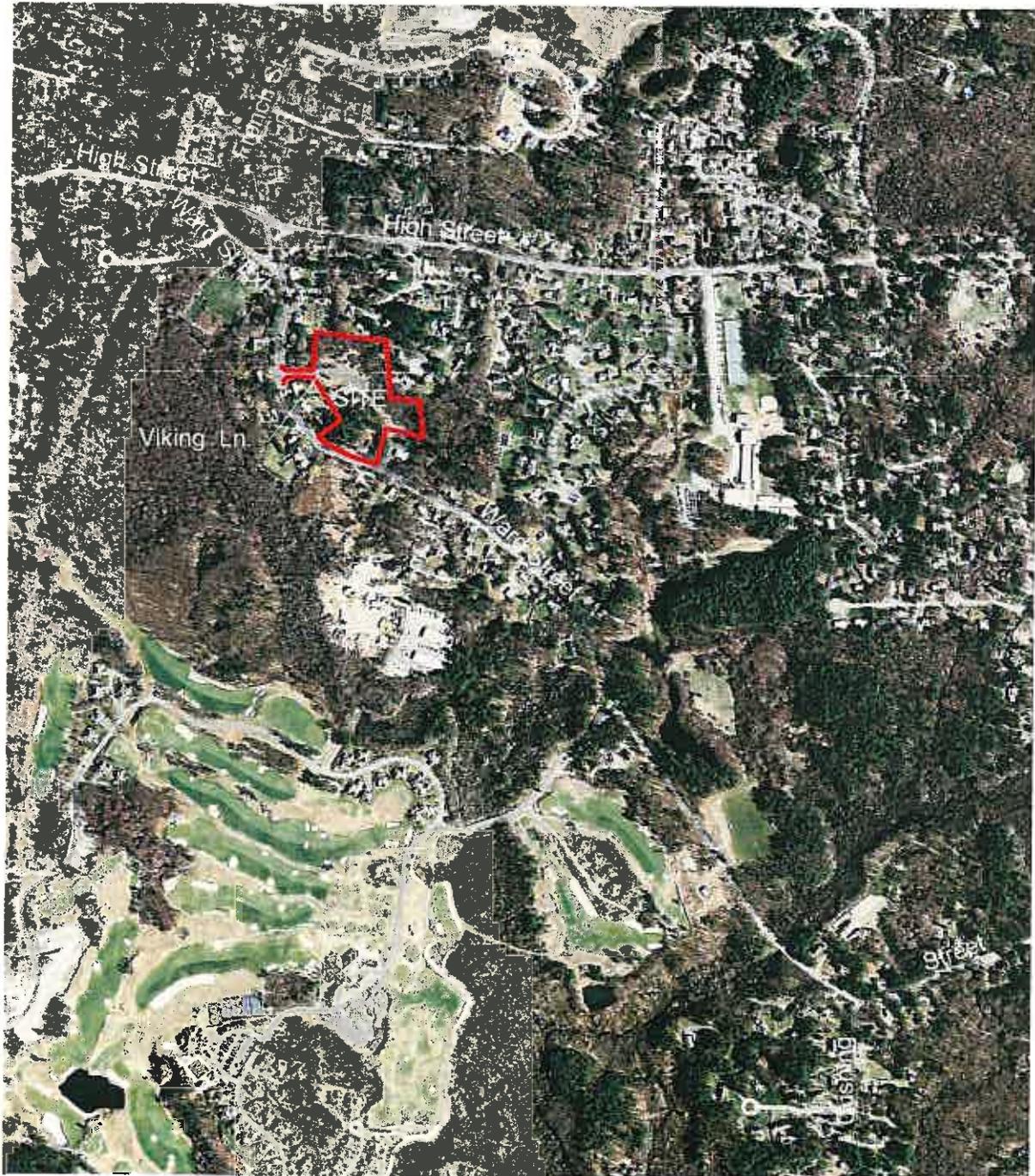
INTRODUCTION

Ron Müller & Associates (RMA) has conducted this Traffic Impact and Access Study for the proposed 40B condominium development to be located on an existing subdivision street constructed off Ward Street in Hingham, Massachusetts. This subdivision street will be named Viking Lane as part of this proposal. As proposed, the development includes construction of 10 new buildings on the site containing a total of 36 condominium units. Site access is proposed onto Ward Street via Viking Lane. The site location with respect to the surrounding streets is shown on Figure 1.

This report has been prepared to assess the safety of the Viking Lane intersection with Ward Street, estimate the increase in traffic as a result of site development, evaluate the impacts of this traffic on the adjacent streets and nearby intersections, and provide recommendations on access to the site. As this report shows, the development is expected to add at most 17 to 20 additional peak hour vehicles to Ward Street to the north of the site. These increases represent approximately one additional vehicle every three minutes, on average. Negligible volume increases are expected on Ward Street to the south of the site.

The Viking Lane intersection with Ward Street will operate at desirable levels of service during the peak hours with little impact to traffic flow along Ward Street. The Ward Street and French Street approaches to High Street are projected to operate with long delays by 2023, with or without the proposed development traffic. It is recommended that the Town of Hingham consider installation of all-way STOP control at this intersection.

Figure 1
Site Location Map



Ample sight distances exist at the proposed Viking Lane intersection to allow safe operation. It is recommended that any proposed landscaping or signs in the vicinity of the site driveway be kept low, or set back sufficiently so as not to impede the available sight distances. It is also recommended that a sidewalk be constructed along Viking Lane connecting the existing sidewalk on Ward Street with the proposed buildings to provide safe pedestrian access. In addition, a crosswalk should be striped across Viking Lane at its intersection with Ward Street and a STOP sign and stop line should be installed on the Viking Lane approach.

EXISTING CONDITIONS

Study Area

Evaluation of the traffic impacts associated with the proposed site development requires an evaluation of existing and projected traffic volumes, the volume of traffic expected to be generated by the project, and the impact that this traffic will have on the adjacent street. In preparing this study, the following intersections were analyzed and evaluated:

- High Street at Ward Street and French Street
- Ward Street at Ward Street Extension
- Ward Street at Viking Lane
- Ward Street at Cushing Street

Due to the project's anticipated traffic generation as described later in this report, the development is expected to have a minimal effect on traffic operations beyond this study area.

Traffic Volumes

Base traffic conditions were developed by conducting an automatic traffic recorder (ATR) count on Ward Street adjacent to the site to collect daily traffic volume information as well as manual turning movement and vehicle classification counts at the study intersections during the weekday AM peak period (7:00 to 9:00 AM) and the weekday PM peak period (4:00 to 6:00 PM). The traffic counts were collected in March and April 2016 and are provided in the Appendix. The count data indicate that the weekday AM peak hour generally occurs from 7:15 to 8:15 AM and the weekday PM peak hour generally occurs from 5:00 to 6:00 PM. However, the individual intersection peak hours were used to present a conservative analytical scenario.

To determine if the count data needed to be adjusted to represent annual average month conditions consistent with state guidelines for traffic impact assessment, historical traffic volume data were obtained from MassDOT. The closest permanent count station to the project site is located on Route 3 in Hingham south between Exits 14 and 15 (Station No. 7318). Based on this

information, traffic during the month of March is approximately 3 percent below annual average-month conditions and traffic during the month of April is approximately 1 percent below average. Accordingly, the collected data were increased accordingly to represent an annual average-month condition. The MassDOT seasonal adjustment data are provided in the Appendix and the daily and peak hour traffic flows are summarized in Table 1. The 2016 Existing peak hour traffic flow networks are shown graphically on Figure 2.

Table 1
Existing Traffic Volume Summary

Location	Daily Volume ^a	Peak Hour Volume ^b	K-Factor ^c	Directional Distribution ^d
Ward Street Adjacent to the Site:	5,700	AM: 454 PM: 666	8.0% 11.7%	67% NB 51% SB

^aIn vehicles per day.

^bIn vehicles per hour.

^cPercentage of daily traffic occurring during the peak hour.

^dNB = northbound, SB = southbound.

Accidents

Accident data for the study intersections were obtained from MassDOT for the period between 2011 and 2013, the latest three years of available data at the time of the request. A summary of the MassDOT accident data is provided in Table 2. In addition to the summary, accident occurrence should also be compared to the volume of traffic through a particular intersection to determine any significance. Accordingly, an accident rate was calculated for the study intersections and compared with the statewide and district-wide averages. An intersection accident rate is a measure of the frequency of accidents compared to the volume of traffic through an intersection and is presented in accidents per million entering vehicles (acc/mev). For unsignalized intersections, the statewide average accident rate is 0.60 acc/mev and the district-wide accident rate is 0.58 acc/mev. A comparison of the calculated accident rate to the statewide and district-wide averages can be used to establish the significance of accident occurrence and whether or not potential safety problems exist. The crash rate worksheets are provided in the Appendix.

Figure 2
 2016 Existing
 Peak Hour Traffic Volumes

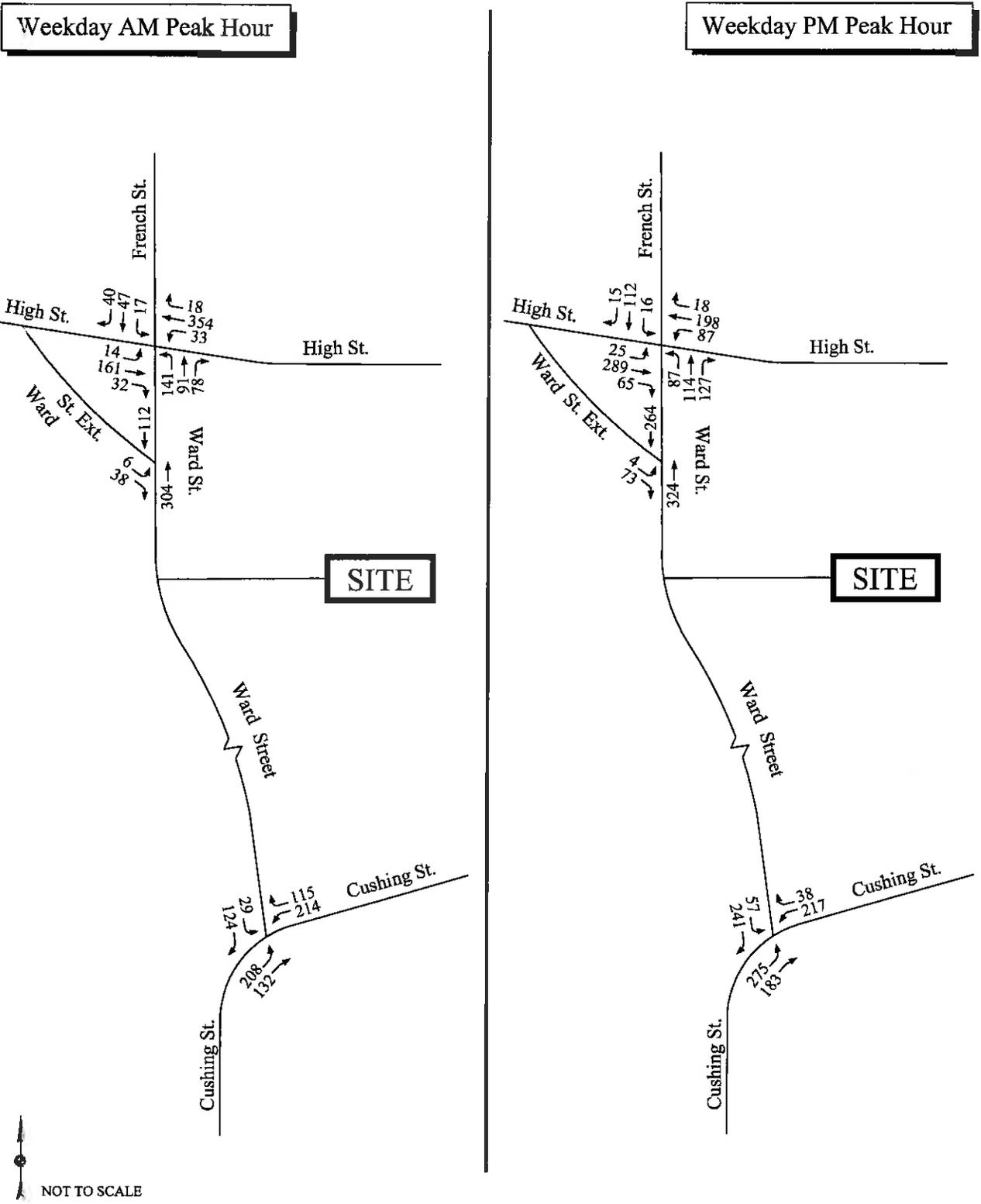


Table 2
Accident Summary

Location	Number of Accidents			Severity ^a			Accident Type ^b						% During Wet/Icy Conditions
	Total	Avg./Year	Accident Rate ^c	PD	PI	F	CM	RE	HO	FO	Ped	Other	
High Street at Ward Street and French Street	16	5.3	1.48	12	4	0	14	1	0	1	0	0	13%
Ward Street at Ward Street Extension	1	0.3	0.16	1	0	0	0	0	0	1	0	0	100%
Cushing Street at Ward Street	2	0.7	0.21	2	0	0	0	0	0	2	0	0	50%

Source: MassDOT Traffic Operations Safety Management System – 2011 through 2013 data.

^a PD = property damage only; PI = personal injury; F = fatality.

^b CM = cross movement/angle; RE = rear end; HO = head on; FO = fixed object; Ped = pedestrian.

^c Measured in accidents per million entering vehicles.

^d Not Applicable.

As shown in Table 2, the High Street intersection with Ward Street and French Street experienced the most accidents over the three-year analysis period with an average of over five accidents per year. The calculated crash rate is also significantly higher than both the district-wide and statewide averages. A detailed review of the accidents revealed that the predominant accident type (75%) was angle collisions occurring as a result of vehicles turning onto High Street from either Ward Street or French Street. This may be due the limited sight distance for vehicles on French Street looking left (east) as well as limited sight distance for vehicles on Ward Street looking left (west). Of the accidents reported at this location, 75 percent involved property damage only and the majority (88%) were angle or cross movement incidents.

The other two study intersections experienced a minimal number of accident over the three-year analysis period. Both locations have a calculated crash rate well below the district-wide and statewide averages.

Vehicle Speeds

Speed measurements were conducted along Ward Street adjacent to the site by measuring the elapsed time for vehicles traveling a short, pre-measured distance between two checkpoints. The travel time was recorded using automatic traffic recorders and the speed is derived by dividing the elapsed time into the measured distance between checkpoints. The results of the speed measurements are summarized in Table 3.

Table 3
Observed Travel Speeds ^a

Location/Direction	Posted Speed Limit ^b	Average Speed	85 th Percentile Speed ^c
Ward Street			
Adjacent to the Site:			
Northbound	30	31	34
Southbound	30	27	32

^a In miles per hour (mph).

^b Speed limit not posted. A limit of 30 mph is assumed consistent with Massachusetts speed regulations for thickly settled roads.

^c Speed at, or below which 85 percent of all observed vehicles travel.

As shown, average speeds on Ward Street were recorded generally consistent with the speed limit of 30 miles per hour (mph) and the 85th percentile speeds were recorded slightly higher at 32 to 34 mph. These higher speeds were accordingly used in the calculation of minimum sight distance requirements, as described below.

Sight Distance

To identify potential safety concerns associated with site access and egress, sight distances have been evaluated at the Viking Lane intersection with Ward Street to determine if the available sight distances for vehicles exiting the site meet or exceed the minimum distances required for approaching vehicles to safely stop. The available sight distances were compared with minimum requirements, as established by the American Association of State Highway and Transportation Officials (AASHTO).¹ AASHTO is the national standard by which vehicle sight distance is calculated, measured, and reported. The MassDOT and the Executive Office of Energy and Environmental Affairs (EEA) require the use of AASHTO sight distance standards when preparing traffic impact assessments and studies, as stated in their guidelines for traffic impact assessments.

Sight distance is the length of roadway ahead that is visible to the driver. Stopping Sight Distance (SSD) is the minimum distance required for a vehicle traveling at a certain speed to safely stop before reaching a stationary object in its path. The values are based on a driver perception and reaction time of 2.5 seconds and a braking distance calculated for wet, level pavements. When the roadway is either on an upgrade or downgrade, grade correction factors are applied. Stopping sight distance is measured from an eye height of 3.5 feet to an object height of

¹A Policy on Geometric Design of Highways and Streets; American Association of State Highway and Transportation Officials (AASHTO); 2004.

2 feet above street level, equivalent to the taillight height of a passenger car. The SSD is measured along the centerline of the traveled way of the major road.

Intersection sight distance (ISD) is provided on minor street approaches to allow the drivers of stopped vehicles a sufficient view of the major roadway to decide when to enter the major roadway. By definition, ISD is the minimum distance required for a motorist exiting a minor street to turn onto the major street, without being overtaken by an approaching vehicle reducing its speed from the design speed to 70 percent of the design speed. ISD is measured from an eye height of 3.5 feet to an object height of 3.5 feet above street level. The use of an object height equal to the driver eye height makes intersection sight distances reciprocal (i.e., if one driver can see another vehicle, then the driver of that vehicle can also see the first vehicle). When the minor street is on an upgrade that exceeds 3 percent, grade correction factors are applied.

SSD is generally more important as it represents the minimum distance required for safe stopping while ISD is based only upon acceptable speed reductions to the approaching traffic stream. However, the ISD must be equal to or greater than the minimum required SSD in order to provide safe operations at the intersection. In accordance with the AASHTO manual, *“If the available sight distance for an entering or crossing vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to anticipate and avoid collisions. However, in some cases, this may require a major-road vehicle to stop or slow to accommodate the maneuver by a minor-road vehicle. To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road.”* Accordingly, ISD should be at least equal to the distance required to allow a driver approaching the minor road to safely stop.

The available intersection sight distances at Viking Lane were measured and compared to minimum requirements as established by AASHTO based on the observed speeds and are shown in Table 4.

Table 4
Sight Distance Summary

Location/Direction	Sight Distance (feet)		
	Measured	Minimum Required (SSD) ^a	Desirable (ISD) ^b
Ward Street at Viking Lane:			
North of intersection	500+	215	335
South of intersection	415	235	335

^a Values based on AASHTO SSD requirements for observed 85th percentile travel speeds of 34 mph northbound and 32 mph southbound on Ward Street.

^b Values based on AASHTO ISD requirements for thickly settled speed limit of 30 mph on Ward Street.

As shown in the table, ample sight distances exist at the Viking Lane intersection, exceeding both minimum requirements and desirable distances. Safe operation of this roadway can therefore be expected. It is recommended that any proposed landscaping or signs in the vicinity of the Viking Lane intersection be kept low to the ground (less than 3 feet above street level) or outside the sight triangles as defined by AASHTO so as not to impede the available sight distances for drivers exiting Viking Lane.

FUTURE CONDITIONS

Traffic Growth

Future traffic conditions were projected to the year 2023, representing a 7-year design horizon consistent with EEA and MassDOT requirements for traffic impact analysis. To project traffic conditions within this design horizon, two components of traffic growth were included. First, an annual average traffic growth rate was determined to account for general population growth and smaller development projects (i.e. residential subdivisions) that may impact traffic in the site vicinity. Based on historical traffic volume information from the MassDOT permanent count station on Route 3 in Hingham (Station #7318), traffic volumes have remained level over the past ten years on average. However, the most recent 5-year period has seen an increase in traffic of 1.63 percent per year. Accordingly, a traffic growth rate of 2.0 percent per year was used in this study. The MassDOT historical traffic data are provided in the Appendix.

Second, any planned or approved specific developments in the area that would generate a significant volume of traffic on study area roadways within the next seven years were considered. Based on discussions with the Hingham planning office, no other development projects of significant size were identified.

No-Build Conditions

The 2023 No-Build conditions were accordingly developed by applying a compounded 2.0 percent annual growth rate (14.9 percent over seven years) to the existing adjacent street volumes. The 2023 No-Build peak-hour traffic volumes are shown graphically on Figure 3.

Trip Generation

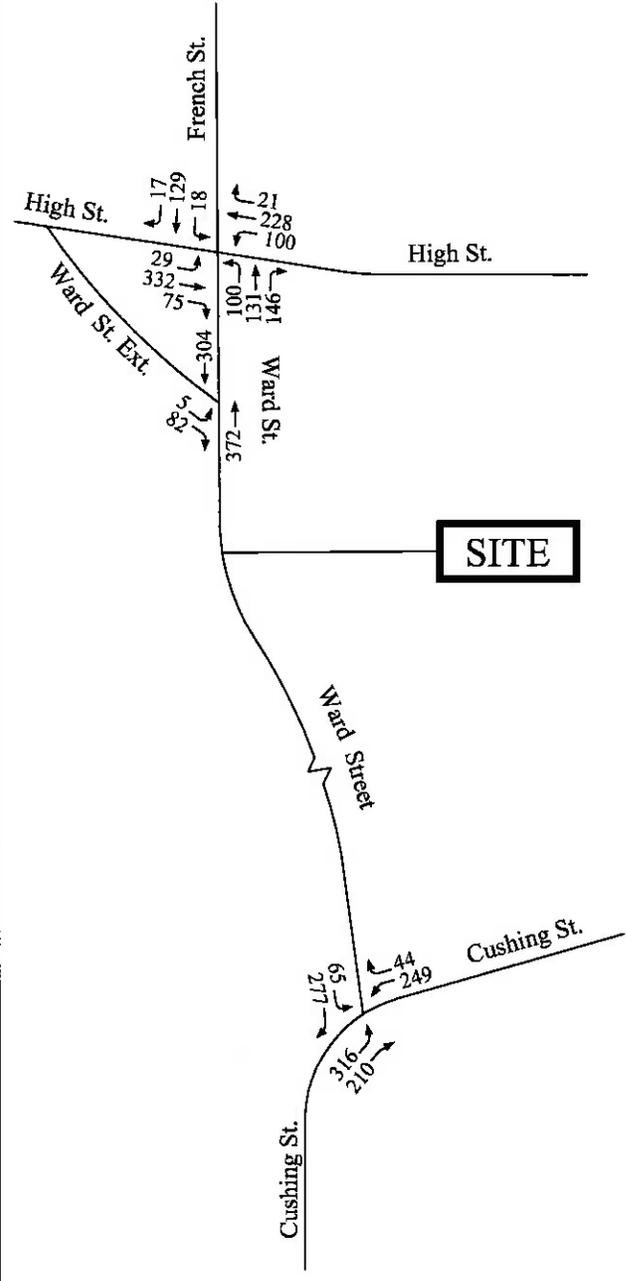
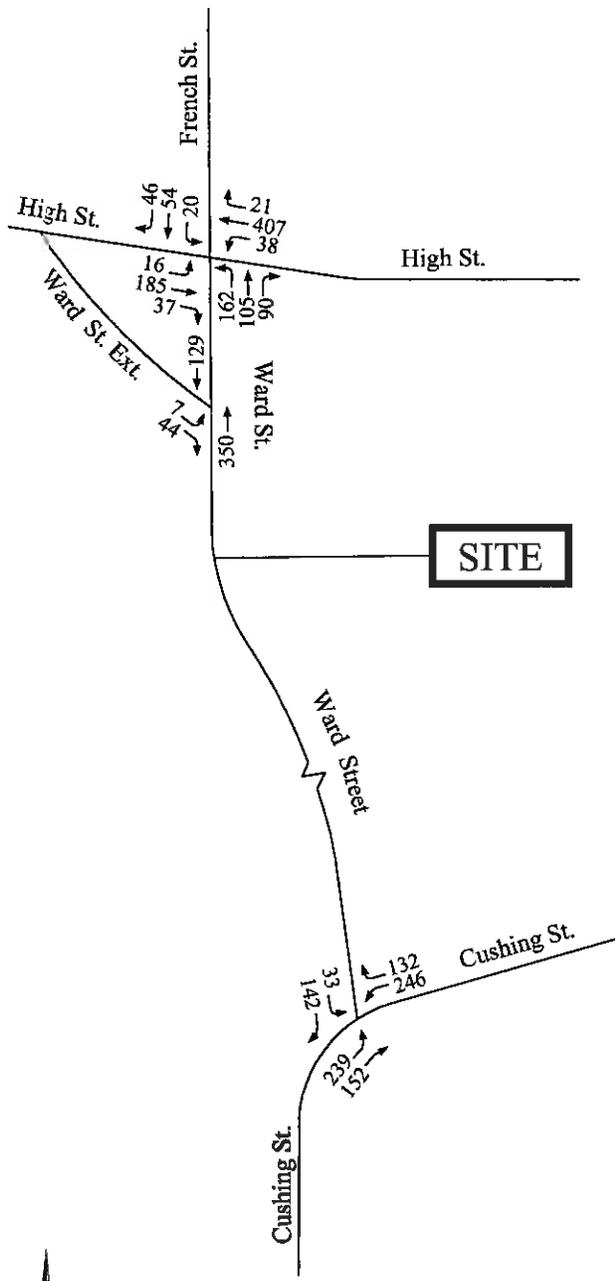
The traffic to be generated by the proposed 36-unit condominium project was estimated using the Institute of Transportation Engineers (ITE) *Trip Generation Manual*² for Land Use Code 230

² *Trip Generation Manual, 9th Edition*; Institute of Transportation Engineers; Washington, DC; 2012.

Figure 3
 2023 No-Build
 Peak Hour Traffic Volumes

Weekday AM Peak Hour

Weekday PM Peak Hour



↑
 NOT TO SCALE

(Residential Condominium/Townhouse). The anticipated traffic generation is shown in Table 5 and the trip generation calculations are provided in the Appendix.

Table 5
Trip Generation Summary

<u>Time Period</u>	<u>River Stone Condominiums ^a</u>
Weekday Daily	210
Weekday AM Peak Hour	
Enter	4
Exit	<u>19</u>
Total	23
Weekday PM Peak Hour	
Enter	17
Exit	<u>9</u>
Total	26

^a ITE Land Use Code 230 (Residential Condominiums/Townhouse).

As shown in Table 5, the proposed condominium project will generate 210 vehicle trips (105 in and 105 out) on a weekday daily basis, of which 23 vehicle trips (4 in and 19 out) will occur during the weekday AM peak hour and 26 vehicle trips (17 in and 9 out) will occur during the weekday PM peak hour.

Trip Distribution

The distribution of new traffic generated by the project is based on Journey-to-Work data provided by the U.S. Census Bureau for people residing in Hingham. It is accordingly expected that approximately 75 percent of the site traffic will be oriented to/from the north on Ward Street and 25 percent to/from the south. Of the traffic heading north on Ward Street, 50 percent are expected on High Street to/from the west, 15 percent on High Street to/from the east, and 10 percent on French Street to/from the north. Of the traffic traveling on Ward Street to the south, 20 percent are expected on Cushing Street to/from the south and 5 percent on Cushing Street to/from the east. The U.S. Census data are provided in the Appendix.

Build Conditions

Based on the traffic generation and distribution estimates for this project, the traffic volumes generated by the proposed project were assigned to the roadway network as shown on Figure 4 and were added to the 2023 No-Build traffic volumes to develop the 2023 Build traffic volumes. The 2023 Build weekday AM and PM peak hour traffic volume networks are graphically depicted on Figure 5.

Traffic Increases

Based on the above traffic generation and distribution patterns, the largest traffic increases will be experienced on Ward Street to the north of the site ranging from 17 to 20 vehicles during the peak hours. These increases average approximately one additional vehicle on Ward Street every three minutes during peak hours. These volume increases are minimal and represent an increase in traffic over the No-Build conditions of approximately 3 percent. Smaller increases in traffic would be expected during all other hours of the day. On Ward Street to the south of the site, volume increases will be negligible at 6 additional vehicles during peak hours, or approximately one additional vehicle every 10 minutes.

Site Access

Viking Lane is 18 feet in width and is consistent with MassDOT minimum design standards³ for local roads and has been approved by the Town of Hingham as a subdivision street. To accommodate pedestrian access to the site, it is recommended that a sidewalk be constructed along Viking Lane and along the proposed Roads A and B as shown on the site plan prepared by McKenzie Engineering Group, Inc. to provide safe pedestrian access to each of the proposed buildings. Since a sidewalk currently exists along Ward Street, a crosswalk should be striped across Viking Lane and a STOP sign (R1-1) and stop line should be installed on the Viking Lane approach to Ward Street. The stop line should be located 4 feet from the crosswalk.

CAPACITY ANALYSIS

Level-of-service (LOS) analyses were conducted at the study area intersections under existing and projected volume conditions to determine the effects that the site generated traffic will have on traffic operations. The capacity analysis methodology is based on the concepts and procedures in the *Highway Capacity Manual*⁴ (HCM) and is described in the Appendix. For unsignalized intersections, the 95th percentile queue represents the length of queue of the critical

³ *Project Development & Design Guide*; Massachusetts Department of Transportation; 2006.

⁴ *Highway Capacity Manual 2010*; Transportation Research Board; Washington, DC; 2010.

Figure 4
 Site Generated
 Peak Hour Traffic Volumes

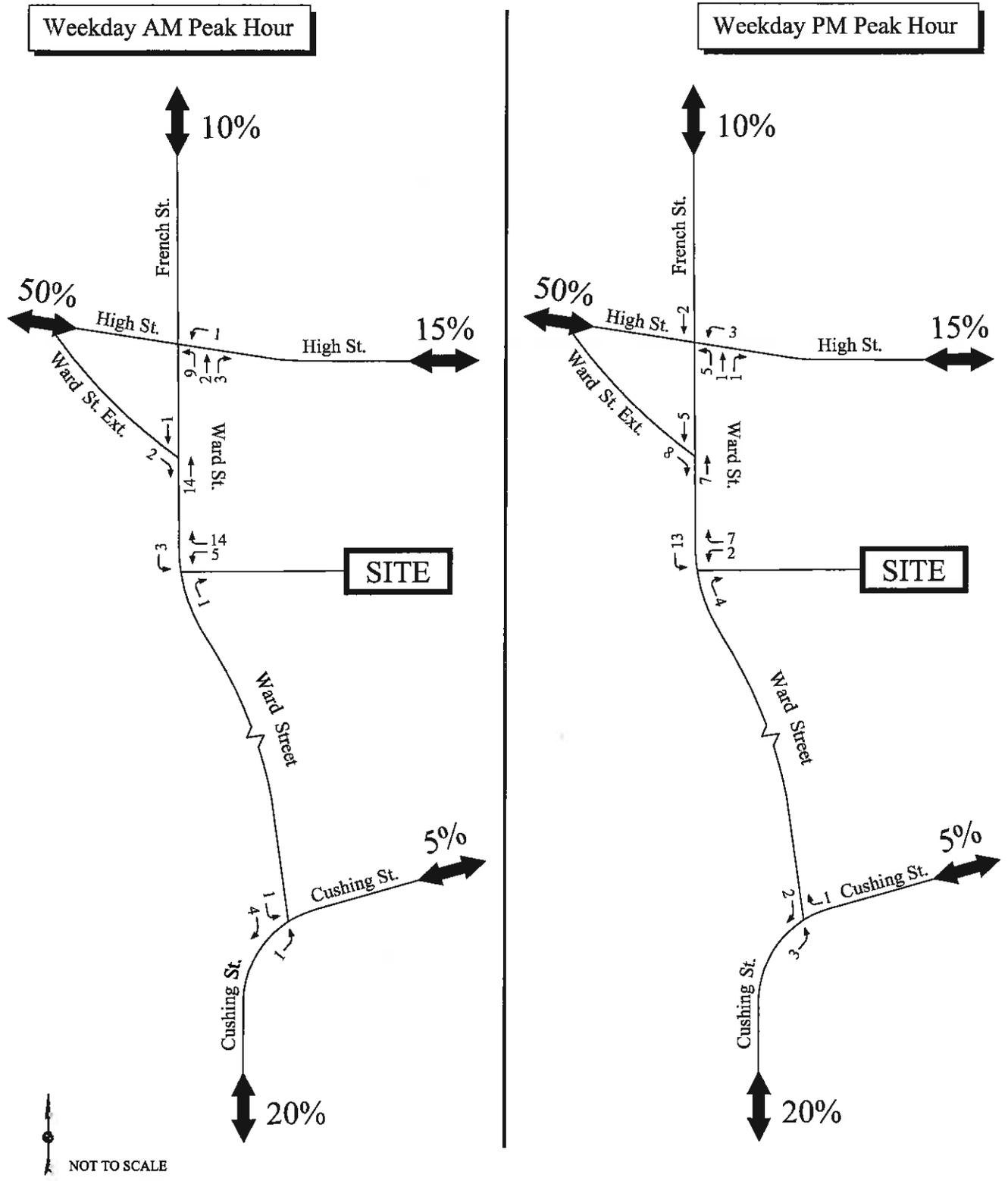
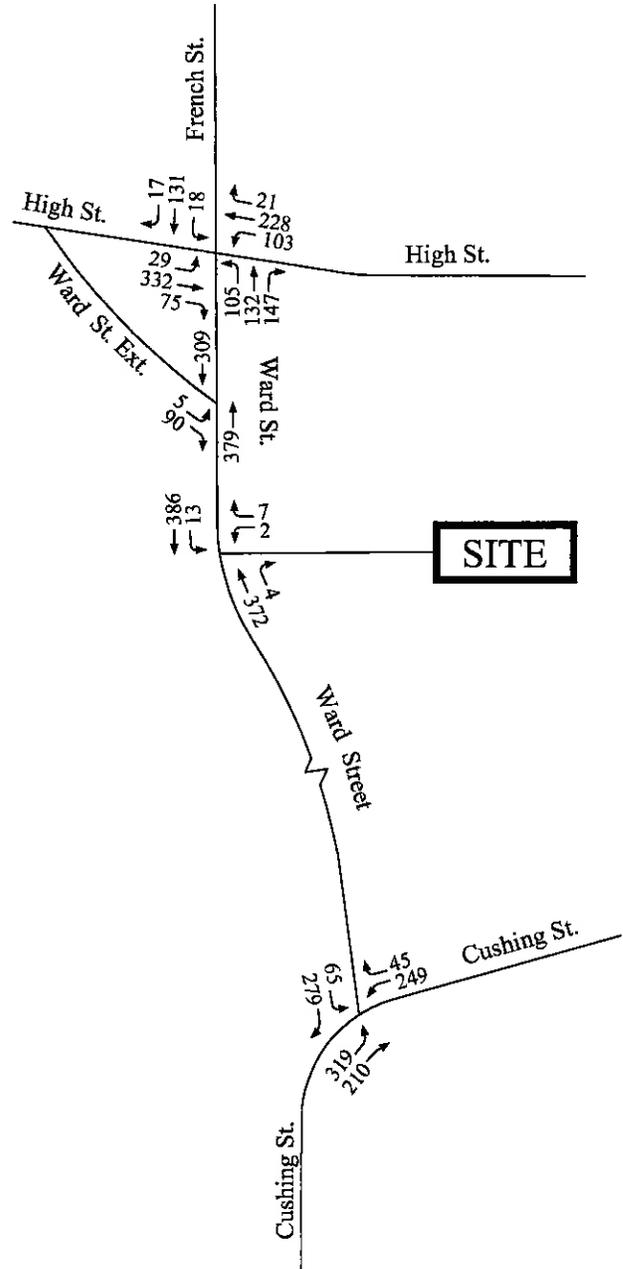
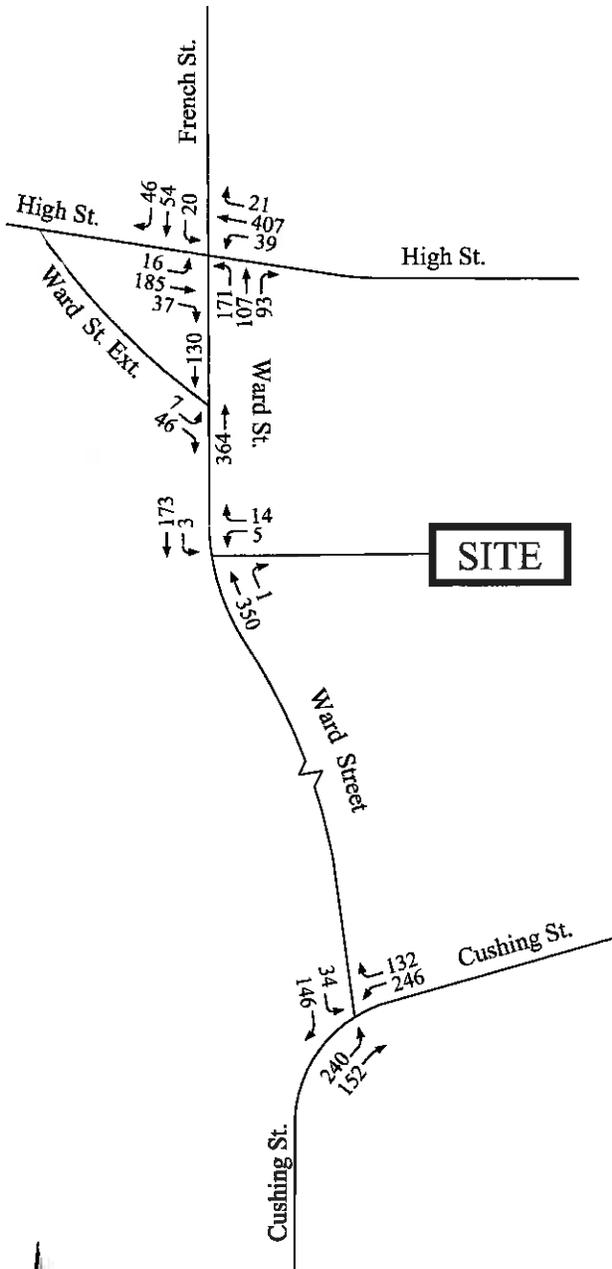


Figure 5
 2023 Build
 Peak Hour Traffic Volumes

Weekday AM Peak Hour

Weekday PM Peak Hour



NOT TO SCALE

minor-street movement that is not expected to be exceeded 95 percent of the time during the analysis period (typically one hour). In this case, the queue length is a function of the capacity of the movement and the movement's degree of saturation. The level-of-service and queue results are presented in Table 6 and are discussed below. All analysis worksheets are provided in the Appendix.

As shown in the table, the High Street and Ward Street/French Street intersection currently experiences significant delay for vehicles on the Ward Street northbound approach (LOS E to F) with volumes nearing the capacity of the approach. The increase in traffic expected from normal population growth by the 2023 design year (No-Build) will cause this approach to operate well over capacity at level-of-service F. The French Street southbound approach will also experience operational difficulties at level F during the weekday PM peak hour. The proposed development will add minimal traffic to these approaches, ranging from 2 to 14 additional vehicles during peak times. No changes in level of service are predicted as a result of this project. Given the projected delays as well as the significant past accident experience, improvements are recommended at this intersection as described in the *Recommended Improvements* section of this report.

The Cushing Street intersection with Ward Street currently operates at acceptable levels (LOS B to C) during both peak hours. By 2023, the intersection will continue to operate at acceptable levels during the weekday AM peak hour, but increased delays will be experienced during the weekday PM peak hour on the Ward Street approach (LOS E). The project will add negligible volumes to the intersection approaches (1 to 4 peak hour vehicles) and no changes in level of service are predicted. Left and right turns exiting the Ward Street Extension will operate at desirable levels (LOS A to B) under all analysis conditions.

Site traffic exiting Viking Lane onto Ward Street is expected to operate at a desirable level (LOS B) during the analyzed peak hours, indicating little delay to motorists. Left turns from Ward Street into Viking Lane will operate at a desirable level A. Vehicle queues of no more than one vehicle are expected for exiting site vehicles.

Table 6
Level-of-Service Analysis Summary

Location/Peak Hour Movement	2016 Existing				2023 No-Build				2023 Build			
	v/c ^a	Del. ^b	LOS ^c	Queue ^d	v/c	Del.	LOS	Queue	v/c	Del.	LOS	Queue
High Street at Ward Street and French Street												
<i>Weekday AM Peak</i>												
NB All	0.84	47.5	E	200	1.20	NA ^e	F	415	1.28	NA	F	475
EB Left	0.01	8.2	A	0	0.02	8.4	A	0	0.02	8.4	A	0
WB Left	0.03	7.7	A	25	0.03	7.8	A	25	0.03	7.8	A	25
SB All	0.29	18.1	C	50	0.40	23.6	C	50	0.41	23.8	C	50
<i>Weekday PM Peak</i>												
NB All	0.91	60.9	F	235	1.51	NA	F	570	1.62	NA	F	625
EB Left	0.02	7.7	A	25	0.02	7.8	A	25	0.02	7.8	A	25
WB Left	0.07	8.2	A	25	0.09	8.4	A	25	0.09	8.4	A	25
SB All	0.54	32.5	D	75	0.79	65.2	F	140	0.81	69.2	F	150
Ward Street at Ward Street Extension												
<i>Weekday AM Peak</i>												
EB Left	0.01	11.6	B	0	0.02	12.2	B	0	0.02	12.4	B	0
EB Right	0.05	9.1	A	25	0.05	9.2	A	25	0.06	9.3	A	25
<i>Weekday PM Peak</i>												
EB Left	0.02	16.0	C	25	0.03	18.1	C	25	0.03	18.4	C	25
EB Right	0.16	11.4	B	25	0.19	12.2	B	25	0.21	12.4	B	25
Cushing Street at Ward Street												
<i>Weekday AM Peak</i>												
EB Left	0.18	8.6	A	25	0.21	8.9	A	25	0.21	9.0	A	25
SB Left/Right	0.28	13.8	B	50	0.36	16.2	C	50	0.37	16.5	C	50
<i>Weekday PM Peak</i>												
EB Left	0.22	8.5	A	25	0.26	8.8	A	25	0.26	8.9	A	50
SB Left/Right	0.61	22.3	C	100	0.82	41.5	E	195	0.83	42.7	E	200
Ward Street at Viking Lane (Site Drive)												
<i>Weekday AM Peak</i>												
WB Left/Right	---	---	---	---	---	---	---	---	0.03	11.1	B	25
SB Left	---	---	---	---	---	---	---	---	0.00	8.0	A	0
<i>Weekday PM Peak</i>												
WB Left/Right	---	---	---	---	---	---	---	---	0.02	11.9	B	25
SB Left	---	---	---	---	---	---	---	---	0.01	8.1	A	0

^a Volume-to-capacity ratio

^b Average control delay in seconds per vehicle

^c Level of service

^d 95th percentile queue in vehicles.

^e NA = Delay meaningless at v/c ratios < 1.20.

RECOMMENDED IMPROVEMENTS

As described in the analysis section of this report, operational difficulties are expected by the 2023 design year, with or without the proposed development project. Specifically, both the northbound Ward Street and southbound French Street approaches will operate at LOS F with very long delays and queues particularly on the Ward Street approach. In addition, the intersection has experienced over five accidents per year and has a calculated crash rate well above the statewide average. The intersection may therefore be a candidate for traffic signalization. However, the Manual on Uniform Traffic Control Devices (MUTCD)⁵ recommends that alternatives to traffic signal control be investigated as “...vehicular delay and the frequency of some types of crashes are sometimes greater under traffic signal control than under STOP sign control...consideration should be given to providing alternatives to traffic control signals even if one or more of the signal warrants has been satisfied.”

One of the recommended alternatives in the MUTCD is to install all-way STOP control at the intersection. All-way STOP control is generally recommended at locations where the volume of traffic on the intersecting streets is approximately even and when the hourly volumes equal at least 300 vehicles per hour on the major street approaches and at least 200 vehicles per hour on the minor street approaches. The High Street intersection with Ward Street and French Street meets these criteria. Capacity analysis of the intersection under all-way STOP control is summarized in Table 7 and the analysis worksheets are provided in the Appendix.

As shown in Table 7, with implementation of all-way STOP control, the High Street and Ward Street/French Street intersection can operate at an overall LOS D during both peak hours under projected 2023 design year conditions with all approaches operating below capacity. Both Ward Street and French Street approaches would operate at acceptable levels (LOS S to D). Due to the directional flow of commuter traffic on High Street, the higher volume westbound approach during the AM peak hour would operate with longer delays at LOS E. Similarly, during the PM peak hour, the higher volume eastbound approach would also operate at LOS E during this time period. As the table shows, the proposed development will have a minimal impact on this intersection with no changes in level of service expected. Installation of all-way STOP control should also help to reduce the frequency of accidents that are likely caused by the limited sight distances on the minor street approaches.

It is therefore recommended that, independent of the residential development project, the Town of Hingham consider installing all-way STOP control at this intersection. STOP signs (R1-1) and stop lines should be placed on all four intersection approaches with “All Way” plaques (R1-3P) mounted beneath the STOP signs. In addition, advance “Stop Ahead” warning signs (W3-1) should be placed on all approaches to warn motorists of the upcoming traffic control. To further enhance the safety of the intersection and draw attention to the new STOP control, the Town of

⁵ *Manual on Uniform Traffic Control Devices for Streets and Highways, 2009 Edition*; US Department of Transportation - Federal Highway Administration; Washington, DC; Revised May 2012.

Hingham may wish to install an overhead flashing beacon with flashing red indications for all four intersection approaches.

Table 7
Level-of-Service Analysis Summary - With Improvements

Location/Peak Hour Movement	2023 No-Build				2023 Build			
	v/c ^a	Del. ^b	LOS ^c	Queue ^d	v/c	Del.	LOS	Queue
High Street at Ward Street and French Street								
<i>Weekday AM Peak</i>								
NB All	0.72	25.0	C	145	0.75	27.3	D	160
EB All	0.49	16.6	C	75	0.50	17.0	C	75
WB All	0.89	40.2	E	255	0.90	42.5	E	265
SB All	0.27	13.1	B	50	0.27	13.3	B	50
Overall	---	28.1	D	---	---	29.8	D	---
<i>Weekday PM Peak</i>								
NB All	0.78	30.7	D	170	0.80	33.0	D	190
EB All	0.87	40.7	E	235	0.88	42.7	E	240
WB All	0.73	27.7	D	150	0.75	29.9	D	160
SB All	0.38	16.2	C	50	0.39	16.7	C	50
Overall	---	31.4	D	---	---	33.3	D	---

^a Volume-to-capacity ratio
^b Average control delay in seconds per vehicle
^c Level of service
^d 95th percentile queue in vehicles.

CONCLUSIONS

Existing and future conditions at the study area intersections have been described and analyzed with respect to traffic operations and the impact of the proposed site development. Conclusions of this effort and recommendations are presented below.

- As proposed, the site will be developed by constructing 10 new buildings on the site containing a total of 36 condominium units. Site access is proposed onto Ward Street via an existing subdivision street to be named Viking Lane.
- The accident investigation revealed that the High Street and Ward Street/French Street intersection has experienced over five accidents per year and has a calculated crash rate significantly higher than the statewide average.

- The available sight distances to the north and south of Viking Lane exceed both minimum and desirable distances based on the observed speeds and safe operation can therefore be expected. It is recommended that any proposed landscaping or signs in the vicinity of Viking Lane intersection with Ward Street be kept low to the ground or set back sufficiently so as not to impede the available sight distances.
- The proposed condominium project is expected to generate 23 to 26 vehicle trips (total entering and exiting) during the weekday AM and PM peak hours, respectively. Once distributed onto the adjacent roadways, the development will add at most 17 to 20 additional peak hour vehicles to Ward Street to the north of the site. These increases represent approximately one additional vehicle every three minutes, on average, and represent an increase in traffic on Ward Street of approximately 3 percent. Negligible volume increases are expected on Ward Street to the south of the site.
- The Viking Lane intersection with Ward Street will operate at desirable levels of service (LOS B) during the peak hours with little impact to traffic flow along Ward Street.
- The Ward Street and French Street approaches to High Street are projected to operate at LOS F by 2023, with or without the proposed development traffic. It is recommended that the Town of Hingham consider installation of all-way STOP control at this intersection. Such traffic control would significantly improve traffic operations as well as improved safety.
- The project will have a negligible impact on traffic operations at the Cushing Street and Ward Street intersection and at the Ward Street intersection with the Ward Street Extension.
- It is recommended that a sidewalk be constructed along Viking Lane connecting the existing sidewalk on Ward Street with the proposed buildings to provide safe pedestrian access. In addition, a crosswalk should be striped across Viking Lane at its intersection with Ward Street and a STOP sign and stop line should be installed on the Viking Lane approach.

APPENDIX

Traffic Count Data
Seasonal/Historical Adjustment Data and Crash Rate Worksheets
Trip Generation and Distribution Worksheets
Capacity Analysis Methodology and Worksheets

Traffic Count Data

Accurate Counts

Location : Ward Street
 Location : South of High Street
 City/State: Hingham, MA

978-664-2565

16001VOL

Start Time	06-Apr-16 Wed	NB		Hour Totals		SB		Hour Totals		Combined Totals	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		2	34			0	42				
12:15		1	50			1	29				
12:30		4	40			2	41				
12:45		1	48	8	172	0	40	3	152	11	324
01:00		2	40			0	41				
01:15		0	43			0	25				
01:30		0	51			0	25				
01:45		2	46	4	180	0	30	0	121	4	301
02:00		0	35			0	33				
02:15		0	53			1	48				
02:30		0	46			0	43				
02:45		0	63	0	197	1	47	2	171	2	368
03:00		1	57			0	41				
03:15		0	65			0	40				
03:30		1	66			0	52				
03:45		0	85	2	273	1	54	1	187	3	460
04:00		0	59			1	38				
04:15		0	59			3	56				
04:30		2	53			1	58				
04:45		1	44	3	215	2	61	7	213	10	428
05:00		4	70			2	44				
05:15		4	74			2	72				
05:30		8	54			5	61				
05:45		14	67	30	265	1	60	10	237	40	502
06:00		21	52			8	59				
06:15		11	60			6	54				
06:30		26	53			14	36				
06:45		44	51	102	216	18	39	46	188	148	404
07:00		40	35			42	25				
07:15		78	30			37	39				
07:30		77	35			32	27				
07:45		61	25	256	125	37	19	148	110	404	235
08:00		78	36			39	20				
08:15		43	21			50	16				
08:30		45	15			49	16				
08:45		48	25	214	97	31	25	169	77	383	174
09:00		30	17			33	8				
09:15		40	17			30	4				
09:30		20	18			33	4				
09:45		37	13	127	65	43	7	139	23	266	88
10:00		34	16			26	5				
10:15		37	10			37	4				
10:30		45	6			36	5				
10:45		36	2	152	34	26	2	125	16	277	50
11:00		34	9			33	4				
11:15		42	5			36	2				
11:30		39	5			33	4				
11:45		41	6	156	25	46	3	148	13	304	38
Total		1054	1864			798	1508			1852	3372
Percent		36.1%	63.9%			34.6%	65.4%			35.5%	64.5%

Accurate Counts

Location : Ward Street
 Location : South of High Street
 City/State: Hingham, MA

978-664-2565

16001VOL

Start Time	07-Apr-16 Thu	NB		Hour Totals		SB		Hour Totals		Combined Totals	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		2	52			0	45				
12:15		1	45			2	35				
12:30		3	37			0	78				
12:45		2	44	8	178	1	65	3	223	11	401
01:00		0	63			1	42				
01:15		0	49			0	37				
01:30		1	47			1	40				
01:45		1	37	2	196	0	32	2	151	4	347
02:00		1	31			1	36				
02:15		0	57			0	30				
02:30		1	49			0	37				
02:45		1	62	3	199	1	65	2	168	5	367
03:00		0	52			1	60				
03:15		0	47			0	69				
03:30		2	52			0	64				
03:45		0	63	2	214	1	64	2	257	4	471
04:00		0	40			1	47				
04:15		0	55			7	61				
04:30		1	59			0	117				
04:45		1	57	2	211	6	108	14	333	16	544
05:00		2	53			3	57				
05:15		4	55			0	74				
05:30		10	65			7	78				
05:45		20	60	36	233	1	81	11	290	47	523
06:00		20	56			8	110				
06:15		15	59			14	94				
06:30		30	28			12	89				
06:45		64	39	129	182	27	48	61	341	190	523
07:00		41	48			44	91				
07:15		87	38			36	74				
07:30		63	33			31	42				
07:45		77	26	268	145	35	56	146	263	414	408
08:00		55	37			31	11				
08:15		42	32			56	21				
08:30		50	21			38	14				
08:45		47	27	194	117	51	14	176	60	370	177
09:00		60	16			31	19				
09:15		40	29			50	9				
09:30		47	21			39	8				
09:45		37	15	184	81	47	6	167	42	351	123
10:00		26	19			26	3				
10:15		37	23			40	7				
10:30		44	14			27	6				
10:45		38	10	145	66	40	6	133	22	278	88
11:00		51	9			48	4				
11:15		39	9			46	1				
11:30		40	10			40	0				
11:45		41	6	171	34	49	0	183	5	354	39
Total		1144	1856			900	2155			2044	4011
Percent		38.1%	61.9%			29.5%	70.5%			33.8%	66.2%
Grand Total		2198	3720			1698	3663			3896	7383
Percent		37.1%	62.9%			31.7%	68.3%			34.5%	65.5%
ADT		ADT 5,640		AADT 5,640							

Accurate Counts

978-664-2565

16001VOL

Location : Ward Street
 Location : South of High Street
 City/State: Hingham, MA

Start Time	04-Apr-16		Tue		Wed		Thu		Fri		Sat		Sun		Week Average	
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
12:00 AM	*	*	*	*	8	3	8	3	*	*	*	*	*	*	8	3
01:00	*	*	*	*	4	0	2	2	*	*	*	*	*	*	3	1
02:00	*	*	*	*	0	2	3	2	*	*	*	*	*	*	2	2
03:00	*	*	*	*	2	1	2	2	*	*	*	*	*	*	2	2
04:00	*	*	*	*	3	7	2	14	*	*	*	*	*	*	2	10
05:00	*	*	*	*	30	10	36	11	*	*	*	*	*	*	33	10
06:00	*	*	*	*	102	46	129	61	*	*	*	*	*	*	116	54
07:00	*	*	*	*	256	148	268	146	*	*	*	*	*	*	262	147
08:00	*	*	*	*	214	169	194	176	*	*	*	*	*	*	204	172
09:00	*	*	*	*	127	139	184	167	*	*	*	*	*	*	156	153
10:00	*	*	*	*	152	125	145	133	*	*	*	*	*	*	148	129
11:00	*	*	*	*	156	148	171	183	*	*	*	*	*	*	164	166
12:00 PM	*	*	*	*	172	152	178	223	*	*	*	*	*	*	175	188
01:00	*	*	*	*	180	121	196	151	*	*	*	*	*	*	188	136
02:00	*	*	*	*	197	171	199	168	*	*	*	*	*	*	198	170
03:00	*	*	*	*	273	187	214	257	*	*	*	*	*	*	244	222
04:00	*	*	*	*	215	213	211	333	*	*	*	*	*	*	213	273
05:00	*	*	*	*	265	237	233	290	*	*	*	*	*	*	249	264
06:00	*	*	*	*	216	188	182	341	*	*	*	*	*	*	199	264
07:00	*	*	*	*	125	110	145	263	*	*	*	*	*	*	135	186
08:00	*	*	*	*	97	77	117	60	*	*	*	*	*	*	107	68
09:00	*	*	*	*	65	23	81	42	*	*	*	*	*	*	73	32
10:00	*	*	*	*	34	16	66	22	*	*	*	*	*	*	50	19
11:00	*	*	*	*	25	13	34	5	*	*	*	*	*	*	30	9
Lane	0	0	0	0	2918	2306	3000	3055	0	0	0	0	0	0	2961	2680
Day	0	0	0	0	5224	6055	6055	11:00	0	0	0	0	0	0	5641	
AM Peak	-	-	-	-	07:00	08:00	07:00	11:00	-	-	-	-	-	-	07:00	08:00
Vol.	-	-	-	-	256	169	268	183	-	-	-	-	-	-	262	172
PM Peak	-	-	-	-	15:00	17:00	17:00	18:00	-	-	-	-	-	-	17:00	16:00
Vol.	-	-	-	-	273	237	233	341	-	-	-	-	-	-	249	273

Comb. Total 0 0 5224 6055 0 0 5641

ADT ADT 5,640 AADT 5,640 6055 0 0 5641

Accurate Counts
978-664-2565

Location : Ward Street
Location : South of High Street
City/State: Hingham, MA

16001SPD

Start Time	1	4	7	10	13	16	19	22	25	28	31	34	37	40	Total	85th Percent	95th Percent
04/07/16	3	6	9	12	15	18	21	24	27	30	33	36	39	43	3000	35	37
01:00	0	0	0	0	0	0	0	0	0	1	2	2	1	1	8	35	37
02:00	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	32	32
03:00	0	0	0	0	0	0	0	0	0	2	0	1	0	0	3	34	35
04:00	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2	29	29
05:00	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2	32	32
06:00	0	0	0	0	0	0	0	0	3	8	14	9	1	1	36	34	35
07:00	1	0	0	1	1	2	4	3	17	52	95	64	25	6	268	36	38
08:00	1	0	0	0	0	0	0	0	2	36	76	51	20	8	194	35	37
09:00	3	0	0	0	0	0	2	5	15	43	62	41	12	1	184	34	36
10:00	0	0	0	0	0	0	0	1	11	29	50	38	12	4	145	35	37
11:00	1	0	0	0	0	0	0	1	12	44	81	25	4	3	171	33	35
12 PM	0	0	0	0	0	0	0	1	18	36	74	36	10	3	178	34	36
13:00	0	0	0	0	0	0	0	1	23	65	70	29	6	2	196	33	35
14:00	0	0	0	0	1	1	2	10	28	59	67	28	3	0	199	33	35
15:00	0	0	0	0	0	0	0	2	22	63	78	34	13	2	214	34	36
16:00	0	0	0	0	0	1	3	8	28	56	77	31	6	1	211	33	35
17:00	2	0	0	0	0	3	3	3	12	60	98	39	11	2	233	34	35
18:00	0	0	0	0	0	0	4	5	31	56	55	22	6	3	182	33	35
19:00	0	0	0	0	1	1	3	5	24	38	50	17	5	1	145	33	35
20:00	0	0	0	0	0	0	0	3	22	30	38	23	1	0	117	33	35
21:00	2	0	0	0	0	0	0	1	21	19	20	11	7	0	81	34	37
22:00	0	0	0	0	0	0	1	2	11	19	24	3	5	1	66	32	37
23:00	2	0	0	0	0	0	0	0	4	6	13	6	2	1	34	34	36
Total	13	0	0	1	3	9	22	53	307	745	1092	543	169	43	3000	35	37
Percent	0.4%	0.0%	0.0%	0.0%	0.1%	0.3%	0.7%	1.8%	10.2%	24.8%	36.4%	18.1%	5.6%	1.4%			
AM Peak	09:00																
Vol.	3			1	1	2	4	5	17	52	95	64	25	8	268		
PM Peak	17:00																
Vol.	2			1	1	3	4	10	31	65	98	39	13	3	233		
Grand Total	22	0	0	2	14	20	41	90	536	1316	2161	1149	449	118	5918		
Percent	0.4%	0.0%	0.0%	0.0%	0.2%	0.3%	0.7%	1.5%	9.1%	22.2%	36.5%	19.4%	7.6%	2.0%			

Statistics
 10 MPH Pace Speed : 27-36 MPH
 Number in Pace : 4805
 Percent in Pace : 81.2%
 Number of Vehicles > 30 MPH : 3877
 Percent of Vehicles > 30 MPH : 65.5%
 Mean Speed(Average) : 31 MPH

Ron Müller & Associates

Traffic Engineering and Consulting Services

File Name : 16001 High-French AM

Site Code : 16001

Start Date : 4/7/2016

Page No : 1

E-W Street: High Street

N-S Street: French Street-Ward Street

Groups Printed- Cars - Trucks

Start Time	French Street From North					High Street From East					Ward Street From South					High Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	3	18	9	0	30	5	67	1	0	73	27	10	8	0	45	2	26	6	0	34	182
07:15 AM	5	14	5	2	26	7	90	5	0	102	57	18	22	0	97	3	38	9	0	50	275
07:30 AM	5	7	10	2	24	4	81	2	1	88	20	26	25	1	72	5	51	9	1	66	250
07:45 AM	1	9	11	0	21	15	89	4	0	108	31	30	20	0	81	4	39	6	0	49	259
Total	14	48	35	4	101	31	327	12	1	371	135	84	75	1	295	14	154	30	1	199	966
08:00 AM	6	17	14	0	37	7	90	7	0	104	32	16	10	0	58	2	31	8	0	41	240
08:15 AM	7	28	10	0	45	12	68	7	2	89	10	23	14	0	47	1	45	7	0	53	234
08:30 AM	7	21	20	0	48	11	62	7	0	80	19	24	19	0	62	0	29	5	0	34	224
08:45 AM	4	29	9	1	43	9	54	2	0	65	9	30	8	0	47	2	31	5	0	38	193
Total	24	95	53	1	173	39	274	23	2	338	70	93	51	0	214	5	136	25	0	166	891
Grand Total	38	143	88	5	274	70	601	35	3	709	205	177	126	1	509	19	290	55	1	365	1857
Apprch %	13.9	52.2	32.1	1.8		9.9	84.8	4.9	0.4		40.3	34.8	24.8	0.2		5.2	79.5	15.1	0.3		
Total %	2	7.7	4.7	0.3	14.8	3.8	32.4	1.9	0.2	38.2	11	9.5	6.8	0.1	27.4	1	15.6	3	0.1	19.7	
Cars	36	143	85	5	269	70	584	32	3	689	199	173	119	1	492	18	272	53	1	344	1794
% Cars	94.7	100	96.6	100	98.2	100	97.2	91.4	100	97.2	97.1	97.7	94.4	100	96.7	94.7	93.8	96.4	100	94.2	96.6
Trucks	2	0	3	0	5	0	17	3	0	20	6	4	7	0	17	1	18	2	0	21	63
% Trucks	5.3	0	3.4	0	1.8	0	2.8	8.6	0	2.8	2.9	2.3	5.6	0	3.3	5.3	6.2	3.6	0	5.8	3.4

Ron Müller & Associates

Traffic Engineering and Consulting Services

File Name : 16001 High-French AM

Site Code : 16001

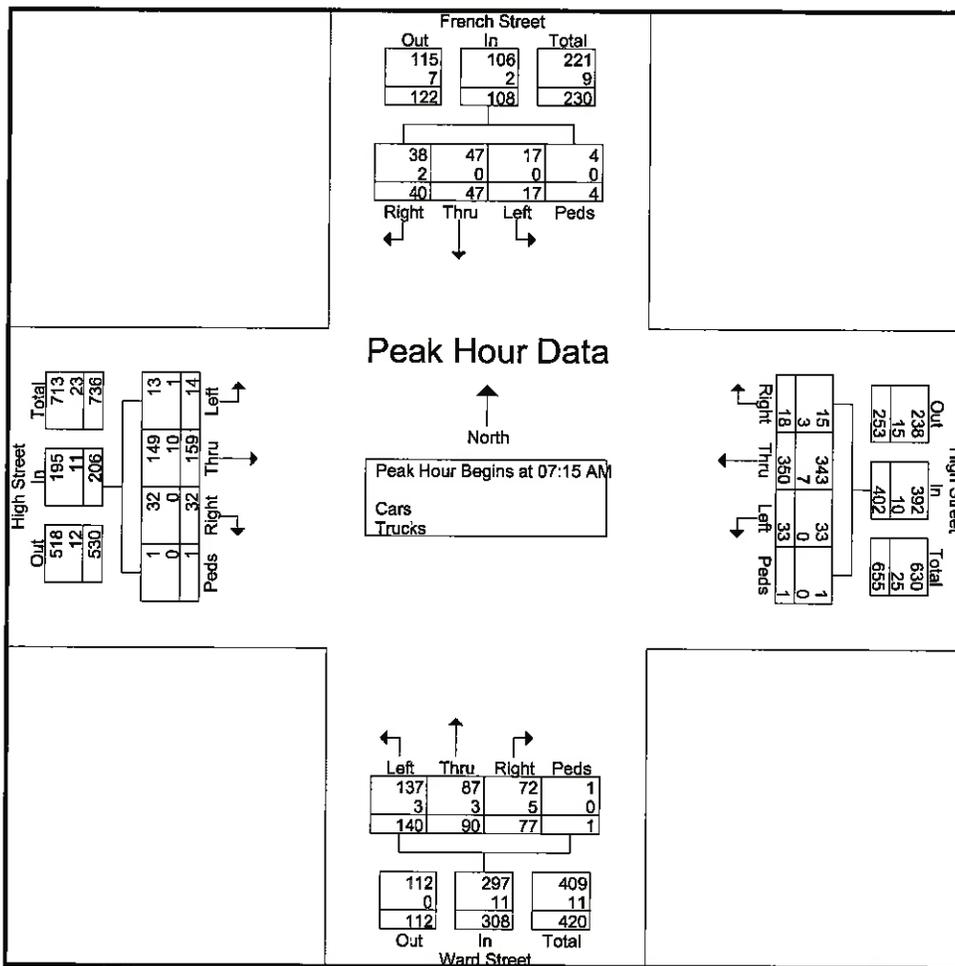
Start Date : 4/7/2016

Page No : 2

E-W Street: High Street

N-S Street: French Street-Ward Street

Start Time	French Street From North					High Street From East					Ward Street From South					High Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	5	14	5	2	26	7	90	5	0	102	57	18	22	0	97	3	38	9	0	50	275
07:30 AM	5	7	10	2	24	4	81	2	1	88	20	26	25	1	72	5	51	9	1	66	250
07:45 AM	1	9	11	0	21	15	89	4	0	108	31	30	20	0	81	4	39	6	0	49	259
08:00 AM	6	17	14	0	37	7	90	7	0	104	32	16	10	0	58	2	31	8	0	41	240
Total Volume	17	47	40	4	108	33	350	18	1	402	140	90	77	1	308	14	159	32	1	206	1024
% App. Total	15.7	43.5	37	3.7		8.2	87.1	4.5	0.2		45.5	29.2	25	0.3		6.8	77.2	15.5	0.5		
PHF	.708	.691	.714	.500	.730	.550	.972	.643	.250	.931	.614	.750	.770	.250	.794	.700	.779	.889	.250	.780	.931
Cars	17	47	38	4	106	33	343	15	1	392	137	87	72	1	297	13	149	32	1	195	990
% Cars	100	100	95.0	100	98.1	100	98.0	83.3	100	97.5	97.9	96.7	93.5	100	96.4	92.9	93.7	100	100	94.7	96.7
Trucks	0	0	2	0	2	0	7	3	0	10	3	3	5	0	11	1	10	0	0	11	34
% Trucks	0	0	5.0	0	1.9	0	2.0	16.7	0	2.5	2.1	3.3	6.5	0	3.6	7.1	6.3	0	0	5.3	3.3



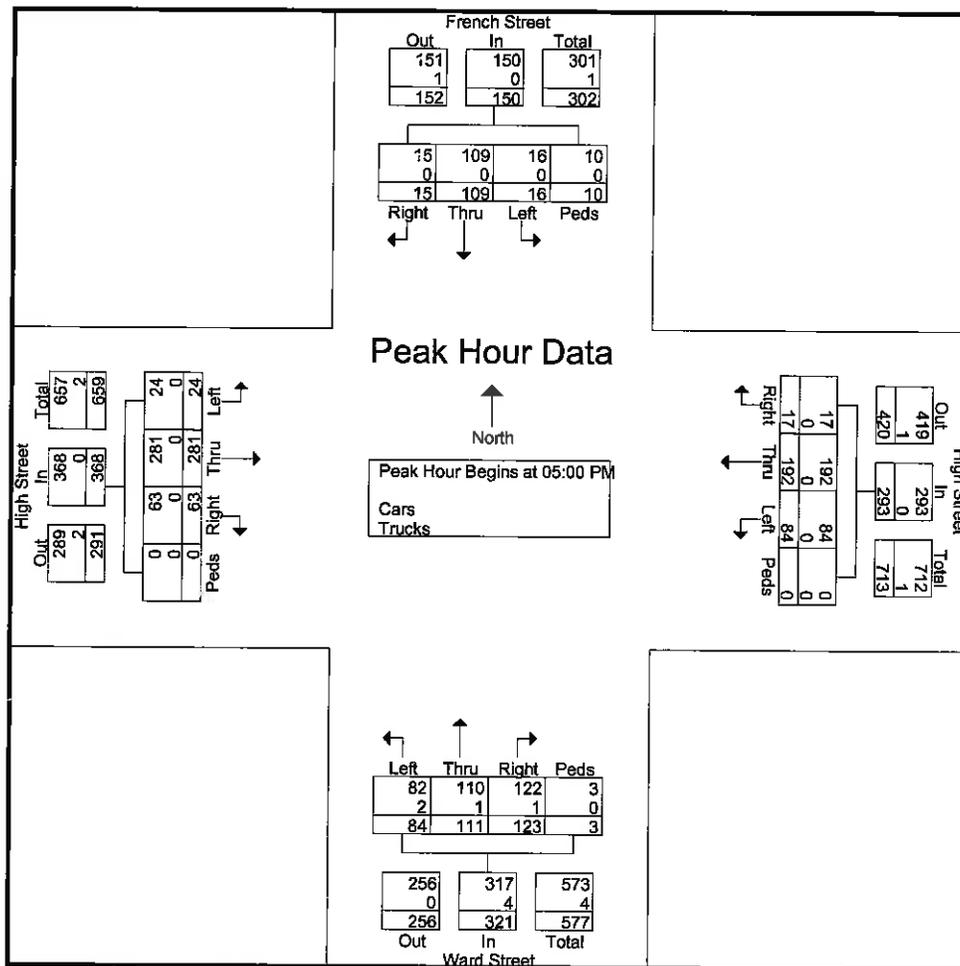
E-W Street: High Street
 N-S Street: French St.-Ward St.

Groups Printed- Cars - Trucks

Start Time	French Street From North					High Street From East					Ward Street From South					High Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
04:00 PM	5	11	4	1	21	12	40	5	0	57	13	29	24	0	66	8	44	3	0	55	199
04:15 PM	3	22	3	0	28	6	46	6	0	58	16	21	22	1	60	3	46	11	0	60	206
04:30 PM	4	18	5	1	28	15	38	4	0	57	9	15	22	0	46	6	67	17	0	90	221
04:45 PM	5	26	5	3	39	21	44	4	0	69	18	26	22	0	66	5	49	10	0	64	238
Total	17	77	17	5	116	54	168	19	0	241	56	91	90	1	238	22	206	41	0	269	864
05:00 PM	4	19	2	2	27	27	54	5	0	86	25	33	27	1	86	9	63	8	0	80	279
05:15 PM	4	36	1	4	45	24	45	6	0	75	15	40	38	0	93	8	59	13	0	80	293
05:30 PM	3	23	7	2	35	18	48	2	0	68	19	17	37	0	73	4	90	16	0	110	286
05:45 PM	5	31	5	2	43	15	45	4	0	64	25	21	21	2	69	3	69	26	0	98	274
Total	16	109	15	10	150	84	192	17	0	293	84	111	123	3	321	24	281	63	0	368	1132
Grand Total	33	186	32	15	266	138	360	36	0	534	140	202	213	4	559	46	487	104	0	637	1996
Apprch %	12.4	69.9	12	5.6		25.8	67.4	6.7	0		25	36.1	38.1	0.7		7.2	76.5	16.3	0		
Total %	1.7	9.3	1.6	0.8	13.3	6.9	18	1.8	0	26.8	7	10.1	10.7	0.2	28	2.3	24.4	5.2	0	31.9	
Cars	33	186	32	15	266	138	360	36	0	534	136	200	211	4	551	46	486	104	0	636	1987
% Cars	100	100	100	100	100	100	100	100	0	100	97.1	99	99.1	100	98.6	100	99.8	100	0	99.8	99.5
Trucks	0	0	0	0	0	0	0	0	0	0	4	2	2	0	8	0	1	0	0	1	9
% Trucks	0	0	0	0	0	0	0	0	0	0	2.9	1	0.9	0	1.4	0	0.2	0	0	0.2	0.5

E-W Street: High Street
 N-S Street: French St.-Ward St.

Start Time	French Street From North					High Street From East					Ward Street From South					High Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	4	19	2	2	27	27	54	5	0	86	25	33	27	1	86	9	63	8	0	80	279
05:15 PM	4	36	1	4	45	24	45	6	0	75	15	40	38	0	93	8	59	13	0	80	293
05:30 PM	3	23	7	2	35	18	48	2	0	68	19	17	37	0	73	4	90	16	0	110	286
05:45 PM	5	31	5	2	43	15	45	4	0	64	25	21	21	2	69	3	69	26	0	98	274
Total Volume	16	109	15	10	150	84	192	17	0	293	84	111	123	3	321	24	281	63	0	368	1132
% App. Total	10.7	72.7	10	6.7		28.7	65.5	5.8	0		26.2	34.6	38.3	0.9		6.5	76.4	17.1	0		
PHF	.800	.757	.536	.625	.833	.778	.889	.708	.000	.852	.840	.694	.809	.375	.863	.667	.781	.606	.000	.836	.966
Cars	16	109	15	10	150	84	192	17	0	293	82	110	122	3	317	24	281	63	0	368	1128
% Cars	100	100	100	100	100	100	100	100	0	100	97.6	99.1	99.2	100	98.8	100	100	100	0	100	99.6
Trucks	0	0	0	0	0	0	0	0	0	0	2	1	1	0	4	0	0	0	0	0	4
% Trucks	0	0	0	0	0	0	0	0	0	0	2.4	0.9	0.8	0	1.2	0	0	0	0	0	0.4



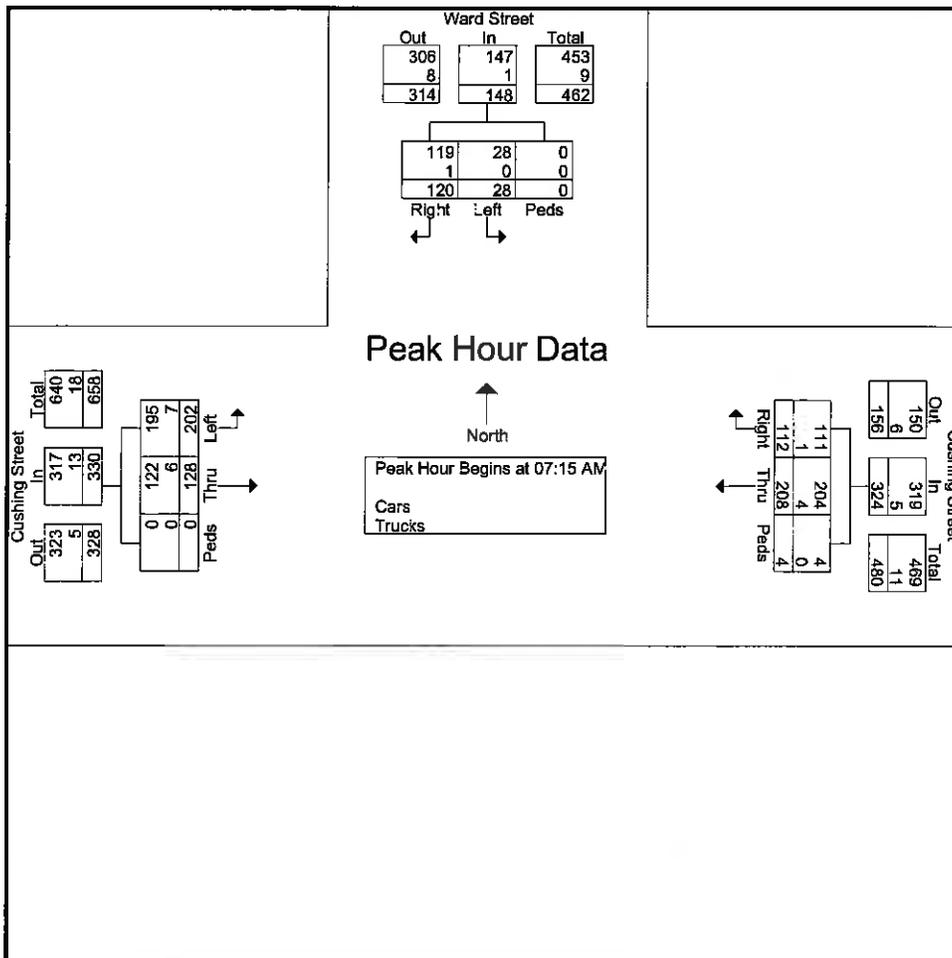
E-W Street: Cushing Street
 N-S Street: Ward Street

Groups Printed- Cars - Trucks

Start Time	Ward Street From North				Cushing Street From East				Cushing Street From West				Int. Total
	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	
07:00 AM	20	32	0	52	30	19	0	49	24	27	0	51	152
07:15 AM	4	25	0	29	50	37	0	87	63	28	0	91	207
07:30 AM	12	27	0	39	60	17	0	77	42	37	0	79	195
07:45 AM	8	31	0	39	49	25	0	74	49	33	0	82	195
Total	44	115	0	159	189	98	0	287	178	125	0	303	749
08:00 AM	4	37	0	41	49	33	4	86	48	30	0	78	205
08:15 AM	5	41	0	46	55	11	0	66	35	33	0	68	180
08:30 AM	5	29	0	34	68	12	1	81	51	38	0	89	204
08:45 AM	3	30	0	33	67	15	0	82	35	26	0	61	176
Total	17	137	0	154	239	71	5	315	169	127	0	296	765
Grand Total	61	252	0	313	428	169	5	602	347	252	0	599	1514
Apprch %	19.5	80.5	0		71.1	28.1	0.8		57.9	42.1	0		
Total %	4	16.6	0	20.7	28.3	11.2	0.3	39.8	22.9	16.6	0	39.6	
Cars	59	248	0	307	420	168	5	593	338	241	0	579	1479
% Cars	96.7	98.4	0	98.1	98.1	99.4	100	98.5	97.4	95.6	0	96.7	97.7
Trucks	2	4	0	6	8	1	0	9	9	11	0	20	35
% Trucks	3.3	1.6	0	1.9	1.9	0.6	0	1.5	2.6	4.4	0	3.3	2.3

E-W Street: Cushing Street
 N-S Street: Ward Street

Start Time	Ward Street From North				Cushing Street From East				Cushing Street From West				Int. Total
	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	4	25	0	29	50	37	0	87	63	28	0	91	207
07:30 AM	12	27	0	39	60	17	0	77	42	37	0	79	195
07:45 AM	8	31	0	39	49	25	0	74	49	33	0	82	195
08:00 AM	4	37	0	41	49	33	4	86	48	30	0	78	205
Total Volume	28	120	0	148	208	112	4	324	202	128	0	330	802
% App. Total	18.9	81.1	0		64.2	34.6	1.2		61.2	38.8	0		
PHF	.583	.811	.000	.902	.867	.757	.250	.931	.802	.865	.000	.907	.969
Cars	28	119	0	147	204	111	4	319	195	122	0	317	783
% Cars	100	99.2	0	99.3	98.1	99.1	100	98.5	96.5	95.3	0	96.1	97.6
Trucks	0	1	0	1	4	1	0	5	7	6	0	13	19
% Trucks	0	0.8	0	0.7	1.9	0.9	0	1.5	3.5	4.7	0	3.9	2.4



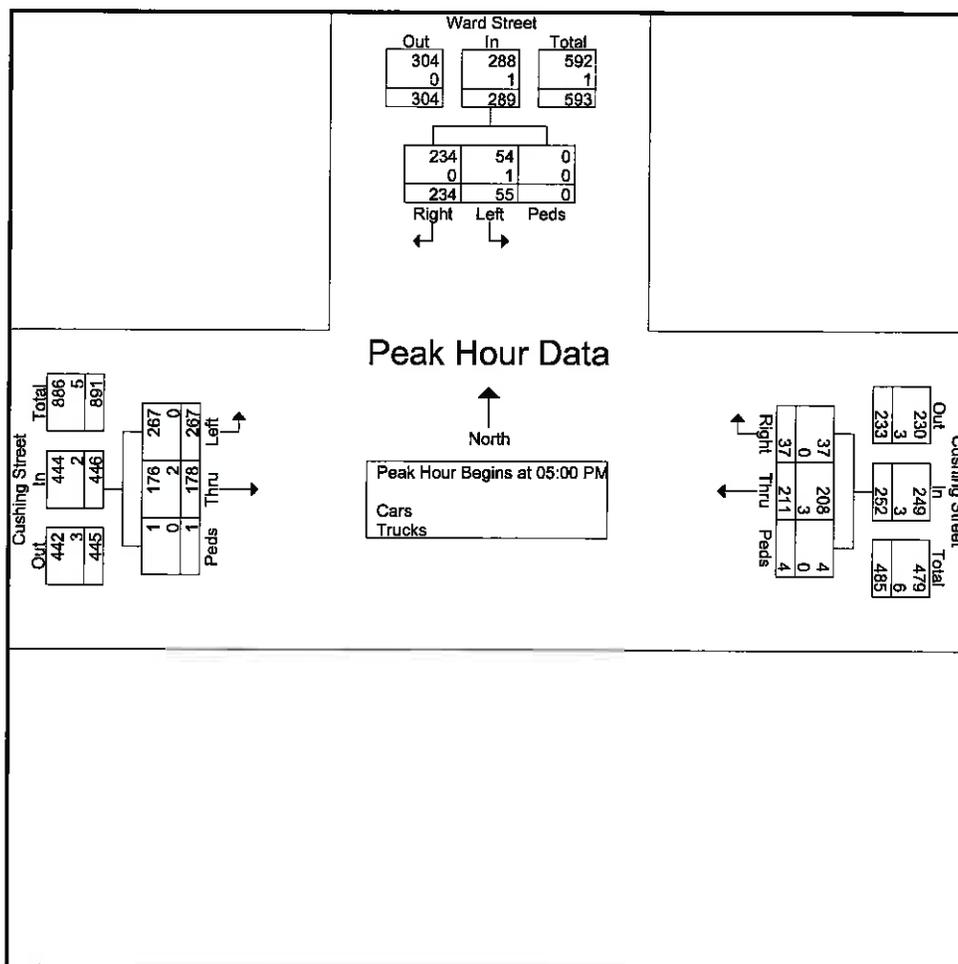
E-W Street: Cushing Street
 N-S Street: Ward Street

Groups Printed- Cars - Trucks

Start Time	Ward Street From North				Cushing Street From East				Cushing Street From West				Int. Total
	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	
04:00 PM	4	51	0	55	44	9	0	53	51	32	0	83	191
04:15 PM	8	48	0	56	53	8	0	61	49	47	0	96	213
04:30 PM	11	46	0	57	31	10	0	41	59	37	0	96	194
04:45 PM	21	52	0	73	42	17	2	61	43	43	0	86	220
Total	44	197	0	241	170	44	2	216	202	159	0	361	818
05:00 PM	10	44	0	54	55	14	2	71	67	49	0	116	241
05:15 PM	10	65	0	75	63	6	1	70	70	43	0	113	258
05:30 PM	13	63	0	76	47	8	1	56	73	37	0	110	242
05:45 PM	22	62	0	84	46	9	0	55	57	49	1	107	246
Total	55	234	0	289	211	37	4	252	267	178	1	446	987
Grand Total	99	431	0	530	381	81	6	468	469	337	1	807	1805
Apprch %	18.7	81.3	0		81.4	17.3	1.3		58.1	41.8	0.1		
Total %	5.5	23.9	0	29.4	21.1	4.5	0.3	25.9	26	18.7	0.1	44.7	
Cars	98	430	0	528	372	80	6	458	468	333	1	802	1788
% Cars	99	99.8	0	99.6	97.6	98.8	100	97.9	99.8	98.8	100	99.4	99.1
Trucks	1	1	0	2	9	1	0	10	1	4	0	5	17
% Trucks	1	0.2	0	0.4	2.4	1.2	0	2.1	0.2	1.2	0	0.6	0.9

E-W Street: Cushing Street
 N-S Street: Ward Street

Start Time	Ward Street From North				Cushing Street From East				Cushing Street From West				Int. Total
	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	10	44	0	54	55	14	2	71	67	49	0	116	241
05:15 PM	10	65	0	75	63	6	1	70	70	43	0	113	258
05:30 PM	13	63	0	76	47	8	1	56	73	37	0	110	242
05:45 PM	22	62	0	84	46	9	0	55	57	49	1	107	246
Total Volume	55	234	0	289	211	37	4	252	267	178	1	446	987
% App. Total	19	81	0		83.7	14.7	1.6		59.9	39.9	0.2		
PEF	.625	.900	.000	.860	.837	.661	.500	.887	.914	.908	.250	.961	.956
Cars	54	234	0	288	208	37	4	249	267	176	1	444	981
% Cars	98.2	100	0	99.7	98.6	100	100	98.8	100	98.9	100	99.6	99.4
Trucks	1	0	0	1	3	0	0	3	0	2	0	2	6
% Trucks	1.8	0	0	0.3	1.4	0	0	1.2	0	1.1	0	0.4	0.6



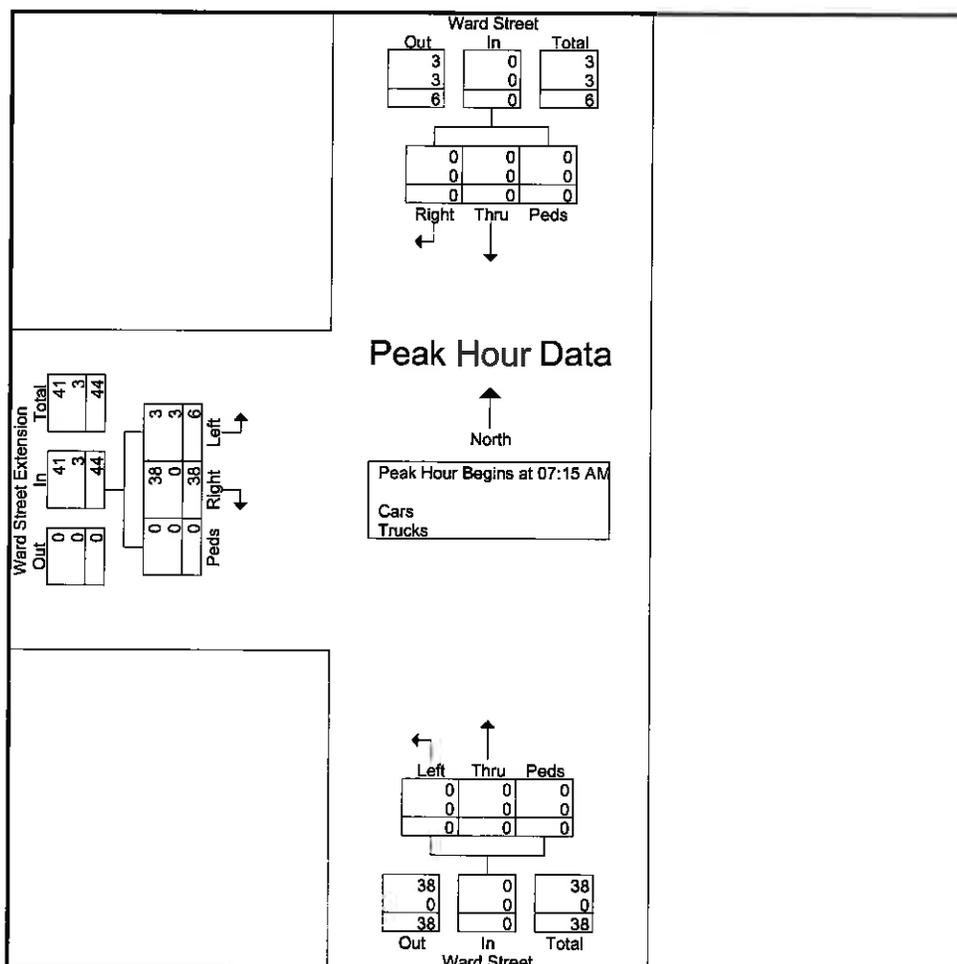
E-W Street: Ward Street Extension
 N-S Street: Ward Street

Groups Printed- Cars - Trucks

Start Time	Ward Street From North				Ward Street From South				Ward Street Extension From West				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
07:00 AM	0	0	0	0	0	0	0	0	3	18	0	21	21
07:15 AM	0	0	0	0	0	0	0	0	1	11	0	12	12
07:30 AM	0	0	0	0	0	0	0	0	3	8	0	11	11
07:45 AM	0	0	0	0	0	0	0	0	1	10	0	11	11
Total	0	0	0	0	0	0	0	0	8	47	0	55	55
08:00 AM	0	0	0	0	0	0	0	0	1	9	0	10	10
08:15 AM	0	0	0	0	0	0	0	0	3	13	0	16	16
08:30 AM	0	0	0	0	0	0	0	0	2	8	0	10	10
08:45 AM	0	0	0	0	0	0	0	0	2	6	0	8	8
Total	0	0	0	0	0	0	0	0	8	36	0	44	44
Grand Total	0	0	0	0	0	0	0	0	16	83	0	99	99
Apprch %	0	0	0	0	0	0	0	0	16.2	83.8	0		
Total %	0	0	0	0	0	0	0	0	16.2	83.8	0	100	
Cars	0	0	0	0	0	0	0	0	10	82	0	92	92
% Cars	0	0	0	0	0	0	0	0	62.5	98.8	0	92.9	92.9
Trucks	0	0	0	0	0	0	0	0	6	1	0	7	7
% Trucks	0	0	0	0	0	0	0	0	37.5	1.2	0	7.1	7.1

E-W Street: Ward Street Extension
 N-S Street: Ward Street

Start Time	Ward Street From North				Ward Street From South				Ward Street Extension From West				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
Peak Hour Analysis From 07:15 AM to 08:00 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	0	0	0	0	0	0	0	0	1	11	0	12	12
07:30 AM	0	0	0	0	0	0	0	0	3	8	0	11	11
07:45 AM	0	0	0	0	0	0	0	0	1	10	0	11	11
08:00 AM	0	0	0	0	0	0	0	0	1	9	0	10	10
Total Volume	0	0	0	0	0	0	0	0	6	38	0	44	44
% App. Total	0	0	0	0	0	0	0	0	13.6	86.4	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.500	.864	.000	.917	.917
Cars	0	0	0	0	0	0	0	0	3	38	0	41	41
% Cars	0	0	0	0	0	0	0	0	50.0	100	0	93.2	93.2
Trucks	0	0	0	0	0	0	0	0	3	0	0	3	3
% Trucks	0	0	0	0	0	0	0	0	50.0	0	0	6.8	6.8



File Name : 16001 Ward St-Ward St Ext PM
 Site Code : 16001
 Start Date : 3/30/2016
 Page No : 1

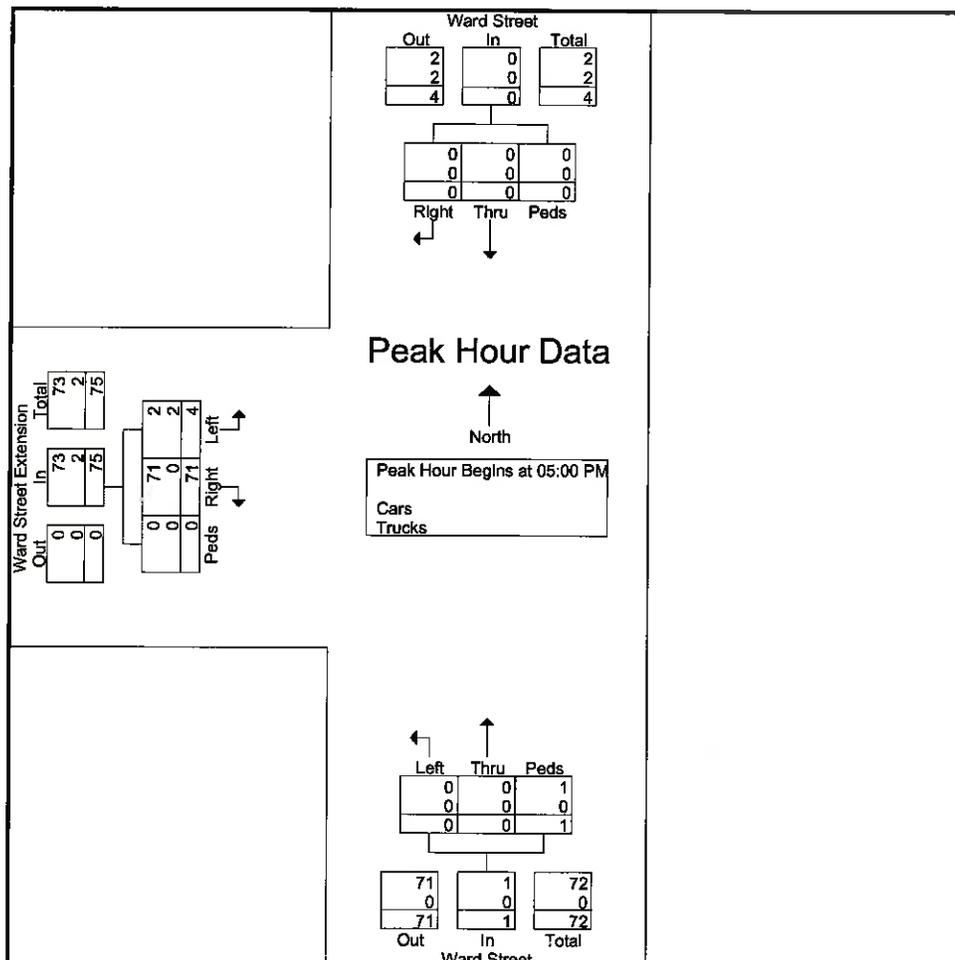
E-W Street: Ward Street Extension
 N-S Street: Ward Street

Groups Printed- Cars - Trucks

Start Time	Ward Street From North				Ward Street From South				Ward Street Extension From West				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
04:00 PM	0	0	0	0	0	0	0	0	1	12	0	13	13
04:15 PM	0	0	0	0	0	0	0	0	1	7	0	8	8
04:30 PM	0	0	0	0	0	0	0	0	1	27	1	29	29
04:45 PM	0	0	0	0	0	0	0	0	1	12	0	13	13
Total	0	0	0	0	0	0	0	0	4	58	1	63	63
05:00 PM	0	0	0	0	0	0	0	0	0	9	0	9	9
05:15 PM	0	0	0	0	0	0	0	0	2	14	0	16	16
05:30 PM	0	0	0	0	0	0	0	0	1	26	0	27	27
05:45 PM	0	0	0	0	0	0	1	1	1	22	0	23	24
Total	0	0	0	0	0	0	1	1	4	71	0	75	76
Grand Total	0	0	0	0	0	0	1	1	8	129	1	138	139
Apprch %	0	0	0	0	0	0	100		5.8	93.5	0.7		
Total %	0	0	0	0	0	0	0.7	0.7	5.8	92.8	0.7	99.3	
Cars	0	0	0	0	0	0	1	1	4	129	1	134	135
% Cars	0	0	0	0	0	0	100	100	50	100	100	97.1	97.1
Trucks	0	0	0	0	0	0	0	0	4	0	0	4	4
% Trucks	0	0	0	0	0	0	0	0	50	0	0	2.9	2.9

E-W Street: Ward Street Extension
 N-S Street: Ward Street

Start Time	Ward Street From North			App. Total	Ward Street From South			App. Total	Ward Street Extension From West			App. Total	Int. Total
	Thru	Right	Peds		Left	Thru	Peds		Left	Right	Peds		
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	0	0	0	0	0	0	0	0	0	9	0	9	9
05:15 PM	0	0	0	0	0	0	0	0	2	14	0	16	16
05:30 PM	0	0	0	0	0	0	0	0	1	26	0	27	27
05:45 PM	0	0	0	0	0	0	1	1	1	22	0	23	24
Total Volume	0	0	0	0	0	0	1	1	4	71	0	75	76
% App. Total	0	0	0	0	0	0	100		5.3	94.7	0		
PHF	.000	.000	.000	.000	.000	.000	.250	.250	.500	.683	.000	.694	.704
Cars	0	0	0	0	0	0	1	1	2	71	0	73	74
% Cars	0	0	0	0	0	0	100	100	50.0	100	0	97.3	97.4
Trucks	0	0	0	0	0	0	0	0	2	0	0	2	2
% Trucks	0	0	0	0	0	0	0	0	50.0	0	0	2.7	2.6



Seasonal/Historical Adjustment Data & Crash Rate Worksheets

STATION 7318 - HINGHAM - RTE.3 - BETWEEN EXITS 14 AND 15

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
2005	87,000	88,804	91,725	96,534	98,981	106,927	106,895	108,782	98,248	94,298	95,093	92,026	97,109
2006	83,878	88,500	93,541	94,036	97,168	101,493	104,458	103,714	96,982	94,006	91,503	92,813	95,174
2007	88,880	89,923	91,597	91,818	98,247	99,653	99,656	101,792	95,339	95,500	94,030	88,576	94,584
2008	89,419	93,856	92,600	92,464	94,682	94,660	99,019	98,704	88,097	91,202	87,772	88,382	92,571
Monthly Avg:	87,294	90,271	92,366	93,713	97,270	100,683	102,507	103,248	94,667	93,752	92,100	90,449	94,860

Factor to

Annual Avg.:	1.09	1.05	1.03	1.01	0.98	0.94	0.93	0.92	1.00	1.01	1.03	1.05
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Annual Growth:

2005-2006	-1.99%
2005-2007	-1.30%
2005-2008	-1.56%
2006-2007	-0.62%
2006-2008	-1.37%
2007-2008	-2.13%
Avg. Growth:	-1.49%

MassDOT Transportation Data Management System

STATION 7318 - HINGHAM - RTE 3 - BETWEEN EXITS 14 AND 15

YEAR #	YEAR	AADT	Traffic Growth Calculations																																				
			Year 1-2	Year 1-3	Year 1-4	Year 1-5	Year 1-6	Year 1-7	Year 1-8	Year 1-9	Year 1-10	Year 2-3	Year 2-4	Year 2-5	Year 2-6	Year 2-7	Year 2-8	Year 2-9	Year 2-10	Year 3-4	Year 3-5	Year 3-6	Year 3-7	Year 3-8	Year 3-9	Year 3-10	Year 4-5	Year 4-6	Year 4-7	Year 4-8	Year 4-9	Year 4-10	Year 5-6	Year 5-7	Year 5-8	Year 5-9	Year 5-10		
1	2006	95,174	-0.62%	-1.97%	-0.58%	-1.15%	-0.73%	-0.67%	-0.35%	0.12%	-3.34%	-0.56%	-1.30%	-0.76%	-0.68%	-0.32%	0.22%																						
2	2007	94,584																																					
3	2008	91,424																																					
4	2009																																						
5	2010	92,983																																					
6	2011	89,680																																					
7	2012	90,993																																					
8	2013	90,738																																					
9	2014	92,478																																					
10	2015	96,218																																					

Year 6-7	1.46%	Year 7-8	-0.28%	Year 8-9	1.92%	Year 9-10	4.04%
Year 6-8	0.59%	Year 7-9	0.82%	Year 8-10	3.02%		
Year 6-9	1.04%	Year 7-10	1.91%				
Year 6-10	1.82%						

2011-2015 Annual Growth:

Year 6-7	1.46%
Year 6-8	0.59%
Year 6-9	1.04%
Year 6-10	1.82%
Year 7-8	-0.28%
Year 7-9	0.82%
Year 7-10	1.91%
Year 8-9	1.92%
Year 8-10	3.02%
Year 9-10	4.04%
Avg. Growth:	1.63%

Year 3-4	0.85%
Year 3-5	-0.64%
Year 3-6	-0.12%
Year 3-7	-0.15%
Year 3-8	0.19%
Year 3-9	0.75%
Year 3-10	

2006-2015 Annual Average Traffic Growth Rate: -0.01%

Trip Generation & Distribution Worksheets

Institute of Transportation Engineers (ITE); 9th Edition
Land Use Code (LUC) 230 - Residential Condominium/Townhouse

Average Vehicle Trips Ends vs: Dwelling Units
 Independent Variable (X): 36

AVERAGE WEEKDAY DAILY

$\ln T = 0.87 \ln (X) + 2.46$
 $\ln T = 5.58$
 $T = 265.07$
 $T = 270$ vehicle trips
 with 50% (135 vpd) entering and 50% (135 vpd) exiting.

Use Avg. Rate for < 50 Units:

$T = 5.81 * (X)$
 $T = 209.16$
 $T = 210$ vehicle trips
 with 50% (105 vpd) entering and 50% (105 vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

$\ln T = 0.80 \ln (X) + 0.26$
 $\ln T = 3.13$
 $T = 22.87$
 $T = 23$ vehicle trips
 with 17% (4 vph) entering and 83% (19 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

$\ln T = 0.82 \ln (X) + 0.32$
 $\ln T = 3.26$
 $T = 26.05$
 $T = 26$ vehicle trips
 with 67% (17 vpd) entering and 37% (9 vpd) exiting.

SATURDAY DAILY

$T = 3.62 (X) + 427.93$
 $T = 558.25$
 $T = 560$ vehicle trips
 with 50% (280 vpd) entering and 50% (280 vpd) exiting.

Use Avg. Rate for < 50 Units:

$T = 5.67 * (X)$
 $T = 204.12$
 $T = 200$ vehicle trips
 with 50% (100 vpd) entering and 50% (100 vpd) exiting.

SATURDAY MIDDAY PEAK HOUR OF GENERATOR

$T = 0.29 (X) + 42.63$
 $T = 53.07$
 $T = 53$ vehicle trips
 with 54% (29 vph) entering and 47% (24 vph) exiting.

Use Max. Rate for < 50 Units:

$T = 0.93 * (X)$
 $T = 33.48$
 $T = 33$ vehicle trips
 with 54% (18 vph) entering and 47% (15 vph) exiting.

**Residence MCD/County to Workplace MCD/County Flows for Massachusetts: 2000
Sorted by Residence State-County, or State-County-County Subdivision (in 12 states)**

Residence State-County- MCD Name	Workplace State-County- MCD Name	Count	% of Total	High St. East	High St. West	French St.	Cushing St. East	Cushing St. South	High St. East	High St. West	French St.	Cushing St. East	Cushing St. South
Hingham town Plymouth Co. M/	Hingham town Plymouth Co. M/	2456	29%	30%	100%	40%	10%	20%	8.70%	0.00%	11.60%	2.90%	5.80%
Hingham town Plymouth Co. M/	Boston city Suffolk Co. MA	2304	27%						0.00%	27.20%	0.00%	0.00%	0.00%
Hingham town Plymouth Co. M/	Quincy city Norfolk Co. MA	836	10%	100%					0.00%	9.87%	0.00%	0.00%	0.00%
Hingham town Plymouth Co. M/	Weymouth town Norfolk Co. M/	473	6%	50%				50%	0.00%	2.79%	0.00%	0.00%	2.79%
Hingham town Plymouth Co. M/	Braintree town Norfolk Co. MA	379	4%	100%			100%		0.00%	4.47%	0.00%	0.00%	0.00%
Hingham town Plymouth Co. M/	Norwell town Norfolk Co. MA	270	3%						0.00%	0.00%	0.00%	3.19%	0.00%
Hingham town Plymouth Co. M/	Brockton city Plymouth Co. MA	193	2%	100%					0.00%	2.28%	0.00%	0.00%	0.00%
Hingham town Plymouth Co. M/	Cambridge city Middlesex Co. I	160	2%	100%					0.00%	1.89%	0.00%	0.00%	0.00%
Hingham town Plymouth Co. M/	Rockland town Plymouth Co. M.	156	2%						0.00%	0.00%	0.00%	0.00%	1.84%
Hingham town Plymouth Co. M/	Cohasset town Norfolk Co. MA	147	2%	100%				100%	1.74%	0.00%	0.00%	0.00%	0.00%
Hingham town Plymouth Co. M/	Canton town Norfolk Co. MA	106	1%						0.00%	0.00%	0.00%	0.00%	1.23%
Hingham town Plymouth Co. M/	Dedham town Norfolk Co. MA	101	1%						0.00%	0.00%	0.00%	0.00%	1.25%
Hingham town Plymouth Co. M/	Hanover town Plymouth Co. M/	93	1%						0.00%	0.00%	0.00%	0.00%	1.19%
Hingham town Plymouth Co. M/	Milton town Norfolk Co. MA	76	1%	100%					0.00%	0.00%	0.00%	0.00%	1.10%
Hingham town Plymouth Co. M/	Hull town Plymouth Co. MA	74	1%						0.87%	0.00%	0.00%	0.00%	0.00%
Hingham town Plymouth Co. M/	Newton city Middlesex Co. MA	69	1%						0.00%	0.00%	0.00%	0.00%	0.81%
Hingham town Plymouth Co. M/	Norwood town Norfolk Co. MA	69	1%						0.00%	0.00%	0.00%	0.00%	0.81%
Hingham town Plymouth Co. M/	Scituate town Plymouth Co. MA	65	1%	50%				50%	0.38%	0.00%	0.00%	0.00%	0.38%
Hingham town Plymouth Co. M/	Wellesley town Norfolk Co. MA	63	1%						0.00%	0.00%	0.00%	0.00%	0.74%
Hingham town Plymouth Co. M/	Waltham city Middlesex Co. MA	61	1%						0.00%	0.00%	0.00%	0.00%	0.72%
Hingham town Plymouth Co. M/	Marshfield town Plymouth Co. I	58	1%						0.00%	0.00%	0.00%	0.00%	0.68%
Hingham town Plymouth Co. M/	Framingham town Middlesex Co.	55	1%						0.00%	0.00%	0.00%	0.00%	0.65%
Hingham town Plymouth Co. M/	Randolph town Norfolk Co. MA	53	1%	100%					0.00%	0.63%	0.00%	0.00%	0.00%
Hingham town Plymouth Co. M/	Pembroke town Plymouth Co. I	51	1%						0.00%	0.00%	0.00%	0.00%	0.60%

8472

Total:	11.69%	49.12%	11.60%	6.09%	21.51%
Say:	15.00%	50.00%	10.00%	5.00%	20.00%

Source: U.S. Census Bureau
Internet Release date: July 25, 2003

Capacity Analysis Methodology and Worksheets

General

A primary result of capacity analysis is the assignment of levels of service to traffic facilities under various traffic flow conditions. The capacity analysis methodology is based on the concepts and procedures in the *Highway Capacity Manual (HCM)*; Transportation Research Board; Washington, D.C.; 2010. The concept of level of service (LOS) is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A level of service definition provides an index to quality of traffic flow in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety.

Six levels of service are defined for each type of facility. They are given letter designations from A to F, with LOS A representing the best operating conditions and LOS F the worst. Since the level of service of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of levels of service, depending on the time of day, day of week, or period of year. A description of the operating condition under each level of service is provided below:

- LOS A describes conditions with little to no delay to motorists.
- LOS B represents a desirable level with relatively low delay to motorists.
- LOS C describes conditions with average delays to motorists.
- LOS D describes operations where the influence of congestion becomes more noticeable. Delays are still within an acceptable range.
- LOS E represents operating conditions with high delay values. This level is considered by many agencies to be the limit of acceptable delay.
- LOS F is considered to be unacceptable to most drivers with high delay values that often occur, when arrival flow rates exceed the capacity of the intersection.

Unsignalized Intersections

Levels of service for unsignalized intersections are calculated using the operational analysis methodology of the HCM. The procedure accounts for lane configuration on both the minor and major street approaches, conflicting traffic stream volumes, and the type of intersection control (STOP, YIELD, or all-way STOP control). The definition of level of service for unsignalized intersections is a function of average *control* delay. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The level-of-service criteria for unsignalized intersections are shown in Table A-1.

Signalized Intersections

Levels of service for signalized intersections are also calculated using the operational analysis methodology of the HCM. The methodology for signalized intersections assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometries on average *control* delay. Control delay includes queue move-up time and stopped delay. Table A-1 summarizes the relationship between level of service and average control delay.

Table A-1
Level-of-Service Criteria for Intersections

<u>Level of Service</u>	<u>Unsignalized Criteria</u> <u>Average Control Delay</u> <u>In Seconds Per Vehicle</u>	<u>Signalized Criteria</u> <u>Average Control Delay</u> <u>In Seconds Per Vehicle</u>
A	≤ 10	≤ 10
B	10.1 to 15.0	10.1 to 20.0
C	15.1 to 25.0	20.1 to 35.0
D	25.1 to 35.0	35.1 to 55.0
E	35.1 to 50.0	55.1 to 80.0
F	>50	>80

For signalized intersections, this delay criterion may be applied in assigning level of service designations to individual lane groups, to individual intersection approaches, or to the entire intersection. For unsignalized intersections, this delay criterion may be applied in assigning level of service designations to individual lane groups or to individual intersection approaches.

Intersection

Int Delay, s/veh 4.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	208	132	214	115	29	124
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	4	4	2	2	1	1
Mvmt Flow	214	136	221	119	30	128

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	339	0	845
Stage 1	-	-	280
Stage 2	-	-	565
Critical Hdwy	4.14	-	6.41
Critical Hdwy Stg 1	-	-	5.41
Critical Hdwy Stg 2	-	-	5.41
Follow-up Hdwy	2.236	-	3.509
Pot Cap-1 Maneuver	1209	-	334
Stage 1	-	-	770
Stage 2	-	-	571
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1209	-	270
Mov Cap-2 Maneuver	-	-	270
Stage 1	-	-	770
Stage 2	-	-	462

Approach	EB	WB	SB
HCM Control Delay, s	5.3	0	13.8
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1209	-	-	-	566
HCM Lane V/C Ratio	0.177	-	-	-	0.279
HCM Control Delay (s)	8.6	0	-	-	13.8
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.6	-	-	-	1.1

Intersection

Int Delay, s/veh 16.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	14	161	32	33	354	18	141	91	79	17	47	40
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	Yield	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	5	5	5	3	3	3	4	4	4	2	2	2
Mvmt Flow	15	173	34	35	381	19	152	98	85	18	51	43

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	400	0	0	208	0	0	728	691	190	730	699	390
Stage 1	-	-	-	-	-	-	220	220	-	461	461	-
Stage 2	-	-	-	-	-	-	508	471	-	269	238	-
Critical Hdwy	4.15	-	-	4.13	-	-	7.14	6.54	6.24	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.14	5.54	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.14	5.54	-	6.12	5.52	-
Follow-up Hdwy	2.245	-	-	2.227	-	-	3.536	4.036	3.336	3.518	4.018	3.318
Pot Cap-1 Maneuver	1143	-	-	1357	-	-	336	365	847	338	364	658
Stage 1	-	-	-	-	-	-	778	717	-	581	565	-
Stage 2	-	-	-	-	-	-	544	556	-	737	708	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1143	-	-	1357	-	-	269	348	847	230	347	658
Mov Cap-2 Maneuver	-	-	-	-	-	-	269	348	-	230	347	-
Stage 1	-	-	-	-	-	-	766	706	-	572	546	-
Stage 2	-	-	-	-	-	-	446	538	-	563	697	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.6	0.6	47.5	18.1
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	396	1143	-	-	1357	-	-	385
HCM Lane V/C Ratio	0.844	0.013	-	-	0.026	-	-	0.29
HCM Control Delay (s)	47.5	8.2	0	-	7.7	0	-	18.1
HCM Lane LOS	E	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	8	0	-	-	0.1	-	-	1.2

Intersection

Int Delay, s/veh 0.9

Movement	NBL	NBT	SBT	SBR	SEL	SER
Vol, veh/h	0	304	112	0	6	38
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	4	2	0	7	7
Mvmt Flow	0	330	122	0	7	41

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	122	0	452
Stage 1	-	-	122
Stage 2	-	-	330
Critical Hdwy	4.1	-	6.47
Critical Hdwy Stg 1	-	-	5.47
Critical Hdwy Stg 2	-	-	5.47
Follow-up Hdwy	2.2	-	3.563
Pot Cap-1 Maneuver	1478	-	556
Stage 1	-	-	891
Stage 2	-	-	717
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1478	-	556
Mov Cap-2 Maneuver	-	-	556
Stage 1	-	-	891
Stage 2	-	-	717

Approach	NB	SB	SE
HCM Control Delay, s	0	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	NBL	NBT	SELn1	SELn2	SBT	SBR
Capacity (veh/h)	1478	-	556	916	-	-
HCM Lane V/C Ratio	-	-	0.012	0.045	-	-
HCM Control Delay (s)	0	-	11.6	9.1	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0.1	-	-

Intersection

Int Delay, s/veh 8.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	275	183	217	38	57	241
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	0	1	1	0	0
Mvmt Flow	286	191	226	40	59	251

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	268	0	1010
Stage 1	-	-	246
Stage 2	-	-	764
Critical Hdwy	4.1	-	6.4
Critical Hdwy Stg 1	-	-	5.4
Critical Hdwy Stg 2	-	-	5.4
Follow-up Hdwy	2.2	-	3.5
Pot Cap-1 Maneuver	1310	-	268
Stage 1	-	-	800
Stage 2	-	-	463
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1310	-	203
Mov Cap-2 Maneuver	-	-	203
Stage 1	-	-	800
Stage 2	-	-	350

Approach	EB	WB	SB
HCM Control Delay, s	5.1	0	22.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1310	-	-	-	511
HCM Lane V/C Ratio	0.219	-	-	-	0.607
HCM Control Delay (s)	8.5	0	-	-	22.3
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.8	-	-	-	4

Intersection

Int Delay, s/veh 22.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	25	289	65	87	198	18	87	114	127	16	112	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	Yield	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	0	0	0	0	0	0	1	1	1	0	0	0
Mvmt Flow	26	298	67	90	204	19	90	118	131	16	115	15

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	223	0	0	365	0	0	841	785	331	835	809	213
Stage 1	-	-	-	-	-	-	383	383	-	393	393	-
Stage 2	-	-	-	-	-	-	458	402	-	442	416	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.11	6.51	6.21	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.11	5.51	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.11	5.51	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.509	4.009	3.309	3.5	4	3.3
Pot Cap-1 Maneuver	1358	-	-	1205	-	-	286	326	713	289	317	832
Stage 1	-	-	-	-	-	-	642	614	-	636	609	-
Stage 2	-	-	-	-	-	-	585	602	-	598	595	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1358	-	-	1205	-	-	177	291	713	149	283	832
Mov Cap-2 Maneuver	-	-	-	-	-	-	177	291	-	149	283	-
Stage 1	-	-	-	-	-	-	627	599	-	621	557	-
Stage 2	-	-	-	-	-	-	416	551	-	383	581	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	2.4	60.9	32.5
HCM LOS			F	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	371	1358	-	-	1205	-	-	274
HCM Lane V/C Ratio	0.911	0.019	-	-	0.074	-	-	0.538
HCM Control Delay (s)	60.9	7.7	0	-	8.2	0	-	32.5
HCM Lane LOS	F	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	9.4	0.1	-	-	0.2	-	-	2.9

Intersection

Int Delay, s/veh 1.3

Movement	NBL	NBT	SBT	SBR	SEL	SER
Vol, veh/h	0	324	264	0	4	73
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	70	70	70	70	70	70
Heavy Vehicles, %	0	1	0	0	3	3
Mvmt Flow	0	463	377	0	6	104

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	377	0	840
Stage 1	-	-	377
Stage 2	-	-	463
Critical Hdwy	4.1	-	6.43
Critical Hdwy Stg 1	-	-	5.43
Critical Hdwy Stg 2	-	-	5.43
Follow-up Hdwy	2.2	-	3.527
Pot Cap-1 Maneuver	1193	-	334
Stage 1	-	-	691
Stage 2	-	-	632
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1193	-	334
Mov Cap-2 Maneuver	-	-	334
Stage 1	-	-	691
Stage 2	-	-	632

Approach	NB	SB	SE
HCM Control Delay, s	0	0	11.6
HCM LOS			B

Minor Lane/Major Mvmt	NBL	NBT	SELn1	SELn2	SBT	SBR
Capacity (veh/h)	1193	-	334	667	-	-
HCM Lane V/C Ratio	-	-	0.017	0.156	-	-
HCM Control Delay (s)	0	-	16	11.4	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	0.6	-	-

Intersection

Int Delay, s/veh 5.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	239	152	246	132	33	142
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	4	4	2	2	1	1
Mvmt Flow	246	157	254	136	34	146

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	390	0	971
Stage 1	-	-	322
Stage 2	-	-	649
Critical Hdwy	4.14	-	6.41
Critical Hdwy Stg 1	-	-	5.41
Critical Hdwy Stg 2	-	-	5.41
Follow-up Hdwy	2.236	-	3.509
Pot Cap-1 Maneuver	1158	-	282
Stage 1	-	-	737
Stage 2	-	-	522
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1158	-	216
Mov Cap-2 Maneuver	-	-	216
Stage 1	-	-	737
Stage 2	-	-	400

Approach	EB	WB	SB
HCM Control Delay, s	5.5	0	16.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1158	-	-	-	500
HCM Lane V/C Ratio	0.213	-	-	-	0.361
HCM Control Delay (s)	8.9	0	-	-	16.2
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.8	-	-	-	1.6

Intersection

Int Delay, s/veh 48.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	16	185	37	38	407	21	162	105	90	20	54	46
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	Yield	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	5	5	5	3	3	3	4	4	4	2	2	2
Mvmt Flow	17	199	40	41	438	23	174	113	97	22	58	49

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	460	0	0	239	0	0	837	795	219	841	804	449
Stage 1	-	-	-	-	-	-	253	253	-	531	531	-
Stage 2	-	-	-	-	-	-	584	542	-	310	273	-
Critical Hdwy	4.15	-	-	4.13	-	-	7.14	6.54	6.24	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.14	5.54	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.14	5.54	-	6.12	5.52	-
Follow-up Hdwy	2.245	-	-	2.227	-	-	3.536	4.036	3.336	3.518	4.018	3.318
Pot Cap-1 Maneuver	1085	-	-	1322	-	-	284	318	816	284	316	610
Stage 1	-	-	-	-	-	-	747	694	-	532	526	-
Stage 2	-	-	-	-	-	-	494	517	-	700	684	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1085	-	-	1322	-	-	212	299	816	169	297	610
Mov Cap-2 Maneuver	-	-	-	-	-	-	212	299	-	169	297	-
Stage 1	-	-	-	-	-	-	734	682	-	522	504	-
Stage 2	-	-	-	-	-	-	385	495	-	506	672	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.6	0.6	151.1	23.6
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	320	1085	-	-	1322	-	-	320
HCM Lane V/C Ratio	1.2	0.016	-	-	0.031	-	-	0.403
HCM Control Delay (s)	151.1	8.4	0	-	7.8	0	-	23.6
HCM Lane LOS	F	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	16.6	0	-	-	0.1	-	-	1.9

Intersection

Int Delay, s/veh 0.9

Movement	NBL	NBT	SBT	SBR	SEL	SER
Vol, veh/h	0	350	129	0	7	44
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	4	2	0	7	7
Mvmt Flow	0	380	140	0	8	48

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	140	0	140
Stage 1	-	-	-
Stage 2	-	-	380
Critical Hdwy	4.1	-	6.27
Critical Hdwy Stg 1	-	-	5.47
Critical Hdwy Stg 2	-	-	5.47
Follow-up Hdwy	2.2	-	3.363
Pot Cap-1 Maneuver	1456	-	895
Stage 1	-	-	875
Stage 2	-	-	681
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1456	-	895
Mov Cap-2 Maneuver	-	-	508
Stage 1	-	-	875
Stage 2	-	-	681

Approach	NB	SB	SE
HCM Control Delay, s	0	0	9.6
HCM LOS			A

Minor Lane/Major Mvmt	NBL	NBT	SELn1	SELn2	SBT	SBR
Capacity (veh/h)	1456	-	508	895	-	-
HCM Lane V/C Ratio	-	-	0.015	0.053	-	-
HCM Control Delay (s)	0	-	12.2	9.2	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0.2	-	-

Intersection

Int Delay, s/veh 14.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	316	210	249	44	65	277
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	0	1	1	0	0
Mvmt Flow	329	219	259	46	68	289

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	305	0	1159
Stage 1	-	-	282
Stage 2	-	-	877
Critical Hdwy	4.1	-	6.4
Critical Hdwy Stg 1	-	-	5.4
Critical Hdwy Stg 2	-	-	5.4
Follow-up Hdwy	2.2	-	3.5
Pot Cap-1 Maneuver	1267	-	218
Stage 1	-	-	770
Stage 2	-	-	410
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1267	-	153
Mov Cap-2 Maneuver	-	-	153
Stage 1	-	-	770
Stage 2	-	-	289

Approach	EB	WB	SB
HCM Control Delay, s	5.3	0	41.5
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1267	-	-	-	434
HCM Lane V/C Ratio	0.26	-	-	-	0.821
HCM Control Delay (s)	8.8	0	-	-	41.5
HCM Lane LOS	A	A	-	-	E
HCM 95th %tile Q(veh)	1	-	-	-	7.7

Intersection

Int Delay, s/veh 89.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	29	332	75	100	228	21	100	131	146	18	129	17
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	Yield	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	0	0	0	0	0	0	1	1	1	0	0	0
Mvmt Flow	30	342	77	103	235	22	103	135	151	19	133	18

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	257	0	0	420	0	0	968	904	381	960	931	246
Stage 1	-	-	-	-	-	-	441	441	-	452	452	-
Stage 2	-	-	-	-	-	-	527	463	-	508	479	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.11	6.51	6.21	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.11	5.51	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.11	5.51	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.509	4.009	3.309	3.5	4	3.3
Pot Cap-1 Maneuver	1320	-	-	1150	-	-	234	278	668	238	269	798
Stage 1	-	-	-	-	-	-	597	579	-	591	574	-
Stage 2	-	-	-	-	-	-	536	566	-	551	558	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1320	-	-	1150	-	-	114	241	668	93	234	798
Mov Cap-2 Maneuver	-	-	-	-	-	-	114	241	-	93	234	-
Stage 1	-	-	-	-	-	-	579	562	-	573	514	-
Stage 2	-	-	-	-	-	-	348	507	-	315	541	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	2.4	282.7	65.2
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	258	1320	-	-	1150	-	-	214
HCM Lane V/C Ratio	1.506	0.023	-	-	0.09	-	-	0.79
HCM Control Delay (s)	282.7	7.8	0	-	8.4	0	-	65.2
HCM Lane LOS	F	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	22.7	0.1	-	-	0.3	-	-	5.6

Intersection

Int Delay, s/veh 1.4

Movement	NBL	NBT	SBT	SBR	SEL	SER
Vol, veh/h	0	372	304	0	5	82
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	70	70	70	70	70	70
Heavy Vehicles, %	0	1	0	0	3	3
Mvmt Flow	0	531	434	0	7	117

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	434	0	965
Stage 1	-	-	434
Stage 2	-	-	531
Critical Hdwy	4.1	-	6.43
Critical Hdwy Stg 1	-	-	5.43
Critical Hdwy Stg 2	-	-	5.43
Follow-up Hdwy	2.2	-	3.527
Pot Cap-1 Maneuver	1136	-	282
Stage 1	-	-	651
Stage 2	-	-	588
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1136	-	282
Mov Cap-2 Maneuver	-	-	282
Stage 1	-	-	651
Stage 2	-	-	588

Approach	NB	SB	SE
HCM Control Delay, s	0	0	12.5
HCM LOS			B

Minor Lane/Major Mvmt	NBL	NBT	SELn1	SELn2	SBT	SBR
Capacity (veh/h)	1136	-	282	620	-	-
HCM Lane V/C Ratio	-	-	0.025	0.189	-	-
HCM Control Delay (s)	0	-	18.1	12.2	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	0.7	-	-

Intersection

Int Delay, s/veh 5.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	240	152	246	132	34	146
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	4	4	2	2	1	1
Mvmt Flow	247	157	254	136	35	151

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	390	0	974
Stage 1	-	-	322
Stage 2	-	-	652
Critical Hdwy	4.14	-	6.41
Critical Hdwy Stg 1	-	-	5.41
Critical Hdwy Stg 2	-	-	5.41
Follow-up Hdwy	2.236	-	3.509
Pot Cap-1 Maneuver	1158	-	280
Stage 1	-	-	737
Stage 2	-	-	520
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1158	-	214
Mov Cap-2 Maneuver	-	-	214
Stage 1	-	-	737
Stage 2	-	-	398

Approach	EB	WB	SB
HCM Control Delay, s	5.5	0	16.5
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1158	-	-	-	498
HCM Lane V/C Ratio	0.214	-	-	-	0.373
HCM Control Delay (s)	9	0	-	-	16.5
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.8	-	-	-	1.7

Intersection

Int Delay, s/veh 59.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	16	185	37	39	407	21	171	107	93	20	54	46
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	Yield	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	5	5	5	3	3	3	4	4	4	2	2	2
Mvmt Flow	17	199	40	42	438	23	184	115	100	22	58	49

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	460	0	0	239	0	0	840	797	219	844	806	449
Stage 1	-	-	-	-	-	-	253	253	-	533	533	-
Stage 2	-	-	-	-	-	-	587	544	-	311	273	-
Critical Hdwy	4.15	-	-	4.13	-	-	7.14	6.54	6.24	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.14	5.54	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.14	5.54	-	6.12	5.52	-
Follow-up Hdwy	2.245	-	-	2.227	-	-	3.536	4.036	3.336	3.518	4.018	3.318
Pot Cap-1 Maneuver	1085	-	-	1322	-	-	283	317	816	283	316	610
Stage 1	-	-	-	-	-	-	747	694	-	531	525	-
Stage 2	-	-	-	-	-	-	492	516	-	699	684	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1085	-	-	1322	-	-	211	298	816	166	297	610
Mov Cap-2 Maneuver	-	-	-	-	-	-	211	298	-	166	297	-
Stage 1	-	-	-	-	-	-	734	682	-	521	502	-
Stage 2	-	-	-	-	-	-	383	494	-	501	672	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.6	0.7	183.8	23.8
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	311	1085	-	-	1322	-	-	318
HCM Lane V/C Ratio	1.283	0.016	-	-	0.032	-	-	0.406
HCM Control Delay (s)	183.8	8.4	0	-	7.8	0	-	23.8
HCM Lane LOS	F	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	18.9	0	-	-	0.1	-	-	1.9

Intersection

Int Delay, s/veh 0.9

Movement	NBL	NBT	SBT	SBR	SEL	SER
Vol, veh/h	0	364	130	0	7	46
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	4	2	0	7	7
Mvmt Flow	0	396	141	0	8	50

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	141	0	537
Stage 1	-	-	141
Stage 2	-	-	396
Critical Hdwy	4.1	-	6.47
Critical Hdwy Stg 1	-	-	5.47
Critical Hdwy Stg 2	-	-	5.47
Follow-up Hdwy	2.2	-	3.563
Pot Cap-1 Maneuver	1455	-	496
Stage 1	-	-	874
Stage 2	-	-	669
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1455	-	496
Mov Cap-2 Maneuver	-	-	496
Stage 1	-	-	874
Stage 2	-	-	669

Approach	NB	SB	SE
HCM Control Delay, s	0	0	9.7
HCM LOS			A

Minor Lane/Major Mvmt	NBL	NBT	SELn1	SELn2	SBT	SBR
Capacity (veh/h)	1455	-	496	894	-	-
HCM Lane V/C Ratio	-	-	0.015	0.056	-	-
HCM Control Delay (s)	0	-	12.4	9.3	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0.2	-	-

Intersection

Int Delay, s/veh 0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	5	14	350	1	3	173
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	4	0	0	2
Mvmt Flow	5	15	380	1	3	188

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	576	381	0	0	382	0
Stage 1	381	-	-	-	-	-
Stage 2	195	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	482	671	-	-	1188	-
Stage 1	695	-	-	-	-	-
Stage 2	843	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	481	671	-	-	1188	-
Mov Cap-2 Maneuver	481	-	-	-	-	-
Stage 1	695	-	-	-	-	-
Stage 2	840	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	11.1		0		0.1
HCM LOS	B				

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 608	1188	-
HCM Lane V/C Ratio	-	- 0.034	0.003	-
HCM Control Delay (s)	-	- 11.1	8	0
HCM Lane LOS	-	- B	A	A
HCM 95th %tile Q(veh)	-	- 0.1	0	-

Intersection

Int Delay, s/veh 15

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	319	210	249	45	65	279
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	0	1	1	0	0
Mvmt Flow	332	219	259	47	68	291

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	306	0	1166
Stage 1	-	-	283
Stage 2	-	-	883
Critical Hdwy	4.1	-	6.4
Critical Hdwy Stg 1	-	-	5.4
Critical Hdwy Stg 2	-	-	5.4
Follow-up Hdwy	2.2	-	3.5
Pot Cap-1 Maneuver	1266	-	216
Stage 1	-	-	770
Stage 2	-	-	408
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1266	-	151
Mov Cap-2 Maneuver	-	-	151
Stage 1	-	-	770
Stage 2	-	-	286

Approach	EB	WB	SB
HCM Control Delay, s	5.3	0	42.7
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1266	-	-	-	432
HCM Lane V/C Ratio	0.262	-	-	-	0.829
HCM Control Delay (s)	8.9	0	-	-	42.7
HCM Lane LOS	A	A	-	-	E
HCM 95th %tile Q(veh)	1.1	-	-	-	7.9

Intersection

Int Delay, s/veh 105.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	29	332	75	103	228	21	105	132	147	18	131	17
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	Yield	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	0	0	0	0	0	0	1	1	1	0	0	0
Mvmt Flow	30	342	77	106	235	22	108	136	152	19	135	18

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	257	0	0	420	0	0	976	910	381	967	937	246
Stage 1	-	-	-	-	-	-	441	441	-	458	458	-
Stage 2	-	-	-	-	-	-	535	469	-	509	479	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.11	6.51	6.21	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.11	5.51	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.11	5.51	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.509	4.009	3.309	3.5	4	3.3
Pot Cap-1 Maneuver	1320	-	-	1150	-	-	231	276	668	236	267	798
Stage 1	-	-	-	-	-	-	597	579	-	587	570	-
Stage 2	-	-	-	-	-	-	531	562	-	550	558	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1320	-	-	1150	-	-	110	239	668	91	231	798
Mov Cap-2 Maneuver	-	-	-	-	-	-	110	239	-	91	231	-
Stage 1	-	-	-	-	-	-	579	562	-	569	508	-
Stage 2	-	-	-	-	-	-	340	501	-	313	541	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	2.5	\$ 334.1	69.2
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	244	1320	-	-	1150	-	-	211
HCM Lane V/C Ratio	1.622	0.023	-	-	0.092	-	-	0.811
HCM Control Delay (s)	\$ 334.1	7.8	0	-	8.4	0	-	69.2
HCM Lane LOS	F	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	24.9	0.1	-	-	0.3	-	-	5.9

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 1.5

Movement	NBL	NBT	SBT	SBR	SEL	SER
Vol, veh/h	0	379	309	0	5	90
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	70	70	70	70	70	70
Heavy Vehicles, %	0	1	0	0	3	3
Mvmt Flow	0	541	441	0	7	129

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	441	0	982
Stage 1	-	-	441
Stage 2	-	-	541
Critical Hdwy	4.1	-	6.43
Critical Hdwy Stg 1	-	-	5.43
Critical Hdwy Stg 2	-	-	5.43
Follow-up Hdwy	2.2	-	3.527
Pot Cap-1 Maneuver	1130	-	275
Stage 1	-	-	646
Stage 2	-	-	581
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1130	-	275
Mov Cap-2 Maneuver	-	-	275
Stage 1	-	-	646
Stage 2	-	-	581

Approach	NB	SB	SE
HCM Control Delay, s	0	0	12.7
HCM LOS			B

Minor Lane/Major Mvmt	NBL	NBT	SELn1	SELn2	SBT	SBR
Capacity (veh/h)	1130	-	275	614	-	-
HCM Lane V/C Ratio	-	-	0.026	0.209	-	-
HCM Control Delay (s)	0	-	18.4	12.4	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	0.8	-	-

Intersection

Int Delay, s/veh 0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	2	7	372	4	13	386
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	2	8	404	4	14	420

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	855	407	0	0	409	0
Stage 1	407	-	-	-	-	-
Stage 2	448	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	331	648	-	-	1161	-
Stage 1	676	-	-	-	-	-
Stage 2	648	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	326	648	-	-	1161	-
Mov Cap-2 Maneuver	326	-	-	-	-	-
Stage 1	676	-	-	-	-	-
Stage 2	638	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	11.9		0		0.3
HCM LOS	B				

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	531	1161
HCM Lane V/C Ratio	-	-	0.018	0.012
HCM Control Delay (s)	-	-	11.9	8.1
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection

Intersection Delay, s/veh	28.1											
Intersection LOS	D											
Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	16	185	37	0	38	407	21	0	162	105	90
Peak Hour Factor	0.92	0.93	0.93	0.93	0.92	0.93	0.93	0.93	0.92	0.93	0.93	0.93
Heavy Vehicles, %	2	5	5	5	2	3	3	3	2	4	4	4
Mvmt Flow	0	17	199	40	0	41	438	23	0	174	113	97
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	16.6	40.2	25
HCM LOS	C	E	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	45%	7%	8%	17%
Vol Thru, %	29%	78%	87%	45%
Vol Right, %	25%	16%	5%	38%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	357	238	466	120
LT Vol	162	16	38	20
Through Vol	105	185	407	54
RT Vol	90	37	21	46
Lane Flow Rate	384	256	501	129
Geometry Grp	1	1	1	1
Degree of Util (X)	0.714	0.495	0.883	0.267
Departure Headway (Hd)	6.802	6.959	6.347	7.438
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	534	520	566	485
Service Time	4.802	4.971	4.447	5.454
HCM Lane V/C Ratio	0.719	0.492	0.885	0.266
HCM Control Delay	25	16.6	40.2	13.1
HCM Lane LOS	C	C	E	B
HCM 95th-tile Q	5.7	2.7	10.1	1.1

Intersection

Intersection Delay, s/veh

Intersection LOS

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	20	54	46
Peak Hour Factor	0.92	0.93	0.93	0.93
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	22	58	49
Number of Lanes	0	0	1	0

Approach SB

Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	13.1
HCM LOS	B

Lane

Intersection

Intersection Delay, s/veh	31.4											
Intersection LOS	D											
Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	29	332	75	0	100	228	21	0	100	131	146
Peak Hour Factor	0.92	0.97	0.97	0.97	0.92	0.97	0.97	0.97	0.92	0.97	0.97	0.97
Heavy Vehicles, %	2	0	0	0	2	0	0	0	2	1	1	1
Mvmt Flow	0	30	342	77	0	103	235	22	0	103	135	151
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	40.7	27.7	30.7
HCM LOS	E	D	D

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	27%	7%	29%	11%
Vol Thru, %	35%	76%	65%	79%
Vol Right, %	39%	17%	6%	10%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	377	436	349	164
LT Vol	100	29	100	18
Through Vol	131	332	228	129
RT Vol	146	75	21	17
Lane Flow Rate	389	449	360	169
Geometry Grp	1	1	1	1
Degree of Util (X)	0.772	0.868	0.728	0.385
Departure Headway (Hd)	7.151	6.955	7.393	8.197
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	501	517	493	441
Service Time	5.246	5.051	5.393	6.197
HCM Lane V/C Ratio	0.776	0.868	0.73	0.383
HCM Control Delay	30.7	40.7	27.7	16.2
HCM Lane LOS	D	E	D	C
HCM 95th-tile Q	6.8	9.3	5.9	1.8

Intersection

Intersection Delay, s/veh

Intersection LOS

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	18	129	17
Peak Hour Factor	0.92	0.97	0.97	0.97
Heavy Vehicles, %	2	0	0	0
Mvmt Flow	0	19	133	18
Number of Lanes	0	0	1	0

Approach SB

Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	16.2
HCM LOS	C

Lane

Intersection

Intersection Delay, s/veh	29.8											
Intersection LOS	D											
Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	16	185	37	0	39	407	21	0	171	107	93
Peak Hour Factor	0.92	0.93	0.93	0.93	0.92	0.93	0.93	0.93	0.92	0.93	0.93	0.93
Heavy Vehicles, %	2	5	5	5	2	3	3	3	2	4	4	4
Mvmt Flow	0	17	199	40	0	42	438	23	0	184	115	100
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	17	42.5	27.3
HCM LOS	C	E	D

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	46%	7%	8%	17%
Vol Thru, %	29%	78%	87%	45%
Vol Right, %	25%	16%	4%	38%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	371	238	467	120
LT Vol	171	16	39	20
Through Vol	107	185	407	54
RT Vol	93	37	21	46
Lane Flow Rate	399	256	502	129
Geometry Grp	1	1	1	1
Degree of Util (X)	0.746	0.502	0.896	0.27
Departure Headway (Hd)	6.846	7.064	6.532	7.54
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	531	512	557	479
Service Time	4.846	5.074	4.532	5.559
HCM Lane V/C Ratio	0.751	0.5	0.901	0.269
HCM Control Delay	27.3	17	42.5	13.3
HCM Lane LOS	D	C	E	B
HCM 95th-tile Q	6.4	2.8	10.5	1.1

Intersection

Intersection Delay, s/veh

Intersection LOS

Movement	SBU	SBL	SBT	SBR
Vol, vsh/h	0	20	54	46
Peak Hour Factor	0.92	0.93	0.93	0.93
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	22	58	49
Number of Lanes	0	0	1	0

Approach SB

Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	13.3
HCM LOS	B

Lane

Intersection

Intersection Delay, s/veh	33.3											
Intersection LOS	D											
Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	29	332	75	0	103	228	21	0	105	132	147
Peak Hour Factor	0.92	0.97	0.97	0.97	0.92	0.97	0.97	0.97	0.92	0.97	0.97	0.97
Heavy Vehicles, %	2	0	0	0	2	0	0	0	2	1	1	1
Mvmt Flow	0	30	342	77	0	106	235	22	0	108	136	152
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	42.7	29.9	33
HCM LOS	E	D	D

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	27%	7%	29%	11%
Vol Thru, %	34%	76%	65%	79%
Vol Right, %	38%	17%	6%	10%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	384	436	352	166
LT Vol	105	29	103	18
Through Vol	132	332	228	131
RT Vol	147	75	21	17
Lane Flow Rate	396	449	363	171
Geometry Grp	1	1	1	1
Degree of Util (X)	0.793	0.879	0.753	0.395
Departure Headway (Hd)	7.339	7.163	7.472	8.304
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	495	508	486	435
Service Time	5.339	5.163	5.487	6.328
HCM Lane V/C Ratio	0.8	0.884	0.747	0.393
HCM Control Delay	33	42.7	29.9	16.7
HCM Lane LOS	D	E	D	C
HCM 95th-file Q	7.3	9.6	6.4	1.9

Intersection

Intersection Delay, s/veh

Intersection LOS

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	18	131	17
Peak Hour Factor	0.92	0.97	0.97	0.97
Heavy Vehicles, %	2	0	0	0
Mvmt Flow	0	19	135	18
Number of Lanes	0	0	1	0

Approach SB

Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	16.7
HCM LOS	C

Lane