Functional Design Report

Massachusetts Avenue Corridor Improvements

Lexington, Massachusetts

MassDOT File No. 607409

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(Revised August 2015 for Town Submission)

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Executive Summary

BSC Group has prepared this Functional Design Report to document existing traffic operations, evaluate safety and operational deficiencies, and recommend improvements for a 3,500 foot segment of Massachusetts Avenue (Mass Ave), designated as Route 4 and 225 in Lexington, Massachusetts, between the intersections of Marrett Road and Pleasant Street / Follen Road. The study area intersections for the project include Mass Ave at Marrett Road, Mass Ave at Maple Street, and Mass Ave at Pleasant Street / Follen Road. The intersection of Mass Ave at Maple Street is included on the list of MassDOT 2010 HSIP Crash Clusters that covered crashes from 2007 to 2009.

Study Methodology

This report includes a review of existing traffic and roadway conditions, a review of existing deficiencies along the corridor and at each of the study intersections, safety analyses, and signal warrant analyses. This report evaluates several design alternatives along the corridor and at each of the study intersections and evaluates the capacity for each alternative under a 10-year planning horizon (2023).

Existing Deficiencies

Existing deficiencies that were identified along the corridor and at each of the study intersections are listed below.

Mass Ave Corridor – Fair to poor sidewalk conditions, large number of mid-block crosswalks, missing or outdated pedestrian accessible ramps, outdated emergency signal at fire station, and lack of bicycle accommodation

Mass Ave at Marrett Road - Inadequate traffic control, lack of pedestrian accommodation

Mass Ave at Maple Street - Lack of traffic control, short turning lanes on Maple Street westbound, narrow travel lanes on Mass Ave southbound, long vehicular delays during peak hours, lack of pedestrian / bicycle accommodation, poor service station driveway access

Mass Ave at Pleasant Street / Follen Road - Inadequate traffic control, poor pedestrian accommodations, limited on-street parking, outdated signal equipment for pedestrian crossing at Waldorf School, queues spill back onto Mass Ave from Waldorf School parents waiting in afternoon, conflicts between Pleasant Street northbound queues and Wilson Farm driveways

Safety Analysis

Over the recent three years reviewed (2009 to 2011), crash rates were calculated at each of the study intersections. At Mass Ave and Marrett Road, 14 crashes occurred over 3 years, resulting in a crash rate of 0.47, which is below both the statewide and District 4 average crash rates. At Mass Ave and Pleasant Street / Follen Road, 13 crashes occurred over 3 years, resulting in a crash rate of 0.50,

which is below both the statewide and District 4 average crash rates. At Mass Ave and Maple Street, 24 crashes occurred over 3 years, resulting in a crash rate of 0.63, which is above both the statewide and District 4 average crash rates. It is anticipated that the proposed improvements at Mass Ave / Maple Street will help to improve operations and safety at this location.

Signal Warrant Analysis

Traffic signal warrant analyses were conducted in order to justify the signalization of the three major unsignalized intersections in the corridor. Based on the results of these analyses, it was determined that all three major study intersections of Mass Ave / Maple Street, Mass Ave / Marrett Road, and Mass Ave / Pleasant Street / Follen Road met warrants 1 (Eight Hour Vehicular Volume), 2 (Four-Hour Vehicular Volume), 3 (Peak Hour), and 8 (Roadway Network).

Proposed Alternatives

This project proposes improvements along the length of Mass Ave in the project area, at the three major study intersections, for the pedestrian signal at the Waldorf School, and for the traffic control at the fire station at Locust Ave.

Along the corridor, general improvements include a proposed cross section with 6-foot sidewalks on both sides of the roadway, parallel parking or a grass strip, 5-foot wide bicycle lanes on both sides of the roadway, one 11-foot general use travel lane in each direction, and turning lanes at key intersections. The proposed cross-section narrows the travel lanes to provide the sense of a village center and to help reduce travel speeds. Additionally, the number of crosswalks across Mass Ave will be reduced to only be located at several strategic locations. These improvements align with MassDOT's Healthy Transportation Policy Directive by providing both sidewalks and bicycle lanes on both sides of Mass Ave, providing "safe and comfortable healthy transportation options" for the Mass Ave corridor.

The proposed improvements at the major study intersections generally include three alternatives: retain the existing design, signalize the intersection, or install a roundabout. For each location, the Massachusetts Roundabout Installation Screening Form was used to determine the appropriateness of installing a roundabout at the intersection. It was determined that a roundabout is not recommended at the intersections of Mass Ave at Marrett Road or Mass Ave at Maple Street. A roundabout is a candidate for the intersection of Mass Ave at Pleasant Street / Follen Road, warranting further review and analysis.

Three alternatives are proposed for the pedestrian signal at the Waldorf School. The first alternative is a flashing warning beacon that would consist of a flashing circular yellow signal for vehicles that would supplement the "Pedestrian (symbol)" warning sign. The second alternative would provide a pedestrian hybrid beacon, which flashes a yellow signal to motorists upon actuation by pedestrians, and then flashes a red signal to motorists indicating them to stop. The third alternative consists of installing a full pedestrian signal to replace in-kind the existing pedestrian signal, while providing upgraded signal timings with new traffic and pedestrian signal heads.

The existing emergency signal at the fire station at the corner of Mass Ave and Locust Ave consists of a flashing red light for the Locust Ave and fire station approaches and a flashing yellow light for the Mass Ave approach. Upon emergency pre-emption, the Mass Ave and Locust Ave approaches

turn solid red, allowing emergency vehicles to have the right of way. An existing crosswalk is located across the south leg of Mass Ave, between Locust Ave and the fire station, which is not equipped with a pedestrian signal. The existing signal heads are only 8” in diameter and do not conform to current Manual on Uniform Traffic Control Devices (MUTCD) standards.

Capacity Analyses

Capacity analyses were conducted for the three major study intersections under existing conditions, future No Build conditions under the 10-year planning horizon (2023), and for future Build conditions (2023) for the signalization and roundabout alternatives. These capacity analyses reviewed delay and LOS, as well as approach delays and queue lengths.

Recommendations

Based on the results of the roundabout screening tool, the capacity analyses, and the layout of the proposed alternatives, BSC recommends that traffic signals be installed at all three of the major study intersections. BSC recommends constructing all three signals at the same time, in order to fully implement coordination between the intersections.

BSC recommends that a rectangular rapid flashing warning beacon be installed at the pedestrian signal at the Waldorf School.

At the fire station, BSC recommends replacing the existing 8” signal heads with the current standard of 12”. An additional traffic signal head should be installed for the fire station egress.

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Chapter 1: Existing Conditions

1.1 Project Background

BSC Group, Inc. (BSC) has prepared this Functional Design Report on behalf of the Town of Lexington, Massachusetts to document existing traffic operations, evaluate safety and operational deficiencies, and recommend improvements for the Massachusetts Avenue Intersections Project. This project includes a segment of Massachusetts Avenue (Mass Ave), designated as Route 4 and 225 in Lexington, Massachusetts, between the intersections of Marrett Road and Pleasant Street / Follen Road.

1.1.1. Study Area

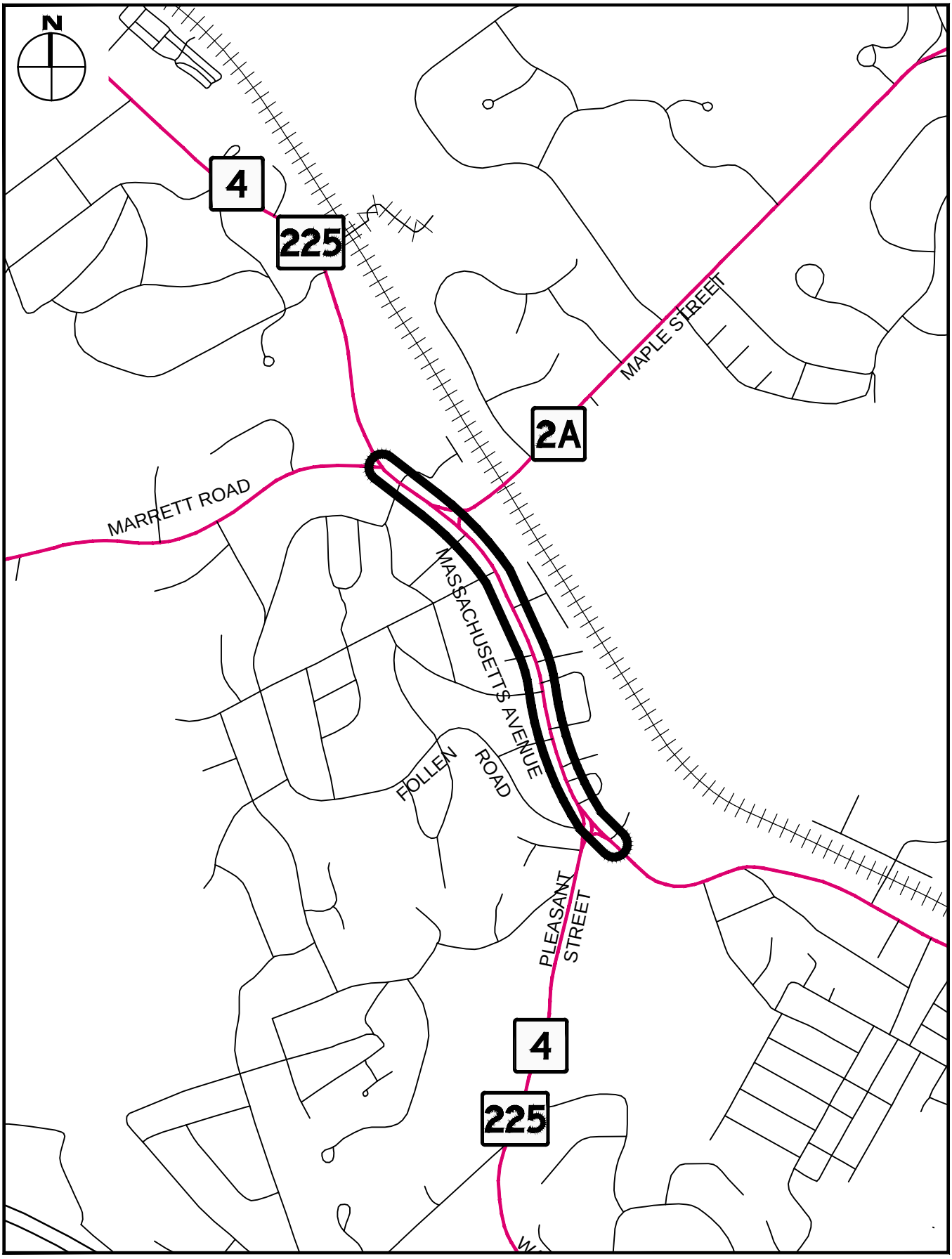
This segment of Mass Avenue is located in Lexington north of Route 2 and east of Route I-95 and is under the jurisdiction of the Town of Lexington. The segment is approximately 3,500 feet long and includes three major unsignalized intersections: Mass Ave at Marrett Road, Mass Ave at Maple Street, and Mass Ave at Pleasant Street / Follen Road.

Figure 1 displays the locus area for this project.

Massachusetts Avenue (Mass Ave) Corridor

Massachusetts Avenue (Mass Ave) is classified as an urban principal arterial that is under the jurisdiction of the Town of Lexington. Mass Ave is designated as the Battle Road Scenic Byway and has many historic elements along the route. In the project area, Mass Ave generally runs in a northwest-southeast direction, with the limits of the study beginning at Marrett Road in the northwest and continuing southeast to Pleasant Street. Mass Ave generally provides one 22-foot wide multi-purpose lane in each direction along its length for this project, with no delineated shoulders. Sidewalks are provided along both sides of Mass Ave.

The project area includes three major intersections at Marrett Road, Maple Street, and Pleasant Street. There are also 11 side-streets that intersect with Mass Ave, along with many driveways. A fire station is located at the intersection of Mass Ave and Locust Ave. Access to and egress from the fire station is controlled by emergency traffic signals on Mass Ave.



Project Location Map
East Massachusetts Avenue Intersections Project
Lexington, Massachusetts

Figure 1
Scale: 1" = 1000'

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The posted speed limit in both the northbound and southbound direction on Mass Ave is 35 MPH between Marrett Road and Independence Avenue and 30 MPH between Independence Avenue and Pleasant Street. These are consistent with the designated speed limits according to Massachusetts Speed Regulation 158[1]. There is a school zone in the vicinity of the Waldorf School which posts a school speed limit of 20 MPH during the times when school is in session.

On-street parking is permitted on Mass Ave from Maple Street to Pleasant Street. The highest use of on-street parking along Mass Ave is between Independence Avenue and Pleasant Street. This parking demand could be attributed to businesses, churches, and the Waldorf School.

The project area is served by two MBTA bus routes: Route 62 (Bedford V.A. Hospital to/from Alewife Station) and Route 76 (Hanscom/Lincoln Labs to/from Alewife Station). Within the project limits, there are six (6) bus stops in the northbound direction and five (5) bus stops in the southbound direction. The Town of Lexington's Lexpress bus system also serves the area of the project, with Route 1 traveling southbound on Mass Ave and turning right onto Pleasant Street, then looping around back to Mass Ave northbound. Route 3 of the Lexpress travels westbound on Maple Street and turns right onto Mass Ave northbound.

Land uses along Mass Ave include residential, commercial, and institutional. The Minuteman Commuter Bikeway runs parallel to Mass Ave on its east side, from Arlington in the south and continuing through Bedford in the north.

Massachusetts Avenue (Mass Ave) at Marrett Road

Marrett Road generally runs in an east-west direction from Massachusetts Avenue in the east to the Lincoln Town Line in the west. Marrett Road is designated as Route 2A and is classified as an urban minor arterial under the jurisdiction of the State.

Marrett Road intersects Mass Ave to form an unsignalized intersection with Marrett Road under yield control. Marrett Road provides one general use 13-foot wide travel lane with a 4-foot shoulder. Mass Ave northbound provides one 11-foot wide through lane and one 10-foot wide left-turn lane with a 1-foot shoulder. Mass Ave southbound provides one 20-foot wide general use travel lane. Sidewalks are provided on both sides of all approaches. Land use in the vicinity of the intersection is residential and a museum. The posted speed limit on Marrett Road in the vicinity of the intersection is 35 MPH.

[1] Special Speed Regulation No. 158, The Commonwealth of Massachusetts Department of Public Works, Town of Lexington, dated April 22, 1958, with amended Regulation No. 158-C

Massachusetts Avenue (Mass Ave) at Maple Street

The segment of Maple Street near its intersection with Mass Ave is under the jurisdiction of the Town of Lexington, while further away from the intersection, it is under the jurisdiction of the State. Maple Street generally runs in an east-west direction from Mass Ave in the east to Lowell Street in the west. Maple Street is designated as Route 2A and is classified as an urban minor arterial roadway.

Maple Street intersects Mass Ave to form an unsignalized intersection; the Maple Street approach acts as if under stop control, though no stop line or stop sign are provided. Mass Ave northbound provides one general use 20-foot wide lane, while Mass Ave southbound provides one 11-foot wide left-turn lane and one 9-foot wide through lane with a one-foot shoulder. At its intersection with Mass Ave, Maple Street widens to provide a 16-foot wide left-turn lane and a painted channelized 14-foot wide right-turn lane with a 2-foot shoulder. The posted speed limit on Maple Street in the vicinity of the intersection is 25 MPH. It should be noted that this intersection is included on the list of MassDOT 2010 HSIP Crash Clusters that covered crashes from 2007 to 2009.

Massachusetts Avenue (Mass Ave) at Pleasant Street / Follen Road

This location is a complex intersection with several approaches, a large paved area, and a round, landscaped island offset to the west of Mass Ave measuring approximately 50 feet in diameter. The intersection acts as two separate intersections, with Pleasant Street intersecting Mass Ave and Follen Road intersecting Pleasant Street.

Pleasant Street generally runs in a north-south direction from Mass Ave in the north to Concord Avenue in the south. Pleasant Street provides access to the regional highway network at its interchange with Route 2. Pleasant Street is designated as Routes 4 and 225 and is classified as an urban principal arterial under the jurisdiction of the Town of Lexington.

Pleasant Street intersects Mass Ave to form a T intersection with Pleasant Street under stop control. Mass Ave northbound provides one 22-foot wide general use multi-purpose lane, while Mass Ave southbound provides one 23-foot wide general use multi-purpose lane. Pleasant Street provides one

14-foot wide left-turn lane and one 12-foot wide right turn lane. The posted speed limit on Pleasant Street in the vicinity of the intersection is 30 MPH.

Follen Road is classified as an urban collector roadway and is under the jurisdiction of the Town of Lexington. Follen Road generally runs in a northwest-southeast direction from Pleasant Street in the southeast to Marrett Road in the northwest. Follen Road intersects Pleasant Street just south of where Pleasant Street intersects Mass Ave. Follen Road is under stop control and provides one 15-foot wide general use travel lane in each direction.

1.1.2. Existing Conditions

This segment of Mass Ave is characterized by heavy vehicular, bicycle and pedestrian use. During peak hours, the three major unsignalized intersections experience long vehicle delays and queues. There are pedestrian safety concerns along the corridor, resulting from high vehicular volumes and numerous pedestrian crossings. The Mass Ave corridor and three major intersections are characterized by many crashes, the majority of which are rear-end and angle crashes, as is outlined further in Chapter 3.

The following section lists deficiencies that are present along the Mass Ave corridor and at the three major unsignalized intersections.

Massachusetts Avenue (Mass Ave) Corridor

- Fair to poor Sidewalk Conditions – Along the entire corridor of Mass Ave, many of the sidewalks are in poor condition: either warped, cracked, or broken. This is due in part to age, but also in part to the tree and shrub roots that push underneath the surface. The poor sidewalk conditions can cause safety hazards to pedestrians, and can inhibit the travel path for disabled persons.
- Large Number of Crosswalks – There are 7 existing crosswalks along the entire length of the Mass Ave corridor between Marrett Road and Pleasant Street. Despite the large number, crosswalks are missing at several key locations. Additionally, a large number of the existing crosswalks are at mid-block locations, each of which presents a vehicle-pedestrian conflict point.
- Pedestrian Accessible Ramps – Despite the large number of painted crosswalks, most of them are not accessible, with wheelchair ramps that do not meet current ADA/AAB standards, or with no wheelchair ramps at all.
- Outdated Emergency Signal – The existing emergency traffic signals located at the Fire Station near Locust Avenue are post-mounted and outdated. The signal lenses are 8" while the current standard of 12" would improve visibility for drivers. During the Road Safety Audit conducted for the intersection of Mass Ave / Maple Street[2], it was noted that "vehicles frequently run the red signal, especially during times when the signal is active but a fire vehicle is not leaving the station with lights flashing, such as when the vehicle backs in upon its return to the station."
- Lack of Bicycle Accommodation – Generally, the Mass Ave corridor consists of one 22-foot wide multi-purpose lane in each direction, with no lanes marked specifically for bicycles. The Minuteman Bike Path is located parallel to the east of Mass Ave, and many bicyclists prefer to use Mass Ave as it has more connections to the neighborhood. Some bicyclists also use Mass Ave to connect to the Bike Path via Maple Street. There are two other informal connections between

[2] Road Safety Audit, Massachusetts Avenue at Maple Street, May 17, 2012, prepared by BETA Group, Inc.

Mass Ave and the Bike Path within the project limits: one at Curve Street and one at the Waldorf School. Additionally, it has been reported during public hearings that many commuter bicyclists prefer to use Mass Ave over the Bike Path.

Massachusetts Avenue (Mass Ave) at Marrett Road

- Inadequate Traffic Control – The Marrett Road approach is under yield control, and the yield sign is located approximately 60 feet back from where Marrett Road intersects Maple Street. In addition, vehicles traveling eastbound on Marrett Road approach Mass Ave at relatively high speeds and at an angle, with a large right-turning radius. Because of these elements, vehicles turning right onto Mass Ave barely yield to vehicles already traveling southbound on Mass Ave.
- Lack of Pedestrian Accommodation – While sidewalks are provided on both sides of Marrett Road and Mass Ave, there are no wheelchair ramps or crosswalks at the intersection. In addition, the condition of the existing sidewalks is fair to poor, with many being cracked or broken due to age, or tree and shrub roots.

Massachusetts Avenue (Mass Ave) at Maple Street

A Road Safety Audit[3] (RSA) was conducted in 2012 for the intersection of Mass Ave and Maple Street. Members of MassDOT, the Town of Lexington, CTPS, and Beta Group, Inc. reviewed the existing conditions at the intersection and a report was prepared to discuss the existing deficiencies and potential improvements to be made at the intersection. The following existing deficiencies include those noted in the RSA.

- Lack of Traffic Control – The intersection at Mass Ave / Maple Street is currently marked to provide one approach lane on Maple Street that divides into one channelized right-turn lane with a large radius and one left-turn lane. The eastbound and westbound directions are separated by a traffic circle. There are no stop signs or stop lines for left-turning vehicles from Maple Street. The right-turning vehicles from Maple Street have no indication whether they should stop or yield, and the angle of the roadway makes it difficult for drivers to look left to avoid other vehicles traveling northbound on Mass Ave. The RSA recommended installing a stop sign for the left-turn lane and a yield sign for the right-turn lane. These signs have since been installed at the intersection.
- Short Turning Lanes on Maple Street Westbound – As indicated above, one approach lane on Maple Street westbound divides into one left-turning and one right-turning lane. The right-turning lane provides approximately 80 feet of storage, while the left-turning lane provides just 30 feet of storage, not long enough for more than one vehicle.
- Narrow Travel Lanes on Mass Ave Southbound – The Mass Ave southbound approach provides one 11-foot wide left-turn lane and one through lane that measures just 9 feet wide, with a one-foot shoulder.
- Long Delays – The Maple Street westbound approach is currently characterized by long delays, especially during the weekday morning peak hour, when drivers are traveling northbound on Mass Ave towards Route 2 or I-95. The large number of crashes at this location, which is discussed later in Chapter 3, may be caused by driver frustration at this location.

[3] *Road Safety Audit, Massachusetts Avenue at Maple Street, Town of Lexington*, dated May 17, 2012, prepared by Beta Group, Inc.

- Lack of Pedestrian / Bicycle Accommodation – Sidewalks are provided on both sides of Mass Ave and on the south side of Maple Street, however there are no existing crosswalks or wheelchair ramps at the intersection. There is an existing mid-block crosswalk just south of the intersection near Plainfield Street. However, there are no wheelchair ramps for this crosswalk. Maple Street acts as a connection for pedestrians and bicyclists to the Minuteman Bicycle Path, which intersects Maple Street approximately 300 feet from Mass Ave on its east side. However, the lack of bicycle and pedestrian facilities at the intersection affects their accessibility.

- Service Station Driveway Access – The existing service station on the northeast corner of the intersection has three curb cuts along the north side of Maple Street, the widest of which is approximately 70 feet. This means that vehicles entering or exiting the service station have multiple points of conflict with vehicles traveling on Maple Street.

Massachusetts Avenue (Mass Ave) at Pleasant Street / Follen Road

- Inadequate Traffic Control / Driver Confusion – This intersection is characterized by a wide area of open pavement, with an approximate 50-foot diameter traffic circle offset to the west of Mass Ave, creating a roundabout-like intersection. The geometry of the intersection implies that it should operate as a roundabout, however actually both Pleasant Street and Follen Road are under stop control. Drivers, especially those that are new to the area, are confused by the current operations. For example, drivers traveling eastbound on Pleasant Street and wish to turn onto Follen Road sometimes take a direct left, when correct operation would be to drive to the stop line on Mass Ave, turn left onto Mass Ave, then turn left again around the circle onto Follen Road.

- Poor Pedestrian Accommodations – The existing crosswalks at this intersection are long, in some cases over 75 feet in length. There are no existing wheelchair ramps for the crosswalks. In addition, there is no sidewalk on the south side of Pleasant Street, which is a common route for pedestrians going to or from the nearby Wilson Farms.

- Limited On-Street Parking – This area is frequented by patrons of three churches, the Waldorf School, and Wilson Farms. On-street parking is available but unmarked along Mass Ave. Parking is in high demand in the area, particularly on Sundays and during special events such as funeral services.

- Waldorf School – There is a signalized pedestrian crosswalk at the Waldorf School driveway; the signal equipment is outdated and provides a long crossing time for pedestrians. A crossing guard is present during the weekday morning and afternoon school periods to assist students and parents crossing Mass Ave. When school lets out in the afternoon, parents queue entering into the school driveway and spill back onto Mass Ave, waiting to pick up their children. This occurs for approximately 30 minutes each afternoon.

- Wilson Farm – Wilson Farm is located on Pleasant Street just south of its intersection with Mass Ave and provides three driveway access points off of Pleasant Street. While the north-most driveway is not part of the intersection and is out of the scope of this project, it is of note that many crashes were recorded at this location, and there are often conflicts between vehicles queuing on Pleasant Street northbound and vehicles using the Wilson Farm driveways. In addition, employees and patrons of Wilson Farm often park on Mass Ave east of Pleasant Street.

Chapter 2: Traffic Volumes

2.1 Automatic Traffic Recorder (ATR) Counts

Existing daily traffic volumes were conducted on September 14 and 15, 2011 over a 48-hour period on Mass Ave (north of Curve Street), Maple Street (east of Mass Ave), and Pleasant Street (south of Mass Ave), through the placement of Automatic Traffic Recorders (ATR).

A summary of the 2011 daily average and peak hour traffic volumes are shown in Table 1.

Table 1: Traffic Volume Summary

		Morning Peak Hour			Afternoon Peak Hour		
Location	Weekday 24-hour Volume[a]	Traffic Volumes[b]	K-Factor[c]	Dir. Dist.[d]	Traffic Volumes[b]	K-Factor[c]	Dir. Dist.[d]
Massachusetts Avenue (north of Curve Street)	20,161	1,530	0.076	57% SB	1,604	0.079	51% NB
Maple Street (east of Massachusetts Avenue)	12,630	876	0.069	65% WB	1,211	0.094	68% WB
Pleasant Street (south of Massachusetts Avenue)	13,815	1,191	0.086	73% SB	967	0.069	52% SB

[a] *Measured in vehicles per day*
[b] *Measured in vehicles per hour*
[c] *Percentage of daily traffic during the peak hour*
[d] *Directional Distribution*

Supplemental daily traffic volumes were obtained from the report entitled Massachusetts Avenue Traffic Evaluation[4]. These volumes were conducted in March 2009 on Mass Ave (both north and south of Marrett Road), Mass Ave (south of Pleasant Street), and Marrett Road (west of Mass Ave).

Table 2: Supplemental Traffic Volumes

Location	NB/EB	SB/WB	Weekday 24-hour volume
Massachusetts Avenue (north of Marrett Road)	6,629	7,203	13,832
Massachusetts Avenue (south of Marrett Road)	8,772	9,646	18,418
Massachusetts Avenue (south of Pleasant Street)	6,412	6,055	12,467
Marrett Road (west of Mass Ave)	3,946	3,714	7,660

[4] Prepared by Weston & Sampson Engineers, Inc., June 2009

Speed Regulations & Vehicle Speeds

As part of the data collection program, vehicles speeds were collected over a 48-hour period at the ATR locations. Table 3 below compares the posted speed limits with the 85th percentile speeds. The posted speed limits are consistent with the designated speed limits according to Massachusetts Speed Regulation 158 (see Appendix).

Table 3: Traffic Speed Summary

Location	Posted Speed Limit (MPH)	85th Percentile Speed
Massachusetts Avenue northbound (north of Curve Street)	35	36
Massachusetts Avenue southbound (north of Curve Street)	35	36
Maple Street westbound (east of Massachusetts Avenue)	25	33
Pleasant Street northbound (south of Massachusetts Avenue)	30	27

2.2 Turning Movement Counts (TMC)

In addition to the daily traffic volume counts, turning movement counts (TMCs) were conducted on September 15, 2011 at the three major unsignalized intersections:

- Massachusetts Avenue at Marrett Road
- Massachusetts Avenue at Maple Street
- Massachusetts Avenue at Pleasant Street / Follen Road

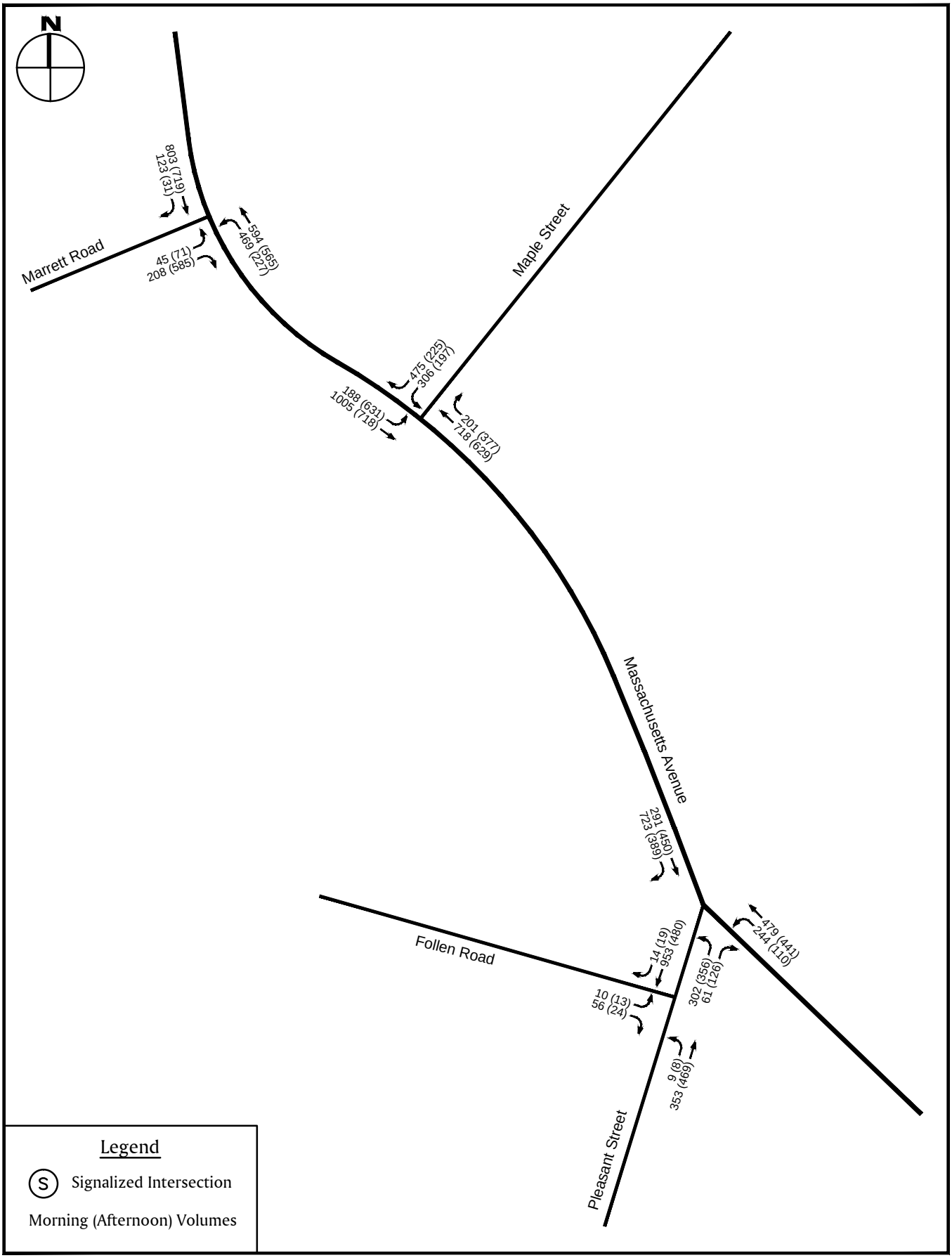
These TMCs were conducted during the weekday morning (7:00 – 9:00AM) and afternoon (12:00 – 6:00PM) peak hours. The results of these counts indicate that the peak hours of traffic at all three intersections were 7:45 AM – 8:45 AM and 4:45 – 5:45 PM on weekdays. Existing 2011 traffic volumes were increased by a rate of one-half percent per year over two years to develop 2013 Baseline traffic volumes.

Existing peak hour turning movement traffic counts are displayed in Figure 2. Complete traffic volume count data are contained in the Appendix.

2.3 Pedestrian and Bicycle Counts

The number of pedestrians was recorded at the three major intersections as well as at the six mid-block crossings along Mass Ave. The number of bicyclists was recorded at the three major intersections. Each of these counts was conducted during weekday morning and afternoon peak hours.

Existing 2011 peak hour pedestrian and bicycle counts are displayed in Figures 3 and 4, respectively. Complete traffic volume count data are contained in the Appendix.



2011 Existing Peak Hour Traffic Volumes
East Massachusetts Avenue Intersections Project
Lexington, Massachusetts

Figure 2
Not to Scale

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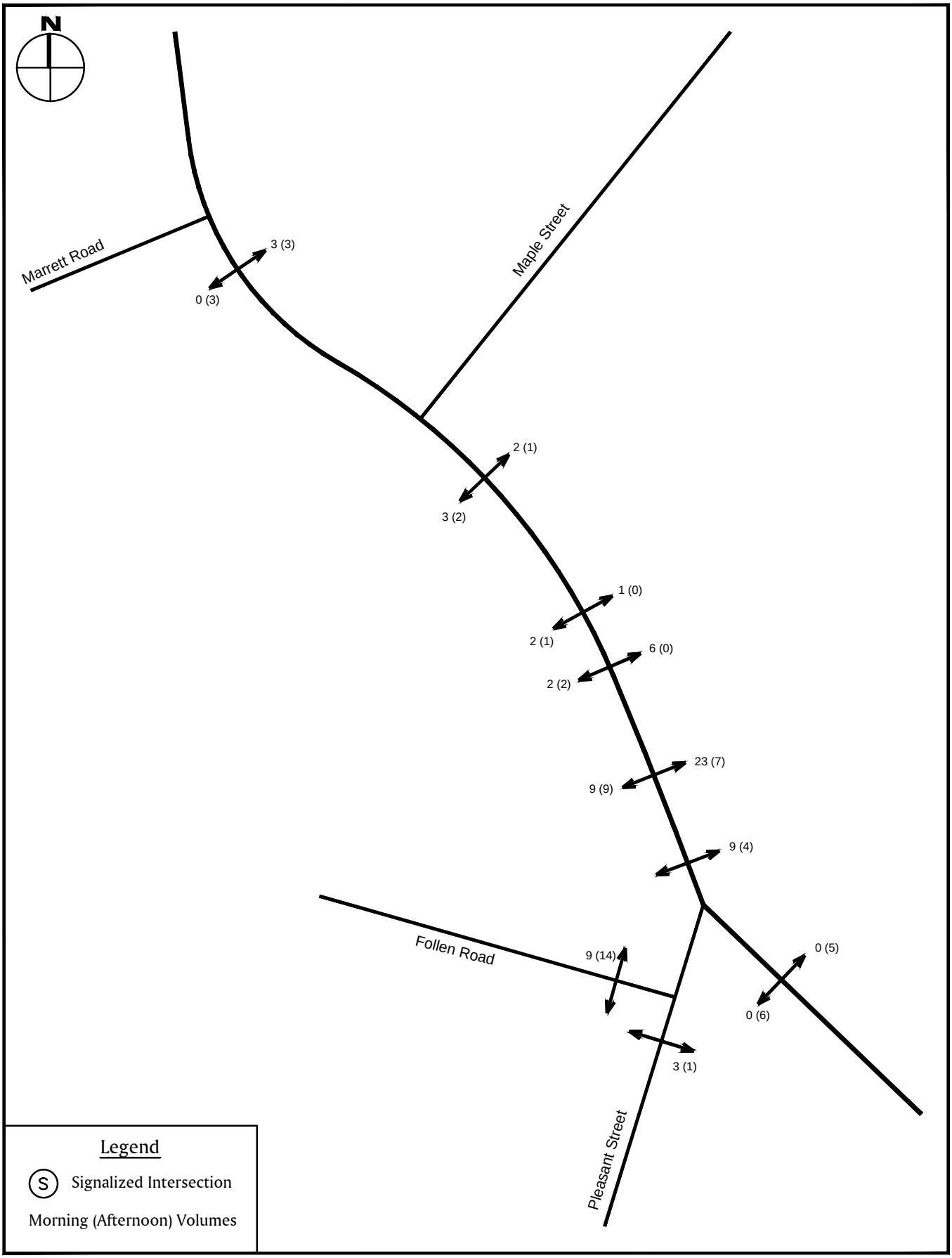
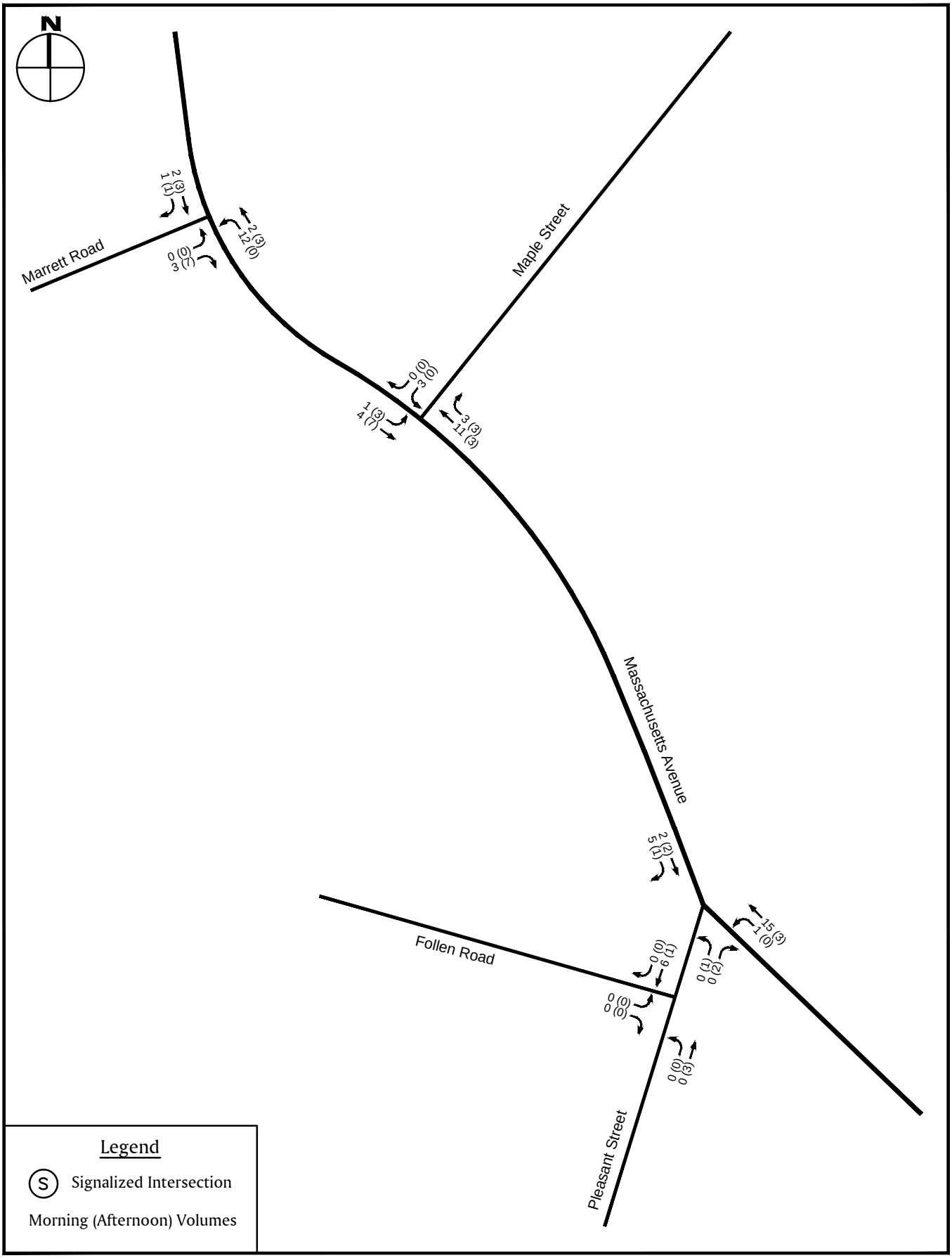


2011 Existing Pedestrian Volumes
East Massachusetts Avenue Intersections Project
Lexington, Massachusetts

Figure 3
Not to Scale

BSC GROUP



2011 Existing Bicycle Volumes
East Massachusetts Avenue Intersections Project
Lexington, Massachusetts

Figure 4
Not to Scale

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2.4 Development Projects and Growth Rate Adjustments

Future Condition traffic volume projections generally consist of background growth, and traffic generated from specific proposed development projects in the study area. This report examined traffic conditions ten years into the future (2023) with the proposed geometric improvements.

Based on discussions with the Central Transportation Planning Staff (CTPS), a compounded one-half percent annual growth rate for traffic will be employed to account for all background growth that will occur over the ten year planning horizon. Discussions with the Town of Lexington Planning Board revealed that there are no approved or proposed projects near the study area of this report.

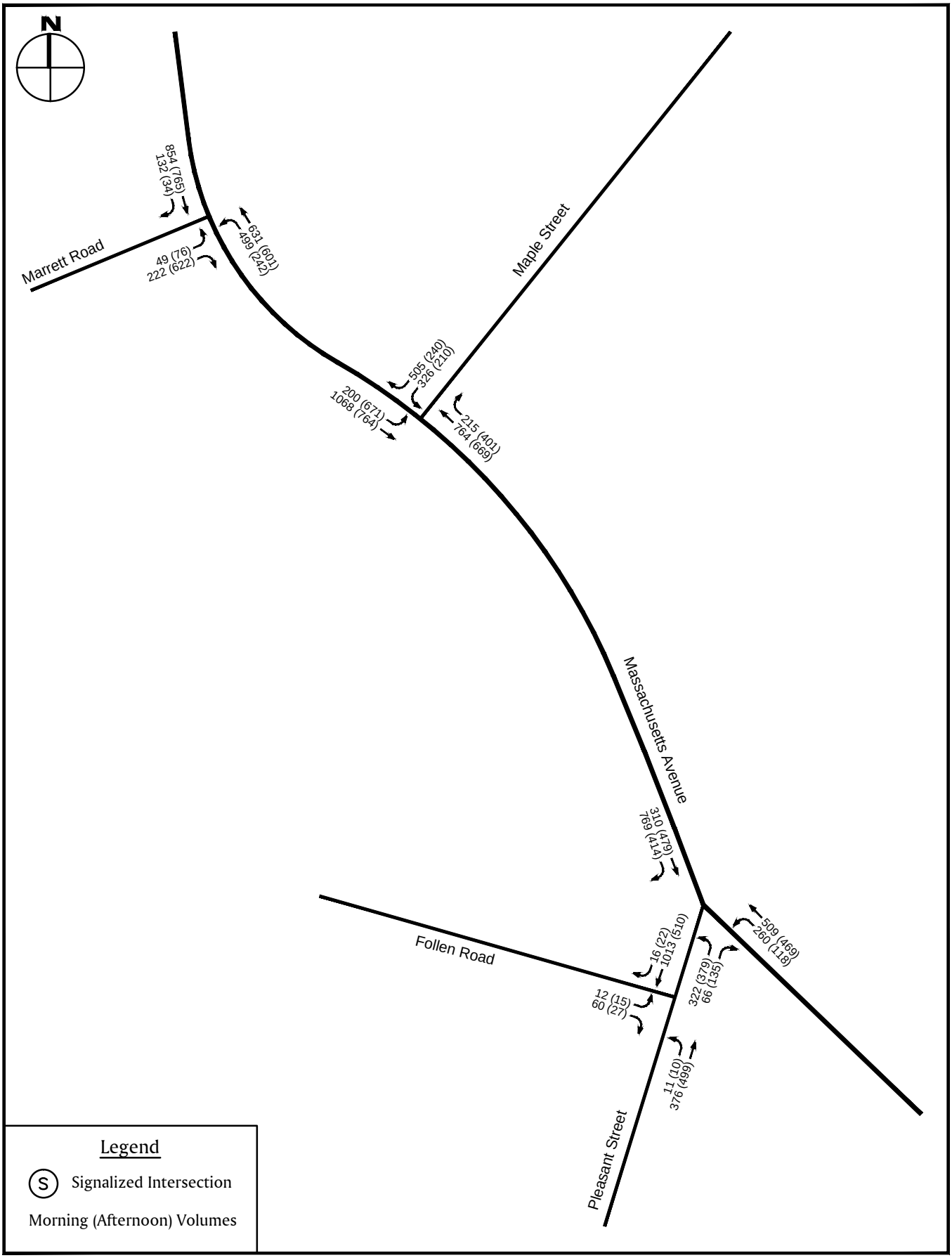
2.5 Seasonal Factors

The Massachusetts Department of Transportation (MassDOT) no longer provides seasonal factors, but issues a *Monthly ADT Comparisons Report*, which provides data from permanent count stations across the state. Seasonal adjustment factors should be based off of data from the *Monthly ADT* report and applied to existing traffic count data in order to reflect average traffic volume conditions.

The nearest count station (4798 – Route 2 West of Pleasant Street, Lexington) indicates that traffic counts in September are 0.1 percent greater than the average month. However, in order to provide a conservative estimate of traffic conditions, no seasonal adjustment factors were applied to the traffic counts.

2.6 Future Year Conditions

In order to evaluate traffic impacts associated with the proposed improvements for the Mass Ave Intersections Project, future No-Build Condition traffic volumes were estimated to provide a baseline condition for comparison. The future No Build condition assumes that no improvements are constructed for the project. The No-Build Condition traffic volumes (Figure 5) were projected for the year 2023 based on baseline traffic volume data and one-half percent per year compounded over ten years as the general background growth.



2023 Future Peak Hour Traffic Volumes
East Massachusetts Avenue Intersections Project
Lexington, Massachusetts

Figure 5
Not to Scale

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Chapter 3: Safety Analysis

Crash data for the study area intersections were obtained from MassDOT for the most recent 3 years on record (2009 to 2011). Crash rates were calculated for all of the study area intersections. The rates represent the number of crashes per million vehicles entering the intersection. The most recent statewide and district average crash rates issued by MassDOT (2013) indicate that the statewide average for unsignalized intersections is 0.60, while the District 4 (which includes the Town of Lexington) average for unsignalized intersections is 0.58. These rates represent 'average' crash experience and serve as a basis for comparing reported crash rates for study area intersections. The results of this analysis, including the classifications of the reported crashes, are listed in Table 4.

As can be seen in Table 4, the calculated crash rates at Mass Ave / Marrett Road and Mass Ave / Pleasant Street / Follen Road were calculated to be 0.47 and 0.50, respectively, both of which are below the average State and District crash rates.

The crash rate at the intersection of Mass Ave / Maple Street, where there were 24 crashes over a three year period, was calculated to be 0.63 which is above both the average State and District crash rate. As part of this report, BSC will investigate several alternatives to address the high number of crashes and improve safety, not only at this location but also at the other two study area intersections.

Also as part of this study, segmental crash rates were calculated along the length of Mass Ave between the intersections of Mass Ave / Marrett Road and Mass Ave / Pleasant Street / Follen Road. Mass Ave is classified as an Urban Principal Arterial, for which the average crash rate is given as 1.99. During the three years studied (2009 to 2011), there were 24 crashes along the segment that is 0.6 miles long. This resulted in a crash rate of 1.78 which is below the MassDOT average crash rate.

In total, approximately 88% of the crashes at the three study area intersections were either rear-end (19 / 37%) or angle (26 / 51%) crashes. Both of these crash types are likely due to the long queues, inadequate gaps in mainline traffic, and driver impatience at the study area intersections.

It should be noted that during the three years studied, there was one crash involving a pedestrian, which occurred at the intersection of Mass Ave and Pleasant Street / Follen Road. Also during this time, there were two bicycle crashes, one located at the intersection of Mass Ave / Maple Street and one at Mass Ave / Marrett Road. It is also of significance that one fatality occurred in October 2008 at the intersection of Massachusetts Avenue and Barnes Place.

Crash data and crash rate worksheets are contained in the Appendix.

Table 4: Summary of Crash Data

	Mass Ave / Marrett Road			Mass Ave / Maple Street			Mass Ave / Pleasant Street / Follen Road		
	2009	2010	2011	2009	2010	2011	2009	2010	2011
Severity									
Property Damage	1	5	3	6	6	5	5	3	1
Injury	2	2	1	3	2	2	1	2	1
Hit and Run									
Fatality									
Other									
Collision Type									
Rear End	1	4	4	2	4	1	3		
Angle	1	2		7	2	6	2	4	2
Single	1						1	1	
Other		1			2				
Time									
6am-10am		1		2	1	2	2	2	
10am-4pm		5	4	6	2	1	3	2	1
4pm-7pm	3	1		1	2	3	1	1	1
7pm-6am					3	1			
Road Conditions									
Dry	3	6	3	7	6	7	5	5	1
Wet				2	2		1		1
Snow/Ice		1	1						
Other									
Season									
Dec-Feb	2	1	1		2	2	2	2	1
Mar-May		3	3	4	2	2	2	2	
Jun-Aug		2		3	1	1	1		1
Sep-Nov	1	1		2	3	2	1	1	
Light									
Daylight		7	4	7	6	6	5	4	2
Dawn/Dusk	1								
Dark (Unlit)									
Dark (Lit)	2			1	2	1	1	1	
Unknown				1					
Total No. of Crashes	**3**	**7**	**4**	**9**	**8**	**7**	**6**	**5**	**2**
Avg. No. of Crashes	**4.67**			**8.00**			**4.33**		
Calculated Crash Rate [a]	**0.47**			**0.63**			**0.50**		
MassDOT Avg. Statewide / District 4 Crash Rate[b]	**0.60 / 0.58**			**0.60 / 0.58**			**0.60 / 0.58**		

[a]per million entering vehicles, as defined by the Massachusetts Department of Transportation – Highway Division
[b]crash information queried on January 23, 2013 from www.massdot.state.ma.us

Chapter 4: MUTCD Signal Warrants

A traffic signal warrant analysis was conducted in order to justify the signalization of the three major unsignalized intersections. Utilizing traffic volumes from the collected traffic data, a Traffic Signal Warrant analysis was conducted for these intersections as part of the safety and operational analysis.

The current *Manual on Uniform Traffic Control Devices (MUTCD)* contains nine traffic signal warrants, at least one of which must be satisfied, in order to justify the installation or continuous operation of traffic signals at a particular location. Satisfying one or more warrants, however does not necessarily justify the installation or continuous operation of a traffic signal. The traffic signal warrants are:

- Warrant 1: Eight-Hour Vehicular Volume;
- Warrant 2: Four-Hour Vehicular Volume
- Warrant 3: Peak Hour
- Warrant 4: Pedestrian Volume
- Warrant 5: School Crossing
- Warrant 6: Coordinated Signal System
- Warrant 7: Crash Experience
- Warrant 8: Roadway Network
- Warrant 9: Intersection Near a Grade Crossing

Signal warrant analyses were conducted using the procedure contained in the MUTCD. Not all warrants were evaluated for each intersection, depending on the applicability and data available for the location. Table 5 below displays which of those warrants that were evaluated were met for the three study area intersections.

Table 5: Warrant Analysis

Warrant / Location	Mass Ave / Maple Street	Mass Ave / Marrett Road	Mass Ave / Pleasant Street / Follen Road
Warrant 1	**YES**	**YES**	**YES**
Warrant 2	**YES**	**YES**	**YES**
Warrant 3	**YES**	**YES**	**YES**
Warrant 8	**YES**	**YES**	**YES**

See the Appendix for signal warrant analyses worksheets.

Chapter 5: Operational Analysis

5.1 Existing / Future Year Capacity Analysis

Intersection capacity analyses have been performed to determine traffic operations under existing and future No Build volume conditions. For the purposes of this report, the intersections of Pleasant Street/Follen Road and Mass Ave/Pleasant Street were analyzed as two separate intersections. Table 6 summarizes the results of the analyses.

Capacity analyses provide a standardized indication of the ability of an intersection to accommodate the traffic demands placed upon it. The primary results of capacity analyses are intersection delay, (by approach and overall delay) and level of service. Level of service (LOS) is a qualitative measure that describes operating conditions through letter designations, from A to F. Level of service A represents the best operating conditions, while level of service F represents the worst. Level of Service D is generally considered to be acceptable.

Due to the known issues with the HCM 2010 methodology in the Synchro traffic analysis software, the results of the capacity analyses were conducted using the HCM 2000 methodology.

Table 6: LOS Summary – Existing and Future Conditions

	Weekday Morning Peak Hour								Weekday Afternoon Peak Hour							
	2013 Existing				2023 No Build				2013 Existing				2023 No Build			
	Ave. Delay (sec)	LOS	V/C Ratio	95th Queue (ft)	Ave. Delay (sec)	LOS	V/C Ratio	95th Queue (ft)	Ave. Delay (sec)	LOS	V/C Ratio	95th Queue (ft)	Ave. Delay (sec)	LOS	V/C Ratio	95th Queue (ft)
Mass Ave at Marrett Road																
Marrett Road EB LR	>80	F	>1.20	**	>80	F	>1.20	**	>80	F	>1.20	**	>80	F	>1.20	**
Mass Ave NB L	26.4	D	0.76	176	34.8	D	0.84	229	11.5	B	0.31	34	12.0	B	0.34	38
Mass Ave NB T	0.0	A	0.36	0	0.0	A	0.38	0	0.0	A	0.37	0	0.0	A	0.39	0
Mass Ave SB TR	0.0	A	0.63	0	0.0	A	0.67	0	0.0	A	0.48	0	0.0	A	0.51	0
Mass Ave at Maple Street																
Maple Street WB L	>80	F	>1.20	**	>80	F	>1.20	**	>80	F	>1.20	**	>80	F	>1.20	**
Maple Street WB R	>80	F	>1.20	736	>80	F	>1.20	900	43.0	E	0.78	161	57.7	F	0.87	203
Mass Ave NB TR	0.0	A	0.57	0	0.0	A	0.60	0	0.0	A	0.62	0	0.0	A	0.66	0
Mass Ave SB L	12.3	B	0.31	31	13.0	B	0.34	37	>80	F	1.14	582	>80	F	>1.20	745
Mass Ave SB T	0.0	A	0.68	0	0.0	A	0.71	0	0.0	A	0.50	0	0.0	A	0.53	0
Mass Ave at Pleasant Street																
Pleasant Street EB L	>80	F	>1.20	**	>80	F	>1.20	**	>80	F	>1.20	**	>80	F	>1.20	**
Pleasant Street EB R	15.2	C	0.17	16	16.0	C	0.19	18	18.8	C	0.35	40	20.5	C	0.40	47
Mass Ave NB TR	11.7	B	0.44	56	13.8	B	0.49	66	4.5	A	0.17	16	5.0	A	0.19	18
Mass Ave SB LT	0.0	A	0.66	0	0.0	A	0.70	0	0.0	A	0.58	0	0.0	A	0.62	0
Pleasant Street at Follen Road																
Pleasant Street EB LT	0.5	A	0.02	1	0.6	A	0.02	2	0.3	A	0.01	1	0.3	A	0.01	1
Pleasant Street WB TR	0.0	A	0.61	0	0.0	A	0.64	0	0.0	A	0.34	0	0.0	A	0.36	0
Follen Road SB LR	27.5	D	0.34	36	31.5	D	0.39	44	16.5	C	0.14	12	17.6	C	0.16	14

Table 6 shows the overall delay and LOS under Existing and No Build conditions during the weekday morning and afternoon peak hours.

Under existing conditions, the Marrett Road eastbound approach operates at LOS F during both the weekday morning and afternoon peak hours. The Mass Ave northbound left-turn movement operates at LOS D during the weekday morning peak hour and LOS B during the weekday afternoon peak hour. The Maple Street westbound left-turn movement operates at LOS F during both peak hours, while the Maple Street westbound right-turn movement operates at LOS F and E during the weekday morning and afternoon peak hours, respectively. During both peak hours, the Pleasant Street eastbound left-turn operates at LOS F and the Pleasant Street eastbound right-turn operates at LOS C. The Follen Road approach operates at LOS D during the weekday morning peak hour and at LOS C during the weekday afternoon peak hour.

Under the future No Build condition, the Marrett Road eastbound approach operates at LOS F during both the weekday morning and afternoon peak hours. The Mass Ave northbound left-turn movement operates at LOS D during the weekday morning peak hour and LOS B during the weekday afternoon peak hour. The Maple Street westbound left- and right-turn movements operate at LOS F during both peak hours. During both peak hours, the Pleasant Street eastbound left-turn operates at LOS F and the Pleasant Street eastbound right-turn operates at LOS C. The Follen Road approach operates at LOS D during the weekday morning peak hour and at LOS C during the weekday afternoon peak hour.

All capacity analysis worksheets can be found in the Appendix.

Chapter 6: Proposed Geometry

As discussed in Section 1.1.2, there are a variety of existing issues along the corridor and at the major project intersections that need to be addressed. These existing issues, including traffic control, pedestrian and bicycle accommodations, and vehicular delays, are listed below.

Massachusetts Avenue (Mass Ave) Corridor

- Poor Sidewalk Conditions
- Large Number of Crosswalks
- Pedestrian Accessible Ramps
- Outdated Emergency Signal
- Lack of Bicycle Accommodation

Massachusetts Avenue (Mass Ave) at Marrett Road

- Inadequate Traffic Control
- Lack of Pedestrian Accommodation

Massachusetts Avenue (Mass Ave) at Maple Street

- Lack of Traffic Control
- Short Turning Lanes on Maple Street Westbound
- Narrow Travel Lanes on Mass Ave Southbound
- Long Delays
- Lack of Pedestrian / Bicycle Accommodation
- Service Station Driveway Access

Massachusetts Avenue (Mass Ave) at Pleasant Street / Follen Road

- Inadequate Traffic Control
- Poor Pedestrian Accommodations
- Limited On-Street Parking
- Waldorf School

Roadway geometry and traffic control changes are being proposed along the Mass Ave corridor and at each of the three study area intersections in order to improve operations and safety for vehicles, pedestrians, and bicycles. The sections below discuss the proposed changes along the Mass Ave corridor, and review several proposed alternatives at each of the three study area intersections.

6.1 Mass Ave Corridor

Generally, the proposed improvements to the Mass Ave corridor consist of 6-foot sidewalks on either side of the roadway, parallel parking or a grass strip, 5-foot wide bicycle lanes on each side of the

roadway, and one 11-foot general use travel lane in each direction. The proposed sidewalks would provide a smooth and level walking surface, improving upon the existing sidewalks that are generally sloped or cracked due to tree or shrub roots. Areas with proposed grass strips would provide areas for landscaping or planting. The vehicular travel way would be narrowed, providing a sense like a downtown boulevard which may reduce travel speeds. Bicycle lanes would connect bicycle access through this section of Lexington. In addition, the number of crosswalks along the corridor would be reduced to only be located at strategic locations.

6.1.1 MassDOT Healthy Transportation Policy Directive

The MassDOT Healthy Transportation Policy Directive[5] was issued to ensure that all MassDOT facilities "have access to safe and comfortable transportation options" including walking, bicycling and taking transit. The Directive indicates that MassDOT funded and/or design projects shall "seek to increase and encourage more pedestrian, bicycle and transit trips."

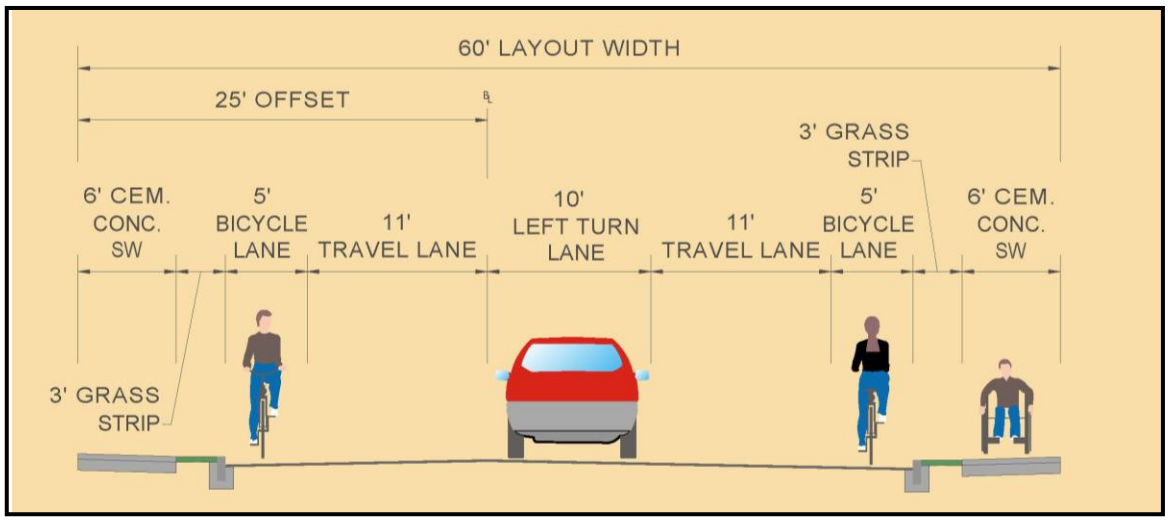
The proposed Mass Ave project is rebuilding the existing sidewalks along the corridor, providing 6-foot wide ADA/AAB compliant sidewalks along both sides of the roadway between Pleasant Street and Marrett Road. For each proposed alternative, the Project proposes sidewalks on both sides of Marrett Road, on the south side of Maple Street, and on both sides of Follen Road and Pleasant Street. The proposed sidewalks on Pleasant Street will provide formal connections between Mass Ave and Wilson Farm.

In addition to providing ADA/AAB compliant sidewalks, the proposed 5-foot bicycle lanes on both sides of Mass Ave will further serve to promote healthy transportation options. The corridor does not currently provide exclusive bicycle accommodation and it is expected that the proposed bicycle lanes will promote bicycle usage. The bicycle lanes will provide a connection via Maple Street to the existing Minuteman Commuter Bikeway, which runs parallel to Mass Ave and is a part of the Bay State Greenway system.

6.1.2 Marrett Road to Maple Street

Between Marrett Road and Maple Street, the proposed roadway cross-section consists of one 11-foot travel lane in each direction, 5-foot bicycle lanes in each direction, and a 6-foot sidewalk buffered by a 3-foot wide grass strip on each side. In addition, a 10-foot wide turning lane in the center of the roadway provides approximately 130 feet of storage for its approach to Marrett Road, then transitions to provide approximately 130 feet of storage for its approach to Maple Street. On-street parking is prohibited in this section.

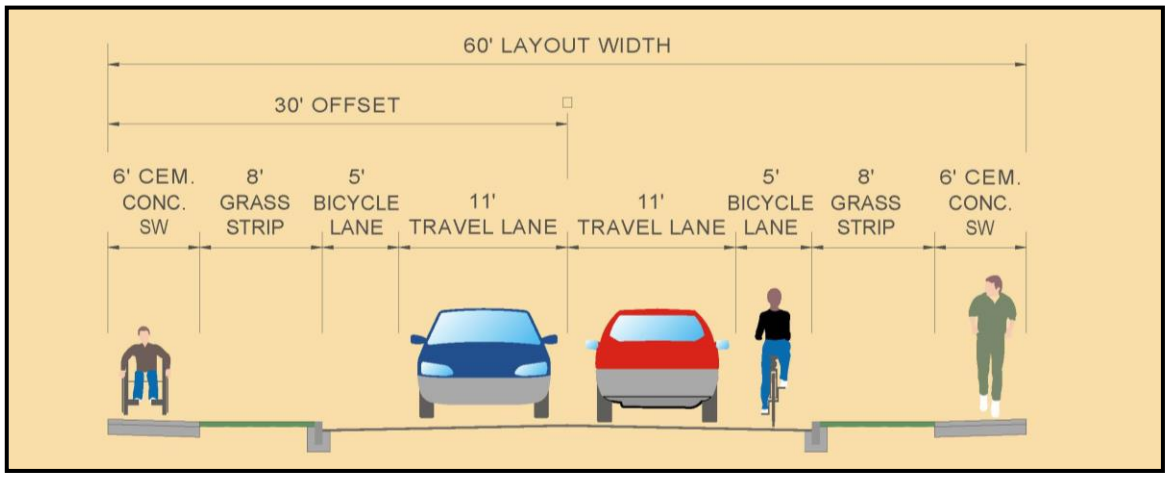
[5] Healthy Transportation Policy Directive, Policy P-13-0001, MassDOT, September 9, 2013



Proposed Cross-Section of Mass Ave between Marrett Road and Maple Street

6.1.3 Maple Street to Curve Street

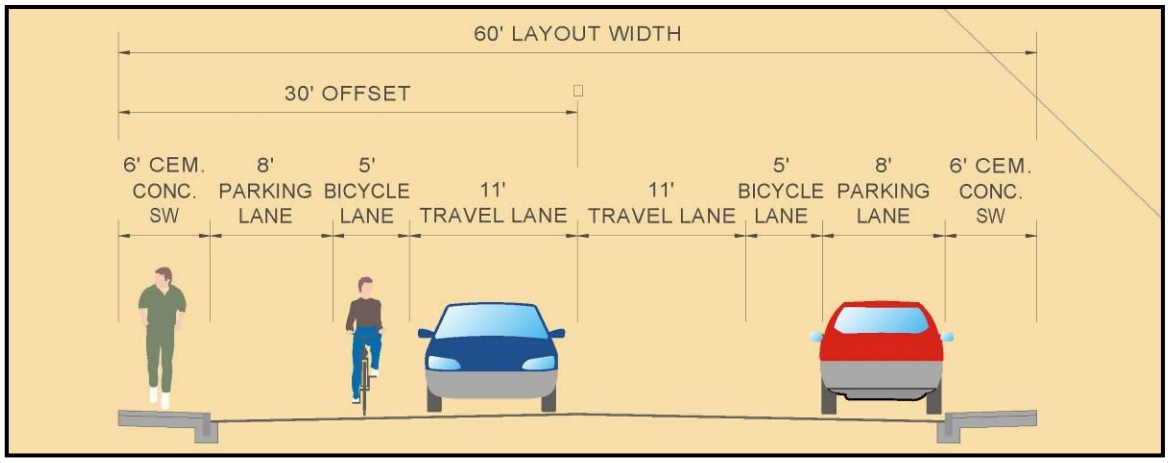
Along Mass Ave between Maple Street and Curve Street, the proposed roadway cross-section consists of one 11-foot general use travel lane in each direction, a 5-foot bicycle lane on both sides, and an 8-foot grass strip buffering a 6-foot cement concrete sidewalk on both sides of the roadway. A few on-street parking spaces are proposed on the west side of Mass Ave for the use of the local businesses in this area. A crosswalk is proposed across Mass Ave at Locust Avenue.



Proposed Cross-Section of Mass Ave between Maple Street and Curve Street

6.1.4 Curve Street to Pleasant Street

Between Curve Street and Pleasant Street along Mass Ave, the proposed roadway cross-section consists of one 11-foot travel lane in each direction, 5-foot bicycle lanes in each direction, 8-foot wide parking lanes on both sides of the roadway, and a 6-foot sidewalk on each side. Crosswalks across Mass Ave are proposed on the north side of the southern leg of Curve Street and south of Barnes Place near the Waldorf School.



Proposed Cross-Section of Mass Ave between Curve Street and Pleasant Street

6.1.5 Pedestrian Accessibility

The pedestrian improvements proposed as part of this Project include rebuilding existing sidewalks and reviewing and consolidating the locations of crosswalks across Mass Ave. The existing sidewalks are generally cracked or sloped due to tree and shrub roots. The Project proposes to rebuild the sidewalks to provide a smooth and level walking surface, with a consistent 6-foot width. The project also proposes to reconstruct or build new accessible pedestrian ramps where necessary.

Currently, there are seven existing crosswalks along Mass Ave corridor between Marrett Road and Pleasant Street. Despite the large number, crosswalks are missing at several key locations. Additionally, a large number of the existing crosswalks are at mid-block locations, each of which presents a vehicle-pedestrian conflict point. The Project proposes to eliminate or move some of these crosswalks, resulting in two crosswalks across Mass Ave at each of the study area intersections: Marrett Road, Maple Street, and Pleasant Street. Additional mid-block crosswalks will be located just south of Locust Ave, north of Curve Street, and north of Pleasant Street at the Waldorf School and Follen Church.

6.2 Massachusetts Roundabout Installation Screening Form

The Massachusetts Roundabout Installation Screening Tool, developed by the Central Transportation Planning Staff (CTPS), is intended to assess the appropriateness of a potential roundabout installation at a particular location. BSC completed the Roundabout Installation Screening Form (RISF) for each of the three major project intersections at Mass Ave and Marrett Street, Maple Street, and Pleasant Street / Follen Road. These completed forms are included in the Appendix.

Based on the four (4) sections presented in the form, the user makes a guided decision for one of three selections as to the appropriateness of installing a roundabout:

- Candidate – Advance a roundabout design for further analysis and design if it meets the criteria for (1) space requirements and (2) one or more of the project objectives
- Conditional – Advance a roundabout design for further analysis and design under conditions
- Not Recommended – A roundabout is not recommended for further consideration if it fails to meet either (1) space requirements or (2) none of the project objectives.

Upon completing the form for each of the study intersections, it was determined that a roundabout is not recommended at the intersections of Mass Ave at Marrett Road or Mass Ave at Maple Street. A roundabout is a candidate at the intersection of Mass Ave at Pleasant Street / Follen Road.

6.3 Alternatives Analyses

The following section discusses several alternatives that are proposed at the three major study intersections of Mass Ave with Marrett Road, Maple Street, and Pleasant Street / Follen Road, as well as at the existing pedestrian crossing at the Waldorf School.

6.3.1 Mass Ave at Marrett Road

Alternative 1 – Retain Current Design

The first design alternative at this location is to retain the current design of the intersection and make no modifications. This location would remain as an unsignalized intersection, however BSC recommends changing the existing yield control to stop control for the Marrett Road approach.

Alternative 2 - Signalization

The second proposed alternative at the intersection of Mass Ave and Marrett Road involves constructing traffic signals at the intersection and re-aligning the intersection in order to direct Marrett Road perpendicularly into Mass Ave. This alternative proposes one general-use travel lane on Marrett Road eastbound. Mass Ave northbound would have one 10-foot wide left-turn lane and one 11-foot wide through lane, with 5-foot wide sidewalks and a 3-foot wide grass strip on both sides. Mass Ave southbound has one 11-foot wide general use travel lane, with a 6-foot wide sidewalk and 8-foot wide grass strip on both sides of the roadway. There is a 5-foot bicycle lane proposed on both sides of Mass Ave. A figure for this alternative is shown at the end of this section.

Alternative 3 - Roundabout

BSC investigated the possibility of constructing a roundabout at this intersection. Based on the daily volumes entering the intersection (over 15,000 vpd), it was determined that a single-lane roundabout could be adequate for this intersection[6]. A minimum inscribed diameter of 90 feet is typical for this type of roundabout; however a larger diameter would be required to accommodate large trucks. The necessary size diameter was not available within the existing right-of-way.

[6] Roundabouts: An Informational Guide, NCHRP Report 672, Second Edition, Transportation Research Board, 2010

6.3.2 Mass Ave at Maple Street

Alternative 1 – Retain Current Design

The first design alternative at this location is to retain the current design of the intersection and make no modifications. This location would remain as an unsignalized intersection with Maple Street under stop control.

Alternative 2 - Signalization

The second alternative for the intersection at Mass Ave and Maple Street involves constructing traffic signals at this location. Mass Ave northbound provides one 11-foot wide through lane and one 10-foot wide right-turn lane. Mass Ave southbound provides one 10-foot wide left turn lane and one 11-foot wide through lane. Maple Street westbound provides one 11-foot wide left-turn lane and one 11-foot wide right-turn lane. Both sides of Mass Ave provide 5-foot wide bicycle lanes in each direction, a minimum of 3-foot wide grass strips, and 6-foot wide sidewalks on both sides. The south side of Maple Street provides a 4-foot wide shoulder from Maple Street to the bridge, providing bicycle accommodation leading to the Minuteman Commuter Bikeway. A figure for this alternative is shown at the end of this section.

Alternative 3 – Roundabout

A roundabout alternative was considered for this location, which would consist of a 110-foot diameter single-lane roundabout with three legs. The Maple Street and Mass Ave southbound approaches are 15 feet wide, while the Mass Ave northbound approach is 17.5 feet wide. The travel lane width in the roundabout measures 20-feet wide. The center grass or landscaped island includes a concrete apron to allow for larger trucks to circulate. Crosswalks are provided across each leg. Additional right of way may be required to construct this roundabout. A figure for this alternative is shown at the end of this section.

6.3.3 Mass Ave at Pleasant Street / Follen Road

Alternative 1 – Retain Current Design

The first design alternative at this location is to retain the current design of the intersection and make no modifications. This location would remain as an unsignalized intersection with Follen Road and Pleasant Street under stop control.

Alternative 2 – Signalization

The second alternative at this location involves the construction of traffic signals at the intersection of Mass Ave and Pleasant Street. Follen Road intersects Pleasant Street under strop-control, west of the Mass Ave / Pleasant Street intersection. The Mass Ave northbound approach provides one 10-foot wide left-turn lane and one 11-foot through lane, with a 3-foot wide grass strip and 6-foot sidewalks on both sides. The Mass Ave southbound approach provides one 11-foot through lane and one 10-foot wide right-turn lane, with a 6-foot wide sidewalk. The Pleasant Street approach to Mass Ave provides one 11-foot left-turn lane and one 13-foot right-turn lane. The Follen Road approach to Pleasant Street provides one 16-foot wide general use travel lane. 5-foot wide bicycle lanes are provided on both sides of Mass Ave. A figure for this alternative is shown at the end of this section.

Alternative 3 – Roundabout

This alternative involves the construction of a 100-foot diameter single-lane roundabout with four legs – both sides of Mass Ave, Pleasant Street, and Follen Road. The center of the roundabout would include a 48-foot diameter grass or landscaped island with a 10-foot wide apron to allow for larger trucks to circulate. The width of the circulation lane would vary between 20-30 feet. The design would include a single lane approach on all legs, while an alternative to this design would include two approach lanes from Mass Ave southbound. Crosswalks would be provided on all four legs. A figure for this alternative is shown at the end of this section.

6.3.4 Pedestrian Signal at Waldorf School

There is an existing pedestrian crossing signal on Mass Ave at the Waldorf School that needs to be upgraded as part of the proposed roadway and intersection safety improvements along the Mass Ave corridor. The amount of time currently allotted to pedestrians with the existing signal is longer than needed to cross the roadway. The following sections describe the three alternatives that could be used to replace the existing signal

Alternative 1 - Flashing Warning Beacon

A flashing warning beacon consists of a flashing circular yellow signal for vehicles that would supplement the "Pedestrian (symbol)" warning sign. The beacon operates only when pedestrians push the button; otherwise the signal is dark (not illuminated). This alternative would emphasize the mid-block crosswalk, but would not provide vehicular stop control, or alert pedestrians to the walking phase.

Alternative 2 - Pedestrian Hybrid Beacon

A pedestrian hybrid beacon flashes a yellow signal to motorists upon actuation by pedestrians, and then flashes a red signal to motorists indicating them to stop. It alerts pedestrians to the walking phase by incorporating a walk / flashing don't walk signal. The beacon operates only when pedestrians push the button; otherwise the signal is dark (not illuminated). A "Crosswalk Stop on Red (symbol)" warning sign would be mounted adjacent to the Beacon face on each major street approach.

This type of pedestrian signal is relatively new and could be unfamiliar to motorists and pedestrians alike. Additionally, it would need to be warranted for implementation.

Alternative 3 - Full Pedestrian Signal

This alternative would replace in kind the existing pedestrian signal with upgraded signal timings and new signal and pedestrian heads. This alternative would be constantly illuminated, providing a green signal to major roads unless pedestrians place a call. This alternative would assign a right of way to pedestrians and bring motorists to a complete stop upon push button actuation. The pedestrian phase is a positive reinforcement for the pedestrians to cross the roadway. This signal would need to be fully warranted for implementation.

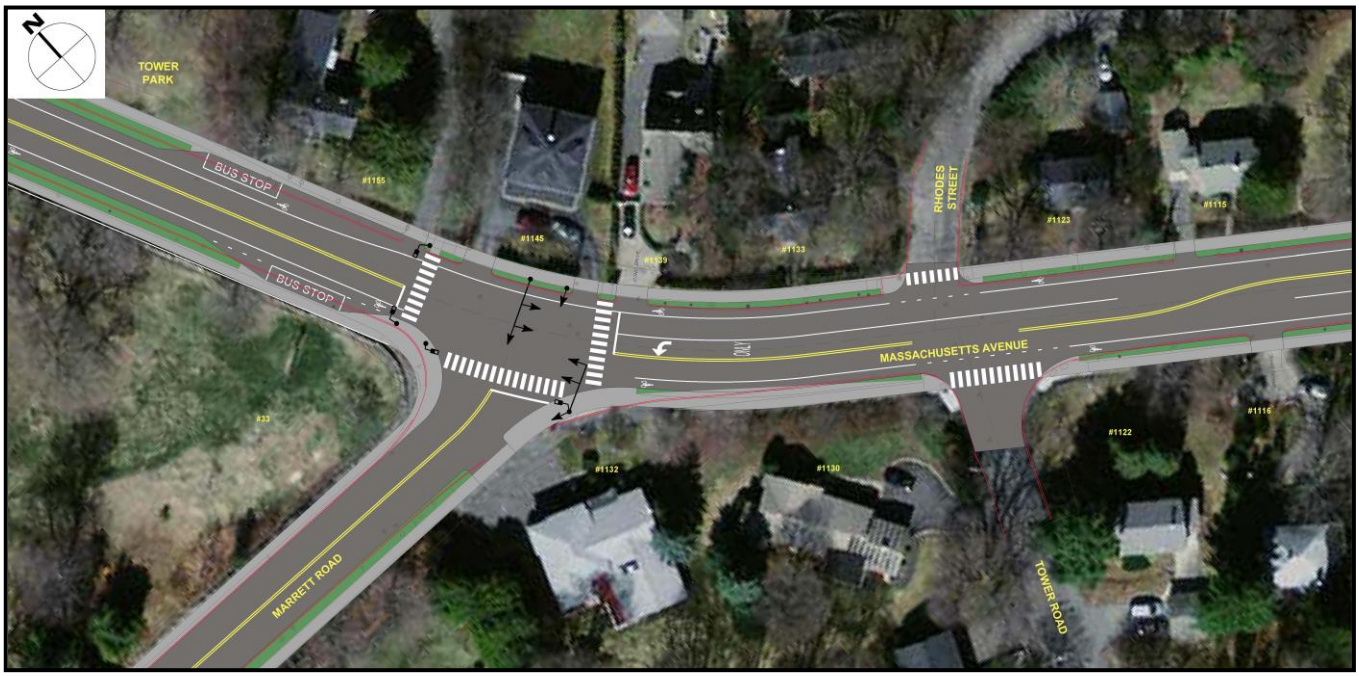
6.4 Traffic Control at Locust Ave / Fire Station

A Town of Lexington fire station is located at the southwest corner of the intersection of Mass Ave and Locust Ave. Locust Ave is a connecting route between Mass Ave and the adjacent neighborhood to the west, including Bowman Elementary School. Egress from the fire station is controlled by a flashing red light for both the Locust Ave and fire station approaches and a flashing yellow light for

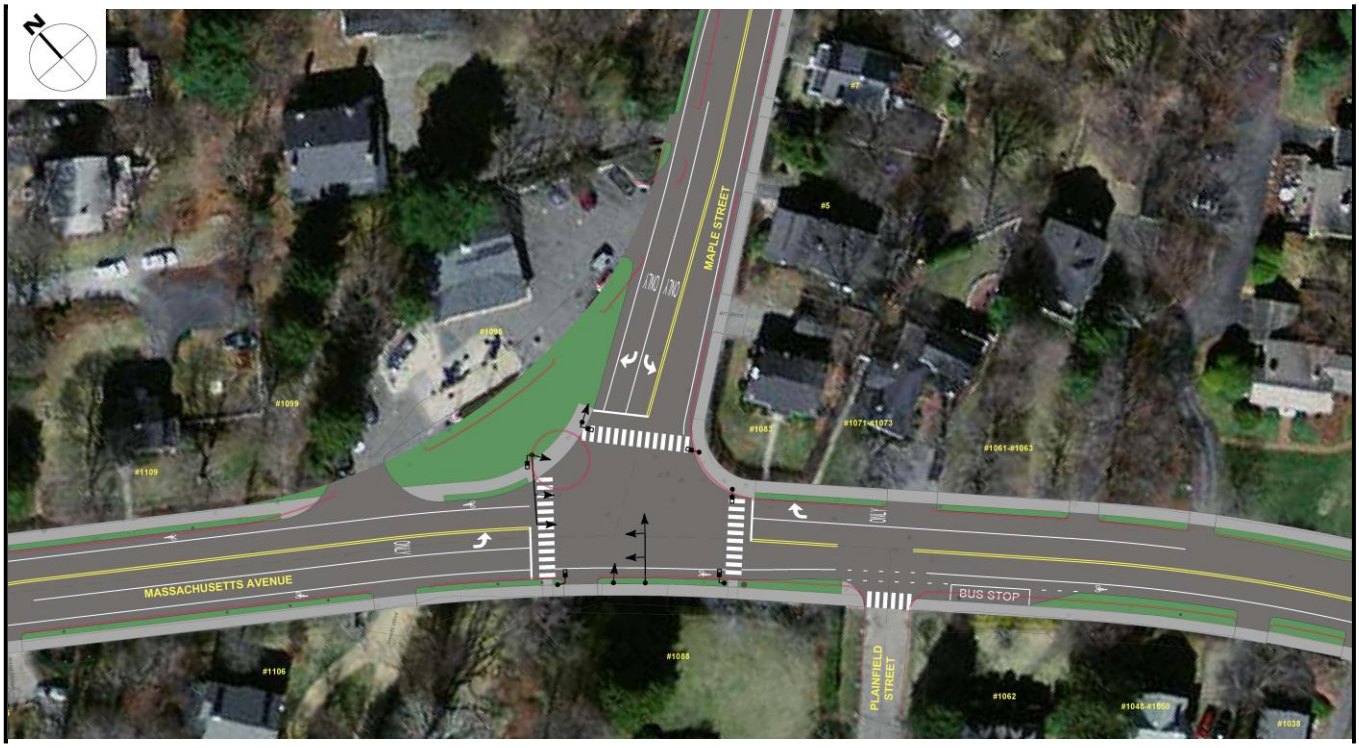
both Mass Ave approaches. Upon emergency pre-emption, both the Locust Ave and Mass Ave approaches turn solid red and the emergency vehicles are given the right of way.

There is an existing crosswalk on the southern leg of Mass Ave, between Locust Ave and the fire station driveway. This crosswalk provides a connection from the west side of Mass Ave to the Minuteman Bikeway located east of Mass Ave. The crosswalk is not equipped with a pedestrian signal.

The existing traffic signals are post-mounted and outdated. It is recommended to replace the existing 8” signal lenses with the current standard of 12”, which would improve visibility for drivers.

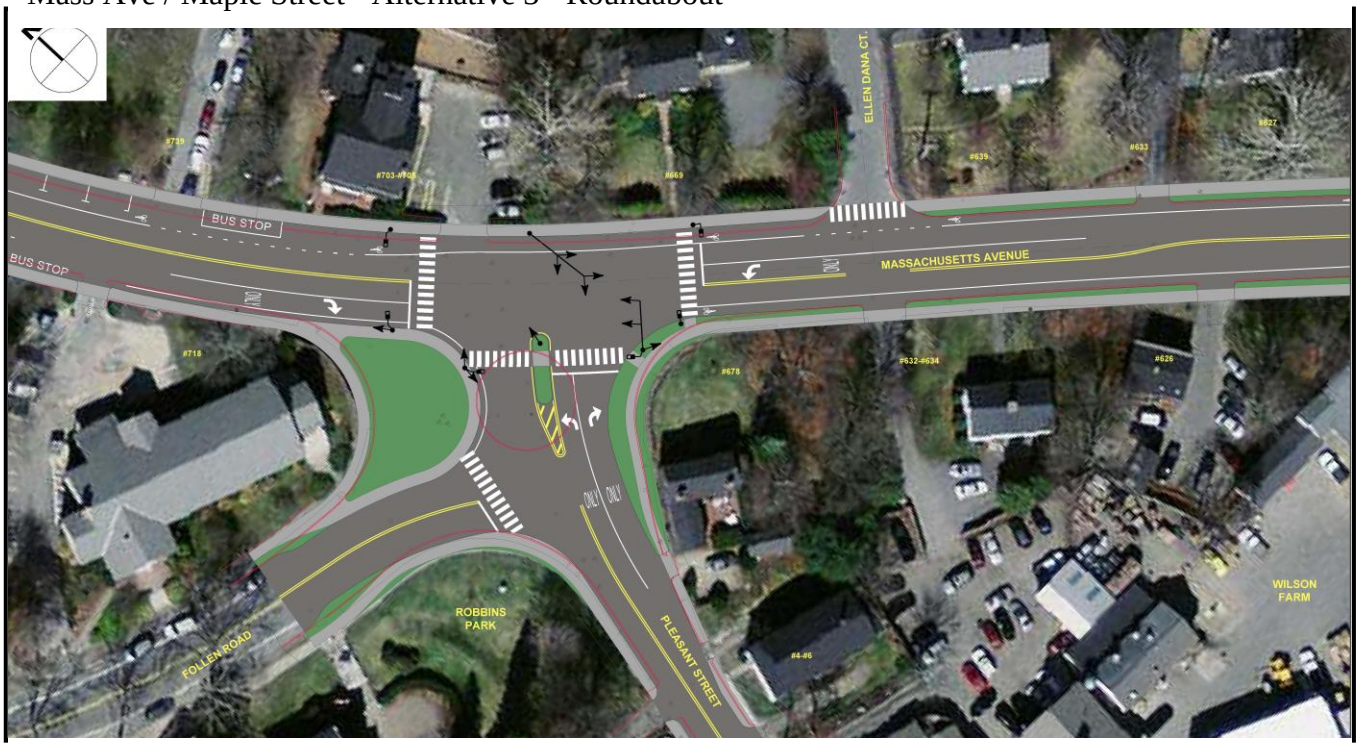


Mass Ave / Marrett Road - Alternative 2 - Signalization



Mass Ave / Maple Street - Alternative 2 - Signalization

Mass Ave / Maple Street - Alternative 3 - Roundabout



Mass Ave / Pleasant Street / Follen Road - Alternative 2 - Signalization

Mass Ave / Pleasant Street / Follen Road - Alternative 3 - Roundabout

6.5 Intersection Capacity Analyses for Alternatives

Tables 7 and 8 summarize the LOS for each alternative during the weekday morning and afternoon peak hours.

Mass Ave at Marrett Road

Under **Alternative 1 – Retain Current Design (No Build)**, the Marrett Road eastbound approach is expected to operate at LOS F during both the weekday morning and afternoon peak hours. Under **Alternative 2 – Signalization**, the intersection is expected to operate at an overall LOS D during both peak hours, with the Marrett Road approach operating at LOS D and E during the weekday morning and afternoon peak hours, respectively. An analysis was not conducted for **Alternative 3 – Roundabout** because space was not available within the existing right-of-way for the necessary diameter.

Mass Ave at Maple Street

The Mass Ave/Maple Street intersection is expected to operate at LOS F during both peak hours under **Alternative 1 – Retain Current Design (No Build).** The overall intersection is expected to operate at LOS C and D during the weekday morning and afternoon peak hours, respectively, under **Alternative 2 – Signalization.** Under this alternative, the Maple Street eastbound left-turn lane will operate at LOS D during the weekday morning peak hour and LOS E during the weekday afternoon peak hour. Under **Alternative 3 – Roundabout**, the intersection is expected to operate at an overall LOS F during both peak hours.

Mass Ave at Pleasant Street / Follen Road

The Mass Ave/Pleasant Street intersection is expected to operate at LOS F under **Alternative 1 – Retain Current Design (No Build)** during both the weekday morning and afternoon peak hours. Under **Alternative 2 – Signalization**, the overall intersection will operate at LOS B during the weekday morning and afternoon peak hours, respectively, with the Pleasant Street eastbound left-turn lane operating at LOS B and C during the weekday morning and afternoon peak hours, respectively.

During the weekday morning peak hour, the Follen Road southbound approach is expected to operate at LOS D under both **Alternative 1** and **Alternative 2**. During the weekday afternoon peak hour, this approach will operate at LOS C under both **Alternative 1** and **Alternative 2**.

Under **Alternative 3 – Roundabout**, the overall intersection at Mass Ave at Pleasant Street / Follen Road is expected to operate at LOS D during the weekday morning peak hour and LOS C during the weekday afternoon peak hour. Under this alternative, the Pleasant Street eastbound approach will operate at LOS B and D during the weekday morning and afternoon peak hours, respectively. The Follen Road southeastbound approach is expected to operate at LOS B during both peak hours.

Table 7: LOS Summary – Design Alternatives - Weekday Morning Peak Hour

	Alt 1 - 2023 No Build				2023 Alt 2 – Signalization				2023 Alt 3 - Roundabout			
	Ave. Delay (sec)	LOS	V/C Ratio	95th Queue (ft)	Ave. Delay (sec)	LOS	V/C Ratio	95th Queue (ft)	Ave. Delay (sec)	LOS	V/C Ratio	95th Queue (ft)
Mass Ave at Marrett Road												
Marrett Road EB LR	>80	F	>1.20	**	41.1	D	0.56	148				
Mass Ave NB L	34.8	D	0.84	229	74.6	E	1.09	323				
Mass Ave NB T	0.0	A	0.38	0	3.8	A	0.47	94		Not Applicable		
Mass Ave SB TR	0.0	A	0.67	0	58.4	E	1.04	779				
Overall	-	-	-		*45.4*	*D*	*1.08*					
Mass Ave at Maple Street												
Maple Street WB L	>80	F	>1.20	**	52.5	D	0.89	305	>80	F	>1.20	3361
Maple Street WB R	>80	F	>1.20	900	25.9	C	0.73	350	>80	F	>1.20	3361
Mass Ave NB TR	0.0	A	0.60	0	-	-	-	-	-	-	-	-
Mass Ave NB T	-	-	-	-	28.7	C	0.87	563	>80	F	1.11	1729
Mass Ave NB R	-	-	-	-	11.1	B	0.15	32	>80	F	1.11	1729
Mass Ave SB L	13.0	B	0.34	37	23.4	C	0.74	23	>80	F	>1.20	4538
Mass Ave SB T	0.0	A	0.71	0	22.9	C	0.97	633	>80	F	>1.20	4538
Overall	-	-	-		*27.2*	*C*	*0.99*		*>80*	*F*	*>1.20*	
Mass Ave at Pleasant Street												
Pleasant Street EB L	>80	F	>1.20	**	19.1	B	0.58	201				
Pleasant Street EB R	16.0	C	0.19	18	14.7	B	0.04	25				
Mass Ave NB TR	13.8	B	0.49	66	-	-	-	-				
Mass Ave NB T	-	-	-	-	9.2	A	0.47	99				
Mass Ave NB R	-	-	-	-	9.6	A	0.49	222		Not Applicable		
Mass Ave SB LT	0.0	A	0.70	0	-	-	-	-				
Mass Ave SB L	-	-	-	-	21.8	C	0.65	198				
Mass Ave SB T	-	-	-	-	11.3	B	0.70	121				
Overall	-	-	-		*13.4*	*B*	*0.65*					
Mass Ave at Pleasant Street / Follen Road												
Pleasant Street EB HL									11.4	B	0.50	68
Pleasant Street EB L									11.4	B	0.50	68
Pleasant Street EB R									11.4	B	0.50	68
Follen Road SEB HL									11.1	B	0.17	11
Follen Road SEB BR									11.1	B	0.17	11
Follen Road SEB HR		Not Applicable				Not Applicable			11.1	B	0.17	11
Mass Ave NB L									38.8	E	0.93	441
Mass Ave NB BL									38.8	E	0.93	441
Mass Ave NB T									38.8	E	0.93	441
Mass Ave SB T									8.7	A	0.38	43
Mass Ave SB R									27.0	D	0.86	318
Mass Ave SB HR									27.0	D	0.86	318
Overall									*25.4*	*D*	*0.93*	
Pleasant Street at Follen Road												
Pleasant Street EB LT	0.6	A	0.02	2	0.5	A	0.01	1				
Pleasant Street WB TR	0.0	A	0.64	0	0.0	A	0.62	0		Not Applicable		
Follen Road SB LR	31.5	D	0.39	44	25.9	D	0.29	30				

Table 8: LOS Summary – Design Alternatives - Weekday Afternoon Peak Hour

	Alt 1 - 2023 No Build				2023 Alt 2 – Signalization				2023 Alt 3 - Roundabout			
	Ave. Delay (sec)	LOS	V/C Ratio	95th Queue (ft)	Ave. Delay (sec)	LOS	V/C Ratio	95th Queue (ft)	Ave. Delay (sec)	LOS	V/C Ratio	95th Queue (ft)
Mass Ave at Marrett Road												
Marrett Road EB LR	>120	F	>1.20	**	66.9	E	0.97	541				
Mass Ave NB L	12.0	B	0.34	38	66.6	E	0.91	144				
Mass Ave NB T	0.0	A	0.39	0	15.4	B	0.58	199		Not Applicable		
Mass Ave SB TR	0.0	A	0.51	0	54.0	D	0.98	767				
Overall	-	-	-		*49.2*	*D*	*0.96*					
Mass Ave at Maple Street												
Maple Street WB L	>120	F	>1.20	**	59.7	E	0.82	247	20.0	C	0.70	136
Maple Street WB R	57.7	F	0.87	203	15.2	B	0.27	92	20.0	C	0.70	136
Mass Ave NB TR	0.0	A	0.66	0	-	-	-	-	-	-	-	-
Mass Ave NB T	-	-	-	-	86.8	F	1.07	703	>80	F	>1.20	3895
Mass Ave NB R	-	-	-	-	15.7	B	0.43	175	>80	F	>1.20	3895
Mass Ave SB L	>120	F	>1.20	745	86.3	F	1.10	499	>80	F	>1.20	6192
Mass Ave SB T	0.0	A	0.53	0	9.2	A	0.60	273	>80	F	>1.20	6192
Overall	-	-	-		*49.2*	*D*	*1.09*		*>80*	*F*	*>1.20*	
Mass Ave at Pleasant Street												
Pleasant Street EB L	>120	F	>1.20	**	23.0	C	0.70	262				
Pleasant Street EB R	20.5	C	0.40	47	15.4	B	0.09	36				
Mass Ave NB TR	5.0	A	0.19	18	-	-	-	-				
Mass Ave NB T	-	-	-	-	10.7	B	0.36	50				
Mass Ave NB R	-	-	-	-	11.2	B	0.52	222		Not Applicable		
Mass Ave SB LT	0.0	A	0.62	0	-	-	-	-				
Mass Ave SB L	-	-	-	-	24.0	C	0.77	319				
Mass Ave SB T	-	-	-	-	4.3	A	0.23	15				
Overall	-	-	-	-	*15.4*	*B*	*0.71*					
Mass Ave at Pleasant Street / Follen Road												
Pleasant Street EB HL									26.2	D	0.78	176
Pleasant Street EB L									26.2	D	0.78	176
Pleasant Street EB R									26.2	D	0.78	176
Follen Road SEB HL									10.7	B	0.11	9
Follen Road SEB BR									10.7	B	0.11	9
Follen Road SEB HR									10.7	B	0.11	9
Mass Ave NB L		Not Applicable				Not Applicable			26.3	D	0.81	217
Mass Ave NB BL									26.3	D	0.81	217
Mass Ave NB T									26.3	D	0.81	217
Mass Ave SB T									9.9	A	0.50	74
Mass Ave SB R									8.7	A	0.44	58
Mass Ave SB HR									8.7	A	0.44	58
Overall									*18.5*	*C*	*0.81*	
Pleasant Street at Follen Road												
Pleasant Street EB LT	0.3	A	0.01	1	0.2	A	0.01	1				
Pleasant Street WB TR	0.0	A	0.36	0	0.0	A	0.32	0		Not Applicable		
Follen Road SB LR	17.6	C	0.16	14	15.4	C	0.10	9				

Chapter 7: Recommendations

Chapter 6 discussed the proposed design alternatives provided for the three study area intersections and along the corridor of Mass Ave between Pleasant Street and Marrett Road. Based on geometry constraints, benefits to roadway users, and anticipated traffic operations, the recommended and preferred alternatives are discussed in the following section.

7.1 Mass Ave at Marrett Road

The preferred alternative at this location is **Alternative 1 – Signalization**. Based on preliminary design, in conjunction with the Roundabout Screening Tool, the roundabout alternative was deemed inappropriate for this location based on space constraints. Alternative 3 – Unsignalized intersection is a possible second option and may be considered as an interim option during construction and implementation of the entire corridor, but it would not provide for safe pedestrian accessibility and would not reduce delays at the intersection.

7.2 Mass Ave at Maple Street

The preferred alternative at this location is **Alternative 1 – Signalization**. In order to accommodate the number of vehicles entering this intersection, a roundabout would require two lanes of circulation for some movements. A roundabout of this size would not fit within the existing right-of-way constraints and therefore would require costly land takings.

7.3 Mass Ave at Pleasant Street / Follen Road

The preferred alternative at this location is **Alternative 1 – Signalization**. The Roundabout Screening Tool indicated that a roundabout is a candidate at this location. However, a review of the anticipated traffic operations for both the roundabout and signalization at this intersection indicate that signalization is the preferred alternative. Additionally, pedestrian crossings for a roundabout would be located farther from the Mass Ave corridor than with a signalized alternative.

Police traffic management activities at this location occur during parades or events at the Waldorf School or area churches. A traffic signal is more conducive to this traffic management than a roundabout.

The current practice is that parents of students at the Waldorf School queue in the school driveway while waiting to pick up their children from school in the afternoon. Often, these queues spill back into the Mass Ave northbound travel lane. A traffic signal would provide more storage on Mass Ave for this queuing than would a roundabout.

7.4 Construction and Implementation

The preferred alternative for all three study area intersections is to provide traffic signals, and the capacity analyses reviewed the corridor as if all three intersections would be signalized at the same time. BSC recommends constructing all three signals at the same time, in order to fully implement coordination between the intersections.

7.5 Pedestrian Signal at Waldorf School

There is an existing pedestrian crossing signal on Mass Ave at the Waldorf School that needs to be upgraded as part of the proposed roadway and intersection safety improvements along the Mass Ave corridor. The Town of Lexington currently uses flashing warning beacons at many locations throughout the town and desires to use this type of control at the Waldorf School pedestrian crossing as well. However, per comments from MassDOT, Rectangular Rapid Flashing Beacons (RRFB), will be proposed for this location. The RRFB consists of alternating flashing rectangular yellow beacons, supplementing a "Pedestrian (symbol)" warning sign. The RRFB is activated by pedestrian pushbutton.

7.6 Traffic Control at Locust Ave / Fire Station

The recommended improvement at this intersection is to replace the existing 8" traffic signal lenses with the current 12" standard. An additional traffic signal head should be installed for the Fire Station egress.

Appendices

Appendix A: Raw Traffic Data

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Massachusetts Avenue (Route 2A/4/225)
north of Curve Street (North)
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 A Class
Site Code: 28280.00

NB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
9/14/11	0	26	8	0	1	0	0	0	0	0	0	0	0	35
01:00	1	9	2	1	1	0	0	0	0	0	0	0	0	14
02:00	0	6	3	1	1	0	0	0	0	0	0	0	0	11
03:00	0	4	3	0	2	0	0	0	0	0	0	0	0	9
04:00	0	16	1	0	0	1	0	0	0	0	0	0	0	18
05:00	4	50	10	0	3	0	0	0	0	0	0	0	0	67
06:00	7	182	37	5	15	0	0	1	1	0	0	0	0	248
07:00	6	448	81	5	21	3	1	3	2	0	0	0	0	570
08:00	19	540	87	11	9	6	0	0	0	0	0	0	0	672
09:00	10	512	101	6	20	8	1	2	1	0	0	0	0	661
10:00	6	412	100	4	23	4	0	0	0	0	0	0	0	549
11:00	7	456	112	7	32	6	0	2	1	0	0	0	0	623
12 PM	8	454	123	8	22	3	0	2	0	0	0	0	0	620
13:00	13	472	100	6	18	4	0	1	2	0	0	0	0	616
14:00	6	462	102	3	22	8	0	4	1	0	0	1	0	609
15:00	9	555	131	6	17	7	0	0	0	0	0	0	0	725
16:00	9	578	99	4	18	3	0	4	0	0	0	0	0	715
17:00	11	644	89	2	11	5	0	2	0	0	0	0	0	764
18:00	14	646	101	3	9	10	0	0	0	0	0	0	0	783
19:00	5	493	64	5	6	2	0	1	0	0	0	0	0	576
20:00	4	325	50	1	3	0	0	0	1	0	0	0	0	384
21:00	5	218	31	0	3	1	0	0	0	0	0	0	0	258
22:00	2	154	24	0	2	0	0	0	0	0	0	0	0	182
23:00	1	65	15	0	2	0	0	0	0	0	0	0	0	83
Total	147	7727	1474	78	261	71	2	22	9	0	0	1	0	9792
Percent	1.5%	78.9%	15.1%	0.8%	2.7%	0.7%	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	08:00	11:00	08:00	11:00	09:00	07:00	07:00	07:00					08:00
Vol.	19	540	112	11	32	8	1	3	2					672
PM Peak	18:00	18:00	15:00	12:00	12:00	18:00		14:00	13:00			14:00		18:00
Vol.	14	646	131	8	22	10		4	2			1		783

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9/15/11	1	30	8	0	1	0	0	0	0	0	0	0	0	40
01:00	0	22	2	1	2	0	0	0	0	0	0	0	0	27
02:00	1	4	2	1	0	0	0	0	0	0	0	0	0	8
03:00	0	5	2	0	2	0	0	0	0	0	0	0	0	9
04:00	2	18	1	0	0	0	0	0	0	0	0	0	0	21
05:00	2	56	21	0	0	0	0	0	0	0	0	0	0	79
06:00	2	172	40	4	19	1	0	1	0	0	0	0	0	239
07:00	10	421	70	5	12	9	0	2	0	0	0	0	0	529
08:00	11	428	63	2	12	8	0	2	0	0	0	1	0	527
09:00	5	441	97	3	27	10	0	5	2	0	0	0	0	590
10:00	7	463	104	9	17	5	0	2	0	0	0	0	0	607
11:00	5	471	113	4	27	6	0	0	0	0	0	0	0	626
12 PM	6	493	121	8	31	6	1	2	0	0	1	0	0	669
13:00	4	450	91	3	19	5	1	1	0	0	0	0	0	574
14:00	3	488	103	6	19	4	0	2	0	0	0	0	0	625
15:00	10	555	116	2	22	10	0	0	0	0	0	0	0	715
16:00	9	646	107	2	19	5	0	1	0	0	0	0	0	789
17:00	4	667	107	4	8	4	0	0	1	0	0	0	0	795
18:00	6	657	98	5	19	6	0	0	0	0	0	0	0	791
19:00	5	485	65	2	8	3	0	0	0	0	0	0	0	568
20:00	2	311	50	3	6	1	0	0	0	0	0	0	0	373
21:00	2	227	39	0	3	0	0	1	0	0	0	0	0	272
22:00	0	153	30	0	2	0	0	0	0	0	0	0	0	185
23:00	0	84	9	0	0	0	0	0	0	0	0	0	0	93
Total	97	7747	1459	64	275	83	2	19	3	0	1	1	0	9751
Percent	1.0%	79.4%	15.0%	0.7%	2.8%	0.9%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	11:00	11:00	10:00	09:00	09:00		09:00	09:00			08:00		11:00
Vol.	11	471	113	9	27	10		5	2			1		626
PM Peak	15:00	17:00	12:00	12:00	12:00	15:00	12:00	12:00	17:00		12:00			17:00
Vol.	10	667	121	8	31	10	1	2	1		1			795

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9/14/11	1	14	4	0	0	0	0	0	0	0	0	0	0	19
01:00	0	16	2	0	0	0	0	0	0	0	0	0	0	18
02:00	0	9	2	0	2	0	0	0	0	0	0	0	0	13
03:00	0	6	2	0	1	0	0	0	0	0	0	0	0	9
04:00	2	9	4	0	1	1	0	0	0	0	0	0	0	17
05:00	1	64	14	0	0	1	0	0	0	0	0	0	0	80
06:00	8	303	74	7	12	2	0	0	1	0	0	0	0	407
07:00	4	807	100	9	11	2	0	1	1	0	0	0	0	935
08:00	6	734	92	4	17	6	0	0	0	0	0	0	0	859
09:00	3	622	104	6	14	2	0	3	1	0	0	0	0	755
10:00	2	484	79	5	20	3	0	2	0	0	0	0	0	595
11:00	1	475	83	6	18	4	0	2	1	0	0	0	0	590
12 PM	2	496	75	4	11	2	1	2	1	0	0	0	0	594
13:00	3	488	85	3	13	2	0	2	0	0	0	0	0	596
14:00	9	535	76	6	15	0	0	1	1	0	0	0	0	643
15:00	5	592	97	6	11	3	0	2	0	0	0	0	0	716
16:00	7	652	85	5	11	2	0	3	0	0	0	0	0	765
17:00	8	717	78	3	8	2	0	0	0	0	0	0	0	816
18:00	7	626	52	4	4	1	0	1	0	0	0	0	0	695
19:00	1	435	53	2	1	0	0	0	1	0	0	0	0	493
20:00	1	334	38	2	3	0	0	0	0	0	0	0	0	378
21:00	1	205	21	2	1	0	0	0	0	0	0	0	0	230
22:00	0	132	11	1	0	0	0	0	0	0	0	0	0	144
23:00	2	36	8	0	1	0	0	0	0	0	0	0	0	47
Total	74	8791	1239	75	175	33	1	19	7	0	0	0	0	10414
Percent	0.7%	84.4%	11.9%	0.7%	1.7%	0.3%	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	06:00	07:00	09:00	07:00	10:00	08:00		09:00	06:00					07:00
Vol.	8	807	104	9	20	6		3	1					935
PM Peak	14:00	17:00	15:00	14:00	14:00	15:00	12:00	16:00	12:00					17:00
Vol.	9	717	97	6	15	3	1	3	1					816

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9/15/11	0	17	4	0	0	0	0	0	0	0	0	0	0	21
01:00	0	4	3	0	0	0	0	0	0	0	0	0	0	7
02:00	1	7	1	0	1	0	0	0	0	0	0	0	0	10
03:00	0	7	4	0	2	0	0	0	0	0	0	0	0	13
04:00	0	8	3	0	0	0	0	0	0	0	0	0	0	11
05:00	1	82	9	0	0	1	0	0	0	0	0	0	0	93
06:00	1	281	77	6	12	0	0	1	1	0	0	0	0	379
07:00	3	766	83	7	11	6	1	1	0	0	0	0	0	878
08:00	4	708	77	4	16	3	0	3	0	0	0	0	0	815
09:00	1	565	102	10	10	3	0	2	1	0	0	0	0	694
10:00	1	459	81	3	22	0	0	1	0	0	0	0	0	567
11:00	1	511	89	4	22	1	0	1	0	0	0	0	0	629
12 PM	3	546	78	6	17	0	0	2	2	0	0	0	0	654
13:00	3	556	74	5	18	1	0	2	0	0	0	0	0	659
14:00	1	530	96	4	18	0	0	2	3	0	0	0	0	654
15:00	4	623	87	2	9	1	0	3	0	1	0	0	0	730
16:00	3	640	85	1	6	5	0	1	0	0	0	0	0	741
17:00	2	725	81	5	2	0	0	1	0	0	0	0	0	816
18:00	1	624	68	9	1	1	0	1	0	0	0	0	0	705
19:00	1	435	42	5	2	0	0	0	0	0	0	0	0	485
20:00	1	309	34	3	1	0	0	2	0	0	0	0	0	350
21:00	1	236	23	1	0	0	0	0	0	0	0	0	0	261
22:00	0	121	14	1	0	0	0	0	0	0	0	0	0	136
23:00	1	49	7	0	0	0	0	0	0	0	0	0	0	57
Total	34	8809	1222	76	170	22	1	23	7	1	0	0	0	10365
Percent	0.3%	85.0%	11.8%	0.7%	1.6%	0.2%	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	07:00	09:00	09:00	10:00	07:00	07:00	08:00	06:00					07:00
Vol.	4	766	102	10	22	6	1	3	1					878
PM Peak	15:00	17:00	14:00	18:00	13:00	16:00		15:00	14:00	15:00				17:00
Vol.	4	725	96	9	18	5		3	3	1				816

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Email: datarequests@pdillc.com

Massachusetts Avenue (Route 2A/4/225)
north of Curve Street (North)
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 A Speed
Site Code: 28280.00

NB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
9/14/1																
1	0	0	0	1	15	14	4	1	0	0	0	0	0	35	39	35
01:00	0	0	0	3	3	3	3	2	0	0	0	0	0	14	42	36
02:00	0	0	0	1	1	8	0	0	0	0	**1**	0	0	11	38	38
03:00	0	0	0	1	3	1	2	2	0	0	0	0	0	9	45	38
04:00	0	0	0	4	5	6	3	0	0	0	0	0	0	18	39	34
05:00	0	3	2	6	20	27	9	0	0	0	0	0	0	67	39	34
06:00	**1**	**6**	3	12	87	107	**27**	**5**	0	0	0	0	0	248	39	35
07:00	0	1	49	118	282	**110**	10	0	0	0	0	0	0	570	36	31
08:00	1	3	**99**	**250**	278	36	5	0	0	0	0	0	0	**672**	33	29
09:00	1	3	17	185	**344**	102	9	0	0	0	0	0	0	661	35	31
10:00	0	2	9	96	302	134	6	0	0	0	0	0	0	549	37	32
11:00	0	**3**	**29**	181	325	82	3	0	0	0	0	0	0	**623**	34	31
12 PM	**3**	1	15	**216**	299	83	3	0	0	0	0	0	0	620	34	31
13:00	0	3	19	134	**355**	99	6	0	0	0	0	0	0	616	35	31
14:00	2	2	21	130	334	**109**	**11**	0	0	0	0	0	0	609	36	32
15:00	0	**4**	**31**	**243**	366	76	5	0	0	0	0	0	0	725	34	30
16:00	0	4	24	132	400	**146**	9	0	0	0	0	0	0	715	36	32
17:00	**2**	2	23	153	439	141	4	0	0	0	0	0	0	764	36	32
18:00	0	3	3	141	**501**	131	4	0	0	0	0	0	0	**783**	35	32
19:00	2	1	26	172	311	59	5	0	0	0	0	0	0	576	34	31
20:00	0	2	3	57	236	79	7	0	0	0	0	0	0	384	36	32
21:00	0	1	7	38	141	65	6	0	0	0	0	0	0	258	37	32
22:00	0	1	2	15	83	66	**14**	0	**1**	0	0	0	0	182	39	34
23:00	0	0	0	9	39	29	6	0	0	0	0	0	0	83	38	34
Total	12	45	382	2298	5169	1713	161	10	1	0	1	0	0	9792		
%	0.1%	0.5%	3.9%	23.5%	52.8%	17.5%	1.6%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	06:00	06:00	08:00	08:00	09:00	07:00	06:00	06:00			02:00			08:00		
Vol.	1	6	99	250	344	110	27	5			1			672		
Midday Peak	12:00	11:00	11:00	12:00	13:00	14:00	14:00							11:00		
Vol.	3	3	29	216	355	109	11							623		
PM Peak	17:00	15:00	15:00	15:00	18:00	16:00	22:00		22:00					18:00		
Vol.	2	4	31	243	501	146	14		1					783		

% iles

15th Percentile : 27 MPH
50th Percentile : 32 MPH
85th Percentile : 36 MPH
95th Percentile : 39 MPH

Stats

10 MPH Pace Speed : 25-34 MPH
Number in Pace : 7467
Percent in Pace : 76.3%
Number of Vehicles > 35 MPH : 1543
Percent of Vehicles > 35 MPH : 15.8%
Mean Speed(Average) : 31 MPH

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
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Email: datarequests@pdillc.com

Massachusetts Avenue (Route 2A/4/225)
north of Curve Street (North)
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 A Speed
Site Code: 28280.00

NB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
9/15/1																
1	1	0	0	4	13	16	4	**2**	0	0	0	0	0	40	39	34
01:00	0	0	0	1	13	6	7	0	0	0	0	0	0	27	41	35
02:00	0	0	0	0	1	6	1	0	0	0	0	0	0	8	39	37
03:00	0	0	0	0	7	1	1	0	0	0	0	0	0	9	39	33
04:00	0	1	0	1	6	8	3	2	0	0	0	0	0	21	41	35
05:00	0	2	1	5	28	30	12	1	0	0	0	0	0	79	40	35
06:00	1	0	2	13	113	87	**21**	2	0	0	0	0	0	239	39	34
07:00	2	3	69	125	236	**90**	4	0	0	0	0	0	0	529	35	30
08:00	**6**	**5**	**134**	206	158	17	1	0	0	0	0	0	0	527	33	27
09:00	0	4	29	**208**	**285**	61	3	0	0	0	0	0	0	**590**	34	30
10:00	1	6	19	166	314	92	9	0	0	0	0	0	0	607	35	31
11:00	0	4	17	162	333	105	**5**	0	0	0	0	0	0	626	35	31
12 PM	**2**	**7**	36	196	354	70	4	0	0	0	0	0	0	**669**	34	30
13:00	2	0	**44**	**237**	251	36	4	0	0	0	0	0	0	574	34	29
14:00	0	4	8	131	**368**	**109**	5	0	0	0	0	0	0	625	35	32
15:00	1	8	**48**	**222**	367	67	2	0	0	0	0	0	0	715	34	30
16:00	2	4	21	191	466	94	8	**3**	0	0	0	0	0	789	34	31
17:00	**4**	3	26	182	**481**	90	9	0	0	0	0	0	0	**795**	34	31
18:00	1	**9**	11	159	460	**147**	4	0	0	0	0	0	0	791	36	32
19:00	2	3	29	168	287	76	3	0	0	0	0	0	0	568	34	31
20:00	1	1	3	61	217	82	8	0	0	0	0	0	0	373	36	32
21:00	0	0	1	56	151	58	6	0	0	0	0	0	0	272	36	32
22:00	0	0	1	12	94	65	**13**	0	0	0	0	0	0	185	38	34
23:00	0	0	1	8	51	25	7	1	0	0	0	0	0	93	38	34
Total	26	64	500	2514	5054	1438	144	11	0	0	0	0	0	9751		
%	0.3%	0.7%	5.1%	25.8%	51.8%	14.7%	1.5%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	08:00	08:00	09:00	09:00	07:00	06:00	00:00						09:00		
Vol.	6	5	134	208	285	90	21	2						590		
Midday Peak	12:00	12:00	13:00	13:00	14:00	14:00	11:00							12:00		
Vol.	2	7	44	237	368	109	5							669		
PM Peak	17:00	18:00	15:00	15:00	17:00	18:00	22:00	16:00						17:00		
Vol.	4	9	48	222	481	147	13	3						795		

% iles

15th Percentile : 26 MPH
50th Percentile : 31 MPH
85th Percentile : 35 MPH
95th Percentile : 38 MPH

Stats

10 MPH Pace Speed : 25-34 MPH
Number in Pace : 7568
Percent in Pace : 77.6%
Number of Vehicles > 35 MPH : 1305
Percent of Vehicles > 35 MPH : 13.4%
Mean Speed(Average) : 31 MPH

PRECISION
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north of Curve Street (North)
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 A Speed
Site Code: 28280.00

SB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
9/14/1																
1	0	0	1	0	8	7	2	1	0	0	0	0	0	19	39	34
01:00	0	0	0	3	4	7	3	1	0	0	0	0	0	18	40	35
02:00	0	0	0	0	0	12	0	1	0	0	0	0	0	13	39	37
03:00	0	0	0	0	4	4	0	1	0	0	0	0	0	9	38	36
04:00	0	0	0	1	5	6	4	1	0	0	0	0	0	17	41	36
05:00	0	0	0	2	27	37	12	**2**	0	0	0	0	0	80	40	36
06:00	0	0	4	19	154	**195**	**35**	0	0	0	0	0	0	407	39	35
07:00	18	45	123	**252**	388	102	7	0	0	0	0	0	0	**935**	34	29
08:00	**73**	**114**	**211**	230	203	28	0	0	0	0	0	0	0	859	32	24
09:00	5	7	42	189	**389**	109	14	0	0	0	0	0	0	755	35	31
10:00	0	3	13	103	290	155	29	0	2	0	0	0	0	595	38	33
11:00	1	9	**42**	171	307	56	4	0	0	0	0	0	0	590	34	30
12 PM	1	6	30	**179**	278	93	**5**	**2**	0	0	0	0	0	594	35	31
13:00	0	15	30	112	331	**105**	3	0	0	0	0	0	0	596	35	31
14:00	**3**	**19**	36	133	**347**	100	4	1	0	0	0	0	0	**643**	35	31
15:00	9	15	43	**190**	333	110	**16**	0	0	0	0	0	0	716	35	30
16:00	**23**	13	48	176	370	**125**	10	0	0	0	0	0	0	765	35	30
17:00	22	**34**	**79**	168	**385**	120	8	0	0	0	0	0	0	**816**	35	30
18:00	1	7	47	158	358	117	7	0	0	0	0	0	0	695	35	31
19:00	0	1	9	84	301	93	5	0	0	0	0	0	0	493	36	32
20:00	0	0	2	48	247	74	7	0	0	0	0	0	0	378	36	32
21:00	0	1	4	37	117	60	8	**2**	0	0	**1**	0	0	230	37	33
22:00	0	0	0	12	68	57	5	2	0	0	0	0	0	144	38	34
23:00	0	0	0	2	18	22	4	1	0	0	0	0	0	47	39	35
Total	156	289	764	2269	4932	1794	192	15	2	0	1	0	0	10414		
%	1.5%	2.8%	7.3%	21.8%	47.4%	17.2%	1.8%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	08:00	08:00	07:00	09:00	06:00	06:00	05:00						07:00		
Vol.	73	114	211	252	389	195	35	2						935		
Midday Peak	14:00	14:00	11:00	12:00	14:00	13:00	12:00	12:00						14:00		
Vol.	3	19	42	179	347	105	5	2						643		
PM Peak	16:00	17:00	17:00	15:00	17:00	16:00	15:00	21:00			21:00			17:00		
Vol.	23	34	79	190	385	125	16	2			1			816		

% iles

15th Percentile : 25 MPH
50th Percentile : 31 MPH
85th Percentile : 36 MPH
95th Percentile : 39 MPH

Stats

10 MPH Pace Speed : 25-34 MPH
Number in Pace : 7201
Percent in Pace : 69.1%
Number of Vehicles > 35 MPH : 1645
Percent of Vehicles > 35 MPH : 15.8%
Mean Speed(Average) : 30 MPH

PRECISION
D A T A
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112612 A Speed
Site Code: 28280.00

SB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
9/15/1																
1	0	0	1	2	6	7	3	**2**	0	0	0	0	0	21	41	35
01:00	0	0	0	2	2	3	0	0	0	0	0	0	0	7	36	33
02:00	0	0	0	0	1	7	2	0	0	0	0	0	0	10	39	37
03:00	0	0	0	1	5	5	2	0	0	0	0	0	0	13	39	35
04:00	0	0	0	0	5	2	2	2	0	0	0	0	0	11	44	38
05:00	0	0	0	3	18	52	**18**	2	0	0	0	0	0	93	41	37
06:00	1	1	11	22	159	**170**	14	1	0	0	0	0	0	379	38	34
07:00	64	98	204	190	235	80	7	0	0	0	0	0	0	**878**	34	26
08:00	**141**	**165**	**286**	113	92	17	1	0	0	0	0	0	0	815	29	21
09:00	2	8	26	**198**	**330**	120	9	1	0	0	0	0	0	694	36	31
10:00	1	1	17	123	311	106	7	1	0	0	0	0	0	567	36	32
11:00	1	12	26	155	305	122	6	**2**	0	0	0	0	0	629	36	31
12 PM	17	16	37	153	312	110	9	0	0	0	0	0	0	654	35	30
13:00	**64**	**33**	**103**	**163**	229	64	3	0	0	0	0	0	0	**659**	34	27
14:00	0	1	6	138	**357**	**141**	**11**	0	0	0	0	0	0	654	36	32
15:00	**10**	**31**	**80**	**220**	308	74	7	0	0	0	0	0	0	730	34	29
16:00	3	9	31	133	431	122	12	0	0	0	0	0	0	741	35	31
17:00	2	6	41	168	**460**	133	5	1	0	0	0	0	0	**816**	35	31
18:00	0	0	12	114	391	**178**	10	0	0	0	0	0	0	705	37	32
19:00	1	6	18	154	245	55	5	1	0	0	0	0	0	485	34	31
20:00	0	3	14	42	189	91	9	**2**	0	0	0	0	0	350	37	33
21:00	1	5	7	31	135	69	**13**	0	0	0	0	0	0	261	38	33
22:00	0	0	0	9	71	50	6	0	0	0	0	0	0	136	38	34
23:00	0	0	1	6	19	25	5	1	0	0	0	0	0	57	39	35
Total	308	395	921	2140	4616	1803	166	16	0	0	0	0	0	10365		
%	3.0%	3.8%	8.9%	20.6%	44.5%	17.4%	1.6%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	08:00	08:00	09:00	09:00	06:00	05:00	00:00						07:00		
Vol.	141	165	286	198	330	170	18	2						878		
Midday Peak	13:00	13:00	13:00	13:00	14:00	14:00	14:00	11:00						13:00		
Vol.	64	33	103	163	357	141	11	2						659		
PM Peak	15:00	15:00	15:00	15:00	17:00	18:00	21:00	20:00						17:00		
Vol.	10	31	80	220	460	178	13	2						816		

% iles

15th Percentile : 24 MPH
50th Percentile : 31 MPH
85th Percentile : 36 MPH
95th Percentile : 39 MPH

Stats

10 MPH Pace Speed : 25-34 MPH
Number in Pace : 6756
Percent in Pace : 65.2%
Number of Vehicles > 35 MPH : 1624
Percent of Vehicles > 35 MPH : 15.7%
Mean Speed(Average) : 30 MPH

PRECISION
D A T A
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Massachusetts Avenue (Route 2A/4/225)
north of Curve Street (North)
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 A Volume
Site Code: 28280.00

Start	NB				SB				Combined				14-Sep-11
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Wed
12:00	11		135		7		168		18		303		
12:15	7		154		4		148		11		302		
12:30	7		169		4		128		11		297		
12:45	10	35	162	620	4	19	150	594	14	54	312	1214	
01:00	0		145		5		143		5		288		
01:15	4		162		4		145		8		307		
01:30	5		142		3		166		8		308		
01:45	5	14	167	616	6	18	142	596	11	32	309	1212	
02:00	5		146		4		143		9		289		
02:15	1		148		2		153		3		301		
02:30	4		160		2		169		6		329		
02:45	1	11	155	609	5	13	178	643	6	24	333	1252	
03:00	1		161		2		171		3		332		
03:15	2		205		3		164		5		369		
03:30	2		177		2		193		4		370		
03:45	4	9	182	725	2	9	188	716	6	18	370	1441	
04:00	1		157		1		188		2		345		
04:15	4		198		1		176		5		374		
04:30	4		178		3		197		7		375		
04:45	9	18	182	715	12	17	204	765	21	35	386	1480	
05:00	12		178		8		210		20		388		
05:15	12		187		15		195		27		382		
05:30	18		198		18		209		36		407		
05:45	25	67	201	764	39	80	202	816	64	147	403	1580	
06:00	31		197		48		206		79		403		
06:15	42		183		80		187		122		370		
06:30	60		203		108		156		168		359		
06:45	115	248	200	783	171	407	146	695	286	655	346	1478	
07:00	123		177		190		122		313		299		
07:15	124		149		246		139		370		288		
07:30	153		148		241		121		394		269		
07:45	170	570	102	576	258	935	111	493	428	1505	213	1069	
08:00	130		117		185		103		315		220		
08:15	196		95		210		89		406		184		
08:30	159		91		245		96		404		187		
08:45	187	672	81	384	219	859	90	378	406	1531	171	762	
09:00	173		82		233		66		406		148		
09:15	172		62		179		61		351		123		
09:30	157		54		189		59		346		113		
09:45	159	661	60	258	154	755	44	230	313	1416	104	488	
10:00	144		45		139		72		283		117		
10:15	128		50		160		30		288		80		
10:30	153		46		139		25		292		71		
10:45	124	549	41	182	157	595	17	144	281	1144	58	326	
11:00	166		26		121		19		287		45		
11:15	152		19		138		14		290		33		
11:30	148		20		155		10		303		30		
11:45	157	623	18	83	176	590	4	47	333	1213	22	130	
Total	3477		6315		4297		6117		7774		12432		
Percent	44.7%		50.8%		55.3%		49.2%						
Day Total		9792				10414				20206			
Peak	08:15		05:45		07:00		04:45		08:15		05:15		
Vol.	715		784		935		818		1622		1595		
P.H.F.	0.912		0.966		0.906		0.974		0.999		0.980		

PRECISION
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Massachusetts Avenue (Route 2A/4/225)
north of Curve Street (North)
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 A Volume
Site Code: 28280.00

Start	NB				SB				Combined				15-Sep-11
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Thu
12:00	17		163		6		144		23		307		
12:15	8		151		3		176		11		327		
12:30	11		179		7		168		18		347		
12:45	4	40	176	669	5	21	166	654	9	61	342	1323	
01:00	10		123		1		148		11		271		
01:15	2		141		4		174		6		315		
01:30	10		155		1		165		11		320		
01:45	5	27	155	574	1	7	172	659	6	34	327	1233	
02:00	3		154		3		145		6		299		
02:15	1		160		2		133		3		293		
02:30	4		158		2		181		6		339		
02:45	0	8	153	625	3	10	195	654	3	18	348	1279	
03:00	1		165		2		202		3		367		
03:15	2		177		6		189		8		366		
03:30	4		199		3		161		7		360		
03:45	2	9	174	715	2	13	178	730	4	22	352	1445	
04:00	3		190		1		191		4		381		
04:15	3		189		0		169		3		358		
04:30	6		189		6		184		12		373		
04:45	9	21	221	789	4	11	197	741	13	32	418	1530	
05:00	9		186		17		211		26		397		
05:15	16		205		21		195		37		400		
05:30	29		211		26		194		55		405		
05:45	25	79	193	795	29	93	216	816	54	172	409	1611	
06:00	26		193		48		206		74		399		
06:15	40		204		78		182		118		386		
06:30	64		199		104		152		168		351		
06:45	109	239	195	791	149	379	165	705	258	618	360	1496	
07:00	108		191		202		159		310		350		
07:15	131		146		204		126		335		272		
07:30	166		124		252		108		418		232		
07:45	124	529	107	568	220	878	92	485	344	1407	199	1053	
08:00	103		99		163		105		266		204		
08:15	125		98		190		104		315		202		
08:30	157		98		231		65		388		163		
08:45	142	527	78	373	231	815	76	350	373	1342	154	723	
09:00	163		71		199		82		362		153		
09:15	152		60		175		77		327		137		
09:30	127		79		167		56		294		135		
09:45	148	590	62	272	153	694	46	261	301	1284	108	533	
10:00	145		52		156		48		301		100		
10:15	148		41		146		30		294		71		
10:30	135		48		148		28		283		76		
10:45	179	607	44	185	117	567	30	136	296	1174	74	321	
11:00	142		35		136		19		278		54		
11:15	157		23		167		16		324		39		
11:30	158		26		162		15		320		41		
11:45	169	626	9	93	164	629	7	57	333	1255	16	150	
Total	3302		6449		4117		6248		7419		12697		
Percent	44.5%		50.8%		55.5%		49.2%						
Day Total		9751				10365				20116			
Peak	10:45		04:45		07:00		05:00		08:30		04:45		
Vol.	636		823		878		816		1450		1620		
P.H.F.	0.888		0.931		0.871		0.944		0.934		0.969		

PRECISION
D A T A
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Pleasant Street (Route 4/225)
south of Massachusetts Avenue
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 B Class
Site Code: 28280.00

SB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
9/14/11	0	12	1	0	0	0	0	1	0	0	0	0	0	14
01:00	0	10	0	0	0	0	0	0	0	0	0	0	0	10
02:00	0	5	0	0	1	0	0	0	0	0	0	0	0	6
03:00	0	4	1	0	0	0	0	0	0	0	0	0	0	5
04:00	0	18	1	0	0	0	0	0	0	0	0	0	0	19
05:00	1	66	5	0	1	0	0	0	0	0	0	0	0	73
06:00	6	288	45	1	6	2	0	0	0	0	0	0	0	348
07:00	1	806	60	5	6	2	0	2	1	0	0	0	0	883
08:00	3	788	47	3	6	1	0	2	0	0	0	0	0	850
09:00	3	500	46	6	10	2	0	0	1	0	0	0	0	568
10:00	1	370	38	1	10	1	0	2	0	0	0	0	0	423
11:00	0	376	39	2	10	1	0	0	2	0	0	0	0	430
12 PM	1	376	25	6	7	1	0	2	0	1	0	0	0	419
13:00	2	400	34	2	3	1	0	1	0	0	0	0	0	443
14:00	2	368	25	1	4	2	0	1	0	0	0	0	0	403
15:00	3	374	29	1	6	5	0	0	0	0	0	0	0	418
16:00	6	406	30	1	2	2	0	2	0	0	0	0	0	449
17:00	4	427	29	2	4	1	0	1	1	0	0	0	0	469
18:00	1	304	12	2	1	0	0	0	0	0	0	0	0	320
19:00	0	261	12	1	2	0	0	0	0	0	0	0	0	276
20:00	1	230	10	1	0	0	0	0	0	0	0	0	0	242
21:00	2	175	7	1	0	1	0	0	0	0	0	0	0	186
22:00	0	95	3	1	0	0	0	0	0	0	0	0	0	99
23:00	1	30	2	0	0	0	0	1	0	0	0	0	0	34
Total	38	6689	501	37	79	22	0	15	5	1	0	0	0	7387
Percent	0.5%	90.6%	6.8%	0.5%	1.1%	0.3%	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	06:00	07:00	07:00	09:00	09:00	06:00		07:00	11:00					07:00
Vol.	6	806	60	6	10	2		2	2					883
PM Peak	16:00	17:00	13:00	12:00	12:00	15:00		12:00	17:00	12:00				17:00
Vol.	6	427	34	6	7	5		2	1	1				469

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112612 B Class
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SB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
9/15/11	0	10	1	0	0	0	0	0	0	0	0	0	0	11
01:00	0	7	1	0	0	0	0	0	0	0	0	0	0	8
02:00	1	2	0	0	0	1	0	0	0	0	0	0	0	4
03:00	0	6	1	0	1	0	0	0	0	0	0	0	0	8
04:00	0	17	0	0	0	0	0	0	0	0	0	0	0	17
05:00	0	73	10	0	1	0	0	0	0	0	0	0	0	84
06:00	0	289	44	2	7	0	0	1	0	0	0	0	0	343
07:00	3	745	51	4	7	4	0	2	1	0	0	0	0	817
08:00	4	794	43	4	8	3	0	2	0	0	0	0	0	858
09:00	2	499	37	3	5	1	0	5	0	0	0	0	0	552
10:00	1	379	40	3	7	1	0	0	0	0	0	0	0	431
11:00	2	376	33	3	11	1	0	1	0	0	0	0	0	427
12 PM	2	390	33	1	1	2	0	0	1	0	0	0	0	430
13:00	1	404	40	3	12	1	0	2	0	0	0	0	0	463
14:00	2	409	35	0	14	1	0	1	0	0	0	0	0	462
15:00	3	414	37	1	7	2	0	0	1	0	0	0	0	465
16:00	4	403	33	1	5	1	0	1	0	0	0	0	0	448
17:00	1	419	18	1	2	2	0	0	0	0	0	0	0	443
18:00	0	357	18	3	0	0	0	0	0	0	0	0	0	378
19:00	0	253	12	2	0	0	0	1	0	0	0	0	0	268
20:00	0	212	8	1	1	0	0	0	1	0	0	0	0	223
21:00	0	153	4	1	1	0	0	0	0	0	0	0	0	159
22:00	1	79	3	1	0	1	0	0	0	0	0	0	0	85
23:00	0	37	2	0	0	0	0	1	0	0	0	0	0	40
Total	27	6727	504	34	90	21	0	17	4	0	0	0	0	7424
Percent	0.4%	90.6%	6.8%	0.5%	1.2%	0.3%	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	08:00	07:00	07:00	11:00	07:00		09:00	07:00					08:00
Vol.	4	794	51	4	11	4		5	1					858
PM Peak	16:00	17:00	13:00	13:00	14:00	12:00		13:00	12:00					15:00
Vol.	4	419	40	3	14	2		2	1					465

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Pleasant Street (Route 4/225)
south of Massachusetts Avenue
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 B Class
Site Code: 28280.00

NB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
9/14/11	0	35	1	0	0	1	0	0	0	0	0	0	0	37
01:00	0	6	3	0	0	0	0	0	0	0	0	0	0	9
02:00	0	5	0	0	1	0	0	0	0	0	0	0	0	6
03:00	0	3	1	0	2	0	0	1	0	0	0	0	0	7
04:00	0	10	0	0	0	1	0	0	0	0	0	0	0	11
05:00	1	28	5	0	2	0	0	0	0	0	0	0	0	36
06:00	3	110	26	3	10	2	0	0	0	0	0	0	0	154
07:00	0	281	28	3	8	0	0	2	0	0	0	0	0	322
08:00	0	261	7	0	0	0	0	0	0	0	0	0	0	268
09:00	0	337	22	5	6	0	0	0	0	0	0	0	0	370
10:00	0	321	55	4	6	1	0	0	0	0	0	0	0	387
11:00	3	337	50	2	13	2	0	0	0	0	0	0	0	407
12 PM	2	348	50	3	12	0	0	1	0	0	0	0	0	416
13:00	2	356	55	1	5	1	0	0	0	0	0	0	0	420
14:00	1	418	50	3	7	0	0	0	0	0	0	0	0	479
15:00	5	481	34	1	4	1	0	0	0	0	0	0	0	526
16:00	1	454	27	1	2	0	0	0	0	0	0	0	0	485
17:00	0	370	25	0	2	0	0	0	0	0	0	0	0	397
18:00	0	469	27	0	3	0	0	1	0	0	0	0	0	500
19:00	0	369	31	3	1	0	0	2	0	0	0	0	0	406
20:00	0	268	19	1	0	0	0	0	1	0	0	0	0	289
21:00	0	177	17	1	2	0	0	0	0	0	0	0	0	197
22:00	1	128	16	1	1	0	0	0	0	0	0	0	0	147
23:00	0	70	9	0	0	0	0	0	0	0	0	0	0	79
Total	19	5642	558	32	87	9	0	7	1	0	0	0	0	6355
Percent	0.3%	88.8%	8.8%	0.5%	1.4%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	06:00	09:00	10:00	09:00	11:00	06:00		07:00						11:00
Vol.	3	337	55	5	13	2		2						407
PM Peak	15:00	15:00	13:00	12:00	12:00	13:00		19:00	20:00					15:00
Vol.	5	481	55	3	12	1		2	1					526

PRECISION
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Pleasant Street (Route 4/225)
south of Massachusetts Avenue
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 B Class
Site Code: 28280.00

NB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
9/15/11	0	35	4	0	0	0	0	0	0	0	0	0	0	39
01:00	0	24	2	0	1	0	0	0	0	0	0	0	0	27
02:00	2	4	1	0	0	2	0	0	0	0	0	0	0	9
03:00	0	5	0	0	1	0	0	0	0	0	0	0	0	6
04:00	0	6	0	0	0	0	0	0	0	0	0	0	0	6
05:00	1	29	10	0	3	0	0	0	0	0	0	0	0	43
06:00	0	124	25	3	8	0	0	0	0	0	0	0	0	160
07:00	0	295	24	3	6	0	0	1	0	0	0	0	0	329
08:00	1	297	22	1	2	0	0	0	0	0	0	0	0	323
09:00	0	349	46	1	7	0	0	0	0	0	0	0	0	403
10:00	2	334	50	0	5	4	0	0	0	0	0	0	0	395
11:00	0	360	53	2	5	0	0	0	0	0	0	0	0	420
12 PM	1	429	38	0	2	1	0	0	0	0	0	0	0	471
13:00	1	364	35	4	7	0	0	0	0	0	0	0	0	411
14:00	1	392	42	1	8	1	0	2	0	0	0	0	0	447
15:00	1	446	40	0	7	1	0	1	0	0	0	0	0	496
16:00	0	436	37	1	3	0	0	0	0	0	0	0	0	477
17:00	0	380	28	1	2	0	0	1	0	0	0	0	0	412
18:00	0	432	23	2	5	0	0	0	0	0	0	0	0	462
19:00	1	345	34	0	3	1	0	0	0	0	0	0	0	384
20:00	0	245	25	2	2	0	0	0	0	0	0	0	0	274
21:00	1	205	22	1	0	1	0	0	0	0	0	0	0	230
22:00	1	150	13	0	0	1	0	0	0	0	0	0	0	165
23:00	0	69	6	0	0	0	0	0	0	0	0	0	0	75
Total	13	5755	580	22	77	12	0	5	0	0	0	0	0	6464
Percent	0.2%	89.0%	9.0%	0.3%	1.2%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	02:00	11:00	11:00	06:00	06:00	10:00		07:00						11:00
Vol.	2	360	53	3	8	4		1						420
PM Peak	12:00	15:00	14:00	13:00	14:00	12:00		14:00						15:00
Vol.	1	446	42	4	8	1		2						496

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Pleasant Street (Route 4/225)
south of Massachusetts Avenue
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 B Speed
Site Code: 28280.00

SB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
9/14/1																
1	0	1	1	5	6	1	0	0	0	0	0	0	0	14	33	29
01:00	0	0	0	2	5	2	**1**	0	0	0	0	0	0	10	35	33
02:00	0	0	3	3	0	0	0	0	0	0	0	0	0	6	26	24
03:00	0	0	0	3	2	0	0	0	0	0	0	0	0	5	30	28
04:00	1	0	4	10	3	1	0	0	0	0	0	0	0	19	30	26
05:00	0	1	12	28	30	2	0	0	0	0	0	0	0	73	33	28
06:00	2	4	34	176	**125**	**7**	0	0	0	0	0	0	0	348	33	28
07:00	15	67	258	**458**	82	3	0	0	0	0	0	0	0	**883**	29	25
08:00	**51**	**155**	**398**	221	23	2	0	0	0	0	0	0	0	850	27	22
09:00	4	34	208	273	48	1	0	0	0	0	0	0	0	568	29	25
10:00	35	45	138	163	40	2	0	0	0	0	0	0	0	423	29	23
11:00	**38**	**62**	**196**	116	18	0	0	0	0	0	0	0	0	430	27	22
12 PM	7	27	174	171	**39**	1	0	0	0	0	0	0	0	419	29	24
13:00	13	36	190	**179**	23	**2**	0	0	0	0	0	0	0	**443**	28	24
14:00	10	46	168	139	39	1	0	0	0	0	0	0	0	403	29	24
15:00	8	43	229	125	13	0	0	0	0	0	0	0	0	418	27	23
16:00	**15**	**69**	190	**159**	15	1	0	0	0	0	0	0	0	449	28	23
17:00	6	51	**258**	133	21	0	0	0	0	0	0	0	0	**469**	28	23
18:00	9	23	168	111	9	0	0	0	0	0	0	0	0	320	28	23
19:00	1	10	99	130	35	1	0	0	0	0	0	0	0	276	29	25
20:00	0	6	77	119	**39**	1	0	0	0	0	0	0	0	242	30	26
21:00	0	13	48	92	27	**4**	**2**	0	0	0	0	0	0	186	30	26
22:00	1	4	18	51	21	3	1	0	0	0	0	0	0	99	32	27
23:00	0	1	6	12	12	3	0	0	0	0	0	0	0	34	33	28
Total	216	698	2877	2879	675	38	4	0	0	0	0	0	0	7387		
%	2.9%	9.4%	38.9%	39.0%	9.1%	0.5%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	08:00	08:00	07:00	06:00	06:00	01:00							07:00		
Vol.	51	155	398	458	125	7	1							883		
Midday Peak	11:00	11:00	11:00	13:00	12:00	13:00								13:00		
Vol.	38	62	196	179	39	2								443		
PM Peak	16:00	16:00	17:00	16:00	20:00	21:00	21:00							17:00		
Vol.	15	69	258	159	39	4	2							469		

% iles

15th Percentile : 20 MPH
50th Percentile : 24 MPH
85th Percentile : 29 MPH
95th Percentile : 32 MPH

Stats

10 MPH Pace Speed : 20-29 MPH
Number in Pace : 5756
Percent in Pace : 77.9%
Number of Vehicles > 25 MPH : 3020
Percent of Vehicles > 25 MPH : 40.9%
Mean Speed(Average) : 24 MPH

PRECISION
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SB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
9/15/1																
1	0	0	0	6	1	4	0	0	0	0	0	0	0	11	36	31
01:00	0	1	0	5	2	0	0	0	0	0	0	0	0	8	30	26
02:00	1	2	0	0	1	0	0	0	0	0	0	0	0	4	16	19
03:00	0	0	2	5	1	0	0	0	0	0	0	0	0	8	29	26
04:00	1	0	7	5	2	2	0	0	0	0	0	0	0	17	33	25
05:00	0	4	11	37	27	5	0	0	0	0	0	0	0	84	33	28
06:00	1	11	62	176	**85**	**8**	0	0	0	0	0	0	0	343	32	27
07:00	13	74	336	**329**	64	1	0	0	0	0	0	0	0	817	29	24
08:00	**41**	**121**	**397**	265	34	0	0	0	0	0	0	0	0	**858**	28	23
09:00	17	49	195	236	53	1	**1**	0	0	0	0	0	0	552	29	24
10:00	12	35	155	184	43	2	0	0	0	0	0	0	0	431	29	24
11:00	**14**	48	201	139	24	0	**1**	0	0	0	0	0	0	427	28	23
12 PM	14	**66**	**223**	115	11	1	0	0	0	0	0	0	0	430	27	22
13:00	9	63	221	153	15	**2**	0	0	0	0	0	0	0	**463**	28	23
14:00	8	27	216	**179**	**30**	2	0	0	0	0	0	0	0	462	28	24
15:00	**23**	**79**	**225**	123	15	0	0	0	0	0	0	0	0	**465**	27	22
16:00	2	31	223	168	24	0	0	0	0	0	0	0	0	448	28	24
17:00	4	28	200	**192**	18	1	0	0	0	0	0	0	0	443	28	24
18:00	6	53	180	122	17	0	0	0	0	0	0	0	0	378	28	23
19:00	0	20	120	105	23	0	0	0	0	0	0	0	0	268	29	24
20:00	0	11	62	121	25	**4**	0	0	0	0	0	0	0	223	29	26
21:00	1	4	36	87	**31**	0	0	0	0	0	0	0	0	159	30	27
22:00	0	3	18	43	18	3	0	0	0	0	0	0	0	85	31	27
23:00	0	0	4	20	16	0	0	0	0	0	0	0	0	40	32	28
Total	167	730	3094	2815	580	36	2	0	0	0	0	0	0	7424		
%	2.2%	9.8%	41.7%	37.9%	7.8%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	08:00	08:00	07:00	06:00	06:00	09:00							08:00		
Vol.	41	121	397	329	85	8	1							858		
Midday Peak	11:00	12:00	12:00	14:00	14:00	13:00	11:00							13:00		
Vol.	14	66	223	179	30	2	1							463		
PM Peak	15:00	15:00	15:00	17:00	21:00	20:00								15:00		
Vol.	23	79	225	192	31	4								465		

% iles		
	15th Percentile :	20 MPH
	50th Percentile :	24 MPH
	85th Percentile :	29 MPH
	95th Percentile :	32 MPH

Stats		
	10 MPH Pace Speed :	20-29 MPH
	Number in Pace :	5909
	Percent in Pace :	79.6%
	Number of Vehicles > 25 MPH :	2870
	Percent of Vehicles > 25 MPH :	38.7%
	Mean Speed(Average) :	24 MPH

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

Pleasant Street (Route 4/225)
south of Massachusetts Avenue
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 B Speed
Site Code: 28280.00

NB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
9/14/1																
1	0	2	5	16	13	1	0	0	0	0	0	0	0	37	32	28
01:00	0	1	1	4	1	2	0	0	0	0	0	0	0	9	35	28
02:00	0	0	0	1	5	0	0	0	0	0	0	0	0	6	33	32
03:00	0	1	0	2	3	1	0	0	0	0	0	0	0	7	32	29
04:00	0	0	0	9	2	0	0	0	0	0	0	0	0	11	29	27
05:00	0	2	8	11	14	1	0	0	0	0	0	0	0	36	33	28
06:00	0	7	30	96	**17**	**3**	**1**	0	0	0	0	0	0	154	29	26
07:00	19	31	123	**136**	13	0	0	0	0	0	0	0	0	322	28	23
08:00	**51**	5	163	49	0	0	0	0	0	0	0	0	0	268	25	20
09:00	42	**49**	**169**	106	4	0	0	0	0	0	0	0	0	**370**	27	21
10:00	33	74	168	104	8	0	0	0	0	0	0	0	0	387	27	21
11:00	41	**82**	199	81	4	0	0	0	0	0	0	0	0	407	26	21
12 PM	54	70	208	79	5	0	0	0	0	0	0	0	0	416	26	20
13:00	30	70	210	**97**	**12**	**1**	0	0	0	0	0	0	0	420	27	22
14:00	**81**	82	**240**	71	5	0	0	0	0	0	0	0	0	**479**	25	20
15:00	211	33	**278**	4	0	0	0	0	0	0	0	0	0	**526**	23	16
16:00	183	32	253	14	2	1	0	0	0	0	0	0	0	485	23	16
17:00	154	2	216	25	0	0	0	0	0	0	0	0	0	397	24	17
18:00	**223**	29	233	15	0	0	0	0	0	0	0	0	0	500	23	15
19:00	89	**60**	185	68	4	0	0	0	0	0	0	0	0	406	25	19
20:00	4	21	122	**122**	19	1	0	0	0	0	0	0	0	289	29	24
21:00	0	11	50	115	19	2	0	0	0	0	0	0	0	197	29	26
22:00	2	7	33	79	**23**	**3**	0	0	0	0	0	0	0	147	30	26
23:00	3	2	25	33	15	0	**1**	0	0	0	0	0	0	79	31	25
Total	1220	673	2919	1337	188	16	2	0	0	0	0	0	0	6355		
%	19.2%	10.6%	45.9%	21.0%	3.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	09:00	09:00	07:00	06:00	06:00	06:00							09:00		
Vol.	51	49	169	136	17	3	1							370		
Midday Peak	14:00	11:00	14:00	13:00	13:00	13:00								14:00		
Vol.	81	82	240	97	12	1								479		
PM Peak	18:00	19:00	15:00	20:00	22:00	22:00	23:00							15:00		
Vol.	223	60	278	122	23	3	1							526		

% iles	
15th Percentile :	11 MPH
50th Percentile :	22 MPH
85th Percentile :	27 MPH
95th Percentile :	29 MPH

Stats	
10 MPH Pace Speed :	20-29 MPH
Number in Pace :	4256
Percent in Pace :	67.0%
Number of Vehicles > 25 MPH :	1275
Percent of Vehicles > 25 MPH :	20.1%
Mean Speed(Average) :	20 MPH

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

Pleasant Street (Route 4/225)
south of Massachusetts Avenue
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 B Speed
Site Code: 28280.00

NB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
9/15/1																
1	0	0	10	17	9	**2**	**1**	0	0	0	0	0	0	39	32	28
01:00	0	0	1	15	9	2	0	0	0	0	0	0	0	27	33	29
02:00	0	4	1	3	1	0	0	0	0	0	0	0	0	9	27	22
03:00	0	0	1	4	1	0	0	0	0	0	0	0	0	6	28	27
04:00	0	0	0	4	1	1	0	0	0	0	0	0	0	6	34	29
05:00	0	3	8	17	13	2	0	0	0	0	0	0	0	43	32	27
06:00	1	10	41	88	**19**	0	1	0	0	0	0	0	0	160	29	26
07:00	50	32	151	87	9	0	0	0	0	0	0	0	0	329	27	21
08:00	**56**	25	**202**	40	0	0	0	0	0	0	0	0	0	323	24	20
09:00	35	**61**	192	**111**	3	1	0	0	0	0	0	0	0	**403**	27	22
10:00	18	75	156	132	14	0	0	0	0	0	0	0	0	395	28	22
11:00	64	79	212	58	**7**	0	0	0	0	0	0	0	0	420	25	20
12 PM	**134**	52	**250**	32	3	0	0	0	0	0	0	0	0	**471**	24	18
13:00	44	**90**	193	**79**	5	0	0	0	0	0	0	0	0	411	26	20
14:00	68	85	212	78	4	0	0	0	0	0	0	0	0	447	25	20
15:00	196	**61**	**213**	22	4	0	0	0	0	0	0	0	0	**496**	23	16
16:00	189	50	206	31	1	0	0	0	0	0	0	0	0	477	24	16
17:00	174	5	201	32	0	0	0	0	0	0	0	0	0	412	24	16
18:00	**224**	16	205	17	0	0	0	0	0	0	0	0	0	462	23	15
19:00	68	48	186	77	5	0	0	0	0	0	0	0	0	384	26	20
20:00	0	16	119	**130**	8	0	**1**	0	0	0	0	0	0	274	28	24
21:00	0	16	89	105	19	1	0	0	0	0	0	0	0	230	29	25
22:00	0	11	43	84	**24**	3	0	0	0	0	0	0	0	165	30	26
23:00	0	2	12	44	13	**4**	0	0	0	0	0	0	0	75	31	27
Total	1321	741	2904	1307	172	16	3	0	0	0	0	0	0	6464		
%	20.4%	11.5%	44.9%	20.2%	2.7%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	09:00	08:00	09:00	06:00	00:00	00:00							09:00		
Vol.	56	61	202	111	19	2	1							403		
Midday Peak	12:00	13:00	12:00	13:00	11:00									12:00		
Vol.	134	90	250	79	7									471		
PM Peak	18:00	15:00	15:00	20:00	22:00	23:00	20:00							15:00		
Vol.	224	61	213	130	24	4	1							496		

% iles

15th Percentile : 11 MPH
50th Percentile : 22 MPH
85th Percentile : 27 MPH
95th Percentile : 29 MPH

Stats

10 MPH Pace Speed : 20-29 MPH
Number in Pace : 4211
Percent in Pace : 65.1%
Number of Vehicles > 25 MPH : 1236
Percent of Vehicles > 25 MPH : 19.1%
Mean Speed(Average) : 20 MPH

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

Pleasant Street (Route 4/225)
south of Massachusetts Avenue
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 B Volume
Site Code: 28280.00

Start	SB				NB				Combined				14-Sep-11
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Wed
12:00	4		116		14		107		18		223		
12:15	4		104		9		127		13		231		
12:30	2		106		6		93		8		199		
12:45	4	14	93	419	8	37	89	416	12	51	182	835	
01:00	3		116		1		100		4		216		
01:15	3		109		3		104		6		213		
01:30	1		109		3		101		4		210		
01:45	3	10	109	443	2	9	115	420	5	19	224	863	
02:00	3		91		1		127		4		218		
02:15	0		103		2		110		2		213		
02:30	0		86		3		121		3		207		
02:45	3	6	123	403	0	6	121	479	3	12	244	882	
03:00	1		123		1		129		2		252		
03:15	3		94		5		136		8		230		
03:30	0		95		0		131		0		226		
03:45	1	5	106	418	1	7	130	526	2	12	236	944	
04:00	2		118		1		112		3		230		
04:15	2		111		0		126		2		237		
04:30	3		103		3		128		6		231		
04:45	12	19	117	449	7	11	119	485	19	30	236	934	
05:00	8		133		6		88		14		221		
05:15	14		115		9		104		23		219		
05:30	18		119		11		109		29		228		
05:45	33	73	102	469	10	36	96	397	43	109	198	866	
06:00	44		111		13		113		57		224		
06:15	66		78		26		114		92		192		
06:30	97		65		47		150		144		215		
06:45	141	348	66	320	68	154	123	500	209	502	189	820	
07:00	183		79		73		103		256		182		
07:15	243		60		67		115		310		175		
07:30	233		68		85		94		318		162		
07:45	224	883	69	276	97	322	94	406	321	1205	163	682	
08:00	215		72		66		85		281		157		
08:15	236		57		44		60		280		117		
08:30	193		56		82		71		275		127		
08:45	206	850	57	242	76	268	73	289	282	1118	130	531	
09:00	154		64		99		64		253		128		
09:15	160		48		88		50		248		98		
09:30	144		36		92		44		236		80		
09:45	110	568	38	186	91	370	39	197	201	938	77	383	
10:00	105		36		99		39		204		75		
10:15	119		27		92		40		211		67		
10:30	110		22		111		38		221		60		
10:45	89	423	14	99	85	387	30	147	174	810	44	246	
11:00	98		15		90		30		188		45		
11:15	100		7		108		16		208		23		
11:30	114		8		111		16		225		24		
11:45	118	430	4	34	98	407	17	79	216	837	21	113	
Total	3629		3758		2014		4341		5643		8099		
Percent	64.3%		46.4%		35.7%		53.6%						
Day Total		7387				6355				13742			
Peak	07:15		04:45		11:00		03:00		07:15		02:45		
Vol.	915		484		407		526		1230		952		
P.H.F.	0.941		0.910		0.917		0.967		0.958		0.944		

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
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Pleasant Street (Route 4/225)
south of Massachusetts Avenue
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 B Volume
Site Code: 28280.00

Start	SB				NB				Combined				15-Sep-11
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Thu
12:00	1		114		15		119		16		233		
12:15	2		107		11		127		13		234		
12:30	4		118		7		105		11		223		
12:45	4	11	91	430	6	39	120	471	10	50	211	901	
01:00	0		112		10		101		10		213		
01:15	5		112		2		100		7		212		
01:30	0		125		9		104		9		229		
01:45	3	8	114	463	6	27	106	411	9	35	220	874	
02:00	0		100		1		103		1		203		
02:15	2		114		1		111		3		225		
02:30	2		109		6		119		8		228		
02:45	0	4	139	462	1	9	114	447	1	13	253	909	
03:00	0		136		2		115		2		251		
03:15	4		120		3		112		7		232		
03:30	2		98		1		148		3		246		
03:45	2	8	111	465	0	6	121	496	2	14	232	961	
04:00	1		122		0		116		1		238		
04:15	2		96		1		131		3		227		
04:30	8		108		1		122		9		230		
04:45	6	17	122	448	4	6	108	477	10	23	230	925	
05:00	9		112		3		103		12		215		
05:15	17		116		11		102		28		218		
05:30	23		91		21		108		44		199		
05:45	35	84	124	443	8	43	99	412	43	127	223	855	
06:00	42		102		15		121		57		223		
06:15	67		102		37		111		104		213		
06:30	94		87		45		127		139		214		
06:45	140	343	87	378	63	160	103	462	203	503	190	840	
07:00	185		87		69		116		254		203		
07:15	210		66		56		109		266		175		
07:30	212		58		90		83		302		141		
07:45	210	817	57	268	114	329	76	384	324	1146	133	652	
08:00	180		70		79		79		259		149		
08:15	220		60		76		64		296		124		
08:30	251		43		89		78		340		121		
08:45	207	858	50	223	79	323	53	274	286	1181	103	497	
09:00	153		45		91		66		244		111		
09:15	151		34		104		47		255		81		
09:30	133		43		96		60		229		103		
09:45	115	552	37	159	112	403	57	230	227	955	94	389	
10:00	112		27		116		46		228		73		
10:15	116		18		92		44		208		62		
10:30	110		20		93		35		203		55		
10:45	93	431	20	85	94	395	40	165	187	826	60	250	
11:00	88		13		101		26		189		39		
11:15	106		10		107		22		213		32		
11:30	121		10		98		22		219		32		
11:45	112	427	7	40	114	420	5	75	226	847	12	115	
Total	3560		3864		2160		4304		5720		8168		
Percent	62.2%		47.3%		37.8%		52.7%						
Day Total		7424				6464				13888			
Peak	07:45		02:30		09:15		03:30		07:45		02:45		
Vol.	861		504		428		516		1219		982		
P.H.F.	0.858		0.906		0.922		0.872		0.896		0.970		

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

Maple Street (Route 2A)
east of Massachusetts Ave (Route 4/225)
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 C Class
Site Code: 28280.00

EB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
9/14/11	0	17	2	0	0	0	0	0	0	0	0	0	0	19
01:00	0	3	1	0	0	0	0	0	0	0	0	0	0	4
02:00	0	5	0	0	0	0	0	0	0	0	0	0	0	5
03:00	0	1	2	0	0	1	0	0	0	0	0	0	0	4
04:00	0	8	2	0	0	1	0	0	0	0	0	0	0	11
05:00	0	18	12	0	1	0	0	0	0	0	0	0	0	31
06:00	1	102	29	0	4	1	0	0	0	0	0	0	0	137
07:00	2	229	47	1	6	3	1	2	1	0	0	0	0	292
08:00	3	249	47	2	8	1	0	0	1	0	0	0	0	311
09:00	1	233	52	0	7	3	0	3	0	1	0	0	0	300
10:00	0	223	52	2	8	0	0	1	0	0	0	0	0	286
11:00	0	254	61	3	13	0	0	3	0	0	0	0	0	334
12 PM	3	252	72	3	8	2	0	0	0	0	0	0	0	340
13:00	3	303	71	3	9	1	0	1	0	0	0	0	0	391
14:00	4	321	69	3	5	2	0	4	0	0	0	0	0	408
15:00	3	423	103	3	12	2	0	1	0	0	0	0	0	547
16:00	9	559	82	0	10	1	0	2	0	0	0	0	0	663
17:00	6	676	83	1	4	1	0	1	0	0	0	0	0	772
18:00	5	570	61	1	6	0	0	2	1	0	0	0	0	646
19:00	3	318	46	1	2	2	0	0	0	0	0	0	0	372
20:00	0	217	24	0	1	3	0	0	0	0	0	0	0	245
21:00	0	149	37	0	1	0	0	0	0	0	0	0	0	187
22:00	0	102	19	0	0	0	0	0	0	0	0	0	0	121
23:00	0	38	8	0	0	0	0	0	0	0	0	0	0	46
Total	43	5270	982	23	105	24	1	20	3	1	0	0	0	6472
Percent	0.7%	81.4%	15.2%	0.4%	1.6%	0.4%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	11:00	11:00	11:00	11:00	07:00	07:00	09:00	07:00	09:00				11:00
Vol.	3	254	61	3	13	3	1	3	1	1				334
PM Peak	16:00	17:00	15:00	12:00	15:00	20:00		14:00	18:00					17:00
Vol.	9	676	103	3	12	3		4	1					772

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

Maple Street (Route 2A)
east of Massachusetts Ave (Route 4/225)
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 C Class
Site Code: 28280.00

EB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
9/15/11	0	22	4	0	0	0	0	0	0	0	0	0	0	26
01:00	0	10	2	0	1	0	0	0	0	0	0	0	0	13
02:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
03:00	0	4	2	0	0	0	0	0	0	0	0	0	0	6
04:00	0	7	1	0	0	0	0	0	0	0	0	0	0	8
05:00	0	25	10	0	0	0	0	0	0	0	0	0	0	35
06:00	2	91	31	0	5	2	0	1	0	0	0	0	0	132
07:00	3	249	43	1	5	0	0	4	0	0	0	0	0	305
08:00	3	250	44	1	5	1	0	0	0	0	1	0	0	305
09:00	0	243	63	0	10	1	0	4	0	0	0	0	0	321
10:00	2	233	55	5	13	3	0	2	0	0	0	0	0	313
11:00	2	277	58	2	10	0	0	0	0	0	0	0	0	349
12 PM	2	308	66	3	12	2	0	1	2	0	0	0	0	396
13:00	1	312	60	2	7	2	1	1	0	0	0	0	0	386
14:00	2	313	71	2	9	5	0	3	0	0	0	0	0	405
15:00	2	442	97	1	12	3	0	4	0	0	0	0	0	561
16:00	3	549	95	1	13	1	0	2	0	0	0	0	0	664
17:00	4	753	103	0	3	4	0	1	1	1	0	0	0	870
18:00	9	566	58	1	11	1	0	0	0	0	0	0	0	646
19:00	2	294	36	0	2	0	0	0	0	0	0	0	0	334
20:00	2	224	31	0	2	0	0	0	0	0	0	0	0	259
21:00	0	183	23	0	0	0	0	1	0	0	0	0	0	207
22:00	0	88	22	0	0	0	0	0	0	0	0	0	0	110
23:00	0	52	9	0	1	0	0	0	0	0	0	0	0	62
Total	39	5497	984	19	121	25	1	24	3	1	1	0	0	6715
Percent	0.6%	81.9%	14.7%	0.3%	1.8%	0.4%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	07:00	11:00	09:00	10:00	10:00	10:00		07:00			08:00			11:00
Vol.	3	277	63	5	13	3		4			1			349
PM Peak	18:00	17:00	17:00	12:00	16:00	14:00	13:00	15:00	12:00	17:00				17:00
Vol.	9	753	103	3	13	5	1	4	2	1				870

PRECISION
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Maple Street (Route 2A)
east of Massachusetts Ave (Route 4/225)
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 C Class
Site Code: 28280.00

WB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
9/14/11	0	14	1	0	0	0	0	0	0	0	0	0	0	15
01:00	0	9	0	0	0	0	0	0	0	0	0	0	0	9
02:00	0	4	2	0	0	0	0	0	0	0	0	0	0	6
03:00	0	4	1	0	0	0	0	0	0	0	0	0	0	5
04:00	1	12	3	0	0	0	0	0	0	0	0	0	0	16
05:00	1	46	12	0	0	1	0	0	0	0	0	0	0	60
06:00	4	231	50	1	7	1	0	0	0	0	0	0	0	294
07:00	2	496	48	3	5	2	0	6	0	0	0	0	0	562
08:00	5	419	50	0	0	1	1	1	0	0	0	0	0	477
09:00	2	429	59	3	8	0	0	1	0	0	0	0	0	502
10:00	2	290	46	1	10	1	0	1	0	0	0	0	0	351
11:00	0	258	51	1	7	0	0	4	0	0	0	0	0	321
12 PM	1	309	43	3	7	1	0	1	0	0	0	0	0	365
13:00	2	286	44	1	8	1	0	4	0	0	0	0	0	346
14:00	0	384	38	2	8	0	0	1	0	0	0	0	0	433
15:00	2	404	54	2	12	2	0	1	1	0	0	0	0	478
16:00	2	355	46	0	9	3	0	2	0	0	0	1	0	418
17:00	4	336	26	0	3	3	0	0	0	0	0	0	0	372
18:00	4	353	21	0	2	0	0	1	0	0	0	0	0	381
19:00	1	250	16	0	1	0	0	0	0	0	0	0	0	268
20:00	1	172	11	0	1	0	0	0	0	0	0	0	0	185
21:00	1	97	8	0	0	0	0	0	0	0	0	0	0	106
22:00	0	45	4	0	0	0	0	0	0	0	0	0	0	49
23:00	0	23	5	0	0	0	0	0	0	0	0	0	0	28
Total	35	5226	639	17	88	16	1	23	1	0	0	1	0	6047
Percent	0.6%	86.4%	10.6%	0.3%	1.5%	0.3%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	07:00	09:00	07:00	10:00	07:00	08:00	07:00						07:00
Vol.	5	496	59	3	10	2	1	6						562
PM Peak	17:00	15:00	15:00	12:00	15:00	16:00		13:00	15:00			16:00		15:00
Vol.	4	404	54	3	12	3		4	1			1		478

PRECISION
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Maple Street (Route 2A)
east of Massachusetts Ave (Route 4/225)
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 C Class
Site Code: 28280.00

WB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
9/15/11	0	13	3	0	0	0	0	0	0	0	0	0	0	16
01:00	0	3	2	0	1	0	0	0	0	0	0	0	0	6
02:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
03:00	0	3	2	0	0	0	0	0	0	0	0	0	0	5
04:00	0	10	2	0	0	0	0	0	0	0	0	0	0	12
05:00	0	52	9	0	1	0	0	0	0	0	0	0	0	62
06:00	3	242	46	2	8	2	0	0	0	0	0	0	0	303
07:00	3	519	42	2	6	2	0	1	1	0	0	0	0	576
08:00	1	462	48	2	9	3	0	9	0	0	0	0	0	534
09:00	3	363	52	1	8	1	0	3	0	0	0	0	0	431
10:00	0	310	35	2	10	1	0	0	1	0	0	0	0	359
11:00	2	310	36	4	12	2	0	2	1	0	0	0	0	369
12 PM	1	350	40	3	6	1	0	2	0	0	0	0	0	403
13:00	1	281	49	1	13	4	0	3	0	0	0	0	0	352
14:00	1	317	49	1	11	2	0	5	1	0	0	0	0	387
15:00	1	385	46	0	9	2	0	4	0	0	0	0	0	447
16:00	2	337	34	0	6	0	0	0	0	0	0	0	0	379
17:00	4	318	17	0	3	3	0	0	0	0	0	0	0	345
18:00	1	369	22	0	2	1	0	1	0	0	0	0	0	396
19:00	2	215	16	1	1	0	0	0	0	0	0	0	0	235
20:00	1	150	14	0	1	0	0	1	0	0	0	0	0	167
21:00	0	117	10	0	0	0	0	0	0	0	0	0	0	127
22:00	0	66	7	0	0	0	0	0	0	0	0	0	0	73
23:00	1	39	1	0	0	0	0	0	0	0	0	0	0	41
Total	27	5232	582	19	107	24	0	31	4	0	0	0	0	6026
Percent	0.4%	86.8%	9.7%	0.3%	1.8%	0.4%	0.0%	0.5%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	06:00	07:00	09:00	11:00	11:00	08:00		08:00	07:00					07:00
Vol.	3	519	52	4	12	3		9	1					576
PM Peak	17:00	15:00	13:00	12:00	13:00	13:00		14:00	14:00					15:00
Vol.	4	385	49	3	13	4		5	1					447

PRECISION
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Maple Street (Route 2A)
east of Massachusetts Ave (Route 4/225)
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 C Speed
Site Code: 28280.00

EB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
9/14/1																
1	0	0	1	3	8	7	0	0	0	0	0	0	0	19	36	32
01:00	0	0	0	0	2	2	0	0	0	0	0	0	0	4	35	34
02:00	0	0	0	1	1	3	0	0	0	0	0	0	0	5	36	34
03:00	0	0	1	2	1	0	0	0	0	0	0	0	0	4	26	26
04:00	0	1	1	2	3	4	0	0	0	0	0	0	0	11	36	31
05:00	0	0	3	9	13	5	1	0	0	0	0	0	0	31	35	31
06:00	0	0	3	50	66	**15**	**3**	0	0	0	0	0	0	137	34	31
07:00	0	**4**	**62**	108	104	13	1	0	0	0	0	0	0	292	33	28
08:00	**1**	1	57	**132**	105	15	0	0	0	0	0	0	0	**311**	33	28
09:00	0	1	37	126	**121**	15	0	0	0	0	0	0	0	300	33	29
10:00	1	6	23	126	111	19	0	0	0	0	0	0	0	286	33	29
11:00	0	**5**	**24**	147	130	27	1	0	0	0	0	0	0	334	34	29
12 PM	0	0	12	134	164	25	**5**	0	0	0	0	0	0	340	34	30
13:00	0	0	14	145	192	38	2	0	0	0	0	0	0	391	34	30
14:00	0	1	9	**161**	**194**	**40**	1	**1**	0	**1**	0	0	0	**408**	34	30
15:00	0	1	27	227	235	52	4	**1**	0	0	0	0	0	547	34	30
16:00	1	**2**	10	238	351	**59**	2	0	0	0	0	0	0	663	34	30
17:00	**5**	2	**34**	**301**	**378**	50	2	0	0	0	0	0	0	**772**	34	30
18:00	0	0	18	242	331	49	**5**	1	0	0	0	0	0	646	34	30
19:00	1	0	15	133	185	34	4	0	0	0	0	0	0	372	34	30
20:00	0	0	8	98	110	28	1	0	0	0	0	0	0	245	34	30
21:00	0	0	11	59	94	23	0	0	0	0	0	0	0	187	34	30
22:00	2	0	2	37	55	20	5	0	0	0	0	0	0	121	36	31
23:00	1	0	5	11	20	6	3	0	0	0	0	0	0	46	35	30
Total	12	24	377	2492	2974	549	40	3	0	1	0	0	0	6472		
%	0.2%	0.4%	5.8%	38.5%	46.0%	8.5%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	07:00	07:00	08:00	09:00	06:00	06:00							08:00		
Vol.	1	4	62	132	121	15	3							311		
Midday Peak		11:00	11:00	14:00	14:00	14:00	12:00	14:00		14:00				14:00		
Vol.		5	24	161	194	40	5	1		1				408		
PM Peak	17:00	16:00	17:00	17:00	17:00	16:00	18:00	15:00						17:00		
Vol.	5	2	34	301	378	59	5	1						772		

% iles		
15th Percentile :	26	MPH
50th Percentile :	30	MPH
85th Percentile :	34	MPH
95th Percentile :	37	MPH

Stats		
10 MPH Pace Speed :	25-34	MPH
Number in Pace :	5466	
Percent in Pace :	84.5%	
Number of Vehicles > 35 MPH :	483	
Percent of Vehicles > 35 MPH :	7.5%	
Mean Speed(Average) :	30	MPH

PRECISION
D A T A
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Maple Street (Route 2A)
east of Massachusetts Ave (Route 4/225)
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 C Speed
Site Code: 28280.00

EB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
9/15/1																
1	0	0	0	9	9	8	0	0	0	0	0	0	0	26	36	32
01:00	0	0	0	4	6	2	1	0	0	0	0	0	0	13	35	32
02:00	0	0	1	0	0	1	0	0	0	0	0	0	0	2	35	28
03:00	0	0	0	3	2	1	0	0	0	0	0	0	0	6	31	29
04:00	0	0	0	1	3	4	0	0	0	0	0	0	0	8	37	34
05:00	0	0	4	6	15	8	**2**	0	0	0	0	0	0	35	37	32
06:00	0	0	3	43	72	14	0	0	0	0	0	0	0	132	34	31
07:00	**1**	0	42	125	122	15	0	0	0	0	0	0	0	305	33	29
08:00	1	0	**63**	127	105	9	0	0	0	0	0	0	0	305	33	28
09:00	0	**3**	31	**138**	**123**	**25**	1	0	0	0	0	0	0	**321**	34	29
10:00	0	5	24	112	146	25	0	0	0	0	0	0	1	313	34	30
11:00	0	1	20	131	164	**33**	0	0	0	0	0	0	0	349	34	30
12 PM	0	**3**	38	145	180	27	**3**	0	0	0	0	0	0	396	34	30
13:00	0	1	**39**	**167**	150	28	1	0	0	0	0	0	0	386	34	29
14:00	0	2	24	159	**185**	32	3	0	0	0	0	0	0	**405**	34	30
15:00	0	**11**	27	248	226	44	**5**	0	0	0	0	0	0	561	34	29
16:00	**1**	3	38	241	325	51	3	1	0	0	0	0	**1**	664	34	30
17:00	1	5	**53**	**388**	**382**	38	3	0	0	0	0	0	0	**870**	33	29
18:00	0	1	35	256	302	**52**	0	0	0	0	0	0	0	646	34	30
19:00	0	1	14	135	160	21	1	**2**	0	0	0	0	0	334	34	30
20:00	0	0	6	78	141	29	3	2	0	0	0	0	0	259	34	31
21:00	1	0	8	76	92	24	5	1	0	0	0	0	0	207	34	31
22:00	0	0	1	39	45	23	2	0	0	0	0	0	0	110	36	31
23:00	1	0	1	13	31	13	2	1	0	0	0	0	0	62	37	32
Total	6	36	472	2644	2986	527	35	7	0	0	0	0	2	6715		
%	0.1%	0.5%	7.0%	39.4%	44.5%	7.8%	0.5%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	07:00	09:00	08:00	09:00	09:00	09:00	05:00							09:00		
Vol.	1	3	63	138	123	25	2							321		
Midday Peak		12:00	13:00	13:00	14:00	11:00	12:00							14:00		
Vol.		3	39	167	185	33	3							405		
PM Peak	16:00	15:00	17:00	17:00	17:00	18:00	15:00	19:00					16:00	17:00		
Vol.	1	11	53	388	382	52	5	2					1	870		

% iles

15th Percentile : 25 MPH
50th Percentile : 30 MPH
85th Percentile : 34 MPH
95th Percentile : 37 MPH

Stats

10 MPH Pace Speed : 25-34 MPH
Number in Pace : 5630
Percent in Pace : 83.8%
Number of Vehicles > 35 MPH : 465
Percent of Vehicles > 35 MPH : 6.9%
Mean Speed(Average) : 30 MPH

PRECISION DATA INDUSTRIES, LLC
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112612 C Speed
Site Code: 28280.00

WB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
9/14/1																
1	0	0	0	2	6	7	0	0	0	0	0	0	0	15	37	34
01:00	0	0	0	3	2	3	1	0	0	0	0	0	0	9	37	33
02:00	0	0	0	0	3	2	0	**1**	0	0	0	0	0	6	36	35
03:00	0	0	0	0	3	2	0	0	0	0	0	0	0	5	35	33
04:00	0	0	1	1	8	4	2	0	0	0	0	0	0	16	38	33
05:00	0	0	0	6	33	16	**5**	0	0	0	0	0	0	60	38	34
06:00	0	0	0	55	**181**	**54**	4	0	0	0	0	0	0	294	36	32
07:00	238	**60**	**132**	72	51	9	0	0	0	0	0	0	0	**562**	28	17
08:00	**273**	60	117	24	3	0	0	0	0	0	0	0	0	477	23	13
09:00	109	40	76	**123**	136	17	1	0	0	0	0	0	0	502	32	23
10:00	0	2	27	128	157	34	3	0	0	0	0	0	0	351	34	30
11:00	**13**	3	21	110	148	25	0	**1**	0	0	0	0	0	321	34	29
12 PM	7	**12**	13	134	165	**32**	**2**	0	0	0	0	0	0	365	34	29
13:00	10	5	33	140	135	22	1	0	0	0	0	0	0	346	33	28
14:00	3	8	**46**	**148**	**206**	20	2	0	0	0	0	0	0	**433**	33	29
15:00	44	**29**	**75**	**188**	126	15	1	0	0	0	0	0	0	**478**	32	25
16:00	21	11	60	154	146	25	1	0	0	0	0	0	0	418	33	27
17:00	**47**	29	66	140	79	11	0	0	0	0	0	0	0	372	32	24
18:00	9	17	38	144	**158**	13	2	0	0	0	0	0	0	381	33	28
19:00	0	0	23	107	110	26	2	0	0	0	0	0	0	268	34	30
20:00	1	0	3	57	95	26	3	0	0	0	0	0	0	185	35	31
21:00	0	0	3	21	50	**28**	**4**	0	0	0	0	0	0	106	37	32
22:00	0	0	0	9	22	18	0	0	0	0	0	0	0	49	37	33
23:00	1	1	0	6	9	6	4	**1**	0	0	0	0	0	28	40	32
Total	776	277	734	1772	2032	415	38	3	0	0	0	0	0	6047		
%	12.8%	4.6%	12.1%	29.3%	33.6%	6.9%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	07:00	07:00	09:00	06:00	06:00	05:00	02:00						07:00		
Vol.	273	60	132	123	181	54	5	1						562		
Midday Peak	11:00	12:00	14:00	14:00	14:00	12:00	12:00	11:00						14:00		
Vol.	13	12	46	148	206	32	2	1						433		
PM Peak	17:00	15:00	15:00	15:00	18:00	21:00	21:00	23:00						15:00		
Vol.	47	29	75	188	158	28	4	1						478		

% iles

15th Percentile : 17 MPH
50th Percentile : 28 MPH
85th Percentile : 33 MPH
95th Percentile : 36 MPH

Stats

10 MPH Pace Speed : 25-34 MPH
Number in Pace : 3804
Percent in Pace : 62.9%
Number of Vehicles > 35 MPH : 373
Percent of Vehicles > 35 MPH : 6.2%
Mean Speed(Average) : 26 MPH

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

Maple Street (Route 2A)
east of Massachusetts Ave (Route 4/225)
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 C Speed
Site Code: 28280.00

WB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
9/15/1																
1	0	0	1	0	4	5	5	**1**	0	0	0	0	0	16	43	37
01:00	0	0	1	0	3	1	1	0	0	0	0	0	0	6	39	32
02:00	0	0	0	0	1	0	0	0	0	0	0	0	0	1	30	30
03:00	0	0	0	0	2	3	0	0	0	0	0	0	0	5	36	35
04:00	0	0	0	4	4	2	2	0	0	0	0	0	0	12	39	33
05:00	0	0	1	8	29	18	**6**	0	0	0	0	0	0	62	38	34
06:00	0	2	10	77	**171**	**41**	2	0	0	0	0	0	0	303	34	31
07:00	228	46	119	109	61	13	0	0	0	0	0	0	0	**576**	29	18
08:00	**329**	**59**	**124**	21	1	0	0	0	0	0	0	0	0	534	22	13
09:00	41	24	58	**139**	143	25	1	0	0	0	0	0	0	431	33	26
10:00	0	0	25	154	159	21	0	0	0	0	0	0	0	359	33	29
11:00	**27**	**22**	30	121	141	**27**	1	0	0	0	0	0	0	369	34	27
12 PM	27	11	**55**	142	148	20	0	0	0	0	0	0	0	**403**	33	27
13:00	2	7	31	**157**	135	20	0	0	0	0	0	0	0	352	33	29
14:00	19	10	38	126	**167**	25	**2**	0	0	0	0	0	0	387	34	28
15:00	6	17	**63**	**181**	161	18	1	0	0	0	0	0	0	**447**	33	28
16:00	5	6	28	150	158	**27**	**5**	0	0	0	0	0	0	379	34	29
17:00	**23**	**21**	37	149	95	20	0	0	0	0	0	0	0	345	33	26
18:00	2	0	36	151	**183**	22	2	0	0	0	0	0	0	396	34	29
19:00	0	0	18	100	93	23	1	0	0	0	0	0	0	235	34	30
20:00	1	0	0	63	73	27	3	0	0	0	0	0	0	167	35	31
21:00	0	0	5	45	55	21	1	0	0	0	0	0	0	127	35	31
22:00	0	0	3	16	30	20	4	0	0	0	0	0	0	73	38	32
23:00	3	0	1	4	16	13	3	**1**	0	0	0	0	0	41	38	32
Total	713	225	684	1917	2033	412	40	2	0	0	0	0	0	6026		
%	11.8%	3.7%	11.4%	31.8%	33.7%	6.8%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	08:00	08:00	09:00	06:00	06:00	05:00	00:00						07:00		
Vol.	329	59	124	139	171	41	6	1						576		
Midday Peak	11:00	11:00	12:00	13:00	14:00	11:00	14:00							12:00		
Vol.	27	22	55	157	167	27	2							403		
PM Peak	17:00	17:00	15:00	15:00	18:00	16:00	16:00	23:00						15:00		
Vol.	23	21	63	181	183	27	5	1						447		

% iles

15th Percentile :	19 MPH
50th Percentile :	28 MPH
85th Percentile :	33 MPH
95th Percentile :	36 MPH

Stats

10 MPH Pace Speed :	25-34 MPH
Number in Pace :	3950
Percent in Pace :	65.5%
Number of Vehicles > 35 MPH :	371
Percent of Vehicles > 35 MPH :	6.2%
Mean Speed(Average) :	26 MPH

PRECISION
D A T A
INDUSTRIES, LLC
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Maple Street (Route 2A)
east of Massachusetts Ave (Route 4/225)
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 C Volume
Site Code: 28280.00

Start	EB				WB				Combined				14-Sep-11
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Wed
12:00	6		64		4		83		10		147		
12:15	3		101		6		90		9		191		
12:30	6		99		1		95		7		194		
12:45	4	19	76	340	4	15	97	365	8	34	173	705	
01:00	1		91		3		82		4		173		
01:15	0		99		3		87		3		186		
01:30	3		113		1		98		4		211		
01:45	0	4	88	391	2	9	79	346	2	13	167	737	
02:00	3		101		1		92		4		193		
02:15	0		89		1		103		1		192		
02:30	2		107		0		124		2		231		
02:45	0	5	111	408	4	6	114	433	4	11	225	841	
03:00	1		142		1		139		2		281		
03:15	0		120		2		130		2		250		
03:30	2		142		1		105		3		247		
03:45	1	4	143	547	1	5	104	478	2	9	247	1025	
04:00	1		138		2		108		3		246		
04:15	2		175		3		105		5		280		
04:30	3		158		6		103		9		261		
04:45	5	11	192	663	5	16	102	418	10	27	294	1081	
05:00	6		181		5		88		11		269		
05:15	5		208		5		85		10		293		
05:30	9		208		20		101		29		309		
05:45	11	31	175	772	30	60	98	372	41	91	273	1144	
06:00	14		212		34		113		48		325		
06:15	25		160		56		89		81		249		
06:30	39		146		82		85		121		231		
06:45	59	137	128	646	122	294	94	381	181	431	222	1027	
07:00	75		117		136		93		211		210		
07:15	58		97		148		70		206		167		
07:30	88		97		160		58		248		155		
07:45	71	292	61	372	118	562	47	268	189	854	108	640	
08:00	89		63		118		65		207		128		
08:15	73		64		116		30		189		94		
08:30	84		61		141		47		225		108		
08:45	65	311	57	245	102	477	43	185	167	788	100	430	
09:00	77		60		166		23		243		83		
09:15	63		55		130		34		193		89		
09:30	79		39		104		28		183		67		
09:45	81	300	33	187	102	502	21	106	183	802	54	293	
10:00	81		31		85		17		166		48		
10:15	66		41		100		11		166		52		
10:30	79		26		80		9		159		35		
10:45	60	286	23	121	86	351	12	49	146	637	35	170	
11:00	82		19		51		11		133		30		
11:15	80		12		83		6		163		18		
11:30	89		9		84		9		173		18		
11:45	83	334	6	46	103	321	2	28	186	655	8	74	
Total	1734		4738		2618		3429		4352		8167		
Percent	39.8%		58.0%		60.2%		42.0%						
Day Total		6472				6047				12519			
Peak	11:00		05:15		06:45		02:30		07:00		05:15		
Vol.	334		803		566		507		854		1200		
P.H.F.	0.938		0.947		0.884		0.912		0.861		0.923		

PRECISION DATA INDUSTRIES, LLC
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Maple Street (Route 2A)
east of Massachusetts Ave (Route 4/225)
City,State: Lexington, MA
Client: BSC Group/ J. Lunsford

112612 C Volume
Site Code: 28280.00

Start	EB				WB				Combined				15-Sep-11
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Thu
12:00	12		90		5		87		17		177		
12:15	6		95		2		138		8		233		
12:30	6		98		4		86		10		184		
12:45	2	26	113	396	5	16	92	403	7	42	205	799	
01:00	4		95		0		84		4		179		
01:15	1		95		4		95		5		190		
01:30	3		102		1		83		4		185		
01:45	5	13	94	386	1	6	90	352	6	19	184	738	
02:00	0		95		0		98		0		193		
02:15	1		99		1		88		2		187		
02:30	1		102		0		95		1		197		
02:45	0	2	109	405	0	1	106	387	0	3	215	792	
03:00	2		119		3		114		5		233		
03:15	1		130		1		127		2		257		
03:30	3		154		0		102		3		256		
03:45	0	6	158	561	1	5	104	447	1	11	262	1008	
04:00	2		161		1		107		3		268		
04:15	2		146		1		92		3		238		
04:30	1		176		5		70		6		246		
04:45	3	8	181	664	5	12	110	379	8	20	291	1043	
05:00	5		231		9		89		14		320		
05:15	5		199		10		78		15		277		
05:30	14		241		20		87		34		328		
05:45	11	35	199	870	23	62	91	345	34	97	290	1215	
06:00	15		210		29		116		44		326		
06:15	30		174		67		104		97		278		
06:30	33		153		90		94		123		247		
06:45	54	132	109	646	117	303	82	396	171	435	191	1042	
07:00	63		115		143		72		206		187		
07:15	72		83		157		70		229		153		
07:30	100		80		124		44		224		124		
07:45	70	305	56	334	152	576	49	235	222	881	105	569	
08:00	72		70		154		47		226		117		
08:15	93		64		109		46		202		110		
08:30	72		64		123		37		195		101		
08:45	68	305	61	259	148	534	37	167	216	839	98	426	
09:00	84		44		131		39		215		83		
09:15	82		55		109		24		191		79		
09:30	76		49		105		34		181		83		
09:45	79	321	59	207	86	431	30	127	165	752	89	334	
10:00	74		35		73		32		147		67		
10:15	73		19		94		15		167		34		
10:30	77		28		97		13		174		41		
10:45	89	313	28	110	95	359	13	73	184	672	41	183	
11:00	76		26		84		16		160		42		
11:15	86		18		79		8		165		26		
11:30	97		12		100		11		197		23		
11:45	90	349	6	62	106	369	6	41	196	718	12	103	
Total	1815		4900		2674		3352		4489		8252		
Percent	40.4%		59.4%		59.6%		40.6%						
Day Total		6715				6026				12741			
Peak	11:00		05:00		07:15		02:45		07:15		05:30		
Vol.	349		870		587		449		901		1222		
P.H.F.	0.899		0.902		0.935		0.884		0.984		0.931		

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
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N/S: Massachusetts Ave (Route 4/225)
W: Marrett Road (Route 2A)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 A
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Massachusetts Ave (Route 4/225) From North		Massachusetts Ave (Route 2A/4/225) From South		Marrett Road (Route 2A) From West		
Start Time	Right	Thru	Thru	Left	Right	Left	Int. Total
07:00 AM	3	138	78	81	30	8	338
07:15 AM	7	157	99	123	57	6	449
07:30 AM	25	222	119	92	62	3	523
07:45 AM	27	238	142	118	53	10	588
Total	62	755	438	414	202	27	1898
08:00 AM	31	168	130	131	60	15	535
08:15 AM	37	203	162	113	45	13	573
08:30 AM	28	194	160	107	50	7	546
08:45 AM	15	178	146	109	41	6	495
Total	111	743	598	460	196	41	2149
Grand Total	173	1498	1036	874	398	68	4047
Apprch %	10.4	89.6	54.2	45.8	85.4	14.6	
Total %	4.3	37	25.6	21.6	9.8	1.7	
Cars	165	1448	984	851	369	62	3879
% Cars	95.4	96.7	95	97.4	92.7	91.2	95.8
Heavy Vehicles	8	50	52	23	29	6	168
% Heavy Vehicles	4.6	3.3	5	2.6	7.3	8.8	4.2

	Massachusetts Ave (Route 4/225) From North			Massachusetts Ave (Route 2A/4/225) From South			Marrett Road (Route 2A) From West			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	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 07:45 AM										
07:45 AM	27	**238**	**265**	142	118	260	53	10	63	**588**
08:00 AM	31	168	199	130	**131**	261	**60**	**15**	**75**	535
08:15 AM	**37**	203	240	**162**	113	**275**	45	13	58	573
08:30 AM	28	194	222	160	107	267	50	7	57	546
Total Volume	123	803	926	594	469	1063	208	45	253	2242
% App. Total	13.3	86.7		55.9	44.1		82.2	17.8		
PHF	.831	.843	.874	.917	.895	.966	.867	.750	.843	.953
Cars	120	777	897	566	455	1021	198	41	239	2157
% Cars	97.6	96.8	96.9	95.3	97.0	96.0	95.2	91.1	94.5	96.2
Heavy Vehicles	3	26	29	28	14	42	10	4	14	85
% Heavy Vehicles	2.4	3.2	3.1	4.7	3.0	4.0	4.8	8.9	5.5	3.8

PRECISION
D A T A
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N/S: Massachusetts Ave (Route 4/225)
W: Marrett Road (Route 2A)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 A
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars

	Massachusetts Ave (Route 4/225) From North		Massachusetts Ave (Route 2A/4/225) From South		Marrett Road (Route 2A) From West		
Start Time	Right	Thru	Thru	Left	Right	Left	Int. Total
07:00 AM	2	133	72	80	27	7	321
07:15 AM	7	153	93	120	47	6	426
07:30 AM	23	215	113	90	59	3	503
07:45 AM	26	231	137	115	52	10	571
Total	58	732	415	405	185	26	1821
08:00 AM	31	161	124	126	56	13	511
08:15 AM	36	197	154	107	42	12	548
08:30 AM	27	188	151	107	48	6	527
08:45 AM	13	170	140	106	38	5	472
Total	107	716	569	446	184	36	2058
Grand Total	165	1448	984	851	369	62	3879
Apprch %	10.2	89.8	53.6	46.4	85.6	14.4	
Total %	4.3	37.3	25.4	21.9	9.5	1.6	

	Massachusetts Ave (Route 4/225) From North			Massachusetts Ave (Route 2A/4/225) From South			Marrett Road (Route 2A) From West			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	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 07:45 AM										
07:45 AM	26	**231**	**257**	137	115	252	52	10	62	**571**
08:00 AM	31	161	192	124	**126**	250	**56**	**13**	**69**	511
08:15 AM	**36**	197	233	**154**	107	**261**	42	12	54	548
08:30 AM	27	188	215	151	107	258	48	6	54	527
Total Volume	120	777	897	566	455	1021	198	41	239	2157
% App. Total	13.4	86.6		55.4	44.6		82.8	17.2		
PHF	.833	.841	.873	.919	.903	.978	.884	.788	.866	.944

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City, State: Lexington, MA
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File Name : 112612 A
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Heavy Vehicles

	Massachusetts Ave (Route 4/225) From North		Massachusetts Ave (Route 2A/4/225) From South		Marrett Road (Route 2A) From West		
Start Time	Right	Thru	Thru	Left	Right	Left	Int. Total
07:00 AM	1	5	6	1	3	1	17
07:15 AM	0	4	6	3	10	0	23
07:30 AM	2	7	6	2	3	0	20
07:45 AM	1	7	5	3	1	0	17
Total	4	23	23	9	17	1	77
08:00 AM	0	7	6	5	4	2	24
08:15 AM	1	6	8	6	3	1	25
08:30 AM	1	6	9	0	2	1	19
08:45 AM	2	8	6	3	3	1	23
Total	4	27	29	14	12	5	91
Grand Total	8	50	52	23	29	6	168
Apprch %	13.8	86.2	69.3	30.7	82.9	17.1	
Total %	4.8	29.8	31	13.7	17.3	3.6	

	Massachusetts Ave (Route 4/225) From North			Massachusetts Ave (Route 2A/4/225) From South			Marrett Road (Route 2A) From West			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	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 08:00 AM										
08:00 AM	0	7	7	6	5	11	**4**	**2**	**6**	24
08:15 AM	1	6	7	8	**6**	**14**	3	1	4	**25**
08:30 AM	1	6	7	**9**	0	9	2	1	3	19
08:45 AM	**2**	**8**	**10**	6	3	9	3	1	4	23
Total Volume	4	27	31	29	14	43	12	5	17	91
% App. Total	12.9	87.1		67.4	32.6		70.6	29.4		
PHF	.500	.844	.775	.806	.583	.768	.750	.625	.708	.910

PRECISION
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N/S: Massachusetts Ave (Route 4/225)
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File Name : 112612 A
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Peds and Bicycles

	Massachusetts Ave (Route 4/225) From North			Massachusetts Ave (Route 2A/4/225) From South			Marrett Road (Route 2A) From West			
Start Time	Right	Thru	Peds	Thru	Left	Peds	Right	Left	Peds	Int. Total
07:00 AM	1	0	0	2	0	0	0	2	0	5
07:15 AM	0	1	0	0	3	0	0	0	0	4
07:30 AM	1	0	0	1	1	0	1	0	0	4
07:45 AM	0	1	0	1	0	0	2	0	0	4
Total	2	2	0	4	4	0	3	2	0	17
08:00 AM	0	0	0	0	8	0	0	0	0	8
08:15 AM	0	0	0	3	1	0	0	0	0	4
08:30 AM	1	0	0	0	0	0	2	0	0	3
08:45 AM	0	0	0	3	0	0	1	0	0	4
Total	1	0	0	6	9	0	3	0	0	19
Grand Total	3	2	0	10	13	0	6	2	0	36
Apprch %	60	40	0	43.5	56.5	0	75	25	0	
Total %	8.3	5.6	0	27.8	36.1	0	16.7	5.6	0	

	Massachusetts Ave (Route 4/225) From North				Massachusetts Ave (Route 2A/4/225) From South				Marrett Road (Route 2A) From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	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 07:15 AM													
07:15 AM	0	**1**	0	**1**	0	3	0	3	0	0	0	0	4
07:30 AM	**1**	0	0	1	**1**	1	0	2	1	0	0	1	4
07:45 AM	0	1	0	1	1	0	0	1	**2**	0	0	**2**	4
08:00 AM	0	0	0	0	0	**8**	0	**8**	0	0	0	0	**8**
Total Volume	1	2	0	3	2	12	0	14	3	0	0	3	20
% App. Total	33.3	66.7	0		14.3	85.7	0		100	0	0		
PHF	.250	.500	.000	.750	.500	.375	.000	.438	.375	.000	.000	.375	.625

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
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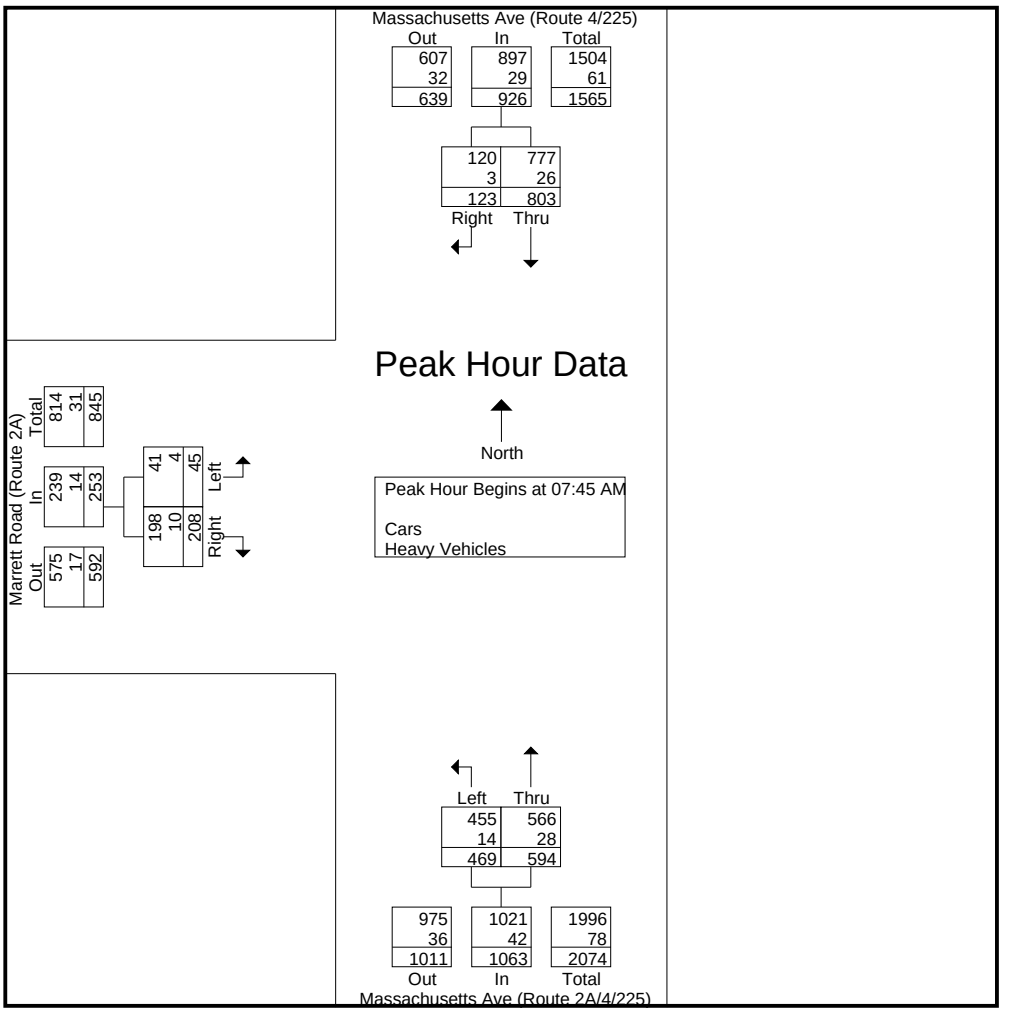
N/S: Massachusetts Ave (Route 4/225)
W: Marrett Road (Route 2A)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 A
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

	Massachusetts Ave (Route 4/225) From North			Massachusetts Ave (Route 2A/4/225) From South			Marrett Road (Route 2A) From West			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	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 07:45 AM										
07:45 AM	27	**238**	**265**	142	118	260	53	10	63	**588**
08:00 AM	31	168	199	130	**131**	261	**60**	**15**	**75**	535
08:15 AM	**37**	203	240	**162**	113	**275**	45	13	58	573
08:30 AM	28	194	222	160	107	267	50	7	57	546
Total Volume	123	803	926	594	469	1063	208	45	253	2242
% App. Total	13.3	86.7		55.9	44.1		82.2	17.8		
PHF	.831	.843	.874	.917	.895	.966	.867	.750	.843	.953
Cars	120	777	897	566	455	1021	198	41	239	2157
% Cars	97.6	96.8	96.9	95.3	97.0	96.0	95.2	91.1	94.5	96.2
Heavy Vehicles	3	26	29	28	14	42	10	4	14	85
% Heavy Vehicles	2.4	3.2	3.1	4.7	3.0	4.0	4.8	8.9	5.5	3.8



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N/S: Massachusetts Ave (Route 2A/4/225)
E: Maple Street (Route 2A)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 B
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Massachusetts Ave (Route 2A/4/225) From North		Maple Street (Route 2A) From East		Massachusetts Ave (Route 4/225) From South		
Start Time	Thru	Left	Right	Left	Right	Thru	Int. Total
07:00 AM	142	33	77	77	29	90	448
07:15 AM	177	45	93	84	34	136	569
07:30 AM	232	65	83	62	60	147	649
07:45 AM	302	38	136	86	58	163	783
Total	853	181	389	309	181	536	2449
08:00 AM	228	39	138	76	54	171	706
08:15 AM	264	61	102	72	43	197	739
08:30 AM	211	50	99	72	46	187	665
08:45 AM	192	49	94	88	49	141	613
Total	895	199	433	308	192	696	2723
Grand Total	1748	380	822	617	373	1232	5172
Apprch %	82.1	17.9	57.1	42.9	23.2	76.8	
Total %	33.8	7.3	15.9	11.9	7.2	23.8	
Cars	1694	360	800	601	365	1189	5009
% Cars	96.9	94.7	97.3	97.4	97.9	96.5	96.8
Heavy Vehicles	54	20	22	16	8	43	163
% Heavy Vehicles	3.1	5.3	2.7	2.6	2.1	3.5	3.2

	Massachusetts Ave (Route 2A/4/225) From North			Maple Street (Route 2A) From East			Massachusetts Ave (Route 4/225) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	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 07:45 AM										
07:45 AM	**302**	38	**340**	136	**86**	**222**	**58**	163	221	**783**
08:00 AM	228	39	267	**138**	76	214	54	171	225	706
08:15 AM	264	**61**	325	102	72	174	43	**197**	**240**	739
08:30 AM	211	50	261	99	72	171	46	187	233	665
Total Volume	1005	188	1193	475	306	781	201	718	919	2893
% App. Total	84.2	15.8		60.8	39.2		21.9	78.1		
PHF	.832	.770	.877	.861	.890	.880	.866	.911	.957	.924
Cars	980	180	1160	460	302	762	198	698	896	2818
% Cars	97.5	95.7	97.2	96.8	98.7	97.6	98.5	97.2	97.5	97.4
Heavy Vehicles	25	8	33	15	4	19	3	20	23	75
% Heavy Vehicles	2.5	4.3	2.8	3.2	1.3	2.4	1.5	2.8	2.5	2.6

PRECISION
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N/S: Massachusetts Ave (Route 2A/4/225)
E: Maple Street (Route 2A)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 B
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars

	Massachusetts Ave (Route 2A/4/225) From North		Maple Street (Route 2A) From East		Massachusetts Ave (Route 4/225) From South		
Start Time	Thru	Left	Right	Left	Right	Thru	Int. Total
07:00 AM	136	29	76	77	29	85	432
07:15 AM	173	41	92	79	32	129	546
07:30 AM	220	64	82	61	57	142	626
07:45 AM	298	38	134	86	58	161	775
Total	827	172	384	303	176	517	2379
08:00 AM	220	37	131	76	52	167	683
08:15 AM	256	58	98	71	42	190	715
08:30 AM	206	47	97	69	46	180	645
08:45 AM	185	46	90	82	49	135	587
Total	867	188	416	298	189	672	2630
Grand Total	1694	360	800	601	365	1189	5009
Apprch %	82.5	17.5	57.1	42.9	23.5	76.5	
Total %	33.8	7.2	16	12	7.3	23.7	

	Massachusetts Ave (Route 2A/4/225) From North			Maple Street (Route 2A) From East			Massachusetts Ave (Route 4/225) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	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 07:45 AM										
07:45 AM	**298**	38	**336**	**134**	**86**	**220**	**58**	161	219	**775**
08:00 AM	220	37	257	131	76	207	52	167	219	683
08:15 AM	256	**58**	314	98	71	169	42	**190**	**232**	715
08:30 AM	206	47	253	97	69	166	46	180	226	645
Total Volume	980	180	1160	460	302	762	198	698	896	2818
% App. Total	84.5	15.5		60.4	39.6		22.1	77.9		
PHF	.822	.776	.863	.858	.878	.866	.853	.918	.966	.909

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Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Heavy Vehicles

	Massachusetts Ave (Route 2A/4/225) From North		Maple Street (Route 2A) From East		Massachusetts Ave (Route 4/225) From South		
Start Time	Thru	Left	Right	Left	Right	Thru	Int. Total
07:00 AM	6	4	1	0	0	5	16
07:15 AM	4	4	1	5	2	7	23
07:30 AM	12	1	1	1	3	5	23
07:45 AM	4	0	2	0	0	2	8
Total	26	9	5	6	5	19	70
08:00 AM	8	2	7	0	2	4	23
08:15 AM	8	3	4	1	1	7	24
08:30 AM	5	3	2	3	0	7	20
08:45 AM	7	3	4	6	0	6	26
Total	28	11	17	10	3	24	93
Grand Total	54	20	22	16	8	43	163
Apprch %	73	27	57.9	42.1	15.7	84.3	
Total %	33.1	12.3	13.5	9.8	4.9	26.4	

	Massachusetts Ave (Route 2A/4/225) From North			Maple Street (Route 2A) From East			Massachusetts Ave (Route 4/225) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	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 08:00 AM										
08:00 AM	**8**	2	10	**7**	0	7	**2**	4	6	23
08:15 AM	8	**3**	**11**	4	1	5	1	**7**	**8**	24
08:30 AM	5	3	8	2	3	5	0	7	7	20
08:45 AM	7	3	10	4	**6**	**10**	0	6	6	**26**
Total Volume	28	11	39	17	10	27	3	24	27	93
% App. Total	71.8	28.2		63	37		11.1	88.9		
PHF	.875	.917	.886	.607	.417	.675	.375	.857	.844	.894

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Site Code : 28280.00
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Page No : 1

Groups Printed- Peds and Bicycles

	Massachusetts Ave (Route 2A/4/225) From North			Maple Street (Route 2A) From East			Massachusetts Ave (Route 4/225) From South			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
07:00 AM	0	0	0	0	0	1	0	2	0	3
07:15 AM	1	0	0	0	2	0	2	0	0	5
07:30 AM	1	0	0	0	1	0	1	3	2	8
07:45 AM	2	1	1	0	0	0	0	0	8	12
Total	4	1	1	0	3	1	3	5	10	28
08:00 AM	0	0	0	0	0	2	0	8	2	12
08:15 AM	1	0	0	1	0	0	0	3	0	5
08:30 AM	3	0	0	0	0	0	0	0	0	3
08:45 AM	0	1	0	0	0	0	0	3	0	4
Total	4	1	0	1	0	2	0	14	2	24
Grand Total	8	2	1	1	3	3	3	19	12	52
Apprch %	72.7	18.2	9.1	14.3	42.9	42.9	8.8	55.9	35.3	
Total %	15.4	3.8	1.9	1.9	5.8	5.8	5.8	36.5	23.1	

	Massachusetts Ave (Route 2A/4/225) From North				Maple Street (Route 2A) From East				Massachusetts Ave (Route 4/225) From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	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 07:15 AM													
07:15 AM	1	0	0	1	0	**2**	0	**2**	**2**	0	0	2	5
07:30 AM	1	0	0	1	0	1	0	1	1	3	2	6	8
07:45 AM	**2**	**1**	**1**	**4**	0	0	0	0	0	0	**8**	8	**12**
08:00 AM	0	0	0	0	0	0	**2**	2	0	**8**	2	**10**	12
Total Volume	4	1	1	6	0	3	2	5	3	11	12	26	37
% App. Total	66.7	16.7	16.7		0	60	40		11.5	42.3	46.2		
PHF	.500	.250	.250	.375	.000	.375	.250	.625	.375	.344	.375	.650	.771

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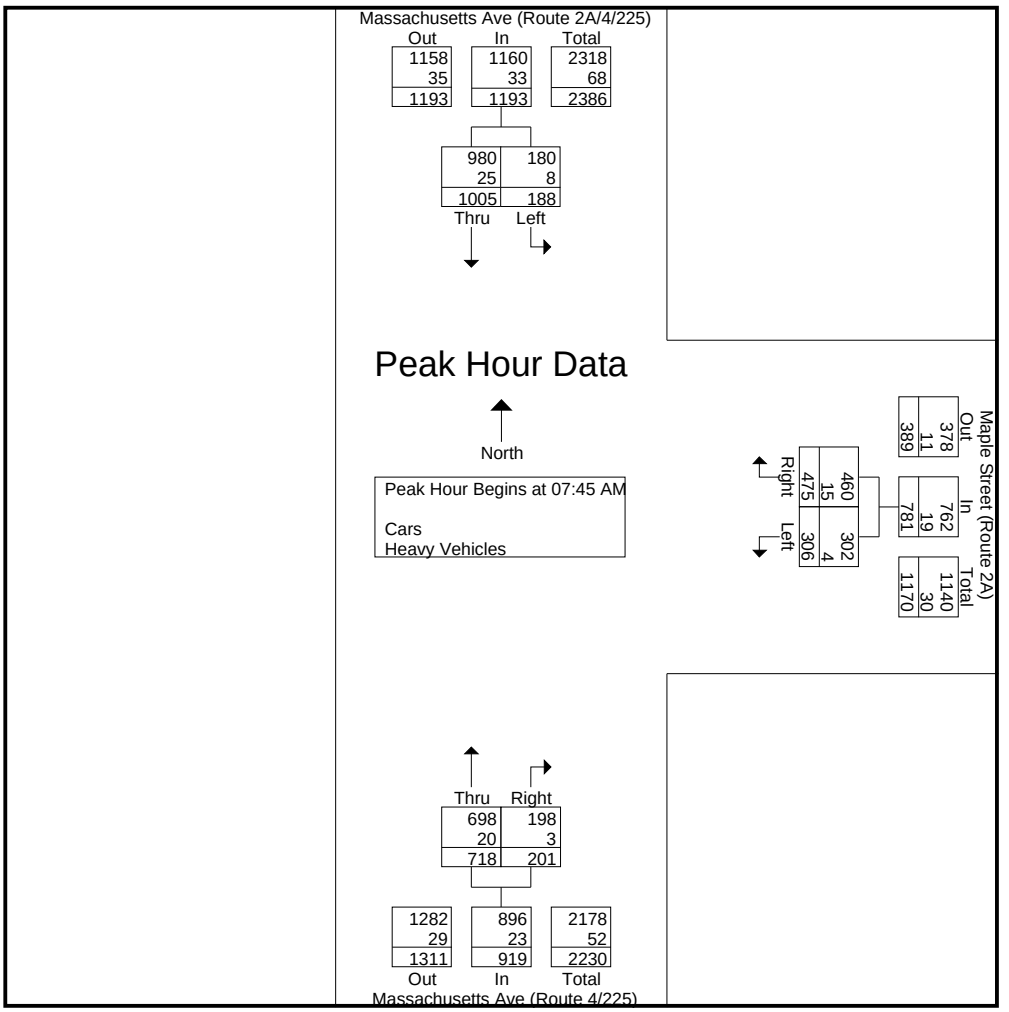
File Name : 112612 B
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

	Massachusetts Ave (Route 2A/4/225) From North			Maple Street (Route 2A) From East			Massachusetts Ave (Route 4/225) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	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 07:45 AM										
07:45 AM	**302**	38	**340**	136	**86**	**222**	**58**	163	221	**783**
08:00 AM	228	39	267	**138**	76	214	54	171	225	706
08:15 AM	264	**61**	325	102	72	174	43	**197**	**240**	739
08:30 AM	211	50	261	99	72	171	46	187	233	665
Total Volume	1005	188	1193	475	306	781	201	718	919	2893
% App. Total	84.2	15.8		60.8	39.2		21.9	78.1		
PHF	.832	.770	.877	.861	.890	.880	.866	.911	.957	.924
Cars	980	180	1160	460	302	762	198	698	896	2818
% Cars	97.5	95.7	97.2	96.8	98.7	97.6	98.5	97.2	97.5	97.4
Heavy Vehicles	25	8	33	15	4	19	3	20	23	75
% Heavy Vehicles	2.5	4.3	2.8	3.2	1.3	2.4	1.5	2.8	2.5	2.6



PRECISION DATA INDUSTRIES, LLC
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N/S: Massachusetts Avenue (Route 4/225)
NW/W: Follen Rd/ Pleasant St (Rt 4/225)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 C
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Massachusetts Ave (Route 2A/4/225) From North			Massachusetts Ave From South			Pleasant Street (Route 4/225) From West			Follen Road From Northwest			
Start Time	Hard Right	Right	Thru	Thru	Bear Left	Left	Right	Left	Hard Left	Hard Right	Bear Right	Hard Left	Int. Total
07:00 AM	0	163	46	79	2	42	12	53	0	7	2	3	409
07:15 AM	2	184	60	87	6	43	7	71	3	6	1	0	470
07:30 AM	2	199	69	99	11	44	10	74	2	12	0	0	522
07:45 AM	2	183	64	109	4	51	16	87	4	12	3	2	537
Total	6	729	239	374	23	180	45	285	9	37	6	5	1938
08:00 AM	1	155	75	110	2	60	12	78	0	20	0	0	513
08:15 AM	0	183	73	122	2	67	8	73	0	14	2	1	545
08:30 AM	1	198	79	138	2	56	18	61	5	10	2	0	570
08:45 AM	0	180	88	98	1	37	15	72	0	10	4	0	505
Total	2	716	315	468	7	220	53	284	5	54	8	1	2133
Grand Total	8	1445	554	842	30	400	98	569	14	91	14	6	4071
Apprch %	0.4	72	27.6	66.2	2.4	31.4	14.4	83.6	2.1	82	12.6	5.4	
Total %	0.2	35.5	13.6	20.7	0.7	9.8	2.4	14	0.3	2.2	0.3	0.1	
Cars	6	1417	511	802	28	382	94	551	14	89	14	6	3914
% Cars	75	98.1	92.2	95.2	93.3	95.5	95.9	96.8	100	97.8	100	100	96.1
Heavy Vehicles	2	28	43	40	2	18	4	18	0	2	0	0	157
% Heavy Vehicles	25	1.9	7.8	4.8	6.7	4.5	4.1	3.2	0	2.2	0	0	3.9

	Massachusetts Ave (Route 2A/4/225) From North				Massachusetts Ave From South				Pleasant Street (Route 4/225) From West				Follen Road From Northwest				
Start Time	Hard Right	Right	Thru	App. Total	Thru	Bear Left	Left	App. Total	Right	Left	Hard Left	App. Total	Hard Right	Bear Right	Hard Left	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 07:45 AM																	
07:45 AM	**2**	183	64	249	109	**4**	51	164	16	**87**	4	**107**	12	**3**	**2**	17	537
08:00 AM	1	155	75	231	110	2	60	172	12	78	0	90	**20**	0	0	**20**	513
08:15 AM	0	183	73	256	122	2	**67**	191	8	73	0	81	14	2	1	17	545
08:30 AM	1	**198**	**79**	**278**	**138**	2	56	**196**	**18**	61	**5**	84	10	2	0	12	**570**
Total Volume	4	719	291	1014	479	10	234	723	54	299	9	362	56	7	3	66	2165
% App. Total	0.4	70.9	28.7		66.3	1.4	32.4		14.9	82.6	2.5		84.8	10.6	4.5		
PHF	.500	.908	.921	.912	.868	.625	.873	.922	.750	.859	.450	.846	.700	.583	.375	.825	.950
Cars	4	705	270	979	458	9	225	692	53	292	9	354	55	7	3	65	2090
% Cars	100	98.1	92.8	96.5	95.6	90.0	96.2	95.7	98.1	97.7	100	97.8	98.2	100	100	98.5	96.5
Heavy Vehicles	0	14	21	35	21	1	9	31	1	7	0	8	1	0	0	1	75
% Heavy Vehicles	0	1.9	7.2	3.5	4.4	10.0	3.8	4.3	1.9	2.3	0	2.2	1.8	0	0	1.5	3.5

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NW/W: Follen Rd/ Pleasant St (Rt 4/225)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 C
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars

	Massachusetts Ave (Route 2A/4/225) From North			Massachusetts Ave From South			Pleasant Street (Route 4/225) From West			Follen Road From Northwest			
Start Time	Hard Right	Right	Thru	Thru	Bear Left	Left	Right	Left	Hard Left	Hard Right	Bear Right	Hard Left	Int. Total
07:00 AM	0	160	43	76	2	38	10	51	0	7	2	3	392
07:15 AM	1	181	56	81	6	42	7	68	3	6	1	0	452
07:30 AM	1	197	63	94	10	40	9	72	2	11	0	0	499
07:45 AM	2	182	59	106	4	47	15	86	4	12	3	2	522
Total	4	720	221	357	22	167	41	277	9	36	6	5	1865
08:00 AM	1	152	68	108	2	57	12	76	0	19	0	0	495
08:15 AM	0	181	67	114	1	66	8	70	0	14	2	1	524
08:30 AM	1	190	76	130	2	55	18	60	5	10	2	0	549
08:45 AM	0	174	79	93	1	37	15	68	0	10	4	0	481
Total	2	697	290	445	6	215	53	274	5	53	8	1	2049
Grand Total	6	1417	511	802	28	382	94	551	14	89	14	6	3914
Apprch %	0.3	73.3	26.4	66.2	2.3	31.5	14.3	83.6	2.1	81.7	12.8	5.5	
Total %	0.2	36.2	13.1	20.5	0.7	9.8	2.4	14.1	0.4	2.3	0.4	0.2	

	Massachusetts Ave (Route 2A/4/225) From North				Massachusetts Ave From South				Pleasant Street (Route 4/225) From West				Follen Road From Northwest				
Start Time	Hard Right	Right	Thru	App. Total	Thru	Bear Left	Left	App. Total	Right	Left	Hard Left	App. Total	Hard Right	Bear Right	Hard Left	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 07:45 AM																	
07:45 AM	**2**	182	59	243	106	**4**	47	157	15	**86**	4	**105**	12	**3**	**2**	17	522
08:00 AM	1	152	68	221	108	2	57	167	12	76	0	88	**19**	0	0	**19**	495
08:15 AM	0	181	67	248	114	1	**66**	181	8	70	0	78	14	2	1	17	524
08:30 AM	1	**190**	**76**	**267**	**130**	2	55	**187**	**18**	60	**5**	83	10	2	0	12	**549**
Total Volume	4	705	270	979	458	9	225	692	53	292	9	354	55	7	3	65	2090
% App. Total	0.4	72	27.6		66.2	1.3	32.5		15	82.5	2.5		84.6	10.8	4.6		
PHF	.500	.928	.888	.917	.881	.563	.852	.925	.736	.849	.450	.843	.724	.583	.375	.855	.952

PRECISION
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N/S: Massachusetts Avenue (Route 4/225)
NW/W: Follen Rd/ Pleasant St (Rt 4/225)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 C
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Heavy Vehicles

	Massachusetts Ave (Route 2A/4/225) From North			Massachusetts Ave From South			Pleasant Street (Route 4/225) From West			Follen Road From Northwest			
Start Time	Hard Right	Right	Thru	Thru	Bear Left	Left	Right	Left	Hard Left	Hard Right	Bear Right	Hard Left	Int. Total
07:00 AM	0	3	3	3	0	4	2	2	0	0	0	0	17
07:15 AM	1	3	4	6	0	1	0	3	0	0	0	0	18
07:30 AM	1	2	6	5	1	4	1	2	0	1	0	0	23
07:45 AM	0	1	5	3	0	4	1	1	0	0	0	0	15
Total	2	9	18	17	1	13	4	8	0	1	0	0	73
08:00 AM	0	3	7	2	0	3	0	2	0	1	0	0	18
08:15 AM	0	2	6	8	1	1	0	3	0	0	0	0	21
08:30 AM	0	8	3	8	0	1	0	1	0	0	0	0	21
08:45 AM	0	6	9	5	0	0	0	4	0	0	0	0	24
Total	0	19	25	23	1	5	0	10	0	1	0	0	84
Grand Total	2	28	43	40	2	18	4	18	0	2	0	0	157
Apprch %	2.7	38.4	58.9	66.7	3.3	30	18.2	81.8	0	100	0	0	
Total %	1.3	17.8	27.4	25.5	1.3	11.5	2.5	11.5	0	1.3	0	0	

	Massachusetts Ave (Route 2A/4/225) From North				Massachusetts Ave From South				Pleasant Street (Route 4/225) From West				Follen Road From Northwest				
Start Time	Hard Right	Right	Thru	App. Total	Thru	Bear Left	Left	App. Total	Right	Left	Hard Left	App. Total	Hard Right	Bear Right	Hard Left	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 08:00 AM																	
08:00 AM	0	3	7	10	2	0	**3**	5	0	2	0	2	**1**	0	0	**1**	18
08:15 AM	0	2	6	8	**8**	**1**	1	**10**	0	3	0	3	0	0	0	0	21
08:30 AM	0	**8**	3	11	8	0	1	9	0	1	0	1	0	0	0	0	21
08:45 AM	0	6	**9**	**15**	5	0	0	5	0	**4**	0	**4**	0	0	0	0	**24**
Total Volume	0	19	25	44	23	1	5	29	0	10	0	10	1	0	0	1	84
% App. Total	0	43.2	56.8		79.3	3.4	17.2		0	100	0		100	0	0		
PHF	.000	.594	.694	.733	.719	.250	.417	.725	.000	.625	.000	.625	.250	.000	.000	.250	.875

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NW/W: Follen Rd/ Pleasant St (Rt 4/225)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 C
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Peds and Bicycles

	Massachusetts Ave (Route 2A/4/225) From North				Massachusetts Ave From South				Pleasant Street (Route 4/225) From West				Follen Road From Northwest				
Start Time	Hard Right	Right	Thru	Peds	Thru	Bear Left	Left	Peds	Right	Left	Hard Left	Peds	Hard Right	Bear Right	Hard Left	Peds	Int. Total
07:00 AM	0	1	0	2	1	0	0	0	0	0	0	0	0	0	0	0	4
07:15 AM	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	1	4
07:30 AM	0	1	1	0	2	0	1	0	0	0	0	1	0	0	0	1	7
07:45 AM	0	0	1	3	8	0	0	0	0	0	0	0	0	0	0	5	17
Total	0	2	2	6	12	0	1	0	0	0	0	2	0	0	0	7	32
08:00 AM	0	0	0	2	5	0	0	0	0	0	0	0	0	0	0	2	9
08:15 AM	0	4	0	4	0	0	0	0	0	0	0	2	0	0	0	1	11
08:30 AM	0	0	2	3	0	0	1	0	0	0	0	0	0	0	0	1	7
08:45 AM	0	0	1	0	2	0	0	0	0	2	0	0	0	0	0	0	5
Total	0	4	3	9	7	0	1	0	0	2	0	2	0	0	0	4	32
Grand Total	0	6	5	15	19	0	2	0	0	2	0	4	0	0	0	11	64
Apprch %	0	23.1	19.2	57.7	90.5	0	9.5	0	0	33.3	0	66.7	0	0	0	100	
Total %	0	9.4	7.8	23.4	29.7	0	3.1	0	0	3.1	0	6.2	0	0	0	17.2	

	Massachusetts Ave (Route 2A/4/225) From North					Massachusetts Ave From South					Pleasant Street (Route 4/225) From West					Follen Road From Northwest					
Start Time	Hard Right	Right	Thru	Peds	App. Total	Thru	Bear Left	Left	Peds	App. Total	Right	Left	Hard Left	Peds	App. Total	Hard Right	Bear Right	Hard Left	Peds	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	1	**1**	0	2	2	0	**1**	0	3	0	0	0	1	1	0	0	0	1	1	7
07:45 AM	0	0	1	3	4	**8**	0	0	0	**8**	0	0	0	0	0	0	0	0	**5**	**5**	**17**
08:00 AM	0	0	0	2	2	5	0	0	0	5	0	0	0	0	0	0	0	0	2	2	9
08:15 AM	0	**4**	0	**4**	**8**	0	0	0	0	0	0	0	0	**2**	**2**	0	0	0	1	1	11
Total Volume	0	5	2	9	16	15	0	1	0	16	0	0	0	3	3	0	0	0	9	9	44
% App. Total	0	31.2	12.5	56.2		93.8	0	6.2	0		0	0	0	100		0	0	0	100		
PHF	.000	.313	.500	.563	.500	.469	.000	.250	.000	.500	.000	.000	.000	.375	.375	.000	.000	.000	.450	.450	.647

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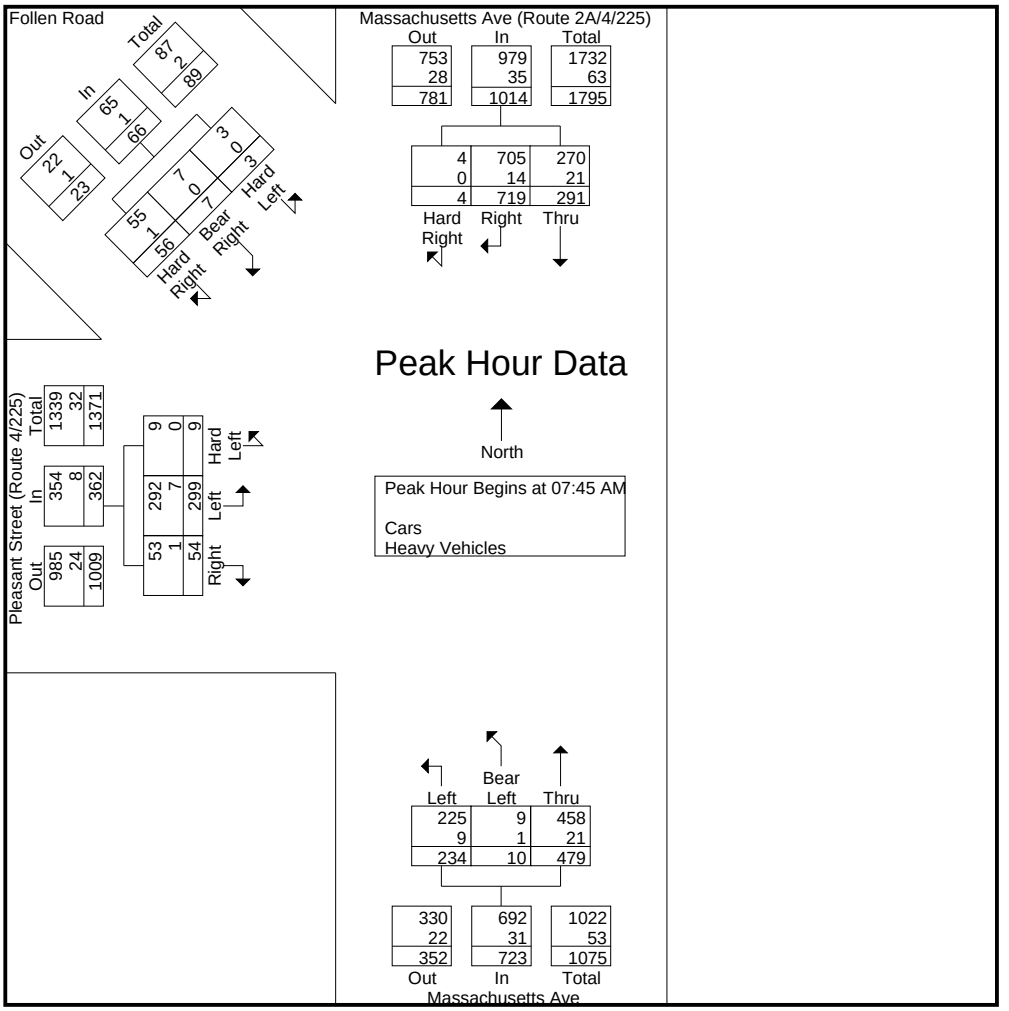
NW/W: Follen Rd/ Pleasant St (Rt 4/225)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 C
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

	Massachusetts Ave (Route 2A/4/225) From North				Massachusetts Ave From South				Pleasant Street (Route 4/225) From West				Follen Road From Northwest				
Start Time	Hard Right	Right	Thru	App. Total	Thru	Bear Left	Left	App. Total	Right	Left	Hard Left	App. Total	Hard Right	Bear Right	Hard Left	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 07:45 AM																	
07:45 AM	**2**	183	64	249	109	**4**	51	164	16	**87**	4	**107**	12	**3**	**2**	17	537
08:00 AM	1	155	75	231	110	2	60	172	12	78	0	90	**20**	0	0	**20**	513
08:15 AM	0	183	73	256	122	2	**67**	191	8	73	0	81	14	2	1	17	545
08:30 AM	1	**198**	**79**	**278**	**138**	2	56	**196**	**18**	61	**5**	84	10	2	0	12	**570**
Total Volume	4	719	291	1014	479	10	234	723	54	299	9	362	56	7	3	66	2165
% App. Total	0.4	70.9	28.7		66.3	1.4	32.4		14.9	82.6	2.5		84.8	10.6	4.5		
PHF	.500	.908	.921	.912	.868	.625	.873	.922	.750	.859	.450	.846	.700	.583	.375	.825	.950
Cars	4	705	270	979	458	9	225	692	53	292	9	354	55	7	3	65	2090
% Cars	100	98.1	92.8	96.5	95.6	90.0	96.2	95.7	98.1	97.7	100	97.8	98.2	100	100	98.5	96.5
Heavy Vehicles	0	14	21	35	21	1	9	31	1	7	0	8	1	0	0	1	75
% Heavy Vehicles	0	1.9	7.2	3.5	4.4	10.0	3.8	4.3	1.9	2.3	0	2.2	1.8	0	0	1.5	3.5



PRECISION
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N/S: Massachusetts Avenue
E/W: Ellen Dana Court/ Driveway
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 D
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Massachusetts Avenue From North			Ellen Dana Court From East			Massachusetts Avenue From South			Driveway From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00 AM	0	5	0	0	0	0	0	6	0	0	0	0	11
07:15 AM	0	4	1	0	0	0	0	7	0	0	0	0	12
07:30 AM	0	5	1	0	0	0	0	11	0	0	0	0	17
07:45 AM	0	6	0	0	0	0	0	6	0	0	0	0	12
Total	0	20	2	0	0	0	0	30	0	0	0	0	52
Grand Total	0	20	2	0	0	0	0	30	0	0	0	0	52
Apprch %	0	90.9	9.1	0	0	0	0	100	0	0	0	0	
Total %	0	38.5	3.8	0	0	0	0	57.7	0	0	0	0	
Cars	0	0	2	0	0	0	0	0	0	0	0	0	2
% Cars	0	0	100	0	0	0	0	0	0	0	0	0	3.8
Heavy Vehicles	0	20	0	0	0	0	0	30	0	0	0	0	50
% Heavy Vehicles	0	100	0	0	0	0	0	100	0	0	0	0	96.2

	Massachusetts Avenue From North				Ellen Dana Court From East				Massachusetts Avenue From South				Driveway From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	5	0	5	0	0	0	0	0	6	0	6	0	0	0	0	11
07:15 AM	0	4	**1**	5	0	0	0	0	0	7	0	7	0	0	0	0	12
07:30 AM	0	5	1	**6**	0	0	0	0	0	**11**	0	**11**	0	0	0	0	**17**
07:45 AM	0	**6**	0	6	0	0	0	0	0	6	0	6	0	0	0	0	12
Total Volume	0	20	2	22	0	0	0	0	0	30	0	30	0	0	0	0	52
% App. Total	0	90.9	9.1		0	0	0		0	100	0		0	0	0		
PHF	.000	.833	.500	.917	.000	.000	.000	.000	.000	.682	.000	.682	.000	.000	.000	.000	.765
Cars	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2
% Cars	0	0	100	9.1	0	0	0	0	0	0	0	0	0	0	0	0	3.8
Heavy Vehicles	0	20	0	20	0	0	0	0	0	30	0	30	0	0	0	0	50
% Heavy Vehicles	0	100	0	90.9	0	0	0	0	0	100	0	100	0	0	0	0	96.2

PRECISION
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N/S: Massachusetts Avenue
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City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 D
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars

	Massachusetts Avenue From North			Ellen Dana Court From East			Massachusetts Avenue From South			Driveway From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	1	0	0	0	0	0	0	0	0	0	1
07:30 AM	0	0	1	0	0	0	0	0	0	0	0	0	1
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	2	0	0	0	0	0	0	0	0	0	2
Grand Total	0	0	2	0	0	0	0	0	0	0	0	0	2
Apprch %	0	0	100	0	0	0	0	0	0	0	0	0	
Total %	0	0	100	0	0	0	0	0	0	0	0	0	

	Massachusetts Avenue From North				Ellen Dana Court From East				Massachusetts Avenue From South				Driveway From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	**1**	**1**	0	0	0	0	0	0	0	0	0	0	0	0	**1**
07:30 AM	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2
% App. Total	0	0	100		0	0	0		0	0	0		0	0	0		
PHF	.000	.000	.500	.500	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.500

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File Name : 112612 D
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Page No : 1

Groups Printed- Heavy Vehicles

	Massachusetts Avenue From North			Ellen Dana Court From East			Massachusetts Avenue From South			Driveway From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00 AM	0	5	0	0	0	0	0	6	0	0	0	0	11
07:15 AM	0	4	0	0	0	0	0	7	0	0	0	0	11
07:30 AM	0	5	0	0	0	0	0	11	0	0	0	0	16
07:45 AM	0	6	0	0	0	0	0	6	0	0	0	0	12
Total	0	20	0	0	0	0	0	30	0	0	0	0	50
Grand Total	0	20	0	0	0	0	0	30	0	0	0	0	50
Apprch %	0	100	0	0	0	0	0	100	0	0	0	0	
Total %	0	40	0	0	0	0	0	60	0	0	0	0	

	Massachusetts Avenue From North				Ellen Dana Court From East				Massachusetts Avenue From South				Driveway From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	5	0	5	0	0	0	0	0	6	0	6	0	0	0	0	11
07:15 AM	0	4	0	4	0	0	0	0	0	7	0	7	0	0	0	0	11
07:30 AM	0	5	0	5	0	0	0	0	0	**11**	0	**11**	0	0	0	0	**16**
07:45 AM	0	**6**	0	**6**	0	0	0	0	0	6	0	6	0	0	0	0	12
Total Volume	0	20	0	20	0	0	0	0	0	30	0	30	0	0	0	0	50
% App. Total	0	100	0		0	0	0		0	100	0		0	0	0		
PHF	.000	.833	.000	.833	.000	.000	.000	.000	.000	.682	.000	.682	.000	.000	.000	.000	.781

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File Name : 112612 D
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Start Date : 9/15/2011
Page No : 1

Groups Printed- Peds and Bicycles

	Massachusetts Avenue From North				Ellen Dana Court From East				Massachusetts Avenue From South					Driveway From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds EB	Peds WB	Right	Thru	Left	Peds	Int. Total
07:00 AM	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2
07:15 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	2
07:30 AM	0	1	0	0	0	0	0	1	0	3	0	0	0	0	0	0	1	6
07:45 AM	0	1	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	9
Total	0	2	0	0	0	0	0	2	0	13	0	0	0	0	0	0	2	19
Grand Total	0	2	0	0	0	0	0	2	0	13	0	0	0	0	0	0	2	19
Apprch %	0	100	0	0	0	0	0	100	0	100	0	0	0	0	0	0	100	
Total %	0	10.5	0	0	0	0	0	10.5	0	68.4	0	0	0	0	0	0	10.5	

	Massachusetts Avenue From North					Ellen Dana Court From East					Massachusetts Avenue From South						Driveway From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds EB	Peds WB	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 07:00 AM																						
07:00 AM	0	0	0	0	0	0	0	0	**1**	**1**	0	1	0	0	0	1	0	0	0	0	0	2
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	**1**	**1**	2
07:30 AM	0	**1**	0	0	**1**	0	0	0	1	1	0	3	0	0	0	3	0	0	0	1	1	6
07:45 AM	0	1	0	0	1	0	0	0	0	0	0	**8**	0	0	0	**8**	0	0	0	0	0	**9**
Total Volume	0	2	0	0	2	0	0	0	2	2	0	13	0	0	0	13	0	0	0	2	2	19
% App. Total	0	100	0	0		0	0	0	100		0	100	0	0	0		0	0	0	100		
PHF	.000	.500	.000	.000	.500	.000	.000	.000	.500	.500	.000	.406	.000	.000	.000	.406	.000	.000	.000	.500	.500	.528

PRECISION
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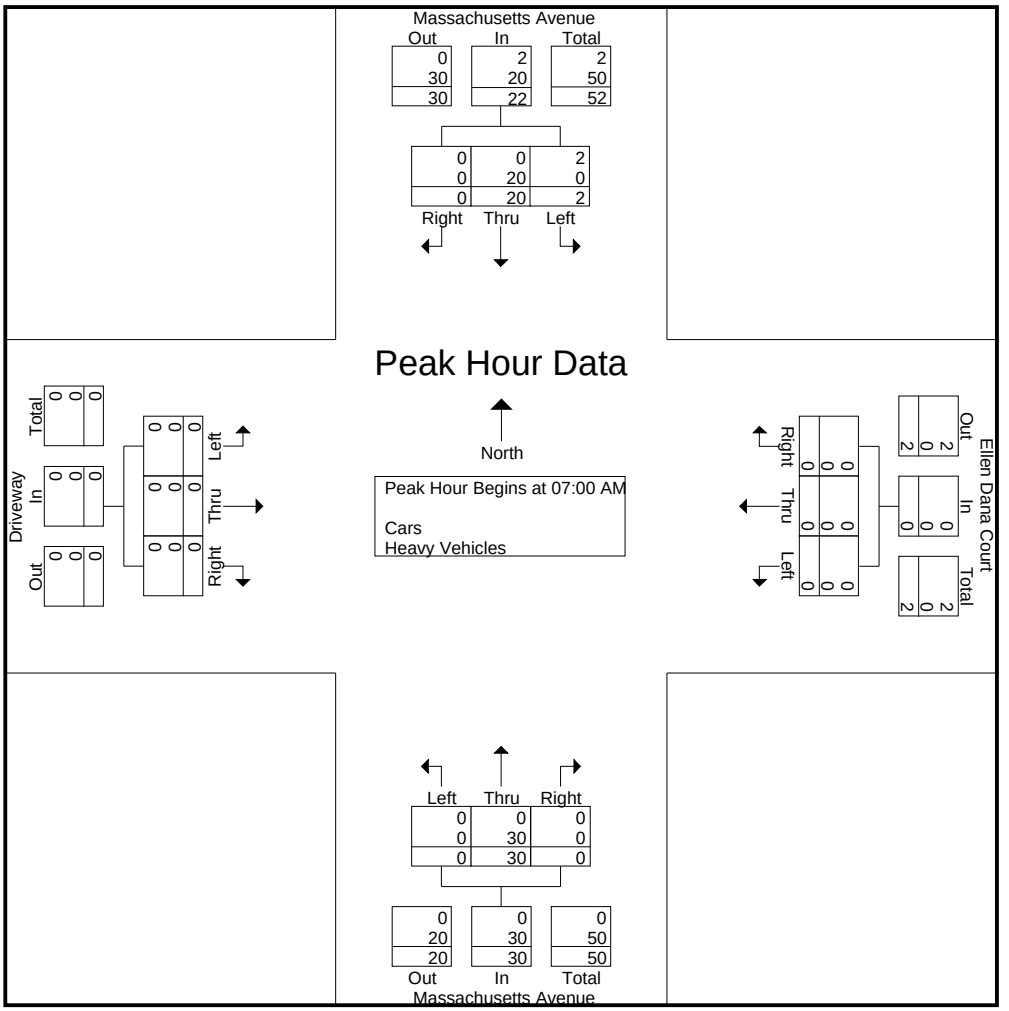
N/S: Massachusetts Avenue
E/W: Ellen Dana Court/ Driveway
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 D
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

	Massachusetts Avenue From North				Ellen Dana Court From East				Massachusetts Avenue From South				Driveway From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	5	0	5	0	0	0	0	0	6	0	6	0	0	0	0	11
07:15 AM	0	4	**1**	5	0	0	0	0	0	7	0	7	0	0	0	0	12
07:30 AM	0	5	1	**6**	0	0	0	0	0	**11**	0	**11**	0	0	0	0	**17**
07:45 AM	0	**6**	0	6	0	0	0	0	0	6	0	6	0	0	0	0	12
Total Volume	0	20	2	22	0	0	0	0	0	30	0	30	0	0	0	0	52
% App. Total	0	90.9	9.1		0	0	0		0	100	0		0	0	0		
PHF	.000	.833	.500	.917	.000	.000	.000	.000	.000	.682	.000	.682	.000	.000	.000	.000	.765
Cars	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2
% Cars	0	0	100	9.1	0	0	0	0	0	0	0	0	0	0	0	0	3.8
Heavy Vehicles	0	20	0	20	0	0	0	0	0	30	0	30	0	0	0	0	50
% Heavy Vehicles	0	100	0	90.9	0	0	0	0	0	100	0	100	0	0	0	0	96.2



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N/S: Massachusetts Avenue
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City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 DD
Site Code : 28280.00
Start Date : 9/16/2011
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Massachusetts Avenue From North			Ellen Dana Court From East			Massachusetts Avenue From South			Driveway From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
04:00 PM	0	137	1	0	0	0	0	135	0	0	0	0	273
04:15 PM	0	145	0	1	0	0	0	155	0	1	0	0	302
04:30 PM	0	121	1	2	0	0	0	146	0	0	0	0	270
04:45 PM	0	130	0	1	0	0	0	121	0	0	0	1	253
Total	0	533	2	4	0	0	0	557	0	1	0	1	1098
Grand Total	0	533	2	4	0	0	0	557	0	1	0	1	1098
Apprch %	0	99.6	0.4	100	0	0	0	100	0	50	0	50	
Total %	0	48.5	0.2	0.4	0	0	0	50.7	0	0.1	0	0.1	
Cars	0	510	2	4	0	0	0	541	0	1	0	1	1059
% Cars	0	95.7	100	100	0	0	0	97.1	0	100	0	100	96.4
Heavy Vehicles	0	23	0	0	0	0	0	16	0	0	0	0	39
% Heavy Vehicles	0	4.3	0	0	0	0	0	2.9	0	0	0	0	3.6

	Massachusetts Avenue From North				Ellen Dana Court From East				Massachusetts Avenue From South				Driveway From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	137	**1**	138	0	0	0	0	0	135	0	135	0	0	0	0	273
04:15 PM	0	**145**	0	**145**	1	0	0	1	0	**155**	0	**155**	**1**	0	0	**1**	**302**
04:30 PM	0	121	1	122	**2**	0	0	**2**	0	146	0	146	0	0	0	0	270
04:45 PM	0	130	0	130	1	0	0	1	0	121	0	121	0	0	**1**	1	253
Total Volume	0	533	2	535	4	0	0	4	0	557	0	557	1	0	1	2	1098
% App. Total	0	99.6	0.4		100	0	0		0	100	0		50	0	50		
PHF	.000	.919	.500	.922	.500	.000	.000	.500	.000	.898	.000	.898	.250	.000	.250	.500	.909
Cars	0	510	2	512	4	0	0	4	0	541	0	541	1	0	1	2	1059
% Cars	0	95.7	100	95.7	100	0	0	100	0	97.1	0	97.1	100	0	100	100	96.4
Heavy Vehicles	0	23	0	23	0	0	0	0	0	16	0	16	0	0	0	0	39
% Heavy Vehicles	0	4.3	0	4.3	0	0	0	0	0	2.9	0	2.9	0	0	0	0	3.6

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City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 DD
Site Code : 28280.00
Start Date : 9/16/2011
Page No : 1

Groups Printed- Cars

	Massachusetts Avenue From North			Ellen Dana Court From East			Massachusetts Avenue From South			Driveway From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
04:00 PM	0	133	1	0	0	0	0	128	0	0	0	0	262
04:15 PM	0	135	0	1	0	0	0	151	0	1	0	0	288
04:30 PM	0	118	1	2	0	0	0	143	0	0	0	0	264
04:45 PM	0	124	0	1	0	0	0	119	0	0	0	1	245
Total	0	510	2	4	0	0	0	541	0	1	0	1	1059
Grand Total	0	510	2	4	0	0	0	541	0	1	0	1	1059
Apprch %	0	99.6	0.4	100	0	0	0	100	0	50	0	50	
Total %	0	48.2	0.2	0.4	0	0	0	51.1	0	0.1	0	0.1	

	Massachusetts Avenue From North				Ellen Dana Court From East				Massachusetts Avenue From South				Driveway From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	133	**1**	134	0	0	0	0	0	128	0	128	0	0	0	0	262
04:15 PM	0	**135**	0	**135**	1	0	0	1	0	**151**	0	**151**	**1**	0	0	**1**	**288**
04:30 PM	0	118	1	119	**2**	0	0	**2**	0	143	0	143	0	0	0	0	264
04:45 PM	0	124	0	124	1	0	0	1	0	119	0	119	0	0	**1**	1	245
Total Volume	0	510	2	512	4	0	0	4	0	541	0	541	1	0	1	2	1059
% App. Total	0	99.6	0.4		100	0	0		0	100	0		50	0	50		
PHF	.000	.944	.500	.948	.500	.000	.000	.500	.000	.896	.000	.896	.250	.000	.250	.500	.919

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City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 DD
Site Code : 28280.00
Start Date : 9/16/2011
Page No : 1

Groups Printed- Heavy Vehicles

	Massachusetts Avenue From North			Ellen Dana Court From East			Massachusetts Avenue From South			Driveway From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
04:00 PM	0	4	0	0	0	0	0	7	0	0	0	0	11
04:15 PM	0	10	0	0	0	0	0	4	0	0	0	0	14
04:30 PM	0	3	0	0	0	0	0	3	0	0	0	0	6
04:45 PM	0	6	0	0	0	0	0	2	0	0	0	0	8
Total	0	23	0	0	0	0	0	16	0	0	0	0	39
Grand Total	0	23	0	0	0	0	0	16	0	0	0	0	39
Apprch %	0	100	0	0	0	0	0	100	0	0	0	0	
Total %	0	59	0	0	0	0	0	41	0	0	0	0	

	Massachusetts Avenue From North				Ellen Dana Court From East				Massachusetts Avenue From South				Driveway From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	4	0	4	0	0	0	0	0	**7**	0	**7**	0	0	0	0	11
04:15 PM	0	**10**	0	**10**	0	0	0	0	0	4	0	4	0	0	0	0	**14**
04:30 PM	0	3	0	3	0	0	0	0	0	3	0	3	0	0	0	0	6
04:45 PM	0	6	0	6	0	0	0	0	0	2	0	2	0	0	0	0	8
Total Volume	0	23	0	23	0	0	0	0	0	16	0	16	0	0	0	0	39
% App. Total	0	100	0		0	0	0		0	100	0		0	0	0		
PHF	.000	.575	.000	.575	.000	.000	.000	.000	.000	.571	.000	.571	.000	.000	.000	.000	.696

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Site Code : 28280.00
Start Date : 9/16/2011
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Groups Printed- Peds and Bicycles

	Massachusetts Avenue From North				Ellen Dana Court From East				Massachusetts Avenue From South					Driveway From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds EB	Peds WB	Right	Thru	Left	Peds	Int. Total
04:00 PM	0	0	0	0	0	0	0	10	0	1	0	4	3	0	1	0	1	20
04:15 PM	0	2	0	0	0	0	0	2	0	0	0	1	2	0	0	0	0	7
04:30 PM	0	0	0	0	0	0	0	4	0	2	0	0	0	0	0	0	3	9
04:45 PM	0	1	0	0	0	0	0	2	0	3	0	0	1	0	0	0	3	10
Total	0	3	0	0	0	0	0	18	0	6	0	5	6	0	1	0	7	46
Grand Total	0	3	0	0	0	0	0	18	0	6	0	5	6	0	1	0	7	46
Apprch %	0	100	0	0	0	0	0	100	0	35.3	0	29.4	35.3	0	12.5	0	87.5	
Total %	0	6.5	0	0	0	0	0	39.1	0	13	0	10.9	13	0	2.2	0	15.2	

	Massachusetts Avenue From North					Ellen Dana Court From East					Massachusetts Avenue From South						Driveway From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds EB	Peds WB	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 04:00 PM																						
04:00 PM	0	0	0	0	0	0	0	0	**10**	**10**	0	1	0	**4**	**3**	**8**	0	**1**	0	1	2	**20**
04:15 PM	0	**2**	0	0	**2**	0	0	0	2	2	0	0	0	1	2	3	0	0	0	0	0	7
04:30 PM	0	0	0	0	0	0	0	0	4	4	0	2	0	0	0	2	0	0	0	**3**	**3**	9
04:45 PM	0	1	0	0	1	0	0	0	2	2	0	**3**	0	0	1	4	0	0	0	3	3	10
Total Volume	0	3	0	0	3	0	0	0	18	18	0	6	0	5	6	17	0	1	0	7	8	46
% App. Total	0	100	0	0		0	0	0	100		0	35.3	0	29.4	35.3		0	12.5	0	87.5		
PHF	.000	.375	.000	.000	.375	.000	.000	.000	.450	.450	.000	.500	.000	.313	.500	.531	.000	.250	.000	.583	.667	.575

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City, State: Lexington, MA
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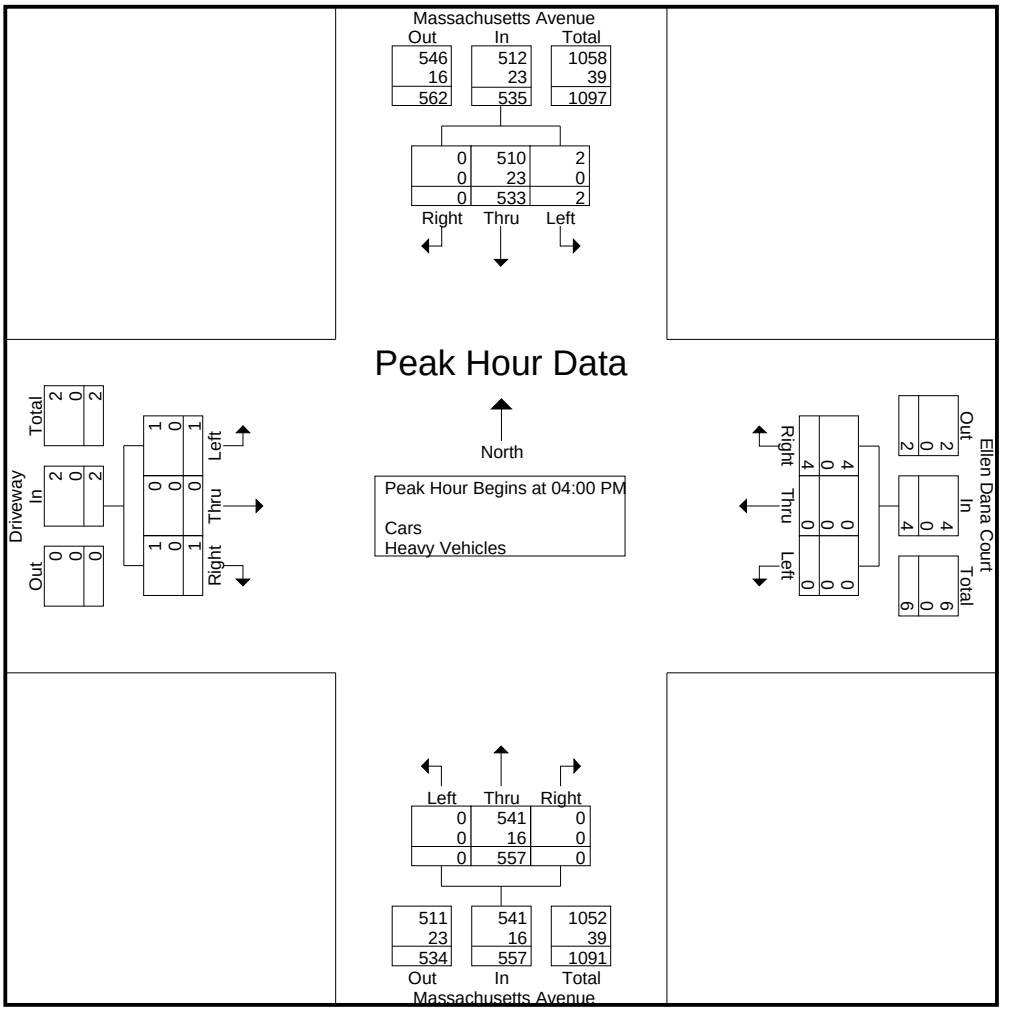
Site Code : 28280.00
Start Date : 9/16/2011
Page No : 1

	Massachusetts Avenue From North				Ellen Dana Court From East				Massachusetts Avenue From South				Driveway From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	137	**1**	138	0	0	0	0	0	135	0	135	0	0	0	0	273
04:15 PM	0	**145**	0	**145**	1	0	0	1	0	**155**	0	**155**	**1**	0	0	**1**	**302**
04:30 PM	0	121	1	122	**2**	0	0	**2**	0	146	0	146	0	0	0	0	270
04:45 PM	0	130	0	130	1	0	0	1	0	121	0	121	0	0	**1**	1	253
Total Volume	0	533	2	535	4	0	0	4	0	557	0	557	1	0	1	2	1098
% App. Total	0	99.6	0.4		100	0	0		0	100	0		50	0	50		
PHF	.000	.919	.500	.922	.500	.000	.000	.500	.000	.898	.000	.898	.250	.000	.250	.500	.909
Cars	0	510	2	512	4	0	0	4	0	541	0	541	1	0	1	2	1059
% Cars	0	95.7	100	95.7	100	0	0	100	0	97.1	0	97.1	100	0	100	100	96.4
Heavy Vehicles	0	23	0	23	0	0	0	0	0	16	0	16	0	0	0	0	39
% Heavy Vehicles	0	4.3	0	4.3	0	0	0	0	0	2.9	0	2.9	0	0	0	0	3.6



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E: Waldorf School Driveways
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 E
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Massachusetts Avenue (Route 4/225) From North		Waldorf School Driveways From East		Massachusetts Avenue (Route 4/225) From South		
Start Time	Thru	Left	Right	Left	Right	Thru	Int. Total
08:00 AM	196	25	26	37	26	156	466
08:15 AM	229	13	10	19	15	177	463
08:30 AM	269	7	8	5	4	189	482
08:45 AM	264	6	11	6	5	166	458
Total	958	51	55	67	50	688	1869
Grand Total	958	51	55	67	50	688	1869
Apprch %	94.9	5.1	45.1	54.9	6.8	93.2	
Total %	51.3	2.7	2.9	3.6	2.7	36.8	
Cars	912	51	55	66	49	655	1788
% Cars	95.2	100	100	98.5	98	95.2	95.7
Heavy Vehicles	46	0	0	1	1	33	81
% Heavy Vehicles	4.8	0	0	1.5	2	4.8	4.3

	Massachusetts Avenue (Route 4/225) From North			Waldorf School Driveways From East			Massachusetts Avenue (Route 4/225) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 08:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:00 AM										
08:00 AM	196	**25**	221	**26**	**37**	**63**	**26**	156	182	466
08:15 AM	229	13	242	10	19	29	15	177	192	463
08:30 AM	**269**	7	**276**	8	5	13	4	**189**	**193**	**482**
08:45 AM	264	6	270	11	6	17	5	166	171	458
Total Volume	958	51	1009	55	67	122	50	688	738	1869
% App. Total	94.9	5.1		45.1	54.9		6.8	93.2		
PHF	.890	.510	.914	.529	.453	.484	.481	.910	.956	.969
Cars	912	51	963	55	66	121	49	655	704	1788
% Cars	95.2	100	95.4	100	98.5	99.2	98.0	95.2	95.4	95.7
Heavy Vehicles	46	0	46	0	1	1	1	33	34	81
% Heavy Vehicles	4.8	0	4.6	0	1.5	0.8	2.0	4.8	4.6	4.3

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E: Waldorf School Driveways
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 E
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars

	Massachusetts Avenue (Route 4/225) From North		Waldorf School Driveways From East		Massachusetts Avenue (Route 4/225) From South		
Start Time	Thru	Left	Right	Left	Right	Thru	Int. Total
08:00 AM	186	25	26	36	26	152	451
08:15 AM	221	13	10	19	14	166	443
08:30 AM	258	7	8	5	4	180	462
08:45 AM	247	6	11	6	5	157	432
Total	912	51	55	66	49	655	1788
Grand Total	912	51	55	66	49	655	1788
Apprch %	94.7	5.3	45.5	54.5	7	93	
Total %	51	2.9	3.1	3.7	2.7	36.6	

	Massachusetts Avenue (Route 4/225) From North			Waldorf School Driveways From East			Massachusetts Avenue (Route 4/225) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 08:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:00 AM										
08:00 AM	186	**25**	211	**26**	**36**	**62**	**26**	152	178	451
08:15 AM	221	13	234	10	19	29	14	166	180	443
08:30 AM	**258**	7	**265**	8	5	13	4	**180**	**184**	**462**
08:45 AM	247	6	253	11	6	17	5	157	162	432
Total Volume	912	51	963	55	66	121	49	655	704	1788
% App. Total	94.7	5.3		45.5	54.5		7	93		
PHF	.884	.510	.908	.529	.458	.488	.471	.910	.957	.968

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E: Waldorf School Driveways
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 E
Site Code : 28280.00
Start Date : 9/15/2011
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Groups Printed- Heavy Vehicles

	Massachusetts Avenue (Route 4/225) From North		Waldorf School Driveways From East		Massachusetts Avenue (Route 4/225) From South		
Start Time	Thru	Left	Right	Left	Right	Thru	Int. Total
08:00 AM	10	0	0	1	0	4	15
08:15 AM	8	0	0	0	1	11	20
08:30 AM	11	0	0	0	0	9	20
08:45 AM	17	0	0	0	0	9	26
Total	46	0	0	1	1	33	81
Grand Total	46	0	0	1	1	33	81
Apprch %	100	0	0	100	2.9	97.1	
Total %	56.8	0	0	1.2	1.2	40.7	

	Massachusetts Avenue (Route 4/225) From North			Waldorf School Driveways From East			Massachusetts Avenue (Route 4/225) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 08:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:00 AM										
08:00 AM	10	0	10	0	**1**	**1**	0	4	4	15
08:15 AM	8	0	8	0	0	0	**1**	**11**	**12**	20
08:30 AM	11	0	11	0	0	0	0	9	9	20
08:45 AM	**17**	0	**17**	0	0	0	0	9	9	**26**
Total Volume	46	0	46	0	1	1	1	33	34	81
% App. Total	100	0		0	100		2.9	97.1		
PHF	.676	.000	.676	.000	.250	.250	.250	.750	.708	.779

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N/S: Massachusetts Avenue (Route 4/225)
E: Waldorf School Driveways
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 E
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Peds and Bicycles

	Massachusetts Avenue (Route 4/225) From North				Waldorf School Driveways From East			Massachusetts Avenue (Route 4/225) From South			
Start Time	Thru	Left	Peds EB	Peds WB	Right	Left	Peds	Right	Thru	Peds	Int. Total
08:00 AM	0	0	15	1	0	0	1	0	5	0	22
08:15 AM	4	0	6	1	0	0	3	0	0	0	14
08:30 AM	2	0	0	3	0	0	6	0	0	0	11
08:45 AM	1	0	2	4	0	0	0	0	4	0	11
Total	7	0	23	9	0	0	10	0	9	0	58
Grand Total	7	0	23	9	0	0	10	0	9	0	58
Apprch %	17.9	0	59	23.1	0	0	100	0	100	0	
Total %	12.1	0	39.7	15.5	0	0	17.2	0	15.5	0	

	Massachusetts Avenue (Route 4/225) From North					Waldorf School Driveways From East				Massachusetts Avenue (Route 4/225) From South				
Start Time	Thru	Left	Peds EB	Peds WB	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 08:00 AM to 08:45 AM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 08:00 AM														
08:00 AM	0	0	**15**	1	**16**	0	0	1	1	0	**5**	0	**5**	**22**
08:15 AM	**4**	0	6	1	11	0	0	3	3	0	0	0	0	14
08:30 AM	2	0	0	3	5	0	0	**6**	**6**	0	0	0	0	11
08:45 AM	1	0	2	**4**	7	0	0	0	0	0	4	0	4	11
Total Volume	7	0	23	9	39	0	0	10	10	0	9	0	9	58
% App. Total	17.9	0	59	23.1		0	0	100		0	100	0		
PHF	.438	.000	.383	.563	.609	.000	.000	.417	.417	.000	.450	.000	.450	.659

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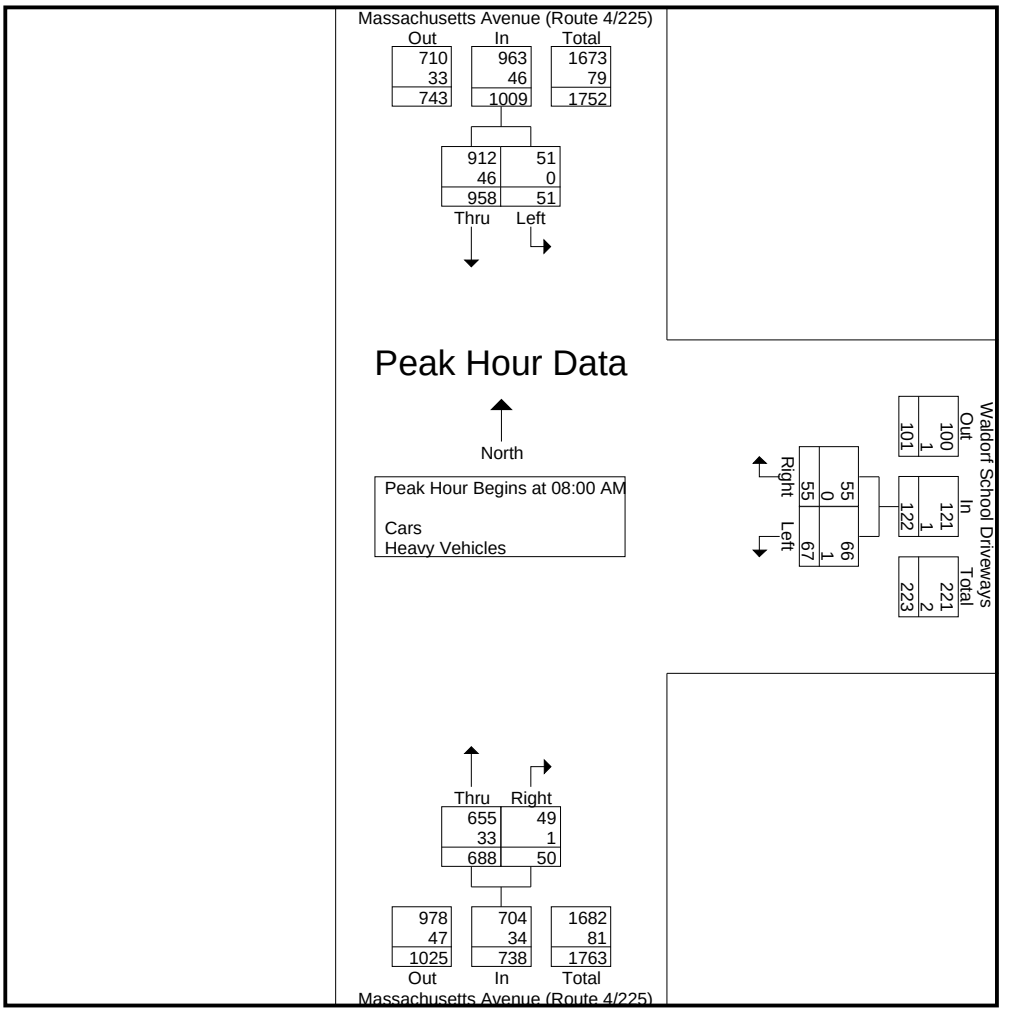
	Massachusetts Avenue (Route 4/225) From North			Waldorf School Driveways From East			Massachusetts Avenue (Route 4/225) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 08:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:00 AM										
08:00 AM	196	**25**	221	**26**	**37**	**63**	**26**	156	182	466
08:15 AM	229	13	242	10	19	29	15	177	192	463
08:30 AM	**269**	7	**276**	8	5	13	4	**189**	**193**	**482**
08:45 AM	264	6	270	11	6	17	5	166	171	458
Total Volume	958	51	1009	55	67	122	50	688	738	1869
% App. Total	94.9	5.1		45.1	54.9		6.8	93.2		
PHF	.890	.510	.914	.529	.453	.484	.481	.910	.956	.969
Cars	912	51	963	55	66	121	49	655	704	1788
% Cars	95.2	100	95.4	100	98.5	99.2	98.0	95.2	95.4	95.7
Heavy Vehicles	46	0	46	0	1	1	1	33	34	81
% Heavy Vehicles	4.8	0	4.6	0	1.5	0.8	2.0	4.8	4.6	4.3



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File Name : 112612 EE
Site Code : 28280.00
Start Date : 9/16/2011
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Massachusetts Avenue (Route 4/225) From North		Waldorf School Driveways From East		Massachusetts Avenue (Route 4/225) From South		
Start Time	Thru	Left	Right	Left	Right	Thru	Int. Total
05:00 PM	224	7	8	5	5	201	450
05:15 PM	201	1	5	5	1	209	422
05:30 PM	241	0	3	1	1	220	466
05:45 PM	185	1	2	1	1	154	344
Total	851	9	18	12	8	784	1682
Grand Total	851	9	18	12	8	784	1682
Apprch %	99	1	60	40	1	99	
Total %	50.6	0.5	1.1	0.7	0.5	46.6	
Cars	837	9	18	12	8	772	1656
% Cars	98.4	100	100	100	100	98.5	98.5
Heavy Vehicles	14	0	0	0	0	12	26
% Heavy Vehicles	1.6	0	0	0	0	1.5	1.5

	Massachusetts Avenue (Route 4/225) From North			Waldorf School Driveways From East			Massachusetts Avenue (Route 4/225) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 05:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:00 PM										
05:00 PM	224	**7**	231	**8**	**5**	**13**	**5**	201	206	450
05:15 PM	201	1	202	5	5	10	1	209	210	422
05:30 PM	**241**	0	**241**	3	1	4	1	**220**	**221**	**466**
05:45 PM	185	1	186	2	1	3	1	154	155	344
Total Volume	851	9	860	18	12	30	8	784	792	1682
% App. Total	99	1		60	40		1	99		
PHF	.883	.321	.892	.563	.600	.577	.400	.891	.896	.902
Cars	837	9	846	18	12	30	8	772	780	1656
% Cars	98.4	100	98.4	100	100	100	100	98.5	98.5	98.5
Heavy Vehicles	14	0	14	0	0	0	0	12	12	26
% Heavy Vehicles	1.6	0	1.6	0	0	0	0	1.5	1.5	1.5

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City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 EE
Site Code : 28280.00
Start Date : 9/16/2011
Page No : 1

Groups Printed- Cars

	Massachusetts Avenue (Route 4/225) From North		Waldorf School Driveways From East		Massachusetts Avenue (Route 4/225) From South		
Start Time	Thru	Left	Right	Left	Right	Thru	Int. Total
05:00 PM	219	7	8	5	5	200	444
05:15 PM	199	1	5	5	1	205	416
05:30 PM	239	0	3	1	1	216	460
05:45 PM	180	1	2	1	1	151	336
Total	837	9	18	12	8	772	1656
Grand Total	837	9	18	12	8	772	1656
Apprch %	98.9	1.1	60	40	1	99	
Total %	50.5	0.5	1.1	0.7	0.5	46.6	

	Massachusetts Avenue (Route 4/225) From North			Waldorf School Driveways From East			Massachusetts Avenue (Route 4/225) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 05:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:00 PM										
05:00 PM	219	**7**	226	**8**	**5**	**13**	**5**	200	205	444
05:15 PM	199	1	200	5	5	10	1	205	206	416
05:30 PM	**239**	0	**239**	3	1	4	1	**216**	**217**	**460**
05:45 PM	180	1	181	2	1	3	1	151	152	336
Total Volume	837	9	846	18	12	30	8	772	780	1656
% App. Total	98.9	1.1		60	40		1	99		
PHF	.876	.321	.885	.563	.600	.577	.400	.894	.899	.900

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City, State: Lexington, MA
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File Name : 112612 EE
Site Code : 28280.00
Start Date : 9/16/2011
Page No : 1

Groups Printed- Heavy Vehicles

	Massachusetts Avenue (Route 4/225) From North		Waldorf School Driveways From East		Massachusetts Avenue (Route 4/225) From South		
Start Time	Thru	Left	Right	Left	Right	Thru	Int. Total
05:00 PM	5	0	0	0	0	1	6
05:15 PM	2	0	0	0	0	4	6
05:30 PM	2	0	0	0	0	4	6
05:45 PM	5	0	0	0	0	3	8
Total	14	0	0	0	0	12	26
Grand Total	14	0	0	0	0	12	26
Apprch %	100	0	0	0	0	100	
Total %	53.8	0	0	0	0	46.2	

	Massachusetts Avenue (Route 4/225) From North			Waldorf School Driveways From East			Massachusetts Avenue (Route 4/225) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 05:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:00 PM										
05:00 PM	**5**	0	**5**	0	0	0	0	1	1	6
05:15 PM	2	0	2	0	0	0	0	**4**	**4**	6
05:30 PM	2	0	2	0	0	0	0	4	4	6
05:45 PM	5	0	5	0	0	0	0	3	3	**8**
Total Volume	14	0	14	0	0	0	0	12	12	26
% App. Total	100	0		0	0		0	100		
PHF	.700	.000	.700	.000	.000	.000	.000	.750	.750	.813

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File Name : 112612 EE
Site Code : 28280.00
Start Date : 9/16/2011
Page No : 1

Groups Printed- Peds and Bicycles

	Massachusetts Avenue (Route 4/225) From North				Waldorf School Driveways From East			Massachusetts Avenue (Route 4/225) From South			
Start Time	Thru	Left	Peds EB	Peds WB	Right	Left	Peds	Right	Thru	Peds	Int. Total
05:00 PM	3	0	0	4	0	0	0	0	2	0	9
05:15 PM	3	0	5	3	0	0	3	0	0	0	14
05:30 PM	3	0	0	0	0	0	3	0	2	0	8
05:45 PM	1	0	2	2	0	0	4	0	2	0	11
Total	10	0	7	9	0	0	10	0	6	0	42
Grand Total	10	0	7	9	0	0	10	0	6	0	42
Apprch %	38.5	0	26.9	34.6	0	0	100	0	100	0	
Total %	23.8	0	16.7	21.4	0	0	23.8	0	14.3	0	

	Massachusetts Avenue (Route 4/225) From North					Waldorf School Driveways From East				Massachusetts Avenue (Route 4/225) From South				
Start Time	Thru	Left	Peds EB	Peds WB	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 05:00 PM to 05:45 PM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 05:00 PM														
05:00 PM	**3**	0	0	**4**	7	0	0	0	0	0	**2**	0	**2**	9
05:15 PM	3	0	**5**	3	**11**	0	0	3	3	0	0	0	0	**14**
05:30 PM	3	0	0	0	3	0	0	3	3	0	2	0	2	8
05:45 PM	1	0	2	2	5	0	0	**4**	**4**	0	2	0	2	11
Total Volume	10	0	7	9	26	0	0	10	10	0	6	0	6	42
% App. Total	38.5	0	26.9	34.6		0	0	100		0	100	0		
PHF	.833	.000	.350	.563	.591	.000	.000	.625	.625	.000	.750	.000	.750	.750

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File Name : 112612 EE
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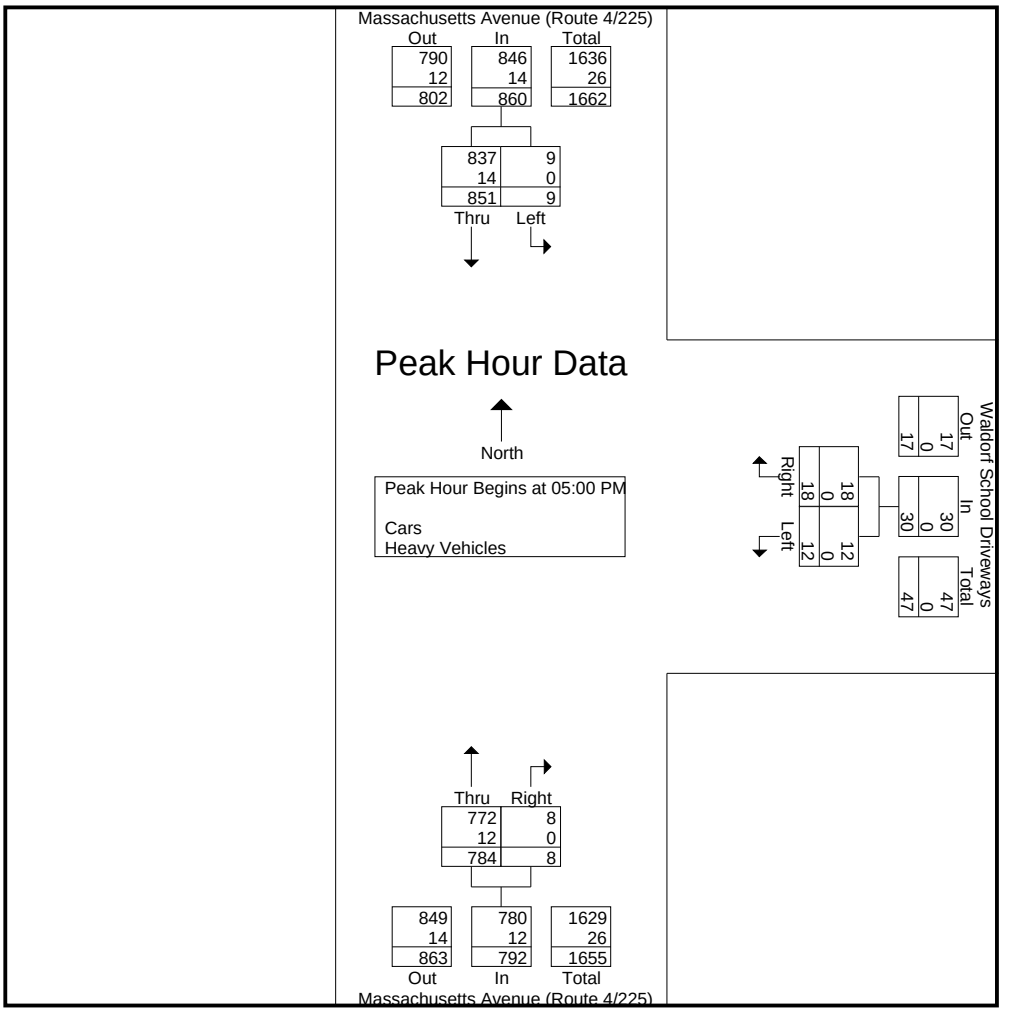
Start Date : 9/16/2011
Page No : 1

	Massachusetts Avenue (Route 4/225) From North			Waldorf School Driveways From East			Massachusetts Avenue (Route 4/225) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 05:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:00 PM										
05:00 PM	224	**7**	231	**8**	**5**	**13**	**5**	201	206	450
05:15 PM	201	1	202	5	5	10	1	209	210	422
05:30 PM	**241**	0	**241**	3	1	4	1	**220**	**221**	**466**
05:45 PM	185	1	186	2	1	3	1	154	155	344
Total Volume	851	9	860	18	12	30	8	784	792	1682
% App. Total	99	1		60	40		1	99		
PHF	.883	.321	.892	.563	.600	.577	.400	.891	.896	.902
Cars	837	9	846	18	12	30	8	772	780	1656
% Cars	98.4	100	98.4	100	100	100	100	98.5	98.5	98.5
Heavy Vehicles	14	0	14	0	0	0	0	12	12	26
% Heavy Vehicles	1.6	0	1.6	0	0	0	0	1.5	1.5	1.5



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N/S: Massachusetts Avenue (Rte 2A/4/225)
@ both Crosswalks between Curve St N & S
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 FF-GG
Site Code : 28280.00
Start Date : 9/16/2011
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Massachusetts Avenue (Route 2A/4/225) From North	Massachusetts Avenue (Route 2A/4/225) From South	
Start Time	Thru	Thru	Int. Total
04:00 PM	209	170	379
04:15 PM	176	228	404
04:30 PM	161	204	365
04:45 PM	205	179	384
Total	751	781	1532
05:00 PM	231	209	440
05:15 PM	219	194	413
05:30 PM	238	226	464
05:45 PM	177	149	326
Total	865	778	1643
Grand Total	1616	1559	3175
Apprch %	100	100	
Total %	50.9	49.1	
Cars	1580	1536	3116
% Cars	97.8	98.5	98.1
Heavy Vehicles	36	23	59
% Heavy Vehicles	2.2	1.5	1.9

	Massachusetts Avenue (Route 2A/4/225) From North		Massachusetts Avenue (Route 2A/4/225) From South		
Start Time	Thru	App. Total	Thru	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	205	205	179	179	384
05:00 PM	231	231	209	209	440
05:15 PM	219	219	194	194	413
05:30 PM	**238**	**238**	**226**	**226**	**464**
Total Volume	893	893	808	808	1701
% App. Total	100		100		
PHF	.938	.938	.894	.894	.916
Cars	874	874	798	798	1672
% Cars	97.9	97.9	98.8	98.8	98.3
Heavy Vehicles	19	19	10	10	29
% Heavy Vehicles	2.1	2.1	1.2	1.2	1.7

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Page No : 1

Groups Printed- Cars

	Massachusetts Avenue (Route 2A/4/225) From North	Massachusetts Avenue (Route 2A/4/225) From South	
Start Time	Thru	Thru	Int. Total
04:00 PM	204	167	371
04:15 PM	171	224	395
04:30 PM	158	201	359
04:45 PM	197	176	373
Total	730	768	1498
05:00 PM	226	208	434
05:15 PM	217	191	408
05:30 PM	234	223	457
05:45 PM	173	146	319
Total	850	768	1618
Grand Total	1580	1536	3116
Apprch %	100	100	
Total %	50.7	49.3	

	Massachusetts Avenue (Route 2A/4/225) From North		Massachusetts Avenue (Route 2A/4/225) From South		
Start Time	Thru	App. Total	Thru	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	197	197	176	176	373
05:00 PM	226	226	208	208	434
05:15 PM	217	217	191	191	408
05:30 PM	**234**	**234**	**223**	**223**	**457**
Total Volume	874	874	798	798	1672
% App. Total	100		100		
PHF	.934	.934	.895	.895	.915

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Start Date : 9/16/2011
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Groups Printed- Heavy Vehicles

	Massachusetts Avenue (Route 2A/4/225) From North	Massachusetts Avenue (Route 2A/4/225) From South	
Start Time	Thru	Thru	Int. Total
04:00 PM	5	3	8
04:15 PM	5	4	9
04:30 PM	3	3	6
04:45 PM	8	3	11
Total	21	13	34
05:00 PM	5	1	6
05:15 PM	2	3	5
05:30 PM	4	3	7
05:45 PM	4	3	7
Total	15	10	25
Grand Total	36	23	59
Apprch %	100	100	
Total %	61	39	

	Massachusetts Avenue (Route 2A/4/225) From North		Massachusetts Avenue (Route 2A/4/225) From South		
Start Time	Thru	App. Total	Thru	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 04:00 PM					
04:00 PM	5	5	3	3	8
04:15 PM	5	5	**4**	**4**	9
04:30 PM	3	3	3	3	6
04:45 PM	**8**	**8**	3	3	**11**
Total Volume	21	21	13	13	34
% App. Total	100		100		
PHF	.656	.656	.813	.813	.773

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Groups Printed- Peds and Bicycles

	Massachusetts Avenue (Route 2A/4/225) From North			Massachusetts Avenue (Route 2A/4/225) From South			
Start Time	Thru	Peds WB	Peds EB	Thru	Peds WB	Peds EB	Int. Total
04:00 PM	0	0	2	1	0	0	3
04:15 PM	0	0	0	0	1	0	1
04:30 PM	0	0	1	2	0	0	3
04:45 PM	1	1	0	3	0	0	5
Total	1	1	3	6	1	0	12
05:00 PM	3	0	0	2	1	0	6
05:15 PM	3	0	0	0	0	0	3
05:30 PM	3	0	0	2	1	0	6
05:45 PM	1	0	1	2	0	0	4
Total	10	0	1	6	2	0	19
Grand Total	11	1	4	12	3	0	31
Apprch %	68.8	6.2	25	80	20	0	
Total %	35.5	3.2	12.9	38.7	9.7	0	

	Massachusetts Avenue (Route 2A/4/225) From North				Massachusetts Avenue (Route 2A/4/225) From South				
Start Time	Thru	Peds WB	Peds EB	App. Total	Thru	Peds WB	Peds EB	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	1	**1**	0	2	**3**	0	0	**3**	5
05:00 PM	**3**	0	0	**3**	2	**1**	0	3	**6**
05:15 PM	3	0	0	3	0	0	0	0	3
05:30 PM	3	0	0	3	2	1	0	3	6
Total Volume	10	1	0	11	7	2	0	9	20
% App. Total	90.9	9.1	0		77.8	22.2	0		
PHF	.833	.250	.000	.917	.583	.500	.000	.750	.833

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N/S: Massachusetts Avenue (Rte 2A/4/225)
@ both Crosswalks between Curve St N & S
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 FF-GG
Site Code : 28280.00
Start Date : 9/16/2011
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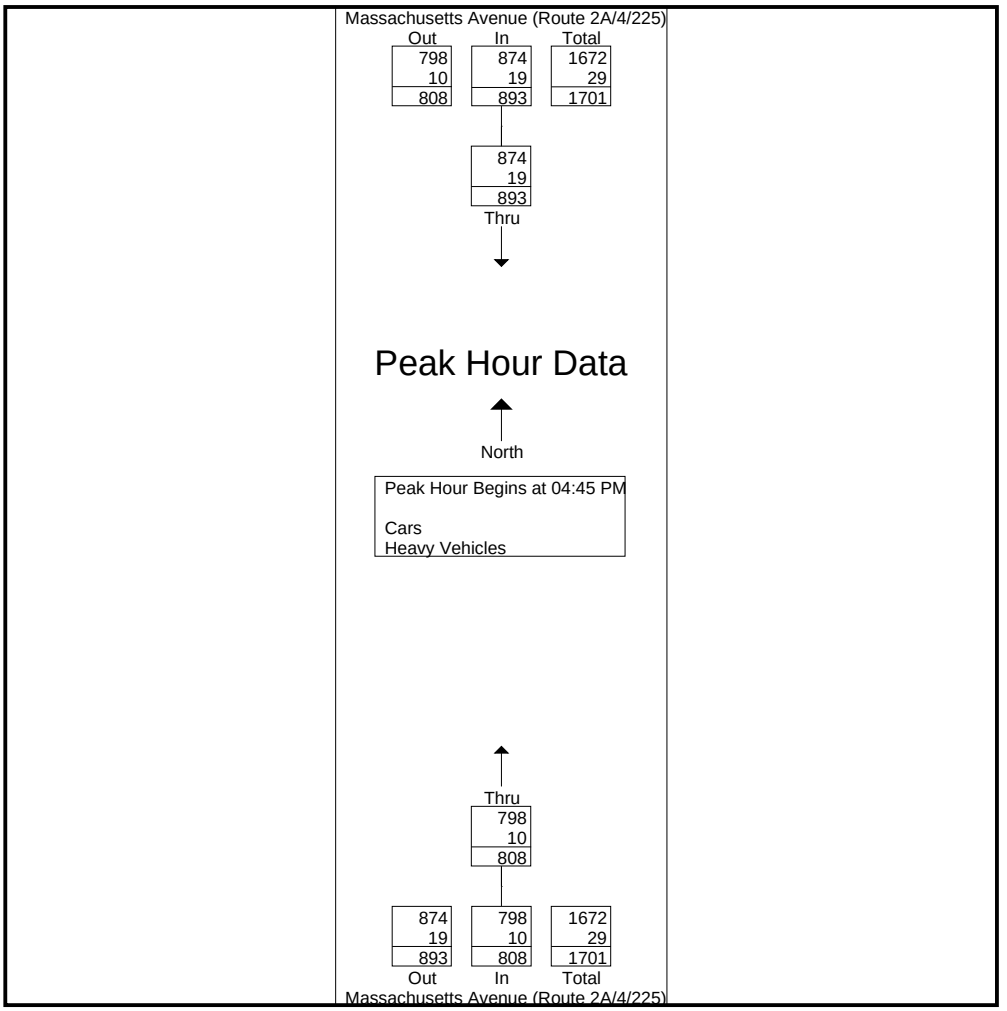
	Massachusetts Avenue (Route 2A/4/225) From North		Massachusetts Avenue (Route 2A/4/225) From South		
Start Time	Thru	App. Total	Thru	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1					
Peak Hour for Entire Intersection Begins at 04:45 PM					
04:45 PM	205	205	179	179	384
05:00 PM	231	231	209	209	440
05:15 PM	219	219	194	194	413
05:30 PM	**238**	**238**	**226**	**226**	**464**
Total Volume	893	893	808	808	1701
% App. Total	100		100		
PHF	.938	.938	.894	.894	.916
Cars	874	874	798	798	1672
% Cars	97.9	97.9	98.8	98.8	98.3
Heavy Vehicles	19	19	10	10	29
% Heavy Vehicles	2.1	2.1	1.2	1.2	1.7



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@ both Crosswalks between Curve St N & S
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File Name : 112612 F-G
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Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Massachusetts Avenue (Route 2A/4/225) From North	Massachusetts Avenue (Route 2A/4/225) From South	
Start Time	Thru	Thru	Int. Total
07:00 AM	219	114	333
07:15 AM	242	155	397
07:30 AM	287	185	472
07:45 AM	258	196	454
Total	1006	650	1656
08:00 AM	219	192	411
08:15 AM	250	194	444
08:30 AM	286	201	487
08:45 AM	274	173	447
Total	1029	760	1789
Grand Total	2035	1410	3445
Apprch %	100	100	
Total %	59.1	40.9	
Cars	1963	1350	3313
% Cars	96.5	95.7	96.2
Heavy Vehicles	72	60	132
% Heavy Vehicles	3.5	4.3	3.8

	Massachusetts Avenue (Route 2A/4/225) From North		Massachusetts Avenue (Route 2A/4/225) From South		
Start Time	Thru	App. Total	Thru	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 07:45 AM

07:45 AM	258	258	196	196	454
08:00 AM	219	219	192	192	411
08:15 AM	250	250	194	194	444
08:30 AM	**286**	**286**	**201**	**201**	**487**
Total Volume	1013	1013	783	783	1796
% App. Total	100		100		
PHF	.885	.885	.974	.974	.922
Cars	984	984	755	755	1739
% Cars	97.1	97.1	96.4	96.4	96.8
Heavy Vehicles	29	29	28	28	57
% Heavy Vehicles	2.9	2.9	3.6	3.6	3.2

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@ both Crosswalks between Curve St N & S
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 F-G
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars

	Massachusetts Avenue (Route 2A/4/225) From North	Massachusetts Avenue (Route 2A/4/225) From South	
Start Time	Thru	Thru	Int. Total
07:00 AM	212	109	321
07:15 AM	232	144	376
07:30 AM	276	176	452
07:45 AM	256	191	447
Total	976	620	1596
08:00 AM	208	186	394
08:15 AM	243	186	429
08:30 AM	277	192	469
08:45 AM	259	166	425
Total	987	730	1717
Grand Total	1963	1350	3313
Apprch %	100	100	
Total %	59.3	40.7	

	Massachusetts Avenue (Route 2A/4/225) From North		Massachusetts Avenue (Route 2A/4/225) From South		
Start Time	Thru	App. Total	Thru	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 07:45 AM					
07:45 AM	256	256	191	191	447
08:00 AM	208	208	186	186	394
08:15 AM	243	243	186	186	429
08:30 AM	**277**	**277**	**192**	**192**	**469**
Total Volume	984	984	755	755	1739
% App. Total	100		100		
PHF	.888	.888	.983	.983	.927

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File Name : 112612 F-G
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Start Date : 9/15/2011
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Groups Printed- Heavy Vehicles

	Massachusetts Avenue (Route 2A/4/225) From North	Massachusetts Avenue (Route 2A/4/225) From South	
Start Time	Thru	Thru	Int. Total
07:00 AM	7	5	12
07:15 AM	10	11	21
07:30 AM	11	9	20
07:45 AM	2	5	7
Total	30	30	60
08:00 AM	11	6	17
08:15 AM	7	8	15
08:30 AM	9	9	18
08:45 AM	15	7	22
Total	42	30	72
Grand Total	72	60	132
Apprch %	100	100	
Total %	54.5	45.5	

	Massachusetts Avenue (Route 2A/4/225) From North		Massachusetts Avenue (Route 2A/4/225) From South		
Start Time	Thru	App. Total	Thru	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 08:00 AM					
08:00 AM	11	11	6	6	17
08:15 AM	7	7	8	8	15
08:30 AM	9	9	**9**	**9**	18
08:45 AM	**15**	**15**	7	7	**22**
Total Volume	42	42	30	30	72
% App. Total	100		100		
PHF	.700	.700	.833	.833	.818

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File Name : 112612 F-G
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Peds and Bicycles

	Massachusetts Avenue (Route 2A/4/225) From North			Massachusetts Avenue (Route 2A/4/225) From South			
Start Time	Thru	Peds WB	Peds EB	Thru	Peds WB	Peds EB	Int. Total
07:00 AM	1	0	0	2	0	0	3
07:15 AM	1	1	0	1	2	1	6
07:30 AM	1	1	1	2	0	0	5
07:45 AM	1	0	1	0	1	0	3
Total	4	2	2	5	3	1	17
08:00 AM	0	0	0	8	0	2	10
08:15 AM	1	0	0	3	1	1	6
08:30 AM	1	1	1	1	0	2	6
08:45 AM	1	1	0	3	1	1	7
Total	3	2	1	15	2	6	29
Grand Total	7	4	3	20	5	7	46
Apprch %	50	28.6	21.4	62.5	15.6	21.9	
Total %	15.2	8.7	6.5	43.5	10.9	15.2	

	Massachusetts Avenue (Route 2A/4/225) From North				Massachusetts Avenue (Route 2A/4/225) From South				
Start Time	Thru	Peds WB	Peds EB	App. Total	Thru	Peds WB	Peds EB	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 08:00 AM									
08:00 AM	0	0	0	0	**8**	0	**2**	**10**	**10**
08:15 AM	**1**	0	0	1	3	**1**	1	5	6
08:30 AM	1	**1**	**1**	**3**	1	0	2	3	6
08:45 AM	1	1	0	2	3	1	1	5	7
Total Volume	3	2	1	6	15	2	6	23	29
% App. Total	50	33.3	16.7		65.2	8.7	26.1		
PHF	.750	.500	.250	.500	.469	.500	.750	.575	.725

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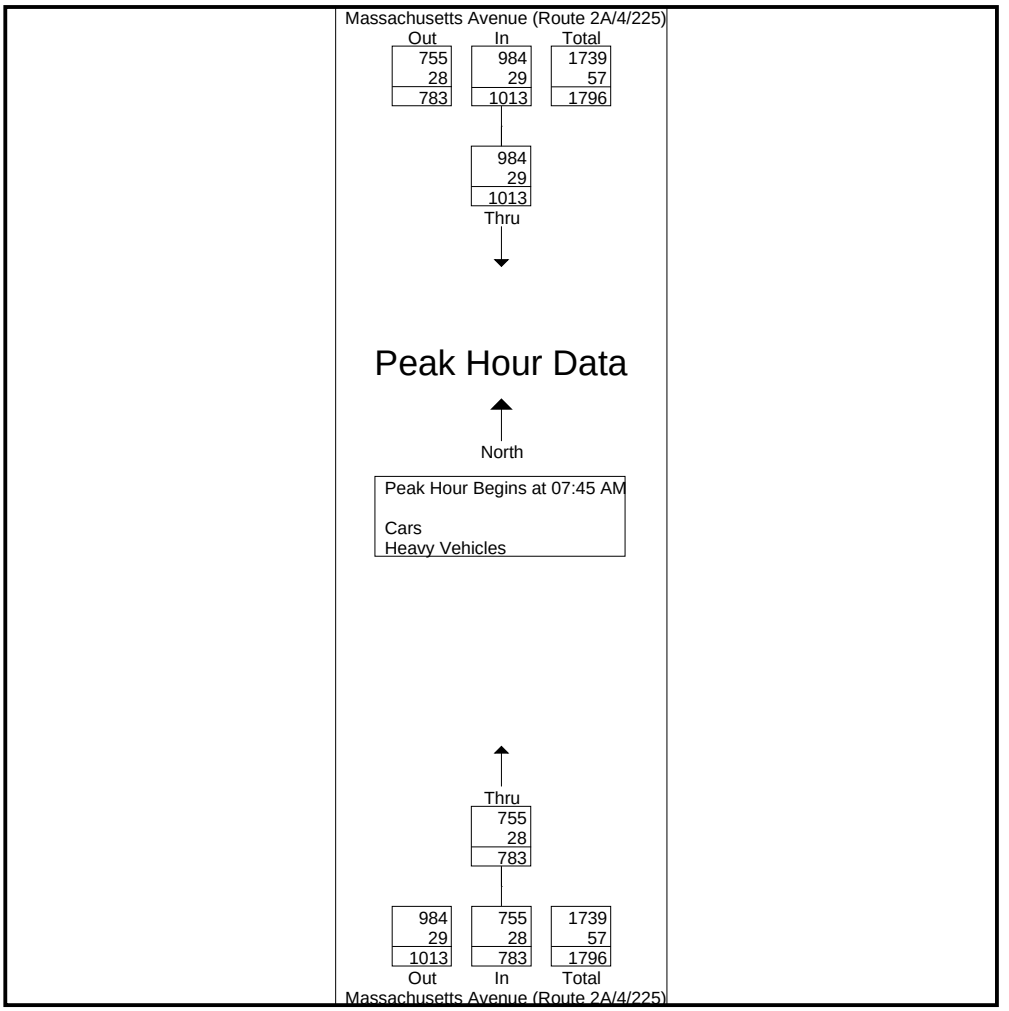
File Name : 112612 F-G
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

	Massachusetts Avenue (Route 2A/4/225) From North		Massachusetts Avenue (Route 2A/4/225) From South		
Start Time	Thru	App. Total	Thru	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 07:45 AM					
07:45 AM	258	258	196	196	454
08:00 AM	219	219	192	192	411
08:15 AM	250	250	194	194	444
08:30 AM	**286**	**286**	**201**	**201**	**487**
Total Volume	1013	1013	783	783	1796
% App. Total	100		100		
PHF	.885	.885	.974	.974	.922
Cars	984	984	755	755	1739
% Cars	97.1	97.1	96.4	96.4	96.8
Heavy Vehicles	29	29	28	28	57
% Heavy Vehicles	2.9	2.9	3.6	3.6	3.2



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N/S: Massachusetts Ave (Route 2A/4/225)
W: Locust Avenue w/Crosswalk
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 H
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Massachusetts Ave (Route 2A/4/225) From North		Massachusetts Ave (Route 2A/4/225) From South		Locut Avenue From West		
Start Time	Right	Thru	Thru	Left	Right	Left	Int. Total
07:00 AM	1	206	114	2	1	3	327
07:15 AM	2	239	157	1	3	3	405
07:30 AM	5	275	191	1	4	3	479
07:45 AM	7	270	161	1	3	0	442
Total	15	990	623	5	11	9	1653
Grand Total	15	990	623	5	11	9	1653
Apprch %	1.5	98.5	99.2	0.8	55	45	
Total %	0.9	59.9	37.7	0.3	0.7	0.5	
Cars	14	964	605	4	10	9	1606
% Cars	93.3	97.4	97.1	80	90.9	100	97.2
Heavy Vehicles	1	26	18	1	1	0	47
% Heavy Vehicles	6.7	2.6	2.9	20	9.1	0	2.8

	Massachusetts Ave (Route 2A/4/225) From North			Massachusetts Ave (Route 2A/4/225) From South			Locut Avenue From West			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	1	206	207	114	**2**	116	1	**3**	4	327
07:15 AM	2	239	241	157	1	158	3	3	6	405
07:30 AM	5	**275**	**280**	**191**	1	**192**	**4**	3	**7**	**479**
07:45 AM	**7**	270	277	161	1	162	3	0	3	442
Total Volume	15	990	1005	623	5	628	11	9	20	1653
% App. Total	1.5	98.5		99.2	0.8		55	45		
PHF	.536	.900	.897	.815	.625	.818	.688	.750	.714	.863
Cars	14	964	978	605	4	609	10	9	19	1606
% Cars	93.3	97.4	97.3	97.1	80.0	97.0	90.9	100	95.0	97.2
Heavy Vehicles	1	26	27	18	1	19	1	0	1	47
% Heavy Vehicles	6.7	2.6	2.7	2.9	20.0	3.0	9.1	0	5.0	2.8

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N/S: Massachusetts Ave (Route 2A/4/225)
W: Locust Avenue w/Crosswalk
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 H
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars

	Massachusetts Ave (Route 2A/4/225) From North		Massachusetts Ave (Route 2A/4/225) From South		Locut Avenue From West		
Start Time	Right	Thru	Thru	Left	Right	Left	Int. Total
07:00 AM	1	201	110	2	1	3	318
07:15 AM	1	232	151	0	2	3	389
07:30 AM	5	265	183	1	4	3	461
07:45 AM	7	266	161	1	3	0	438
Total	14	964	605	4	10	9	1606
Grand Total	14	964	605	4	10	9	1606
Apprch %	1.4	98.6	99.3	0.7	52.6	47.4	
Total %	0.9	60	37.7	0.2	0.6	0.6	

	Massachusetts Ave (Route 2A/4/225) From North			Massachusetts Ave (Route 2A/4/225) From South			Locut Avenue From West			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	1	201	202	110	**2**	112	1	**3**	4	318
07:15 AM	1	232	233	151	0	151	2	3	5	389
07:30 AM	5	265	270	**183**	1	**184**	**4**	3	**7**	**461**
07:45 AM	**7**	**266**	**273**	161	1	162	3	0	3	438
Total Volume	14	964	978	605	4	609	10	9	19	1606
% App. Total	1.4	98.6		99.3	0.7		52.6	47.4		
PHF	.500	.906	.896	.827	.500	.827	.625	.750	.679	.871

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Groups Printed- Heavy Vehicles

	Massachusetts Ave (Route 2A/4/225) From North		Massachusetts Ave (Route 2A/4/225) From South		Locut Avenue From West		
Start Time	Right	Thru	Thru	Left	Right	Left	Int. Total
07:00 AM	0	5	4	0	0	0	9
07:15 AM	1	7	6	1	1	0	16
07:30 AM	0	10	8	0	0	0	18
07:45 AM	0	4	0	0	0	0	4
Total	1	26	18	1	1	0	47
Grand Total	1	26	18	1	1	0	47
Apprch %	3.7	96.3	94.7	5.3	100	0	
Total %	2.1	55.3	38.3	2.1	2.1	0	

	Massachusetts Ave (Route 2A/4/225) From North			Massachusetts Ave (Route 2A/4/225) From South			Locut Avenue From West			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	0	5	5	4	0	4	0	0	0	9
07:15 AM	**1**	7	8	6	**1**	7	**1**	0	**1**	16
07:30 AM	0	**10**	**10**	**8**	0	**8**	0	0	0	**18**
07:45 AM	0	4	4	0	0	0	0	0	0	4
Total Volume	1	26	27	18	1	19	1	0	1	47
% App. Total	3.7	96.3		94.7	5.3		100	0		
PHF	.250	.650	.675	.563	.250	.594	.250	.000	.250	.653

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Groups Printed- Peds and Bicycles

	Massachusetts Ave (Route 2A/4/225) From North			Massachusetts Ave (Route 2A/4/225) From South				Locut Avenue From West			
Start Time	Right	Thru	Peds	Thru	Left	Peds WB	Peds EB	Right	Left	Peds	Int. Total
07:00 AM	0	0	0	2	0	0	1	0	0	0	3
07:15 AM	0	1	0	1	0	1	1	0	0	1	5
07:30 AM	0	2	1	6	0	2	0	0	0	1	12
07:45 AM	0	1	1	1	0	0	0	0	0	1	4
Total	0	4	2	10	0	3	2	0	0	3	24
Grand Total	0	4	2	10	0	3	2	0	0	3	24
Apprch %	0	66.7	33.3	66.7	0	20	13.3	0	0	100	
Total %	0	16.7	8.3	41.7	0	12.5	8.3	0	0	12.5	

	Massachusetts Ave (Route 2A/4/225) From North				Massachusetts Ave (Route 2A/4/225) From South					Locut Avenue From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds WB	Peds EB	App. Total	Right	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 07:00 AM														
07:00 AM	0	0	0	0	2	0	0	**1**	3	0	0	0	0	3
07:15 AM	0	1	0	1	1	0	1	1	3	0	0	**1**	**1**	5
07:30 AM	0	**2**	**1**	**3**	**6**	0	**2**	0	**8**	0	0	1	1	**12**
07:45 AM	0	1	1	2	1	0	0	0	1	0	0	1	1	4
Total Volume	0	4	2	6	10	0	3	2	15	0	0	3	3	24
% App. Total	0	66.7	33.3		66.7	0	20	13.3		0	0	100		
PHF	.000	.500	.500	.500	.417	.000	.375	.500	.469	.000	.000	.750	.750	.500

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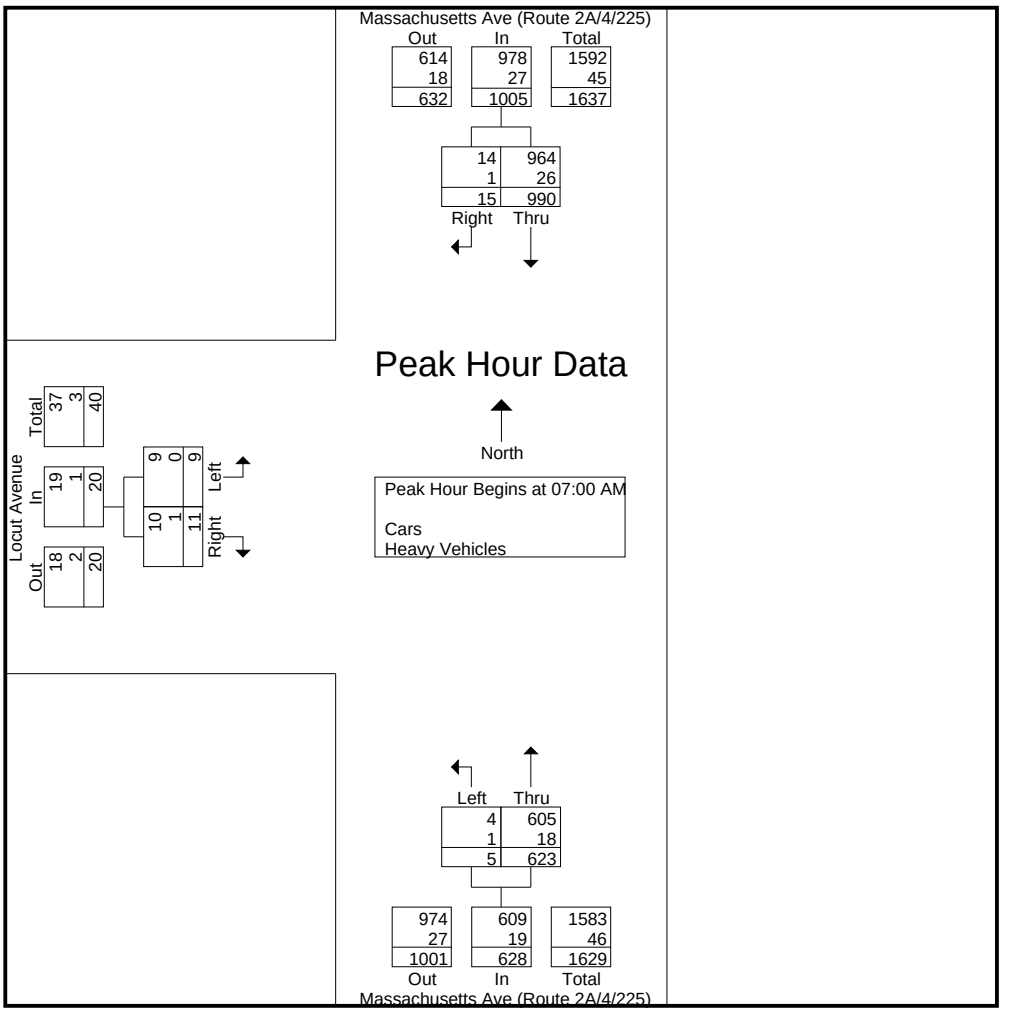
	Massachusetts Ave (Route 2A/4/225) From North			Massachusetts Ave (Route 2A/4/225) From South			Locut Avenue From West			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	1	206	207	114	**2**	116	1	**3**	4	327
07:15 AM	2	239	241	157	1	158	3	3	6	405
07:30 AM	5	**275**	**280**	**191**	1	**192**	**4**	3	**7**	**479**
07:45 AM	**7**	270	277	161	1	162	3	0	3	442
Total Volume	15	990	1005	623	5	628	11	9	20	1653
% App. Total	1.5	98.5		99.2	0.8		55	45		
PHF	.536	.900	.897	.815	.625	.818	.688	.750	.714	.863
Cars	14	964	978	605	4	609	10	9	19	1606
% Cars	93.3	97.4	97.3	97.1	80.0	97.0	90.9	100	95.0	97.2
Heavy Vehicles	1	26	27	18	1	19	1	0	1	47
% Heavy Vehicles	6.7	2.6	2.7	2.9	20.0	3.0	9.1	0	5.0	2.8



PRECISION DATA INDUSTRIES, LLC
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N/S: Massachusetts Ave (Route 2A/4/225)
W: Locust Avenue w/Crosswalk
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 HH
Site Code : 28280.00
Start Date : 9/16/2011
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Massachusetts Ave (Route 2A/4/225) From North		Massachusetts Ave (Route 2A/4/225) From South		Locut Avenue From West		
Start Time	Right	Thru	Thru	Left	Right	Left	Int. Total
04:00 PM	2	204	177	0	2	10	395
04:15 PM	5	179	230	3	2	11	430
04:30 PM	5	170	222	0	2	11	410
04:45 PM	6	180	158	0	1	9	354
Total	18	733	787	3	7	41	1589
Grand Total	18	733	787	3	7	41	1589
Apprch %	2.4	97.6	99.6	0.4	14.6	85.4	
Total %	1.1	46.1	49.5	0.2	0.4	2.6	
Cars	18	713	776	2	7	40	1556
% Cars	100	97.3	98.6	66.7	100	97.6	97.9
Heavy Vehicles	0	20	11	1	0	1	33
% Heavy Vehicles	0	2.7	1.4	33.3	0	2.4	2.1

	Massachusetts Ave (Route 2A/4/225) From North			Massachusetts Ave (Route 2A/4/225) From South			Locut Avenue From West			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:00 PM										
04:00 PM	2	**204**	**206**	177	0	177	**2**	10	12	395
04:15 PM	5	179	184	**230**	**3**	**233**	2	**11**	**13**	**430**
04:30 PM	5	170	175	222	0	222	2	11	13	410
04:45 PM	**6**	180	186	158	0	158	1	9	10	354
Total Volume	18	733	751	787	3	790	7	41	48	1589
% App. Total	2.4	97.6		99.6	0.4		14.6	85.4		
PHF	.750	.898	.911	.855	.250	.848	.875	.932	.923	.924
Cars	18	713	731	776	2	778	7	40	47	1556
% Cars	100	97.3	97.3	98.6	66.7	98.5	100	97.6	97.9	97.9
Heavy Vehicles	0	20	20	11	1	12	0	1	1	33
% Heavy Vehicles	0	2.7	2.7	1.4	33.3	1.5	0	2.4	2.1	2.1

PRECISION
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Client: BSC Group/ J. Lunsford

File Name : 112612 HH
Site Code : 28280.00
Start Date : 9/16/2011
Page No : 1

Groups Printed- Cars

	Massachusetts Ave (Route 2A/4/225) From North		Massachusetts Ave (Route 2A/4/225) From South		Locut Avenue From West		
Start Time	Right	Thru	Thru	Left	Right	Left	Int. Total
04:00 PM	2	199	174	0	2	9	386
04:15 PM	5	173	227	2	2	11	420
04:30 PM	5	167	220	0	2	11	405
04:45 PM	6	174	155	0	1	9	345
Total	18	713	776	2	7	40	1556
Grand Total	18	713	776	2	7	40	1556
Apprch %	2.5	97.5	99.7	0.3	14.9	85.1	
Total %	1.2	45.8	49.9	0.1	0.4	2.6	

	Massachusetts Ave (Route 2A/4/225) From North			Massachusetts Ave (Route 2A/4/225) From South			Locut Avenue From West			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:00 PM										
04:00 PM	2	**199**	**201**	174	0	174	**2**	9	11	386
04:15 PM	5	173	178	**227**	**2**	**229**	2	**11**	**13**	**420**
04:30 PM	5	167	172	220	0	220	2	11	13	405
04:45 PM	**6**	174	180	155	0	155	1	9	10	345
Total Volume	18	713	731	776	2	778	7	40	47	1556
% App. Total	2.5	97.5		99.7	0.3		14.9	85.1		
PHF	.750	.896	.909	.855	.250	.849	.875	.909	.904	.926

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File Name : 112612 HH
Site Code : 28280.00
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Groups Printed- Heavy Vehicles

	Massachusetts Ave (Route 2A/4/225) From North		Massachusetts Ave (Route 2A/4/225) From South		Locut Avenue From West		
Start Time	Right	Thru	Thru	Left	Right	Left	Int. Total
04:00 PM	0	5	3	0	0	1	9
04:15 PM	0	6	3	1	0	0	10
04:30 PM	0	3	2	0	0	0	5
04:45 PM	0	6	3	0	0	0	9
Total	0	20	11	1	0	1	33
Grand Total	0	20	11	1	0	1	33
Apprch %	0	100	91.7	8.3	0	100	
Total %	0	60.6	33.3	3	0	3	

	Massachusetts Ave (Route 2A/4/225) From North			Massachusetts Ave (Route 2A/4/225) From South			Locut Avenue From West			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:00 PM										
04:00 PM	0	5	5	**3**	0	3	0	**1**	**1**	9
04:15 PM	0	**6**	**6**	3	**1**	**4**	0	0	0	**10**
04:30 PM	0	3	3	2	0	2	0	0	0	5
04:45 PM	0	6	6	3	0	3	0	0	0	9
Total Volume	0	20	20	11	1	12	0	1	1	33
% App. Total	0	100		91.7	8.3		0	100		
PHF	.000	.833	.833	.917	.250	.750	.000	.250	.250	.825

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File Name : 112612 HH
Site Code : 28280.00
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Page No : 1

Groups Printed- Peds and Bicycles

	Massachusetts Ave (Route 2A/4/225) From North			Massachusetts Ave (Route 2A/4/225) From South				Locut Avenue From West			
Start Time	Right	Thru	Peds	Thru	Left	Peds WB	Peds EB	Right	Left	Peds	Int. Total
04:00 PM	0	0	0	1	0	2	0	2	9	4	18
04:15 PM	0	1	0	0	0	0	0	2	11	1	15
04:30 PM	0	1	0	2	0	0	1	2	11	3	20
04:45 PM	0	1	0	2	0	0	0	1	9	0	13
Total	0	3	0	5	0	2	1	7	40	8	66
Grand Total	0	3	0	5	0	2	1	7	40	8	66
Apprch %	0	100	0	62.5	0	25	12.5	12.7	72.7	14.5	
Total %	0	4.5	0	7.6	0	3	1.5	10.6	60.6	12.1	

	Massachusetts Ave (Route 2A/4/225) From North				Massachusetts Ave (Route 2A/4/225) From South					Locut Avenue From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds WB	Peds EB	App. Total	Right	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 04:00 PM														
04:00 PM	0	0	0	0	1	0	**2**	0	**3**	**2**	9	**4**	15	18
04:15 PM	0	**1**	0	**1**	0	0	0	0	0	2	**11**	1	14	15
04:30 PM	0	1	0	1	**2**	0	0	**1**	3	2	11	3	**16**	**20**
04:45 PM	0	1	0	1	2	0	0	0	2	1	9	0	10	13
Total Volume	0	3	0	3	5	0	2	1	8	7	40	8	55	66
% App. Total	0	100	0		62.5	0	25	12.5		12.7	72.7	14.5		
PHF	.000	.750	.000	.750	.625	.000	.250	.250	.667	.875	.909	.500	.859	.825

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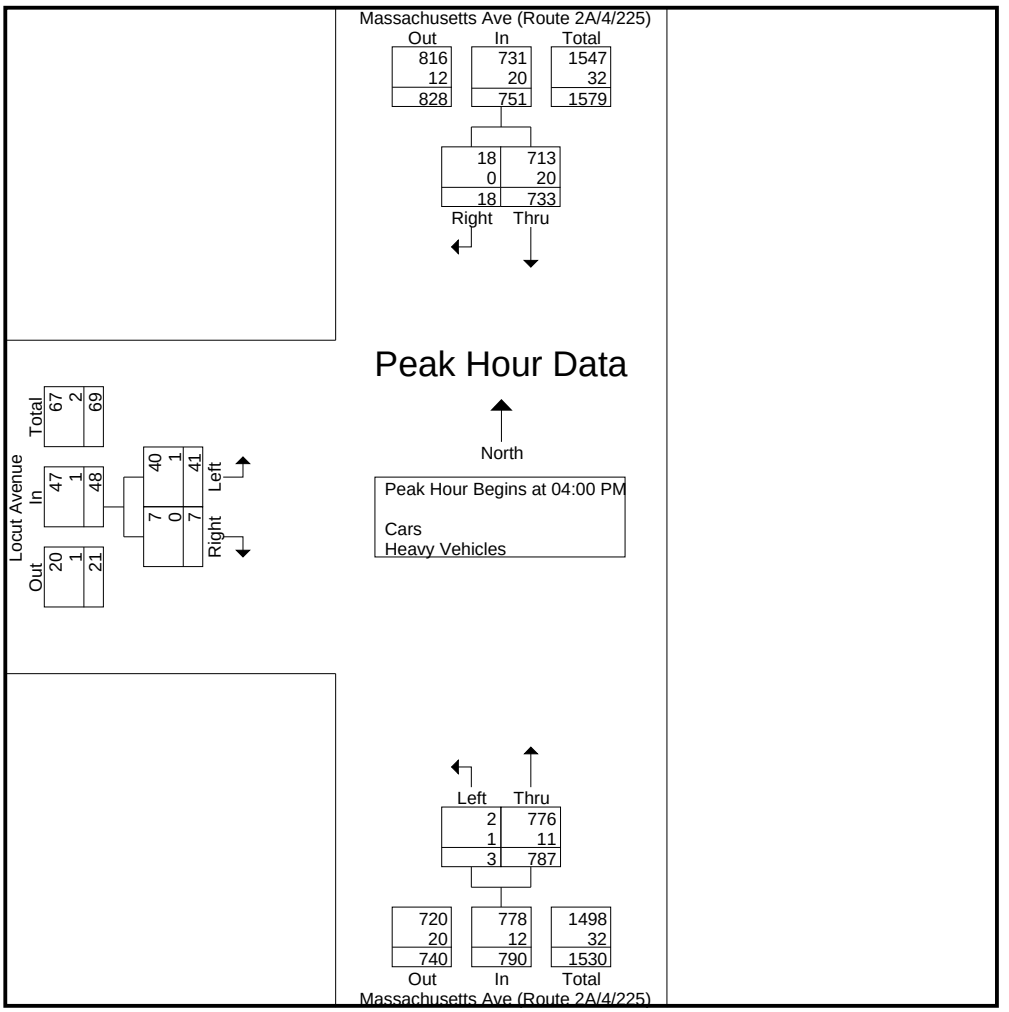
	Massachusetts Ave (Route 2A/4/225) From North			Massachusetts Ave (Route 2A/4/225) From South			Locut Avenue From West			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:00 PM										
04:00 PM	2	**204**	**206**	177	0	177	**2**	10	12	395
04:15 PM	5	179	184	**230**	**3**	**233**	2	**11**	**13**	**430**
04:30 PM	5	170	175	222	0	222	2	11	13	410
04:45 PM	**6**	180	186	158	0	158	1	9	10	354
Total Volume	18	733	751	787	3	790	7	41	48	1589
% App. Total	2.4	97.6		99.6	0.4		14.6	85.4		
PHF	.750	.898	.911	.855	.250	.848	.875	.932	.923	.924
Cars	18	713	731	776	2	778	7	40	47	1556
% Cars	100	97.3	97.3	98.6	66.7	98.5	100	97.6	97.9	97.9
Heavy Vehicles	0	20	20	11	1	12	0	1	1	33
% Heavy Vehicles	0	2.7	2.7	1.4	33.3	1.5	0	2.4	2.1	2.1



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File Name : 112612 I
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Massachusetts Ave (Route 2A/4/225) From North			Rhodes Street From East			Massachusetts Ave (Route 2A/4/225) From South			Tower Road From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
08:00 AM	6	188	1	0	0	1	1	231	5	2	0	1	436
08:15 AM	2	252	0	0	0	0	0	267	2	0	0	1	524
08:30 AM	0	236	0	1	0	0	0	257	2	4	0	1	501
08:45 AM	0	222	0	0	0	0	1	242	3	2	0	1	471
Total	8	898	1	1	0	1	2	997	12	8	0	4	1932
Grand Total	8	898	1	1	0	1	2	997	12	8	0	4	1932
Apprch %	0.9	99	0.1	50	0	50	0.2	98.6	1.2	66.7	0	33.3	
Total %	0.4	46.5	0.1	0.1	0	0.1	0.1	51.6	0.6	0.4	0	0.2	
Cars	8	866	1	1	0	1	2	964	11	8	0	4	1866
% Cars	100	96.4	100	100	0	100	100	96.7	91.7	100	0	100	96.6
Heavy Vehicles	0	32	0	0	0	0	0	33	1	0	0	0	66
% Heavy Vehicles	0	3.6	0	0	0	0	0	3.3	8.3	0	0	0	3.4

	Massachusetts Ave (Route 2A/4/225) From North				Rhodes Street From East				Massachusetts Ave (Route 2A/4/225) From South				Tower Road From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 08:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	**6**	188	**1**	195	0	0	**1**	**1**	**1**	231	**5**	237	2	0	**1**	3	436
08:15 AM	2	**252**	0	**254**	0	0	0	0	0	**267**	2	**269**	0	0	1	1	**524**
08:30 AM	0	236	0	236	**1**	0	0	1	0	257	2	259	**4**	0	1	**5**	501
08:45 AM	0	222	0	222	0	0	0	0	1	242	3	246	2	0	1	3	471
Total Volume	8	898	1	907	1	0	1	2	2	997	12	1011	8	0	4	12	1932
% App. Total	0.9	99	0.1		50	0	50		0.2	98.6	1.2		66.7	0	33.3		
PHF	.333	.891	.250	.893	.250	.000	.250	.500	.500	.934	.600	.940	.500	.000	1.000	.600	.922
Cars	8	866	1	875	1	0	1	2	2	964	11	977	8	0	4	12	1866
% Cars	100	96.4	100	96.5	100	0	100	100	100	96.7	91.7	96.6	100	0	100	100	96.6
Heavy Vehicles	0	32	0	32	0	0	0	0	0	33	1	34	0	0	0	0	66
% Heavy Vehicles	0	3.6	0	3.5	0	0	0	0	0	3.3	8.3	3.4	0	0	0	0	3.4

PRECISION
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Groups Printed- Cars

	Massachusetts Ave (Route 2A/4/225) From North			Rhodes Street From East			Massachusetts Ave (Route 2A/4/225) From South			Tower Road From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
08:00 AM	6	180	1	0	0	1	1	224	4	2	0	1	420
08:15 AM	2	243	0	0	0	0	0	257	2	0	0	1	505
08:30 AM	0	230	0	1	0	0	0	250	2	4	0	1	488
08:45 AM	0	213	0	0	0	0	1	233	3	2	0	1	453
Total	8	866	1	1	0	1	2	964	11	8	0	4	1866
Grand Total	8	866	1	1	0	1	2	964	11	8	0	4	1866
Apprch %	0.9	99	0.1	50	0	50	0.2	98.7	1.1	66.7	0	33.3	
Total %	0.4	46.4	0.1	0.1	0	0.1	0.1	51.7	0.6	0.4	0	0.2	

	Massachusetts Ave (Route 2A/4/225) From North				Rhodes Street From East				Massachusetts Ave (Route 2A/4/225) From South				Tower Road From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 08:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	**6**	180	**1**	187	0	0	**1**	**1**	**1**	224	**4**	229	2	0	**1**	3	420
08:15 AM	2	**243**	0	**245**	0	0	0	0	0	**257**	2	**259**	0	0	1	1	**505**
08:30 AM	0	230	0	230	**1**	0	0	1	0	250	2	252	**4**	0	1	**5**	488
08:45 AM	0	213	0	213	0	0	0	0	1	233	3	237	2	0	1	3	453
Total Volume	8	866	1	875	1	0	1	2	2	964	11	977	8	0	4	12	1866
% App. Total	0.9	99	0.1		50	0	50		0.2	98.7	1.1		66.7	0	33.3		
PHF	.333	.891	.250	.893	.250	.000	.250	.500	.500	.938	.688	.943	.500	.000	1.000	.600	.924

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Groups Printed- Heavy Vehicles

	Massachusetts Ave (Route 2A/4/225) From North			Rhodes Street From East			Massachusetts Ave (Route 2A/4/225) From South			Tower Road From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
08:00 AM	0	8	0	0	0	0	0	7	1	0	0	0	16
08:15 AM	0	9	0	0	0	0	0	10	0	0	0	0	19
08:30 AM	0	6	0	0	0	0	0	7	0	0	0	0	13
08:45 AM	0	9	0	0	0	0	0	9	0	0	0	0	18
Total	0	32	0	0	0	0	0	33	1	0	0	0	66
Grand Total	0	32	0	0	0	0	0	33	1	0	0	0	66
Apprch %	0	100	0	0	0	0	0	97.1	2.9	0	0	0	
Total %	0	48.5	0	0	0	0	0	50	1.5	0	0	0	

	Massachusetts Ave (Route 2A/4/225) From North				Rhodes Street From East				Massachusetts Ave (Route 2A/4/225) From South				Tower Road From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 08:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	0	8	0	8	0	0	0	0	0	7	**1**	8	0	0	0	0	16
08:15 AM	0	**9**	0	**9**	0	0	0	0	0	**10**	0	**10**	0	0	0	0	**19**
08:30 AM	0	6	0	6	0	0	0	0	0	7	0	7	0	0	0	0	13
08:45 AM	0	9	0	9	0	0	0	0	0	9	0	9	0	0	0	0	18
Total Volume	0	32	0	32	0	0	0	0	0	33	1	34	0	0	0	0	66
% App. Total	0	100	0		0	0	0		0	97.1	2.9		0	0	0		
PHF	.000	.889	.000	.889	.000	.000	.000	.000	.000	.825	.250	.850	.000	.000	.000	.000	.868

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Groups Printed- Peds and Bicycles

	Massachusetts Ave (Route 2A/4/225) From North				Rhodes Street From East				Massachusetts Ave (Route 2A/4/225) From South					Tower Road From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds WB	Peds EB	Right	Thru	Left	Peds	Int. Total
08:00 AM	0	0	0	0	0	0	0	1	0	8	0	0	0	0	0	0	1	10
08:15 AM	0	1	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	5
08:30 AM	0	2	0	0	0	0	0	1	0	0	0	0	3	0	0	0	0	6
08:45 AM	0	1	0	0	0	0	0	1	0	3	0	0	0	0	0	0	0	5
Total	0	4	0	0	0	0	0	3	0	15	0	0	3	0	0	0	1	26
Grand Total	0	4	0	0	0	0	0	3	0	15	0	0	3	0	0	0	1	26
Apprch %	0	100	0	0	0	0	0	100	0	83.3	0	0	16.7	0	0	0	100	
Total %	0	15.4	0	0	0	0	0	11.5	0	57.7	0	0	11.5	0	0	0	3.8	

	Massachusetts Ave (Route 2A/4/225) From North					Rhodes Street From East					Massachusetts Ave (Route 2A/4/225) From South						Tower Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds WB	Peds EB	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 08:00 AM to 08:45 AM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 08:00 AM																						
08:00 AM	0	0	0	0	0	0	0	0	**1**	**1**	0	**8**	0	0	0	**8**	0	0	0	**1**	**1**	**10**
08:15 AM	0	1	0	0	1	0	0	0	0	0	0	4	0	0	0	4	0	0	0	0	0	5
08:30 AM	0	**2**	0	0	**2**	0	0	0	1	1	0	0	0	0	**3**	3	0	0	0	0	0	6
08:45 AM	0	1	0	0	1	0	0	0	1	1	0	3	0	0	0	3	0	0	0	0	0	5
Total Volume	0	4	0	0	4	0	0	0	3	3	0	15	0	0	3	18	0	0	0	1	1	26
% App. Total	0	100	0	0		0	0	0	100		0	83.3	0	0	16.7		0	0	0	100		
PHF	.000	.500	.000	.000	.500	.000	.000	.000	.750	.750	.000	.469	.000	.000	.250	.563	.000	.000	.000	.250	.250	.650

PRECISION
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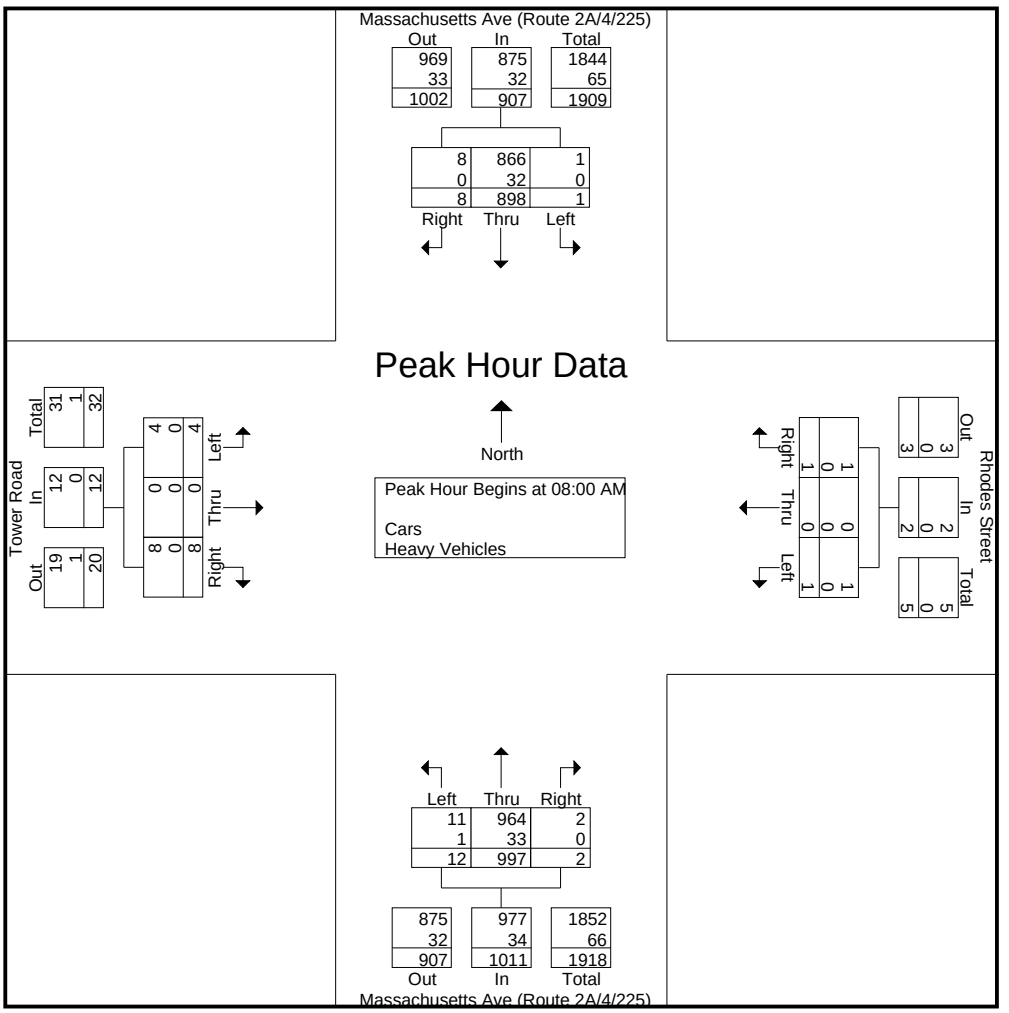
N/S: Massachusetts Ave (Route 2A/4/225)
E/W: Rhodes Street/ Tower Road
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 I
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

	Massachusetts Ave (Route 2A/4/225) From North				Rhodes Street From East				Massachusetts Ave (Route 2A/4/225) From South				Tower Road From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 08:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	**6**	188	**1**	195	0	0	**1**	**1**	**1**	231	**5**	237	2	0	**1**	3	436
08:15 AM	2	**252**	0	**254**	0	0	0	0	0	**267**	2	**269**	0	0	1	1	**524**
08:30 AM	0	236	0	236	**1**	0	0	1	0	257	2	259	**4**	0	1	**5**	501
08:45 AM	0	222	0	222	0	0	0	0	1	242	3	246	2	0	1	3	471
Total Volume	8	898	1	907	1	0	1	2	2	997	12	1011	8	0	4	12	1932
% App. Total	0.9	99	0.1		50	0	50		0.2	98.6	1.2		66.7	0	33.3		
PHF	.333	.891	.250	.893	.250	.000	.250	.500	.500	.934	.600	.940	.500	.000	1.000	.600	.922
Cars	8	866	1	875	1	0	1	2	2	964	11	977	8	0	4	12	1866
% Cars	100	96.4	100	96.5	100	0	100	100	100	96.7	91.7	96.6	100	0	100	100	96.6
Heavy Vehicles	0	32	0	32	0	0	0	0	0	33	1	34	0	0	0	0	66
% Heavy Vehicles	0	3.6	0	3.5	0	0	0	0	0	3.3	8.3	3.4	0	0	0	0	3.4



PRECISION
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N/S: Massachusetts Ave (Route 2A/4/225)
E/W: Rhodes Street/ Tower Road
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 II
Site Code : 28280.00
Start Date : 9/16/2011
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Massachusetts Ave (Route 2A/4/225) From North			Rhodes Street From East			Massachusetts Ave (Route 2A/4/225) From South			Tower Road From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
05:00 PM	0	296	0	0	0	0	1	184	7	1	0	1	490
05:15 PM	3	305	0	1	0	0	0	172	2	7	0	0	490
05:30 PM	4	319	1	0	0	0	0	192	9	4	0	1	530
05:45 PM	3	291	1	2	0	0	0	197	6	5	0	1	506
Total	10	1211	2	3	0	0	1	745	24	17	0	3	2016
Grand Total	10	1211	2	3	0	0	1	745	24	17	0	3	2016
Apprch %	0.8	99	0.2	100	0	0	0.1	96.8	3.1	85	0	15	
Total %	0.5	60.1	0.1	0.1	0	0	0	37	1.2	0.8	0	0.1	
Cars	10	1195	2	3	0	0	1	727	24	17	0	3	1982
% Cars	100	98.7	100	100	0	0	100	97.6	100	100	0	100	98.3
Heavy Vehicles	0	16	0	0	0	0	0	18	0	0	0	0	34
% Heavy Vehicles	0	1.3	0	0	0	0	0	2.4	0	0	0	0	1.7

	Massachusetts Ave (Route 2A/4/225) From North				Rhodes Street From East				Massachusetts Ave (Route 2A/4/225) From South				Tower Road From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 05:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	0	296	0	296	0	0	0	0	**1**	184	7	192	1	0	**1**	2	490
05:15 PM	3	305	0	308	1	0	0	1	0	172	2	174	**7**	0	0	**7**	490
05:30 PM	**4**	**319**	**1**	**324**	0	0	0	0	0	192	**9**	201	4	0	1	5	**530**
05:45 PM	3	291	1	295	**2**	0	0	**2**	0	**197**	6	**203**	5	0	1	6	506
Total Volume	10	1211	2	1223	3	0	0	3	1	745	24	770	17	0	3	20	2016
% App. Total	0.8	99	0.2		100	0	0		0.1	96.8	3.1		85	0	15		
PHF	.625	.949	.500	.944	.375	.000	.000	.375	.250	.945	.667	.948	.607	.000	.750	.714	.951
Cars	10	1195	2	1207	3	0	0	3	1	727	24	752	17	0	3	20	1982
% Cars	100	98.7	100	98.7	100	0	0	100	100	97.6	100	97.7	100	0	100	100	98.3
Heavy Vehicles	0	16	0	16	0	0	0	0	0	18	0	18	0	0	0	0	34
% Heavy Vehicles	0	1.3	0	1.3	0	0	0	0	0	2.4	0	2.3	0	0	0	0	1.7

PRECISION
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N/S: Massachusetts Ave (Route 2A/4/225)
E/W: Rhodes Street/ Tower Road
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 II
Site Code : 28280.00
Start Date : 9/16/2011
Page No : 1

Groups Printed- Cars

	Massachusetts Ave (Route 2A/4/225) From North			Rhodes Street From East			Massachusetts Ave (Route 2A/4/225) From South			Tower Road From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
05:00 PM	0	291	0	0	0	0	1	181	7	1	0	1	482
05:15 PM	3	303	0	1	0	0	0	165	2	7	0	0	481
05:30 PM	4	313	1	0	0	0	0	189	9	4	0	1	521
05:45 PM	3	288	1	2	0	0	0	192	6	5	0	1	498
Total	10	1195	2	3	0	0	1	727	24	17	0	3	1982
Grand Total	10	1195	2	3	0	0	1	727	24	17	0	3	1982
Apprch %	0.8	99	0.2	100	0	0	0.1	96.7	3.2	85	0	15	
Total %	0.5	60.3	0.1	0.2	0	0	0.1	36.7	1.2	0.9	0	0.2	

	Massachusetts Ave (Route 2A/4/225) From North				Rhodes Street From East				Massachusetts Ave (Route 2A/4/225) From South				Tower Road From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 05:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	0	291	0	291	0	0	0	0	**1**	181	7	189	1	0	**1**	2	482
05:15 PM	3	303	0	306	1	0	0	1	0	165	2	167	**7**	0	0	**7**	481
05:30 PM	**4**	**313**	**1**	**318**	0	0	0	0	0	189	**9**	**198**	4	0	1	5	**521**
05:45 PM	3	288	1	292	**2**	0	0	**2**	0	**192**	6	198	5	0	1	6	498
Total Volume	10	1195	2	1207	3	0	0	3	1	727	24	752	17	0	3	20	1982
% App. Total	0.8	99	0.2		100	0	0		0.1	96.7	3.2		85	0	15		
PHF	.625	.954	.500	.949	.375	.000	.000	.375	.250	.947	.667	.949	.607	.000	.750	.714	.951

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E/W: Rhodes Street/ Tower Road
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 II
Site Code : 28280.00
Start Date : 9/16/2011
Page No : 1

Groups Printed- Heavy Vehicles

	Massachusetts Ave (Route 2A/4/225) From North			Rhodes Street From East			Massachusetts Ave (Route 2A/4/225) From South			Tower Road From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
05:00 PM	0	5	0	0	0	0	0	3	0	0	0	0	8
05:15 PM	0	2	0	0	0	0	0	7	0	0	0	0	9
05:30 PM	0	6	0	0	0	0	0	3	0	0	0	0	9
05:45 PM	0	3	0	0	0	0	0	5	0	0	0	0	8
Total	0	16	0	0	0	0	0	18	0	0	0	0	34
Grand Total	0	16	0	0	0	0	0	18	0	0	0	0	34
Apprch %	0	100	0	0	0	0	0	100	0	0	0	0	
Total %	0	47.1	0	0	0	0	0	52.9	0	0	0	0	

	Massachusetts Ave (Route 2A/4/225) From North				Rhodes Street From East				Massachusetts Ave (Route 2A/4/225) From South				Tower Road From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 05:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	0	5	0	5	0	0	0	0	0	3	0	3	0	0	0	0	8
05:15 PM	0	2	0	2	0	0	0	0	0	**7**	0	**7**	0	0	0	0	**9**
05:30 PM	0	**6**	0	**6**	0	0	0	0	0	3	0	3	0	0	0	0	9
05:45 PM	0	3	0	3	0	0	0	0	0	5	0	5	0	0	0	0	8
Total Volume	0	16	0	16	0	0	0	0	0	18	0	18	0	0	0	0	34
% App. Total	0	100	0		0	0	0		0	100	0		0	0	0		
PHF	.000	.667	.000	.667	.000	.000	.000	.000	.000	.643	.000	.643	.000	.000	.000	.000	.944

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E/W: Rhodes Street/ Tower Road
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 II
Site Code : 28280.00
Start Date : 9/16/2011
Page No : 1

Groups Printed- Peds and Bicycles

	Massachusetts Ave (Route 2A/4/225) From North				Rhodes Street From East				Massachusetts Ave (Route 2A/4/225) From South					Tower Road From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds WB	Peds EB	Right	Thru	Left	Peds	Int. Total
05:00 PM	0	4	0	0	0	0	0	3	0	2	0	0	0	0	0	0	1	10
05:15 PM	0	1	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	4
05:30 PM	0	3	0	0	0	0	0	2	0	3	0	0	2	0	0	0	3	13
05:45 PM	0	1	0	0	0	0	0	2	0	2	0	1	1	0	0	0	1	8
Total	0	9	0	0	0	0	0	7	0	8	0	3	3	0	0	0	5	35
Grand Total	0	9	0	0	0	0	0	7	0	8	0	3	3	0	0	0	5	35
Apprch %	0	100	0	0	0	0	0	100	0	57.1	0	21.4	21.4	0	0	0	100	
Total %	0	25.7	0	0	0	0	0	20	0	22.9	0	8.6	8.6	0	0	0	14.3	

	Massachusetts Ave (Route 2A/4/225) From North					Rhodes Street From East					Massachusetts Ave (Route 2A/4/225) From South						Tower Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds WB	Peds EB	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 05:00 PM to 05:45 PM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 05:00 PM																						
05:00 PM	0	**4**	0	0	**4**	0	0	0	**3**	**3**	0	2	0	0	0	2	0	0	0	1	1	10
05:15 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	**2**	0	3	0	0	0	0	0	4
05:30 PM	0	3	0	0	3	0	0	0	2	2	0	**3**	0	0	**2**	**5**	0	0	0	**3**	**3**	**13**
05:45 PM	0	1	0	0	1	0	0	0	2	2	0	2	0	1	1	4	0	0	0	1	1	8
Total Volume	0	9	0	0	9	0	0	0	7	7	0	8	0	3	3	14	0	0	0	5	5	35
% App. Total	0	100	0	0		0	0	0	100		0	57.1	0	21.4	21.4		0	0	0	100		
PHF	.000	.563	.000	.000	.563	.000	.000	.000	.583	.583	.000	.667	.000	.375	.375	.700	.000	.000	.000	.417	.417	.673

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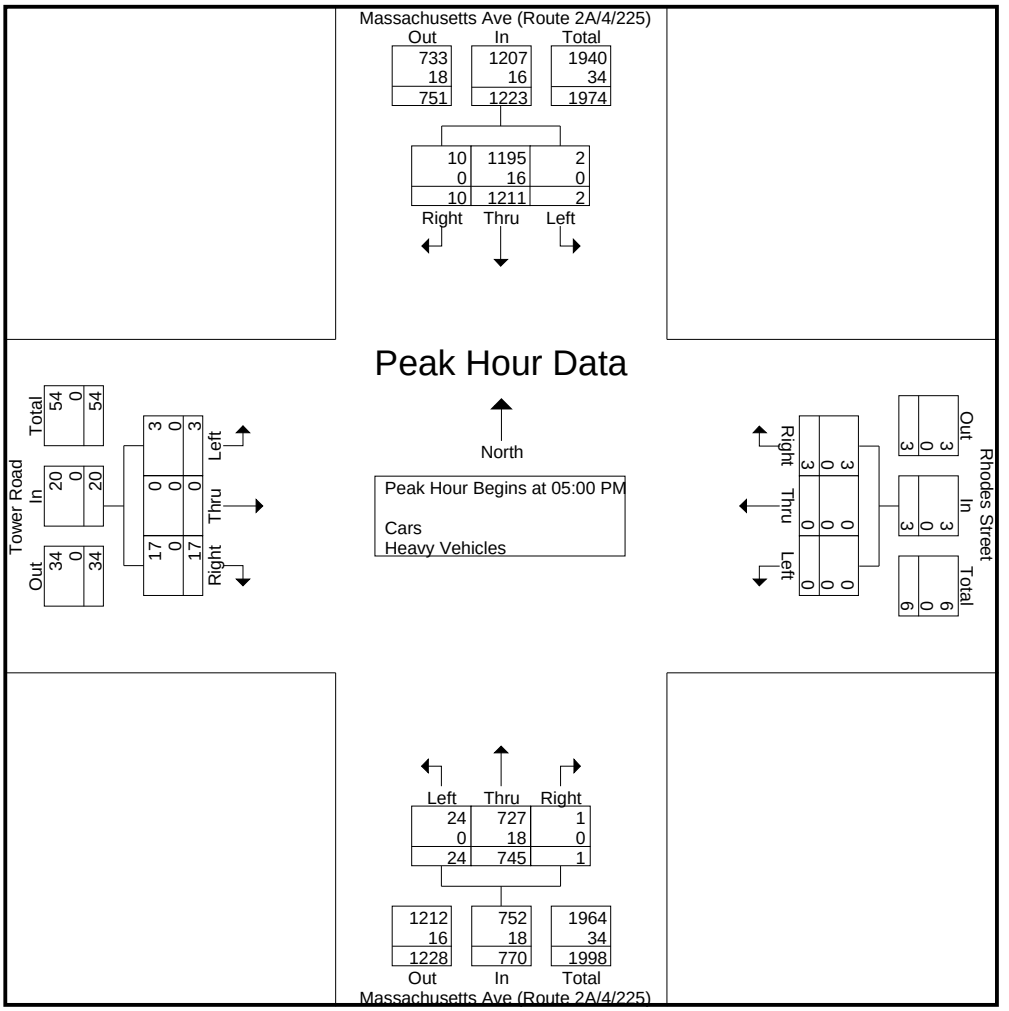
E/W: Rhodes Street/ Tower Road
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 II
Site Code : 28280.00
Start Date : 9/16/2011
Page No : 1

	Massachusetts Ave (Route 2A/4/225) From North				Rhodes Street From East				Massachusetts Ave (Route 2A/4/225) From South				Tower Road From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 05:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	0	296	0	296	0	0	0	0	**1**	184	7	192	1	0	**1**	2	490
05:15 PM	3	305	0	308	1	0	0	1	0	172	2	174	**7**	0	0	**7**	490
05:30 PM	**4**	**319**	**1**	**324**	0	0	0	0	0	192	**9**	201	4	0	1	5	**530**
05:45 PM	3	291	1	295	**2**	0	0	**2**	0	**197**	6	**203**	5	0	1	6	506
Total Volume	10	1211	2	1223	3	0	0	3	1	745	24	770	17	0	3	20	2016
% App. Total	0.8	99	0.2		100	0	0		0.1	96.8	3.1		85	0	15		
PHF	.625	.949	.500	.944	.375	.000	.000	.375	.250	.945	.667	.948	.607	.000	.750	.714	.951
Cars	10	1195	2	1207	3	0	0	3	1	727	24	752	17	0	3	20	1982
% Cars	100	98.7	100	98.7	100	0	0	100	100	97.6	100	97.7	100	0	100	100	98.3
Heavy Vehicles	0	16	0	16	0	0	0	0	0	18	0	18	0	0	0	0	34
% Heavy Vehicles	0	1.3	0	1.3	0	0	0	0	0	2.4	0	2.3	0	0	0	0	1.7



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N/S: Massachusetts Ave (Route 4/225)
W: Marrett Road (Route 2A)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 AA
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Massachusetts Ave (Route 4/225) From North		Massachusetts Ave (Route 2A/4/225) From South		Marrett Road (Route 2A) From West		
Start Time	Right	Thru	Thru	Left	Right	Left	Int. Total
12:00 PM	21	92	137	35	67	12	364
12:15 PM	10	134	137	48	52	16	397
12:30 PM	8	98	137	51	52	10	356
12:45 PM	10	136	134	49	65	10	404
Total	49	460	545	183	236	48	1521
01:00 PM	6	124	122	44	64	6	366
01:15 PM	11	101	120	49	53	2	336
01:30 PM	11	127	111	40	47	7	343
01:45 PM	8	123	106	41	53	7	338
Total	36	475	459	174	217	22	1383
02:00 PM	5	107	119	39	51	8	329
02:15 PM	5	107	120	53	53	8	346
02:30 PM	17	133	122	44	61	9	386
02:45 PM	14	153	117	52	62	14	412
Total	41	500	478	188	227	39	1473
03:00 PM	19	150	121	62	66	13	431
03:15 PM	18	152	140	62	84	10	466
03:30 PM	23	155	158	59	86	9	490
03:45 PM	16	163	145	54	83	12	473
Total	76	620	564	237	319	44	1860
04:00 PM	11	166	136	49	95	18	475
04:15 PM	10	142	132	54	87	22	447
04:30 PM	9	147	130	42	110	15	453
04:45 PM	7	170	164	55	137	23	556
Total	37	625	562	200	429	78	1931
05:00 PM	4	197	123	56	157	23	560
05:15 PM	11	170	144	62	127	18	532
05:30 PM	9	182	134	54	164	7	550
05:45 PM	4	180	135	46	150	13	528
Total	28	729	536	218	598	61	2170
Grand Total	267	3409	3144	1200	2026	292	10338
Apprch %	7.3	92.7	72.4	27.6	87.4	12.6	
Total %	2.6	33	30.4	11.6	19.6	2.8	
Cars	258	3293	3038	1153	1980	278	10000
% Cars	96.6	96.6	96.6	96.1	97.7	95.2	96.7
Heavy Vehicles	9	116	106	47	46	14	338
% Heavy Vehicles	3.4	3.4	3.4	3.9	2.3	4.8	3.3

	Massachusetts Ave (Route 4/225) From North			Massachusetts Ave (Route 2A/4/225) From South			Marrett Road (Route 2A) From West			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:45 PM										
04:45 PM	7	170	177	**164**	55	**219**	137	**23**	160	556
05:00 PM	4	**197**	**201**	123	56	179	157	23	**180**	**560**
05:15 PM	**11**	170	181	144	**62**	206	127	18	145	532
05:30 PM	9	182	191	134	54	188	**164**	7	171	550
Total Volume	31	719	750	565	227	792	585	71	656	2198
% App. Total	4.1	95.9		71.3	28.7		89.2	10.8		
PHF	.705	.912	.933	.861	.915	.904	.892	.772	.911	.981
Cars	30	709	739	555	224	779	578	71	649	2167
% Cars	96.8	98.6	98.5	98.2	98.7	98.4	98.8	100	98.9	98.6
Heavy Vehicles	1	10	11	10	3	13	7	0	7	31

PRECISION
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N/S: Massachusetts Ave (Route 4/225)
W: Marrett Road (Route 2A)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 AA
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars

	Massachusetts Ave (Route 4/225) From North		Massachusetts Ave (Route 2A/4/225) From South		Marrett Road (Route 2A) From West		
Start Time	Right	Thru	Thru	Left	Right	Left	Int. Total
12:00 PM	19	88	133	34	62	11	347
12:15 PM	10	129	128	45	51	15	378
12:30 PM	8	90	132	50	48	9	337
12:45 PM	9	128	123	48	59	10	377
Total	46	435	516	177	220	45	1439
01:00 PM	6	120	117	42	62	6	353
01:15 PM	11	98	114	48	50	2	323
01:30 PM	10	119	107	38	45	5	324
01:45 PM	7	116	99	37	53	6	318
Total	34	453	437	165	210	19	1318
02:00 PM	5	100	116	38	48	7	314
02:15 PM	5	104	111	48	52	7	327
02:30 PM	16	128	120	44	57	7	372
02:45 PM	14	146	114	45	61	14	394
Total	40	478	461	175	218	35	1407
03:00 PM	18	147	118	58	65	13	419
03:15 PM	17	147	134	57	83	9	447
03:30 PM	23	149	155	58	86	9	480
03:45 PM	16	158	140	51	82	12	459
Total	74	601	547	224	316	43	1805
04:00 PM	11	160	133	48	92	17	461
04:15 PM	10	139	131	52	87	22	441
04:30 PM	9	139	127	42	110	14	441
04:45 PM	6	170	161	55	135	23	550
Total	36	608	552	197	424	76	1893
05:00 PM	4	192	121	54	153	23	547
05:15 PM	11	167	141	62	126	18	525
05:30 PM	9	180	132	53	164	7	545
05:45 PM	4	179	131	46	149	12	521
Total	28	718	525	215	592	60	2138
Grand Total	258	3293	3038	1153	1980	278	10000
Apprch %	7.3	92.7	72.5	27.5	87.7	12.3	
Total %	2.6	32.9	30.4	11.5	19.8	2.8	

	Massachusetts Ave (Route 4/225) From North			Massachusetts Ave (Route 2A/4/225) From South			Marrett Road (Route 2A) From West			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:45 PM										
04:45 PM	6	170	176	**161**	55	**216**	135	**23**	158	**550**
05:00 PM	4	**192**	**196**	121	54	175	153	23	**176**	547
05:15 PM	**11**	167	178	141	**62**	203	126	18	144	525
05:30 PM	9	180	189	132	53	185	**164**	7	171	545
Total Volume	30	709	739	555	224	779	578	71	649	2167
% App. Total	4.1	95.9		71.2	28.8		89.1	10.9		
PHF	.682	.923	.943	.862	.903	.902	.881	.772	.922	.985

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N/S: Massachusetts Ave (Route 4/225)
W: Marrett Road (Route 2A)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 AA
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Heavy Vehicles

	Massachusetts Ave (Route 4/225) From North		Massachusetts Ave (Route 2A/4/225) From South		Marrett Road (Route 2A) From West		
Start Time	Right	Thru	Thru	Left	Right	Left	Int. Total
12:00 PM	2	4	4	1	5	1	17
12:15 PM	0	5	9	3	1	1	19
12:30 PM	0	8	5	1	4	1	19
12:45 PM	1	8	11	1	6	0	27
Total	3	25	29	6	16	3	82
01:00 PM	0	4	5	2	2	0	13
01:15 PM	0	3	6	1	3	0	13
01:30 PM	1	8	4	2	2	2	19
01:45 PM	1	7	7	4	0	1	20
Total	2	22	22	9	7	3	65
02:00 PM	0	7	3	1	3	1	15
02:15 PM	0	3	9	5	1	1	19
02:30 PM	1	5	2	0	4	2	14
02:45 PM	0	7	3	7	1	0	18
Total	1	22	17	13	9	4	66
03:00 PM	1	3	3	4	1	0	12
03:15 PM	1	5	6	5	1	1	19
03:30 PM	0	6	3	1	0	0	10
03:45 PM	0	5	5	3	1	0	14
Total	2	19	17	13	3	1	55
04:00 PM	0	6	3	1	3	1	14
04:15 PM	0	3	1	2	0	0	6
04:30 PM	0	8	3	0	0	1	12
04:45 PM	1	0	3	0	2	0	6
Total	1	17	10	3	5	2	38
05:00 PM	0	5	2	2	4	0	13
05:15 PM	0	3	3	0	1	0	7
05:30 PM	0	2	2	1	0	0	5
05:45 PM	0	1	4	0	1	1	7
Total	0	11	11	3	6	1	32
Grand Total	9	116	106	47	46	14	338
Apprch %	7.2	92.8	69.3	30.7	76.7	23.3	
Total %	2.7	34.3	31.4	13.9	13.6	4.1	

	Massachusetts Ave (Route 4/225) From North			Massachusetts Ave (Route 2A/4/225) From South			Marrett Road (Route 2A) From West			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 12:00 PM										
12:00 PM	**2**	4	6	4	1	5	5	**1**	**6**	17
12:15 PM	0	5	5	9	**3**	**12**	1	1	2	19
12:30 PM	0	**8**	8	5	1	6	4	1	5	19
12:45 PM	1	8	**9**	**11**	1	12	**6**	0	6	**27**
Total Volume	3	25	28	29	6	35	16	3	19	82
% App. Total	10.7	89.3		82.9	17.1		84.2	15.8		
PHF	.375	.781	.778	.659	.500	.729	.667	.750	.792	.759

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N/S: Massachusetts Ave (Route 4/225)
W: Marrett Road (Route 2A)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

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Site Code : 28280.00
Start Date : 9/15/2011
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Groups Printed- Peds and Bicycles

	Massachusetts Ave (Route 4/225) From North			Massachusetts Ave (Route 2A/4/225) From South			Marrett Road (Route 2A) From West			
Start Time	Right	Thru	Peds	Thru	Left	Peds	Right	Left	Peds	Int. Total
12:00 PM	0	0	0	2	0	0	3	0	0	5
12:15 PM	0	1	0	1	0	0	1	0	0	3
12:30 PM	1	1	0	0	0	0	0	0	1	3
12:45 PM	0	1	0	0	0	0	3	0	0	4
Total	1	3	0	3	0	0	7	0	1	15
01:00 PM	0	0	0	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	2	0	1	0	0	3
01:45 PM	0	0	0	1	0	0	0	0	0	1
Total	0	0	0	1	2	0	1	0	0	4
02:00 PM	0	0	0	0	0	0	0	0	2	2
02:15 PM	0	0	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	1	0	0	1	0	0	0	0	2
Total	0	1	0	0	1	0	0	0	2	4
03:00 PM	0	1	0	0	1	0	0	0	0	2
03:15 PM	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	2	0	1	0	0	3
03:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	3	0	1	0	0	5
04:00 PM	0	0	0	2	0	0	1	0	0	3
04:15 PM	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	1	0	0	0	0	0	1
Total	0	0	0	3	0	0	1	0	0	4
05:00 PM	0	0	0	1	1	0	0	0	0	2
05:15 PM	0	1	0	0	0	0	0	0	0	1
05:30 PM	1	2	0	0	1	0	1	1	0	6
05:45 PM	0	2	0	3	0	0	0	0	0	5
Total	1	5	0	4	2	0	1	1	0	14
Grand Total	2	10	0	11	8	0	11	1	3	46
Apprch %	16.7	83.3	0	57.9	42.1	0	73.3	6.7	20	
Total %	4.3	21.7	0	23.9	17.4	0	23.9	2.2	6.5	

	Massachusetts Ave (Route 4/225) From North				Massachusetts Ave (Route 2A/4/225) From South				Marrett Road (Route 2A) From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 12:00 PM													
12:00 PM	0	0	0	0	**2**	0	0	**2**	**3**	0	0	**3**	**5**
12:15 PM	0	**1**	0	1	1	0	0	1	1	0	0	1	3
12:30 PM	**1**	1	0	**2**	0	0	0	0	0	0	**1**	1	3
12:45 PM	0	1	0	1	0	0	0	0	3	0	0	3	4
Total Volume	1	3	0	4	3	0	0	3	7	0	1	8	15
% App. Total	25	75	0		100	0	0		87.5	0	12.5		
PHF	.250	.750	.000	.500	.375	.000	.000	.375	.583	.000	.250	.667	.750

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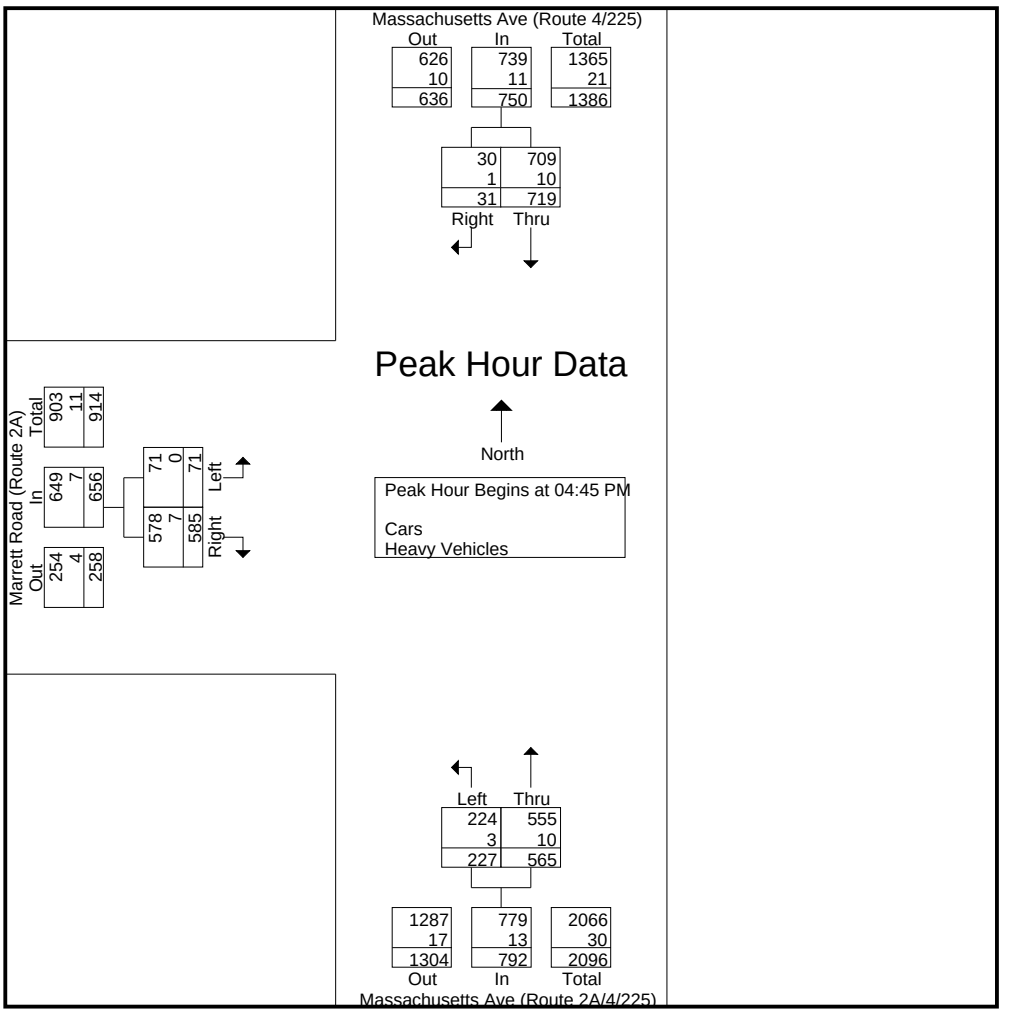
N/S: Massachusetts Ave (Route 4/225)
W: Marrett Road (Route 2A)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 AA
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

	Massachusetts Ave (Route 4/225) From North			Massachusetts Ave (Route 2A/4/225) From South			Marrett Road (Route 2A) From West			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:45 PM										
04:45 PM	7	170	177	**164**	55	**219**	137	**23**	160	556
05:00 PM	4	**197**	**201**	123	56	179	157	23	**180**	**560**
05:15 PM	**11**	170	181	144	**62**	206	127	18	145	532
05:30 PM	9	182	191	134	54	188	**164**	7	171	550
Total Volume	31	719	750	565	227	792	585	71	656	2198
% App. Total	4.1	95.9		71.3	28.7		89.2	10.8		
PHF	.705	.912	.933	.861	.915	.904	.892	.772	.911	.981
Cars	30	709	739	555	224	779	578	71	649	2167
% Cars	96.8	98.6	98.5	98.2	98.7	98.4	98.8	100	98.9	98.6
Heavy Vehicles	1	10	11	10	3	13	7	0	7	31
% Heavy Vehicles	3.2	1.4	1.5	1.8	1.3	1.6	1.2	0	1.1	1.4



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N/S: Massachusetts Ave (Route 2A/4/225)
E: Maple Street (Route 2A)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 BB
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Massachusetts Ave (Route 2A/4/225) From North		Maple Street (Route 2A) From East		Massachusetts Ave (Route 4/225) From South		
Start Time	Thru	Left	Right	Left	Right	Thru	Int. Total
12:00 PM	124	49	46	51	53	137	460
12:15 PM	146	46	65	61	56	117	491
12:30 PM	111	55	44	73	65	138	486
12:45 PM	133	62	44	45	55	129	468
Total	514	212	199	230	229	521	1905
01:00 PM	142	49	39	41	59	121	451
01:15 PM	116	60	52	61	54	126	469
01:30 PM	122	48	46	47	65	106	434
01:45 PM	125	52	37	58	51	116	439
Total	505	209	174	207	229	469	1793
02:00 PM	117	48	55	58	50	110	438
02:15 PM	108	53	54	40	52	119	426
02:30 PM	139	48	51	50	59	117	464
02:45 PM	147	77	63	73	56	112	528
Total	511	226	223	221	217	458	1856
03:00 PM	145	69	55	56	62	123	510
03:15 PM	156	86	65	70	75	143	595
03:30 PM	151	99	66	43	83	160	602
03:45 PM	154	97	53	66	74	143	587
Total	606	351	239	235	294	569	2294
04:00 PM	155	97	54	51	86	130	573
04:15 PM	146	109	55	71	58	159	598
04:30 PM	161	128	30	43	79	143	584
04:45 PM	168	124	58	50	86	174	660
Total	630	458	197	215	309	606	2415
05:00 PM	196	202	38	46	98	135	715
05:15 PM	157	135	73	55	89	163	672
05:30 PM	197	170	56	46	104	157	730
05:45 PM	193	152	48	53	74	148	668
Total	743	659	215	200	365	603	2785
Grand Total	3509	2115	1247	1308	1643	3226	13048
Apprch %	62.4	37.6	48.8	51.2	33.7	66.3	
Total %	26.9	16.2	9.6	10	12.6	24.7	
Cars	3404	2064	1192	1254	1597	3129	12640
% Cars	97	97.6	95.6	95.9	97.2	97	96.9
Heavy Vehicles	105	51	55	54	46	97	408
% Heavy Vehicles	3	2.4	4.4	4.1	2.8	3	3.1

	Massachusetts Ave (Route 2A/4/225) From North			Maple Street (Route 2A) From East			Massachusetts Ave (Route 4/225) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:00 PM										
05:00 PM	196	**202**	**398**	38	46	84	98	135	233	715
05:15 PM	157	135	292	**73**	**55**	**128**	89	**163**	252	672
05:30 PM	**197**	170	367	56	46	102	**104**	157	**261**	**730**
05:45 PM	193	152	345	48	53	101	74	148	222	668
Total Volume	743	659	1402	215	200	415	365	603	968	2785
% App. Total	53	47		51.8	48.2		37.7	62.3		
PHF	.943	.816	.881	.736	.909	.811	.877	.925	.927	.954
Cars	732	652	1384	212	198	410	363	594	957	2751
% Cars	98.5	98.9	98.7	98.6	99.0	98.8	99.5	98.5	98.9	98.8
Heavy Vehicles	11	7	18	3	2	5	2	9	11	34
% Heavy Vehicles	1.5	1.1	1.3	1.4	1.0	1.2	0.5	1.5	1.1	1.2

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E: Maple Street (Route 2A)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 BB
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars

	Massachusetts Ave (Route 2A/4/225) From North		Maple Street (Route 2A) From East		Massachusetts Ave (Route 4/225) From South		
Start Time	Thru	Left	Right	Left	Right	Thru	Int. Total
12:00 PM	117	47	44	46	51	132	437
12:15 PM	142	46	60	57	51	110	466
12:30 PM	103	52	43	68	60	132	458
12:45 PM	125	57	43	43	52	119	439
Total	487	202	190	214	214	493	1800
01:00 PM	137	48	37	36	58	115	431
01:15 PM	114	57	51	57	53	122	454
01:30 PM	115	47	44	44	60	102	412
01:45 PM	120	50	32	56	48	110	416
Total	486	202	164	193	219	449	1713
02:00 PM	112	46	54	53	45	107	417
02:15 PM	106	51	49	40	50	110	406
02:30 PM	132	45	49	49	59	116	450
02:45 PM	144	73	58	67	56	107	505
Total	494	215	210	209	210	440	1778
03:00 PM	141	67	52	55	62	118	495
03:15 PM	150	85	61	68	74	137	575
03:30 PM	147	96	63	43	79	160	588
03:45 PM	153	92	49	64	71	138	567
Total	591	340	225	230	286	553	2225
04:00 PM	149	94	51	50	85	128	557
04:15 PM	145	109	54	70	57	158	593
04:30 PM	156	126	29	40	79	141	571
04:45 PM	164	124	57	50	84	173	652
Total	614	453	191	210	305	600	2373
05:00 PM	191	196	37	46	98	132	700
05:15 PM	153	134	72	54	88	161	662
05:30 PM	195	170	55	45	103	156	724
05:45 PM	193	152	48	53	74	145	665
Total	732	652	212	198	363	594	2751
Grand Total	3404	2064	1192	1254	1597	3129	12640
Apprch %	62.3	37.7	48.7	51.3	33.8	66.2	
Total %	26.9	16.3	9.4	9.9	12.6	24.8	

	Massachusetts Ave (Route 2A/4/225) From North			Maple Street (Route 2A) From East			Massachusetts Ave (Route 4/225) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:00 PM										
05:00 PM	191	**196**	**387**	37	46	83	98	132	230	700
05:15 PM	153	134	287	**72**	**54**	**126**	88	**161**	249	662
05:30 PM	**195**	170	365	55	45	100	**103**	156	**259**	**724**
05:45 PM	193	152	345	48	53	101	74	145	219	665
Total Volume	732	652	1384	212	198	410	363	594	957	2751
% App. Total	52.9	47.1		51.7	48.3		37.9	62.1		
PHF	.938	.832	.894	.736	.917	.813	.881	.922	.924	.950

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E: Maple Street (Route 2A)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 BB
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Heavy Vehicles

	Massachusetts Ave (Route 2A/4/225) From North		Maple Street (Route 2A) From East		Massachusetts Ave (Route 4/225) From South		
Start Time	Thru	Left	Right	Left	Right	Thru	Int. Total
12:00 PM	7	2	2	5	2	5	23
12:15 PM	4	0	5	4	5	7	25
12:30 PM	8	3	1	5	5	6	28
12:45 PM	8	5	1	2	3	10	29
Total	27	10	9	16	15	28	105
01:00 PM	5	1	2	5	1	6	20
01:15 PM	2	3	1	4	1	4	15
01:30 PM	7	1	2	3	5	4	22
01:45 PM	5	2	5	2	3	6	23
Total	19	7	10	14	10	20	80
02:00 PM	5	2	1	5	5	3	21
02:15 PM	2	2	5	0	2	9	20
02:30 PM	7	3	2	1	0	1	14
02:45 PM	3	4	5	6	0	5	23
Total	17	11	13	12	7	18	78
03:00 PM	4	2	3	1	0	5	15
03:15 PM	6	1	4	2	1	6	20
03:30 PM	4	3	3	0	4	0	14
03:45 PM	1	5	4	2	3	5	20
Total	15	11	14	5	8	16	69
04:00 PM	6	3	3	1	1	2	16
04:15 PM	1	0	1	1	1	1	5
04:30 PM	5	2	1	3	0	2	13
04:45 PM	4	0	1	0	2	1	8
Total	16	5	6	5	4	6	42
05:00 PM	5	6	1	0	0	3	15
05:15 PM	4	1	1	1	1	2	10
05:30 PM	2	0	1	1	1	1	6
05:45 PM	0	0	0	0	0	3	3
Total	11	7	3	2	2	9	34
Grand Total	105	51	55	54	46	97	408
Apprch %	67.3	32.7	50.5	49.5	32.2	67.8	
Total %	25.7	12.5	13.5	13.2	11.3	23.8	

	Massachusetts Ave (Route 2A/4/225) From North			Maple Street (Route 2A) From East			Massachusetts Ave (Route 4/225) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 12:00 PM										
12:00 PM	7	2	9	2	**5**	7	2	5	7	23
12:15 PM	4	0	4	**5**	4	**9**	**5**	7	12	25
12:30 PM	**8**	3	11	1	5	6	5	6	11	28
12:45 PM	8	**5**	**13**	1	2	3	3	**10**	**13**	**29**
Total Volume	27	10	37	9	16	25	15	28	43	105
% App. Total	73	27		36	64		34.9	65.1		
PHF	.844	.500	.712	.450	.800	.694	.750	.700	.827	.905

PRECISION
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N/S: Massachusetts Ave (Route 2A/4/225)
E: Maple Street (Route 2A)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 BB
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Peds and Bicycles

	Massachusetts Ave (Route 2A/4/225) From North			Maple Street (Route 2A) From East			Massachusetts Ave (Route 4/225) From South			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
12:00 PM	4	0	0	0	0	0	3	2	0	9
12:15 PM	1	1	0	0	0	1	0	1	0	4
12:30 PM	1	0	0	0	0	0	0	0	2	3
12:45 PM	1	2	0	0	0	1	0	0	0	4
Total	7	3	0	0	0	2	3	3	2	20
01:00 PM	1	0	0	0	1	0	0	0	0	2
01:15 PM	0	0	0	0	0	0	0	0	0	0
01:30 PM	0	2	0	0	0	0	0	1	1	4
01:45 PM	1	0	0	0	0	0	1	0	0	2
Total	2	2	0	0	1	0	1	1	1	8
02:00 PM	0	0	0	0	0	0	1	0	0	1
02:15 PM	0	0	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0	0	0
02:45 PM	1	0	0	1	0	0	0	0	0	2
Total	1	0	0	1	0	0	1	0	0	3
03:00 PM	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	1	0	0	0	1	0	2
03:30 PM	0	1	0	0	0	0	0	0	0	1
03:45 PM	0	0	0	0	0	0	0	1	2	3
Total	0	1	0	1	0	0	0	2	2	6
04:00 PM	2	0	0	0	0	0	0	1	0	3
04:15 PM	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	1	0	1
Total	2	0	0	0	0	0	0	2	0	4
05:00 PM	0	0	0	1	0	0	0	1	0	2
05:15 PM	0	1	0	0	0	0	0	0	0	1
05:30 PM	2	1	0	0	0	0	0	1	0	4
05:45 PM	2	0	0	0	0	0	0	3	0	5
Total	4	2	0	1	0	0	0	5	0	12
Grand Total	16	8	0	3	1	2	5	13	5	53
Apprch %	66.7	33.3	0	50	16.7	33.3	21.7	56.5	21.7	
Total %	30.2	15.1	0	5.7	1.9	3.8	9.4	24.5	9.4	

	Massachusetts Ave (Route 2A/4/225) From North				Maple Street (Route 2A) From East				Massachusetts Ave (Route 4/225) From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 12:00 PM													
12:00 PM	**4**	0	0	**4**	0	0	0	0	**3**	**2**	0	**5**	**9**
12:15 PM	1	1	0	2	0	0	**1**	**1**	0	1	0	1	4
12:30 PM	1	0	0	1	0	0	0	0	0	0	**2**	2	3
12:45 PM	1	**2**	0	3	0	0	1	1	0	0	0	0	4
Total Volume	7	3	0	10	0	0	2	2	3	3	2	8	20
% App. Total	70	30	0		0	0	100		37.5	37.5	25		
PHF	.438	.375	.000	.625	.000	.000	.500	.500	.250	.375	.250	.400	.556

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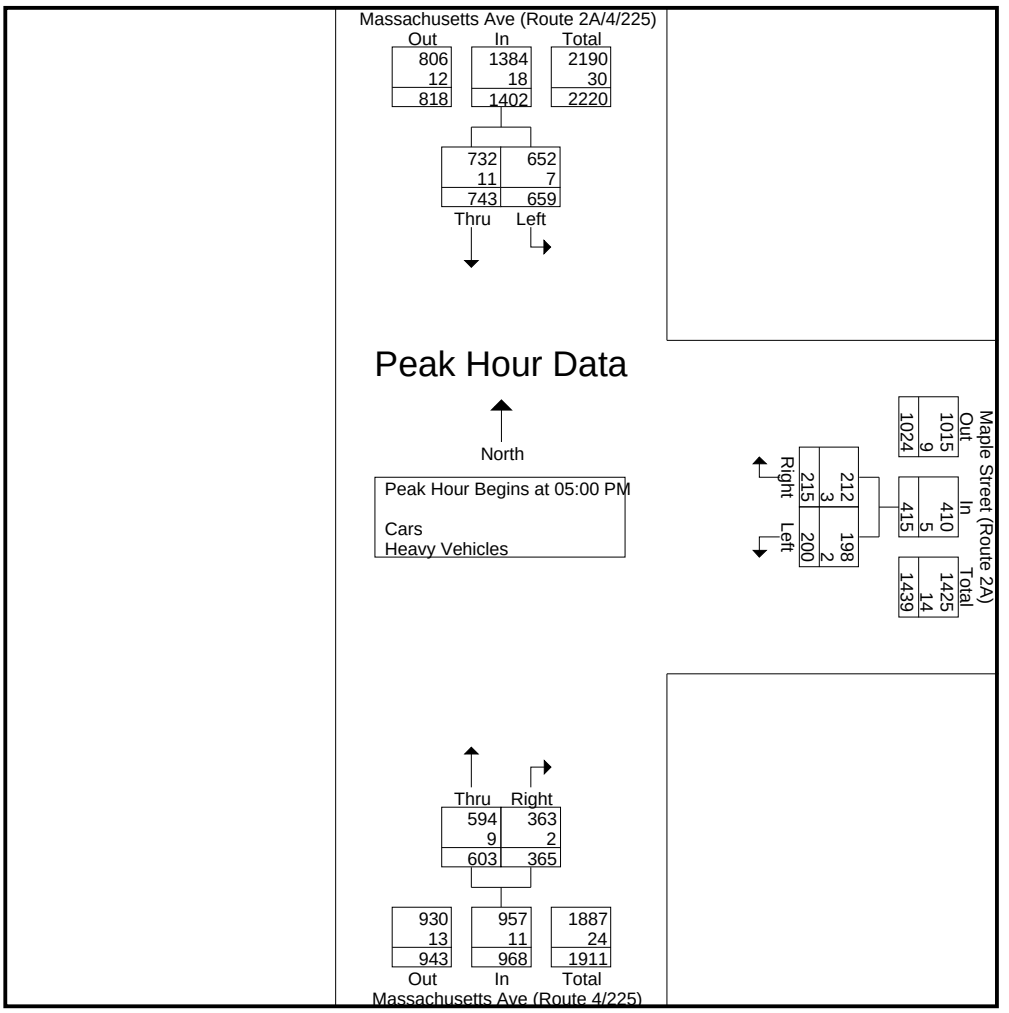
N/S: Massachusetts Ave (Route 2A/4/225)
E: Maple Street (Route 2A)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 BB
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

	Massachusetts Ave (Route 2A/4/225) From North			Maple Street (Route 2A) From East			Massachusetts Ave (Route 4/225) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:00 PM										
05:00 PM	196	**202**	**398**	38	46	84	98	135	233	715
05:15 PM	157	135	292	**73**	**55**	**128**	89	**163**	252	672
05:30 PM	**197**	170	367	56	46	102	**104**	157	**261**	**730**
05:45 PM	193	152	345	48	53	101	74	148	222	668
Total Volume	743	659	1402	215	200	415	365	603	968	2785
% App. Total	53	47		51.8	48.2		37.7	62.3		
PHF	.943	.816	.881	.736	.909	.811	.877	.925	.927	.954
Cars	732	652	1384	212	198	410	363	594	957	2751
% Cars	98.5	98.9	98.7	98.6	99.0	98.8	99.5	98.5	98.9	98.8
Heavy Vehicles	11	7	18	3	2	5	2	9	11	34
% Heavy Vehicles	1.5	1.1	1.3	1.4	1.0	1.2	0.5	1.5	1.1	1.2



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N/S: Massachusetts Avenue (Route 4/225)
NW/W: Follen Rd/ Pleasant St (Rt 4/225)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 CC
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Massachusetts Ave (Route 2A/4/225) From North			Massachusetts Ave From South			Pleasant Street (Route 4/225) From West			Follen Road From Northwest			
Start Time	Hard Right	Right	Thru	Thru	Bear Left	Left	Right	Left	Hard Left	Hard Right	Bear Right	Hard Left	Int. Total
12:00 PM	4	63	54	84	9	41	4	70	1	7	2	1	340
12:15 PM	2	93	75	74	5	25	7	101	6	1	1	3	393
12:30 PM	1	105	71	104	6	36	20	87	3	6	0	1	440
12:45 PM	0	80	61	118	8	24	21	67	2	4	0	0	385
Total	7	341	261	380	28	126	52	325	12	18	3	5	1558
01:00 PM	2	96	88	92	7	24	23	68	5	6	2	1	414
01:15 PM	1	100	90	91	4	27	20	72	0	8	6	0	419
01:30 PM	0	96	90	78	4	26	12	81	4	4	1	0	396
01:45 PM	2	87	83	66	2	28	22	92	1	1	2	0	386
Total	5	379	351	327	17	105	77	313	10	19	11	1	1615
02:00 PM	3	77	69	69	3	23	20	66	4	4	1	0	339
02:15 PM	0	82	54	74	1	39	25	68	9	3	2	0	357
02:30 PM	0	82	85	82	4	33	35	81	4	6	3	0	415
02:45 PM	0	119	78	75	5	32	46	90	3	8	4	0	460
Total	3	360	286	300	13	127	126	305	20	21	10	0	1571
03:00 PM	2	111	85	87	2	43	34	93	4	5	2	1	469
03:15 PM	0	97	84	94	5	38	36	105	2	4	3	0	468
03:30 PM	1	71	83	91	6	32	27	120	2	15	4	0	452
03:45 PM	1	111	94	104	5	23	26	98	4	7	3	0	476
Total	4	390	346	376	18	136	123	416	12	31	12	1	1865
04:00 PM	0	109	94	109	5	31	40	89	7	8	4	0	496
04:15 PM	2	91	93	97	4	37	48	99	2	2	1	0	476
04:30 PM	1	95	88	93	7	21	20	95	6	7	3	1	437
04:45 PM	2	111	92	119	4	27	37	94	0	4	4	0	494
Total	5	406	367	418	20	116	145	377	15	21	12	1	1903
05:00 PM	0	89	127	97	4	23	21	88	1	7	4	0	461
05:15 PM	1	97	100	111	2	30	18	90	3	5	2	0	459
05:30 PM	0	89	131	114	6	14	37	84	4	9	3	0	491
05:45 PM	0	96	116	93	4	34	26	79	2	6	4	0	460
Total	1	371	474	415	16	101	102	341	10	27	13	0	1871
Grand Total	25	2247	2085	2216	112	711	625	2077	79	137	61	8	10383
Apprch %	0.6	51.6	47.9	72.9	3.7	23.4	22.5	74.7	2.8	66.5	29.6	3.9	
Total %	0.2	21.6	20.1	21.3	1.1	6.8	6	20	0.8	1.3	0.6	0.1	
Cars	23	2169	2006	2126	106	676	596	2020	71	134	61	7	9995
% Cars	92	96.5	96.2	95.9	94.6	95.1	95.4	97.3	89.9	97.8	100	87.5	96.3
Heavy Vehicles	2	78	79	90	6	35	29	57	8	3	0	1	388
% Heavy Vehicles	8	3.5	3.8	4.1	5.4	4.9	4.6	2.7	10.1	2.2	0	12.5	3.7

	Massachusetts Ave (Route 2A/4/225) From North				Massachusetts Ave From South				Pleasant Street (Route 4/225) From West				Follen Road From Northwest				
Start Time	Hard Right	Right	Thru	App. Total	Thru	Bear Left	Left	App. Total	Right	Left	Hard Left	App. Total	Hard Right	Bear Right	Hard Left	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	**2**	**111**	92	205	**119**	4	27	**150**	**37**	**94**	0	**131**	4	**4**	0	8	**494**
05:00 PM	0	89	127	216	97	4	23	124	21	88	1	110	7	4	0	11	461
05:15 PM	1	97	100	198	111	2	**30**	143	18	90	3	111	5	2	0	7	459
05:30 PM	0	89	**131**	**220**	114	**6**	14	134	37	84	**4**	125	**9**	3	0	**12**	491
Total Volume	3	386	450	839	441	16	94	551	113	356	8	477	25	13	0	38	1905
% App. Total	0.4	46	53.6		80	2.9	17.1		23.7	74.6	1.7		65.8	34.2	0		
PHF	.375	.869	.859	.953	.926	.667	.783	.918	.764	.947	.500	.910	.694	.813	.000	.792	.964
Cars	2	378	439	819	432	15	91	538	110	351	7	468	25	13	0	38	1863
% Cars	66.7	97.9	97.6	97.6	98.0	93.8	96.8	97.6	97.3	98.6	87.5	98.1	100	100	0	100	97.8
Heavy Vehicles	1	8	11	20	9	1	3	13	3	5	1	9	0	0	0	0	42
% Heavy Vehicles	33.3	2.1	2.4	2.4	2.0	6.3	3.2	2.4	2.7	1.4	12.5	1.9	0	0	0	0	2.2

PRECISION
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N/S: Massachusetts Avenue (Route 4/225)
NW/W: Follen Rd/ Pleasant St (Rt 4/225)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 CC
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Cars

	Massachusetts Ave (Route 2A/4/225) From North			Massachusetts Ave From South			Pleasant Street (Route 4/225) From West			Follen Road From Northwest			
Start Time	Hard Right	Right	Thru	Thru	Bear Left	Left	Right	Left	Hard Left	Hard Right	Bear Right	Hard Left	Int. Total
12:00 PM	3	61	47	79	7	39	3	67	1	5	2	0	314
12:15 PM	2	90	69	64	5	24	7	99	5	1	1	3	370
12:30 PM	1	100	65	99	5	35	20	84	2	6	0	1	418
12:45 PM	0	75	57	111	8	21	18	60	1	4	0	0	355
Total	6	326	238	353	25	119	48	310	9	16	3	4	1457
01:00 PM	2	90	84	88	6	20	21	67	5	6	2	1	392
01:15 PM	1	97	86	89	4	25	20	72	0	8	6	0	408
01:30 PM	0	91	84	68	4	25	10	78	4	4	1	0	369
01:45 PM	2	83	82	63	2	26	20	87	1	1	2	0	369
Total	5	361	336	308	16	96	71	304	10	19	11	1	1538
02:00 PM	3	69	67	64	3	22	19	65	3	3	1	0	319
02:15 PM	0	81	52	69	1	38	25	62	8	3	2	0	341
02:30 PM	0	79	81	79	3	33	30	79	4	6	3	0	397
02:45 PM	0	115	75	72	5	31	45	89	3	8	4	0	447
Total	3	344	275	284	12	124	119	295	18	20	10	0	1504
03:00 PM	2	108	82	83	2	38	30	90	3	5	2	1	446
03:15 PM	0	94	80	90	5	37	36	105	1	4	3	0	455
03:30 PM	1	69	80	91	6	30	26	115	2	15	4	0	439
03:45 PM	1	109	94	100	5	20	23	94	4	7	3	0	460
Total	4	380	336	364	18	125	115	404	10	31	12	1	1800
04:00 PM	0	106	90	106	5	29	39	88	7	8	4	0	482
04:15 PM	2	90	91	97	4	37	48	96	2	2	1	0	470
04:30 PM	1	88	86	90	7	21	20	95	6	7	3	1	425
04:45 PM	1	108	89	118	3	26	36	93	0	4	4	0	482
Total	4	392	356	411	19	113	143	372	15	21	12	1	1859
05:00 PM	0	89	124	94	4	21	21	86	0	7	4	0	450
05:15 PM	1	95	97	109	2	30	16	89	3	5	2	0	449
05:30 PM	0	86	129	111	6	14	37	83	4	9	3	0	482
05:45 PM	0	96	115	92	4	34	26	77	2	6	4	0	456
Total	1	366	465	406	16	99	100	335	9	27	13	0	1837
Grand Total	23	2169	2006	2126	106	676	596	2020	71	134	61	7	9995
Apprch %	0.5	51.7	47.8	73.1	3.6	23.2	22.2	75.2	2.6	66.3	30.2	3.5	
Total %	0.2	21.7	20.1	21.3	1.1	6.8	6	20.2	0.7	1.3	0.6	0.1	

	Massachusetts Ave (Route 2A/4/225) From North				Massachusetts Ave From South				Pleasant Street (Route 4/225) From West				Follen Road From Northwest				
Start Time	Hard Right	Right	Thru	App. Total	Thru	Bear Left	Left	App. Total	Right	Left	Hard Left	App. Total	Hard Right	Bear Right	Hard Left	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	**1**	**108**	89	198	**118**	3	26	**147**	36	**93**	0	**129**	4	**4**	0	8	**482**
05:00 PM	0	89	124	213	94	4	21	119	21	86	0	107	7	4	0	11	450
05:15 PM	1	95	97	193	109	2	**30**	141	16	89	3	108	5	2	0	7	449
05:30 PM	0	86	**129**	**215**	111	**6**	14	131	**37**	83	**4**	124	**9**	3	0	**12**	482
Total Volume	2	378	439	819	432	15	91	538	110	351	7	468	25	13	0	38	1863
% App. Total	0.2	46.2	53.6		80.3	2.8	16.9		23.5	75	1.5		65.8	34.2	0		
PHF	.500	.875	.851	.952	.915	.625	.758	.915	.743	.944	.438	.907	.694	.813	.000	.792	.966

PRECISION
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NW/W: Follen Rd/ Pleasant St (Rt 4/225)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 CC
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Heavy Vehicles

	Massachusetts Ave (Route 2A/4/225) From North			Massachusetts Ave From South			Pleasant Street (Route 4/225) From West			Follen Road From Northwest			
Start Time	Hard Right	Right	Thru	Thru	Bear Left	Left	Right	Left	Hard Left	Hard Right	Bear Right	Hard Left	Int. Total
12:00 PM	1	2	7	5	2	2	1	3	0	2	0	1	26
12:15 PM	0	3	6	10	0	1	0	2	1	0	0	0	23
12:30 PM	0	5	6	5	1	1	0	3	1	0	0	0	22
12:45 PM	0	5	4	7	0	3	3	7	1	0	0	0	30
Total	1	15	23	27	3	7	4	15	3	2	0	1	101
01:00 PM	0	6	4	4	1	4	2	1	0	0	0	0	22
01:15 PM	0	3	4	2	0	2	0	0	0	0	0	0	11
01:30 PM	0	5	6	10	0	1	2	3	0	0	0	0	27
01:45 PM	0	4	1	3	0	2	2	5	0	0	0	0	17
Total	0	18	15	19	1	9	6	9	0	0	0	0	77
02:00 PM	0	8	2	5	0	1	1	1	1	1	0	0	20
02:15 PM	0	1	2	5	0	1	0	6	1	0	0	0	16
02:30 PM	0	3	4	3	1	0	5	2	0	0	0	0	18
02:45 PM	0	4	3	3	0	1	1	1	0	0	0	0	13
Total	0	16	11	16	1	3	7	10	2	1	0	0	67
03:00 PM	0	3	3	4	0	5	4	3	1	0	0	0	23
03:15 PM	0	3	4	4	0	1	0	0	1	0	0	0	13
03:30 PM	0	2	3	0	0	2	1	5	0	0	0	0	13
03:45 PM	0	2	0	4	0	3	3	4	0	0	0	0	16
Total	0	10	10	12	0	11	8	12	2	0	0	0	65
04:00 PM	0	3	4	3	0	2	1	1	0	0	0	0	14
04:15 PM	0	1	2	0	0	0	0	3	0	0	0	0	6
04:30 PM	0	7	2	3	0	0	0	0	0	0	0	0	12
04:45 PM	1	3	3	1	1	1	1	1	0	0	0	0	12
Total	1	14	11	7	1	3	2	5	0	0	0	0	44
05:00 PM	0	0	3	3	0	2	0	2	1	0	0	0	11
05:15 PM	0	2	3	2	0	0	2	1	0	0	0	0	10
05:30 PM	0	3	2	3	0	0	0	1	0	0	0	0	9
05:45 PM	0	0	1	1	0	0	0	2	0	0	0	0	4
Total	0	5	9	9	0	2	2	6	1	0	0	0	34
Grand Total	2	78	79	90	6	35	29	57	8	3	0	1	388
Apprch %	1.3	49.1	49.7	68.7	4.6	26.7	30.9	60.6	8.5	75	0	25	
Total %	0.5	20.1	20.4	23.2	1.5	9	7.5	14.7	2.1	0.8	0	0.3	

	Massachusetts Ave (Route 2A/4/225) From North				Massachusetts Ave From South				Pleasant Street (Route 4/225) From West				Follen Road From Northwest				
Start Time	Hard Right	Right	Thru	App. Total	Thru	Bear Left	Left	App. Total	Right	Left	Hard Left	App. Total	Hard Right	Bear Right	Hard Left	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 12:00 PM																	
12:00 PM	**1**	2	**7**	10	5	**2**	2	9	1	3	0	4	**2**	0	**1**	**3**	26
12:15 PM	0	3	6	9	**10**	0	1	**11**	0	2	**1**	3	0	0	0	0	23
12:30 PM	0	**5**	6	**11**	5	1	1	7	0	3	1	4	0	0	0	0	22
12:45 PM	0	5	4	9	7	0	**3**	10	**3**	**7**	1	**11**	0	0	0	0	**30**
Total Volume	1	15	23	39	27	3	7	37	4	15	3	22	2	0	1	3	101
% App. Total	2.6	38.5	59		73	8.1	18.9		18.2	68.2	13.6		66.7	0	33.3		
PHF	.250	.750	.821	.886	.675	.375	.583	.841	.333	.536	.750	.500	.250	.000	.250	.250	.842

PRECISION
D A T A
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N/S: Massachusetts Avenue (Route 4/225)
NW/W: Follen Rd/ Pleasant St (Rt 4/225)
City, State: Lexington, MA
Client: BSC Group/ J. Lunsford

File Name : 112612 CC
Site Code : 28280.00
Start Date : 9/15/2011
Page No : 1

Groups Printed- Peds and Bicycles

	Massachusetts Ave (Route 2A/4/225) From North				Massachusetts Ave From South				Pleasant Street (Route 4/225) From West				Follen Road From Northwest				
Start Time	Hard Right	Right	Thru	Peds	Thru	Bear Left	Left	Peds	Right	Left	Hard Left	Peds	Hard Right	Bear Right	Hard Left	Peds	Int. Total
12:00 PM	0	0	1	9	0	0	0	0	0	2	0	2	0	0	0	2	16
12:15 PM	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	3
12:30 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
12:45 PM	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	1	4
Total	0	1	4	9	1	0	0	0	0	4	0	2	0	0	0	3	24
01:00 PM	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	3
01:15 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
01:30 PM	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
01:45 PM	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	3
Total	0	0	2	0	3	0	0	1	1	0	0	0	0	0	0	1	8
02:00 PM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	3
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	4
02:30 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	3
02:45 PM	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	1	4
Total	0	1	2	0	1	0	2	1	0	0	0	2	0	0	0	5	14
03:00 PM	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	3	6
03:15 PM	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	3	4
03:30 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	3	5
03:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	2
Total	0	0	1	0	2	0	0	2	0	2	0	0	0	0	0	10	17
04:00 PM	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	3
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	3
Total	0	0	2	0	1	0	0	2	0	0	0	0	0	0	0	2	7
05:00 PM	0	0	0	1	1	0	0	0	1	0	0	1	0	0	0	6	10
05:15 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	7	8
05:30 PM	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	1	5
05:45 PM	0	0	1	0	2	0	0	0	1	1	0	0	0	0	0	0	5
Total	0	1	2	4	3	0	0	0	2	1	0	1	0	0	0	14	28
Grand Total	0	3	13	13	11	0	2	6	3	7	0	5	0	0	0	35	98
Apprch %	0	10.3	44.8	44.8	57.9	0	10.5	31.6	20	46.7	0	33.3	0	0	0	100	
Total %	0	3.1	13.3	13.3	11.2	0	2	6.1	3.1	7.1	0	5.1	0	0	0	35.7	

	Massachusetts Ave (Route 2A/4/225) From North					Massachusetts Ave From South					Pleasant Street (Route 4/225) From West					Follen Road From Northwest					
Start Time	Hard Right	Right	Thru	Peds	App. Total	Thru	Bear Left	Left	Peds	App. Total	Right	Left	Hard Left	Peds	App. Total	Hard Right	Bear Right	Hard Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 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	1	1	1	0	0	0	1	**1**	0	0	**1**	**2**	0	0	0	6	6	**10**
05:15 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**7**	**7**	8
05:30 PM	0	**1**	**1**	**2**	**4**	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	5
05:45 PM	0	0	1	0	1	**2**	0	0	0	**2**	1	**1**	0	0	2	0	0	0	0	0	5
Total Volume	0	1	2	4	7	3	0	0	0	3	2	1	0	1	4	0	0	0	14	14	28
% App. Total	0	14.3	28.6	57.1		100	0	0	0		50	25	0	25		0	0	0	100		
PHF	.000	.250	.500	.500	.438	.375	.000	.000	.000	.375	.500	.250	.000	.250	.500	.000	.000	.000	.500	.500	.700

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N/S: Massachusetts Avenue (Route 4/225)
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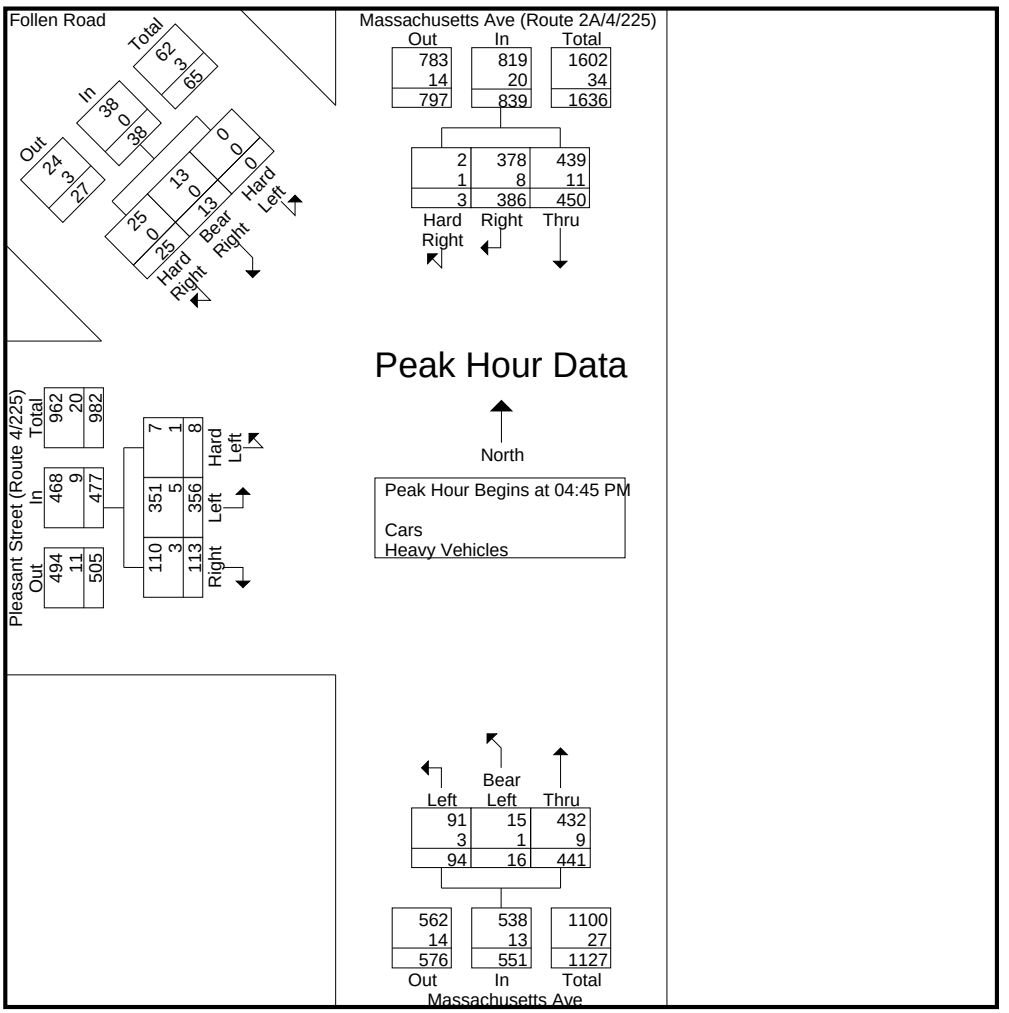
	Massachusetts Ave (Route 2A/4/225) From North				Massachusetts Ave From South				Pleasant Street (Route 4/225) From West				Follen Road From Northwest				
Start Time	Hard Right	Right	Thru	App. Total	Thru	Bear Left	Left	App. Total	Right	Left	Hard Left	App. Total	Hard Right	Bear Right	Hard Left	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	**2**	**111**	92	205	**119**	4	27	**150**	**37**	**94**	0	**131**	4	**4**	0	8	**494**
05:00 PM	0	89	127	216	97	4	23	124	21	88	1	110	7	4	0	11	461
05:15 PM	1	97	100	198	111	2	**30**	143	18	90	3	111	5	2	0	7	459
05:30 PM	0	89	**131**	**220**	114	**6**	14	134	37	84	**4**	125	**9**	3	0	**12**	491
Total Volume	3	386	450	839	441	16	94	551	113	356	8	477	25	13	0	38	1905
% App. Total	0.4	46	53.6		80	2.9	17.1		23.7	74.6	1.7		65.8	34.2	0		
PHF	.375	.869	.859	.953	.926	.667	.783	.918	.764	.947	.500	.910	.694	.813	.000	.792	.964
Cars	2	378	439	819	432	15	91	538	110	351	7	468	25	13	0	38	1863
% Cars	66.7	97.9	97.6	97.6	98.0	93.8	96.8	97.6	97.3	98.6	87.5	98.1	100	100	0	100	97.8
Heavy Vehicles	1	8	11	20	9	1	3	13	3	5	1	9	0	0	0	0	42
% Heavy Vehicles	33.3	2.1	2.4	2.4	2.0	6.3	3.2	2.4	2.7	1.4	12.5	1.9	0	0	0	0	2.2



Appendix B: Road Safety Audit

ROAD SAFETY AUDIT

Massachusetts Avenue at Maple Street

Town of Lexington

May 17, 2012

Prepared For:
MassDOT Highway Division

Prepared By:
BETA Group, Inc.

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Project Data

A Road Safety Audit for the intersection of Massachusetts Avenue and Maple Street was held on April 17, 2012 at the Town Hall in Lexington, MA. As indicated in Table 1, the audit team consisted of representatives from State, Regional and Local agencies and included a cross-section of engineering, planning and emergency response expertise.

Table 1. Participating Audit Team Members

Audit Team Member	Agency/Affiliation
Lisa Schletzbaum	MassDOT Highway Division – Safety Section
John Livsey	Town of Lexington – Town Engineer
John Fleck	Town of Lexington – Fire
Marc Valenti	Town of Lexington – Highway Superintendent
Bill Hadley	Town of Lexington – Director of Public Works
Aaron Henry	Town of Lexington – Planning
John Mazerall	Town of Lexington – Police
Chen-Yuan Wang	CTPS (Boston Region MPO)
Sara Timoner	MassDOT Highway Division – District 4 Traffic
Constance Raphael	MassDOT Highway Division – District 4
Dominic Caiazzo	MassDOT Highway Division – Safety Section
Douglas Halpert	MassDOT Highway Division – Safety Section
Greg Lucas	BETA Group, Inc.
Jaklyn Centracchio	BETA Group, Inc.

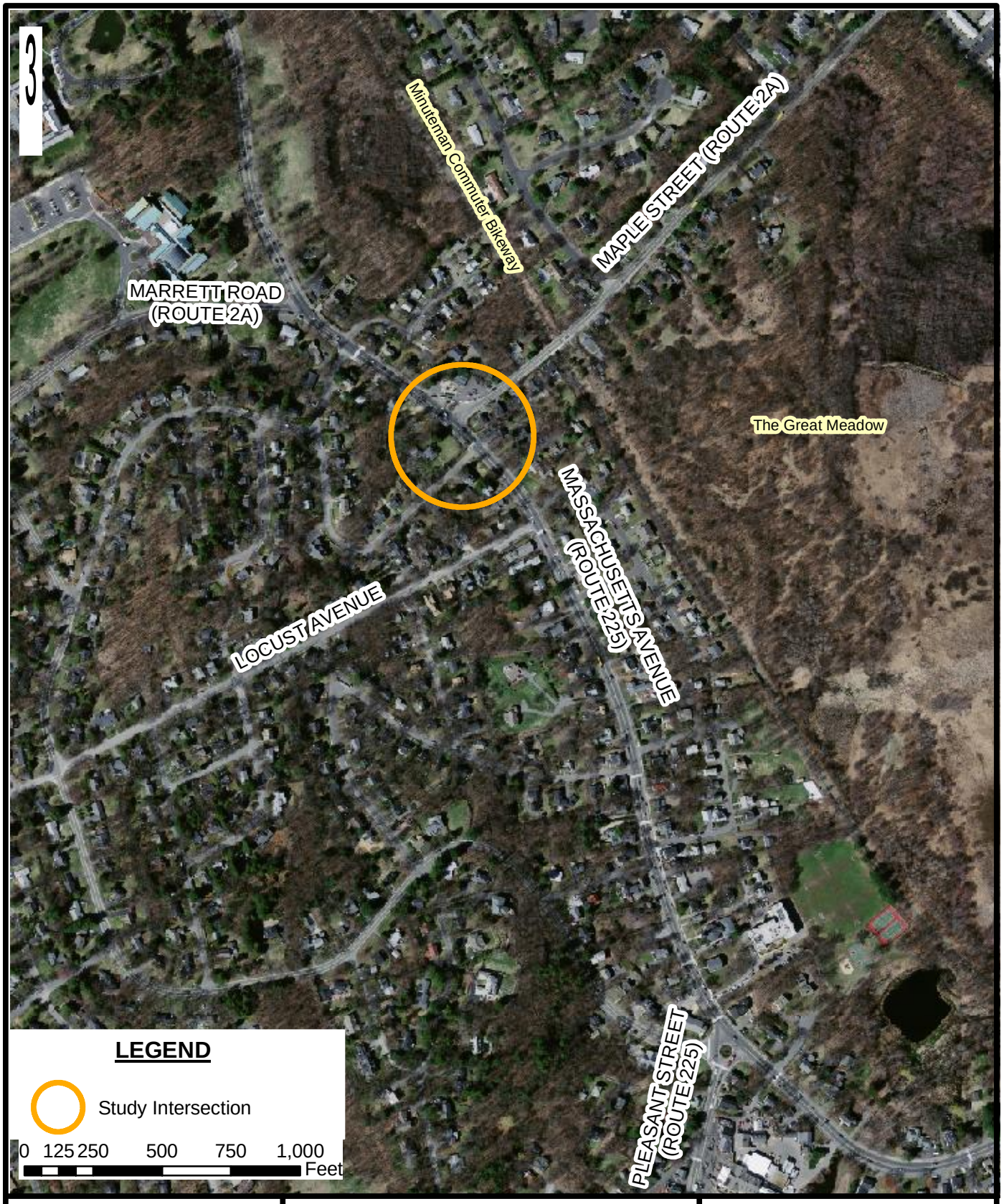
Background

The Federal Highway Administration defines a Road Safety Audit (RSA) as *the formal safety examination* of an existing or future road or intersection by an *independent, multidisciplinary team*. The purpose of an RSA is to *identify potential safety issues and possible opportunities for safety improvements* considering all roadway users. A Road Safety Audit was scheduled for the intersection of Massachusetts Avenue and Maple Street as required by MassDOT Highway Safety Improvement Program (HSIP) guidelines. A Private design consultant is under contract with the Town of Lexington to design roadway improvements for Massachusetts Avenue from Marrett Road to Pleasant Street. The intersection of Massachusetts Avenue and Maple Street has been identified as a high crash location in the Boston Region MPO and would be eligible for Federal Highway Safety Improvement Program (HSIP) funds for construction, provided that the proposed improvements enhance safety. The RSA is intended to identify both short and long term safety improvements that can be made at the subject intersection prior to the proposed project and/or incorporated into the proposed project.

Project Description

Massachusetts Avenue at Maple Street

The intersection of Massachusetts Avenue and Maple Street, shown in Figure 1, is located in the eastern part of Lexington. Massachusetts Avenue is functionally classified as an Urban Principal Arterial, while Maple Street is classified as an Urban Minor Arterial. Both roadways are under Town of Lexington jurisdiction in the vicinity of the intersection, although Maple Street is state-owned further north of the intersection. The intersection carries three state-numbered routes: Routes 4 and 225 follow Massachusetts Avenue through the intersection, while Route 2A joins Massachusetts Avenue from its intersection with Marrett Road approximately 600 feet to the northwest, then departs Massachusetts Avenue via Maple Street northward. The intersection serves several important regional connections; Massachusetts Avenue connects Lexington Center to Arlington, Cambridge and Boston to the southeast; while Maple Street carries traffic from residential areas of Lexington and Winchester to MA Route 2 and I-95/Route 128. Vehicles follow Maple Street to Massachusetts Avenue and then to Pleasant Street approximately ½ mile southeast of Maple Street to access Route 2, while vehicles bound for I-95/Route 128 may follow the same route and follow Route 2 west, or follow Massachusetts Avenue to Marrett Road to its interchange with I-95. The Minuteman Bikeway, an 11-mile bicycle trail through Bedford, Lexington, Arlington and Cambridge, runs essentially parallel to Massachusetts Avenue and has access to Maple Street from an underpass approximately 400 feet north of the study intersection. It was noted that despite the proximity of the Bikeway, there is a significant amount of bicycle traffic in both directions on Massachusetts Avenue through the intersection.



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Massachusetts Avenue at Maple Street

ROAD SAFETY AUDIT

LEXINGTON, MA

Figure 1

Location Map

Massachusetts Avenue and Maple Street form a 3-way T-type intersection with a circular island separating the approach and departure lanes of the Maple Street leg. No traffic control devices are provided at the intersection. Massachusetts Avenue runs generally northwest-southeast through the intersection but is generally an east-west route through the region; for clarity purposes, this report will refer to it as an east-west route. Massachusetts Avenue eastbound provides two narrow lanes, a left turn lane and a through lane, while Massachusetts Avenue westbound provides a single general purpose lane. Maple Street has a wide departure lane on the south side of the circular median and separate left and right turn approach lanes on the north side of the median, with the left and right turn lanes separated by a painted gore area. Maple Street widens from a typical width of approximately 28 feet north of the intersection to approximately 200 feet at the gutter line to Massachusetts Avenue; the end result is a wide expanse of pavement that allows turning movements from a wide range of entry points and at great variances in vehicle speed. This wide expanse of pavement also proves challenging for pedestrians and bicyclists attempting to cross Maple Street to continue along Massachusetts Avenue.

Sidewalks are provided along both sides of Massachusetts Avenue and along the east side of Maple Street in the vicinity of the intersection. No crosswalks are provided at the intersection, although crosswalks are provided across Massachusetts Avenue at its intersection with Plainfield Street approximately 80 feet east of Maple Street, and at its intersection with Tower Road approximately 300 feet west of Maple Street. Both crosswalks are at the location of MBTA bus stops for Routes 62 and 76, which follow Massachusetts Avenue through Lexington.

Land use in the area is primarily residential, with the exception of an automotive service center on the northeast corner of the intersection. It was noted that a recent request for a change in zoning for the service center property was denied by the Town.

Crash data were provided by the Lexington Police Department and summarized by MassDOT. There were a total of eighteen reported and police documented crashes at the intersection within the period from January 2008 to December 2011. Crashes documented by operators only were not reviewed. During the three year period from 2007 to 2009, there were 29 police and operator reported crashes located to the study intersection. The crash summary shows that thirteen of the eighteen crashes (72%) were angle crashes. Eight of the thirteen angle crashes involved a vehicle turning left from Maple Street to Massachusetts Avenue eastbound, with five colliding with an eastbound vehicle and three colliding with a westbound vehicle. Two crashes involved a bicycle traveling west on Massachusetts Avenue, one involving a vehicle turning left onto Maple Street and the other involving a vehicle departing Maple Street. The right lane from Maple Street to Massachusetts Avenue westbound experienced four crashes – two angle crashes involving a turning vehicle and a through vehicle, and two rear-end crashes between vehicles waiting to merge onto Massachusetts Avenue. Rear-end crashes with this type of geometry typically occur when two drivers are both looking to the left for an available gap, and the following driver assumes the lead driver will go and accelerates before the lead driver has accelerated. An additional rear-end crash included in the intersection summary occurred at the crosswalk crossing Massachusetts Avenue at Plainfield Street. Crash data summaries and a collision diagram are included in the Appendix.

Speed regulations maintained by MassDOT Highway Division establish a 30 MPH speed limit for Massachusetts Avenue from Maple Street to Marrett Road, and a 35 MPH speed limit for Massachusetts Avenue southeast of Maple Street. Complete speed regulations for Massachusetts Avenue in Lexington are included in the Appendix.

Audit Observations

Following a brief introduction to the RSA process and a summary of existing geometry, crash and speed regulation information, audit participants were asked to discuss safety issues at the intersection of Massachusetts Avenue and Maple Street. Audit participants then conducted a site visit as a group, at which time they offered observations on safety concerns and deficiencies. A summary of those major safety considerations is as follows:

- Lack of Traffic Control – No traffic control devices are provided at the intersection. The left turn from Maple Street generally operates as a STOP-controlled approach, although neither a STOP sign or a painted STOP bar are provided. The right turn from Maple Street to Massachusetts Avenue westbound generally operates as a yield, but the lack of yield sign or yield markings may give vehicles on Maple Street the false sense that they have the right of way. A number of crashes at the intersection may be attributed to the lack of traffic control, especially the four crashes related to the right turn lane from Maple Street.

- Excessive Delay–Audit participants familiar with the intersection operation stated that traffic congestion is a significant issue during peak periods. It was noted that long queues develop on Maple Street and that driver aggression and frustration may be a contributing factor to the crash history of the intersection. It was noted that the nearby intersection of Massachusetts Avenue and Pleasant Street has similar characteristics and may contribute to the level of driver frustration.

- Narrow Lane Widths – The two-lane section of Massachusetts Avenue eastbound approaching the intersection provides narrow lanes for turning vehicles and for through vehicles. Although lane widths were not measured on the day of the audit, they appear to be 10-feet or less in width. This may be a factor in the sideswipe crash in this area, which involved vehicles traveling in the opposite direction. It was noted that the left turn lane was added approximately five years ago to increase capacity, but that the modification was completed by restriping the roadway without widening.

- Pedestrian Accommodations – A number of safety issues related to pedestrian accommodations were discussed during the audit.

    - No crosswalks are provided across Massachusetts Avenue or Maple Street at the intersection. Pedestrians are accommodated at crosswalks adjacent to MBTA bus stops both east and west of the intersection on Massachusetts Avenue, although this does not address pedestrians needing to cross Maple Street in order to follow Massachusetts Avenue on its north side.

- The excessive width of Maple Street provides a challenge for pedestrians and bicyclists, who must cross both a wide departure lane with vehicles turning from a wide range of entry points and at a great variance in speeds, and a wide approach area with two separate turning lanes and a wide, unprotected painted gore area. This may be a factor in the two bicycle crashes that occurred at the intersection.

- Handicap ramps are not provided at the crosswalk at Plainfield Street. It should be noted that handicap ramps are provided at the crosswalk crossing Massachusetts Avenue west of Maple Street at Tower Road.

- Pedestrian warning signs are not provided for the crosswalks crossing Massachusetts Avenue at Plainfield Street and at Tower Road. This may be a factor in the rear-end crash at the Plainfield Street crosswalk.

- Visibility – A number of safety issues related to visibility for turning vehicles were discussed at the audit.

  - The marked left turn lane from Massachusetts Avenue eastbound to Maple Street is approximately 150 feet in length, but ends at a point adjacent to the southern edge of the painted gore on the Maple Street approach in order to avoid conflicts between vehicles turning left from Massachusetts Avenue and vehicles turning left from Maple Street. A vehicle turning left from Massachusetts Avenue must travel approximately two to three car lengths beyond the end of the turn lane before making the turn onto Maple Street, and vehicle queues often start at the point where vehicles turn from, not the point where the turn lane ends. As a result, left turn queues from Massachusetts Avenue block left turns from Maple Street. In instances where vehicles in queue leave gaps for vehicles from Maple Street, the cars in queue present visibility constraints for turning vehicles. The blockage of turning movements and constrained visibility are likely a factor in the angle crashes involving left turning vehicles.

  - A utility pole and signs located in the circular median constrain visibility of westbound traffic for vehicles turning left from Maple Street.

  - A utility pole and hedges on the southeast corner of the intersection restrict potential visibility of pedestrians on the sidewalk for vehicles turning right from Massachusetts Avenue westbound to Maple Street.

- Signage – In addition to the visibility issues noted above related to signage in the median, it should be noted that the object marker sign in the median violates MassDOT guidelines and should be removed. The Massachusetts amendments to the Manual on Uniform Traffic Control Devices (MUTCD) state that an H1-2 warning cluster panel should be used in place of MUTCD standard object markers, and that H1-2 panels shall be used only where traffic can pass on both sides (immediately to the right or left side) of a gore, island, or other obstruction. The H1-2 object marker on this island is visible to eastbound vehicles on Massachusetts Avenue, who can only pass to the right side of the island when turning to Maple Street.

- Bicycle Accommodation – As previously noted, the excessive width of the Maple Street approach to Massachusetts Avenue presents a challenge to bicycles traveling along the north side of Massachusetts Avenue. It was also noted that while shared lane use is permitted along Massachusetts Avenue, lane and shoulder widths do not meet state guidelines for bicycle accommodation. This may be a contributing factor to the two bicycle crashes at the intersection.

- Speeding – Speed was noted as a concern, both for through traffic along Massachusetts Avenue and for turning traffic. The wide departure lane for Maple Street allows vehicles to navigate both left and right turns from Massachusetts Avenue at a high rate of speed.

- Service station – The automotive service station on the northeast corner of the intersection has three curb cuts along the Maple Street right turn lane. It was noted that vehicles exiting the service station to go east on Massachusetts Avenue cross the painted median separating the left and right turn lanes from Maple Street, which can create conflicts and additional visibility constraints for both left and right turning vehicles. Vehicles leaving the service station to go north on Maple Street must cross the wide approach lane, and may not be able to see cars approaching from the north on Maple Street or turning from Massachusetts Avenue. Finally, it was noted that vehicles parked on the northwest corner of the property are parked such that they must back out into the right turn lane from Maple Street to exit the parking space. Town personnel noted that the vehicle typically parked in this spot, including on the day of the audit, belongs to the owner of the service station.

- Emergency Signal – Although outside the limits of the intersection and beyond the limits of the reconstruction project along Massachusetts Avenue from Marrett Road to Pleasant Street, safety issues related to the existing emergency signal at the East Lexington fire station approximately 2.5 miles to the east were discussed during the audit. It was noted that the existing signals are post-

mounted with 8" heads, which provides reduced visibility when compared to standard 12" heads mounted overhead. It was noted that vehicles frequently run the red signal, especially during times when the signal is active but a fire vehicle is not leaving the station with lights flashing, such as when the vehicle backs in upon its return to the station.

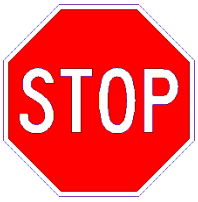
Potential Safety Enhancements

After the site visit, audit participants returned to the meeting location to discuss the safety issues and consider improvements. Audit participants were encouraged to consider both short and long term improvements for each issue. Each improvement considered has been categorized as short-term, mid-term, or long-term based on the definitions shown in Table 2. Additionally, a cost category has been assigned to each improvement based on the parameters set forth in Table 2.

Table 2. Estimated Time Frame and Costs Breakdown

Time Frame		Costs	
Short-term	<1 year	Low	<$10,000
Mid-term	1–3 years	Medium	$10,000–$50,000
Long-term	>3 years	High	>$50,000

The following improvements were suggested by audit participants to improve safety issues associated with the intersection of Massachusetts Avenue and Maple Street.



- Install STOP and Yield signs for the Maple Street approach. The left turn from Maple Street to Massachusetts Avenue generally operates under STOP control, and should have a STOP sign installed. A Yield sign should be installed for the right turn lane from Maple Street to Massachusetts Avenue westbound. This is a low cost improvement that should be implemented immediately in advance of long-term improvements at the intersection.

- Improve control by considering a traffic signal or roundabout. It was noted that the planned reconstruction project from Maple Street to Pleasant Street is currently at the 25% design stage and is considering concepts for improvements to both the Maple Street and Pleasant Street intersections. The design should consider traffic signal installation along with geometric improvements discussed in detail below. It was noted that the proposed reconstruction project may also consider a roundabout for the intersection of Massachusetts Avenue and Maple Street. A roundabout would address visibility issues at the intersection, but may present challenges to pedestrians when compared to a traffic signal because of the lack of a protected crossing. In some cases, a roundabout design improves safety when compared to a signal. It was noted that construction of a roundabout may require property acquisition on the northeast corner of the intersection. The design should follow established state guidelines for roundabouts by providing proper deflection for the entering roadways. This is a long-term, high cost improvement, regardless of the reconstruction strategy considered. If a traffic signal is constructed, it should include emergency preemption equipment.

- Widen Massachusetts Avenue between Marrett Road and Maple Street. The short segment of Massachusetts Avenue between these two roadways includes the two lane approach section at Maple Street. This segment should be widened to provide lane and shoulder widths meeting state guidelines. This long-term, high cost improvement can be incorporated into traffic signal improvements at the intersection, but may not be required if a roundabout is constructed.

- Reduce width of the Maple Street approach. The excessive width creates a number of potential safety issues documented in this report. A significant reduction in width can be achieved while still maintaining adequate turning radii and lane widths to allow all existing turning movements. A beneficial side effect is the creation of additional green space at the intersection. This is a long-term, high cost improvement that can be incorporated into other improvements proposed at the intersection.

- Provide "Share The Road" signage along Massachusetts Avenue. It was noted that despite the proximity of the Minuteman Bikeway, a significant number of cyclists choose to ride along Massachusetts Avenue through the study intersection. It was suggested that drivers should be alerted to the presence of these cyclists by installation of "Share The Road" signs. This is a short-term, low cost improvement.

- Provide W11-2 pedestrian warning signs for the existing crosswalks at Plainfield Street and Tower Road. It was noted that the Town has installed yellow-green fluorescent pedestrian warning signs with a W16-7p arrow panel at a number of crosswalks town-wide. Similar signs should be installed at these two crosswalks to increase awareness of the potential for pedestrians to be in the roadway. This is a short-term, low cost improvement.

- Install handicap ramps for the crosswalk at Plainfield Street. This is a short-term, medium cost improvement that can be incorporated into proposed improvements along the corridor.

- Determine long-term strategies for pedestrian access. Some audit participants suggested that intersection improvements at the Maple Street intersection should include pedestrian crosswalks across Massachusetts Avenue, while others suggested that pedestrian crossings of Massachusetts Avenue continue to be accommodated via the existing crossings at Plainfield Street and Tower Road. The proposed reconstruction project should consider the location of existing and proposed crosswalks based on pedestrian desire lines and existing pedestrian counts, as well as the location of bus stops. This is a mid-term, potentially high cost improvement.

- Relocate utility pole located within the existing circular island on Maple Street. The utility pole creates visibility constraints for vehicles waiting to turn left onto Massachusetts Avenue. This utility pole should be relocated as part of any improvements considered for the intersection. This is a potentially short-term, low cost improvement that will be incorporated into other long-term improvements.

- Remove H1-2 object marker from the circular island. This sign is not in compliance with the Massachusetts amendments to the MUTCD and should be removed. This is a short-term, low cost improvement.

- Widen Massachusetts Avenue to provide bicycle accommodation. In addition to the specific intersection improvements aimed at improving bicycle access, overall corridor improvements should include lane and shoulder widths meeting state standards for bicycle accommodation. This is a long-term, high cost improvement.

- Enforce speed at and in the vicinity of the intersection. Police enforcement carries no additional cost, but will result in decreased enforcement elsewhere in the Town. It was also noted that installation of a roundabout would likely decrease speeds along Massachusetts Avenue.

- Trim hedges along the southeast corner. Vegetation along the back of sidewalk currently presents a potential sight distance obstruction. Geometric improvements may reduce or eliminate the need to trim these hedges. This is a short term, low cost improvement.

- Consider restricting left turns from the center service station driveway. The service station has three separate curb cuts along Maple Street that directly abut the right turn lane from Maple Street to Massachusetts Avenue. Vehicles exiting the center driveway must turn across the wide Maple Street approach or across the painted gore area separating the left and right turn lanes, presenting additional conflict points with turning vehicles. It was suggested that restricting this center driveway as a right in/right out driveway would eliminate these potential conflicts. This is a short-term, low cost improvement.

- Install overhead signal heads with 12” LED lenses for the East Lexington fire station on Massachusetts Avenue. Although not located within the audit study area, the audit team discussed improvement strategies related to the existing emergency signal at the East Lexington fire station. Mast arms supporting overhead signal heads with 12” LED lenses should be installed at this location to increase visibility of the signal for approaching vehicles. This is a long-term, high cost improvement. Existing ground-mounted heads could be replaced with new heads with 12” LED lenses as an interim short-term measure.

Summary of Road Safety Audit

Table 3 summarizes potential recommendations discussed by the audit team. The recommendations are categorized based on the potential safety payoff, as well as by time frame and cost. The safety payoff is a qualitative judgment of the effectiveness of the potential safety improvements. Each recommendation has a responsibility assigned to it stating whether MassDOT or the Town of Lexington would be responsible for implementing the recommended improvement. "Project" refers to improvements that are assumed to be included or could reasonably be accommodated as part of proposed improvements at the intersection. Costs provided for "Project" improvements are an order of magnitude estimate which estimates the cost of the improvement if completed independent of the project.

Table 3. Potential Safety Enhancement Summary

Safety Issue	Safety Enhancement	Responsibility	Safety Payoff	Time Frame	Cost
Lack of Traffic Control	Install STOP and Yield signs for the Maple Street approach.	Town	High	Short-term	$1,000
Lack of Traffic Control, Excessive Delay, Pedestrian Accommodations, Visibility, Speeding	Improve control by considering installation of a traffic signal or roundabout. If a traffic signal is installed, it should include emergency preemption.	Project	High	Long-term	TBD
Narrow Lane Widths, Bicycle Accommodation	Widen Massachusetts Avenue between Marrett Road and Maple Street. This improvement is intended to specifically address the narrow lane widths of the existing two lane approach at Maple Street.	Town	Medium	Long-term	$200,000
Pedestrian Accommodations, Visibility, Speeding	Reduce width of the Maple Street approach.	Project	High	Long-term	TBD
Bicycle Accommodations	Provide “Share The Road” signage along Massachusetts Avenue.	Town	Medium	Short-term	$2,000
Pedestrian Accommodations	Provide W11-2 pedestrian warning signs with W16-7p arrow panels for the existing crosswalks at Plainfield Street and Tower Road.	Town	Medium	Short-term	$3,000
Pedestrian Accommodations	Install handicap ramps for the crosswalk at Plainfield Street.	Town	Low	Short-term	$10,000
Pedestrian Accommodations	Determine long-term strategies for pedestrian access. This improvement includes conducting pedestrian counts and studying pedestrian travel patterns.	Town/Project	Medium	Mid-term	TBD
Visibility	Relocate utility pole located within the existing circular island on Maple Street. (This improvement will be incorporated into other geometric improvements at the intersection.)	Town/Project	Medium	Long-term	*
Signage	Remove H1-2 object marker from the circular island.	Town	Low	Short-term	$500
Bicycle Accommodation	Widen Massachusetts Avenue to provide bicycle accommodation.	Project	Medium	Long-term	TBD

Table 3. Potential Safety Enhancement Summary

Safety Issue	Safety Enhancement	Responsibility	Safety Payoff	Time Frame	Cost
Speeding	Enforce speed at and in the vicinity of the intersection.	Town	Medium	Short-term	$0 (Reduced enforcement elsewhere)
Visibility	Trim hedges along the southeast corner of the intersection.	Town	Medium	Short-term	$500
Service Station	Consider restricting left turns from the center service station driveway.	Town	Medium	Short-term	$1,000
Emergency Signal	Install overhead signal heads with 12” LED lenses for the East Lexington fire station.	Town	High	Long-term	$50,000 **
Emergency Signal	Replace ground-mounted signal heads with new heads with 12” LED lenses.	Town	Medium	Short-term	$5,000 **

* Improvements to be incorporated into the proposed project are assumed to be included as part of the overall project cost.

** These safety issues and improvements were discussed at the audit, but are outside of the limits of the proposed reconstruction project.

Appendix A. RSA Meeting Agenda

Agenda

Road Safety Audit

Lexington

Massachusetts Avenue at Maple Street

Meeting Location: Samuel Hadley Public Services Building, 201 Bedford Street, 2nd floor conference room**, Lexington, MA**
Tuesday, April 17, 2012
10:00 AM – 12:00 noon

Type of meeting:	**High Crash Location – Road Safety Audit**
Attendees:	**Invited Participants to Comprise a Multidisciplinary Team**
Please bring:	**Thoughts and Enthusiasm!!**
10:00 AM	**Welcome and Introductions**
10:15 AM	**Discussion of Safety Issues** • Crash history, Speed Regulations – provided in advance • Existing Geometries and Conditions
11:00 AM	**Site Visit** • Drive to the intersection of Mass. Ave at Maple St • As a group, identify areas for improvement
11:30 AM	**Discussion of Potential Improvements** • Discuss observations and finalize safety issue areas • Discuss potential improvements and finalize recommendations
12:00 noon	**Adjourn for the Day – but the RSA has not ended**

Instructions for Participants:

- **Before attending the RSA on April 17th, participants are encouraged to drive/walk through the intersection and complete/consider elements on the RSA Prompt List with a focus on safety.**
- **All participants will be actively involved in the process throughout. Participants are encouraged to come with thoughts and ideas, but are reminded that the synergy that develops and respect for others' opinions are key elements to the success of the overall RSA process.**
- **After the RSA meeting, participants will be asked to comment and respond to the document materials to assure it is reflective of the RSA completed by the multidisciplinary team.**

Appendix B. RSA Audit Team Contact List

Participating Audit Team Members

Date: April 17, 2012 Location: Lexington – Massachusetts Avenue at Maple Street

Audit Team Member	Agency/Affiliation	Email Address	Phone Number
Greg Lucas	BETA Group	GLucas@BETA-Inc.com	781-255-1982
Jaklyn Centracchio	"	jcentracchio@beta-inc.com	"
JOHN LIVSEY	ENGINEERING	JLIVSEY@LEXINGTONMA.GOV	781-274-8311
Constance Raphael	MassDOT-D4	Connie.Raphael@State.MA.US	781-641-8468
SARA TIMONER	MASSDOT DA TRAFFIC	Sara.Timoner@state.ma.us	781-641-8435
Chenyuan Wang	Boston Region MPO	cWang@ctps.org	617-973-8009
John Klucke	FIRE	JKlucke/LexingtonMA.Gov	781 862 0272
Lisa Schletzbaum	MassDOT-Safety	lisa.schletzbaum@state.ma.us	617 973 7685
MARC VALENTI	LEXINGTON DPW	MVALENTI@LEXINGTONMA.GOV	781-274-8357
Bill Hadley	" "	whadley@lexingtonma.gov	781-274-8314
Dominic Cauazzo	MassDOT-Traffic	dominic.Cauazzo@state.MA.US	617-973-7599
Douglas Halpert	MassDOT - Traffic	Douglas.Halpert@state.MA.US	617-973-7599
AARON HENRY	Lex. Planning	ahenry@lexingtonMA.gov	781-862-0500 x246
JOHN MAZERALL	Lex Police	JMAZERALL@LexingtonMA.GOV	781-862-1212

Appendix C. Detailed Crash Data


Maps
Search
Query
Bloomfield St
Massachusetts Avenue
225
4
Percy Rd
Eustis St
Washington St
Warren St
Tavern Ln
Eliot Rd
Pelham Academy
Pelham Rd
Bennington Rd
Armenian Sisters Academy
Minuteman Commuter Bikeway
Hollow Ln
Solomon Pierce Rd
Butterfield Rd
John Hosmer St
Pheasant Brook
First Circle Learning Center
Maple St
2A
Gold Star Nursery
Ingleside Rd
Emerson Gardens
Emerson
National Heritage Museum
Marrett Rd
Lockwood Rd
Tricorne Rd
Paddock Ln
Follen Rd
Richard Rd
Robbins Rd
Plymouth Rd
Tower Rd
Plainfield St
Locust Ave
Spencer St
Barnes Pl
The Great Meadow
Lothrop
Crash Count: 27
Fatalities: 0
Injured: 8
Non-injured: 19
EPDO: 59
RPA: METROPOLITAN AREA PLANNING COUNCIL
Municipality: LEXINGTON
MassDOT District: 4
Equivalent Property Damage Only (EPDO)
Less then 50
50-150
150-300
More then 300
View on Google Fusion Tables
Download the file
massDOT
Massachusetts Department of Transportation
Office of Transportation Planning
Google
Map data ©2012 Google

COLLISION DIAGRAM

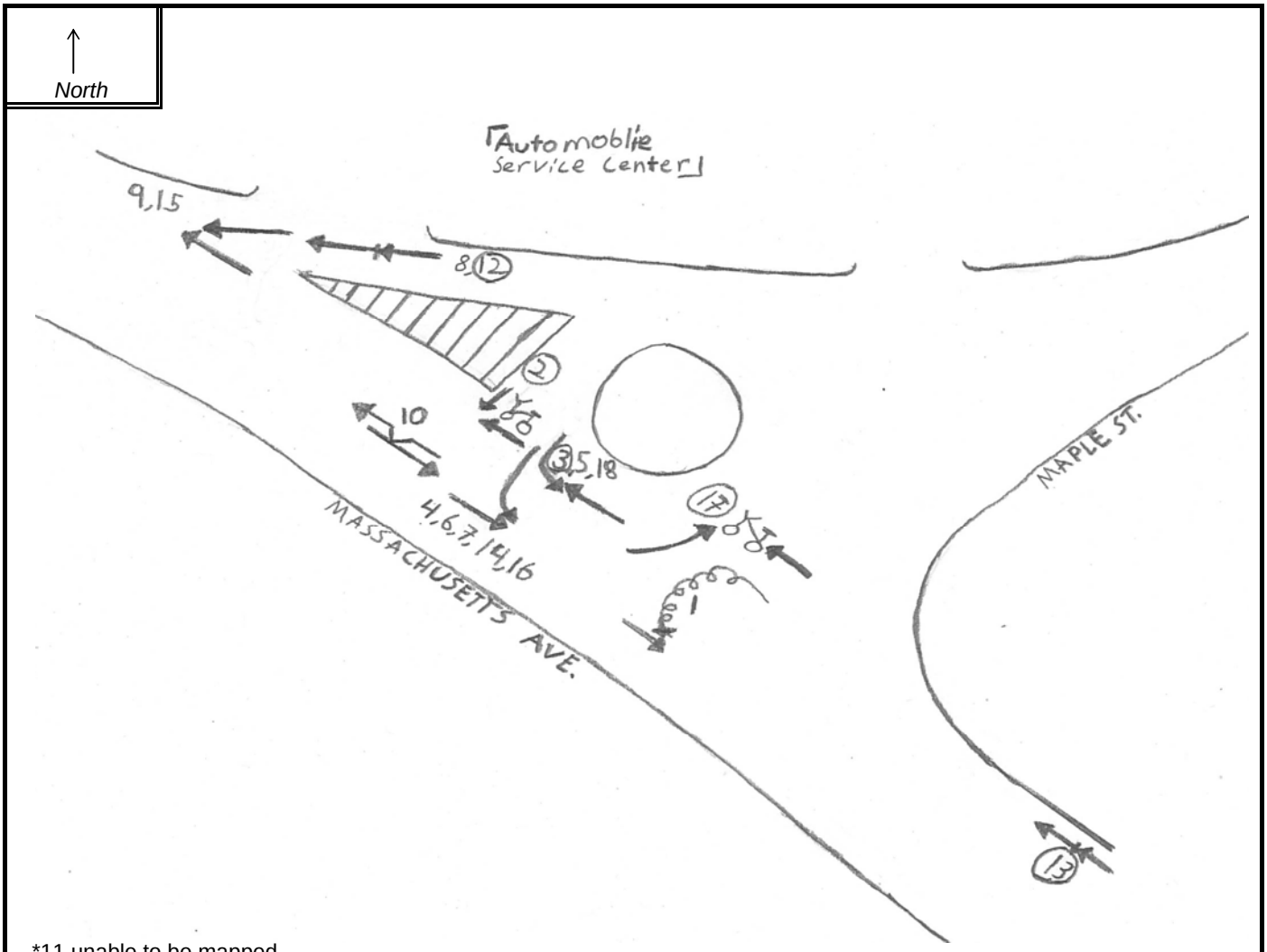
CITY/TOWN : Lexington | DATE PREPARED: Feb-12

REGION: MAPC | PREPARED BY: **D. Halpert & D. Caiazzo**

ROADWAY NAMES: Maple Street and Massachusetts Avenue

TIME PERIOD ANALYZED: 1/1/09 - Dec. 2011

SOURCE OF CRASH REPORTS: Lexington Police Department



*11 unable to be mapped

SYMBOLS		TYPES OF CRASH		SEVERITY
→	Moving Vehicle	→←	Head On	
⇉	Backing Vehicle	↘↙	Angle	
- - - →	Non-Involved Vehicle			○ Injury Accident
→🚶	Pedestrian	↴←	Turning Move	
→▭	Parked Vehicle	→|→	Rear End	
→□	Fixed Object			● Fatal Accident
→🚲	Bicycle	⇉	Sideswipe	
→🐾	Animal	↝	Out of Control	

Crash Data Summary Table

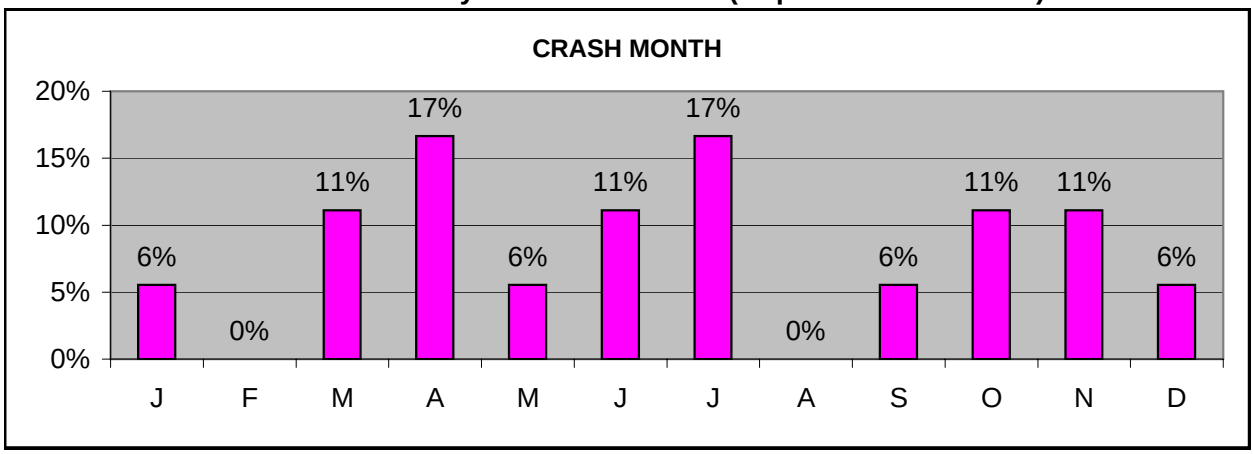
Intersection of Maple Street and Massachusetts Avenue; Lexington, MA

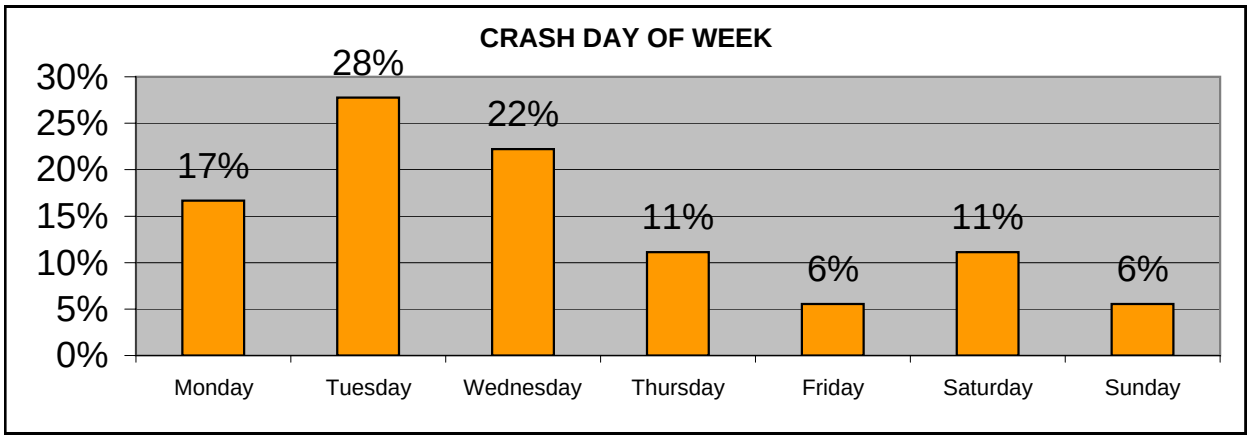
January 2009 - December 2011

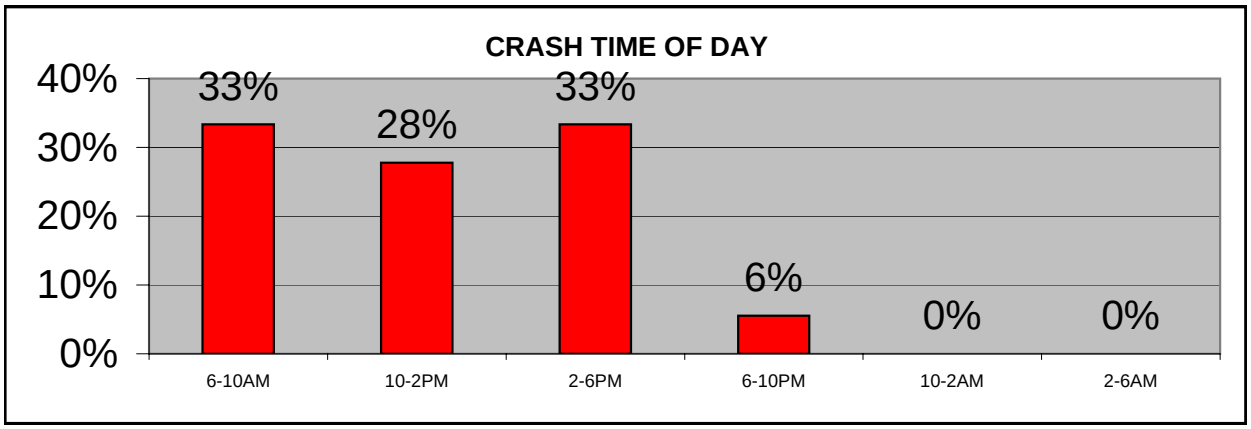
#	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	Ages		Comments
1	3/2/09	Monday	3:17 PM	Angle	Daylight	Cloudy	Wet	Wrong side or wrong way	45	53	Out of control possibly due to wet roadway
2	3/15/09	Sunday	3:41 PM	Angle	Daylight	Clear	Dry	Inattention	66	41	
3	4/23/09	Thursday	12:33 PM	Angle	Daylight	Clear	Dry	Failed to yield to right of way	30	19	
4	6/10/09	Wednesday	3:43 PM	Angle	Daylight	Cloudy	Dry	Failed to yield to right of way	83	73	
5	7/1/09	Wednesday	10:24 AM	Angle	Daylight	Cloudy	Dry	Other improper action	16	47	
6	7/7/09	Tuesday	9:12 AM	Angle	Daylight	Rain	Wet	Failed to yield to right of way	45	38	
7	11/17/09	Tuesday	5:23 PM	Angle	Dark - lighted roadway	Clear	Dry	Operating Vehicle in erratic, reckless, careless, negligent, or aggressive manner	40	57	
8	4/19/10	Monday	12:35 PM	Rear-end	Daylight	Clear	Dry	Distracted	48	44	
9	6/14/10	Monday	9:47 AM	Angle	Daylight	Cloudy	Dry	Other improper action	19	48	Limited visibility
10	10/7/10	Thursday	9:13 AM	Sideswipe, opposite direction	Daylight	Cloudy	Dry	Unknown	25	34	
11	10/26/10	Tuesday	10:41 AM	Unknown	Daylight	Clear	Wet	Glare	82		Struck unknown object. Sun glare
12	12/15/10	Wednesday	8:33 AM	Rear-end	Daylight	Clear	Dry	Other improper action	25	50	
13	1/11/11	Tuesday	8:03 AM	Rear-end	Daylight	Clear	Dry	Followed too closely	41	38	Occurred at a crosswalk where pedestrian was crossing
14	4/12/11	Tuesday	5:45 PM	Angle	Daylight	Clear	Dry	Exceeded authorized speed limit	52	22	
15	5/13/11	Friday	8:03 PM	Angle	Dark - lighted roadway	Cloudy	Dry	Failed to yield to right of way	38	27	
16	7/27/11	Wednesday	5:48 PM	Angle	Daylight	Clear	Dry	No Improper Driving	55	27	
17	9/17/11	Saturday	8:36 AM	Angle	Daylight	Clear	Dry	Failed to yield to right of way	32	63	
18	11/19/11	Saturday	12:10 PM	Angle	Daylight	Clear	Dry	Failed to yield to right of way	33	86	

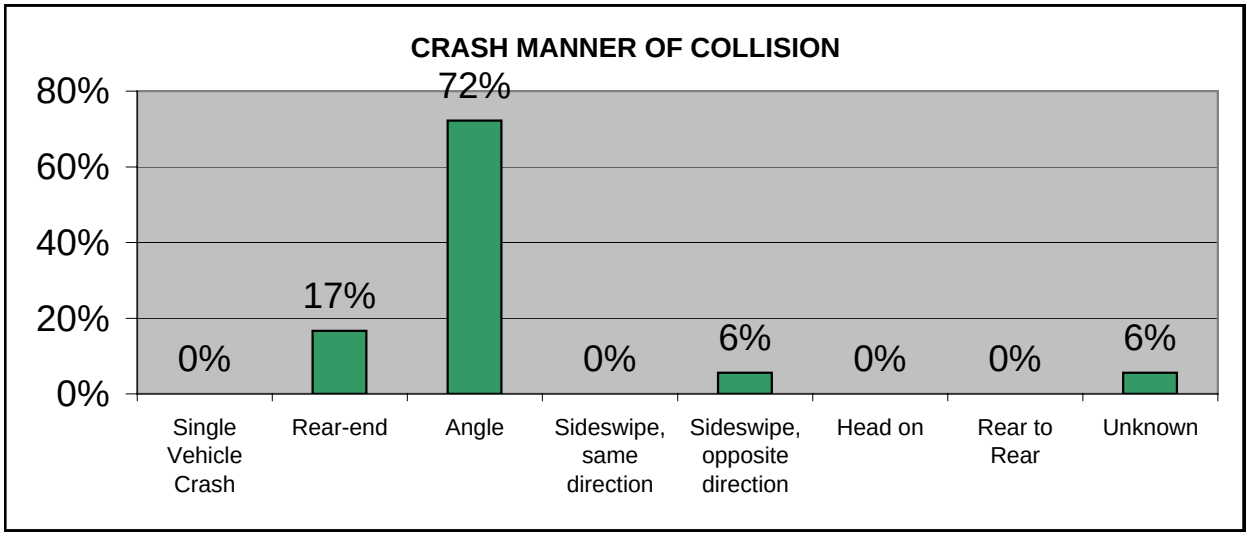
Summary based on Crash Reports obtained from the Lexington Police Department

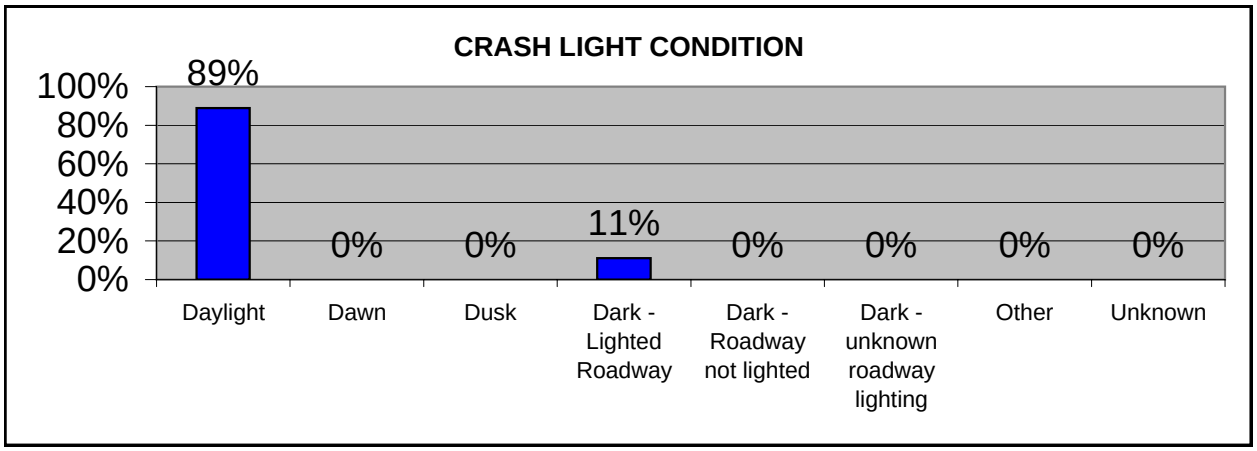
Crash Data Summary Tables and Charts (Maple St. & Mass. Ave.)

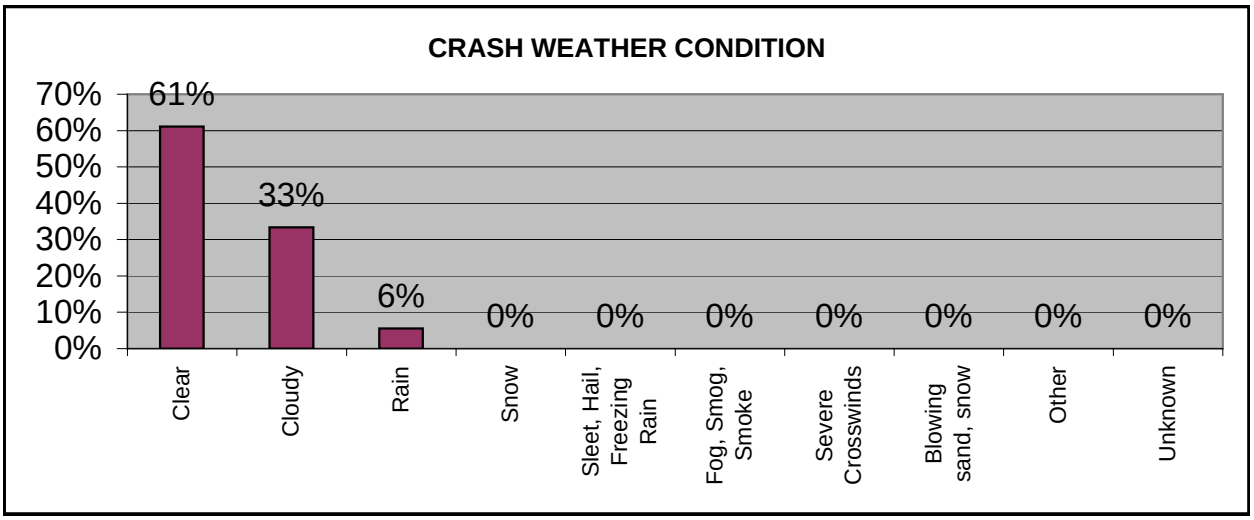


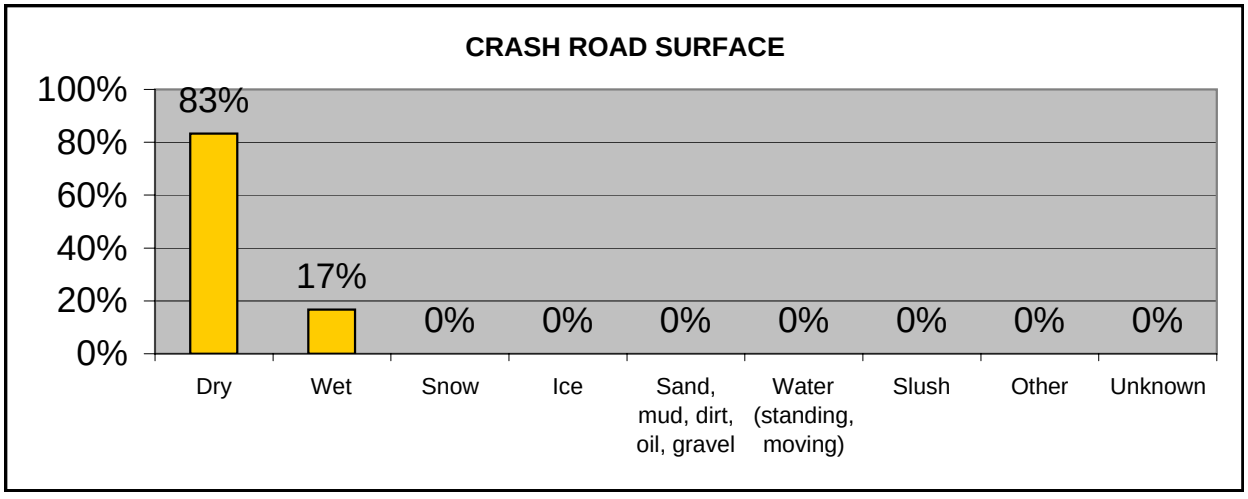


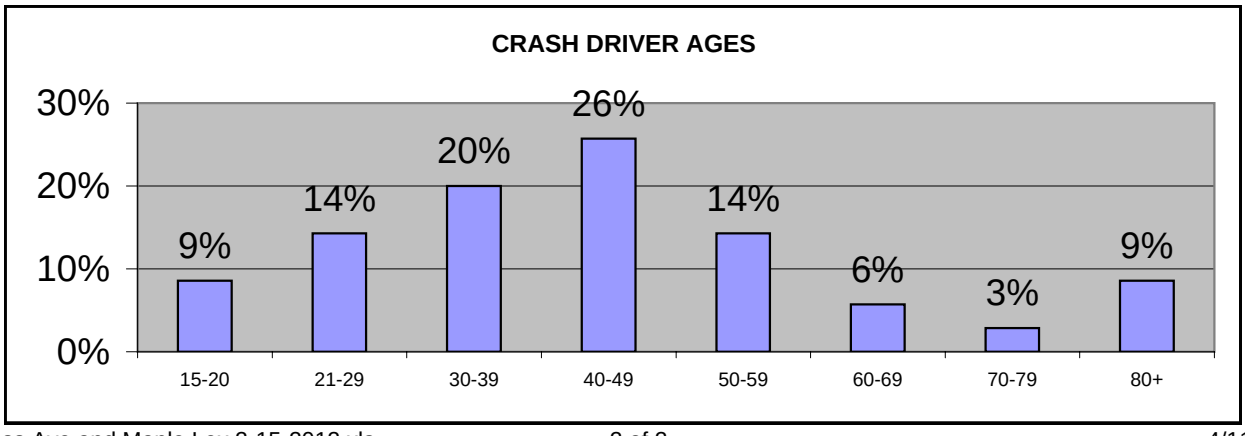





CRASH LIGHT CONDITION
100%
80%
60%
40%
20%
0%
89%
0%
0%
11%
0%
0%
0%
0%
Daylight
Dawn
Dusk
Dark - Lighted Roadway
Dark - Roadway not lighted
Dark - unknown roadway lighting
Other
Unknown


CRASH WEATHER CONDITION
70%
60%
50%
40%
30%
20%
10%
0%
61%
33%
6%
0%
0%
0%
0%
0%
0%
0%
Clear
Cloudy
Rain
Snow
Sleet, Hail, Freezing Rain
Fog, Smog, Smoke
Severe Crosswinds
Blowing sand, snow
Other
Unknown


CRASH ROAD SURFACE
100%
80%
60%
40%
20%
0%
83%
17%
0%
0%
0%
0%
0%
0%
0%
Dry
Wet
Snow
Ice
Sand, mud, dirt, oil, gravel
Water (standing, moving)
Slush
Other
Unknown


CRASH DRIVER AGES
30%
20%
10%
0%
9%
14%
20%
26%
14%
6%
3%
9%
15-20
21-29
30-39
40-49
50-59
60-69
70-79
80+

Appendix D. Speed Regulations

NO. 158

THE COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF PUBLIC WORKS

SPECIAL REGULATION GOVERNING THE SPEED OF MOTOR VEHICLES ON TOWN WAYS, IN THE TOWN OF LEXINGTON

April 22, 1958

SPECIAL SPEED REGULATION NO. 158

Highway Location: LEXINGTON

Authority in Control: TOWN OF LEXINGTON

Name of Highway: Massachusetts Avenue, Bedford Street, Waltham Street, Woburn Street, Lowell Street, Watertown Street, Pleasant Street, Hancock Street, Adams Street, Lincoln Street, School Street, Spring Street, East Street, Grant Street and Wood Street

In accordance with the provisions of Section 18 of Chapter 90 of the General Laws (Ter. Ed.), as amended by Section 2 of Chapter 564 of the Acts of 1948, the following Special Speed Regulations made by the Board of Selectmen of the Town of Lexington shall be effective immediately upon compliance with the applicable provisions of the above-referenced Section 2.

The following designated speed limits are established at which motor vehicles may be operated in the areas described:

MASSACHUSETTS AVENUE-EASTBOUND

Beginning at Marrett Road (Route 2A),

thence easterly	0.13	miles at	30	miles per	hour	
thence	1.38	"	" 35	"	"	"
"	0.39	"	" 30	"	"	"
"	0.31	"	" 25	"	"	"
"	0.29	"	" 30	"	"	"
"	1.15	"	" 35	"	"	"
"	0.43	"	" 30	"	"	"
"	0.59	"	" 35	"	"	" to the Arlington line; the

total distance being 4.67 miles.

MASSACHUSETTS AVENUE-WESTBOUND

Beginning at the Arlington line,

thence westerly	0.59	miles at	35	miles per	hour	
thence	0.43	"	" 30	"	"	"
"	1.15	"	" 35	"	"	"
"	0.29	"	" 30	"	"	"
"	0.31	"	" 25	"	"	"
"	0.39	"	" 30	"	"	"
"	1.38	"	" 35	"	"	"
"	0.13	"	" 30	"	"	" to Marrett Road (Route 2A);

the total distance being 4.67 miles.

JUL 9 2007

THE COMMONWEALTH OF MASSACHUSETTS
HIGHWAY DEPARTMENT
TOWN OF LEXINGTON
SPECIAL SPEED REGULATION # 158-C

Highway Location:	LEXINGTON
Authority In Control:	TOWN OF LEXINGTON
Name of Highway (s):	MASSACHUSETTS AVENUE WALTHAM STREET BEDFORD STREET

In accordance with the provisions of Chapter 90, Section 18, of the General Laws (Ter. Ed.) as amended, the following Special Speed Regulation is

Hereby Adopted

by the Board of Selectmen

of the Town of Lexington

Special Speed Regulation number 158, dated April 22, 1958 is hereby amended on Massachusetts Avenue and Waltham Street as follows, and Special Speed Regulation 158-A, dated October 1, 1973 is hereby amended by striking out the regulation in its entirety and inserting in place thereof the following revisions and addenda:

That the following speed limits are established at which motor vehicles may be operated in the areas described:

MASSACHUSETTS AVENUE - EASTBOUND

By striking out the clauses reading:

0.39 miles at 30 miles per hour
0.31 miles at 25 miles per hour
0.29 miles at 30 miles per hour

And inserting in place thereof:

0.26 miles at 30 miles per hour
0.57 miles at 25 miles per hour
0.16 miles at 30 miles per hour

MASSACHUSETTS AVENUE - WESTBOUND

By striking out the clauses reading:

0.29 miles at 30 miles per hour
0.31 miles at 25 miles per hour
0.39 miles at 30 miles per hour

And inserting in place thereof:

0.16 miles at 30 miles per hour
0.57 miles at 25 miles per hour
0.26 miles at 30 miles per hour

WALTHAM STREET – NORTHBOUND

By striking out the clause reading:

0.31 miles at 30 miles per hour to Massachusetts Avenue; the total distance being 2.54 miles.

And inserting in place thereof:

0.24 miles at 30 miles per hour
0.07 miles at 25 miles per hour ending at the junction of Massachusetts Avenue; the total distance being 2.54 miles.

WALTHAM STREET – SOUTHBOUND

By striking out the clause reading:

Beginning at Massachusetts Avenue, thence southerly
0.31 miles at 30 miles per hour

And inserting in place thereof:

Beginning at the junction of Massachusetts Avenue, thence southerly on Waltham Street
0.07 miles at 25 miles per hour
0.24 miles at 30 miles per hour

Appendix C: Seasonal Factors

STATION 4798 - LEXINGTON - RTE. 2 - WEST OF PLEASANT ST.

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
05	57,027	66,995	72,196	77,189	74,222	74,735	66,931	69,361	77,829	76,238	*75,564*	72,282	71,714
07	*68,000*	68,616	72,673	74,017	78,084	77,591	72,321	*73,150*	*73,355*	79,113	74,842	*67,488*	73,271
	7.2%	6.4%	0.8%	-1.0%	-6.6%	-5.9%	1.3%	0.2%	-0.1%	-8.0%	-2.1%	7.9%	

Appendix D: Crash Data and Crash Rate Worksheets

MassHighway

CRASH RATE WORKSHEET

CITY/TOWN : Lexington, MA COUNT DATE : 9/15/2011

DISTRICT : 4 UNSIGNALIZED : X SIGNALIZED :

MHD USE ONLY

Source #

~ INTERSECTION DATA ~

MAJOR STREET : Massachusetts Avenue ST #

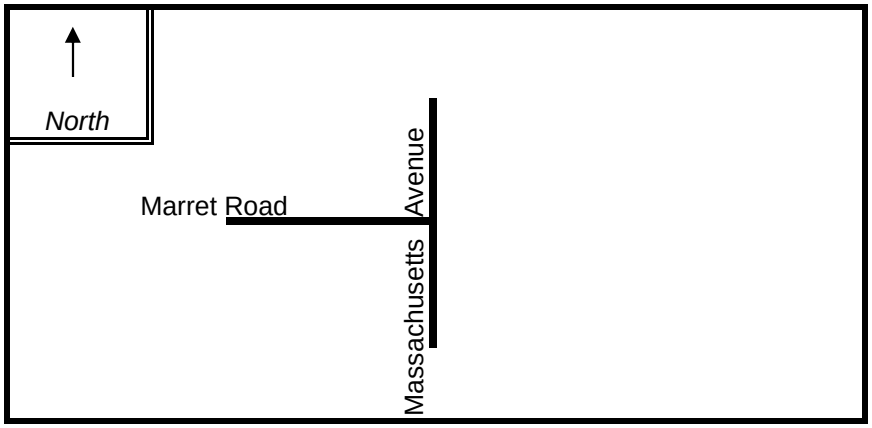
MINOR STREET(S) : Marrett Road ST #

ST #

ST #

ST #

INTERSECTION DIAGRAM
(Label Approaches)



INTERSECTION REF #

Peak Hour Volumes

APPROACH :	1	2	3	4	5	Total Entering Vehicles
DIRECTION :	EB	NB	SB			
VOLUMES (PM) :	656	792	750			2,198

" K " FACTOR : 0.080 APPROACH ADT : 27,475 **ADT** = TOTAL VOL/"K" FACT.

TOTAL # OF ACCIDENTS : 14 # OF YEARS : 3 AVERAGE # OF ACCIDENTS (**A**) : 4.67

CRASH RATE CALCULATION : 0.47 RATE = $\frac{(A * 1{,}000{,}000)}{(ADT * 365)}$

Comments :

MassHighway

CRASH RATE WORKSHEET

CITY/TOWN : Lexington, MA COUNT DATE : 9/15/2011

DISTRICT : 4 UNSIGNALIZED : X SIGNALIZED :

MHD USE ONLY

Source #

~ INTERSECTION DATA ~

MAJOR STREET : Massachusetts Avenue ST #

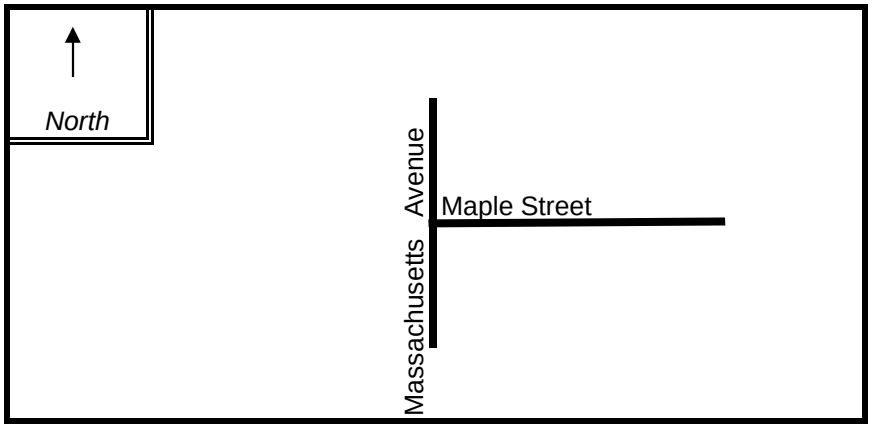
MINOR STREET(S) : Maple Street ST #

ST #

ST #

ST #

INTERSECTION DIAGRAM
(Label Approaches)



INTERSECTION REF #

Peak Hour Volumes

APPROACH :	1	2	3	4	5	Total Entering Vehicles
DIRECTION :	WB	NB	SB			
VOLUMES (PM) :	422	1,006	1,349			**2,777**

" K " FACTOR : **0.080** APPROACH ADT : **34,713** **ADT** = TOTAL VOL/"K" FACT.

TOTAL # OF ACCIDENTS : 24 # OF YEARS : 3 AVERAGE # OF ACCIDENTS (**A**) : **8.00**

CRASH RATE CALCULATION : **0.63** RATE = $\frac{(A * 1{,}000{,}000)}{(ADT * 365)}$

Comments :

MassHighway

CRASH RATE WORKSHEET

CITY/TOWN : Lexington, MA COUNT DATE : 9/15/2011

DISTRICT : 4 UNSIGNALIZED : X SIGNALIZED :

MHD USE ONLY

Source #

~ INTERSECTION DATA ~

MAJOR STREET : Massachusetts Avenue ST #

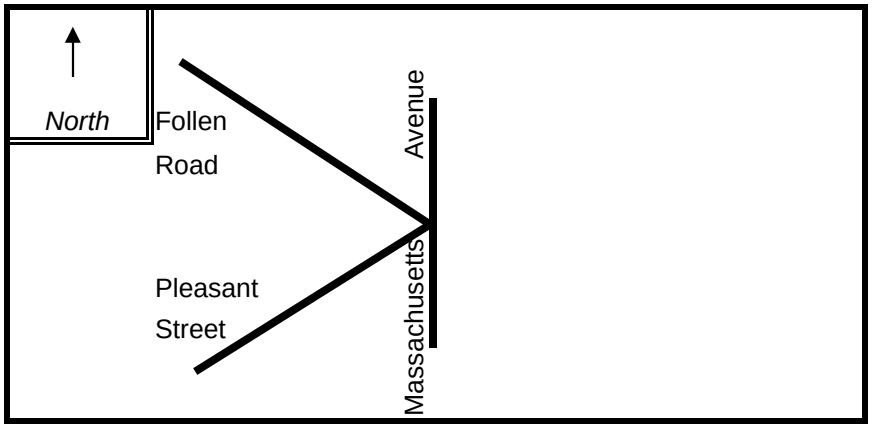
MINOR STREET(S) : Pleasant Street / Follen Road ST #

ST #

ST #

ST #

INTERSECTION DIAGRAM (Label Approaches)



INTERSECTION REF #

Peak Hour Volumes

APPROACH :	1	2	3	4	5	Total Entering Vehicles
DIRECTION :	EB	SEB	NB	SB		
VOLUMES (PM) :	477	38	551	839		1,905

" K " FACTOR : **0.080** APPROACH ADT : **23,813** **ADT** = TOTAL VOL/"K" FACT.

TOTAL # OF ACCIDENTS : 13 # OF YEARS : 3 AVERAGE # OF ACCIDENTS (**A**) : **4.33**

CRASH RATE CALCULATION : **0.50** RATE = $\frac{(A * 1{,}000{,}000)}{(ADT * 365)}$

Comments :

SEGMENT CRASH RATE WORKSHEET

CITY/TOWN : Lexington COUNT DATE :

DISTRICT : 4

~ SEGMENT DATA ~

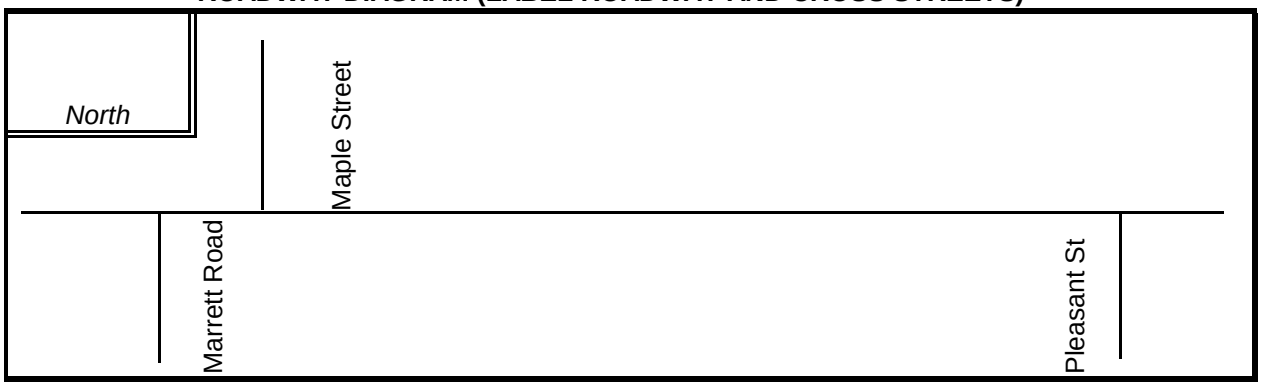
ROADWAY NAME: Massachusetts Avenue (Routes 4 / 225)

START POINT: Marrett Road (Route 2A)

END POINT: Pleasant Street (Routes 4 / 225)

FUNCTIONAL CLASSIFICATION OF ROADWAY: Urban Principal Arterial

ROADWAY DIAGRAM (LABEL ROADWAY AND CROSS STREETS)



AVERAGE DAILY TRAFFIC

SEGMENT LENGTH IN MILES (**L**):	**0.61**
AVERAGE DAILY TRAFFIC VOLUME (**V**):	20,161

TOTAL # OF CRASHES:	24	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**8.00**

CRASH RATE CALCULATION : **1.78**

$$\text{RATE} = \frac{(A * 1{,}000{,}000)}{(L * V * 365)}$$

Comments :

Project Title & Date:

massDOT Crash Report for LEXINGTON for the year 2009

Crash Number	Crash Date	Crash Time	Crash Severity	Manner of Collision	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	Distance from Nearest Milemarker	Distance from Nearest Exit	Distance from Nearest Landmark	Non Motorist Type	X Coordinate	Y Coordinate
2529457	26-Sep-2009	5:44 PM	Non-fatal injury	Angle	Dry	Dusk	Clear	MASSACHUSETTS AVENUE Rte 2A E / MARRETT ROAD Rte 2A W						225509.4062	909598.4376
2440121	15-Feb-2009	6:31 PM	Non-fatal injury	Single vehicle crash	Dry	Dark - lighted roadway	Clear		120 feet W from Intersection 8 MARRETT ROAD / MASSACHUSETTS AVENUE					220807.1562	908205.0624
2557513	24-Dec-2009	6:29 PM	Property damage only (none injured)	Rear-end	Dry	Dark - lighted roadway	Clear	MASSACHUSETTS AVENUE / MARRETT ROAD Rte 2A E						223425.7569	914179.4667
2460701	22-Apr-2009	8:04 AM	Property damage only (none injured)	Rear-end	Dry	Daylight	Clear	MAPLE STREET / MASSACHUSETTS AVENUE						219861.7075	908666.134
2485585	10-Jun-2009	3:43 PM	Property damage only (none injured)	Angle	Dry	Daylight	Cloudy	MASSACHUSETTS AVENUE Rte 225 E / MAPLE STREET						224125.4533	908718.9998
2543831	17-Nov-2009	5:23 PM	Property damage only (none injured)	Angle	Dry	Dark - lighted roadway	Clear	MASSACHUSETTS AVENUE Rte 225 E / MAPLE STREET Rte 2A E				1098 MASSACHUSETTS AVENUE		225303.7501	908971.8751
2492123	07-Jul-2009	9:12 AM	Property damage only (none injured)	Angle	Wet	Daylight	Cloudy/Rain	MASSACHUSETTS AVENUE Rte 225 E / MAPLE STREET Rte 2A W						222142.1562	908606.9998
2460708	23-Apr-2009	12:33 PM	Non-fatal injury	Angle	Dry	Not reported	Clear	MASSACHUSETTS AVENUE Rte 225 W / MAPLE STREET Rte 2A S						221362.9302	914075.6972
2449742	02-Mar-2009	3:17 PM	Property damage only (none injured)	Angle	Wet	Daylight	Cloudy	MASSACHUSETTS AVENUE Rte 2A / MAPLE STREET						222404.2388	911759.6454
2452607	15-Mar-2009	3:41 PM	Non-fatal injury	Angle	Dry	Daylight	Clear	MASSACHUSETTS AVENUE Rte 2A / MAPLE STREET						222169.9998	911108.6876
2497746	01-Jul-2009	10:24 AM	Property damage only (none injured)	Angle	Dry	Daylight	Cloudy	MASSACHUSETTS AVENUE / MAPLE STREET						223780.5782	909453.3122
2522780	10-Sep-2009	3:36 PM	Non-fatal injury	Rear-end	Dry	Daylight	Clear	MASSACHUSETTS AVENUE / MAPLE STREET						220726.6877	913693.1873
2452613	12-Mar-2009	9:48 AM	Property damage only (none injured)	Rear-end	Dry	Daylight	Clear	FOLLEN ROAD / MASSACHUSETTS AVENUE						220977.84365	913335.50003
2492144	11-Jul-2009	2:05 PM	Non-fatal injury	Single vehicle crash	Dry	Daylight	Clear	MASSACHUSETTS AVENUE / PLEASANT STREET						223591.4844	907681.3125
2535916	04-Nov-2009	6:04 AM	Property damage only (none injured)	Angle	Dry	Dark - lighted roadway	Clear	MASSACHUSETTS AVENUE / PLEASANT STREET						223538.2031	912860.3748
2423081	16-Jan-2009	12:27 PM	Property damage only (none injured)	Rear-end	Dry	Daylight	Clear	PLEASANT STREET / MASSACHUSETTS AVENUE						222093.2879	908057.4123
2485337	30-May-2009	5:35 PM	Property damage only (none injured)	Angle	Dry	Daylight	Clear	PLEASANT STREET / MASSACHUSETTS AVENUE Rte 4 / FULLER ROAD						219851.8935	908653.5233
2572974	03-Feb-2009	1:00 PM	Property damage only (none injured)	Rear-end	Wet	Daylight	Snow		754 MASSACHUSETTS AVENUE Rte 225 / PLEASANT STREET Rte 4					222093.8751	907576.375
2514878	07-Sep-2009	2:29 AM	Property damage only (none injured)	Single vehicle crash	Dry	Dark - lighted roadway	Clear		100 feet E from Intersection 789 MASSACHUSETTS AVENUE / GIBSON ROAD					224742.4841	911009.6872

massDOT Crash Report for LEXINGTON for the year 2009

Crash Number	Crash Date	Crash Time	Crash Severity	Manner of Collision	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	Distance from Nearest Milemarker	Distance from Nearest Exit	Distance from Nearest Landmark	Non Motorist Type	X Coordinate	Y Coordinate
2523428	21-Sep-2009	5:02 PM	Property damage only (none injured)	Rear-end	Dry	Daylight	Clear		1050 MASSACHUSETTS AVENUE Rte 4 / LOCUST AVENUE Rte 225					219788.3965	909529.0939
2423321	15-Jan-2009	5:36 PM	Non-fatal injury	Single vehicle crash	Dry	Dark - lighted roadway	Cloudy		20 feet W from Intersection 870 MASSACHUSETTS AVENUE Rte 4 E / INDEPENDENCE AVENUE					224310.9375	912015.9373
2485428	21-Jun-2009	2:42 AM	Property damage only (none injured)	Single vehicle crash	Wet	Dark - lighted roadway	Cloudy		250 feet E from Intersection 1133 MASSACHUSETTS AVENUE / MARRETT STREET						
2468194	29-Apr-2009	5:41 PM	Non-fatal injury	Single vehicle crash	Dry	Daylight	Clear		300 feet S from Intersection 758 MARRETT ROAD / MASSACHUSETTS AVENUE					220971.692	913332.1937
2548083	09-Dec-2009	10:50 PM	Property damage only (none injured)	Angle	Snow	Daylight	Rain/Snow		822 MASSACHUSETTS AVENUE Rte 225 E					220392.6876	914040.2501
2491858	02-Jul-2009	6:07 PM	Property damage only (none injured)	Rear-end	Wet	Daylight	Cloudy		844 MASSACHUSETTS AVENUE					222169.9998	911108.6876
2594554	28-Jan-2009	6:30 AM	Not Reported	Rear-end	Ice	Daylight	Sleet, hail (freezing rain or drizzle)		INDEPENDENCE AVENUE / MASSACHUSETTS AVENUE					223425.7569	914179.4667
2503732	04-Aug-2009	7:30 PM	Property damage only (none injured)	Rear-end	Dry	Daylight	Clear		MASSACHUSETTS AVE			BIKEWAY CROSSWALK		225435.1254	909768.5621

massDOT Crash Report for LEXINGTON for the year 2010

Crash Number	Crash Date	Crash Time	Crash Severity	Manner of Collision	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	Distance from Nearest Milemarker	Distance from Nearest Exit	Distance from Nearest Landmark	Non Motorist Type	X Coordinate	Y Coordinate
2576949	16-Feb-2010	3:16 PM	Property damage only (none injured)	Angle	Snow	Daylight	Cloudy/Snow		300 feet N from Intersection MASSACHUSETTS AVENUE Rte 225 W / MARRETT ROAD Rte 2A W			TOWER PARK		223629.3052	909617.6932
2553680	10-Mar-2010	9:53 AM	Non-fatal injury	Angle	Dry	Daylight	Clear	MARRETT ROAD Rte 2A E / MASSACHUSETTS AVENUE / MINUTEMAN TECH ROAD							
2555065	02-Apr-2010	1:45 PM	Property damage only (none injured)	Rear-end	Dry	Daylight	Clear	MASSACHUSETTS AVENUE Rte 225 W / MARRETT ROAD Rte 2A E						223672.2498	909537.1251
2574230	11-May-2010	6:13 PM	Property damage only (none injured)	Sideswipe, same direction	Dry	Daylight	Clear		100 feet E from Intersection MARRETT ROAD Rte 2A W / MASSACHUSETTS AVENUE					219327.3783	910776.1149
2555067	14-Jun-2010	2:50 PM	Property damage only (none injured)	Rear-end	Dry	Daylight	Clear		MARRETT ROAD Rte 2A E / Rte 2A						
2574231	24-Jul-2010	12:54 PM	Non-fatal injury	Rear-end	Dry	Daylight	Clear	MARRETT STREET / MASSACHUSETTS AVENUE					P2:Pedalcyclist (bicycle, tricycle, unicycle, pedal car)	219303.4531	910794.8127
2576692	20-Sep-2010	3:12 PM	Property damage only (none injured)	Rear-end	Dry	Daylight	Clear		MARRETT ROAD Rte 2A E / MASSACHUSETTS AVENUE			MINUTEMAN TECH HS		219519.3746	910582.6322
2558220	03-Feb-2010	7:09 PM	Property damage only (none injured)	Rear-end	Dry	Dark - lighted roadway	Clear	MAPLE STREET Rte 2A S / MASSACHUSETTS AVENUE						223778.8651	909455.2363
2559631	19-Apr-2010	12:35 PM	Property damage only (none injured)	Rear-end	Dry	Daylight	Clear	MAPLE STREET / MASSACHUSETTS AVENUE						223778.8651	909455.2363
2574236	06-May-2010	3:06 PM	Property damage only (none injured)	Angle	Wet	Daylight	Cloudy/Rain	MARRETT ROAD Rte 2A W / MASSACHUSETTS AVENUE						219498.2502	910603.9375
2555063	14-Jun-2010	9:47 AM	Property damage only (none injured)	Angle	Dry	Daylight	Cloudy	MAPLE STREET / MASSACHUSETTS AVENUE						223778.8651	909455.2363
2725373	07-Oct-2010	9:13 PM	Property damage only (none injured)	Sideswipe, opposite direction	Dry	Daylight	Cloudy	MASSACHUSETTS AVENUE Rte 225 W / MAPLE STREET Rte 2A S						223778.8651	909455.2363
2576947	26-Oct-2010	10:41 PM	Property damage only (none injured)	Unknown	Wet	Daylight	Clear	MASSACHUSETTS AVENUE / MAPLE STREET Rte 2A						223778.8651	909455.2363
2746453	12-Nov-2010	6:11 PM	Non-fatal injury	Rear-end	Dry	Dark - lighted roadway	Clear	MASSACHUSETTS AVENUE / MAPLE STREET						223778.8651	909455.2363
2653590	15-Dec-2010	6:33 PM	Non-fatal injury	Rear-end	Dry	Daylight	Clear	MAPLE STREET / MASSACHUSETTS AVENUE						223778.8651	909455.2363
2733298	12-Oct-2010	1:47 PM	Property damage only (none injured)	Angle	Dry	Daylight	Clear	FOLLEN ROAD / PLEASANT STREET						224125.4533	908718.9998
2896034	10-Jan-2010	6:01 PM	Property damage only (none injured)	Angle	Dry	Dark - lighted roadway	Clear	MASSACHUSETTS AVENUE / PLEASANT STREET						224113.7541	908775.5717
2553682	11-Feb-2010	11:45 AM	Property damage only (none injured)	Angle	Dry	Daylight	Clear	MASSACHUSETTS AVENUE / PLEASANT STREET						224113.7541	908775.5717

Crash Number	Crash Date	Crash Time	Crash Severity	Manner of Collision	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	Distance from Nearest Milemarker	Distance from Nearest Exit	Distance from Nearest Landmark	Non Motorist Type	X Coordinate	Y Coordinate
2574233	02-Mar-2010	6:16 AM	Non-fatal injury	Single vehicle crash	Dry	Daylight	Clear	MASSACHUSETTS AVENUE / PLEASANT STREET					P2:Pedestrian	224113.7541	908775.5717
2574226	02-Mar-2010	7:33 AM	Non-fatal injury	Angle	Dry	Daylight	Clear	MASSACHUSETTS AVENUE / PLEASANT STREET						224113.7541	908775.5717
2574228	30-Mar-2010	6:16 PM	Property damage only (none injured)	Unknown	Wet	Dusk	Rain/Cloudy		794 MASSACHUSETTS AVENUE					224060.2131	908911.656
2574229	14-Apr-2010	6:00 PM	Property damage only (none injured)	Rear-end	Dry	Daylight	Clear		1024 MASSACHUSETTS AVENUE / LOCUST AVENUE					223929.8631	909297.9161
2574225	11-Jun-2010	10:33 PM	Non-fatal injury	Single vehicle crash	Dry	Dark - lighted roadway	Cloudy		33 feet S from Intersection 755 MASSACHUSETTS AVENUE / BARNES PLACE				P2:Pedestrian	224080.4884	908849.182
2555070	25-Aug-2010	8:50 AM	Property damage only (none injured)	Angle	Wet	Daylight	Cloudy/Rain	MASSACHUSETTS AVENUE Rte 225 / LOCUST AVENUE						223927.6876	909301.9374
2576707	12-Dec-2010	11:53 PM	Property damage only (none injured)	Single vehicle crash	Dry	Dark - lighted roadway	Clear		100 feet W from Intersection 977 MASSACHUSETTS AVENUE / JOSEPH ROAD					223953.6232	909246.0581

massDOT Crash Report for LEXINGTON for the year 2011

Crash Number	Crash Date	Crash Time	Crash Severity	Manner of Collision	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	Distance from Nearest Milemarker	Distance from Nearest Exit	Distance from Nearest Landmark	Non Motorist Type	X Coordinate	Y Coordinate
2716348	22-Mar-2011	3:45 PM	Property damage only (none injured)	Rear-end	Dry	Daylight	Clear	MARRETT ROAD Rte 2A E / MASSACHUSETTS AVENUE Rte 2A W				MINUTEMAN RHS ENTRANCE		219303.4531	910794.8127
2742411	20-May-2011	11:37 AM	Property damage only (none injured)	Rear-end	Dry	Daylight	Clear	MARRETT STREET / MASSACHUSETTS AVENUE Rte 2A W						219303.4531	910794.8127
2938947	07-Dec-2011	10:04 AM	Non-fatal injury	Rear-end	Ice	Daylight	Rain	Rte 2A / MARRETT ROAD / MASSACHUSETTS AVENUE							
2725278	02-May-2011	3:27 PM	Property damage only (none injured)	Rear-end	Dry	Daylight	Clear		225 feet W from Intersection MASSACHUSETTS AVENUE Rte 225 W			20 MARRETT ROAD		223602.9515	909540.694
2764383	27-Feb-2011	5:48 PM	Property damage only (none injured)	Angle	Dry	Daylight	Clear	MASSACHUSETTS AVENUE / MAPLE STREET						223778.8651	909455.2363
2733247	13-May-2011	8:03 PM	Property damage only (none injured)	Angle	Dry	Dark - lighted roadway	Cloudy	MASSACHUSETTS AVENUE / MAPLE STREET						223778.8651	909455.2363
2781443	17-Sep-2011	8:36 AM	Non-fatal injury	Angle	Dry	Daylight	Clear	MASSACHUSETTS AVENUE / MAPLE STREET					P2:Pedalcyclist (bicycle, tricycle, unicycle, pedal car)	223778.8651	909455.2363
2721048	12-Apr-2011	5:45 PM	Property damage only (none injured)	Angle	Dry	Daylight	Clear	MASSACHUSETTS AVENUE / MAPLE STREET Rte 2A						223778.8651	909455.2363
2827104	19-Nov-2011	12:10 PM	Property damage only (none injured)	Angle	Dry	Daylight	Clear	MASSACHUSETTS AVENUE / Rte 2A / MAPLE STREET						223778.8651	909455.2363
2691611	11-Jan-2011	8:03 AM	Non-fatal injury	Rear-end	Dry	Daylight	Clear		100 feet E from Intersection MASSACHUSETTS AVENUE / MAPLE STREET					223803.50557	909437.29536
2762246	19-Aug-2011	5:47 PM	Property damage only (none injured)	Angle	Dry	Daylight	Clear		40 feet N from Intersection MAPLE STREET Rte 2A N / MASSACHUSETTS AVENUE					223790.2694	909450.9253
2704372	08-Feb-2011	12:33 PM	Property damage only (none injured)	Angle	Wet	Daylight	Cloudy	MASSACHUSETTS AVENUE / PLEASANT STREET						224113.7541	908775.5717
2763430	21-Aug-2011	4:54 PM	Non-fatal injury	Angle	Dry	Daylight	Clear	MASSACHUSETTS AVENUE / PLEASANT STREET						224113.7541	908775.5717
2749693	25-Jul-2011	11:19 AM	Non-fatal injury	Rear-end	Dry	Daylight	Clear	MASSACHUSETTS AVENUE / INDEPENDENCE AVENUE					P3:Pedestrian	224034.6562	909030.7499
2787865	10-Oct-2011	3:17 PM	Property damage only (none injured)	Rear-end	Dry	Daylight	Clear	MASSACHUSETTS AVENUE / INDEPENDENCE AVENUE						224034.6562	909030.7499
2737633	03-Jun-2011	2:25 PM	Property damage only (none injured)	Angle	Dry	Daylight	Clear	MASSACHUSETTS AVENUE / PLAINFIELD STREET						223861.3125	909385.6248

Crash Number	Crash Date	Crash Time	Crash Severity	Manner of Collision	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	Distance from Nearest Milemarker	Distance from Nearest Exit	Distance from Nearest Landmark	Non Motorist Type	X Coordinate	Y Coordinate
2763188	07-Sep-2011	2:14 PM	Property damage only (none injured)	Sideswipe, same direction	Wet	Daylight	Cloudy/Rain		100 feet N from Intersection 837 MASSACHUSETTS AVENUE / CURVE STREET					224024.6563	909079.5957
2726350	23-May-2011	8:09 AM	Property damage only (none injured)	Rear-end	Wet	Daylight	Cloudy/Rain		1048 MASSACHUSETTS AVENUE Rte 4 / LOCUST AVENUE					223947.1313	909260.5897
2827092	20-Nov-2011	4:34 PM	Property damage only (none injured)	Sideswipe, same direction	Dry	Dusk	Clear		1050 MASSACHUSETTS AVENUE					223888.6509	909357.238
2806316	12-Aug-2011	12:10 PM	Property damage only (none injured)	Rear-end	Dry	Daylight	Clear		120 feet E from Intersection 1006 MASSACHUSETTS AVENUE / LOCUST AVENUE					223941.237	909273.8891
2699055	06-Feb-2011	10:51 AM	Property damage only (none injured)	Sideswipe, same direction	Wet	Daylight	Clear		739 MASSACHUSETTS AVENUE Rte 4 / BARNES PLACE Rte 225			WALDORE SCHOOL		224077.2613	908858.7087
2781340	05-Sep-2011	3:56 PM	Property damage only (none injured)	Rear-end	Wet	Daylight	Rain		803 MASSACHUSETTS AVENUE					224053.9761	908933.0536
2787871	01-Oct-2011	2:20 PM	Property damage only (none injured)	Angle	Dry	Daylight	Clear/Cloudy		935 MASSACHUSETTS AVENUE					223988.8986	909172.7172
2695639	04-Jan-2011	9:37 AM	Unknown	Angle	Dry	Daylight	Clear		LOCUST AVENUE / MASSACHUSETTS AVENUE			EAST FIRE STATION		223927.68727	909301.93723

Appendix E: Warrant Analysis

HCS 2010: MUTCD Signal Warrants Release 6.40

Analyst: JML
Agency: BSC Group
Date: 10/26/2011
Project ID: 28280.00 East Lexington
EW Street: Maple Street

Intersection: Mass Ave at Maple St
Jurisdiction: District 4
Units: U.S. Customary
Analysis Year: 2011
NS Street: Massachusetts Avenue

General Information

Major St. Speed (mph): 0
Nearest Signal (ft): 0
Crashes per Yr: 0

Population: Not less than 10000
Coordinated Signal System: N

School Crossing

Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0

Roadway Network

Two Major Routes: 1
Weekend Count: 0
5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	0	0	0	0	1	0	0	1	0
LaneUsage					LR			TR			LT	

Results

Warrant 1: Eight-Hour Vehicular Volume	[X]
1 A. Minimum Vehicular Volumes	[X]
1 B. Interruption of Continuous Traffic	[X]
1 80% Vehicular --and-- Interruption Volumes	[X]
Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[X]
Warrant 3: Peak Hour	[X]
3 A. Peak-Hour Conditions	[ ]
3 B. Peak-Hour Vehicular Volume Hours Met	[X]
Warrant 4: Pedestrian Volume	[ ]
4 A. Pedestrian Volumes	[ ]
4 B. Gaps Same Period	[ ]
Warrant 5: School Crossing	[ ]
5 A. Student Volumes	[ ]
5 B. Gaps Same Period	[ ]
Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[ ]
Warrant 7: Crash Experience	[ ]
7 A. Adequate trials of alternatives	[ ]

```
7 B. Reported crashes                                                   [ ]
7 80% Volumes for Warrants 1A, 1B --or-- 4                              [X]

Warrant 8: Roadway Network                                              [X]
8 A. Weekday Volume                                                     [X]
8 B. Weekend Volume                                                     [ ]
______________________________ Summary ____________________________________
       Major  Minor  Total  Delay    1A    1A   1B     1B   2     3A    3B
Hours  Volume Volume Volume (Veh-hr) 100%  80%  100%   80%  100%  100% 100%
07-08 | 1751 | 698  | 2449 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
08-09 | 1982 | 741  | 2723 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
09-10 | 0    | 0    | 0    |  0.0  | No  | No  | No  | No  | No | No  | No
10-11 | 0    | 0    | 0    |  0.0  | No  | No  | No  | No  | No | No  | No
11-12 | 0    | 0    | 0    |  0.0  | No  | No  | No  | No  | No | No  | No
12-13 | 1476 | 429  | 1905 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
13-14 | 1412 | 381  | 1793 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
14-15 | 1412 | 444  | 1856 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
15-16 | 1820 | 474  | 2294 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
16-17 | 2003 | 412  | 2415 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
17-18 | 2370 | 415  | 2785 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
18-19 | 0    | 0    | 0    |  0.0  | No  | No  | No  | No  | No | No  | No
Total | 14226| 3994 | 18220|       | 8   | 8   | 8   | 8   | 8  | 0   | 8

Traffic Volumes (vph)
      |    Eastbound     |    Westbound     |    Northbound    |    Southbound    |
      |  L    T    R     |  L    T    R     |  L    T    R     |  L    T    R     |
      | 0    0    0      | 309  0    389    | 0    536  181    | 181  853  0      |
      | 0    0    0      | 308  0    433    | 0    696  192    | 199  895  0      |
      | 0    0    0      | 0    0    0      | 0    0    0      | 0    0    0      |
      | 0    0    0      | 0    0    0      | 0    0    0      | 0    0    0      |
      | 0    0    0      | 0    0    0      | 0    0    0      | 0    0    0      |
      | 0    0    0      | 230  0    199    | 0    521  229    | 212  514  0      |
      | 0    0    0      | 207  0    174    | 0    469  229    | 209  505  0      |
      | 0    0    0      | 221  0    223    | 0    458  217    | 226  511  0      |
      | 0    0    0      | 235  0    239    | 0    569  294    | 351  606  0      |
      | 0    0    0      | 215  0    197    | 0    606  309    | 458  630  0      |
      | 0    0    0      | 200  0    215    | 0    603  365    | 659  743  0      |
      | 0    0    0      | 0    0    0      | 0    0    0      | 0    0    0      |

Pedestrian Volumes and Gaps (Per Hour)
      |  Volume   Gap    |  Volume   Gap    |  Volume   Gap    |  Volume   Gap    |
      |   0        0     |   0        0     |   0        0     |   0        0     |
      |   0        0     |   0        0     |   0        0     |   0        0     |
      |   0        0     |   0        0     |   0        0     |   0        0     |
      |   0        0     |   0        0     |   0        0     |   0        0     |
      |   0        0     |   0        0     |   0        0     |   0        0     |
      |   0        0     |   0        0     |   0        0     |   0        0     |
      |   0        0     |   0        0     |   0        0     |   0        0     |
      |   0        0     |   0        0     |   0        0     |   0        0     |
      |   0        0     |   0        0     |   0        0     |   0        0     |
      |   0        0     |   0        0     |   0        0     |   0        0     |
      |   0        0     |   0        0     |   0        0     |   0        0     |
      |   0        0     |   0        0     |   0        0     |   0        0     |
                                                                            !
Delay |sec/veh  veh-hrs|sec/veh  veh-hrs|sec/veh  veh-hrs|sec/veh  veh-hrs|
      | 0.0      0.0    | 0.0      0.0    | 0.0      0.0    | 0.0      0.0    |
      | 0.0      0.0    | 0.0      0.0    | 0.0      0.0    | 0.0      0.0    |
      | 0.0      0.0    | 0.0      0.0    | 0.0      0.0    | 0.0      0.0    |
      | 0.0      0.0    | 0.0      0.0    | 0.0      0.0    | 0.0      0.0    |
      | 0.0      0.0    | 0.0      0.0    | 0.0      0.0    | 0.0      0.0    |
      | 0.0      0.0    | 0.0      0.0    | 0.0      0.0    | 0.0      0.0    |
```

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

HCS 2010: MUTCD Signal Warrants Release 6.40

Analyst: JML
Agency: BSC Group
Date: 10/26/2011
Project ID: 28280.00 East Lexington
EW Street: Marrett Road

Intersection: Mass Ave at Marrett Rd
Jurisdiction: District 4
Units: U.S. Customary
Analysis Year: 2011
NS Street: Massachusetts Avenue

General Information

Major St. Speed (mph): 0
Nearest Signal (ft): 0
Crashes per Yr: 0

Population: Not less than 10000
Coordinated Signal System: N

School Crossing

Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0

Roadway Network

Two Major Routes: 1
Weekend Count: 0
5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	0	0	0	0	1	0	0	1	0
LaneUsage		LR						LT			TR	

Results

Warrant 1: Eight-Hour Vehicular Volume	[X]
1 A. Minimum Vehicular Volumes	[X]
1 B. Interruption of Continuous Traffic	[X]
1 80% Vehicular --and-- Interruption Volumes	[X]
Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[X]
Warrant 3: Peak Hour	[X]
3 A. Peak-Hour Conditions	[ ]
3 B. Peak-Hour Vehicular Volume Hours Met	[X]
Warrant 4: Pedestrian Volume	[ ]
4 A. Pedestrian Volumes	[ ]
4 B. Gaps Same Period	[ ]
Warrant 5: School Crossing	[ ]
5 A. Student Volumes	[ ]
5 B. Gaps Same Period	[ ]
Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[ ]
Warrant 7: Crash Experience	[ ]
7 A. Adequate trials of alternatives	[ ]

```
7 B. Reported crashes                                                    [ ]
7 80% Volumes for Warrants 1A, 1B --or-- 4                               [X]

Warrant 8: Roadway Network                                               [X]
8 A. Weekday Volume                                                      [X]
8 B. Weekend Volume                                                      [ ]
______________________________ Summary ____________________________________
       Major  Minor  Total  Delay    1A    1A   1B    1B   2     3A    3B
Hours  Volume Volume Volume (Veh-hr) 100%  80%  100%  80%  100%  100% 100%
07-08 | 1669 | 229  | 1898 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
08-09 | 1912 | 237  | 2149 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
09-10 | 0    | 0    | 0    |  0.0  | No  | No  | No  | No  | No | No  | No
10-11 | 0    | 0    | 0    |  0.0  | No  | No  | No  | No  | No | No  | No
11-12 | 0    | 0    | 0    |  0.0  | No  | No  | No  | No  | No | No  | No
12-13 | 1237 | 284  | 1521 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
13-14 | 1144 | 239  | 1383 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
14-15 | 1207 | 266  | 1473 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
15-16 | 1497 | 363  | 1860 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
16-17 | 1424 | 507  | 1931 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
17-18 | 1511 | 659  | 2170 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
18-19 | 0    | 0    | 0    |  0.0  | No  | No  | No  | No  | No | No  | No
Total | 11601| 2784 | 14385|       | 8   | 8   | 8   | 8   | 8  | 0   | 8

Traffic Volumes (vph)
      |   Eastbound     |   Westbound     |   Northbound    |   Southbound    |
      |  L    T    R    |  L    T    R    |  L    T    R    |  L    T    R    |
      | 27   0    202   | 0    0    0     | 414  438  0     | 0    755  62    |
      | 41   0    196   | 0    0    0     | 460  598  0     | 0    743  111   |
      | 0    0    0     | 0    0    0     | 0    0    0     | 0    0    0     |
      | 0    0    0     | 0    0    0     | 0    0    0     | 0    0    0     |
      | 0    0    0     | 0    0    0     | 0    0    0     | 0    0    0     |
      | 48   0    236   | 0    0    0     | 183  545  0     | 0    460  49    |
      | 22   0    217   | 0    0    0     | 174  459  0     | 0    475  36    |
      | 39   0    227   | 0    0    0     | 188  478  0     | 0    500  41    |
      | 44   0    319   | 0    0    0     | 237  564  0     | 0    620  76    |
      | 78   0    429   | 0    0    0     | 200  562  0     | 0    625  37    |
      | 61   0    598   | 0    0    0     | 218  536  0     | 0    729  28    |
      | 0    0    0     | 0    0    0     | 0    0    0     | 0    0    0     |

Pedestrian Volumes and Gaps (Per Hour)
      |  Volume   Gap   |  Volume   Gap   |  Volume   Gap   |  Volume   Gap   |
      |   0       0     |   0       0     |   0       0     |   0       0     |
      |   0       0     |   0       0     |   0       0     |   0       0     |
      |   0       0     |   0       0     |   0       0     |   0       0     |
      |   0       0     |   0       0     |   0       0     |   0       0     |
      |   0       0     |   0       0     |   0       0     |   0       0     |
      |   0       0     |   0       0     |   0       0     |   0       0     |
      |   0       0     |   0       0     |   0       0     |   0       0     |
      |   0       0     |   0       0     |   0       0     |   0       0     |
      |   0       0     |   0       0     |   0       0     |   0       0     |
      |   0       0     |   0       0     |   0       0     |   0       0     |
      |   0       0     |   0       0     |   0       0     |   0       0     |
      |   0       0     |   0       0     |   0       0     |   0       0     |
                                                                              !
Delay |sec/veh  veh-hrs|sec/veh  veh-hrs|sec/veh  veh-hrs|sec/veh  veh-hrs|
      | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   |
      | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   |
      | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   |
      | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   |
      | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   |
      | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   |
```

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

HCS 2010: MUTCD Signal Warrants Release 6.40

Analyst: JML
Agency: BSC Group
Date: 10/26/2011
Project ID: 28280.00 East Lexington
EW Street: Pleasant Street / Follen Road
Intersection: Mass / Pleasant / Follen
Jurisdiction: District 4
Units: U.S. Customary
Analysis Year: 2011
Street: Massachusetts Avenue

General Information

Major St. Speed (mph): 35
Nearest Signal (ft): 0
Crashes per Yr: 0
Population: Not less than 10000
Coordinated Signal System: N

School Crossing

Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0

Roadway Network

Two Major Routes: 1
Weekend Count: 0
5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
LaneUsage		LTR			LTR			LTR			LTR	

Results

Warrant 1: Eight-Hour Vehicular Volume	[X]
1 A. Minimum Vehicular Volumes	[X]
1 B. Interruption of Continuous Traffic	[X]
1 80% Vehicular --and-- Interruption Volumes	[X]
Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[X]
Warrant 3: Peak Hour	[X]
3 A. Peak-Hour Conditions	[ ]
3 B. Peak-Hour Vehicular Volume Hours Met	[X]
Warrant 4: Pedestrian Volume	[ ]
4 A. Pedestrian Volumes	[ ]
4 B. Gaps Same Period	[ ]
Warrant 5: School Crossing	[ ]
5 A. Student Volumes	[ ]
5 B. Gaps Same Period	[ ]
Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[ ]
Warrant 7: Crash Experience	[ ]
7 A. Adequate trials of alternatives	[ ]

```
7 B. Reported crashes                                                   [ ]
7 80% Volumes for Warrants 1A, 1B --or-- 4                              [X]

Warrant 8: Roadway Network                                              [X]
8 A. Weekday Volume                                                     [X]
8 B. Weekend Volume                                                     [ ]
______________________________ Summary ____________________________________
       Major  Minor  Total  Delay    1A    1A    1B     1B    2     3A    3B
Hours  Volume Volume Volume (Veh-hr) 100%  80%   100%   80%   100%  100% 100%
07-08 | 1551 | 339  | 1938 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
08-09 | 1728 | 342  | 2133 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
09-10 | 0    | 0    | 0    |  0.0  | No  | No  | No  | No  | No | No  | No
10-11 | 0    | 0    | 0    |  0.0  | No  | No  | No  | No  | No | No  | No
11-12 | 0    | 0    | 0    |  0.0  | No  | No  | No  | No  | No | No  | No
12-13 | 1143 | 389  | 1558 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
13-14 | 1184 | 400  | 1615 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
14-15 | 1089 | 451  | 1571 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
15-16 | 1270 | 551  | 1865 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
16-17 | 1332 | 537  | 1903 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
17-18 | 1378 | 453  | 1871 |  0.0  | Yes | Yes | Yes | Yes | Yes| No  | Yes
18-19 | 0    | 0    | 0    |  0.0  | No  | No  | No  | No  | No | No  | No
Total | 10675| 3462 | 14454|       | 8   | 8   | 8   | 8   | 8  | 0   | 8

Traffic Volumes (vph)
      |   Eastbound     |   Westbound     |   Northbound    |   Southbound    |
      |  L    T    R    |  L    T    R    |  L    T    R    |  L    T    R    |
      | 9    285  45   | 5    6    37   | 180  23   374  | 239  729  6    |
      | 5    284  53   | 1    8    54   | 220  7    468  | 315  716  2    |
      | 0    0    0    | 0    0    0    | 0    0    0    | 0    0    0    |
      | 0    0    0    | 0    0    0    | 0    0    0    | 0    0    0    |
      | 0    0    0    | 0    0    0    | 0    0    0    | 0    0    0    |
      | 12   325  52   | 5    3    18   | 126  28   380  | 261  341  7    |
      | 10   313  77   | 1    11   19   | 105  17   327  | 351  379  5    |
      | 20   305  126  | 0    10   21   | 127  13   300  | 286  360  3    |
      | 12   416  123  | 1    12   31   | 136  18   376  | 346  390  4    |
      | 15   377  145  | 1    12   21   | 116  20   418  | 367  406  5    |
      | 10   341  102  | 0    13   27   | 101  16   415  | 474  371  1    |
      | 0    0    0    | 0    0    0    | 0    0    0    | 0    0    0    |

Pedestrian Volumes and Gaps (Per Hour)
      |  Volume   Gap  |  Volume   Gap  |  Volume   Gap  |  Volume   Gap  |
      |   0       0    |   0       0    |   0       0    |   0       0    |
      |   0       0    |   0       0    |   0       0    |   0       0    |
      |   0       0    |   0       0    |   0       0    |   0       0    |
      |   0       0    |   0       0    |   0       0    |   0       0    |
      |   0       0    |   0       0    |   0       0    |   0       0    |
      |   0       0    |   0       0    |   0       0    |   0       0    |
      |   0       0    |   0       0    |   0       0    |   0       0    |
      |   0       0    |   0       0    |   0       0    |   0       0    |
      |   0       0    |   0       0    |   0       0    |   0       0    |
      |   0       0    |   0       0    |   0       0    |   0       0    |
      |   0       0    |   0       0    |   0       0    |   0       0    |
      |   0       0    |   0       0    |   0       0    |   0       0    |
                                                                          !
Delay |sec/veh  veh-hrs|sec/veh  veh-hrs|sec/veh  veh-hrs|sec/veh  veh-hrs|
      | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   |
      | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   |
      | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   |
      | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   |
      | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   |
      | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   | 0.0      0.0   |
```

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Appendix F: Roundabout Installation Screening Forms

MASSACHUSETTS ROUNDABOUT INSTALLATION SCREENING FORM

GENERAL INFORMATION

Highway district:	District 4	Major street:	Massachusetts Avenue
MPO/RPA:	Boston MPO / MAPC	Minor street:	Marrett Road
City or Town:	Lexington, MA	Existing intersection control:	STOP
Prepared by:	J. Kavalaris	Number of legs at the	3
Submitted by:	BSC Group	ADT on major road:	19,700
Reviewed by:	S. Offei-Addo	ADT on minor road:	8,200
Phone:	617-896-4300	Total # of crashes (3-yr avg):	5
Email:	soffeiaddo@bscgroup.com	Speed limit (major road):	35 MPH
Date:	2/14/2013	Speed limit (minor road):	35 MPH

RESOURCES: DATA AND INFORMATION REQUIRED FOR ASSESSMENT

1. Traffic counts (ADT and turning movements)	6. Aerial photographs of location
2. Vehicle classification (trucks and buses)	7. Crash data (3 years)
3. Pedestrian and bicyclist counts	8. Crash diagrams
4. Plan sheet or layout of existing intersection	9. Speed data
5. Geometric layout of roundabout	

STEP 1: BRIEF DESCRIPTION OF EXISTING PROBLEMS

The intersection of Massachusetts Avenue (Mass Ave) and Marrett Road currently experiences long delays and large queues. Drivers turning left from Mass Ave onto Marrett Road have difficulty finding gaps in the southbound traffic on Mass Ave. Drivers exiting Marrett Road experience difficulties in finding gaps in traffic on Mass Ave in order to turn left or right. The project seeks to improve safety for pedestrians, bicyclists, and drivers; improve traffic operations; and reduce delays and congestion during the peak hours.

STEP 2: PROJECT OBJECTIVES (Check all that apply)

Question Number	Objectives	Primary		Secondary		Comment
		Yes	No	Yes	No	
2.1	Safety improvement	X				
2.2	Operational improvement	X				
2.3	Traffic-calming improvement		X		X	
2.4	Aesthetics/community enhancements			X		
2.5	Access management improvement		X		X	

MASSACHUSETTS ROUNDABOUT INSTALLATION SCREENING FORM						
STEP 3: TYPE OF ROUNDABOUT AND SPACE REQUIREMENTS (Check one)						
Question Number	**What type of roundabout is needed?**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
3.1	**Mini-roundabout**		X			
	Single-lane roundabout (Use Exhibit 2 or 3 for planning estimate of a single- lane roundabout.)	X			See the attachments for traffic volume data and roundabout type requirements.	Familiar to many motorists, pedestrians, and bicyclists. Has fewer conflict points than multi-lane roundabouts.
	Double-lane roundabout (Use Exhibit 2 or 3 for planning estimate of a double- lane roundabout.)		X			Multi-lane roundabout is a big step from a single-lane roundabout and could pose challenges for pedestrians, bicyclists, and motorists. Consequently, a multi-lane roundabout could lead to project delays and may be a major factor in rejecting a roundabout design from further consideration in some cities and towns.
3.2	**Space requirement** Would there be sufficient right-of-way to build the roundabout? (Use Exhibit 4 for planning estimate of space requirements.)		X		90 - 150 FT	Right-of-way and geometric complications can be overcome in certain situations. In addition, consider cost and impact of land acquisition.
Assessment (3.1 to 3.2)	Based on your answers above, is the space requirement met?		X			
STEP 4: ROUNDABOUT SCREENING FACTORS (Check all that apply)						
SAFETY FACTORS						
Question Number	**Does the intersection where a roundabout is being considered have safety issues:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
4.1	Resulting from multi-leg intersection or unusual geometry?		X			Too-tight skewed intersections can be problematic for large vehicles (design issues). In addition, too many legs could preclude using a roundabout design.
4.2	Resulting from high-speed crashes?		X			The purpose of considering a roundabout design could be to control speeds in conjunction with addressing other intersection control needs.
4.3	Causing crashes that are angle-type?	X			33% of crashes over a 3 year period were angle-type.	Roundabouts reduce the number of conflict points at which opposing vehicles intersect, hence they can provide possible solutions for angle crashes involving left-turn and crossing movements.
4.4	Associated with crashes resulting in personal injuries?	X			36% of crashes over a 3 year period resulted in personal injuries.	Collisions at roundabouts tend to be less severe because of low speeds on the entry approach and in the circulating roadway (20 - 25 mph).

MASSACHUSETTS ROUNDABOUT INSTALLATION SCREENING FORM						
Question Number	**Does the intersection where a roundabout is being considered have safety issues:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
4.5	Associated with sight distance obstructions caused by alignment on existing stop-controlled approach?		X			
4.6	Associated with a change-in-speed environment of the roadway?		X			Generally, they occur at the fringes of an urban environment.
4.7	Associated with visibility from all approaches?		X			Some types of topography and construction complications can be overcome. The Highway Division successfully addressed vertical alignment issues and steep grades of a roundabout proposal on Cape Cod.
4.8	Associated with pedestrian and bicyclist volumes?		X			This would be an issue with a multi-lane roundabout and would need for further investigation, but it is less of a concern with a single- lane roundabout.
Assessment (4-1 to 4-8)	Based on your answers above, is the project safety improvement objective met—i.e., would a roundabout design address one or more of the project safety issues?	X				
OPERATIONAL FACTORS						
Question Number	**Does the intersection where a roundabout is being considered have issues:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
4.9	Resulting from a high percentage of left turns experiencing high delay or a need for left-turn lanes or U-turns?	X				Roundabouts may accommodate left-turning vehicles more efficiently with lower delays because they may not require storage lanes or separate turning phases.
4.10	Resulting in high delay but failing to meet traffic signal warrants?		X			
4.11	Resulting from a high proportion of left turns experiencing high delay and limited storage on an off- ramp?		X			A roundabout design can be particularly beneficial at interchanges if the roundabout alternative does not require bridge widening.
Question Number	**Is the intersection where a roundabout is being considered located:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
4.12	Where traffic volumes on the minor roads are such that STOP or YIELD signs result in unacceptably high delays for the minor road?	X				
4.13	Where high traffic volumes during peak hours face excessive delays, but relatively low volumes and delays during non-peak hours?		X		Weekday traffic volumes appear relatively consistent from the morning peak hour through the middle of the day to the evening peak hour.	
4.14	Away from a signalized intersection, where queues in general will not spill back into the roundabout?			X	A traffic signal is being proposed at the nearby intersection of Mass Ave & Maple Street. If installed, queues from this signalized intersection may spill back into a roundabout.	Queue detection is an example of a possible remedy if queue spillback into the roundabout is occasional. Proper signal timing and coordination may remedy some queue spillbacks.

MASSACHUSETTS ROUNDABOUT INSTALLATION SCREENING FORM						
Question Number	**Is the intersection where a roundabout is being considered located:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
4.15	Away from a school drop-off/pickup area, or transit stop, where queues in general will not spill back into the roundabout?		X		Bus stops are located on both sides of Mass Ave in the vicinity of this intersection.	Bus bays or pullouts or locating transit stops further downstream of the splitter island may prevent queues from blocking the roundabout.
4.16	Outside of a coordinated arterial signal system or proposed roundabout where it will not impede progression through a corridor?	X				If the quality of progression is poor, a roundabout can replace a signalized intersection and improve coordination. Also, with correct signal timing and coordination, roundabouts and traffic signals can exist on the same corridor.
4.17	In an area where the percentage of major street traffic volume does not exceed 90% of the total entering traffic volume and the major street traffic volume is not opposed by relatively light traffic on the minor street?	X				Depends on how light the traffic is on the minor approach. In addition, if traffic calming is the main focus, then high or low traffic volume should not be the deciding factor.
4.18	Away from a railroad grade crossing, where queuing would not impact the roundabout or grade crossing?	X				Depends on the frequency of railroad trips.
4.19	Away from a direct emergency access roadway or driveway with preemption, where a roundabout would not impede emergency services?	X				Depends on the frequency of emergency trips.
Assessment (4.9 to 4.19)	Based on your answers above, is the project location favorable for roundabout installation—i.e., a roundabout design would function well and would not create additional operations problems?		X		A roundabout may create additional operation problems due to the potential installation of a nearby signal. It is expected that bus stops would be able to be adjusted.	
TRAFFIC CALMING FACTORS						
Question Number	**Does the intersection where a roundabout is being considered have issues:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
4.20	That need to be addressed by traffic-calming measures for pedestrians, bicyclists, motorists, and transit users?	X				Generally, roundabout designs addressing traffic calming are located on local and residential roads.
4.21	Resulting from changes in land-use environments or transition to a new land-use environment?		X			Roundabout designs addressing environment or land-use transitions are located in areas where there may be a need to signify to drivers that the character of the road and surrounding land use is changing and, therefore, they need to change their driving behavior.
Assessment (4.20 to 4.21)	Based on your answers above, is the project traffic-calming improvement objective met—i.e., would a roundabout design address one or more of the project traffic calming issues?			X	Traffic calming is not a main objective of this project. However it is expected that other elements of this project, such as lane narrowing, and bump-outs, will provide for traffic calming along the corridor.	

MASSACHUSETTS ROUNDABOUT INSTALLATION SCREENING FORM						
AESTHETICS AND COMMUNITY ENHANCEMENT FACTOR						
Question Number	**Is the proposed roundabout part of:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/supporting information**
4.22	A community enhancement or aesthetics (gateways) improvement project?			X	While aesthetics are important to the community and the project is in an historic area, it is not a primary objective of this project.	Roundabouts proposed for community enhancements and improved aesthetics should demonstrate that they would not introduce traffic problems that do not currently exist.
Assessment (4.22)	Based on your answer above, is the project aesthetics and community enhancement objective met—i.e., would the roundabout design address aesthetics and community enhancement issues?			X	While aesthetics are important to the community and the project is in an historic area, it is not a primary objective of this project.	
ACCESS MANAGEMENT FACTORS						
Question Number	**Does the corridor in which a roundabout is being considered have issues:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/supporting information**
4.23	Related to a controlled-access corridor, where U-turns/left turns are desirable at an intersection to access properties on the opposite side of the road?		X			Corridors that are hampered with numerous driveways, especially those to businesses, can benefit from roundabouts. Roundabouts in conjunction with raised medians facilitate the use of U-turns and left turns at intersections and allow right-in-right-out movements at driveways.
4.24	Related to many access/egress points where left turns experience unacceptable delay turning into and out of driveways and consolidating and controlling access points (installing a raised median) are desirable objectives?		X			
Assessment (4.23 to 4.24)	Based on your answers above, is the project access management objective met—i.e., does the roundabout address access management issues?			X	Access management is not an objective of this project.	

STEP 5: SCREENING EVALUATION (Please circle one decision)		
Decision	**Criteria**	**Comments**
Candidate	Advance a roundabout design for further analysis and design if it meets both of these criteria: 1. Space requirements 2. One or more of the project objectives	
Conditional	Advance a roundabout design for further analysis and design under these conditions (specify):	
Not recommended	A roundabout is not recommended for further consideration if it fails to meet either of these criteria: 1. Space requirements 2. None of the project objectives	

ATTACHMENTS
Please attach all of the data and information applied to this roundabout assessment tool to support your decision.

MASSACHUSETTS ROUNDABOUT INSTALLATION SCREENING FORM

GENERAL INFORMATION

Highway district:	District 4	Major street:	Massachusetts Avenue
MPO/RPA:	Boston MPO / MAPC	Minor street:	Maple Street
City or Town:	Lexington, MA	Existing intersection control:	STOP
Prepared by:	J. Kavalaris	Number of legs at the intersection:	3
Submitted by:	BSC Group	ADT on major road:	20,200
Reviewed by:	S. Offei-Addo	ADT on minor road:	12,650
Phone:	617-896-4300	Total number of crashes (3-yr avg):	9.67
Email:	soffeiaddo@bscgroup.com	Speed limit (major road):	35 MPH
Date:	2/14/2013	Speed limit (minor road):	25 MPH

RESOURCES: DATA AND INFORMATION REQUIRED FOR ASSESSMENT

1. Traffic counts (ADT and turning movements)	6. Aerial photographs of location
2. Vehicle classification (trucks and buses)	7. Crash data (3 years)
3. Pedestrian and bicyclist counts	8. Crash diagrams
4. Plan sheet or layout of existing intersection	9. Speed data
5. Geometric layout of roundabout	

STEP 1: BRIEF DESCRIPTION OF EXISTING PROBLEMS

The intersection of Massachusetts Avenue (Mass Ave) and Maple Street experiences high traffic volumes and, in particular, high volumes of left turning vehicles from both Maple Street and Mass Ave southbound, particularly during the weekday morning and afternoon peak commuting hours. The geometry of the intersection consists of a traffic circle with large pavement areas that many vehicles have trouble navigating. The intersection experiences a high percentage of angle and rear-end crashes due to long queues, difficulty making turns, and driver impatience. Sidewalks near the intersection are in poor condition, and there are no pedestrian crosswalks at the intersection. The project seeks to improve safety for pedestrians, bicyclists, and drivers; improve traffic operations; and reduce delays and congestion during the peak hours.

STEP 2: PROJECT OBJECTIVES (Check all that apply)

Question Number	Objectives	Primary		Secondary		Comment
		Yes	No	Yes	No	
2.1	Safety improvement	X				
2.2	Operational improvement	X				
2.3	Traffic-calming improvement		X		X	
2.4	Aesthetics/community enhancements			X		
2.5	Access management improvement		X		X	

MASSACHUSETTS ROUNDABOUT INSTALLATION SCREENING FORM						
STEP 3: TYPE OF ROUNDABOUT AND SPACE REQUIREMENTS (Check one)						
Question Number	**What type of roundabout is needed?**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
3.1	**Mini-roundabout**		X			
	Single-lane roundabout (Use Exhibit 2 or 3 for planning estimate of a single- lane roundabout.)		X			Familiar to many motorists, pedestrians, and bicyclists. Has fewer conflict points than multi-lane roundabouts.
	Double-lane roundabout (Use Exhibit 2 or 3 for planning estimate of a double- lane roundabout.)	X			See the attachments for traffic volume data and roundabout type requirements.	Multi-lane roundabout is a big step from a single-lane roundabout and could pose challenges for pedestrians, bicyclists, and motorists. Consequently, a multi-lane roundabout could lead to project delays and may be a major factor in rejecting a roundabout design from further consideration in some cities and towns.
3.2	**Space requirement** Would there be sufficient right-of-way to build the roundabout? (Use Exhibit 4 for planning estimate of space requirements.)		X		120 - 200 FT	Right-of-way and geometric complications can be overcome in certain situations. In addition, consider cost and impact of land acquisition.
Assessment (3.1 to 3.2)	Based on your answers above, is the space requirement met?		X			
STEP 4: ROUNDABOUT SCREENING FACTORS (Check all that apply)						
SAFETY FACTORS						
Question Number	**Does the intersection where a roundabout is being considered have safety issues:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
4.1	Resulting from multi-leg intersection or unusual geometry?		X			Too-tight skewed intersections can be problematic for large vehicles (design issues). In addition, too many legs could preclude using a roundabout design.
4.2	Resulting from high-speed crashes?		X			The purpose of considering a roundabout design could be to control speeds in conjunction with addressing other intersection control needs.
4.3	Causing crashes that are angle-type?	X			41% of crashes over a 3 year period were angle-type.	Roundabouts reduce the number of conflict points at which opposing vehicles intersect, hence they can provide possible solutions for angle crashes involving left-turn and crossing movements.
4.4	Associated with crashes resulting in personal injuries?	X			27% of crashes over a 3 year period resulted in personal injuries.	Collisions at roundabouts tend to be less severe because of low speeds on the entry approach and in the circulating roadway (20 - 25 mph).

MASSACHUSETTS ROUNDABOUT INSTALLATION SCREENING FORM						
Question Number	**Does the intersection where a roundabout is being considered have safety issues:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
4.5	Associated with sight distance obstructions caused by alignment on existing stop-controlled approach?		X			
4.6	Associated with a change-in-speed environment of the roadway?		X			Generally, they occur at the fringes of an urban environment.
4.7	Associated with visibility from all approaches?		X			Some types of topography and construction complications can be overcome. The Highway Division successfully addressed vertical alignment issues and steep grades of a roundabout proposal on Cape Cod.
4.8	Associated with pedestrian and bicyclist volumes?		X			This would be an issue with a multi-lane roundabout and would need for further investigation, but it is less of a concern with a single- lane roundabout.
Assessment (4-1 to 4-8)	Based on your answers above, is the project safety improvement objective met—i.e., would a roundabout design address one or more of the project safety issues?		X			
OPERATIONAL FACTORS						
Question Number	**Does the intersection where a roundabout is being considered have issues:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
4.9	Resulting from a high percentage of left turns experiencing high delay or a need for left-turn lanes or U-turns?	X				Roundabouts may accommodate left-turning vehicles more efficiently with lower delays because they may not require storage lanes or separate turning phases.
4.10	Resulting in high delay but failing to meet traffic signal warrants?		X			
4.11	Resulting from a high proportion of left turns experiencing high delay and limited storage on an off- ramp?		X			A roundabout design can be particularly beneficial at interchanges ifthe roundabout alternative does not require bridge widening.
Question Number	**Is the intersection where a roundabout is being considered located:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
4.12	Where traffic volumes on the minor roads are such that STOP or YIELD signs result in unacceptably high delays for the minor	X				
4.13	Where high traffic volumes during peak hours face excessive delays, but relatively low volumes and delays during non-peak hours?		X		Weekday traffic volumes appear relatively consistent from the morning peak hour through the middle of the day to the evening peak hour.	
4.14	Away from a signalized intersection, where queues in general will not spill back into the roundabout?	X			A traffic signal is being proposed at the nearby intersection of Mass Ave & Marrett Road. If installed, queues from this signalized intersection may spill back into a roundabout.	Queue detection is an example of a possible remedy if queue spillback into the roundabout is occasional. Proper signal timing and coordination may remedy some queue spillbacks.

MASSACHUSETTS ROUNDABOUT INSTALLATION SCREENING FORM						
Question Number	**Is the intersection where a roundabout is being considered located:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
4.15	Away from a school drop-off/pickup area, or transit stop, where queues in general will not spill back into the roundabout?		X		Bus stops are located on both sides of Mass Ave in the vicinity of this intersection.	Bus bays or pullouts or locating transit stops further downstream of the splitter island may prevent queues from blocking the roundabout.
4.16	Outside of a coordinated arterial signal system or proposed roundabout where it will not impede progression through a corridor?	X				If the quality of progression is poor, a roundabout can replace a signalized intersection and improve coordination. Also, with correct signal timing and coordination, roundabouts and traffic signals can exist on the same corridor.
4.17	In an area where the percentage of major street traffic volume does not exceed 90% of the total entering traffic volume and the major street traffic volume is not opposed by relatively light traffic on the minor street?	X				Depends on how light the traffic is on the minor approach. In addition, if traffic calming is the main focus, then high or low traffic volume should not be the deciding factor.
4.18	Away from a railroad grade crossing, where queuing would not impact the roundabout or grade crossing?	X				Depends on the frequency of railroad trips.
4.19	Away from a direct emergency access roadway or driveway with preemption, where a roundabout would not impede emergency services?		X		An emergency signal for the fire station is located 500 feet from the intersection.	Depends on the frequency of emergency trips.
Assessment (4.9 to 4.19)	Based on your answers above, is the project location favorable for roundabout installation—i.e., a roundabout design would function well and would not create additional operations problems?		X		A roundabout may create additional operation problems due to the potential installation of a nearby signal. It is expected that bus stops would be able to be adjusted.	
TRAFFIC CALMING FACTORS						
Question Number	**Does the intersection where a roundabout is being considered have issues:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
4.20	That need to be addressed by traffic-calming measures for pedestrians, bicyclists, motorists, and transit users?			X	Pedestrian and bicycle safety issues are of concern at this location. It is expected that these issues can be resolved with methods other than traffic calming.	Generally, roundabout designs addressing traffic calming are located on local and residential roads.
4.21	Resulting from changes in land-use environments or transition to a new land-use environment?		X			Roundabout designs addressing environment or land-use transitions are located in areas where there may be a need to signify to drivers that the character of the road and surrounding land use is changing and, therefore, they need to change their driving behavior.
Assessment (4.20 to 4.21)	Based on your answers above, is the project traffic-calming improvement objective met—i.e., would a roundabout design address one or more of the project traffic calming issues?			X	Traffic calming is not a main objective of this project. However it is expected that other elements of this project, such as lane narrowing, and bump-outs, will provide for traffic calming along the corridor.	

MASSACHUSETTS ROUNDABOUT INSTALLATION SCREENING FORM						
AESTHETICS AND COMMUNITY ENHANCEMENT FACTOR						
Question Number	**Is the proposed roundabout part of:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/supporting information**
4.22	A community enhancement or aesthetics (gateways) improvement project?			X	While aesthetics are important to the community and the project is in an historic area, it is not a primary objective of this project.	Roundabouts proposed for community enhancements and improved aesthetics should demonstrate that they would not introduce traffic problems that do not currently exist.
Assessment (4.22)	Based on your answer above, is the project aesthetics and community enhancement objective met—i.e., would the roundabout design address aesthetics and community enhancement issues?			X	While aesthetics are important to the community and the project is in an historic area, it is not a primary objective of this project.	
ACCESS MANAGEMENT FACTORS						
Question Number	**Does the corridor in which a roundabout is being considered have issues:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/supporting information**
4.23	Related to a controlled-access corridor, where U-turns/left turns are desirable at an intersection to access properties on the opposite side of the road?		X			Corridors that are hampered with numerous driveways, especially those to businesses, can benefit from roundabouts. Roundabouts in conjunction with raised medians facilitate the use of U-turns and left turns at intersections and allow right-in-right-out movements at driveways.
4.24	Related to many access/egress points where left turns experience unacceptable delay turning into and out of driveways and consolidating and controlling access points (installing a raised median) are desirable objectives?		X			
Assessment (4.23 to 4.24)	Based on your answers above, is the project access management objective met—i.e., does the roundabout address access management issues?			X	Access management is not an objective of this project.	

STEP 5: SCREENING EVALUATION (Please circle one decision)		
Decision	**Criteria**	**Comments**
Candidate	Advance a roundabout design for further analysis and design if it meets both of these criteria: 1. Space requirements 2. One or more of the project objectives	
Conditional	Advance a roundabout design for further analysis and design under these conditions (specify):	
Not recommended	A roundabout is not recommended for further consideration if it fails to meet either of these criteria: 1. Space requirements 2. None of the project objectives	

ATTACHMENTS
Please attach all of the data and information applied to this roundabout assessment tool to support your decision.

MASSACHUSETTS ROUNDABOUT INSTALLATION SCREENING FORM

GENERAL INFORMATION

Highway district:	District 4	Major street:	Massachusetts Avenue
MPO/RPA:	Boston MPO / MAPC	Minor street:	Pleasant Street
City or Town:	Lexington, MA	Existing intersection control:	STOP
Prepared by:	J. Kavalaris	Number of legs at the intersection:	3
Submitted by:	BSC Group	ADT on major road:	20,200
Reviewed by:	S. Offei-Addo	ADT on minor road:	13,800
Phone:	617-896-4300	Total number of crashes (3-yr avg):	4.67
Email:	soffeiaddo@bscgroup.com	Speed limit (major road):	35 MPH
Date:	2/14/2013	Speed limit (minor road):	30 MPH

RESOURCES: DATA AND INFORMATION REQUIRED FOR ASSESSMENT

1. Traffic counts (ADT and turning movements)	6. Aerial photographs of location
2. Vehicle classification (trucks and buses)	7. Crash data (3 years)
3. Pedestrian and bicyclist counts	8. Crash diagrams
4. Plan sheet or layout of existing intersection	9. Speed data
5. Geometric layout of roundabout	

STEP 1: BRIEF DESCRIPTION OF EXISTING PROBLEMS

The intersection of Massachusetts Avenue (Mass Ave) and Pleasant Street currently experiences high levels of congestion and long delays. Vehicles wishing to turn left from Pleasant Street onto Mass Ave northbound have difficulty finding gaps in the traffic in order to turn. This results in long delays and queues on Pleasant Street. In addition, the current geometry of this area consists of a mini-roundabout with large paved areas, which many drivers have difficulty navigating. The intersection has poor or no sidewalks and long crosswalks. The project seeks to improve safety for pedestrians, bicyclists, and drivers; improve traffic operations; and reduce delays and congestion during the peak hours.

STEP 2: PROJECT OBJECTIVES (Check all that apply)

Question Number	Objectives	Primary		Secondary		Comment
		Yes	No	Yes	No	
2.1	Safety improvement	X				
2.2	Operational improvement	X				
2.3	Traffic-calming improvement		X		X	
2.4	Aesthetics/community enhancements			X		
2.5	Access management improvement		X		X	

MASSACHUSETTS ROUNDABOUT INSTALLATION SCREENING FORM						
STEP 3: TYPE OF ROUNDABOUT AND SPACE REQUIREMENTS (Check one)						
Question Number	**What type of roundabout is needed?**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
3.1	**Mini-roundabout**		X			
	Single-lane roundabout (Use Exhibit 2 or 3 for planning estimate of a single- lane roundabout.)	X			See the attachments for traffic volume data and roundabout type requirements. A double lane approach is recommended for Mass Ave southbound.	Familiar to many motorists, pedestrians, and bicyclists. Has fewer conflict points than multi-lane roundabouts.
	Double-lane roundabout (Use Exhibit 2 or 3 for planning estimate of a double- lane roundabout.)		X			Multi-lane roundabout is a big step from a single-lane roundabout and could pose challenges for pedestrians, bicyclists, and motorists. Consequently, a multi-lane roundabout could lead to project delays and may be a major factor in rejecting a roundabout design from further consideration in some cities and towns.
3.2	**Space requirement** Would there be sufficient right-of-way to build the roundabout? (Use Exhibit 4 for planning estimate of space requirements.)	X			90 - 150 FT	Right-of-way and geometric complications can be overcome in certain situations. In addition, consider cost and impact of land acquisition.
Assessment (3.1 to 3.2)	Based on your answers above, is the space requirement met?	X				
STEP 4: ROUNDABOUT SCREENING FACTORS (Check all that apply)						
SAFETY FACTORS						
Question Number	**Does the intersection where a roundabout is being considered have safety issues:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
4.1	Resulting from multi-leg intersection or unusual geometry?	X			The intersection includes wide pavement areas and a circle in the center of the pavement. Follen Road intersects to create unusual geometry.	Too-tight skewed intersections can be problematic for large vehicles (design issues). In addition, too many legs could preclude using a roundabout design.
4.2	Resulting from high-speed crashes?		X			The purpose of considering a roundabout design could be to control speeds in conjunction with addressing other intersection control needs.
4.3	Causing crashes that are angle-type?	X			43% of crashes over a 3 year period were angle-type.	Roundabouts reduce the number of conflict points at which opposing vehicles intersect, hence they can provide possible solutions for angle crashes involving left-turn and crossing movements.
4.4	Associated with crashes resulting in personal injuries?	X			29% of crashes over a 3 year period resulted in personal injuries.	Collisions at roundabouts tend to be less severe because of low speeds on the entry approach and in the circulating roadway (20 - 25 mph).

MASSACHUSETTS ROUNDABOUT INSTALLATION SCREENING FORM						
Question Number	**Does the intersection where a roundabout is being considered have safety issues:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
4.5	Associated with sight distance obstructions caused by alignment on existing stop-controlled approach?		X			
4.6	Associated with a change-in-speed environment of the roadway?		X			Generally, they occur at the fringes of an urban environment.
4.7	Associated with visibility from all approaches?		X			Some types of topography and construction complications can be overcome. The Highway Division successfully addressed vertical alignment issues and steep grades of a roundabout proposal on Cape Cod.
4.8	Associated with pedestrian and bicyclist volumes?		X			This would be an issue with a multi-lane roundabout and would need for further investigation, but it is less of a concern with a single- lane roundabout.
Assessment (4-1 to 4-8)	Based on your answers above, is the project safety improvement objective met—i.e., would a roundabout design address one or more of the project safety issues?	X				
OPERATIONAL FACTORS						
Question Number	**Does the intersection where a roundabout is being considered have issues:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
4.9	Resulting from a high percentage of left turns experiencing high delay or a need for left-turn lanes or U-turns?	X				Roundabouts may accommodate left-turning vehicles more efficiently with lower delays because they may not require storage lanes or separate turning phases.
4.10	Resulting in high delay but failing to meet traffic signal warrants?		X			
4.11	Resulting from a high proportion of left turns experiencing high delay and limited storage on an off- ramp?		X			A roundabout design can be particularly beneficial at interchanges if the roundabout alternative does not require bridge widening.
Question Number	**Is the intersection where a roundabout is being considered located:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
4.12	Where traffic volumes on the minor roads are such that STOP or YIELD signs result in unacceptably high delays for the minor road?	X				
4.13	Where high traffic volumes during peak hours face excessive delays, but relatively low volumes and delays during non-peak hours?		X		Weekday traffic volumes appear relatively consistent from the morning peak hour through the middle of the day to the evening peak hour.	
4.14	Away from a signalized intersection, where queues in general will not spill back into the roundabout?		X		A pedestrian traffic signal is located approximately 1000 feet from the intersection.	Queue detection is an example of a possible remedy if queue spillback into the roundabout is occasional. Proper signal timing and coordination may remedy some queue spillbacks.

MASSACHUSETTS ROUNDABOUT INSTALLATION SCREENING FORM						
Question Number	**Is the intersection where a roundabout is being considered located:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
4.15	Away from a school drop-off/pickup area, or transit stop, where queues in general will not spill back into the roundabout?		X		Bus stops are located on both sides of Mass Ave in the vicinity of this intersection. A school drop-off is located on Mass Ave north of this intersection.	Bus bays or pullouts or locating transit stops further downstream of the splitter island may prevent queues from blocking the roundabout.
4.16	Outside of a coordinated arterial signal system or proposed roundabout where it will not impede progression through a corridor?	X				If the quality of progression is poor, a roundabout can replace a signalized intersection and improve coordination. Also, with correct signal timing and coordination, roundabouts and traffic signals can exist on the same corridor.
4.17	In an area where the percentage of major street traffic volume does not exceed 90% of the total entering traffic volume and the major street traffic volume is not opposed by relatively light traffic on the minor street?	X				Depends on how light the traffic is on the minor approach. In addition, if traffic calming is the main focus, then high or low traffic volume should not be the deciding factor.
4.18	Away from a railroad grade crossing, where queuing would not impact the roundabout or grade crossing?	X				Depends on the frequency of railroad trips.
4.19	Away from a direct emergency access roadway or driveway with preemption, where a roundabout would not impede emergency services?	X				Depends on the frequency of emergency trips.
Assessment (4.9 to 4.19)	Based on your answers above, is the project location favorable for roundabout installation—i.e., a roundabout design would function well and would not create additional operations problems?	X				
TRAFFIC CALMING FACTORS						
Question Number	**Does the intersection where a roundabout is being considered have issues:**	**Yes**	**No**	**Other**	**Comment**	**Considerations/Supporting Information**
4.20	That need to be addressed by traffic-calming measures for pedestrians, bicyclists, motorists, and transit users?	X				Generally, roundabout designs addressing traffic calming are located on local and residential roads.
4.21	Resulting from changes in land-use environments or transition to a new land-use environment?		X			Roundabout designs addressing environment or land-use transitions are located in areas where there may be a need to signify to drivers that the character of the road and surrounding land use is changing and, therefore, they need to change their driving behavior.
Assessment (4.20 to 4.21)	Based on your answers above, is the project traffic-calming improvement objective met—i.e., would a roundabout design address one or more of the project traffic calming issues?			X	Traffic calming is not a main objective of this project. However it is expected that other elements of this project, such as lane narrowing, and bump-outs, will provide for traffic calming along the corridor.	

MASSACHUSETTS ROUNDABOUT INSTALLATION SCREENING FORM

AESTHETICS AND COMMUNITY ENHANCEMENT FACTOR

Question Number	Is the proposed roundabout part of:	Yes	No	Other	Comment	Considerations/supporting information
4.22	A community enhancement or aesthetics (gateways) improvement project?			X	While aesthetics are important to the community and the project is in an historic area, it is not a primary objective of this project.	Roundabouts proposed for community enhancements and improved aesthetics should demonstrate that they would not introduce traffic problems that do not currently exist.
Assessment (4.22)	Based on your answer above, is the project aesthetics and community enhancement objective met—i.e., would the roundabout design address aesthetics and community enhancement issues?			X	While aesthetics are important to the community and the project is in an historic area, it is not a primary objective of this project.	

ACCESS MANAGEMENT FACTORS

Question Number	Does the corridor in which a roundabout is being considered have issues:	Yes	No	Other	Comment	Considerations/supporting information
4.23	Related to a controlled-access corridor, where U-turns/left turns are desirable at an intersection to access properties on the opposite side of the road?		X			Corridors that are hampered with numerous driveways, especially those to businesses, can benefit from roundabouts. Roundabouts in conjunction with raised medians facilitate the use of U-turns and left turns at intersections and allow right-in-right-out movements at driveways.
4.24	Related to many access/egress points where left turns experience unacceptable delay turning into and out of driveways and consolidating and controlling access points (installing a raised median) are desirable objectives?		X			
Assessment (4.23 to 4.24)	Based on your answers above, is the project access management objective met—i.e., does the roundabout address access management issues?			X	Access management is not an objective of this project.	

STEP 5: SCREENING EVALUATION (Please circle one decision)

Decision	Criteria	Comments
Candidate	Advance a roundabout design for further analysis and design if it meets both of these criteria: 1. Space requirements 2. One or more of the project objectives	
Conditional	Advance a roundabout design for further analysis and design under these conditions (specify):	
Not recommended	A roundabout is not recommended for further consideration if it fails to meet either of these criteria: 1. Space requirements 2. None of the project objectives	

ATTACHMENTS

Please attach all of the data and information applied to this roundabout assessment tool to support your decision.

PRELIMINARY ROUNDABOUT ENTRY LANE ANALYSIS

EXISTING TRAFFIC VOLUMES

	AM Peak				PM Peak			
	Entering Vol a	Circulating Vol b	a+b		Entering Vol a	Circulating Vol b	a+b	
Maple St WB	781	718	1499	**2**	422	629	1051	**1-2**
Mass Ave SB	1193	306	1499	**2**	1349	197	1546	**2**
Mass Ave NB	919	188	1107	**1-2**	1006	631	1637	**2**

	AM Peak				PM Peak			
	Entering Vol a	Circulating Vol b	a+b		Entering Vol a	Circulating Vol b	a+b	
Marret Rd EB	253	803	1056	**1-2**	656	719	1375	**2**
Mass Ave SB	926	469	1395	**2**	750	227	977	**1**
Mass Ave NB	1063	45	1108	**1-2**	792	71	863	**1**

	AM Peak				PM Peak			
	Entering Vol a	Circulating Vol b	a+b		Entering Vol a	Circulating Vol b	a+b	
Pleasant St EB	363	291	654	**1**	482	450	932	**1**
Mass Ave SB	1014	244	1258	**1-2**	839	110	949	**1**
Mass Ave NB	723	302	1025	**1-2**	551	356	907	**1**

Rule of Thumb: If the sum of the entering and circulating volumes for each approach is less than 1,000 veh/h, then a single-lane roundabout is likely to operate acceptably.

Volume Thresholds for Determining the Number of Entry Lanes Required

Volume Range (sum of entering and conflicting volumes)	**Number of Lanes Required**
0 to 1,000 veh/h	Single-lane entry likely to be sufficient
1,000 to 1,300 veh/h	Two-lane entry may be needed Single-lane may be sufficient based upon more detailed analysis.
1,300 to 1,800 veh/h	Two-lane entry likely to be sufficient
Above 1,800 veh/h	More than two entering lanes may be required A more detailed capacity evaluation should be conducted to verify lane numbers and arrangements.

Source: New York State Department of Transportation
Referenced in NCHRP #672, *Roundabouts: Informational Guide,* 2nd Edition, USDOT/ FHWA

PRELIMINARY ROUNDABOUT ENTRY LANE ANALYSIS

FUTURE TRAFFIC VOLUMES

	AM Peak				PM Peak			
	Entering Vol a	Circulating Vol b	a+b		Entering Vol a	Circulating Vol b	a+b	
Maple St WB	864	794	1658	**2**	467	695	1162	**1-2**
Mass Ave SB	1319	339	1658	**2**	1492	218	1710	**2**
Mass Ave NB	1017	208	1225	**1-2**	1112	698	1810	**2+**

	AM Peak				PM Peak			
	Entering Vol a	Circulating Vol b	a+b		Entering Vol a	Circulating Vol b	a+b	
Marret Rd EB	280	888	1168	**1-2**	726	795	1521	**2**
Mass Ave SB	1024	519	1543	**2**	830	251	1081	**1-2**
Mass Ave NB	1176	50	1226	**1-2**	876	79	955	**1**

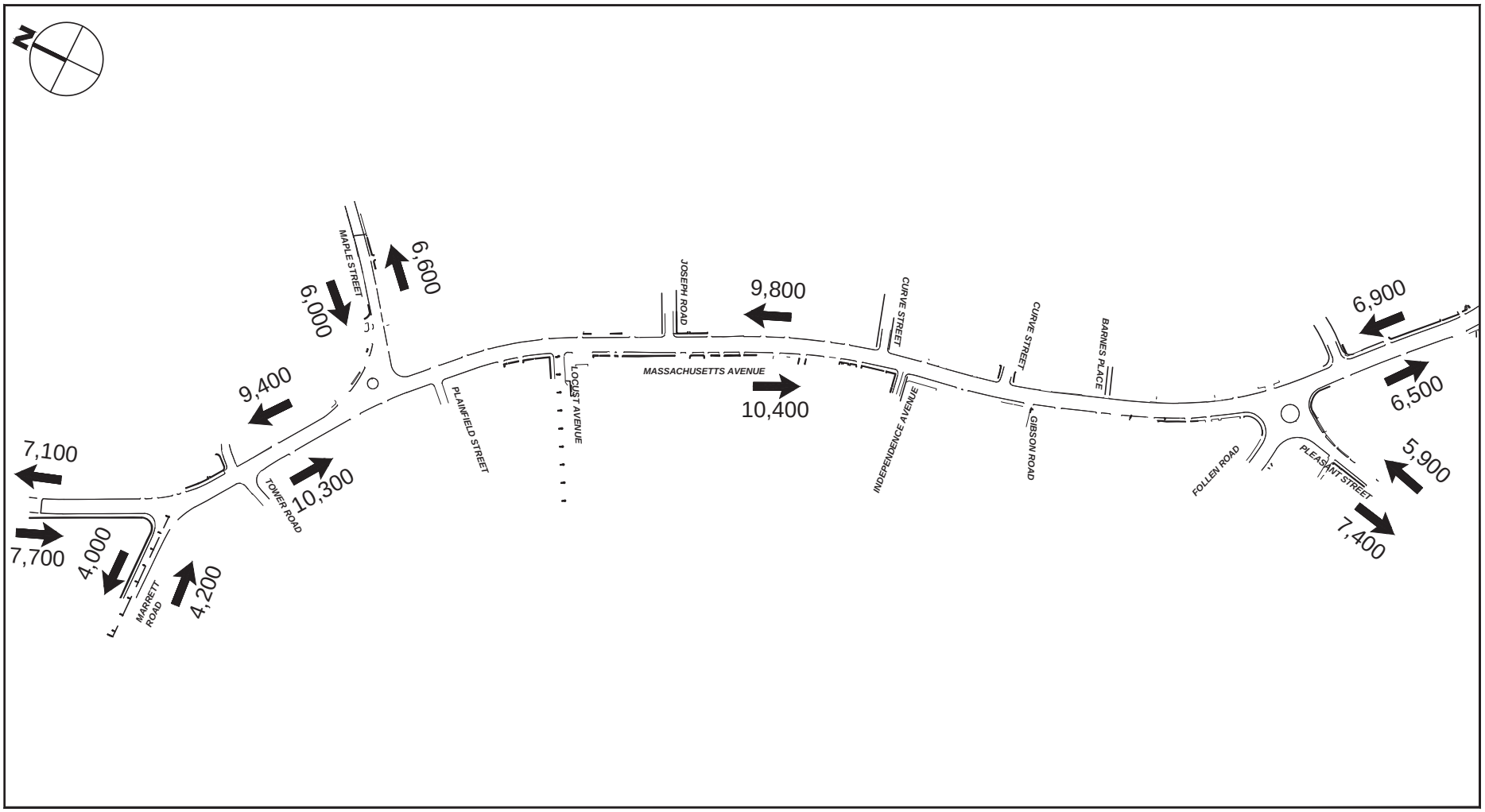
	AM Peak				PM Peak			
	Entering Vol a	Circulating Vol b	a+b		Entering Vol a	Circulating Vol b	a+b	
Pleasant St EB	402	322	724	**1**	534	498	1032	**1-2**
Mass Ave SB	1121	270	1391	**2**	928	122	1050	**1-2**
Mass Ave NB	800	334	1134	**1-2**	610	394	1004	**1-2**

Rule of Thumb: If the sum of the entering and circulating volumes for each approach is less than 1,000 veh/h, then a single-lane roundabout is likely to operate acceptably.

Volume Thresholds for Determining the Number of Entry Lanes Required

Volume Range (sum of entering and conflicting volumes)	**Number of Lanes Required**
0 to 1,000 veh/h	Single-lane entry likely to be sufficient
1,000 to 1,300 veh/h	Two-lane entry may be needed Single-lane may be sufficient based upon more detailed analysis.
1,300 to 1,800 veh/h	Two-lane entry likely to be sufficient
Above 1,800 veh/h	More than two entering lanes may be required A more detailed capacity evaluation should be conducted to verify lane numbers and arrangements.

Source: New York State Department of Transportation
Referenced in NCHRP #672, *Roundabouts: Informational Guide,* 2nd Edition, USDOT/ FHWA

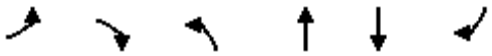


Existing 2011 Weekday Daily Traffic Volumes
East Massachusetts Avenue
Lexington, Massachusetts

Not to Scale

BSC GROUP

Appendix G: Capacity Analysis Worksheets



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	46	211	474	600	812	125
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.97	0.97	0.87	0.87
Hourly flow rate (vph)	55	251	489	619	933	144
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	2601	1005	1077			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2601	1005	1077			
tC, single (s)	6.5	6.3	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.2			
p0 queue free %	0	13	24			
cM capacity (veh/h)	6	288	640			

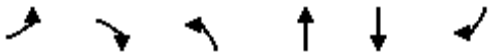
Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	306	489	619	1077
Volume Left	55	489	0	0
Volume Right	251	0	0	144
cSH	32	640	1700	1700
Volume to Capacity	9.62	0.76	0.36	0.63
Queue Length 95th (ft)	Err	176	0	0
Control Delay (s)	Err	26.4	0.0	0.0
Lane LOS	F	D		
Approach Delay (s)	Err	11.7		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	1233.7		
Intersection Capacity Utilization	102.1%	ICU Level of Service	G
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	310	480	726	204	190	1016
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.96	0.96	0.88	0.88
Hourly flow rate (vph)	352	545	756	212	216	1155
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	2449	862			969	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2449	862			969	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	0			69	
cM capacity (veh/h)	24	354			707	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	352	545	969	216	1155
Volume Left	352	0	0	216	0
Volume Right	0	545	212	0	0
cSH	24	354	1700	707	1700
Volume to Capacity	14.83	1.54	0.57	0.31	0.68
Queue Length 95th (ft)	Err	764	0	32	0
Control Delay (s)	Err	283.9	0.0	12.3	0.0
Lane LOS	F	F		B	
Approach Delay (s)	4096.2		0.0	1.9	
Approach LOS	F				

Intersection Summary			
Average Delay	1136.9		
Intersection Capacity Utilization	88.3%	ICU Level of Service	E
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	306	62	247	484	294	731
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.92	0.92	0.91	0.91
Hourly flow rate (vph)	364	74	268	526	323	803
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	1788	725	1126			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1788	725	1126			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	83	56			
cM capacity (veh/h)	50	425	613			

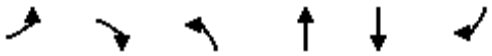
Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	364	74	795	1126
Volume Left	364	0	268	0
Volume Right	0	74	0	803
cSH	50	425	613	1700
Volume to Capacity	7.26	0.17	0.44	0.66
Queue Length 95th (ft)	Err	16	56	0
Control Delay (s)	Err	15.2	11.7	0.0
Lane LOS	F	C	B	
Approach Delay (s)	8317.0		11.7	0.0
Approach LOS	F			

Intersection Summary			
Average Delay	1548.5		
Intersection Capacity Utilization	126.5%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	10	357	963	15	11	57
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.94	0.94	0.83	0.83
Hourly flow rate (vph)	12	420	1024	16	13	69
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	1040				1476	1032
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1040				1476	1032
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				90	76
cM capacity (veh/h)	668				137	283

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	432	1040	82
Volume Left	12	0	13
Volume Right	0	16	69
cSH	668	1700	241
Volume to Capacity	0.02	0.61	0.34
Queue Length 95th (ft)	1	0	36
Control Delay (s)	0.5	0.0	27.5
Lane LOS	A		D
Approach Delay (s)	0.5	0.0	27.5
Approach LOS			D

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	62.4%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	72	591	230	571	727	32
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.90	0.90	0.93	0.93
Hourly flow rate (vph)	79	649	256	634	782	34
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	1944	799	816			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1944	799	816			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	0	69			
cM capacity (veh/h)	49	387	812			

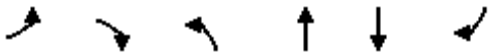
Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	729	256	634	816
Volume Left	79	256	0	0
Volume Right	649	0	0	34
cSH	222	812	1700	1700
Volume to Capacity	3.29	0.31	0.37	0.48
Queue Length 95th (ft)	Err	34	0	0
Control Delay (s)	Err	11.5	0.0	0.0
Lane LOS	F	B		
Approach Delay (s)	Err	3.3		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	2993.4		
Intersection Capacity Utilization	103.4%	ICU Level of Service	G
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	199	228	636	381	638	726
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.82	0.82	0.96	0.96	0.85	0.85
Hourly flow rate (vph)	243	278	662	397	751	854
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	3216	861			1059	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3216	861			1059	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	22			0	
cM capacity (veh/h)	0	357			661	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	243	278	1059	751	854
Volume Left	243	0	0	751	0
Volume Right	0	278	397	0	0
cSH	0	357	1700	661	1700
Volume to Capacity	Err	0.78	0.62	1.14	0.50
Queue Length 95th (ft)	Err	161	0	582	0
Control Delay (s)	Err	43.0	0.0	101.7	0.0
Lane LOS	F	E		F	
Approach Delay (s)	Err		0.0	47.6	
Approach LOS	F				

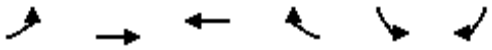
Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	113.1%	ICU Level of Service	H
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	360	128	112	446	455	393
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.89	0.89	0.92	0.92	0.85	0.85
Hourly flow rate (vph)	404	144	122	485	535	462
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	1495	766	998			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1495	766	998			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	64	82			
cM capacity (veh/h)	112	402	694			

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	404	144	607	998
Volume Left	404	0	122	0
Volume Right	0	144	0	462
cSH	112	402	694	1700
Volume to Capacity	3.62	0.36	0.18	0.59
Queue Length 95th (ft)	Err	40	16	0
Control Delay (s)	Err	18.8	4.5	0.0
Lane LOS	F	C	A	
Approach Delay (s)	7381.3		4.5	0.0
Approach LOS	F			

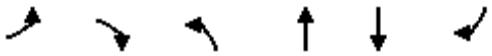
Intersection Summary			
Average Delay	1881.5		
Intersection Capacity Utilization	107.6%	ICU Level of Service	G
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	9	474	485	20	14	25
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.91	0.91	0.87	0.87	0.79	0.79
Hourly flow rate (vph)	10	521	557	23	18	32
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	580				1110	569
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	580				1110	569
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				92	94
cM capacity (veh/h)	994				232	525

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	531	580	49
Volume Left	10	0	18
Volume Right	0	23	32
cSH	994	1700	361
Volume to Capacity	0.01	0.34	0.14
Queue Length 95th (ft)	1	0	12
Control Delay (s)	0.3	0.0	16.5
Lane LOS	A		C
Approach Delay (s)	0.3	0.0	16.5
Approach LOS			C

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	42.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	49	222	499	631	854	132
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.97	0.97	0.87	0.87
Hourly flow rate (vph)	58	264	514	651	982	152
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	2737	1057	1133			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2737	1057	1133			
tC, single (s)	6.5	6.3	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.2			
p0 queue free %	0	2	16			
cM capacity (veh/h)	3	268	609			

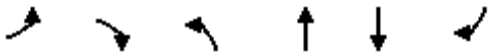
Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	323	514	651	1133
Volume Left	58	514	0	0
Volume Right	264	0	0	152
cSH	18	609	1700	1700
Volume to Capacity	18.35	0.84	0.38	0.67
Queue Length 95th (ft)	Err	229	0	0
Control Delay (s)	Err	34.8	0.0	0.0
Lane LOS	F	D		
Approach Delay (s)	Err	15.4		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	1237.7		
Intersection Capacity Utilization	107.0%	ICU Level of Service	G
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	326	505	764	215	200	1068
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.96	0.96	0.88	0.88
Hourly flow rate (vph)	370	574	796	224	227	1214
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	2576	908			1020	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2576	908			1020	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	0			66	
cM capacity (veh/h)	19	334			677	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	370	574	1020	227	1214
Volume Left	370	0	0	227	0
Volume Right	0	574	224	0	0
cSH	19	334	1700	677	1700
Volume to Capacity	19.68	1.72	0.60	0.34	0.71
Queue Length 95th (ft)	Err	900	0	37	0
Control Delay (s)	Err	363.7	0.0	13.0	0.0
Lane LOS	F	F		B	
Approach Delay (s)	4143.6		0.0	2.0	
Approach LOS	F				

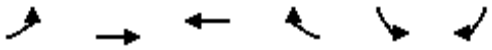
Intersection Summary			
Average Delay	1150.0		
Intersection Capacity Utilization	92.4%	ICU Level of Service	F
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	322	66	260	509	310	769
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.92	0.92	0.91	0.91
Hourly flow rate (vph)	383	79	283	553	341	845
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	1882	763	1186			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1882	763	1186			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	81	51			
cM capacity (veh/h)	40	404	582			

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	383	79	836	1186
Volume Left	383	0	283	0
Volume Right	0	79	0	845
cSH	40	404	582	1700
Volume to Capacity	9.55	0.19	0.49	0.70
Queue Length 95th (ft)	Err	18	66	0
Control Delay (s)	Err	16.0	13.8	0.0
Lane LOS	F	C	B	
Approach Delay (s)	8300.9		13.8	0.0
Approach LOS	F			

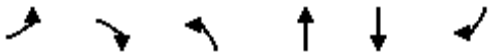
Intersection Summary			
Average Delay	1548.5		
Intersection Capacity Utilization	132.6%	ICU Level of Service	H
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	11	376	1013	16	12	60
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.94	0.94	0.83	0.83
Hourly flow rate (vph)	13	442	1078	17	14	72
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	1095				1554	1086
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1095				1554	1086
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				88	73
cM capacity (veh/h)	638				122	263

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	455	1095	87
Volume Left	13	0	14
Volume Right	0	17	72
cSH	638	1700	220
Volume to Capacity	0.02	0.64	0.39
Queue Length 95th (ft)	2	0	44
Control Delay (s)	0.6	0.0	31.5
Lane LOS	A		D
Approach Delay (s)	0.6	0.0	31.5
Approach LOS			D

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	65.3%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	76	622	242	601	765	34
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.90	0.90	0.93	0.93
Hourly flow rate (vph)	84	684	269	668	823	37
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	2046	841	859			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2046	841	859			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	0	66			
cM capacity (veh/h)	41	366	782			

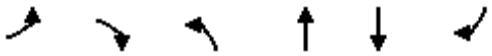
Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	767	269	668	859
Volume Left	84	269	0	0
Volume Right	684	0	0	37
cSH	196	782	1700	1700
Volume to Capacity	3.92	0.34	0.39	0.51
Queue Length 95th (ft)	Err	38	0	0
Control Delay (s)	Err	12.0	0.0	0.0
Lane LOS	F	B		
Approach Delay (s)	Err	3.4		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	2993.9		
Intersection Capacity Utilization	108.4%	ICU Level of Service	G
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	210	240	669	401	671	764
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.82	0.82	0.96	0.96	0.85	0.85
Hourly flow rate (vph)	256	293	697	418	789	899
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	3383	906			1115	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3383	906			1115	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	13			0	
cM capacity (veh/h)	0	336			630	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	256	293	1115	789	899
Volume Left	256	0	0	789	0
Volume Right	0	293	418	0	0
cSH	0	336	1700	630	1700
Volume to Capacity	Err	0.87	0.66	1.25	0.53
Queue Length 95th (ft)	Err	203	0	745	0
Control Delay (s)	Err	57.7	0.0	147.8	0.0
Lane LOS	F	F		F	
Approach Delay (s)	Err		0.0	69.1	
Approach LOS	F				

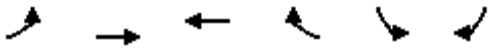
Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	118.5%	ICU Level of Service	H
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	379	135	118	469	479	414
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.89	0.89	0.92	0.92	0.85	0.85
Hourly flow rate (vph)	426	152	128	510	564	487
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	1573	807	1051			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1573	807	1051			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	60	81			
cM capacity (veh/h)	98	381	662			

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	426	152	638	1051
Volume Left	426	0	128	0
Volume Right	0	152	0	487
cSH	98	381	662	1700
Volume to Capacity	4.36	0.40	0.19	0.62
Queue Length 95th (ft)	Err	47	18	0
Control Delay (s)	Err	20.5	5.0	0.0
Lane LOS	F	C	A	
Approach Delay (s)	7378.2		5.0	0.0
Approach LOS	F			

Intersection Summary			
Average Delay	1881.7		
Intersection Capacity Utilization	112.7%	ICU Level of Service	H
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	10	499	510	22	15	27
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.91	0.91	0.87	0.87	0.79	0.79
Hourly flow rate (vph)	11	548	586	25	19	34
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	611				1169	599
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	611				1169	599
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				91	93
cM capacity (veh/h)	968				213	505

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	559	611	53
Volume Left	11	0	19
Volume Right	0	25	34
cSH	968	1700	339
Volume to Capacity	0.01	0.36	0.16
Queue Length 95th (ft)	1	0	14
Control Delay (s)	0.3	0.0	17.6
Lane LOS	A		C
Approach Delay (s)	0.3	0.0	17.6
Approach LOS			C

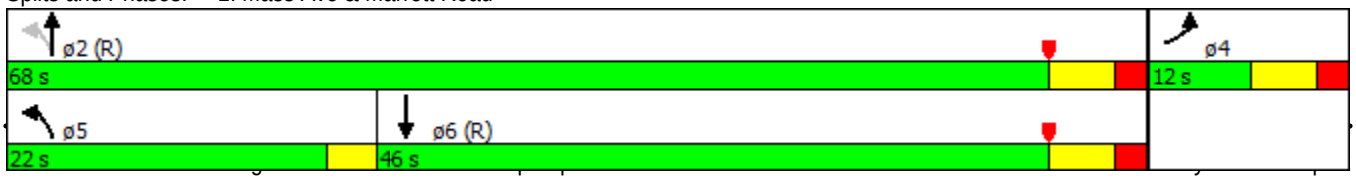
Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	44.3%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	NBL	NBT	SBT
Lane Configurations				
Volume (vph)	45	469	594	803
Lane Group Flow (vph)	275	510	646	1007
Turn Type	NA	pm+pt	NA	NA
Protected Phases	4	5	2	6
Permitted Phases		2		
Detector Phase	4	5	2	6
Switch Phase				
Minimum Initial (s)	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	8.0	12.0	12.0
Total Split (s)	12.0	22.0	68.0	46.0
Total Split (%)	15.0%	27.5%	85.0%	57.5%
Yellow Time (s)	4.0	3.0	4.0	4.0
All-Red Time (s)	2.0	0.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	3.0	6.0	6.0
Lead/Lag		Lead		Lag
Lead-Lag Optimize?		Yes		Yes
Recall Mode	None	None	C-Min	C-Min
v/c Ratio	0.84	1.07	0.47	1.03
Control Delay	32.6	70.6	4.0	60.2
Queue Delay	22.1	0.0	0.0	18.0
Total Delay	54.7	70.6	4.0	78.2
Queue Length 50th (ft)	25	~232	86	~547
Queue Length 95th (ft)	#148	m#323	m94	#779
Internal Link Dist (ft)	1023		613	895
Turn Bay Length (ft)		300		
Base Capacity (vph)	329	476	1368	973
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	54	0	0	43
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	1.00	1.07	0.47	1.08

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 80
Offset: 49 (61%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 80
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Mass Ave & Marrett Road



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	45	208	469	594	803	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	13	12	10	11	14	12
Total Lost time (s)	6.0		3.0	6.0	6.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.89		1.00	1.00	0.98	
Flt Protected	0.99		0.95	1.00	1.00	
Satd. Flow (prot)	1632		1620	1766	1932	
Flt Permitted	0.99		0.09	1.00	1.00	
Satd. Flow (perm)	1632		159	1766	1932	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	226	510	646	873	134
RTOR Reduction (vph)	207	0	0	0	7	0
Lane Group Flow (vph)	68	0	510	646	1000	0
Heavy Vehicles (%)	6%	6%	4%	4%	3%	3%
Turn Type	NA		pm+pt	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases			2			
Actuated Green, G (s)	6.0		62.0	62.0	40.0	
Effective Green, g (s)	6.0		62.0	62.0	40.0	
Actuated g/C Ratio	0.08		0.78	0.78	0.50	
Clearance Time (s)	6.0		3.0	6.0	6.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	122		470	1368	966	
v/s Ratio Prot	c0.04		c0.26	0.37	0.52	
v/s Ratio Perm			c0.58			
v/c Ratio	0.56		1.09	0.47	1.04	
Uniform Delay, d1	35.7		25.1	3.2	20.0	
Progression Factor	1.00		0.79	1.02	1.00	
Incremental Delay, d2	5.4		54.8	0.6	38.4	
Delay (s)	41.1		74.6	3.8	58.4	
Level of Service	D		E	A	E	
Approach Delay (s)	41.1			35.0	58.4	
Approach LOS	D			D	E	

Intersection Summary

HCM 2000 Control Delay	45.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	104.4%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	306	475	718	201	188	1005
Lane Group Flow (vph)	333	516	780	218	204	1092
Turn Type	NA	pt+ov	NA	Perm	pm+pt	NA
Protected Phases	8	8 1	2		1	6
Permitted Phases				2	6	
Detector Phase	8	8 1	2	2	1	6
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	12.0		12.0	12.0	9.0	12.0
Total Split (s)	24.0		46.0	46.0	10.0	56.0
Total Split (%)	30.0%		57.5%	57.5%	12.5%	70.0%
Yellow Time (s)	4.0		4.0	4.0	3.0	4.0
All-Red Time (s)	2.0		2.0	2.0	0.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0		6.0	6.0	3.0	6.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None		C-Min	C-Min	None	C-Min
v/c Ratio	0.89	0.83	0.87	0.26	0.73	0.97
Control Delay	58.4	31.1	30.2	2.5	20.5	25.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	4.3
Total Delay	58.4	31.1	30.2	2.5	20.5	29.9
Queue Length 50th (ft)	161	173	328	0	16	563
Queue Length 95th (ft)	#305	#350	#563	32	m23	m#633
Internal Link Dist (ft)	829		2448			613
Turn Bay Length (ft)	100			250	300	
Base Capacity (vph)	384	608	899	846	281	1126
Starvation Cap Reductn	0	0	0	0	0	27
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.87	0.85	0.87	0.26	0.73	0.99

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Mass Ave & Maple Street

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	306	475	718	201	188	1005
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	10	10	11
Total Lost time (s)	6.0	6.0	6.0	6.0	3.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1711	1531	1783	1463	1636	1783
Flt Permitted	0.95	1.00	1.00	1.00	0.14	1.00
Satd. Flow (perm)	1711	1531	1783	1463	235	1783
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	333	516	780	218	204	1092
RTOR Reduction (vph)	0	86	0	108	0	0
Lane Group Flow (vph)	333	430	780	110	204	1092
Heavy Vehicles (%)	2%	2%	3%	3%	3%	3%
Turn Type	NA	pt+ov	NA	Perm	pm+pt	NA
Protected Phases	8	8 1	2		1	6
Permitted Phases				2	6	
Actuated Green, G (s)	17.5	30.7	40.3	40.3	50.5	50.5
Effective Green, g (s)	17.5	30.7	40.3	40.3	50.5	50.5
Actuated g/C Ratio	0.22	0.38	0.50	0.50	0.63	0.63
Clearance Time (s)	6.0		6.0	6.0	3.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	374	587	898	736	274	1125
v/s Ratio Prot	c0.19	0.28	0.44		0.07	c0.61
v/s Ratio Perm				0.08	0.40	
v/c Ratio	0.89	0.73	0.87	0.15	0.74	0.97
Uniform Delay, d1	30.3	21.1	17.5	10.7	13.1	14.0
Progression Factor	1.00	1.00	1.00	1.00	1.36	0.68
Incremental Delay, d2	22.2	4.7	11.1	0.4	5.5	13.4
Delay (s)	52.5	25.9	28.7	11.1	23.4	22.9
Level of Service	D	C	C	B	C	C
Approach Delay (s)	36.3		24.8			23.0
Approach LOS	D		C			C

Intersection Summary

HCM 2000 Control Delay	27.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	79.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	302	61	244	479	291	723
Lane Group Flow (vph)	328	66	265	521	316	786
Turn Type	NA	Perm	pm+pt	NA	NA	pm+ov
Protected Phases	4		5	2	6	4
Permitted Phases		4	2			6
Detector Phase	4	4	5	2	6	4
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	8.0	22.0	22.0	21.0
Total Split (s)	30.0	30.0	15.0	50.0	35.0	30.0
Total Split (%)	37.5%	37.5%	18.8%	62.5%	43.8%	37.5%
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	0.0	2.0	2.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	3.0	6.0	6.0	5.0
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None	None	None	Min	Min	None
v/c Ratio	0.59	0.13	0.45	0.49	0.66	0.67
Control Delay	23.6	5.9	10.1	12.1	27.6	5.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.6	5.9	10.1	12.1	27.6	5.7
Queue Length 50th (ft)	99	0	43	111	101	53
Queue Length 95th (ft)	201	25	99	222	198	121
Internal Link Dist (ft)	57			1095	2448	
Turn Bay Length (ft)						400
Base Capacity (vph)	831	734	616	1575	902	1339
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.39	0.09	0.43	0.33	0.35	0.59

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 59.5
Natural Cycle: 55
Control Type: Actuated-Uncoordinated

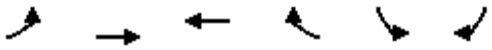
Splits and Phases: 6: Mass Ave & Pleasant Street

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	302	61	244	479	291	723
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	14	12	12	16	11	12
Total Lost time (s)	5.0	5.0	3.0	6.0	6.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1888	1583	1736	2071	1766	1553
Flt Permitted	0.95	1.00	0.39	1.00	1.00	1.00
Satd. Flow (perm)	1888	1583	711	2071	1766	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	328	66	265	521	316	786
RTOR Reduction (vph)	0	46	0	0	0	164
Lane Group Flow (vph)	328	20	265	521	316	622
Heavy Vehicles (%)	2%	2%	4%	4%	4%	4%
Turn Type	NA	Perm	pm+pt	NA	NA	pm+ov
Protected Phases	4		5	2	6	4
Permitted Phases		4	2			6
Actuated Green, G (s)	17.6	17.6	30.4	30.4	16.3	33.9
Effective Green, g (s)	17.6	17.6	30.4	30.4	16.3	33.9
Actuated g/C Ratio	0.30	0.30	0.52	0.52	0.28	0.57
Clearance Time (s)	5.0	5.0	3.0	6.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	563	472	559	1067	487	892
v/s Ratio Prot	0.17		0.09	c0.25	0.18	c0.21
v/s Ratio Perm		0.01	0.16			0.19
v/c Ratio	0.58	0.04	0.47	0.49	0.65	0.70
Uniform Delay, d1	17.6	14.7	8.6	9.3	18.8	8.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.5	0.0	0.6	0.4	3.0	2.4
Delay (s)	19.1	14.7	9.2	9.6	21.8	11.3
Level of Service	B	B	A	A	C	B
Approach Delay (s)	18.4			9.5	14.3	
Approach LOS	B			A	B	

Intersection Summary

HCM 2000 Control Delay	13.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	59.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	9	353	953	14	10	56
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	384	1036	15	11	61
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			137			
pX, platoon unblocked						
vC, conflicting volume	1051				1447	1043
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1051				1447	1043
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				92	78
cM capacity (veh/h)	662				143	278

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	393	1051	72
Volume Left	10	0	11
Volume Right	0	15	61
cSH	662	1700	243
Volume to Capacity	0.01	0.62	0.29
Queue Length 95th (ft)	1	0	30
Control Delay (s)	0.5	0.0	25.9
Lane LOS	A		D
Approach Delay (s)	0.5	0.0	25.9
Approach LOS			D

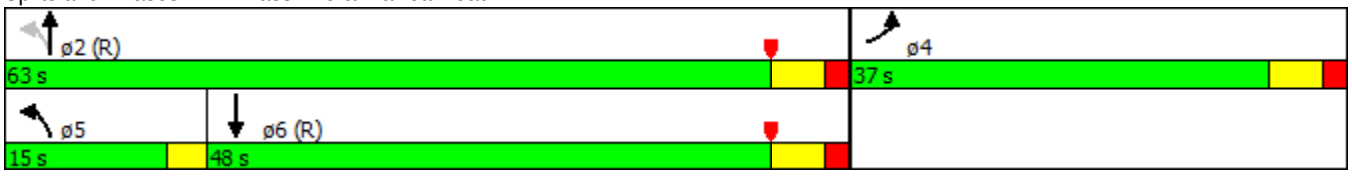
Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	61.7%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	NBL	NBT	SBT
Lane Configurations				
Volume (vph)	71	227	565	719
Lane Group Flow (vph)	713	247	614	816
Turn Type	NA	pm+pt	NA	NA
Protected Phases	4	5	2	6
Permitted Phases		2		
Detector Phase	4	5	2	6
Switch Phase				
Minimum Initial (s)	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	10.0	12.0	22.0
Total Split (s)	37.0	15.0	63.0	48.0
Total Split (%)	37.0%	15.0%	63.0%	48.0%
Yellow Time (s)	4.0	3.0	4.0	4.0
All-Red Time (s)	2.0	0.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	3.0	6.0	6.0
Lead/Lag		Lead		Lag
Lead-Lag Optimize?		Yes		Yes
Recall Mode	None	None	C-Min	C-Min
v/c Ratio	0.98	0.89	0.58	0.97
Control Delay	49.6	55.8	15.9	55.2
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	49.6	55.8	15.9	55.2
Queue Length 50th (ft)	285	131	190	500
Queue Length 95th (ft)	#541	m144	m199	#767
Internal Link Dist (ft)	1027		621	895
Turn Bay Length (ft)		300		
Base Capacity (vph)	727	281	1062	837
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.98	0.88	0.58	0.97

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 3 (3%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Mass Ave & Marrett Road



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	71	585	227	565	719	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	11	12	14	12
Total Lost time (s)	6.0		3.0	6.0	6.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.88		1.00	1.00	0.99	
Flt Protected	0.99		0.95	1.00	1.00	
Satd. Flow (prot)	1646		1711	1863	1976	
Flt Permitted	0.99		0.09	1.00	1.00	
Satd. Flow (perm)	1646		159	1863	1976	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	77	636	247	614	782	34
RTOR Reduction (vph)	217	0	0	0	2	0
Lane Group Flow (vph)	496	0	247	614	814	0
Heavy Vehicles (%)	1%	1%	2%	2%	2%	2%
Turn Type	NA		pm+pt	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases			2			
Actuated Green, G (s)	31.0		57.0	57.0	42.3	
Effective Green, g (s)	31.0		57.0	57.0	42.3	
Actuated g/C Ratio	0.31		0.57	0.57	0.42	
Clearance Time (s)	6.0		3.0	6.0	6.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	510		272	1061	835	
v/s Ratio Prot	c0.30		c0.11	0.33	c0.41	
v/s Ratio Perm			0.41			
v/c Ratio	0.97		0.91	0.58	0.98	
Uniform Delay, d1	34.1		28.8	13.8	28.3	
Progression Factor	1.00		1.67	1.04	1.00	
Incremental Delay, d2	32.8		18.4	1.1	25.7	
Delay (s)	66.9		66.6	15.4	54.0	
Level of Service	E		E	B	D	
Approach Delay (s)	66.9			30.1	54.0	
Approach LOS	E			C	D	

Intersection Summary

HCM 2000 Control Delay	49.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	105.7%	ICU Level of Service	G
Analysis Period (min)	15		

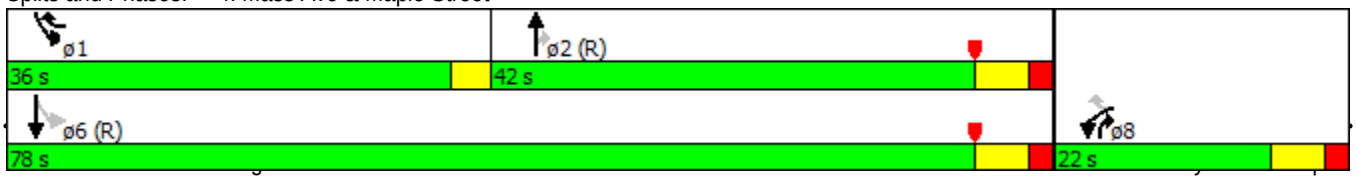
c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	197	225	629	377	631	718
Lane Group Flow (vph)	214	245	684	410	686	780
Turn Type	NA	pm+ov	NA	pm+ov	pm+pt	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2	6	
Detector Phase	8	1	2	8	1	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	12.0	10.0	12.0	12.0	10.0	12.0
Total Split (s)	22.0	36.0	42.0	22.0	36.0	78.0
Total Split (%)	22.0%	36.0%	42.0%	22.0%	36.0%	78.0%
Yellow Time (s)	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	2.0	0.0	2.0	2.0	0.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	3.0	6.0	6.0	3.0	6.0
Lead/Lag		Lead	Lag		Lead	
Lead-Lag Optimize?		Yes	Yes		Yes	
Recall Mode	None	None	C-Min	None	None	C-Min
v/c Ratio	0.83	0.28	1.07	0.47	1.09	0.60
Control Delay	67.1	8.4	87.2	11.1	80.0	9.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.3
Total Delay	67.1	8.4	87.2	11.1	80.0	10.2
Queue Length 50th (ft)	133	48	~484	103	~470	259
Queue Length 95th (ft)	#247	92	#703	175	m#499	m273
Internal Link Dist (ft)	876		2384			621
Turn Bay Length (ft)	250			250	300	
Base Capacity (vph)	273	881	641	889	628	1298
Starvation Cap Reductn	0	0	0	0	0	145
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.78	0.28	1.07	0.46	1.09	0.68

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow, Master Intersection
Natural Cycle: 100
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Mass Ave & Maple Street



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	197	225	629	377	631	718
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	10	10	11
Total Lost time (s)	6.0	3.0	6.0	6.0	3.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1711	1531	1783	1463	1636	1783
Flt Permitted	0.95	1.00	1.00	1.00	0.10	1.00
Satd. Flow (perm)	1711	1531	1783	1463	177	1783
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	214	245	684	410	686	780
RTOR Reduction (vph)	0	44	0	47	0	0
Lane Group Flow (vph)	214	201	684	363	686	780
Heavy Vehicles (%)	2%	2%	3%	3%	3%	3%
Turn Type	NA	pm+ov	NA	pm+ov	pm+pt	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2	6	
Actuated Green, G (s)	15.2	49.0	36.0	51.2	72.8	72.8
Effective Green, g (s)	15.2	49.0	36.0	51.2	72.8	72.8
Actuated g/C Ratio	0.15	0.49	0.36	0.51	0.73	0.73
Clearance Time (s)	6.0	3.0	6.0	6.0	3.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	260	750	641	836	621	1298
v/s Ratio Prot	c0.13	0.09	0.38	0.07	c0.37	0.44
v/s Ratio Perm		0.04		0.18	c0.43	
v/c Ratio	0.82	0.27	1.07	0.43	1.10	0.60
Uniform Delay, d1	41.1	15.0	32.0	15.3	28.0	6.6
Progression Factor	1.00	1.00	1.00	1.00	1.10	1.29
Incremental Delay, d2	18.6	0.2	54.8	0.4	55.7	0.7
Delay (s)	59.7	15.2	86.8	15.7	86.3	9.2
Level of Service	E	B	F	B	F	A
Approach Delay (s)	35.9		60.1			45.3
Approach LOS	D		E			D

Intersection Summary

HCM 2000 Control Delay	49.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	92.3%	ICU Level of Service	F
Analysis Period (min)	15		

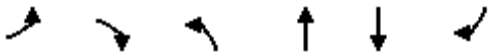
c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	356	126	110	441	450	389
Lane Group Flow (vph)	387	137	120	479	489	423
Turn Type	NA	Perm	pm+pt	NA	NA	pm+ov
Protected Phases	4		5	2	6	4
Permitted Phases		4	2			6
Detector Phase	4	4	5	2	6	4
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	8.0	22.0	22.0	22.0
Total Split (s)	32.0	32.0	12.0	48.0	36.0	32.0
Total Split (%)	40.0%	40.0%	15.0%	60.0%	45.0%	40.0%
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	0.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	3.0	6.0	6.0	6.0
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None	None	None	None	None	None
v/c Ratio	0.71	0.23	0.30	0.53	0.78	0.31
Control Delay	29.5	5.2	10.0	14.0	29.9	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.5	5.2	10.0	14.0	29.9	0.9
Queue Length 50th (ft)	144	0	22	124	185	0
Queue Length 95th (ft)	262	36	50	222	319	15
Internal Link Dist (ft)	31			1121	2384	
Turn Bay Length (ft)			150			200
Base Capacity (vph)	803	793	422	1261	943	1403
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.17	0.28	0.38	0.52	0.30

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 63.9
Natural Cycle: 60
Control Type: Actuated-Uncoordinated

Splits and Phases: 6: Mass Ave & Pleasant Street

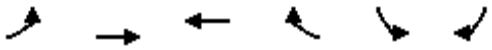


Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	356	126	110	441	450	389
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	10	12	11	12
Total Lost time (s)	6.0	6.0	3.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1652	1863	1801	1583
Flt Permitted	0.95	1.00	0.25	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	434	1863	1801	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	387	137	120	479	489	423
RTOR Reduction (vph)	0	94	0	0	0	142
Lane Group Flow (vph)	387	43	120	479	489	281
Turn Type	NA	Perm	pm+pt	NA	NA	pm+ov
Protected Phases	4		5	2	6	4
Permitted Phases		4	2			6
Actuated Green, G (s)	19.8	19.8	31.5	31.5	22.3	42.1
Effective Green, g (s)	19.8	19.8	31.5	31.5	22.3	42.1
Actuated g/C Ratio	0.31	0.31	0.50	0.50	0.35	0.67
Clearance Time (s)	6.0	6.0	3.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	553	495	335	927	634	1202
v/s Ratio Prot	c0.22		0.04	c0.26	c0.27	0.07
v/s Ratio Perm		0.03	0.14			0.10
v/c Ratio	0.70	0.09	0.36	0.52	0.77	0.23
Uniform Delay, d1	19.1	15.4	10.0	10.8	18.2	4.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.9	0.1	0.7	0.5	5.8	0.1
Delay (s)	23.0	15.4	10.7	11.2	24.0	4.3
Level of Service	C	B	B	B	C	A
Approach Delay (s)	21.0			11.1	14.9	
Approach LOS	C			B	B	

Intersection Summary

HCM 2000 Control Delay	15.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	63.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	62.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	8	469	480	19	13	24
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	510	522	21	14	26
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			111			
pX, platoon unblocked						
vC, conflicting volume	542				1059	532
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	542				1059	532
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				94	95
cM capacity (veh/h)	1026				248	551

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	518	542	40
Volume Left	9	0	14
Volume Right	0	21	26
cSH	1026	1700	386
Volume to Capacity	0.01	0.32	0.10
Queue Length 95th (ft)	1	0	9
Control Delay (s)	0.2	0.0	15.4
Lane LOS	A		C
Approach Delay (s)	0.2	0.0	15.4
Approach LOS			C

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	41.1%	ICU Level of Service	A
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: 2023 AM Build Single lane approach

Roundabout with single lane approaches and circulating road, and 1-lane exits
MUTCD (FHWA 2009) example number: 3C-5
Roundabout Guide (TRB 2010) example number: A-6
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Mass Ave NB											
8	T1	830	2.0	1.108	82.8	LOS F	68.1	1729.1	1.00	3.86	9.6
18	R2	234	2.0	1.108	82.8	LOS F	68.1	1729.1	1.00	3.86	9.6
Approach		1064	2.0	1.108	82.8	LOS F	68.1	1729.1	1.00	1.93	9.6
East: Maple St WB											
1	L2	354	2.0	1.745	362.8	LOS F	132.3	3361.4	1.00	12.94	3.0
16	R2	549	2.0	1.745	362.8	LOS F	132.3	3361.4	1.00	12.94	3.0
Approach		903	2.0	1.745	362.8	LOS F	132.3	3361.4	1.00	6.47	3.0
North: Mass Ave SB											
7	L2	217	2.0	1.525	256.2	LOS F	178.7	4538.2	1.00	9.93	4.0
4	T1	1161	2.0	1.525	256.2	LOS F	178.7	4538.2	1.00	9.93	4.0
Approach		1378	2.0	1.525	256.2	LOS F	178.7	4538.2	1.00	4.97	4.0
All Vehicles		3346	2.0	1.745	229.8	LOS F	178.7	4538.2	1.00	4.41	4.4

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2023 AM Single lane Rev 11-12

Lexington - Mass Ave Improvements
Roundabout
Sensitivity Analysis (Lane Utilisation Ratio): Results for Parameter Scale = 50.0 %

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Pleasant St											
3b	L3	10	2.0	0.496	11.4	LOS B	2.7	67.9	0.58	1.14	20.7
3	L2	325	2.0	0.496	11.4	LOS B	2.7	67.9	0.58	1.14	20.7
18	R2	59	2.0	0.496	11.4	LOS B	2.7	67.9	0.58	1.14	20.7
Approach		393	2.0	0.496	11.4	LOS B	2.7	67.9	0.58	0.57	20.7
East: Mass Ave WB											
1	L2	254	2.0	0.933	38.8	LOS E	17.4	441.3	1.00	2.82	14.5
1a	L1	11	2.0	0.933	38.8	LOS E	17.4	441.3	1.00	2.82	14.5
6	T1	521	2.0	0.933	38.8	LOS E	17.4	441.3	1.00	2.82	14.5
Approach		786	2.0	0.933	38.8	LOS E	17.4	441.3	1.00	1.41	14.5
West: Mass Ave EB											
2	T1	316	2.0	0.377	8.7	LOS A	1.7	43.0	0.48	0.82	23.3
12	R2	782	2.0	0.861	27.0	LOS D	12.5	317.7	0.96	2.14	16.8
12b	R3	4	2.0	0.861	27.0	LOS D	12.5	317.7	0.96	2.14	16.8
Approach		1102	2.0	0.861	21.7	LOS C	12.5	317.7	0.82	0.88	18.3
SouthWest: Follen Rd											
5bx	L3	3	2.0	0.170	11.1	LOS B	0.4	11.0	0.66	1.32	21.5
12ax	R1	8	2.0	0.170	11.1	LOS B	0.4	11.0	0.66	1.32	21.5
12bx	R3	61	2.0	0.170	11.1	LOS B	0.4	11.0	0.66	1.32	21.5
Approach		72	2.0	0.170	11.1	LOS B	0.4	11.0	0.66	0.66	21.5
All Vehicles		2353	2.0	0.933	25.4	LOS D	17.4	441.3	0.84	1.00	17.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2023 PM Build Single lane approach

Roundabout with single lane approaches and circulating road, and 1-lane exits
MUTCD (FHWA 2009) example number: 3C-5
Roundabout Guide (TRB 2010) example number: A-6
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Mass Ave NB											
8	T1	727	2.0	1.596	290.6	LOS F	153.4	3895.3	1.00	12.28	3.6
18	R2	436	2.0	1.596	290.6	LOS F	153.4	3895.3	1.00	12.28	3.6
Approach		1163	2.0	1.596	290.6	LOS F	153.4	3895.3	1.00	6.14	3.6
East: Maple St WB											
1	L2	228	2.0	0.703	20.0	LOS C	5.4	136.2	0.79	1.84	18.4
16	R2	261	2.0	0.703	20.0	LOS C	5.4	136.2	0.79	1.84	18.4
Approach		489	2.0	0.703	20.0	LOS C	5.4	136.2	0.79	0.92	18.4
North: Mass Ave SB											
7	L2	729	2.0	1.777	367.9	LOS F	243.8	6192.2	1.00	12.55	3.0
4	T1	830	2.0	1.777	367.9	LOS F	243.8	6192.2	1.00	12.55	3.0
Approach		1560	2.0	1.777	367.9	LOS F	243.8	6192.2	1.00	6.28	3.0
All Vehicles		3212	2.0	1.777	286.9	LOS F	243.8	6192.2	0.97	5.41	3.7

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2023 PM Single lane Rev 11-12

Lexington - Mass Ave Improvements
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Pleasant St											
3b	L3	9	2.0	0.784	26.2	LOS D	6.9	176.3	0.86	2.15	16.7
3	L2	387	2.0	0.784	26.2	LOS D	6.9	176.3	0.86	2.15	16.7
18	R2	123	2.0	0.784	26.2	LOS D	6.9	176.3	0.86	2.15	16.7
Approach		518	2.0	0.784	26.2	LOS D	6.9	176.3	0.86	1.07	16.7
East: Mass Ave WB											
1	L2	102	2.0	0.811	26.3	LOS D	8.5	216.8	0.89	2.20	17.2
1a	L1	17	2.0	0.811	26.3	LOS D	8.5	216.8	0.89	2.20	17.2
6	T1	479	2.0	0.811	26.3	LOS D	8.5	216.8	0.89	2.20	17.2
Approach		599	2.0	0.811	26.3	LOS D	8.5	216.8	0.89	1.10	17.2
West: Mass Ave EB											
2	T1	489	2.0	0.503	9.9	LOS A	2.9	73.8	0.41	0.54	22.8
12	R2	420	2.0	0.435	8.7	LOS A	2.3	57.8	0.37	0.48	22.6
12b	R3	3	2.0	0.435	8.7	LOS A	2.3	57.8	0.37	0.48	22.6
Approach		912	2.0	0.503	9.3	LOS A	2.9	73.8	0.39	0.26	22.7
SouthWest: Follen Rd											
5bx	L3	2	2.0	0.107	10.7	LOS B	0.3	8.5	0.67	1.34	21.8
12ax	R1	14	2.0	0.107	10.7	LOS B	0.3	8.5	0.67	1.34	21.8
12bx	R3	26	2.0	0.107	10.7	LOS B	0.3	8.5	0.67	1.34	21.8
Approach		42	2.0	0.107	10.7	LOS B	0.3	8.5	0.67	0.67	21.8
All Vehicles		2072	2.0	0.811	18.5	LOS C	8.5	216.8	0.66	0.71	19.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.