



Vanasse Hangen Brustlin, Inc.

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Memorandum

To: Al Ziedins
c/o CPC-T Holdings, LLC
1601 Trapelo Road, Suite 280
Waltham, Massachusetts 02451

Date: September 25, 2014

Project No.: 12109.00

From: Matt Kealey, P.E., PTOE
Project Manager

Re: Proposed Residential Development
Somerville, Massachusetts

INTRODUCTION

Vanasse Hangen Brustlin, Inc. (VHB), on behalf of CPC-T Holdings, LLC (Proponent), has reviewed the potential traffic impacts associated with the proposed residential development to be located at the corner of Mystic Avenue and the Stop & Shop Supermarket Driveway in Somerville, Massachusetts. The proposed development involves the construction of a total of 75 apartment units. Access to the site is proposed via a single driveway within the Stop & Shop parking lot.

In January 2013, a full traffic impact and access study (TIAS) was conducted for a previously proposed project on the site, which included construction of 121 apartment units. The previous traffic study evaluated existing conditions, projected future traffic conditions, and identified potential impacts within the study area. The study concluded that the proposed project would have no significant impacts on traffic operations at the study area intersections. For reference, the January 2013 TIAS has been included as an attachment to this memorandum. To support the current proposal of 75 units on the site, the following memorandum provides a summary of the January 2013 TIAS as well as a summary of future traffic projections for the proposed project.

JANUARY 2013 TIAS EXECUTIVE SUMMARY

The following text provides a summary of the key components that were included in the January 2013 TIAS.

Study Area Intersections

- Mystic Avenue at Stop & Shop Driveway
- Garfield Avenue at Blakeley Avenue
- Proposed Site Driveway at Stop & Shop Driveway

Existing Traffic Volumes

48-hour daily traffic volumes were collected on Mystic Avenue west of the Stop & Shop Driveway on December 5 and 6, 2012 (Wednesday and Thursday) using automatic traffic recorders (ATR). These dates represent typical weekdays for traffic count purposes (non-holidays while schools are in session). Concurrent with the ATR counts, turning movements counts (TMCs) were conducted at each of the study area intersections in December 2012 during the weekday morning peak period

from 7:00 AM to 9:00 AM and the evening peak period from 4:00 PM to 6:00 PM. The TMC data indicates that, within the study area, the weekday morning peak hour generally occurs between 8:00 AM and 9:00 AM and the weekday evening peak hour occurs between 5:00 PM and 6:00 PM. The TMC and ATR data are provided in the Attachments.

Crash History

No crashes were reported at the study area intersections during the three-year study period evaluated in the TIAS.

Public Transportation

Within a half mile of the site, there are five different bus routes providing a total of 26 bus stops. Collectively, these bus routes provide riders with the ability to connect to the MBTA Green Line, Orange Line, and Red Line.

Site-Generated Traffic Volumes

The previously proposed development (121 units) was estimated to generate about 850 new daily trips. Of this total, it was estimated that about 63 site-generated trips (13 enter/50 exit) would occur during the morning peak hour and about 83 trips (54 enter/29 exit) during the evening peak hour. It should be noted that these trip generation projections do not include any trip credits for the proximity of the site to public transit routes. The location of the site is very accessible to/from public transportation which will reduce residents' dependence on automobiles. As such, the traffic projections very likely overstate the site-generated vehicular traffic resulting from the proposed project.

Trip Distribution

The site-generated traffic volumes were assigned to the roadway network based on U.S. Census Journey-to-Work data for the City of Somerville, and added to the No-Build traffic volumes to develop the peak hour Build traffic volume networks. The trip distribution and the site generated traffic volumes are provided in the attached TIAS.

Traffic Operations Analysis

Based on capacity analysis provided in the January 2013 TIAS, the three study area intersections operated at LOS B or better under existing conditions. Under future conditions without the project (2017 No Build), the study area intersections are expected to operate at LOS C or better. The study area intersections would continue to operate at these levels with the previous proposal of 121 units under 2017 Build conditions with the project in place. Overall, a comparison of the No-Build and Build operations indicates that the proposed development would not result in significant increases in delays at all the study intersections.

PROPOSED BUILD PROGRAM

Since January 2013, the proposed build program has been substantially reduced and now includes 75 units. Access to the site would be provided directly from the Stop & Shop parking lot. No access is proposed directly from Mystic Avenue. As noted above, no vehicle crashes occurred at the study area intersections based on previous research. As such, access to the site is expected to operate safely.

Site-Generated Traffic Volumes

The rate at which any development generates traffic is dependent upon a number of factors such as size, location and concentration of surrounding developments. The number of vehicle-trips estimated to be generated by proposed project was estimated based on trip generation rates published in the Institute of Transportation Engineers *Trip Generation*¹, 9th Edition. ITE land use code 220, Apartments, was determined to be the most appropriate land use code for this development. Table 1 summarizes the projected trip generation associated with the proposed residential development. For comparison purposes, the trip generation projections associated with the previous proposal are also summarized. The trip generation calculations are provided in the Attachments.

Table 1
Project Trip Generation Summary

Time Period	Previously Proposed Site Generated Traffic ^a	Currently Proposed Site Generated Traffic ^b
Daily (vpd)	850	578
Morning Peak Hour (vph)		
Entering	13	8
Exiting	<u>50</u>	<u>32</u>
Total	63	40
Evening Peak Hour (vph)		
Entering	54	38
Exiting	<u>29</u>	<u>21</u>
Total	83	59

a ITE Trip Generation, 9th Edition, based on 120 apartment units (LUC 220)

b ITE Trip Generation, 9th Edition, based on 75 apartment units (LUC 220)

vpd vehicles per day

vph vehicles per hour

As shown in Table 1, the proposed development is expected to generate substantially less traffic than the previous proposal. The project is estimated to generate about 578 new daily trips. Of this total, it is estimated that about 40 site-generated trips (8 enter/32 exit) will occur during the morning peak hour and about 59 trips (38 enter/21 exit) during the evening peak hour. It should be noted that the trip generation projections summarized in Table 1 do not include any trip credits for the proximity of the site to public transit routes. As mentioned previously, five different bus routes are available and there are 26 bus stops within a half mile of the site, making it very accessible to/from public transportation and reducing residents' dependence on automobiles. As such, the projections summarized in Table 1 very likely overstate the site-generated vehicular traffic resulting from the proposed project.

CONCLUSIONS

As stated in this memorandum, the proposed residential development is projected to generate approximately 40 vehicles per hour (8 enter/32 exit) during the weekday morning peak hour and 59 vph (38 enter/21 exit) during the weekday evening peak hour. It is important to note that these projections are substantially lower than the projections used in the January 2013 TIAS because detailed traffic analyses in that study indicated that the study area intersections operate at acceptable levels of service under existing conditions and will continue to operate at similar levels in the 2017 No-Build and Build conditions. Accordingly, based on the proposed build program of 75 units, the site generated traffic will have minimal effect on traffic operations within the study area and that the existing transportation infrastructure can adequately accommodate the traffic volumes projected to be generated by the proposed residential development.

¹ Institute of Transportation Engineers, *Trip Generation*, Ninth Edition, Washington, D.C., 2012.

Attachments

- **Trip Generation Projections**
- **January 2013 TIAS**

Trip Generation Projections

ITE TRIP GENERATION WORKSHEET
(9th Edition, Updated 2012)

LANDUSE: Apartment
LANDUSE CODE: 220

Independent Variable --- Number of Units

JOB NAME: Somerville
JOB NUMBER: 12109

Peak Hour Traffic on Adjacent Street: 75 units

WEEKDAY

RATES:	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	88	0.87	6.65	1.27	12.50	210	0	1,000	50%	50%
AM PEAK (ADJACENT ST)	78	0.83	0.51	0.10	1.02	235	0	1,100	20%	80%
PM PEAK (ADJACENT ST)	90	0.77	0.62	0.10	1.64	233	0	1,100	65%	35%

TRIPS:		BY AVERAGE			BY REGRESSION		
		Total	Enter	Exit	Total	Enter	Exit
DAILY		499	249	249	578	289	289
AM PEAK (ADJACENT ST)		38	8	31	40	8	32
PM PEAK (ADJACENT ST)		47	30	16	59	38	21

SATURDAY

RATES:	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	15	0.85	6.39	2.84	8.40	175	65	360	50%	50%
PEAK OF GENERATOR	14	0.56	0.52	0.26	1.05	178	65	360	Peak Distribution Not Available	

TRIPS:		BY AVERAGE			BY REGRESSION		
		Total	Enter	Exit	Total	Enter	Exit
DAILY		479	240	240	333	166	166
PEAK OF GENERATOR		39	NA	NA	50	NA	NA

SUNDAY

RATES:	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	14	0.82	5.86	3.21	7.53	182	90	360	50%	50%
PEAK OF GENERATOR	13	--	0.51	0.26	1.43	186	90	360	Peak Distribution Not Available	

TRIPS:		BY AVERAGE			BY REGRESSION		
		Total	Enter	Exit	Total	Enter	Exit
DAILY		440	240	240	380	190	190
PEAK OF GENERATOR		38	NA	NA	NA	NA	NA

January 2013 TIAS



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Memorandum

To: Al Ziedins
c/o CPC-T Holdings, LLC
1601 Trapelo Road, Suite 280
Waltham, Massachusetts 02451

Date: January 31, 2013

Project No.: 12109.00

From: Matt Kealey, P.E., PTOE
Project Manager

Re: Somerville Residential

INTRODUCTION

Vanasse Hangen Brustlin, Inc. (VHB), on behalf of CPC-T Holdings, LLC (Proponent), has conducted a traffic impact and access study for a proposed residential development to be located at the corner of Mystic Avenue and Cross Street East in Somerville, Massachusetts. The proposed development involves the construction of a total of 121 apartment units. One of these units will be furnished and will remain unoccupied as a model apartment. In addition, the project will include the redevelopment of The City of Somerville's Harris Park and the discontinuance and redevelopment of a portion of Cross Street East as open space in front of the project site. The roughly 1.6 acre site is comprised of three lots, including 0.35 acres of Harris Park, a portion of Cross Street East, and the 1.25 acre "Lot B", which was part of the Stop & Shop Subdivision. Lot B, located within the existing Stop & Shop Supermarket site, was previously approved for the development of 25,000 sf of office space as part of the 2001 Planned Unit Development (PUD). Figure 1 shows the site locus map.

Access to the site is proposed via a single entrance-only driveway on Cross Street East, and an exit only driveway onto the Stop & Shop Driveway. Under existing conditions, access to Cross Street East from Mystic Avenue is barricaded. Under proposed conditions, this barricade will be removed to allow entrance movements into the proposed building and access to public parking for Harris Park. As part of the project, the section of Cross Street East from just north of Pennsylvania Avenue to the proposed site driveway and public park access will be closed to vehicular traffic and converted to open space adjacent to Harris Park. This traffic study quantifies existing and projected future traffic conditions, and identifies potential impacts within the study area.

EXISTING CONDITIONS

Evaluation of the transportation impacts associated with the proposed project requires a thorough understanding of the existing transportation system in the project study area. A complete inventory and evaluation of the existing transportation system in the project study area was conducted. The analysis of existing transportation conditions is based on the existing roadway network, roadway/intersection geometry, traffic control, existing daily and peak hour traffic volumes, traffic safety conditions, and existing public transportation. A description of existing conditions within the study area is presented below.



Vanasse Hangen Brustlin, Inc.



0 250 500 Feet

Site Locus
Proposed Residential Development
60-70 Cross Street East
Somerville, Massachusetts

Figure 1
January 28, 2013

Study Area Intersections

The key roadways in the study area include Mystic Avenue, Cross Street East, and Garfield Avenue. The transportation study area is based on the expected level of traffic to be generated by the project and an understanding of the surrounding area roadways. The proposed study area includes the following intersections:

- Mystic Avenue at Stop & Shop Driveway
- Garfield Avenue at Blakeley Avenue
- Proposed Site Driveway at Stop & Shop Driveway

The following description of the study area intersections includes the physical characteristics, geometric conditions, and traffic control.

Mystic Avenue at Stop & Shop Driveway

Mystic Avenue intersects with the Stop & Shop Driveway two form a two-legged T-type intersection. Mystic Avenue is one-way traveling southbound at this intersection. The Stop & Shop Driveway provides right-turn in/right-turn out access at this intersection and is under STOP sign control.

Garfield Avenue at Blakeley Avenue

Garfield Avenue intersects with Blakeley Avenue to form a four-legged unsignalized intersection under all-way STOP control. The section of roadway north of Blakeley Avenue provides access to Stop & Shop and Mystic Avenue. To the south, Garfield Avenue provides access to residences and Broadway. Blakeley Avenue provides access to commercial uses to the east, with minimal traffic activity due to its dead end before intersecting with Cross Street. Blakeley Avenue provides access to McGrath Highway to the west.

Proposed Site Driveway at Stop & Shop Driveway

The proposed Site Driveway is currently in the vicinity of the access to the satellite parking area for Stop & Shop. Based on traffic counts and observations, this parking area is not used heavily. Under proposed conditions, the residential building will have an egress-only driveway in this location.

Existing Traffic Volumes

48-hour daily traffic volume data were collected on Mystic Avenue west of the Stop & Shop Driveway on December 5 and 6, 2012 (Wednesday and Thursday) using automatic traffic recorders (ATR). These dates represent typical weekdays for traffic count purposes (non-holidays while schools are in session). The volumes are summarized in Table 1.

Table 1
Existing Traffic Volume Summary

Location	Direction	ADT ^a	Morning Peak Hour			Evening Peak Hour		
			Volume	K Factor ^b	Dir. Dist. ^c	Volume	K Factor	Dir. Dist.
Mystic Avenue west of Stop & Shop Driveway	Total	5,300	650	12.3%	100% EB	330	6.2%	100% EB

Source: VHB based on automatic traffic recorder counts conducted in December 5 and 6, 2012.

a. Average Daily Traffic volume expressed in vehicles per day.

b. Represents the percent of daily traffic that occurs during the peak hour.

c. Directional distribution of peak hour traffic.

Note: Peak hours do not necessarily coincide with the peak hours of turning movement counts.

As shown in Table 1, Mystic Avenue, west of the Stop & Shop Driveway, carries approximately 5,300 vehicles on a typical weekday with the peak hours accounting for 12.3 percent (morning peak hour) and 6.2 percent (evening peak hour) of the daily traffic flow.

Concurrent with the ATR counts, turning movements counts (TMCs) were conducted at each of the study area intersections in December 2012 during the weekday morning peak period from 7:00 AM to 9:00 AM and the evening peak period from 4:00 PM to 6:00 PM. The TMC data indicates that, within the study area, the weekday morning peak hour generally occurs between 8:00 AM and 9:00 AM and the weekday evening peak hour occurs between 5:00 PM and 6:00 PM. The TMC and ATR data are provided in the Attachments.

Seasonal Variation

MassDOT historical traffic counts were reviewed to understand the seasonality of traffic count data collected in the month of December. The statewide data for seasonal variation of traffic volumes on urban arterials, collectors and rural arterials indicated that traffic counts in December are generally higher than the average month. In addition, specific traffic data from MassDOT Permanent Count Station 8098 (I-93 north of McGrath Highway) were reviewed. This data showed that historic volumes in early December, which is when the 2012 counts were conducted, were also higher than average conditions. Since the count data were found to be higher than annual average conditions, no further seasonal adjustment factors were applied to the data. Figure 2 illustrates the resulting 2012 weekday morning and evening peak hour Existing Conditions traffic volumes.

Crash History

To identify motor vehicle crash trends in the project study area, the most current crash data for the study area intersections was obtained from MassDOT for the most recent three years available (2008 through 2010). A summary of the vehicle crash data is presented in Table 2.

Mystic Avenue

Weekday Morning Peak Hour
neg = negligible

Stop & Shop

Blakeley Avenue

Garfield Avenue

Site

Mystic Avenue

Weekday Evening Peak Hour
neg = negligible

Stop & Shop

Blakeley Avenue

Garfield Avenue

Site

Vanasse Hangen Brustlin, Inc.

2012 Existing Conditions
Peak Hour Traffic Volumes
Proposed Residential Development
Somerville, Massachusetts

Figure 2
January 18, 2013



Not to Scale

Table 2
Vehicle Accident Summary (2008-2010)*

	Mystic Avenue at Stop & Shop Driveway	Garfield Avenue at Blakeley Ave.	Stop & Shop Driveway at Parking Lot Driveway
Year			
2008	0	0	0
2009	0	0	0
<u>2010</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	0	0	0
MassDOT Crash Rates	0.0	0.0	0.0

Source: Crash data was obtained from MassDOT.

* MassDOT Crash Rate worksheets are included in the Appendix.

As shown in Table 2, no crashes were reported at the study area intersections during the three-year study period.

Public Transportation

Public transportation in the study area is provided by the Massachusetts Bay Transportation Authority (MBTA) via five bus routes that run near the site. The bus routes and the stops closest to the site are summarized below:

- Bus 80 – Arlington Center Lechmere Station via Medford Hillside
 - o Cross Street at Pearl Street
 - o Pearl Street at McGrath Highway
- Bus 89 – Clarendon Hill of Davis Square Sullivan Square Station via Broadway
 - o Broadway at Cross Street
 - o Broadway at Kensington Street
- Bus 90 – Davis Square Wellington Station via Sullivan Square Station and Assembly Mall
 - o Cross Street at Ellsworth Street
 - o Cross Street at Otis Street
- Bus 95 – West Medford Sullivan Square Station via Mystic Avenue
 - o Mystic Avenue at Kensington Avenue (Stop & Shop)
- Bus 101 – Malden Center Station Sullivan Square Station via Salem St., Main St., and Broadway
 - o Broadway at Cross Street
 - o Broadway at Kensington Street

Within a half mile of the site, these five bus routes provide 26 bus stops. Collectively, the bus routes mentioned above provide riders with the ability to connect to the MBTA Green Line, Orange Line, and Red Line.

FUTURE CONDITIONS

To determine future roadway operations, traffic volumes in the study area were projected to the year 2017 to reflect a five-year planning horizon from the existing conditions. The year 2017 was selected as the horizon year for the preparation of this study in conformance with EEA/EOTPW and MassDOT guidelines.

Traffic volumes on the roadway network under future conditions without the project (No-Build) are assumed to include all existing traffic, any new traffic due to regional and area background traffic growth, and traffic related to any specific nearby development projects expected to be completed by the 2017 horizon year. Anticipated traffic volumes from the proposed development were added to the No-Build traffic volumes to reflect future conditions with the project (Build).

No-Build Conditions

No-Build traffic volumes were determined by considering existing traffic volumes and adding regional traffic growth and traffic from other nearby developments. Traffic growth is a function of expected new development, changes in demographics, and changes in auto usage and ownership in the region. Regional traffic growth is projected by examining historic traffic growth trends.

Regional Traffic Growth

To determine trends in traffic growth in this area, VHB reviewed traffic available from MassDOT for the City of Somerville. Generally speaking, traffic volumes in the surrounding area have remained level or have decreased in recent years. However, in order to present a conservative analysis, a growth rate of one percent per year was applied to the traffic volumes within the study area.

Planned/Approved Developments

In addition to accounting for background growth, the traffic associated with other planned/approved developments near the site was also considered. Based on information provided by the Somerville Planning Department, it was determined that four projects are planned and were considered as background development projects:

- Assembly Square: Approximately 5 million sf mixed-use redevelopment
- 625 McGrath Highway: 34 residential units
- 100 Fellsway West: 54 residential units
- Saint Polycarps Phase 3 (Mystic Ave./Butler Dr./Temple St.): 30 residential units

Given the limited amount of traffic generated by the three residential projects and the limited study area for the Proponent's proposed development, no specific volumes from these projects were added to the study area intersections. Regarding the Assembly Square project, site-generated traffic volumes were collected from the Traffic Impact and Access Study that was originally prepared in conjunction with the permitting of the Planned Unit Development (PUD) Preliminary Master Plan, which was approved by the Somerville Planning Board on December 14, 2006 and subsequently amended on August 5, 2010. The year 2017 No-Build traffic volume networks were developed by applying the one percent annual growth rate over the five-year study horizon to the existing volume networks and adding the Assembly Square site generated traffic volumes. Figure 3 shows the resulting 2017 No-Build peak hour traffic volume networks. Background traffic volumes associated with Assembly Square are provided in the Attachments.

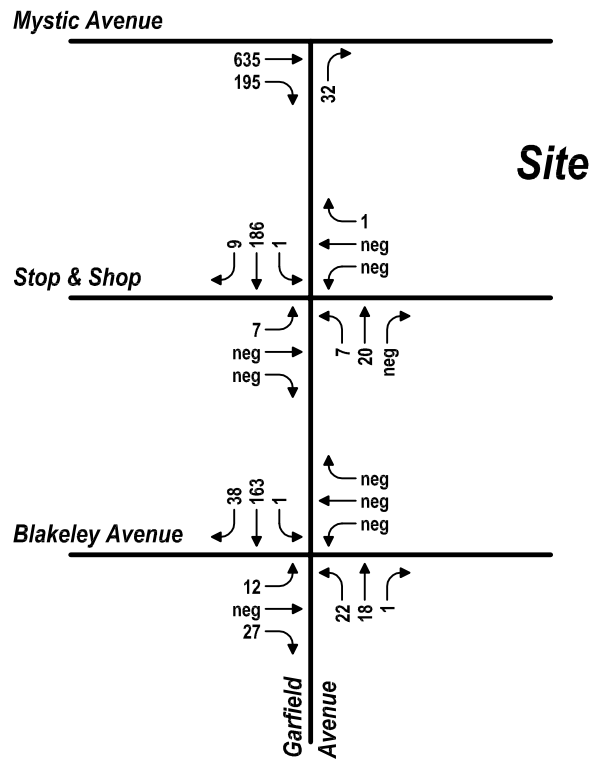
Build Conditions

Build traffic volumes were determined by estimating site-generated traffic volumes and distributing these volumes over the study area roadways. The site generated volumes include new trips due to the proposed residential development.

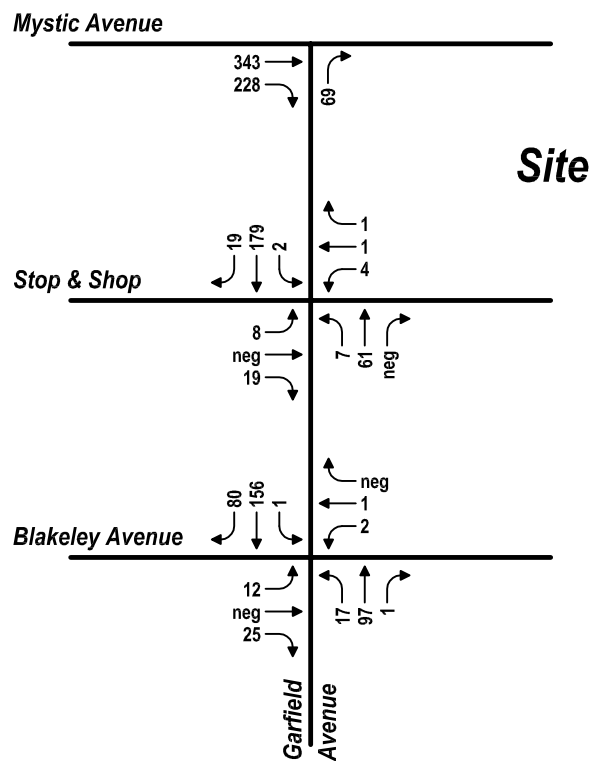
Site-Generated Traffic Volumes

The rate at which any development generates traffic is dependent upon a number of factors such as size, location and concentration of surrounding developments. The number of vehicle-trips estimated to be generated by proposed project was estimated based on trip generation rates published in the Institute of Transportation Engineers *Trip Generation*¹, 9th Edition. ITE land use code 220, Apartments, was determined to be the most appropriate land use code for this development.

¹ Institute of Transportation Engineers, *Trip Generation*, Ninth Edition, Washington, D.C., 2012.



Weekday Morning Peak Hour
neg = negligible



Weekday Evening Peak Hour
neg = negligible

Vanasse Hangen Brustlin, Inc.

2017 No Build Conditions
Peak Hour Traffic Volumes
Proposed Residential Development
Somerville, Massachusetts

Figure 3
January 18, 2013



Not to Scale

Table 3 summarizes the projected trip generation associated with the proposed residential development. The trip generation calculations are provided in the Attachments.

Table 3
Project Trip Generation Summary

Time Period	Site Generated Traffic ^a
Daily (vpd)	850
Morning Peak Hour (vph)	
Entering	13
Exiting	<u>50</u>
Total	63
Evening Peak Hour (vph)	
Entering	54
Exiting	<u>29</u>
Total	83

a ITE Trip Generation, 9th Edition, based on 120 apartment units (LUC 220).
vpd vehicles per day
vph vehicles per hour

As shown in Table 3, the proposed development is estimated to generate about 850 new daily trips. Of this total, it is estimated that about 63 site-generated trips (13 enter/50 exit) will occur during the morning peak hour and about 83 trips (54 enter/29 exit) during the evening peak hour. It should be noted that the trip generation projections summarized in Table 3 do not include any trip credits for the proximity of the site to public transit routes. As mentioned previously, five different bus routes are available and there are 26 bus stops within a half mile of the site, making it very accessible to/from public transportation and reducing residents' dependence on automobiles. As such, the projections summarized in Table 3 very likely overstate the site-generated vehicular traffic resulting from the proposed project.

Trip Distribution

The directional distribution of the traffic approaching and departing the site is a function of population densities, the location of employment, existing travel patterns, and the efficiency of the existing roadway system. Trips made from and to the proposed residential development during the peak hours are expected to be predominantly home-to-work and work-to-home trips in the morning and evening peak hours, respectively. Accordingly, the trip distribution for the proposed development was based on U.S. Census Journey-to-Work data for the City of Somerville, which was collected from the residential trip distribution evaluation completed for the Assembly Square PUD Traffic Impact and Access Study. Table 4 summarizes the trip distribution pattern used in the current analysis.

Table 4
Trip Distribution Summary

Travel Route	Direction (to/from)	Percent of New Site Generated Traffic Assigned to Route
Broadway/McGrath Highway	South and West	47%
I-93/McGrath Highway/Mystic Ave	North and West	20%
I-93/Sullivan Square	South and East	33%
Total		100%

The site-generated traffic volumes were assigned to the roadway network according to the distribution and travel patterns described above, and added to the No-Build traffic volumes to develop the peak hour Build traffic volume networks. The trip distribution and the site generated traffic volumes are provided in the Attachments. Figure 4 presents the resulting 2017 Build traffic volumes for the weekday morning and evening peak hours.

TRAFFIC OPERATIONS ANALYSIS

Measuring existing traffic volumes and projecting future traffic volumes quantifies traffic within the study area. To assess quality of flow, roadway capacity analyses were conducted with respect to existing conditions and projected No-Build and Build traffic volume conditions. Capacity analyses provide an indication of how well the roadway facilities serve the traffic demands placed on them. Calculated levels of service classify roadway operating conditions.

Level of Service Criteria

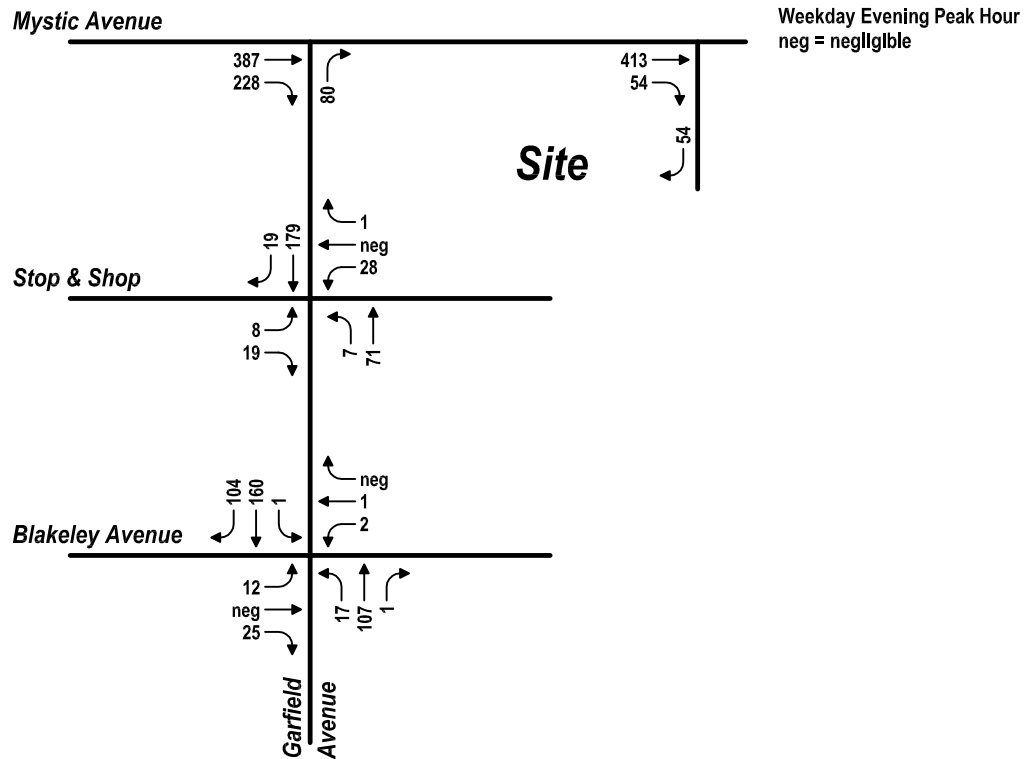
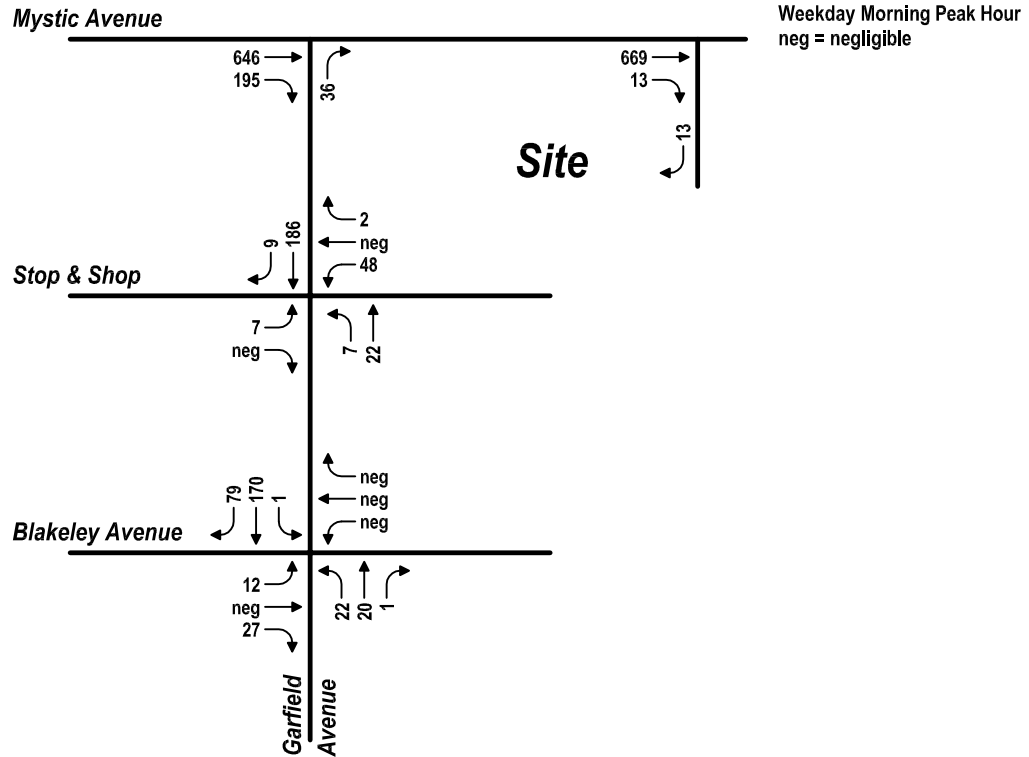
Level of service (LOS) is the term used to denote the different operating conditions that occur on a given roadway segment under various traffic volume loads. It is a qualitative measure that considers a number of factors including roadway geometry, speed, travel delay, freedom to maneuver, and safety. Level of service provides an index to the operational qualities of a roadway segment or an intersection. Level of service designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions.

For unsignalized intersections, the analysis assumes that traffic on the mainline is not affected by traffic on the side streets. The level of service is only determined for left-turns from the main street and all movements from the minor street. The overall level of service designation is for the most critical movement, which is most often the left-turn out of the side street. The evaluation criteria used to analyze area intersections and roadways are based on the 2000 Highway Capacity Manual (HCM)².

Intersection Capacity Analysis

Intersection capacity analyses were conducted at the three intersections in the study area. Analyses were conducted for the 2012 Existing, 2017 No-Build and 2017 Build conditions. Table 5 summarizes the results of the capacity analyses. The analysis worksheets are included in the Attachments.

² Transportation Research Board, *Highway Capacity Manual*, Washington, D.C., 2000.



Vanasse Hangen Brustlin, Inc.

2017 Build Conditions
Peak Hour Traffic Volumes
Proposed Residential Development
Somerville, Massachusetts

Figure 4
January 18, 2013



Not to Scale

Table 5
Intersection Capacity Analysis

Location/Peak Hour	2012 Existing			2017 No-Build			2017 Build		
	Demand ^a	Delay ^b	LOS ^c	Demand	Delay	LOS	Demand	Delay	LOS
Mystic Ave at Stop & Shop Driveway									
Weekday Morning Peak Hour	30	14	B	32	16	C	36	16	C
Weekday Evening Peak Hour	66	11	B	69	12	B	80	13	B
Site Driveway at Stop & Shop Driveway									
Weekday Morning Peak Hour	1	9	A	1	9	A	50	12	B
Weekday Evening Peak Hour	6	11	B	6	11	B	29	12	B
Garfield Ave. at Blakeley Ave.									
Weekday Morning Peak Hour	192	8	A	202	8	A	250	9	A
Weekday Evening Peak Hour	226	8	A	237	9	A	265	9	A

- a. Demand of critical movement.
b. Average Total Delay (seconds/vehicle).
c. Level-of-service.
+ Delay exceeds thresholds.

As shown in Table 5, the three study area intersections currently operate at LOS B or better under existing conditions. Under future conditions without the project (2017 No Build), the study area intersections are expected to operate at LOS C or better. The study area intersections are expected to continue to operate at these levels under 2017 Build conditions with the project in place. Overall, a comparison of the No-Build and Build operations indicates that the proposed development would not result in significant increases in delays at all the study intersections.

CONCLUSIONS AND RECOMMENDATIONS

This study evaluated the impacts associated with the proposed residential development to be located at the corner of Mystic Avenue and Cross Street East in Somerville, Massachusetts. The project will include the redevelopment of The City of Somerville's Harris Park and the discontinuance and redevelopment of a portion of Cross Street East as open space in front of the project site. The roughly 1.6 acre site is comprised of three lots, including 0.35 acres of Harris Park, a portion of Cross Street East, and the 1.25 acre "Lot B", which was part of the Stop & Shop Subdivision. Lot B, located within the existing Stop & Shop Supermarket site, was previously approved for the development of 25,000 sf of office space as part of the 2001 PUD.

Access to the site is proposed via a single entrance-only driveway on Cross Street East, and an exit only driveway onto the Stop & Shop Driveway. Under existing conditions, access to Cross Street East from Mystic Avenue is barricaded. Under proposed conditions, this barricade will be removed to allow entrance movements into the proposed building and access to public parking for Harris Park. As part of the project, the section of Cross Street East from just north of Pennsylvania Avenue to the proposed site driveway and public park access will be closed to vehicular traffic and converted to open space adjacent to Harris Park.

The proposed residential development is projected to generate approximately 63 vehicles per hour (vph) (13 enter/50 exit) during the weekday morning peak hour and 83 vph (54 enter/29 exit) during the weekday evening peak hour. Detailed traffic analyses indicate that the study area intersections operate at acceptable levels of service under existing conditions and will continue to operate at similar levels in the 2017 No-Build and Build conditions. Overall, the study finds that the site generated traffic will have minimal effect on traffic operations within the study area and that the

existing transportation infrastructure can adequately accommodate the traffic volumes projected to be generated by the proposed residential development.

Attachments

- **Traffic Count Data**
- **Background Traffic Volumes**
- **Trip Generation Calculations**
- **Trip Distribution**
- **Intersection Capacity Analysis**



Traffic Count Data

Accurate Counts

978-664-2565

N/S Street : Stop & Shop / Garfield Av
 E/W Street : Blakeley Avenue
 City/State : Somerville, MA
 Weather : Cloudy

File Name : 12109001
 Site Code : 12109001
 Start Date : 12/11/2012
 Page No : 1

Groups Printed- Cars - Trucks

	Stop & Shop Dr From North			Blakaley Ave From East			Garfield Ave From South			Blakaley Ave From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	1	34	7	0	0	0	8	0	0	4	0	6	60
07:15 AM	0	39	9	0	0	0	1	1	0	2	0	6	58
07:30 AM	0	42	12	0	0	0	7	7	0	3	0	8	79
07:45 AM	0	40	8	0	0	0	5	9	1	2	0	6	71
Total	1	155	36	0	0	0	21	17	1	11	0	26	268
08:00 AM	0	36	6	0	0	0	1	5	0	1	0	4	53
08:15 AM	1	38	3	2	0	0	9	7	0	0	1	6	67
08:30 AM	0	29	15	0	0	0	5	4	0	1	1	8	63
08:45 AM	0	22	7	1	0	0	3	6	1	3	0	5	48
Total	1	125	31	3	0	0	18	22	1	5	2	23	231
Grand Total	2	280	67	3	0	0	39	39	2	16	2	49	499
Apprch %	0.6	80.2	19.2	100	0	0	48.8	48.8	2.5	23.9	3	73.1	
Total %	0.4	56.1	13.4	0.6	0	0	7.8	7.8	0.4	3.2	0.4	9.8	
Cars	2	280	64	2	0	0	39	38	2	16	1	45	489
% Cars	100	100	95.5	66.7	0	0	100	97.4	100	100	50	91.8	98
Trucks	0	0	3	1	0	0	0	1	0	0	1	4	10
% Trucks	0	0	4.5	33.3	0	0	0	2.6	0	0	50	8.2	2

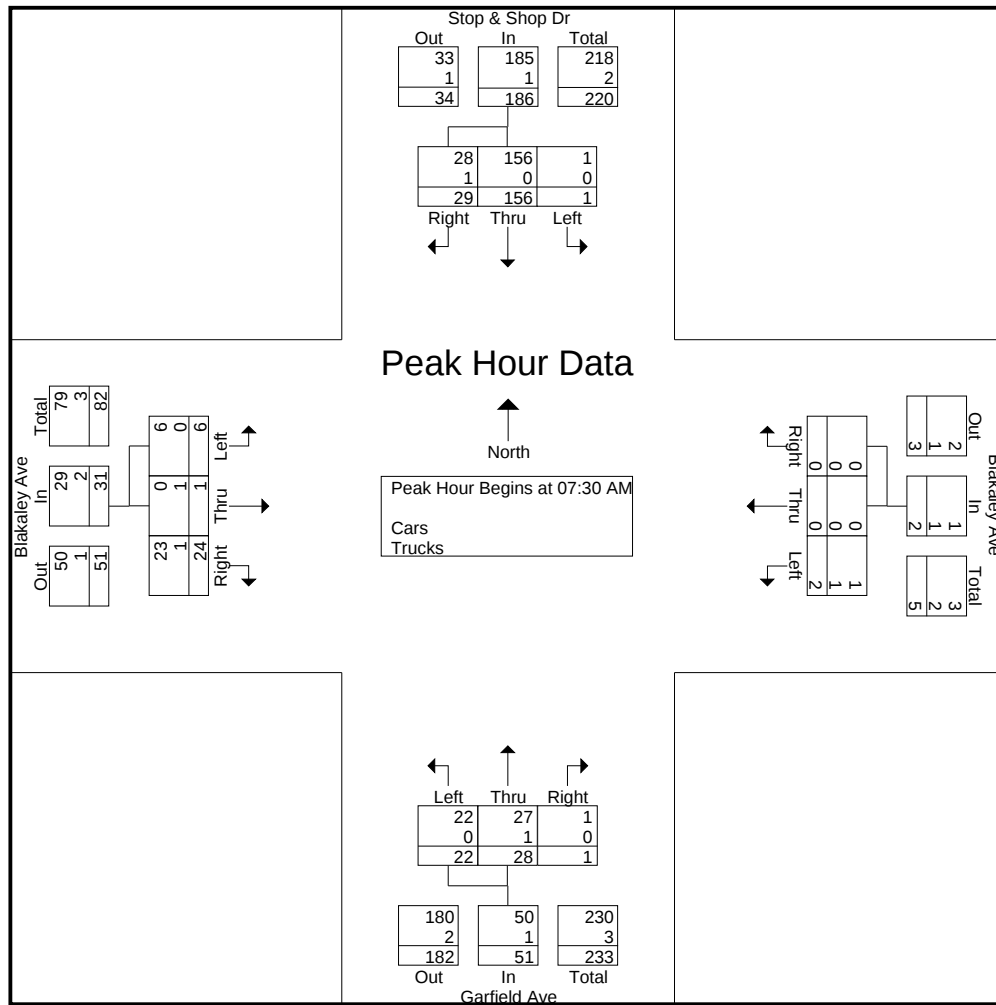
	Stop & Shop Dr From North				Blakaley Ave From East				Garfield Ave From South				Blakaley Ave From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	0	42	12	54	0	0	0	0	7	7	0	14	3	0	8	11	79
07:45 AM	0	40	8	48	0	0	0	0	5	9	1	15	2	0	6	8	71
08:00 AM	0	36	6	42	0	0	0	0	1	5	0	6	1	0	4	5	53
08:15 AM	1	38	3	42	2	0	0	2	9	7	0	16	0	1	6	7	67
Total Volume	1	156	29	186	2	0	0	2	22	28	1	51	6	1	24	31	270
% App. Total	0.5	83.9	15.6		100	0	0		43.1	54.9	2		19.4	3.2	77.4		
PHF	.250	.929	.604	.861	.250	.000	.000	.250	.611	.778	.250	.797	.500	.250	.750	.705	.854
Cars	1	156	28	185	1	0	0	1	22	27	1	50	6	0	23	29	265
% Cars	100	100	96.6	99.5	50.0	0	0	50.0	100	96.4	100	98.0	100	0	95.8	93.5	98.1
Trucks	0	0	1	1	1	0	0	1	0	1	0	1	0	1	1	2	5
% Trucks	0	0	3.4	0.5	50.0	0	0	50.0	0	3.6	0	2.0	0	100	4.2	6.5	1.9

Accurate Counts

978-664-2565

N/S Street : Stop & Shop / Garfield Av
 E/W Street : Blakeley Avenue
 City/State : Somerville, MA
 Weather : Cloudy

File Name : 12109001
 Site Code : 12109001
 Start Date : 12/11/2012
 Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
 Peak Hour for Each Approach Begins at:

	07:00 AM				08:00 AM				07:30 AM				07:00 AM			
+0 mins.	1	34	7	42	0	0	0	0	7	7	0	14	4	0	6	10
+15 mins.	0	39	9	48	2	0	0	2	5	9	1	15	2	0	6	8
+30 mins.	0	42	12	54	0	0	0	0	1	5	0	6	3	0	8	11
+45 mins.	0	40	8	48	1	0	0	1	9	7	0	16	2	0	6	8
Total Volume	1	155	36	192	3	0	0	3	22	28	1	51	11	0	26	37
% App. Total	0.5	80.7	18.8		100	0	0		43.1	54.9	2		29.7	0	70.3	
PHF	.250	.923	.750	.889	.375	.000	.000	.375	.611	.778	.250	.797	.688	.000	.813	.841
Cars	1	155	35	191	2	0	0	2	22	27	1	50	11	0	26	37
% Cars	100	100	97.2	99.5	66.7	0	0	66.7	100	96.4	100	98	100	0	100	100
Trucks	0	0	1	1	1	0	0	1	0	1	0	1	0	0	0	0
% Trucks	0	0	2.8	0.5	33.3	0	0	33.3	0	3.6	0	2	0	0	0	0

Accurate Counts

978-664-2565

N/S Street : Stop & Shop / Garfield Av
 E/W Street : Blakeley Avenue
 City/State : Somerville, MA
 Weather : Cloudy

File Name : 12109001
 Site Code : 12109001
 Start Date : 12/11/2012
 Page No : 1

Groups Printed- Cars

	Stop & Shop Dr From North			Blakaley Ave From East			Garfield Ave From South			Blakaley Ave From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
04:00 PM	0	29	10	0	0	0	4	24	0	3	0	6	76
04:15 PM	0	37	14	0	0	0	1	17	0	1	0	3	73
04:30 PM	0	42	18	0	0	0	2	23	0	0	0	9	94
04:45 PM	0	27	15	0	0	1	7	10	0	5	0	7	72
Total	0	135	57	0	0	1	14	74	0	9	0	25	315
05:00 PM	1	37	13	1	1	0	1	22	0	5	0	9	90
05:15 PM	0	38	19	0	0	0	8	23	0	1	0	7	96
05:30 PM	0	40	17	0	0	0	2	26	0	1	0	3	89
05:45 PM	0	34	27	1	0	0	5	21	1	4	0	5	98
Total	1	149	76	2	1	0	16	92	1	11	0	24	373
Grand Total	1	284	133	2	1	1	30	166	1	20	0	49	688
Apprch %	0.2	67.9	31.8	50	25	25	15.2	84.3	0.5	29	0	71	
Total %	0.1	41.3	19.3	0.3	0.1	0.1	4.4	24.1	0.1	2.9	0	7.1	

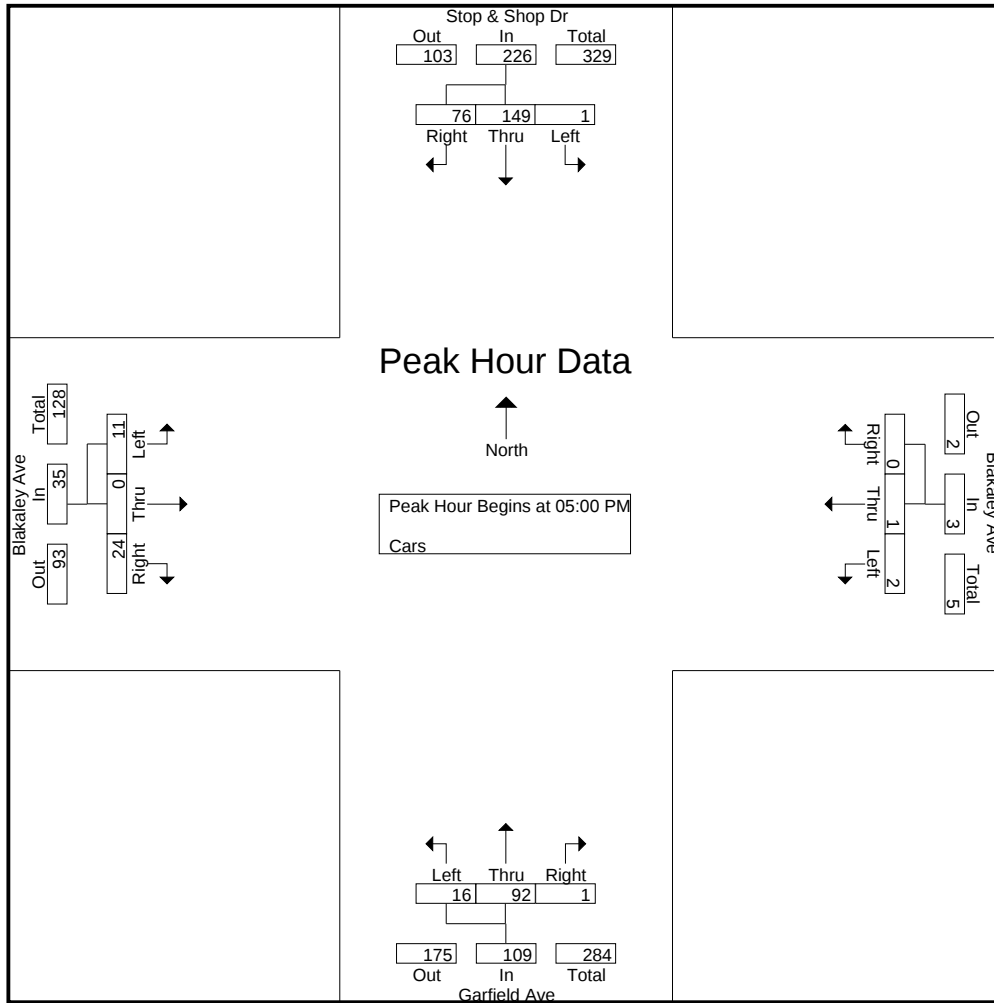
	Stop & Shop Dr From North				Blakaley Ave From East				Garfield Ave From South				Blakaley Ave From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	1	37	13	51	1	1	0	2	1	22	0	23	5	0	9	14	90
05:15 PM	0	38	19	57	0	0	0	0	8	23	0	31	1	0	7	8	96
05:30 PM	0	40	17	57	0	0	0	0	2	26	0	28	1	0	3	4	89
05:45 PM	0	34	27	61	1	0	0	1	5	21	1	27	4	0	5	9	98
Total Volume	1	149	76	226	2	1	0	3	16	92	1	109	11	0	24	35	373
% App. Total	0.4	65.9	33.6		66.7	33.3	0		14.7	84.4	0.9		31.4	0	68.6		
PHF	.250	.931	.704	.926	.500	.250	.000	.375	.500	.885	.250	.879	.550	.000	.667	.625	.952

Accurate Counts

978-664-2565

N/S Street : Stop & Shop / Garfield Av
 E/W Street : Blakeley Avenue
 City/State : Somerville, MA
 Weather : Cloudy

File Name : 12109001
 Site Code : 12109001
 Start Date : 12/11/2012
 Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
 Peak Hour for Each Approach Begins at:

	05:00 PM				04:15 PM				05:00 PM				04:30 PM			
+0 mins.	1	37	13	51	0	0	0	0	1	22	0	23	0	0	9	9
+15 mins.	0	38	19	57	0	0	0	0	8	23	0	31	5	0	7	12
+30 mins.	0	40	17	57	0	0	1	1	2	26	0	28	5	0	9	14
+45 mins.	0	34	27	61	1	1	0	2	5	21	1	27	1	0	7	8
Total Volume	1	149	76	226	1	1	1	3	16	92	1	109	11	0	32	43
% App. Total	0.4	65.9	33.6		33.3	33.3	33.3		14.7	84.4	0.9		25.6	0	74.4	
PHF	.250	.931	.704	.926	.250	.250	.250	.375	.500	.885	.250	.879	.550	.000	.889	.768

Accurate Counts

978-664-2565

N/S Street : Stop & Spop Driveway
 E/W Street: Mystic Avenue
 City/State : Somerville, MA
 Weather : Cloudy

File Name : 12109002
 Site Code : 12109002
 Start Date : 12/11/2012
 Page No : 1

Groups Printed- Cars - Trucks

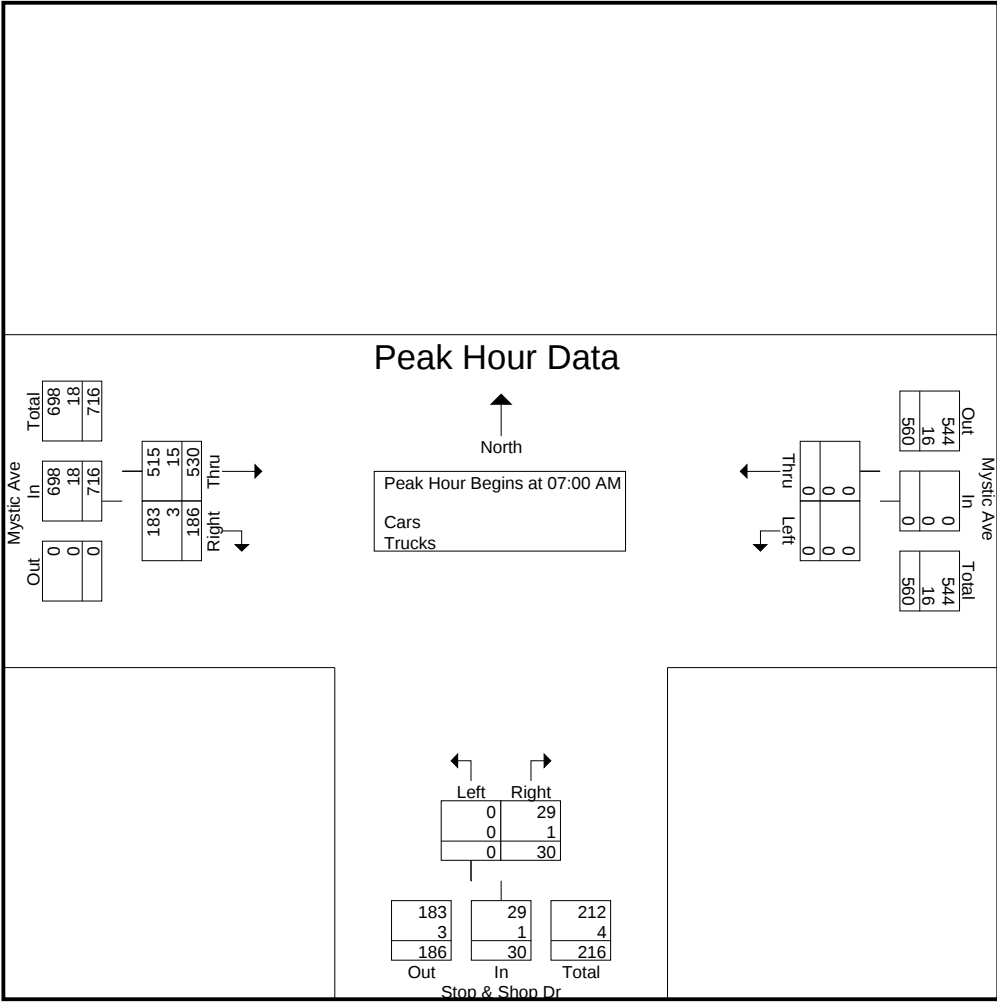
	Mystic Ave From East		Stop & Shop Dr From South		Mystic Ave From West		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
07:00 AM	0	0	0	6	132	50	188
07:15 AM	0	0	0	4	120	51	175
07:30 AM	0	0	0	14	142	49	205
07:45 AM	0	0	0	6	136	36	178
Total	0	0	0	30	530	186	746
08:00 AM	0	0	0	6	112	48	166
08:15 AM	0	0	0	4	118	50	172
08:30 AM	0	0	0	7	114	46	167
08:45 AM	0	0	0	6	93	40	139
Total	0	0	0	23	437	184	644
Grand Total	0	0	0	53	967	370	1390
Apprch %	0	0	0	100	72.3	27.7	
Total %	0	0	0	3.8	69.6	26.6	
Cars	0	0	0	51	933	361	1345
% Cars	0	0	0	96.2	96.5	97.6	96.8
Trucks	0	0	0	2	34	9	45
% Trucks	0	0	0	3.8	3.5	2.4	3.2

	Mystic Ave From East			Stop & Shop Dr From South			Mystic Ave From West			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	0	0	0	0	6	6	132	50	182	188
07:15 AM	0	0	0	0	4	4	120	51	171	175
07:30 AM	0	0	0	0	14	14	142	49	191	205
07:45 AM	0	0	0	0	6	6	136	36	172	178
Total Volume	0	0	0	0	30	30	530	186	716	746
% App. Total	0	0		0	100		74	26		
PHF	.000	.000	.000	.000	.536	.536	.933	.912	.937	.910
Cars	0	0	0	0	29	29	515	183	698	727
% Cars	0	0	0	0	96.7	96.7	97.2	98.4	97.5	97.5
Trucks	0	0	0	0	1	1	15	3	18	19
% Trucks	0	0	0	0	3.3	3.3	2.8	1.6	2.5	2.5

Accurate Counts
978-664-2565

N/S Street : Stop & Spop Driveway
E/W Street: Mystic Avenue
City/State : Somerville, MA
Weather : Cloudy

File Name : 12109002
Site Code : 12109002
Start Date : 12/11/2012
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:00 AM			07:00 AM			07:00 AM		
+0 mins.	0	0	0	0	6	6	132	50	182
+15 mins.	0	0	0	0	4	4	120	51	171
+30 mins.	0	0	0	0	14	14	142	49	191
+45 mins.	0	0	0	0	6	6	136	36	172
Total Volume	0	0	0	0	30	30	530	186	716
% App. Total	0	0		0	100		74	26	
PHF	.000	.000	.000	.000	.536	.536	.933	.912	.937
Cars	0	0	0	0	29	29	515	183	698
% Cars	0	0	0	0	96.7	96.7	97.2	98.4	97.5
Trucks	0	0	0	0	1	1	15	3	18
% Trucks	0	0	0	0	3.3	3.3	2.8	1.6	2.5

Accurate Counts

978-664-2565

N/S Street : Stop & Spop Driveway
 E/W Street: Mystic Avenue
 City/State : Somerville, MA
 Weather : Cloudy

File Name : 12109002
 Site Code : 12109002
 Start Date : 12/11/2012
 Page No : 1

Groups Printed- Cars - Trucks

	Mystic Ave From East		Stop & Shop Dr From South		Mystic Ave From West		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
04:00 PM	0	0	0	13	55	50	118
04:15 PM	0	0	0	21	64	51	136
04:30 PM	0	0	1	12	62	53	128
04:45 PM	0	0	0	16	61	46	123
Total	0	0	1	62	242	200	505
05:00 PM	0	0	0	21	72	46	139
05:15 PM	0	0	0	14	71	67	152
05:30 PM	0	1	0	13	56	53	123
05:45 PM	0	0	0	18	43	51	112
Total	0	1	0	66	242	217	526
Grand Total	0	1	1	128	484	417	1031
Apprch %	0	100	0.8	99.2	53.7	46.3	
Total %	0	0.1	0.1	12.4	46.9	40.4	
Cars	0	1	1	127	478	415	1022
% Cars	0	100	100	99.2	98.8	99.5	99.1
Trucks	0	0	0	1	6	2	9
% Trucks	0	0	0	0.8	1.2	0.5	0.9

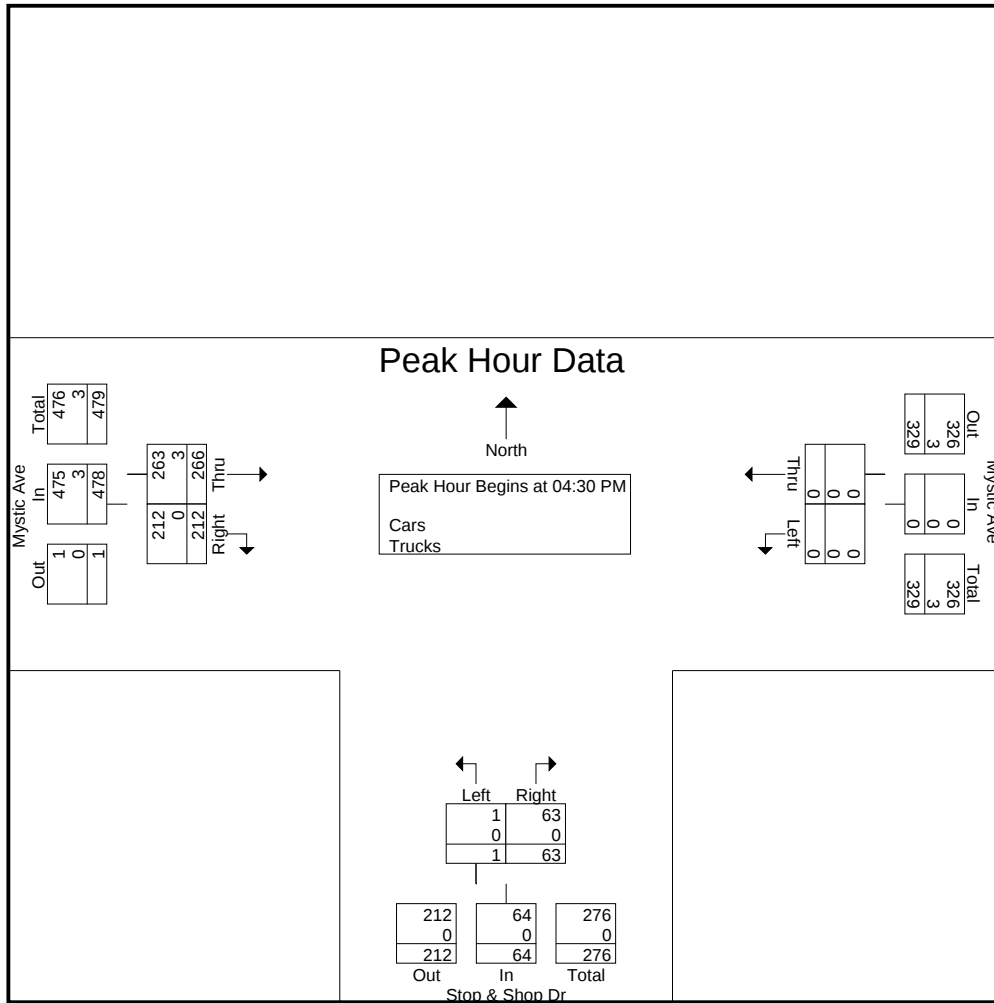
	Mystic Ave From East			Stop & Shop Dr From South			Mystic Ave From West			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:30 PM										
04:30 PM	0	0	0	1	12	13	62	53	115	128
04:45 PM	0	0	0	0	16	16	61	46	107	123
05:00 PM	0	0	0	0	21	21	72	46	118	139
05:15 PM	0	0	0	0	14	14	71	67	138	152
Total Volume	0	0	0	1	63	64	266	212	478	542
% App. Total	0	0		1.6	98.4		55.6	44.4		
PHF	.000	.000	.000	.250	.750	.762	.924	.791	.866	.891
Cars	0	0	0	1	63	64	263	212	475	539
% Cars	0	0	0	100	100	100	98.9	100	99.4	99.4
Trucks	0	0	0	0	0	0	3	0	3	3
% Trucks	0	0	0	0	0	0	1.1	0	0.6	0.6

Accurate Counts

978-664-2565

N/S Street : Stop & Spop Driveway
 E/W Street: Mystic Avenue
 City/State : Somerville, MA
 Weather : Cloudy

File Name : 12109002
 Site Code : 12109002
 Start Date : 12/11/2012
 Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
 Peak Hour for Each Approach Begins at:

	04:45 PM			04:15 PM			04:30 PM		
+0 mins.	0	0	0	0	21	21	62	53	115
+15 mins.	0	0	0	1	12	13	61	46	107
+30 mins.	0	0	0	0	16	16	72	46	118
+45 mins.	0	1	1	0	21	21	71	67	138
Total Volume	0	1	1	1	70	71	266	212	478
% App. Total	0	100		1.4	98.6		55.6	44.4	
PHF	.000	.250	.250	.250	.833	.845	.924	.791	.866
Cars	0	1	1	1	69	70	263	212	475
% Cars	0	100	100	100	98.6	98.6	98.9	100	99.4
Trucks	0	0	0	0	1	1	3	0	3
% Trucks	0	0	0	0	1.4	1.4	1.1	0	0.6

978-664-2565

File Name : 12109003
Site Code : 12109003
Start Date : 12/11/2012
Page No : 1

Groups Printed- Cars - Trucks

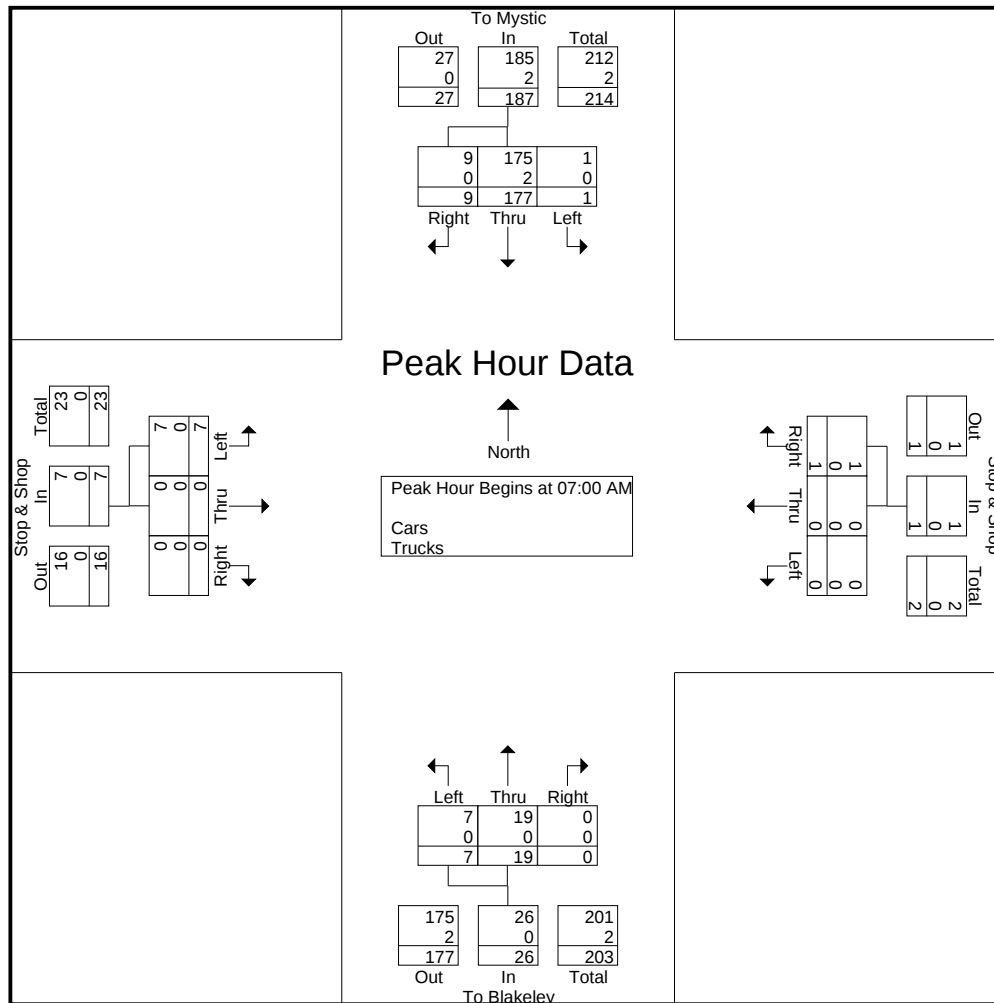
	To Mystic From North			Stop & Shop From East			To Blakeley From South			Stop & Shop From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	0	42	3	0	0	1	0	2	0	2	0	0	50
07:15 AM	0	49	3	0	0	0	1	4	0	0	0	0	57
07:30 AM	1	47	3	0	0	0	3	8	0	4	0	0	66
07:45 AM	0	39	0	0	0	0	3	5	0	1	0	0	48
Total	1	177	9	0	0	1	7	19	0	7	0	0	221
08:00 AM	1	36	6	0	0	0	0	4	0	0	0	2	49
08:15 AM	0	42	3	0	0	0	0	4	0	0	0	0	49
08:30 AM	0	48	5	0	0	0	1	5	0	0	0	2	61
08:45 AM	1	18	1	0	0	0	1	0	0	3	0	2	26
Total	2	144	15	0	0	0	2	13	0	3	0	6	185
Grand Total	3	321	24	0	0	1	9	32	0	10	0	6	406
Apprch %	0.9	92.2	6.9	0	0	100	22	78	0	62.5	0	37.5	
Total %	0.7	79.1	5.9	0	0	0.2	2.2	7.9	0	2.5	0	1.5	
Cars	3	317	24	0	0	1	9	31	0	10	0	6	401
% Cars	100	98.8	100	0	0	100	100	96.9	0	100	0	100	98.8
Trucks	0	4	0	0	0	0	0	1	0	0	0	0	5
% Trucks	0	1.2	0	0	0	0	0	3.1	0	0	0	0	1.2

[illegible]

Accurate Counts
978-664-2565

N/S Street : Internal to/from Mystic
E/W Street : Internal to/from S&S
City/State : Somerville, MA
Weather : Cloudy

File Name : 12109003
Site Code : 12109003
Start Date : 12/11/2012
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

[illegible]

Accurate Counts

978-664-2565

N/S Street : Internal to/from Mystic
 E/W Street : Internal to/from S&S
 City/State : Somerville, MA
 Weather : Cloudy

File Name : 12109003
 Site Code : 12109003
 Start Date : 12/11/2012
 Page No : 1

Groups Printed- Cars

	To Mystic From North			Stop & Shop From East			To Blakeley From South			Stop & Shop From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
04:00 PM	0	36	5	0	0	0	3	13	0	4	0	1	62
04:15 PM	0	36	7	0	0	1	1	18	0	1	0	5	69
04:30 PM	1	48	2	0	0	0	4	5	0	2	0	4	66
04:45 PM	0	36	2	0	0	0	2	13	0	1	0	4	58
Total	1	156	16	0	0	1	10	49	0	8	0	14	255
05:00 PM	1	38	6	0	0	1	2	17	0	3	0	6	74
05:15 PM	1	51	5	1	0	0	4	16	0	2	0	3	83
05:30 PM	0	44	5	2	0	0	1	14	0	1	0	5	72
05:45 PM	0	37	2	1	1	0	0	11	0	2	0	4	58
Total	2	170	18	4	1	1	7	58	0	8	0	18	287
Grand Total	3	326	34	4	1	2	17	107	0	16	0	32	542
Apprch %	0.8	89.8	9.4	57.1	14.3	28.6	13.7	86.3	0	33.3	0	66.7	
Total %	0.6	60.1	6.3	0.7	0.2	0.4	3.1	19.7	0	3	0	5.9	

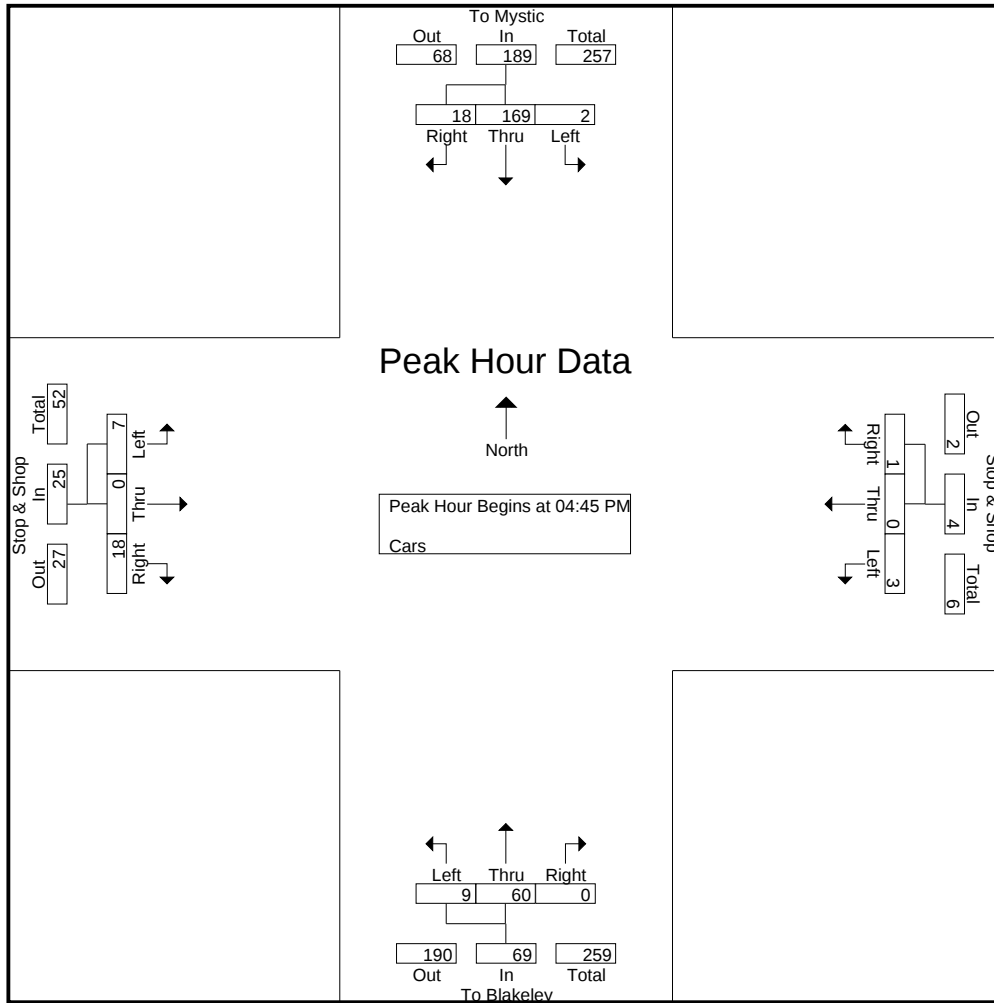
	To Mystic From North				Stop & Shop From East				To Blakeley From South				Stop & Shop From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	0	36	2	38	0	0	0	0	2	13	0	15	1	0	4	5	58
05:00 PM	1	38	6	45	0	0	1	1	2	17	0	19	3	0	6	9	74
05:15 PM	1	51	5	57	1	0	0	1	4	16	0	20	2	0	3	5	83
05:30 PM	0	44	5	49	2	0	0	2	1	14	0	15	1	0	5	6	72
Total Volume	2	169	18	189	3	0	1	4	9	60	0	69	7	0	18	25	287
% App. Total	1.1	89.4	9.5		75	0	25		13	87	0		28	0	72		
PHF	.500	.828	.750	.829	.375	.000	.250	.500	.563	.882	.000	.863	.583	.000	.750	.694	.864

Accurate Counts

978-664-2565

N/S Street : Internal to/from Mystic
 E/W Street : Internal to/from S&S
 City/State : Somerville, MA
 Weather : Cloudy

File Name : 12109003
 Site Code : 12109003
 Start Date : 12/11/2012
 Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
 Peak Hour for Each Approach Begins at:

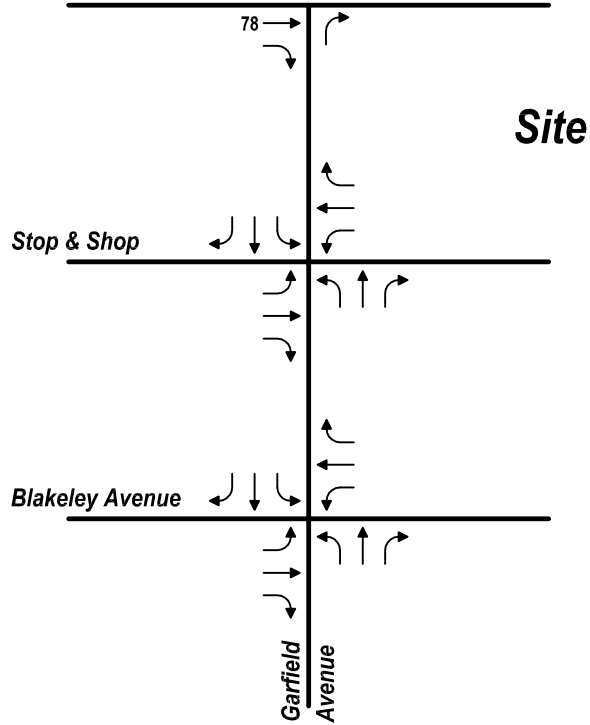
	04:30 PM				05:00 PM				04:45 PM				04:15 PM			
+0 mins.	1	48	2	51	0	0	1	1	2	13	0	15	1	0	5	6
+15 mins.	0	36	2	38	1	0	0	1	2	17	0	19	2	0	4	6
+30 mins.	1	38	6	45	2	0	0	2	4	16	0	20	1	0	4	5
+45 mins.	1	51	5	57	1	1	0	2	1	14	0	15	3	0	6	9
Total Volume	3	173	15	191	4	1	1	6	9	60	0	69	7	0	19	26
% App. Total	1.6	90.6	7.9		66.7	16.7	16.7		13	87	0		26.9	0	73.1	
PHF	.750	.848	.625	.838	.500	.250	.250	.750	.563	.882	.000	.863	.583	.000	.792	.722



Background Traffic Volumes

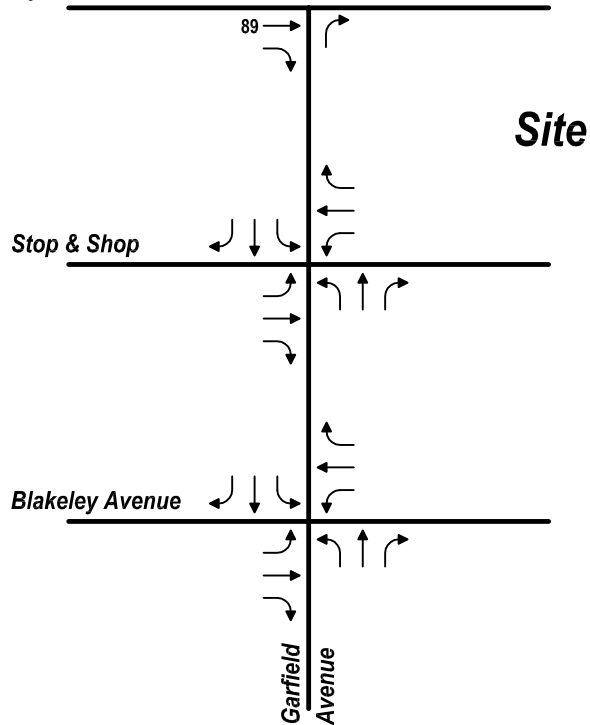
Mystic Avenue

Weekday Morning Peak Hour



Mystic Avenue

Weekday Evening Peak Hour



Vanasse Hangen Brustlin, Inc.

Assembly Square Background Project
Peak Hour Traffic Volumes
Proposed Residential Development
Somerville, Massachusetts



Not to Scale



Trip Generation Calculations

ITE TRIP GENERATION WORKSHEET
(9th Edition, Updated 2012)

LANDUSE: Apartment
LANDUSE CODE: 220

Independent Variable --- Number of Units

JOB NAME:
JOB NUMBER:

Peak Hour Traffic on Adjacent Street: 120 units

WEEKDAY

RATES:	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	88	0.87	6.65	1.27	12.50	210	0	1,000	50%	50%
AM PEAK (ADJACENT ST)	78	0.83	0.51	0.10	1.02	235	0	1,100	20%	80%
PM PEAK (ADJACENT ST)	90	0.77	0.62	0.10	1.64	233	0	1,100	65%	35%

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	798	399	399	851	425	425
AM PEAK (ADJACENT ST)	61	12	49	63	13	50
PM PEAK (ADJACENT ST)	74	48	26	84	54	29

SATURDAY

RATES:	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	15	0.85	6.39	2.84	8.40	175	65	360	50%	50%
PEAK OF GENERATOR	14	0.56	0.52	0.26	1.05	178	65	360	Peak Distribution Not Available	

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	767	383	383	686	343	343
PEAK OF GENERATOR	62	NA	NA	68	NA	NA

SUNDAY

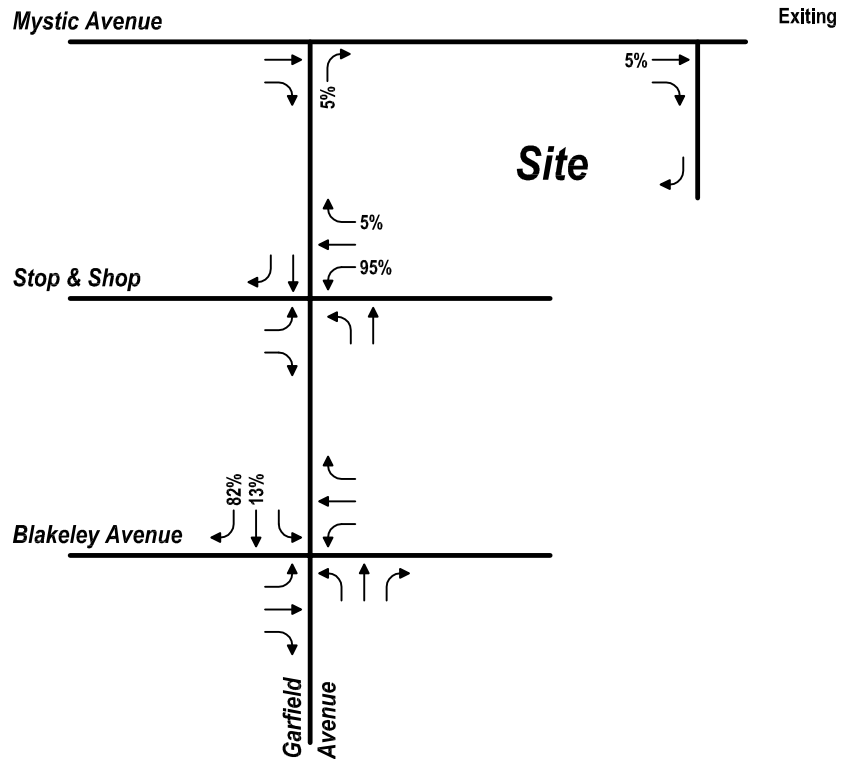
RATES:	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	14	0.82	5.86	3.21	7.53	182	90	360	50%	50%
PEAK OF GENERATOR	13	--	0.51	0.26	1.43	186	90	360	Peak Distribution Not Available	

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	703	383	383	669	335	335
PEAK OF GENERATOR	61	NA	NA	NA	NA	NA



Trip Distribution



Vanasse Hangen Brustlin, Inc.

Trip Distribution
Peak Hour Traffic Volumes
Proposed Residential Development
Somerville, Massachusetts



Not to Scale

Mystic Avenue

Stop & Shop

Blakeley Avenue

Garfield Avenue

Site

Weekday Morning Peak Hour

Entering = xx

Exiting = (xx)

Mystic Avenue

Stop & Shop

Blakeley Avenue

Garfield Avenue

Site

Weekday Evening Peak Hour

Entering = xx

Exiting = (xx)

Vanasse Hangen Brustlin, Inc.

Site Generated Trips
Peak Hour Traffic Volumes
Proposed Residential Development
Somerville, Massachusetts



Not to Scale



Intersection Capacity Analysis

2012 Existing Conditions
2: Mystic Avenue & Garfield Avenue

Weekday Morning Peak Hour
Timing Plan: Default

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Volume (veh/h)	530	186	0	0	0	30
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.92	0.92	0.54	0.54
Hourly flow rate (vph)	564	198	0	0	0	56
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			762		663	663
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			762		663	663
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	88
cM capacity (veh/h)			851		425	460
Direction, Lane #	SE 1	NE 1				
Volume Total	762	56				
Volume Left	0	0				
Volume Right	198	56				
cSH	1700	460				
Volume to Capacity	0.45	0.12				
Queue Length 95th (ft)	0	10				
Control Delay (s)	0.0	13.9				
Lane LOS		B				
Approach Delay (s)	0.0	13.9				
Approach LOS		B				
Intersection Summary						
Average Delay		0.9				
Intersection Capacity Utilization		49.2%	ICU Level of Service	A		
Analysis Period (min)		15				

2012 Existing Conditions
5: Stop&Shop & Garfield Avenue

Weekday Morning Peak Hour
Timing Plan: Default

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	7	0	0	0	0	1	7	19	0	1	177	9
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.44	0.44	0.44	0.25	0.25	0.25	0.59	0.59	0.59	0.90	0.90	0.90
Hourly flow rate (vph)	16	0	0	0	0	4	12	32	0	1	197	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	264	260	202	260	265	32	207			32		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	264	260	202	260	265	32	207			32		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	100	100	100	100	99			100		
cM capacity (veh/h)	686	642	844	692	638	1047	1377			1586		
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total	16	4	44	208								
Volume Left	16	0	12	1								
Volume Right	0	4	0	10								
cSH	686	1047	1377	1586								
Volume to Capacity	0.02	0.00	0.01	0.00								
Queue Length 95th (ft)	2	0	1	0								
Control Delay (s)	10.4	8.5	2.1	0.0								
Lane LOS	B	A	A	A								
Approach Delay (s)	10.4	8.5	2.1	0.0								
Approach LOS	B	A										
Intersection Summary												
Average Delay			1.1									
Intersection Capacity Utilization			22.4%	ICU Level of Service					A			
Analysis Period (min)			15									

2012 Existing Conditions
7: Blakeley Avenue & Garfield Avenue

Weekday Morning Peak Hour
Timing Plan: Default

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	11	0	26	0	0	0	21	17	1	1	155	36
Peak Hour Factor	0.84	0.84	0.84	0.92	0.92	0.92	0.65	0.65	0.65	0.89	0.89	0.89
Hourly flow rate (vph)	13	0	31	0	0	0	32	26	2	1	174	40
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total (vph)	44	0	60	216								
Volume Left (vph)	13	0	32	1								
Volume Right (vph)	31	0	2	40								
Hadj (s)	-0.36	0.00	0.09	-0.09								
Departure Headway (s)	4.1	4.5	4.3	4.0								
Degree Utilization, x	0.05	0.00	0.07	0.24								
Capacity (veh/h)	807	755	813	894								
Control Delay (s)	7.3	7.5	7.6	8.2								
Approach Delay (s)	7.3	0.0	7.6	8.2								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				8.0								
HCM Level of Service				A								
Intersection Capacity Utilization				27.1%	ICU Level of Service	A						
Analysis Period (min)				15								

2012 Existing Conditions
2: Mystic Avenue & Garfield Avenue

Weekday Evening Peak Hour
Timing Plan: Default

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Volume (veh/h)	242	217	0	0	0	66
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.92	0.92	0.74	0.74
Hourly flow rate (vph)	252	226	0	0	0	89
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			478		365	365
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			478		365	365
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	87
cM capacity (veh/h)			1084		634	680
Direction, Lane #	SE 1	NE 1				
Volume Total	478	89				
Volume Left	0	0				
Volume Right	226	89				
cSH	1700	680				
Volume to Capacity	0.28	0.13				
Queue Length 95th (ft)	0	11				
Control Delay (s)	0.0	11.1				
Lane LOS		B				
Approach Delay (s)	0.0	11.1				
Approach LOS		B				
Intersection Summary						
Average Delay		1.7				
Intersection Capacity Utilization		36.8%	ICU Level of Service	A		
Analysis Period (min)		15				

2012 Existing Conditions
5: Stop&Shop & Garfield Avenue

Weekday Evening Peak Hour
Timing Plan: Default

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	8	0	18	4	1	1	7	58	0	2	170	18
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.72	0.72	0.72	0.75	0.75	0.75	0.81	0.81	0.81	0.83	0.83	0.83
Hourly flow rate (vph)	11	0	25	5	1	1	9	72	0	2	205	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	311	309	216	334	320	72	227			72		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	311	309	216	334	320	72	227			72		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	97	99	100	100	99			100		
cM capacity (veh/h)	639	604	829	601	595	996	1354			1541		
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total	36	8	80	229								
Volume Left	11	5	9	2								
Volume Right	25	1	0	22								
cSH	760	642	1354	1541								
Volume to Capacity	0.05	0.01	0.01	0.00								
Queue Length 95th (ft)	4	1	0	0								
Control Delay (s)	10.0	10.7	0.9	0.1								
Lane LOS	A	B	A	A								
Approach Delay (s)	10.0	10.7	0.9	0.1								
Approach LOS	A	B										
Intersection Summary												
Average Delay			1.5									
Intersection Capacity Utilization			20.4%		ICU Level of Service				A			
Analysis Period (min)			15									

2012 Existing Conditions
7: Blakeley Avenue & Garfield Avenue

Weekday Evening Peak Hour
Timing Plan: Default

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	11	0	24	2	1	0	16	92	1	1	149	76
Peak Hour Factor	0.63	0.63	0.63	0.38	0.38	0.38	0.88	0.88	0.88	0.93	0.93	0.93
Hourly flow rate (vph)	17	0	38	5	3	0	18	105	1	1	160	82
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total (vph)	56	8	124	243								
Volume Left (vph)	17	5	18	1								
Volume Right (vph)	38	0	1	82								
Hadj (s)	-0.35	0.13	0.02	-0.20								
Departure Headway (s)	4.3	4.9	4.3	4.0								
Degree Utilization, x	0.07	0.01	0.15	0.27								
Capacity (veh/h)	757	671	809	888								
Control Delay (s)	7.7	7.9	8.1	8.4								
Approach Delay (s)	7.7	7.9	8.1	8.4								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				8.2								
HCM Level of Service				A								
Intersection Capacity Utilization				27.1%	ICU Level of Service	A						
Analysis Period (min)				15								

2017 No Build Conditions
2: Mystic Avenue & Garfield Avenue

Weekday Morning Peak Hour
Timing Plan: Default

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Volume (veh/h)	635	195	0	0	0	32
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.92	0.92	0.54	0.54
Hourly flow rate (vph)	676	207	0	0	0	59
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			883		779	779
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			883		779	779
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	85
cM capacity (veh/h)			766		363	394
Direction, Lane #	SE 1	NE 1				
Volume Total	883	59				
Volume Left	0	0				
Volume Right	207	59				
cSH	1700	394				
Volume to Capacity	0.52	0.15				
Queue Length 95th (ft)	0	13				
Control Delay (s)	0.0	15.7				
Lane LOS		C				
Approach Delay (s)	0.0	15.7				
Approach LOS		C				
Intersection Summary						
Average Delay		1.0				
Intersection Capacity Utilization		55.3%	ICU Level of Service		B	
Analysis Period (min)		15				

2017 No Build Conditions
5: Stop&Shop & Garfield Avenue

Weekday Morning Peak Hour
Timing Plan: Default

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	7	0	0	0	0	1	7	20	0	1	186	9
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.44	0.44	0.44	0.25	0.25	0.25	0.59	0.59	0.59	0.90	0.90	0.90
Hourly flow rate (vph)	16	0	0	0	0	4	12	34	0	1	207	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	276	272	212	272	277	34	217			34		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	276	272	212	272	277	34	217			34		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	100	100	100	100	99			100		
cM capacity (veh/h)	673	633	834	680	629	1045	1365			1584		
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total	16	4	46	218								
Volume Left	16	0	12	1								
Volume Right	0	4	0	10								
cSH	673	1045	1365	1584								
Volume to Capacity	0.02	0.00	0.01	0.00								
Queue Length 95th (ft)	2	0	1	0								
Control Delay (s)	10.5	8.5	2.0	0.0								
Lane LOS	B	A	A	A								
Approach Delay (s)	10.5	8.5	2.0	0.0								
Approach LOS	B	A										
Intersection Summary												
Average Delay			1.1									
Intersection Capacity Utilization			22.9%	ICU Level of Service					A			
Analysis Period (min)			15									

2017 No Build Conditions
7: Blakeley Avenue & Garfield Avenue

Weekday Morning Peak Hour
Timing Plan: Default

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	12	0	27	0	0	0	22	18	1	1	163	38
Peak Hour Factor	0.84	0.84	0.84	0.92	0.92	0.92	0.65	0.65	0.65	0.89	0.89	0.89
Hourly flow rate (vph)	14	0	32	0	0	0	34	28	2	1	183	43
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total (vph)	46	0	63	227								
Volume Left (vph)	14	0	34	1								
Volume Right (vph)	32	0	2	43								
Hadj (s)	-0.35	0.00	0.09	-0.09								
Departure Headway (s)	4.2	4.6	4.3	4.0								
Degree Utilization, x	0.05	0.00	0.08	0.25								
Capacity (veh/h)	798	747	809	892								
Control Delay (s)	7.4	7.6	7.7	8.3								
Approach Delay (s)	7.4	0.0	7.7	8.3								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				8.1								
HCM Level of Service				A								
Intersection Capacity Utilization				27.6%	ICU Level of Service	A						
Analysis Period (min)				15								

2017 No Build Conditions
2: Mystic Avenue & Garfield Avenue

Weekday Evening Peak Hour
Timing Plan: Default

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Volume (veh/h)	343	228	0	0	0	69
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.92	0.92	0.74	0.74
Hourly flow rate (vph)	357	238	0	0	0	93
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			595		476	476
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			595		476	476
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	84
cM capacity (veh/h)			981		548	589
Direction, Lane #	SE 1	NE 1				
Volume Total	595	93				
Volume Left	0	0				
Volume Right	238	93				
cSH	1700	589				
Volume to Capacity	0.35	0.16				
Queue Length 95th (ft)	0	14				
Control Delay (s)	0.0	12.3				
Lane LOS		B				
Approach Delay (s)	0.0	12.3				
Approach LOS		B				
Intersection Summary						
Average Delay		1.7				
Intersection Capacity Utilization		42.9%	ICU Level of Service	A		
Analysis Period (min)		15				

2017 No Build Conditions
5: Stop&Shop & Garfield Avenue

Weekday Evening Peak Hour
Timing Plan: Default

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	8	0	19	4	1	1	7	61	0	2	179	19
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.72	0.72	0.72	0.75	0.75	0.75	0.81	0.81	0.81	0.83	0.83	0.83
Hourly flow rate (vph)	11	0	26	5	1	1	9	75	0	2	216	23
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	327	325	227	351	336	75	239			75		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	327	325	227	351	336	75	239			75		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	97	99	100	100	99			100		
cM capacity (veh/h)	625	592	817	584	583	992	1340			1537		
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total	38	8	84	241								
Volume Left	11	5	9	2								
Volume Right	26	1	0	23								
cSH	749	627	1340	1537								
Volume to Capacity	0.05	0.01	0.01	0.00								
Queue Length 95th (ft)	4	1	0	0								
Control Delay (s)	10.1	10.8	0.8	0.1								
Lane LOS	B	B	A	A								
Approach Delay (s)	10.1	10.8	0.8	0.1								
Approach LOS	B	B										
Intersection Summary												
Average Delay			1.5									
Intersection Capacity Utilization			21.0%	ICU Level of Service					A			
Analysis Period (min)			15									

2017 No Build Conditions
7: Blakeley Avenue & Garfield Avenue

Weekday Evening Peak Hour
Timing Plan: Default

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	12	0	25	2	1	0	17	97	1	1	156	80
Peak Hour Factor	0.63	0.63	0.63	0.38	0.38	0.38	0.88	0.88	0.88	0.93	0.93	0.93
Hourly flow rate (vph)	19	0	40	5	3	0	19	110	1	1	168	86
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total (vph)	59	8	131	255								
Volume Left (vph)	19	5	19	1								
Volume Right (vph)	40	0	1	86								
Hadj (s)	-0.34	0.13	0.02	-0.20								
Departure Headway (s)	4.4	4.9	4.3	4.0								
Degree Utilization, x	0.07	0.01	0.16	0.28								
Capacity (veh/h)	747	663	804	884								
Control Delay (s)	7.7	8.0	8.1	8.6								
Approach Delay (s)	7.7	8.0	8.1	8.6								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				8.3								
HCM Level of Service				A								
Intersection Capacity Utilization				28.2%	ICU Level of Service	A						
Analysis Period (min)				15								

2017 Build Conditions
2: Mystic Avenue & Garfield Avenue

Weekday Morning Peak Hour
Timing Plan: Default

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Volume (veh/h)	646	195	0	0	0	36
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.92	0.92	0.54	0.54
Hourly flow rate (vph)	687	207	0	0	0	67
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			895		791	791
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			895		791	791
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	83
cM capacity (veh/h)			758		357	388
Direction, Lane #	SE 1	NE 1				
Volume Total	895	67				
Volume Left	0	0				
Volume Right	207	67				
cSH	1700	388				
Volume to Capacity	0.53	0.17				
Queue Length 95th (ft)	0	15				
Control Delay (s)	0.0	16.2				
Lane LOS		C				
Approach Delay (s)	0.0	16.2				
Approach LOS		C				
Intersection Summary						
Average Delay		1.1				
Intersection Capacity Utilization		55.9%	ICU Level of Service		B	
Analysis Period (min)		15				

2017 Build Conditions
5: Stop&Shop & Garfield Avenue

Weekday Morning Peak Hour
Timing Plan: Default

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	7	0	0	48	0	2	7	22	0	0	186	9
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.44	0.44	0.44	0.25	0.25	0.25	0.59	0.59	0.59	0.90	0.90	0.90
Hourly flow rate (vph)	16	0	0	192	0	8	12	37	0	0	207	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	281	273	212	273	278	37	217			37		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	281	273	212	273	278	37	217			37		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	100	72	100	99	99			100		
cM capacity (veh/h)	666	632	834	679	628	1041	1365			1580		
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total	16	200	49	217								
Volume Left	16	192	12	0								
Volume Right	0	8	0	10								
cSH	666	689	1365	1580								
Volume to Capacity	0.02	0.29	0.01	0.00								
Queue Length 95th (ft)	2	30	1	0								
Control Delay (s)	10.5	12.3	1.9	0.0								
Lane LOS	B	B	A									
Approach Delay (s)	10.5	12.3	1.9	0.0								
Approach LOS	B	B										
Intersection Summary												
Average Delay			5.7									
Intersection Capacity Utilization			20.3%	ICU Level of Service					A			
Analysis Period (min)			15									

2017 Build Conditions
7: Blakeley Avenue & Garfield Avenue

Weekday Morning Peak Hour
Timing Plan: Default

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	12	0	27	0	0	0	22	20	1	1	170	79
Peak Hour Factor	0.84	0.84	0.84	0.92	0.92	0.92	0.65	0.65	0.65	0.89	0.89	0.89
Hourly flow rate (vph)	14	0	32	0	0	0	34	31	2	1	191	89
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total (vph)	46	0	66	281								
Volume Left (vph)	14	0	34	1								
Volume Right (vph)	32	0	2	89								
Hadj (s)	-0.35	0.00	0.09	-0.17								
Departure Headway (s)	4.3	4.7	4.4	3.9								
Degree Utilization, x	0.06	0.00	0.08	0.30								
Capacity (veh/h)	772	723	800	909								
Control Delay (s)	7.5	7.7	7.7	8.6								
Approach Delay (s)	7.5	0.0	7.7	8.6								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				8.3								
HCM Level of Service				A								
Intersection Capacity Utilization				29.4%	ICU Level of Service	A						
Analysis Period (min)				15								

2017 Build Conditions
2: Mystic Avenue & Garfield Avenue

Weekday Evening Peak Hour
Timing Plan: Default

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Volume (veh/h)	387	228	0	0	0	80
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.92	0.92	0.74	0.74
Hourly flow rate (vph)	403	238	0	0	0	108
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			641		522	522
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			641		522	522
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	81
cM capacity (veh/h)			944		515	555
Direction, Lane #	SE 1	NE 1				
Volume Total	641	108				
Volume Left	0	0				
Volume Right	238	108				
cSH	1700	555				
Volume to Capacity	0.38	0.19				
Queue Length 95th (ft)	0	18				
Control Delay (s)	0.0	13.1				
Lane LOS		B				
Approach Delay (s)	0.0	13.1				
Approach LOS		B				
Intersection Summary						
Average Delay		1.9				
Intersection Capacity Utilization		45.9%	ICU Level of Service	A		
Analysis Period (min)		15				

2017 Build Conditions
5: Stop&Shop & Garfield Avenue

Weekday Evening Peak Hour
Timing Plan: Default

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	8	0	19	28	0	1	7	71	0	0	179	19
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.72	0.72	0.72	0.75	0.75	0.75	0.81	0.81	0.81	0.83	0.83	0.83
Hourly flow rate (vph)	11	0	26	37	0	1	9	88	0	0	216	23
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	333	332	227	358	343	88	239			88		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	333	332	227	358	343	88	239			88		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	97	94	100	100	99			100		
cM capacity (veh/h)	620	587	817	579	579	976	1340			1521		
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total	38	39	96	239								
Volume Left	11	37	9	0								
Volume Right	26	1	0	23								
cSH	747	587	1340	1521								
Volume to Capacity	0.05	0.07	0.01	0.00								
Queue Length 95th (ft)	4	5	0	0								
Control Delay (s)	10.1	11.6	0.7	0.0								
Lane LOS	B	B	A									
Approach Delay (s)	10.1	11.6	0.7	0.0								
Approach LOS	B	B										
Intersection Summary												
Average Delay			2.2									
Intersection Capacity Utilization			21.6%	ICU Level of Service					A			
Analysis Period (min)			15									

2017 Build Conditions
7: Blakeley Avenue & Garfield Avenue

Weekday Evening Peak Hour
Timing Plan: Default

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	12	0	25	2	1	0	17	107	1	1	160	104
Peak Hour Factor	0.63	0.63	0.63	0.38	0.38	0.38	0.88	0.88	0.88	0.93	0.93	0.93
Hourly flow rate (vph)	19	0	40	5	3	0	19	122	1	1	172	112
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total (vph)	59	8	142	285								
Volume Left (vph)	19	5	19	1								
Volume Right (vph)	40	0	1	112								
Hadj (s)	-0.34	0.13	0.02	-0.23								
Departure Headway (s)	4.5	5.0	4.4	4.0								
Degree Utilization, x	0.07	0.01	0.17	0.31								
Capacity (veh/h)	729	645	798	888								
Control Delay (s)	7.8	8.1	8.3	8.8								
Approach Delay (s)	7.8	8.1	8.3	8.8								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				8.5								
HCM Level of Service				A								
Intersection Capacity Utilization				28.8%	ICU Level of Service	A						
Analysis Period (min)				15								