



## MEMORANDUM

**TO:** Salvatore Lupoli  
Lupoli Companies  
290 Merrimack Street, 2<sup>nd</sup> Floor  
Lawrence, MA 01843

**DATE:** October 27, 2017

**FROM:** Samuel W. Gregorio, P.E., PTOE, Senior Traffic Engineer  
Eindra (Elena) Aung, E.I.T., Project Traffic Engineer

**PROJECT NO.:** T0525

**RE:** The Dascomb Road Project (#146 Dascomb Road) – Andover, Massachusetts  
Traffic Impact and Access Study (TIAS)

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### INTRODUCTION

TEC, Inc. (TEC) has been retained by Lupoli Companies (the "Applicant") to prepare a Traffic Impact and Access Study (TIAS) for the proposed Dascomb Road Project (the "Project"), located at #146 Dascomb Road in Andover, Massachusetts. The existing site currently consists of ±188,960 square feet (SF) of mixed office and industrial uses with associated parking. The existing office and industrial space on-site is currently underutilized; servicing on and off-again occupancy for temporary tenants. A ±90,000 SF Restaurant Depot facility, who partially shared driveways connections with the site, operates on the property located adjacent to and south of the site at #148 Dascomb Road. The #146 Dascomb Road site is currently accessed via five (5) site driveways along the easterly side of Smith Drive, south of Dascomb Road.

The Dascomb Road Project consists of razing the existing ±188,960 SF of underutilized office and industrial space and constructing a 600,000 SF mixed-use development; comprised of 225 senior/age-restricted (55 and over) residential units; a 100-room hotel; 150,000 SF of office space; 50,000 SF of general retail space; a 15,000 SF fitness center; a 35,000 SF neighborhood market; a 5,000 SF recreational center; and 20,000 SF of restaurant space. The adjacent Restaurant Depot facility will remain in addition to the mixed-use development. The project proposes to modify the access/egress to the property, providing two full-access/egress driveways along the easterly side of Smith Drive with separated access/egress to the site's underground parking facility. The full-access/egress driveway for the Restaurant Depot facility along Smith Drive will be retained. Additionally, a full-access / full-egress driveway will be provided immediately opposite Frontage Road at the signalized intersection on Dascomb Road.

### Methodology

TEC has evaluated the traffic operations for the study area intersections under existing and future conditions consistent with the Transportation Impact Assessment Guidelines issued by the Massachusetts Department of Transportation (MassDOT)<sup>1</sup>. The future planning horizon

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<sup>1</sup> *Transportation Impact Assessment (TIA) Guidelines*, Massachusetts Department of Transportation; March 13, 2014.

examines traffic operations under existing conditions (2016 traffic count year), as well as an 11-year planning horizon (2027) for traffic-volume projections; which includes an evaluation of the No-Build conditions (without the proposed project), Build conditions (with the proposed project), and Build with Mitigation conditions (with the proposed project and any proposed mitigation).

## **Regulatory Context**

As this project is anticipated to generate more than 3,000 new vehicle trips per day (VPD) along the adjacent roadway network, will include the construction of more than 1,000 new parking spaces, directly abuts state-owned property, and provides direct access/egress to a state-owned roadway, the project will require review by the Massachusetts Environmental Policy Act (MEPA) office in the form of an Environmental Notification Form (ENF) and mandatory Environmental Impact Report (EIR).

Traffic operations, transportation design, and traffic safety are primary components to the preferred alternative for the Dascomb Road Project's off-site mitigation along the Dascomb Road and Frontage Road corridors. As off-site mitigation is proposed within State Highway Layout (SHLO) and along direct access/egress points of the Interstate Highway System, the project will be subject to review by MassDOT and the Federal Highway Administration (FHWA) in the form of a Permit to Access State Highway and a Project Framework Document (PFD) respectively.

## **EXISTING CONDITIONS**

The traffic study area was selected to contain major roadways providing local and regional access to the project site. The following intersections were included in the study area and are shown graphically in Figure 1:

1. Dascomb Road / East Street / Shawsheen Street
2. Dascomb Road / Hewlett Packard Site Driveway
3. Dascomb Road / Smith Drive
4. Dascomb Road / Frontage Road
5. Dascomb Road / Interstate 93 NB Ramps [Interchange 42]
6. Frontage Road / Interstate 93 SB Ramps [Interchange 42]

In addition to the study area intersections listed above, the study examines operational characteristics of the Interstate 93 (I-93) mainline merge and diverge connections at Interchange 42.

## **Geometry**

A comprehensive field inventory of existing traffic conditions within the study area was conducted by TEC staff between October 2016 and August 2017. The field investigation consisted of an inventory of existing roadway geometrics, operating characteristics, and safety characteristics. A description of the existing roadway and intersection inventory is provided below.

## **Roadways**

### *Dascomb Road*

Dascomb Road is a northeast-southwest urban minor arterial roadway maintained by the Town of Andover. MassDOT maintains a short segment of the roadway between Frontage Road and the I-93 NB Interchange 42 Ramps. For the purposes of this study, the cardinal direction of the corridor is east-west. Within the Town of Tewksbury, the corridor is signed as East Street. The corridor provides a local connection between Tewksbury Center to the west and Andover Street to Andover Center to the east. Dascomb Road ranges from approximately 42 to 55 feet wide and features a posted speed limit of 40 miles per hour (mph) within the vicinity of the project site. Land uses along Dascomb Road include a mix of residential, light retail, office, and industrial uses. Dascomb Road / East Street to the west carries a significant level of heavy commercial vehicle traffic as a result of the Market Basket / Demoulas headquarters and distribution warehouse approximately 1-mile west of the study area.

### *Frontage Road*

Frontage Road is a north-south local roadway maintained by the Town of Andover. The roadway provides a local connection between Osgood Street and the Raytheon facility to the north and Dascomb Road to the south as well as direct regional access to the I-93 SB Interchange 42 Ramps. Frontage Road is approximately 53-feet wide and does not feature a posted speed limit within the vicinity of the study area. Land uses along Frontage Road are predominantly industrial in nature. Immediately north of Dascomb Road, Frontage Road provides access/egress to a MassDOT Park and Ride facility.

## **Intersections**

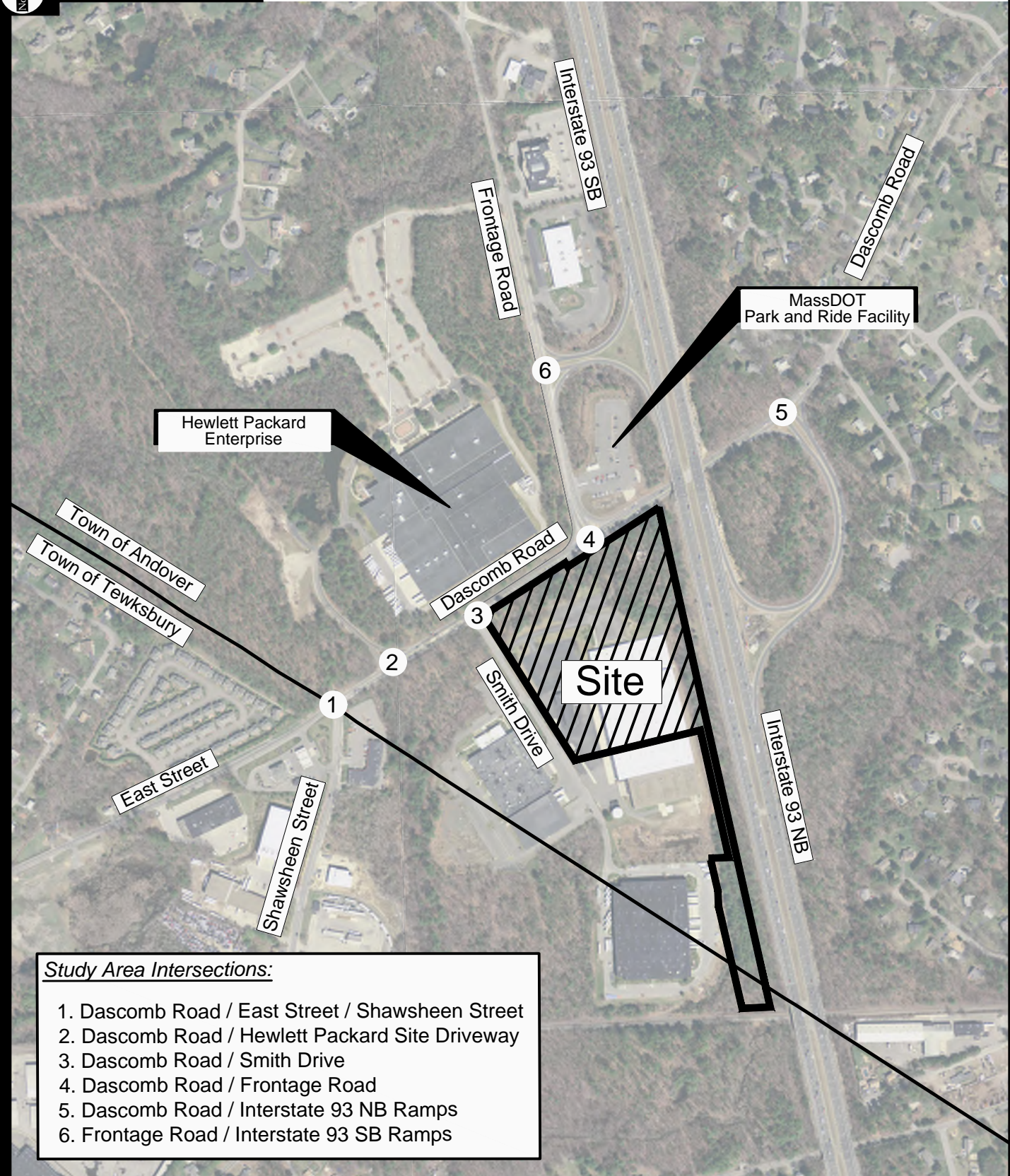
### *Dascomb Road / East Street / Shawsheen Street*

The intersection of Dascomb Road / East Street / Shawsheen Street was recently reconstructed and signalized as part of MassDOT Project #606298. Shawsheen Street intersects Dascomb Road and East Street to form a three-way, T-type, actuated signalized intersection. The East Street eastbound approach consists of a through lane and an exclusive right-turn lane, with directional flow separated by a striped median. The Dascomb Road westbound approach consists of an exclusive left-turn lane and a through lane, with directional flow separated by a marked centerline. The Shawsheen Street northbound approach consists of an exclusive left-turn lane and an exclusive right-turn lane, with directional flow separated by a marked centerline. Bicycle shoulders are provided along both sides of each roadway on all three intersection approaches. Sidewalks are provided along both sides of East Street and Shawsheen Street, with crosswalks connecting them on the eastbound and northbound intersection approaches. Sidewalks are not provided along Dascomb Road to the east of the intersection. Although the traffic signal is programmed for coordination, the traffic signal currently operates under free operation. At present, the master controller is located at this intersection; however, it will be transferred to the Frontage Road intersection per MassDOT upon further improvements to the corridor signalization.





1" = 600'



- Study Area Intersections:**
1. Dascomb Road / East Street / Shawsheen Street
  2. Dascomb Road / Hewlett Packard Site Driveway
  3. Dascomb Road / Smith Drive
  4. Dascomb Road / Frontage Road
  5. Dascomb Road / Interstate 93 NB Ramps
  6. Frontage Road / Interstate 93 SB Ramps

Figure 1

Project Location Map & Study Area Intersections



*Dascomb Road / Hewlett Packard Site Driveway*

The Hewlett Packard (HP) Site Driveway intersects Dascomb Road to form a three-way, T-type, unsignalized intersection. The HP Site Driveway operates under STOP-control while the Dascomb Road approaches are free-flowing. The Dascomb Road eastbound approach consists of a shared left-turn / through lane, with directional flow separated by a marked centerline. The Dascomb Road westbound approach consists of a through lane and a channelized right-turn lane, which operates under YIELD-control. Directional flow is separated by a striped median. The HP Site Driveway southbound approach consists of a shared left-turn / right-turn lane, with directional flow separated by a marked centerline. Sidewalks and crosswalks are not provided along any of the roadways or intersection approaches.

*Dascomb Road / Smith Drive*

Smith Drive (also referred to as Smith Way) intersects Dascomb Road to form a three-way, T-type, unsignalized intersection. Smith Drive operates under STOP-control while the Dascomb Road approaches are free-flowing. The Dascomb Road eastbound approach consists of a shared through / right-turn lane, while the Dascomb Road westbound approach consists of an exclusive left-turn lane and a through lane. Directional flow along Dascomb Road is separated by a raised concrete median. The Smith Drive northbound approach consists of an exclusive left-turn lane and an exclusive right-turn lane, with directional flow separated by a marked centerline. Sidewalks and crosswalks are not provided along any of the roadways or intersection approaches.

*Dascomb Road / Frontage Road*

Frontage Road intersects Dascomb Road to form a three-way, T-type, actuated signalized intersection. The traffic signal at this location is under the operation of MassDOT. The Dascomb Road eastbound approach consists of an exclusive left-turn lane and a through lane, while the Dascomb Road westbound approach consists of two through lanes and a channelized right-turn lane, which operates under YIELD-control. Directional flow along Dascomb Road is separated by a marked centerline. The Frontage Road southbound approach consists of an exclusive left-turn lane and a channelized right-turn lane, which operates under YIELD-control. Directional flow along Frontage Road is separated by a raised concrete median which transitions to a marked centerline. Sidewalks and crosswalks are not provided along any of the roadways or intersection approaches. Although the traffic signal is programmed for coordination, the traffic signal currently operates under free operation. The master controller currently located at the Dascomb Road / East Street / Shawsheen Street intersection will be transferred to this intersection per MassDOT upon further improvements to the corridor signalization.

*Dascomb Road / Interstate 93 Northbound Ramps [Interchange 42]*

The I-93 Northbound Interchange 42 Ramps (I-93 NB Ramps) intersect Dascomb Road to form a three-way, T-type, unsignalized intersection. The Dascomb Road eastbound approach consists of a through lane and a channelized right-turn lane, which operates under YIELD-control. The Dascomb Road westbound approach consists of an exclusive left-turn lane and a through lane. Directional flow along Dascomb Road is separated by a marked centerline. The



I-93 NB Ramps northbound approach consists of an exclusive left-turn lane and a channelized right-turn lane, which operates under YIELD-control. Directional flow along the Northbound Ramps is separated by a landscaped median which transitions to a raised concrete median. Sidewalks and crosswalks are not provided along any of the roadways or intersection approaches. Upon observation, the queue for the left-turn movement along the I-93 NB Ramps is extensive during the commuter peak periods. As a result, many side street roadways along Dascomb Road to the east are signed for prohibited reverse movements. Although much of the off-ramp is striped as one-lane, left-turning vehicles will queue against the far-left shoulder allowing right-turning vehicles to bypass.

#### *Frontage Road / Interstate 93 Southbound Ramps [Interchange 42]*

The I-93 Southbound Interchange 42 Ramps (I-93 SB Ramps) intersect Frontage Road to form a three-way, T-type, unsignalized intersection. The Frontage Road northbound approach consists of a through lane and a channelized right-turn lane, which operates under YIELD-control. The Frontage Road southbound approach consists of a shared left-turn / through lane and a through lane. Directional flow along Frontage Road is separated by a marked centerline. The I-93 SB Ramps westbound approach consists of an exclusive left-turn lane and a channelized right-turn lane, which operates under YIELD-control. Directional flow along the Southbound Ramps is separated by a landscaped median. Sidewalks and crosswalks are not provided along any of the roadways or intersection approaches. Upon observation, the queue for the left-turn movement along the I-93 SB Ramps can be extensive during the commuter peak periods; however, it is not to the same degree as seen on the I-93 NB Ramps at Dascomb Road. This queue has been noted to back onto I-93 along the shoulder.

### **Existing Traffic Volumes**

To establish existing traffic-volume conditions within the study area, manual turning movement counts (TMCs) were conducted at the study area intersections on Thursday, October 6, 2016 during the weekday morning (7:00 AM – 9:00 AM) and weekday evening (4:00 PM – 6:00 PM) peak periods and on Saturday, October 8, 2016 during the Saturday midday (11:00 AM – 1:00 PM) peak period. TMCs were also conducted during the typical weekday (7:00 AM – 7:00 PM) on Thursday, October 6, 2016 at the intersections of Dascomb Road / Smith Drive, Dascomb Road / I-93 NB Ramps, and Frontage Road / I-93 SB Ramps. Area schools were in regular session during the time of the traffic counts. A detailed summary of the TMCs, partitioned into 15-minute intervals, is provided within Attachment A.

Automatic Traffic Recorder (ATR) counts were conducted on Dascomb Road east of Smith Drive and on Frontage Road south of the I-93 SB Ramps concurrently with the TMCs from Thursday, October 6, 2016 through Saturday, October 8, 2016 to gather daily traffic-volume and speed data for the study area roadways during a continuous 72-hour time period. A summary of the weekday and Saturday ATR traffic data is presented in Tables 1 and 2, respectively. A detailed summary of the ATR counts, partitioned into 15-minute intervals, is provided in Attachment B.

**Table 1 – Existing Weekday Traffic Volume Summary**

Location	Weekday Traffic Volume <sup>(a)</sup>	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
		Traffic Volume <sup>(b)</sup>	K Factor <sup>(c)</sup>	Directional Distribution <sup>(d)</sup>	Traffic Volume	K Factor	Directional Distribution
Dascomb Road, east of Smith Drive	26,668	1,858	7.0	51.0% EB	2,267	8.5	50.6% WB
Frontage Road, south of I-93 SB Ramps	16,486	1,323	8.0	56.8% NB	1,212	7.4	51.9% SB

<sup>a</sup> Daily traffic expressed in vehicles per day

<sup>b</sup> Hourly traffic expressed in vehicles per hour

<sup>c</sup> Percent of daily traffic volumes which occurs during the peak hour

<sup>d</sup> Percent of peak-hour volume in the predominant direction of travel

EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound

**Table 2 – Existing Saturday Traffic Volume Summary**

Location	Saturday Traffic Volume <sup>(a)</sup>	Weekday Morning Peak Hour		
		Traffic Volume <sup>(b)</sup>	K Factor <sup>(c)</sup>	Directional Distribution <sup>(d)</sup>
Dascomb Road, east of Smith Drive	20,523	1,695	8.3	54.4% EB
Frontage Road, south of I-93 SB Ramps	11,694	911	7.8	53.2% NB

<sup>a</sup> Daily traffic expressed in vehicles per day

<sup>b</sup> Hourly traffic expressed in vehicles per hour

<sup>c</sup> Percent of daily traffic volumes which occurs during the peak hour

<sup>d</sup> Percent of peak-hour volume in the predominant direction of travel

EB = Eastbound; NB = Northbound

Dascomb Road, in the vicinity of Smith Drive, carries approximately 26,700 vehicles per day (vpd) on an average weekday. As shown in Table 1, traffic volumes on Dascomb Road are approximately 18 percent lower during the weekday morning peak hour than during weekday evening peak hour. Directional distribution along the roadway was roughly split 50-50 during both peak hours. The split is generally consistent to the nature of Dascomb Road being a major entrance and exit point for I-93. As shown in Table 2, Dascomb Road, in the vicinity of Smith Drive, carries approximately 20,500 vpd on a typical Saturday, approximately 23 percent lower than on a typical weekday.

Frontage Road, in the vicinity of the I-93 SB Ramps, carries approximately 16,500 vpd on an average weekday. An overwhelming majority of this traffic is to/from the I-93 SB Ramps. As shown in Table 1, traffic volumes on Frontage Road are approximately nine percent greater during the weekday morning peak hour than during the weekday evening peak hour. Directional distribution indicates larger traffic volumes heading toward Boston during the morning peak hour and larger traffic volumes coming from New Hampshire during the evening peak hour. As shown in Table 2, Frontage Road, in the vicinity of the I-93 SB Ramps, carries approximately 11,700 vpd on a typical Saturday, approximately 29 percent lower than on a typical weekday.

### **Seasonal Adjustment**

In accordance with MassDOT standards, traffic volumes are typically adjusted to reflect average-month conditions for preparation of a traffic study. A review of historic traffic-volume counts collected by MassDOT at permanent count stations along Interstate 93 in Andover<sup>2</sup> and Interstate 495 in Tewksbury<sup>3</sup> indicated that traffic volumes in October are approximately 2.0 percent greater than average-month conditions. Although these counts are along freeway roadways, Dascomb Road and Frontage Road through the study area generally operate consistent with commuter seasonal patterns. Therefore, the October 2016 traffic volumes were left unadjusted to reflect a conservative (worse case) analysis scenario. The compiled seasonal adjustment data is provided in Attachment C. The resulting 2016 Existing traffic volumes are shown graphically in Figure 2.

### **Existing Crash History Analysis**

Crash reports for the study area intersections were compiled and analyzed for the most recent consecutive six-year period (2011-2016) on file from MassDOT. Crash reports were also compiled for 2011-2016 by both the Tewksbury and Andover Police Departments. The motor vehicle crash data was reviewed to determine if any crash trends exist within the study area. Summaries of the vehicle crash data and intersection crash rates are provided in Table 3.

### **Highway Safety Improvement Plan Eligible**

Based on the MassDOT online crash cluster database, the Dascomb Road / Smith Drive intersection and I-93 Interchange 42 are considered 2014 Highway Safety Improvement Plan (HSIP) eligible (current crash year of HSIP-eligibility). Upon further review of the compiled crash reports, many of the crashes that were geocoded to the intersection of Dascomb Road / Smith Drive by MassDOT were incorrectly placed. Crash reports indicate that most of these crashes occurred at or within the influence of the Dascomb Road / Frontage Road intersection. TEC identified this error with the MassDOT Traffic Safety Section in October 2016. As part of this TIAS and subsequent traffic related documents, the intersection of Dascomb Road / Smith Drive is not considered HSIP-eligible; however, the intersection Dascomb Road / Frontage Road is to be considered as HSIP-eligible.

Similarly, many freeway interchanges across the Commonwealth are noted as HSIP-eligible locations; however, this is generally the result of crashes being geocoded on the center of the interchange, as opposed to the specific crash location along a freeway segment, along the ramps, or other location of the interchange. Although the interchange does experience a large number of crashes, TEC examined the crash reports to denote the actual crash location along the different portions of the interchange. This examination indicates that the surface intersection of Dascomb Road / I-93 NB Ramps is HSIP-eligible separate from the interchange as a whole.

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<sup>2</sup> MassDOT Permanent Count Station 5022 – Andover – Rte. I-93 – north of Rte. 125

<sup>3</sup> MassDOT Permanent Count Station 4094 – Tewksbury – Rte. I-495 – south of Rte. 133

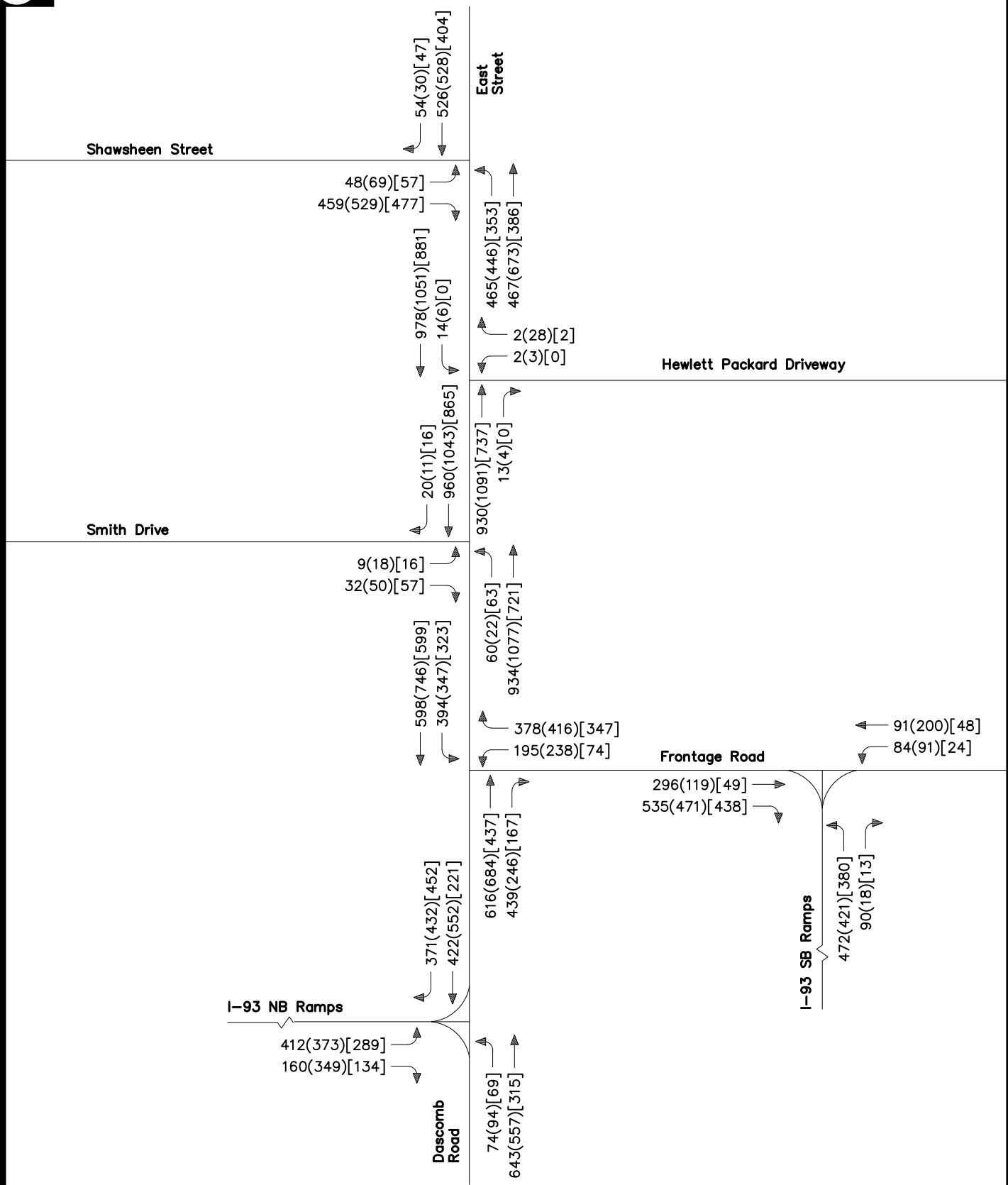




Not to Scale

# 146 Dascomb Road Site Redevelopment Project - Andover, Massachusetts

Traffic Impact and Access Study



**Figure 2**  
**2016 Existing Conditions**  
**Weekday Morning, Weekday Evening**  
**and Saturday Midday**  
**Peak Hour Traffic Volumes**



TEC, Inc.  
 65 Glenn Street | 169 Ocean Blvd, Unit 101  
 Lawrence, MA 01843 | Hampton, NH 03842  
 (978) 794.1792 | (603) 601.8154  
 www.TheEngineeringCorp.com

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**Table 3 - Crash Data Summary**

	Dascomb Road /				Annual Average**	Crash Rate (MEV)**:	Significant:	Type:	Surface Conditions:	Severity:	Day of Week:	Time of Day:
	East Street / Shawsheen Street	Dascomb Road / HP Driveway	Dascomb Road / Smith Drive	Dascomb Road / Frontage Road								
Crash Year:	4	0	1	8	5	0						
	0	2	0	13	3	0						
	1	2	0	12	2	0						
	4	2	1	13	3	0						
	2	4	4	10	7	3						
	1	5	2	13	6	1						
<b>TOTAL</b>	<b>12</b>	<b>15</b>	<b>8</b>	<b>69</b>	<b>26</b>	<b>4</b>						
	<b>2.09</b>	<b>2.61</b>	<b>1.39</b>	<b>12.0</b>	<b>4.52</b>	<b>0.70</b>						
	<b>0.22</b>	<b>0.28</b>	<b>0.15</b>	<b>1.05</b>	<b>0.45</b>	<b>0.10</b>						
	No	No	No	Yes	No	No						
	3	7	2	37	17	3						
	5	6	4	24	3	1						
	3	0	1	3	1	0						
	0	2	1	2	3	0						
	1	0	0	3	1	0						
	0	0	0	0	1	0						
	0	0	0	0	0	0						
<b>TOTAL</b>	<b>12</b>	<b>15</b>	<b>8</b>	<b>69</b>	<b>26</b>	<b>4</b>						
	12	13	7	54	22	3						
	0	2	1	12	2	1						
	0	0	0	2	1	0						
	0	0	0	1	1	0						
<b>TOTAL</b>	<b>12</b>	<b>15</b>	<b>8</b>	<b>69</b>	<b>26</b>	<b>4</b>						
	12	11	8	43	19	4						
	0	4	0	26	7	0						
	0	0	0	0	0	0						
<b>TOTAL</b>	<b>12</b>	<b>15</b>	<b>8</b>	<b>69</b>	<b>26</b>	<b>4</b>						
	10	13	6	56	20	4						
	2	2	2	13	6	0						
<b>TOTAL</b>	<b>12</b>	<b>15</b>	<b>8</b>	<b>69</b>	<b>26</b>	<b>4</b>						
	1	5	1	11	5	1						
	1	1	3	9	1	1						
	6	2	0	5	5	0						
	3	4	2	12	7	1						
	1	2	2	19	4	0						
	0	1	0	13	4	1						
<b>TOTAL</b>	<b>12</b>	<b>15</b>	<b>8</b>	<b>69</b>	<b>26</b>	<b>4</b>						

\* 2016 data includes crashes occurring between 1/1/2016 and 9/21/2016.

\*\* The Annual Average and Crash Rate (MEV) do not include 2016 collisions.

Prior to this TIAS, TEC and the Applicant facilitated a Road Safety Audit (RSA) for the intersections of Dascomb Road / Frontage Road and Dascomb Road / I-93 NB Ramps in coordination with the MassDOT Traffic and Safety Engineering Section. The RSA meeting for both HSIP-eligible locations within the study area was held on December 14, 2016. A copy of the RSA, as approved by MassDOT, is provided in Attachment D.

### **Crash Rate Worksheets**

In addition to examining the number of crashes at the study area intersections, a crash rate was calculated to compare the occurrence of crashes to the volume of traffic passing through the intersection. The crash rate per million entering vehicles (MEV) was calculated using the evening peak hour volumes from the TMCs and a calculated K-factor obtained from the ATR counts to establish a daily intersection traffic volume. The crash rates at each of the study area intersections were compared to the statewide and district-wide averages published by MassDOT in February 2016 to determine the significance of the collision occurrence. The statewide average for signalized intersections is 0.77, and the District 4 average for signalized intersections is 0.73. The statewide average for unsignalized intersections is 0.58, and the District 4 average for unsignalized intersections is 0.56. A compilation of the MEV rate calculation worksheets and detailed crash data are provided in Attachment E.

### **Crash Data Summary**

The intersection of Dascomb Road / East Street / Shawsheen Street experienced an average of approximately two (2.09) crashes per year over the six-year study period. The crash rate for this intersection is significantly less than the statewide and district-wide averages for signalized intersections. A RSA had been conducted at this intersection in early 2011. Approximately half (5 of 12) of the crashes were rear-end crashes, which are typical at signalized intersections or locations where a significant number of vehicles are turning left without by-pass capabilities. The latter was an intersection condition prior to reconstruction. The lack of historical by-pass condition may be a cause of the three (3) sideswipe crashes that had occurred at the intersection. Note that nine (9) of the reported crashes at this intersection during the study period occurred prior to and including 2014. Since this timeframe, the intersection has been reconstructed as a signalized intersection. Only three (3) of the reported crashes have occurred since the full installation of the traffic signal at this location.

The intersection of Dascomb Road / HP Site Driveway experienced an average of less than three (2.61) crashes per year over the six-year study period. The crash rate for this intersection is significantly less than the statewide and district-wide averages for unsignalized intersections. Six (6) of the reported crashes were rear-ends and seven (7) of the reported crashes were angle crashes. Nine (9) of the reported crashes, approximately two-thirds of the intersection crashes, occurred during the commuter peak periods which is consistent with the commuter nature of the HP Driveway. These time periods provide significant levels of traffic along the Dascomb Road corridor which may be a cause of the rear-end and angled crashes; where stop-and-go vehicles and a lack of by-pass capabilities develop the condition for these crash types.

The intersection of Dascomb Road / Smith Drive experienced an average of more than one (1.39) collision per year over the six-year study period. The crash rate for this intersection is significantly less than the statewide and district-wide averages for unsignalized intersections. Half (4 of 8) of the crashes were rear-end collisions, which may be the result of vehicles stopping unexpectedly along Dascomb Road to allow vehicles to exit from Smith Drive. With the low level of crashes noted at this intersection, there is no apparent crash trend.

The intersection of Dascomb Road / Frontage Road experienced an average of approximately twelve (12.00) crashes per year during the six-year study period. The crash rate for this intersection is significantly greater than the statewide and district-wide averages for signalized intersections. The intersection currently holds an HSIP-eligible high crash location designation. Approximately half (37 of 69) of the reported crashes were designated as angle crashes, which are typical of signalized intersections and channelized right-turn movements under YIELD control. Approximately one-third (24 of 69) of the reported crashes were designated as rear-end crashes, which are typical at signalized intersections. The high rate of rear-end crashes may be a result of insufficient clearance time which is shorter than typical standards. The existing clearance interval for the eastbound-westbound approaches on Dascomb Road is currently five (5) seconds (three seconds yellow and two seconds all-red). Based on the existing geometry and the travel speeds at the intersection, the yellow time along Dascomb Road should be increased to 3.5 seconds. Further information related to crash trends at this intersection is described in the RSA provided in Attachment D.

The intersection of Dascomb Road / Interstate 93 Northbound Ramps experienced an average of approximately five (4.52) crashes per year during the six-year study period. The crash rate for this intersection is significantly less than the statewide and district-wide averages for unsignalized intersections. The intersection currently holds an HSIP-eligible high crash location designation. Approximately 65 percent (17 of 26) of the crashes were designated as angle crashes, which are typical at unsignalized intersections and channelized right-turn movements. The high rate of angle crashes may be a result of drivers misjudging the gap in traffic when attempting to access Dascomb Road from the half-cloverleaf ramp intersection. Further information related to crash trends at this intersection are described in the RSA provided in Attachment D.

The intersection of Frontage Road / Interstate 93 Southbound Ramps experienced an average of less than one (0.70) crash per year during the six-year study period. The crash rate for this intersection is significantly less than the statewide and district-wide averages for unsignalized intersections. Three-quarters (3 of 4) of the reported crashes were designated as angle crashes, which are typical at unsignalized intersections and channelized right-turn movements. With the low level of crashes noted at this intersection, there is no apparent crash trend.

### **Public Transportation Access**

The Massachusetts Bay Transportation Authority (MBTA) provides Commuter Rail service to the Town of Andover via the Haverhill Commuter Rail Line. Commuter rail route and schedule data are included in Attachment F, and a summary of the route is provided below.



- *Haverhill Commuter Rail Line* - The MBTA commuter rail provides connections from North Station in Boston with stations at Malden Center, Wyoming Hill, Melrose/Cedar Park, Melrose Highlands, Greenwood, Wakefield, Reading, North Wilmington, Ballardvale, Andover, Lawrence, Bradford, and Haverhill. Inbound service from Haverhill runs between 5:05 AM and 11:55PM, and outbound service from Boston runs between 6:43 AM and 1:18 AM, with headways of approximately 20 minutes to 100 minutes on weekdays. On Saturdays and Sundays, inbound service from Haverhill runs between 7:15 AM and 11:16 PM, and outbound service from Boston runs between 8:40 AM and 12:37 AM, with headways of approximately 170 minutes to 200 minutes. The Ballardvale Station is located at #195 Andover Street, approximately 1.6 miles east of the Project site. The Andover Station is located at 11 Lewis Street, approximately 3.2 miles northeast of the Dascomb Road Project site.

The Lowell Regional Transit Authority (LRTA) provides bus service near the Dascomb Road Project site via Route #11 – IRS / Raytheon via Route 133. Bus route and schedule data are included in Attachment F, and a summary of the route is provided below.

- *Route 11 – IRS / Raytheon via Route 133* – The LRTA bus service provides connections from the Kennedy Center in Downtown Lowell with large business complexes located along Route 133 in Lowell, Tewksbury, and Andover; including the 495 Business Center, Ames Pond Corporate Park, Raytheon, and the Internal Revenue Service (IRS). Four (4) roundtrips are offered on weekdays, with two (2) in the morning (between 6:00 AM and 8:00 AM) and two (2) in the evening (between 3:00 PM and 5:00 PM). Due to the office-focused nature of the route, weekend service is not provided. Although service is not provided directly to the Dascomb Road Project site, the Raytheon bus stop is located only 1.4 miles north of the Project site.

MassDOT operates a Park-and-Ride service lot along Frontage Road, immediately north of Dascomb Road, adjacent to the Project site. 154 parking spaces are available. Bike racks are also provided for the commuters who use bicycles. Commuter bus services do not stop at this Park and Ride service lot. Information related to future and proposed public transportation services near and to/from the Project site is provided in the "Proposed Improvement" section of this TIAS.

## **FUTURE CONDITIONS**

Traffic volumes in the study area were projected to the year 2027, which reflects an eleven-year planning horizon from the planned date of submission for permitting. The traffic conditions for the year 2027, under No-Build conditions, were developed to document the operating conditions independent of the proposed project; including all existing traffic, new traffic resulting from background growth, and traffic from specific development by others in the vicinity. Anticipated site-generated traffic volumes for the proposed redevelopment were superimposed upon the No-Build traffic networks to reflect the Build conditions with the proposed project.

### **Background Traffic Growth**

Traffic growth is a function of the expected land development in the immediate area and the surrounding region. Several methods can be used to estimate this growth. Traffic engineers frequently employ an annual percentage increase in traffic growth, which is applied to all traffic volumes under study. The drawback to such a procedure is that some turning volumes may actually grow at either a greater or a lesser rate at particular intersections.

An alternative procedure identifies the location and type of planned development, estimates the traffic to be generated, and assigns it to the area roadway network. This procedure produces a more realistic estimate of growth for local traffic; however, the potential growth in population and development external to the study area are not accounted for in the traffic projections.

To provide a conservative analysis framework, both procedures were considered.

### **General Background Growth**

Traffic-volume data compiled by MassDOT from permanent count stations and historic traffic counts in Andover<sup>4,5,6,7,8,9</sup> and Tewksbury<sup>10,11,12</sup> were reviewed to determine traffic growth trends. Based on the MassDOT traffic-volume data, traffic volumes in the area have been increasing at a rate of 0.41 percent per year since 2006. To provide a conservative (worse case) analysis scenario, a 0.5 percent per year compounded annual background traffic growth rate was used to account for potential future traffic growth external to the study area and any presently unforeseen development. MassDOT historic count station data have been included in Attachment G.

### **Specific Developments by Others**

TEC coordinated with the Town of Tewksbury and Town of Andover Planning Departments to identify nearby private and public development projects in the vicinity of the study area that are either in the planning process or were recently approved by the municipal Planning Boards. After discussions with Town officials and a review of recently approved projects, two (2) projects were identified, one within the Town of Tewksbury and the other within the Town of Andover that may contribute a noticeable amount of new traffic through the study area. These projects are described in detail below:

- *The Residence at Joan's Farm (Tewksbury)* – This project includes the construction of 96 residential apartment units with access provided on Livingston Street via a new subdivision street (Donny Martel Way) located opposite

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<sup>4</sup> MassDOT Permanent Count Station R12211 – Andover – I-93 North Ramp – south of Dascomb Road

<sup>5</sup> MassDOT Permanent Count Station R12242 – Andover – I-93 South Ramp – east of Frontage Road

<sup>6</sup> MassDOT Permanent Count Station R12243 – Andover – I-93 South Ramp – east of Frontage Road

<sup>7</sup> MassDOT Permanent Count Station 254017 – Andover – Clark Road – south of Dascomb Road

<sup>8</sup> MassDOT Permanent Count Station H12565 – Andover – I-93 South – south of Exit 43

<sup>9</sup> MassDOT Permanent Count Station 5022 – Andover – I-93 North – north of Exit 41

<sup>10</sup> MassDOT Permanent Count Station 258034 – Tewksbury – Maple Street – east of East Street

<sup>11</sup> MassDOT Permanent Count Station 237098 – Tewksbury – Livingston Street – north of East Street

<sup>12</sup> MassDOT Permanent Count Station 250850 – Tewksbury – Livingston Street – south of East Street

Chandler Street. Traffic volumes expected to be generated by this development were obtained from the Traffic Impact and Access Study<sup>13</sup> conducted by Ron Müller & Associates and dated February 23, 2015. Thirty percent of the site-generated trips are anticipated to travel along Dascomb Road through the study area and thus have been included as part of this study.

- *Hewlett-Packard Campus Expansion (Andover)* – The Town of Andover Planning Department indicated the potential for a campus expansion of the existing Hewlett-Packard site located at #165 Dascomb Road. Access to the site is provided via a driveway along Dascomb Road (within the study area) and a driveway along Frontage Road (immediately north of the study area). Additional employees at the site would result in increased trips passing through the study area. Additionally, the Town of Andover identified an 82-acre "HP Site" future development site at #18 Frontage Road. A planning study and conceptual design were prepared for the Town of Andover that outlined development concepts; however, further progress for development is hindered by lack of adequate site access and sewer infrastructure. Substantial development in this site would require expansive off-site mitigation to improve access/egress along Frontage Road. Traffic for this potential future project was not included as part of this study as a development and access/egress plan has not been identified; however, potential future development traffic is assumed to be included within the 0.5 percent per year compounded annual background traffic growth rate.

The off-site improvements along the Dascomb Road corridor have been designed to carry additional reserve capacity for potential future expansion of projects along the immediate Dascomb Road and Frontage Road area; including the Hewlett-Packard Campus Expansion Project listed above. The improvements have also been designed to not preclude additional transportation improvement measures should measures be warranted.

The resulting "Specific Development by Others" traffic volumes are illustrated in Figure 3 for the weekday morning, weekday evening, and Saturday midday peak hours, respectively.

### **2027 No-Build Traffic Volumes**

The 2027 No-Build weekday morning, weekday evening, and Saturday midday peak-hour traffic-volume networks were developed by applying the 0.5 percent per year compounded annual background traffic growth rate on the 2016 Existing peak-hour traffic volumes over the 11-year design horizon and adding traffic to be generated by the specific developments by others. The resulting 2027 No-Build weekday morning, weekday evening, and Saturday midday peak-hour traffic-volume networks are illustrated in Figure 4.

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<sup>13</sup> *Traffic Impact and Access Study; Apartment Development, 715-737 Livingston Street* – Tewksbury, Massachusetts; Ron Müller & Associates; February 2015.

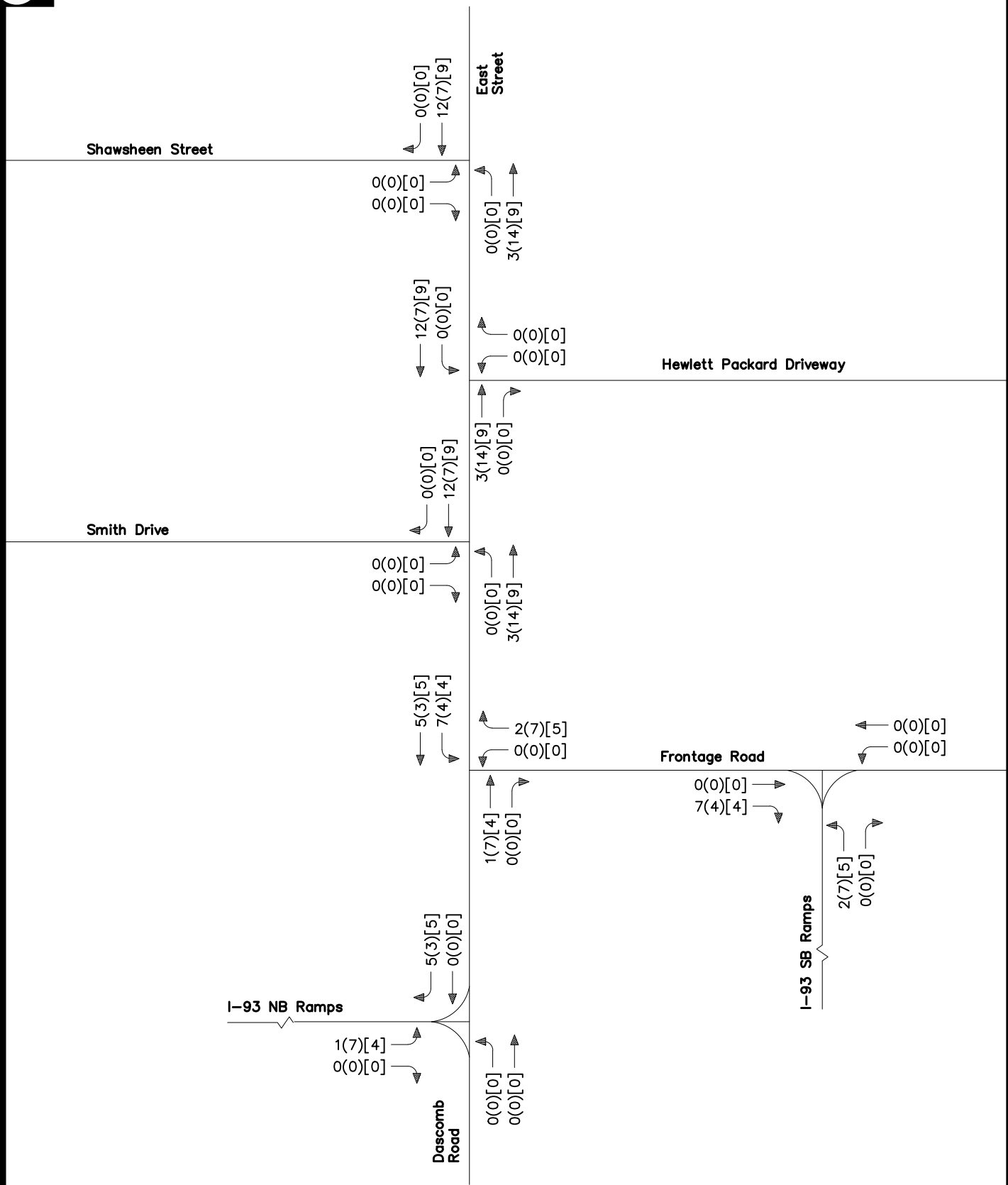


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# 146 Dascomb Road Site Redevelopment Project - Andover, Massachusetts

Traffic Impact and Access Study (TIAS)

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XXX(XXX)[XXX] = Weekday Morning(Weekday Evening)[Saturday Midday]

Figure 3

Specific Development by Others  
Weekday Morning, Weekday Evening  
and Saturday Midday  
Peak Hour Traffic Volumes



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Traffic Impact and Access Study (TIAS)

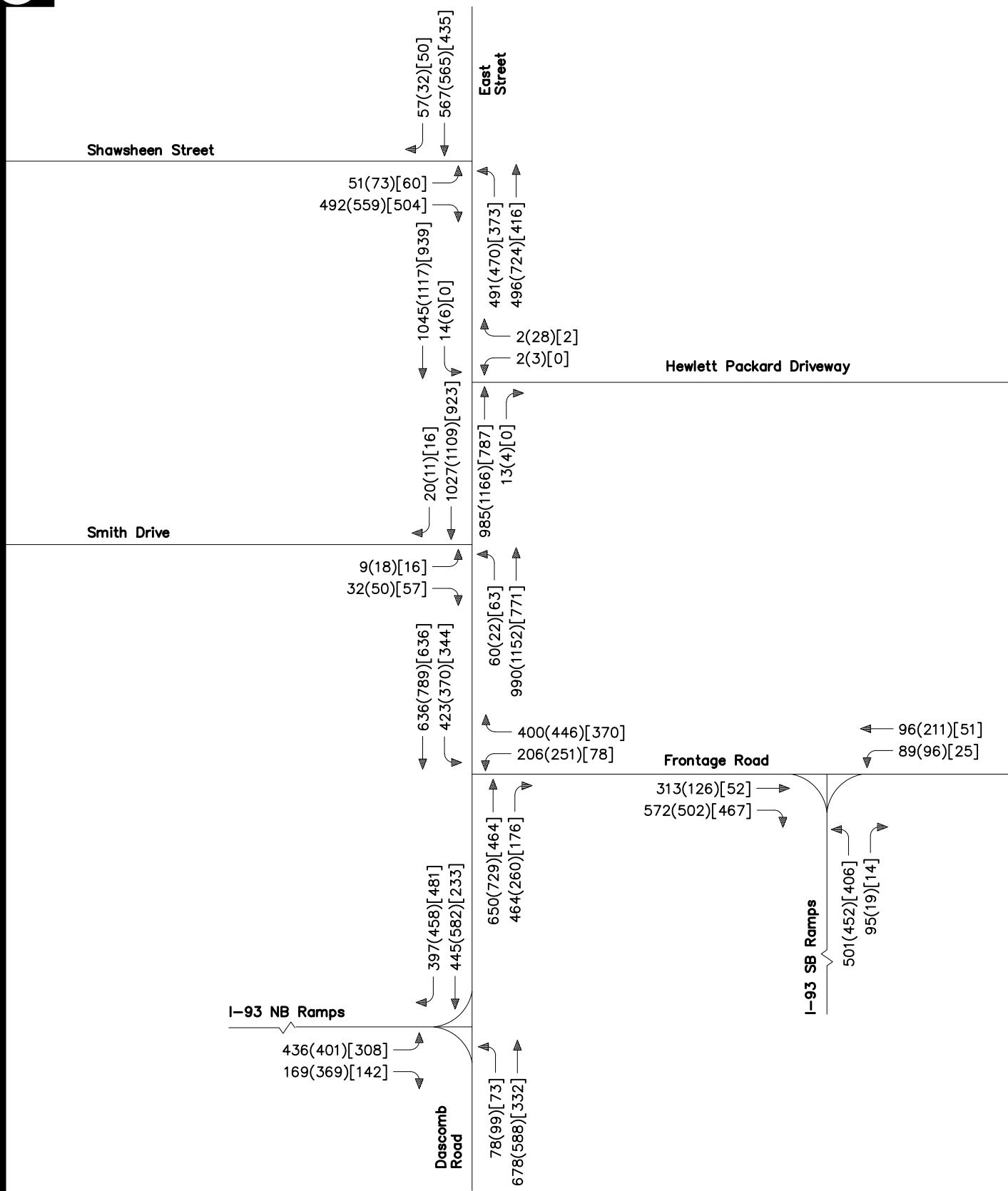


Figure 4

2027 No-Build Conditions  
Weekday Morning, Weekday Evening  
and Saturday Midday  
Peak Hour Traffic Volumes



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### **Site-Generated Traffic**

The existing site currently consists of ±188,960 SF of mixed office and industrial uses. The existing office and industrial space on-site is currently underutilized; servicing on and off-again occupancy for temporary tenants. A ±90,000 SF Restaurant Depot facility, who partially shared driveways connections with the site, operates on the property located adjacent to and south of the site at #148 Dascomb Road. The Dascomb Road Project will consist of razing the existing ±188,960 SF of underutilized office and industrial space. The adjacent Restaurant Depot facility will remain in addition to the mixed-use development. For the purposes of this study no credit was taken for the underutilized office and industrial space on the existing site. The traffic volumes currently accessing/egressing Smith Drive within the existing traffic counts are assumed to access/egress Smith Drive under the proposed mixed-use development.

Upon razing the existing uses, the Dascomb Road Project proposed building program consists of constructing a ±600,000 SF mixed-use development; comprised of 225 senior/age-restricted (55 and over) residential units; a 100-room hotel; 150,000 SF of office space; 50,000 SF of general retail space; a 15,000 SF fitness center; a 35,000 SF neighborhood market; a 5,000 SF recreational center; and 20,000 SF of restaurant space (assumes 10,000 SF of quality restaurant and 10,000 SF of a high-turnover sit-down restaurant). TEC estimated the site-generated traffic based on industry standard trip rates published in the Institute of Transportation Engineers (ITE) publication, *Trip Generation, 9<sup>th</sup> Edition* for Land Use Code (LUC) 252 – Senior Adult Housing (Attached), LUC 310 – Hotel, LUC 710 – General Office Building, LUC 820 – Shopping Center, LUC 931 – Quality Restaurant, and LUC 932 – High-Turnover (Sit-Down) Restaurant.

#### *Retail / Shopping Center Lane Use Code*

Several land uses as defined in the proposed building program have been combined under LUC 820 – Shopping Center. This includes the 15,000 SF fitness center; the 35,000 SF neighborhood market; the 5,000 SF of recreational space, and the 50,000 SF of general retail space. Each of the land uses listed above have been combined based on the nature of patrons then intend on serving where there equivalent ITE LUC may not provide an accurate representation of the expected traffic. For instance, the 35,000 SF neighborhood market will provide grocery services; however the land use is not intended to be a standard supermarket comparable to a "Stop n Shop" or a "Shaw's". In addition, the 15,000 SF fitness center is defined as more of a community gym servicing mostly residents and employees of the development and generally not matching the average size of a fitness center defined by ITE, at generally 40,000 SF in size.

The combination of the individual minor lane uses have been combined under LUC 820 – Shopping Center based on the description of LUC 820 – Shopping Centers in the industry standard publication, ITE's *Trip Generation, 9<sup>th</sup> Edition*:

*"Shopping centers; including neighborhood centers, community centers, regional centers, and super regional centers; were surveyed for this land use. Some of these centers contained non-merchandising facilities such as office buildings,*

*movie theaters, restaurants, post offices, banks, health clubs, and recreational facilities (for example, ice skating rinks or indoor miniature golf courses)."*

The shopping center land use has been combined to include each of the above-mentioned land used to be comprised of 105,000 SF. As a result of the combination within one individual land use, no credit for internal capture rate has been assessed between these particular uses. Should the individual land uses be broken out separately, an internal capture rate applied to each of the land uses would generally be comparable to the combination of the land uses under LUC 820 – Shopping Center. TEC has not included the restaurant land uses in this combination as they are generally expected to generate a higher trip rate than LUC 820 – Shopping Center.

### **Internal Capture**

It is reasonable to expect that some trips to the site will be shared amongst multiple land uses. For example, someone traveling to the offices may choose to shop at the retail or eat at a restaurant on the Project site. Therefore, a reduction in the overall external trips experienced at the site driveways can be anticipated as a result of multi-use, or shared, trips that include stops at more than one use on the site. Based on information contained in the industry standard ITE publication *Trip Generation Handbook, 3<sup>rd</sup> Edition*, multi-use trips were assigned for trip sharing amongst the senior / age-restricted housing, hotel, office, retail, and restaurant land uses. Credit was not taken for internal capture between the proposed uses and the existing land uses along Smith Drive (Restaurant Depot, California Paints, and Mayo Medical Laboratories). Therefore, it can be assumed that the internal capture rate is conservative as it is expected that some vehicle trips to and from the existing land uses may visit parts of the proposed redevelopment.

As previously noted, no credit for internal capture rate has been assessed between the several land uses combined as part of LUC 820 – Shopping Center. For example, there is no multi-use trips assessed between the 5,000 SF recreation center to/from the 35,000 SF neighborhood market. The multi-use trip generation worksheets are included in Attachment H.

### **Transit Trips**

Per the 2010-2014 American Community Survey 5-Year Estimates provided by the U.S. Census Bureau, five (5) percent of Andover residents utilize public transportation to commute to work. A Park-and-Ride facility for carpooling and bus service is located immediately across from the Project site along Frontage Road, and the Ballardvale MBTA Commuter Rail Station along the MBTA Haverhill Commuter Rail Line is located only 1.6 miles east of the Project site. Furthermore, the Applicant is actively seeking a bus route extension to provide LRTA bus service for the Dascomb Road Project site and seeking to provide shuttle service to/from the Ballardvale MBTA Commuter Rail Station. Due to these factors, a five (5) percent transit trip credit was applied to the senior / age-restricted housing, hotel, and general office land uses. The transit credit was not applied to the retail and restaurant uses as these uses generally do not experience the level of public transportation uses in comparison.

## **Pass-by Traffic**

Not all of the trips generated by the proposed mixed-use development will be new to the roadway network. Many of the trips generated by the proposed mixed-use development are already present in the existing traffic flow passing by the site and may decide to visit the site on their way to another destination. For example, a driver travelling along Dascomb Road on the way home from work in Boston may stop at the on-site neighborhood market and then continue his/her trip home. These vehicle trips are known as “pass-by” trips and are subtracted from the total trips to calculate the total primary (or “new”) trips that affect the volume of traffic within the study area away from the site. Based on information contained in the industry standard ITE publication *Trip Generation Handbook, 3<sup>d</sup> Edition*, approximately 26 to 34 percent of the general retail / shopping center site-generated traffic, 44 percent of quality restaurant site-generated traffic, and 43 percent of high-turnover (sit-down) restaurant site-generated traffic are expected to be pass-by traffic.

Table 4 provides a summary of the resulting trip generation estimate separated by LUC and the total trip generation separated by multi-use, transit, pass-by, and primary trips. The detailed trip generation calculation worksheets are provided in Attachment H.

As shown in Table 4 below, the proposed mixed-use development is anticipated to generate approximately 5,296 new vehicle trips (2,648 entering and 2,648 exiting) during the average weekday, with 357 new vehicle trips (288 entering and 69 exiting) during the weekday morning peak hour and 500 new vehicle trips (190 entering and 310 exiting) during the weekday evening peak hour. Approximately 5,030 new vehicle trips (2,515 entering and 2,515 exiting) are anticipated during the average Saturday, with 455 new vehicle trips (263 entering and 192 exiting) during the Saturday midday peak hour.

As this project is anticipated to generate more than 3,000 new vehicle trips per day (VPD) along the adjacent roadway network, will include the construction of more than 1,000 new parking spaces, directly abuts state-owned property, and provides direct access/egress to a state-owned roadway, the project will require review by the MEPA office in the form of an ENF and mandatory EIR.

## **Trip Distribution**

### **Site Access and Egress**

The existing #146 Dascomb Road site is currently accessed via five (5) site driveways along the easterly side of Smith Drive, south of Dascomb Road. The project proposes to modify the access/egress to the property, providing two full-access/egress driveways along the easterly side of Smith Drive with separated access/egress to the site’s underground parking facility. The full-access/egress driveway for the Restaurant Depot facility along Smith Drive will be retained. Additionally, a full-access / full-egress driveway will be provided immediately opposite Frontage Road at the signalized intersection on Dascomb Road.



## **Study Area Trip Distribution Models**

### *Commuter (Residential and Office) Land Uses*

The distribution of senior adult housing and office site-generated traffic volumes were based on gravity models using 2000 U.S. Census Bureau Journey-to-Work data (current complete data for public use) for the Town of Andover. The senior adult housing distribution models the commutes of Andover residents to the top 30 workplace cities and towns, which represent approximately 85 percent of total Andover residents. The office distribution models the commutes of residents to Andover from the top 30 residential cities and towns, which represent approximately 77 percent of total Andover workers. The top 30 communities generally allow for an approximation of overall distribution of traffic.

**Table 4 - Trip Generation Summary by Land Use Code**

Time Period	Senior Adult				Hotel (LUC 310)	General Office Building (LUC 710)	Shopping Center (LUC 820)	Quality Restaurant (LUC 931)	High-Turnover Restaurant (LUC 932)	Total Trips	Multi-Use Trips	Transit Trips	Pass-by Trips	Primary Trips
	Housing - Attached (LUC 252)	Housing - Attached (LUC 252)	Housing - Attached (LUC 252)	Housing - Attached (LUC 252)										
<i>Weekday Daily</i>														
IN	346	261	893	2,242	450	636	4,828	1,371	75	734	2,648			
OUT	346	261	893	2,242	450	636	4,828	1,371	75	734	2,648			
TOTAL	692	522	1,786	4,484	900	1,272	9,656	2,742	150	1,468	5,296			
<i>Weekday Morning</i>														
IN	15	32	232	62	4	59	404	78	15	23	288			
OUT	29	22	32	38	4	49	174	78	4	23	69			
TOTAL	44	54	264	100	8	108	578	156	19	46	357			
<i>Weekday Evening</i>														
IN	30	31	42	187	50	59	399	136	6	67	190			
OUT	26	29	204	203	24	39	525	136	12	67	310			
TOTAL	56	60	246	390	74	98	924	272	18	134	500			
<i>Saturday Daily</i>														
IN	250	334	168	2,623	472	792	4,639	1,157	38	929	2,515			
OUT	250	334	168	2,623	472	792	4,639	1,157	38	929	2,515			
TOTAL	500	668	336	5,246	944	1,584	9,278	2,314	76	1,858	5,030			
<i>Saturday Midday</i>														
IN	40	41	35	263	64	74	517	171	6	77	263			
OUT	30	33	29	243	44	66	445	171	5	77	192			
TOTAL	70	74	64	506	108	140	962	342	11	154	455			

*Retail and Restaurant Land Uses*

The distribution of retail and restaurant site-generated traffic volumes was based on a gravity model using 2010 U.S. Census Bureau population data for the surrounding communities within a 7.5-mile radius of the Project site. The retail and restaurant distribution models the commutes of residents from the Town of Andover and twelve (12) adjacent communities to/from the Project site after weighting each community based on total population, travel-time to/from the Project site, and the presence of competing retail opportunities. The distribution of retail and restaurant pass-by trips was based on existing travel patterns along the streets immediately surrounding the site.

*Hotel Land Use*

The site-generated traffic for the hotel land use was anticipated to generate trips exclusively to/from I-93, Dascomb Road, East Street and Shawsheen Street. This is based on the low level of nearby commercial land uses to generate hotel-type traffic in the immediate project vicinity as tourists and business travelers will primarily utilize I-93 to access the hotel. It is anticipated that 54 percent of hotel traffic will be generated to/from the south along I-93, 34 percent to/from the north along I-93, 5 percent to/from the east along Dascomb Road, 5 percent to/from the west along East Street, and 2 percent to/from the south along Shawsheen Street.

**Trip Distribution Summary**

The resulting primary trip distributions for senior adult housing, office, retail, and restaurant are shown in Table 5. Trip distribution gravity models are included in Attachment I. The weekday morning, weekday evening, and Saturday midday site-generated traffic-volume networks are presented in Figure 5, Figure 6, and Figure 7, respectively.

**Table 5 – Trip Distribution Summary**

<b>Direction</b>	<b>Senior Adult Housing (LUC 252)</b>	<b>General Office Building (LUC 710)</b>	<b>Retail (LUC 820) and Restaurant (LUC 931, 932)</b>
Interstate 93 to/from North	10%	15%	20%
Interstate 93 to/from South	35%	35%	15%
Dascomb Road to/from East	40%	30%	25%
East Street to/from West	5%	10%	20%
<u>Shawsheen Street to/from South</u>	<u>10%</u>	<u>10%</u>	<u>20%</u>
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Access to the site will be provided via multiple driveway locations along Smith Drive and a fourth intersection leg at the Dascomb Road / Frontage Road intersection. Trip distribution to/from these driveway locations was estimated based on the most convenient entering and exiting maneuver for drivers along Dascomb Road and Frontage Road. Based on the parking locations for the different land uses, it is assumed that all office-related traffic will enter/exit the site via Smith Drive and all hotel traffic will enter/exit via the new driveway connection opposite Frontage Road, where applicable. Residential and retail related traffic are expected to utilize both driveways to enter/exit the site.

### **2027 Build Traffic Volumes**

The 2027 Build Condition traffic-volume networks consist of the 2027 No-Build traffic volumes with the addition of the site-generated traffic for the proposed redevelopment. The resulting 2027 Build weekday morning, weekday evening, and Saturday midday peak-hour traffic-volume networks are presented in Figure 8.

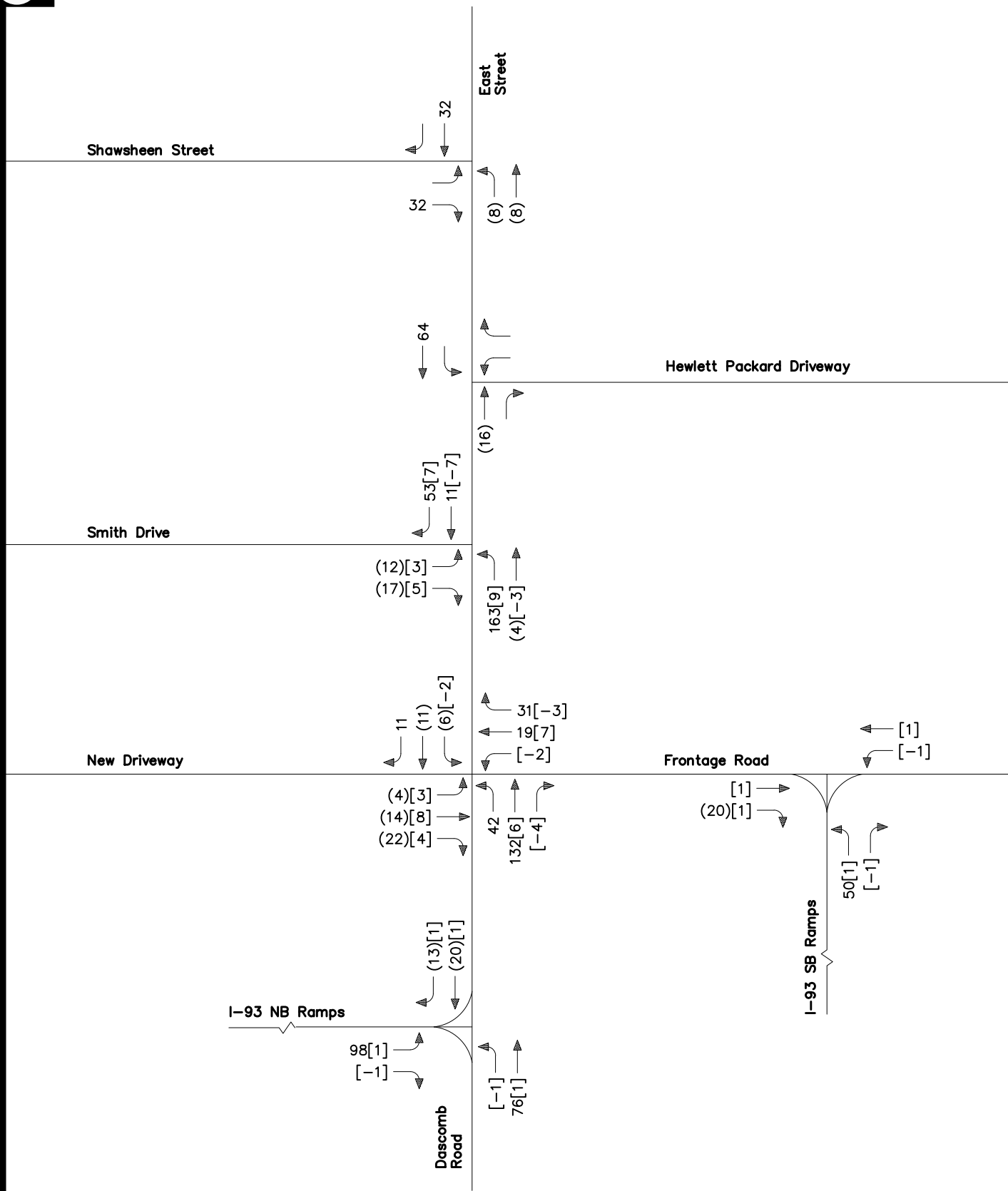


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# 146 Dascomb Road Site Redevelopment Project - Andover, Massachusetts

Traffic Impact and Access Study (TIAS)

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XXX(XXX)[XXX] = Entering(Exiting)[Pass-by]

Figure 5

Site-Generated Traffic  
Weekday Morning  
Peak Hour Traffic Volumes



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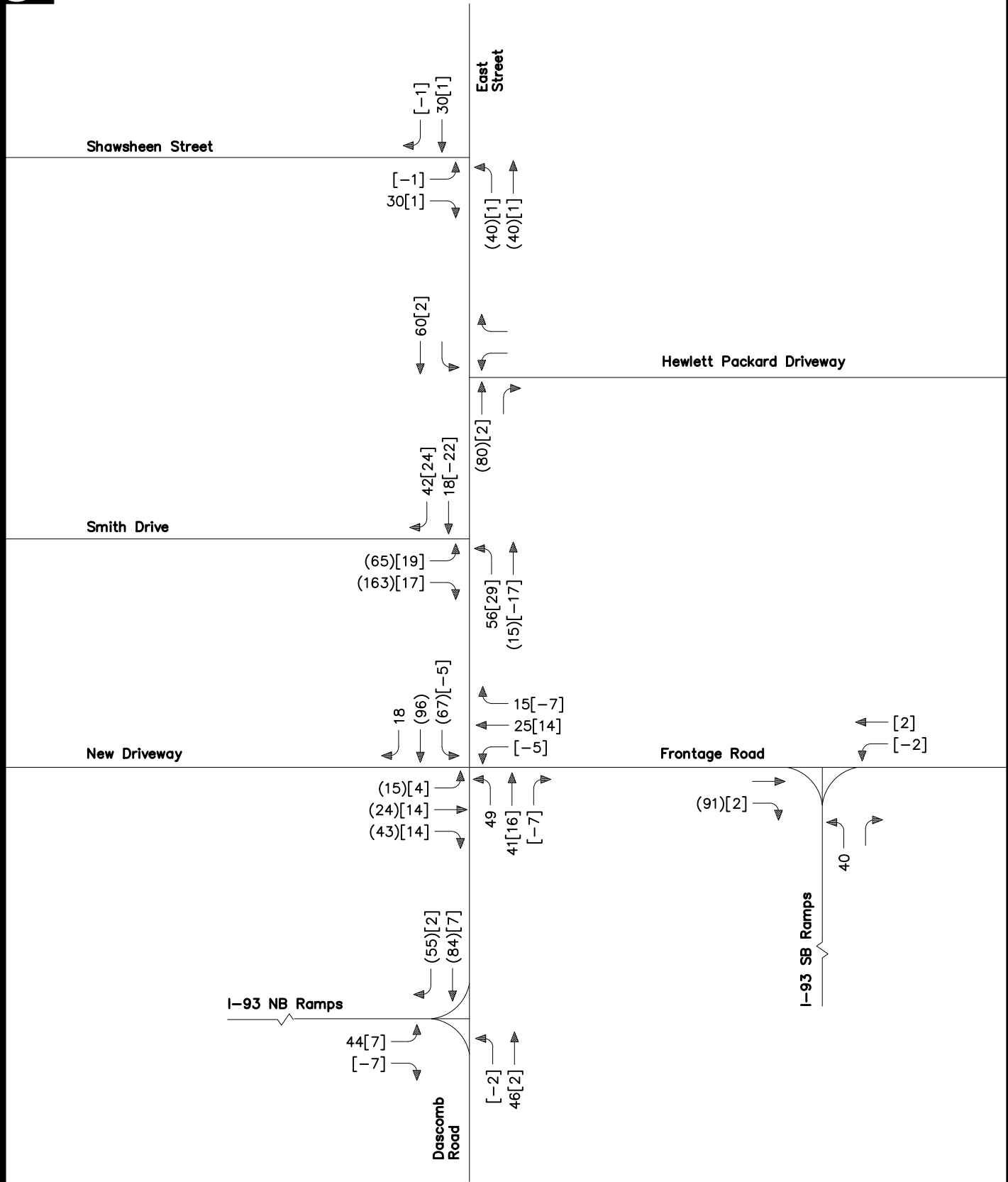


Figure 6

Site-Generated Traffic  
Weekday Evening  
Peak Hour Traffic Volumes



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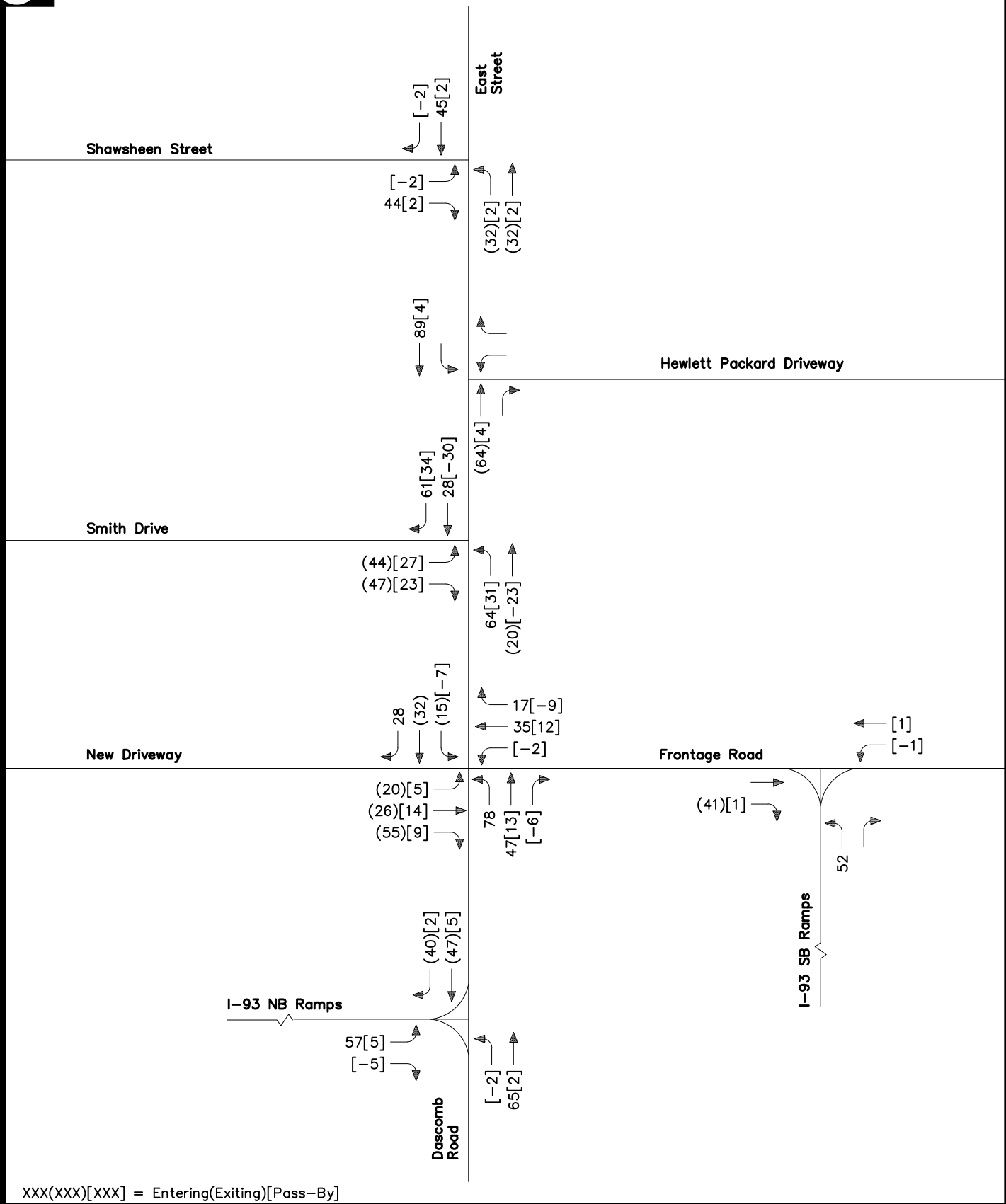


Figure 7

Site-Generated Traffic  
Saturday Midday  
Peak Hour Traffic Volumes



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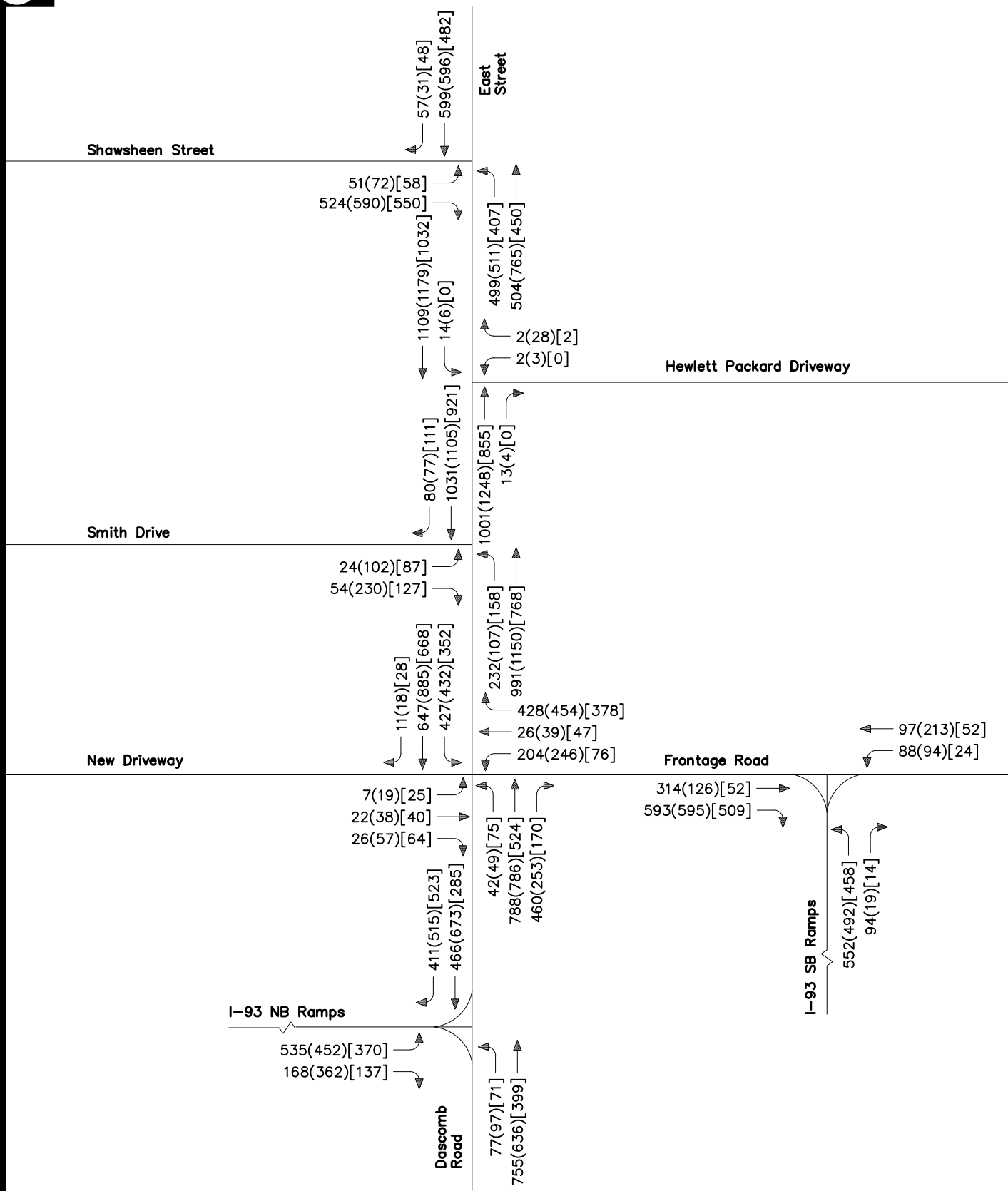


Figure 8

2027 Build Conditions  
Weekday Morning, Weekday Evening  
and Saturday Midday  
Peak Hour Traffic Volumes



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## **TRAFFIC SIGNAL WARRANT ANALYSIS**

Traffic signal warrant analyses were conducted for three intersections within the study area; including, Dascomb Road / Smith Drive, Dascomb Road / I-93 NB Ramps, and Frontage Road / I-93 SB Ramps, to document the warranting condition should a traffic signal be recommended as mitigation for the project. TEC performed the traffic signal warrant analyses based on criteria contained within the *Manual on Uniform Traffic Control Devices (MUTCD)*<sup>14</sup>. The *MUTCD* contains eight warrants for evaluating the need for installation of a traffic signal. The two multi-hour volume-related warrants were evaluated to determine whether a traffic signal is warranted at the three intersections described above. These warrants include:

- Warrant 1: Eight-Hour Vehicular Volume
- Warrant 2: Four-Hour Vehicular Volume

For the purposes of this analysis, TEC utilized 12-hour TMCs conducted at the three study area intersections to assess the warranting condition over a typical weekday.

### **Dascomb Road / Smith Drive**

For the signal warrant analysis of the Dascomb Road / Smith Drive intersection, the Smith Drive northbound approach was considered the “minor street” volume, while the opposing Dascomb Road eastbound and westbound approaches were considered to be the “major street”. Site-generated traffic volumes for the non-peak hours were assessed based on trip generation rates obtained in the ITE publication, *Trip Generation, 9<sup>th</sup> Edition* for Land Use Code 820 – Shopping Center and from empirical data for the other land uses.

Based on the existing traffic volumes and the addition of site-generated trips, the intersection of Dascomb Road / Smith Drive meets the criteria for Warrant 1 (Conditions A and B). Therefore, installation of a traffic signal at this intersection is recommended as part of the overall improvements to the intersection. The signal warrant analysis worksheets are included in Attachment J.

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<sup>14</sup> Manual on Uniform Traffic Control Devices (MUTC) – Federal Highway Administration / U.S. DOT – 2009 Edition.

### **Dascomb Road / Interstate 93 NB Ramps**

For the traffic signal warrant analysis of the Dascomb Road / I-93 NB Ramps intersection, the I-93 NB Ramps northbound approach was considered the “minor street” volume, while the opposing Dascomb Road eastbound and westbound approaches were considered to be the “major street”. Traffic volumes utilized in the traffic signal warrant were conducted during a 12-hour continuous TMC on Thursday, October 6, 2016. Site-generated traffic volumes were not included in the warrant analyses for the Dascomb Road / I-93 NB Ramps intersection. For the purposes of this analysis, right-turns exiting the I-93 NB ramp were discounted as they are able to travel relatively free-flowing during the projected signalized condition.

Based on the existing traffic volumes alone, the intersection of Dascomb Road / I-93 NB Ramps meets the criteria for Warrant 1 (Conditions A and B) and Warrant 2. As a traffic signal is warranted and due to the operating and safety conditions of the intersection without a traffic signal in place, installation of a traffic signal at this intersection is recommended as part of the off-site corridor improvements along Dascomb Road. The signal warrant analysis worksheets are included in Attachment J.

### **Frontage Road / Interstate 93 SB Ramps**

For the signal warrant analysis of the Frontage Road / Interstate 93 Southbound Ramps intersection, the Interstate 93 Southbound Ramps westbound approach was considered the “minor street” volume, while the opposing Frontage Road northbound and southbound approaches were considered to be the “major street”.

Site-generated traffic volumes were not included in the warrant analyses for the Frontage Road / I-93 SB Ramps. Based on the existing traffic volumes alone, the intersection of Frontage Road / I-93 SB Ramps meets the criteria for Warrant 2. The addition of site-generated traffic did not trigger Warrant 1. As a traffic signal is warranted and due to the operating and safety conditions of the intersection without a traffic signal in place, installation of a traffic signal at this intersection is recommended as part of the overall improvements along the Dascomb Road / Frontage Road corridors. The signal warrant analysis worksheets are included in Attachment J.

## **TRAFFIC OPERATIONS ANALYSIS**

Measuring existing and future traffic volumes quantifies traffic flow within the study area. To assess quality of flow, roadway capacity and vehicle queue analyses were conducted under Existing, No-Build, Build, and Build with Mitigation traffic-volume conditions. Capacity analyses provide an indication of how well the roadway facilities serve the traffic demands placed upon them, with vehicle queue analyses providing a secondary measure of the operational characteristics of an intersection or section of roadway under study.



## **Methodology for Analyzing Traffic Operations**

### **Levels of Service**

A primary result of capacity analyses is the assignment of level-of-service to traffic facilities under various traffic-flow conditions.<sup>15</sup> The concept of level-of-service is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A level-of-service definition provides an index to quality of traffic flow in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety.

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

### **Intersection Queue Length Analysis**

Vehicle queue analyses are a direct measurement of an intersections ability to process vehicles under various traffic control and volume scenarios and lane use arrangements.

The vehicle queue analysis was performed using the Synchro 9.1 intersection capacity analysis software which is also based upon the methodology and procedures presented in the industry standard *Highway Capacity Manual (HCM 2010)*. Synchro reports the 95<sup>th</sup> percentile queues for unsignalized intersections and both the 50<sup>th</sup> (average) and 95<sup>th</sup> percentile vehicle queues for signalized intersections, which are based on the number of vehicles that experience a delay of six seconds or more at an intersection and is a function of the traffic signal timing; vehicle arrival patterns during the analysis period; and the saturation flow rate. The 50<sup>th</sup> percentile or average vehicle queue is the average number of vehicles that are projected to be delayed by six seconds or more at the intersection under study during the analysis period. The 95<sup>th</sup> percentile vehicle queue is the vehicle queue length that will be exceeded only five percent of the time; or approximately three minutes out of 60 minutes during the peak one hour of the day. During the remaining 57 minutes, the vehicle queue length will be less than the 95<sup>th</sup> percentile queue length.

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<sup>15</sup> The capacity analysis methodology is based on the concepts and procedures presented in the *Highway Capacity Manual 2010*; Transportation Research Board; Washington, DC; 2010.

## Freeway Merge and Diverge Analysis

The analysis of merge and diverge operations at freeway ramps and interchanges is based on methodologies presented in Chapter 13, Freeway Merge and Diverge Segments, of the *HCM 2010*. The methodology assesses the interaction of the freeway mainline section traffic and traffic diverging or merging to/from the freeway ramps. The analysis is based on geometric and operational factors such as length of acceleration or deceleration lanes, the free-flow speed along the freeway and the ramps, adjacent ramps along the freeway, and the number of vehicles in merging and diverging influence area.

The focus of the analysis is at the freeway-ramp junction for merge and diverge movements, which forces entering or exiting vehicles to shift subsequent to enter or exit the freeway and occupy the correct travel lane, causing temporary instability as the vehicles shift lanes and accelerate or decelerate. According to *HCM 2010*, the influence area for these movement is approximately 1,500-feet after the merge area or before the diverge area. Acceleration and deceleration lengths used in the merge and diverge analyses were based on existing taper lengths.

## Parameters for Traffic Impact Analyses

### Unsignalized Intersections

The levels of service of unsignalized intersections are determined by application of a procedure described in the *HCM 2010*. Level of service is measured in terms of average control delay. Mathematically, control delay is a function of the capacity and degree of saturation of the lane group and/or approach under study and is a quantification of motorist delay associated with traffic control devices such as traffic signals and STOP signs. Control delay includes the effects of initial deceleration delay approaching a STOP sign, stopped delay, queue move-up time, and final acceleration delay from a stopped condition. Table 6 summarizes the relationship between level of service and average control delay for unsignalized intersections.

**Table 6 – Level-of-Service Criteria for Unsignalized Intersections<sup>(a)</sup>**

Level of Service	Average Control Delay (seconds per vehicle)	Description
A	≤10.0	LOS A represents a condition with little or no control delay to minor street traffic.
B	10.1 to 15.0	LOS B represents a condition with short control delays to minor street traffic.
C	15.1 to 25.0	LOS C represents a condition with average control delays to minor street traffic.
D	25.1 to 35.0	LOS D represents a condition with long control delays to minor street traffic.
E	35.1 to 50.0	LOS E represents operating conditions at or near capacity level, with very long control delays to minor street traffic.
F	>50.0	LOS F represents a condition where minor street demand volume exceeds capacity of an approach lane, with excessive control delays resulting.

<sup>a</sup> Source: *Highway Capacity Manual 2010*; Transportation Research Board; Washington D.C.; 2010

## Signalized Intersections

LOS for signalized intersections is calculated using the operational analysis methodology of the *HCM 2010*. This method assesses the effects of signal type, timing, phasing, progression; vehicle mix; and geometrics on delay. LOS designations are based on the criterion of control or signal delay per vehicle. Control or signal delay can be related to driver discomfort, frustration, and fuel consumption, and includes initial deceleration delay approaching the traffic signal, queue move-up time, stopped delay and final acceleration delay.

Table 7 summarizes the relationship between LOS and control delay. The tabulated control delay criterion may be applied in assigning LOS designations to individual lane groups, to individual intersection approaches, or to entire intersections.

**Table 7 – Level-of-Service Criteria for Signalized Intersections<sup>(a)</sup>**

Level of Service ( $v/c \leq 1.0$ )	Average Control Delay (seconds per vehicle)	Description
A	$\leq 10.0$	LOS A describes operations with very low control delay; most vehicles do not stop at all.
B	10.1 to 20.0	LOS B describes operations with relatively low control delay. However, more vehicles stop than LOS A.
C	20.1 to 35.0	LOS C describes operations with higher control delays. Individual cycle failures may begin to appear. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
D	35.1 to 55.0	LOS D describes operations with control delay in the range where the influence of congestion becomes more noticeable. Many vehicles stop and individual cycle failures are noticeable, whereby motorists are not able to get through the signal on one cycle.
E	55.1 to 80.0	LOS E describes operations with high control delay values. Individual cycle failures are frequent occurrences.
F	$> 80.0$	LOS F describes operations with high control delay values that often occur with over-saturation. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

<sup>a</sup> Source: *Highway Capacity Manual 2010*; Transportation Research Board; Washington D.C.; 2010

## Freeway Merge and Diverge Ramp Junctions

LOS for merge and diverge junctions is calculated using the operational analysis methodology of the *2010 HCM*. This method assesses the effects of ramp and freeway volume, as well as volume up upstream or downstream ramps within the influence area, number of lanes, the length of acceleration or deceleration lane, ramp and freeway free-flow speed, and other such measures such as driver type. LOS designations are based on the criterion of density in terms of passenger cars per mile per lane (pcpmpln). Density can be related to driver discomfort, frustration, and fuel consumption. Table 8 summarizes the relationship between LOS and density. The tabulated density criterion may be applied in assigning LOS designations to individual lane groups, to individual intersection approaches, or to entire intersections.

**Table 8 – Level-of-Service Criteria for Ramp Junctions<sup>(a)</sup>**

<b>Level of Service</b>	<b>Density (pcpmpln)</b>	<b>Description</b>
A	≤10.0	<i>LOS A</i> describes operations with very low density; unrestricted operations.
B	10.1 to 20.0	<i>LOS B</i> describes operations with relatively low density. Merging and diverging maneuvers are noticeable to drivers.
C	20.1 to 28.0	<i>LOS C</i> describes operations with higher densities. The vehicle speeds within the influence areas begin to decline as a result of merge / diverge maneuvers.
D	28.1 to 35.0	<i>LOS D</i> describes operations with densities in the range where the influence area turbulence becomes intrusive.
E	>35.0	<i>LOS E</i> describes operations with high densities. Turbulence is felt by all drivers.
F	Demand Exceeds Capacity	<i>LOS F</i> describes operations with high densities where ramp and freeway ramp queues form.

<sup>a</sup> Source: *Highway Capacity Manual 2010*; Transportation Research Board; Washington D.C.; 2010; page 13-4

### **Intersection Capacity and Queue Analysis Results**

Level-of-service and queue analyses were conducted for the 2016 Existing, 2027 No-Build, 2027 Build, and 2027 Build with Mitigation conditions for the unsignalized and signalized intersections within the study area. The results of the intersection capacity and queue analysis are summarized in Table 9 and Table 10. The detailed intersection capacity and queue analysis worksheets are provided in Attachment K.

#### **Dascomb Road / East Street / Shawsheen Street**

Without mitigation, the intersection of Dascomb Road / East Street / Shawsheen Street is anticipated to operate at LOS D or better under 2027 Build conditions during the weekday morning, weekday evening and Saturday midday peak periods. Improvements are recommended and proposed at this intersection as part of the Dascomb Road Project’s off-site mitigation, which include re-timing the existing signal timings to accommodate the site-generated trips and coordinating the signal with the other proposed signals along the Dascomb Road corridor. With these improvements, this intersection is anticipated to operate at acceptable levels of service (LOS B) under 2027 Build with Mitigation conditions. All movements at the intersection are anticipated to operate at acceptable levels of service (LOS D or better) during all peak hour analysis scenarios.

#### **Dascomb Road / HP Driveway**

Specific improvements are not proposed at the HP Driveway. Although the southbound left-turn movement is anticipated to operate primarily under LOS F during the weekday morning and evening peak periods, the 95<sup>th</sup> percentile queue is not expected to exceed two (2) vehicles. Volume-to-capacity (V/C) ratios at the intersection are well below 1.00 which indicates that the intersection can accommodate the additional demand along Dascomb Road.

**Table 9 –Intersection Capacity and Queue Analysis Summary**

Intersection / Lane Group	2016 Existing				2027 No-Build				2027 Build				2027 Build w/ Mitigation			
	V/C <sup>a</sup>	Delay <sup>b</sup>	LOS <sup>c</sup>	Queue <sup>d</sup>	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue
<b>Dascomb Road / East Street / Shawsheen Street</b>																
<i>Weekday Morning Peak Period</i>																
East Street EBT	0.74	20.9	C	229/351	0.78	23.2	C	259/392	0.80	24.3	C	283/428	0.68	15.8	B	229/419
East Street EBR	0.06	5.5	A	<25/<25	0.07	5.8	A	<25/<25	0.06	5.7	A	<25/<25	0.08	8.1	A	<25/<25
Dascomb Road WBL	0.93	34.7	C	129/351	0.99	53.2	D	204/427	1.04	69.1	F	241/460	0.85	14.6	B	81/241
Dascomb Road WBT	0.43	6.3	A	95/147	0.44	6.1	A	105/160	0.44	6.0	A	108/164	0.40	0.9	A	82/112
Shawsheen Street NBL	0.15	25.2	C	<25/58	0.17	27.7	C	<25/61	0.17	28.5	C	<25/61	0.38	30.8	C	<25/56
Shawsheen Street NBR	0.84	30.9	C	81/231	0.89	38.0	D	118/275	0.96	53.3	D	157/342	0.58	6.8	A	140/314
<b>Overall Intersection</b>	<b>0.50</b>	<b>22.7</b>	<b>C</b>	<b>-</b>	<b>0.53</b>	<b>29.1</b>	<b>C</b>	<b>-</b>	<b>0.55</b>	<b>36.6</b>	<b>D</b>	<b>-</b>	<b>0.50</b>	<b>10.2</b>	<b>B</b>	<b>-</b>
<i>Weekday Evening Peak Period</i>																
East Street EBT	0.68	18.5	B	227/338	0.71	19.5	B	251/374	0.74	21.7	C	272/404	0.62	16.4	B	298/473
East Street EBR	0.03	4.9	A	<25/<25	0.03	5.0	A	<25/<25	0.03	5.5	A	<25/<25	0.04	9.3	A	<25/<25
Dascomb Road WBL	0.87	23.0	C	118/326	0.93	32.8	C	162/402	0.99	53.8	D	250/488	0.84	13.2	B	77/159
Dascomb Road WBT	0.58	7.5	A	163/244	0.61	7.7	A	185/277	0.63	7.8	A	204/308	0.57	1.6	A	30/43
Shawsheen Street NBL	0.20	25.4	C	29/77	0.22	27.0	C	32/80	0.23	29.3	C	33/79	0.37	37.1	D	42/85
Shawsheen Street NBR	0.97	52.5	D	107/296	1.04	73.2	F	145/395	1.07	85.2	F	184/453	0.59	7.3	A	233/394
<b>Overall Intersection</b>	<b>0.53</b>	<b>24.1</b>	<b>C</b>	<b>-</b>	<b>0.56</b>	<b>31.0</b>	<b>C</b>	<b>-</b>	<b>0.59</b>	<b>38.6</b>	<b>D</b>	<b>-</b>	<b>0.52</b>	<b>9.8</b>	<b>A</b>	<b>-</b>
<i>Saturday Midday Peak Period</i>																
East Street EBT	0.63	17.9	B	107/243	0.65	18.1	B	133/264	0.68	18.5	B	188/298	0.68	14.4	B	138/290
East Street EBR	0.05	4.9	A	<25/<25	0.05	5.0	A	<25/<25	0.05	5.0	A	<25/<25	0.08	9.7	A	<25/<25
Dascomb Road WBL	0.68	11.5	B	41/99	0.72	12.8	B	53/125	0.79	16.4	B	75/146	0.73	9.2	A	35/108
Dascomb Road WBT	0.38	7.1	A	49/116	0.40	7.0	A	64/126	0.42	6.7	A	89/137	0.41	4.8	A	49/93
Shawsheen Street NBL	0.15	18.4	B	<25/57	0.16	19.7	B	<25/62	0.16	21.7	C	<25/64	0.22	18.9	B	<25/59
Shawsheen Street NBR	0.78	21.7	C	28/126	0.84	27.2	C	45/171	0.94	42.9	D	82/265	0.65	8.0	A	94/235
<b>Overall Intersection</b>	<b>0.48</b>	<b>14.9</b>	<b>B</b>	<b>-</b>	<b>0.44</b>	<b>16.7</b>	<b>B</b>	<b>-</b>	<b>0.48</b>	<b>21.9</b>	<b>C</b>	<b>-</b>	<b>0.49</b>	<b>9.4</b>	<b>A</b>	<b>-</b>
<b>Dascomb Road / HP Driveway</b>																
<i>Weekday Morning Peak Period</i>																
Dascomb Road EBL	0.02	10.3	B	<25	0.02	10.5	B	<25	0.02	10.6	B	<25	0.03	10.8	B	<25
HP Driveway SB approach	0.06	58.2	F	<25	0.11	102.8	F	<25	0.08	82.0	F	<25	0.24	146.0	F	<25
<i>Weekday Evening Peak Period</i>																
Dascomb Road EBL	0.01	11.1	B	<25	0.01	11.6	B	<25	0.01	12.1	B	<25	0.01	12.4	B	<25
HP Driveway SB approach	0.31	51.6	F	<25	0.37	65.2	F	35	0.47	93.0	F	48	0.67	156.9	F	68
<i>Saturday Midday Peak Period</i>																
Dascomb Road EBL	-	0.0	A	<25	-	0.0	A	<25	-	0.0	A	<25	-	0.0	A	<25
HP Driveway SB approach	0.01	13.9	B	<25	0.01	14.6	B	<25	0.01	15.5	C	<25	0.01	11.3	B	<25

<sup>a</sup> Volume-to-capacity ratio,

<sup>b</sup> Delay expressed in seconds per vehicle (average)

<sup>c</sup> Level of service,

<sup>d</sup> 50<sup>th</sup>/95<sup>th</sup> Percentile Queue [95<sup>th</sup> Percentile Queue only for unsignalized intersections]



**Table 9 Continued - Intersection Capacity and Queue Analysis Summary**

Intersection / Lane Group	2016 Existing				2027 No-Build				2027 Build				2027 Build w/ Mitigation			
	V/C <sup>a</sup>	Delay <sup>b</sup>	LOS <sup>c</sup>	Queue <sup>d</sup>	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue
<b>Dascomb Road / Smith Drive</b>																
<i>Weekday Morning Peak Period</i>																
Dascomb Road EB approach	-	-	-	-	-	-	-	-	-	-	-	-	0.61	2.8	A	188/271
Dascomb Road WBL	0.10	11.5	B	<25	0.11	12.0	B	<25	0.59	20.6	C	95	0.88	28.8	C	91/166
Dascomb Road WBT	-	-	-	-	-	-	-	-	-	-	-	-	0.40	0.4	A	98/120
Smith Drive NBL	0.21	100.5	F	<25	0.26	129.5	F	<25	>2.00	>999	F	140	0.21	31.1	C	<25/32
Smith Drive NBR	0.13	20.6	C	<25	0.14	22.5	C	<25	0.48	34.1	D	60	0.59	33.7	C	<25/32
<b>Overall Intersection</b>	-	-	-	-	-	-	-	-	-	-	-	-	<b>0.50</b>	<b>5.3</b>	<b>A</b>	-
<i>Weekday Evening Peak Period</i>																
Dascomb Road EB approach	-	-	-	-	-	-	-	-	-	-	-	-	0.63	9.6	A	227/420
Dascomb Road WBL	0.05	11.9	B	<25	0.05	12.3	B	<25	0.44	18.3	C	55	0.83	40.5	D	63/121
Dascomb Road WBT	-	-	-	-	-	-	-	-	-	-	-	-	0.51	0.7	A	61/96
Smith Drive NBL	0.58	208.0	F	<25	0.71	280.2	F	58	>2.00	>999	F	455	0.35	31.8	C	61/109
Smith Drive NBR	0.24	25.0	D	<25	0.26	27.8	D	25	1.73	389.8	F	610	0.89	56.1	E	<25/65
<b>Overall Intersection</b>	-	-	-	-	-	-	-	-	-	-	-	-	<b>0.58</b>	<b>11.8</b>	<b>B</b>	-
<i>Saturday Midday Peak Period</i>																
Dascomb Road EB approach	-	-	-	-	-	-	-	-	-	-	-	-	0.65	9.8	A	135/258
Dascomb Road WBL	0.09	10.3	B	<25	0.09	10.6	B	<25	0.44	14.9	B	58	0.78	21.6	C	46/114
Dascomb Road WBT	-	-	-	-	-	-	-	-	-	-	-	-	0.35	3.5	A	43/79
Smith Drive NBL	0.20	58.0	F	<25	0.23	69.3	F	<25	>2.00	>999	F	363	0.40	18.6	B	26/75
Smith Drive NBR	0.17	17.8	C	<25	0.19	19.1	C	<25	0.79	50.4	F	158	0.65	20.1	C	<25/43
<b>Overall Intersection</b>	-	-	-	-	-	-	-	-	-	-	-	-	<b>0.49</b>	<b>9.4</b>	<b>A</b>	-
<b>Dascomb Road / Frontage Road</b>																
<i>Weekday Morning Peak Period</i>																
Dascomb Road EBL	0.65	8.1	A	59/216	0.72	9.7	A	82/277	0.84	16.0	B	128/384	0.84	33.4	C	112/169
Dascomb Road EBT/R	0.55	4.8	A	100/218	0.58	5.2	A	114/251	0.59	5.2	A	131/281	0.79	15.0	B	79/463
Dascomb Road WBL	-	-	-	-	-	-	-	-	-	-	-	-	0.51	31.8	C	<25/26
Dascomb Road WBT	0.58	13.4	B	102/168	0.59	13.6	B	111/181	0.66	14.2	B	156/245	0.64	7.8	A	188/225
Dascomb Road WBR	0.00	0.0	A	<25/<25	0.00	0.0	A	<25/<25	0.00	0.0	A	<25/<25	0.00	0.0	A	<25/<25
Site Driveway NBL	-	-	-	-	-	-	-	-	-	-	-	-	0.04	30.5	C	<25/<25
Site Driveway NBT / NBR	-	-	-	-	-	-	-	-	-	-	-	-	0.43	32.2	C	<25/39
Frontage Road SBL	0.77	21.4	C	64/132	0.78	22.0	C	70/144	0.79	24.7	C	78/160	0.84	45.7	D	<25/182
Frontage Road SBT	-	-	-	-	-	-	-	-	-	-	-	-	0.06	19.1	B	<25/<25
Frontage Road SBR	0.00	0.0	A	<25/<25	0.00	0.0	A	<25/<25	0.00	0.0	A	<25/<25	0.00	0.0	A	<25/44
<b>Overall Intersection</b>	<b>0.48</b>	<b>10.3</b>	<b>B</b>	-	<b>0.50</b>	<b>10.8</b>	<b>B</b>	-	<b>0.54</b>	<b>12.7</b>	<b>B</b>	-	<b>0.48</b>	<b>19.6</b>	<b>B</b>	-
<i>Weekday Evening Peak Period</i>																
Dascomb Road EBL	0.59	8.2	A	50/186	0.65	9.1	A	67/240	0.85	18.2	B	138/417	0.86	33.7	C	133/191
Dascomb Road EBT/R	0.65	6.0	A	149/339	0.68	6.5	A	169/385	0.78	8.2	A	259/536	0.90	9.7	A	544/772
Dascomb Road WBL	-	-	-	-	-	-	-	-	-	-	-	-	0.60	45.4	D	30/62
Dascomb Road WBT	0.58	13.9	B	106/196	0.59	14.1	B	125/213	0.62	14.8	B	161/246	0.51	30.1	C	173/274
Dascomb Road WBR	0.00	0.0	A	<25/<25	0.00	0.0	A	<25/<25	0.00	0.0	A	<25/<25	0.00	0.0	A	<25/<25
Site Driveway NBL	-	-	-	-	-	-	-	-	-	-	-	-	0.11	38.8	D	<25/32
Site Driveway NBT / NBR	-	-	-	-	-	-	-	-	-	-	-	-	0.74	45.3	D	<25/69
Frontage Road SBL	0.79	22.4	C	74/161	0.80	23.2	C	86/178	0.81	26.1	C	91/194	0.76	38.8	D	48/82
Frontage Road SBT	-	-	-	-	-	-	-	-	-	-	-	-	0.09	26.2	C	<25/<25
Frontage Road SBR	0.00	0.0	A	<25/<25	0.00	0.0	A	<25/<25	0.00	0.0	A	<25/<25	0.00	0.0	A	<25/28
<b>Overall Intersection</b>	<b>0.50</b>	<b>11.0</b>	<b>B</b>	-	<b>0.52</b>	<b>11.5</b>	<b>B</b>	-	<b>0.58</b>	<b>14.1</b>	<b>B</b>	-	<b>0.49</b>	<b>25.2</b>	<b>C</b>	-

<sup>a</sup> Volume-to-capacity ratio; <sup>b</sup> Delay expressed in seconds per vehicle (average)  
<sup>c</sup> Level of service; <sup>d</sup> 50<sup>th</sup>/95<sup>th</sup> Percentile Queue [95<sup>th</sup> Percentile Queue only for unsignalized intersections]

**Table 9 Continued - Intersection Capacity and Queue Analysis Summary**

Intersection / Lane Group	2016 Existing				2027 No-Build				2027 Build				2027 Build w/ Mitigation			
	V/C <sup>a</sup>	Delay <sup>b</sup>	LOS <sup>c</sup>	Queue <sup>d</sup>	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue
<b>Dascomb Road / Frontage Road</b>																
<i>Saturday Midday Peak Period</i>																
Dascomb Road EBL	0.43	5.1	A	30/68	0.47	5.3	A	33/74	0.57	6.0	A	39/122	0.74	23.9	C	71/115
Dascomb Road EBT	0.51	3.5	A	68/146	0.53	3.7	A	75/162	0.60	3.8	A	96/213	0.88	22.6	C	261/528
Dascomb Road WBL	-	-	-	-	-	-	-	-	-	-	-	-	0.59	26.7	C	30/71
Dascomb Road WBT	0.46	11.8	B	48/92	0.46	11.8	B	52/100	0.51	11.5	B	75/140	0.42	13.1	B	84/141
Dascomb Road WBR	0.00	0.0	A	<25/<25	0.00	0.0	A	<25/<25	0.00	0.0	A	<25/<25	0.00	0.0	A	<25/<25
Site Driveway NBL	-	-	-	-	-	-	-	-	-	-	-	-	0.10	23.3	C	<25/31
Site Driveway NBT / NBR	-	-	-	-	-	-	-	-	-	-	-	-	0.64	25.9	C	<25/59
Frontage Road SBL	0.48	18.1	B	<25/48	0.49	18.5	B	<25/52	0.51	20.2	C	<25/57	0.56	26.4	C	30/72
Frontage Road SBT	-	-	-	-	-	-	-	-	-	-	-	-	0.11	16.8	B	<25/39
Frontage Road SBR	0.00	0.0	A	<25/<25	0.00	0.0	A	<25/<25	0.00	0.0	A	<25/<25	0.00	0.0	A	<25/<25
<b>Overall Intersection</b>	<b>0.40</b>	<b>7.2</b>	<b>A</b>	<b>-</b>	<b>0.41</b>	<b>7.3</b>	<b>A</b>	<b>-</b>	<b>0.46</b>	<b>7.5</b>	<b>A</b>	<b>-</b>	<b>0.42</b>	<b>20.6</b>	<b>C</b>	<b>-</b>
<b>Dascomb Road / I-93 NB Ramps</b>																
<i>Weekday Morning Peak Period</i>																
Dascomb Road EBT	-	-	-	-	-	-	-	-	-	-	-	-	0.38	2.2	A	157/233
Dascomb Road EBR	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.0	A	<25/<25
Dascomb Road WBL	0.07	8.4	A	<25	0.07	8.5	A	<25	0.07	8.6	A	<25	0.12	6.1	A	<25/32
Dascomb Road WBT	-	-	-	-	-	-	-	-	-	-	-	-	0.62	9.2	A	182/321
NB Ramps NBL	>2.00	>999	F	35.8	>2.00	891.7	F	1015	>2.00	>999	F	1388	0.84	31.9	C	113/158
NB Ramps NBR	0.27	12.9	B	<25	0.29	13.4	B	30	0.30	13.7	B	30	0.00	0.0	A	<25/<25
<b>Overall Intersection</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>0.36</b>	<b>13.9</b>	<b>B</b>	<b>-</b>
<i>Weekday Evening Peak Period</i>																
Dascomb Road EBT	-	-	-	-	-	-	-	-	-	-	-	-	0.51	12.7	B	102/173
Dascomb Road EBR	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.0	A	<25/<25
Dascomb Road WBL	0.10	9.0	A	<25	0.11	9.1	A	<25	0.11	9.5	A	<25	0.23	15.6	B	<25/46
Dascomb Road WBT	-	-	-	-	-	-	-	-	-	-	-	-	0.48	6.4	A	144/259
NB Ramps NBL	>2.00	>999	F	33.3	>2.00	976.9	F	965	>2.00	>999	F	1200	0.84	37.9	D	130/171
NB Ramps NBR	0.69	25.5	D	<25	0.75	30.8	D	163	0.84	42.6	E	203	0.00	0.0	A	<25/<25
<b>Overall Intersection</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>0.37</b>	<b>16.8</b>	<b>B</b>	<b>-</b>
<i>Saturday Midday Peak Period</i>																
Dascomb Road EBT	-	-	-	-	-	-	-	-	-	-	-	-	0.41	5.8	A	30/77
Dascomb Road EBR	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.0	A	<25/<25
Dascomb Road WBL	0.06	7.9	A	<25	0.06	7.9	A	<25	0.06	8.1	A	<25	0.13	7.3	A	<25/25
Dascomb Road WBT	-	-	-	-	-	-	-	-	-	-	-	-	0.58	6.4	A	46/111
NB Ramps NBL	0.83	47.6	E	<25	0.94	69.0	F	245	1.33	206.4	F	495	0.53	9.1	A	<25/63
NB Ramps NBR	0.18	10.4	B	<25	0.19	10.6	B	<25	0.20	11.1	B	<25	0.00	0.0	A	<25/<25
<b>Overall Intersection</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>0.32</b>	<b>7.2</b>	<b>A</b>	<b>-</b>

<sup>a</sup> Volume-to-capacity ratio,

<sup>b</sup> Delay expressed in seconds per vehicle (average)

<sup>c</sup> Level of service,

<sup>d</sup> 50<sup>th</sup>/95<sup>th</sup> Percentile Queue [95<sup>th</sup> Percentile Queue only for unsignalized intersections]

**Table 9 Continued - Intersection Capacity and Queue Analysis Summary**

Intersection / Lane Group	2016 Existing				2027 No-Build				2027 Build				2027 Build w/ Mitigation			
	V/C <sup>a</sup>	Delay <sup>b</sup>	LOS <sup>c</sup>	Queue <sup>d</sup>	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue
<b>Frontage Road / I-93 SB Ramps</b>																
<i>Weekday Morning Peak Period</i>																
SB Ramps WBL	1.12	108.2	F	<25	1.24	156.4	F	548	1.37	207.2	F	688	0.83	27.3	C	118/153
SB Ramps WBR	0.13	10.6	B	<25	0.14	10.8	B	<25	0.14	10.8	B	<25	0.00	0.0	A	<25/<25
Frontage Road NBT	-	-	-	-	-	-	-	-	-	-	-	-	0.26	5.7	A	90/111
Frontage Road NBR	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.0	A	72/141
Frontage Road SB approach	0.07	8.1	A	<25	0.08	8.1	A	<25	0.08	8.1	A	<25	0.13	6.1	A	<25/35
<b>Overall Intersection</b>	-	-	-	-	-	-	-	-	-	-	-	-	<b>0.22</b>	<b>17.1</b>	<b>B</b>	-
<i>Weekday Evening Peak Period</i>																
SB Ramps WBL	0.90	47.0	E	<25	1.00	69.8	F	343	1.08	93.2	F	428	0.85	36.6	D	148/189
SB Ramps WBR	0.02	9.1	A	<25	0.02	9.1	A	<25	0.02	9.1	A	<25	0.00	0.0	A	<25/<25
Frontage Road NBT	-	-	-	-	-	-	-	-	-	-	-	-	0.10	4.4	A	<25/<25
Frontage Road NBR	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.0	A	129/151
Frontage Road SB approach	0.07	7.6	A	<25	0.07	7.7	A	<25	0.07	7.7	A	<25	0.16	4.8	A	32/58
<b>Overall Intersection</b>	-	-	-	-	-	-	-	-	-	-	-	-	<b>0.18</b>	<b>21.7</b>	<b>C</b>	-
<i>Saturday Midday Peak Period</i>																
SB Ramps WBL	0.47	13.1	B	<25	0.51	13.7	B	73	0.57	14.9	B	93	0.61	9.2	A	27/47
SB Ramps WBR	0.01	8.6	A	<25	0.01	8.6	A	<25	0.01	8.6	A	<25	0.00	0.0	A	<25/<25
Frontage Road NBT	-	-	-	-	-	-	-	-	-	-	-	-	0.07	5.1	A	<25/<25
Frontage Road NBR	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.0	A	<25/<25
Frontage Road SB approach	0.02	7.4	A	<25	0.02	7.4	A	<25	0.02	7.4	A	<25	0.06	5.1	A	<25/<25
<b>Overall Intersection</b>	-	-	-	-	-	-	-	-	-	-	-	-	<b>0.16</b>	<b>8.3</b>	<b>A</b>	-

<sup>a</sup> Volume-to-capacity ratio,

<sup>b</sup> Delay expressed in seconds per vehicle (average)

<sup>c</sup> Level of service,

<sup>d</sup> 50<sup>th</sup>/95<sup>th</sup> Percentile Queue [95<sup>th</sup> Percentile Queue only for unsignalized intersections]

**Table 9 Continued – Interstate 93 Merge/Diverge Analysis Summary**

Intersection / Lane Group	2016 Existing		2027 No-Build		2027 Build	
	Density <sup>a</sup>	LOS <sup>b</sup>	Density	LOS	Density	LOS
<b>Interstate 93 NB Diverge:</b>						
<b>Exit 43 Off-Ramp</b>						
<i>Weekday Morning Peak Period</i>	23.0	C	24.2	C	25.0	C
<i>Weekday Evening Peak Period</i>	42.9	F	46.4	F	46.8	F
<i>Saturday Midday Peak Period</i>	21.2	C	22.4	C	22.6	C
<b>Interstate 93 NB Merge:</b>						
<b>Exit 43 On-Ramp</b>						
<i>Weekday Morning Peak Period</i>	22.7	C	24.0	C	24.7	C
<i>Weekday Evening Peak Period</i>	43.7	F	47.1	F	47.8	F
<i>Saturday Midday Peak Period</i>	21.9	C	23.3	C	23.6	C
<b>Interstate 93 SB Diverge:</b>						
<b>Exit 43 Off-Ramp</b>						
<i>Weekday Morning Peak Period</i>	48.1	F	51.8	F	52.4	F
<i>Weekday Evening Peak Period</i>	26.1	C	27.4	C	27.6	C
<i>Saturday Midday Peak Period</i>	22.0	C	23.2	C	23.4	C
<b>Interstate 93 SB Merge:</b>						
<b>Exit 43 On-Ramp</b>						
<i>Weekday Morning Peak Period</i>	49.1	F	52.9	F	53.6	F
<i>Weekday Evening Peak Period</i>	27.7	C	29.2	D	30.0	D
<i>Saturday Midday Peak Period</i>	23.0	C	24.3	C	24.6	C

<sup>a</sup> Density Expressed in passenger cars per mile per lane (pcmpl),

<sup>b</sup> Level of service

### Dascomb Road / Smith Drive

Without mitigation, the northbound left-turn movement at the intersection of Dascomb Road / Smith Drive is anticipated to operate at LOS F under 2027 Build conditions during all three peak hour periods. The Dascomb Road westbound left movement is anticipated to operate under LOS C during weekday morning and weekday evening peak periods, and LOS B during Saturday midday peak periods.

Improvements are recommended and proposed at this intersection as part of the Dascomb Road Project's off-site mitigation, which include installation of a fully-actuated traffic signal coordinated with the other signals along the Dascomb Road corridor and adding additional travel lanes to each approach. With these improvements, this intersection is anticipated to operate at an acceptable level of service (LOS B or better) under 2027 Build with Mitigation conditions. All movements at the intersection are anticipated to operate at acceptable levels of service (LOS D or better) during all peak hour analysis scenarios with exception to the Smith Drive northbound right-turn movement. The Smith Drive northbound right-turn movement is anticipated to operate at LOS E during the weekday evening peak hour; however, the analysis does not specifically take into account sufficient gaps in traffic created by the upstream traffic signal at East Street / Dascomb Road / Shawsheen Street which will further allow for the minor number of right-turning vehicles to egress in a safe and comfortable manner. This would

effectively provide a superior level-of-service than as reported on the movement. In addition, the LOS E is only expected on the site; therefore mainline traffic movements are expected to operate at elevated levels-of-service.

### **Dascomb Road / Frontage Road**

Without mitigation, the intersection of Dascomb Road / Frontage Road is anticipated to operate at LOS B under 2027 Build conditions during the weekday morning and weekday evening peak periods. Improvements are recommended and proposed at this intersection as part of the Dascomb Road Project's off-site mitigation, which include re-timing the existing signal timings to accommodate the site-generated trips and coordinating the signal with the other signals along the Dascomb Road corridor. Additional travel lanes will also be added to multiple approaches. To improve access to the Project site, construction of a fourth intersection leg for direct project access/egress is also proposed.

With these improvements added, in addition to the improvements listed above, all movements at the intersection are anticipated to operate at acceptable levels of service (LOS D or better) during all peak hour analysis scenarios with exception to the Site Driveway northbound right-turn movement.

### **Dascomb Road / Interstate 93 Northbound Ramps**

Without mitigation, the northbound left movement at the intersection of Dascomb Road / I-93 NB Ramps is anticipated to continue operating at LOS F under 2027 Build conditions during all three peak hour periods. The northbound right movement is anticipated to operate under LOS E during the weekday evening peak period. Improvements are recommended and proposed at this intersection as part of the Dascomb Road Project's off-site mitigation, which include installation of a fully-actuated traffic signal coordinated with the other signals along the Dascomb Road corridor and adding additional travel lanes to the intersection approaches. With these improvements, this intersection is anticipated to operate at acceptable levels of service (LOS B or better) under 2027 Build with Mitigation conditions. All movements at the intersection are anticipated to operate at acceptable levels of service (LOS D or better) during all peak hour analysis scenarios. Queues along the I-93 NB Ramp approach are expected to significantly decrease as the signal provides gaps in the mainline green time.

Operations at the merge and diverge sections of the I-93 NB Interchange 42 Ramps are not anticipated to significantly change as a result of the project. The merge and diverge points are expected to continue operating at LOS F during the weekday evening peak hour. This is generally a result of the high traffic volumes experienced along I-93's northbound mainline during the weekday evening peak hour. Although the density-based level of service is expected to continue as LOS F, the delay and queue for the off-ramp is expected to significantly improve in direct correlation to the signalization and lane improvements at the surface intersection along Dascomb Road.

### **Frontage Road / Interstate 93 Southbound Ramps**

Without mitigation, the westbound left movement at the intersection of Frontage Road / I-93 SB Ramps is anticipated to operate at LOS F under 2027 Build conditions during the weekday morning and weekday evening peak periods. Improvements are recommended and proposed at this intersection as part of the Dascomb Road Project's off-site mitigation, which include installation of a fully-actuated traffic signal coordinated with the other signals along the Dascomb Road corridor and adding an additional turn lane to the westbound approach. With these improvements, this intersection is anticipated to operate at acceptable levels of service (LOS C or better) under 2027 Build with Mitigation conditions. All movements at the intersection are anticipated to operate at acceptable levels of service (LOS D or better) during all peak hour analysis scenarios. Queues along the I-93 SB Ramp approach are expected to significantly decrease as the signal provides gaps in the mainline green time.

Operations at the merge and diverge sections of the I-93 SB Interchange 42 Ramps are not anticipated to significantly change as a result of the project. The merge and diverge points are expected to continue operating at LOS F during the weekday evening peak hour. This is generally a result of the high traffic volumes experienced along I-93's southbound mainline during the weekday morning peak hour. Although the density-based level of service is expected to continue as LOS F, the delay and queue for the off-ramp is expected to significantly improve in direct correlation to the signalization and lane improvements at the surface intersection along Dascomb Road.

### **RECOMMENDATIONS FOR ACCESS AND OFF-SITE IMPROVEMENTS**

After evaluating the operations and safety of the study area roadways and intersections, the next step is to identify measures to improve the roadways and intersections based on existing and future deficiencies. The Project has impacts in the area immediately adjacent to the site and requires mitigation. The following section provides a summary of measures that are recommended in order to improve the existing and future operations and safety of the study area intersections. These recommended measures were noted in the previous capacity and queue analysis.

The Applicant has proposed a robust transportation mitigation program along Dascomb Road, Frontage Road, and Smith Drive to improve vehicular, bicycle, and pedestrian operations and safety. The primary improvements include the installation of three new traffic signals within the study area to provide a coordinate network of signals; improving driver progression in the vicinity of the I-93 Interchange 42. In addition, the Applicant seeks to significantly improve accommodations for bicycles and pedestrians along Dascomb Road to service not only the Dascomb Road Project; but other existing developments along the corridor. Finally, the Applicant has proposed improvements along the Dascomb Road corridor have been designed to carry additional reserve capacity for potential future expansion of projects along the immediate Dascomb Road and Frontage Road area; including the Hewlett-Packard Campus Expansion Project.



### **Site Access**

As part of the Project, a fourth leg will be added to the intersection of Dascomb Road / Frontage Road. Primary access/egress to the site is proposed via a series of internal driveways along Smith Drive; however, the addition of a driveway at the intersection of Dascomb Road / Frontage Road would improve access and egress along Dascomb Road for users of the site. TEC has assigned a moderate number of trips to this driveway to provide a conservative analysis of the potential impacts to traffic operations at this driveway. The site trip distribution is identified in the prior sections. The proposed site driveway will be designed to accommodate safe travel speeds and in accordance with *MUTCD* standards for pavement markings and signage and American Association of State Highway and Transportation Officials (AASHTO) standards for sight lines and geometry.

Although operations at the intersection are expected to improve as a result of the proposed fourth leg, the safety characteristics of the intersection will be improved significantly. Without the proposed fourth intersection leg, all site-generated traffic entering the site via the Frontage Road southbound approach will be required to traverse two lanes of traffic along Dascomb Road westbound immediately after exiting the channelized right-turn from Frontage Road. Where the channelized right-turn operates under YIELD-control, vehicles entering the site from that movement will need to accurately judge the gaps in Dascomb Road westbound traffic before cutting across two (2) lanes of traffic to access the two (2) exclusive left-turn lanes into the Project site. After construction of the proposed fourth leg, site-generated trips entering the site via the Frontage Road southbound approach can access the site directly under signalized protection without the need to use Dascomb Road or the channelized right-turn, significantly improving vehicular safety.

### **Intersection Improvements**

#### **Dascomb Road / East Street / Shawsheen Street**

To improve traffic operations at the intersection of Dascomb Road / East Street / Shawsheen Street, the Applicant will extend the exclusive left-turn lane along the Dascomb Road westbound approach to provide adequate storage capacity for the increased westbound traffic volumes. In addition, the existing traffic signal timings will be modified to run in coordination with the two new traffic signals proposed along the Dascomb Road corridor. The master controller currently housed at the intersection of Dascomb Road / East Street / Shawsheen Street will be transferred to the intersection of Dascomb Road / Frontage Road.

#### **Dascomb Road / Smith Drive**

To mitigate the impacts of the Project and to provide additional reserve capacity along the corridor, the Applicant has committed to the following improvements at the intersection of Dascomb Road / Smith Drive:

- Install a fully-actuated traffic signal with coordination to/from other traffic signals located along the Dascomb Road corridor. Provide demand-based vehicular and

bicycle detection as part of the new traffic signal, as well as providing accommodations for emergency-vehicle pre-emption;

- Widen Smith Drive to accommodate an exclusive left-turn lane, an exclusive right-turn lane, and two (2) receiving lanes;
- Widen Dascomb Road to include a through lane and a shared through / right-turn lane on the eastbound approach; an exclusive left-turn lane and two (2) through lanes on the westbound approach; and two (2) receiving lanes on each approach; and
- Add Americans with Disabilities Act (ADA) / Architectural Access Board (AAB) compliant pedestrian accommodations; including crosswalks across Dascomb Road and Smith Drive, accessible ramps, and audio/vibratory pedestrian signal equipment.

### **Dascomb Road / Frontage Road**

To improve traffic operations at the intersection of Dascomb Road / Frontage Road, the Applicant has committed to the following intersection improvements:

- Various short-term to long-term improvements as noted in the December 2016 RSA as coordinated with the Town of Andover and MassDOT;
- Reconstruct the fully-actuated traffic signal with coordination to/from other traffic signals located along the Dascomb Road corridor. Provide new demand-based vehicular and bicycle detection as part of the new traffic signal, as well as providing accommodations for emergency-vehicle pre-emption;
- Construct a fourth intersection leg with an exclusive left-turn lane, a shared through / right-turn lane, and a receiving lane;
- Widen Frontage Road to accommodate an exclusive left-turn lane, a through lane, a channelized right-turn lane, and two (2) receiving lanes;
- Widen Dascomb Road to include two (2) exclusive left-turn lanes and a shared through / right-turn lane on the eastbound approach; a left-turn lane, two (2) through lanes and a channelized right-turn lane on the westbound approach; and two (2) receiving lanes on each approach; and
- Add ADA/AAB-compliant pedestrian accommodations; including crosswalks across fourth intersection leg, accessible ramps, and audio/vibratory pedestrian signal equipment.

### **Dascomb Road / Interstate 93 NB Ramps**

The additional traffic generated by the proposed Dascomb Road Project is anticipated to degrade the overall intersection level of service at the Dascomb Road / I-93 NB Ramps unsignalized intersection. To mitigate this issue, the Applicant has committed to the following intersection improvements:

- Various short-term to long-term improvements as noted in the December 2016 RSA as coordinated with the Town of Andover and MassDOT;
- Install a fully-actuated traffic signal with coordination to/from other traffic signals located along the Dascomb Road corridor. Provide demand-based vehicular and bicycle detection as part of the new traffic signal, as well as providing accommodations for emergency-vehicle pre-emption;
- Widen Dascomb Road to include a through lane and a channelized right-turn lane on the eastbound approach; an exclusive left-turn lane and a through lane on the westbound approach; two (2) receiving lanes west of the intersection; and one (1) receiving lane east of the intersection;
- Re-stripe (with minor geometric modifications) the I-93 Northbound Ramps northbound approach to include two (2) exclusive left-turn lanes and a channelized right-turn lane; and
- Add ADA/AAB-compliant pedestrian accommodations; including crosswalks across the I-93 Northbound Ramps, accessible ramps, and audio/vibratory pedestrian signal equipment.

### **Frontage Road / Interstate 93 SB Ramps**

The additional traffic generated by the proposed Dascomb Road Project is anticipated to degrade the overall intersection level of service at the Frontage Road / I-93 SB Ramps unsignalized intersection. To mitigate this issue, the Applicant has committed to the following intersection improvements:

- Install a fully-actuated traffic signal with coordination to/from the traffic signal located at the Dascomb Road / Frontage Road intersection. Provide demand-based vehicular and bicycle detection as part of the new traffic signal, as well as providing accommodations for emergency-vehicle pre-emption;
- Re-stripe the I-93 Southbound Ramps westbound approach to include two (2) exclusive left-turn lanes and a channelized right-turn lane.

### **Traffic Calming along Dascomb Road**

As part of the Project, the Applicant will also investigate opportunities to install traffic calming measures along Dascomb Road, between the I-93 NB ramps and Lovejoy Road. The Applicant will consult with the Town of Andover on the scope and location of these measures, if applicable.

### **Transportation Demand Management Measures**

The Applicant has commitment to research and provide a dynamic Transportation Demand Management (TDM) program in order to reduce single-occupancy vehicle (SOV) trips to/from the site. The compilation of TDM measures have not been identified to-date; but will be further evaluated by the Applicant during the state's MEPA review.

## **SUMMARY AND CONCLUSIONS**

TEC has examined the potential traffic impacts associated with the proposed Dascomb Road Project, located at #146 Dascomb Road in Andover, Massachusetts on the study area roadways and intersections. The following is a summary of the results and conclusions of this effort:

- The existing site currently consists of ±188,960 SF of mixed office and industrial uses with associated parking. The existing office and industrial space on-site is currently underutilized; servicing on and off-again occupancy for temporary tenants. A ±90,000 SF Restaurant Depot facility, who partially shared driveways connections with the site, operates on the property located adjacent to and south of the site at #148 Dascomb Road.
- The Dascomb Road Project consists of razing the existing ±188,960 SF of underutilized office and industrial space and constructing a 600,000 SF mixed-use development; comprised of 225 senior/age-restricted (55 and over) residential units; a 100-room hotel; 150,000 SF of office space; 50,000 SF of general retail space; a 15,000 SF fitness center; a 35,000 SF neighborhood market; a 5,000 SF recreational center; and 20,000 SF of restaurant space. The adjacent Restaurant Depot facility will remain in addition to the mixed-use development.
- As the development is anticipated to generate more than 3,000 new vehicle trips per day, the project is subject to Environmental Impact Report (EIR) review by the Massachusetts Environmental Policy Act (MEPA) office. In addition, as the project provides direct frontage to State Highway Layout (SHLO) and the interstate highway system, the project is subject to a Permit to Access State Highway, direct review by the Massachusetts Department of Transportation (MassDOT), and review by the Federal Highway Administration (FHWA);
- The Dascomb Road Project site is currently accessed via five (5) site driveways along the easterly side of Smith Drive, south of Dascomb Road. The project proposes to modify the access/egress to the property, providing two full-access/egress driveways along the easterly side of Smith Drive with separated access/egress to the site's underground parking facility. The full-access/egress driveway for the Restaurant Depot facility along Smith Drive will be retained. Additionally, a full-access / full-egress driveway will be provided immediately opposite Frontage Road at the signalized intersection on Dascomb Road.
- TEC conducted a RSA, in coordination with MassDOT, at two high crash designated intersections within the study area; including the intersections of Dascomb Road / Frontage Road and Dascomb Road / I-93 NB Ramps. Various improvements as identified in the RSA will be incorporated into the off-site mitigation to be implemented by the Applicant;
- The proposed development is anticipated to generate approximately 5,296 new vehicle trips (2,648 entering and 2,648 exiting) during the average weekday, with approximately 357 new vehicle trips (288 entering and 69 exiting) during the weekday morning peak hour and 500 new vehicle trips (190 entering and

310 exiting) during the weekday evening peak hour. Approximately 5,030 new vehicle trips (2,515 entering and 2,515 exiting) are anticipated during the average Saturday, with approximately 455 new vehicle trips (263 entering and 192 exiting) during the Saturday midday peak hour;

- Improvements are recommended and proposed at the intersection of Dascomb Road / East Street / Shawsheen Street. With these improvements, the intersection is anticipated to operate at acceptable levels of service (LOS B) under 2027 Build with Mitigation conditions. All movements at the intersection are anticipated to operate at acceptable levels of service (LOS D or better) during all peak hour analysis scenarios;
- Although the southbound left-turn movement at the intersection of Dascomb Road / HP Driveway is anticipated to operate primarily under LOS F during the weekday morning and evening peak periods, the 95th percentile queue is not expected to exceed two (2) vehicles. Volume-to-capacity (V/C) ratios at the intersection are well below 1.00 which indicates that the intersection can accommodate the additional demand along Dascomb Road;
- Improvements are recommended and proposed at the intersection of Dascomb Road / Smith Drive. With these improvements, this intersection is anticipated to operate at an acceptable level of service (LOS B or better) under 2027 Build with Mitigation conditions. All movements at the intersection are anticipated to operate at acceptable levels of service (LOS D or better) during all peak hour analysis scenarios with exception to the Smith Drive side-street approach during the weekday evening peak hour which will operate at LOS E;
- Improvements are recommended and proposed at the intersection of Dascomb Road / Frontage Road. With these improvements added, including installation of a fourth intersection leg, all movements at the intersection are anticipated to operate at acceptable levels of service (LOS D or better) during all peak hour analysis scenarios;
- Improvements are recommended and proposed at the intersection of Dascomb Road / I-93 NB Ramps. With these improvements, this intersection is anticipated to operate at acceptable levels of service (LOS B or better) under 2027 Build with Mitigation conditions. All movements at the intersection are anticipated to operate at acceptable levels of service (LOS D or better) during all peak hour analysis scenarios. Queues along the I-93 NB Ramp approach are expected to significantly decrease as the signal provides gaps in the mainline green time;
- Improvements are recommended and proposed at the intersection of Frontage Road / I-93 SB Ramps. With these improvements, this intersection is anticipated to operate at acceptable levels of service (LOS C or better) under 2027 Build with Mitigation conditions. All movements at the intersection are anticipated to operate at acceptable levels of service (LOS D or better) during all peak hour analysis scenarios. Queues along the I-93 SB Ramp approach are expected to significantly decrease as the signal provides gaps in the mainline green time; and

- The Applicant has proposed a robust off-site transportation mitigation program along Dascomb Road, Frontage Road, and Smith Drive to improve vehicular, bicycle, and pedestrian operations and safety. The primary improvements include the installation of three new traffic signals within the study area to provide a coordinate network of signals; improving driver progression in the vicinity of the I-93 Interchange 42. In addition, the Applicant seeks to significantly improve accommodations for bicycles and pedestrians along Dascomb Road to service not only the Dascomb Road Project; but other existing developments along the corridor. Finally, the Applicant has proposed improvements along the Dascomb Road corridor have been designed to carry additional reserve capacity for potential future expansion of projects along the immediate Dascomb Road and Frontage Road area; including the Hewlett-Packard Campus Expansion Project.

In conclusion, with implementation of the proposed improvements, the anticipated traffic generated by the proposed redevelopment can be safely and efficiently accommodated within the study area corridors and intersections. The Applicant has committed to work hand-and-hand with the Town of Andover and MassDOT to implement the robust transportation mitigation program.



**Attachment A**

Turning Movement Counts (TMCs)



S: Shawsheen Street  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 A  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Cars - Heavy Vehicles

Start Time	Dascomb Road From East			Shawsheen Street From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
07:00 AM	86	108	0	92	8	0	12	92	0	398
07:15 AM	90	113	0	112	12	0	10	111	0	448
07:30 AM	98	134	0	138	10	0	17	143	0	540
07:45 AM	126	132	0	118	10	0	18	129	0	533
Total	400	487	0	460	40	0	57	475	0	1919
08:00 AM	110	105	0	103	15	0	8	121	0	462
08:15 AM	132	94	0	100	13	0	11	125	0	475
08:30 AM	127	89	0	97	13	0	6	92	0	424
08:45 AM	90	81	0	72	9	0	10	69	0	331
Total	459	369	0	372	50	0	35	407	0	1692
Grand Total	859	856	0	832	90	0	92	882	0	3611
Apprch %	50.1	49.9	0	90.2	9.8	0	9.4	90.6	0	
Total %	23.8	23.7	0	23	2.5	0	2.5	24.4	0	
Cars	789	821	0	796	81	0	84	818	0	3389
% Cars	91.9	95.9	0	95.7	90	0	91.3	92.7	0	93.9
Heavy Vehicles	70	35	0	36	9	0	8	64	0	222
% Heavy Vehicles	8.1	4.1	0	4.3	10	0	8.7	7.3	0	6.1

Start Time	Dascomb Road From East				Shawsheen Street From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	98	134	0	232	138	10	0	148	17	143	0	160	540
07:45 AM	126	132	0	258	118	10	0	128	18	129	0	147	533
08:00 AM	110	105	0	215	103	15	0	118	8	121	0	129	462
08:15 AM	132	94	0	226	100	13	0	113	11	125	0	136	475
Total Volume	466	465	0	931	459	48	0	507	54	518	0	572	2010
% App. Total	50.1	49.9	0		90.5	9.5	0		9.4	90.6	0		
PHF	.883	.868	.000	.902	.832	.800	.000	.856	.750	.906	.000	.894	.931
Cars	429	449	0	878	443	45	0	488	49	480	0	529	1895
% Cars	92.1	96.6	0	94.3	96.5	93.8	0	96.3	90.7	92.7	0	92.5	94.3
Heavy Vehicles	37	16	0	53	16	3	0	19	5	38	0	43	115
% Heavy Vehicles	7.9	3.4	0	5.7	3.5	6.3	0	3.7	9.3	7.3	0	7.5	5.7

S: Shawsheen Street  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 A  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

**Groups Printed- Cars**

Start Time	Dascomb Road From East			Shawsheen Street From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
07:00 AM	80	101	0	88	6	0	12	84	0	371
07:15 AM	82	109	0	105	12	0	10	104	0	422
07:30 AM	90	126	0	131	9	0	15	129	0	500
07:45 AM	118	128	0	115	10	0	17	119	0	507
<b>Total</b>	<b>370</b>	<b>464</b>	<b>0</b>	<b>439</b>	<b>37</b>	<b>0</b>	<b>54</b>	<b>436</b>	<b>0</b>	<b>1800</b>
08:00 AM	102	104	0	100	14	0	6	111	0	437
08:15 AM	119	91	0	97	12	0	11	121	0	451
08:30 AM	118	84	0	93	11	0	4	87	0	397
08:45 AM	80	78	0	67	7	0	9	63	0	304
<b>Total</b>	<b>419</b>	<b>357</b>	<b>0</b>	<b>357</b>	<b>44</b>	<b>0</b>	<b>30</b>	<b>382</b>	<b>0</b>	<b>1589</b>
<b>Grand Total</b>	<b>789</b>	<b>821</b>	<b>0</b>	<b>796</b>	<b>81</b>	<b>0</b>	<b>84</b>	<b>818</b>	<b>0</b>	<b>3389</b>
Apprch %	49	51	0	90.8	9.2	0	9.3	90.7	0	
Total %	23.3	24.2	0	23.5	2.4	0	2.5	24.1	0	

Start Time	Dascomb Road From East				Shawsheen Street From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	90	126	0	216	131	9	0	140	15	129	0	144	500
07:45 AM	118	128	0	246	115	10	0	125	17	119	0	136	507
08:00 AM	102	104	0	206	100	14	0	114	6	111	0	117	437
08:15 AM	119	91	0	210	97	12	0	109	11	121	0	132	451
<b>Total Volume</b>	<b>429</b>	<b>449</b>	<b>0</b>	<b>878</b>	<b>443</b>	<b>45</b>	<b>0</b>	<b>488</b>	<b>49</b>	<b>480</b>	<b>0</b>	<b>529</b>	<b>1895</b>
<b>% App. Total</b>	<b>48.9</b>	<b>51.1</b>	<b>0</b>		<b>90.8</b>	<b>9.2</b>	<b>0</b>		<b>9.3</b>	<b>90.7</b>	<b>0</b>		
PHF	.901	.877	.000	.892	.845	.804	.000	.871	.721	.930	.000	.918	.934

S: Shawsheen Street  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 A  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Heavy Vehicles

Start Time	Dascomb Road From East			Shawsheen Street From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
07:00 AM	6	7	0	4	2	0	0	8	0	27
07:15 AM	8	4	0	7	0	0	0	7	0	26
07:30 AM	8	8	0	7	1	0	2	14	0	40
07:45 AM	8	4	0	3	0	0	1	10	0	26
Total	30	23	0	21	3	0	3	39	0	119
08:00 AM	8	1	0	3	1	0	2	10	0	25
08:15 AM	13	3	0	3	1	0	0	4	0	24
08:30 AM	9	5	0	4	2	0	2	5	0	27
08:45 AM	10	3	0	5	2	0	1	6	0	27
Total	40	12	0	15	6	0	5	25	0	103
Grand Total	70	35	0	36	9	0	8	64	0	222
Apprch %	66.7	33.3	0	80	20	0	11.1	88.9	0	
Total %	31.5	15.8	0	16.2	4.1	0	3.6	28.8	0	

Start Time	Dascomb Road From East				Shawsheen Street From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
07:00 AM	6	7	0	13	4	2	0	6	0	8	0	8	27
07:15 AM	8	4	0	12	7	0	0	7	0	7	0	7	26
07:30 AM	8	8	0	16	7	1	0	8	2	14	0	16	40
07:45 AM	8	4	0	12	3	0	0	3	1	10	0	11	26
Total Volume	30	23	0	53	21	3	0	24	3	39	0	42	119
% App. Total	56.6	43.4	0		87.5	12.5	0		7.1	92.9	0		
PHF	.938	.719	.000	.828	.750	.375	.000	.750	.375	.696	.000	.656	.744

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

S: Shawsheen Street  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 A  
 Site Code : TBA  
 Start Date : 10/6/2016  
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Groups Printed- Peds and Bikes

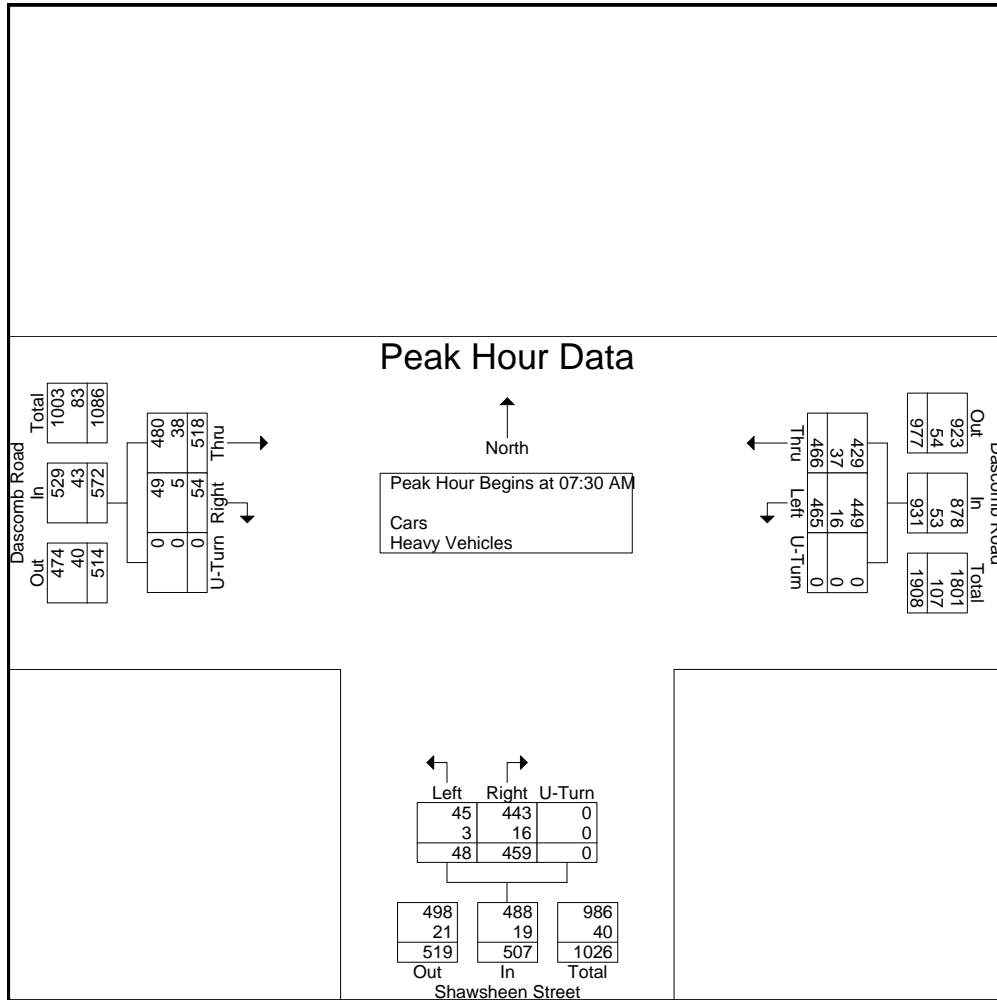
Start Time	Dascomb Road From East				Shawsheen Street From South				Dascomb Road From West				Int. Total
	Thru	Left	Peds SB	Peds NB	Right	Left	Peds WB	Peds EB	Right	Thru	Peds NB	Peds SB	
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0	0	0	0	0	0	0	0	0	
Total %													

Start Time	Dascomb Road From East					Shawsheen Street From South					Dascomb Road From West					Int. Total
	Thru	Left	Peds SB	Peds NB	App. Total	Right	Left	Peds WB	Peds EB	App. Total	Right	Thru	Peds NB	Peds SB	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																
Peak Hour for Entire Intersection Begins at 07:00 AM																
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

S: Shawsheen Street  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 A  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Start Time	Dascomb Road From East				Shawsheen Street From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	98	134	0	232	138	10	0	148	17	143	0	160	540
07:45 AM	126	132	0	258	118	10	0	128	18	129	0	147	533
08:00 AM	110	105	0	215	103	15	0	118	8	121	0	129	462
08:15 AM	132	94	0	226	100	13	0	113	11	125	0	136	475
Total Volume	466	465	0	931	459	48	0	507	54	518	0	572	2010
% App. Total	50.1	49.9	0		90.5	9.5	0		9.4	90.6	0		
PHF	.883	.868	.000	.902	.832	.800	.000	.856	.750	.906	.000	.894	.931
Cars	429	449	0	878	443	45	0	488	49	480	0	529	1895
% Cars	92.1	96.6	0	94.3	96.5	93.8	0	96.3	90.7	92.7	0	92.5	94.3
Heavy Vehicles	37	16	0	53	16	3	0	19	5	38	0	43	115
% Heavy Vehicles	7.9	3.4	0	5.7	3.5	6.3	0	3.7	9.3	7.3	0	7.5	5.7





S: Shawsheen Street  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 AA  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Cars - Heavy Vehicles

Start Time	Dascomb Road From East			Shawsheen Street From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
04:00 PM	143	94	0	118	18	0	15	130	0	518
04:15 PM	149	119	0	116	13	0	6	120	0	523
04:30 PM	160	122	0	129	17	0	11	148	0	587
04:45 PM	168	129	0	119	25	0	13	105	0	559
Total	620	464	0	482	73	0	45	503	0	2187
05:00 PM	145	101	0	138	13	0	6	146	0	549
05:15 PM	183	102	0	109	13	0	9	119	0	535
05:30 PM	177	120	0	138	27	0	1	135	0	598
05:45 PM	152	113	0	137	16	0	14	121	0	553
Total	657	436	0	522	69	0	30	521	0	2235
Grand Total	1277	900	0	1004	142	0	75	1024	0	4422
Apprch %	58.7	41.3	0	87.6	12.4	0	6.8	93.2	0	
Total %	28.9	20.4	0	22.7	3.2	0	1.7	23.2	0	
Cars	1251	881	0	990	140	0	72	996	0	4330
% Cars	98	97.9	0	98.6	98.6	0	96	97.3	0	97.9
Heavy Vehicles	26	19	0	14	2	0	3	28	0	92
% Heavy Vehicles	2	2.1	0	1.4	1.4	0	4	2.7	0	2.1

Start Time	Dascomb Road From East				Shawsheen Street From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. 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	168	129	0	297	119	25	0	144	13	105	0	118	559
05:00 PM	145	101	0	246	138	13	0	151	6	146	0	152	549
05:15 PM	183	102	0	285	109	13	0	122	9	119	0	128	535
05:30 PM	177	120	0	297	138	27	0	165	1	135	0	136	598
Total Volume	673	452	0	1125	504	78	0	582	29	505	0	534	2241
% App. Total	59.8	40.2	0		86.6	13.4	0		5.4	94.6	0		
PHF	.919	.876	.000	.947	.913	.722	.000	.882	.558	.865	.000	.878	.937
Cars	665	443	0	1108	500	77	0	577	28	498	0	526	2211
% Cars	98.8	98.0	0	98.5	99.2	98.7	0	99.1	96.6	98.6	0	98.5	98.7
Heavy Vehicles	8	9	0	17	4	1	0	5	1	7	0	8	30
% Heavy Vehicles	1.2	2.0	0	1.5	0.8	1.3	0	0.9	3.4	1.4	0	1.5	1.3

S: Shawsheen Street  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 AA  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

**Groups Printed- Cars**

Start Time	Dascomb Road From East			Shawsheen Street From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
04:00 PM	139	91	0	114	17	0	14	123	0	498
04:15 PM	144	116	0	113	13	0	5	115	0	506
04:30 PM	155	118	0	129	17	0	11	140	0	570
04:45 PM	165	125	0	119	25	0	13	104	0	551
<b>Total</b>	<b>603</b>	<b>450</b>	<b>0</b>	<b>475</b>	<b>72</b>	<b>0</b>	<b>43</b>	<b>482</b>	<b>0</b>	<b>2125</b>
05:00 PM	141	98	0	137	13	0	5	144	0	538
05:15 PM	182	100	0	108	13	0	9	116	0	528
05:30 PM	177	120	0	136	26	0	1	134	0	594
05:45 PM	148	113	0	134	16	0	14	120	0	545
<b>Total</b>	<b>648</b>	<b>431</b>	<b>0</b>	<b>515</b>	<b>68</b>	<b>0</b>	<b>29</b>	<b>514</b>	<b>0</b>	<b>2205</b>
<b>Grand Total</b>	<b>1251</b>	<b>881</b>	<b>0</b>	<b>990</b>	<b>140</b>	<b>0</b>	<b>72</b>	<b>996</b>	<b>0</b>	<b>4330</b>
Apprch %	58.7	41.3	0	87.6	12.4	0	6.7	93.3	0	
Total %	28.9	20.3	0	22.9	3.2	0	1.7	23	0	

Start Time	Dascomb Road From East				Shawsheen Street From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. 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	165	125	0	290	119	25	0	144	13	104	0	117	551
05:00 PM	141	98	0	239	137	13	0	150	5	144	0	149	538
05:15 PM	182	100	0	282	108	13	0	121	9	116	0	125	528
05:30 PM	177	120	0	297	136	26	0	162	1	134	0	135	594
<b>Total Volume</b>	<b>665</b>	<b>443</b>	<b>0</b>	<b>1108</b>	<b>500</b>	<b>77</b>	<b>0</b>	<b>577</b>	<b>28</b>	<b>498</b>	<b>0</b>	<b>526</b>	<b>2211</b>
<b>% App. Total</b>	<b>60</b>	<b>40</b>	<b>0</b>		<b>86.7</b>	<b>13.3</b>	<b>0</b>		<b>5.3</b>	<b>94.7</b>	<b>0</b>		
PHF	.913	.886	.000	.933	.912	.740	.000	.890	.538	.865	.000	.883	.931

S: Shawsheen Street  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 AA  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

**Groups Printed- Heavy Vehicles**

Start Time	Dascomb Road From East			Shawsheen Street From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
04:00 PM	4	3	0	4	1	0	1	7	0	20
04:15 PM	5	3	0	3	0	0	1	5	0	17
04:30 PM	5	4	0	0	0	0	0	8	0	17
04:45 PM	3	4	0	0	0	0	0	1	0	8
<b>Total</b>	<b>17</b>	<b>14</b>	<b>0</b>	<b>7</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>21</b>	<b>0</b>	<b>62</b>
05:00 PM	4	3	0	1	0	0	1	2	0	11
05:15 PM	1	2	0	1	0	0	0	3	0	7
05:30 PM	0	0	0	2	1	0	0	1	0	4
05:45 PM	4	0	0	3	0	0	0	1	0	8
<b>Total</b>	<b>9</b>	<b>5</b>	<b>0</b>	<b>7</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>7</b>	<b>0</b>	<b>30</b>
<b>Grand Total</b>	<b>26</b>	<b>19</b>	<b>0</b>	<b>14</b>	<b>2</b>	<b>0</b>	<b>3</b>	<b>28</b>	<b>0</b>	<b>92</b>
Apprch %	57.8	42.2	0	87.5	12.5	0	9.7	90.3	0	
Total %	28.3	20.7	0	15.2	2.2	0	3.3	30.4	0	

Start Time	Dascomb Road From East				Shawsheen Street From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. 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	4	3	0	7	4	1	0	5	1	7	0	8	20
04:15 PM	5	3	0	8	3	0	0	3	1	5	0	6	17
04:30 PM	5	4	0	9	0	0	0	0	0	8	0	8	17
04:45 PM	3	4	0	7	0	0	0	0	0	1	0	1	8
<b>Total Volume</b>	<b>17</b>	<b>14</b>	<b>0</b>	<b>31</b>	<b>7</b>	<b>1</b>	<b>0</b>	<b>8</b>	<b>2</b>	<b>21</b>	<b>0</b>	<b>23</b>	<b>62</b>
<b>% App. Total</b>	<b>54.8</b>	<b>45.2</b>	<b>0</b>		<b>87.5</b>	<b>12.5</b>	<b>0</b>		<b>8.7</b>	<b>91.3</b>	<b>0</b>		
PHF	.850	.875	.000	.861	.438	.250	.000	.400	.500	.656	.000	.719	.775

S: Shawsheen Street  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 AA  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Peds and Bikes

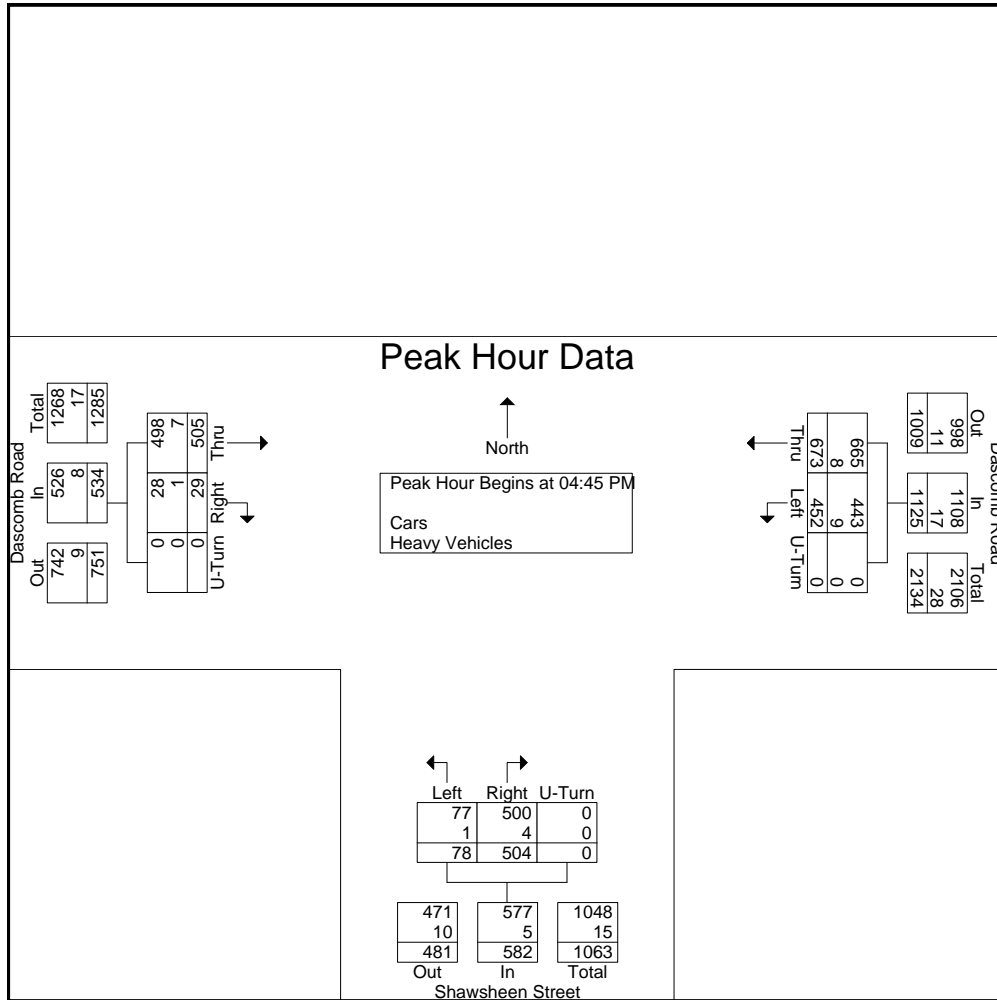
Start Time	Dascomb Road From East				Shawsheen Street From South				Dascomb Road From West				Int. Total
	Thru	Left	Peds SB	Peds NB	Right	Left	Peds WB	Peds EB	Right	Thru	Peds NB	Peds SB	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	1	0	0	0	0	0	0	0	1
Grand Total	0	0	0	0	1	0	0	0	0	0	0	0	1
Apprch %	0	0	0	0	100	0	0	0	0	0	0	0	0
Total %	0	0	0	0	100	0	0	0	0	0	0	0	0

Start Time	Dascomb Road From East					Shawsheen Street From South					Dascomb Road From West					Int. Total
	Thru	Left	Peds SB	Peds NB	App. Total	Right	Left	Peds WB	Peds EB	App. Total	Right	Thru	Peds NB	Peds SB	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																
Peak Hour for Entire Intersection Begins at 04:15 PM																
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
05:00 PM	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	
Total Volume	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	
% App. Total	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	
PHF	.000	.000	.000	.000	.000	.250	.000	.000	.000	.250	.000	.000	.000	.000	.250	

S: Shawsheen Street  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 AA  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Start Time	Dascomb Road From East				Shawsheen Street From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. 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	168	129	0	297	119	25	0	144	13	105	0	118	559
05:00 PM	145	101	0	246	138	13	0	151	6	146	0	152	549
05:15 PM	183	102	0	285	109	13	0	122	9	119	0	128	535
05:30 PM	177	120	0	297	138	27	0	165	1	135	0	136	598
Total Volume	673	452	0	1125	504	78	0	582	29	505	0	534	2241
% App. Total	59.8	40.2	0		86.6	13.4	0		5.4	94.6	0		
PHF	.919	.876	.000	.947	.913	.722	.000	.882	.558	.865	.000	.878	.937
Cars	665	443	0	1108	500	77	0	577	28	498	0	526	2211
% Cars	98.8	98.0	0	98.5	99.2	98.7	0	99.1	96.6	98.6	0	98.5	98.7
Heavy Vehicles	8	9	0	17	4	1	0	5	1	7	0	8	30
% Heavy Vehicles	1.2	2.0	0	1.5	0.8	1.3	0	0.9	3.4	1.4	0	1.5	1.3



S: Shawsheen Street  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 AAA  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Groups Printed- Cars - Heavy Vehicles

Start Time	Dascomb Road From East			Shawsheen Street From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
11:00 AM	94	87	0	106	9	0	17	121	0	434
11:15 AM	107	83	0	129	17	0	15	105	0	456
11:30 AM	83	91	0	120	19	0	7	82	0	402
11:45 AM	98	88	0	121	12	0	8	95	0	422
Total	382	349	0	476	57	0	47	403	0	1714
12:00 PM	90	90	0	97	10	0	13	100	0	400
12:15 PM	83	85	0	97	20	0	11	107	0	403
12:30 PM	97	64	0	104	13	0	16	99	0	393
12:45 PM	91	107	0	103	15	0	9	78	0	403
Total	361	346	0	401	58	0	49	384	0	1599
Grand Total	743	695	0	877	115	0	96	787	0	3313
Apprch %	51.7	48.3	0	88.4	11.6	0	10.9	89.1	0	
Total %	22.4	21	0	26.5	3.5	0	2.9	23.8	0	
Cars	716	687	0	869	111	0	96	772	0	3251
% Cars	96.4	98.8	0	99.1	96.5	0	100	98.1	0	98.1
Heavy Vehicles	27	8	0	8	4	0	0	15	0	62
% Heavy Vehicles	3.6	1.2	0	0.9	3.5	0	0	1.9	0	1.9

Start Time	Dascomb Road From East				Shawsheen Street From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	94	87	0	181	106	9	0	115	17	121	0	138	434
11:15 AM	107	83	0	190	129	17	0	146	15	105	0	120	456
11:30 AM	83	91	0	174	120	19	0	139	7	82	0	89	402
11:45 AM	98	88	0	186	121	12	0	133	8	95	0	103	422
Total Volume	382	349	0	731	476	57	0	533	47	403	0	450	1714
% App. Total	52.3	47.7	0		89.3	10.7	0		10.4	89.6	0		
PHF	.893	.959	.000	.962	.922	.750	.000	.913	.691	.833	.000	.815	.940
Cars	362	343	0	705	471	53	0	524	47	397	0	444	1673
% Cars	94.8	98.3	0	96.4	98.9	93.0	0	98.3	100	98.5	0	98.7	97.6
Heavy Vehicles	20	6	0	26	5	4	0	9	0	6	0	6	41
% Heavy Vehicles	5.2	1.7	0	3.6	1.1	7.0	0	1.7	0	1.5	0	1.3	2.4

S: Shawsheen Street  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 AAA  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

**Groups Printed- Cars**

Start Time	Dascomb Road From East			Shawsheen Street From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
11:00 AM	88	85	0	104	9	0	17	119	0	422
11:15 AM	102	81	0	128	17	0	15	105	0	448
11:30 AM	78	89	0	118	17	0	7	80	0	389
11:45 AM	94	88	0	121	10	0	8	93	0	414
<b>Total</b>	<b>362</b>	<b>343</b>	<b>0</b>	<b>471</b>	<b>53</b>	<b>0</b>	<b>47</b>	<b>397</b>	<b>0</b>	<b>1673</b>
12:00 PM	86	88	0	95	10	0	13	96	0	388
12:15 PM	82	85	0	97	20	0	11	103	0	398
12:30 PM	96	64	0	103	13	0	16	98	0	390
12:45 PM	90	107	0	103	15	0	9	78	0	402
<b>Total</b>	<b>354</b>	<b>344</b>	<b>0</b>	<b>398</b>	<b>58</b>	<b>0</b>	<b>49</b>	<b>375</b>	<b>0</b>	<b>1578</b>
<b>Grand Total</b>	<b>716</b>	<b>687</b>	<b>0</b>	<b>869</b>	<b>111</b>	<b>0</b>	<b>96</b>	<b>772</b>	<b>0</b>	<b>3251</b>
Apprch %	51	49	0	88.7	11.3	0	11.1	88.9	0	
Total %	22	21.1	0	26.7	3.4	0	3	23.7	0	

Start Time	Dascomb Road From East				Shawsheen Street From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	88	85	0	173	104	9	0	113	17	119	0	136	422
11:15 AM	102	81	0	183	128	17	0	145	15	105	0	120	448
11:30 AM	78	89	0	167	118	17	0	135	7	80	0	87	389
11:45 AM	94	88	0	182	121	10	0	131	8	93	0	101	414
<b>Total Volume</b>	<b>362</b>	<b>343</b>	<b>0</b>	<b>705</b>	<b>471</b>	<b>53</b>	<b>0</b>	<b>524</b>	<b>47</b>	<b>397</b>	<b>0</b>	<b>444</b>	<b>1673</b>
<b>% App. Total</b>	<b>51.3</b>	<b>48.7</b>	<b>0</b>		<b>89.9</b>	<b>10.1</b>	<b>0</b>		<b>10.6</b>	<b>89.4</b>	<b>0</b>		
PHF	.887	.963	.000	.963	.920	.779	.000	.903	.691	.834	.000	.816	.934



S: Shawsheen Street  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 AAA  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Groups Printed- Heavy Vehicles

Start Time	Dascomb Road From East			Shawsheen Street From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
11:00 AM	6	2	0	2	0	0	0	2	0	12
11:15 AM	5	2	0	1	0	0	0	0	0	8
11:30 AM	5	2	0	2	2	0	0	2	0	13
11:45 AM	4	0	0	0	2	0	0	2	0	8
Total	20	6	0	5	4	0	0	6	0	41
12:00 PM	4	2	0	2	0	0	0	4	0	12
12:15 PM	1	0	0	0	0	0	0	4	0	5
12:30 PM	1	0	0	1	0	0	0	1	0	3
12:45 PM	1	0	0	0	0	0	0	0	0	1
Total	7	2	0	3	0	0	0	9	0	21
Grand Total	27	8	0	8	4	0	0	15	0	62
Apprch %	77.1	22.9	0	66.7	33.3	0	0	100	0	
Total %	43.5	12.9	0	12.9	6.5	0	0	24.2	0	

Start Time	Dascomb Road From East				Shawsheen Street From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	6	2	0	8	2	0	0	2	0	2	0	2	12
11:15 AM	5	2	0	7	1	0	0	1	0	0	0	0	8
11:30 AM	5	2	0	7	2	2	0	4	0	2	0	2	13
11:45 AM	4	0	0	4	0	2	0	2	0	2	0	2	8
Total Volume	20	6	0	26	5	4	0	9	0	6	0	6	41
% App. Total	76.9	23.1	0		55.6	44.4	0		0	100	0		
PHF	.833	.750	.000	.813	.625	.500	.000	.563	.000	.750	.000	.750	.788

S: Shawsheen Street  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 AAA  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Groups Printed- Peds and Bikes

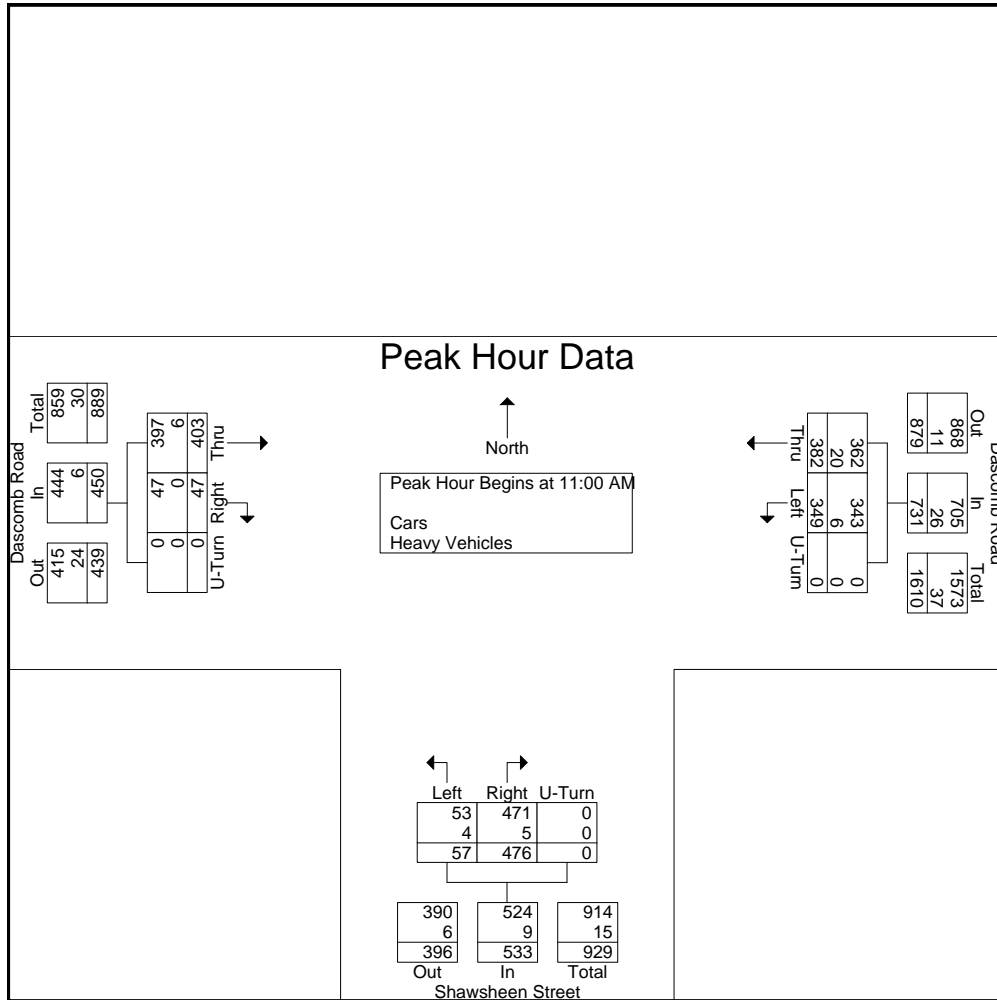
Start Time	Dascomb Road From East				Shawsheen Street From South				Dascomb Road From West				Int. Total
	Thru	Left	Peds SB	Peds NB	Right	Left	Peds WB	Peds EB	Right	Thru	Peds NB	Peds SB	
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	1	0	0	0	0	0	0	0	1
Grand Total	0	0	0	0	1	0	0	0	0	0	0	0	1
Apprch %	0	0	0	0	100	0	0	0	0	0	0	0	0
Total %	0	0	0	0	100	0	0	0	0	0	0	0	0

Start Time	Dascomb Road From East					Shawsheen Street From South					Dascomb Road From West					Int. Total
	Thru	Left	Peds SB	Peds NB	App. Total	Right	Left	Peds WB	Peds EB	App. Total	Right	Thru	Peds NB	Peds SB	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1																
Peak Hour for Entire Intersection Begins at 11:15 AM																
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12:00 PM	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	
Total Volume	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	
% App. Total	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	
PHF	.000	.000	.000	.000	.000	.250	.000	.000	.000	.250	.000	.000	.000	.000	.250	

S: Shawsheen Street  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 AAA  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Start Time	Dascomb Road From East				Shawsheen Street From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	94	87	0	181	106	9	0	115	17	121	0	138	434
11:15 AM	107	83	0	190	129	17	0	146	15	105	0	120	456
11:30 AM	83	91	0	174	120	19	0	139	7	82	0	89	402
11:45 AM	98	88	0	186	121	12	0	133	8	95	0	103	422
Total Volume	382	349	0	731	476	57	0	533	47	403	0	450	1714
% App. Total	52.3	47.7	0		89.3	10.7	0		10.4	89.6	0		
PHF	.893	.959	.000	.962	.922	.750	.000	.913	.691	.833	.000	.815	.940
Cars	362	343	0	705	471	53	0	524	47	397	0	444	1673
% Cars	94.8	98.3	0	96.4	98.9	93.0	0	98.3	100	98.5	0	98.7	97.6
Heavy Vehicles	20	6	0	26	5	4	0	9	0	6	0	6	41
% Heavy Vehicles	5.2	1.7	0	3.6	1.1	7.0	0	1.7	0	1.5	0	1.3	2.4



N: HP Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 B  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Cars - Heavy Vehicles

Start Time	HP Driveway From North			Dascomb Road From East			Dascomb Road From West			Int. Total
	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
07:00 AM	1	3	0	8	186	0	177	6	0	381
07:15 AM	1	2	0	2	208	0	218	6	0	437
07:30 AM	0	0	0	3	229	0	282	3	0	517
07:45 AM	1	1	0	5	256	0	252	3	0	518
Total	3	6	0	18	879	0	929	18	0	1853
08:00 AM	1	0	0	3	216	0	212	6	0	438
08:15 AM	0	1	0	2	228	0	228	2	0	461
08:30 AM	1	0	0	9	214	0	181	5	0	410
08:45 AM	0	0	0	6	176	0	140	3	0	325
Total	2	1	0	20	834	0	761	16	0	1634
Grand Total	5	7	0	38	1713	0	1690	34	0	3487
Apprch %	41.7	58.3	0	2.2	97.8	0	98	2	0	
Total %	0.1	0.2	0	1.1	49.1	0	48.5	1	0	
Cars	5	6	0	37	1608	0	1598	34	0	3288
% Cars	100	85.7	0	97.4	93.9	0	94.6	100	0	94.3
Heavy Vehicles	0	1	0	1	105	0	92	0	0	199
% Heavy Vehicles	0	14.3	0	2.6	6.1	0	5.4	0	0	5.7

Start Time	HP Driveway From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	0	0	0	0	3	229	0	232	282	3	0	285	517
07:45 AM	1	1	0	2	5	256	0	261	252	3	0	255	518
08:00 AM	1	0	0	1	3	216	0	219	212	6	0	218	438
08:15 AM	0	1	0	1	2	228	0	230	228	2	0	230	461
Total Volume	2	2	0	4	13	929	0	942	974	14	0	988	1934
% App. Total	50	50	0		1.4	98.6	0		98.6	1.4	0		
PHF	.500	.500	.000	.500	.650	.907	.000	.902	.863	.583	.000	.867	.933
Cars	2	1	0	3	13	877	0	890	930	14	0	944	1837
% Cars	100	50.0	0	75.0	100	94.4	0	94.5	95.5	100	0	95.5	95.0
Heavy Vehicles	0	1	0	1	0	52	0	52	44	0	0	44	97
% Heavy Vehicles	0	50.0	0	25.0	0	5.6	0	5.5	4.5	0	0	4.5	5.0

N: HP Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 B  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

**Groups Printed- Cars**

Start Time	HP Driveway From North			Dascomb Road From East			Dascomb Road From West			Int. Total
	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
07:00 AM	1	3	0	8	172	0	165	6	0	355
07:15 AM	1	2	0	1	196	0	203	6	0	409
07:30 AM	0	0	0	3	214	0	267	3	0	487
07:45 AM	1	0	0	5	245	0	240	3	0	494
<b>Total</b>	<b>3</b>	<b>5</b>	<b>0</b>	<b>17</b>	<b>827</b>	<b>0</b>	<b>875</b>	<b>18</b>	<b>0</b>	<b>1745</b>
08:00 AM	1	0	0	3	208	0	201	6	0	419
08:15 AM	0	1	0	2	210	0	222	2	0	437
08:30 AM	1	0	0	9	199	0	170	5	0	384
08:45 AM	0	0	0	6	164	0	130	3	0	303
<b>Total</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>20</b>	<b>781</b>	<b>0</b>	<b>723</b>	<b>16</b>	<b>0</b>	<b>1543</b>
<b>Grand Total</b>	<b>5</b>	<b>6</b>	<b>0</b>	<b>37</b>	<b>1608</b>	<b>0</b>	<b>1598</b>	<b>34</b>	<b>0</b>	<b>3288</b>
Apprch %	45.5	54.5	0	2.2	97.8	0	97.9	2.1	0	
Total %	0.2	0.2	0	1.1	48.9	0	48.6	1	0	

Start Time	HP Driveway From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	0	0	0	0	3	214	0	217	267	3	0	270	487
07:45 AM	1	0	0	1	5	245	0	250	240	3	0	243	494
08:00 AM	1	0	0	1	3	208	0	211	201	6	0	207	419
08:15 AM	0	1	0	1	2	210	0	212	222	2	0	224	437
<b>Total Volume</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>	<b>13</b>	<b>877</b>	<b>0</b>	<b>890</b>	<b>930</b>	<b>14</b>	<b>0</b>	<b>944</b>	<b>1837</b>
<b>% App. Total</b>	<b>66.7</b>	<b>33.3</b>	<b>0</b>		<b>1.5</b>	<b>98.5</b>	<b>0</b>		<b>98.5</b>	<b>1.5</b>	<b>0</b>		
PHF	.500	.250	.000	.750	.650	.895	.000	.890	.871	.583	.000	.874	.930

N: HP Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 B  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Heavy Vehicles

Start Time	HP Driveway From North			Dascomb Road From East			Dascomb Road From West			Int. Total
	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
07:00 AM	0	0	0	0	14	0	12	0	0	26
07:15 AM	0	0	0	1	12	0	15	0	0	28
07:30 AM	0	0	0	0	15	0	15	0	0	30
07:45 AM	0	1	0	0	11	0	12	0	0	24
Total	0	1	0	1	52	0	54	0	0	108
08:00 AM	0	0	0	0	8	0	11	0	0	19
08:15 AM	0	0	0	0	18	0	6	0	0	24
08:30 AM	0	0	0	0	15	0	11	0	0	26
08:45 AM	0	0	0	0	12	0	10	0	0	22
Total	0	0	0	0	53	0	38	0	0	91
Grand Total	0	1	0	1	105	0	92	0	0	199
Apprch %	0	100	0	0.9	99.1	0	100	0	0	
Total %	0	0.5	0	0.5	52.8	0	46.2	0	0	

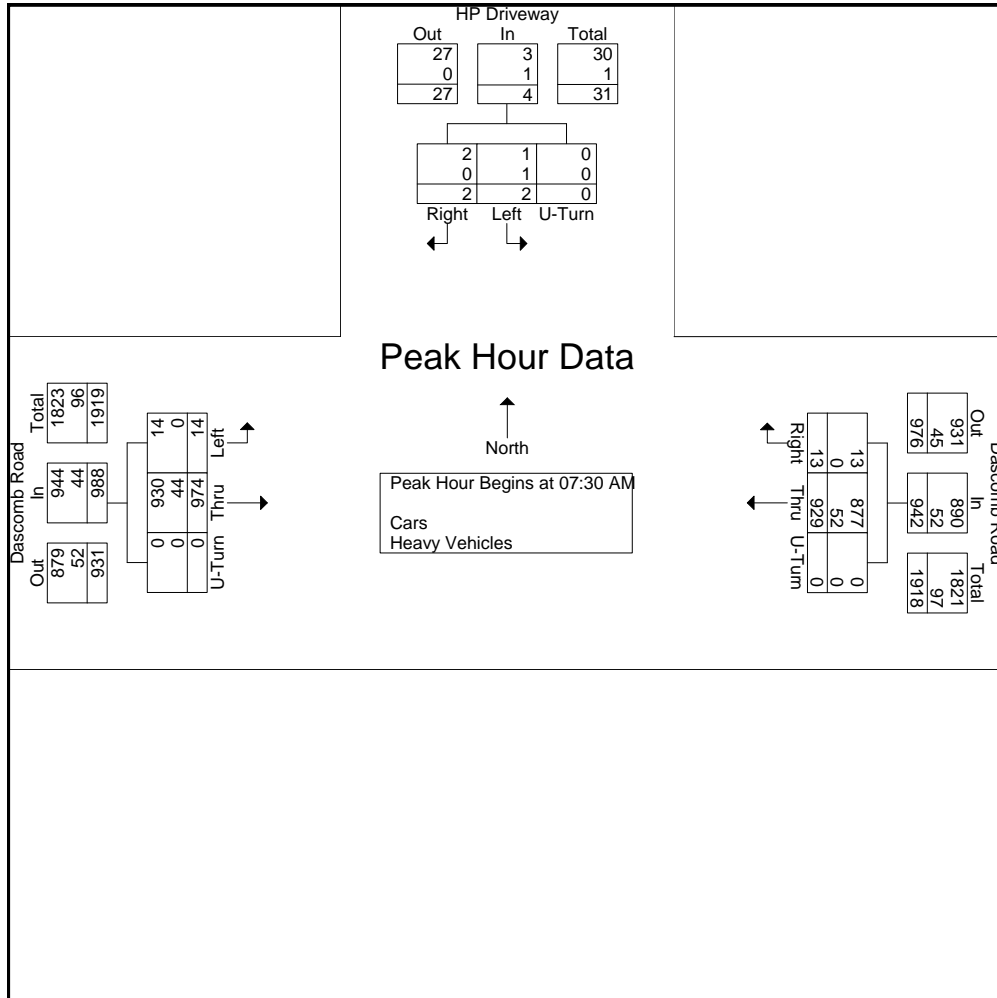
Start Time	HP Driveway From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:00 AM													
07:00 AM	0	0	0	0	0	14	0	14	12	0	0	12	26
07:15 AM	0	0	0	0	1	12	0	13	15	0	0	15	28
07:30 AM	0	0	0	0	0	15	0	15	15	0	0	15	30
07:45 AM	0	1	0	1	0	11	0	11	12	0	0	12	24
Total Volume	0	1	0	1	1	52	0	53	54	0	0	54	108
% App. Total	0	100	0		1.9	98.1	0		100	0	0		
PHF	.000	.250	.000	.250	.250	.867	.000	.883	.900	.000	.000	.900	.900



N: HP Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 B  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Start Time	HP Driveway From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	0	0	0	0	3	229	0	232	282	3	0	285	517
07:45 AM	1	1	0	2	5	256	0	261	252	3	0	255	518
08:00 AM	1	0	0	1	3	216	0	219	212	6	0	218	438
08:15 AM	0	1	0	1	2	228	0	230	228	2	0	230	461
Total Volume	2	2	0	4	13	929	0	942	974	14	0	988	1934
% App. Total	50	50	0		1.4	98.6	0		98.6	1.4	0		
PHF	.500	.500	.000	.500	.650	.907	.000	.902	.863	.583	.000	.867	.933
Cars	2	1	0	3	13	877	0	890	930	14	0	944	1837
% Cars	100	50.0	0	75.0	100	94.4	0	94.5	95.5	100	0	95.5	95.0
Heavy Vehicles	0	1	0	1	0	52	0	52	44	0	0	44	97
% Heavy Vehicles	0	50.0	0	25.0	0	5.6	0	5.5	4.5	0	0	4.5	5.0





N: HP Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 BB  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Cars - Heavy Vehicles

Start Time	HP Driveway From North			Dascomb Road From East			Dascomb Road From West			Int. Total
	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
04:00 PM	8	0	0	2	247	0	246	1	0	504
04:15 PM	11	0	0	2	258	0	241	1	0	513
04:30 PM	10	1	0	3	277	0	278	1	0	570
04:45 PM	6	0	0	2	292	0	223	0	0	523
Total	35	1	0	9	1074	0	988	3	0	2110
05:00 PM	7	2	0	0	250	0	287	2	0	548
05:15 PM	7	0	0	1	273	0	232	1	0	514
05:30 PM	7	0	0	3	303	0	274	3	0	590
05:45 PM	7	1	0	0	259	0	258	0	0	525
Total	28	3	0	4	1085	0	1051	6	0	2177
Grand Total	63	4	0	13	2159	0	2039	9	0	4287
Apprch %	94	6	0	0.6	99.4	0	99.6	0.4	0	
Total %	1.5	0.1	0	0.3	50.4	0	47.6	0.2	0	
Cars	61	0	0	8	2110	0	2000	9	0	4188
% Cars	96.8	0	0	61.5	97.7	0	98.1	100	0	97.7
Heavy Vehicles	2	4	0	5	49	0	39	0	0	99
% Heavy Vehicles	3.2	100	0	38.5	2.3	0	1.9	0	0	2.3

Start Time	HP Driveway From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	7	2	0	9	0	250	0	250	287	2	0	289	548
05:15 PM	7	0	0	7	1	273	0	274	232	1	0	233	514
05:30 PM	7	0	0	7	3	303	0	306	274	3	0	277	590
05:45 PM	7	1	0	8	0	259	0	259	258	0	0	258	525
Total Volume	28	3	0	31	4	1085	0	1089	1051	6	0	1057	2177
% App. Total	90.3	9.7	0		0.4	99.6	0		99.4	0.6	0		
PHF	1.00	.375	.000	.861	.333	.895	.000	.890	.916	.500	.000	.914	.922
Cars	27	0	0	27	2	1066	0	1068	1036	6	0	1042	2137
% Cars	96.4	0	0	87.1	50.0	98.2	0	98.1	98.6	100	0	98.6	98.2
Heavy Vehicles	1	3	0	4	2	19	0	21	15	0	0	15	40
% Heavy Vehicles	3.6	100	0	12.9	50.0	1.8	0	1.9	1.4	0	0	1.4	1.8

N: HP Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 BB  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Cars

Start Time	HP Driveway From North			Dascomb Road From East			Dascomb Road From West			Int. Total
	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
04:00 PM	8	0	0	0	239	0	237	1	0	485
04:15 PM	11	0	0	2	251	0	233	1	0	498
04:30 PM	9	0	0	2	268	0	273	1	0	553
04:45 PM	6	0	0	2	286	0	221	0	0	515
Total	34	0	0	6	1044	0	964	3	0	2051
05:00 PM	7	0	0	0	242	0	285	2	0	536
05:15 PM	7	0	0	0	267	0	228	1	0	503
05:30 PM	7	0	0	2	302	0	270	3	0	584
05:45 PM	6	0	0	0	255	0	253	0	0	514
Total	27	0	0	2	1066	0	1036	6	0	2137
Grand Total	61	0	0	8	2110	0	2000	9	0	4188
Apprch %	100	0	0	0.4	99.6	0	99.6	0.4	0	
Total %	1.5	0	0	0.2	50.4	0	47.8	0.2	0	

Start Time	HP Driveway From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. 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	6	0	0	6	2	286	0	288	221	0	0	221	515
05:00 PM	7	0	0	7	0	242	0	242	285	2	0	287	536
05:15 PM	7	0	0	7	0	267	0	267	228	1	0	229	503
05:30 PM	7	0	0	7	2	302	0	304	270	3	0	273	584
Total Volume	27	0	0	27	4	1097	0	1101	1004	6	0	1010	2138
% App. Total	100	0	0		0.4	99.6	0		99.4	0.6	0		
PHF	.964	.000	.000	.964	.500	.908	.000	.905	.881	.500	.000	.880	.915

N: HP Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 BB  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Heavy Vehicles

Start Time	HP Driveway From North			Dascomb Road From East			Dascomb Road From West			Int. Total
	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
04:00 PM	0	0	0	2	8	0	9	0	0	19
04:15 PM	0	0	0	0	7	0	8	0	0	15
04:30 PM	1	1	0	1	9	0	5	0	0	17
04:45 PM	0	0	0	0	6	0	2	0	0	8
Total	1	1	0	3	30	0	24	0	0	59
05:00 PM	0	2	0	0	8	0	2	0	0	12
05:15 PM	0	0	0	1	6	0	4	0	0	11
05:30 PM	0	0	0	1	1	0	4	0	0	6
05:45 PM	1	1	0	0	4	0	5	0	0	11
Total	1	3	0	2	19	0	15	0	0	40
Grand Total	2	4	0	5	49	0	39	0	0	99
Apprch %	33.3	66.7	0	9.3	90.7	0	100	0	0	
Total %	2	4	0	5.1	49.5	0	39.4	0	0	

Start Time	HP Driveway From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. 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	0	0	0	0	2	8	0	10	9	0	0	9	19
04:15 PM	0	0	0	0	0	7	0	7	8	0	0	8	15
04:30 PM	1	1	0	2	1	9	0	10	5	0	0	5	17
04:45 PM	0	0	0	0	0	6	0	6	2	0	0	2	8
Total Volume	1	1	0	2	3	30	0	33	24	0	0	24	59
% App. Total	50	50	0		9.1	90.9	0		100	0	0		
PHF	.250	.250	.000	.250	.375	.833	.000	.825	.667	.000	.000	.667	.776

N: HP Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 BB  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Peds and Bikes

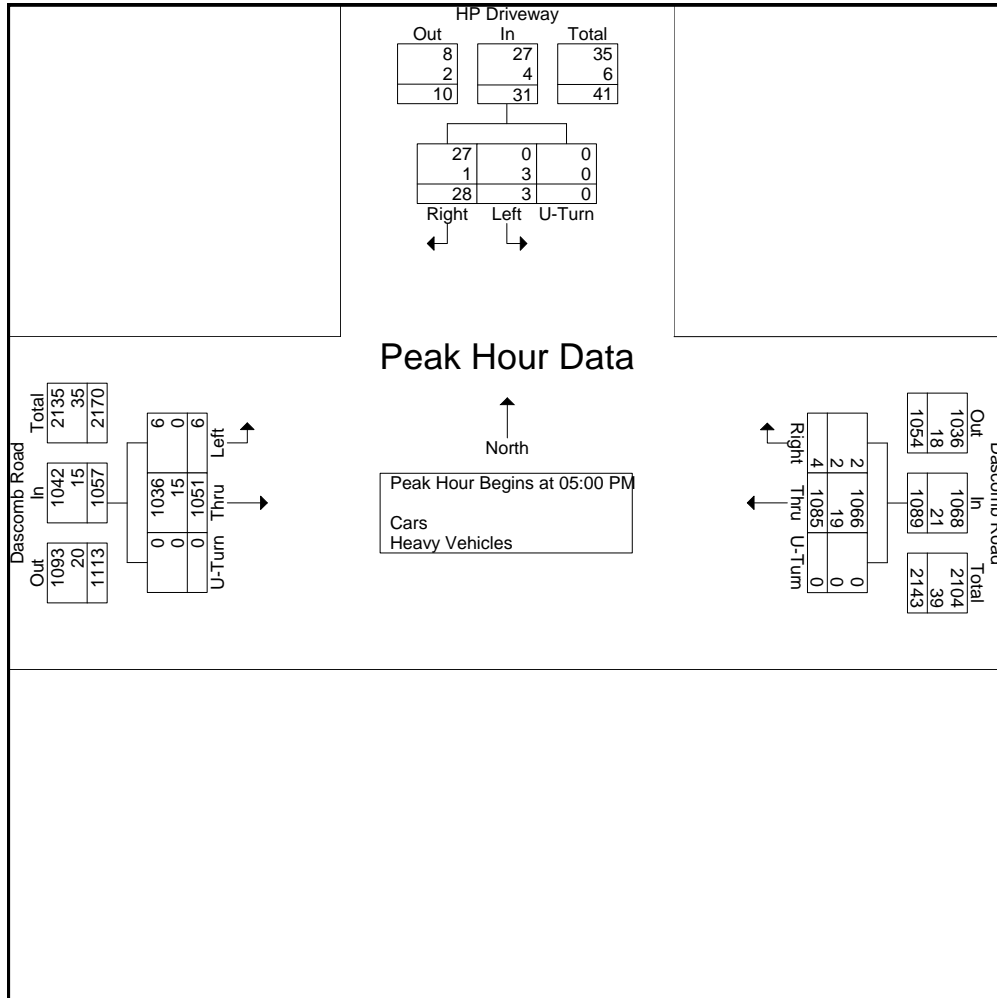
Start Time	HP Driveway From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	Peds EB	Peds WB	Right	Thru	Peds SB	Peds NB	Thru	Left	Peds NB	Peds SB	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	1	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	1	0	0	0	1
Grand Total	0	0	0	0	0	0	0	0	1	0	0	0	1
Apprch %	0	0	0	0	0	0	0	0	100	0	0	0	
Total %	0	0	0	0	0	0	0	0	100	0	0	0	

Start Time	HP Driveway From North					Dascomb Road From East					Dascomb Road From West					Int. Total
	Right	Left	Peds EB	Peds WB	App. Total	Right	Thru	Peds SB	Peds NB	App. Total	Thru	Left	Peds NB	Peds SB	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																
Peak Hour for Entire Intersection Begins at 04:15 PM																
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
05:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
Total Volume	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
% App. Total	0	0	0	0	0	0	0	0	0	0	100	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.000	.000	.250	

N: HP Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 BB  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Start Time	HP Driveway From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	7	2	0	9	0	250	0	250	287	2	0	289	548
05:15 PM	7	0	0	7	1	273	0	274	232	1	0	233	514
05:30 PM	7	0	0	7	3	303	0	306	274	3	0	277	590
05:45 PM	7	1	0	8	0	259	0	259	258	0	0	258	525
Total Volume	28	3	0	31	4	1085	0	1089	1051	6	0	1057	2177
% App. Total	90.3	9.7	0		0.4	99.6	0		99.4	0.6	0		
PHF	1.00	.375	.000	.861	.333	.895	.000	.890	.916	.500	.000	.914	.922
Cars	27	0	0	27	2	1066	0	1068	1036	6	0	1042	2137
% Cars	96.4	0	0	87.1	50.0	98.2	0	98.1	98.6	100	0	98.6	98.2
Heavy Vehicles	1	3	0	4	2	19	0	21	15	0	0	15	40
% Heavy Vehicles	3.6	100	0	12.9	50.0	1.8	0	1.9	1.4	0	0	1.4	1.8



N: HP Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 BBB  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Groups Printed- Cars - Heavy Vehicles

Start Time	HP Driveway From North			Dascomb Road From East			Dascomb Road From West			Int. Total
	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
11:00 AM	0	0	0	0	184	0	227	0	0	411
11:15 AM	2	0	0	0	184	0	234	0	0	420
11:30 AM	0	0	0	0	176	0	204	0	0	380
11:45 AM	0	0	0	0	184	0	214	0	0	398
Total	2	0	0	0	728	0	879	0	0	1609
12:00 PM	4	0	0	0	182	0	203	0	0	389
12:15 PM	1	0	0	0	167	0	202	0	0	370
12:30 PM	1	1	0	2	160	0	202	0	0	366
12:45 PM	1	0	0	0	196	0	185	0	0	382
Total	7	1	0	2	705	0	792	0	0	1507
Grand Total	9	1	0	2	1433	0	1671	0	0	3116
Apprch %	90	10	0	0.1	99.9	0	100	0	0	
Total %	0.3	0	0	0.1	46	0	53.6	0	0	
Cars	9	1	0	2	1396	0	1644	0	0	3052
% Cars	100	100	0	100	97.4	0	98.4	0	0	97.9
Heavy Vehicles	0	0	0	0	37	0	27	0	0	64
% Heavy Vehicles	0	0	0	0	2.6	0	1.6	0	0	2.1

Start Time	HP Driveway From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	0	0	0	0	0	184	0	184	227	0	0	227	411
11:15 AM	2	0	0	2	0	184	0	184	234	0	0	234	420
11:30 AM	0	0	0	0	0	176	0	176	204	0	0	204	380
11:45 AM	0	0	0	0	0	184	0	184	214	0	0	214	398
Total Volume	2	0	0	2	0	728	0	728	879	0	0	879	1609
% App. Total	100	0	0	100	0	100	0	100	100	0	0	100	
PHF	.250	.000	.000	.250	.000	.989	.000	.989	.939	.000	.000	.939	.958
Cars	2	0	0	2	0	701	0	701	864	0	0	864	1567
% Cars	100	0	0	100	0	96.3	0	96.3	98.3	0	0	98.3	97.4
Heavy Vehicles	0	0	0	0	0	27	0	27	15	0	0	15	42
% Heavy Vehicles	0	0	0	0	0	3.7	0	3.7	1.7	0	0	1.7	2.6

N: HP Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 BBB  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Groups Printed- Cars

Start Time	HP Driveway From North			Dascomb Road From East			Dascomb Road From West			Int. Total
	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
11:00 AM	0	0	0	0	176	0	221	0	0	397
11:15 AM	2	0	0	0	177	0	231	0	0	410
11:30 AM	0	0	0	0	169	0	200	0	0	369
11:45 AM	0	0	0	0	179	0	212	0	0	391
Total	2	0	0	0	701	0	864	0	0	1567
12:00 PM	4	0	0	0	176	0	197	0	0	377
12:15 PM	1	0	0	0	166	0	198	0	0	365
12:30 PM	1	1	0	2	159	0	200	0	0	363
12:45 PM	1	0	0	0	194	0	185	0	0	380
Total	7	1	0	2	695	0	780	0	0	1485
Grand Total	9	1	0	2	1396	0	1644	0	0	3052
Apprch %	90	10	0	0.1	99.9	0	100	0	0	
Total %	0.3	0	0	0.1	45.7	0	53.9	0	0	

Start Time	HP Driveway From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	0	0	0	0	0	176	0	176	221	0	0	221	397
11:15 AM	2	0	0	2	0	177	0	177	231	0	0	231	410
11:30 AM	0	0	0	0	0	169	0	169	200	0	0	200	369
11:45 AM	0	0	0	0	0	179	0	179	212	0	0	212	391
Total Volume	2	0	0	2	0	701	0	701	864	0	0	864	1567
% App. Total	100	0	0		0	100	0		100	0	0		
PHF	.250	.000	.000	.250	.000	.979	.000	.979	.935	.000	.000	.935	.955

N: HP Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 BBB  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Groups Printed- Heavy Vehicles

Start Time	HP Driveway From North			Dascomb Road From East			Dascomb Road From West			Int. Total
	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
11:00 AM	0	0	0	0	8	0	6	0	0	14
11:15 AM	0	0	0	0	7	0	3	0	0	10
11:30 AM	0	0	0	0	7	0	4	0	0	11
11:45 AM	0	0	0	0	5	0	2	0	0	7
Total	0	0	0	0	27	0	15	0	0	42
12:00 PM	0	0	0	0	6	0	6	0	0	12
12:15 PM	0	0	0	0	1	0	4	0	0	5
12:30 PM	0	0	0	0	1	0	2	0	0	3
12:45 PM	0	0	0	0	2	0	0	0	0	2
Total	0	0	0	0	10	0	12	0	0	22
Grand Total	0	0	0	0	37	0	27	0	0	64
Apprch %	0	0	0	0	100	0	100	0	0	
Total %	0	0	0	0	57.8	0	42.2	0	0	

Start Time	HP Driveway From North				Dascomb Road From East			Dascomb Road From West				Int. Total	
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn		App. Total
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	0	0	0	0	0	8	0	8	6	0	0	6	14
11:15 AM	0	0	0	0	0	7	0	7	3	0	0	3	10
11:30 AM	0	0	0	0	0	7	0	7	4	0	0	4	11
11:45 AM	0	0	0	0	0	5	0	5	2	0	0	2	7
Total Volume	0	0	0	0	0	27	0	27	15	0	0	15	42
% App. Total	0	0	0	0	0	100	0	100	100	0	0	100	
PHF	.000	.000	.000	.000	.000	.844	.000	.844	.625	.000	.000	.625	.750



N: HP Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 BBB  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Groups Printed- Peds and Bikes

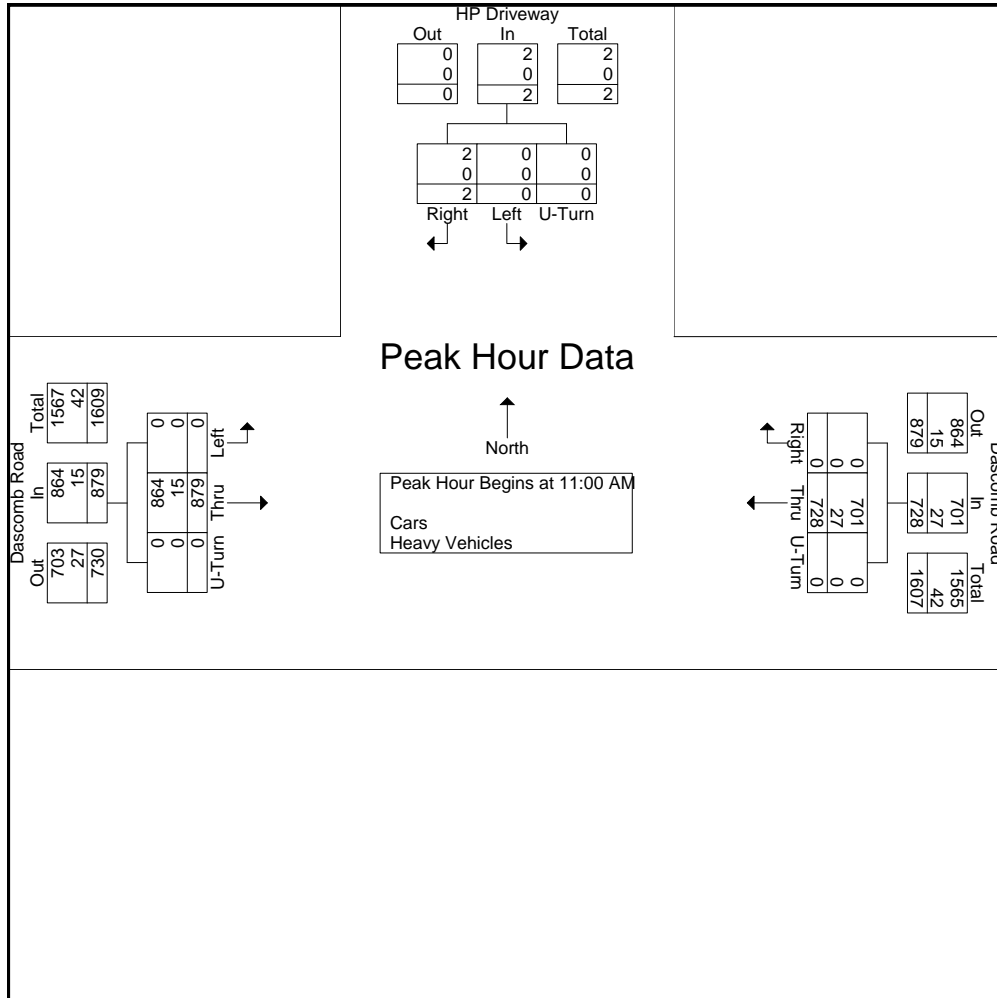
Start Time	HP Driveway From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	Peds EB	Peds WB	Right	Thru	Peds SB	Peds NB	Thru	Left	Peds NB	Peds SB	
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	1	0	0	0	1
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	1	0	0	0	1
Grand Total	0	0	0	0	0	0	0	0	1	0	0	0	1
Apprch %	0	0	0	0	0	0	0	0	100	0	0	0	
Total %	0	0	0	0	0	0	0	0	100	0	0	0	

Start Time	HP Driveway From North					Dascomb Road From East					Dascomb Road From West					Int. Total
	Right	Left	Peds EB	Peds WB	App. Total	Right	Thru	Peds SB	Peds NB	App. Total	Thru	Left	Peds NB	Peds SB	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1																
Peak Hour for Entire Intersection Begins at 11:15 AM																
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
Total Volume	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
% App. Total	0	0	0	0	0	0	0	0	0	0	100	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.000	.000	.250	

N: HP Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 BBB  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Start Time	HP Driveway From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	0	0	0	0	0	184	0	184	227	0	0	227	411
11:15 AM	2	0	0	2	0	184	0	184	234	0	0	234	420
11:30 AM	0	0	0	0	0	176	0	176	204	0	0	204	380
11:45 AM	0	0	0	0	0	184	0	184	214	0	0	214	398
Total Volume	2	0	0	2	0	728	0	728	879	0	0	879	1609
% App. Total	100	0	0		0	100	0		100	0	0		
PHF	.250	.000	.000	.250	.000	.989	.000	.989	.939	.000	.000	.939	.958
Cars	2	0	0	2	0	701	0	701	864	0	0	864	1567
% Cars	100	0	0	100	0	96.3	0	96.3	98.3	0	0	98.3	97.4
Heavy Vehicles	0	0	0	0	0	27	0	27	15	0	0	15	42
% Heavy Vehicles	0	0	0	0	0	3.7	0	3.7	1.7	0	0	1.7	2.6



S: California Products Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 C  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Cars - Heavy Vehicles

Start Time	Dascomb Road From East			California Products Driveway From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
07:00 AM	189	16	0	2	0	0	7	174	0	388
07:15 AM	208	11	0	6	2	0	4	216	0	447
07:30 AM	228	12	0	8	2	0	3	275	0	528
07:45 AM	249	17	0	9	4	0	4	252	0	535
Total	874	56	0	25	8	0	18	917	0	1898
08:00 AM	218	18	0	6	0	0	7	201	0	450
08:15 AM	230	13	0	9	3	0	6	225	0	486
08:30 AM	226	13	0	8	1	0	5	174	0	427
08:45 AM	177	21	0	16	1	0	5	135	0	355
Total	851	65	0	39	5	0	23	735	0	1718
09:00 AM	192	14	0	12	4	0	3	182	0	407
09:15 AM	160	24	0	10	3	0	2	141	0	340
09:30 AM	137	24	0	24	4	0	3	147	0	339
09:45 AM	160	20	0	14	2	0	5	135	0	336
Total	649	82	0	60	13	0	13	605	0	1422
10:00 AM	126	25	0	22	7	0	3	160	0	343
10:15 AM	142	21	0	14	7	0	7	135	0	326
10:30 AM	137	17	0	16	2	0	10	139	0	321
10:45 AM	117	18	1	22	4	0	5	166	0	333
Total	522	81	1	74	20	0	25	600	0	1323
11:00 AM	131	13	0	13	4	0	4	159	0	324
11:15 AM	127	14	0	21	5	0	1	150	0	318
11:30 AM	141	11	0	18	4	0	4	147	0	325
11:45 AM	174	17	0	26	6	0	5	139	0	367
Total	573	55	0	78	19	0	14	595	0	1334
12:00 PM	153	14	0	13	11	0	5	145	0	341
12:15 PM	155	10	0	8	5	0	6	128	1	313
12:30 PM	153	12	0	9	3	0	2	142	0	321
12:45 PM	142	20	0	12	4	0	8	177	0	363
Total	603	56	0	42	23	0	21	592	1	1338
01:00 PM	146	11	1	14	6	0	2	150	0	330
01:15 PM	169	16	0	16	4	0	4	168	0	377
01:30 PM	140	18	0	15	1	0	5	167	0	346
01:45 PM	159	14	0	17	5	0	6	157	0	358
Total	614	59	1	62	16	0	17	642	0	1411
02:00 PM	155	16	0	15	4	0	3	171	0	364
02:15 PM	158	18	0	15	3	0	4	190	0	388
02:30 PM	177	11	0	20	5	0	2	194	0	409
02:45 PM	221	11	0	16	3	0	6	198	0	455
Total	711	56	0	66	15	0	15	753	0	1616
03:00 PM	217	15	0	31	7	0	5	215	0	490
03:15 PM	243	16	0	21	3	0	3	216	0	502
03:30 PM	232	11	0	29	8	0	7	260	0	547
03:45 PM	237	15	1	12	6	0	3	211	0	485
Total	929	57	1	93	24	0	18	902	0	2024
04:00 PM	229	12	1	26	7	0	7	242	0	524
04:15 PM	235	7	0	16	4	0	2	239	0	503
04:30 PM	242	6	0	15	3	0	4	276	0	546
04:45 PM	267	9	0	7	9	0	1	222	0	515
Total	973	34	1	64	23	0	14	979	0	2088

S: California Products Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 C  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 2

Groups Printed- Cars - Heavy Vehicles

Start Time	Dascomb Road From East			California Products Driveway From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
05:00 PM	243	4	0	18	9	0	1	286	0	561
05:15 PM	267	5	1	8	4	0	2	229	0	516
05:30 PM	307	5	0	14	4	0	5	273	0	608
05:45 PM	258	8	0	10	1	0	3	255	0	535
Total	1075	22	1	50	18	0	11	1043	0	2220
06:00 PM	251	11	0	8	5	0	0	263	0	538
06:15 PM	231	7	0	7	5	0	2	259	0	511
06:30 PM	209	4	0	13	7	0	2	233	0	468
06:45 PM	192	1	0	7	1	0	2	186	0	389
Total	883	23	0	35	18	0	6	941	0	1906
Grand Total	9257	646	5	688	202	0	195	9304	1	20298
Apprch %	93.4	6.5	0.1	77.3	22.7	0	2.1	97.9	0	
Total %	45.6	3.2	0	3.4	1	0	1	45.8	0	
Cars	8686	584	5	624	188	0	177	8763	1	19028
% Cars	93.8	90.4	100	90.7	93.1	0	90.8	94.2	100	93.7
Heavy Vehicles	571	62	0	64	14	0	18	541	0	1270
% Heavy Vehicles	6.2	9.6	0	9.3	6.9	0	9.2	5.8	0	6.3

Start Time	Dascomb Road From East				California Products Driveway From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	228	12	0	240	8	2	0	10	3	275	0	278	528
07:45 AM	249	17	0	266	9	4	0	13	4	252	0	256	535
08:00 AM	218	18	0	236	6	0	0	6	7	201	0	208	450
08:15 AM	230	13	0	243	9	3	0	12	6	225	0	231	486
Total Volume	925	60	0	985	32	9	0	41	20	953	0	973	1999
% App. Total	93.9	6.1	0		78	22	0		2.1	97.9	0		
PHF	.929	.833	.000	.926	.889	.563	.000	.788	.714	.866	.000	.875	.934
Cars	873	52	0	925	28	9	0	37	20	904	0	924	1886
% Cars	94.4	86.7	0	93.9	87.5	100	0	90.2	100	94.9	0	95.0	94.3
Heavy Vehicles	52	8	0	60	4	0	0	4	0	49	0	49	113
% Heavy Vehicles	5.6	13.3	0	6.1	12.5	0	0	9.8	0	5.1	0	5.0	5.7
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 12:45 PM													
12:45 PM	142	20	0	162	12	4	0	16	8	177	0	185	363
01:00 PM	146	11	1	158	14	6	0	20	2	150	0	152	330
01:15 PM	169	16	0	185	16	4	0	20	4	168	0	172	377
01:30 PM	140	18	0	158	15	1	0	16	5	167	0	172	346
Total Volume	597	65	1	663	57	15	0	72	19	662	0	681	1416
% App. Total	90	9.8	0.2		79.2	20.8	0		2.8	97.2	0		
PHF	.883	.813	.250	.896	.891	.625	.000	.900	.594	.935	.000	.920	.939
Cars	543	60	1	604	50	15	0	65	17	609	0	626	1295
% Cars	91.0	92.3	100	91.1	87.7	100	0	90.3	89.5	92.0	0	91.9	91.5
Heavy Vehicles	54	5	0	59	7	0	0	7	2	53	0	55	121
% Heavy Vehicles	9.0	7.7	0	8.9	12.3	0	0	9.7	10.5	8.0	0	8.1	8.5

S: California Products Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 C  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 3

Start Time	Dascomb Road From East				California Products Driveway From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	243	4	0	247	18	9	0	27	1	286	0	287	561
05:15 PM	267	5	1	273	8	4	0	12	2	229	0	231	516
05:30 PM	307	5	0	312	14	4	0	18	5	273	0	278	608
05:45 PM	258	8	0	266	10	1	0	11	3	255	0	258	535
Total Volume	1075	22	1	1098	50	18	0	68	11	1043	0	1054	2220
% App. Total	97.9	2	0.1		73.5	26.5	0		1	99	0		
PHF	.875	.688	.250	.880	.694	.500	.000	.630	.550	.912	.000	.918	.913
Cars	1055	18	1	1074	46	17	0	63	10	1029	0	1039	2176
% Cars	98.1	81.8	100	97.8	92.0	94.4	0	92.6	90.9	98.7	0	98.6	98.0
Heavy Vehicles	20	4	0	24	4	1	0	5	1	14	0	15	44
% Heavy Vehicles	1.9	18.2	0	2.2	8.0	5.6	0	7.4	9.1	1.3	0	1.4	2.0

S: California Products Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 C  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

**Groups Printed- Cars**

Start Time	Dascomb Road From East			California Products Driveway From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
07:00 AM	175	16	0	2	0	0	7	162	0	362
07:15 AM	197	10	0	5	2	0	4	202	0	420
07:30 AM	213	11	0	7	2	0	3	256	0	492
07:45 AM	239	13	0	8	4	0	4	240	0	508
Total	824	50	0	22	8	0	18	860	0	1782
08:00 AM	209	16	0	6	0	0	7	189	0	427
08:15 AM	212	12	0	7	3	0	6	219	0	459
08:30 AM	212	12	0	6	1	0	4	164	0	399
08:45 AM	165	18	0	12	1	0	4	125	0	325
Total	798	58	0	31	5	0	21	697	0	1610
09:00 AM	178	11	0	10	4	0	3	164	0	370
09:15 AM	140	23	0	10	2	0	2	130	0	307
09:30 AM	120	20	0	23	3	0	2	131	0	299
09:45 AM	144	16	0	11	2	0	4	117	0	294
Total	582	70	0	54	11	0	11	542	0	1270
10:00 AM	106	25	0	17	6	0	3	139	0	296
10:15 AM	128	19	0	14	7	0	6	116	0	290
10:30 AM	127	14	0	14	2	0	8	123	0	288
10:45 AM	107	18	1	19	4	0	5	150	0	304
Total	468	76	1	64	19	0	22	528	0	1178
11:00 AM	116	13	0	11	3	0	4	147	0	294
11:15 AM	114	10	0	19	5	0	0	138	0	286
11:30 AM	133	11	0	14	3	0	4	138	0	303
11:45 AM	149	15	0	25	5	0	4	129	0	327
Total	512	49	0	69	16	0	12	552	0	1210
12:00 PM	138	12	0	11	10	0	5	131	0	307
12:15 PM	139	9	0	7	5	0	6	116	1	283
12:30 PM	142	11	0	8	2	0	2	132	0	297
12:45 PM	125	19	0	9	4	0	6	161	0	324
Total	544	51	0	35	21	0	19	540	1	1211
01:00 PM	136	10	1	14	6	0	2	138	0	307
01:15 PM	156	14	0	13	4	0	4	157	0	348
01:30 PM	126	17	0	14	1	0	5	153	0	316
01:45 PM	143	14	0	16	4	0	5	141	0	323
Total	561	55	1	57	15	0	16	589	0	1294
02:00 PM	143	16	0	14	3	0	2	152	0	330
02:15 PM	144	17	0	14	3	0	3	176	0	357
02:30 PM	161	11	0	20	5	0	2	179	0	378
02:45 PM	202	10	0	15	3	0	5	186	0	421
Total	650	54	0	63	14	0	12	693	0	1486
03:00 PM	209	15	0	28	7	0	3	205	0	467
03:15 PM	228	13	0	20	2	0	3	208	0	474
03:30 PM	213	10	0	29	8	0	7	249	0	516
03:45 PM	227	14	1	12	6	0	3	194	0	457
Total	877	52	1	89	23	0	16	856	0	1914
04:00 PM	219	12	1	25	6	0	7	229	0	499
04:15 PM	229	6	0	16	4	0	2	230	0	487
04:30 PM	234	5	0	15	3	0	4	268	0	529
04:45 PM	262	8	0	7	9	0	1	220	0	507
Total	944	31	1	63	22	0	14	947	0	2022

S: California Products Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 C  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 2

**Groups Printed- Cars**

Start Time	Dascomb Road From East			California Products Driveway From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
05:00 PM	235	4	0	17	9	0	1	284	0	550
05:15 PM	261	5	1	6	3	0	2	225	0	503
05:30 PM	305	3	0	14	4	0	5	270	0	601
05:45 PM	254	6	0	9	1	0	2	250	0	522
<b>Total</b>	<b>1055</b>	<b>18</b>	<b>1</b>	<b>46</b>	<b>17</b>	<b>0</b>	<b>10</b>	<b>1029</b>	<b>0</b>	<b>2176</b>
06:00 PM	244	11	0	5	5	0	0	260	0	525
06:15 PM	230	5	0	7	4	0	2	253	0	501
06:30 PM	206	3	0	13	7	0	2	231	0	462
06:45 PM	191	1	0	6	1	0	2	186	0	387
<b>Total</b>	<b>871</b>	<b>20</b>	<b>0</b>	<b>31</b>	<b>17</b>	<b>0</b>	<b>6</b>	<b>930</b>	<b>0</b>	<b>1875</b>
<b>Grand Total</b>	<b>8686</b>	<b>584</b>	<b>5</b>	<b>624</b>	<b>188</b>	<b>0</b>	<b>177</b>	<b>8763</b>	<b>1</b>	<b>19028</b>
Apprch %	93.6	6.3	0.1	76.8	23.2	0	2	98	0	
Total %	45.6	3.1	0	3.3	1	0	0.9	46.1	0	

Start Time	Dascomb Road From East				California Products Driveway From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	213	11	0	224	7	2	0	9	3	256	0	259	492
07:45 AM	239	13	0	252	8	4	0	12	4	240	0	244	508
08:00 AM	209	16	0	225	6	0	0	6	7	189	0	196	427
08:15 AM	212	12	0	224	7	3	0	10	6	219	0	225	459
<b>Total Volume</b>	<b>873</b>	<b>52</b>	<b>0</b>	<b>925</b>	<b>28</b>	<b>9</b>	<b>0</b>	<b>37</b>	<b>20</b>	<b>904</b>	<b>0</b>	<b>924</b>	<b>1886</b>
<b>% App. Total</b>	<b>94.4</b>	<b>5.6</b>	<b>0</b>		<b>75.7</b>	<b>24.3</b>	<b>0</b>		<b>2.2</b>	<b>97.8</b>	<b>0</b>		
PHF	.913	.813	.000	.918	.875	.563	.000	.771	.714	.883	.000	.892	.928

Start Time	Dascomb Road From East				California Products Driveway From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 12:45 PM													
12:45 PM	125	19	0	144	9	4	0	13	6	161	0	167	324
01:00 PM	136	10	1	147	14	6	0	20	2	138	0	140	307
01:15 PM	156	14	0	170	13	4	0	17	4	157	0	161	348
01:30 PM	126	17	0	143	14	1	0	15	5	153	0	158	316
<b>Total Volume</b>	<b>543</b>	<b>60</b>	<b>1</b>	<b>604</b>	<b>50</b>	<b>15</b>	<b>0</b>	<b>65</b>	<b>17</b>	<b>609</b>	<b>0</b>	<b>626</b>	<b>1295</b>
<b>% App. Total</b>	<b>89.9</b>	<b>9.9</b>	<b>0.2</b>		<b>76.9</b>	<b>23.1</b>	<b>0</b>		<b>2.7</b>	<b>97.3</b>	<b>0</b>		
PHF	.870	.789	.250	.888	.893	.625	.000	.813	.708	.946	.000	.937	.930

Start Time	Dascomb Road From East				California Products Driveway From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	235	4	0	239	17	9	0	26	1	284	0	285	550
05:15 PM	261	5	1	267	6	3	0	9	2	225	0	227	503
05:30 PM	305	3	0	308	14	4	0	18	5	270	0	275	601
05:45 PM	254	6	0	260	9	1	0	10	2	250	0	252	522
<b>Total Volume</b>	<b>1055</b>	<b>18</b>	<b>1</b>	<b>1074</b>	<b>46</b>	<b>17</b>	<b>0</b>	<b>63</b>	<b>10</b>	<b>1029</b>	<b>0</b>	<b>1039</b>	<b>2176</b>
<b>% App. Total</b>	<b>98.2</b>	<b>1.7</b>	<b>0.1</b>		<b>73</b>	<b>27</b>	<b>0</b>		<b>1</b>	<b>99</b>	<b>0</b>		
PHF	.865	.750	.250	.872	.676	.472	.000	.606	.500	.906	.000	.911	.905

S: California Products Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 C  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Heavy Vehicles

Start Time	Dascomb Road From East			California Products Driveway From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
07:00 AM	14	0	0	0	0	0	0	12	0	26
07:15 AM	11	1	0	1	0	0	0	14	0	27
07:30 AM	15	1	0	1	0	0	0	19	0	36
07:45 AM	10	4	0	1	0	0	0	12	0	27
Total	50	6	0	3	0	0	0	57	0	116
08:00 AM	9	2	0	0	0	0	0	12	0	23
08:15 AM	18	1	0	2	0	0	0	6	0	27
08:30 AM	14	1	0	2	0	0	1	10	0	28
08:45 AM	12	3	0	4	0	0	1	10	0	30
Total	53	7	0	8	0	0	2	38	0	108
09:00 AM	14	3	0	2	0	0	0	18	0	37
09:15 AM	20	1	0	0	1	0	0	11	0	33
09:30 AM	17	4	0	1	1	0	1	16	0	40
09:45 AM	16	4	0	3	0	0	1	18	0	42
Total	67	12	0	6	2	0	2	63	0	152
10:00 AM	20	0	0	5	1	0	0	21	0	47
10:15 AM	14	2	0	0	0	0	1	19	0	36
10:30 AM	10	3	0	2	0	0	2	16	0	33
10:45 AM	10	0	0	3	0	0	0	16	0	29
Total	54	5	0	10	1	0	3	72	0	145
11:00 AM	15	0	0	2	1	0	0	12	0	30
11:15 AM	13	4	0	2	0	0	1	12	0	32
11:30 AM	8	0	0	4	1	0	0	9	0	22
11:45 AM	25	2	0	1	1	0	1	10	0	40
Total	61	6	0	9	3	0	2	43	0	124
12:00 PM	15	2	0	2	1	0	0	14	0	34
12:15 PM	16	1	0	1	0	0	0	12	0	30
12:30 PM	11	1	0	1	1	0	0	10	0	24
12:45 PM	17	1	0	3	0	0	2	16	0	39
Total	59	5	0	7	2	0	2	52	0	127
01:00 PM	10	1	0	0	0	0	0	12	0	23
01:15 PM	13	2	0	3	0	0	0	11	0	29
01:30 PM	14	1	0	1	0	0	0	14	0	30
01:45 PM	16	0	0	1	1	0	1	16	0	35
Total	53	4	0	5	1	0	1	53	0	117
02:00 PM	12	0	0	1	1	0	1	19	0	34
02:15 PM	14	1	0	1	0	0	1	14	0	31
02:30 PM	16	0	0	0	0	0	0	15	0	31
02:45 PM	19	1	0	1	0	0	1	12	0	34
Total	61	2	0	3	1	0	3	60	0	130
03:00 PM	8	0	0	3	0	0	2	10	0	23
03:15 PM	15	3	0	1	1	0	0	8	0	28
03:30 PM	19	1	0	0	0	0	0	11	0	31
03:45 PM	10	1	0	0	0	0	0	17	0	28
Total	52	5	0	4	1	0	2	46	0	110
04:00 PM	10	0	0	1	1	0	0	13	0	25
04:15 PM	6	1	0	0	0	0	0	9	0	16
04:30 PM	8	1	0	0	0	0	0	8	0	17
04:45 PM	5	1	0	0	0	0	0	2	0	8
Total	29	3	0	1	1	0	0	32	0	66



S: California Products Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 C  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 2

Groups Printed- Heavy Vehicles

Start Time	Dascomb Road From East			California Products Driveway From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
05:00 PM	8	0	0	1	0	0	0	2	0	11
05:15 PM	6	0	0	2	1	0	0	4	0	13
05:30 PM	2	2	0	0	0	0	0	3	0	7
05:45 PM	4	2	0	1	0	0	1	5	0	13
Total	20	4	0	4	1	0	1	14	0	44
06:00 PM	7	0	0	3	0	0	0	3	0	13
06:15 PM	1	2	0	0	1	0	0	6	0	10
06:30 PM	3	1	0	0	0	0	0	2	0	6
06:45 PM	1	0	0	1	0	0	0	0	0	2
Total	12	3	0	4	1	0	0	11	0	31
Grand Total	571	62	0	64	14	0	18	541	0	1270
Apprch %	90.2	9.8	0	82.1	17.9	0	3.2	96.8	0	
Total %	45	4.9	0	5	1.1	0	1.4	42.6	0	

Start Time	Dascomb Road From East				California Products Driveway From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 09:00 AM													
09:00 AM	14	3	0	17	2	0	0	2	0	18	0	18	37
09:15 AM	20	1	0	21	0	1	0	1	0	11	0	11	33
09:30 AM	17	4	0	21	1	1	0	2	1	16	0	17	40
09:45 AM	16	4	0	20	3	0	0	3	1	18	0	19	42
Total Volume	67	12	0	79	6	2	0	8	2	63	0	65	152
% App. Total	84.8	15.2	0		75	25	0		3.1	96.9	0		
PHF	.838	.750	.000	.940	.500	.500	.000	.667	.500	.875	.000	.855	.905

Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 10:00 AM													
10:00 AM	20	0	0	20	5	1	0	6	0	21	0	21	47
10:15 AM	14	2	0	16	0	0	0	0	1	19	0	20	36
10:30 AM	10	3	0	13	2	0	0	2	2	16	0	18	33
10:45 AM	10	0	0	10	3	0	0	3	0	16	0	16	29
Total Volume	54	5	0	59	10	1	0	11	3	72	0	75	145
% App. Total	91.5	8.5	0		90.9	9.1	0		4	96	0		
PHF	.675	.417	.000	.738	.500	.250	.000	.458	.375	.857	.000	.893	.771

Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 02:00 PM													
02:00 PM	12	0	0	12	1	1	0	2	1	19	0	20	34
02:15 PM	14	1	0	15	1	0	0	1	1	14	0	15	31
02:30 PM	16	0	0	16	0	0	0	0	0	15	0	15	31
02:45 PM	19	1	0	20	1	0	0	1	1	12	0	13	34
Total Volume	61	2	0	63	3	1	0	4	3	60	0	63	130
% App. Total	96.8	3.2	0		75	25	0		4.8	95.2	0		
PHF	.803	.500	.000	.788	.750	.250	.000	.500	.750	.789	.000	.788	.956

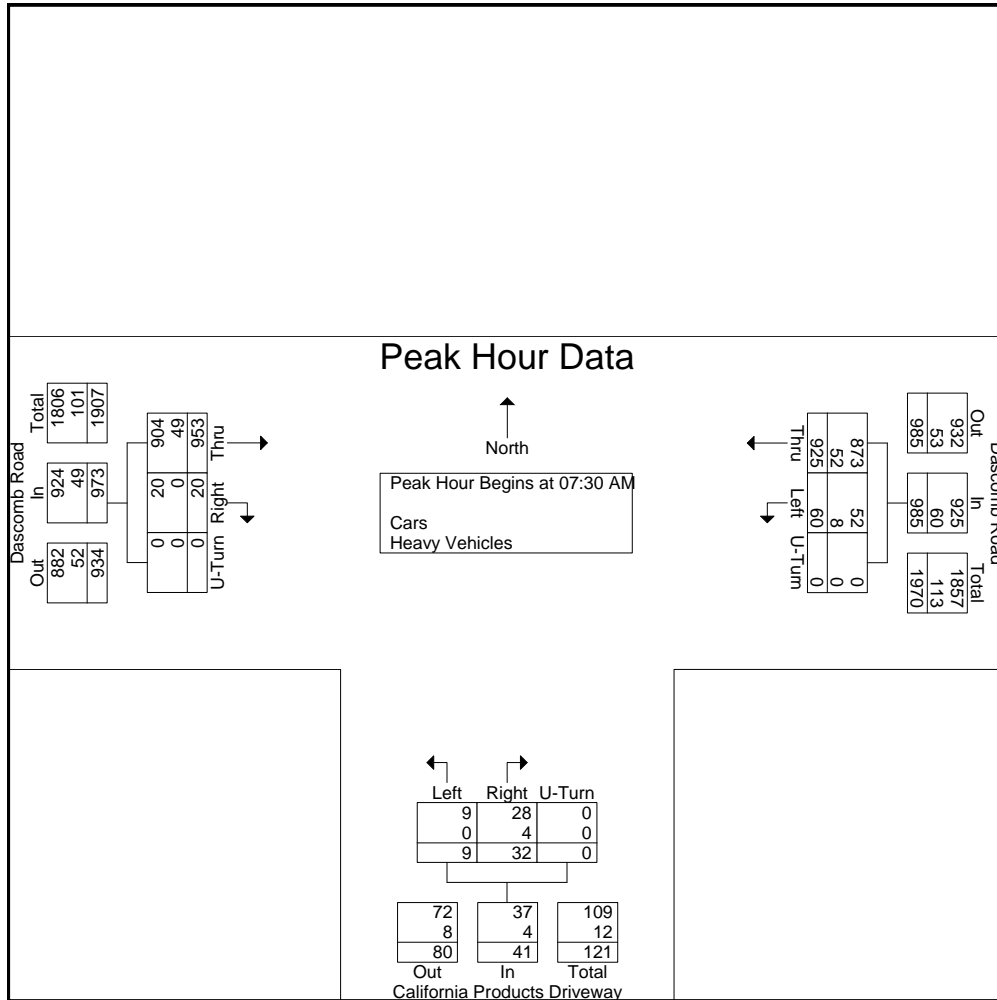




S: California Products Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 C  
 Site Code : TBA  
 Start Date : 10/6/2016  
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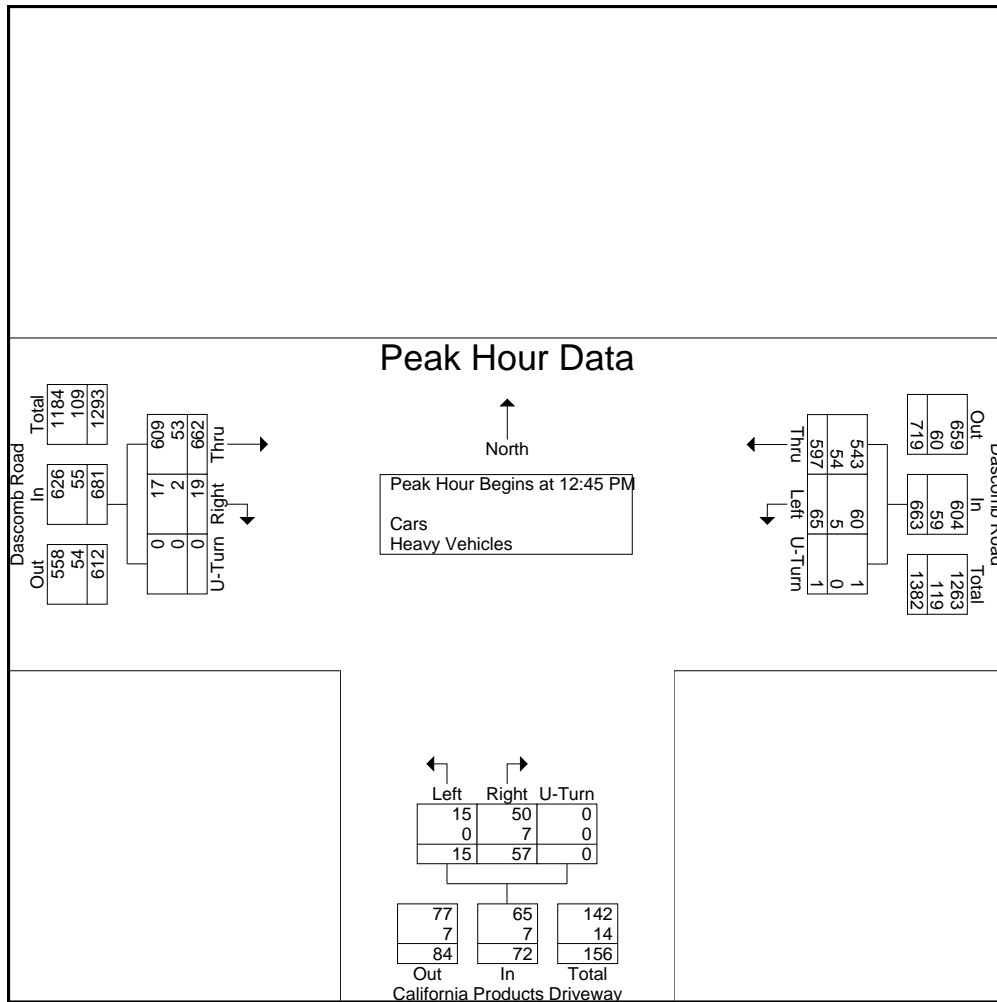
Start Time	Dascomb Road From East				California Products Driveway From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	228	12	0	240	8	2	0	10	3	275	0	278	528
07:45 AM	249	17	0	266	9	4	0	13	4	252	0	256	535
08:00 AM	218	18	0	236	6	0	0	6	7	201	0	208	450
08:15 AM	230	13	0	243	9	3	0	12	6	225	0	231	486
Total Volume	925	60	0	985	32	9	0	41	20	953	0	973	1999
% App. Total	93.9	6.1	0		78	22	0		2.1	97.9	0		
PHF	.929	.833	.000	.926	.889	.563	.000	.788	.714	.866	.000	.875	.934
Cars	873	52	0	925	28	9	0	37	20	904	0	924	1886
% Cars	94.4	86.7	0	93.9	87.5	100	0	90.2	100	94.9	0	95.0	94.3
Heavy Vehicles	52	8	0	60	4	0	0	4	0	49	0	49	113
% Heavy Vehicles	5.6	13.3	0	6.1	12.5	0	0	9.8	0	5.1	0	5.0	5.7



S: California Products Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 C  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 2

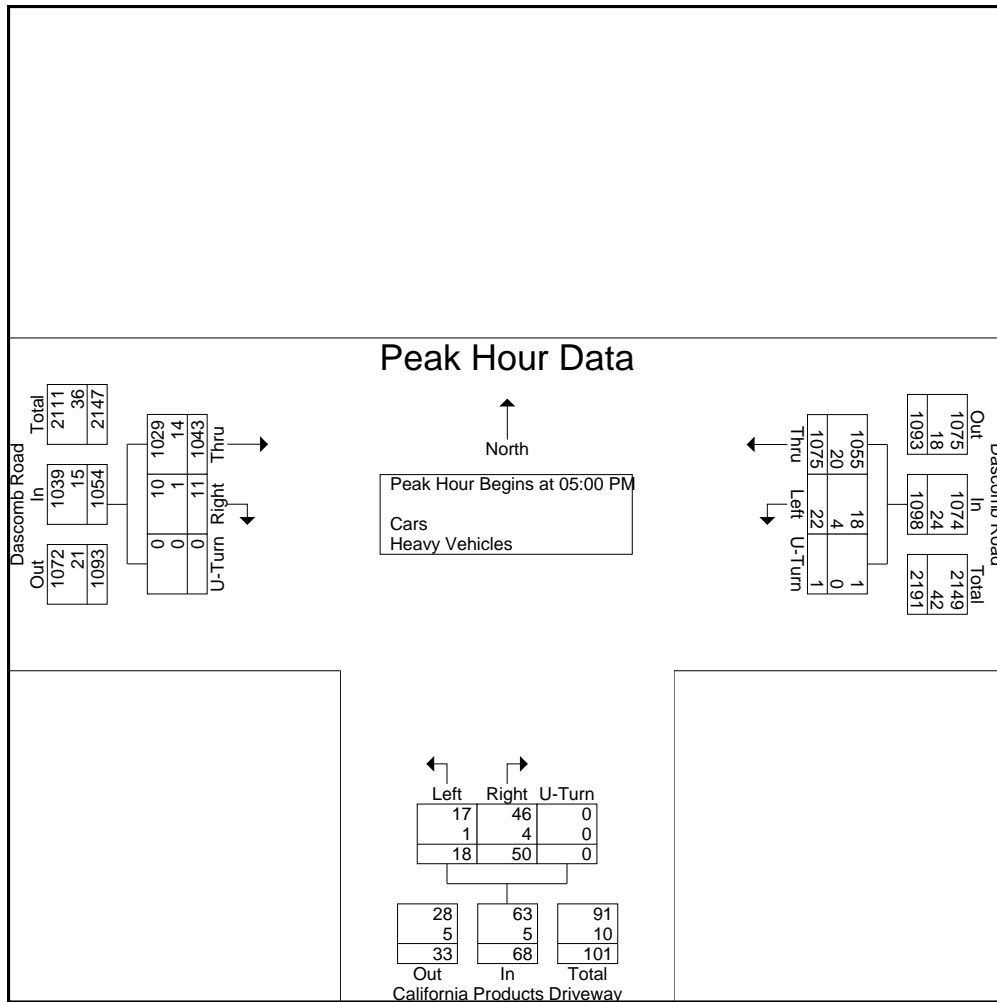
Start Time	Dascomb Road From East				California Products Driveway From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 12:45 PM													
12:45 PM	142	20	0	162	12	4	0	16	8	177	0	185	363
01:00 PM	146	11	1	158	14	6	0	20	2	150	0	152	330
01:15 PM	169	16	0	185	16	4	0	20	4	168	0	172	377
01:30 PM	140	18	0	158	15	1	0	16	5	167	0	172	346
Total Volume	597	65	1	663	57	15	0	72	19	662	0	681	1416
% App. Total	90	9.8	0.2		79.2	20.8	0		2.8	97.2	0		
PHF	.883	.813	.250	.896	.891	.625	.000	.900	.594	.935	.000	.920	.939
Cars	543	60	1	604	50	15	0	65	17	609	0	626	1295
% Cars	91.0	92.3	100	91.1	87.7	100	0	90.3	89.5	92.0	0	91.9	91.5
Heavy Vehicles	54	5	0	59	7	0	0	7	2	53	0	55	121
% Heavy Vehicles	9.0	7.7	0	8.9	12.3	0	0	9.7	10.5	8.0	0	8.1	8.5



S: California Products Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 C  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 3

Start Time	Dascomb Road From East				California Products Driveway From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	243	4	0	247	18	9	0	27	1	286	0	287	561
05:15 PM	267	5	1	273	8	4	0	12	2	229	0	231	516
05:30 PM	307	5	0	312	14	4	0	18	5	273	0	278	608
05:45 PM	258	8	0	266	10	1	0	11	3	255	0	258	535
Total Volume	1075	22	1	1098	50	18	0	68	11	1043	0	1054	2220
% App. Total	97.9	2	0.1		73.5	26.5	0		1	99	0		
PHF	.875	.688	.250	.880	.694	.500	.000	.630	.550	.912	.000	.918	.913
Cars	1055	18	1	1074	46	17	0	63	10	1029	0	1039	2176
% Cars	98.1	81.8	100	97.8	92.0	94.4	0	92.6	90.9	98.7	0	98.6	98.0
Heavy Vehicles	20	4	0	24	4	1	0	5	1	14	0	15	44
% Heavy Vehicles	1.9	18.2	0	2.2	8.0	5.6	0	7.4	9.1	1.3	0	1.4	2.0



S: California Products Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 CC  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Groups Printed- Cars - Heavy Vehicles

Start Time	Dascomb Road From East			California Products Driveway From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
11:00 AM	179	14	0	18	4	0	5	225	0	445
11:15 AM	185	15	0	14	3	0	3	228	0	448
11:30 AM	174	21	0	9	5	0	1	206	0	416
11:45 AM	183	13	0	16	4	0	7	206	0	429
Total	721	63	0	57	16	0	16	865	0	1738
12:00 PM	169	14	1	14	10	0	4	201	0	413
12:15 PM	165	17	0	13	4	0	4	199	0	402
12:30 PM	160	13	1	16	2	0	6	195	0	393
12:45 PM	194	14	0	13	3	0	4	181	0	409
Total	688	58	2	56	19	0	18	776	0	1617
Grand Total	1409	121	2	113	35	0	34	1641	0	3355
Apprch %	92	7.9	0.1	76.4	23.6	0	2	98	0	
Total %	42	3.6	0.1	3.4	1	0	1	48.9	0	
Cars	1370	118	2	110	34	0	33	1611	0	3278
% Cars	97.2	97.5	100	97.3	97.1	0	97.1	98.2	0	97.7
Heavy Vehicles	39	3	0	3	1	0	1	30	0	77
% Heavy Vehicles	2.8	2.5	0	2.7	2.9	0	2.9	1.8	0	2.3

Start Time	Dascomb Road From East				California Products Driveway From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	179	14	0	193	18	4	0	22	5	225	0	230	445
11:15 AM	185	15	0	200	14	3	0	17	3	228	0	231	448
11:30 AM	174	21	0	195	9	5	0	14	1	206	0	207	416
11:45 AM	183	13	0	196	16	4	0	20	7	206	0	213	429
Total Volume	721	63	0	784	57	16	0	73	16	865	0	881	1738
% App. Total	92	8	0		78.1	21.9	0		1.8	98.2	0		
PHF	.974	.750	.000	.980	.792	.800	.000	.830	.571	.948	.000	.953	.970
Cars	694	61	0	755	55	15	0	70	16	848	0	864	1689
% Cars	96.3	96.8	0	96.3	96.5	93.8	0	95.9	100	98.0	0	98.1	97.2
Heavy Vehicles	27	2	0	29	2	1	0	3	0	17	0	17	49
% Heavy Vehicles	3.7	3.2	0	3.7	3.5	6.3	0	4.1	0	2.0	0	1.9	2.8

S: California Products Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 CC  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

**Groups Printed- Cars**

Start Time	Dascomb Road From East			California Products Driveway From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
11:00 AM	172	14	0	17	3	0	5	218	0	429
11:15 AM	178	15	0	13	3	0	3	225	0	437
11:30 AM	166	20	0	9	5	0	1	202	0	403
11:45 AM	178	12	0	16	4	0	7	203	0	420
<b>Total</b>	<b>694</b>	<b>61</b>	<b>0</b>	<b>55</b>	<b>15</b>	<b>0</b>	<b>16</b>	<b>848</b>	<b>0</b>	<b>1689</b>
12:00 PM	162	14	1	14	10	0	4	195	0	400
12:15 PM	164	16	0	13	4	0	3	196	0	396
12:30 PM	159	13	1	15	2	0	6	192	0	388
12:45 PM	191	14	0	13	3	0	4	180	0	405
<b>Total</b>	<b>676</b>	<b>57</b>	<b>2</b>	<b>55</b>	<b>19</b>	<b>0</b>	<b>17</b>	<b>763</b>	<b>0</b>	<b>1589</b>
<b>Grand Total</b>	<b>1370</b>	<b>118</b>	<b>2</b>	<b>110</b>	<b>34</b>	<b>0</b>	<b>33</b>	<b>1611</b>	<b>0</b>	<b>3278</b>
Apprch %	91.9	7.9	0.1	76.4	23.6	0	2	98	0	
Total %	41.8	3.6	0.1	3.4	1	0	1	49.1	0	

Start Time	Dascomb Road From East				California Products Driveway From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	172	14	0	186	17	3	0	20	5	218	0	223	429
11:15 AM	178	15	0	193	13	3	0	16	3	225	0	228	437
11:30 AM	166	20	0	186	9	5	0	14	1	202	0	203	403
11:45 AM	178	12	0	190	16	4	0	20	7	203	0	210	420
<b>Total Volume</b>	<b>694</b>	<b>61</b>	<b>0</b>	<b>755</b>	<b>55</b>	<b>15</b>	<b>0</b>	<b>70</b>	<b>16</b>	<b>848</b>	<b>0</b>	<b>864</b>	<b>1689</b>
<b>% App. Total</b>	<b>91.9</b>	<b>8.1</b>	<b>0</b>		<b>78.6</b>	<b>21.4</b>	<b>0</b>		<b>1.9</b>	<b>98.1</b>	<b>0</b>		
PHF	.975	.763	.000	.978	.809	.750	.000	.875	.571	.942	.000	.947	.966



S: California Products Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 CC  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Groups Printed- Heavy Vehicles

Start Time	Dascomb Road From East			California Products Driveway From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
11:00 AM	7	0	0	1	1	0	0	7	0	16
11:15 AM	7	0	0	1	0	0	0	3	0	11
11:30 AM	8	1	0	0	0	0	0	4	0	13
11:45 AM	5	1	0	0	0	0	0	3	0	9
Total	27	2	0	2	1	0	0	17	0	49
12:00 PM	7	0	0	0	0	0	0	6	0	13
12:15 PM	1	1	0	0	0	0	1	3	0	6
12:30 PM	1	0	0	1	0	0	0	3	0	5
12:45 PM	3	0	0	0	0	0	0	1	0	4
Total	12	1	0	1	0	0	1	13	0	28
Grand Total	39	3	0	3	1	0	1	30	0	77
Apprch %	92.9	7.1	0	75	25	0	3.2	96.8	0	
Total %	50.6	3.9	0	3.9	1.3	0	1.3	39	0	

Start Time	Dascomb Road From East				California Products Driveway From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
11:00 AM	7	0	0	7	1	1	0	2	0	7	0	7	16
11:15 AM	7	0	0	7	1	0	0	1	0	3	0	3	11
11:30 AM	8	1	0	9	0	0	0	0	0	4	0	4	13
11:45 AM	5	1	0	6	0	0	0	0	0	3	0	3	9
Total Volume	27	2	0	29	2	1	0	3	0	17	0	17	49
% App. Total	93.1	6.9	0		66.7	33.3	0		0	100	0		
PHF	.844	.500	.000	.806	.500	.250	.000	.375	.000	.607	.000	.607	.766

Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 11:00 AM

S: California Products Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 CC  
 Site Code : TBA  
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Groups Printed- Peds and Bikes

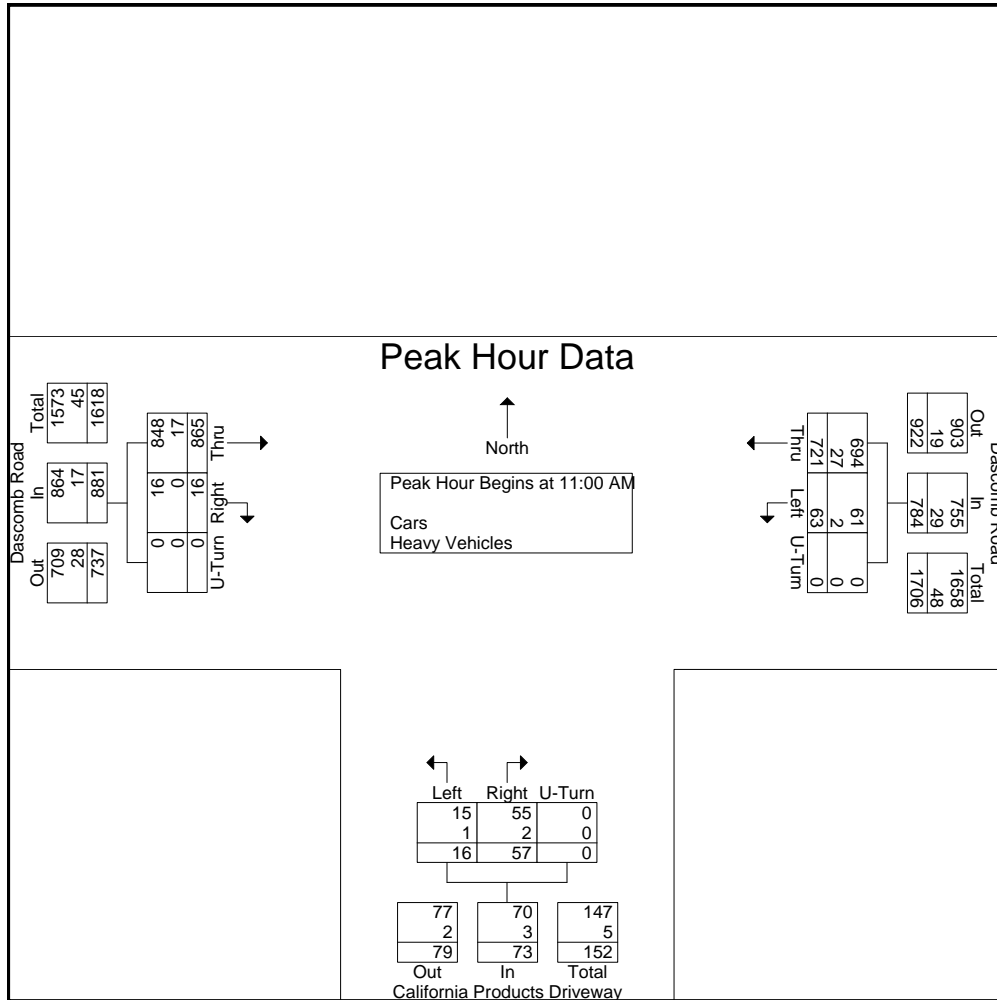
Start Time	Dascomb Road From East				California Products Driveway From South				Dascomb Road From West				Int. Total
	Thru	Left	Peds SB	Peds NB	Right	Left	Peds WB	Peds EB	Right	Thru	Peds NB	Peds SB	
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	1
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	1	0	0	0	0	1
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	1	0	1	0	0	2
Grand Total	0	0	0	0	0	0	0	1	0	1	0	0	2
Apprch %	0	0	0	0	0	0	0	100	0	100	0	0	
Total %	0	0	0	0	0	0	0	50	0	50	0	0	

Start Time	Dascomb Road From East					California Products Driveway From South					Dascomb Road From West					Int. Total
	Thru	Left	Peds SB	Peds NB	App. Total	Right	Left	Peds WB	Peds EB	App. Total	Right	Thru	Peds NB	Peds SB	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1																
Peak Hour for Entire Intersection Begins at 11:45 AM																
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12:30 PM	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	
Total Volume	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	
% App. Total	0	0	0	0	0	0	0	0	100		0	100	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.250	.250	.000	.250	.000	.000	.250	

S: California Products Driveway  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 CC  
 Site Code : TBA  
 Start Date : 10/8/2016  
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Start Time	Dascomb Road From East				California Products Driveway From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	179	14	0	193	18	4	0	22	5	225	0	230	445
11:15 AM	185	15	0	200	14	3	0	17	3	228	0	231	448
11:30 AM	174	21	0	195	9	5	0	14	1	206	0	207	416
11:45 AM	183	13	0	196	16	4	0	20	7	206	0	213	429
Total Volume	721	63	0	784	57	16	0	73	16	865	0	881	1738
% App. Total	92	8	0		78.1	21.9	0		1.8	98.2	0		
PHF	.974	.750	.000	.980	.792	.800	.000	.830	.571	.948	.000	.953	.970
Cars	694	61	0	755	55	15	0	70	16	848	0	864	1689
% Cars	96.3	96.8	0	96.3	96.5	93.8	0	95.9	100	98.0	0	98.1	97.2
Heavy Vehicles	27	2	0	29	2	1	0	3	0	17	0	17	49
% Heavy Vehicles	3.7	3.2	0	3.7	3.5	6.3	0	4.1	0	2.0	0	1.9	2.8



N: Frontage Road  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 D  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Cars - Heavy Vehicles

Start Time	Frontage Road From North			Dascomb Road From East			Dascomb Road From West			Int. Total
	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
07:00 AM	85	48	0	87	121	0	107	73	0	521
07:15 AM	110	51	0	88	111	0	128	96	0	584
07:30 AM	106	43	0	99	141	0	183	104	0	676
07:45 AM	96	54	0	115	170	0	151	108	0	694
Total	397	196	0	389	543	0	569	381	0	2475
08:00 AM	99	43	0	133	138	0	137	76	0	626
08:15 AM	77	54	0	92	167	0	124	106	0	620
08:30 AM	97	50	0	93	141	0	115	71	0	567
08:45 AM	83	60	0	91	116	0	98	45	0	493
Total	356	207	0	409	562	0	474	298	0	2306
Grand Total	753	403	0	798	1105	0	1043	679	0	4781
Apprch %	65.1	34.9	0	41.9	58.1	0	60.6	39.4	0	
Total %	15.7	8.4	0	16.7	23.1	0	21.8	14.2	0	
Cars	695	386	0	791	1050	0	982	638	0	4542
% Cars	92.3	95.8	0	99.1	95	0	94.2	94	0	95
Heavy Vehicles	58	17	0	7	55	0	61	41	0	239
% Heavy Vehicles	7.7	4.2	0	0.9	5	0	5.8	6	0	5

Start Time	Frontage Road From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	106	43	0	149	99	141	0	240	183	104	0	287	676
07:45 AM	96	54	0	150	115	170	0	285	151	108	0	259	694
08:00 AM	99	43	0	142	133	138	0	271	137	76	0	213	626
08:15 AM	77	54	0	131	92	167	0	259	124	106	0	230	620
Total Volume	378	194	0	572	439	616	0	1055	595	394	0	989	2616
% App. Total	66.1	33.9	0		41.6	58.4	0		60.2	39.8	0		
PHF	.892	.898	.000	.953	.825	.906	.000	.925	.813	.912	.000	.861	.942
Cars	350	188	0	538	437	587	0	1024	564	373	0	937	2499
% Cars	92.6	96.9	0	94.1	99.5	95.3	0	97.1	94.8	94.7	0	94.7	95.5
Heavy Vehicles	28	6	0	34	2	29	0	31	31	21	0	52	117
% Heavy Vehicles	7.4	3.1	0	5.9	0.5	4.7	0	2.9	5.2	5.3	0	5.3	4.5

N: Frontage Road  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 D  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Cars

Start Time	Frontage Road From North			Dascomb Road From East			Dascomb Road From West			Int. Total
	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
07:00 AM	80	44	0	85	113	0	102	66	0	490
07:15 AM	102	48	0	88	105	0	117	92	0	552
07:30 AM	97	43	0	99	133	0	177	93	0	642
07:45 AM	89	52	0	115	163	0	140	104	0	663
Total	368	187	0	387	514	0	536	355	0	2347
08:00 AM	94	39	0	132	133	0	128	73	0	599
08:15 AM	70	54	0	91	158	0	119	103	0	595
08:30 AM	91	48	0	92	132	0	108	67	0	538
08:45 AM	72	58	0	89	113	0	91	40	0	463
Total	327	199	0	404	536	0	446	283	0	2195
Grand Total	695	386	0	791	1050	0	982	638	0	4542
Apprch %	64.3	35.7	0	43	57	0	60.6	39.4	0	
Total %	15.3	8.5	0	17.4	23.1	0	21.6	14	0	

Start Time	Frontage Road From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	97	43	0	140	99	133	0	232	177	93	0	270	642
07:45 AM	89	52	0	141	115	163	0	278	140	104	0	244	663
08:00 AM	94	39	0	133	132	133	0	265	128	73	0	201	599
08:15 AM	70	54	0	124	91	158	0	249	119	103	0	222	595
Total Volume	350	188	0	538	437	587	0	1024	564	373	0	937	2499
% App. Total	65.1	34.9	0		42.7	57.3	0		60.2	39.8	0		
PHF	.902	.870	.000	.954	.828	.900	.000	.921	.797	.897	.000	.868	.942

N: Frontage Road  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 D  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Heavy Vehicles

Start Time	Frontage Road From North			Dascomb Road From East			Dascomb Road From West			Int. Total
	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
07:00 AM	5	4	0	2	8	0	5	7	0	31
07:15 AM	8	3	0	0	6	0	11	4	0	32
07:30 AM	9	0	0	0	8	0	6	11	0	34
07:45 AM	7	2	0	0	7	0	11	4	0	31
Total	29	9	0	2	29	0	33	26	0	128
08:00 AM	5	4	0	1	5	0	9	3	0	27
08:15 AM	7	0	0	1	9	0	5	3	0	25
08:30 AM	6	2	0	1	9	0	7	4	0	29
08:45 AM	11	2	0	2	3	0	7	5	0	30
Total	29	8	0	5	26	0	28	15	0	111
Grand Total	58	17	0	7	55	0	61	41	0	239
Apprch %	77.3	22.7	0	11.3	88.7	0	59.8	40.2	0	
Total %	24.3	7.1	0	2.9	23	0	25.5	17.2	0	

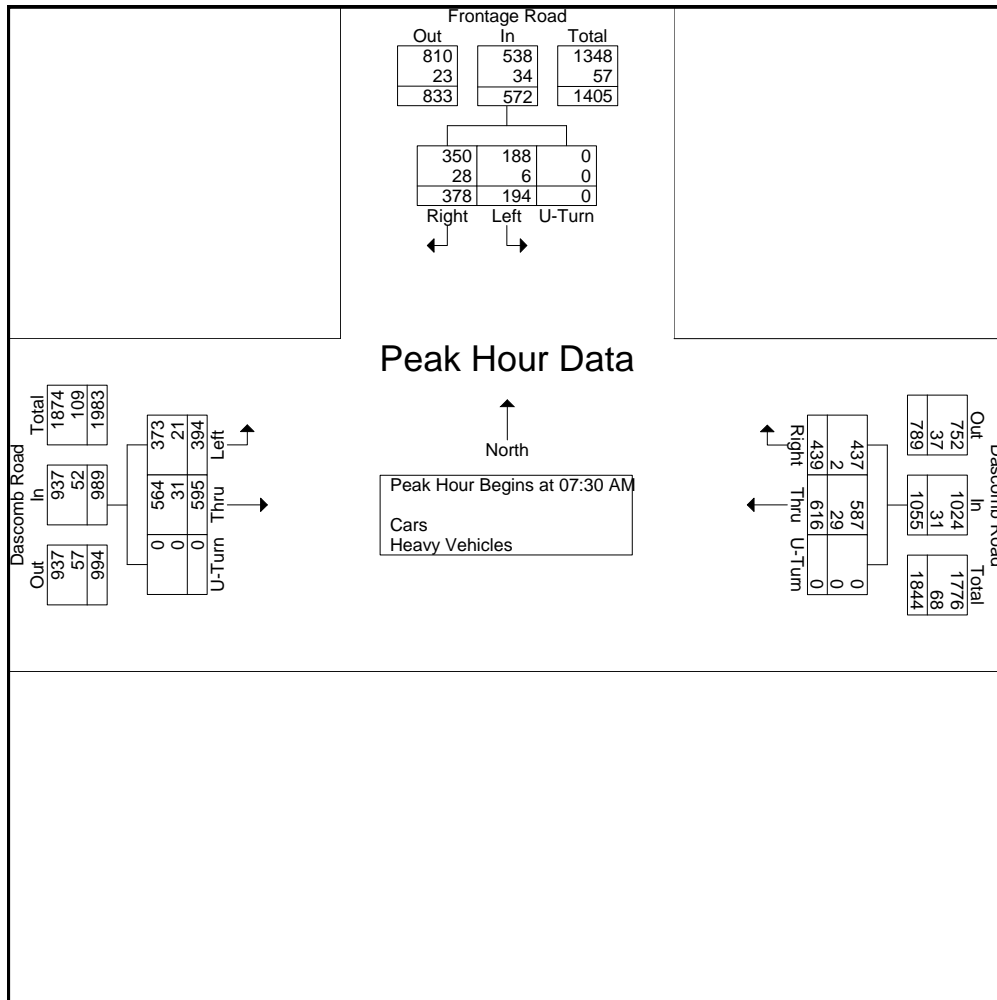
Start Time	Frontage Road From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:00 AM													
07:00 AM	5	4	0	9	2	8	0	10	5	7	0	12	31
07:15 AM	8	3	0	11	0	6	0	6	11	4	0	15	32
07:30 AM	9	0	0	9	0	8	0	8	6	11	0	17	34
07:45 AM	7	2	0	9	0	7	0	7	11	4	0	15	31
Total Volume	29	9	0	38	2	29	0	31	33	26	0	59	128
% App. Total	76.3	23.7	0		6.5	93.5	0		55.9	44.1	0		
PHF	.806	.563	.000	.864	.250	.906	.000	.775	.750	.591	.000	.868	.941



N: Frontage Road  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 D  
 Site Code : TBA  
 Start Date : 10/6/2016  
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Start Time	Frontage Road From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	106	43	0	149	99	141	0	240	183	104	0	287	676
07:45 AM	96	54	0	150	115	170	0	285	151	108	0	259	694
08:00 AM	99	43	0	142	133	138	0	271	137	76	0	213	626
08:15 AM	77	54	0	131	92	167	0	259	124	106	0	230	620
Total Volume	378	194	0	572	439	616	0	1055	595	394	0	989	2616
% App. Total	66.1	33.9	0		41.6	58.4	0		60.2	39.8	0		
PHF	.892	.898	.000	.953	.825	.906	.000	.925	.813	.912	.000	.861	.942
Cars	350	188	0	538	437	587	0	1024	564	373	0	937	2499
% Cars	92.6	96.9	0	94.1	99.5	95.3	0	97.1	94.8	94.7	0	94.7	95.5
Heavy Vehicles	28	6	0	34	2	29	0	31	31	21	0	52	117
% Heavy Vehicles	7.4	3.1	0	5.9	0.5	4.7	0	2.9	5.2	5.3	0	5.3	4.5





N: Frontage Road  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 DD  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Cars - Heavy Vehicles

Start Time	Frontage Road From North			Dascomb Road From East			Dascomb Road From West			Int. Total
	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
04:00 PM	61	50	0	41	155	0	174	94	0	575
04:15 PM	100	61	0	63	154	0	173	91	0	642
04:30 PM	53	53	0	40	166	0	189	94	0	595
04:45 PM	55	57	0	47	176	0	157	79	0	571
Total	269	221	0	191	651	0	693	358	0	2383
05:00 PM	100	74	0	56	147	0	199	95	0	671
05:15 PM	100	64	0	64	175	0	158	85	0	646
05:30 PM	115	44	0	52	199	0	201	83	0	694
05:45 PM	101	55	0	74	163	0	185	82	0	660
Total	416	237	0	246	684	0	743	345	0	2671
Grand Total	685	458	0	437	1335	0	1436	703	0	5054
Apprch %	59.9	40.1	0	24.7	75.3	0	67.1	32.9	0	
Total %	13.6	9.1	0	8.6	26.4	0	28.4	13.9	0	
Cars	659	450	0	432	1302	0	1412	682	0	4937
% Cars	96.2	98.3	0	98.9	97.5	0	98.3	97	0	97.7
Heavy Vehicles	26	8	0	5	33	0	24	21	0	117
% Heavy Vehicles	3.8	1.7	0	1.1	2.5	0	1.7	3	0	2.3

Start Time	Frontage Road From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	100	74	0	174	56	147	0	203	199	95	0	294	671
05:15 PM	100	64	0	164	64	175	0	239	158	85	0	243	646
05:30 PM	115	44	0	159	52	199	0	251	201	83	0	284	694
05:45 PM	101	55	0	156	74	163	0	237	185	82	0	267	660
Total Volume	416	237	0	653	246	684	0	930	743	345	0	1088	2671
% App. Total	63.7	36.3	0		26.5	73.5	0		68.3	31.7	0		
PHF	.904	.801	.000	.938	.831	.859	.000	.926	.924	.908	.000	.925	.962
Cars	405	235	0	640	243	668	0	911	736	336	0	1072	2623
% Cars	97.4	99.2	0	98.0	98.8	97.7	0	98.0	99.1	97.4	0	98.5	98.2
Heavy Vehicles	11	2	0	13	3	16	0	19	7	9	0	16	48
% Heavy Vehicles	2.6	0.8	0	2.0	1.2	2.3	0	2.0	0.9	2.6	0	1.5	1.8

N: Frontage Road  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 DD  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Cars

Start Time	Frontage Road From North			Dascomb Road From East			Dascomb Road From West			Int. Total
	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
04:00 PM	58	47	0	41	148	0	165	90	0	549
04:15 PM	95	59	0	61	151	0	166	91	0	623
04:30 PM	49	52	0	40	161	0	188	90	0	580
04:45 PM	52	57	0	47	174	0	157	75	0	562
Total	254	215	0	189	634	0	676	346	0	2314
05:00 PM	96	73	0	54	143	0	197	94	0	657
05:15 PM	97	64	0	64	172	0	157	82	0	636
05:30 PM	113	44	0	52	195	0	199	79	0	682
05:45 PM	99	54	0	73	158	0	183	81	0	648
Total	405	235	0	243	668	0	736	336	0	2623
Grand Total	659	450	0	432	1302	0	1412	682	0	4937
Apprch %	59.4	40.6	0	24.9	75.1	0	67.4	32.6	0	
Total %	13.3	9.1	0	8.8	26.4	0	28.6	13.8	0	

Start Time	Frontage Road From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	96	73	0	169	54	143	0	197	197	94	0	291	657
05:15 PM	97	64	0	161	64	172	0	236	157	82	0	239	636
05:30 PM	113	44	0	157	52	195	0	247	199	79	0	278	682
05:45 PM	99	54	0	153	73	158	0	231	183	81	0	264	648
Total Volume	405	235	0	640	243	668	0	911	736	336	0	1072	2623
% App. Total	63.3	36.7	0		26.7	73.3	0		68.7	31.3	0		
PHF	.896	.805	.000	.947	.832	.856	.000	.922	.925	.894	.000	.921	.962

N: Frontage Road  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 DD  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Heavy Vehicles

Start Time	Frontage Road From North			Dascomb Road From East			Dascomb Road From West			Int. Total
	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
04:00 PM	3	3	0	0	7	0	9	4	0	26
04:15 PM	5	2	0	2	3	0	7	0	0	19
04:30 PM	4	1	0	0	5	0	1	4	0	15
04:45 PM	3	0	0	0	2	0	0	4	0	9
Total	15	6	0	2	17	0	17	12	0	69
05:00 PM	4	1	0	2	4	0	2	1	0	14
05:15 PM	3	0	0	0	3	0	1	3	0	10
05:30 PM	2	0	0	0	4	0	2	4	0	12
05:45 PM	2	1	0	1	5	0	2	1	0	12
Total	11	2	0	3	16	0	7	9	0	48
Grand Total	26	8	0	5	33	0	24	21	0	117
Apprch %	76.5	23.5	0	13.2	86.8	0	53.3	46.7	0	
Total %	22.2	6.8	0	4.3	28.2	0	20.5	17.9	0	

Start Time	Frontage Road From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
04:00 PM	3	3	0	6	0	7	0	7	9	4	0	13	26
04:15 PM	5	2	0	7	2	3	0	5	7	0	0	7	19
04:30 PM	4	1	0	5	0	5	0	5	1	4	0	5	15
04:45 PM	3	0	0	3	0	2	0	2	0	4	0	4	9
Total Volume	15	6	0	21	2	17	0	19	17	12	0	29	69
% App. Total	71.4	28.6	0		10.5	89.5	0		58.6	41.4	0		
PHF	.750	.500	.000	.750	.250	.607	.000	.679	.472	.750	.000	.558	.663

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

N: Frontage Road  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 DD  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Peds and Bikes

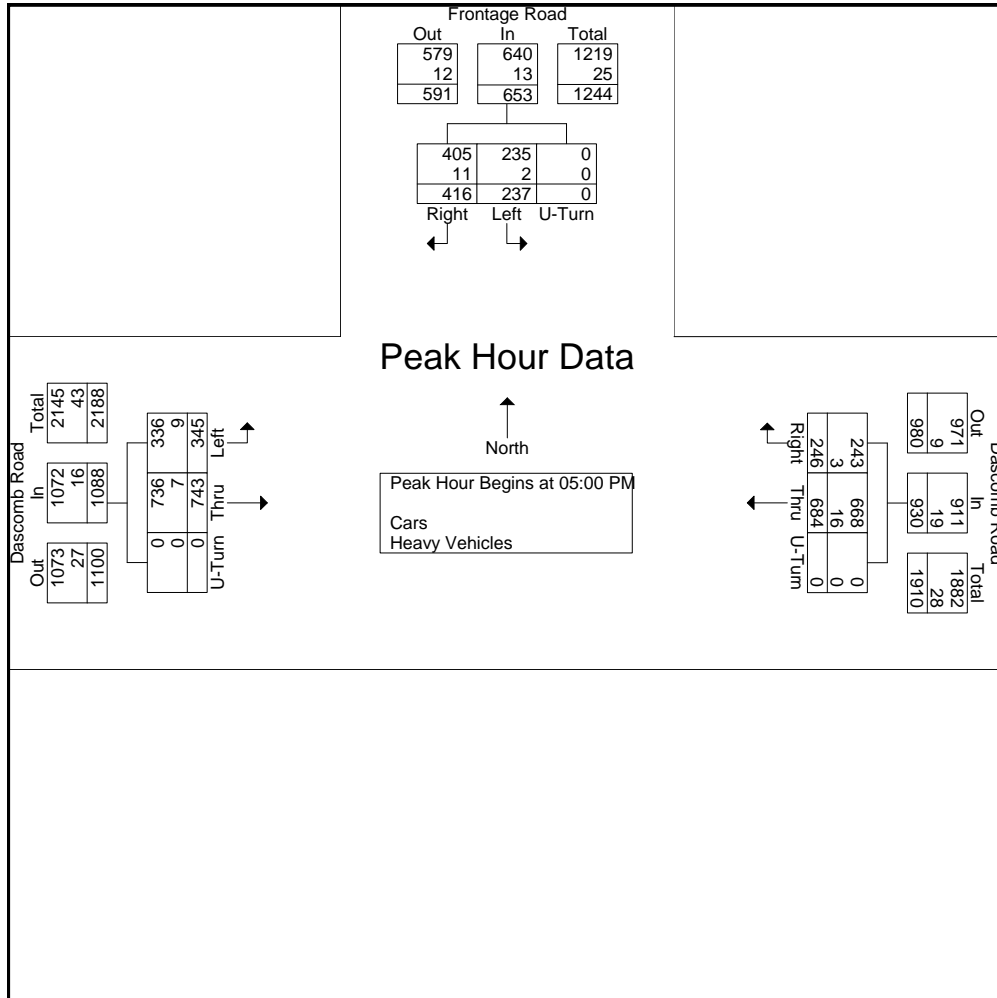
Start Time	Frontage Road From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	Peds EB	Peds WB	Right	Thru	Peds SB	Peds NB	Thru	Left	Peds NB	Peds SB	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	1	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	1	0	0	1	0	0	0	2	0	0	0	4
Total	0	1	0	0	1	0	0	0	3	0	0	0	5
Grand Total	0	1	0	0	1	0	0	0	3	0	0	0	5
Apprch %	0	100	0	0	100	0	0	0	100	0	0	0	
Total %	0	20	0	0	20	0	0	0	60	0	0	0	

Start Time	Frontage Road From North					Dascomb Road From East					Dascomb Road From West					Int. Total
	Right	Left	Peds EB	Peds WB	App. Total	Right	Thru	Peds SB	Peds NB	App. Total	Thru	Left	Peds NB	Peds SB	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																
Peak Hour for Entire Intersection Begins at 05:00 PM																
05:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
05:45 PM	0	1	0	0	1	1	0	0	0	1	2	0	0	0	2	
Total Volume	0	1	0	0	1	1	0	0	0	1	3	0	0	0	3	
% App. Total	0	100	0	0		100	0	0	0		100	0	0	0		
PHF	.000	.250	.000	.000	.250	.250	.000	.000	.000	.250	.375	.000	.000	.000	.375	

N: Frontage Road  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 DD  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Start Time	Frontage Road From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	100	74	0	174	56	147	0	203	199	95	0	294	671
05:15 PM	100	64	0	164	64	175	0	239	158	85	0	243	646
05:30 PM	115	44	0	159	52	199	0	251	201	83	0	284	694
05:45 PM	101	55	0	156	74	163	0	237	185	82	0	267	660
Total Volume	416	237	0	653	246	684	0	930	743	345	0	1088	2671
% App. Total	63.7	36.3	0		26.5	73.5	0		68.3	31.7	0		
PHF	.904	.801	.000	.938	.831	.859	.000	.926	.924	.908	.000	.925	.962
Cars	405	235	0	640	243	668	0	911	736	336	0	1072	2623
% Cars	97.4	99.2	0	98.0	98.8	97.7	0	98.0	99.1	97.4	0	98.5	98.2
Heavy Vehicles	11	2	0	13	3	16	0	19	7	9	0	16	48
% Heavy Vehicles	2.6	0.8	0	2.0	1.2	2.3	0	2.0	0.9	2.6	0	1.5	1.8



N: Frontage Road  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 DDD  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Groups Printed- Cars - Heavy Vehicles

Start Time	Frontage Road From North			Dascomb Road From East			Dascomb Road From West			Int. Total
	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
11:00 AM	82	19	0	54	111	0	160	82	0	508
11:15 AM	89	15	0	42	104	0	168	73	0	491
11:30 AM	87	21	0	37	101	0	138	79	0	463
11:45 AM	82	19	0	34	112	0	133	89	0	469
Total	340	74	0	167	428	0	599	323	0	1931
12:00 PM	70	26	0	37	117	0	148	63	0	461
12:15 PM	74	19	0	50	106	0	152	61	0	462
12:30 PM	72	26	0	45	103	0	141	77	0	464
12:45 PM	86	16	0	46	125	0	138	57	0	468
Total	302	87	0	178	451	0	579	258	0	1855
Grand Total	642	161	0	345	879	0	1178	581	0	3786
Apprch %	80	20	0	28.2	71.8	0	67	33	0	
Total %	17	4.3	0	9.1	23.2	0	31.1	15.3	0	
Cars	620	160	0	341	860	0	1162	566	0	3709
% Cars	96.6	99.4	0	98.8	97.8	0	98.6	97.4	0	98
Heavy Vehicles	22	1	0	4	19	0	16	15	0	77
% Heavy Vehicles	3.4	0.6	0	1.2	2.2	0	1.4	2.6	0	2

Start Time	Frontage Road From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	82	19	0	101	54	111	0	165	160	82	0	242	508
11:15 AM	89	15	0	104	42	104	0	146	168	73	0	241	491
11:30 AM	87	21	0	108	37	101	0	138	138	79	0	217	463
11:45 AM	82	19	0	101	34	112	0	146	133	89	0	222	469
Total Volume	340	74	0	414	167	428	0	595	599	323	0	922	1931
% App. Total	82.1	17.9	0		28.1	71.9	0		65	35	0		
PHF	.955	.881	.000	.958	.773	.955	.000	.902	.891	.907	.000	.952	.950
Cars	323	73	0	396	165	418	0	583	591	314	0	905	1884
% Cars	95.0	98.6	0	95.7	98.8	97.7	0	98.0	98.7	97.2	0	98.2	97.6
Heavy Vehicles	17	1	0	18	2	10	0	12	8	9	0	17	47
% Heavy Vehicles	5.0	1.4	0	4.3	1.2	2.3	0	2.0	1.3	2.8	0	1.8	2.4

N: Frontage Road  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 DDD  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

**Groups Printed- Cars**

Start Time	Frontage Road From North			Dascomb Road From East			Dascomb Road From West			Int. Total
	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
11:00 AM	78	19	0	53	108	0	158	79	0	495
11:15 AM	85	15	0	42	101	0	166	70	0	479
11:30 AM	81	21	0	36	99	0	136	77	0	450
11:45 AM	79	18	0	34	110	0	131	88	0	460
<b>Total</b>	<b>323</b>	<b>73</b>	<b>0</b>	<b>165</b>	<b>418</b>	<b>0</b>	<b>591</b>	<b>314</b>	<b>0</b>	<b>1884</b>
12:00 PM	68	26	0	36	111	0	145	60	0	446
12:15 PM	73	19	0	50	105	0	152	59	0	458
12:30 PM	72	26	0	44	102	0	136	77	0	457
12:45 PM	84	16	0	46	124	0	138	56	0	464
<b>Total</b>	<b>297</b>	<b>87</b>	<b>0</b>	<b>176</b>	<b>442</b>	<b>0</b>	<b>571</b>	<b>252</b>	<b>0</b>	<b>1825</b>
<b>Grand Total</b>	<b>620</b>	<b>160</b>	<b>0</b>	<b>341</b>	<b>860</b>	<b>0</b>	<b>1162</b>	<b>566</b>	<b>0</b>	<b>3709</b>
Apprch %	79.5	20.5	0	28.4	71.6	0	67.2	32.8	0	
Total %	16.7	4.3	0	9.2	23.2	0	31.3	15.3	0	

Start Time	Frontage Road From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	78	19	0	97	53	108	0	161	158	79	0	237	495
11:15 AM	85	15	0	100	42	101	0	143	166	70	0	236	479
11:30 AM	81	21	0	102	36	99	0	135	136	77	0	213	450
11:45 AM	79	18	0	97	34	110	0	144	131	88	0	219	460
<b>Total Volume</b>	<b>323</b>	<b>73</b>	<b>0</b>	<b>396</b>	<b>165</b>	<b>418</b>	<b>0</b>	<b>583</b>	<b>591</b>	<b>314</b>	<b>0</b>	<b>905</b>	<b>1884</b>
<b>% App. Total</b>	<b>81.6</b>	<b>18.4</b>	<b>0</b>		<b>28.3</b>	<b>71.7</b>	<b>0</b>		<b>65.3</b>	<b>34.7</b>	<b>0</b>		
PHF	.950	.869	.000	.971	.778	.950	.000	.905	.890	.892	.000	.955	.952

N: Frontage Road  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 DDD  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Groups Printed- Heavy Vehicles

Start Time	Frontage Road From North			Dascomb Road From East			Dascomb Road From West			Int. Total
	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
11:00 AM	4	0	0	1	3	0	2	3	0	13
11:15 AM	4	0	0	0	3	0	2	3	0	12
11:30 AM	6	0	0	1	2	0	2	2	0	13
11:45 AM	3	1	0	0	2	0	2	1	0	9
Total	17	1	0	2	10	0	8	9	0	47
12:00 PM	2	0	0	1	6	0	3	3	0	15
12:15 PM	1	0	0	0	1	0	0	2	0	4
12:30 PM	0	0	0	1	1	0	5	0	0	7
12:45 PM	2	0	0	0	1	0	0	1	0	4
Total	5	0	0	2	9	0	8	6	0	30
Grand Total	22	1	0	4	19	0	16	15	0	77
Apprch %	95.7	4.3	0	17.4	82.6	0	51.6	48.4	0	
Total %	28.6	1.3	0	5.2	24.7	0	20.8	19.5	0	

Start Time	Frontage Road From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:15 AM													
11:15 AM	4	0	0	4	0	3	0	3	2	3	0	5	12
11:30 AM	6	0	0	6	1	2	0	3	2	2	0	4	13
11:45 AM	3	1	0	4	0	2	0	2	2	1	0	3	9
12:00 PM	2	0	0	2	1	6	0	7	3	3	0	6	15
Total Volume	15	1	0	16	2	13	0	15	9	9	0	18	49
% App. Total	93.8	6.2	0		13.3	86.7	0		50	50	0		
PHF	.625	.250	.000	.667	.500	.542	.000	.536	.750	.750	.000	.750	.817



N: Frontage Road  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 DDD  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Groups Printed- Peds and Bikes

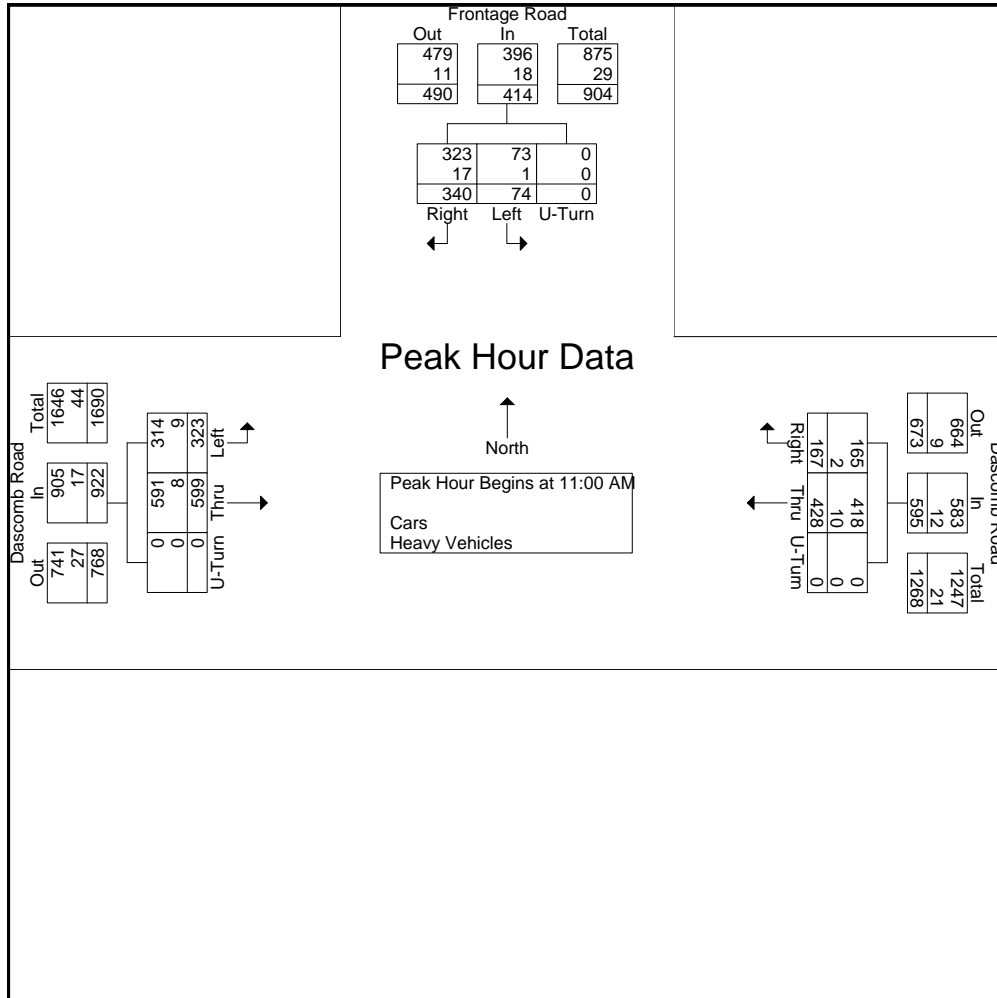
Start Time	Frontage Road From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	Peds EB	Peds WB	Right	Thru	Peds SB	Peds NB	Thru	Left	Peds NB	Peds SB	
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	1	0	0	0	1
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	1	0	0	0	1
Grand Total	0	0	0	0	0	0	0	0	1	0	0	0	1
Apprch %	0	0	0	0	0	0	0	0	100	0	0	0	
Total %	0	0	0	0	0	0	0	0	100	0	0	0	

Start Time	Frontage Road From North					Dascomb Road From East					Dascomb Road From West					Int. Total
	Right	Left	Peds EB	Peds WB	App. Total	Right	Thru	Peds SB	Peds NB	App. Total	Thru	Left	Peds NB	Peds SB	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1																
Peak Hour for Entire Intersection Begins at 11:15 AM																
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
Total Volume	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
% App. Total	0	0	0	0	0	0	0	0	0	0	100	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.000	.000	.250	

N: Frontage Road  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 DDD  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Start Time	Frontage Road From North				Dascomb Road From East				Dascomb Road From West				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	82	19	0	101	54	111	0	165	160	82	0	242	508
11:15 AM	89	15	0	104	42	104	0	146	168	73	0	241	491
11:30 AM	87	21	0	108	37	101	0	138	138	79	0	217	463
11:45 AM	82	19	0	101	34	112	0	146	133	89	0	222	469
Total Volume	340	74	0	414	167	428	0	595	599	323	0	922	1931
% App. Total	82.1	17.9	0		28.1	71.9	0		65	35	0		
PHF	.955	.881	.000	.958	.773	.955	.000	.902	.891	.907	.000	.952	.950
Cars	323	73	0	396	165	418	0	583	591	314	0	905	1884
% Cars	95.0	98.6	0	95.7	98.8	97.7	0	98.0	98.7	97.2	0	98.2	97.6
Heavy Vehicles	17	1	0	18	2	10	0	12	8	9	0	17	47
% Heavy Vehicles	5.0	1.4	0	4.3	1.2	2.3	0	2.0	1.3	2.8	0	1.8	2.4



S: I-93 NB Ramps  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 E  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Cars - Heavy Vehicles

Start Time	Dascomb Road From East			I-93 NB Ramps From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
07:00 AM	115	14	0	26	102	0	70	81	0	408
07:15 AM	112	23	0	30	88	0	78	104	0	435
07:30 AM	149	23	0	25	92	0	117	111	0	517
07:45 AM	172	14	0	40	108	0	91	111	0	536
Total	548	74	0	121	390	0	356	407	0	1896
08:00 AM	165	14	0	42	112	1	81	100	0	515
08:15 AM	154	23	0	53	98	1	82	100	0	511
08:30 AM	147	27	0	37	95	0	72	93	0	471
08:45 AM	128	29	0	27	70	0	71	85	0	410
Total	594	93	0	159	375	2	306	378	0	1907
09:00 AM	99	14	0	29	93	0	73	78	0	386
09:15 AM	80	24	0	21	82	0	56	60	0	323
09:30 AM	83	11	0	21	66	0	85	49	0	315
09:45 AM	75	17	0	28	60	0	58	46	0	284
Total	337	66	0	99	301	0	272	233	0	1308
10:00 AM	81	13	0	10	66	0	73	40	0	283
10:15 AM	84	19	0	13	67	0	66	31	0	280
10:30 AM	62	9	0	28	68	0	60	36	0	263
10:45 AM	64	16	0	23	48	0	85	50	0	286
Total	291	57	0	74	249	0	284	157	0	1112
11:00 AM	56	6	0	21	61	0	57	56	0	257
11:15 AM	69	9	0	20	58	0	84	49	0	289
11:30 AM	58	13	0	19	58	0	92	43	0	283
11:45 AM	65	14	0	34	76	0	84	70	0	343
Total	248	42	0	94	253	0	317	218	0	1172
12:00 PM	62	17	0	34	60	1	81	44	0	299
12:15 PM	74	15	0	39	79	0	56	48	0	311
12:30 PM	64	13	0	27	80	0	63	48	0	295
12:45 PM	45	18	0	35	75	1	70	57	0	301
Total	245	63	0	135	294	2	270	197	0	1206
01:00 PM	72	25	0	34	67	1	60	57	0	316
01:15 PM	64	22	0	39	96	0	82	61	0	364
01:30 PM	62	14	0	41	68	0	93	60	0	338
01:45 PM	52	18	0	33	84	0	81	55	0	323
Total	250	79	0	147	315	1	316	233	0	1341
02:00 PM	81	24	0	34	85	1	91	68	0	384
02:15 PM	80	30	0	25	77	1	97	68	0	378
02:30 PM	99	40	0	25	60	0	132	80	0	436
02:45 PM	95	51	0	26	87	0	114	76	0	449
Total	355	145	0	110	309	2	434	292	0	1647
03:00 PM	103	55	0	45	90	0	146	82	0	521
03:15 PM	110	45	0	48	97	0	134	72	0	506
03:30 PM	100	46	0	30	95	0	175	78	0	524
03:45 PM	97	25	0	58	100	0	113	83	0	476
Total	410	171	0	181	382	0	568	315	0	2027
04:00 PM	92	28	0	52	110	0	128	93	0	503
04:15 PM	127	17	0	45	100	0	113	115	0	517
04:30 PM	116	27	0	81	91	0	122	123	0	560
04:45 PM	122	19	0	82	111	0	98	114	0	546
Total	457	91	0	260	412	0	461	445	0	2126

S: I-93 NB Ramps  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 E  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 2

Groups Printed- Cars - Heavy Vehicles

Start Time	Dascomb Road From East			I-93 NB Ramps From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
05:00 PM	103	27	0	80	104	0	133	139	0	586
05:15 PM	138	24	0	82	95	0	90	134	0	563
05:30 PM	156	21	0	96	93	0	109	131	0	606
05:45 PM	155	22	0	91	78	0	100	148	0	594
Total	552	94	0	349	370	0	432	552	0	2349
06:00 PM	111	15	0	117	120	1	97	106	0	567
06:15 PM	104	18	0	69	104	1	94	112	0	502
06:30 PM	87	17	0	55	119	0	98	99	0	475
06:45 PM	73	19	0	64	90	0	78	87	0	411
Total	375	69	0	305	433	2	367	404	0	1955
Grand Total	4662	1044	0	2034	4083	9	4383	3831	0	20046
Apprch %	81.7	18.3	0	33.2	66.7	0.1	53.4	46.6	0	
Total %	23.3	5.2	0	10.1	20.4	0	21.9	19.1	0	
Cars	4566	1003	0	2004	3800	9	4084	3725	0	19191
% Cars	97.9	96.1	0	98.5	93.1	100	93.2	97.2	0	95.7
Heavy Vehicles	96	41	0	30	283	0	299	106	0	855
% Heavy Vehicles	2.1	3.9	0	1.5	6.9	0	6.8	2.8	0	4.3

Start Time	Dascomb Road From East			App. Total	I-93 NB Ramps From South			App. Total	Dascomb Road From West			App. Total	Int. Total
	Thru	Left	U-Turn		Right	Left	U-Turn		Right	Thru	U-Turn		
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	149	23	0	172	25	92	0	117	117	111	0	228	517
07:45 AM	172	14	0	186	40	108	0	148	91	111	0	202	536
08:00 AM	165	14	0	179	42	112	1	155	81	100	0	181	515
08:15 AM	154	23	0	177	53	98	1	152	82	100	0	182	511
Total Volume	640	74	0	714	160	410	2	572	371	422	0	793	2079
% App. Total	89.6	10.4	0		28	71.7	0.3		46.8	53.2	0		
PHF	.930	.804	.000	.960	.755	.915	.500	.923	.793	.950	.000	.870	.970
Cars	628	72	0	700	155	385	2	542	345	413	0	758	2000
% Cars	98.1	97.3	0	98.0	96.9	93.9	100	94.8	93.0	97.9	0	95.6	96.2
Heavy Vehicles	12	2	0	14	5	25	0	30	26	9	0	35	79
% Heavy Vehicles	1.9	2.7	0	2.0	3.1	6.1	0	5.2	7.0	2.1	0	4.4	3.8

Start Time	Dascomb Road From East			App. Total	I-93 NB Ramps From South			App. Total	Dascomb Road From West			App. Total	Int. Total
	Thru	Left	U-Turn		Right	Left	U-Turn		Right	Thru	U-Turn		
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 01:00 PM													
01:00 PM	72	25	0	97	34	67	1	102	60	57	0	117	316
01:15 PM	64	22	0	86	39	96	0	135	82	61	0	143	364
01:30 PM	62	14	0	76	41	68	0	109	93	60	0	153	338
01:45 PM	52	18	0	70	33	84	0	117	81	55	0	136	323
Total Volume	250	79	0	329	147	315	1	463	316	233	0	549	1341
% App. Total	76	24	0		31.7	68	0.2		57.6	42.4	0		
PHF	.868	.790	.000	.848	.896	.820	.250	.857	.849	.955	.000	.897	.921
Cars	242	74	0	316	144	290	1	435	288	224	0	512	1263
% Cars	96.8	93.7	0	96.0	98.0	92.1	100	94.0	91.1	96.1	0	93.3	94.2
Heavy Vehicles	8	5	0	13	3	25	0	28	28	9	0	37	78
% Heavy Vehicles	3.2	6.3	0	4.0	2.0	7.9	0	6.0	8.9	3.9	0	6.7	5.8

S: I-93 NB Ramps  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 E  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 3

Start Time	Dascomb Road From East				I-93 NB Ramps From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	103	27	0	130	80	104	0	184	133	139	0	272	586
05:15 PM	138	24	0	162	82	95	0	177	90	134	0	224	563
05:30 PM	156	21	0	177	96	93	0	189	109	131	0	240	606
05:45 PM	155	22	0	177	91	78	0	169	100	148	0	248	594
Total Volume	552	94	0	646	349	370	0	719	432	552	0	984	2349
% App. Total	85.4	14.6	0		48.5	51.5	0		43.9	56.1	0		
PHF	.885	.870	.000	.912	.909	.889	.000	.951	.812	.932	.000	.904	.969
Cars	546	91	0	637	349	363	0	712	427	545	0	972	2321
% Cars	98.9	96.8	0	98.6	100	98.1	0	99.0	98.8	98.7	0	98.8	98.8
Heavy Vehicles	6	3	0	9	0	7	0	7	5	7	0	12	28
% Heavy Vehicles	1.1	3.2	0	1.4	0	1.9	0	1.0	1.2	1.3	0	1.2	1.2

S: I-93 NB Ramps  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 E  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Cars

Start Time	Dascomb Road From East			I-93 NB Ramps From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
07:00 AM	113	14	0	26	94	0	66	79	0	392
07:15 AM	110	23	0	28	84	0	71	99	0	415
07:30 AM	146	23	0	25	87	0	112	109	0	502
07:45 AM	171	14	0	39	102	0	82	109	0	517
Total	540	74	0	118	367	0	331	396	0	1826
08:00 AM	161	12	0	40	108	1	74	95	0	491
08:15 AM	150	23	0	51	88	1	77	100	0	490
08:30 AM	145	24	0	36	87	0	65	91	0	448
08:45 AM	127	27	0	26	66	0	64	84	0	394
Total	583	86	0	153	349	2	280	370	0	1823
09:00 AM	98	13	0	28	80	0	62	72	0	353
09:15 AM	78	20	0	20	71	0	54	56	0	299
09:30 AM	83	11	0	21	59	0	72	44	0	290
09:45 AM	73	17	0	25	52	0	48	42	0	257
Total	332	61	0	94	262	0	236	214	0	1199
10:00 AM	80	12	0	9	56	0	63	37	0	257
10:15 AM	80	18	0	12	59	0	54	31	0	254
10:30 AM	61	9	0	27	61	0	52	33	0	243
10:45 AM	59	16	0	23	41	0	75	49	0	263
Total	280	55	0	71	217	0	244	150	0	1017
11:00 AM	54	6	0	21	57	0	50	54	0	242
11:15 AM	65	9	0	20	51	0	72	49	0	266
11:30 AM	56	12	0	19	54	0	85	41	0	267
11:45 AM	63	13	0	34	65	0	77	68	0	320
Total	238	40	0	94	227	0	284	212	0	1095
12:00 PM	59	17	0	34	54	1	75	43	0	283
12:15 PM	73	15	0	38	70	0	51	46	0	293
12:30 PM	62	13	0	27	73	0	55	45	0	275
12:45 PM	44	18	0	34	67	1	61	55	0	280
Total	238	63	0	133	264	2	242	189	0	1131
01:00 PM	72	25	0	34	62	1	55	54	0	303
01:15 PM	61	19	0	38	92	0	76	59	0	345
01:30 PM	60	12	0	39	62	0	83	57	0	313
01:45 PM	49	18	0	33	74	0	74	54	0	302
Total	242	74	0	144	290	1	288	224	0	1263
02:00 PM	79	24	0	33	78	1	79	66	0	360
02:15 PM	79	28	0	24	74	1	91	67	0	364
02:30 PM	98	39	0	25	54	0	123	77	0	416
02:45 PM	91	50	0	26	74	0	108	76	0	425
Total	347	141	0	108	280	2	401	286	0	1565
03:00 PM	101	53	0	43	85	0	135	82	0	499
03:15 PM	107	43	0	46	86	0	131	69	0	482
03:30 PM	96	43	0	30	88	0	171	75	0	503
03:45 PM	94	22	0	58	96	0	108	80	0	458
Total	398	161	0	177	355	0	545	306	0	1942
04:00 PM	91	28	0	52	105	0	120	90	0	486
04:15 PM	125	16	0	45	97	0	110	107	0	500
04:30 PM	114	26	0	81	87	0	121	121	0	550
04:45 PM	121	18	0	82	109	0	98	114	0	542
Total	451	88	0	260	398	0	449	432	0	2078

S: I-93 NB Ramps  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 E  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 2

Groups Printed- Cars

Start Time	Dascomb Road From East			I-93 NB Ramps From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
05:00 PM	102	27	0	80	100	0	131	137	0	577
05:15 PM	135	24	0	82	95	0	90	133	0	559
05:30 PM	155	20	0	96	92	0	107	130	0	600
05:45 PM	154	20	0	91	76	0	99	145	0	585
Total	546	91	0	349	363	0	427	545	0	2321
06:00 PM	111	15	0	116	117	1	93	105	0	558
06:15 PM	103	18	0	69	104	1	89	110	0	494
06:30 PM	86	17	0	54	117	0	98	99	0	471
06:45 PM	71	19	0	64	90	0	77	87	0	408
Total	371	69	0	303	428	2	357	401	0	1931
Grand Total	4566	1003	0	2004	3800	9	4084	3725	0	19191
Apprch %	82	18	0	34.5	65.4	0.2	52.3	47.7	0	
Total %	23.8	5.2	0	10.4	19.8	0	21.3	19.4	0	

Start Time	Dascomb Road From East				I-93 NB Ramps From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	146	23	0	169	25	87	0	112	112	109	0	221	502
07:45 AM	171	14	0	185	39	102	0	141	82	109	0	191	517
08:00 AM	161	12	0	173	40	108	1	149	74	95	0	169	491
08:15 AM	150	23	0	173	51	88	1	140	77	100	0	177	490
Total Volume	628	72	0	700	155	385	2	542	345	413	0	758	2000
% App. Total	89.7	10.3	0		28.6	71	0.4		45.5	54.5	0		
PHF	.918	.783	.000	.946	.760	.891	.500	.909	.770	.947	.000	.857	.967

Start Time	Dascomb Road From East				I-93 NB Ramps From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 01:00 PM													
01:00 PM	72	25	0	97	34	62	1	97	55	54	0	109	303
01:15 PM	61	19	0	80	38	92	0	130	76	59	0	135	345
01:30 PM	60	12	0	72	39	62	0	101	83	57	0	140	313
01:45 PM	49	18	0	67	33	74	0	107	74	54	0	128	302
Total Volume	242	74	0	316	144	290	1	435	288	224	0	512	1263
% App. Total	76.6	23.4	0		33.1	66.7	0.2		56.2	43.8	0		
PHF	.840	.740	.000	.814	.923	.788	.250	.837	.867	.949	.000	.914	.915

Start Time	Dascomb Road From East				I-93 NB Ramps From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	102	27	0	129	80	100	0	180	131	137	0	268	577
05:15 PM	135	24	0	159	82	95	0	177	90	133	0	223	559
05:30 PM	155	20	0	175	96	92	0	188	107	130	0	237	600
05:45 PM	154	20	0	174	91	76	0	167	99	145	0	244	585
Total Volume	546	91	0	637	349	363	0	712	427	545	0	972	2321
% App. Total	85.7	14.3	0		49	51	0		43.9	56.1	0		
PHF	.881	.843	.000	.910	.909	.908	.000	.947	.815	.940	.000	.907	.967

S: I-93 NB Ramps  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 E  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Heavy Vehicles

Start Time	Dascomb Road From East			I-93 NB Ramps From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
07:00 AM	2	0	0	0	8	0	4	2	0	16
07:15 AM	2	0	0	2	4	0	7	5	0	20
07:30 AM	3	0	0	0	5	0	5	2	0	15
07:45 AM	1	0	0	1	6	0	9	2	0	19
Total	8	0	0	3	23	0	25	11	0	70
08:00 AM	4	2	0	2	4	0	7	5	0	24
08:15 AM	4	0	0	2	10	0	5	0	0	21
08:30 AM	2	3	0	1	8	0	7	2	0	23
08:45 AM	1	2	0	1	4	0	7	1	0	16
Total	11	7	0	6	26	0	26	8	0	84
09:00 AM	1	1	0	1	13	0	11	6	0	33
09:15 AM	2	4	0	1	11	0	2	4	0	24
09:30 AM	0	0	0	0	7	0	13	5	0	25
09:45 AM	2	0	0	3	8	0	10	4	0	27
Total	5	5	0	5	39	0	36	19	0	109
10:00 AM	1	1	0	1	10	0	10	3	0	26
10:15 AM	4	1	0	1	8	0	12	0	0	26
10:30 AM	1	0	0	1	7	0	8	3	0	20
10:45 AM	5	0	0	0	7	0	10	1	0	23
Total	11	2	0	3	32	0	40	7	0	95
11:00 AM	2	0	0	0	4	0	7	2	0	15
11:15 AM	4	0	0	0	7	0	12	0	0	23
11:30 AM	2	1	0	0	4	0	7	2	0	16
11:45 AM	2	1	0	0	11	0	7	2	0	23
Total	10	2	0	0	26	0	33	6	0	77
12:00 PM	3	0	0	0	6	0	6	1	0	16
12:15 PM	1	0	0	1	9	0	5	2	0	18
12:30 PM	2	0	0	0	7	0	8	3	0	20
12:45 PM	1	0	0	1	8	0	9	2	0	21
Total	7	0	0	2	30	0	28	8	0	75
01:00 PM	0	0	0	0	5	0	5	3	0	13
01:15 PM	3	3	0	1	4	0	6	2	0	19
01:30 PM	2	2	0	2	6	0	10	3	0	25
01:45 PM	3	0	0	0	10	0	7	1	0	21
Total	8	5	0	3	25	0	28	9	0	78
02:00 PM	2	0	0	1	7	0	12	2	0	24
02:15 PM	1	2	0	1	3	0	6	1	0	14
02:30 PM	1	1	0	0	6	0	9	3	0	20
02:45 PM	4	1	0	0	13	0	6	0	0	24
Total	8	4	0	2	29	0	33	6	0	82
03:00 PM	2	2	0	2	5	0	11	0	0	22
03:15 PM	3	2	0	2	11	0	3	3	0	24
03:30 PM	4	3	0	0	7	0	4	3	0	21
03:45 PM	3	3	0	0	4	0	5	3	0	18
Total	12	10	0	4	27	0	23	9	0	85
04:00 PM	1	0	0	0	5	0	8	3	0	17
04:15 PM	2	1	0	0	3	0	3	8	0	17
04:30 PM	2	1	0	0	4	0	1	2	0	10
04:45 PM	1	1	0	0	2	0	0	0	0	4
Total	6	3	0	0	14	0	12	13	0	48



S: I-93 NB Ramps  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 E  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 2

Groups Printed- Heavy Vehicles

Start Time	Dascomb Road From East			I-93 NB Ramps From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
05:00 PM	1	0	0	0	4	0	2	2	0	9
05:15 PM	3	0	0	0	0	0	0	1	0	4
05:30 PM	1	1	0	0	1	0	2	1	0	6
05:45 PM	1	2	0	0	2	0	1	3	0	9
Total	6	3	0	0	7	0	5	7	0	28
06:00 PM	0	0	0	1	3	0	4	1	0	9
06:15 PM	1	0	0	0	0	0	5	2	0	8
06:30 PM	1	0	0	1	2	0	0	0	0	4
06:45 PM	2	0	0	0	0	0	1	0	0	3
Total	4	0	0	2	5	0	10	3	0	24
Grand Total	96	41	0	30	283	0	299	106	0	855
Apprch %	70.1	29.9	0	9.6	90.4	0	73.8	26.2	0	
Total %	11.2	4.8	0	3.5	33.1	0	35	12.4	0	

Start Time	Dascomb Road From East				I-93 NB Ramps From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 09:00 AM													
09:00 AM	1	1	0	2	1	13	0	14	11	6	0	17	33
09:15 AM	2	4	0	6	1	11	0	12	2	4	0	6	24
09:30 AM	0	0	0	0	0	7	0	7	13	5	0	18	25
09:45 AM	2	0	0	2	3	8	0	11	10	4	0	14	27
Total Volume	5	5	0	10	5	39	0	44	36	19	0	55	109
% App. Total	50	50	0		11.4	88.6	0		65.5	34.5	0		
PHF	.625	.313	.000	.417	.417	.750	.000	.786	.692	.792	.000	.764	.826

Start Time	Dascomb Road From East				I-93 NB Ramps From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 10:00 AM													
10:00 AM	1	1	0	2	1	10	0	11	10	3	0	13	26
10:15 AM	4	1	0	5	1	8	0	9	12	0	0	12	26
10:30 AM	1	0	0	1	1	7	0	8	8	3	0	11	20
10:45 AM	5	0	0	5	0	7	0	7	10	1	0	11	23
Total Volume	11	2	0	13	3	32	0	35	40	7	0	47	95
% App. Total	84.6	15.4	0		8.6	91.4	0		85.1	14.9	0		
PHF	.550	.500	.000	.650	.750	.800	.000	.795	.833	.583	.000	.904	.913

Start Time	Dascomb Road From East				I-93 NB Ramps From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 02:45 PM													
02:45 PM	4	1	0	5	0	13	0	13	6	0	0	6	24
03:00 PM	2	2	0	4	2	5	0	7	11	0	0	11	22
03:15 PM	3	2	0	5	2	11	0	13	3	3	0	6	24
03:30 PM	4	3	0	7	0	7	0	7	4	3	0	7	21
Total Volume	13	8	0	21	4	36	0	40	24	6	0	30	91
% App. Total	61.9	38.1	0		10	90	0		80	20	0		
PHF	.813	.667	.000	.750	.500	.692	.000	.769	.545	.500	.000	.682	.948



S: I-93 NB Ramps  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 E  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 2

Groups Printed- Peds and Bikes

Start Time	Dascomb Road From East				I-93 NB Ramps From South				Dascomb Road From West				Int. Total
	Thru	Left	Peds SB	Peds NB	Right	Left	Peds WB	Peds EB	Right	Thru	Peds NB	Peds SB	
05:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	1
Total	0	0	0	0	0	0	0	0	0	2	0	0	2
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15 PM	1	0	0	0	0	0	0	0	0	0	0	0	1
06:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	0	0	0	0	0	0	0	0	0	0	0	1
Grand Total	7	1	0	0	0	0	0	1	2	8	0	0	19
Apprch %	87.5	12.5	0	0	0	0	0	100	20	80	0	0	
Total %	36.8	5.3	0	0	0	0	0	5.3	10.5	42.1	0	0	

Start Time	Dascomb Road From East					I-93 NB Ramps From South					Dascomb Road From West					Int. Total
	Thru	Left	Peds SB	Peds NB	App. Total	Right	Left	Peds WB	Peds EB	App. Total	Right	Thru	Peds NB	Peds SB	App. Total	
Peak Hour Analysis From 07:00 AM to 09:45 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	0	0	0	0	0	0	0	
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
08:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
Total Volume	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
% App. Total	0	0	0	0	0	0	0	0	0	0	100	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.000	.000	.250	

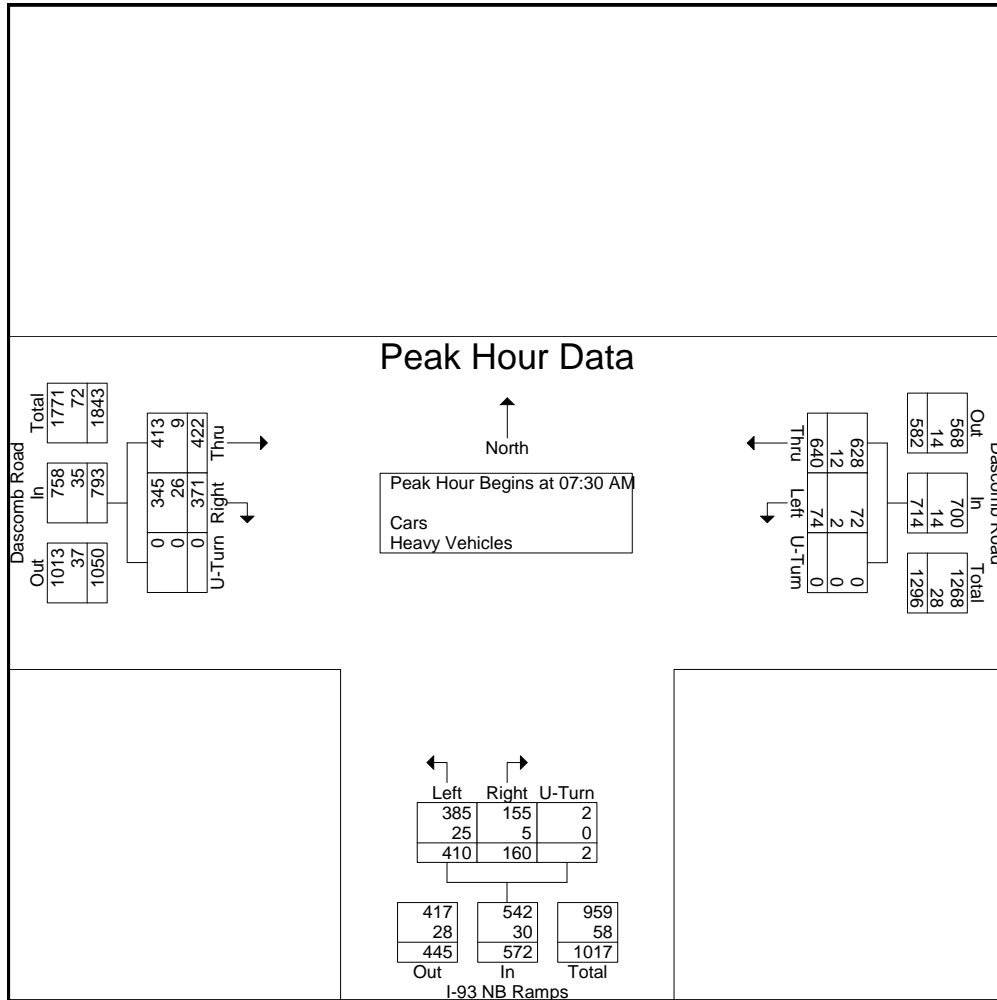
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1															
Peak Hour for Entire Intersection Begins at 12:00 PM															
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
12:15 PM	2	0	0	0	2	0	0	0	0	0	0	0	0	0	2
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3
Total Volume	2	0	0	0	2	0	0	0	0	0	0	5	0	0	5
% App. Total	100	0	0	0	0	0	0	0	0	0	0	100	0	0	
PHF	.250	.000	.000	.000	.250	.000	.000	.000	.000	.000	.000	.417	.000	.000	.417

Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1															
Peak Hour for Entire Intersection Begins at 05:00 PM															
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Total Volume	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
% App. Total	0	0	0	0	0	0	0	0	0	0	0	100	0	0	
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.500	.000	.000	.500

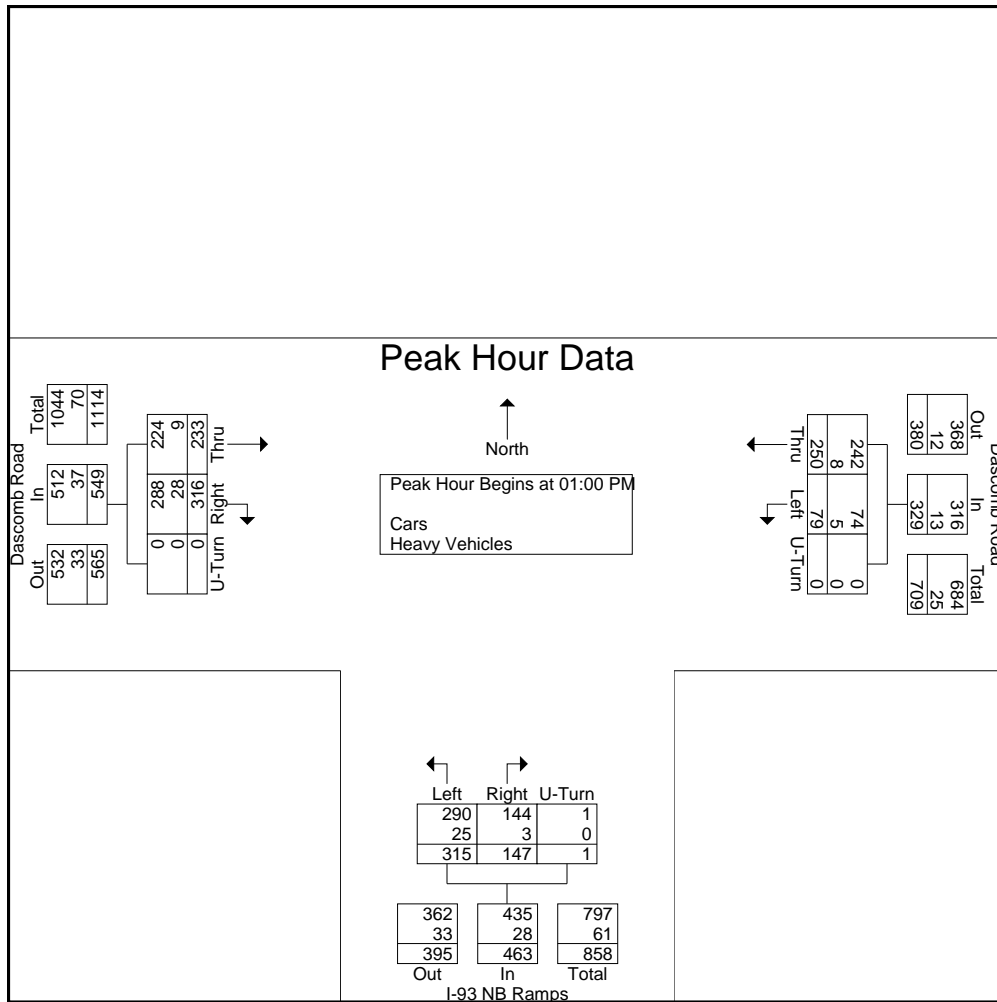
S: I-93 NB Ramps  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 E  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Start Time	Dascomb Road From East				I-93 NB Ramps From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	149	23	0	172	25	92	0	117	117	111	0	228	517
07:45 AM	172	14	0	186	40	108	0	148	91	111	0	202	536
08:00 AM	165	14	0	179	42	112	1	155	81	100	0	181	515
08:15 AM	154	23	0	177	53	98	1	152	82	100	0	182	511
Total Volume	640	74	0	714	160	410	2	572	371	422	0	793	2079
% App. Total	89.6	10.4	0		28	71.7	0.3		46.8	53.2	0		
PHF	.930	.804	.000	.960	.755	.915	.500	.923	.793	.950	.000	.870	.970
Cars	628	72	0	700	155	385	2	542	345	413	0	758	2000
% Cars	98.1	97.3	0	98.0	96.9	93.9	100	94.8	93.0	97.9	0	95.6	96.2
Heavy Vehicles	12	2	0	14	5	25	0	30	26	9	0	35	79
% Heavy Vehicles	1.9	2.7	0	2.0	3.1	6.1	0	5.2	7.0	2.1	0	4.4	3.8



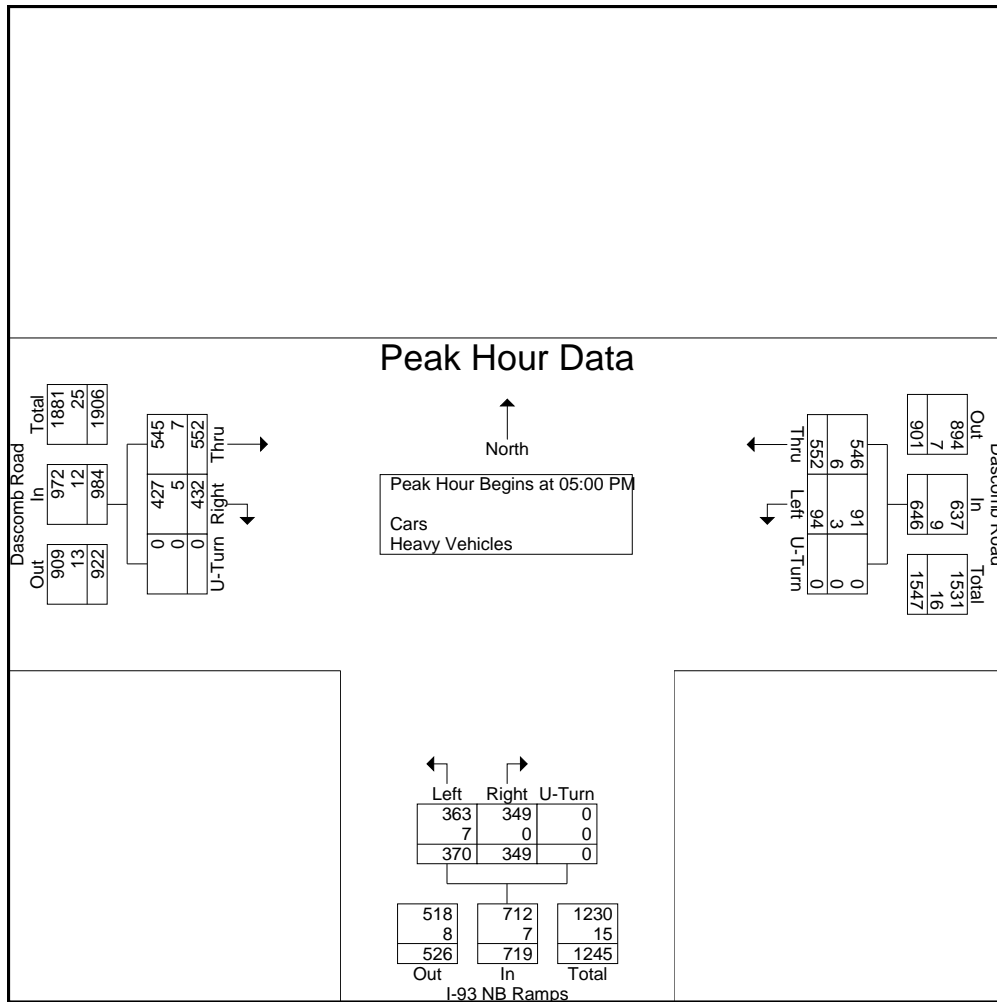
Start Time	Dascomb Road From East				I-93 NB Ramps From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 01:00 PM													
01:00 PM	72	25	0	97	34	67	1	102	60	57	0	117	316
01:15 PM	64	22	0	86	39	96	0	135	82	61	0	143	364
01:30 PM	62	14	0	76	41	68	0	109	93	60	0	153	338
01:45 PM	52	18	0	70	33	84	0	117	81	55	0	136	323
Total Volume	250	79	0	329	147	315	1	463	316	233	0	549	1341
% App. Total	76	24	0		31.7	68	0.2		57.6	42.4	0		
PHF	.868	.790	.000	.848	.896	.820	.250	.857	.849	.955	.000	.897	.921
Cars	242	74	0	316	144	290	1	435	288	224	0	512	1263
% Cars	96.8	93.7	0	96.0	98.0	92.1	100	94.0	91.1	96.1	0	93.3	94.2
Heavy Vehicles	8	5	0	13	3	25	0	28	28	9	0	37	78
% Heavy Vehicles	3.2	6.3	0	4.0	2.0	7.9	0	6.0	8.9	3.9	0	6.7	5.8



S: I-93 NB Ramps  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 E  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 3

Start Time	Dascomb Road From East			App. Total	I-93 NB Ramps From South			App. Total	Dascomb Road From West			Int. Total	
	Thru	Left	U-Turn		Right	Left	U-Turn		Right	Thru	U-Turn		
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	103	27	0	130	80	104	0	184	133	139	0	272	586
05:15 PM	138	24	0	162	82	95	0	177	90	134	0	224	563
05:30 PM	156	21	0	177	96	93	0	189	109	131	0	240	606
05:45 PM	155	22	0	177	91	78	0	169	100	148	0	248	594
Total Volume	552	94	0	646	349	370	0	719	432	552	0	984	2349
% App. Total	85.4	14.6	0		48.5	51.5	0		43.9	56.1	0		
PHF	.885	.870	.000	.912	.909	.889	.000	.951	.812	.932	.000	.904	.969
Cars	546	91	0	637	349	363	0	712	427	545	0	972	2321
% Cars	98.9	96.8	0	98.6	100	98.1	0	99.0	98.8	98.7	0	98.8	98.8
Heavy Vehicles	6	3	0	9	0	7	0	7	5	7	0	12	28
% Heavy Vehicles	1.1	3.2	0	1.4	0	1.9	0	1.0	1.2	1.3	0	1.2	1.2



S: I-93 NB Ramps  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 EE  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Groups Printed- Cars - Heavy Vehicles

Start Time	Dascomb Road From East			I-93 NB Ramps From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
11:00 AM	95	20	0	24	74	1	118	62	0	394
11:15 AM	80	25	0	37	64	0	128	57	0	391
11:30 AM	68	14	0	28	72	0	104	53	0	339
11:45 AM	68	10	0	45	76	0	102	49	0	350
Total	311	69	0	134	286	1	452	221	0	1474
12:00 PM	64	9	0	34	89	0	107	64	0	367
12:15 PM	73	18	0	52	82	0	107	65	0	397
12:30 PM	71	16	0	40	76	0	107	64	0	374
12:45 PM	76	17	0	37	96	0	98	54	0	378
Total	284	60	0	163	343	0	419	247	0	1516
Grand Total	595	129	0	297	629	1	871	468	0	2990
Apprch %	82.2	17.8	0	32	67.9	0.1	65	35	0	
Total %	19.9	4.3	0	9.9	21	0	29.1	15.7	0	
Cars	592	126	0	292	611	1	861	464	0	2947
% Cars	99.5	97.7	0	98.3	97.1	100	98.9	99.1	0	98.6
Heavy Vehicles	3	3	0	5	18	0	10	4	0	43
% Heavy Vehicles	0.5	2.3	0	1.7	2.9	0	1.1	0.9	0	1.4

Start Time	Dascomb Road From East				I-93 NB Ramps From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 12:00 PM													
12:00 PM	64	9	0	73	34	89	0	123	107	64	0	171	367
12:15 PM	73	18	0	91	52	82	0	134	107	65	0	172	397
12:30 PM	71	16	0	87	40	76	0	116	107	64	0	171	374
12:45 PM	76	17	0	93	37	96	0	133	98	54	0	152	378
Total Volume	284	60	0	344	163	343	0	506	419	247	0	666	1516
% App. Total	82.6	17.4	0		32.2	67.8	0		62.9	37.1	0		
PHF	.934	.833	.000	.925	.784	.893	.000	.944	.979	.950	.000	.968	.955
Cars	283	60	0	343	158	336	0	494	414	245	0	659	1496
% Cars	99.6	100	0	99.7	96.9	98.0	0	97.6	98.8	99.2	0	98.9	98.7
Heavy Vehicles	1	0	0	1	5	7	0	12	5	2	0	7	20
% Heavy Vehicles	0.4	0	0	0.3	3.1	2.0	0	2.4	1.2	0.8	0	1.1	1.3

S: I-93 NB Ramps  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 EE  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Groups Printed- Cars

Start Time	Dascomb Road From East			I-93 NB Ramps From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
11:00 AM	93	18	0	24	71	1	116	62	0	385
11:15 AM	80	25	0	37	61	0	127	56	0	386
11:30 AM	68	14	0	28	69	0	102	53	0	334
11:45 AM	68	9	0	45	74	0	102	48	0	346
Total	309	66	0	134	275	1	447	219	0	1451
12:00 PM	63	9	0	32	84	0	105	63	0	356
12:15 PM	73	18	0	49	82	0	107	65	0	394
12:30 PM	71	16	0	40	75	0	104	63	0	369
12:45 PM	76	17	0	37	95	0	98	54	0	377
Total	283	60	0	158	336	0	414	245	0	1496
Grand Total	592	126	0	292	611	1	861	464	0	2947
Apprch %	82.5	17.5	0	32.3	67.6	0.1	65	35	0	
Total %	20.1	4.3	0	9.9	20.7	0	29.2	15.7	0	

Start Time	Dascomb Road From East				I-93 NB Ramps From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 12:00 PM													
12:00 PM	63	9	0	72	32	84	0	116	105	63	0	168	356
12:15 PM	73	18	0	91	49	82	0	131	107	65	0	172	394
12:30 PM	71	16	0	87	40	75	0	115	104	63	0	167	369
12:45 PM	76	17	0	93	37	95	0	132	98	54	0	152	377
Total Volume	283	60	0	343	158	336	0	494	414	245	0	659	1496
% App. Total	82.5	17.5	0		32	68	0		62.8	37.2	0		
PHF	.931	.833	.000	.922	.806	.884	.000	.936	.967	.942	.000	.958	.949



S: I-93 NB Ramps  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 EE  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Groups Printed- Heavy Vehicles

Start Time	Dascomb Road From East			I-93 NB Ramps From South			Dascomb Road From West			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
11:00 AM	2	2	0	0	3	0	2	0	0	9
11:15 AM	0	0	0	0	3	0	1	1	0	5
11:30 AM	0	0	0	0	3	0	2	0	0	5
11:45 AM	0	1	0	0	2	0	0	1	0	4
Total	2	3	0	0	11	0	5	2	0	23
12:00 PM	1	0	0	2	5	0	2	1	0	11
12:15 PM	0	0	0	3	0	0	0	0	0	3
12:30 PM	0	0	0	0	1	0	3	1	0	5
12:45 PM	0	0	0	0	1	0	0	0	0	1
Total	1	0	0	5	7	0	5	2	0	20
Grand Total	3	3	0	5	18	0	10	4	0	43
Apprch %	50	50	0	21.7	78.3	0	71.4	28.6	0	
Total %	7	7	0	11.6	41.9	0	23.3	9.3	0	

Start Time	Dascomb Road From East				I-93 NB Ramps From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:15 AM													
11:15 AM	0	0	0	0	0	3	0	3	1	1	0	2	5
11:30 AM	0	0	0	0	0	3	0	3	2	0	0	2	5
11:45 AM	0	1	0	1	0	2	0	2	0	1	0	1	4
12:00 PM	1	0	0	1	2	5	0	7	2	1	0	3	11
Total Volume	1	1	0	2	2	13	0	15	5	3	0	8	25
% App. Total	50	50	0		13.3	86.7	0		62.5	37.5	0		
PHF	.250	.250	.000	.500	.250	.650	.000	.536	.625	.750	.000	.667	.568

S: I-93 NB Ramps  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 EE  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Groups Printed- Peds and Bikes

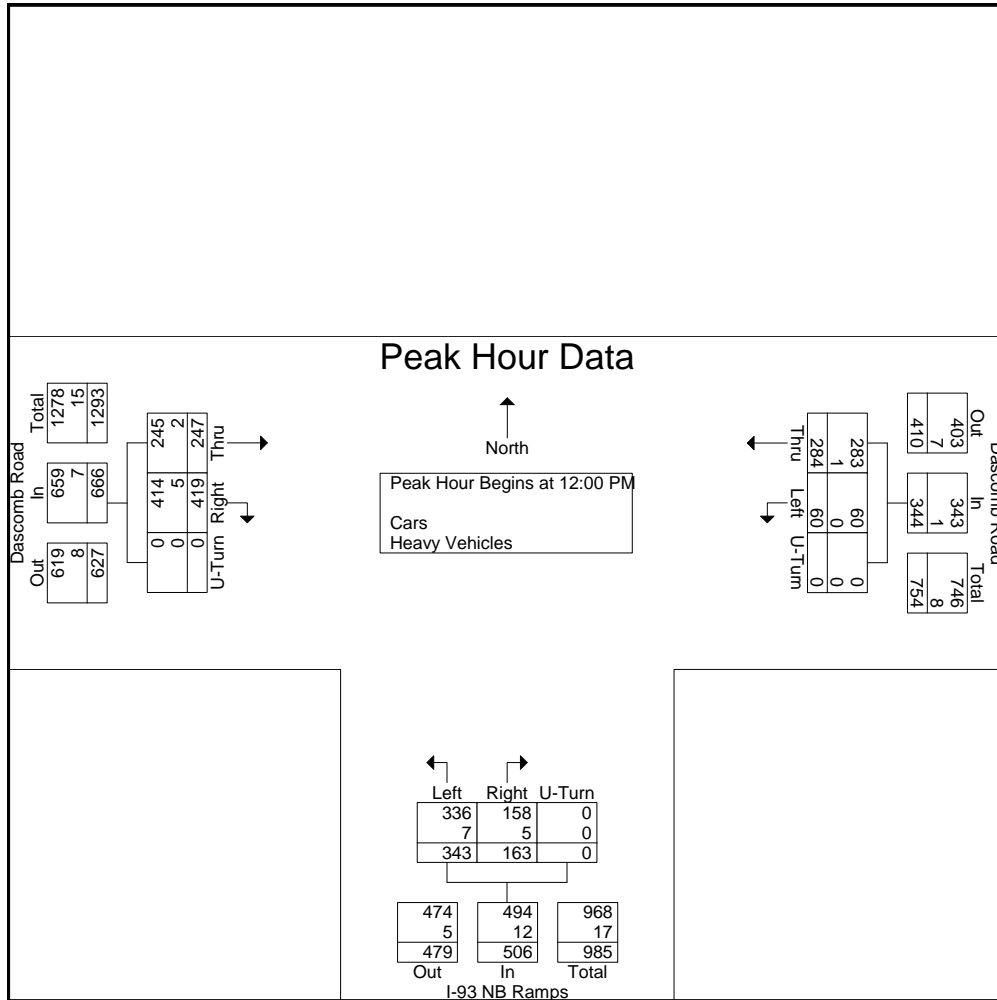
Start Time	Dascomb Road From East				I-93 NB Ramps From South				Dascomb Road From West				Int. Total
	Thru	Left	Peds SB	Peds NB	Right	Left	Peds WB	Peds EB	Right	Thru	Peds NB	Peds SB	
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	1	0	0	0	0	0	1
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	0	0	0	0	0	1
12:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	1
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	1	0	0	0	0	1
Total	0	0	0	0	0	0	0	1	0	1	0	0	2
Grand Total	0	0	0	0	0	0	1	1	0	1	0	0	3
Apprch %	0	0	0	0	0	0	50	50	0	100	0	0	
Total %	0	0	0	0	0	0	33.3	33.3	0	33.3	0	0	

Start Time	Dascomb Road From East					I-93 NB Ramps From South					Dascomb Road From West					Int. Total
	Thru	Left	Peds SB	Peds NB	App. Total	Right	Left	Peds WB	Peds EB	App. Total	Right	Thru	Peds NB	Peds SB	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1																
Peak Hour for Entire Intersection Begins at 11:15 AM																
11:15 AM	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
Total Volume	0	0	0	0	0	0	0	1	0	1	0	1	0	0	1	2
% App. Total	0	0	0	0	0	0	0	100	0	0	0	100	0	0	0	
PHF	.000	.000	.000	.000	.000	.000	.000	.250	.000	.250	.000	.250	.000	.000	.250	.500

S: I-93 NB Ramps  
 E/W: Dascomb Road  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 EE  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Start Time	Dascomb Road From East				I-93 NB Ramps From South				Dascomb Road From West				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 12:00 PM													
12:00 PM	64	9	0	73	34	89	0	123	107	64	0	171	367
12:15 PM	73	18	0	91	52	82	0	134	107	65	0	172	397
12:30 PM	71	16	0	87	40	76	0	116	107	64	0	171	374
12:45 PM	76	17	0	93	37	96	0	133	98	54	0	152	378
Total Volume	284	60	0	344	163	343	0	506	419	247	0	666	1516
% App. Total	82.6	17.4	0		32.2	67.8	0		62.9	37.1	0		
PHF	.934	.833	.000	.925	.784	.893	.000	.944	.979	.950	.000	.968	.955
Cars	283	60	0	343	158	336	0	494	414	245	0	659	1496
% Cars	99.6	100	0	99.7	96.9	98.0	0	97.6	98.8	99.2	0	98.9	98.7
Heavy Vehicles	1	0	0	1	5	7	0	12	5	2	0	7	20
% Heavy Vehicles	0.4	0	0	0.3	3.1	2.0	0	2.4	1.2	0.8	0	1.1	1.3



N/S: Frontage Road  
 E: I-93 SB Ramps  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 F  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Cars - Heavy Vehicles

Start Time	Frontage Road From North			I-93 SB Ramps From East			Frontage Road From South			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
07:00 AM	23	13	0	22	106	0	102	50	0	316
07:15 AM	31	34	0	17	133	0	123	60	0	398
07:30 AM	32	27	0	16	120	0	136	61	0	392
07:45 AM	19	19	0	21	127	0	142	84	0	412
Total	105	93	0	76	486	0	503	255	0	1518
08:00 AM	19	20	0	26	116	0	119	89	0	389
08:15 AM	21	18	0	27	109	0	138	62	0	375
08:30 AM	19	10	0	26	127	0	118	43	0	343
08:45 AM	17	12	0	26	121	0	92	49	0	317
Total	76	60	0	105	473	0	467	243	0	1424
09:00 AM	17	10	0	20	111	0	115	40	0	313
09:15 AM	12	8	0	13	99	0	96	27	0	255
09:30 AM	15	9	0	12	80	0	116	16	0	248
09:45 AM	7	5	0	10	84	0	93	14	0	213
Total	51	32	0	55	374	0	420	97	0	1029
10:00 AM	15	5	0	9	68	0	121	13	0	231
10:15 AM	11	4	0	5	68	0	116	13	0	217
10:30 AM	11	0	0	5	66	0	87	11	0	180
10:45 AM	13	8	0	5	77	0	107	19	0	229
Total	50	17	0	24	279	0	431	56	0	857
11:00 AM	20	7	0	8	70	0	98	16	0	219
11:15 AM	16	7	0	11	62	0	106	15	0	217
11:30 AM	31	8	0	6	91	0	86	14	0	236
11:45 AM	38	2	0	5	84	0	81	14	0	224
Total	105	24	0	30	307	0	371	59	0	896
12:00 PM	32	1	0	3	73	0	81	11	0	201
12:15 PM	20	5	0	3	69	0	89	23	0	209
12:30 PM	22	4	0	7	74	0	91	23	0	221
12:45 PM	13	7	0	7	90	0	76	28	0	221
Total	87	17	0	20	306	0	337	85	0	852
01:00 PM	17	6	0	3	72	0	100	22	0	220
01:15 PM	10	2	0	7	79	0	85	23	0	206
01:30 PM	21	6	0	7	81	0	89	23	0	227
01:45 PM	17	5	0	5	91	0	95	18	0	231
Total	65	19	0	22	323	0	369	86	0	884
02:00 PM	28	19	0	4	85	0	113	18	0	267
02:15 PM	20	9	0	5	86	1	117	20	0	258
02:30 PM	65	43	0	3	96	0	107	30	0	344
02:45 PM	27	19	0	9	116	0	99	24	0	294
Total	140	90	0	21	383	1	436	92	0	1163
03:00 PM	38	27	0	6	93	0	87	17	0	268
03:15 PM	42	13	0	6	104	1	106	27	0	299
03:30 PM	44	26	0	1	92	0	104	23	0	290
03:45 PM	25	15	0	6	101	1	68	34	0	250
Total	149	81	0	19	390	2	365	101	0	1107
04:00 PM	46	41	1	3	92	0	102	27	0	312
04:15 PM	36	27	0	4	115	0	115	38	0	335
04:30 PM	44	37	0	5	117	0	112	24	0	339
04:45 PM	56	29	0	5	110	0	97	27	0	324
Total	182	134	1	17	434	0	426	116	0	1310

N/S: Frontage Road  
 E: I-93 SB Ramps  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 F  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 2

Groups Printed- Cars - Heavy Vehicles

Start Time	Frontage Road From North			I-93 SB Ramps From East			Frontage Road From South			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
05:00 PM	71	51	0	6	87	0	122	26	0	363
05:15 PM	55	15	0	2	106	0	118	35	0	331
05:30 PM	46	14	0	5	110	0	109	25	0	309
05:45 PM	28	11	0	5	118	0	122	33	0	317
Total	200	91	0	18	421	0	471	119	0	1320
06:00 PM	30	11	0	3	81	0	124	30	0	279
06:15 PM	27	18	0	3	80	0	109	27	0	264
06:30 PM	27	12	0	2	61	0	95	36	0	233
06:45 PM	31	11	0	2	66	0	87	14	0	211
Total	115	52	0	10	288	0	415	107	0	987
Grand Total	1325	710	1	417	4464	3	5011	1416	0	13347
Apprch %	65.1	34.9	0	8.5	91.4	0.1	78	22	0	
Total %	9.9	5.3	0	3.1	33.4	0	37.5	10.6	0	
Cars	1292	699	1	403	4115	3	4744	1385	0	12642
% Cars	97.5	98.5	100	96.6	92.2	100	94.7	97.8	0	94.7
Heavy Vehicles	33	11	0	14	349	0	267	31	0	705
% Heavy Vehicles	2.5	1.5	0	3.4	7.8	0	5.3	2.2	0	5.3

Start Time	Frontage Road From North				I-93 SB Ramps From East				Frontage Road From South				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	31	34	0	65	17	133	0	150	123	60	0	183	398
07:30 AM	32	27	0	59	16	120	0	136	136	61	0	197	392
07:45 AM	19	19	0	38	21	127	0	148	142	84	0	226	412
08:00 AM	19	20	0	39	26	116	0	142	119	89	0	208	389
Total Volume	101	100	0	201	80	496	0	576	520	294	0	814	1591
% App. Total	50.2	49.8	0		13.9	86.1	0		63.9	36.1	0		
PHF	.789	.735	.000	.773	.769	.932	.000	.960	.915	.826	.000	.900	.965
Cars	95	100	0	195	80	465	0	545	497	294	0	791	1531
% Cars	94.1	100	0	97.0	100	93.8	0	94.6	95.6	100	0	97.2	96.2
Heavy Vehicles	6	0	0	6	0	31	0	31	23	0	0	23	60
% Heavy Vehicles	5.9	0	0	3.0	0	6.3	0	5.4	4.4	0	0	2.8	3.8

Start Time	Frontage Road From North				I-93 SB Ramps From East				Frontage Road From South				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 10:45 AM													
10:45 AM	13	8	0	21	5	77	0	82	107	19	0	126	229
11:00 AM	20	7	0	27	8	70	0	78	98	16	0	114	219
11:15 AM	16	7	0	23	11	62	0	73	106	15	0	121	217
11:30 AM	31	8	0	39	6	91	0	97	86	14	0	100	236
Total Volume	80	30	0	110	30	300	0	330	397	64	0	461	901
% App. Total	72.7	27.3	0		9.1	90.9	0		86.1	13.9	0		
PHF	.645	.938	.000	.705	.682	.824	.000	.851	.928	.842	.000	.915	.954
Cars	74	26	0	100	26	280	0	306	369	60	0	429	835
% Cars	92.5	86.7	0	90.9	86.7	93.3	0	92.7	92.9	93.8	0	93.1	92.7
Heavy Vehicles	6	4	0	10	4	20	0	24	28	4	0	32	66
% Heavy Vehicles	7.5	13.3	0	9.1	13.3	6.7	0	7.3	7.1	6.3	0	6.9	7.3

N/S: Frontage Road  
 E: I-93 SB Ramps  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 F  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 3

Start Time	Frontage Road From North				I-93 SB Ramps From East				Frontage Road From South				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:15 PM													
04:15 PM	36	27	0	63	4	115	0	119	115	38	0	153	335
04:30 PM	44	37	0	81	5	117	0	122	112	24	0	136	339
04:45 PM	56	29	0	85	5	110	0	115	97	27	0	124	324
05:00 PM	71	51	0	122	6	87	0	93	122	26	0	148	363
Total Volume	207	144	0	351	20	429	0	449	446	115	0	561	1361
% App. Total	59	41	0		4.5	95.5	0		79.5	20.5	0		
PHF	.729	.706	.000	.719	.833	.917	.000	.920	.914	.757	.000	.917	.937
Cars	206	143	0	349	18	409	0	427	435	115	0	550	1326
% Cars	99.5	99.3	0	99.4	90.0	95.3	0	95.1	97.5	100	0	98.0	97.4
Heavy Vehicles	1	1	0	2	2	20	0	22	11	0	0	11	35
% Heavy Vehicles	0.5	0.7	0	0.6	10.0	4.7	0	4.9	2.5	0	0	2.0	2.6

N/S: Frontage Road  
 E: I-93 SB Ramps  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 F  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Cars

Start Time	Frontage Road From North			I-93 SB Ramps From East			Frontage Road From South			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
07:00 AM	22	13	0	22	100	0	95	49	0	301
07:15 AM	30	34	0	17	124	0	119	60	0	384
07:30 AM	31	27	0	16	112	0	125	61	0	372
07:45 AM	19	19	0	21	119	0	138	84	0	400
Total	102	93	0	76	455	0	477	254	0	1457
08:00 AM	15	20	0	26	110	0	115	89	0	375
08:15 AM	21	18	0	27	102	0	135	62	0	365
08:30 AM	18	10	0	26	119	0	113	43	0	329
08:45 AM	17	12	0	26	107	0	88	47	0	297
Total	71	60	0	105	438	0	451	241	0	1366
09:00 AM	16	10	0	19	101	0	111	38	0	295
09:15 AM	11	8	0	13	84	0	89	26	0	231
09:30 AM	14	9	0	12	63	0	112	16	0	226
09:45 AM	7	5	0	8	72	0	85	13	0	190
Total	48	32	0	52	320	0	397	93	0	942
10:00 AM	13	5	0	9	61	0	110	12	0	210
10:15 AM	11	4	0	5	61	0	103	13	0	197
10:30 AM	10	0	0	4	60	0	78	10	0	162
10:45 AM	12	7	0	5	73	0	95	16	0	208
Total	46	16	0	23	255	0	386	51	0	777
11:00 AM	18	6	0	6	62	0	91	16	0	199
11:15 AM	13	6	0	9	57	0	99	14	0	198
11:30 AM	31	7	0	6	88	0	84	14	0	230
11:45 AM	37	2	0	5	69	0	76	14	0	203
Total	99	21	0	26	276	0	350	58	0	830
12:00 PM	32	1	0	3	64	0	73	11	0	184
12:15 PM	20	5	0	3	59	0	80	23	0	190
12:30 PM	20	4	0	6	66	0	88	21	0	205
12:45 PM	13	6	0	6	79	0	69	26	0	199
Total	85	16	0	18	268	0	310	81	0	778
01:00 PM	16	4	0	3	63	0	95	21	0	202
01:15 PM	10	2	0	7	73	0	81	23	0	196
01:30 PM	21	6	0	7	71	0	85	20	0	210
01:45 PM	15	5	0	5	86	0	82	18	0	211
Total	62	17	0	22	293	0	343	82	0	819
02:00 PM	28	19	0	4	75	0	103	18	0	247
02:15 PM	20	9	0	5	77	1	110	19	0	241
02:30 PM	65	42	0	3	87	0	102	28	0	327
02:45 PM	27	18	0	9	107	0	91	24	0	276
Total	140	88	0	21	346	1	406	89	0	1091
03:00 PM	38	26	0	5	89	0	82	16	0	256
03:15 PM	40	13	0	6	94	1	100	26	0	280
03:30 PM	44	26	0	1	82	0	101	22	0	276
03:45 PM	25	15	0	6	94	1	61	32	0	234
Total	147	80	0	18	359	2	344	96	0	1046
04:00 PM	43	41	1	2	87	0	98	27	0	299
04:15 PM	35	27	0	4	111	0	113	38	0	328
04:30 PM	44	37	0	4	108	0	109	24	0	326
04:45 PM	56	28	0	5	107	0	94	27	0	317
Total	178	133	1	15	413	0	414	116	0	1270

N/S: Frontage Road  
 E: I-93 SB Ramps  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 F  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 2

Groups Printed- Cars

Start Time	Frontage Road From North			I-93 SB Ramps From East			Frontage Road From South			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
05:00 PM	71	51	0	5	83	0	119	26	0	355
05:15 PM	55	15	0	2	105	0	116	34	0	327
05:30 PM	45	14	0	5	109	0	105	25	0	303
05:45 PM	28	11	0	5	116	0	120	33	0	313
Total	199	91	0	17	413	0	460	118	0	1298
06:00 PM	30	11	0	3	77	0	122	29	0	272
06:15 PM	27	18	0	3	77	0	108	27	0	260
06:30 PM	27	12	0	2	60	0	92	36	0	229
06:45 PM	31	11	0	2	65	0	84	14	0	207
Total	115	52	0	10	279	0	406	106	0	968
Grand Total	1292	699	1	403	4115	3	4744	1385	0	12642
Apprch %	64.9	35.1	0.1	8.9	91	0.1	77.4	22.6	0	
Total %	10.2	5.5	0	3.2	32.6	0	37.5	11	0	

Start Time	Frontage Road From North				I-93 SB Ramps From East				Frontage Road From South				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	30	34	0	64	17	124	0	141	119	60	0	179	384
07:30 AM	31	27	0	58	16	112	0	128	125	61	0	186	372
07:45 AM	19	19	0	38	21	119	0	140	138	84	0	222	400
08:00 AM	15	20	0	35	26	110	0	136	115	89	0	204	375
Total Volume	95	100	0	195	80	465	0	545	497	294	0	791	1531
% App. Total	48.7	51.3	0		14.7	85.3	0		62.8	37.2	0		
PHF	.766	.735	.000	.762	.769	.938	.000	.966	.900	.826	.000	.891	.957

Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 10:45 AM													
10:45 AM	12	7	0	19	5	73	0	78	95	16	0	111	208
11:00 AM	18	6	0	24	6	62	0	68	91	16	0	107	199
11:15 AM	13	6	0	19	9	57	0	66	99	14	0	113	198
11:30 AM	31	7	0	38	6	88	0	94	84	14	0	98	230
Total Volume	74	26	0	100	26	280	0	306	369	60	0	429	835
% App. Total	74	26	0		8.5	91.5	0		86	14	0		
PHF	.597	.929	.000	.658	.722	.795	.000	.814	.932	.938	.000	.949	.908

Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:15 PM													
04:15 PM	35	27	0	62	4	111	0	115	113	38	0	151	328
04:30 PM	44	37	0	81	4	108	0	112	109	24	0	133	326
04:45 PM	56	28	0	84	5	107	0	112	94	27	0	121	317
05:00 PM	71	51	0	122	5	83	0	88	119	26	0	145	355
Total Volume	206	143	0	349	18	409	0	427	435	115	0	550	1326
% App. Total	59	41	0		4.2	95.8	0		79.1	20.9	0		
PHF	.725	.701	.000	.715	.900	.921	.000	.928	.914	.757	.000	.911	.934



N/S: Frontage Road  
 E: I-93 SB Ramps  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 F  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

Groups Printed- Heavy Vehicles

Start Time	Frontage Road From North			I-93 SB Ramps From East			Frontage Road From South			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
07:00 AM	1	0	0	0	6	0	7	1	0	15
07:15 AM	1	0	0	0	9	0	4	0	0	14
07:30 AM	1	0	0	0	8	0	11	0	0	20
07:45 AM	0	0	0	0	8	0	4	0	0	12
Total	3	0	0	0	31	0	26	1	0	61
08:00 AM	4	0	0	0	6	0	4	0	0	14
08:15 AM	0	0	0	0	7	0	3	0	0	10
08:30 AM	1	0	0	0	8	0	5	0	0	14
08:45 AM	0	0	0	0	14	0	4	2	0	20
Total	5	0	0	0	35	0	16	2	0	58
09:00 AM	1	0	0	1	10	0	4	2	0	18
09:15 AM	1	0	0	0	15	0	7	1	0	24
09:30 AM	1	0	0	0	17	0	4	0	0	22
09:45 AM	0	0	0	2	12	0	8	1	0	23
Total	3	0	0	3	54	0	23	4	0	87
10:00 AM	2	0	0	0	7	0	11	1	0	21
10:15 AM	0	0	0	0	7	0	13	0	0	20
10:30 AM	1	0	0	1	6	0	9	1	0	18
10:45 AM	1	1	0	0	4	0	12	3	0	21
Total	4	1	0	1	24	0	45	5	0	80
11:00 AM	2	1	0	2	8	0	7	0	0	20
11:15 AM	3	1	0	2	5	0	7	1	0	19
11:30 AM	0	1	0	0	3	0	2	0	0	6
11:45 AM	1	0	0	0	15	0	5	0	0	21
Total	6	3	0	4	31	0	21	1	0	66
12:00 PM	0	0	0	0	9	0	8	0	0	17
12:15 PM	0	0	0	0	10	0	9	0	0	19
12:30 PM	2	0	0	1	8	0	3	2	0	16
12:45 PM	0	1	0	1	11	0	7	2	0	22
Total	2	1	0	2	38	0	27	4	0	74
01:00 PM	1	2	0	0	9	0	5	1	0	18
01:15 PM	0	0	0	0	6	0	4	0	0	10
01:30 PM	0	0	0	0	10	0	4	3	0	17
01:45 PM	2	0	0	0	5	0	13	0	0	20
Total	3	2	0	0	30	0	26	4	0	65
02:00 PM	0	0	0	0	10	0	10	0	0	20
02:15 PM	0	0	0	0	9	0	7	1	0	17
02:30 PM	0	1	0	0	9	0	5	2	0	17
02:45 PM	0	1	0	0	9	0	8	0	0	18
Total	0	2	0	0	37	0	30	3	0	72
03:00 PM	0	1	0	1	4	0	5	1	0	12
03:15 PM	2	0	0	0	10	0	6	1	0	19
03:30 PM	0	0	0	0	10	0	3	1	0	14
03:45 PM	0	0	0	0	7	0	7	2	0	16
Total	2	1	0	1	31	0	21	5	0	61
04:00 PM	3	0	0	1	5	0	4	0	0	13
04:15 PM	1	0	0	0	4	0	2	0	0	7
04:30 PM	0	0	0	1	9	0	3	0	0	13
04:45 PM	0	1	0	0	3	0	3	0	0	7
Total	4	1	0	2	21	0	12	0	0	40

N/S: Frontage Road  
 E: I-93 SB Ramps  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 F  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 2

Groups Printed- Heavy Vehicles

Start Time	Frontage Road From North			I-93 SB Ramps From East			Frontage Road From South			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
05:00 PM	0	0	0	1	4	0	3	0	0	8
05:15 PM	0	0	0	0	1	0	2	1	0	4
05:30 PM	1	0	0	0	1	0	4	0	0	6
05:45 PM	0	0	0	0	2	0	2	0	0	4
Total	1	0	0	1	8	0	11	1	0	22
06:00 PM	0	0	0	0	4	0	2	1	0	7
06:15 PM	0	0	0	0	3	0	1	0	0	4
06:30 PM	0	0	0	0	1	0	3	0	0	4
06:45 PM	0	0	0	0	1	0	3	0	0	4
Total	0	0	0	0	9	0	9	1	0	19
Grand Total	33	11	0	14	349	0	267	31	0	705
Apprch %	75	25	0	3.9	96.1	0	89.6	10.4	0	
Total %	4.7	1.6	0	2	49.5	0	37.9	4.4	0	

Start Time	Frontage Road From North				I-93 SB Ramps From East				Frontage Road From South				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 09:00 AM													
09:00 AM	1	0	0	1	1	10	0	11	4	2	0	6	18
09:15 AM	1	0	0	1	0	15	0	15	7	1	0	8	24
09:30 AM	1	0	0	1	0	17	0	17	4	0	0	4	22
09:45 AM	0	0	0	0	2	12	0	14	8	1	0	9	23
Total Volume	3	0	0	3	3	54	0	57	23	4	0	27	87
% App. Total	100	0	0		5.3	94.7	0		85.2	14.8	0		
PHF	.750	.000	.000	.750	.375	.794	.000	.838	.719	.500	.000	.750	.906

Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 10:00 AM													
10:00 AM	2	0	0	2	0	7	0	7	11	1	0	12	21
10:15 AM	0	0	0	0	0	7	0	7	13	0	0	13	20
10:30 AM	1	0	0	1	1	6	0	7	9	1	0	10	18
10:45 AM	1	1	0	2	0	4	0	4	12	3	0	15	21
Total Volume	4	1	0	5	1	24	0	25	45	5	0	50	80
% App. Total	80	20	0		4	96	0		90	10	0		
PHF	.500	.250	.000	.625	.250	.857	.000	.893	.865	.417	.000	.833	.952

Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 02:00 PM													
02:00 PM	0	0	0	0	0	10	0	10	10	0	0	10	20
02:15 PM	0	0	0	0	0	9	0	9	7	1	0	8	17
02:30 PM	0	1	0	1	0	9	0	9	5	2	0	7	17
02:45 PM	0	1	0	1	0	9	0	9	8	0	0	8	18
Total Volume	0	2	0	2	0	37	0	37	30	3	0	33	72
% App. Total	0	100	0		0	100	0		90.9	9.1	0		
PHF	.000	.500	.000	.500	.000	.925	.000	.925	.750	.375	.000	.825	.900



N/S: Frontage Road  
 E: I-93 SB Ramps  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 F  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 2

Groups Printed- Peds and Bikes

Start Time	Frontage Road From North				I-93 SB Ramps From East				Frontage Road From South				Int. Total
	Thru	Left	Peds EB	Peds WB	Right	Left	Peds SB	Peds NB	Right	Thru	Peds WB	Peds EB	
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	1
Total	0	0	0	0	0	0	0	0	0	1	0	0	1
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	5	0	0	0	0	0	0	0	0	5	0	0	10
Apprch %	100	0	0	0	0	0	0	0	0	100	0	0	
Total %	50	0	0	0	0	0	0	0	0	50	0	0	

Start Time	Frontage Road From North					I-93 SB Ramps From East					Frontage Road From South					Int. Total
	Thru	Left	Peds EB	Peds WB	App. Total	Right	Left	Peds SB	Peds NB	App. Total	Right	Thru	Peds WB	Peds EB	App. Total	
Peak Hour Analysis From 07:00 AM to 09:45 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
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
% App. Total	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.000	.250	.250

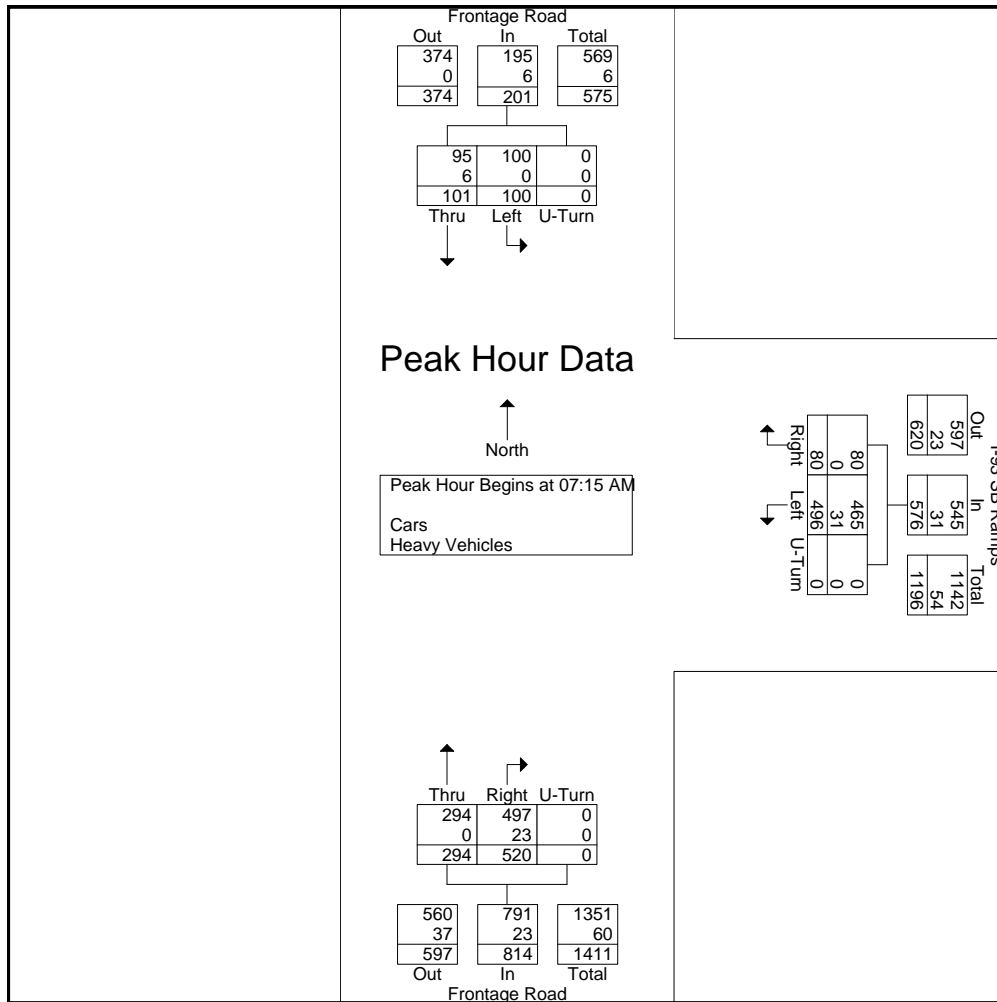
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																
Peak Hour for Entire Intersection Begins at 11:15 AM																
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
12:00 PM	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
Total Volume	2	0	0	0	2	0	0	0	0	0	0	2	0	0	2	4
% App. Total	100	0	0	0	0	0	0	0	0	0	0	100	0	0	0	
PHF	.250	.000	.000	.000	.250	.000	.000	.000	.000	.000	.000	.500	.000	.000	.500	.500

Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1																
Peak Hour for Entire Intersection Begins at 05:00 PM																
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
Total Volume	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
% App. Total	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.000	.250	.250

N/S: Frontage Road  
 E: I-93 SB Ramps  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 F  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 1

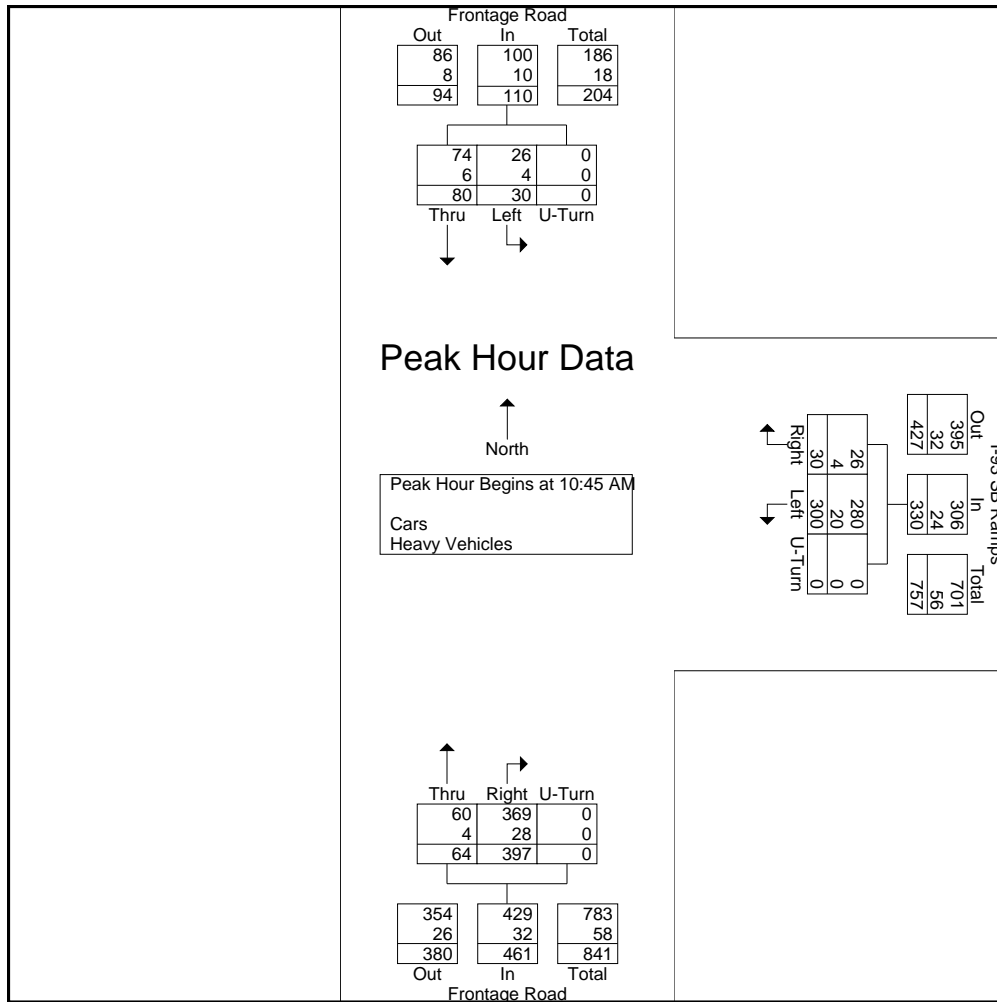
Start Time	Frontage Road From North				I-93 SB Ramps From East				Frontage Road From South				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	31	34	0	65	17	133	0	150	123	60	0	183	398
07:30 AM	32	27	0	59	16	120	0	136	136	61	0	197	392
07:45 AM	19	19	0	38	21	127	0	148	142	84	0	226	412
08:00 AM	19	20	0	39	26	116	0	142	119	89	0	208	389
Total Volume	101	100	0	201	80	496	0	576	520	294	0	814	1591
% App. Total	50.2	49.8	0		13.9	86.1	0		63.9	36.1	0		
PHF	.789	.735	.000	.773	.769	.932	.000	.960	.915	.826	.000	.900	.965
Cars	95	100	0	195	80	465	0	545	497	294	0	791	1531
% Cars	94.1	100	0	97.0	100	93.8	0	94.6	95.6	100	0	97.2	96.2
Heavy Vehicles	6	0	0	6	0	31	0	31	23	0	0	23	60
% Heavy Vehicles	5.9	0	0	3.0	0	6.3	0	5.4	4.4	0	0	2.8	3.8



N/S: Frontage Road  
 E: I-93 SB Ramps  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 F  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 2

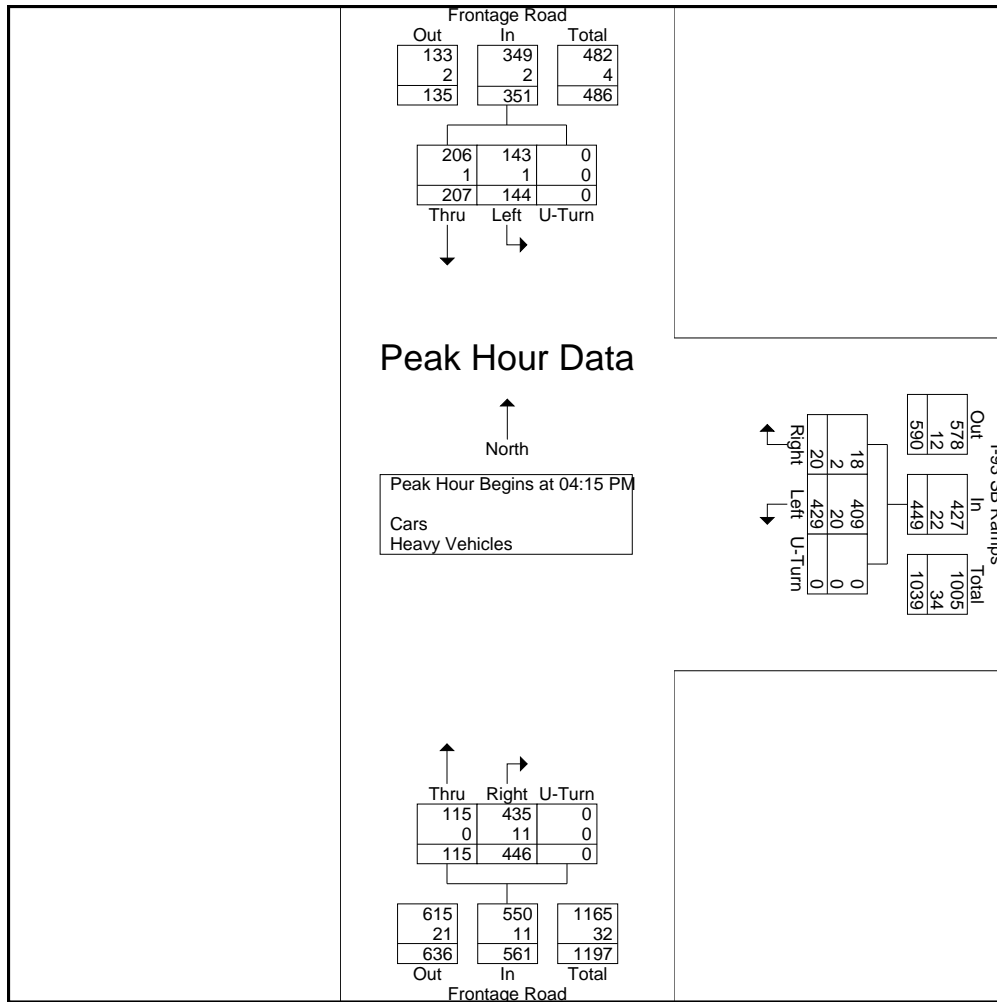
Start Time	Frontage Road From North				I-93 SB Ramps From East				Frontage Road From South				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 10:45 AM													
10:45 AM	13	8	0	21	5	77	0	82	107	19	0	126	229
11:00 AM	20	7	0	27	8	70	0	78	98	16	0	114	219
11:15 AM	16	7	0	23	11	62	0	73	106	15	0	121	217
11:30 AM	31	8	0	39	6	91	0	97	86	14	0	100	236
Total Volume	80	30	0	110	30	300	0	330	397	64	0	461	901
% App. Total	72.7	27.3	0		9.1	90.9	0		86.1	13.9	0		
PHF	.645	.938	.000	.705	.682	.824	.000	.851	.928	.842	.000	.915	.954
Cars	74	26	0	100	26	280	0	306	369	60	0	429	835
% Cars	92.5	86.7	0	90.9	86.7	93.3	0	92.7	92.9	93.8	0	93.1	92.7
Heavy Vehicles	6	4	0	10	4	20	0	24	28	4	0	32	66
% Heavy Vehicles	7.5	13.3	0	9.1	13.3	6.7	0	7.3	7.1	6.3	0	6.9	7.3



N/S: Frontage Road  
 E: I-93 SB Ramps  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 F  
 Site Code : TBA  
 Start Date : 10/6/2016  
 Page No : 3

Start Time	Frontage Road From North				I-93 SB Ramps From East				Frontage Road From South				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:15 PM													
04:15 PM	36	27	0	63	4	115	0	119	115	38	0	153	335
04:30 PM	44	37	0	81	5	117	0	122	112	24	0	136	339
04:45 PM	56	29	0	85	5	110	0	115	97	27	0	124	324
05:00 PM	71	51	0	122	6	87	0	93	122	26	0	148	363
Total Volume	207	144	0	351	20	429	0	449	446	115	0	561	1361
% App. Total	59	41	0		4.5	95.5	0		79.5	20.5	0		
PHF	.729	.706	.000	.719	.833	.917	.000	.920	.914	.757	.000	.917	.937
Cars	206	143	0	349	18	409	0	427	435	115	0	550	1326
% Cars	99.5	99.3	0	99.4	90.0	95.3	0	95.1	97.5	100	0	98.0	97.4
Heavy Vehicles	1	1	0	2	2	20	0	22	11	0	0	11	35
% Heavy Vehicles	0.5	0.7	0	0.6	10.0	4.7	0	4.9	2.5	0	0	2.0	2.6



N/S: Frontage Road  
 E: I-93 SB Ramps  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 FF  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Groups Printed- Cars - Heavy Vehicles

Start Time	Frontage Road From North			I-93 SB Ramps From East			Frontage Road From South			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
11:00 AM	15	7	0	7	87	0	122	10	0	248
11:15 AM	9	5	0	2	98	0	103	15	0	232
11:30 AM	8	4	0	2	105	0	104	12	0	235
11:45 AM	16	8	0	2	90	0	109	12	0	237
Total	48	24	0	13	380	0	438	49	0	952
12:00 PM	18	7	0	1	74	0	92	12	0	204
12:15 PM	3	8	0	0	87	0	91	17	0	206
12:30 PM	6	3	0	0	89	0	101	17	0	216
12:45 PM	5	3	0	3	96	0	89	11	0	207
Total	32	21	0	4	346	0	373	57	0	833
Grand Total	80	45	0	17	726	0	811	106	0	1785
Apprch %	64	36	0	2.3	97.7	0	88.4	11.6	0	
Total %	4.5	2.5	0	1	40.7	0	45.4	5.9	0	
Cars	79	43	0	17	703	0	789	106	0	1737
% Cars	98.8	95.6	0	100	96.8	0	97.3	100	0	97.3
Heavy Vehicles	1	2	0	0	23	0	22	0	0	48
% Heavy Vehicles	1.2	4.4	0	0	3.2	0	2.7	0	0	2.7

Start Time	Frontage Road From North				I-93 SB Ramps From East				Frontage Road From South				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	15	7	0	22	7	87	0	94	122	10	0	132	248
11:15 AM	9	5	0	14	2	98	0	100	103	15	0	118	232
11:30 AM	8	4	0	12	2	105	0	107	104	12	0	116	235
11:45 AM	16	8	0	24	2	90	0	92	109	12	0	121	237
Total Volume	48	24	0	72	13	380	0	393	438	49	0	487	952
% App. Total	66.7	33.3	0		3.3	96.7	0		89.9	10.1	0		
PHF	.750	.750	.000	.750	.464	.905	.000	.918	.898	.817	.000	.922	.960
Cars	47	22	0	69	13	362	0	375	424	49	0	473	917
% Cars	97.9	91.7	0	95.8	100	95.3	0	95.4	96.8	100	0	97.1	96.3
Heavy Vehicles	1	2	0	3	0	18	0	18	14	0	0	14	35
% Heavy Vehicles	2.1	8.3	0	4.2	0	4.7	0	4.6	3.2	0	0	2.9	3.7



N/S: Frontage Road  
 E: I-93 SB Ramps  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 FF  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

**Groups Printed- Cars**

Start Time	Frontage Road From North			I-93 SB Ramps From East			Frontage Road From South			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
11:00 AM	15	6	0	7	83	0	115	10	0	236
11:15 AM	9	4	0	2	94	0	101	15	0	225
11:30 AM	8	4	0	2	99	0	101	12	0	226
11:45 AM	15	8	0	2	86	0	107	12	0	230
<b>Total</b>	<b>47</b>	<b>22</b>	<b>0</b>	<b>13</b>	<b>362</b>	<b>0</b>	<b>424</b>	<b>49</b>	<b>0</b>	<b>917</b>
12:00 PM	18	7	0	1	72	0	88	12	0	198
12:15 PM	3	8	0	0	86	0	89	17	0	203
12:30 PM	6	3	0	0	89	0	100	17	0	215
12:45 PM	5	3	0	3	94	0	88	11	0	204
<b>Total</b>	<b>32</b>	<b>21</b>	<b>0</b>	<b>4</b>	<b>341</b>	<b>0</b>	<b>365</b>	<b>57</b>	<b>0</b>	<b>820</b>
<b>Grand Total</b>	<b>79</b>	<b>43</b>	<b>0</b>	<b>17</b>	<b>703</b>	<b>0</b>	<b>789</b>	<b>106</b>	<b>0</b>	<b>1737</b>
Apprch %	64.8	35.2	0	2.4	97.6	0	88.2	11.8	0	
Total %	4.5	2.5	0	1	40.5	0	45.4	6.1	0	

Start Time	Frontage Road From North				I-93 SB Ramps From East				Frontage Road From South				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	15	6	0	21	7	83	0	90	115	10	0	125	236
11:15 AM	9	4	0	13	2	94	0	96	101	15	0	116	225
11:30 AM	8	4	0	12	2	99	0	101	101	12	0	113	226
11:45 AM	15	8	0	23	2	86	0	88	107	12	0	119	230
<b>Total Volume</b>	<b>47</b>	<b>22</b>	<b>0</b>	<b>69</b>	<b>13</b>	<b>362</b>	<b>0</b>	<b>375</b>	<b>424</b>	<b>49</b>	<b>0</b>	<b>473</b>	<b>917</b>
<b>% App. Total</b>	<b>68.1</b>	<b>31.9</b>	<b>0</b>		<b>3.5</b>	<b>96.5</b>	<b>0</b>		<b>89.6</b>	<b>10.4</b>	<b>0</b>		
PHF	.783	.688	.000	.750	.464	.914	.000	.928	.922	.817	.000	.946	.971

N/S: Frontage Road  
 E: I-93 SB Ramps  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 FF  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

**Groups Printed- Heavy Vehicles**

Start Time	Frontage Road From North			I-93 SB Ramps From East			Frontage Road From South			Int. Total
	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
11:00 AM	0	1	0	0	4	0	7	0	0	12
11:15 AM	0	1	0	0	4	0	2	0	0	7
11:30 AM	0	0	0	0	6	0	3	0	0	9
11:45 AM	1	0	0	0	4	0	2	0	0	7
<b>Total</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>18</b>	<b>0</b>	<b>14</b>	<b>0</b>	<b>0</b>	<b>35</b>
12:00 PM	0	0	0	0	2	0	4	0	0	6
12:15 PM	0	0	0	0	1	0	2	0	0	3
12:30 PM	0	0	0	0	0	0	1	0	0	1
12:45 PM	0	0	0	0	2	0	1	0	0	3
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>13</b>
<b>Grand Total</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>23</b>	<b>0</b>	<b>22</b>	<b>0</b>	<b>0</b>	<b>48</b>
Apprch %	33.3	66.7	0	0	100	0	100	0	0	
Total %	2.1	4.2	0	0	47.9	0	45.8	0	0	

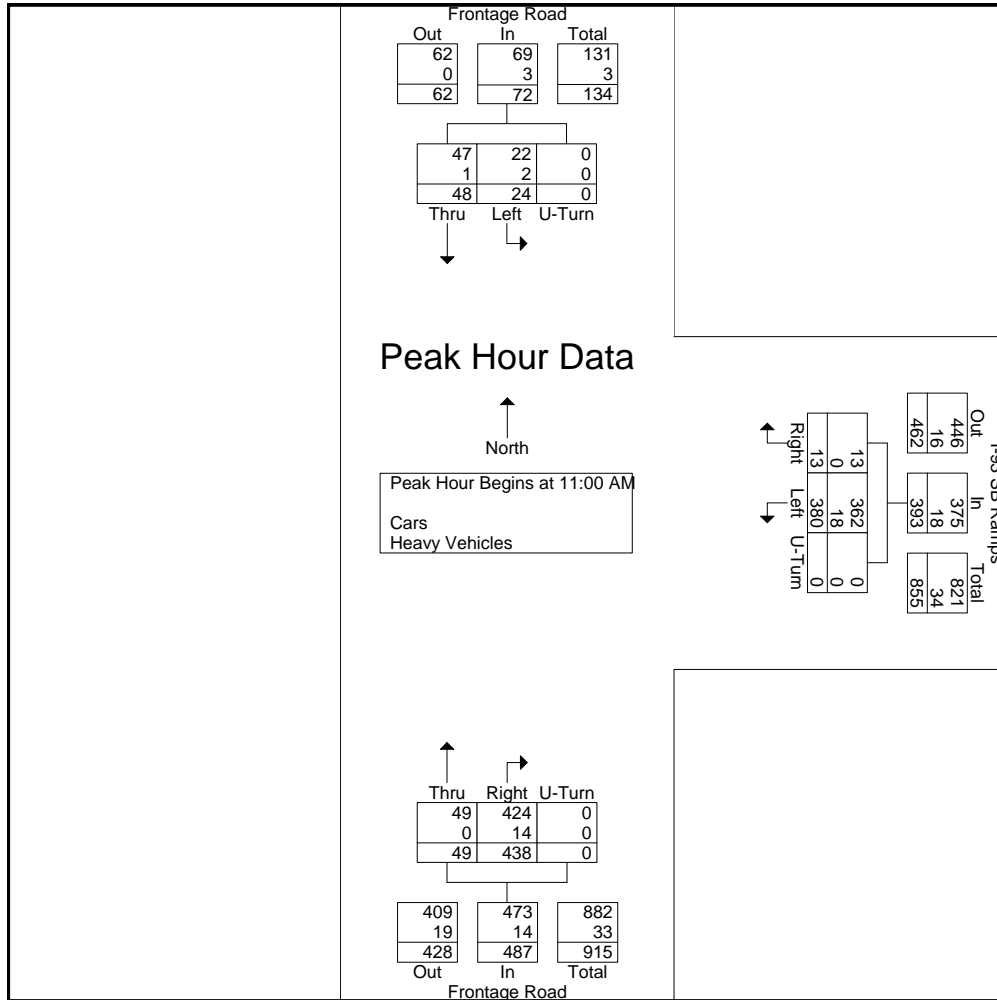
Start Time	Frontage Road From North				I-93 SB Ramps From East				Frontage Road From South				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	0	1	0	1	0	4	0	4	7	0	0	7	12
11:15 AM	0	1	0	1	0	4	0	4	2	0	0	2	7
11:30 AM	0	0	0	0	0	6	0	6	3	0	0	3	9
11:45 AM	1	0	0	1	0	4	0	4	2	0	0	2	7
<b>Total Volume</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>18</b>	<b>0</b>	<b>18</b>	<b>14</b>	<b>0</b>	<b>0</b>	<b>14</b>	<b>35</b>
<b>% App. Total</b>	<b>33.3</b>	<b>66.7</b>	<b>0</b>		<b>0</b>	<b>100</b>	<b>0</b>		<b>100</b>	<b>0</b>	<b>0</b>		
PHF	.250	.500	.000	.750	.000	.750	.000	.750	.500	.000	.000	.500	.729



N/S: Frontage Road  
 E: I-93 SB Ramps  
 City, State: Andover, MA  
 Client: Lupoli Companies/ S. Lupoli

File Name : 165301 FF  
 Site Code : TBA  
 Start Date : 10/8/2016  
 Page No : 1

Start Time	Frontage Road From North				I-93 SB Ramps From East				Frontage Road From South				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	15	7	0	22	7	87	0	94	122	10	0	132	248
11:15 AM	9	5	0	14	2	98	0	100	103	15	0	118	232
11:30 AM	8	4	0	12	2	105	0	107	104	12	0	116	235
11:45 AM	16	8	0	24	2	90	0	92	109	12	0	121	237
Total Volume	48	24	0	72	13	380	0	393	438	49	0	487	952
% App. Total	66.7	33.3	0		3.3	96.7	0		89.9	10.1	0		
PHF	.750	.750	.000	.750	.464	.905	.000	.918	.898	.817	.000	.922	.960
Cars	47	22	0	69	13	362	0	375	424	49	0	473	917
% Cars	97.9	91.7	0	95.8	100	95.3	0	95.4	96.8	100	0	97.1	96.3
Heavy Vehicles	1	2	0	3	0	18	0	18	14	0	0	14	35
% Heavy Vehicles	2.1	8.3	0	4.2	0	4.7	0	4.6	3.2	0	0	2.9	3.7



**Attachment B**

Automatic Traffic Recorder (ATR) Counts





PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Dascomb Road EB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
EB

165301 A EB Class  
Site Code:

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
10/06/1														
6	2	35	13	1	4	1	0	0	0	0	0	0	0	56
01:00	2	59	13	1	2	2	0	0	4	0	0	0	0	83
02:00	2	36	6	2	2	1	0	0	5	0	0	0	0	54
03:00	2	22	10	2	7	3	0	0	0	0	0	0	0	46
04:00	5	84	31	3	15	5	0	1	4	0	0	0	0	148
05:00	10	308	120	2	47	14	1	0	26	0	0	0	0	528
06:00	7	399	126	3	33	14	1	2	9	0	0	0	0	594
07:00	14	700	156	21	41	14	1	3	9	0	0	0	0	959
08:00	15	572	134	6	36	11	0	3	9	0	0	0	0	786
09:00	15	454	135	12	31	15	0	6	12	0	0	0	0	680
10:00	16	409	151	13	52	18	1	8	23	0	0	0	0	691
11:00	14	438	150	10	50	13	0	5	9	0	0	0	0	689
12 PM	14	425	124	7	38	16	0	2	15	0	0	0	0	641
13:00	10	469	150	9	48	16	0	3	9	0	0	0	0	714
14:00	11	563	171	12	43	16	1	4	10	0	0	0	0	831
15:00	13	693	201	8	63	11	0	4	5	0	0	0	0	998
16:00	6	773	211	5	45	1	0	4	3	0	0	0	0	1048
17:00	10	865	166	3	35	1	0	5	2	0	0	0	0	1087
18:00	10	763	157	3	41	3	0	2	2	0	0	0	0	981
19:00	7	471	94	2	23	0	0	2	1	0	0	0	0	600
20:00	7	304	77	0	5	7	0	0	1	0	0	0	0	401
21:00	5	241	51	1	8	1	0	0	0	0	0	0	0	307
22:00	4	127	22	0	6	3	0	0	6	0	0	0	0	168
23:00	4	116	17	0	4	1	0	0	0	0	0	0	0	142
Percent	1.5%	70.5%	18.8%	1.0%	5.1%	1.4%	0.0%	0.4%	1.2%	0.0%	0.0%	0.0%	0.0%	
AM Peak	10:00	07:00	07:00	07:00	10:00	10:00	05:00	10:00	05:00					07:00
Vol.	16	700	156	21	52	18	1	8	26					959
PM Peak	12:00	17:00	16:00	14:00	15:00	12:00	14:00	17:00	12:00					17:00
Vol.	14	865	211	12	63	16	1	5	15					1087



PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Dascomb Road EB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
EB

165301 A EB Class  
Site Code:

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
10/07/1														
6	1	44	4	0	1	1	0	0	1	0	0	0	0	52
01:00	4	51	7	0	1	5	0	1	1	0	0	0	0	70
02:00	2	14	6	0	4	2	0	0	1	0	0	0	0	29
03:00	1	20	9	4	4	1	0	0	5	0	0	0	0	44
04:00	10	89	25	1	16	12	0	0	25	0	0	0	0	178
05:00	11	279	109	2	42	12	1	0	11	0	0	0	1	468
06:00	10	363	128	8	41	14	1	4	14	0	0	0	0	583
07:00	12	660	172	10	46	10	1	12	11	0	0	0	0	934
08:00	13	627	154	5	35	15	0	6	7	0	0	0	0	862
09:00	24	485	147	7	33	16	0	6	19	0	0	0	0	737
10:00	16	430	137	13	50	18	0	6	19	0	0	0	0	689
11:00	19	437	139	15	45	15	0	6	15	0	0	0	0	691
12 PM	16	519	140	10	37	15	1	13	17	0	0	0	0	768
13:00	16	542	165	16	40	13	1	8	11	0	0	0	0	812
14:00	15	602	200	15	51	12	0	2	3	0	0	0	0	900
15:00	7	794	212	7	42	6	0	2	2	0	0	0	0	1072
16:00	12	776	186	4	43	7	0	8	3	0	0	0	0	1039
17:00	12	906	175	6	43	4	0	8	0	0	0	0	0	1154
18:00	10	763	168	4	27	1	0	2	1	0	0	0	0	976
19:00	5	449	85	0	22	2	0	1	0	0	0	0	0	564
20:00	5	287	65	1	9	4	0	0	4	0	0	0	0	375
21:00	3	154	33	0	10	1	0	0	1	0	0	0	0	202
22:00	1	250	55	0	16	1	0	0	2	0	0	0	0	325
23:00	0	211	29	1	10	0	0	0	0	0	0	0	0	251
Percent	1.6%	70.8%	18.5%	0.9%	4.8%	1.4%	0.0%	0.6%	1.3%	0.0%	0.0%	0.0%	0.0%	
AM Peak	09:00	07:00	07:00	11:00	10:00	10:00	05:00	07:00	04:00				05:00	07:00
Vol.	24	660	172	15	50	18	1	12	25				1	934
PM Peak	12:00	17:00	15:00	13:00	14:00	12:00	12:00	12:00	12:00					17:00
Vol.	16	906	212	16	51	15	1	13	17					1154





PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Dascomb Road EB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
EB

165301 A EB Class  
Site Code:

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
10/08/1														
6	0	128	19	0	6	0	0	0	2	0	0	0	0	155
01:00	2	61	8	0	2	2	0	0	0	0	0	0	0	75
02:00	0	17	7	0	0	0	0	0	0	0	0	0	0	24
03:00	0	26	8	1	5	0	0	0	0	0	0	0	0	40
04:00	1	48	19	0	7	1	0	1	1	0	0	0	0	78
05:00	5	97	37	1	6	11	0	0	19	0	0	0	0	176
06:00	3	156	61	5	18	6	1	0	5	0	0	0	0	255
07:00	3	309	102	5	37	3	0	1	0	0	0	0	0	460
08:00	1	427	130	5	33	7	0	1	2	0	0	0	0	606
09:00	6	508	149	1	29	7	0	5	2	0	0	0	0	707
10:00	4	579	142	3	33	8	0	3	5	0	0	0	0	777
11:00	9	667	189	2	41	7	0	5	2	0	0	0	0	922
12 PM	4	638	160	3	22	3	0	3	3	0	0	0	0	836
13:00	15	585	145	2	36	1	1	5	0	0	0	0	0	790
14:00	4	544	144	0	31	2	0	0	0	0	0	0	0	725
15:00	6	652	124	0	28	1	1	3	0	0	0	0	0	815
16:00	4	516	97	1	30	0	0	3	0	0	0	0	0	651
17:00	3	479	92	1	19	0	0	3	0	0	0	0	0	597
18:00	0	374	80	2	24	1	0	0	0	0	0	0	0	481
19:00	0	299	62	0	12	0	0	0	1	0	0	0	0	374
20:00	2	196	45	0	9	0	0	0	0	0	0	0	0	252
21:00	0	194	32	2	5	0	0	0	0	0	0	0	0	233
22:00	0	145	25	0	4	0	0	0	0	0	0	0	0	174
23:00	0	126	18	0	5	0	0	0	0	0	0	0	0	149
Percent	0.7%	75.1%	18.3%	0.3%	4.3%	0.6%	0.0%	0.3%	0.4%	0.0%	0.0%	0.0%	0.0%	
AM Peak	11:00	11:00	11:00	06:00	11:00	05:00	06:00	09:00	05:00					11:00
Vol.	9	667	189	5	41	11	1	5	19					922
PM Peak	13:00	15:00	12:00	12:00	13:00	12:00	13:00	13:00	12:00					12:00
Vol.	15	652	160	3	36	3	1	5	3					836



PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Dascomb Road EB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
EB

165301 A EB Speed  
Site Code:

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th %ile	Ave Speed
10/06/	14	19	24	29	34	39	44	49	54	59	64	69	9999			
16	0	0	0	1	18	30	4	2	0	1	0	0	0	56	38	36
01:00	0	0	2	7	22	40	10	1	1	0	0	0	0	83	38	35
02:00	0	0	1	9	15	23	5	1	0	0	0	0	0	54	38	34
03:00	0	0	1	8	15	13	9	0	0	0	0	0	0	46	40	34
04:00	2	5	6	27	47	52	7	2	0	0	0	0	0	148	37	32
05:00	0	0	20	120	250	126	12	0	0	0	0	0	0	528	36	32
06:00	0	9	28	136	261	144	16	0	0	0	0	0	0	594	36	32
07:00	9	49	101	335	369	82	13	1	0	0	0	0	0	959	33	29
08:00	5	23	72	243	328	109	6	0	0	0	0	0	0	786	33	30
09:00	11	46	70	159	271	111	12	0	0	0	0	0	0	680	34	29
10:00	4	23	133	232	217	60	21	1	0	0	0	0	0	691	33	29
11:00	11	26	88	212	275	69	7	1	0	0	0	0	0	689	33	29
12 PM	2	19	75	210	251	74	8	2	0	0	0	0	0	641	33	29
13:00	3	15	83	255	262	85	10	1	0	0	0	0	0	714	33	29
14:00	16	26	101	294	298	87	8	1	0	0	0	0	0	831	33	29
15:00	19	76	176	327	302	80	18	0	0	0	0	0	0	998	33	28
16:00	4	15	112	331	436	141	9	0	0	0	0	0	0	1048	33	30
17:00	35	66	144	426	340	66	9	1	0	0	0	0	0	1087	32	27
18:00	5	28	123	380	357	80	8	0	0	0	0	0	0	981	33	29
19:00	0	7	50	183	238	104	16	2	0	0	0	0	0	600	35	31
20:00	0	5	11	82	182	102	17	2	0	0	0	0	0	401	36	32
21:00	0	2	10	64	127	91	11	2	0	0	0	0	0	307	37	32
22:00	0	3	5	25	82	35	12	4	2	0	0	0	0	168	37	33
23:00	0	0	4	13	54	55	13	3	0	0	0	0	0	142	38	34
Total	126	443	1416	4079	5017	1859	261	27	3	1	0	0	0	13232		
%	1.0%	3.3%	10.7%	30.8%	37.9%	14.0%	2.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	09:00	07:00	10:00	07:00	07:00	06:00	10:00	00:00	01:00	00:00					07:00	
Vol.	11	49	133	335	369	144	21	2	1	1					959	
PM Peak	17:00	15:00	15:00	17:00	16:00	16:00	15:00	22:00	22:00						17:00	
Vol.	35	76	176	426	436	141	18	4	2						1087	

Stats

15th Percentile : 23 MPH  
50th Percentile : 29 MPH  
85th Percentile : 34 MPH  
95th Percentile : 38 MPH

Mean Speed(Average) : 30 MPH  
10 MPH Pace Speed : 25-34 MPH  
Number in Pace : 9096  
Percent in Pace : 68.7%  
Number of Vehicles > 30 MPH : 6165  
Percent of Vehicles > 30 MPH : 46.6%



PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Dascomb Road EB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
EB

165301 A EB Speed  
Site Code:

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th % ile	Ave Speed
10/07/	14	19	24	29	34	39	44	49	54	59	64	69	9999			
16	0	0	2	9	14	19	7	0	1	0	0	0	0	52	39	34
01:00	0	0	0	9	30	21	9	1	0	0	0	0	0	70	38	34
02:00	0	0	1	8	5	9	4	1	1	0	0	0	0	29	41	34
03:00	0	0	2	9	17	12	2	2	0	0	0	0	0	44	37	33
04:00	0	0	16	36	68	37	14	7	0	0	0	0	0	178	38	33
05:00	8	14	66	108	168	86	16	2	0	0	0	0	0	468	35	30
06:00	0	3	56	156	250	104	13	1	0	0	0	0	0	583	35	31
07:00	11	21	115	367	323	90	6	1	0	0	0	0	0	934	33	29
08:00	0	17	119	269	348	96	11	2	0	0	0	0	0	862	33	29
09:00	1	19	113	217	300	81	6	0	0	0	0	0	0	737	33	29
10:00	2	23	113	223	236	79	11	2	0	0	0	0	0	689	33	29
11:00	0	6	114	233	249	81	7	1	0	0	0	0	0	691	33	29
12 PM	2	28	129	299	244	60	5	1	0	0	0	0	0	768	32	28
13:00	0	20	145	301	268	74	4	0	0	0	0	0	0	812	33	28
14:00	26	49	157	342	267	48	11	0	0	0	0	0	0	900	32	27
15:00	46	71	235	400	234	79	7	0	0	0	0	0	0	1072	32	26
16:00	18	20	105	350	416	118	9	3	0	0	0	0	0	1039	33	29
17:00	51	69	218	392	354	65	5	0	0	0	0	0	0	1154	32	27
18:00	31	73	168	375	264	59	3	3	0	0	0	0	0	976	32	27
19:00	0	0	29	155	256	104	18	2	0	0	0	0	0	564	35	31
20:00	0	0	17	85	170	84	16	3	0	0	0	0	0	375	36	32
21:00	0	0	8	39	93	46	13	2	1	0	0	0	0	202	37	33
22:00	0	2	8	63	151	83	15	3	0	0	0	0	0	325	37	33
23:00	0	1	3	54	93	71	27	2	0	0	0	0	0	251	38	33
Total	196	436	1939	4499	4818	1606	239	39	3	0	0	0	0	13775		
%	1.4%	3.2%	14.1%	32.7%	35.0%	11.7%	1.7%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	07:00	10:00	08:00	07:00	08:00	06:00	05:00	04:00	00:00							07:00
Vol.	11	23	119	367	348	104	16	7	1							934
PM Peak	17:00	18:00	15:00	15:00	16:00	16:00	23:00	16:00	21:00							17:00
Vol.	51	73	235	400	416	118	27	3	1							1154

Stats

15th Percentile : 22 MPH  
 50th Percentile : 28 MPH  
 85th Percentile : 33 MPH  
 95th Percentile : 37 MPH

Mean Speed(Average) : 29 MPH  
 10 MPH Pace Speed : 25-34 MPH  
 Number in Pace : 9317  
 Percent in Pace : 67.6%  
 Number of Vehicles > 30 MPH : 5741  
 Percent of Vehicles > 30 MPH : 41.7%



PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Dascomb Road EB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
EB

165301 A EB Speed  
Site Code:

Start Time	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
10/08/16	0	2	8	24	55	54	11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	155	37	33	
01:00	1	0	2	15	31	18	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	75	38	33	
02:00	0	0	0	0	8	10	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	41	37	
03:00	0	0	1	7	9	15	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	40	35	
04:00	0	0	6	2	27	31	10	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	78	39	35	
05:00	0	0	3	40	73	50	9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	176	37	33	
06:00	0	1	8	45	93	81	24	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	255	38	33	
07:00	0	0	7	47	187	183	31	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	460	38	34	
08:00	0	1	17	128	244	185	28	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	606	37	33	
09:00	0	5	32	194	323	133	18	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	707	35	31	
10:00	12	21	69	207	322	137	7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	777	35	30	
11:00	4	10	69	293	400	124	20	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	922	34	30	
12 PM	5	7	61	242	370	128	22	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	836	35	31	
13:00	1	9	54	213	333	166	11	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	790	35	31	
14:00	3	2	49	183	322	151	14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	725	35	31	
15:00	2	6	52	245	354	140	14	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	815	35	31	
16:00	0	0	17	153	311	141	25	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	651	36	32	
17:00	0	3	17	107	275	158	34	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	597	37	33	
18:00	0	2	19	100	240	108	11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	481	36	32	
19:00	0	0	10	91	168	86	17	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	374	36	32	
20:00	0	0	5	43	115	71	15	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	252	37	33	
21:00	0	0	2	45	113	63	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	233	37	33	
22:00	0	1	5	48	72	41	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	174	36	32	
23:00	0	0	3	62	60	21	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	149	34	31	
Total	28	70	516	2534	4505	2295	357	43	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10352			
%	0.3%	0.7%	5.0%	24.5%	43.5%	22.2%	3.4%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%				
AM Peak	10:00	10:00	10:00	11:00	11:00	08:00	07:00	07:00	04:00																	11:00		
Vol.	12	21	69	293	400	185	31	5	1																	922		
PM Peak	12:00	13:00	12:00	15:00	12:00	13:00	17:00	16:00	15:00	19:00																12:00		
Vol.	5	9	61	245	370	166	34	4	1	1																836		

Stats

- 15th Percentile : 25 MPH
- 50th Percentile : 31 MPH
- 85th Percentile : 36 MPH
- 95th Percentile : 38 MPH

Mean Speed(Average) : 32 MPH

- 10 MPH Pace Speed : 25-34 MPH
- Number in Pace : 7039
- Percent in Pace : 68.0%
- Number of Vehicles > 30 MPH : 6303
- Percent of Vehicles > 30 MPH : 60.9%







PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Dascomb Road EB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli

165301 A EB Volume  
Site Code:

Start Time	EB												Sat	
	A.M.	P.M.											10/8/201	
12:00	55	218											6	
12:15	41	211												
12:30	35	214												
12:45	24	193	155	836										
01:00	22	208												
01:15	20	216												
01:30	23	165												
01:45	10	201	75	790										
02:00	5	176												
02:15	6	189												
02:30	7	192												
02:45	6	168	24	725										
03:00	9	204												
03:15	8	210												
03:30	11	203												
03:45	12	198	40	815										
04:00	21	170												
04:15	13	166												
04:30	28	180												
04:45	16	135	78	651										
05:00	34	170												
05:15	56	145												
05:30	37	133												
05:45	49	149	176	597										
06:00	43	144												
06:15	57	127												
06:30	77	96												
06:45	78	114	255	481										
07:00	89	96												
07:15	114	79												
07:30	122	106												
07:45	135	93	460	374										
08:00	121	75												
08:15	161	71												
08:30	152	49												
08:45	172	57	606	252										
09:00	148	73												
09:15	154	55												
09:30	196	45												
09:45	209	60	707	233										
10:00	207	40												
10:15	194	47												
10:30	197	47												
10:45	179	40	777	174										
11:00	245	34												
11:15	240	35												
11:30	218	48												
11:45	219	32	922	149										
Total	4275	6077												
Percent		100.0 %	0.0%	0.0%										
Day Total		10352												
Peak Vol.	11:00 922	- 836	12:00	-	-	-	-	-	-	-	-	-	-	-
P.H.F.	0.941	0.959												



PRECISION  
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Office: 508-875-0100 Fax: 508-875-0118  
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Dascomb Road WB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
WB

165301 A WB Class  
Site Code:

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
10/06/1														
6	2	50	13	0	2	2	0	0	3	0	0	0	0	72
01:00	2	24	3	1	0	2	0	0	4	0	0	0	0	36
02:00	1	28	6	0	3	1	0	0	1	0	0	0	0	40
03:00	1	36	11	3	4	1	0	0	2	0	0	0	0	58
04:00	4	88	22	0	11	5	0	0	4	0	0	0	0	134
05:00	9	148	62	6	21	7	0	1	2	0	0	0	0	256
06:00	19	572	162	8	32	20	0	5	8	0	0	0	0	826
07:00	16	711	155	13	29	15	0	2	13	1	0	0	0	955
08:00	21	678	146	11	37	17	0	5	6	0	0	0	0	921
09:00	28	476	140	16	28	26	1	9	9	0	0	0	0	733
10:00	14	391	137	9	39	11	1	4	8	0	0	0	0	614
11:00	13	411	137	14	35	16	3	5	8	0	0	0	0	642
12 PM	20	437	138	6	34	15	0	7	15	0	0	0	0	672
13:00	16	452	146	10	35	17	3	2	5	0	0	0	0	686
14:00	16	507	173	5	32	21	3	5	11	0	1	0	0	774
15:00	14	688	206	13	30	15	0	10	11	0	0	0	0	987
16:00	10	811	191	5	45	5	0	5	4	0	0	0	0	1076
17:00	11	882	152	2	34	2	0	10	2	0	0	0	0	1095
18:00	7	728	131	3	21	2	1	3	1	0	0	0	0	897
19:00	7	500	102	2	14	3	0	1	0	0	1	0	0	630
20:00	4	393	63	3	15	5	0	1	0	0	0	0	0	484
21:00	2	300	56	1	5	0	0	0	2	0	0	0	0	366
22:00	3	200	27	1	5	3	0	0	0	0	0	0	0	239
23:00	2	137	16	0	1	0	0	0	0	0	0	0	0	156
Percent	1.8%	72.3%	17.9%	1.0%	3.8%	1.6%	0.1%	0.6%	0.9%	0.0%	0.0%	0.0%	0.0%	
AM Peak	09:00	07:00	06:00	09:00	10:00	09:00	11:00	09:00	07:00	07:00				07:00
Vol.	28	711	162	16	39	26	3	9	13	1				955
PM Peak	12:00	17:00	15:00	15:00	16:00	14:00	13:00	15:00	12:00		14:00			17:00
Vol.	20	882	206	13	45	21	3	10	15		1			1095





PRECISION  
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INDUSTRIES, LLC

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Dascomb Road WB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
WB

165301 A WB Class  
Site Code:

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
10/07/1														
6	8	74	14	1	2	4	0	0	3	0	0	0	0	106
01:00	3	33	3	0	2	1	0	0	5	0	0	0	0	47
02:00	2	16	8	0	1	2	0	0	1	0	0	0	0	30
03:00	3	38	19	0	4	2	0	0	7	0	0	0	0	73
04:00	3	82	18	0	5	5	0	0	2	0	0	0	0	115
05:00	12	169	65	2	18	10	0	2	9	0	0	0	0	287
06:00	21	475	166	4	30	18	0	6	14	0	0	0	0	734
07:00	23	625	146	10	29	22	1	7	4	0	0	0	0	867
08:00	21	519	124	13	40	17	0	8	11	0	0	0	0	753
09:00	20	432	158	15	20	21	0	10	7	0	0	0	0	683
10:00	12	403	145	9	33	12	0	5	8	0	0	0	0	627
11:00	17	459	122	10	31	15	0	5	10	0	0	0	0	669
12 PM	19	505	168	14	32	9	0	8	8	0	0	0	0	763
13:00	19	439	133	15	40	18	2	5	6	0	0	0	0	677
14:00	7	562	163	7	37	7	0	7	12	0	1	0	1	804
15:00	16	708	185	11	33	12	0	3	8	0	0	0	1	977
16:00	14	927	190	6	39	6	0	8	7	0	0	0	1	1198
17:00	8	842	149	3	33	0	0	6	4	0	0	0	0	1045
18:00	6	552	116	3	15	1	0	2	2	0	0	0	0	697
19:00	3	407	92	1	11	1	0	4	0	0	0	0	0	519
20:00	3	358	59	3	10	1	0	0	0	0	0	0	0	434
21:00	0	281	47	2	12	0	0	0	3	0	0	0	0	345
22:00	2	240	43	2	11	1	0	0	1	0	0	0	0	300
23:00	2	186	35	2	4	0	0	0	0	0	0	0	0	229
Percent	1.9%	71.9%	18.2%	1.0%	3.8%	1.4%	0.0%	0.7%	1.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	07:00	07:00	06:00	09:00	08:00	07:00	07:00	09:00	06:00					07:00
Vol.	23	625	166	15	40	22	1	10	14					867
PM Peak	12:00	16:00	16:00	13:00	13:00	13:00	13:00	12:00	14:00		14:00		14:00	16:00
Vol.	19	927	190	15	40	18	2	8	12		1		1	1198



PRECISION  
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Dascomb Road WB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
WB

165301 A WB Class  
Site Code:

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
10/08/1														
6	1	121	17	0	3	1	0	0	2	0	0	0	0	145
01:00	0	46	10	1	1	0	0	0	1	0	0	0	0	59
02:00	1	38	8	1	1	1	0	0	1	0	0	0	0	51
03:00	0	28	9	0	5	0	0	0	1	0	0	0	0	43
04:00	3	32	19	0	4	1	0	0	0	0	0	0	0	59
05:00	1	87	34	0	9	3	0	0	0	0	0	0	0	134
06:00	2	190	61	2	21	6	0	0	1	0	0	0	0	283
07:00	3	248	78	4	21	5	0	1	2	0	0	0	0	362
08:00	3	371	98	2	18	2	0	1	3	0	0	0	0	498
09:00	8	444	117	3	22	7	0	4	5	0	0	0	0	610
10:00	12	526	150	3	19	9	0	2	4	0	0	0	0	725
11:00	5	582	130	2	30	6	0	4	14	0	0	0	0	773
12 PM	9	573	132	1	18	4	1	6	3	0	0	0	0	747
13:00	4	577	146	5	19	2	0	3	1	0	0	0	0	757
14:00	12	583	145	5	20	1	0	2	1	0	0	0	0	769
15:00	7	591	125	0	21	1	0	1	0	0	0	0	0	746
16:00	6	530	105	4	12	0	0	4	0	0	0	0	0	661
17:00	6	504	95	4	19	1	0	2	0	0	0	0	0	631
18:00	3	428	71	2	13	1	0	0	1	0	0	0	0	519
19:00	0	332	57	0	13	0	0	0	0	0	0	0	0	402
20:00	5	304	60	1	9	0	1	0	0	0	0	0	0	380
21:00	0	264	33	4	5	0	0	0	0	0	0	0	0	306
22:00	1	233	33	0	2	1	0	0	0	0	0	0	0	270
23:00	0	200	34	0	7	0	0	0	0	0	0	0	0	241
Percent	0.9%	77.0%	17.4%	0.4%	3.1%	0.5%	0.0%	0.3%	0.4%	0.0%	0.0%	0.0%	0.0%	
AM Peak	10:00	11:00	10:00	07:00	11:00	10:00		09:00	11:00					11:00
Vol.	12	582	150	4	30	9		4	14					773
PM Peak	14:00	15:00	13:00	13:00	15:00	12:00	12:00	12:00	12:00					14:00
Vol.	12	591	146	5	21	4	1	6	3					769



PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Dascomb Road WB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
WB

165301 A WB Speed  
Site Code:

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th %ile	Ave Speed
10/06/	14	19	24	29	34	39	44	49	54	59	64	69	9999			
16	0	1	2	10	5	24	21	6	3	0	0	0	0	72	43	37
01:00	0	0	4	10	6	5	8	2	0	1	0	0	0	36	42	34
02:00	0	0	0	8	14	7	8	3	0	0	0	0	0	40	42	35
03:00	0	0	4	13	26	7	6	2	0	0	0	0	0	58	38	32
04:00	0	0	5	34	43	21	17	10	3	1	0	0	0	134	42	34
05:00	0	6	18	35	84	55	44	11	3	0	0	0	0	256	41	34
06:00	0	20	45	217	321	<b>166</b>	47	9	1	0	0	0	0	826	36	32
07:00	<b>1</b>	28	<b>71</b>	259	<b>376</b>	164	49	5	2	0	0	0	0	<b>955</b>	36	31
08:00	0	8	70	<b>260</b>	353	161	53	13	3	0	0	0	0	921	36	31
09:00	0	<b>31</b>	64	170	250	141	57	18	2	0	0	0	0	733	37	31
10:00	0	6	36	157	191	136	<b>65</b>	<b>22</b>	1	0	0	0	0	614	38	33
11:00	0	7	50	162	218	122	65	13	<b>5</b>	0	0	0	0	642	38	32
12 PM	4	16	40	141	251	134	66	16	3	<b>1</b>	0	0	0	672	38	32
13:00	0	2	30	146	264	151	81	10	2	0	0	0	0	686	38	33
14:00	0	3	56	209	327	124	45	9	1	0	0	0	0	774	36	31
15:00	0	2	60	309	388	163	60	5	0	0	0	0	0	987	36	31
16:00	2	<b>28</b>	<b>104</b>	315	433	153	31	8	2	0	0	0	0	1076	35	30
17:00	<b>9</b>	24	75	<b>332</b>	<b>453</b>	161	34	7	0	0	0	0	0	<b>1095</b>	35	30
18:00	0	5	41	216	344	<b>198</b>	72	20	1	0	0	0	0	897	37	33
19:00	0	5	21	115	218	158	88	23	2	0	0	0	0	630	40	34
20:00	0	3	6	61	147	147	<b>94</b>	<b>26</b>	0	0	0	0	0	484	41	35
21:00	0	0	3	61	106	92	79	19	4	1	0	0	<b>1</b>	366	42	36
22:00	0	0	5	39	62	50	53	22	<b>7</b>	1	0	0	0	239	43	36
23:00	0	2	3	11	45	40	44	10	1	0	0	0	0	156	42	36
Total	16	197	813	3290	4925	2580	1187	289	46	5	0	0	1	13349		
%	0.1%	1.5%	6.1%	24.6%	36.9%	19.3%	8.9%	2.2%	0.3%	0.0%	0.0%	0.0%	0.0%			
AM Peak	07:00	09:00	07:00	08:00	07:00	06:00	10:00	10:00	11:00	01:00						07:00
Vol.	1	31	71	260	376	166	65	22	5	1				955		
PM Peak	17:00	16:00	16:00	17:00	17:00	18:00	20:00	20:00	22:00	12:00			21:00	17:00		
Vol.	9	28	104	332	453	198	94	26	7	1			1	1095		

Stats

15th Percentile : 25 MPH  
50th Percentile : 31 MPH  
85th Percentile : 38 MPH  
95th Percentile : 42 MPH

Mean Speed(Average) : 32 MPH  
10 MPH Pace Speed : 25-34 MPH  
Number in Pace : 8215  
Percent in Pace : 61.5%  
Number of Vehicles > 30 MPH : 8048  
Percent of Vehicles > 30 MPH : 60.3%



PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Dascomb Road WB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
WB

165301 A WB Speed  
Site Code:

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th % ile	Ave Speed
10/07/	14	19	24	29	34	39	44	49	54	59	64	69	9999			
16	0	8	5	5	24	17	30	13	4	0	0	0	0	106	44	36
01:00	2	0	2	5	14	5	9	8	2	0	0	0	0	47	45	36
02:00	0	2	4	7	10	3	3	0	1	0	0	0	0	30	38	31
03:00	0	0	1	27	24	10	8	3	0	0	0	0	0	73	39	32
04:00	0	0	5	32	33	22	17	4	2	0	0	0	0	115	40	33
05:00	0	13	10	63	102	52	27	17	1	1	1	0	0	287	39	33
06:00	1	<b>20</b>	48	186	283	135	40	19	2	0	0	0	0	734	37	32
07:00	<b>3</b>	14	50	<b>212</b>	<b>350</b>	<b>163</b>	64	10	1	0	0	0	0	<b>867</b>	37	32
08:00	0	14	53	195	295	135	51	9	1	0	0	0	0	753	37	32
09:00	0	19	<b>58</b>	168	215	149	56	16	2	0	0	0	0	683	38	32
10:00	0	1	28	134	207	131	<b>98</b>	<b>22</b>	6	0	0	0	0	627	40	34
11:00	0	5	21	160	233	147	73	21	<b>9</b>	0	0	0	0	669	39	33
12 PM	0	0	39	189	270	158	83	21	3	0	0	0	0	763	38	33
13:00	0	3	40	146	253	136	78	19	2	0	0	0	0	677	38	33
14:00	0	1	17	210	333	155	69	16	2	<b>1</b>	0	0	0	804	37	33
15:00	0	1	55	266	402	168	70	14	1	0	0	0	0	977	37	32
16:00	2	22	<b>110</b>	<b>366</b>	<b>476</b>	165	45	12	0	0	0	0	0	<b>1198</b>	35	30
17:00	<b>11</b>	<b>30</b>	88	260	417	<b>177</b>	51	8	2	0	<b>1</b>	0	0	1045	36	31
18:00	0	0	17	129	273	175	84	16	3	0	0	0	0	697	38	34
19:00	0	0	11	61	193	141	<b>97</b>	14	2	0	0	0	0	519	40	35
20:00	0	0	5	74	111	128	85	<b>25</b>	<b>6</b>	0	0	0	0	434	41	36
21:00	0	0	1	54	106	86	77	19	1	0	0	<b>1</b>	0	345	42	36
22:00	0	0	6	49	86	77	67	12	3	0	0	0	0	300	41	35
23:00	0	0	3	34	65	62	39	19	6	1	0	0	0	229	42	36
Total	19	153	677	3032	4775	2597	1321	337	62	3	2	1	0	12979		
%	0.1%	1.2%	5.2%	23.4%	36.8%	20.0%	10.2%	2.6%	0.5%	0.0%	0.0%	0.0%	0.0%			
AM Peak	07:00	06:00	09:00	07:00	07:00	07:00	10:00	10:00	11:00	05:00	05:00			07:00		
Vol.	3	20	58	212	350	163	98	22	9	1	1			867		
PM Peak	17:00	17:00	16:00	16:00	16:00	17:00	19:00	20:00	20:00	14:00	17:00	21:00		16:00		
Vol.	11	30	110	366	476	177	97	25	6	1	1	1		1198		

Stats

15th Percentile : 25 MPH  
50th Percentile : 31 MPH  
85th Percentile : 38 MPH  
95th Percentile : 43 MPH

Mean Speed(Average) : 33 MPH  
10 MPH Pace Speed : 25-34 MPH  
Number in Pace : 7807  
Percent in Pace : 60.2%  
Number of Vehicles > 30 MPH : 8143  
Percent of Vehicles > 30 MPH : 62.7%



PRECISION  
DATA  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
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Dascomb Road WB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
WB

165301 A WB Speed  
Site Code:

Start Time	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	
10/08/16	0	0	0	3	29	27	31	40	14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	145	43	36	
01:00	0	0	0	1	5	14	10	22	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59	43	38	
02:00	0	0	0	5	12	11	14	7	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	51	44	38	
03:00	0	0	0	5	9	5	14	8	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	46	39	
04:00	0	1	4	18	11	11	8	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59	42	33	
05:00	0	2	2	31	45	25	23	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	134	40	34	
06:00	0	1	5	47	87	60	57	23	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	283	42	35	
07:00	0	0	5	53	127	63	71	35	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	362	43	36	
08:00	0	0	5	77	160	128	97	19	11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	498	41	35	
09:00	0	5	13	106	211	130	106	33	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	610	41	35	
10:00	0	1	23	131	292	158	89	28	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	725	39	34	
11:00	0	5	21	167	300	169	86	21	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	773	38	33	
12 PM	0	2	12	160	278	166	101	25	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	747	39	34	
13:00	2	2	11	141	290	180	98	31	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	757	39	34	
14:00	0	0	18	165	287	162	106	27	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	769	40	34	
15:00	0	0	14	149	281	173	108	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	746	39	34	
16:00	0	0	5	116	268	126	110	34	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	661	41	34	
17:00	0	0	6	107	234	162	93	25	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	631	40	35	
18:00	0	0	5	96	184	121	93	19	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	519	40	35	
19:00	0	0	1	63	152	90	76	18	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	402	41	35	
20:00	0	1	5	73	111	83	80	23	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	380	42	35	
21:00	0	0	2	64	73	80	63	23	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	306	42	35	
22:00	0	5	1	49	82	71	48	12	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	270	41	35	
23:00	0	0	2	76	71	58	30	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	241	38	33	
Total %	0.0%	0.2%	1.6%	19.0%	35.5%	22.3%	16.1%	4.6%	1.6%	0.6%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10171			
AM Peak		09:00	10:00	11:00	11:00	11:00	09:00	07:00	08:00	07:00	02:00																11:00		
Vol.		5	23	167	300	169	106	35	11	2	1																773		
PM Peak	13:00	22:00	14:00	14:00	13:00	13:00	16:00	16:00	12:00	20:00												17:00					14:00		
Vol.	2	5	18	165	290	180	110	34	3	2												1					769		

Stats

15th Percentile : 27 MPH  
50th Percentile : 33 MPH  
85th Percentile : 40 MPH  
95th Percentile : 44 MPH

Mean Speed(Average) : 34 MPH  
10 MPH Pace Speed : 30-39 MPH  
Number in Pace : 5879  
Percent in Pace : 57.8%  
Number of Vehicles > 30 MPH : 7326  
Percent of Vehicles > 30 MPH : 72.0%







PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Dascomb Road WB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli

165301 A WB Volume  
Site Code:

Start Time	WB												Sat	
	A.M.	P.M.											10/8/201	
12:00	44	187											6	
12:15	41	181												
12:30	25	170												
12:45	35	209	145	209	747									
01:00	21	197												
01:15	15	187												
01:30	17	176												
01:45	6	197	59	197	757									
02:00	18	173												
02:15	10	202												
02:30	11	194												
02:45	12	200	51	200	769									
03:00	10	172												
03:15	12	180												
03:30	8	203												
03:45	13	191	43	191	746									
04:00	14	165												
04:15	13	162												
04:30	14	155												
04:45	18	179	59	179	661									
05:00	17	161												
05:15	16	160												
05:30	34	148												
05:45	67	162	134	162	631									
06:00	42	148												
06:15	70	135												
06:30	75	125												
06:45	96	111	283	111	519									
07:00	57	112												
07:15	92	95												
07:30	102	82												
07:45	111	113	362	113	402									
08:00	104	95												
08:15	124	103												
08:30	129	98												
08:45	141	84	498	84	380									
09:00	142	96												
09:15	132	72												
09:30	138	76												
09:45	198	62	610	62	306									
10:00	180	62												
10:15	183	77												
10:30	179	66												
10:45	183	65	725	65	270									
11:00	192	58												
11:15	197	65												
11:30	192	59												
11:45	192	59	773	59	241									
Total	3742	6429												
Percent		100.0 %											0.0%	
Day Total		10171												
Peak	11:00	-	00:45	-	-	-	-	-	-	-	-	-	-	
Vol.	773	-	769	-	-	-	-	-	-	-	-	-	-	
P.H.F.	0.981		0.920											





PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Frontage Road NB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
NB

165301 B NB Class  
Site Code:

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
10/06/1														
6	0	23	6	1	1	0	0	0	0	0	0	0	0	31
01:00	0	23	9	0	0	0	0	0	0	0	0	0	0	32
02:00	1	26	1	1	0	0	0	0	1	0	0	0	0	30
03:00	0	26	7	0	3	2	0	0	0	0	0	0	0	38
04:00	3	81	24	2	3	4	0	1	3	0	0	0	0	121
05:00	7	405	142	2	20	10	1	2	8	0	0	0	0	597
06:00	5	484	84	4	10	8	0	1	6	0	0	0	0	602
07:00	4	629	82	10	17	8	0	2	5	0	0	0	0	757
08:00	2	601	86	8	11	1	0	1	1	0	0	0	0	711
09:00	8	400	79	4	18	10	0	2	3	0	0	0	0	524
10:00	14	355	79	5	25	15	1	2	6	0	0	0	0	502
11:00	5	311	88	4	15	8	0	1	2	0	0	0	0	434
12 PM	12	322	62	5	11	11	0	0	6	0	0	0	0	429
13:00	4	334	80	3	21	11	0	1	3	0	0	0	0	457
14:00	0	399	90	6	18	8	0	3	3	0	0	0	0	527
15:00	1	363	71	5	19	4	0	1	1	0	0	0	0	465
16:00	4	415	103	1	11	1	0	2	2	0	0	0	0	539
17:00	8	493	75	0	14	2	0	1	0	0	0	0	0	593
18:00	4	444	57	1	15	2	0	1	0	0	0	0	0	524
19:00	5	317	36	0	3	2	0	0	0	0	0	0	0	363
20:00	5	191	21	0	1	5	0	0	0	0	0	0	0	223
21:00	1	163	18	0	1	0	0	1	0	0	0	0	0	184
22:00	3	94	20	0	4	2	0	0	3	0	0	0	0	126
23:00	3	60	9	0	1	1	0	0	0	0	0	0	0	74
Percent	1.1%	78.3%	15.0%	0.7%	2.7%	1.3%	0.0%	0.2%	0.6%	0.0%	0.0%	0.0%	0.0%	
AM Peak	10:00	07:00	05:00	07:00	10:00	10:00	05:00	05:00	05:00					07:00
Vol.	14	629	142	10	25	15	1	2	8					757
PM Peak	12:00	17:00	16:00	14:00	13:00	12:00		14:00	12:00					17:00
Vol.	12	493	103	6	21	11		3	6					593



PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Frontage Road NB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
NB

165301 B NB Class  
Site Code:

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
10/07/1														
6	1	22	1	0	0	1	0	0	0	0	0	0	0	25
01:00	2	14	1	0	0	3	0	0	0	0	0	0	0	20
02:00	1	9	2	0	1	1	0	0	1	0	0	0	0	15
03:00	0	18	4	2	1	0	0	0	0	0	0	0	0	25
04:00	4	84	25	1	3	4	0	0	6	0	0	0	0	127
05:00	6	375	121	2	22	6	1	1	6	0	0	0	0	540
06:00	8	397	83	6	16	8	1	1	8	0	0	0	0	528
07:00	7	615	95	2	17	3	0	3	2	0	0	0	0	744
08:00	7	590	87	0	15	8	0	4	4	0	0	0	0	715
09:00	14	399	80	4	10	11	0	2	3	0	0	0	0	523
10:00	8	324	79	4	15	10	0	2	6	0	0	0	0	448
11:00	7	324	63	5	16	7	0	4	2	0	0	0	0	428
12 PM	10	352	68	3	18	12	0	4	4	0	0	0	0	471
13:00	9	330	92	10	10	12	0	5	5	0	0	0	0	473
14:00	2	393	89	9	19	3	0	2	1	0	0	0	1	519
15:00	6	410	76	3	12	6	0	1	0	0	0	0	0	514
16:00	8	430	71	5	24	2	0	1	0	0	0	0	0	541
17:00	5	469	76	5	14	2	0	3	0	0	0	0	0	574
18:00	2	414	61	2	6	1	0	1	0	0	0	0	0	487
19:00	2	251	31	0	7	1	0	0	0	0	0	0	0	292
20:00	2	178	32	0	3	1	0	0	0	0	0	0	0	216
21:00	2	113	19	0	2	1	0	0	0	0	0	0	0	137
22:00	4	177	32	0	8	0	0	1	0	0	0	0	0	222
23:00	0	129	16	1	3	0	0	0	0	0	0	0	0	149
Percent	1.3%	78.1%	14.9%	0.7%	2.8%	1.2%	0.0%	0.4%	0.5%	0.0%	0.0%	0.0%	0.0%	
AM Peak	09:00	07:00	05:00	06:00	05:00	09:00	05:00	08:00	06:00					07:00
Vol.	14	615	121	6	22	11	1	4	8					744
PM Peak	12:00	17:00	13:00	13:00	16:00	12:00		13:00	13:00				14:00	17:00
Vol.	10	469	92	10	24	12		5	5				1	574



PRECISION  
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Frontage Road NB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
NB

165301 B NB Class  
Site Code:

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
10/08/1														
6	0	79	8	0	1	0	0	0	0	0	0	0	0	88
01:00	1	44	8	0	1	1	0	0	0	0	0	0	0	55
02:00	0	15	2	0	0	0	0	0	0	0	0	0	0	17
03:00	0	26	3	1	0	0	0	0	0	0	0	0	0	30
04:00	1	38	10	0	2	1	0	1	0	0	0	0	0	53
05:00	1	75	36	2	1	9	0	0	11	0	0	0	0	135
06:00	1	106	42	3	9	2	1	0	2	0	0	0	0	166
07:00	0	191	35	1	14	2	0	0	1	0	0	0	0	244
08:00	1	247	50	4	6	4	0	0	2	0	0	0	0	314
09:00	4	309	70	0	7	4	0	0	3	0	0	0	0	397
10:00	1	370	62	2	6	6	0	1	2	0	0	0	0	450
11:00	3	381	83	1	7	4	0	2	4	0	0	0	0	485
12 PM	2	365	55	2	5	3	0	0	1	0	0	0	0	433
13:00	4	378	68	2	13	2	0	1	0	0	0	0	0	468
14:00	4	325	76	0	6	0	0	0	0	0	0	0	0	411
15:00	1	373	58	0	6	1	0	0	0	0	0	0	0	439
16:00	2	331	56	0	7	0	0	0	0	0	0	0	0	396
17:00	1	332	50	0	9	0	0	1	0	0	0	0	0	393
18:00	0	303	38	2	8	0	0	0	0	0	0	0	0	351
19:00	1	224	30	0	3	0	0	0	1	0	0	0	0	259
20:00	2	156	21	0	4	0	0	0	0	0	0	0	0	183
21:00	0	147	22	0	2	0	0	0	0	0	0	0	0	171
22:00	0	133	12	0	1	0	0	0	0	0	0	0	0	146
23:00	0	93	13	0	3	0	0	0	0	0	0	0	0	109
Percent	0.5%	81.4%	14.7%	0.3%	2.0%	0.6%	0.0%	0.1%	0.4%	0.0%	0.0%	0.0%	0.0%	
AM Peak	09:00	11:00	11:00	08:00	07:00	05:00	06:00	11:00	05:00					11:00
Vol.	4	381	83	4	14	9	1	2	11					485
PM Peak	13:00	13:00	14:00	12:00	13:00	12:00		13:00	12:00					13:00
Vol.	4	378	76	2	13	3		1	1					468



PRECISION  
D A T A  
INDUSTRIES, LLC

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Frontage Road NB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
NB

165301 B NB Speed  
Site Code:

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th % ile	Ave Speed
10/06/	14	19	24	29	34	39	44	49	54	59	64	69	9999			
16	0	0	2	6	9	13	1	0	0	0	0	0	0	31	37	33
01:00	0	0	1	8	14	6	2	1	0	0	0	0	0	32	37	32
02:00	0	1	1	3	14	9	2	0	0	0	0	0	0	30	37	33
03:00	0	0	1	9	15	11	2	0	0	0	0	0	0	38	37	33
04:00	1	0	16	25	53	24	2	0	0	0	0	0	0	121	35	31
05:00	1	8	73	116	257	124	16	2	0	0	0	0	0	597	36	31
06:00	0	4	16	83	287	179	29	3	1	0	0	0	0	602	37	33
07:00	0	0	19	104	356	252	24	2	0	0	0	0	0	757	37	33
08:00	0	0	11	70	349	237	40	3	1	0	0	0	0	711	37	34
09:00	0	1	18	57	259	170	19	0	0	0	0	0	0	524	37	33
10:00	1	7	41	84	228	129	11	1	0	0	0	0	0	502	36	32
11:00	1	4	9	49	223	128	17	3	0	0	0	0	0	434	37	33
12 PM	0	0	25	68	195	124	14	2	1	0	0	0	0	429	37	33
13:00	0	2	11	66	211	149	18	0	0	0	0	0	0	457	37	33
14:00	0	1	17	64	257	168	19	1	0	0	0	0	0	527	37	33
15:00	0	4	18	47	249	133	14	0	0	0	0	0	0	465	36	33
16:00	0	0	6	58	277	166	32	0	0	0	0	0	0	539	37	33
17:00	0	0	16	87	287	175	27	1	0	0	0	0	0	593	37	33
18:00	0	1	15	60	268	152	23	4	0	1	0	0	0	524	37	33
19:00	0	4	5	52	193	92	16	1	0	0	0	0	0	363	36	33
20:00	0	3	11	31	107	61	9	1	0	0	0	0	0	223	37	32
21:00	0	0	4	40	83	48	7	1	0	1	0	0	0	184	37	33
22:00	0	1	9	29	56	28	3	0	0	0	0	0	0	126	36	31
23:00	0	1	3	9	36	20	5	0	0	0	0	0	0	74	37	33
Total	4	42	348	1225	4283	2598	352	26	3	2	0	0	0	8883		
%	0.0%	0.5%	3.9%	13.8%	48.2%	29.2%	4.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	04:00	05:00	05:00	05:00	07:00	07:00	08:00	06:00	06:00							07:00
Vol.	1	8	73	116	356	252	40	3	1							757
PM Peak		15:00	12:00	17:00	17:00	17:00	16:00	18:00	12:00	18:00						17:00
Vol.		4	25	87	287	175	32	4	1	1						593

Stats

15th Percentile : 27 MPH  
50th Percentile : 32 MPH  
85th Percentile : 37 MPH  
95th Percentile : 38 MPH

Mean Speed(Average) : 33 MPH  
10 MPH Pace Speed : 30-39 MPH  
Number in Pace : 6881  
Percent in Pace : 77.5%  
Number of Vehicles > 30 MPH : 6407  
Percent of Vehicles > 30 MPH : 72.1%



PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Frontage Road NB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
NB

165301 B NB Speed  
Site Code:

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th % ile	Ave Speed
10/07/	14	19	24	29	34	39	44	49	54	59	64	69	9999			
16	0	0	3	4	9	6	2	1	0	0	0	0	0	25	38	33
01:00	0	0	0	10	8	1	1	0	0	0	0	0	0	20	33	30
02:00	0	0	2	3	8	2	0	0	0	0	0	0	0	15	33	30
03:00	0	1	0	4	10	8	2	0	0	0	0	0	0	25	37	33
04:00	0	0	24	15	57	29	2	0	0	0	0	0	0	127	36	31
05:00	2	19	69	115	215	108	11	1	0	0	0	0	0	540	35	30
06:00	5	9	24	62	284	128	15	0	0	1	0	0	0	528	36	32
07:00	0	2	24	123	382	184	25	4	0	0	0	0	0	744	36	32
08:00	0	5	27	93	361	199	28	1	1	0	0	0	0	715	37	33
09:00	0	9	36	76	241	148	10	2	1	0	0	0	0	523	36	32
10:00	0	7	19	71	207	135	8	1	0	0	0	0	0	448	36	32
11:00	0	2	22	73	201	115	13	2	0	0	0	0	0	428	36	32
12 PM	0	0	15	72	201	157	22	3	1	0	0	0	0	471	37	33
13:00	2	9	24	76	183	158	18	2	1	0	0	0	0	473	37	32
14:00	0	1	11	60	250	178	17	2	0	0	0	0	0	519	37	33
15:00	0	0	11	65	238	174	25	1	0	0	0	0	0	514	37	33
16:00	0	0	8	82	285	145	18	3	0	0	0	0	0	541	36	33
17:00	0	1	20	68	302	158	22	3	0	0	0	0	0	574	37	33
18:00	0	0	6	50	268	147	16	0	0	0	0	0	0	487	37	33
19:00	0	1	10	57	140	74	10	0	0	0	0	0	0	292	36	32
20:00	0	0	5	36	108	58	9	0	0	0	0	0	0	216	36	33
21:00	0	1	8	23	72	29	3	1	0	0	0	0	0	137	36	32
22:00	0	1	10	47	92	59	9	4	0	0	0	0	0	222	37	32
23:00	1	0	3	16	66	47	12	4	0	0	0	0	0	149	38	34
Total	10	68	381	1301	4188	2447	298	35	4	1	0	0	0	8733		
%	0.1%	0.8%	4.4%	14.9%	48.0%	28.0%	3.4%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	06:00	05:00	05:00	07:00	07:00	08:00	08:00	07:00	08:00	06:00				07:00		
Vol.	5	19	69	123	382	199	28	4	1	1				744		
PM Peak	13:00	13:00	13:00	16:00	17:00	14:00	15:00	22:00	12:00					17:00		
Vol.	2	9	24	82	302	178	25	4	1					574		

Stats

15th Percentile : 27 MPH  
 50th Percentile : 32 MPH  
 85th Percentile : 37 MPH  
 95th Percentile : 38 MPH

Mean Speed(Average) : 32 MPH  
 10 MPH Pace Speed : 30-39 MPH  
 Number in Pace : 6635  
 Percent in Pace : 76.0%  
 Number of Vehicles > 30 MPH : 6135  
 Percent of Vehicles > 30 MPH : 70.3%



PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
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Frontage Road NB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
NB

165301 B NB Speed  
Site Code:

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th % ile	Ave Speed
10/08/	14	19	24	29	34	39	44	49	54	59	64	69	9999			
16	0	0	2	21	35	21	9	0	0	0	0	0	0	88	38	33
01:00	0	2	0	8	20	23	2	0	0	0	0	0	0	55	37	33
02:00	0	1	2	0	8	4	2	0	0	0	0	0	0	17	38	32
03:00	0	1	3	4	10	9	3	0	0	0	0	0	0	30	38	32
04:00	0	0	5	9	29	10	0	0	0	0	0	0	0	53	35	31
05:00	0	1	5	28	60	36	4	1	0	0	0	0	0	135	36	32
06:00	0	1	7	23	92	37	6	0	0	0	0	0	0	166	36	32
07:00	0	0	3	29	133	68	10	1	0	0	0	0	0	244	37	33
08:00	0	0	2	36	167	96	10	3	0	0	0	0	0	314	37	33
09:00	0	2	11	41	197	136	9	0	1	0	0	0	0	397	37	33
10:00	2	0	12	49	232	138	12	5	0	0	0	0	0	450	37	33
11:00	0	0	15	56	242	146	25	1	0	0	0	0	0	485	37	33
12 PM	0	1	6	46	210	146	23	0	1	0	0	0	0	433	37	34
13:00	0	1	5	61	233	156	11	0	1	0	0	0	0	468	37	33
14:00	0	2	11	48	190	144	15	1	0	0	0	0	0	411	37	33
15:00	1	0	7	45	242	125	17	1	1	0	0	0	0	439	37	33
16:00	0	0	12	28	221	112	21	2	0	0	0	0	0	396	37	33
17:00	0	0	9	48	207	112	17	0	0	0	0	0	0	393	37	33
18:00	0	0	9	43	193	97	8	1	0	0	0	0	0	351	36	33
19:00	1	4	5	32	149	64	4	0	0	0	0	0	0	259	36	32
20:00	0	1	5	27	100	46	4	0	0	0	0	0	0	183	36	32
21:00	0	1	7	27	94	38	4	0	0	0	0	0	0	171	36	32
22:00	0	1	5	41	73	22	4	0	0	0	0	0	0	146	34	31
23:00	0	0	6	38	49	16	0	0	0	0	0	0	0	109	33	30
Total	4	19	154	788	3186	1802	220	16	4	0	0	0	0	6193		
%	0.1%	0.3%	2.5%	12.7%	51.4%	29.1%	3.6%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	10:00	01:00	11:00	11:00	11:00	11:00	11:00	10:00	09:00					11:00		
Vol.	2	2	15	56	242	146	25	5	1					485		
PM Peak	15:00	19:00	16:00	13:00	15:00	13:00	12:00	16:00	12:00					13:00		
Vol.	1	4	12	61	242	156	23	2	1					468		

Stats

15th Percentile : 28 MPH  
 50th Percentile : 32 MPH  
 85th Percentile : 37 MPH  
 95th Percentile : 38 MPH

Mean Speed(Average) : 33 MPH  
 10 MPH Pace Speed : 30-39 MPH  
 Number in Pace : 4988  
 Percent in Pace : 80.5%  
 Number of Vehicles > 30 MPH : 4591  
 Percent of Vehicles > 30 MPH : 74.1%









PRECISION  
D A T A  
INDUSTRIES, LLC

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Frontage Road NB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli

165301 B NB Volume  
Site Code:

Start Time	NB													
	A.M.	P.M.												
12:00	26	107												
12:15	26	107												
12:30	23	120												
12:45	13	88	99	433										
01:00	17	108												
01:15	13	128												
01:30	21	104												
01:45	4	55	128	468										
02:00	4	110												
02:15	4	112												
02:30	3	98												
02:45	6	17	91	411										
03:00	6	107												
03:15	4	109												
03:30	11	117												
03:45	9	30	106	439										
04:00	12	90												
04:15	10	99												
04:30	17	123												
04:45	14	53	84	396										
05:00	19	109												
05:15	47	89												
05:30	31	91												
05:45	38	135	104	393										
06:00	34	107												
06:15	39	83												
06:30	53	82												
06:45	40	166	79	351										
07:00	46	63												
07:15	59	72												
07:30	68	70												
07:45	71	244	54	259										
08:00	56	47												
08:15	75	49												
08:30	94	34												
08:45	89	314	53	183										
09:00	86	50												
09:15	96	45												
09:30	101	40												
09:45	114	397	36	171										
10:00	111	39												
10:15	127	39												
10:30	107	36												
10:45	105	450	32	146										
11:00	133	25												
11:15	115	23												
11:30	116	29												
11:45	121	485	32	109										
Total	2434		3759											
Percent			100.0 %		0.0%	0.0%								
Day Total		6193												
Peak Vol.	11:00	-	01:15	-	-	-	-	-	-	-	-	-	-	-
P.H.F.	485	-	470	-	-	-	-	-	-	-	-	-	-	-
	0.912		0.918											



PRECISION  
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INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Frontage Road SB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
SB

165301 B SB Class  
Site Code:

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
10/06/1														
6	1	13	4	0	2	1	0	0	2	0	0	0	0	23
01:00	1	12	2	1	0	1	0	0	3	0	0	0	0	20
02:00	1	19	8	1	1	1	0	0	0	0	0	0	0	31
03:00	1	32	14	1	2	0	0	0	0	0	0	0	0	50
04:00	5	83	29	0	10	3	0	0	1	0	0	0	0	131
05:00	8	132	59	3	20	6	0	0	1	0	0	0	0	229
06:00	12	364	114	7	34	14	0	1	6	0	0	0	0	552
07:00	12	435	94	10	29	13	0	1	5	0	0	0	0	599
08:00	17	390	101	9	28	13	1	3	1	0	0	0	0	563
09:00	13	261	101	11	22	12	1	5	10	0	0	0	0	436
10:00	6	225	64	3	19	3	0	3	8	0	0	0	1	332
11:00	8	273	87	11	24	8	1	1	5	0	0	0	0	418
12 PM	11	271	73	7	16	7	0	5	10	0	0	0	0	400
13:00	10	249	98	8	18	9	0	2	5	0	0	0	0	399
14:00	8	373	106	2	23	14	1	1	11	0	0	0	0	539
15:00	6	395	104	6	11	8	0	2	9	0	0	0	0	541
16:00	7	465	109	4	26	2	0	2	2	0	0	0	0	617
17:00	8	516	81	1	15	2	0	1	2	0	0	0	0	626
18:00	5	322	68	2	3	2	0	1	1	0	0	0	0	404
19:00	6	210	50	0	6	2	0	1	0	0	0	0	0	275
20:00	3	148	38	0	6	2	0	0	0	0	0	0	0	197
21:00	0	134	29	0	4	0	0	0	0	0	0	0	0	167
22:00	1	110	13	0	1	1	0	0	1	0	0	0	0	127
23:00	1	63	8	0	1	1	0	0	0	0	0	0	0	74
Percent	1.9%	70.9%	18.8%	1.1%	4.1%	1.6%	0.1%	0.4%	1.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	07:00	06:00	09:00	06:00	06:00	08:00	09:00	09:00				10:00	07:00
Vol.	17	435	114	11	34	14	1	5	10				1	599
PM Peak	12:00	17:00	16:00	13:00	16:00	14:00	14:00	12:00	14:00					17:00
Vol.	11	516	109	8	26	14	1	5	11					626



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10/07/1														
6	6	24	4	1	0	6	0	0	0	0	0	0	0	41
01:00	2	17	2	1	3	1	0	0	0	0	0	0	0	26
02:00	1	13	10	0	0	1	0	0	1	0	0	0	0	26
03:00	2	34	19	0	1	1	0	0	3	0	0	0	0	60
04:00	2	71	28	0	4	2	0	0	1	0	0	0	0	108
05:00	8	159	76	0	19	8	0	0	5	0	0	0	0	275
06:00	15	316	112	2	28	17	0	1	9	0	0	0	0	500
07:00	10	404	91	3	23	10	0	1	4	0	0	0	0	546
08:00	15	328	99	8	18	12	0	3	14	0	0	0	0	497
09:00	12	288	83	13	15	12	0	4	5	0	0	0	0	432
10:00	3	187	76	3	18	4	0	2	5	0	0	0	0	298
11:00	11	292	72	4	20	8	0	4	2	0	0	0	0	413
12 PM	11	321	101	7	22	6	0	3	3	0	0	0	0	474
13:00	13	256	92	10	21	10	1	4	6	0	0	0	0	413
14:00	3	385	103	6	21	2	0	0	7	0	0	0	0	527
15:00	3	423	124	5	14	5	0	3	4	0	0	0	0	581
16:00	5	498	94	2	21	6	0	3	2	0	0	0	0	631
17:00	4	427	86	2	19	0	0	3	2	0	0	0	0	543
18:00	7	259	63	0	8	1	0	1	0	0	0	0	0	339
19:00	3	198	40	1	5	1	0	2	0	0	0	0	0	250
20:00	3	154	29	0	2	1	0	0	0	0	0	0	0	189
21:00	0	136	30	1	5	0	0	0	0	0	0	0	0	172
22:00	0	128	16	0	7	0	0	0	1	0	0	0	0	152
23:00	1	86	20	2	4	0	0	0	0	0	0	0	0	113
Percent	1.8%	71.0%	19.3%	0.9%	3.9%	1.5%	0.0%	0.4%	1.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	06:00	07:00	06:00	09:00	06:00	06:00		09:00	08:00					07:00
Vol.	15	404	112	13	28	17		4	14					546
PM Peak	13:00	16:00	15:00	13:00	12:00	13:00	13:00	13:00	14:00					16:00
Vol.	13	498	124	10	22	10	1	4	7					631



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10/08/1														
6	1	51	9	0	4	1	0	0	0	0	0	0	0	66
01:00	0	19	8	0	1	0	0	0	0	0	0	0	0	28
02:00	0	15	5	1	1	0	0	0	0	0	0	0	0	22
03:00	0	14	4	0	1	0	0	0	0	0	0	0	0	19
04:00	2	25	15	0	1	0	0	0	0	0	0	0	0	43
05:00	1	84	32	0	7	3	0	0	0	0	0	0	0	127
06:00	0	103	43	2	12	0	0	0	2	0	0	0	0	162
07:00	2	143	32	2	9	3	0	1	2	0	0	0	0	194
08:00	0	180	54	1	16	0	0	0	2	0	0	0	0	253
09:00	5	217	67	1	10	5	0	4	2	0	0	0	0	311
10:00	4	309	72	1	7	4	0	1	4	0	0	0	0	402
11:00	6	306	80	1	19	5	0	1	8	0	0	0	0	426
12 PM	5	289	75	0	8	1	0	0	1	0	0	0	0	379
13:00	1	294	81	1	13	0	0	1	0	0	0	0	0	391
14:00	3	327	76	0	7	2	0	3	1	0	0	0	0	419
15:00	6	324	83	0	6	1	0	1	0	0	0	0	0	421
16:00	4	286	64	2	8	0	0	0	0	0	0	0	0	364
17:00	4	247	64	2	8	1	0	0	0	0	0	0	0	326
18:00	2	226	39	2	8	1	0	1	0	0	0	0	0	279
19:00	2	193	32	1	8	0	0	0	0	0	0	0	0	236
20:00	1	156	32	0	5	0	0	0	0	0	0	0	0	194
21:00	1	146	21	0	4	0	0	0	0	0	0	0	0	172
22:00	1	114	24	0	1	1	0	0	0	0	0	0	0	141
23:00	0	106	19	0	1	0	0	0	0	0	0	0	0	126
Percent	0.9%	75.9%	18.7%	0.3%	3.0%	0.5%	0.0%	0.2%	0.4%	0.0%	0.0%	0.0%	0.0%	
AM Peak	11:00	10:00	11:00	06:00	11:00	09:00		09:00	11:00					11:00
Vol.	6	309	80	2	19	5		4	8					426
PM Peak	15:00	14:00	15:00	16:00	13:00	14:00		14:00	12:00					15:00
Vol.	6	327	83	2	13	2		3	1					421



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SB

165301 B SB Speed  
Site Code:

Start Time	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	
10/06/																													
16	0	0	0	2	5	6	9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	37	32	
01:00	0	0	0	2	5	8	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	36	31	
02:00	0	0	0	2	1	14	12	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	37	34	
03:00	0	1	2	4	22	17	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	37	33		
04:00	0	0	2	25	56	41	6	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	131	37	33		
05:00	0	0	14	46	76	77	15	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	229	37	33		
06:00	4	2	18	76	209	190	48	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	552	38	33		
07:00	0	2	20	71	243	213	44	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	599	38	34		
08:00	0	1	21	64	204	212	58	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	563	38	34		
09:00	0	1	10	58	149	163	51	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	436	38	34		
10:00	0	0	2	21	123	145	39	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	332	38	35		
11:00	0	0	7	52	152	153	50	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	418	38	34		
12 PM	0	1	8	59	140	145	39	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	400	38	34		
13:00	0	0	8	51	148	145	40	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	399	38	34		
14:00	0	2	9	64	212	190	59	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	539	38	34		
15:00	0	1	5	66	215	205	43	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	541	38	34		
16:00	0	0	7	53	227	249	74	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	617	38	35		
17:00	0	0	5	74	253	237	49	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	626	38	34		
18:00	0	0	0	29	166	169	36	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	404	38	35		
19:00	0	0	3	17	128	113	13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	275	37	34		
20:00	0	0	0	16	81	83	16	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	197	38	35		
21:00	0	0	0	19	79	57	11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	167	37	34		
22:00	0	0	0	18	61	42	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	127	37	33		
23:00	0	0	3	3	36	23	8	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74	38	34		
Total	4	11	150	897	3008	2894	712	67	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7750				
%	0.1%	0.1%	1.9%	11.6%	38.8%	37.3%	9.2%	0.9%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
AM Peak	06:00	06:00	08:00	06:00	07:00	07:00	08:00	07:00	04:00																	07:00			
Vol.	4	2	21	76	243	213	58	6	1																	599			
PM Peak		14:00	14:00	17:00	17:00	16:00	16:00	17:00	12:00																		17:00		
Vol.		2	9	74	253	249	74	8	2																		626		

Stats

15th Percentile : 29 MPH  
50th Percentile : 33 MPH  
85th Percentile : 38 MPH  
95th Percentile : 41 MPH

Mean Speed(Average) : 34 MPH  
10 MPH Pace Speed : 30-39 MPH  
Number in Pace : 5902  
Percent in Pace : 76.2%  
Number of Vehicles > 30 MPH : 6086  
Percent of Vehicles > 30 MPH : 78.5%



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165301 B SB Speed  
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Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th %ile	Ave Speed
10/07/	14	19	24	29	34	39	44	49	54	59	64	69	9999			
16	0	3	8	9	7	10	4	0	0	0	0	0	0	41	37	30
01:00	0	3	2	1	10	6	4	0	0	0	0	0	0	26	39	32
02:00	0	0	3	3	10	10	0	0	0	0	0	0	0	26	37	32
03:00	0	0	1	6	29	21	3	0	0	0	0	0	0	60	37	34
04:00	0	0	5	22	39	30	11	1	0	0	0	0	0	108	38	33
05:00	0	2	9	49	106	89	17	3	0	0	0	0	0	275	37	33
06:00	0	4	26	62	196	170	36	4	1	1	0	0	0	500	38	33
07:00	0	4	16	64	219	202	38	2	1	0	0	0	0	546	37	34
08:00	1	3	12	70	179	182	48	1	0	1	0	0	0	497	38	34
09:00	0	1	23	55	139	163	43	7	1	0	0	0	0	432	38	34
10:00	0	0	6	25	110	120	30	7	0	0	0	0	0	298	38	35
11:00	0	1	3	31	162	167	44	4	1	0	0	0	0	413	38	35
12 PM	0	0	9	36	186	196	43	4	0	0	0	0	0	474	38	35
13:00	0	0	3	52	155	163	36	4	0	0	0	0	0	413	38	34
14:00	0	0	6	49	195	217	51	9	0	0	0	0	0	527	38	35
15:00	0	1	1	63	218	237	52	9	0	0	0	0	0	581	38	35
16:00	0	0	5	62	256	247	56	5	0	0	0	0	0	631	38	34
17:00	0	2	4	48	205	221	55	7	1	0	0	0	0	543	38	35
18:00	0	0	4	39	137	129	26	4	0	0	0	0	0	339	38	34
19:00	0	0	5	19	114	94	17	1	0	0	0	0	0	250	37	34
20:00	0	0	6	16	83	74	9	1	0	0	0	0	0	189	37	34
21:00	0	0	2	18	78	65	7	2	0	0	0	0	0	172	37	34
22:00	0	0	1	12	74	55	10	0	0	0	0	0	0	152	37	34
23:00	0	0	1	3	56	43	9	1	0	0	0	0	0	113	38	35
Total	1	24	161	814	2963	2911	649	76	5	2	0	0	0	7606		
%	0.0%	0.3%	2.1%	10.7%	39.0%	38.3%	8.5%	1.0%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	06:00	06:00	08:00	07:00	07:00	08:00	09:00	06:00	06:00					07:00	
Vol.	1	4	26	70	219	202	48	7	1	1					546	
PM Peak		17:00	12:00	15:00	16:00	16:00	16:00	14:00	17:00						16:00	
Vol.		2	9	63	256	247	56	9	1						631	

Stats

15th Percentile : 29 MPH  
 50th Percentile : 33 MPH  
 85th Percentile : 38 MPH  
 95th Percentile : 41 MPH

Mean Speed(Average) : 34 MPH  
 10 MPH Pace Speed : 30-39 MPH  
 Number in Pace : 5874  
 Percent in Pace : 77.2%  
 Number of Vehicles > 30 MPH : 6013  
 Percent of Vehicles > 30 MPH : 79.1%



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Start Time	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
10/08/16	0	0	4	4	27	23	6	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66	38	34	
01:00	0	0	0	2	14	9	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	38	34	
02:00	0	0	1	0	10	8	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	38	35	
03:00	0	0	1	3	7	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	39	34	
04:00	0	0	1	5	20	14	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	37	34	
05:00	0	0	0	16	45	48	16	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	127	38	35	
06:00	0	0	2	13	51	79	16	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	162	38	35	
07:00	0	0	1	20	72	82	18	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	194	38	35	
08:00	0	1	2	10	86	113	38	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	253	39	36	
09:00	0	0	1	25	98	150	34	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	311	38	35	
10:00	0	0	3	31	156	177	30	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	402	38	35	
11:00	0	0	5	39	171	172	31	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	426	38	34	
12 PM	0	0	0	20	136	170	44	7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	379	38	36	
13:00	0	0	5	17	162	174	31	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	391	38	35	
14:00	0	0	3	31	186	176	21	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	419	37	34	
15:00	1	0	5	30	190	152	39	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	421	38	34	
16:00	0	1	3	21	167	150	18	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	364	37	34	
17:00	0	0	3	25	152	116	29	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	326	38	34	
18:00	0	0	5	16	129	112	14	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	279	37	34	
19:00	0	0	0	33	103	86	10	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	236	37	34	
20:00	0	1	0	22	94	63	12	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	194	37	34	
21:00	0	0	0	22	81	64	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	172	37	34	
22:00	0	0	4	24	80	32	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	141	35	32	
23:00	0	0	1	21	69	32	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	126	36	33	
Total	1	3	50	450	2306	2207	426	49	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5501			
%	0.0%	0.1%	0.9%	8.2%	41.9%	40.1%	7.7%	0.9%	0.2%	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%				
AM Peak		08:00	11:00	11:00	11:00	10:00	08:00	11:00	11:00																	11:00		
Vol.		1	5	39	171	177	38	5	3																	426		
PM Peak	15:00	16:00	13:00	19:00	15:00	14:00	12:00	12:00	12:00																	15:00		
Vol.	1	1	5	33	190	176	44	7	2																	421		

Stats

15th Percentile : 29 MPH  
 50th Percentile : 33 MPH  
 85th Percentile : 38 MPH  
 95th Percentile : 41 MPH

Mean Speed(Average) : 34 MPH  
 10 MPH Pace Speed : 30-39 MPH  
 Number in Pace : 4513  
 Percent in Pace : 82.0%  
 Number of Vehicles > 30 MPH : 4536  
 Percent of Vehicles > 30 MPH : 82.5%



PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Frontage Road SB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli

165301 B SB Volume  
Site Code:

Start Time	SB												Thu
	A.M.	P.M.											10/6/201
12:00	7	108											6
12:15	6	92											
12:30	5	98											
12:45	5	23	102	400									
01:00	2	95											
01:15	4	92											
01:30	11	104											
01:45	3	20	108	399									
02:00	4	117											
02:15	8	105											
02:30	11	171											
02:45	8	31	146	539									
03:00	8	133											
03:15	9	144											
03:30	9	136											
03:45	24	50	128	541									
04:00	15	137											
04:15	24	151											
04:30	30	164											
04:45	62	131	165	617									
05:00	64	163											
05:15	57	158											
05:30	37	155											
05:45	71	229	150	626									
06:00	100	110											
06:15	123	107											
06:30	154	89											
06:45	175	552	98	404									
07:00	131	75											
07:15	167	58											
07:30	156	71											
07:45	145	599	71	275									
08:00	138	56											
08:15	133	43											
08:30	149	48											
08:45	143	563	50	197									
09:00	127	46											
09:15	115	50											
09:30	99	37											
09:45	95	436	34	167									
10:00	82	34											
10:15	80	43											
10:30	79	22											
10:45	91	332	28	127									
11:00	92	25											
11:15	81	18											
11:30	123	16											
11:45	122	418	15	74									
Total	3384		4366										
Percent			100.0 %		0.0%	0.0%							
Day Total			7750										
Peak	06:45	-	04:30	-	-	-	-	-	-	-	-	-	-
Vol.	629	-	650	-	-	-	-	-	-	-	-	-	-
P.H.F.	0.899		0.985										







**Attachment C**

Seasonal Adjustment Data



## Seasonal Adjustment

Project: 146 Dascomb Road Site Redevelopment Project - Andover, MA  
 Date: 9/22/2016  
 Analyst: TEC, Inc. / Eindra (Elena) Aung, E.I.T.  
 Source: MassDOT Temporary Count Station 4094, 5022

### STATION 4094 - TEWKSBURY - RTE.I-495 - SOUTH OF RTE. 133

<u>YR</u>	<u>JAN</u>	<u>FEB</u>	<u>MAR</u>	<u>APR</u>	<u>MAY</u>	<u>JUN</u>	<u>JUL</u>	<u>AUG</u>	<u>SEP</u>	<u>OCT</u>	<u>NOV</u>	<u>DEC</u>	<u>YEAR</u>	<u>Seasonal Adjustment</u>
07	102,351	102,627	106,577	110,198	118,938	121,809	127,805	133,457	119,013	<b>118,605</b>	115,154	106,941	<b>115,290</b>	<b>-2.9%</b>
08	101,374	101,031	111,000	112,165	114,506	120,016	123,483	125,679	114,656	<b>116,648</b>	105,753	108,715	<b>112,919</b>	<b>-3.3%</b>
09	96,811	103,712	104,446	114,001	115,035	122,117	127,687	128,491	118,421	<b>113,868</b>	106,337	100,903	<b>112,652</b>	<b>-1.1%</b>

Average Adj. = **-2.4%**

### STATION 5022 - ANDOVER - RTE. I-93 - NORTH OF RTE. 125

<u>YR</u>	<u>JAN</u>	<u>FEB</u>	<u>MAR</u>	<u>APR</u>	<u>MAY</u>	<u>JUN</u>	<u>JUL</u>	<u>AUG</u>	<u>SEP</u>	<u>OCT</u>	<u>NOV</u>	<u>DEC</u>	<u>YEAR</u>	<u>Seasonal Adjustment</u>
05	124,000	126,185	126,680	131,454	136,994	144,309	149,303	147,936	140,393	<b>134,533</b>	127,383	124,378	<b>134,462</b>	<b>-0.1%</b>
06	131,360	125,662	138,687	137,626	135,905	136,190	140,243	144,711	139,807	<b>140,025</b>	134,818	132,016	<b>136,421</b>	<b>-2.6%</b>
07	132,589	137,375	141,923	138,061	139,177	145,325	141,686	147,710	140,272	<b>143,411</b>	136,392	123,438	<b>138,947</b>	<b>-3.2%</b>
08	131,683	130,041	137,000	138,852	137,621	141,721	139,813	141,255	138,658	<b>131,381</b>	129,380	105,779	<b>133,599</b>	<b>1.7%</b>
09	126,540	133,351	133,285	138,979	137,621	141,721	141,929	143,127	141,948	<b>142,958</b>	134,338	131,723	<b>137,293</b>	<b>-4.1%</b>

Average Adj. = **-1.7%**

Assume 0.0% Seasonal Adjustment.

**Attachment D**

Road Safety Audit



# ROAD SAFETY AUDIT

Dascomb Road (Frontage Road to I-93 NB Ramps)

Town of Andover

March 29, 2017

Prepared For:  
Massachusetts Department of Transportation



Town of Andover, Massachusetts



Prepared By:  
TEC, Inc.  
65 Glenn Street  
Lawrence, MA 01843





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## Background

TEC, Inc. (TEC), in cooperation with the Town of Andover and the Massachusetts Department of Transportation (MassDOT), is evaluating the existing traffic safety characteristics at the Dascomb Road / Frontage Road and Dascomb Road / Interstate 93 (I-93) Northbound (NB) Ramps intersections in Andover, Massachusetts. TEC is conducting this safety evaluation as the first step towards off-site improvements for the proposed #146 Dascomb Road Redevelopment project. To date, the private mixed-use development project is in the early planning phase and is anticipated to begin state review with the Massachusetts Environmental Policy Act (MEPA) office in the spring of 2017.

### **Road Safety Audit Justification**

A Road Safety Audit (RSA), as defined by the Federal Highway Administration (FHWA), is the *formal safety performance examination of an existing or future road or intersection by an independent, multidisciplinary team*. The purpose of the RSA is to observe, identify, and report all safety issues and identify future opportunities for safety enhancement improvements for all roadway users. This includes identifying both short-term and long-term safety enhancements that can be implemented through general maintenance, immediate installation/removal, or could be potentially incorporated into future improvement projects. Enhancements, or improvements, can take the form of one or more of the 4 E's; including: **E**ngineering, **E**ducation, **E**mergency Response, and **E**nforcement.

The U.S. Congress enacted the “Safe, Accountable, Flexible, Efficient, Transportation Act - A Legacy for Users” (SAFETEA-LU) in August 2005. This act provides guidance and funding for the implementation of a State Highway Safety Improvement Program (HSIP). As part of this Program, all states are required to develop a Strategic Highway Safety Plan (SHSP). The MassDOT guidelines require an RSA be conducted where HSIP-eligible crash clusters are present within the study area of a transportation improvement project prior to commencing or finalizing a 25% Design. In this case, the RSA is being conducted during the early MEPA review process. An intersection is defined as HSIP-eligible if the intersection is within the top 5% of crash clusters in its respective Regional Planning Commission (RPC) boundaries based on Equivalent Property Damage Only (EPDO). EPDO rates crashes based on the crash severity.

### ***HSIP Eligibility***

Based on the MassDOT online crash cluster database, the Dascomb Road / Smith Drive intersection is considered 2012-2014 HSIP-eligible. Upon further review of the compiled crash reports, many of the crashes that MassDOT geocoded to the intersection of Dascomb Road / Smith Drive were found to be incorrectly placed. Crash reports indicate that nearly all of these crashes occurred at or within the influence of the Dascomb Road / Frontage Road intersection, which is located approximately 600 feet to the east. TEC had identified this error with the MassDOT Traffic Safety Section in October 2016. As part of all subsequent traffic related documents, the intersection of Dascomb Road / Smith Drive will not be considered HSIP-eligible; however the intersection of Dascomb Road / Frontage Road is to be considered.

The Interstate 93 Interchange 42 is considered HSIP-eligible as a whole. Like many freeway interchanges throughout the Commonwealth, a large number of crashes that occurred along the freeway segment,

ramps, surface intersections, and at locations far upstream and downstream of the interchanges are geocoded to the interchange regardless of influence location. Therefore, it is difficult to decipher where the crash issues, if any, exist on or at the general interchange. After a review of all interchange crash reports, the reports indicated that the surface intersection of Dascomb Road / I-93 NB Ramps is HSIP-eligible separate from the interchange.

## Project Data

TEC of Lawrence, Massachusetts is the primary traffic safety investigation consultant in this RSA for the Dascomb Road / Frontage Road and Dascomb Road / I-93 NB Ramps intersections. The RSA meeting was conducted on Wednesday, December 14, 2016 at 1:00 PM, with the pre- and post-audit meetings held at the Andover Public Safety Center, located at #32 North Main Street in Andover, Massachusetts. A copy of the RSA agenda can be found in Appendix A. TEC and representatives of the Town have also conducted various other field visits to the audit location as part of their private development project scoping process.

As presented in Table 1 below, the audit team consisted of a cross-section of state, regional, and local engineering, enforcement, maintenance, and emergency response professionals and was assembled in conjunction with input from MassDOT's Traffic Safety Management Unit. Contact information for all participating audit team members is provided in Appendix B.

**Table 1: Participating Audit Team Members**

<b>Audit Team Member</b>	<b>Agency/Affiliation</b>
Brian Moore	Andover Engineering Department
Paul Materazzo	Andover Planning Department
Glen Ota	Andover Police Department
Chris Moore	Andover Police Department
John Mangiaratti	Andover Town Manager
Adam Prichard	MassDOT Traffic Safety
Michelle Deng	MassDOT Traffic Safety
Elsa Chan	MassDOT Traffic Safety
Tony Komornick	Merrimack Valley Planning Commission (MVPC)
Jim Terlizzi	Merrimack Valley Planning Commission (MVPC)
Tim Roberts	MassDOT District 4
Timothy Paris	MassDOT District 4
Mikel Myers	TEC, Inc.
Rick Friberg	TEC, Inc.
Samuel Gregorio	TEC, Inc.

Audit participants were provided with materials to review prior to the audit meeting. The materials included a summary of crash data, collision diagrams (See Appendix), a summary of the type and severity of crashes, and traffic volume data. Participants were encouraged to visit the site prior to the audit and urged to consider elements on MassDOT's Safety Review Prompt List.

On the day of the audit, a pre-audit meeting was held to discuss the project's background, the audit process, review the distributed materials, and discuss some of the issues that team members had

observed individually. The audit site walk consisted of field observations at the audit intersections. Handwritten notes and photographs documented the observations made by audit team members during the site walk. Following the audit site walk, a post-audit meeting was held where the team confirmed the observations made in the field and offered solutions to enhance the safety of areas noted in the site walk and pre-audit meeting.

## Project Location and Description

The RSA was conducted at the Dascomb Road / Frontage Road and Dascomb Road / I-93 NB Ramps intersections in the Town of Andover, Massachusetts. A study area location map is provided in Figure 1. A detailed description of the study area roadways and intersections is provided below:

### **Existing Geometry and Infrastructure Summary**

#### ***Dascomb Road***

Dascomb Road is a northeast-southwest urban minor arterial roadway maintained by the Town of Andover. MassDOT maintains a short segment of the roadway between Frontage Road and the I-93 NB Interchange 42 Ramps. For the purposes of this audit, the cardinal direction of the corridor is east-west. Within the Town of Tewksbury, the corridor is signed as East Street. The corridor provides a local connection between Tewksbury Center to the west and Andover Street to Andover Center to the east. Dascomb Road ranges from approximately 42 to 55-foot wide and features a posted speed limit of 35 miles per hour (mph) within the vicinity of the audit site. Land uses along Dascomb Road include residential and industrial uses. Dascomb Road / East Street to the west carries a significant level of heavy vehicle traffic as a result of the Market Basket Headquarters and Distribution Warehouse located approximately 1-mile west of the audit area.

#### ***Frontage Road***

Frontage Road is a north-south local roadway maintained by the Town of Andover. The roadway provides a local connection between Osgood Street and the Raytheon facility to the north and Dascomb Road to the south as well as regional access to the I-93 SB Interchange 42 Ramps. Frontage Road is approximately 53-foot wide and does not feature a posted speed limit within the vicinity of the audit area. Land uses along Frontage Road are predominantly industrial in nature. Immediately north of Dascomb Road, Frontage Road provides access/egress to a MassDOT Park 'n' Ride facility.

#### ***Intersection: Dascomb Road / Frontage Road***

Frontage Road intersects Dascomb Road to form a three-way, T-type, fully-actuated signalized intersection. The Dascomb Road eastbound approach consists of an exclusive left-turn lane and a through lane, while the Dascomb Road westbound approach consists of two through lanes and a channelized right-turn lane, which operates under YIELD-control. Directional flow along Dascomb Road is separated by a marked centerline. The Frontage Road southbound approach consists of an exclusive left-turn lane and a channelized right-turn lane, which operates under YIELD-control. Directional flow along Frontage Road is separated by a raised concrete median which transitions to a marked centerline. Sidewalks and crosswalks are not provided along any of the roadways or intersection approaches. Although the traffic

signal is programmed for coordination, the traffic signal currently operates under free operation. The master controller unit, which is not currently connected and is located at the adjacent East Street / Shawsheen Street / Dascomb Road intersection, will be transferred to this intersection upon further improvements to the corridor signalization per MassDOT.

Recently in the late summer of 2016, MassDOT installed a permitted flashing yellow arrow (FYA) left-turn indication along Dascomb Road eastbound. Anecdotal information from an RSA team member indicates that the installation of the FYA indication has made a minimal impact on the occurrence of crashes on the left-turn movement.

### ***Intersection: Dascomb Road / Interstate 93 Northbound Ramps [Interchange 42]***

The Interstate 93 Northbound Interchange 42 Ramps (I-93 NB Ramps) intersect Dascomb Road to form a three-way, T-type, unsignalized intersection. The intersection is constructed as a standard half-cloverleaf. The Dascomb Road eastbound approach consists of a through lane and a channelized right-turn lane. The Dascomb Road westbound approach consists of an exclusive left-turn lane and a through lane. Directional flow along Dascomb Road is separated by a marked centerline. The I-93 NB Ramps northbound approach consists of an exclusive left-turn lane and a channelized right-turn lane, which operates under YIELD-control. The ramp is marked as one travel lane immediately south of the channelization. Directional flow along the I-93 NB Ramps is separated by a landscaped median which transitions to a raised concrete median. Sidewalks and crosswalks are not provided along any of the roadways or intersection approaches. Upon observation, the queue for the left-turn movement along the I-93 NB Ramps is extensive during the commuter peak periods. To bypass this extensive queue, left-turning vehicles often turn right instead and then make a U-turn on one of the nearby side streets. As a result, many side street roadways to the east along Dascomb Road are signed for prohibited reverse movements. Although much of the off-ramp is striped as one-lane, left-turning vehicles will queue against the far left shoulder allowing right-turning vehicles to by-pass.

### **Sight Distance Measurements**

TEC visited the site on Monday, October 11, 2016 to measure the available sight distances along the study area roadways. The available sight distances were compared to minimum requirements established by the American Association of State Highway and Transportation Officials (AASHTO).

Sight distance represents the length of roadway that is visible to a driver traveling within the roadway. Two types of sight distance are typically evaluated for driveways and intersections: stopping sight distance (SSD) and intersection sight distance (ISD). SSD is the minimum distance required for a driver traveling along a roadway to perceive an object in the roadway and stop safely in advance of the object when traveling on a wet pavement surface. SSD is measured from an eye height of 3.5 feet to an object height of two (2) feet above the ground, which is equivalent to a driver viewing the taillight of a vehicle ahead. SSD is measured along the centerline of the travel lane approaching the driveway or intersection.





1" = 200'

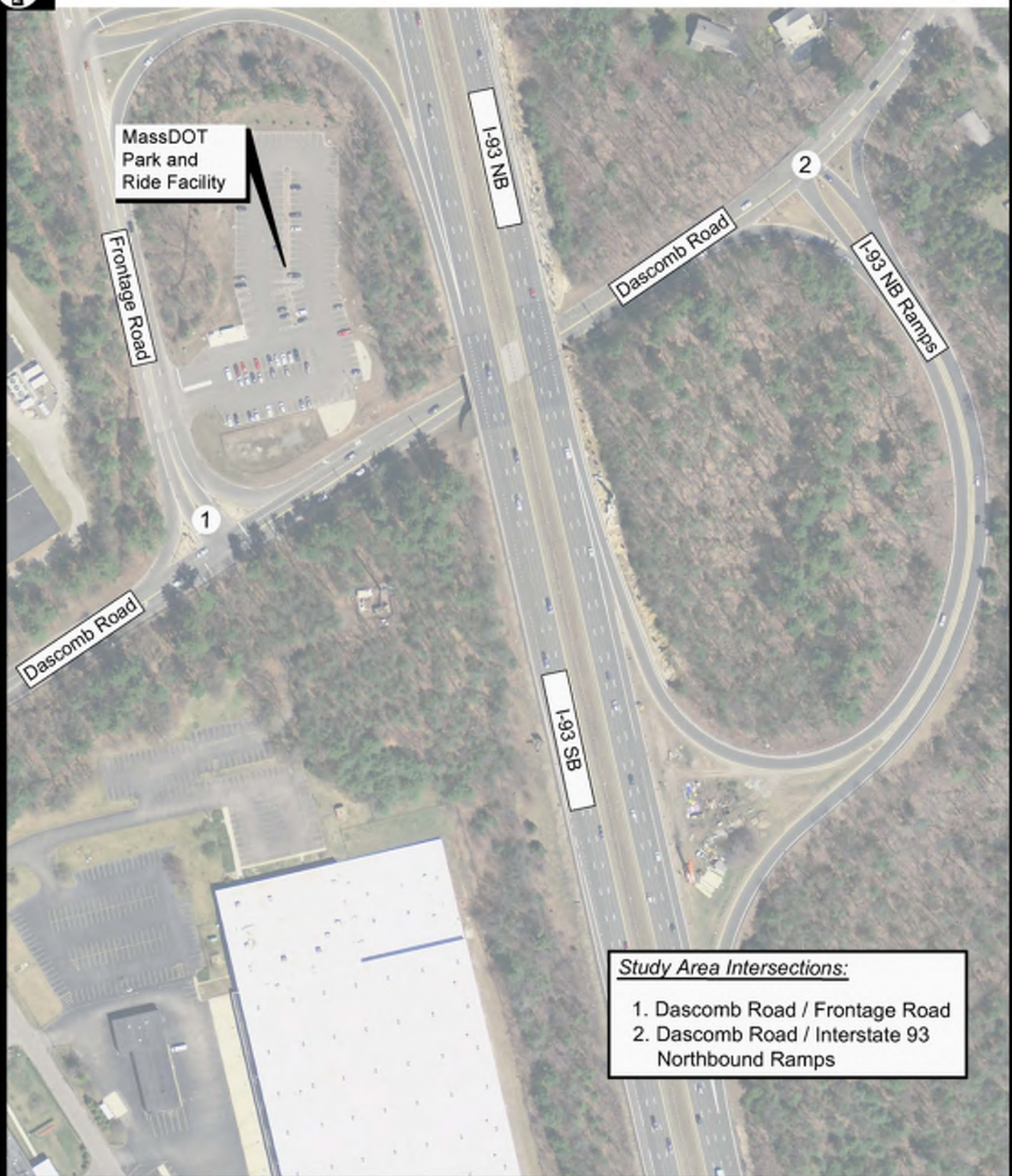


Figure 1

Project Location Map &  
Study Area Intersections



ISD represents the length of the roadway visible to a driver waiting to exit a driveway or minor street. The minimum ISD desired are based on the distance required for a driver to exit a minor street onto a major street without requiring an approaching vehicle to reduce its speed from the design speed to less than 70 percent of the design speed. ISD is measured from an eye height of 3.5 feet to an object height of 3.5 feet, and is measured from a distance 14.5 feet off the edge of the travel-way of the major roadway to represent a driver waiting to exit a driveway or minor roadway.

SSD is typically considered the critical sight distance, as it represents the minimum distance required for safe stopping, while ISD represents an acceptable speed reduction for approaching vehicles. The ISD, however, must be at least equal to the minimum required SSD in order to prevent a driver from entering the roadway when an approaching vehicle is too close to safely stop. The guidance provided by AASHTO states:

*“If the available sight distance for an entering or crossing vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to anticipate and avoid collisions. However, in some cases, this may require a major-road vehicle to stop or slow to accommodate the maneuver by a minor-road vehicle. To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road.”*

Tables 2 and 3 provide a summary of the available SSD and ISD at the audit intersections, respectively. The posted speed of along Dascomb Road is 35 MPH. For calculation purposes, the 85<sup>th</sup> percentile speed measured from the Automatic Traffic Recorder (ATR) counts was utilized as the design speed to provide a conservative depiction of sight distance criteria.

**Table 2: Stopping Sight Distance Summary**

<b>Approach / Direction</b>	<b>Design Speed <sup>(a)</sup></b>	<b>Minimum Required</b>	<b>Measured Sight Distance</b>
Dascomb Road EB	36	260 FT	>500 FT
Dascomb Road WB	40	305 FT	>500 FT

<sup>a</sup> 85<sup>th</sup> percentile speed utilized as measurement of “Design Speed” for Dascomb Road approaches

**Table 3: Intersection Sight Distance Summary**

<b>Approach / Direction</b>	<b>Design Speed <sup>(a)</sup></b>	<b>Minimum Required ISD</b>	<b>Desired ISD</b>	<b>Measured ISD</b>
Frontage Road SB – Looking East	40	305 FT	445 FT	>500 FT
I-93 NB Ramps NB – Looking East	40	305 FT	445 FT	>500 FT
I-93 NB Ramps NB – Looking West	36	260 FT	400 FT	>500 FT

<sup>a</sup> 85<sup>th</sup> percentile speed utilized as measurement of “Design Speed” for Dascomb Road approaches

The sight distance measurements, as shown in Tables 2 and 3, indicate that the SSD approaching the intersections exceed the minimum recommendations for safe operations. The measurements also indicate that the ISD exceed both minimum recommended and desired sight lines.

### **General Crash History**

Crash incident reports for the Dascomb Road / Frontage Road and Dascomb Road / I-93 NB Ramps intersections were compiled and analyzed for the most recent consecutive 5+ year period (January 2011 – September 2016) on file with the Town of Andover Police Department and supplemented by crash reports provided by MassDOT.

In addition to examining the number of crashes at the intersections, a crash rate was calculated to compare the occurrence of crashes to the volume of traffic passing through the intersection. The crash rate per million entering vehicles (MEV) was calculated using the evening peak hour traffic volumes from the Turning Movement Counts (TMCs), and a K-factor of 0.085 was determined from ATR counts conducted along Dascomb Road. The crash rate at each of the intersections was compared to the statewide and district-wide averages published by MassDOT in February 2016 to determine the significance of the crash occurrence. The statewide average for the signalized intersections is 0.77, and the District 4 average for signalized intersections is 0.73. The statewide average for unsignalized intersections is 0.58, and the District 4 average for unsignalized intersections is 0.56.

The crash rate per MEV for the Dascomb Road / Frontage Road and Dascomb Road / I-93 NB Ramps intersections are provided in Table 4.

**Table 4: Crash Rates by Intersection**

<b>Intersection</b>	<b>Total Crashes</b>	<b>Crash Rate</b>
Dascomb Road / Frontage Road	69	1.05
Dascomb Road / I-93 NB Ramps	26	0.45

Below is a general crash history summary for the Dascomb Road / Frontage Road and Dascomb Road / I-93 NB Ramps intersections. Further information regarding crashes is provided in the General Observations section. A detailed breakdown of the reported collisions is provided in Table 5.

#### ***Intersection: Dascomb Road / Frontage Road***

The intersection of Dascomb Road / Frontage Road experienced an average of approximately 12 reported crashes per year during the 5+ year study period. The crash rate for this intersection is higher than the statewide and district-wide averages for signalized intersections. More than half (38 of 69) of the reported crashes located at this intersection were angle crashes in which an eastbound left-turning vehicle and westbound through vehicle made contact. An additional 15 crashes were designated as rear-end crashes that occurred within the channelized right-turn lane along Frontage Road southbound. These two crash occurrences resulted in over 75 percent of the total intersection crashes at the intersection.

Approximately 40 percent of the reported crashes resulted in non-fatal injuries. An RSA team member noted that the high injury occurrence is a direct result of the “T-bone” nature of the angled crashes. Approximately 45 percent of the crashes occurred between 3:00 PM to 9:00 PM during the late-afternoon and evening peak period which represents the peak traffic period for Dascomb Road eastbound traffic. Nearly 35 percent (24 of 69) of the crashes occurred during the nighttime (dark - lighted or dark – not lighted) period, indicating the intersection may not be properly illuminated.



Table 5: Crash Data Summary

		Dascomb Road @ Frontage Road	Dascomb Road @ I- 93 NB Ramps
<b>Crash Year:</b>	2011	8	5
	2012	13	3
	2013	12	2
	2014	13	3
	2015	10	7
	2016 <sup>1</sup>	13	6
<b>TOTAL</b>		<b>69</b>	<b>26</b>
<b>Annual Average Crash Rate (MEV)</b>		<b>12.00</b>	<b>4.52</b>
		<b>1.05</b>	<b>0.45</b>
<b>Type:</b>	Angle	38	18
	Rear-End	24	3
	Sideswipe	2	0
	Head-on	3	1
	Single Vehicle	2	3
	Ped / Bike	0	1
	Not Reported	0	0
<b>TOTAL</b>		<b>69</b>	<b>26</b>
<b>Surface Conditions:</b>	Dry	54	22
	Wet	12	2
	Snow / Ice / Slush	2	1
	Other / Unknown	1	1
<b>TOTAL</b>		<b>69</b>	<b>26</b>
<b>Severity:</b>	Property Damage	43	19
	Non-Fatal Injury	26	7
	Not Reported	0	0
<b>TOTAL</b>		<b>69</b>	<b>26</b>
<b>Day of Week:</b>	Monday-Friday	56	20
	Saturday-Sunday	13	6
<b>TOTAL</b>		<b>69</b>	<b>26</b>
<b>Time of Day:</b>	6:00AM-9:00AM	11	5
	9:00AM-12:00PM	9	1
	12:00PM-3:00PM	5	5
	3:00PM-6:00PM	12	7
	6:00PM-9:00PM	19	4
	9:00PM-6:00AM	13	4
<b>TOTAL</b>		<b>69</b>	<b>26</b>
<b>Ambient Light:</b>	Daylight	40	18
	Dawn/Dusk	5	2
	Dark – Lighted	24	6
<b>TOTAL</b>		<b>69</b>	<b>26</b>

<sup>1</sup> 2016 data include crashes occurring between 1/1/2016 and 9/31/2016.

### ***Intersection: Dascomb Road / I-93 NB Ramps***

The intersection of Dascomb Road / I-93 NB Ramps experienced an average of more than four (4.52) crashes per year during the 5+ year study period. The crash rate for this intersection is significantly lower than the statewide and district-wide averages for unsignalized intersections. Approximately 69 percent (18 of 26) of the crashes were designated as angle crashes, which are typical of unsignalized intersections on half-cloverleaf interchanges. The high rate of angled crashes may be a result of the high travel speeds along Dascomb Road where vehicles attempting to enter the roadway misjudge the gap in traffic. Nearly half (12 of 26) of the crashes attributed “Failure to Yield Right-of-Way” as the primary cause.

Approximately 30 percent of the crashes resulted in non-fatal injuries. In addition, approximately 30 percent of the crashes occurred during the evening commuter peak period (3:00 PM to 6:00 PM) which represents the peak traffic period for Dascomb Road eastbound traffic and a period for which the queue along the I-93 NB Ramp northbound approach is at its peak length. Roughly 23 percent (6 of 26) of the crashes occurred during the nighttime (dark - lighted or dark – not lighted) period, indicating the intersection may not be properly illuminated.

Note that the crash data provided as part of the Appendix indicates the main contributing factor of the crash that was included on the crash report and may not be indicative of what is described in the report narrative. Further details regarding the crash data is noted in the following RSA sections.

## **Audit Observations and Potential Safety Enhancements**

Pre- and post-RSA site walk meetings were held at the Andover Public Safety Center, located at #32 North Main Street in Andover. The pre-audit meeting included brief introductions, an overview of the future design project and RSA process, and an overview of the safety characteristics of the Dascomb Road / Frontage Road and Dascomb Road / I-93 NB Ramps intersections. Each participant was asked to provide his or her concerns and comments related to the safety issues at the intersections. This process was also utilized during comment periods after the audit meeting.

Based on a summary of the existing crash information and the RSA site visit, audit participants identified both corridor-wide safety issues and safety issues that were unique to each of the individual intersections. The findings are summarized below.

### **Summary of Safety Concerns**

The RSA Team identified the following safety issues prior to, during, and after the field visit:

- Solar Glare
- Red Light Running
- Permitted Left-Turn Traffic Signal Phasing
- YIELD Channelization at Traffic Signal
- Sub-Standard Pedestrian and Bicycle Accommodations
- Lack of / Misplacement of Pavement Markings and Regulatory Signage
- Drainage and Debris
- Vehicle Queue Length, Congestion, and Courtesy Gaps
- Speed
- Dascomb Road Westbound Lane Delineation at I-93 NB Ramps

The following section provides a detailed summary of the identified safety concerns and potential safety enhancements along the corridor and at the two intersections.

#### ***Safety Issue #1: Solar Glare***

Solar glare along the corridor currently makes it difficult for drivers to see along Dascomb Road westbound, where the direction of travel and lack of overhead canopy invites direct sunlight onto the roadway. The issue is exacerbated in the Dascomb Road westbound direction as vehicles approach the I-93 overpass and leave the sun-field for an extended period due to the noise barriers along I-93 across the overpass. When the vehicle passes the far-side of the overpass, the sun is unblocked. Only one (1) crash report identified solar glare as a direct factor in the crash; however, solar glare may be a contributing factor in other crashes during the afternoon and evening commuter peak periods. Solar glare does not appear to be an issue for travel along Dascomb Road eastbound.



**Image 1: Solar glare along Dascomb Road westbound.**

To partially mitigate the impacts of solar glare, retro-reflective back plates were installed onto the existing traffic signal housings for the intersection of Dascomb Road / Frontage Road as part of the recent transportation improvement project for the adjacent Dascomb Road / Shawsheen Street / East Street intersection.

#### **Potential Safety Enhancements:**

1. Install under-deck lighting under the I-93 overpass to reduce the impact on drivers' eyes as they transition from glare-darkness-glare.
2. Install advanced warning signage along Dascomb Road westbound to provide notice of solar glare to motorists.

3. Should an alternative for the installation of additional traffic signals along the corridor be implemented, install retro-reflective back plates and tunnel visors on all traffic signal indications to increase signal visibility.

### ***Safety Issue #2: Red Light Running***

#### *Specific Observations:*

Four (4) of the crashes that occurred at the signalized intersection of Dascomb Road / Frontage Road include a vehicle running a red light. Three (3) of these four (4) crashes involved a Dascomb Road westbound vehicle running the red light. All three (3) of the crashes that resulted from the red-light running in the westbound direction occurred during the Dascomb Road eastbound protected left-turn traffic signal phase.

#### *Potential Safety Enhancements:*

1. Re-calculate traffic signal clearance intervals based on standard guidelines for travel speed, roadway grade, and intersection width.
2. Increase enforcement of red-light running at and in the vicinity of the Dascomb Road corridor.

### ***Safety Issue #3: Permitted Left-Turn Signal Phasing***

#### *Specific Observations:*

The Dascomb Road eastbound left-turn movement at the Frontage Road intersection is currently controlled with a protected left-turn traffic signal phase, followed by a permitted left-turn traffic signal phase. The permitted phase currently operates with a FYA, which was recently installed in the summer of 2016. More than half (38 of 69) of the reported crashes located at this intersection were angle crashes in which an eastbound left-turning vehicle and westbound through vehicle made contact. This indicates that most, if not all, of these crashes resulted during the permitted left-turn traffic signal phasing. Anecdotal information from an RSA team member indicates that the installation of the FYA has made a minimal impact on the occurrence of crashes on the left-turn movement; however there is insufficient data to confirm this information.

A representative of the Town of Andover noted that the two through lanes along Dascomb Road westbound through the Frontage Road intersection result in potential conflicts from courtesy gaps. A courtesy gap is created when a Dascomb Road westbound vehicle stops on the green traffic signal indication and “waves” a Dascomb Road eastbound vehicle to turn left. Because Dascomb Road westbound is two through lanes, westbound traffic may by-pass the stopped vehicle unknowing that a “wave” is allowing the left-turning vehicle to go.



**Image 2: Dascomb Road westbound approach at Frontage Road.**

Potential Safety Enhancements:

1. Further evaluate the crash impacts of the FYA installation on the Dascomb Road eastbound approach.
2. Consider the removal of the Dascomb Road eastbound permitted left-turn phase and retain only the protected left-turn phasing.
3. Consider narrowing the cross-section of Dascomb Road westbound to consist of only one through lane. Exploration of this alternative will require evaluation of potential queuing that may result during the commuter peak periods. This will help eliminate potential conflicts with the existing merge condition upstream at the channelized right-turn lane.

***Safety Issue #4: YIELD Channelization at Traffic Signal***

Specific Observations:

The Frontage Road southbound right-turn movement is currently separated from left-turning southbound traffic by a channelized right-turn lane. The channelized lane operates under YIELD-control, though the YIELD sign is currently obscured from view due to overgrown vegetation. The significant skew of the channelized lane forces motorists to view far over their shoulder to decipher gaps in the Dascomb Road westbound traffic. In some cases, a vehicle will begin to “creep” into the flow of traffic only to reevaluate the gap and then step on the brake. This has the potential to cause following vehicles to also stop quickly, or in some cases, rear-end the vehicle in front. Fifteen (15) crashes were designated as rear-end crashes that occurred within the right-turn channelized lane along Frontage Road southbound.

Potential Safety Enhancements:

1. Relocate or supplement (on opposing curb line) existing YIELD signage along the channelized lane to increase visibility.
2. Stripe YIELD markings “Shark Teeth” along the channelized lane to increase awareness of the YIELD-control condition.
3. Consider the removal of YIELD-control along the channelized lane and install traffic signal indications and phasing to control the approach. This may reduce the expectation of right-turning vehicles for the need of a gap in Dascomb Road traffic. As part of this improvement, it is anticipated that the turn-lane can remain channelized to accommodate heavy vehicle turning radii.
4. If pedestrian signals, sidewalk, and crosswalks are considered for the Dascomb Road / Frontage Road intersection, signalized-control should be considered in place of the YIELD-control along the channelized right-turn lane from Frontage Road southbound onto Dascomb Road westbound. An approved variance is required if a YIELD-control, STOP-control, or uncontrolled condition is proposed.

5. Consider narrowing the cross-section of Frontage Road southbound to consist of only one travel lane, thus removing the merge condition from the channelized right-turn lane. Exploration of this alternative will require evaluation of potential queuing that may result during the commuter peak periods and evaluation of heavy vehicle turns.

### ***Safety Issue #5: Sub-Standard Pedestrian and Bicycle Accommodations***

#### ***Specific Observations:***

*Pedestrian Accommodations* - It was noted during the RSA that the intersections lacked ADA-compliant pedestrian accommodations; including accessible ramps, detectable warning strips, crosswalks, or advanced pedestrian warning signage. RSA participants observed roadway debris accumulating in the turning islands and along the roadway edges, specifically in the short segment of paved sidewalk below the I-93 overpass. Pedestrian signal infrastructure is not provided at the intersection of Dascomb Road / Frontage Road. A representative of the Town of Andover indicated that pedestrian traffic is more prevalent further west along the Dascomb Road corridor in the vicinity of Shawsheen Street; however, increased pedestrian traffic is expected should any development become active near the I-93 Interchange. No crashes during the 5+ year period at the subject intersections involved a pedestrian.



**Image 3: Debris located on sidewalk below I-93 overpass.**

*Bicycle Accommodations* – Bicycle accommodations are not currently provided along Dascomb Road in the vicinity of the RSA intersections. On the intersection approaches, the shoulders are relatively narrow and do not provide sufficient space as a bike-able shoulder. One crash involving a bicyclist was reported during the 5+ year study period at the Dascomb Road / I-93 NB Ramps intersection.

#### ***Potential Safety Enhancements:***

1. Consider the construction of sidewalk along Dascomb Road and along Frontage Road through the audit area. Considerations should be made to provide connectivity between existing sidewalk to the east, which terminates at Osgood Street, and to the west, which terminates at Shawsheen Street.
2. Construct new Americans with Disabilities Act (ADA) / Architectural Access Board (AAB) compliant accessible curb ramps at each corner of the several intersections along Dascomb Road and Frontage Road, where applicable. Consider providing two accessible ramps per corner, where two crosswalks are present, to allow for improved access for disabled pedestrians. Stripe new crosswalks at the intersections between each ramp pair.
3. Install pedestrian traffic signal infrastructure at the signalized intersection of Dascomb Road / Frontage Road; including countdown signal heads, Accessible Pedestrian Signal (APS) push buttons, and dedicated pedestrian signal timings.

4. Should an alternative for the installation of additional traffic signals along the corridor be implemented, install pedestrian traffic signal infrastructure at newly constructed signalized intersections.
5. Consider the striping of shared-use “sharrows” pavement markings, with associated signage, along the Dascomb Road corridor to encourage cyclists to travel within the roadway and on the correct roadway approach.
6. Consider the construction of bicycle lanes along Dascomb Road to provide a dedicated space for cyclists to maneuver. The construction of bicycle lanes may require the widening of pavement and potentially require modifications to the I-93 overpass bridge abutments. If Dascomb Road is converted into one lane in each direction, bicycle lanes may be accommodated within the existing curb lines.

***Safety Issue #6: Lack of / Misplacement of Pavement Markings and Regulatory Signage***

***Specific Observations:***

***YIELD-Control Conditions*** – The Dascomb Road westbound and the Frontage Road southbound approaches each provide a channelized right-turn lane which operates under YIELD-control. Each of the YIELD signs posted at the end of each channelized right-turn lanes are partially blocked for upstream viewing by the surroundings; including steep slope grading, vegetation, and traffic signal infrastructure. No advanced YIELD signage is present nor are YIELD pavement markings painted along the channelized lanes. Eighteen (18) crashes at the intersection of Dascomb Road / Frontage Road occurred within both channelized right-turn lanes. An RSA team member noted that it is not uncommon for vehicles turning left onto Frontage Road from Dascomb Road eastbound to ignore the solid white cross hatch markings adjacent to the channelized right-turn lane in order to cut in front of right-turning vehicles prior to the I-93 SB Ramps.



**Image 4: YIELD sign visibility limited by sloped grade.**

The Dascomb Road / I-93 NB Ramps intersection operates as a typical half-cloverleaf unsignalized intersection. The I-93 NB Ramps northbound approach and the Dascomb Road eastbound approach each provide a channelized right-turn lane. The Dascomb Road eastbound channelized right-turn lane lacks both YIELD signage and pavement markings, although geometry normally dictates that right-turning vehicles accessing the on-ramp must yield to Dascomb Road westbound left-turning vehicles. Similar to the Frontage Road intersection, no advanced YIELD signage is present along the I-93 NB Ramps channelized lane. Five (5) crashes at the intersection of Dascomb Road / I-93 NB Ramps occurred within the channelized right-turn lanes. The one crash which occurred within



**Image 5: Lack of YIELD signage and markings on Dascomb Road channelized lane.**



the Dascomb Road eastbound channelized lane resulted in a rear-end crash in which the first vehicle yielded and was subsequently struck by two trailing vehicles. This may have been the result of no defined YIELD condition on the movement.

*YIELD Ambiguity* – The Dascomb Road westbound channelized right-turn lane opens into a dedicated receiving lane along Frontage Road. With a YIELD-sign present, but no pavement markings and the driver expectation that a dedicated lane is provided, some motorists may be confused on whether to yield, stop, or go. This ambiguity of not knowing where or if to yield, and which vehicle has the right-of-way, may be contributing factors with the two (2) rear-end crashes that occurred within the channelized right-turn lane. This issue is exacerbated by the location of the Park and Ride driveway, located immediately north of the intersection, and vehicles trying to position themselves to access the I-93 SB Ramps.

*Faded Pavement Markings* – Although generally in an above average condition, several pavement markings along the Dascomb Road corridor, and along the Frontage Road and I-93 NB Ramps approaches, were observed to be faded or missing. The lack of visible lane lines increases the potential for sideswipe crashes as clear and consistent lane delineation is not provided. There were two (2) sideswipe collisions within the audit area during the study period. It should be noted that an RSA team member indicated that recent restriping of the Dascomb Road westbound channelized lane has resulted in a noticeable improvement.

*Faded or Murky Signage* – Similar to the condition of pavement markings, some traffic signs within the audit area are faded, murky, or have lost their reflectivity over time. For example, the YIELD sign along the Frontage Road southbound channelized lane is currently covered in grime and lacks reflectivity. The lack of sign visibility and the close proximity of some signs to the roadway edge could be contributing factors for damage to the signs caused by heavy vehicles. This condition coupled with the sign placement, as previously noted, renders the sign unable to convey a clear and concise message from a distance or during darker time periods. One (1) rear-end crash within the channelized lane occurred during the nighttime hours when lack of reflectivity may have been a contributing factor.



**Image 6: Murky YIELD sign along Frontage Road.**

*Lack of Lane Configuration Signage* – Although some lane specific signage (R3-7 series) is present for turn lanes along Dascomb Road, approaching Frontage Road, there is a lack of lane configuration signage on the several intersection approaches in the audit area. The lack of signage may be contributing to lane choice confusion. For example, the Dascomb Road westbound exclusive left-turn lane at the I-93 NB Ramps immediately turns into a through lane on the opposing side of the intersection. This may lead to some vehicles utilizing the left-turn lane as a through lane.

Lane configuration signage or delineation is not currently provided along the I-93 NB Ramps. Although striped as a one-lane approach with a diverge point for right-turns, vehicles along the ramp will form two lanes of traffic along the ramp during congested periods. No crashes occurred as a result of the queuing along the ramp; however the potential exists for a safety concern where no clear lane designation signage or markings are present.



*Tewksbury Location Confusion* – An RSA team member noted that drivers exiting the I-93 SB Ramps along Frontage Road sometimes assume the roadway to be Dascomb Road and that a right-turn will head towards Tewksbury. Vehicles will turn right from the ramps and continue north along Frontage Road until they realize that they are on the incorrect roadway. This driver confusion sometime results in unnecessary and illegal turning maneuvers.

*Potential Safety Enhancements:*

1. Install advanced warning signage for YIELD-control upstream from channelized right-turn lanes and provide MUTCD-compliant pavement markings to supplement at both intersections.
2. Relocate or supplement (on opposing curb line) existing YIELD signs along channelized lanes to increase visibility of the signs.
3. Trim the overgrown vegetation currently blocking the YIELD signs to increase visibility of the signs.
4. Stripe YIELD markings “Shark Teeth” along channelized lanes to indicate the required yielding point.
5. Consider the removal of YIELD-control along the Dascomb Road westbound channelized right-turn lane to Frontage Road as a dedicated receiving lane exists.
6. Install advanced guide signage to the MassDOT Park and Ride lot to alert drivers of which lane to travel in to avoid confusion at the Dascomb Road / Frontage Road intersection due to the entrance’s close proximity to the intersection.
7. Restripe pavement markings, including: lane lines and stop bars along all approaches to the intersections within the audit area to provide improved clarity of lane delineation. Supplement lane markings with lane designation signage on the several intersection approaches.
8. Perform a signage inventory along the Dascomb Road corridor to remove/replace any MUTCD non-compliant signage or faded/damage signage. Existing signage post locations should be re-evaluated to a new position out of harm’s way where there is evidence of damage from heavy vehicles. This will reduce the maintenance costs for MassDOT.
9. Improve guide signage along Frontage Road at the I-93 SB Ramps to direct vehicles to Dascomb Road and Tewksbury and to reduce the risk of driver confusion.

### ***Safety Issue #7: Drainage and Debris***

#### **Specific Observations:**

It was noted and observed that a large amount of roadway debris currently lines the edge of pavement along the Dascomb Road corridor. This includes sand, bottles, tree branches, and other litter. Debris is extensive on the sidewalk below the I-93 overpass and within a number of catch basins within the audit area. This debris creates obstacles for bicyclists utilizing the shoulders along Dascomb Road. As cyclists approach debris, they may enter the vehicle paths to avoid it, which forces vehicles in the travel lanes to swerve or to unexpectedly stop or slow. Although no collisions were attributed to a bicyclist entering the travel lane, the potential for roadway debris remains a safety concern. In addition, the build-up of debris also creates a concern for an increase in ponding of stormwater along the roadway edge.



**Image 7: Debris within Dascomb Road catch basin.**

#### **Potential Safety Enhancements:**

1. Clear roadway debris and street sweep along the gutter lines of Dascomb Road, Frontage Road, and the I-93 NB Ramps to improve the travel experience and safety for bicyclists and motorists.

### ***Safety Issue #8: Congestion and Vehicle Queue Length***

#### **Specific Observations:**

*Congestion and Queues* - As a result of the numerous commercial and residential land uses along Dascomb Road, in addition to the proximity to I-93, traffic volumes at the intersections along Dascomb Road generally increase during the weekday peak periods. These additional traffic volumes, combined with the numerous driveway / side-street access locations, result in increased traffic congestion. With elevated traffic volumes along Dascomb Road, insufficient gaps are created for vehicles to exit the I-93 NB Ramps. This problem is exacerbated by the elevated truck traffic attempting to turn left from the off-ramp. Approximately 35 percent of the crashes reported in the audit area occurred during the commuter peak periods. Nearly 30 percent of the crashes reported were rear-end crashes. These collisions indicate that driver frustration caused by heavy traffic congestion may result in drivers running the red light or taking unsafe gaps to make left-turns. Approximately 59 percent of the reported crashes were angle crashes. As previously noted, some of these crashes may be left-turn courtesy crashes, where one vehicle “waves” on the opposing left-turn vehicle to turn when that vehicle does not have the right-of-way. Upon the vehicle making the turn, other vehicles from the second oncoming through lane are unaware of the “courtesy” given and strike the left-turning vehicle while travelling normally through the intersection.



**Image 8: Queue along I-93 NB Ramps.**

*Right-turning U-Turns* - All representatives of the Town of Andover noted the excessive queues along the I-93 NB Ramps during the commuter peak hours. Generally, the queue for left-turning vehicles will line-up along the inside of the ramp and extend back onto the mainline freeway. As the left-turning vehicles

line-up on the inside of the ramp, right-turning traffic by-passes the queue. It was also noted that drivers who want to take a left will historically act as a right-turning vehicle, exit the ramp, and enter Cardinal Lane or Surrey Lane located to the east of the Dascomb Road / I-93 NB Ramps intersection. Vehicles will then make a U-turn and proceed along Dascomb Road westbound. “Turns Prohibited to Reverse Direction” signs are currently present on multiple side streets to discourage this practice. Such an attempt was made during the RSA site walk.

Potential Safety Enhancements:

1. Consider the installation of a traffic signal at the intersection of Dascomb Road / I-93 NB Ramps.
2. Install advanced queue detection on the I-93 NB Ramps, pending the installation of a traffic signal at this location.
3. Continue enforcement and levying penalties to deter motorists from performing illegal U-turns.

**Safety Issue #9: Speed**

Specific Observations:

Excessive speed was noted as the contributing factor in two (2) crashes at the Dascomb Road / I-93 NB Ramps intersection. Based on the traffic counts conducted in October 2016, the 85<sup>th</sup> percentile speed along Dascomb Road was measured above the posted speed. Speed of vehicles along Dascomb Road westbound was also noted anecdotally as a cause for queuing along the I-93 NB Ramps as vehicles will generally have a difficult time perceiving gaps along Dascomb Road.

Potential Safety Enhancements:

1. Consider reducing the travel lane widths along Dascomb Road to encourage slower speeds along the corridor.
2. Increase enforcement of speeding at and in the vicinity of the intersections.
3. Evaluate the need to reconstruct turning islands at both intersections to help reduce turning speeds. Note that damage to curb reveal is evident under existing conditions which may indicate that heavy vehicles may not have sufficient space to complete turns at the intersections.

**Safety Issue #10: Dascomb Road Westbound Lane Delineation at I-93 NB Ramps**

Specific Observations:

It was observed at the audit meeting that left-turning vehicles exiting the I-93 NB Ramps will attempt to enter the far-right lane along Dascomb Road westbound, crossing over the far-left lane. Typically, the traffic volume in this far-left lane is minimal as the opposing lane on Dascomb Road entering the intersection is the exclusive left-turn lane onto the I-93 NB on-ramp. Several audit participants noted that

vehicles attempting to cross these lanes of traffic pose a risk to Dascomb Road westbound traffic that may assume that the ramp traffic is entering Dascomb Road in the far-left lane. It was also observed that almost all heavy vehicle traffic utilized both lanes of Dascomb Road westbound to enter the roadway from the I-93 off-ramp.

Potential Safety Enhancements:

1. Provide tracking pavement markings at the intersection to guide I-93 NB Ramp left-turning traffic into the far-left lane along Dascomb Road. This will maintain unopposed flow in the far-right lane for Dascomb Road westbound traffic.

## Summary of Road Safety Audit

Each improvement considered has been categorized as short-term, mid-term, or long-term. Additionally, a cost category has been assigned to each improvement based on the definitions shown in Table 6. Table 7 includes a summary of the several potential safety enhancements. Safety benefit estimates are subjective and are based on engineering experience and the relative percent of crashes that may be reduced by the enhancement based on known and documented crash reduction factors (such as FHWA documented crash reduction factors).

Note that some costs are noted with two cost thresholds. This is included as some enhancements may require additional measures to ensure regulatory compliance. For instance, the relocation of a YIELD sign is low-cost; however, along the Dascomb Road corridor, the signalization and timing coordination may require reconstruction of intersection approaches and impacts to utilities. In addition, some enhancements are defined to mitigate multiple safety issues. For those enhancements identified for multiple issues, such as the construction of a roundabout, the enhancement has only been listed once in Table 7.

**Table 6: Estimated Time Frame and Costs Breakdown**

Time Frame		Costs	
Short-Term	<1 Year	Low	<\$10,000
Mid-Term	1-3 Years	Medium	\$10,001-\$50,000
Long-Term	>3 Years	High	>\$50,000

**Table 7: Potential Safety Enhancement Summary**

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Party
Solar Glare	Install under-deck lighting under the I-93 overpass to reduce the impact on drivers' eyes as they transition from glare-darkness-glare.	Medium	Short-Term	Medium	MassDOT
	Install advanced warning signage along Dascomb Road westbound to provide notice of solar glare to motorists.	Low	Short-Term	Low	MassDOT / Town
	Should an alternative for the installation of additional traffic signals along the corridor be implemented, install retro-reflective back plates and tunnel visors on all traffic signal indications.	Medium	Short-Term	Low	MassDOT
Red Light Running	Re-calculate traffic signal clearance intervals based on standard guidelines for travel speed, roadway grade, and intersection width.	Medium	Short-Term	Low	MassDOT
	Increase enforcement of red-light running at and in the vicinity of the Dascomb Road corridor.	High	Short-Term	Medium	MSP / Andover PD
Permitted Left-Turn Phasing	Further evaluate the crash impacts of the FYA installation on the Dascomb Road eastbound approach.	Medium	Mid-Term	Low	MassDOT
	Consider the removal of the Dascomb Road eastbound permitted left-turn phase and retain only the protected left-turn phasing.	High	Mid-Term	Low	MassDOT
	Consider narrowing the cross-section of Dascomb Road westbound to consist of only one through lane.	High	Long-Term	High	MassDOT / Town
Yield Channelization at Traffic Signal	Relocate or supplement (on opposing curb line) existing YIELD signage along the channelized lane.	Medium	Short-Term	Low	Town
	Stripe YIELD markings "Shark Teeth" along the channelized lane.	Medium	Short-Term	Low	Town
	Consider the removal of YIELD-control along the channelized lane and install traffic signal indications and phasing to control the approach.	Medium	Long-Term	High	Town
	If pedestrian signals, sidewalk, and crosswalks are considered for the Dascomb Road / Frontage Road intersection, signalized-control should be considered in place of the YIELD-control along the channelized right-turn lane from Frontage Road southbound onto Dascomb Road westbound.	Medium	Long-Term	High	Town

**Table 7: Potential Safety Enhancement Summary**

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Party
Yield Channelization at Traffic Signal	Consider narrowing the cross-section of Frontage Road southbound to consist of only one travel lane, thus removing the merge condition from the channelized right-turn lane.	Low	Long-Term	Medium	Town
Sub-Standard Pedestrian and Bicycle Accommodations	Consider the construction of sidewalk along Dascomb Road and along Frontage Road through the audit area.	High	Long-Term	High	MassDOT / Town
	Construct new ADA / AAB compliant accessible curb ramps at each corner of the several intersections along Dascomb Road and Frontage Road, where applicable. Stripe new crosswalks at the intersections between each ramp pair.	Medium	Long-Term	High	MassDOT / Town
	Install pedestrian traffic signal infrastructure at the signalized intersection of Dascomb Road / Frontage Road; including countdown signal heads, Accessible Pedestrian Signal (APS) push buttons, and dedicated pedestrian signal timings.	High	Long-Term	Medium	MassDOT
	Should an alternative for the installation of additional traffic signals along the corridor be implemented, install pedestrian traffic signal infrastructure at newly constructed signalized intersections.	High	Long-Term	Medium	MassDOT
	Consider the striping of shared-use “sharrows” pavement markings, with associated signage, along the Dascomb Road corridor.	Medium	Short-Term	Low	MassDOT / Town
	Consider the construction of bicycle lanes along Dascomb Road.	High	Long-Term	High	MassDOT / Town
Lack of / Misplacement of Pavement Markings and Regulatory Signage	Install advanced warning signage for YIELD-control upstream from channelized right-turn lanes and provide MUTCD compliant pavement markings to supplement at both intersections.	Low	Short-Term	Low	MassDOT / Town
	Relocate or supplement (on opposing curb line) existing YIELD signs along channelized lanes.	Medium	Short-Term	Low	MassDOT / Town
	Trim the overgrown vegetation currently blocking the YIELD signs.	Medium	Short-Term	Low	Town
	Stripe YIELD markings “Shark Teeth” along channelized.	Medium	Short-Term	Low	MassDOT / Town

**Table 7 Continued: Potential Safety Enhancement Summary**

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Party
Lack of / Misplacement of Pavement Markings and Regulatory Signage	Consider the removal of YIELD-control along the Dascomb Road westbound channelized right-turn lane to Frontage Road.	Low	Short-Term	Low	Town
	Install advanced guide signage to the MassDOT Park and Ride lot.	Low	Short-Term	Low	MassDOT / Town
	Restripe pavement markings, including: lane lines, stop bars, and crosswalks along all approaches to the intersections within the audit area. Supplement lane markings with lane designation signage on the several intersection approaches.	Medium	Short-Term	Medium	MassDOT / Town
	Perform a signage inventory along the Dascomb Road corridor to remove/replace any MUTCD non-compliant signage or faded/damage signage.	Medium	Short-Term	Medium	MassDOT / Town
	Improve guide signage along Frontage Road at the I-93 SB Ramps to direct vehicles to Dascomb Road and Tewksbury.	Low	Short-Term	Low	MassDOT / Town
Drainage and Debris	Clear roadway debris and street sweep along the gutter lines of Dascomb Road, Frontage Road, and the I-93 NB Ramps.	Low	Short-Term	Low	MassDOT / Town
Congestion and Vehicle Queue Length	Consider the installation of a traffic signal at the intersection of Dascomb Road / I-93 NB Ramps.	High	Long-Term	High	MassDOT
	Install advanced queue detection on the I-93 NB Ramps (pending installation of traffic signal control).	Medium	Mid-Term	Medium	MassDOT
	Continue enforcement and levying penalties to deter motorists from performing illegal U-turns.	Medium	Short-Term	Medium	Andover PD
Speed	Consider reducing the travel lane widths along Dascomb Road to encourage slower speeds along the corridor.	Medium	Short-Term	Low	MassDOT / Town
	Increase enforcement of speeding at and in the vicinity of the intersections.	Medium	Short-Term	Medium	MSP / Andover PD
	Evaluate the need to reconstruct turning islands at both intersections to help reduce turning speeds.	Low	Mid-Term	Medium	MassDOT / Town
Dascomb Road WB Lane Delineation at I-93 NB Ramps	Provide tracking pavement markings at the intersection to guide I-93 NB Ramps left-turning traffic into the far-left lane along Dascomb Road.	Medium	Short-Term	Low	MassDOT

## Appendix A. RSA Meeting Agenda

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# Agenda

## Road Safety Audit

### LOCATION

#### Meeting Location:

Andover Public Safety Center  
32 N. Main Street  
Andover, Massachusetts  
Wednesday December 14, 2016  
1:00 PM – 4:00 PM

Type of meeting: High Crash Locations – Road Safety Audit  
Attendees: Invited Participants to Comprise a Multidisciplinary Team  
Please bring: Thoughts and Enthusiasm!

1:00 PM **Welcome and Introductions**  
• Introductions

1:15 PM **Review of Site Specific Material**  
• Crash Summaries – provided in advance  
• Dascomb Road @ Frontage Road  
• Dascomb Road @ I-93 NB Ramps  
• Existing Geometries and Conditions

2:00 PM **Visit the Site**  
• Conduct Field Visit  
• As a group, identify areas for improvement

3:00 PM **Post Visit Discussion / Completion of RSA**  
• Discuss observations and finalize findings  
• Discuss potential improvements and finalize recommendations

4:00 PM **Adjourn for the Day – but the RSA has not ended**

### Instructions for Participants:

- Before attending the RSA on December 14, participants are encouraged to drive through the Dascomb Road intersections with both Frontage Road and the I-93 NB Ramps and complete / consider elements on the RSA Prompt List, with a focus on safety.
- All participants will be actively involved throughout the RSA process. Participants are encouraged to come with thoughts and ideas; however, remember 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

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## Participating Audit Team Members

Date: December 14, 2016    Location: Andover, Massachusetts

<b>Audit Team Members</b>	<b>Agency/Affiliation</b>	<b>Email Address</b>
<i>Name</i>	<i>Agency</i>	<i>Email</i>
Brian Moore	Andover Engineering	<a href="mailto:bmoore@andoverma.gov">bmoore@andoverma.gov</a>
Paul Materazzo	Andover Planning	<a href="mailto:pmaterazzo@andoverma.gov">pmaterazzo@andoverma.gov</a>
Glen Ota	Andover Police Department	<a href="mailto:gota@andoverps.net">gota@andoverps.net</a>
Chris Moore	Andover Police Department	<a href="mailto:cmoo@andoverps.net">cmoo@andoverps.net</a>
Adam Prichard	MassDOT Traffic Safety	<a href="mailto:adam.prichard@dot.state.ma.us">adam.prichard@dot.state.ma.us</a>
Michelle Deng	MassDOT Traffic Safety	<a href="mailto:michelle.deng@dot.state.ma.us">michelle.deng@dot.state.ma.us</a>
Elsa Chan	MassDOT Traffic Safety	<a href="mailto:elsa.chan@dot.state.ma.us">elsa.chan@dot.state.ma.us</a>
John Mangiaratti	Andover Town Manager	<a href="mailto:john.mangiaratti@andoverma.us">john.mangiaratti@andoverma.us</a>
Tony Komornick	Merrimack Valley Planning Commission (MVPC)	<a href="mailto:akomornick@mvpc.org">akomornick@mvpc.org</a>
Jim Terlizzi	Merrimack Valley Planning Commission (MVPC)	<a href="mailto:jterlizzi@mvpc.org">jterlizzi@mvpc.org</a>
Tim Roberts	MassDOT District 4	<a href="mailto:timothy.roberts@state.ma.us">timothy.roberts@state.ma.us</a>
Timothy Paris	MassDOT District 4	<a href="mailto:timothy.paris@state.ma.us">timothy.paris@state.ma.us</a>
Mikel Myers	TEC, Inc.	<a href="mailto:mmyers@theengineeringcorp.com">mmyers@theengineeringcorp.com</a>
Rick Friberg	TEC, Inc.	<a href="mailto:rfriberg@theengineeringcorp.com">rfriberg@theengineeringcorp.com</a>
Samuel Gregorio	TEC, Inc.	<a href="mailto:sgregorio@theengineeringcorp.com">sgregorio@theengineeringcorp.com</a>

## Appendix C. Detailed Crash Data

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**Crash Data Summary Tables**  
**Dascomb Road @ Frontage Road - Andover, MA**  
**01/01/2011 - 09/31/2016**

Collision Diagram	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Operator's Age				Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Portal)
						V1	V2	V3	V4			
1	2/18/2011	12:54 PM	Daylight	Clear	Dry	52	26			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 turned left onto Frontage Rd.
2	3/18/2011	8:14 AM	Daylight	Clear	Dry	28	40			Sideswipe	Not Reported	MV1 and MV2: traveled EB on Dascomb Rd, turned left onto Frontage Rd and traveling NB. MV1 sideswiped in the same direction with MV2 when MV1 attempted to pass MV2 on the right while MV2 was turning right into the Park and Ride causing minor damages to both vehicles.
3	5/19/2011	3:32 PM	Daylight	Cloudy	Dry	56	N/A			Rear-end	Not Reported	MV1 and MV2: traveling SB on Frontage Rd. Both vehicles were stopped at a yield sign to turn right onto Dascomb Rd. MV2 and rear-ended MV1 and fled the scene.
4	6/24/2011	10:31 AM	Daylight	Rain	Wet	30	24			Rear-end	No Improper Driving	MV1 and MV2: traveling SB on Frontage Rd and turning right onto Dascomb Rd WB traffic lane. MV1 slowed/stopped on Frontage Rd. MV2 slowed in time but was unable to stop and collided with MV1. The road surface was wet due to the rain.
5	10/19/2011	8:06 PM	Dark - Lighted	Rain	Wet	28	49			Angled	Erratic / Aggressive / Reckless Driving	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 had the green arrow and was turning left onto Frontage Rd NB lane. MV1 and MV2 collided when MV1 ran the red light.
6	10/26/2011	6:33 AM	Dark - Lighted	Clear	Dry	47	58			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 failed to yield for MV1 while turning left onto Frontage Rd NB lane.
7	11/28/2011	5:11 PM	Dark - Lighted	Clear	Dry	63	30			Rear-end	Inattention / Distracted	MV1 and MV2: traveling EB on Dascomb Rd. MV2 rear-ended MV1 when MV1 stopped at the traffic light to make a left turn onto Frontage Rd. MV2 was towed and the operator was taken to the hospital due to pregnancy.
8	12/24/2011	7:49 PM	Dark - Lighted	Clear	Dry	25	52			Rear-end	Inattention / Distracted	MV1 and MV2: traveling SB on Frontage Rd and waiting to turn left onto Dascomb Rd EB lane. MV1 operator's foot slipped off from brake and rear-ended MV2.
9	1/30/2012	2:35 PM	Daylight	Cloudy	Dry	45	46			Angled	Inattention / Distracted	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 collided with MV1 when MV2 operator was distracted briefly and made a left turn onto Frontage Rd NB lane.
10	2/15/2012	8:12 PM	Dark - Lighted	Clear	Dry	58	26			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 failed to yield for MV1 while turning left onto Frontage Rd NB lane.
11	6/5/2012	5:40 PM	Daylight	Cloudy	Dry	68	53			Rear-end	Followed Too Closely	MV1 and MV2: traveling SB on Frontage Rd. MV1 stopped to yield for traffic on Dascomb Rd before turning right to merge. MV2 followed MV1 too closely and was unable to stop on time and rear-ended MV1.
12	7/5/2012	4:51 PM	Daylight	Clear	Dry	27	22	18		Rear-end	Followed Too Closely	MV1: traveling WB on Dascomb Rd; MV2 and MV3: from Frontage Rd SB lane merged onto Dascomb Rd WB approach. MV3 rear-ended MV2 and pushed MV2 into MV1.
13	8/18/2012	10:55 AM	Daylight	Cloudy	Wet	34	42			Rear-end	Inattention / Distracted	MV1 and MV2: traveling EB on Dascomb Rd. MV2 rear-ended MV1 when MV1 pulled over to the side of the road to use GPS.
14	9/5/2012	8:53 AM	Daylight	Cloudy	Wet	60	45			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 attempted to turn left onto Frontage Rd without yielding to the oncoming traffic.
15	9/26/2012	2:36 PM	Daylight	Cloudy	Dry	48	18			Rear-end	Inattention / Distracted	MV1 and MV2: traveling SB on Frontage Rd. MV1 slowed at a yield sign before turning right to merge onto Dascomb Rd WB traffic. MV2 was unable to stop on time and rear-ended MV1.

**Crash Data Summary Tables**  
**Dascomb Road @ Frontage Road - Andover, MA**  
**01/01/2011 - 09/31/2016**

Collision Diagram	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Operator's Age				Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Portal)
						V1	V2	V3	V4			
16	10/17/2012	6:46 PM	Dark - Lighted	Clear	Dry	19	52			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 attempted to turn left onto Frontage Rd without yielding to the oncoming traffic.
17	10/29/2012	10:35 PM	Dark - Not Lighted	Rain	Wet	28	72			Angled	Inattention / Distracted	MV1: traveling WB on Dascomb Rd; MV2: traveling SB on frontage Rd and turning right onto Dascomb Rd WB lane. MV2 struck MV1 when MV2 failed to yield for MV1 which has the right-
18	11/3/2012	6:53 PM	Dark - Lighted	Clear	Dry	20	27			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 attempted to turn left onto Frontage Rd without yielding to the oncoming traffic.
19	11/6/2012	5:58 PM	Dark - Lighted	Clear	Dry	26	56			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling WB on Dascomb Rd. MV1 struck MV2 when MV1 turned left onto Frontage Road NB lane without yielding for MV2.
20	11/27/2012	5:48 PM	Dark - Lighted	Rain	Wet	66	26			Angled	Other	MV1: traveling WB on Dascomb Rd; MV2: traveling SB on Frontage Rd. MV2 had a red light and attempted to stop but the brake failed and MV2 stuck MV1.
21	12/13/2012	9:20 PM	Dark - Lighted	Clear	Dry	52	64			Rear-end	Inattention / Distracted	MV1 and MV2: traveling SB on Frontage Rd. MV2 rear-ended MV1 causing MV1 operator and passenger to be transported to the hospital with non-incapacitating injuries.
22	1/4/2013	5:31 PM	Dark - Lighted	Cloudy	Dry	31	41			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling WB on Dascomb Rd. MV1 collided with MV2 when MV1 made a left turn onto Frontage Rd NB lane thinking that MV1 was turning right onto Frontage Rd.
23	2/19/2013	7:25 PM	Dark - Lighted	Rain	Wet	41	18			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV1 and MV2 collided when MV2 attempted to turn left onto Frontage Rd.
24	6/20/2013	11:32 PM	Dark - Lighted	Clear	Dry	23	26			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV1 and MV2 collided when MV2 attempted to turn left onto Frontage Rd causing MV1 operator to be taken to
25	6/25/2013	6:10 PM	Dusk	Clear	Dry	18	32			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 was making a left turn onto Frontage Rd without yielding for MV1. All parties involved were transported to the hospital.
26	7/1/2013	6:25 PM	Daylight	Rain	Wet	29	77			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 collided with MV1 when MV2 made a left turn onto Frontage Rd NB lane without yielding for MV1.
27	7/9/2013	6:16 PM	Daylight	Clear	Dry	28	61			Rear-end	Inattention / Distracted	MV1 and MV2: traveling SB on Frontage Rd. MV1 was attempting to turn right onto Dascomb Rd when it was rear-ended by MV2 whom had thought that MV1 was moving and accelerated into it.
28	8/30/2013	3:04 PM	Daylight	Clear	Dry	41	19			Rear-end	Followed Too Closely	MV1 and MV2: traveling SB on Frontage Rd. MV1 stopped to yield for traffic on Dascomb Rd before turning right to merge. MV2 followed MV1 too closely and was unable to stop on time and rear-ended MV1.
29	9/29/2013	3:31 PM	Daylight	Clear	Dry	59	41			Rear-end	Inattention / Distracted	MV1 and MV2: traveling SB on Frontage Rd. MV1 slowed at a yield sign before turning right to merge onto Dascomb Rd WB traffic. MV2 was unable to stop on time and rear-ended MV1.
30	9/30/2013	6:57 AM	Dawn	Other	Dry	49	48			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling WB on Dascomb Rd. MV1 struck MV2 when MV1 turned left onto Frontage Road NB lane without yielding for MV2. MV1 did not have green light to turn at that time as well.
31	10/17/2013	9:24 PM	Dark - Lighted	Clear	Dry	17	26			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 attempted to turn left onto Frontage Rd without yielding for the oncoming traffic.

Crash Data Summary Tables  
Dascomb Road @ Frontage Road - Andover, MA  
01/01/2011 - 09/31/2016

Collision Diagram	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Operator's Age				Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Portal)
						V1	V2	V3	V4			
32	10/31/2013	7:10 AM	Daylight	Cloudy	Dry	22	49			Rear-end	Followed Too Closely	MV1 and MV2: traveled WB on Dascomb Rd and turning right onto Frontage Road. MV2 stopped to yield for traffic on Frontage Rd before merging. MV1 followed MV2 too closely and was unable to stop on time and rear-ended MV1.
33	12/8/2013	6:50 PM	Dark - Lighted	Clear	Dry	43	26	46		Head-on	Disregarded Traffic Controls	MV1: traveling WB on Dascomb Rd; MV2: attempting to turn left onto Frontage Rd NB lane from Dascomb Rd EB lane; MV3: stopped for traffic on Frontage Rd SB lane. MV1 ran the red light and struck MV2 head on. Then MV1 spun out and struck MV3 and the Mass Highway sign.
34	3/10/2014	10:04 AM	Daylight	Cloudy	Dry	67	22			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling WB on Dascomb Rd. MV1 collided with MV2 when MV1 made a left turn onto Frontage Rd NB lane without yielding for MV1.
35	3/18/2014	4:14 PM	Daylight	Clear	Dry	23	25			Rear-end	Followed Too Closely	MV1 and MV2: traveling SB on Frontage Rd. MV1 slowed at a yield sign before turning right to merge onto Dascomb Rd WB traffic. MV2 followed MV1 too closely and was unable to stop on time and rear-ended MV1.
36	3/19/2014	9:23 AM	Daylight	Clear	Dry	34	45			Rear-end	Inattention / Distracted	MV1 and MV2: traveling SB on Frontage Rd. MV2 rear-ended MV1 when MV1 was turning right onto Dascomb Rd EB lane.
37	4/15/2014	3:22 PM	Daylight	Rain	Wet	33	63			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 was attempting to make a left turn onto Frontage Rd NB lane without yielding for
38	7/16/2014	9:18 PM	Dark - Lighted	Clear	Dry	39	22			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 was attempting to make a left turn onto Frontage Rd NB lane without yielding for
39	8/5/2014	5:33 AM	Dawn	Clear	Dry	27	38			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 was attempting to make a left turn onto Frontage Rd NB lane without yielding for
40	8/6/2014	10:05 PM	Dark - Lighted	Clear	Dry	22	27			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 was attempting to make a left turn onto Frontage Rd NB lane without yielding for
41	9/4/2014	9:12 AM	Daylight	Clear	Dry	41	52			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 was attempting to make a left turn onto Frontage Rd NB lane without yielding for
42	9/15/2014	9:43 AM	Daylight	Cloudy	Dry	55	18			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling WB on Dascomb Rd. MV1 struck MV2 when MV1 was attempting to make a left turn onto Frontage Rd NB lane without yielding for
43	10/8/2014	10:47 AM	Daylight	Clear	Dry	28	18			Rear-end	Followed Too Closely	MV1 and MV2: traveling SB on Frontage Rd. MV1 stopped to yield for traffic on Dascomb Rd before turning right to merge. MV2 followed MV1 too closely and was unable to stop on time and rear-ended MV1.
44	10/12/2014	8:52 PM	Dark - Lighted	Clear	Dry	45	19			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 attempted to turn left onto Frontage Rd without yielding for the oncoming traffic.
45	11/20/2014	5:57 AM	Dawn	Clear	Dry	33	23			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 was attempting to make a left turn onto Frontage Rd NB lane without yielding for
46	12/6/2014	5:56 PM	Dark - Not Lighted	Rain	Wet	41	31			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling WB on Dascomb Rd. MV1 struck MV2 when MV1 turned left onto Frontage Road NB lane without yielding for MV2. MV2 might not have the headlights on.

**Crash Data Summary Tables**  
**Dascomb Road @ Frontage Road - Andover, MA**  
**01/01/2011 - 09/31/2016**

Collision Diagram	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Operator's Age				Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Portal)
						V1	V2	V3	V4			
47	2/13/2015	6:28 AM	Dawn	Clear	Snow	31	30			Rear-end	Followed Too Closely	MV1 and MV2: turning right onto Frontage Rd NB lane from Dascomb Rd WB lane. MV2 rear-ended MV1 when MV1 slowed to yield to the oncoming traffic.
48	4/5/2015	5:45 PM	Daylight	Clear	Dry	46	40			Rear-end	No Improper Driving	MV1 and MV2: traveling SB on Frontage Rd. MV2 rear-ended
49	5/28/2015	5:13 AM	Daylight	Clear	Dry	41				Single Vehicle	No Improper Driving	MV1: traveling EB on Dascomb Rd. MV1 attempted to turn left onto Frontage Rd when the operator felt ill. Vehicle continued over an embankment and through a fence landing in a ditch.
50	8/2/2015	4:44 PM	Daylight	Clear	Dry	23	30			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 was attempting to make a left turn onto Frontage Rd NB lane without yielding for
51	8/13/2015	10:15 PM	Dark - Lighted	Clear	Dry	26	26			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 attempted to turn left onto Frontage Rd without yielding for the oncoming traffic.
52	10/21/2015	5:18 AM	Dark - Lighted	Clear	Dry	31	30			Head-on	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 collided head on with MV1 when MV2 turned left onto Frontage Rd NB lane.
53	10/24/2015	4:47 PM	Daylight	Clear	Dry	56	17			Rear-end	Followed Too Closely	MV1 and MV2: traveling SB on Fronage Rd. MV2 rear-ended MV1 when MV1 stopped at the yield sign.
54	11/4/2015	9:08 PM	Dark - Lighted	Clear	Dry	72	25			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 made a left turn onto Frontage Rd NB lane without yielding for MV1.
55	12/14/2015	10:52 AM	Daylight	Cloudy	Dry	30	30			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 made a left turn onto Frontage Rd NB lane without yielding for MV1.
56	12/29/2015	9:03 AM	Daylight	Other	Other	39	23			Rear-end	Not Reported	MV1 and MV2: traveling EB on Dascomb Rd; MV1 rear-ended MV2 when MV2 was slowing due to traffic.
57	1/7/2016	3:20 PM	Daylight	Cloudy	Dry	22	34	80		Rear-end	Other	MV1, MV2 and MV3: traveling EB on Dascomb Rd. MV1 and MV2 stopped at the red light but MV3 didn't stop in time and struck MV2 which caused MV2 to struck MV1.
58	1/13/2016	10:10 PM	Dark - Lighted	Clear	Wet	18	53			Rear-end	Disregarded Traffic Controls	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 ran the red light and turned left onto Frontage Rd.
59	1/14/2016	1:06 PM	Daylight	Clear	Dry	50	28			Rear-end	Followed Too Closely	MV1 and MV2: traveling SB on Frontage Rd. MV1 stopped to yield for traffic on Dascomb Rd before turning right to merge. MV2 followed MV1 too closely and was unable to stop on time and rear-ended MV1.
60	2/16/2016	7:46 AM	Daylight	Cloudy	Ice	36				Single Vehicle	Other	MV1: traveling EB on Dascomb Rd approaching the Frontage Rd intersection. Due to the icy road surface conditions, MV1 began to slide on the ice and in an effort to avoid rear ending a vehicle in front, the operator cut the wheel to the right which caused her to crash into a snow bank.
61	2/24/2016	3:15 PM	Daylight	Rain	Wet	46	24			Rear-end	Followed Too Closely	MV1 and MV2: traveling SB on Frontage Rd. Both vehicles were stopped at a yield sign to turn right onto Dascomb Rd. MV2 rolled forward and rear-ended MV1.
62	5/14/2016	8:26 AM	Daylight	Clear	Dry	62	43			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling WB on Dascomb Rd. MV1 and Mv2 collided when MV1 made a left turn onto Frontage Rd without yielding for MV2.
63	5/19/2016	5:13 PM	Daylight	Clear	Dry	38	37			Angled	Other	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 attempted to turn left onto Frontage Rd.



**Crash Data Summary Tables**  
**Dascomb Road @ Frontage Road - Andover, MA**  
**01/01/2011 - 09/31/2016**

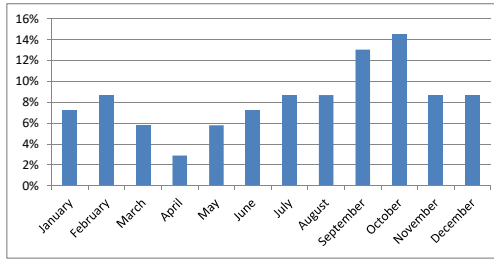
Collision Diagram	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Operator's Age				Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Portal)
						V1	V2	V3	V4			
64	6/19/2016	8:01 AM	Daylight	Clear	Dry	28	58			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV1 and MV2 collided when MV1 turned left onto Frontage Rd without yielding for MV1.
65	7/23/2016	3:25 PM	Daylight	Clear	Dry	32	52			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 attempted to turn left onto Frontage Rd without yielding to the oncoming traffic.
66	7/26/2016	7:17 AM	Daylight	Clear	Dry	48	29			Angled	Disregarded Traffic Controls	MV1: attempting to make a left turn from Dascomb Rd EB lane onto Frontage Rd NB lane; MV2: traveling WB on Dascomb Rd. MV2 struck MV1 when MV2 went through the red light .
67	9/15/2016	1:42 PM	Daylight	Cloudy	Dry	64	49			Sideswipe	Other	MV1 and MV2: traveling SB on Frontage Rd towards Dascomb Rd intersection. MV1 was on the inside lane and MV2 was on the outside lane. The vehicles struck each other when MV1 moved over towards MV2.
68	9/21/2016	6:01 AM	Daylight	Clear	Dry	27	35			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling WB on Dascomb Rd. MV1 struck MV2 when MV1 turned left onto Frontage Road NB lane without yielding for MV2.
69	9/29/2016	4:33 PM	Daylight	Clear	Dry	31	37			Head-on	Not Reported	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV1 and MV2 collided when MV2 attempted to make a left-turn onto Frontage Rd.

**Crash Data Summary Tables**  
**Dascomb Road @ Frontage Road - Andover, MA**  
**01/01/2011 - 09/31/2016**

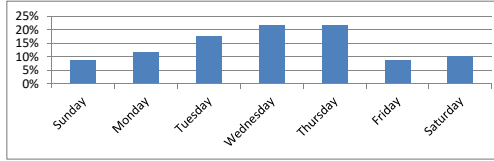
**Dascomb Road @ Frontage Road**

69

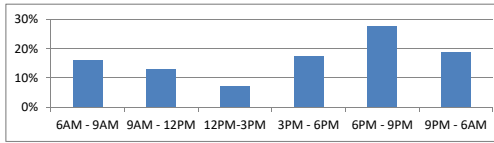
Month	#	%
January	5	7%
February	6	9%
March	4	6%
April	2	3%
May	4	6%
June	5	7%
July	6	9%
August	6	9%
September	9	13%
October	10	14%
November	6	9%
December	6	9%



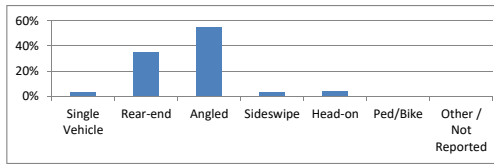
Day of Week	#	%
Sunday	6	9%
Monday	8	12%
Tuesday	12	17%
Wednesday	15	22%
Thursday	15	22%
Friday	6	9%
Saturday	7	10%



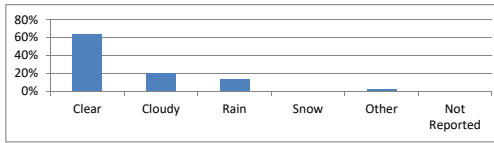
Time of Day	#	%
6AM - 9AM	11	16%
9AM - 12PM	9	13%
12PM-3PM	5	7%
3PM - 6PM	12	17%
6PM - 9PM	19	28%
9PM - 6AM	13	19%



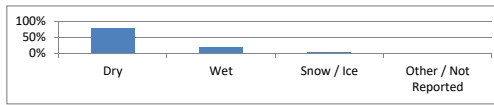
Manner of Collision	#	%
Single Vehicle	2	3%
Rear-end	24	35%
Angled	38	55%
Sideswipe	2	3%
Head-on	3	4%
Ped/Bike	0	0%
Other / Not Reported	0	0%



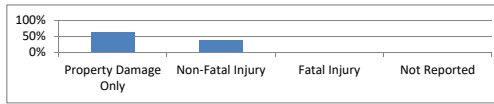
Weather Conditions	#	%
Clear	44	64%
Cloudy	14	20%
Rain	9	13%
Snow	0	0%
Other	2	3%
Not Reported	0	0%



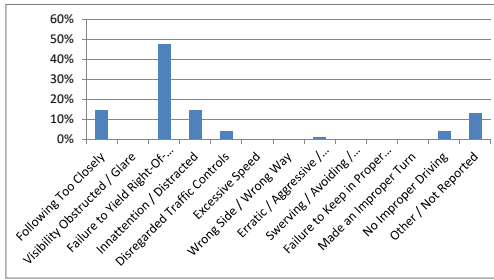
Road Surface	#	%
Dry	54	78%
Wet	12	17%
Snow / Ice	2	3%
Other / Not Reported	1	1%



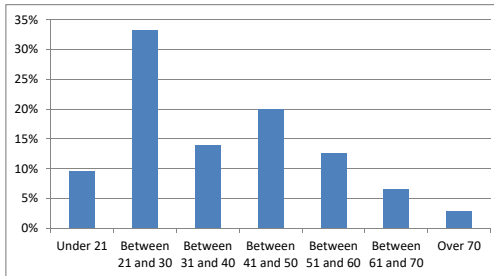
Crash Severity	#	%
Property Damage Only	43	62%
Non-Fatal Injury	26	38%
Fatal Injury	0	0%
Not Reported	0	0%



Main Contributing Factor from Narrative	#	%
Following Too Closely	10	14%
Visibility Obstructed / Glare	0	0%
Failure to Yield Right-Of-Way	33	48%
Inattention / Distracted	10	14%
Disregarded Traffic Controls	3	4%
Excessive Speed	0	0%
Wrong Side / Wrong Way	0	0%
Erratic / Aggressive / Reckless Driving	1	1%
Swerving / Avoiding / Over-Steering / Over-Correcting	0	0%
Failure to Keep in Proper Lane	0	0%
Made an Improper Turn	0	0%
No Improper Driving	3	4%
Other / Not Reported	9	13%



Age	#	%
Under 21	13	10%
Between 21 and 30	45	33%
Between 31 and 40	19	14%
Between 41 and 50	27	20%
Between 51 and 60	17	13%
Between 61 and 70	9	7%
Over 70	4	3%

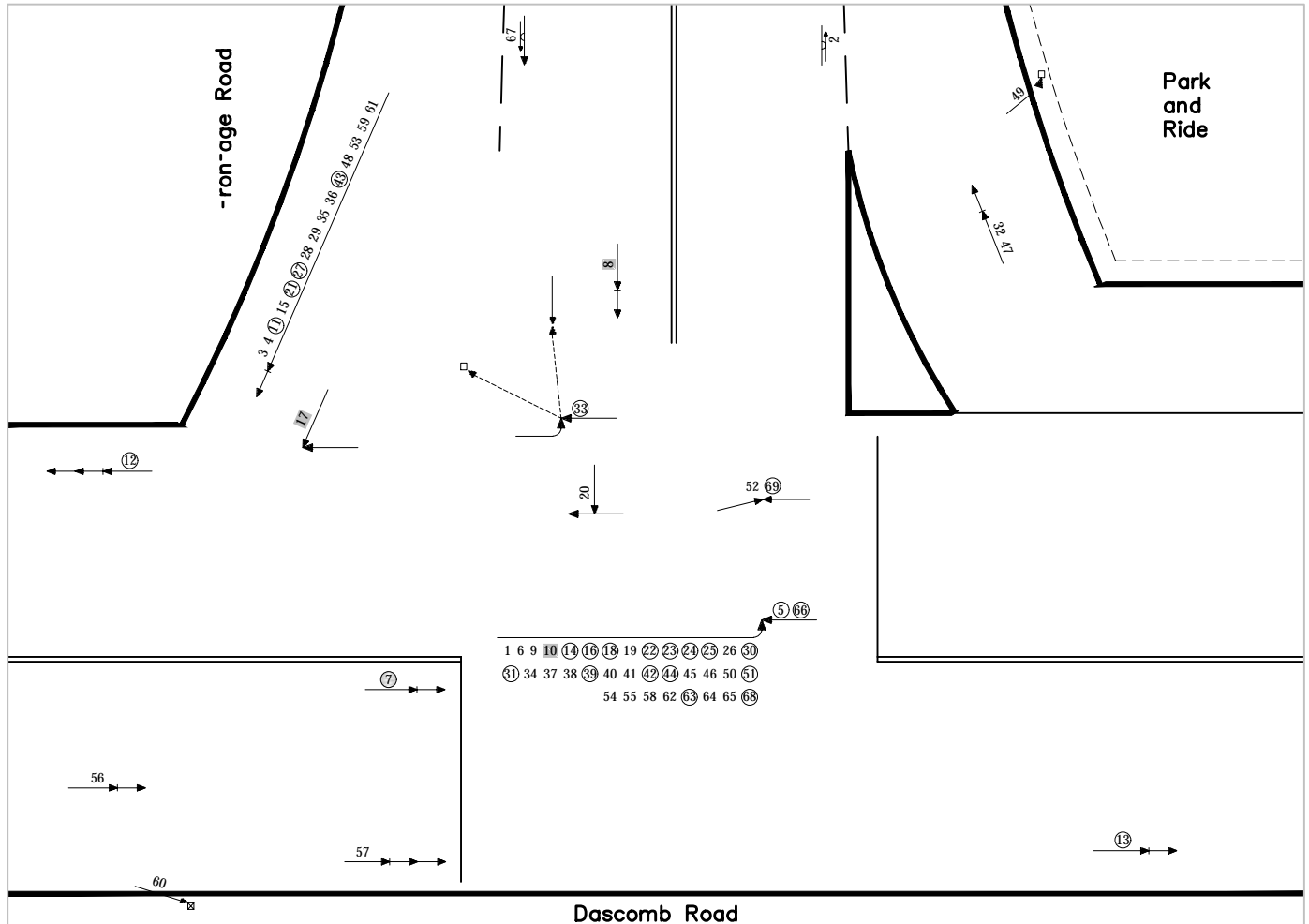




Not to Scale

# Dascomb Road Improvements Project - Andover, Massachusetts Expanded Environmental Notification Form (EENF)

LOCATION: Dascomb Road @ Frontage Road  
 CITY/STATE: Andover, Massachusetts  
 TIME PERIOD: 01/01/2011- 09/31/2016  
 PREPARED BY: TEC, Inc. / Eindra (Elena) Aung, E.I.T.  
 SOURCE: MassDOT / Town of Andover Police Department



Dascomb Road

LEGEND			SHOW FOR COLLISION
→	VEHICLE PATH	□	FIXED OBJECT
←←	BACKING VEHICLE	⊠	MOVEABLE OBJECT
→→	SIDESWIPE COLLISION	▢	PARKED VEHICLE
→P	PEDESTRIAN COLLISION	○	PERSONAL INJURY
→C	CYCLIST COLLISION	○	FATALITY
→→	REAR-END COLLISION	A	ANIMAL
→→	HEAD-ON COLLISION		
↘	ANGLED COLLISION		
→□	FIXED OBJECT COLLISION		
→○	OVERTURNED VEHICLE		
↘↘	OUT-OF-CONTROL VEHICLE		

1. Approximate location of collision,  
 2. Direction of collision,  
 3. Type of collision and vehicles involved,  
 4. Time, Day, Date  
 5. Any other pertinent factors mentioned on the report.

NOTE: Shaded number indicates crash occurred under "nighttime" conditions

### SUMMARY OF CRASHES ON DIAGRAM [no fatal collisions]

	REAR-END	SIDESWIPE	HEAD-ON	ANGLED	SINGLE VEH	PED/BIKE	OTHER / UNK	TOTAL
PROPERTY DAMAGE ONLY	17	2	2	20	2	0	0	43
NON-FATAL INJURY	7	0	1	18	0	0	0	26
UNKNOWN / NOT REPORTED	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>24</b>	<b>2</b>	<b>3</b>	<b>38</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>69</b>

Figure F-6

Collision Diagram  
2011-2016 Collision Data



TEC, Inc.  
 65 Glenn Street | 169 Ocean Blvd, Unit 101  
 Lawrence, MA 01843 | Hampton, NH 03842  
 (978) 794.1792 | (603) 601.8154  
 www.TheEngineeringCorp.com

**Crash Data Summary Tables  
Dascomb Road @ I-93 Northbound Ramps - Andover, MA  
01/01/2011 - 09/31/2016**

Collision Diagram	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Operator's Age				Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Report)
						V1	V2	V3	V4			
1	2/5/2011	12:10 AM	Dark - Lighted	Clear	Dry	54	44			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: exiting from I93 NB off-ramp. MV2 collided with MV1 when MV2 made a left turn onto Dascomb Rd WB lane without yielding for MV1. MV2 did not stop at the STOP-sign prior to making the turn as well. Both vehicles were towed.
2	2/18/2011	5:59 PM	Dark - Lighted	Cloudy	Wet	16	20			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling NB on I-93NB Ramp. MV2 collided with MV1 when MV2 merged onto Dascomb Rd EB lane without yielding for MV1.
3	7/21/2011	5:30 PM	Daylight	Clear	Dry	44	50			Angled	Failure to Yield Right-of-Way	MC1: traveling EB on Dascomb Rd; MV1: traveling WB on Dascomb Rd. MV1 took a left turn onto I93 NB on ramp, cutting off MC1. MV1 struck MC1 and the operator of MC1 was subsequently transported to the hospital.
4	9/21/2011	7:51 AM	Daylight	Clear	Dry	23	44			Angled	Made an Improper Turn	MV1 and MV2: traveling WB on Dascomb Rd. MV2 struck MV1 when MV1 made an improper U-turn to get on the I-93NB on-ramp since MV1 missed the entrance to the on-ramp.
5	10/21/2011	12:30 AM	Dark - Not Lighted	Clear	Dry	24				Single Vehicle	Excessive Speed	MV1: traveling NB on I-93NB off-ramp. MV1 was driving at an excess speed on the ramp. MV1 was unable to negotiate the corner on the ramp and enters the island where it rolls over.
6	1/21/2012	8:25 AM	Daylight	Clear	Other	24	50			Angled	Excessive Speed	MV1: exiting I-93NB off-ramp; MV2: traveling WB on Dascomb Rd. MV1 was driving too fast for the roadway conditions at that time. MV1 could not stop at the Stop sign, continued to slide into Dascomb Rd and collided with MV2.
7	4/1/2012	2:25 AM	Dark - Not Lighted	Clear	Dry	50				Single Vehicle	Other	MV1: traveling NB on I-93NB off-ramp. The operator of MV1 was fatigue/sleepy while operating the vehicle. When the police arrived at the scene, the vehicle was on top of the grassy knoll overturned and on fire with the gas tank exposed.
8	9/13/2012	6:44 PM	Dusk	Clear	Dry	49	N/A			Angled	Other	MV1: exiting I-93NB off-ramp; MV2: traveling WB on Dascomb Rd. MV1 struck MV2 while turning left onto Dascomb Rd without yielding. MV1 turned onto I-93 NB on-ramp and fled the scene.
9	8/2/2013	4:05 PM	Daylight	Clear	Dry	39	21	41		Rear-end	Followed Too Closely	MV1, MV2, and MV3: traveling SB on I-93NB on-ramp. MV3 was yielding for the traffic and was rear-ended by MV1 and MV2.
10	10/8/2013	7:38 AM	Daylight	Clear	Dry	27	40			Angled	Disregarded Traffic Controls	MV1: traveling WB on Dascomb Rd; MV2: exiting I-93NB off-ramps. MV1 was preparing to turn left onto I-93NB on-ramp. MV2 hit MV1 when MV2 failed to use care while turning left onto Dascomb Rd WB lane.
11	1/22/2014	9:24 AM	Daylight	Clear	Wet	62	25			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: exiting I-93NB off-ramps. MV1 was slowing to turn left onto I-93NB on-ramp. MV2 hit MV1 when MV2 failed to use care while turning left onto Dascomb Rd WB lane.
12	7/8/2014	2:53 PM	Daylight	Clear	Dry	77	61			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling NB on I-93NB Ramp. MV2 collided with MV1 when MV2 turned left onto Dascomb Rd WB lane without yielding for MV1.
13	10/6/2014	4:51 PM	Daylight	Clear	Dry	24	60			Angled	Disregarded Traffic Controls	MV1: traveling EB on Dascomb Rd; MV2: exiting I-93NB off-ramps piggy backing the car in front. MV2 hit MV1 when MV2 failed to yield while turning left onto Dascomb Rd WB lane.

**Crash Data Summary Tables**  
**Dascomb Road @ I-93 Northbound Ramps - Andover, MA**  
**01/01/2011 - 09/31/2016**

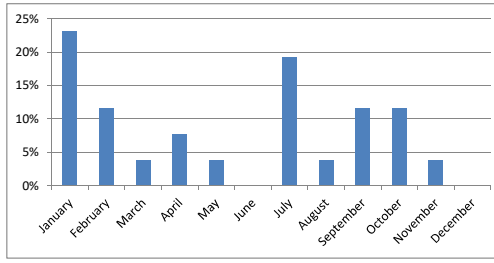
Collision Diagram	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Operator's Age				Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Report)
						V1	V2	V3	V4			
14	1/16/2015	12:41 PM	Daylight	Clear	Dry	63	N/A			Head-on	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV1 made a left turn on to I-93NB on-ramp without yielding for MV2 causing a head-on accident.
15	1/16/2015	4:51 PM	Dusk	Clear	Dry	43	26			Angled	Inattention / Distracted	MV1: traveling EB on Dascomb Rd; MV2: exiting I-93 NB off-ramp. MV1 struck MV2 when MV2 made a left turn onto Dascomb Rd.
16	3/8/2015	7:39 AM	Daylight	Clear	Dry	41	41			Angled	Visibility Obstructed	MV1: traveling WB on Dascomb Rd; MV2: exiting I-93NB off-ramps. MV1 was turning left onto I-93NB on-ramp. MV2 hit MV1 when MV2 failed to use care while turning left onto Dascomb Rd
17	4/11/2015	4:08 PM	Daylight	Clear	Dry	46	27			Rear-end	Followed Too Closely	MV1 and MV2: exiting I-93NB off-ramp. MV2 rear-ended MV1 when MV1 stopped at the yield sign.
18	5/18/2015	3:31 PM	Daylight	Clear	Dry	57	44			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling WB on Dascomb Rd. MV2 struck MV1 when MV2 made a left turn on to I-93NB on-ramp without yielding for MV1.
19	7/15/2015	4:45 PM	Daylight	Clear	Dry	30	18			Rear-end	Other	MV1 and MV2: exiting I-93NB off-ramp. MV2 rear-ended MV1 when MV1 stopped at the yield sign.
20	11/3/2015	3:59 PM	Daylight	Cloudy	Dry	19	75			Angled	No Improper Driving	MC1: traveling EB on Dascomb Rd; MV1: exiting I93NB off-ramp. MV1 struck MC1 when MV1 turned left onto Dascomb Rd.
21	1/15/2016	2:59 PM	Daylight	Cloudy	Dry	34	77			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: exiting from I93 NB off-ramp. MV2 collided with MV1 when MV2 made a left turn onto Dascomb Rd WB lane without yielding for MV1.
22	1/18/2016	8:12 AM	Daylight	Snow	Snow	26	47			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV1 made a left turn on to I-93NB on-ramp without yielding for MV2 causing a head-on accident.
23	2/1/2016	11:24 PM	Dark - Lighted	Clear	Dry	61	56			Angled	Failure to Yield Right-of-Way	MV1: exiting I-93NB off-ramp; MV2: traveling WB on Dascomb Rd. MV1 was attempting to make a left turn onto Dascomb Rd and MV2 was attempting to make a left turn onto I93 NB on -ramp. The accident occurred when MV1 failed to yield for MV2.
24	7/8/2016	12:21 PM	Daylight	Clear	Dry	58	42			Angled	Failure to Yield Right-of-Way	MV1: attempting to enter Dascomb Rd from I-93NB off-ramp; MV2: traveling WB on Dascomb Rd. MV1 collided with MV2 when MV1 turned left without yielding for MV2.
25	7/17/2016	12:16 PM	Daylight	Clear	Dry	27	62			Cyclist	Failure to Yield Right-of-Way	Cyclist 1: traveling EB on Dascomb Rd; MV1: exiting I-93NB off-ramp. MV1 sideswiped Cyclist 1 when MV1 attempted to turn left onto Dascomb Rd.
26	9/29/2016	8:06 PM	Dark - Lighted	Clear	Dry	62				Single Vehicle	No Improper Driving	MV1: traveling WB on Dascomb Rd. MV1 collided with a deer when the deer ran across the roadway.

**Crash Data Summary Tables**  
**Dascomb Road @ I-93 Northbound Ramps - Andover, MA**  
**01/01/2011 - 09/31/2016**

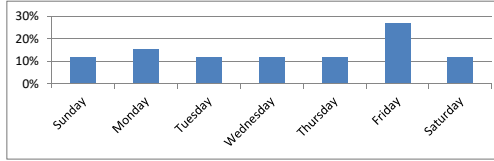
**Dascomb Road @ I-93 North Ramps**

26

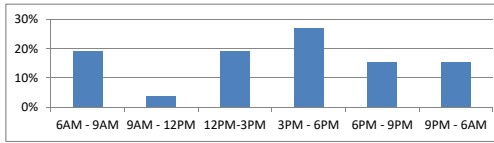
Month	#	%
January	6	23%
February	3	12%
March	1	4%
April	2	8%
May	1	4%
June	0	0%
July	5	19%
August	1	4%
September	3	12%
October	3	12%
November	1	4%
December	0	0%



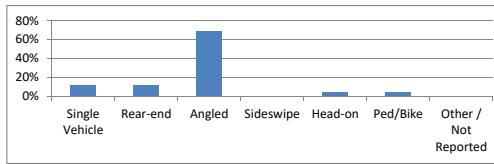
Day of Week	#	%
Sunday	3	12%
Monday	4	15%
Tuesday	3	12%
Wednesday	3	12%
Thursday	3	12%
Friday	7	27%
Saturday	3	12%



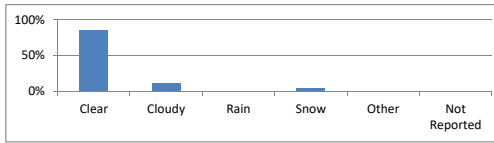
Time of Day	#	%
6AM - 9AM	5	19%
9AM - 12PM	1	4%
12PM-3PM	5	19%
3PM - 6PM	7	27%
6PM - 9PM	4	15%
9PM - 6AM	4	15%



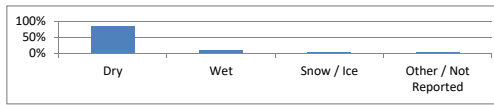
Manner of Collision	#	%
Single Vehicle	3	12%
Rear-end	3	12%
Angled	18	69%
Sideswipe	0	0%
Head-on	1	4%
Ped/Bike	1	4%
Other / Not Reported	0	0%



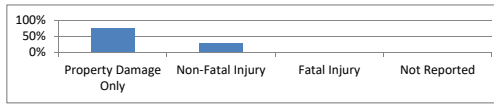
Weather Conditions	#	%
Clear	22	85%
Cloudy	3	12%
Rain	0	0%
Snow	1	4%
Other	0	0%
Not Reported	0	0%



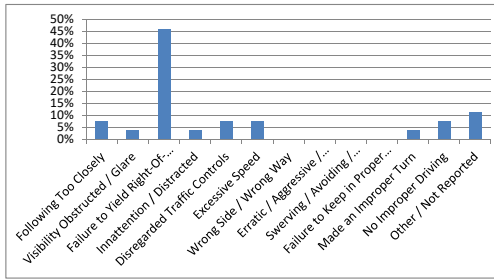
Road Surface	#	%
Dry	22	85%
Wet	2	8%
Snow / Ice	1	4%
Other / Not Reported	1	4%



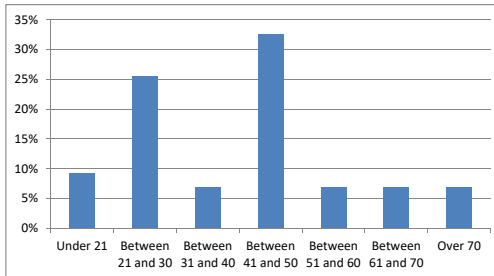
Crash Severity	#	%
Property Damage Only	19	73%
Non-Fatal Injury	7	27%
Fatal Injury	0	0%
Not Reported	0	0%



Main Contributing Factor from Narrative	#	%
Following Too Closely	2	8%
Visibility Obstructed / Glare	1	4%
Failure to Yield Right-Of-Way	12	46%
Inattention / Distracted	1	4%
Disregarded Traffic Controls	2	8%
Excessive Speed	2	8%
Wrong Side / Wrong Way	0	0%
Erratic / Aggressive / Reckless Driving	0	0%
Swerving / Avoiding / Over-Steering / Over-Correcting	0	0%
Failure to Keep in Proper Lane	0	0%
Made an Improper Turn	1	4%
No Improper Driving	2	8%
Other / Not Reported	3	12%



Age	#	%
Under 21	4	9%
Between 21 and 30	11	26%
Between 31 and 40	3	7%
Between 41 and 50	14	33%
Between 51 and 60	3	7%
Between 61 and 70	3	7%
Over 70	3	7%

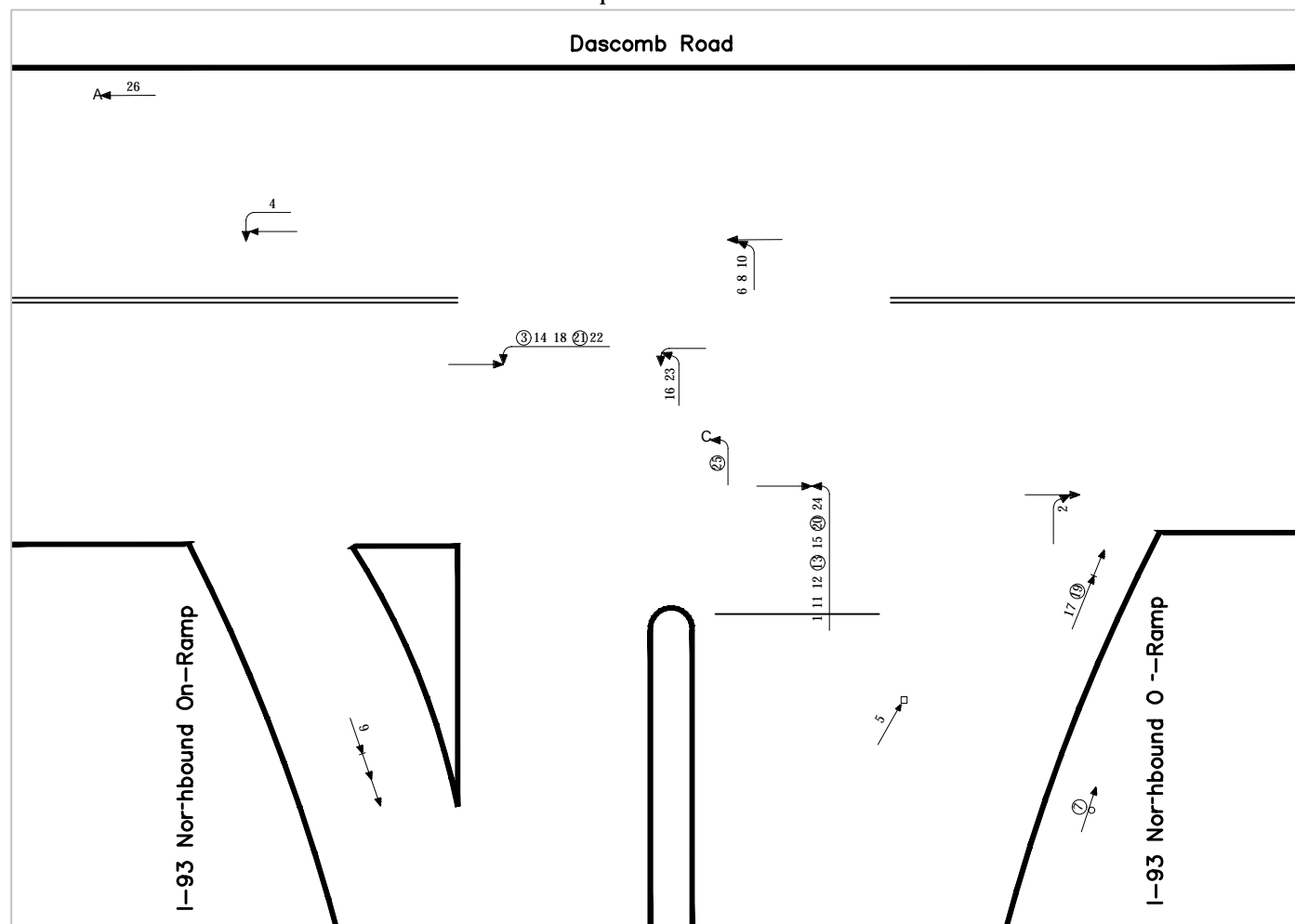




Not to Scale

# Dascomb Road Improvements Project - Andover, Massachusetts Expanded Environmental Notification Form (EENF)

LOCATION: Dascomb Road @ I-93 Northbound Ramps  
 CITY/STATE: Andover, Massachusetts  
 TIME PERIOD: 01/01/2011- 09/31/2016  
 PREPARED BY: TEC, Inc. / Eindra (Elena) Aung, E.I.T.  
 SOURCE: MassDOT / Town of Andover Police Department



LEGEND			SHOW FOR COLLISION
→	VEHICLE PATH	↔	HEAD-ON COLLISION
←←	BACKING VEHICLE	↘	ANGLED COLLISION
↔↔	SIDESWIPE COLLISION	→□	FIXED OBJECT COLLISION
→P	PEDESTRIAN COLLISION	→○	OVERTURNED VEHICLE
→C	CYCLIST COLLISION	↘↘	OUT-OF-CONTROL VEHICLE
→→	REAR-END COLLISION	□	FIXED OBJECT
		⊠	MOVEABLE OBJECT
		▣	PARKED VEHICLE
		○	PERSONAL INJURY
		○	FATALITY
		A	ANIMAL

1. Approximate location of collision,  
 2. Direction of collision,  
 3. Type of collision and vehicles involved,  
 4. Time, Day, Date  
 5. Any other pertinent factors mentioned on the report.  
 NOTE: Shaded number indicates crash occurred under "nighttime" conditions

### SUMMARY OF CRASHES ON DIAGRAM [no fatal collisions]

	REAR-END	SIDESWIPE	HEAD-ON	ANGLED	SINGLE VEH	PED/BIKE	OTHER / UNK	TOTAL
PROPERTY DAMAGE ONLY	2	0	1	14	2	0	0	19
NON-FATAL INJURY	1	0	0	4	1	1	0	7
UNKNOWN / NOT REPORTED	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>3</b>	<b>0</b>	<b>1</b>	<b>18</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>26</b>

Figure F-4

### Collision Diagram 2011-2016 Collision Data



TEC, Inc.  
 65 Glenn Street | 169 Ocean Blvd, Unit 101  
 Lawrence, MA 01843 | Hampton, NH 03842  
 (978) 794.1792 | (603) 601.8154  
 www.TheEngineeringCorp.com

## Appendix D. Additional Information

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PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Dascomb Road EB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
EB

165301 A EB Class  
Site Code:

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
10/06/1														
6	2	35	13	1	4	1	0	0	0	0	0	0	0	56
01:00	2	59	13	1	2	2	0	0	4	0	0	0	0	83
02:00	2	36	6	2	2	1	0	0	5	0	0	0	0	54
03:00	2	22	10	2	7	3	0	0	0	0	0	0	0	46
04:00	5	84	31	3	15	5	0	1	4	0	0	0	0	148
05:00	10	308	120	2	47	14	1	0	26	0	0	0	0	528
06:00	7	399	126	3	33	14	1	2	9	0	0	0	0	594
07:00	14	700	156	21	41	14	1	3	9	0	0	0	0	959
08:00	15	572	134	6	36	11	0	3	9	0	0	0	0	786
09:00	15	454	135	12	31	15	0	6	12	0	0	0	0	680
10:00	16	409	151	13	52	18	1	8	23	0	0	0	0	691
11:00	14	438	150	10	50	13	0	5	9	0	0	0	0	689
12 PM	14	425	124	7	38	16	0	2	15	0	0	0	0	641
13:00	10	469	150	9	48	16	0	3	9	0	0	0	0	714
14:00	11	563	171	12	43	16	1	4	10	0	0	0	0	831
15:00	13	693	201	8	63	11	0	4	5	0	0	0	0	998
16:00	6	773	211	5	45	1	0	4	3	0	0	0	0	1048
17:00	10	865	166	3	35	1	0	5	2	0	0	0	0	1087
18:00	10	763	157	3	41	3	0	2	2	0	0	0	0	981
19:00	7	471	94	2	23	0	0	2	1	0	0	0	0	600
20:00	7	304	77	0	5	7	0	0	1	0	0	0	0	401
21:00	5	241	51	1	8	1	0	0	0	0	0	0	0	307
22:00	4	127	22	0	6	3	0	0	6	0	0	0	0	168
23:00	4	116	17	0	4	1	0	0	0	0	0	0	0	142
Percent	1.5%	70.5%	18.8%	1.0%	5.1%	1.4%	0.0%	0.4%	1.2%	0.0%	0.0%	0.0%	0.0%	
AM Peak	10:00	07:00	07:00	07:00	10:00	10:00	05:00	10:00	05:00					07:00
Vol.	16	700	156	21	52	18	1	8	26					959
PM Peak	12:00	17:00	16:00	14:00	15:00	12:00	14:00	17:00	12:00					17:00
Vol.	14	865	211	12	63	16	1	5	15					1087



PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Dascomb Road EB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
EB

165301 A EB Class  
Site Code:

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
10/07/1														
6	1	44	4	0	1	1	0	0	1	0	0	0	0	52
01:00	4	51	7	0	1	5	0	1	1	0	0	0	0	70
02:00	2	14	6	0	4	2	0	0	1	0	0	0	0	29
03:00	1	20	9	4	4	1	0	0	5	0	0	0	0	44
04:00	10	89	25	1	16	12	0	0	25	0	0	0	0	178
05:00	11	279	109	2	42	12	1	0	11	0	0	0	1	468
06:00	10	363	128	8	41	14	1	4	14	0	0	0	0	583
07:00	12	660	172	10	46	10	1	12	11	0	0	0	0	934
08:00	13	627	154	5	35	15	0	6	7	0	0	0	0	862
09:00	24	485	147	7	33	16	0	6	19	0	0	0	0	737
10:00	16	430	137	13	50	18	0	6	19	0	0	0	0	689
11:00	19	437	139	15	45	15	0	6	15	0	0	0	0	691
12 PM	16	519	140	10	37	15	1	13	17	0	0	0	0	768
13:00	16	542	165	16	40	13	1	8	11	0	0	0	0	812
14:00	15	602	200	15	51	12	0	2	3	0	0	0	0	900
15:00	7	794	212	7	42	6	0	2	2	0	0	0	0	1072
16:00	12	776	186	4	43	7	0	8	3	0	0	0	0	1039
17:00	12	906	175	6	43	4	0	8	0	0	0	0	0	1154
18:00	10	763	168	4	27	1	0	2	1	0	0	0	0	976
19:00	5	449	85	0	22	2	0	1	0	0	0	0	0	564
20:00	5	287	65	1	9	4	0	0	4	0	0	0	0	375
21:00	3	154	33	0	10	1	0	0	1	0	0	0	0	202
22:00	1	250	55	0	16	1	0	0	2	0	0	0	0	325
23:00	0	211	29	1	10	0	0	0	0	0	0	0	0	251
Percent	1.6%	70.8%	18.5%	0.9%	4.8%	1.4%	0.0%	0.6%	1.3%	0.0%	0.0%	0.0%	0.0%	
AM Peak	09:00	07:00	07:00	11:00	10:00	10:00	05:00	07:00	04:00				05:00	07:00
Vol.	24	660	172	15	50	18	1	12	25				1	934
PM Peak	12:00	17:00	15:00	13:00	14:00	12:00	12:00	12:00	12:00					17:00
Vol.	16	906	212	16	51	15	1	13	17					1154



PRECISION  
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INDUSTRIES, LLC

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Dascomb Road EB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
EB

165301 A EB Class  
Site Code:

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
10/08/1														
6	0	128	19	0	6	0	0	0	2	0	0	0	0	155
01:00	2	61	8	0	2	2	0	0	0	0	0	0	0	75
02:00	0	17	7	0	0	0	0	0	0	0	0	0	0	24
03:00	0	26	8	1	5	0	0	0	0	0	0	0	0	40
04:00	1	48	19	0	7	1	0	1	1	0	0	0	0	78
05:00	5	97	37	1	6	11	0	0	19	0	0	0	0	176
06:00	3	156	61	5	18	6	1	0	5	0	0	0	0	255
07:00	3	309	102	5	37	3	0	1	0	0	0	0	0	460
08:00	1	427	130	5	33	7	0	1	2	0	0	0	0	606
09:00	6	508	149	1	29	7	0	5	2	0	0	0	0	707
10:00	4	579	142	3	33	8	0	3	5	0	0	0	0	777
11:00	9	667	189	2	41	7	0	5	2	0	0	0	0	922
12 PM	4	638	160	3	22	3	0	3	3	0	0	0	0	836
13:00	15	585	145	2	36	1	1	5	0	0	0	0	0	790
14:00	4	544	144	0	31	2	0	0	0	0	0	0	0	725
15:00	6	652	124	0	28	1	1	3	0	0	0	0	0	815
16:00	4	516	97	1	30	0	0	3	0	0	0	0	0	651
17:00	3	479	92	1	19	0	0	3	0	0	0	0	0	597
18:00	0	374	80	2	24	1	0	0	0	0	0	0	0	481
19:00	0	299	62	0	12	0	0	0	1	0	0	0	0	374
20:00	2	196	45	0	9	0	0	0	0	0	0	0	0	252
21:00	0	194	32	2	5	0	0	0	0	0	0	0	0	233
22:00	0	145	25	0	4	0	0	0	0	0	0	0	0	174
23:00	0	126	18	0	5	0	0	0	0	0	0	0	0	149
Percent	0.7%	75.1%	18.3%	0.3%	4.3%	0.6%	0.0%	0.3%	0.4%	0.0%	0.0%	0.0%	0.0%	
AM Peak	11:00	11:00	11:00	06:00	11:00	05:00	06:00	09:00	05:00					11:00
Vol.	9	667	189	5	41	11	1	5	19					922
PM Peak	13:00	15:00	12:00	12:00	13:00	12:00	13:00	13:00	12:00					12:00
Vol.	15	652	160	3	36	3	1	5	3					836



PRECISION  
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Dascomb Road EB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
EB

165301 A EB Speed  
Site Code:

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th %ile	Ave Speed
10/06/	14	19	24	29	34	39	44	49	54	59	64	69	9999			
16	0	0	0	1	18	30	4	2	0	1	0	0	0	56	38	36
01:00	0	0	2	7	22	40	10	1	1	0	0	0	0	83	38	35
02:00	0	0	1	9	15	23	5	1	0	0	0	0	0	54	38	34
03:00	0	0	1	8	15	13	9	0	0	0	0	0	0	46	40	34
04:00	2	5	6	27	47	52	7	2	0	0	0	0	0	148	37	32
05:00	0	0	20	120	250	126	12	0	0	0	0	0	0	528	36	32
06:00	0	9	28	136	261	144	16	0	0	0	0	0	0	594	36	32
07:00	9	49	101	335	369	82	13	1	0	0	0	0	0	959	33	29
08:00	5	23	72	243	328	109	6	0	0	0	0	0	0	786	33	30
09:00	11	46	70	159	271	111	12	0	0	0	0	0	0	680	34	29
10:00	4	23	133	232	217	60	21	1	0	0	0	0	0	691	33	29
11:00	11	26	88	212	275	69	7	1	0	0	0	0	0	689	33	29
12 PM	2	19	75	210	251	74	8	2	0	0	0	0	0	641	33	29
13:00	3	15	83	255	262	85	10	1	0	0	0	0	0	714	33	29
14:00	16	26	101	294	298	87	8	1	0	0	0	0	0	831	33	29
15:00	19	76	176	327	302	80	18	0	0	0	0	0	0	998	33	28
16:00	4	15	112	331	436	141	9	0	0	0	0	0	0	1048	33	30
17:00	35	66	144	426	340	66	9	1	0	0	0	0	0	1087	32	27
18:00	5	28	123	380	357	80	8	0	0	0	0	0	0	981	33	29
19:00	0	7	50	183	238	104	16	2	0	0	0	0	0	600	35	31
20:00	0	5	11	82	182	102	17	2	0	0	0	0	0	401	36	32
21:00	0	2	10	64	127	91	11	2	0	0	0	0	0	307	37	32
22:00	0	3	5	25	82	35	12	4	2	0	0	0	0	168	37	33
23:00	0	0	4	13	54	55	13	3	0	0	0	0	0	142	38	34
Total	126	443	1416	4079	5017	1859	261	27	3	1	0	0	0	13232		
%	1.0%	3.3%	10.7%	30.8%	37.9%	14.0%	2.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	09:00	07:00	10:00	07:00	07:00	06:00	10:00	00:00	01:00	00:00					07:00	
Vol.	11	49	133	335	369	144	21	2	1	1				959		
PM Peak	17:00	15:00	15:00	17:00	16:00	16:00	15:00	22:00	22:00						17:00	
Vol.	35	76	176	426	436	141	18	4	2					1087		

Stats

15th Percentile : 23 MPH  
50th Percentile : 29 MPH  
85th Percentile : 34 MPH  
95th Percentile : 38 MPH

Mean Speed(Average) : 30 MPH  
10 MPH Pace Speed : 25-34 MPH  
Number in Pace : 9096  
Percent in Pace : 68.7%  
Number of Vehicles > 30 MPH : 6165  
Percent of Vehicles > 30 MPH : 46.6%



PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
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Dascomb Road EB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
EB

165301 A EB Speed  
Site Code:

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th %ile	Ave Speed
10/07/	14	19	24	29	34	39	44	49	54	59	64	69	9999			
16	0	0	2	9	14	19	7	0	1	0	0	0	0	52	39	34
01:00	0	0	0	9	30	21	9	1	0	0	0	0	0	70	38	34
02:00	0	0	1	8	5	9	4	1	1	0	0	0	0	29	41	34
03:00	0	0	2	9	17	12	2	2	0	0	0	0	0	44	37	33
04:00	0	0	16	36	68	37	14	7	0	0	0	0	0	178	38	33
05:00	8	14	66	108	168	86	16	2	0	0	0	0	0	468	35	30
06:00	0	3	56	156	250	104	13	1	0	0	0	0	0	583	35	31
07:00	11	21	115	367	323	90	6	1	0	0	0	0	0	934	33	29
08:00	0	17	119	269	348	96	11	2	0	0	0	0	0	862	33	29
09:00	1	19	113	217	300	81	6	0	0	0	0	0	0	737	33	29
10:00	2	23	113	223	236	79	11	2	0	0	0	0	0	689	33	29
11:00	0	6	114	233	249	81	7	1	0	0	0	0	0	691	33	29
12 PM	2	28	129	299	244	60	5	1	0	0	0	0	0	768	32	28
13:00	0	20	145	301	268	74	4	0	0	0	0	0	0	812	33	28
14:00	26	49	157	342	267	48	11	0	0	0	0	0	0	900	32	27
15:00	46	71	235	400	234	79	7	0	0	0	0	0	0	1072	32	26
16:00	18	20	105	350	416	118	9	3	0	0	0	0	0	1039	33	29
17:00	51	69	218	392	354	65	5	0	0	0	0	0	0	1154	32	27
18:00	31	73	168	375	264	59	3	3	0	0	0	0	0	976	32	27
19:00	0	0	29	155	256	104	18	2	0	0	0	0	0	564	35	31
20:00	0	0	17	85	170	84	16	3	0	0	0	0	0	375	36	32
21:00	0	0	8	39	93	46	13	2	1	0	0	0	0	202	37	33
22:00	0	2	8	63	151	83	15	3	0	0	0	0	0	325	37	33
23:00	0	1	3	54	93	71	27	2	0	0	0	0	0	251	38	33
Total	196	436	1939	4499	4818	1606	239	39	3	0	0	0	0	13775		
%	1.4%	3.2%	14.1%	32.7%	35.0%	11.7%	1.7%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	07:00	10:00	08:00	07:00	08:00	06:00	05:00	04:00	00:00						07:00	
Vol.	11	23	119	367	348	104	16	7	1					934		
PM Peak	17:00	18:00	15:00	15:00	16:00	16:00	23:00	16:00	21:00						17:00	
Vol.	51	73	235	400	416	118	27	3	1					1154		

Stats

15th Percentile : 22 MPH  
50th Percentile : 28 MPH  
85th Percentile : 33 MPH  
95th Percentile : 37 MPH

Mean Speed(Average) : 29 MPH  
10 MPH Pace Speed : 25-34 MPH  
Number in Pace : 9317  
Percent in Pace : 67.6%  
Number of Vehicles > 30 MPH : 5741  
Percent of Vehicles > 30 MPH : 41.7%



PRECISION  
D A T A  
INDUSTRIES, LLC

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Office: 508-875-0100 Fax: 508-875-0118  
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Dascomb Road EB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
EB

165301 A EB Speed  
Site Code:

Start Time	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	
10/08/																													
16	0	2	8	24	55	54	11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	155	37	33		
01:00	1	0	2	15	31	18	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	75	38	33		
02:00	0	0	0	0	8	10	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	41	37		
03:00	0	0	1	7	9	15	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	40	35		
04:00	0	0	6	2	27	31	10	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	78	39	35		
05:00	0	0	3	40	73	50	9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	176	37	33		
06:00	0	1	8	45	93	81	24	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	255	38	33		
07:00	0	0	7	47	187	183	31	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	460	38	34		
08:00	0	1	17	128	244	185	28	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	606	37	33		
09:00	0	5	32	194	323	133	18	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	707	35	31		
10:00	12	21	69	207	322	137	7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	777	35	30		
11:00	4	10	69	293	400	124	20	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	922	34	30		
12 PM	5	7	61	242	370	128	22	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	836	35	31		
13:00	1	9	54	213	333	166	11	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	790	35	31		
14:00	3	2	49	183	322	151	14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	725	35	31		
15:00	2	6	52	245	354	140	14	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	815	35	31		
16:00	0	0	17	153	311	141	25	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	651	36	32		
17:00	0	3	17	107	275	158	34	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	597	37	33		
18:00	0	2	19	100	240	108	11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	481	36	32		
19:00	0	0	10	91	168	86	17	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	374	36	32		
20:00	0	0	5	43	115	71	15	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	252	37	33		
21:00	0	0	2	45	113	63	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	233	37	33		
22:00	0	1	5	48	72	41	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	174	36	32		
23:00	0	0	3	62	60	21	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	149	34	31		
Total	28	70	516	2534	4505	2295	357	43	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10352				
%	0.3%	0.7%	5.0%	24.5%	43.5%	22.2%	3.4%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
AM Peak	10:00	10:00	10:00	11:00	11:00	08:00	07:00	07:00	04:00																	11:00			
Vol.	12	21	69	293	400	185	31	5	1																	922			
PM Peak	12:00	13:00	12:00	15:00	12:00	13:00	17:00	16:00	15:00	19:00																12:00			
Vol.	5	9	61	245	370	166	34	4	1	1																836			

Stats

15th Percentile : 25 MPH  
50th Percentile : 31 MPH  
85th Percentile : 36 MPH  
95th Percentile : 38 MPH

Mean Speed(Average) : 32 MPH  
10 MPH Pace Speed : 25-34 MPH  
Number in Pace : 7039  
Percent in Pace : 68.0%  
Number of Vehicles > 30 MPH : 6303  
Percent of Vehicles > 30 MPH : 60.9%





PRECISION  
D A T A  
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Dascomb Road EB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli

165301 A EB Volume  
Site Code:

Start Time	EB													
	A.M.	P.M.												
12:00	17	208												
12:15	12	184												
12:30	11	160												
12:45	12	216	768											
01:00	12	222												
01:15	14	183												
01:30	23	214												
01:45	21	193	812											
02:00	6	204												
02:15	5	207												
02:30	6	261												
02:45	12	228	900											
03:00	6	279												
03:15	9	226												
03:30	13	318												
03:45	16	249	1072											
04:00	36	267												
04:15	63	260												
04:30	36	274												
04:45	43	238	1039											
05:00	75	301												
05:15	116	289												
05:30	129	288												
05:45	148	276	1154											
06:00	125	319												
06:15	139	245												
06:30	143	133												
06:45	176	279	976											
07:00	199	183												
07:15	265	144												
07:30	242	114												
07:45	228	123	564											
08:00	216	106												
08:15	227	87												
08:30	210	109												
08:45	209	73	375											
09:00	199	51												
09:15	192	62												
09:30	163	55												
09:45	183	34	202											
10:00	164	111												
10:15	163	47												
10:30	190	98												
10:45	172	69	325											
11:00	161	75												
11:15	180	65												
11:30	182	66												
11:45	168	45	251											
Total	5337	8438												
Percent		100.0 %	0.0%	0.0%										
Day Total		13775												
Peak	07:15	-	05:15	-	-	-	-	-	-	-	-	-	-	-
Vol.	951	-	1172	-	-	-	-	-	-	-	-	-	-	-
P.H.F.	0.897		0.918											





PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Dascomb Road EB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli

165301 A EB Volume  
Site Code:

Start Time	EB												Sat	
	A.M.	P.M.											10/8/201	
12:00	55	218											6	
12:15	41	211												
12:30	35	214												
12:45	24	193	836											
01:00	22	208												
01:15	20	216												
01:30	23	165												
01:45	10	201	790											
02:00	5	176												
02:15	6	189												
02:30	7	192												
02:45	6	168	725											
03:00	9	204												
03:15	8	210												
03:30	11	203												
03:45	12	198	815											
04:00	21	170												
04:15	13	166												
04:30	28	180												
04:45	16	135	651											
05:00	34	170												
05:15	56	145												
05:30	37	133												
05:45	49	149	597											
06:00	43	144												
06:15	57	127												
06:30	77	96												
06:45	78	114	481											
07:00	89	96												
07:15	114	79												
07:30	122	106												
07:45	135	93	374											
08:00	121	75												
08:15	161	71												
08:30	152	49												
08:45	172	57	252											
09:00	148	73												
09:15	154	55												
09:30	196	45												
09:45	209	60	233											
10:00	207	40												
10:15	194	47												
10:30	197	47												
10:45	179	40	174											
11:00	245	34												
11:15	240	35												
11:30	218	48												
11:45	219	32	149											
Total	4275	6077												
Percent		100.0 %	0.0%	0.0%										
Day Total		10352												
Peak Vol.	11:00 922	- 836	-	-	-	-	-	-	-	-	-	-	-	-
P.H.F.	0.941	0.959												



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Dascomb Road WB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
WB

165301 A WB Class  
Site Code:

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
10/06/1														
6	2	50	13	0	2	2	0	0	3	0	0	0	0	72
01:00	2	24	3	1	0	2	0	0	4	0	0	0	0	36
02:00	1	28	6	0	3	1	0	0	1	0	0	0	0	40
03:00	1	36	11	3	4	1	0	0	2	0	0	0	0	58
04:00	4	88	22	0	11	5	0	0	4	0	0	0	0	134
05:00	9	148	62	6	21	7	0	1	2	0	0	0	0	256
06:00	19	572	162	8	32	20	0	5	8	0	0	0	0	826
07:00	16	711	155	13	29	15	0	2	13	1	0	0	0	955
08:00	21	678	146	11	37	17	0	5	6	0	0	0	0	921
09:00	28	476	140	16	28	26	1	9	9	0	0	0	0	733
10:00	14	391	137	9	39	11	1	4	8	0	0	0	0	614
11:00	13	411	137	14	35	16	3	5	8	0	0	0	0	642
12 PM	20	437	138	6	34	15	0	7	15	0	0	0	0	672
13:00	16	452	146	10	35	17	3	2	5	0	0	0	0	686
14:00	16	507	173	5	32	21	3	5	11	0	1	0	0	774
15:00	14	688	206	13	30	15	0	10	11	0	0	0	0	987
16:00	10	811	191	5	45	5	0	5	4	0	0	0	0	1076
17:00	11	882	152	2	34	2	0	10	2	0	0	0	0	1095
18:00	7	728	131	3	21	2	1	3	1	0	0	0	0	897
19:00	7	500	102	2	14	3	0	1	0	0	1	0	0	630
20:00	4	393	63	3	15	5	0	1	0	0	0	0	0	484
21:00	2	300	56	1	5	0	0	0	2	0	0	0	0	366
22:00	3	200	27	1	5	3	0	0	0	0	0	0	0	239
23:00	2	137	16	0	1	0	0	0	0	0	0	0	0	156
Percent	1.8%	72.3%	17.9%	1.0%	3.8%	1.6%	0.1%	0.6%	0.9%	0.0%	0.0%	0.0%	0.0%	
AM Peak	09:00	07:00	06:00	09:00	10:00	09:00	11:00	09:00	07:00	07:00				07:00
Vol.	28	711	162	16	39	26	3	9	13	1				955
PM Peak	12:00	17:00	15:00	15:00	16:00	14:00	13:00	15:00	12:00		14:00			17:00
Vol.	20	882	206	13	45	21	3	10	15		1			1095



PRECISION  
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Dascomb Road WB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
WB

165301 A WB Class  
Site Code:

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
10/07/1														
6	8	74	14	1	2	4	0	0	3	0	0	0	0	106
01:00	3	33	3	0	2	1	0	0	5	0	0	0	0	47
02:00	2	16	8	0	1	2	0	0	1	0	0	0	0	30
03:00	3	38	19	0	4	2	0	0	7	0	0	0	0	73
04:00	3	82	18	0	5	5	0	0	2	0	0	0	0	115
05:00	12	169	65	2	18	10	0	2	9	0	0	0	0	287
06:00	21	475	166	4	30	18	0	6	14	0	0	0	0	734
07:00	23	625	146	10	29	22	1	7	4	0	0	0	0	867
08:00	21	519	124	13	40	17	0	8	11	0	0	0	0	753
09:00	20	432	158	15	20	21	0	10	7	0	0	0	0	683
10:00	12	403	145	9	33	12	0	5	8	0	0	0	0	627
11:00	17	459	122	10	31	15	0	5	10	0	0	0	0	669
12 PM	19	505	168	14	32	9	0	8	8	0	0	0	0	763
13:00	19	439	133	15	40	18	2	5	6	0	0	0	0	677
14:00	7	562	163	7	37	7	0	7	12	0	1	0	1	804
15:00	16	708	185	11	33	12	0	3	8	0	0	0	1	977
16:00	14	927	190	6	39	6	0	8	7	0	0	0	1	1198
17:00	8	842	149	3	33	0	0	6	4	0	0	0	0	1045
18:00	6	552	116	3	15	1	0	2	2	0	0	0	0	697
19:00	3	407	92	1	11	1	0	4	0	0	0	0	0	519
20:00	3	358	59	3	10	1	0	0	0	0	0	0	0	434
21:00	0	281	47	2	12	0	0	0	3	0	0	0	0	345
22:00	2	240	43	2	11	1	0	0	1	0	0	0	0	300
23:00	2	186	35	2	4	0	0	0	0	0	0	0	0	229
Percent	1.9%	71.9%	18.2%	1.0%	3.8%	1.4%	0.0%	0.7%	1.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	07:00	07:00	06:00	09:00	08:00	07:00	07:00	09:00	06:00					07:00
Vol.	23	625	166	15	40	22	1	10	14					867
PM Peak	12:00	16:00	16:00	13:00	13:00	13:00	13:00	12:00	14:00		14:00		14:00	16:00
Vol.	19	927	190	15	40	18	2	8	12		1		1	1198



PRECISION  
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Dascomb Road WB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
WB

165301 A WB Class  
Site Code:

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
10/08/1														
6	1	121	17	0	3	1	0	0	2	0	0	0	0	145
01:00	0	46	10	1	1	0	0	0	1	0	0	0	0	59
02:00	1	38	8	1	1	1	0	0	1	0	0	0	0	51
03:00	0	28	9	0	5	0	0	0	1	0	0	0	0	43
04:00	3	32	19	0	4	1	0	0	0	0	0	0	0	59
05:00	1	87	34	0	9	3	0	0	0	0	0	0	0	134
06:00	2	190	61	2	21	6	0	0	1	0	0	0	0	283
07:00	3	248	78	4	21	5	0	1	2	0	0	0	0	362
08:00	3	371	98	2	18	2	0	1	3	0	0	0	0	498
09:00	8	444	117	3	22	7	0	4	5	0	0	0	0	610
10:00	12	526	150	3	19	9	0	2	4	0	0	0	0	725
11:00	5	582	130	2	30	6	0	4	14	0	0	0	0	773
12 PM	9	573	132	1	18	4	1	6	3	0	0	0	0	747
13:00	4	577	146	5	19	2	0	3	1	0	0	0	0	757
14:00	12	583	145	5	20	1	0	2	1	0	0	0	0	769
15:00	7	591	125	0	21	1	0	1	0	0	0	0	0	746
16:00	6	530	105	4	12	0	0	4	0	0	0	0	0	661
17:00	6	504	95	4	19	1	0	2	0	0	0	0	0	631
18:00	3	428	71	2	13	1	0	0	1	0	0	0	0	519
19:00	0	332	57	0	13	0	0	0	0	0	0	0	0	402
20:00	5	304	60	1	9	0	1	0	0	0	0	0	0	380
21:00	0	264	33	4	5	0	0	0	0	0	0	0	0	306
22:00	1	233	33	0	2	1	0	0	0	0	0	0	0	270
23:00	0	200	34	0	7	0	0	0	0	0	0	0	0	241
Percent	0.9%	77.0%	17.4%	0.4%	3.1%	0.5%	0.0%	0.3%	0.4%	0.0%	0.0%	0.0%	0.0%	
AM Peak	10:00	11:00	10:00	07:00	11:00	10:00		09:00	11:00					11:00
Vol.	12	582	150	4	30	9		4	14					773
PM Peak	14:00	15:00	13:00	13:00	15:00	12:00	12:00	12:00	12:00					14:00
Vol.	12	591	146	5	21	4	1	6	3					769



PRECISION  
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Dascomb Road WB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
WB

165301 A WB Speed  
Site Code:

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th %ile	Ave Speed
10/06/	14	19	24	29	34	39	44	49	54	59	64	69	9999			
16	0	1	2	10	5	24	21	6	3	0	0	0	0	72	43	37
01:00	0	0	4	10	6	5	8	2	0	1	0	0	0	36	42	34
02:00	0	0	0	8	14	7	8	3	0	0	0	0	0	40	42	35
03:00	0	0	4	13	26	7	6	2	0	0	0	0	0	58	38	32
04:00	0	0	5	34	43	21	17	10	3	1	0	0	0	134	42	34
05:00	0	6	18	35	84	55	44	11	3	0	0	0	0	256	41	34
06:00	0	20	45	217	321	<b>166</b>	47	9	1	0	0	0	0	826	36	32
07:00	<b>1</b>	28	<b>71</b>	259	<b>376</b>	164	49	5	2	0	0	0	0	<b>955</b>	36	31
08:00	0	8	70	<b>260</b>	353	161	53	13	3	0	0	0	0	921	36	31
09:00	0	<b>31</b>	64	170	250	141	57	18	2	0	0	0	0	733	37	31
10:00	0	6	36	157	191	136	<b>65</b>	<b>22</b>	1	0	0	0	0	614	38	33
11:00	0	7	50	162	218	122	65	13	<b>5</b>	0	0	0	0	642	38	32
12 PM	4	16	40	141	251	134	66	16	3	<b>1</b>	0	0	0	672	38	32
13:00	0	2	30	146	264	151	81	10	2	0	0	0	0	686	38	33
14:00	0	3	56	209	327	124	45	9	1	0	0	0	0	774	36	31
15:00	0	2	60	309	388	163	60	5	0	0	0	0	0	987	36	31
16:00	2	<b>28</b>	<b>104</b>	315	433	153	31	8	2	0	0	0	0	1076	35	30
17:00	<b>9</b>	24	75	<b>332</b>	<b>453</b>	161	34	7	0	0	0	0	0	<b>1095</b>	35	30
18:00	0	5	41	216	344	<b>198</b>	72	20	1	0	0	0	0	897	37	33
19:00	0	5	21	115	218	158	88	23	2	0	0	0	0	630	40	34
20:00	0	3	6	61	147	147	<b>94</b>	<b>26</b>	0	0	0	0	0	484	41	35
21:00	0	0	3	61	106	92	79	19	4	1	0	0	<b>1</b>	366	42	36
22:00	0	0	5	39	62	50	53	22	<b>7</b>	1	0	0	0	239	43	36
23:00	0	2	3	11	45	40	44	10	1	0	0	0	0	156	42	36
Total	16	197	813	3290	4925	2580	1187	289	46	5	0	0	1	13349		
%	0.1%	1.5%	6.1%	24.6%	36.9%	19.3%	8.9%	2.2%	0.3%	0.0%	0.0%	0.0%	0.0%			
AM Peak	07:00	09:00	07:00	08:00	07:00	06:00	10:00	10:00	11:00	01:00						07:00
Vol.	1	31	71	260	376	166	65	22	5	1				955		
PM Peak	17:00	16:00	16:00	17:00	17:00	18:00	20:00	20:00	22:00	12:00			21:00	17:00		
Vol.	9	28	104	332	453	198	94	26	7	1			1	1095		

Stats

15th Percentile : 25 MPH  
50th Percentile : 31 MPH  
85th Percentile : 38 MPH  
95th Percentile : 42 MPH

Mean Speed(Average) : 32 MPH  
10 MPH Pace Speed : 25-34 MPH  
Number in Pace : 8215  
Percent in Pace : 61.5%  
Number of Vehicles > 30 MPH : 8048  
Percent of Vehicles > 30 MPH : 60.3%



PRECISION  
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Dascomb Road WB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
WB

165301 A WB Speed  
Site Code:

Start Time	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	
10/07/																													
16	0	8	5	5	24	17	30	13	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	106	44	36		
01:00	2	0	2	5	14	5	9	8	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47	45	36		
02:00	0	2	4	7	10	3	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	38	31		
03:00	0	0	1	27	24	10	8	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	73	39	32		
04:00	0	0	5	32	33	22	17	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	115	40	33		
05:00	0	13	10	63	102	52	27	17	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	287	39	33		
06:00	1	<b>20</b>	48	186	283	135	40	19	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	734	37	32		
07:00	<b>3</b>	14	50	<b>212</b>	<b>350</b>	<b>163</b>	64	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<b>867</b>	37	32		
08:00	0	14	53	195	295	135	51	9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	753	37	32		
09:00	0	19	<b>58</b>	168	215	149	56	16	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	683	38	32		
10:00	0	1	28	134	207	131	<b>98</b>	<b>22</b>	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	627	40	34		
11:00	0	5	21	160	233	147	73	21	<b>9</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	669	39	33		
12 PM	0	0	39	189	270	158	83	21	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	763	38	33		
13:00	0	3	40	146	253	136	78	19	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	677	38	33		
14:00	0	1	17	210	333	155	69	16	2	<b>1</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	804	37	33		
15:00	0	1	55	266	402	168	70	14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	977	37	32		
16:00	2	22	<b>110</b>	<b>366</b>	<b>476</b>	165	45	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<b>1198</b>	35	30		
17:00	<b>11</b>	<b>30</b>	88	260	417	<b>177</b>	51	8	2	0	<b>1</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	1045	36	31		
18:00	0	0	17	129	273	175	84	16	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	697	38	34		
19:00	0	0	11	61	193	141	<b>97</b>	14	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	519	40	35		
20:00	0	0	5	74	111	128	85	<b>25</b>	<b>6</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	434	41	36		
21:00	0	0	1	54	106	86	77	19	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	345	42	36		
22:00	0	0	6	49	86	77	67	12	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	300	41	35		
23:00	0	0	3	34	65	62	39	19	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	229	42	36		
Total	19	153	677	3032	4775	2597	1321	337	62	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	12979				
%	0.1%	1.2%	5.2%	23.4%	36.8%	20.0%	10.2%	2.6%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
AM Peak	07:00	06:00	09:00	07:00	07:00	07:00	10:00	10:00	11:00	05:00	05:00															07:00			
Vol.	3	20	58	212	350	163	98	22	9	1	1															867			
PM Peak	17:00	17:00	16:00	16:00	16:00	17:00	19:00	20:00	20:00	14:00	17:00	21:00														16:00			
Vol.	11	30	110	366	476	177	97	25	6	1	1	1														1198			

Stats

15th Percentile : 25 MPH  
50th Percentile : 31 MPH  
85th Percentile : 38 MPH  
95th Percentile : 43 MPH

Mean Speed(Average) : 33 MPH  
10 MPH Pace Speed : 25-34 MPH  
Number in Pace : 7807  
Percent in Pace : 60.2%  
Number of Vehicles > 30 MPH : 8143  
Percent of Vehicles > 30 MPH : 62.7%



PRECISION  
DATA  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Dascomb Road WB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
WB

165301 A WB Speed  
Site Code:

Start Time	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	
10/08/16	0	0	0	3	29	27	31	40	14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	145	43	36	
01:00	0	0	0	1	5	14	10	22	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59	43	38	
02:00	0	0	0	5	12	11	14	7	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	51	44	38	
03:00	0	0	0	5	9	5	14	8	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	46	39	
04:00	0	1	4	18	11	11	8	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59	42	33	
05:00	0	2	2	31	45	25	23	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	134	40	34	
06:00	0	1	5	47	87	60	57	23	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	283	42	35	
07:00	0	0	5	53	127	63	71	35	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	362	43	36	
08:00	0	0	5	77	160	128	97	19	11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	498	41	35	
09:00	0	5	13	106	211	130	106	33	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	610	41	35	
10:00	0	1	23	131	292	158	89	28	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	725	39	34	
11:00	0	5	21	167	300	169	86	21	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	773	38	33	
12 PM	0	2	12	160	278	166	101	25	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	747	39	34	
13:00	2	2	11	141	290	180	98	31	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	757	39	34	
14:00	0	0	18	165	287	162	106	27	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	769	40	34	
15:00	0	0	14	149	281	173	108	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	746	39	34	
16:00	0	0	5	116	268	126	110	34	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	661	41	34	
17:00	0	0	6	107	234	162	93	25	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	631	40	35	
18:00	0	0	5	96	184	121	93	19	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	519	40	35	
19:00	0	0	1	63	152	90	76	18	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	402	41	35	
20:00	0	1	5	73	111	83	80	23	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	380	42	35	
21:00	0	0	2	64	73	80	63	23	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	306	42	35	
22:00	0	5	1	49	82	71	48	12	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	270	41	35	
23:00	0	0	2	76	71	58	30	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	241	38	33	
Total %	0.0%	0.2%	1.6%	19.0%	35.5%	22.3%	16.1%	4.6%	1.6%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10171			
AM Peak Vol.		09:00	10:00	11:00	11:00	11:00	09:00	07:00	08:00	07:00	02:00																11:00		
PM Peak Vol.	13:00	22:00	14:00	14:00	13:00	13:00	16:00	16:00	12:00	20:00												17:00					14:00		

Stats

- 15th Percentile : 27 MPH
- 50th Percentile : 33 MPH
- 85th Percentile : 40 MPH
- 95th Percentile : 44 MPH
  
- Mean Speed(Average) : 34 MPH
- 10 MPH Pace Speed : 30-39 MPH
- Number in Pace : 5879
- Percent in Pace : 57.8%
- Number of Vehicles > 30 MPH : 7326
- Percent of Vehicles > 30 MPH : 72.0%









PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Dascomb Road WB  
east of California Products Driveway  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli

165301 A WB Volume  
Site Code:

Start Time	WB												Sat	
	A.M.	P.M.											10/8/201	
12:00	44	187											6	
12:15	41	181												
12:30	25	170												
12:45	35	209	145	209	747									
01:00	21	197												
01:15	15	187												
01:30	17	176												
01:45	6	197	59	197	757									
02:00	18	173												
02:15	10	202												
02:30	11	194												
02:45	12	200	51	200	769									
03:00	10	172												
03:15	12	180												
03:30	8	203												
03:45	13	191	43	191	746									
04:00	14	165												
04:15	13	162												
04:30	14	155												
04:45	18	179	59	179	661									
05:00	17	161												
05:15	16	160												
05:30	34	148												
05:45	67	162	134	162	631									
06:00	42	148												
06:15	70	135												
06:30	75	125												
06:45	96	111	283	111	519									
07:00	57	112												
07:15	92	95												
07:30	102	82												
07:45	111	113	362	113	402									
08:00	104	95												
08:15	124	103												
08:30	129	98												
08:45	141	84	498	84	380									
09:00	142	96												
09:15	132	72												
09:30	138	76												
09:45	198	62	610	62	306									
10:00	180	62												
10:15	183	77												
10:30	179	66												
10:45	183	65	725	65	270									
11:00	192	58												
11:15	197	65												
11:30	192	59												
11:45	192	59	773	59	241									
Total	3742	6429												
Percent		100.0 %											0.0%	
Day Total		10171												
Peak	11:00	-	00:45	-	-	-	-	-	-	-	-	-	-	
Vol.	773	-	769	-	-	-	-	-	-	-	-	-	-	
P.H.F.	0.981		0.920											



PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Frontage Road NB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
NB

165301 B NB Class  
Site Code:

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
10/06/1														
6	0	23	6	1	1	0	0	0	0	0	0	0	0	31
01:00	0	23	9	0	0	0	0	0	0	0	0	0	0	32
02:00	1	26	1	1	0	0	0	0	1	0	0	0	0	30
03:00	0	26	7	0	3	2	0	0	0	0	0	0	0	38
04:00	3	81	24	2	3	4	0	1	3	0	0	0	0	121
05:00	7	405	142	2	20	10	1	2	8	0	0	0	0	597
06:00	5	484	84	4	10	8	0	1	6	0	0	0	0	602
07:00	4	629	82	10	17	8	0	2	5	0	0	0	0	757
08:00	2	601	86	8	11	1	0	1	1	0	0	0	0	711
09:00	8	400	79	4	18	10	0	2	3	0	0	0	0	524
10:00	14	355	79	5	25	15	1	2	6	0	0	0	0	502
11:00	5	311	88	4	15	8	0	1	2	0	0	0	0	434
12 PM	12	322	62	5	11	11	0	0	6	0	0	0	0	429
13:00	4	334	80	3	21	11	0	1	3	0	0	0	0	457
14:00	0	399	90	6	18	8	0	3	3	0	0	0	0	527
15:00	1	363	71	5	19	4	0	1	1	0	0	0	0	465
16:00	4	415	103	1	11	1	0	2	2	0	0	0	0	539
17:00	8	493	75	0	14	2	0	1	0	0	0	0	0	593
18:00	4	444	57	1	15	2	0	1	0	0	0	0	0	524
19:00	5	317	36	0	3	2	0	0	0	0	0	0	0	363
20:00	5	191	21	0	1	5	0	0	0	0	0	0	0	223
21:00	1	163	18	0	1	0	0	1	0	0	0	0	0	184
22:00	3	94	20	0	4	2	0	0	3	0	0	0	0	126
23:00	3	60	9	0	1	1	0	0	0	0	0	0	0	74
Percent	1.1%	78.3%	15.0%	0.7%	2.7%	1.3%	0.0%	0.2%	0.6%	0.0%	0.0%	0.0%	0.0%	
AM Peak	10:00	07:00	05:00	07:00	10:00	10:00	05:00	05:00	05:00					07:00
Vol.	14	629	142	10	25	15	1	2	8					757
PM Peak	12:00	17:00	16:00	14:00	13:00	12:00		14:00	12:00					17:00
Vol.	12	493	103	6	21	11		3	6					593



PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Frontage Road NB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
NB

165301 B NB Class  
Site Code:

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
10/07/1														
6	1	22	1	0	0	1	0	0	0	0	0	0	0	25
01:00	2	14	1	0	0	3	0	0	0	0	0	0	0	20
02:00	1	9	2	0	1	1	0	0	1	0	0	0	0	15
03:00	0	18	4	2	1	0	0	0	0	0	0	0	0	25
04:00	4	84	25	1	3	4	0	0	6	0	0	0	0	127
05:00	6	375	121	2	22	6	1	1	6	0	0	0	0	540
06:00	8	397	83	6	16	8	1	1	8	0	0	0	0	528
07:00	7	615	95	2	17	3	0	3	2	0	0	0	0	744
08:00	7	590	87	0	15	8	0	4	4	0	0	0	0	715
09:00	14	399	80	4	10	11	0	2	3	0	0	0	0	523
10:00	8	324	79	4	15	10	0	2	6	0	0	0	0	448
11:00	7	324	63	5	16	7	0	4	2	0	0	0	0	428
12 PM	10	352	68	3	18	12	0	4	4	0	0	0	0	471
13:00	9	330	92	10	10	12	0	5	5	0	0	0	0	473
14:00	2	393	89	9	19	3	0	2	1	0	0	0	1	519
15:00	6	410	76	3	12	6	0	1	0	0	0	0	0	514
16:00	8	430	71	5	24	2	0	1	0	0	0	0	0	541
17:00	5	469	76	5	14	2	0	3	0	0	0	0	0	574
18:00	2	414	61	2	6	1	0	1	0	0	0	0	0	487
19:00	2	251	31	0	7	1	0	0	0	0	0	0	0	292
20:00	2	178	32	0	3	1	0	0	0	0	0	0	0	216
21:00	2	113	19	0	2	1	0	0	0	0	0	0	0	137
22:00	4	177	32	0	8	0	0	1	0	0	0	0	0	222
23:00	0	129	16	1	3	0	0	0	0	0	0	0	0	149
Percent	1.3%	78.1%	14.9%	0.7%	2.8%	1.2%	0.0%	0.4%	0.5%	0.0%	0.0%	0.0%	0.0%	
AM Peak	09:00	07:00	05:00	06:00	05:00	09:00	05:00	08:00	06:00					07:00
Vol.	14	615	121	6	22	11	1	4	8					744
PM Peak	12:00	17:00	13:00	13:00	16:00	12:00		13:00	13:00				14:00	17:00
Vol.	10	469	92	10	24	12		5	5				1	574



PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Frontage Road NB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
NB

165301 B NB Class  
Site Code:

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
10/08/1														
6	0	79	8	0	1	0	0	0	0	0	0	0	0	88
01:00	1	44	8	0	1	1	0	0	0	0	0	0	0	55
02:00	0	15	2	0	0	0	0	0	0	0	0	0	0	17
03:00	0	26	3	1	0	0	0	0	0	0	0	0	0	30
04:00	1	38	10	0	2	1	0	1	0	0	0	0	0	53
05:00	1	75	36	2	1	9	0	0	11	0	0	0	0	135
06:00	1	106	42	3	9	2	1	0	2	0	0	0	0	166
07:00	0	191	35	1	14	2	0	0	1	0	0	0	0	244
08:00	1	247	50	4	6	4	0	0	2	0	0	0	0	314
09:00	4	309	70	0	7	4	0	0	3	0	0	0	0	397
10:00	1	370	62	2	6	6	0	1	2	0	0	0	0	450
11:00	3	381	83	1	7	4	0	2	4	0	0	0	0	485
12 PM	2	365	55	2	5	3	0	0	1	0	0	0	0	433
13:00	4	378	68	2	13	2	0	1	0	0	0	0	0	468
14:00	4	325	76	0	6	0	0	0	0	0	0	0	0	411
15:00	1	373	58	0	6	1	0	0	0	0	0	0	0	439
16:00	2	331	56	0	7	0	0	0	0	0	0	0	0	396
17:00	1	332	50	0	9	0	0	1	0	0	0	0	0	393
18:00	0	303	38	2	8	0	0	0	0	0	0	0	0	351
19:00	1	224	30	0	3	0	0	0	1	0	0	0	0	259
20:00	2	156	21	0	4	0	0	0	0	0	0	0	0	183
21:00	0	147	22	0	2	0	0	0	0	0	0	0	0	171
22:00	0	133	12	0	1	0	0	0	0	0	0	0	0	146
23:00	0	93	13	0	3	0	0	0	0	0	0	0	0	109
Percent	0.5%	81.4%	14.7%	0.3%	2.0%	0.6%	0.0%	0.1%	0.4%	0.0%	0.0%	0.0%	0.0%	
AM Peak	09:00	11:00	11:00	08:00	07:00	05:00	06:00	11:00	05:00					11:00
Vol.	4	381	83	4	14	9	1	2	11					485
PM Peak	13:00	13:00	14:00	12:00	13:00	12:00		13:00	12:00					13:00
Vol.	4	378	76	2	13	3		1	1					468



PRECISION  
D A T A  
INDUSTRIES, LLC

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Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Frontage Road NB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
NB

165301 B NB Speed  
Site Code:

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th % ile	Ave Speed
10/06/	14	19	24	29	34	39	44	49	54	59	64	69	9999			
16	0	0	2	6	9	13	1	0	0	0	0	0	0	31	37	33
01:00	0	0	1	8	14	6	2	1	0	0	0	0	0	32	37	32
02:00	0	1	1	3	14	9	2	0	0	0	0	0	0	30	37	33
03:00	0	0	1	9	15	11	2	0	0	0	0	0	0	38	37	33
04:00	1	0	16	25	53	24	2	0	0	0	0	0	0	121	35	31
05:00	1	8	73	116	257	124	16	2	0	0	0	0	0	597	36	31
06:00	0	4	16	83	287	179	29	3	1	0	0	0	0	602	37	33
07:00	0	0	19	104	356	252	24	2	0	0	0	0	0	757	37	33
08:00	0	0	11	70	349	237	40	3	1	0	0	0	0	711	37	34
09:00	0	1	18	57	259	170	19	0	0	0	0	0	0	524	37	33
10:00	1	7	41	84	228	129	11	1	0	0	0	0	0	502	36	32
11:00	1	4	9	49	223	128	17	3	0	0	0	0	0	434	37	33
12 PM	0	0	25	68	195	124	14	2	1	0	0	0	0	429	37	33
13:00	0	2	11	66	211	149	18	0	0	0	0	0	0	457	37	33
14:00	0	1	17	64	257	168	19	1	0	0	0	0	0	527	37	33
15:00	0	4	18	47	249	133	14	0	0	0	0	0	0	465	36	33
16:00	0	0	6	58	277	166	32	0	0	0	0	0	0	539	37	33
17:00	0	0	16	87	287	175	27	1	0	0	0	0	0	593	37	33
18:00	0	1	15	60	268	152	23	4	0	1	0	0	0	524	37	33
19:00	0	4	5	52	193	92	16	1	0	0	0	0	0	363	36	33
20:00	0	3	11	31	107	61	9	1	0	0	0	0	0	223	37	32
21:00	0	0	4	40	83	48	7	1	0	1	0	0	0	184	37	33
22:00	0	1	9	29	56	28	3	0	0	0	0	0	0	126	36	31
23:00	0	1	3	9	36	20	5	0	0	0	0	0	0	74	37	33
Total	4	42	348	1225	4283	2598	352	26	3	2	0	0	0	8883		
%	0.0%	0.5%	3.9%	13.8%	48.2%	29.2%	4.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	04:00	05:00	05:00	05:00	07:00	07:00	08:00	06:00	06:00							07:00
Vol.	1	8	73	116	356	252	40	3	1							757
PM Peak		15:00	12:00	17:00	17:00	17:00	16:00	18:00	12:00	18:00						17:00
Vol.		4	25	87	287	175	32	4	1	1						593

Stats

15th Percentile : 27 MPH  
50th Percentile : 32 MPH  
85th Percentile : 37 MPH  
95th Percentile : 38 MPH

Mean Speed(Average) : 33 MPH  
10 MPH Pace Speed : 30-39 MPH  
Number in Pace : 6881  
Percent in Pace : 77.5%  
Number of Vehicles > 30 MPH : 6407  
Percent of Vehicles > 30 MPH : 72.1%



PRECISION  
DATA  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Frontage Road NB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
NB

165301 B NB Speed  
Site Code:

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th % ile	Ave Speed
10/07/	14	19	24	29	34	39	44	49	54	59	64	69	9999			
16	0	0	3	4	9	6	2	1	0	0	0	0	0	25	38	33
01:00	0	0	0	10	8	1	1	0	0	0	0	0	0	20	33	30
02:00	0	0	2	3	8	2	0	0	0	0	0	0	0	15	33	30
03:00	0	1	0	4	10	8	2	0	0	0	0	0	0	25	37	33
04:00	0	0	24	15	57	29	2	0	0	0	0	0	0	127	36	31
05:00	2	19	69	115	215	108	11	1	0	0	0	0	0	540	35	30
06:00	5	9	24	62	284	128	15	0	0	1	0	0	0	528	36	32
07:00	0	2	24	123	382	184	25	4	0	0	0	0	0	744	36	32
08:00	0	5	27	93	361	199	28	1	1	0	0	0	0	715	37	33
09:00	0	9	36	76	241	148	10	2	1	0	0	0	0	523	36	32
10:00	0	7	19	71	207	135	8	1	0	0	0	0	0	448	36	32
11:00	0	2	22	73	201	115	13	2	0	0	0	0	0	428	36	32
12 PM	0	0	15	72	201	157	22	3	1	0	0	0	0	471	37	33
13:00	2	9	24	76	183	158	18	2	1	0	0	0	0	473	37	32
14:00	0	1	11	60	250	178	17	2	0	0	0	0	0	519	37	33
15:00	0	0	11	65	238	174	25	1	0	0	0	0	0	514	37	33
16:00	0	0	8	82	285	145	18	3	0	0	0	0	0	541	36	33
17:00	0	1	20	68	302	158	22	3	0	0	0	0	0	574	37	33
18:00	0	0	6	50	268	147	16	0	0	0	0	0	0	487	37	33
19:00	0	1	10	57	140	74	10	0	0	0	0	0	0	292	36	32
20:00	0	0	5	36	108	58	9	0	0	0	0	0	0	216	36	33
21:00	0	1	8	23	72	29	3	1	0	0	0	0	0	137	36	32
22:00	0	1	10	47	92	59	9	4	0	0	0	0	0	222	37	32
23:00	1	0	3	16	66	47	12	4	0	0	0	0	0	149	38	34
Total	10	68	381	1301	4188	2447	298	35	4	1	0	0	0	8733		
%	0.1%	0.8%	4.4%	14.9%	48.0%	28.0%	3.4%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	06:00	05:00	05:00	07:00	07:00	08:00	08:00	07:00	08:00	06:00				07:00		
Vol.	5	19	69	123	382	199	28	4	1	1				744		
PM Peak	13:00	13:00	13:00	16:00	17:00	14:00	15:00	22:00	12:00					17:00		
Vol.	2	9	24	82	302	178	25	4	1					574		

Stats

15th Percentile : 27 MPH  
50th Percentile : 32 MPH  
85th Percentile : 37 MPH  
95th Percentile : 38 MPH

Mean Speed(Average) : 32 MPH  
10 MPH Pace Speed : 30-39 MPH  
Number in Pace : 6635  
Percent in Pace : 76.0%  
Number of Vehicles > 30 MPH : 6135  
Percent of Vehicles > 30 MPH : 70.3%



PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Frontage Road NB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
NB

165301 B NB Speed  
Site Code:

Start Time	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	
10/08/																													
16	0	0	2	21	35	21	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	88	38	33		
01:00	0	2	0	8	20	23	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55	37	33		
02:00	0	1	2	0	8	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	38	32		
03:00	0	1	3	4	10	9	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	38	32		
04:00	0	0	5	9	29	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53	35	31		
05:00	0	1	5	28	60	36	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	135	36	32		
06:00	0	1	7	23	92	37	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	166	36	32		
07:00	0	0	3	29	133	68	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	244	37	33		
08:00	0	0	2	36	167	96	10	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	314	37	33		
09:00	0	2	11	41	197	136	9	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	397	37	33		
10:00	2	0	12	49	232	138	12	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	450	37	33		
11:00	0	0	15	56	242	146	25	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	485	37	33		
12 PM	0	1	6	46	210	146	23	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	433	37	34		
13:00	0	1	5	61	233	156	11	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	468	37	33		
14:00	0	2	11	48	190	144	15	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	411	37	33		
15:00	1	0	7	45	242	125	17	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	439	37	33		
16:00	0	0	12	28	221	112	21	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	396	37	33		
17:00	0	0	9	48	207	112	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	393	37	33		
18:00	0	0	9	43	193	97	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	351	36	33		
19:00	1	4	5	32	149	64	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	259	36	32		
20:00	0	1	5	27	100	46	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	183	36	32		
21:00	0	1	7	27	94	38	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	171	36	32		
22:00	0	1	5	41	73	22	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	146	34	31		
23:00	0	0	6	38	49	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	109	33	30		
Total	4	19	154	788	3186	1802	220	16	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6193				
%	0.1%	0.3%	2.5%	12.7%	51.4%	29.1%	3.6%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
AM Peak	10:00	01:00	11:00	11:00	11:00	11:00	11:00	10:00	09:00																	11:00			
Vol.	2	2	15	56	242	146	25	5	1																	485			
PM Peak	15:00	19:00	16:00	13:00	15:00	13:00	12:00	16:00	12:00																	13:00			
Vol.	1	4	12	61	242	156	23	2	1																	468			

Stats

15th Percentile : 28 MPH  
50th Percentile : 32 MPH  
85th Percentile : 37 MPH  
95th Percentile : 38 MPH

Mean Speed(Average) : 33 MPH  
10 MPH Pace Speed : 30-39 MPH  
Number in Pace : 4988  
Percent in Pace : 80.5%  
Number of Vehicles > 30 MPH : 4591  
Percent of Vehicles > 30 MPH : 74.1%











PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Frontage Road SB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
SB

165301 B SB Class  
Site Code:

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
10/06/1														
6	1	13	4	0	2	1	0	0	2	0	0	0	0	23
01:00	1	12	2	1	0	1	0	0	3	0	0	0	0	20
02:00	1	19	8	1	1	1	0	0	0	0	0	0	0	31
03:00	1	32	14	1	2	0	0	0	0	0	0	0	0	50
04:00	5	83	29	0	10	3	0	0	1	0	0	0	0	131
05:00	8	132	59	3	20	6	0	0	1	0	0	0	0	229
06:00	12	364	114	7	34	14	0	1	6	0	0	0	0	552
07:00	12	435	94	10	29	13	0	1	5	0	0	0	0	599
08:00	17	390	101	9	28	13	1	3	1	0	0	0	0	563
09:00	13	261	101	11	22	12	1	5	10	0	0	0	0	436
10:00	6	225	64	3	19	3	0	3	8	0	0	0	1	332
11:00	8	273	87	11	24	8	1	1	5	0	0	0	0	418
12 PM	11	271	73	7	16	7	0	5	10	0	0	0	0	400
13:00	10	249	98	8	18	9	0	2	5	0	0	0	0	399
14:00	8	373	106	2	23	14	1	1	11	0	0	0	0	539
15:00	6	395	104	6	11	8	0	2	9	0	0	0	0	541
16:00	7	465	109	4	26	2	0	2	2	0	0	0	0	617
17:00	8	516	81	1	15	2	0	1	2	0	0	0	0	626
18:00	5	322	68	2	3	2	0	1	1	0	0	0	0	404
19:00	6	210	50	0	6	2	0	1	0	0	0	0	0	275
20:00	3	148	38	0	6	2	0	0	0	0	0	0	0	197
21:00	0	134	29	0	4	0	0	0	0	0	0	0	0	167
22:00	1	110	13	0	1	1	0	0	1	0	0	0	0	127
23:00	1	63	8	0	1	1	0	0	0	0	0	0	0	74
Percent	1.9%	70.9%	18.8%	1.1%	4.1%	1.6%	0.1%	0.4%	1.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	07:00	06:00	09:00	06:00	06:00	08:00	09:00	09:00				10:00	07:00
Vol.	17	435	114	11	34	14	1	5	10				1	599
PM Peak	12:00	17:00	16:00	13:00	16:00	14:00	14:00	12:00	14:00					17:00
Vol.	11	516	109	8	26	14	1	5	11					626



PRECISION  
D A T A  
INDUSTRIES, LLC

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Frontage Road SB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
SB

165301 B SB Class  
Site Code:

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
10/07/1														
6	6	24	4	1	0	6	0	0	0	0	0	0	0	41
01:00	2	17	2	1	3	1	0	0	0	0	0	0	0	26
02:00	1	13	10	0	0	1	0	0	1	0	0	0	0	26
03:00	2	34	19	0	1	1	0	0	3	0	0	0	0	60
04:00	2	71	28	0	4	2	0	0	1	0	0	0	0	108
05:00	8	159	76	0	19	8	0	0	5	0	0	0	0	275
06:00	15	316	112	2	28	17	0	1	9	0	0	0	0	500
07:00	10	404	91	3	23	10	0	1	4	0	0	0	0	546
08:00	15	328	99	8	18	12	0	3	14	0	0	0	0	497
09:00	12	288	83	13	15	12	0	4	5	0	0	0	0	432
10:00	3	187	76	3	18	4	0	2	5	0	0	0	0	298
11:00	11	292	72	4	20	8	0	4	2	0	0	0	0	413
12 PM	11	321	101	7	22	6	0	3	3	0	0	0	0	474
13:00	13	256	92	10	21	10	1	4	6	0	0	0	0	413
14:00	3	385	103	6	21	2	0	0	7	0	0	0	0	527
15:00	3	423	124	5	14	5	0	3	4	0	0	0	0	581
16:00	5	498	94	2	21	6	0	3	2	0	0	0	0	631
17:00	4	427	86	2	19	0	0	3	2	0	0	0	0	543
18:00	7	259	63	0	8	1	0	1	0	0	0	0	0	339
19:00	3	198	40	1	5	1	0	2	0	0	0	0	0	250
20:00	3	154	29	0	2	1	0	0	0	0	0	0	0	189
21:00	0	136	30	1	5	0	0	0	0	0	0	0	0	172
22:00	0	128	16	0	7	0	0	0	1	0	0	0	0	152
23:00	1	86	20	2	4	0	0	0	0	0	0	0	0	113
Percent	1.8%	71.0%	19.3%	0.9%	3.9%	1.5%	0.0%	0.4%	1.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	06:00	07:00	06:00	09:00	06:00	06:00		09:00	08:00					07:00
Vol.	15	404	112	13	28	17		4	14					546
PM Peak	13:00	16:00	15:00	13:00	12:00	13:00	13:00	13:00	14:00					16:00
Vol.	13	498	124	10	22	10	1	4	7					631



PRECISION  
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Frontage Road SB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
SB

165301 B SB Class  
Site Code:

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
10/08/1														
6	1	51	9	0	4	1	0	0	0	0	0	0	0	66
01:00	0	19	8	0	1	0	0	0	0	0	0	0	0	28
02:00	0	15	5	1	1	0	0	0	0	0	0	0	0	22
03:00	0	14	4	0	1	0	0	0	0	0	0	0	0	19
04:00	2	25	15	0	1	0	0	0	0	0	0	0	0	43
05:00	1	84	32	0	7	3	0	0	0	0	0	0	0	127
06:00	0	103	43	2	12	0	0	0	2	0	0	0	0	162
07:00	2	143	32	2	9	3	0	1	2	0	0	0	0	194
08:00	0	180	54	1	16	0	0	0	2	0	0	0	0	253
09:00	5	217	67	1	10	5	0	4	2	0	0	0	0	311
10:00	4	309	72	1	7	4	0	1	4	0	0	0	0	402
11:00	6	306	80	1	19	5	0	1	8	0	0	0	0	426
12 PM	5	289	75	0	8	1	0	0	1	0	0	0	0	379
13:00	1	294	81	1	13	0	0	1	0	0	0	0	0	391
14:00	3	327	76	0	7	2	0	3	1	0	0	0	0	419
15:00	6	324	83	0	6	1	0	1	0	0	0	0	0	421
16:00	4	286	64	2	8	0	0	0	0	0	0	0	0	364
17:00	4	247	64	2	8	1	0	0	0	0	0	0	0	326
18:00	2	226	39	2	8	1	0	1	0	0	0	0	0	279
19:00	2	193	32	1	8	0	0	0	0	0	0	0	0	236
20:00	1	156	32	0	5	0	0	0	0	0	0	0	0	194
21:00	1	146	21	0	4	0	0	0	0	0	0	0	0	172
22:00	1	114	24	0	1	1	0	0	0	0	0	0	0	141
23:00	0	106	19	0	1	0	0	0	0	0	0	0	0	126
Percent	0.9%	75.9%	18.7%	0.3%	3.0%	0.5%	0.0%	0.2%	0.4%	0.0%	0.0%	0.0%	0.0%	
AM Peak	11:00	10:00	11:00	06:00	11:00	09:00		09:00	11:00					11:00
Vol.	6	309	80	2	19	5		4	8					426
PM Peak	15:00	14:00	15:00	16:00	13:00	14:00		14:00	12:00					15:00
Vol.	6	327	83	2	13	2		3	1					421



PRECISION  
DATA  
INDUSTRIES, LLC

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Frontage Road SB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
SB

165301 B SB Speed  
Site Code:

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th %ile	Ave Speed
10/06/	14	19	24	29	34	39	44	49	54	59	64	69	9999			
16	0	0	2	5	6	9	1	0	0	0	0	0	0	23	37	32
01:00	0	0	2	5	8	4	1	0	0	0	0	0	0	20	36	31
02:00	0	0	2	1	14	12	2	0	0	0	0	0	0	31	37	34
03:00	0	1	2	4	22	17	4	0	0	0	0	0	0	50	37	33
04:00	0	0	2	25	56	41	6	0	1	0	0	0	0	131	37	33
05:00	0	0	14	46	76	77	15	1	0	0	0	0	0	229	37	33
06:00	4	2	18	76	209	190	48	5	0	0	0	0	0	552	38	33
07:00	0	2	20	71	243	213	44	6	0	0	0	0	0	599	38	34
08:00	0	1	21	64	204	212	58	2	1	0	0	0	0	563	38	34
09:00	0	1	10	58	149	163	51	3	1	0	0	0	0	436	38	34
10:00	0	0	2	21	123	145	39	2	0	0	0	0	0	332	38	35
11:00	0	0	7	52	152	153	50	4	0	0	0	0	0	418	38	34
12 PM	0	1	8	59	140	145	39	6	2	0	0	0	0	400	38	34
13:00	0	0	8	51	148	145	40	7	0	0	0	0	0	399	38	34
14:00	0	2	9	64	212	190	59	3	0	0	0	0	0	539	38	34
15:00	0	1	5	66	215	205	43	6	0	0	0	0	0	541	38	34
16:00	0	0	7	53	227	249	74	6	1	0	0	0	0	617	38	35
17:00	0	0	5	74	253	237	49	8	0	0	0	0	0	626	38	34
18:00	0	0	0	29	166	169	36	4	0	0	0	0	0	404	38	35
19:00	0	0	3	17	128	113	13	1	0	0	0	0	0	275	37	34
20:00	0	0	0	16	81	83	16	1	0	0	0	0	0	197	38	35
21:00	0	0	0	19	79	57	11	1	0	0	0	0	0	167	37	34
22:00	0	0	0	18	61	42	5	1	0	0	0	0	0	127	37	33
23:00	0	0	3	3	36	23	8	0	1	0	0	0	0	74	38	34
Total	4	11	150	897	3008	2894	712	67	7	0	0	0	0	7750		
%	0.1%	0.1%	1.9%	11.6%	38.8%	37.3%	9.2%	0.9%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	06:00	06:00	08:00	06:00	07:00	07:00	08:00	07:00	04:00							07:00
Vol.	4	2	21	76	243	213	58	6	1							599
PM Peak		14:00	14:00	17:00	17:00	16:00	16:00	17:00	12:00							17:00
Vol.		2	9	74	253	249	74	8	2							626

Stats

15th Percentile : 29 MPH  
50th Percentile : 33 MPH  
85th Percentile : 38 MPH  
95th Percentile : 41 MPH

Mean Speed(Average) : 34 MPH  
10 MPH Pace Speed : 30-39 MPH  
Number in Pace : 5902  
Percent in Pace : 76.2%  
Number of Vehicles > 30 MPH : 6086  
Percent of Vehicles > 30 MPH : 78.5%



PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Frontage Road SB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
SB

165301 B SB Speed  
Site Code:

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th %ile	Ave Speed
10/07/	14	19	24	29	34	39	44	49	54	59	64	69	9999			
16	0	3	8	9	7	10	4	0	0	0	0	0	0	41	37	30
01:00	0	3	2	1	10	6	4	0	0	0	0	0	0	26	39	32
02:00	0	0	3	3	10	10	0	0	0	0	0	0	0	26	37	32
03:00	0	0	1	6	29	21	3	0	0	0	0	0	0	60	37	34
04:00	0	0	5	22	39	30	11	1	0	0	0	0	0	108	38	33
05:00	0	2	9	49	106	89	17	3	0	0	0	0	0	275	37	33
06:00	0	4	26	62	196	170	36	4	1	1	0	0	0	500	38	33
07:00	0	4	16	64	219	202	38	2	1	0	0	0	0	546	37	34
08:00	1	3	12	70	179	182	48	1	0	1	0	0	0	497	38	34
09:00	0	1	23	55	139	163	43	7	1	0	0	0	0	432	38	34
10:00	0	0	6	25	110	120	30	7	0	0	0	0	0	298	38	35
11:00	0	1	3	31	162	167	44	4	1	0	0	0	0	413	38	35
12 PM	0	0	9	36	186	196	43	4	0	0	0	0	0	474	38	35
13:00	0	0	3	52	155	163	36	4	0	0	0	0	0	413	38	34
14:00	0	0	6	49	195	217	51	9	0	0	0	0	0	527	38	35
15:00	0	1	1	63	218	237	52	9	0	0	0	0	0	581	38	35
16:00	0	0	5	62	256	247	56	5	0	0	0	0	0	631	38	34
17:00	0	2	4	48	205	221	55	7	1	0	0	0	0	543	38	35
18:00	0	0	4	39	137	129	26	4	0	0	0	0	0	339	38	34
19:00	0	0	5	19	114	94	17	1	0	0	0	0	0	250	37	34
20:00	0	0	6	16	83	74	9	1	0	0	0	0	0	189	37	34
21:00	0	0	2	18	78	65	7	2	0	0	0	0	0	172	37	34
22:00	0	0	1	12	74	55	10	0	0	0	0	0	0	152	37	34
23:00	0	0	1	3	56	43	9	1	0	0	0	0	0	113	38	35
Total	1	24	161	814	2963	2911	649	76	5	2	0	0	0	7606		
%	0.0%	0.3%	2.1%	10.7%	39.0%	38.3%	8.5%	1.0%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	06:00	06:00	08:00	07:00	07:00	08:00	09:00	06:00	06:00				07:00		
Vol.	1	4	26	70	219	202	48	7	1	1				546		
PM Peak		17:00	12:00	15:00	16:00	16:00	16:00	14:00	17:00					16:00		
Vol.		2	9	63	256	247	56	9	1					631		

Stats

15th Percentile : 29 MPH  
50th Percentile : 33 MPH  
85th Percentile : 38 MPH  
95th Percentile : 41 MPH

Mean Speed(Average) : 34 MPH  
10 MPH Pace Speed : 30-39 MPH  
Number in Pace : 5874  
Percent in Pace : 77.2%  
Number of Vehicles > 30 MPH : 6013  
Percent of Vehicles > 30 MPH : 79.1%





PRECISION  
D A T A  
INDUSTRIES, LLC

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Frontage Road SB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli  
SB

165301 B SB Speed  
Site Code:

Start Time	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
10/08/16	0	0	0	4	4	27	23	6	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66	38	34	
01:00	0	0	0	0	2	14	9	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	38	34	
02:00	0	0	0	1	0	10	8	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	38	35	
03:00	0	0	0	1	3	7	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	39	34	
04:00	0	0	0	1	5	20	14	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	37	34	
05:00	0	0	0	0	16	45	48	16	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	127	38	35	
06:00	0	0	0	2	13	51	79	16	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	162	38	35	
07:00	0	0	0	1	20	72	82	18	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	194	38	35	
08:00	0	1	2	10	86	113	38	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	253	39	36	
09:00	0	0	1	25	98	150	34	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	311	38	35	
10:00	0	0	3	31	156	177	30	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	402	38	35	
11:00	0	0	5	39	171	172	31	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	426	38	34	
12 PM	0	0	0	20	136	170	44	7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	379	38	36	
13:00	0	0	5	17	162	174	31	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	391	38	35	
14:00	0	0	3	31	186	176	21	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	419	37	34	
15:00	1	0	5	30	190	152	39	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	421	38	34	
16:00	0	1	3	21	167	150	18	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	364	37	34	
17:00	0	0	3	25	152	116	29	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	326	38	34	
18:00	0	0	5	16	129	112	14	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	279	37	34	
19:00	0	0	0	33	103	86	10	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	236	37	34	
20:00	0	1	0	22	94	63	12	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	194	37	34	
21:00	0	0	0	22	81	64	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	172	37	34	
22:00	0	0	4	24	80	32	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	141	35	32	
23:00	0	0	1	21	69	32	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	126	36	33	
Total	1	3	50	450	2306	2207	426	49	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5501			
%	0.0%	0.1%	0.9%	8.2%	41.9%	40.1%	7.7%	0.9%	0.2%	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%				
AM Peak		08:00	11:00	11:00	11:00	10:00	08:00	11:00	11:00																	11:00		
Vol.		1	5	39	171	177	38	5	3																	426		
PM Peak	15:00	16:00	13:00	19:00	15:00	14:00	12:00	12:00	12:00																	15:00		
Vol.	1	1	5	33	190	176	44	7	2																	421		

Stats

- 15th Percentile : 29 MPH
- 50th Percentile : 33 MPH
- 85th Percentile : 38 MPH
- 95th Percentile : 41 MPH
  
- Mean Speed(Average) : 34 MPH
- 10 MPH Pace Speed : 30-39 MPH
- Number in Pace : 4513
- Percent in Pace : 82.0%
- Number of Vehicles > 30 MPH : 4536
- Percent of Vehicles > 30 MPH : 82.5%







PRECISION  
D A T A  
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702  
Office: 508-875-0100 Fax: 508-875-0118  
Email: datarequests@pdillc.com

Frontage Road SB  
south of I-93 SB Ramps  
City, State: Andover, MA  
Client: Lupoli Companies / S. Lupoli

165301 B SB Volume  
Site Code:

Start Time	SB													
	A.M.		P.M.											
12:00	24		93											
12:15	17		89											
12:30	13		95											
12:45	12	66	102	379										
01:00	8		99											
01:15	5		83											
01:30	7		94											
01:45	8	28	115	391										
02:00	6		114											
02:15	1		102											
02:30	4		101											
02:45	11	22	102	419										
03:00	2		99											
03:15	6		111											
03:30	7		111											
03:45	4	19	100	421										
04:00	5		90											
04:15	13		88											
04:30	13		81											
04:45	12	43	105	364										
05:00	17		92											
05:15	20		86											
05:30	29		67											
05:45	61	127	81	326										
06:00	26		97											
06:15	40		73											
06:30	46		64											
06:45	50	162	45	279										
07:00	32		68											
07:15	52		54											
07:30	48		53											
07:45	62	194	61	236										
08:00	54		38											
08:15	59		56											
08:30	60		49											
08:45	80	253	51	194										
09:00	76		56											
09:15	65		40											
09:30	72		40											
09:45	98	311	36	172										
10:00	85		37											
10:15	109		46											
10:30	99		20											
10:45	109	402	38	141										
11:00	103		42											
11:15	106		35											
11:30	112		22											
11:45	105	426	27	126										
Total	2053		3448											
Percent			100.0 %	0.0%	0.0%									
Day Total		5501												
Peak	10:45	-	01:45	-	-	-	-	-	-	-	-	-	-	-
Vol.	430	-	432	-	-	-	-	-	-	-	-	-	-	-
P.H.F.	0.960		0.939											

## Appendix E. Road Safety Audit References

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## Road Safety Audit References

*Massachusetts Traffic Safety Toolbox*, Massachusetts Highway Department,  
[www.mhd.state.ma.us/safetytoolbox](http://www.mhd.state.ma.us/safetytoolbox).

*Road Safety Audits, A Synthesis of Highway Practice*. NCHRP Synthesis 336. Transportation Research Board, National Cooperative Highway Research Program, 2004.

*Road Safety Audits*. Institute of Transportation Engineers and U.S. Department of Transportation, Federal Highway Administration, [www.roadwaysafetyaudits.org](http://www.roadwaysafetyaudits.org).

*FHWA Road Safety Audit Guidelines*. U.S. Department of Transportation, Federal Highway Administration, 2006.

*Road Safety Audit*, 2<sup>nd</sup> edition. Austroads, 2000.

*Road Safety Audits*. ITE Technical Council Committee 4S-7. Institute of Transportation Engineers, February 1995.

*Safety Evaluation of Flashing Beacons at STOP-Controlled Intersections*. U.S. Department of Transportation, Federal Highway Administration. April 2008.  
<http://www.fhwa.dot.gov/publications/research/safety/08044/index.cfm>

**Attachment E**

Crash Data





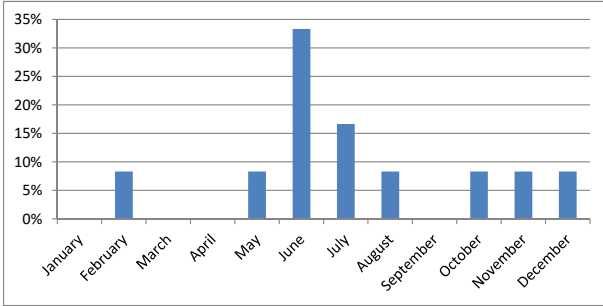
Crash Data Summary Tables  
 Dascomb Road @ East Street / Shawsheen Street - Andover, MA  
 01/01/2011 - 09/31/2016

Collision Diagram	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Number of Vehicles	Vehicle Travel Directions				Crash Severity	Number of NonFatal Injuries	Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Report)
							V1	V2	V3	V4					
1	2/26/2011	1:30 PM	Daylight	Clear	Dry	2	N	N			Property Damage Only	0	Rear-end	Inattention / Distracted	MV1 and MV2: traveling NB on Shawsheen St. Both vehicles were waiting to turn right. MV2 rear-ended MV1 when MV2 started to go before realizing that MV1 had not turned yet causing damages to both vehicles which would cost over \$1000.
2	6/8/2011	10:32 AM	Daylight	Clear	Dry	2	W	W			Property Damage Only	0	Rear-end	Inattention / Distracted	MV1 and MV2: traveling WB on Dascomb Rd. MV2 rear-ended MV1 when MV1 slowed and stopped in traffic. MV2 operator was adjusting the radio and did not pay attention causing damages over \$1000 to MV2.
3	6/30/2011	2:01 PM	Daylight	Clear	Dry	3	W	W	W		Property Damage Only	0	Rear-end	Inattention / Distracted	MV1, MV2 and MV3: traveling WB on Dascomb Rd. MV1 and MV2 stopped in traffic to turn left onto Shawsheen St. MV3 failed to stop in time and rear-ended MV2. The collision of MV2 and MV3 caused another rear-end collision between MV1 and MV2.
4	7/27/2011	5:35 PM	Daylight	Clear	Dry	2	N	E			Property Damage Only	0	Angled	Disregarded Traffic Controls	MV1: traveling NB on Shawsheen St and stopping at a Stop sign; MV2: traveling EB on East St. MV1 collided with MV2 when MV1 attempted to pull out and make a right turn onto East St EB lane. No injuries were reported but MV1 got towed.
5	11/13/2013	4:24 PM	Dusk	Clear	Dry	2	W	W			Property Damage Only	0	Sideswipe	Other	MV1 and MV2: traveling WB on Dascomb Rd. MV1 passed MV2 on the right side of the road when MV1 sideswiped MV2 as MV2 was taking a left turn onto Shawsheen St. Both vehicles received some minor damages.
6	5/19/2014	7:31 AM	Daylight	Clear	Dry	2	E	E			Property Damage Only	0	Rear-end	Not Reported	MV1 and M2: traveling EB in stop and go traffic on East St. MV2 rear-ended MV1 and both vehicles received minor damage.
7	6/16/2014	3:20 PM	Daylight	Clear	Dry	2	E	N			Property Damage Only	0	Sideswipe	Failure to Yield Right-of-Way	MV1: traveling EB on East St; MV2: traveling NB on Shawsheen St. MV2 collided with MV1 when MV2 attempted to pull out and make a left turn onto East St WB lane thinking that MV1 was giving way.
8	8/14/2014	12:55 PM	Daylight	Clear	Dry	2	N	N			Property Damage Only	0	Rear-end	Followed Too Closely	MV1 and MV2: traveling NB on Shawsheen St. Both vehicles were waiting to turn right. MV2 accidentally rear-ended MV1. No injuries or damage were reported.
9	12/30/2014	3:46 PM	Daylight	Clear	Dry	2	E	W			Property Damage Only	0	Angled	Glare	MV1: traveling EB on East St; MV2: traveling WB on Dascomb Rd. MV2 struck MV1 when MV2 attempted a left turn and due to an extreme sun glare, the operator of MV2 did not see MV1. Both vehicles suffered damages estimated to be over \$1000.
10	6/19/2015	2:15 PM	Daylight	Clear	Dry	2	N	N			Property Damage Only	0	Sideswipe	Inattention / Distracted	MV1: stopped on Shawsheen St NB lane to turn right onto Dascomb Rd EB lane; MV2: traveling NB on Shawsheen St. MV2 approach to the intersection on the right of MV1 not noticing the right-turn signal of MV1. MV2 sideswiped the tractor trailer of MV1 causing minor damages to MV2 and MV1's trailer.
11	10/2/2015	12:39 PM	Daylight	Clear	Dry	2	N	E			Property Damage Only	0	Angled	Not Reported	MV1: stopped at a Stop sign on Shawsheen St NB lane waiting to turn left onto East St; MV2: traveling EB on East St. MV1 collided with MV2 when MV1 attempted to pull out and make a left turn onto East St EB lane. No injuries were reported but both vehicles were towed.
12	7/23/2016	2:46 PM	Daylight	Clear	Dry	2	E	W			Property Damage Only	0	Head-on	Not Reported	MV1: traveling EB on East St; MV2: traveling WB on Dascomb Rd. MV2 struck MV1 when MV2 attempted a left turn onto Shawsheen St SB lane.

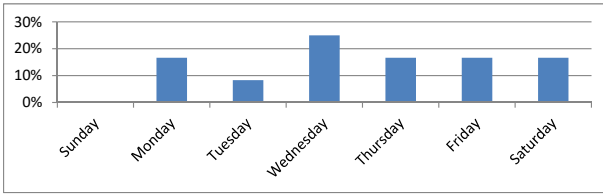
**Crash Data Summary Tables**  
**Dascomb Road @ East Street / Shawsheen Street - Andover, MA**  
**01/01/2011 - 09/31/2016**

**Dascomb Road @ East Street / Shawsheen Street 12**

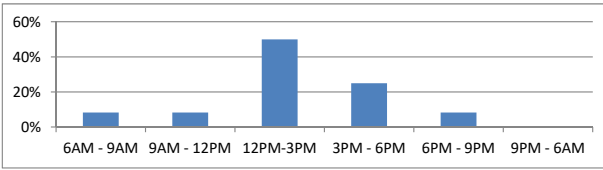
Month	#	%
January	0	0%
February	1	8%
March	0	0%
April	0	0%
May	1	8%
June	4	33%
July	2	17%
August	1	8%
September	0	0%
October	1	8%
November	1	8%
December	1	8%



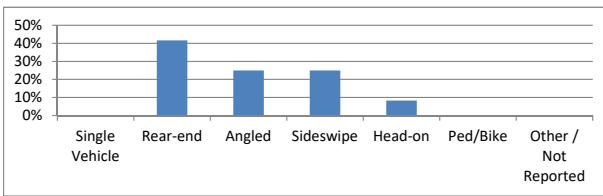
Day of Week	#	%
Sunday	0	0%
Monday	2	17%
Tuesday	1	8%
Wednesday	3	25%
Thursday	2	17%
Friday	2	17%
Saturday	2	17%



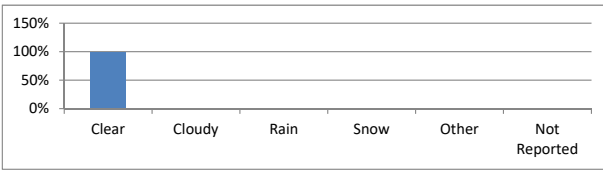
Time of Day	#	%
6AM - 9AM	1	8%
9AM - 12PM	1	8%
12PM-3PM	6	50%
3PM - 6PM	3	25%
6PM - 9PM	1	8%
9PM - 6AM	0	0%



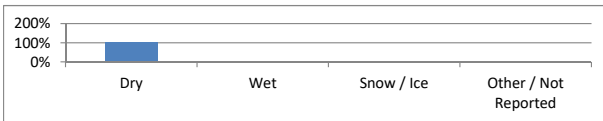
Manner of Collision	#	%
Single Vehicle	0	0%
Rear-end	5	42%
Angled	3	25%
Sideswipe	3	25%
Head-on	1	8%
Ped/Bike	0	0%
Other / Not Reported	0	0%



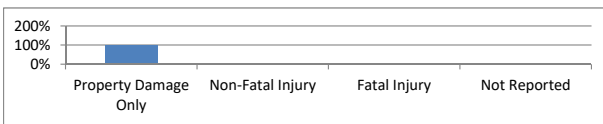
Weather Conditions	#	%
Clear	12	100%
Cloudy	0	0%
Rain	0	0%
Snow	0	0%
Other	0	0%
Not Reported	0	0%



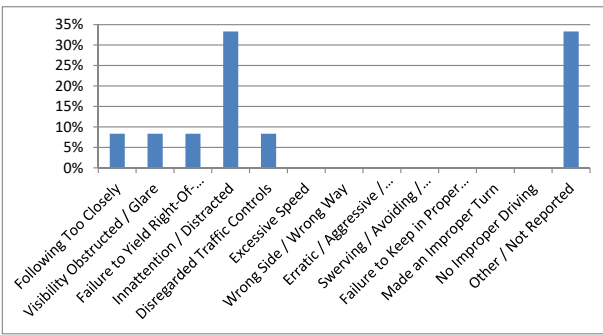
Road Surface	#	%
Dry	12	100%
Wet	0	0%
Snow / Ice	0	0%
Other / Not Reported	0	0%



Crash Severity	#	%
Property Damage Only	12	100%
Non-Fatal Injury	0	0%
Fatal Injury	0	0%
Not Reported	0	0%



Main Contributing Factor from Narrative	#	%
Following Too Closely	1	8%
Visibility Obstructed / Glare	1	8%
Failure to Yield Right-Of-Way	1	8%
Innattention / Distracted	4	33%
Disregarded Traffic Controls	1	8%
Excessive Speed	0	0%
Wrong Side / Wrong Way	0	0%
Erratic / Aggressive / Reckless Driving	0	0%
Swerving / Avoiding / Over-Steering / Over-Correcting	0	0%
Failure to Keep in Proper Lane	0	0%
Made an Improper Turn	0	0%
No Improper Driving	0	0%
Other / Not Reported	4	33%





**Crash Data Summary Tables**  
**Dascomb Road @ Hewlett Packard Driveway - Andover, MA**  
**01/01/2011 - 09/31/2016**

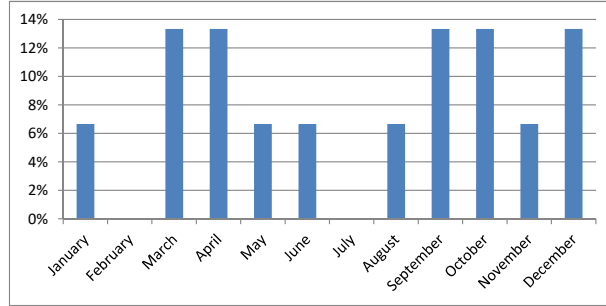
Collision Diagram	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Number of Vehicles	Vehicle Travel Directions				Crash Severity	Number of NonFatal Injuries	Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Report)
							V1	V2	V3	V4					
1	4/9/2012	11:46 AM	Daylight	Cloudy	Dry	2	S	S			Property Damage Only	0	Rear-end	Inattention / Distracted	MV1 and MV2: traveling SB on Hewlett Packard driveway. MV2 struck MV1 when MV1 stopped for Dascomb Rd traffic. There were some minor damages to MV1 but no damages to MV2.
2	10/24/2012	6:54 AM	Dawn	Clear	Dry	2	W	W			Property Damage Only	0	Rear-end	Inattention / Distracted	MV1 and MV2: traveling WB on Dascomb Rd. MV2 rear-ended MV1 when MV1 was slowing due to traffic. The accident occurred because MV2 got distracted as she was looking down at her radio. Both vehicles suffered damages which would worth over \$1000.
3	1/4/2013	2:21 AM	Dark - Lighted	Clear	Dry	1	W				Property Damage Only	1	Single Vehicle	Failure to Keep in Proper Lane	MV1: traveling WB on Dascomb Rd. MV1 traveled left over the snow covered median. MV1 struck a tree near the Hewlett Packard driveway while veering right back into lane causing damages estimated to be over \$1000.
4	11/10/2013	7:27 PM	Dark - Lighted	Cloudy	Dry	1	W				Property Damage Only	0	Single Vehicle	No Improper Driving	MV1: traveling WB on Dascomb Rd. A deer entered the roadway which MV1 struck causing damages over \$1000.
5	6/17/2014	8:15 AM	Daylight	Clear	Dry	2	W	W			Property Damage Only	0	Rear-end	Followed Too Closely	MV1 and MV2: traveling WB on Dascomb Rd. MV2 rear-ended MV1 when MV1 was slowing due to traffic. The accident occurred because MV2 was following too close to MV1. Both vehicles suffered damages which would worth over \$1000.
6	12/30/2014	3:50 PM	Daylight	Clear	Dry	3	W	W	W		Non-fatal Injury	1	Rear-end	Glare	MV1, MV2 and MV3: traveling WB on Dascomb Rd. Due to solar glare, MV1 attempted to adjust her visor. While being distracted, MV1 rear-ended MV2 and then MV2 struck MV3. All vehicles sustained damages and estimated to be well over \$1000.
7	4/7/2015	2:33 PM	Daylight	Cloudy	Dry	2	W	W			Non-fatal Injury	1	Rear-end	Other	MV1 and MV2: traveling WB on Dascomb Rd. MV2 rear-ended MV1 when MV1 slowed to stop in traffic. MV2 operator was taken to the hospital and both vehicles sustained damages.
8	9/16/2015	8:51 AM	Daylight	Clear	Dry	2	W	E			Property Damage Only	0	Angled	Inattention / Distracted	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 collided with MV1 when MV2 made a left turn into Hewlett Packard driveway without paying attention to the opposite lane traffic. Both vehicles were towed and the damage caused was estimated to be over \$1000.
9	10/8/2015	4:37 PM	Daylight	Clear	Dry	2	W	S			Property Damage Only	0	Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd. MV2: attempting to enter onto Dascomb Rd EB lane from Hewlett Packard driveway SB lane. MV2 collided with MV1 when MV2 made a left-turn without yielding for MV1.
10	12/10/2015	4:51 PM	Dark - Lighted	Clear	Dry	2	W	E			Non-fatal Injury	2	Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: attempting to turn left from Dascomb Rd EB lane to Hewlett Packard driveway. MV1 struck MV2 when MV2 turned left without yielding for the oncoming traffic causing damages to both vehicles estimated to be over \$1000.
11	3/15/2016	8:13 AM	Daylight	Rain	Wet	2	W	E			Property Damage Only	0	Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 collided with MV1 when MV2 made a left turn into Hewlett Packard driveway without yielding for MV1.
12	3/15/2016	5:47 PM	Dusk	Clear	Wet	2	S	W			Property Damage Only	0	Angled	Failure to Yield Right-of-Way	MV1: attempting to enter Dascomb Rd from Hewlett Packard driveway SB lane; MV2: traveling WB on Dascomb Rd. MV2 collided with MV1 when MV1 made a left-turn without yielding for the right-of-way vehicle, MV1. MV1 was towed from the scene.
13	5/23/2016	4:48 PM	Daylight	Clear	Dry	2	W	S			Property Damage Only	0	Angled	Inattention / Distracted	MV1: traveling WB on Dascomb Rd; MV2: exiting Hewlett Packard driveway. MV2 struck MV1 when MV2 pulled out of the driveway without paying attention for the oncoming traffic.
14	8/26/2016	7:00 AM	Daylight	Clear	Dry	2	W	E			Property Damage Only	0	Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: attempting to turn left from Dascomb Rd EB lane to Hewlett Packard driveway. MV1 struck MV2 when MV2 turned left without yielding for the oncoming traffic causing damages to both vehicles estimated to be over \$1000.
15	9/9/2016	12:24 PM	Daylight	Clear	Dry	3	E	E	E		Non-fatal Injury	3	Rear-end	Other	MV1, MV2 and MV3: traveling EB on Dascomb Rd. MV3 was stopped to wait for the traffic to clear before taking a left-turn into Hewlett Packard driveway and MV2 was stopped right behind MV2. MV1 rear-ended MV2 and the collision pushed MV2 to hit MV3. All vehicles sustained damages and estimated to be well over \$1000.

**Crash Data Summary Tables**  
**Dascomb Road @ Hewlett Packard Driveway - Andover, MA**  
**01/01/2011 - 09/31/2016**

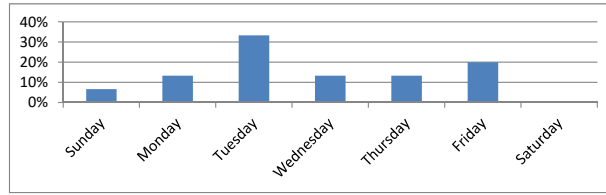
**Dascomb Road @ Hewlett Packard Driveway**

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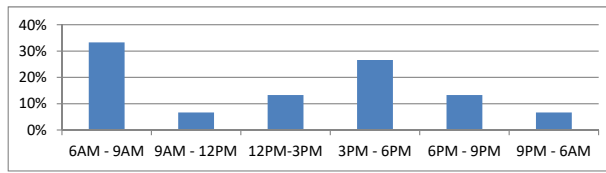
Month	#	%
January	1	7%
February	0	0%
March	2	13%
April	2	13%
May	1	7%
June	1	7%
July	0	0%
August	1	7%
September	2	13%
October	2	13%
November	1	7%
December	2	13%



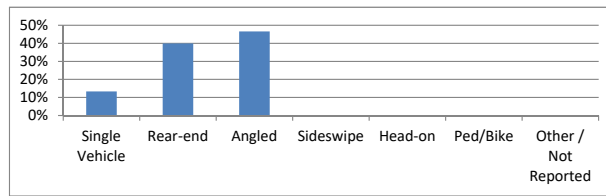
Day of Week	#	%
Sunday	1	7%
Monday	2	13%
Tuesday	5	33%
Wednesday	2	13%
Thursday	2	13%
Friday	3	20%
Saturday	0	0%



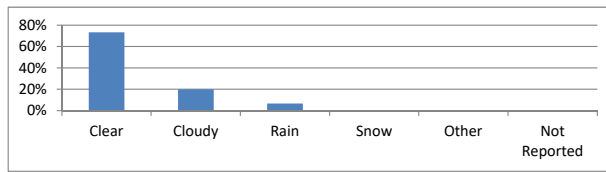
Time of Day	#	%
6AM - 9AM	5	33%
9AM - 12PM	1	7%
12PM-3PM	2	13%
3PM - 6PM	4	27%
6PM - 9PM	2	13%
9PM - 6AM	1	7%



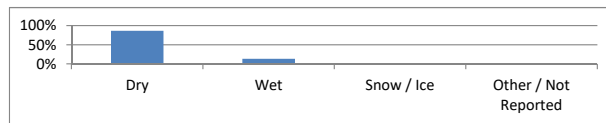
Manner of Collision	#	%
Single Vehicle	2	13%
Rear-end	6	40%
Angled	7	47%
Sideswipe	0	0%
Head-on	0	0%
Ped/Bike	0	0%
Other / Not Reported	0	0%



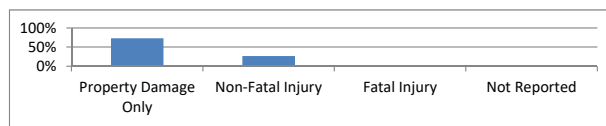
Weather Conditions	#	%
Clear	11	73%
Cloudy	3	20%
Rain	1	7%
Snow	0	0%
Other	0	0%
Not Reported	0	0%



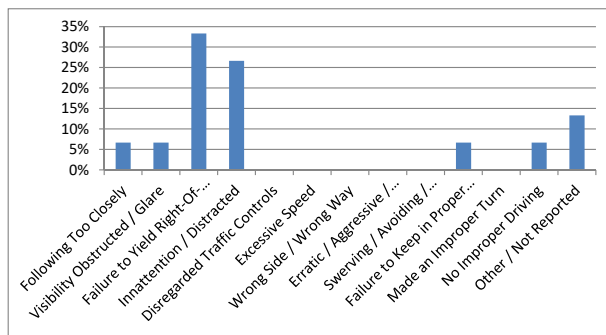
Road Surface	#	%
Dry	13	87%
Wet	2	13%
Snow / Ice	0	0%
Other / Not Reported	0	0%



Crash Severity	#	%
Property Damage Only	11	73%
Non-Fatal Injury	4	27%
Fatal Injury	0	0%
Not Reported	0	0%



Main Contributing Factor from Narrative	#	%
Following Too Closely	1	7%
Visibility Obstructed / Glare	1	7%
Failure to Yield Right-Of-Way	5	33%
Innattention / Distracted	4	27%
Disregarded Traffic Controls	0	0%
Excessive Speed	0	0%
Wrong Side / Wrong Way	0	0%
Erratic / Aggressive / Reckless Driving	0	0%
Swerving / Avoiding / Over-Steering / Over-Correcting	0	0%
Failure to Keep in Proper Lane	1	7%
Made an Improper Turn	0	0%
No Improper Driving	1	7%
Other / Not Reported	2	13%





Crash Data Summary Tables  
 Dascomb Road @ Smith Drive - Andover, MA  
 01/01/2011 - 09/31/2016

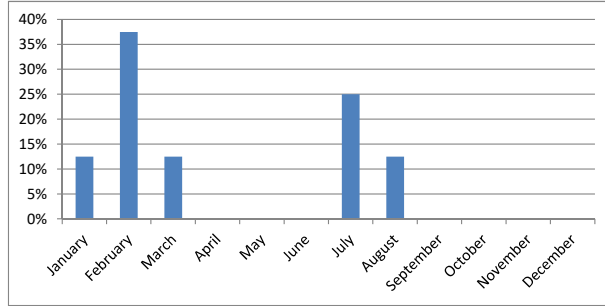
Collision Diagram	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Number of Vehicles	Vehicle Travel Directions				Crash Severity	Number of NonFatal Injuries	Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Report)
							v1	v2	v3	v4					
1	7/15/2011	5:11 PM	Daylight	Clear	Dry	2	E	E			Property Damage Only	0	Rear-end	Inattention / Distracted	MV1: stopped on Dascomb Rd EB lane in front of Smith Dr; MV2: traveling EB on Dascomb Rd. MV2 rear-ended MV1 when MV2 continued driving without noticing that MV1 was parked causing damages over \$1000 to the vehicles.
2	3/3/2014	10:47 AM	Daylight	Clear	Dry	1	E				Property Damage Only	0	Single Vehicle	Inattention / Distracted	MV1: traveling EB on Dascomb Rd. MV1 operator was distracted as he was reaching for his coffee from the cup holder. The vehicle veered right toward the shoulder of the roadway and then struck a utility pole. Total damages to both the vehicle and the utility pole were estimated to be well over \$1000.
3	2/14/2015	7:24 AM	Daylight	Clear	Dry	2	W	W			Property Damage Only	0	Rear-end	Inattention / Distracted	MV1 and MV2: traveled WB on Dascomb Rd and stopped to turn left onto Smith Dr. MV2 rear-ended MV1 when MV2 turned left while MV1 was still stopped. Both vehicles suffered some damages.
4	2/19/2015	4:40 PM	Daylight	Clear	Wet	2	E	N			Property Damage Only	0	Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: attempting to make a left turn onto Dascomb Rd from Smith Dr. MV1 collided with MV2 when MV2 turned left without yielding for MV1 causing some damages and both vehicles were towed from the scene.
5	7/25/2015	10:30 AM	Daylight	Cloudy	Dry	2	N	N			Property Damage Only	0	Rear-end	Other	MV1 and MV2: stopped at a Stop sign on Smith Dr NB lane. MV1 and MV2 collided when MV1 rolled backwards down the slight incline. MV1 operates a standard shit.
6	8/31/2015	3:34 PM	Daylight	Clear	Dry	2	W	W			Property Damage Only	0	Sideswipe	Other	MV1 and MV2: traveling WB on Dascomb Rd. MV1 sideswiped (same direction) MV2 while attempting to pass before the two lanes merged into one. The damage was estimated to be over \$1000.
7	1/14/2016	5:14 PM	Dark - Lighted	Clear	Dry	2	E	N			Property Damage Only	0	Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: attempting to make a left turn onto Dascomb Rd from Smith Dr. MV1 collided with MV2 when MV2 turned left without yielding for MV1 causing some damages and both vehicles were towed from the scene.
8	2/12/2016	10:49 AM	Daylight	Clear	Dry	2	N	N			Property Damage Only	0	Rear-end	Inattention / Distracted	MV1 and MV2: stopped at a Stop sign on Smith Dr NB lane. MV1 and MV2 collided when MV1 put the vehicle into reverse and backed into MV2 while trying to avoid an accident with a tractor trailer unit making a left turn into the driveway.

**Crash Data Summary Tables**  
**Dascomb Road @ Smith Drive - Andover, MA**  
**01/01/2011 - 09/31/2016**

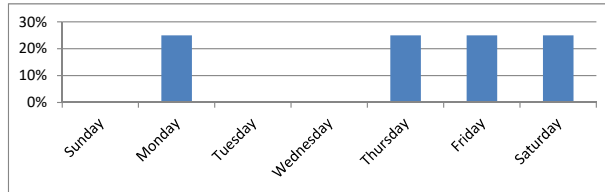
**Dascomb Road @ Smith Drive**

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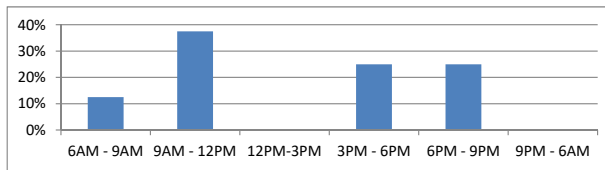
Month	#	%
January	1	13%
February	3	38%
March	1	13%
April	0	0%
May	0	0%
June	0	0%
July	2	25%
August	1	13%
September	0	0%
October	0	0%
November	0	0%
December	0	0%



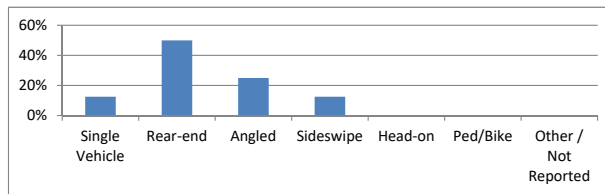
Day of Week	#	%
Sunday	0	0%
Monday	2	25%
Tuesday	0	0%
Wednesday	0	0%
Thursday	2	25%
Friday	2	25%
Saturday	2	25%



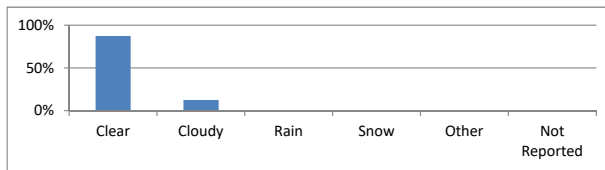
Time of Day	#	%
6AM - 9AM	1	13%
9AM - 12PM	3	38%
12PM-3PM	0	0%
3PM - 6PM	2	25%
6PM - 9PM	2	25%
9PM - 6AM	0	0%



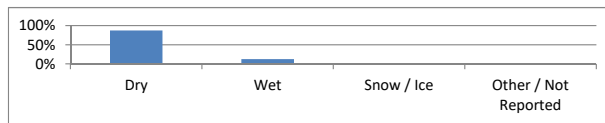
Manner of Collision	#	%
Single Vehicle	1	13%
Rear-end	4	50%
Angled	2	25%
Sideswipe	1	13%
Head-on	0	0%
Ped/Bike	0	0%
Other / Not Reported	0	0%



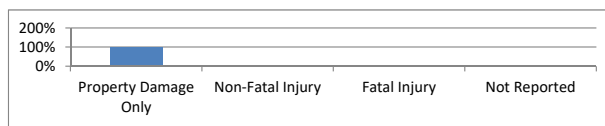
Weather Conditions	#	%
Clear	7	88%
Cloudy	1	13%
Rain	0	0%
Snow	0	0%
Other	0	0%
Not Reported	0	0%



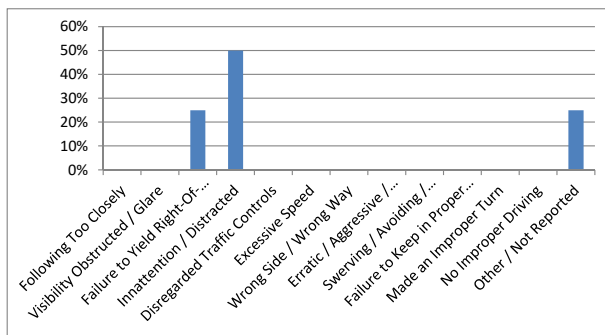
Road Surface	#	%
Dry	7	88%
Wet	1	13%
Snow / Ice	0	0%
Other / Not Reported	0	0%



Crash Severity	#	%
Property Damage Only	8	100%
Non-Fatal Injury	0	0%
Fatal Injury	0	0%
Not Reported	0	0%



Main Contributing Factor from Narrative	#	%
Following Too Closely	0	0%
Visibility Obstructed / Glare	0	0%
Failure to Yield Right-Of-Way	2	25%
Innattention / Distracted	4	50%
Disregarded Traffic Controls	0	0%
Excessive Speed	0	0%
Wrong Side / Wrong Way	0	0%
Erratic / Aggressive / Reckless Driving	0	0%
Swerving / Avoiding / Over-Steering / Over-Correcting	0	0%
Failure to Keep in Proper Lane	0	0%
Made an Improper Turn	0	0%
No Improper Driving	0	0%
Other / Not Reported	2	25%







## INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Andover COUNT DATE : Oct-16

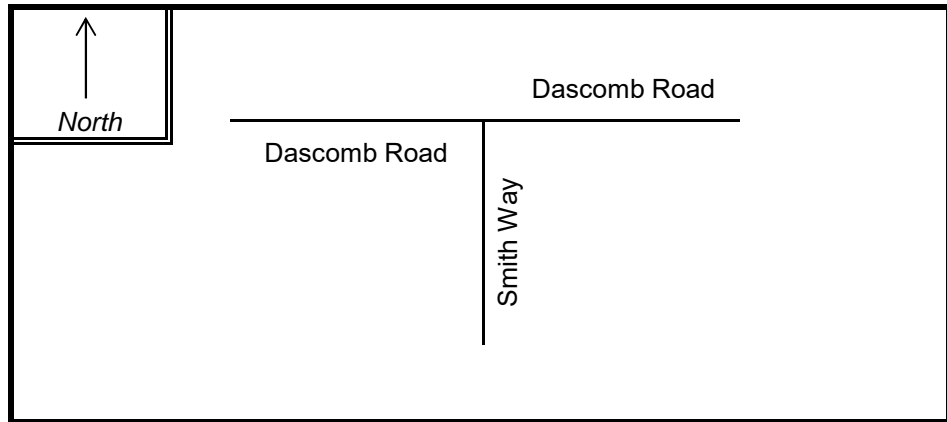
DISTRICT : 4 UNSIGNALIZED :  YES  NO SIGNALIZED :  YES  NO

~ INTERSECTION DATA ~

MAJOR STREET : Dascomb Road

MINOR STREET(S) : Smith Way

**INTERSECTION  
DIAGRAM**  
(Label Approaches)



**PEAK HOUR VOLUMES**

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (AM/PM) :	1,054	1,098	68			2,220

"K" FACTOR :  0.085  INTERSECTION ADT ( V ) = TOTAL DAILY APPROACH VOLUME :  26,118

TOTAL # OF CRASHES :  8 # OF YEARS :  5.75 AVERAGE # OF CRASHES PER YEAR ( A ) :  1.39

**CRASH RATE CALCULATION :**

**0.15**

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

Comments : K Factor based on ATR counts along Dascomb Road

Project Title & Date : 146 Dascomb Road Site Development Project - Andover, MA

Crash Data Summary Tables  
Dascomb Road @ Frontage Road - Andover, MA  
01/01/2011 - 09/31/2016

Collision Diagram	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Operator's Age				Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Portal)
						V1	V2	V3	V4			
1	2/18/2011	12:54 PM	Daylight	Clear	Dry	52	26			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 turned left onto Frontage Rd.
2	3/18/2011	8:14 AM	Daylight	Clear	Dry	28	40			Sideswipe	Not Reported	MV1 and MV2: traveled EB on Dascomb Rd, turned left onto Frontage Rd and traveling NB. MV1 sideswiped in the same direction with MV2 when MV1 attempted to pass MV2 on the right while MV2 was turning right into the Park and Ride causing minor damages to both vehicles.
3	5/19/2011	3:32 PM	Daylight	Cloudy	Dry	56	N/A			Rear-end	Not Reported	MV1 and MV2: traveling SB on Frontage Rd. Both vehicles were stopped at a yield sign to turn right onto Dascomb Rd. MV2 and rear-ended MV1 and fled the scene.
4	6/24/2011	10:31 AM	Daylight	Rain	Wet	30	24			Rear-end	No Improper Driving	MV1 and MV2: traveling SB on Frontage Rd and turning right onto Dascomb Rd WB traffic lane. MV1 slowed/stopped on Frontage Rd. MV2 slowed in time but was unable to stop and collided with MV1. The road surface was wet due to the rain.
5	10/19/2011	8:06 PM	Dark - Lighted	Rain	Wet	28	49			Angled	Erratic / Aggressive / Reckless Driving	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 had the green arrow and was turning left onto Frontage Rd NB lane. MV1 and MV2 collided when MV1 ran the red light.
6	10/26/2011	6:33 AM	Dark - Lighted	Clear	Dry	47	58			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 failed to yield for MV1 while turning left onto Frontage Rd NB lane.
7	11/28/2011	5:11 PM	Dark - Lighted	Clear	Dry	63	30			Rear-end	Inattention / Distracted	MV1 and MV2: traveling EB on Dascomb Rd. MV2 rear-ended MV1 when MV1 stopped at the traffic light to make a left turn onto Frontage Rd. MV2 was towed and the operator was taken to the hospital due to pregnancy.
8	12/24/2011	7:49 PM	Dark - Lighted	Clear	Dry	25	52			Rear-end	Inattention / Distracted	MV1 and MV2: traveling SB on Frontage Rd and waiting to turn left onto Dascomb Rd EB lane. MV1 operator's foot slipped off from brake and rear-ended MV2.
9	1/30/2012	2:35 PM	Daylight	Cloudy	Dry	45	46			Angled	Inattention / Distracted	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 collided with MV1 when MV2 operator was distracted briefly and made a left turn onto Frontage Rd NB lane.
10	2/15/2012	8:12 PM	Dark - Lighted	Clear	Dry	58	26			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 failed to yield for MV1 while turning left onto Frontage Rd NB lane.
11	6/5/2012	5:40 PM	Daylight	Cloudy	Dry	68	53			Rear-end	Followed Too Closely	MV1 and MV2: traveling SB on Frontage Rd. MV1 stopped to yield for traffic on Dascomb Rd before turning right to merge. MV2 followed MV1 too closely and was unable to stop on time and rear ended MV1.
12	7/5/2012	4:51 PM	Daylight	Clear	Dry	27	22	18		Rear-end	Followed Too Closely	MV1: traveling WB on Dascomb Rd; MV2 and MV3: from Frontage Rd SB lane merged onto Dascomb Rd WB approach. MV3 rear-ended MV2 and pushed MV2 into MV1.
13	8/18/2012	10:55 AM	Daylight	Cloudy	Wet	34	42			Rear-end	Inattention / Distracted	MV1 and MV2: traveling EB on Dascomb Rd. MV2 rear-ended MV1 when MV1 pulled over to the side of the road to use GPS.
14	9/5/2012	8:53 AM	Daylight	Cloudy	Wet	60	45			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 attempted to turn left onto Frontage Rd without yielding to the oncoming traffic.
15	9/26/2012	2:36 PM	Daylight	Cloudy	Dry	48	18			Rear-end	Inattention / Distracted	MV1 and MV2: traveling SB on Frontage Rd. MV1 slowed at a yield sign before turning right to merge onto Dascomb Rd WB traffic. MV2 was unable to stop on time and rear-ended MV1.

Crash Data Summary Tables  
 Dascomb Road @ Frontage Road - Andover, MA  
 01/01/2011 - 09/31/2016

Collision Diagram	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Operator's Age				Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Portal)
						V1	V2	V3	V4			
16	10/17/2012	6:46 PM	Dark - Lighted	Clear	Dry	19	52			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 attempted to turn left onto Frontage Rd without yielding to the oncoming traffic.
17	10/29/2012	10:35 PM	Dark - Not Lighted	Rain	Wet	28	72			Angled	Inattention / Distracted	MV1: traveling WB on Dascomb Rd; MV2: traveling SB on frontage Rd and turning right onto Dascomb Rd WB lane. MV2 struck MV1 when MV2 failed to yield for MV1 which has the right-of-way.
18	11/3/2012	6:53 PM	Dark - Lighted	Clear	Dry	20	27			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 attempted to turn left onto Frontage Rd without yielding to the oncoming traffic.
19	11/6/2012	5:58 PM	Dark - Lighted	Clear	Dry	26	56			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling WB on Dascomb Rd. MV1 struck MV2 when MV1 turned left onto Frontage Road NB lane without yielding for MV2.
20	11/27/2012	5:48 PM	Dark - Lighted	Rain	Wet	66	26			Angled	Other	MV1: traveling WB on Dascomb Rd; MV2: traveling SB on Frontage Rd. MV2 had a red light and attempted to stop but the brake failed and MV2 stuck MV1.
21	12/13/2012	9:20 PM	Dark - Lighted	Clear	Dry	52	64			Rear-end	Inattention / Distracted	MV1 and MV2: traveling SB on Frontage Rd. MV2 rear-ended MV1 causing MV1 operator and passenger to be transported to the hospital with non-incapacitating injuries.
22	1/4/2013	5:31 PM	Dark - Lighted	Cloudy	Dry	31	41			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling WB on Dascomb Rd. MV1 collided with MV2 when MV1 made a left turn onto Frontage Rd NB lane thinking that MV1 was turning right onto Frontage Rd.
23	2/19/2013	7:25 PM	Dark - Lighted	Rain	Wet	41	18			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV1 and MV2 collided when MV2 attempted to turn left onto Frontage Rd.
24	6/20/2013	11:32 PM	Dark - Lighted	Clear	Dry	23	26			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV1 and MV2 collided when MV2 attempted to turn left onto Frontage Rd causing MV1 operator to be taken to the hospital.
25	6/25/2013	6:10 PM	Dusk	Clear	Dry	18	32			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 was making a left turn onto Frontage Rd without yielding for MV1. All parties involved were transported to the hospital.
26	7/1/2013	6:25 PM	Daylight	Rain	Wet	29	77			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 collided with MV1 when MV2 made a left turn onto Frontage Rd NB lane without yielding for MV1.
27	7/9/2013	6:16 PM	Daylight	Clear	Dry	28	61			Rear-end	Inattention / Distracted	MV1 and MV2: traveling SB on Frontage Rd. MV1 was attempting to turn right onto Dascomb Rd when it was rear-ended by MV2 whom had thought that MV1 was moving and accelerated into it.
28	8/30/2013	3:04 PM	Daylight	Clear	Dry	41	19			Rear-end	Followed Too Closely	MV1 and MV2: traveling SB on Frontage Rd. MV1 stopped to yield for traffic on Dascomb Rd before turning right to merge. MV2 followed MV1 too closely and was unable to stop on time and rear ended MV1.
29	9/29/2013	3:31 PM	Daylight	Clear	Dry	59	41			Rear-end	Inattention / Distracted	MV1 and MV2: traveling SB on Frontage Rd. MV1 slowed at a yield sign before turning right to merge onto Dascomb Rd WB traffic. MV2 was unable to stop on time and rear-ended MV1.
30	9/30/2013	6:57 AM	Dawn	Other	Dry	49	48			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling WB on Dascomb Rd. MV1 struck MV2 when MV1 turned left onto Frontage Road NB lane without yielding for MV2. MV1 did not have green light to turn at that time as well.
31	10/17/2013	9:24 PM	Dark - Lighted	Clear	Dry	17	26			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 attempted to turn left onto Frontage Rd without yielding for the oncoming traffic.

Crash Data Summary Tables  
Dascomb Road @ Frontage Road - Andover, MA  
01/01/2011 - 09/31/2016

Collision Diagram	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Operator's Age				Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Portal)
						V1	V2	V3	V4			
32	10/31/2013	7:10 AM	Daylight	Cloudy	Dry	22	49			Rear-end	Followed Too Closely	MV1 and MV2: traveled WB on Dascomb Rd and turning right onto Frontage Road. MV2 stopped to yield for traffic on Frontage Rd before merging. MV1 followed MV2 too closely and was unable to stop on time and rear-ended MV1.
33	12/8/2013	6:50 PM	Dark - Lighted	Clear	Dry	43	26	46		Head-on	Disregarded Traffic Controls	MV1: traveling WB on Dascomb Rd; MV2: attempting to turn left onto Frontage Rd NB lane from Dascomb Rd EB lane; MV3: stopped for traffic on Frontage Rd SB lane. MV1 ran the red light and struck MV2 head on. Then MV1 spun out and struck MV3 and the Mass Highway sign.
34	3/10/2014	10:04 AM	Daylight	Cloudy	Dry	67	22			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling WB on Dascomb Rd. MV1 collided with MV2 when MV1 made a left turn onto Frontage Rd NB lane without yielding for MV1.
35	3/18/2014	4:14 PM	Daylight	Clear	Dry	23	25			Rear-end	Followed Too Closely	MV1 and MV2: traveling SB on Frontage Rd. MV1 slowed at a yield sign before turning right to merge onto Dascomb Rd WB traffic. MV2 followed MV1 too closely and was unable to stop on time and rear-ended MV1.
36	3/19/2014	9:23 AM	Daylight	Clear	Dry	34	45			Rear-end	Inattention / Distracted	MV1 and MV2: traveling SB on Frontage Rd. MV2 rear-ended MV1 when MV1 was turning right onto Dascomb Rd EB lane.
37	4/15/2014	3:22 PM	Daylight	Rain	Wet	33	63			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 was attempting to make a left turn onto Frontage Rd NB lane without yielding for MV1.
38	7/16/2014	9:18 PM	Dark - Lighted	Clear	Dry	39	22			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 was attempting to make a left turn onto Frontage Rd NB lane without yielding for MV1.
39	8/5/2014	5:33 AM	Dawn	Clear	Dry	27	38			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 was attempting to make a left turn onto Frontage Rd NB lane without yielding for MV1.
40	8/6/2014	10:05 PM	Dark - Lighted	Clear	Dry	22	27			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 was attempting to make a left turn onto Frontage Rd NB lane without yielding for MV1.
41	9/4/2014	9:12 AM	Daylight	Clear	Dry	41	52			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 was attempting to make a left turn onto Frontage Rd NB lane without yielding for MV1.
42	9/15/2014	9:43 AM	Daylight	Cloudy	Dry	55	18			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling WB on Dascomb Rd. MV1 struck MV2 when MV1 was attempting to make a left turn onto Frontage Rd NB lane without yielding for MV2.
43	10/8/2014	10:47 AM	Daylight	Clear	Dry	28	18			Rear-end	Followed Too Closely	MV1 and MV2: traveling SB on Frontage Rd. MV1 stopped to yield for traffic on Dascomb Rd before turning right to merge. MV2 followed MV1 too closely and was unable to stop on time and rear ended MV1.
44	10/12/2014	8:52 PM	Dark - Lighted	Clear	Dry	45	19			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 attempted to turn left onto Frontage Rd without yielding for the oncoming traffic.
45	11/20/2014	5:57 AM	Dawn	Clear	Dry	33	23			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 was attempting to make a left turn onto Frontage Rd NB lane without yielding for MV1.
46	12/6/2014	5:56 PM	Dark - Not Lighted	Rain	Wet	41	31			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling WB on Dascomb Rd. MV1 struck MV2 when MV1 turned left onto Frontage Road NB lane without yielding for MV2. MV2 might not have the headlights on.

Crash Data Summary Tables  
 Dascomb Road @ Frontage Road - Andover, MA  
 01/01/2011 - 09/31/2016

Collision Diagram	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Operator's Age				Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Portal)
						V1	V2	V3	V4			
47	2/13/2015	6:28 AM	Dawn	Clear	Snow	31	30			Rear-end	Followed Too Closely	MV1 and MV2: turning right onto Frontage Rd NB lane from Dascomb Rd WB lane. MV2 rear-ended MV1 when MV1 slowed to yield to the oncoming traffic.
48	4/5/2015	5:45 PM	Daylight	Clear	Dry	46	40			Rear-end	No Improper Driving	MV1 and MV2: traveling SB on Frontage Rd. MV2 rear-ended MV1.
49	5/28/2015	5:13 AM	Daylight	Clear	Dry	41				Single Vehicle	No Improper Driving	MV1: traveling EB on Dascomb Rd. MV1 attempted to turn left onto Frontage Rd when the operator felt ill. Vehicle continued over an embankment and through a fence landing in a ditch.
50	8/2/2015	4:44 PM	Daylight	Clear	Dry	23	30			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 was attempting to make a left turn onto Frontage Rd NB lane without yielding for MV1.
51	8/13/2015	10:15 PM	Dark - Lighted	Clear	Dry	26	26			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 attempted to turn left onto Frontage Rd without yielding for the oncoming traffic.
52	10/21/2015	5:18 AM	Dark - Lighted	Clear	Dry	31	30			Head-on	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 collided head on with MV1 when MV2 turned left onto Frontage Rd NB lane.
53	10/24/2015	4:47 PM	Daylight	Clear	Dry	56	17			Rear-end	Followed Too Closely	MV1 and MV2: traveling SB on Frontage Rd. MV2 rear-ended MV1 when MV1 stopped at the yield sign.
54	11/4/2015	9:08 PM	Dark - Lighted	Clear	Dry	72	25			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 made a left turn onto Frontage Rd NB lane without yielding for MV1.
55	12/14/2015	10:52 AM	Daylight	Cloudy	Dry	30	30			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 made a left turn onto Frontage Rd NB lane without yielding for MV1.
56	12/29/2015	9:03 AM	Daylight	Other	Other	39	23			Rear-end	Not Reported	MV1 and MV2: traveling EB on Dascomb Rd; MV1 rear-ended MV2 when MV2 was slowing due to traffic.
57	1/7/2016	3:20 PM	Daylight	Cloudy	Dry	22	34	80		Rear-end	Other	MV1, MV2 and MV3: traveling EB on Dascomb Rd. MV1 and MV2 stopped at the red light but MV3 didn't stop in time and struck MV2 which caused MV2 to strike MV1.
58	1/13/2016	10:10 PM	Dark - Lighted	Clear	Wet	18	53			Rear-end	Disregarded Traffic Controls	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 ran the red light and turned left onto Frontage Rd.
59	1/14/2016	1:06 PM	Daylight	Clear	Dry	50	28			Rear-end	Followed Too Closely	MV1 and MV2: traveling SB on Frontage Rd. MV1 stopped to yield for traffic on Dascomb Rd before turning right to merge. MV2 followed MV1 too closely and was unable to stop on time and rear ended MV1.
60	2/16/2016	7:46 AM	Daylight	Cloudy	Ice	36				Single Vehicle	Other	MV1: traveling EB on Dascomb Rd approaching the Frontage Rd intersection. Due to the icy road surface conditions, MV1 began to slide on the ice and in an effort to avoid rear ending a vehicle in front, the operator cut the wheel to the right which caused her to crash into a snow bank.
61	2/24/2016	3:15 PM	Daylight	Rain	Wet	46	24			Rear-end	Followed Too Closely	MV1 and MV2: traveling SB on Frontage Rd. Both vehicles were stopped at a yield sign to turn right onto Dascomb Rd. MV2 rolled forward and rear-ended MV1.
62	5/14/2016	8:26 AM	Daylight	Clear	Dry	62	43			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling WB on Dascomb Rd. MV1 and MV2 collided when MV1 made a left turn onto Frontage Rd without yielding for MV2.
63	5/19/2016	5:13 PM	Daylight	Clear	Dry	38	37			Angled	Other	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 attempted to turn left onto Frontage Rd.
64	6/19/2016	8:01 AM	Daylight	Clear	Dry	28	58			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV1 and MV2 collided when MV1 turned left onto Frontage Rd without yielding for MV1.
65	7/23/2016	3:25 PM	Daylight	Clear	Dry	32	52			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV2 struck MV1 when MV2 attempted to turn left onto Frontage Rd without yielding to the oncoming traffic.

Crash Data Summary Tables  
 Dascomb Road @ Frontage Road - Andover, MA  
 01/01/2011 - 09/31/2016

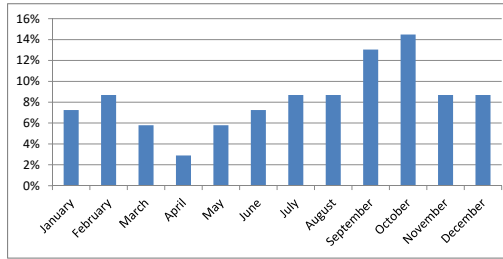
Collision Diagram	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Operator's Age				Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Portal)
						V1	V2	V3	V4			
66	7/26/2016	7:17 AM	Daylight	Clear	Dry	48	29			Angled	Disregarded Traffic Controls	MV1: attempting to make a left turn from Dascomb Rd EB lane onto Frontage Rd NB lane; MV2: traveling WB on Dascomb Rd. MV2 struck MV1 when MV2 went through the red light .
67	9/15/2016	1:42 PM	Daylight	Cloudy	Dry	64	49			Sideswipe	Other	MV1 and MV2: traveling SB on Frontage Rd towards Dascomb Rd intersection. MV1 was on the inside lane and MV2 was on the outside lane. The vehicles struck each other when MV1 moved over towards MV2.
68	9/21/2016	6:01 AM	Daylight	Clear	Dry	27	35			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling WB on Dascomb Rd. MV1 struck MV2 when MV1 turned left onto Frontage Road NB lane without yielding for MV2.
69	9/29/2016	4:33 PM	Daylight	Clear	Dry	31	37			Head-on	Not Reported	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV1 and MV2 collided when MV2 attempted to make a left-turn onto Frontage Rd.

**Crash Data Summary Tables**  
**Dascomb Road @ Frontage Road - Andover, MA**  
**01/01/2011 - 09/31/2016**

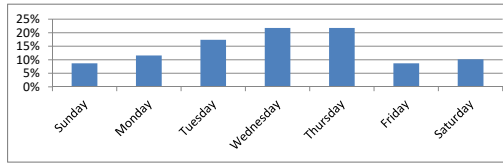
**Dascomb Road @ Frontage Road**

69

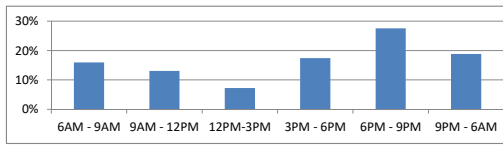
Month	#	%
January	5	7%
February	6	9%
March	4	6%
April	2	3%
May	4	6%
June	5	7%
July	6	9%
August	6	9%
September	9	13%
October	10	14%
November	6	9%
December	6	9%



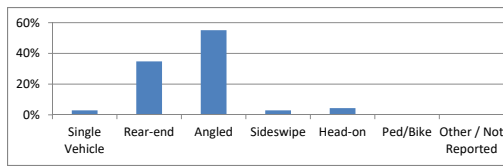
Day of Week	#	%
Sunday	6	9%
Monday	8	12%
Tuesday	12	17%
Wednesday	15	22%
Thursday	15	22%
Friday	6	9%
Saturday	7	10%



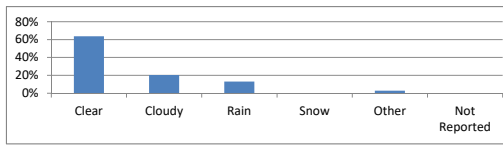
Time of Day	#	%
6AM - 9AM	11	16%
9AM - 12PM	9	13%
12PM-3PM	5	7%
3PM - 6PM	12	17%
6PM - 9PM	19	28%
9PM - 6AM	13	19%



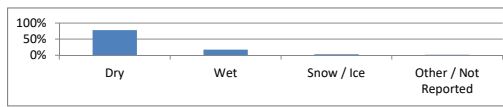
Manner of Collision	#	%
Single Vehicle	2	3%
Rear-end	24	35%
Angled	38	55%
Sideswipe	2	3%
Head-on	3	4%
Ped/Bike	0	0%
Other / Not Reported	0	0%



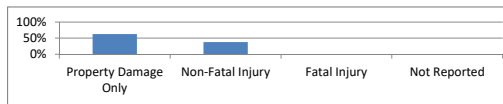
Weather Conditions	#	%
Clear	44	64%
Cloudy	14	20%
Rain	9	13%
Snow	0	0%
Other	2	3%
Not Reported	0	0%



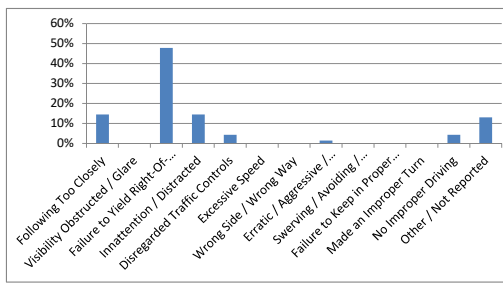
Road Surface	#	%
Dry	54	78%
Wet	12	17%
Snow / Ice	2	3%
Other / Not Reported	1	1%



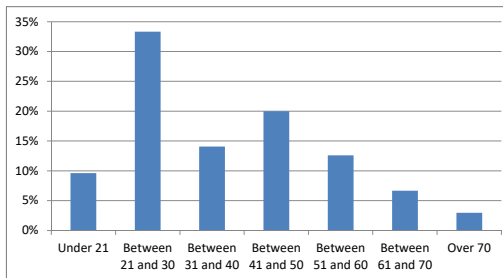
Crash Severity	#	%
Property Damage Only	43	62%
Non-Fatal Injury	26	38%
Fatal Injury	0	0%
Not Reported	0	0%



Main Contributing Factor from Narrative	#	%
Following Too Closely	10	14%
Visibility Obstructed / Glare	0	0%
Failure to Yield Right-Of-Way	33	48%
Inattention / Distracted	10	14%
Disregarded Traffic Controls	3	4%
Excessive Speed	0	0%
Wrong Side / Wrong Way	0	0%
Erratic / Aggressive / Reckless Driving	1	1%
Swerving / Avoiding / Over-Steering / Over-Correcting	0	0%
Failure to Keep in Proper Lane	0	0%
Made an Improper Turn	0	0%
No Improper Driving	3	4%
Other / Not Reported	9	13%



Age	#	%
Under 21	13	10%
Between 21 and 30	45	33%
Between 31 and 40	19	14%
Between 41 and 50	27	20%
Between 51 and 60	17	13%
Between 61 and 70	9	7%
Over 70	4	3%





# INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Andover COUNT DATE : Oct-16

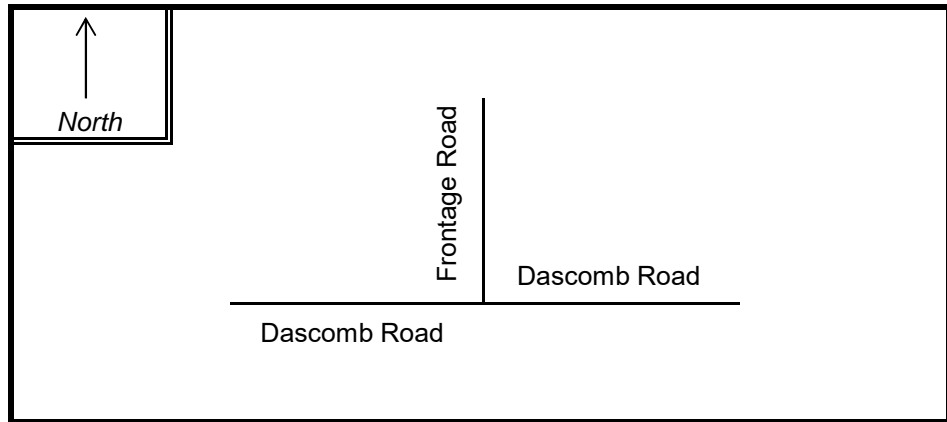
DISTRICT : 4 UNSIGNALIZED :  NO  SIGNALIZED :  YES

~ INTERSECTION DATA ~

MAJOR STREET : Dascomb Road

MINOR STREET(S) : Frontage Road

**INTERSECTION  
DIAGRAM  
(Label Approaches)**



**PEAK HOUR VOLUMES**

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (AM/PM) :	1,088	930		653		2,671

" K " FACTOR :  INTERSECTION ADT ( V ) = TOTAL DAILY APPROACH VOLUME :

TOTAL # OF CRASHES :  # OF YEARS :  AVERAGE # OF CRASHES PER YEAR ( A ) :

**CRASH RATE CALCULATION :**

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

Comments : K Factor based on ATR counts along Dascomb Road

Project Title & Date: 146 Dascomb Road Site Development Project - Andover, MA



Crash Data Summary Tables  
Dascomb Road @ I-93 Northbound Ramps - Andover, MA  
01/01/2011 - 09/31/2016

Collision Diagram	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Operator's Age				Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Report)
						V1	V2	V3	V4			
1	2/5/2011	12:10 AM	Dark - Lighted	Clear	Dry	54	44			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: exiting from I93 NB off-ramp. MV2 collided with MV1 when MV2 made a left turn onto Dascomb Rd WB lane without yielding for MV1. MV2 did not stop at the STOP-sign prior to making the turn as well. Both vehicles were towed.
2	2/18/2011	5:59 PM	Dark - Lighted	Cloudy	Wet	16	20			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling NB on I-93NB Ramp. MV2 collided with MV1 when MV2 merged onto Dascomb Rd EB lane without yielding for MV1.
3	7/21/2011	5:30 PM	Daylight	Clear	Dry	44	50			Angled	Failure to Yield Right-of-Way	MC1: traveling EB on Dascomb Rd; MV1: traveling WB on Dascomb Rd. MV1 took a left turn onto I93 NB on ramp, cutting off MC1. MV1 struck MC1 and the operator of MC1 was subsequently transported to the hospital.
4	9/21/2011	7:51 AM	Daylight	Clear	Dry	23	44			Angled	Made an Improper Turn	MV1 and MV2: traveling WB on Dascomb Rd. MV2 struck MV1 when MV1 made an improper U-turn to get on the I-93NB on-ramp since MV1 missed the entrance to the on-ramp.
5	10/21/2011	12:30 AM	Dark - Not Lighted	Clear	Dry	24				Single Vehicle	Excessive Speed	MV1: traveling NB on I-93NB off-ramp. MV1 was driving at an excess speed on the ramp. MV1 was unable to negotiate the corner on the ramp and enters the island where it rolls over.
6	1/21/2012	8:25 AM	Daylight	Clear	Other	24	50			Angled	Excessive Speed	MV1: exiting I-93NB off-ramp; MV2: traveling WB on Dascomb Rd. MV1 was driving too fast for the roadway conditions at that time. MV1 could not stop at the Stop sign, continued to slide into Dascomb Rd and collided with MV2.
7	4/1/2012	2:25 AM	Dark - Not Lighted	Clear	Dry	50				Single Vehicle	Other	MV1: traveling NB on I-93NB off-ramp. The operator of MV1 was fatigue/sleepy while operating the vehicle. When the police arrived at the scene, the vehicle was ontop of the grassy knoll overturned and on fire with the gas tank exposed.
8	9/13/2012	6:44 PM	Dusk	Clear	Dry	49	N/A			Angled	Other	MV1: exiting I-93NB off-ramp; MV2: traveling WB on Dascomb Rd. MV1 struck MV2 while turning left onto Dascomb Rd without yielding. MV1 turned onto I-93 NB on-ramp and fled the scene.
9	8/2/2013	4:05 PM	Daylight	Clear	Dry	39	21	41		Rear-end	Followed Too Closely	MV1, MV2, and MV3: traveling SB on I-93NB on-ramp. MV3 was yielding for the traffic and was rear-ended by MV1 and MV2.
10	10/8/2013	7:38 AM	Daylight	Clear	Dry	27	40			Angled	Disregarded Traffic Controls	MV1: traveling WB on Dascomb Rd; MV2: exiting I-93NB off-ramps. MV1 was preparing to turn left onto I-93NB on-ramp. MV2 hit MV1 when MV2 failed to use care while turning left onto Dascomb Rd WB lane.
11	1/22/2014	9:24 AM	Daylight	Clear	Wet	62	25			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: exiting I-93NB off-ramps. MV1 was slowing to turn left onto I-93NB on-ramp. MV2 hit MV1 when MV2 failed to use care while turning left onto Dascomb Rd WB lane.
12	7/8/2014	2:53 PM	Daylight	Clear	Dry	77	61			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling NB on I-93NB Ramp. MV2 collided with MV1 when MV2 turned left onto Dascomb Rd WB lane without yielding for MV1.
13	10/6/2014	4:51 PM	Daylight	Clear	Dry	24	60			Angled	Disregarded Traffic Controls	MV1: traveling EB on Dascomb Rd; MV2: exiting I-93NB off-ramps piggy backing the car in front. MV2 hit MV1 when MV2 failed to yield while turning left onto Dascomb Rd WB lane.
14	1/16/2015	12:41 PM	Daylight	Clear	Dry	63	N/A			Head-on	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV1 made a left turn on to I-93NB on-ramp without yielding for MV2 causing a head-on accident.
15	1/16/2015	4:51 PM	Dusk	Clear	Dry	43	26			Angled	Inattention / Distracted	MV1: traveling EB on Dascomb Rd; MV2: exiting I-93 NB off-ramp. MV1 struck MV2 when MV2 made a left turn onto Dascomb Rd.
16	3/8/2015	7:39 AM	Daylight	Clear	Dry	41	41			Angled	Visibility Obstructed	MV1: traveling WB on Dascomb Rd; MV2: exiting I-93NB off-ramps. MV1 was turning left onto I-93NB on-ramp. MV2 hit MV1 when MV2 failed to use care while turning left onto Dascomb Rd WB lane.
17	4/11/2015	4:08 PM	Daylight	Clear	Dry	46	27			Rear-end	Followed Too Closely	MV1 and MV2: exiting I-93NB off-ramp. MV2 rear-ended MV1 when MV1 stopped at the yield sign.

Crash Data Summary Tables  
 Dascomb Road @ I-93 Northbound Ramps - Andover, MA  
 01/01/2011 - 09/31/2016

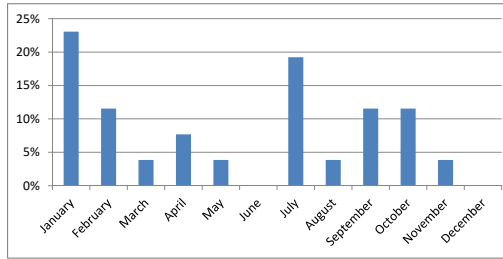
Collision Diagram	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Operator's Age				Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Report)
						V1	V2	V3	V4			
18	5/18/2015	3:31 PM	Daylight	Clear	Dry	57	44			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: traveling WB on Dascomb Rd. MV2 struck MV1 when MV2 made a left turn on to I-93NB on-ramp without yielding for MV1.
19	7/15/2015	4:45 PM	Daylight	Clear	Dry	30	18			Rear-end	Other	MV1 and MV2: exiting I-93NB off-ramp. MV2 rear-ended MV1 when MV1 stopped at the yield sign.
20	11/3/2015	3:59 PM	Daylight	Cloudy	Dry	19	75			Angled	No Improper Driving	MC1: traveling EB on Dascomb Rd; MV1: exiting I93NB off-ramp. MV1 struck MC1 when MV1 turned left onto Dascomb Rd.
21	1/15/2016	2:59 PM	Daylight	Cloudy	Dry	34	77			Angled	Failure to Yield Right-of-Way	MV1: traveling EB on Dascomb Rd; MV2: exiting from I93 NB off-ramp. MV2 collided with MV1 when MV2 made a left turn onto Dascomb Rd WB lane without yielding for MV1.
22	1/18/2016	8:12 AM	Daylight	Snow	Snow	26	47			Angled	Failure to Yield Right-of-Way	MV1: traveling WB on Dascomb Rd; MV2: traveling EB on Dascomb Rd. MV1 made a left turn on to I-93NB on-ramp without yielding for MV2 causing a head-on accident.
23	2/1/2016	11:24 PM	Dark - Lighted	Clear	Dry	61	56			Angled	Failure to Yield Right-of-Way	MV1: exiting I-93NB off-ramp; MV2: traveling WB on Dascomb Rd. MV1 was attempting to make a left turn onto Dascomb Rd and MV2 was attempting to make a left turn onto I93 NB on -ramp. The accident occurred when MV1 failed to yield for MV2.
24	7/8/2016	12:21 PM	Daylight	Clear	Dry	58	42			Angled	Failure to Yield Right-of-Way	MV1: attempting to enter Dascomb Rd from I-93NB off-ramp; MV2: traveling WB on Dascomb Rd. MV1 collided with MV2 when MV1 turned left without yielding for MV2.
25	7/17/2016	12:16 PM	Daylight	Clear	Dry	27	62			Cyclist	Failure to Yield Right-of-Way	Cyclist 1: traveling EB on Dascomb Rd; MV1: exiting I-93NB off-ramp. MV1 sideswiped Cyclist 1 when MV1 attempted to turn left onto Dascomb Rd.
26	9/29/2016	8:06 PM	Dark - Lighted	Clear	Dry	62				Single Vehicle	No Improper Driving	MV1: traveling WB on Dascomb Rd. MV1 collided with a deer when the deer ran across the roadway.

**Crash Data Summary Tables**  
**Dascomb Road @ I-93 Northbound Ramps - Andover, MA**  
**01/01/2011 - 09/31/2016**

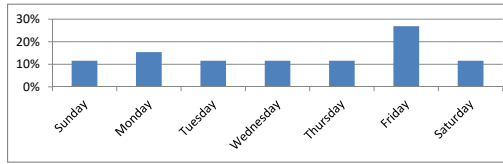
**Dascomb Road @ I-93 North Ramps**

26

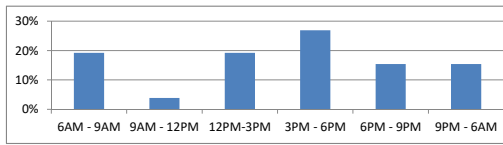
Month	#	%
January	6	23%
February	3	12%
March	1	4%
April	2	8%
May	1	4%
June	0	0%
July	5	19%
August	1	4%
September	3	12%
October	3	12%
November	1	4%
December	0	0%



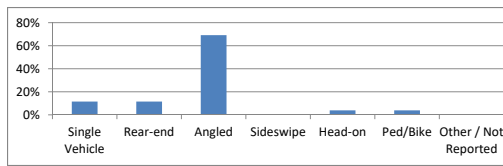
Day of Week	#	%
Sunday	3	12%
Monday	4	15%
Tuesday	3	12%
Wednesday	3	12%
Thursday	3	12%
Friday	7	27%
Saturday	3	12%



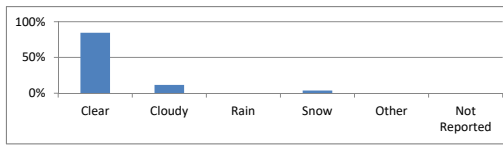
Time of Day	#	%
6AM - 9AM	5	19%
9AM - 12PM	1	4%
12PM-3PM	5	19%
3PM - 6PM	7	27%
6PM - 9PM	4	15%
9PM - 6AM	4	15%



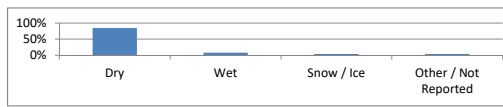
Manner of Collision	#	%
Single Vehicle	3	12%
Rear-end	3	12%
Angled	18	69%
Sideswipe	0	0%
Head-on	1	4%
Ped/Bike	1	4%
Other / Not Reported	0	0%



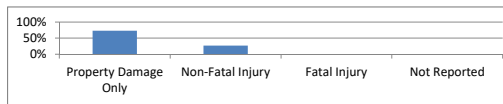
Weather Conditions	#	%
Clear	22	85%
Cloudy	3	12%
Rain	0	0%
Snow	1	4%
Other	0	0%
Not Reported	0	0%



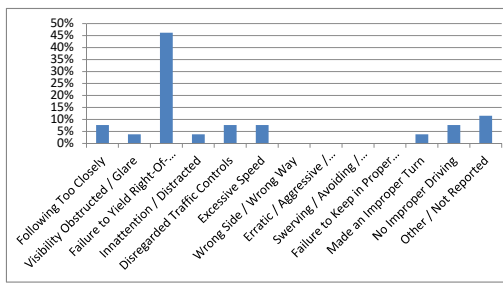
Road Surface	#	%
Dry	22	85%
Wet	2	8%
Snow / Ice	1	4%
Other / Not Reported	1	4%



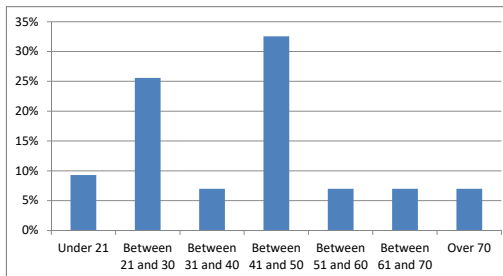
Crash Severity	#	%
Property Damage Only	19	73%
Non-Fatal Injury	7	27%
Fatal Injury	0	0%
Not Reported	0	0%



Main Contributing Factor from Narrative	#	%
Following Too Closely	2	8%
Visibility Obstructed / Glare	1	4%
Failure to Yield Right-Of-Way	12	46%
Inattention / Distracted	1	4%
Disregarded Traffic Controls	2	8%
Excessive Speed	2	8%
Wrong Side / Wrong Way	0	0%
Erratic / Aggressive / Reckless Driving	0	0%
Swerving / Avoiding / Over-Steering / Over-Correcting	0	0%
Failure to Keep in Proper Lane	0	0%
Made an Improper Turn	1	4%
No Improper Driving	2	8%
Other / Not Reported	3	12%



Age	#	%
Under 21	4	9%
Between 21 and 30	11	26%
Between 31 and 40	3	7%
Between 41 and 50	14	33%
Between 51 and 60	3	7%
Between 61 and 70	3	7%
Over 70	3	7%





**Crash Data Summary Tables**  
**Frontage Road @ I-93 Southbound Ramps - Andover, MA**  
**01/01/2011 - 09/31/2016**

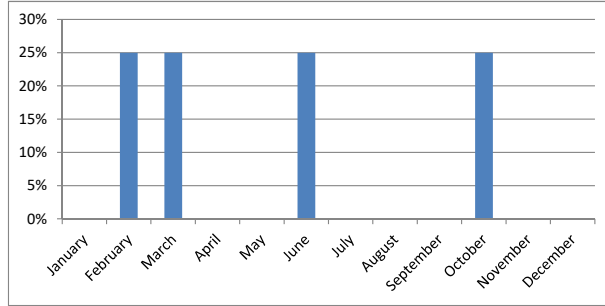
Collision Diagram	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Number of Vehicles	Vehicle Travel Directions				Crash Severity	Number of NonFatal Injuries	Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Report)
							v1	v2	v3	v4					
1	2/20/2015	3:00 PM	Daylight	Clear	Dry	2	W	S			Property Damage Only	0	Angled	Disregarded Traffic Controls	MV1: exiting I-93SB off-ramp; MV2: traveling SB on Frontage Rd. MV1 struck MV2 when MV1 attempted to turn left onto Frontage Rd from the ramp causing MV2 to get towed.
2	3/30/2015	9:01 PM	Dark - Lighted	Cloudy	Dry	2	W	W			Property Damage Only	0	Rear-end	Not Reported	MV1 and MV2: traveling WB on I-93SB off-ramp. MV2 rear-ended MV1 when MV1 was stopped at the stop sign to turn left onto Frontage Rd. Both vehicles sustained minor damages.
3	10/16/2015	8:20 AM	Daylight	Cloudy	Wet	2	S	W			Property Damage Only	0	Angled	Failure to Yield Right-of-Way	MV1: traveling SB on Frontage Rd; MV2: exiting I-93SB off-ramp. MV2 struck MV1 when MV2 attempted to turn left onto Frontage Rd from the ramp.
4	6/29/2016	9:29 AM	Daylight	Clear	Dry	2	S	W			Property Damage Only	0	Angled	No Improper Driving	MV1: traveling SB on Frontage Rd; MV2: exiting I-93SB off-ramp. MV2 struck MV1 when MV2 attempted to turn left onto Frontage Rd from the ramp. Both vehicles received damages estimated to be over \$1000.

**Crash Data Summary Tables**  
**Frontage Road @ I-93 Southbound Ramps - Andover, MA**  
**01/01/2011 - 09/31/2016**

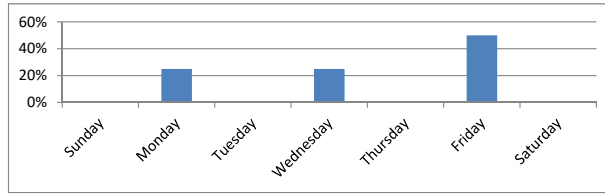
**Frontage Road @ I-93 South Ramps**

4

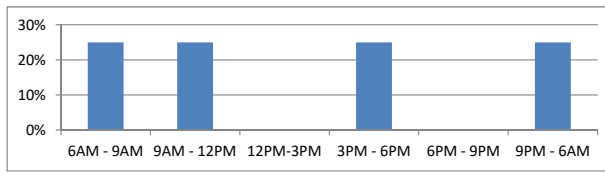
Month	#	%
January	0	0%
February	1	25%
March	1	25%
April	0	0%
May	0	0%
June	1	25%
July	0	0%
August	0	0%
September	0	0%
October	1	25%
November	0	0%
December	0	0%



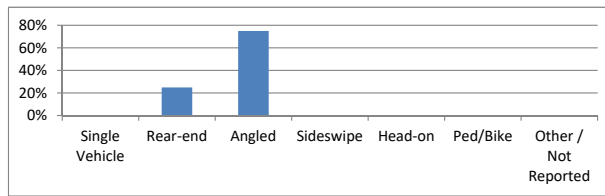
Day of Week	#	%
Sunday	0	0%
Monday	1	25%
Tuesday	0	0%
Wednesday	1	25%
Thursday	0	0%
Friday	2	50%
Saturday	0	0%



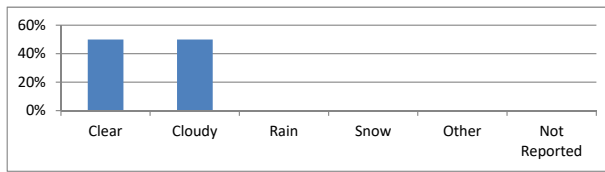
Time of Day	#	%
6AM - 9AM	1	25%
9AM - 12PM	1	25%
12PM-3PM	0	0%
3PM - 6PM	1	25%
6PM - 9PM	0	0%
9PM - 6AM	1	25%



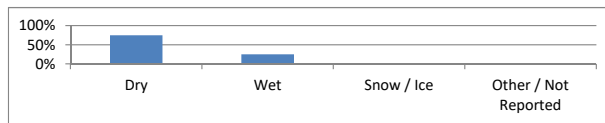
Manner of Collision	#	%
Single Vehicle	0	0%
Rear-end	1	25%
Angled	3	75%
Sideswipe	0	0%
Head-on	0	0%
Ped/Bike	0	0%
Other / Not Reported	0	0%



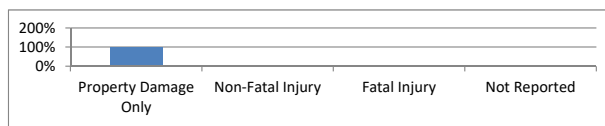
Weather Conditions	#	%
Clear	2	50%
Cloudy	2	50%
Rain	0	0%
Snow	0	0%
Other	0	0%
Not Reported	0	0%



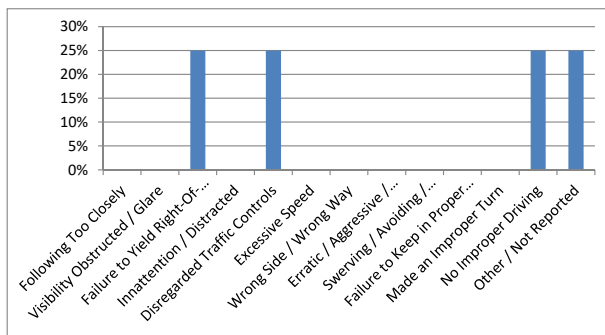
Road Surface	#	%
Dry	3	75%
Wet	1	25%
Snow / Ice	0	0%
Other / Not Reported	0	0%



Crash Severity	#	%
Property Damage Only	4	100%
Non-Fatal Injury	0	0%
Fatal Injury	0	0%
Not Reported	0	0%



Main Contributing Factor from Narrative	#	%
Following Too Closely	0	0%
Visibility Obstructed / Glare	0	0%
Failure to Yield Right-Of-Way	1	25%
Innattention / Distracted	0	0%
Disregarded Traffic Controls	1	25%
Excessive Speed	0	0%
Wrong Side / Wrong Way	0	0%
Erratic / Aggressive / Reckless Driving	0	0%
Swerving / Avoiding / Over-Steering / Over-Correcting	0	0%
Failure to Keep in Proper Lane	0	0%
Made an Improper Turn	0	0%
No Improper Driving	1	25%
Other / Not Reported	1	25%





**Attachment F**

Public Transportation





# HAVERHILL LINE Train Schedule Effective May 23, 2016

## Monday to Friday

### Inbound to Boston

		AM											PM											
ZONE	STATION	TRAIN #	200	202	204	206	286	288	208	290	210	212	214	216	218	292	220	294	296	222	298	224	226	228
	Bikes Allowed		🚲								🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲
7	Haverhill	⊗	5:05	5:40	6:10	6:40	-	-	7:35	-	9:06	10:44	12:18	1:53	3:30	-	<b>B 4:30</b>	-	-	<b>B 6:09</b>	-	7:45	9:10	10:50
7	Bradford		5:07	5:42	6:12	6:42	-	-	7:37	-	<b>f 9:08</b>	<b>f 10:46</b>	<b>f 12:20</b>	<b>f 1:55</b>	<b>f 3:32</b>	-	4:40	-	-	6:19	-	<b>f 7:47</b>	<b>f 9:12</b>	<b>f 10:52</b>
6	Lawrence	⊗	5:16	5:51	6:21	6:51	-	-	7:46	-	9:16	10:54	12:28	2:03	3:40	-	4:55	-	-	6:39	-	7:55	9:20	11:00
5	Andover	⊗	5:23	5:58	6:28	6:58	-	-	7:53	-	<b>f 9:23</b>	<b>f 11:01</b>	<b>f 12:35</b>	<b>f 2:10</b>	<b>f 3:47</b>	-	<b>f 5:02</b>	-	-	<b>f 6:46</b>	-	<b>f 8:02</b>	<b>f 9:27</b>	<b>f 11:07</b>
4	Ballardvale	⊗	5:29	6:04	6:34	7:04	-	-	7:59	-	<b>f 9:28</b>	<b>f 11:06</b>	<b>f 12:40</b>	<b>f 2:15</b>	<b>f 3:52</b>	-	<b>f 5:07</b>	-	-	<b>f 6:51</b>	-	<b>f 8:07</b>	<b>f 9:32</b>	<b>f 11:12</b>
3	North Wilmington		5:36	6:11	6:41	-	-	-	-	-	<b>f 9:35</b>	<b>f 11:13</b>	<b>f 12:47</b>	<b>f 2:22</b>	-	-	-	-	-	-	-	-	<b>f 9:39</b>	<b>f 11:19</b>
2	Reading	⊗	5:43	6:18	6:48	-	7:30	8:00	-	8:30	9:42	11:20	12:54	2:29	-	4:50	-	5:38	6:55	-	8:07	-	9:46	11:26
2	Wakefield		5:49	6:24	6:54	-	7:36	8:06	-	8:36	<b>f 9:47</b>	<b>f 11:25</b>	<b>f 12:59</b>	<b>f 2:34</b>	-	<b>f 4:55</b>	-	<b>f 5:43</b>	<b>f 7:00</b>	-	<b>f 8:12</b>	-	<b>f 9:51</b>	<b>f 11:31</b>
2	Greenwood		5:52	6:27	6:57	-	7:39	8:09	-	8:39	<b>f 9:50</b>	<b>f 11:28</b>	<b>f 1:02</b>	<b>f 2:37</b>	-	<b>f 4:58</b>	-	<b>f 5:46</b>	<b>f 7:03</b>	-	<b>f 8:15</b>	-	<b>f 9:54</b>	<b>f 11:34</b>
1	Melrose Highlands	⊗	5:54	6:29	6:59	-	7:41	8:11	-	8:41	<b>f 9:52</b>	<b>f 11:30</b>	<b>f 1:04</b>	<b>f 2:39</b>	-	<b>f 5:00</b>	-	<b>f 5:48</b>	<b>f 7:05</b>	-	<b>f 8:17</b>	-	<b>f 9:56</b>	<b>f 11:36</b>
1	Melrose/Cedar Park		5:56	6:31	7:01	-	7:43	8:13	-	8:43	<b>f 9:54</b>	<b>f 11:32</b>	<b>f 1:06</b>	<b>f 2:41</b>	-	<b>f 5:01</b>	-	<b>f 5:49</b>	<b>f 7:06</b>	-	<b>f 8:18</b>	-	<b>f 9:58</b>	<b>f 11:38</b>
1	Wyoming Hill		5:58	6:33	7:03	-	7:45	8:15	-	8:45	<b>f 9:56</b>	<b>f 11:34</b>	<b>f 1:08</b>	<b>f 2:43</b>	-	<b>f 5:03</b>	-	<b>f 5:51</b>	<b>f 7:08</b>	-	<b>f 8:20</b>	-	<b>f 10:00</b>	<b>f 11:40</b>
1A	Malden Center	⊗	<b>L 6:02</b>	<b>L 6:37</b>	<b>L 7:07</b>	-	<b>L 7:49</b>	<b>L 8:19</b>	-	<b>L 8:49</b>	<b>L 9:59</b>	<b>L 11:37</b>	<b>L 1:11</b>	<b>L 2:46</b>	-	<b>L 5:06</b>	-	<b>L 5:54</b>	<b>L 7:11</b>	-	<b>L 8:23</b>	-	<b>L 10:03</b>	<b>L 11:43</b>
1A	NORTH STATION	⊗	6:15	6:50	7:20	7:38	8:00	8:30	8:35	9:00	10:11	11:49	1:23	2:58	4:28	5:17	6:05	6:05	7:22	7:25	8:34	8:38	10:15	11:55

Trains in purple box indicate peak period trains.

## Monday to Friday

### Outbound from Boston

		AM											PM										AM	
ZONE	STATION	TRAIN #	285	287	201	289	203	205	207	209	211	291	213	293	215	217	295	219	221	297	223	225	227	229
	Bikes Allowed		🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲	🚲
1A	NORTH STATION	⊗	6:43	7:10	7:35	7:55	9:15	10:55	12:30	2:02	3:15	3:50	4:30	4:48	5:15	5:35	6:05	6:25	6:55	7:20	7:40	9:20	11:00	12:10
1A	Malden Center	⊗	<b>f 6:54</b>	<b>f 7:21</b>	<b>f 7:45</b>	-	<b>f 9:26</b>	<b>f 11:06</b>	<b>f 12:41</b>	<b>f 2:13</b>	3:26	4:01	4:41	4:59	5:26	5:46	6:16	6:36	-	<b>f 7:31</b>	<b>f 7:51</b>	<b>f 9:31</b>	<b>f 11:11</b>	<b>f 12:21</b>
1	Wyoming Hill		<b>f 6:57</b>	<b>f 7:24</b>	<b>f 7:48</b>	-	<b>f 9:29</b>	<b>f 11:09</b>	<b>f 12:44</b>	<b>f 2:16</b>	3:30	4:05	4:45	5:03	-	5:50	6:20	6:40	-	<b>f 7:34</b>	<b>f 7:54</b>	<b>f 9:34</b>	<b>f 11:14</b>	<b>f 12:24</b>
1	Melrose/Cedar Park		<b>f 6:59</b>	<b>f 7:26</b>	<b>f 7:50</b>	-	<b>f 9:31</b>	<b>f 11:11</b>	<b>f 12:46</b>	<b>f 2:18</b>	3:32	4:07	4:47	5:05	-	5:52	6:22	6:42	-	<b>f 7:36</b>	<b>f 7:56</b>	<b>f 9:36</b>	<b>f 11:16</b>	<b>f 12:26</b>
1	Melrose Highlands	⊗	<b>f 7:02</b>	<b>f 7:29</b>	<b>f 7:53</b>	-	<b>f 9:34</b>	<b>f 11:14</b>	<b>f 12:49</b>	<b>f 2:21</b>	3:36	4:11	4:51	5:09	-	5:56	6:26	6:46	Via	<b>f 7:39</b>	<b>f 7:59</b>	<b>f 9:39</b>	<b>f 11:19</b>	<b>f 12:29</b>
2	Greenwood		<b>f 7:05</b>	<b>f 7:32</b>	<b>f 7:56</b>	-	<b>f 9:37</b>	<b>f 11:17</b>	<b>f 12:52</b>	<b>f 2:24</b>	3:39	4:14	4:54	5:12	-	5:59	6:29	6:49	Lowell	<b>f 7:42</b>	<b>f 8:02</b>	<b>f 9:42</b>	<b>f 11:22</b>	<b>f 12:32</b>
2	Wakefield		<b>f 7:09</b>	<b>f 7:36</b>	<b>f 8:00</b>	-	<b>f 9:41</b>	<b>f 11:21</b>	<b>f 12:56</b>	<b>f 2:28</b>	3:43	4:18	4:58	5:16	5:36	6:03	6:33	6:53	Line	<b>f 7:46</b>	<b>f 8:06</b>	<b>f 9:46</b>	<b>f 11:26</b>	<b>f 12:36</b>
2	Reading	⊗	7:15	7:42	8:06	8:15	9:47	11:27	1:02	2:34	3:49	4:24	5:04	5:22	5:42	6:09	6:39	6:59	-	7:52	8:12	9:52	11:32	12:42
3	North Wilmington		-	-	8:12	-	<b>f 9:53</b>	<b>f 11:33</b>	<b>f 1:08</b>	<b>f 2:40</b>	3:56	-	5:11	-	5:49	6:16	-	7:06	-	-	<b>f 8:18</b>	<b>f 9:58</b>	<b>f 11:38</b>	<b>f 12:48</b>
4	Ballardvale	⊗	-	-	8:19	-	<b>f 10:00</b>	<b>f 11:40</b>	<b>f 1:15</b>	<b>f 2:47</b>	4:03	-	5:18	-	5:56	6:23	-	7:13	7:35	-	<b>f 8:25</b>	<b>f 10:05</b>	<b>f 11:45</b>	<b>f 12:55</b>
5	Andover	⊗	-	-	8:24	-	<b>f 10:05</b>	<b>f 11:45</b>	<b>f 1:20</b>	<b>f 2:52</b>	4:09	-	5:24	-	6:02	6:29	-	7:19	7:41	-	<b>f 8:30</b>	<b>f 10:10</b>	<b>f 11:50</b>	<b>f 1:00</b>
6	Lawrence	⊗	-	-	8:31	-	10:12	11:52	1:27	2:59	4:15	-	5:30	-	6:08	6:35	-	7:25	7:47	-	8:37	10:17	11:57	1:07
7	Bradford	⊗	-	-	<b>L 8:40</b>	-	<b>L 10:21</b>	<b>L 12:01</b>	<b>L 1:36</b>	<b>L 3:08</b>	<b>B 4:35</b>	-	<b>B 5:50</b>	-	<b>L 6:18</b>	<b>L 6:45</b>	-	<b>L 7:35</b>	<b>B 8:07</b>	-	<b>L 8:46</b>	<b>L 10:26</b>	<b>L 12:06</b>	<b>L 1:16</b>
7	Haverhill	⊗	-	-	8:42	-	10:23	12:03	1:38	3:10	4:45	-	6:00	-	6:21	6:48	-	7:38	8:17	-	8:48	10:28	12:08	1:18

Trains in purple box indicate peak period trains.

## Keep in Mind

This schedule will be effective from **May 23, 2016**, and will replace the schedule of December 14, 2015.

### Holiday Service:

**Saturday service:** Presidents' Day, 4th of July

### Sunday service:

New Year's Day, Memorial Day, Labor Day, Thanksgiving Day, Christmas Day.

For additional holiday travel information and service modifications, please check MBTA.com or call 617-222-3200.

## Saturday & Sunday

### Inbound to Boston

		AM			PM			
ZONE	STATION	SATURDAY TRAIN #	1200	1202	1204	1206	1208	1210
	Bikes Allowed		🚲	🚲	🚲	🚲	🚲	🚲
7	Haverhill	⊗	7:15	10:25	1:15	4:15	7:20	10:10
7	Bradford	⊗	7:18	10:28	1:18	4:18	7:23	10:13
6	Lawrence	⊗	7:27	10:37	1:27	4:27	7:32	10:22
5	Andover	⊗	7:32	10:42	1:33	4:32	7:38	10:28
4	Ballardvale	⊗	<b>f 7:37</b>	<b>f 10:47</b>	<b>f 1:37</b>	<b>f 4:37</b>	<b>f 7:42</b>	<b>f 10:32</b>
3	North Wilmington		<b>f 7:44</b>	<b>f 10:54</b>	<b>f 1:44</b>	<b>f 4:44</b>	<b>f 7:49</b>	<b>f 10:39</b>
2	Reading	⊗	7:50	11:00	1:50	4:50	7:55	10:45
2	Wakefield		7:55	11:05	1:55	4:55	8:00	10:50
2	Greenwood		<b>f 7:59</b>	<b>f 11:09</b>	<b>f 1:59</b>	<b>f 4:59</b>	<b>f 8:04</b>	<b>f 10:54</b>
1	Melrose Highlands	⊗	8:02	11:12	2:02	5:02	8:07	10:57
1	Melrose/Cedar Park		<b>f 8:04</b>	<b>f 11:14</b>	<b>f 2:04</b>	<b>f 5:04</b>	<b>f 8:09</b>	<b>f 10:59</b>
1	Wyoming Hill		<b>f 8:06</b>	<b>f 11:16</b>	<b>f 2:06</b>	<b>f 5:06</b>	<b>f 8:11</b>	<b>f 11:01</b>
1A	Malden Center	⊗	<b>L 8:10</b>	<b>L 11:20</b>	<b>L 2:10</b>	<b>L 5:10</b>	<b>L 8:15</b>	<b>L 11:05</b>
1A	North Station	⊗	8:21	11:31	2:21	5:21	8:26	11:16

## Saturday & Sunday

### Outbound from Boston

		AM			PM			
ZONE	STATION	SATURDAY TRAIN #	1201	1203	1205	1207	1209	1211
	Bikes Allowed		🚲	🚲	🚲	🚲	🚲	🚲
1A	North Station	⊗	8:40	11:25	2:45	5:50	8:40	11:30
1A	Malden Center	⊗	8:50	11:35	2:55	6:00	8:50	11:40
1	Wyoming Hill		<b>f 8:54</b>	<b>f 11:39</b>	<b>f 2:59</b>	<b>f 6:04</b>	<b>f 8:54</b>	<b>f 11:44</b>
1	Melrose/Cedar Park		<b>f 8:56</b>	<b>f 11:41</b>	<b>f 3:01</b>	<b>f 6:06</b>	<b>f 8:56</b>	<b>f 11:46</b>
1	Melrose Highlands	⊗	8:59	11:44	3:04	6:09	8:59	11:49
2	Greenwood		<b>f 9:02</b>	<b>f 11:47</b>	<b>f 3:07</b>	<b>f 6:12</b>	<b>f 9:02</b>	<b>f 11:52</b>
2	Wakefield		9:05	11:50	3:10	6:15	9:05	11:55
2	Reading	⊗	9:11	11:56	3:16	6:21	9:11	12:01
3	North Wilmington		<b>f 9:17</b>	<b>f 12:02</b>	<b>f 3:22</b>	<b>f 6:27</b>	<b>f 9:17</b>	<b>f 12:07</b>
4	Ballardvale	⊗	<b>f 9:23</b>	<b>f 12:08</b>	<b>f 3:28</b>	<b>f 6:33</b>	<b>f 9:23</b>	<b>f 12:13</b>
5	Andover	⊗	9:28	12:13	3:33	6:38	9:28	12:18
6	Lawrence	⊗	9:35	12:20	3:40	6:45	9:35	12:25
7	Bradford	⊗	<b>L 9:44</b>	<b>L 12:29</b>	<b>L 3:49</b>	<b>L 6:54</b>	<b>L 9:44</b>	<b>L 12:34</b>
7	Haverhill	⊗	9:47	12:32	3:52	6:57	9:47	12:37

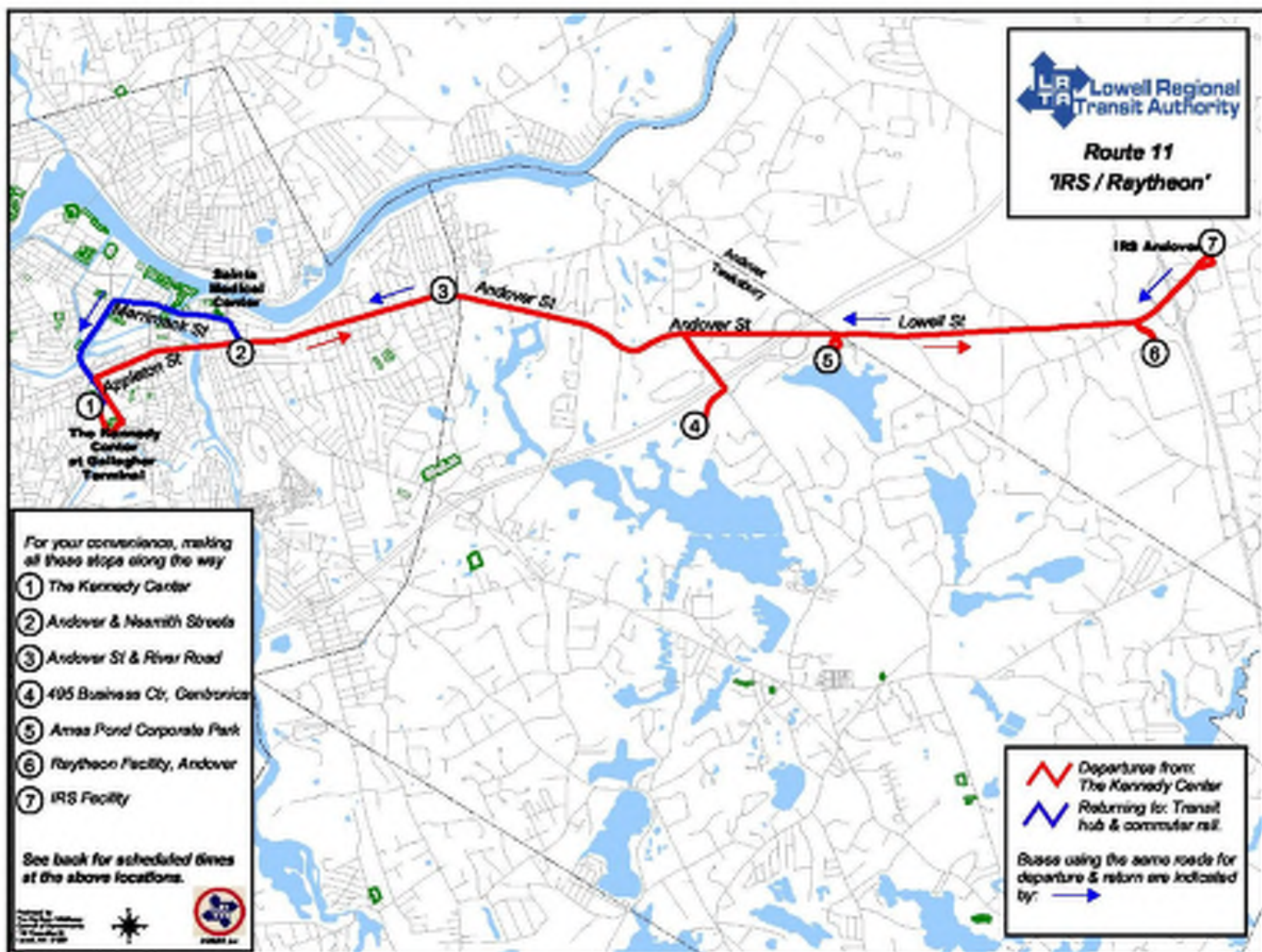
**f** Times in purple with "f" indicate a flag stop: Passengers must advise the conductor they wish to stop. Passengers waiting to board must be visible on the platform for the train to stop.

**L** Times in blue indicate an early departure (L stop): The train may leave ahead of schedule at these stops.

**Bikes:** Bicycles are allowed on trains with the bicycle symbol shown below the train number.

**B:**

# Map of Route 11



11 IRS / Raytheon Via Rte 133

Weekday Schedule

	<b>Outbound</b>						
	1 Kennedy Center Departure	2 Andover St & High St	3 Andover St & River Rd	4 495 Business Center Gentronics	5 Ames Pond Corp Park	6 Raytheon Facility Andover	7 IRS Facility
<b>AM</b>	<b>6:00</b>	<b>6:05</b>	<b>6:09</b>	<b>6:14</b>	<b>6:19</b>	<b>6:22</b>	<b>6:25</b>
	<b>7:00</b>	<b>7:05</b>	<b>7:09</b>	<b>7:14</b>	<b>7:19</b>	<b>7:22</b>	<b>7:25</b>
<b>PM</b>	<b>3:00</b>	<b>3:05</b>	<b>3:09</b>	<b>3:14</b>	<b>3:19</b>	<b>3:22</b>	<b>3:25</b>
	<b>4:00</b>	<b>4:05</b>	<b>4:09</b>	<b>4:14</b>	<b>4:19</b>	<b>4:22</b>	<b>4:25</b>

Weekday Schedule

	<b>Inbound</b>						
	7 IRS Facility	6 Raytheon Facility Andover	5 Ames Pond Corp Park	4 495 Business Center Gentronics	3 Andover St & River Rd	2 Andover St & High St	1 Kennedy Center Arrival
<b>AM</b>	<b>6:30</b>	<b>6:33</b>	<b>6:37</b>	<b>6:41</b>	<b>6:46</b>	<b>6:50</b>	<b>6:55</b>
	<b>7:30</b>	<b>7:33</b>	<b>7:37</b>	<b>7:41</b>	<b>7:46</b>	<b>7:50</b>	<b>7:55</b>
<b>PM</b>	<b>3:30</b>	<b>3:33</b>	<b>3:37</b>	<b>3:41</b>	<b>3:46</b>	<b>3:50</b>	<b>3:55</b>
	<b>4:30</b>	<b>4:33</b>	<b>4:37</b>	<b>4:41</b>	<b>4:46</b>	<b>4:50</b>	<b>4:55</b>

\*\* Route 11 does not offer Saturday Service

**Attachment G**

Ambient Growth Rate Data



**Average Daily Traffic Summary Table**

Project: 146 Dascomb Road Site Redevelopment Project - Andover, MA  
 Date: 9/22/2016  
 Analyst: TEC, Inc. / Eindra (Elena) Aung, E.I.T.  
 Source: MassDOT Permanent Count Stations

STA.	TOWN	ROUTE/STREET	LOCATION	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Amb. Growth
R12211	ANDOVER	I-93 NORTH RAMP	SOUTH OF DASCOMB ROAD	7,361								7629	7804	0.65%
R12242	ANDOVER	I-93 SOUTH RAMP	EAST OF FRONTAGE ROAD	6,150								5397	5527	-1.17%
R12243	ANDOVER	I-93 SOUTH RAMP	EAST OF FRONTAGE ROAD	6,529								6630	6789	0.44%
254017	ANDOVER	CLARK ROAD	SOUTH OF DASCOMB ROAD	5,900									5035	-1.75%
H12565	ANDOVER	I-93 SOUTH	SOUTH OF EXIT 43				128,365	130,303	125936	126735	127976	129835	129667	0.18%
5022	ANDOVER	I-93 NORTH	NORTH OF EXIT 41	135,904	139,015	136,203	134,844	137,116		135921	136213	136495	142104	0.51%
258034	TEWKSBURY	MAPLE STREET	EAST OF EAST STREET								2931	3025	3095	2.76%
237098	TEWKSBURY	LIVINGSTON STREET	NORTH OF EAST STREET									4002	4094	2.30%
250850	TEWKSBURY	LIVINGSTON STREET	SOUTH OF EAST STREET	4,600									4511	-0.22%
														<b>0.41%</b>

Assume 0.50% Ambient Growth.

## **Attachment H**

Trip Generation





# Trip Generation Assessment

Project: 146 Dascomb Road Site Redevelopment Project - Andover, Massachusetts  
 Date: October 24, 2017  
 Analyst: TEC, Inc. / Eindra (Elena) Aung, E.I.T.  
 Source: Institute of Transportation Engineers - Trip Generation - 9th Ed.

## Proposed Development

### 225 Units Senior Adult Housing - Attached (ITE LUC 252)

Units:	Total Trips		Total Trips	% Distribution		# New Trips		Multi-Use Trips		Transit Trips		Total New Pass-by Trips	Total New Primary Trips	# Passby Trips		# Primary Trips	
	Avg. Rates	Fitted Curve		IN	OUT	IN	OUT	IN	OUT	IN	OUT			IN	OUT	IN	OUT
				IN	OUT	IN	OUT	IN	OUT	IN	OUT			IN	OUT	IN	OUT
Weekday Daily	774	692	692	50%	50%	346	346	159	207	17	17	0	292	0	0	170	122
Weekday AM PH	46	44	44	34%	66%	15	29	1	7	1	1	0	34	0	0	13	21
Weekday PM PH	56	56	56	54%	46%	30	26	20	18	2	1	0	15	0	0	8	7
Saturday Daily	588	500	500	50%	50%	250	250	111	150	13	13	0	213	0	0	126	87
Sat Midday PH	70	70	70	57%	43%	40	30	25	21	2	2	0	20	0	0	13	7

### 125 Rooms Hotel (ITE LUC 310)

Units:	Total Trips		Total Trips	% Distribution		# New Trips		Multi-Use Trips		Transit Trips		Total New Pass-by Trips	Total New Primary Trips	# Passby Trips		# Primary Trips	
	Avg. Rates	Fitted Curve		IN	OUT	IN	OUT	IN	OUT	IN	OUT			IN	OUT	IN	OUT
				IN	OUT	IN	OUT	IN	OUT	IN	OUT			IN	OUT	IN	OUT
Weekday Daily	818	522	522	50%	50%	261	261	39	100	13	13	0	357	0	0	209	148
Weekday AM PH	54	N/A	54	59%	41%	32	22	1	11	2	1	0	39	0	0	29	10
Weekday PM PH	60	N/A	60	51%	49%	31	29	10	9	2	1	0	38	0	0	19	19
Saturday Daily	820	668	668	50%	50%	334	334	50	115	17	17	0	469	0	0	267	202
Sat Midday PH	72	74	74	56%	44%	41	33	16	12	2	2	0	42	0	0	23	19

### 200,000 SF General Office Building (ITE LUC 710)

Units:	Total Trips		Total Trips	% Distribution		# New Trips		Multi-Use Trips		Transit Trips		Total New Pass-by Trips	Total New Primary Trips	# Passby Trips		# Primary Trips	
	Avg. Rates	Fitted Curve		IN	OUT	IN	OUT	IN	OUT	IN	OUT			IN	OUT	IN	OUT
				IN	OUT	IN	OUT	IN	OUT	IN	OUT			IN	OUT	IN	OUT
Weekday Daily	1654	1786	1786	50%	50%	893	893	217	154	45	45	0	1325	0	0	631	694
Weekday AM PH	234	264	264	88%	12%	232	32	33	23	12	2	0	194	0	0	187	7
Weekday PM PH	224	246	246	17%	83%	42	204	6	18	2	10	0	210	0	0	34	176
Saturday Daily	370	336	336	50%	50%	168	168	57	77	8	8	0	186	0	0	103	83
Sat Midday PH	64	N/A	64	54%	46%	35	29	7	8	2	1	0	46	0	0	26	20

### 155,000 SF Shopping Center (ITE LUC 820)

Units:	Total Trips		Total Trips	% Distribution		# New Trips		Multi-Use Trips		Transit Trips		Total New Pass-by Trips	Total New Primary Trips	# Passby Trips		# Primary Trips		
	Avg. Rates	Fitted Curve		IN	OUT	IN	OUT	IN	OUT	IN	OUT			IN	OUT	IN	OUT	
				IN	OUT	IN	OUT	IN	OUT	IN	OUT			IN	OUT	IN	OUT	
Weekday Daily	4484	7010	7010	50%	50%	2242	2242	477	498	0	0	0	912	2597	456	456	1309	1288
Weekday AM PH	100	160	160	62%	38%	62	38	16	14	0	0	0	18	52	9	9	37	15
Weekday PM PH	390	620	620	48%	52%	187	203	56	55	0	0	0	94	185	47	47	84	101
Saturday Daily	5246	9528	9528	50%	50%	2623	2623	435	479	0	0	0	1126	3206	563	563	1625	1581
Sat Midday PH	506	902	902	52%	48%	263	243	69	70	0	0	0	96	271	48	48	146	125

Assumed 34% pass-by rate for weekday PM and 26% pass-by rate for all others (Trip Generation Handbook, 3rd Edition).

### 10,000 SF Quality Restaurant (ITE LUC 931)

Units:	Total Trips		Total Trips	% Distribution		# New Trips		Multi-Use Trips		Transit Trips		Total New Pass-by Trips	Total New Primary Trips	# Passby Trips		# Primary Trips		
	Avg. Rates	Fitted Curve		IN	OUT	IN	OUT	IN	OUT	IN	OUT			IN	OUT	IN	OUT	
				IN	OUT	IN	OUT	IN	OUT	IN	OUT			IN	OUT	IN	OUT	
Weekday Daily	900	N/A	900	50%	50%	450	450	198	171	0	0	0	234	297	117	117	135	162
Weekday AM PH	8	N/A	8	50%	50%	4	4	2	2	0	0	0	2	2	1	1	1	1
Weekday PM PH	74	N/A	74	67%	33%	50	24	20	14	0	0	0	18	22	9	9	21	1
Saturday Daily	944	N/A	944	50%	50%	472	472	188	125	0	0	0	278	353	139	139	145	208
Sat Midday PH	108	108	108	59%	41%	64	44	25	24	0	0	0	26	33	13	13	26	7

Assumed 44% passby rate (Trip Generation Handbook, 3rd Edition).

### 10,000 SF High-Turnover (Sit-Down) Restaurant (ITE LUC 932)

Units:	Total Trips		Total Trips	% Distribution		# New Trips		Multi-Use Trips		Transit Trips		Total New Pass-by Trips	Total New Primary Trips	# Passby Trips		# Primary Trips		
	Avg. Rates	Fitted Curve		IN	OUT	IN	OUT	IN	OUT	IN	OUT			IN	OUT	IN	OUT	
				IN	OUT	IN	OUT	IN	OUT	IN	OUT			IN	OUT	IN	OUT	
Weekday Daily	1272	N/A	1272	50%	50%	636	636	281	241	0	0	0	322	428	161	161	194	234
Weekday AM PH	108	N/A	108	55%	45%	59	49	25	21	0	0	0	26	36	13	13	21	15
Weekday PM PH	98	N/A	98	60%	40%	59	39	24	22	0	0	0	22	30	11	11	24	6
Saturday Daily	1584	N/A	1584	50%	50%	792	792	316	211	0	0	0	454	603	227	227	249	354
Sat Midday PH	140	N/A	140	53%	47%	74	66	29	36	0	0	0	32	43	16	16	29	14

Assumed 43% passby rate (Trip Generation Handbook, 3rd Edition).

Net Increase	Total Trips	Total New Trips	Total Multi-Use Trips		Total Transit Trips		Total New Pass-by Trips	Total New Primary Trips	Total Pass-by Trips		Total Primary Trips		
			In	Out	In	Out			In	Out	In	Out	
Weekday Daily	9656	4828	4828	1371	1371	75	75	1468	5296	734	734	2648	2648
Weekday AM Peak Hour	578	404	174	78	78	15	4	46	357	23	23	288	69
Weekday PM Peak Hour	924	399	525	136	136	6	12	134	500	67	67	190	310
Saturday Daily	9278	4639	4639	1157	1157	38	38	1858	5030	929	929	2515	2515
Sat Midday Peak Hour	962	517	445	171	171	6	5	154	455	77	77	263	192

## Trip Generation Estimate

Project: 146 Dascomb Road Site Redevelopment Project - Andover, MA  
 Date: September 13, 2017  
 Analyst: Eindra (Elena) Aung, E.I.T.  
 Source: Institute of Transportation Engineers - Trip Generation, 9th Edition

**ITE Land Use Code (LUC):** 252 Senior Adult Housing - Attached

Average Vehicle Trips Ends vs: Dwelling Units  
 Independent Variable (X): 225  
 Curve Method: Average

### AVERAGE WEEKDAY DAILY

$T = 3.44 * (X)$   
 $T = 3.44 * 225.00$   
 $T = \boxed{774}$  vehicle trips  
 with 50% entering ( 387 vpd) and with 50% exiting ( 387 vpd)

### WEEKDAY MORNING PEAK HOUR

$T = 0.20 * (X)$   
 $T = 0.20 * 225.00$   
 $T = \boxed{46}$  vehicle trips  
 with 34% entering ( 16 vpd) and with 66% exiting ( 30 vpd)

### WEEKDAY EVENING PEAK HOUR

$T = 0.25 * (X)$   
 $T = 0.25 * 225.00$   
 $T = \boxed{56}$  vehicle trips  
 with 54% entering ( 30 vpd) and with 46% exiting ( 26 vpd)

### AVERAGE SATURDAY DAILY

$T = 2.61 * (X)$   
 $T = 2.61 * 225.00$   
 $T = \boxed{588}$  vehicle trips  
 with 50% entering ( 294 vpd) and with 50% exiting ( 294 vpd)

### SATURDAY MIDDAY PEAK HOUR

$T = 0.31 * (X)$   
 $T = 0.31 * 225.00$   
 $T = \boxed{70}$  vehicle trips  
 with 57% entering ( 40 vpd) and with 43% exiting ( 30 vpd)

### AVERAGE SUNDAY DAILY

$T = 2.84 * (X)$   
 $T = 2.84 * 225.00$   
 $T = \boxed{640}$  vehicle trips  
 with 50% entering ( 320 vpd) and with 50% exiting ( 320 vpd)

### SUNDAY MIDDAY PEAK HOUR

$T = 0.41 * (X)$   
 $T = 0.41 * 225.00$   
 $T = \boxed{92}$  vehicle trips  
 with 50% entering ( 46 vpd) and with 50% exiting ( 46 vpd)

## Trip Generation Estimate

Project: 146 Dascomb Road Site Redevelopment Project - Andover, MA  
 Date: September 13, 2017  
 Analyst: Eindra (Elena) Aung, E.I.T.  
 Source: Institute of Transportation Engineers - Trip Generation, 9th Edition

**ITE Land Use Code (LUC):** 252 Senior Adult Housing - Attached

Average Vehicle Trips Ends vs: Dwelling Units  
 Independent Variable (X): 225  
 Curve Method: Fitted

### AVERAGE WEEKDAY DAILY

T = 2.98 \* (X) + 21.05  
 T = 2.98 \* 225.00 + 21.05  
 T = **692** vehicle trips  
 with 50% entering ( 346 vpd) and with 50% exiting ( 346 vpd)

### WEEKDAY MORNING PEAK HOUR

T = 0.20 \* (X) + -0.13  
 T = 0.20 \* 225.00 + -0.13  
 T = **44** vehicle trips  
 with 34% entering ( 15 vpd) and with 66% exiting ( 29 vpd)

### WEEKDAY EVENING PEAK HOUR

T = 0.24 \* (X) + 1.64  
 T = 0.24 \* 225.00 + 1.64  
 T = **56** vehicle trips  
 with 54% entering ( 30 vpd) and with 46% exiting ( 26 vpd)

### AVERAGE SATURDAY DAILY

T = 2.12 \* (X) + 22.3  
 T = 2.12 \* 225.00 + 22.3  
 T = **500** vehicle trips  
 with 50% entering ( 250 vpd) and with 50% exiting ( 250 vpd)

### SATURDAY MIDDAY PEAK HOUR

T = 0.31 \* (X) + 0.46  
 T = 0.31 \* 225.00 + 0.46  
 T = **70** vehicle trips  
 with 57% entering ( 40 vpd) and with 43% exiting ( 30 vpd)

### AVERAGE SUNDAY DAILY

T = 2.29 \* (X) + 25.07  
 T = 2.29 \* 225.00 + 25.07  
 T = **540** vehicle trips  
 with 50% entering ( 270 vpd) and with 50% exiting ( 270 vpd)

### SUNDAY MIDDAY PEAK HOUR

T = 0.48 \* (X) + -2.76  
 T = 0.48 \* 225.00 + -2.76  
 T = **106** vehicle trips  
 with 50% entering ( 53 vpd) and with 50% exiting ( 53 vpd)

## Trip Generation Estimate

Project: 146 Dascomb Road Site Redevelopment Project - Andover, MA  
 Date: October 24, 2017  
 Analyst: Eindra (Elena) Aung, E.I.T.  
 Source: Institute of Transportation Engineers - Trip Generation, 9th Edition

**ITE Land Use Code (LUC):** 310 Hotel

Average Vehicle Trips Ends vs:	Rooms
Independent Variable (X):	100
Curve Method:	Average

### AVERAGE WEEKDAY DAILY

$T = 8.17 * (X)$   
 $T = 8.17 * 100.00$   
 $T = \boxed{818}$  vehicle trips  
 with 50% entering ( 409 vpd) and with 50% exiting ( 409 vpd)

### WEEKDAY MORNING PEAK HOUR

$T = 0.53 * (X)$   
 $T = 0.53 * 100.00$   
 $T = \boxed{54}$  vehicle trips  
 with 59% entering ( 32 vpd) and with 41% exiting ( 22 vpd)

### WEEKDAY EVENING PEAK HOUR

$T = 0.60 * (X)$   
 $T = 0.60 * 100.00$   
 $T = \boxed{60}$  vehicle trips  
 with 51% entering ( 31 vpd) and with 49% exiting ( 29 vpd)

### AVERAGE SATURDAY DAILY

$T = 8.19 * (X)$   
 $T = 8.19 * 100.00$   
 $T = \boxed{820}$  vehicle trips  
 with 50% entering ( 410 vpd) and with 50% exiting ( 410 vpd)

### SATURDAY MIDDAY PEAK HOUR

$T = 0.72 * (X)$   
 $T = 0.72 * 100.00$   
 $T = \boxed{72}$  vehicle trips  
 with 56% entering ( 40 vpd) and with 44% exiting ( 32 vpd)

### AVERAGE SUNDAY DAILY

$T = 5.95 * (X)$   
 $T = 5.95 * 100.00$   
 $T = \boxed{596}$  vehicle trips  
 with 50% entering ( 298 vpd) and with 50% exiting ( 298 vpd)

### SUNDAY MIDDAY PEAK HOUR

$T = 0.56 * (X)$   
 $T = 0.56 * 100.00$   
 $T = \boxed{56}$  vehicle trips  
 with 46% entering ( 26 vpd) and with 54% exiting ( 30 vpd)

## Trip Generation Estimate

Project: 146 Dascomb Road Site Redevelopment Project - Andover, MA  
 Date: October 24, 2017  
 Analyst: Eindra (Elena) Aung, E.I.T.  
 Source: Institute of Transportation Engineers - Trip Generation, 9th Edition

**ITE Land Use Code (LUC):** 310 Hotel

Average Vehicle Trips Ends vs:	Rooms
Independent Variable (X):	100
Curve Method:	Fitted

### AVERAGE WEEKDAY DAILY

T = 8.95 \* (X) + -373.16  
 T = 8.95 \* 100.00 + -373.16  
 T = **522** vehicle trips  
 with 50% entering ( 261 vpd) and with 50% exiting ( 261 vpd)

### WEEKDAY MORNING PEAK HOUR

T = 0.00 \* (X) + 0  
 T = 0.00 \* 100.00 + 0  
 T = **-** vehicle trips  
 with 59% entering ( - vpd) and with 41% exiting ( - vpd)

### WEEKDAY EVENING PEAK HOUR

T = 0.00 \* (X) + 0  
 T = 0.00 \* 100.00 + 0  
 T = **-** vehicle trips  
 with 51% entering ( - vpd) and with 49% exiting ( - vpd)

### AVERAGE SATURDAY DAILY

T = 9.62 \* (X) + -294.56  
 T = 9.62 \* 100.00 + -294.56  
 T = **668** vehicle trips  
 with 50% entering ( 334 vpd) and with 50% exiting ( 334 vpd)

### SATURDAY MIDDAY PEAK HOUR

T = 0.69 \* (X) + 4.32  
 T = 0.69 \* 100.00 + 4.32  
 T = **74** vehicle trips  
 with 56% entering ( 41 vpd) and with 44% exiting ( 33 vpd)

### AVERAGE SUNDAY DAILY

T = 0.00 \* (X) + 0  
 T = 0.00 \* 100.00 + 0  
 T = **-** vehicle trips  
 with 50% entering ( - vpd) and with 50% exiting ( - vpd)

### SUNDAY MIDDAY PEAK HOUR

T = 0.70 \* (X) + -29.89  
 T = 0.70 \* 100.00 + -29.89  
 T = **40** vehicle trips  
 with 46% entering ( 18 vpd) and with 54% exiting ( 22 vpd)

## Trip Generation Estimate

Project: 146 Dascomb Road Site Redevelopment Project - Andover, MA  
 Date: October 24, 2017  
 Analyst: Eindra (Elena) Aung, E.I.T.  
 Source: Institute of Transportation Engineers - Trip Generation, 9th Edition

**ITE Land Use Code (LUC):** 710 General Office Building

Average Vehicle Trips Ends vs: 1000 SF Gross Floor Area  
 Independent Variable (X): 150 KSF  
 Curve Method: Average

### AVERAGE WEEKDAY DAILY

$T = 11.03 * (X)$   
 $T = 11.03 * 150.00$   
 $T = \boxed{1,654}$  vehicle trips  
 with 50% entering ( 827 vpd) and with 50% exiting ( 827 vpd)

### WEEKDAY MORNING PEAK HOUR

$T = 1.56 * (X)$   
 $T = 1.56 * 150.00$   
 $T = \boxed{234}$  vehicle trips  
 with 88% entering ( 206 vpd) and with 12% exiting ( 28 vpd)

### WEEKDAY EVENING PEAK HOUR

$T = 1.49 * (X)$   
 $T = 1.49 * 150.00$   
 $T = \boxed{224}$  vehicle trips  
 with 17% entering ( 38 vpd) and with 83% exiting ( 186 vpd)

### AVERAGE SATURDAY DAILY

$T = 2.46 * (X)$   
 $T = 2.46 * 150.00$   
 $T = \boxed{370}$  vehicle trips  
 with 50% entering ( 185 vpd) and with 50% exiting ( 185 vpd)

### SATURDAY MIDDAY PEAK HOUR

$T = 0.43 * (X)$   
 $T = 0.43 * 150.00$   
 $T = \boxed{64}$  vehicle trips  
 with 54% entering ( 35 vpd) and with 46% exiting ( 29 vpd)

### AVERAGE SUNDAY DAILY

$T = 1.05 * (X)$   
 $T = 1.05 * 150.00$   
 $T = \boxed{158}$  vehicle trips  
 with 50% entering ( 79 vpd) and with 50% exiting ( 79 vpd)

### SUNDAY MIDDAY PEAK HOUR

$T = 0.16 * (X)$   
 $T = 0.16 * 150.00$   
 $T = \boxed{24}$  vehicle trips  
 with 58% entering ( 14 vpd) and with 42% exiting ( 10 vpd)

## Trip Generation Estimate

Project: 146 Dascomb Road Site Redevelopment Project - Andover, MA  
 Date: October 24, 2017  
 Analyst: Eindra (Elena) Aung, E.I.T.  
 Source: Institute of Transportation Engineers - Trip Generation, 9th Edition

**ITE Land Use Code (LUC):** 710 General Office Building

Average Vehicle Trips Ends vs: 1000 SF Gross Floor Area  
 Independent Variable (X): 150 KSF  
 Curve Method: Fitted

### AVERAGE WEEKDAY DAILY

$\ln(T) = 0.76 * \ln(X) + 3.68$   
 $\ln(T) = 0.76 * 5.01 + 3.68$   
 $T = 1,786$  vehicle trips  
 with 50% entering ( 893 vpd) and with 50% exiting ( 893 vpd)

### WEEKDAY MORNING PEAK HOUR

$\ln(T) = 0.80 * \ln(X) + 1.57$   
 $\ln(T) = 0.80 * 5.01 + 1.57$   
 $T = 264$  vehicle trips  
 with 88% entering ( 232 vpd) and with 12% exiting ( 32 vpd)

### WEEKDAY EVENING PEAK HOUR

$T = 1.12 * (X) + 78.45$   
 $T = 1.12 * 150.00 + 78.45$   
 $T = 246$  vehicle trips  
 with 17% entering ( 42 vpd) and with 83% exiting ( 204 vpd)

### AVERAGE SATURDAY DAILY

$T = 2.03 * (X) + 31.75$   
 $T = 2.03 * 150.00 + 31.75$   
 $T = 336$  vehicle trips  
 with 50% entering ( 168 vpd) and with 50% exiting ( 168 vpd)

### SATURDAY MIDDAY PEAK HOUR

$T = 0.00 * (X) + 0$   
 $T = 0.00 * 150.00 + 0$   
 $T = -$  vehicle trips  
 with 54% entering ( - vpd) and with 46% exiting ( - vpd)

### AVERAGE SUNDAY DAILY

$T = 0.00 * (X) + 0$   
 $T = 0.00 * 150.00 + 0$   
 $T = -$  vehicle trips  
 with 50% entering ( - vpd) and with 50% exiting ( - vpd)

### SUNDAY MIDDAY PEAK HOUR

$T = 0.00 * (X) + 0$   
 $T = 0.00 * 150.00 + 0$   
 $T = -$  vehicle trips  
 with 58% entering ( - vpd) and with 42% exiting ( - vpd)



## Trip Generation Estimate

Project: 146 Dascomb Road Site Redevelopment Project - Andover, MA  
Date: October 24, 2017  
Analyst: Eindra (Elena) Aung, E.I.T.  
Source: Institute of Transportation Engineers - Trip Generation, 9th Edition

**ITE Land Use Code (LUC):** 820 Shopping Center

Average Vehicle Trips Ends vs: 1000 SF Gross Leasable Area  
Independent Variable (X): 105 KSF  
Curve Method: Average

### AVERAGE WEEKDAY DAILY

$T = 42.70 * (X)$   
 $T = 42.70 * 105.00$   
 $T = \boxed{4,484}$  vehicle trips  
with 50% entering ( 2,242 vpd) and with 50% exiting ( 2,242 vpd)

### WEEKDAY MORNING PEAK HOUR

$T = 0.96 * (X)$   
 $T = 0.96 * 105.00$   
 $T = \boxed{100}$  vehicle trips  
with 62% entering ( 62 vpd) and with 38% exiting ( 38 vpd)

### WEEKDAY EVENING PEAK HOUR

$T = 3.71 * (X)$   
 $T = 3.71 * 105.00$   
 $T = \boxed{390}$  vehicle trips  
with 48% entering ( 187 vpd) and with 52% exiting ( 203 vpd)

### AVERAGE SATURDAY DAILY

$T = 49.97 * (X)$   
 $T = 49.97 * 105.00$   
 $T = \boxed{5,246}$  vehicle trips  
with 50% entering ( 2,623 vpd) and with 50% exiting ( 2,623 vpd)

### SATURDAY MIDDAY PEAK HOUR

$T = 4.82 * (X)$   
 $T = 4.82 * 105.00$   
 $T = \boxed{506}$  vehicle trips  
with 52% entering ( 263 vpd) and with 48% exiting ( 243 vpd)

### AVERAGE SUNDAY DAILY

$T = 25.24 * (X)$   
 $T = 25.24 * 105.00$   
 $T = \boxed{2,650}$  vehicle trips  
with 50% entering ( 1,325 vpd) and with 50% exiting ( 1,325 vpd)

### SUNDAY MIDDAY PEAK HOUR

$T = 3.12 * (X)$   
 $T = 3.12 * 105.00$   
 $T = \boxed{328}$  vehicle trips  
with 49% entering ( 161 vpd) and with 51% exiting ( 167 vpd)

## Trip Generation Estimate

Project: 146 Dascomb Road Site Redevelopment Project - Andover, MA  
 Date: October 24, 2017  
 Analyst: Eindra (Elena) Aung, E.I.T.  
 Source: Institute of Transportation Engineers - Trip Generation, 9th Edition

**ITE Land Use Code (LUC):** 820 Shopping Center

Average Vehicle Trips Ends vs: 1000 SF Gross Leasable Area  
 Independent Variable (X): 105 KSF  
 Curve Method: Fitted

### AVERAGE WEEKDAY DAILY

$\ln(T) = 0.65 * \ln(X) + 5.83$   
 $\ln(T) = 0.65 * 4.65 + 5.83$   
 $T = \boxed{7,010}$  vehicle trips  
 with 50% entering ( 3,505 vpd) and with 50% exiting ( 3,505 vpd)

### WEEKDAY MORNING PEAK HOUR

$\ln(T) = 0.61 * \ln(X) + 2.24$   
 $\ln(T) = 0.61 * 4.65 + 2.24$   
 $T = \boxed{160}$  vehicle trips  
 with 62% entering ( 99 vpd) and with 38% exiting ( 61 vpd)

### WEEKDAY EVENING PEAK HOUR

$\ln(T) = 0.67 * \ln(X) + 3.31$   
 $\ln(T) = 0.67 * 4.65 + 3.31$   
 $T = \boxed{620}$  vehicle trips  
 with 48% entering ( 298 vpd) and with 52% exiting ( 322 vpd)

### AVERAGE SATURDAY DAILY

$\ln(T) = 0.63 * \ln(X) + 6.23$   
 $\ln(T) = 0.63 * 4.65 + 6.23$   
 $T = \boxed{9,528}$  vehicle trips  
 with 50% entering ( 4,764 vpd) and with 50% exiting ( 4,764 vpd)

### SATURDAY MIDDAY PEAK HOUR

$\ln(T) = 0.65 * \ln(X) + 3.78$   
 $\ln(T) = 0.65 * 4.65 + 3.78$   
 $T = \boxed{902}$  vehicle trips  
 with 52% entering ( 469 vpd) and with 48% exiting ( 433 vpd)

### AVERAGE SUNDAY DAILY

$T = 15.63 * (X) + 4214.46$   
 $T = 15.63 * 105.00 + 4214.46$   
 $T = \boxed{5,856}$  vehicle trips  
 with 50% entering ( 2,928 vpd) and with 50% exiting ( 2,928 vpd)

### SUNDAY MIDDAY PEAK HOUR

$T = 0.00 * (X) + 0$   
 $T = 0.00 * 105.00 + 0$   
 $T = \boxed{-}$  vehicle trips  
 with 49% entering ( - vpd) and with 51% exiting ( - vpd)

## Trip Generation Estimate

Project: 146 Dascomb Road Site Redevelopment Project - Andover, MA  
Date: September 13, 2017  
Analyst: Eindra (Elena) Aung, E.I.T.  
Source: Institute of Transportation Engineers - Trip Generation, 9th Edition

**ITE Land Use Code (LUC):** 931 Quality Restaurant

Average Vehicle Trips Ends vs: 1000 SF Gross Floor Area  
Independent Variable (X): 10 KSF  
Curve Method: Average

### AVERAGE WEEKDAY DAILY

$T = 89.95 * (X)$   
 $T = 89.95 * 10.00$   
 $T = \boxed{900}$  vehicle trips  
with 50% entering ( 450 vpd) and with 50% exiting ( 450 vpd)

### WEEKDAY MORNING PEAK HOUR

$T = 0.81 * (X)$   
 $T = 0.81 * 10.00$   
 $T = \boxed{8}$  vehicle trips  
with 50% entering ( 4 vpd) and with 50% exiting ( 4 vpd)

### WEEKDAY EVENING PEAK HOUR

$T = 7.49 * (X)$   
 $T = 7.49 * 10.00$   
 $T = \boxed{74}$  vehicle trips  
with 67% entering ( 50 vpd) and with 33% exiting ( 24 vpd)

### AVERAGE SATURDAY DAILY

$T = 94.36 * (X)$   
 $T = 94.36 * 10.00$   
 $T = \boxed{944}$  vehicle trips  
with 50% entering ( 472 vpd) and with 50% exiting ( 472 vpd)

### SATURDAY MIDDAY PEAK HOUR

$T = 10.82 * (X)$   
 $T = 10.82 * 10.00$   
 $T = \boxed{108}$  vehicle trips  
with 59% entering ( 64 vpd) and with 41% exiting ( 44 vpd)

### AVERAGE SUNDAY DAILY

$T = 72.16 * (X)$   
 $T = 72.16 * 10.00$   
 $T = \boxed{722}$  vehicle trips  
with 50% entering ( 361 vpd) and with 50% exiting ( 361 vpd)

### SUNDAY MIDDAY PEAK HOUR

$T = 8.38 * (X)$   
 $T = 8.38 * 10.00$   
 $T = \boxed{84}$  vehicle trips  
with 63% entering ( 53 vpd) and with 37% exiting ( 31 vpd)

## Trip Generation Estimate

Project: 146 Dascomb Road Site Redevelopment Project - Andover, MA  
 Date: September 13, 2017  
 Analyst: Eindra (Elena) Aung, E.I.T.  
 Source: Institute of Transportation Engineers - Trip Generation, 9th Edition

**ITE Land Use Code (LUC):** 932 High-Turnover (Sit-Down) Restaurant

Average Vehicle Trips Ends vs: 1000 SF Gross Floor Area  
 Independent Variable (X): 10 KSF  
 Curve Method: Average

### AVERAGE WEEKDAY DAILY

$T = 127.15 * (X)$   
 $T = 127.15 * 10.00$   
 $T = \boxed{1,272}$  vehicle trips  
 with 50% entering ( 636 vpd) and with 50% exiting ( 636 vpd)

### WEEKDAY MORNING PEAK HOUR

$T = 10.81 * (X)$   
 $T = 10.81 * 10.00$   
 $T = \boxed{108}$  vehicle trips  
 with 55% entering ( 59 vpd) and with 45% exiting ( 49 vpd)

### WEEKDAY EVENING PEAK HOUR

$T = 9.85 * (X)$   
 $T = 9.85 * 10.00$   
 $T = \boxed{98}$  vehicle trips  
 with 60% entering ( 59 vpd) and with 40% exiting ( 39 vpd)

### AVERAGE SATURDAY DAILY

$T = 158.37 * (X)$   
 $T = 158.37 * 10.00$   
 $T = \boxed{1,584}$  vehicle trips  
 with 50% entering ( 792 vpd) and with 50% exiting ( 792 vpd)

### SATURDAY MIDDAY PEAK HOUR

$T = 14.07 * (X)$   
 $T = 14.07 * 10.00$   
 $T = \boxed{140}$  vehicle trips  
 with 53% entering ( 74 vpd) and with 47% exiting ( 66 vpd)

### AVERAGE SUNDAY DAILY

$T = 131.84 * (X)$   
 $T = 131.84 * 10.00$   
 $T = \boxed{1,318}$  vehicle trips  
 with 50% entering ( 659 vpd) and with 50% exiting ( 659 vpd)

### SUNDAY MIDDAY PEAK HOUR

$T = 18.46 * (X)$   
 $T = 18.46 * 10.00$   
 $T = \boxed{184}$  vehicle trips  
 with 55% entering ( 101 vpd) and with 45% exiting ( 83 vpd)

Land Use Description	Land Use	A	B	C	D	E
	Land Use Name	Shopping Center	Senior Housing	Office	Restaurant	Hotel
	Land Use Type	Retail	Residential	Office	Restaurant	Hotel
	ITE LUC	820	252	710	932	310
	Size	155 ksf	225 units	200 ksf	20 ksf	125 rooms
New Trips	<i>Weekday Daily</i>					
	Enter	2242	346	893	1086	261
	Exit	2242	346	893	1086	261
	<i>Weekday AM</i>					
	Enter	62	15	232	63	32
	Exit	38	29	32	53	22
	<i>Weekday PM</i>					
	Enter	187	30	42	109	31
	Exit	203	26	204	63	29
	<i>Saturday Daily</i>					
	Enter	2623	250	168	1264	334
	Exit	2623	250	168	1264	334
	<i>Saturday Midday</i>					
	Enter	263	40	35	138	41
	Exit	243	30	29	110	33

Project Name: 146 Dascomb Road Site Redevelopment Project

Analyst: EA

Date: 10/24/2017

KEY: Entry Cells

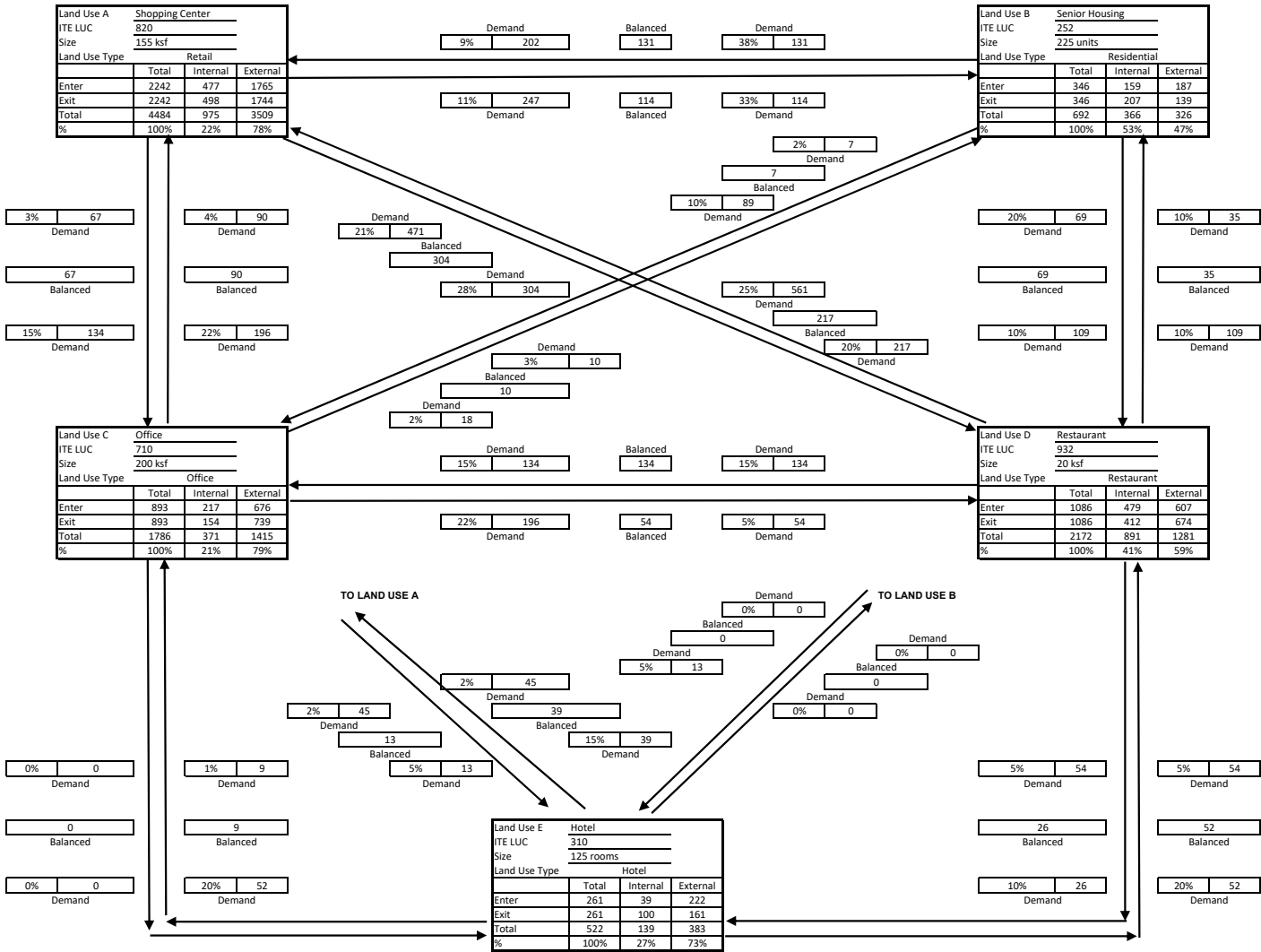
**INSTRUCTIONS:**

- 1.) Enter the Land Use Name for each land use in table above.
- 2.) Select from the drop down menu in the table above which Land Use Type to use.
- 3.) Enter the ITE LUC for each land use in the table above.
- 4.) Enter the Size of each land use in the table above.
- 5.) Fill in the NEW TRIPS for each land use in the table above (Note: This is the total of
- 6.) Enter the Project Name above.
- 7.) Enter you initials for the Analyst above.
- 8.) Enter the Date above.
- 9.) Print the Multi-Use Trip Generation Calculation Sheet for each time period.

**Multi-Use Trip Generation Calculation**

Analyst: EA  
Date: 10/24/2017

Project Name: 146 Dascomb Road Site Redevelopment  
Time Period: Weekday Daily

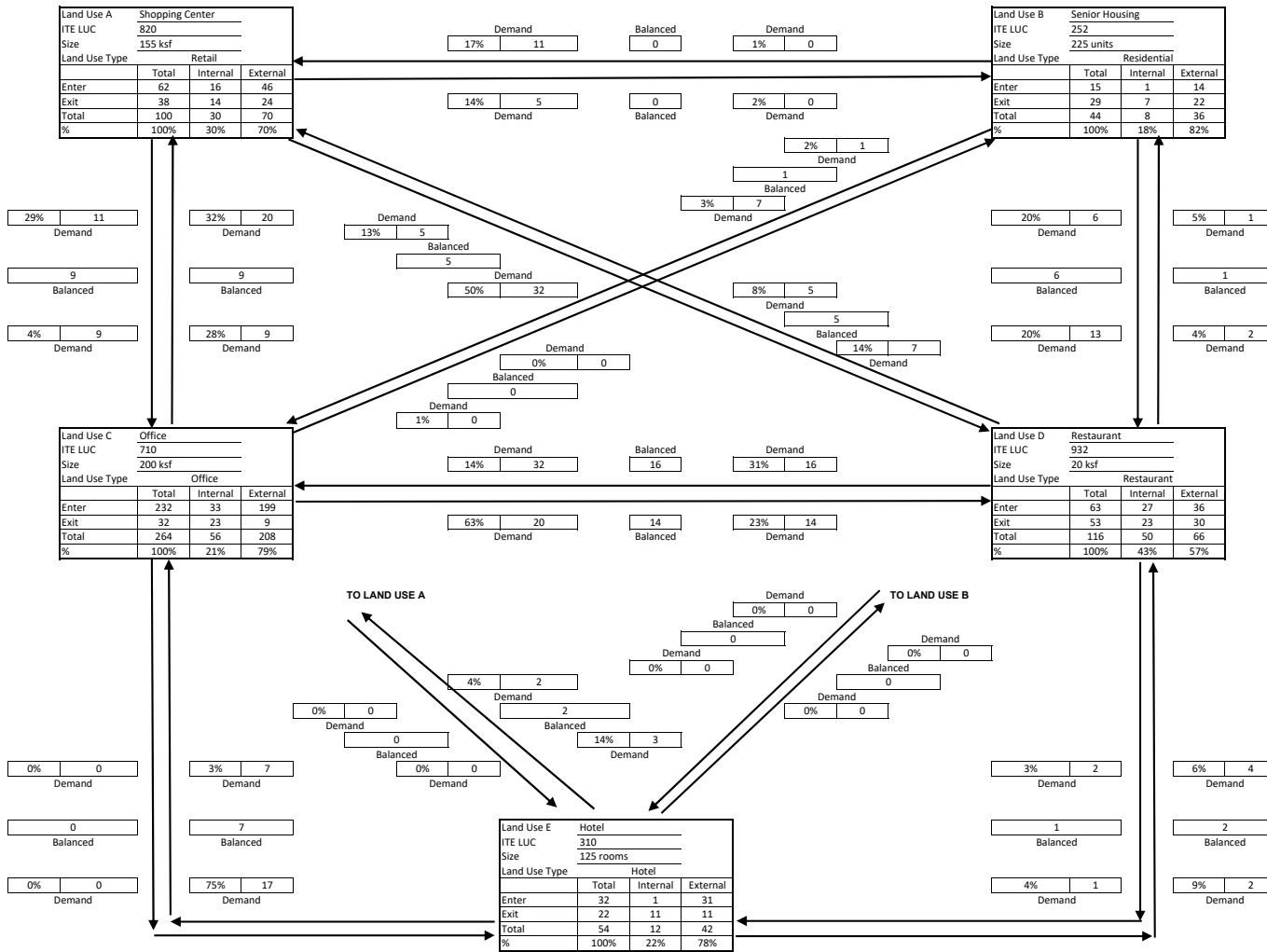


Net External Trips for Multi-Use Development						
Land Use	A	B	C	D	E	Total
Enter	1765	187	676	607	222	3457
Exit	1744	139	739	674	161	3457
Total	3509	326	1415	1281	383	6914
Single-Use Trip Gen. Est.	4484	692	1786	2172	522	9656
						<b>Internal Capture</b>
						<b>28%</b>

**Multi-Use Trip Generation Calculation**

Analyst: EA  
Date: 10/24/2017

Project Name: 146 Dascomb Road Site Redevelopment  
Time Period: Weekday AM Peak Hour



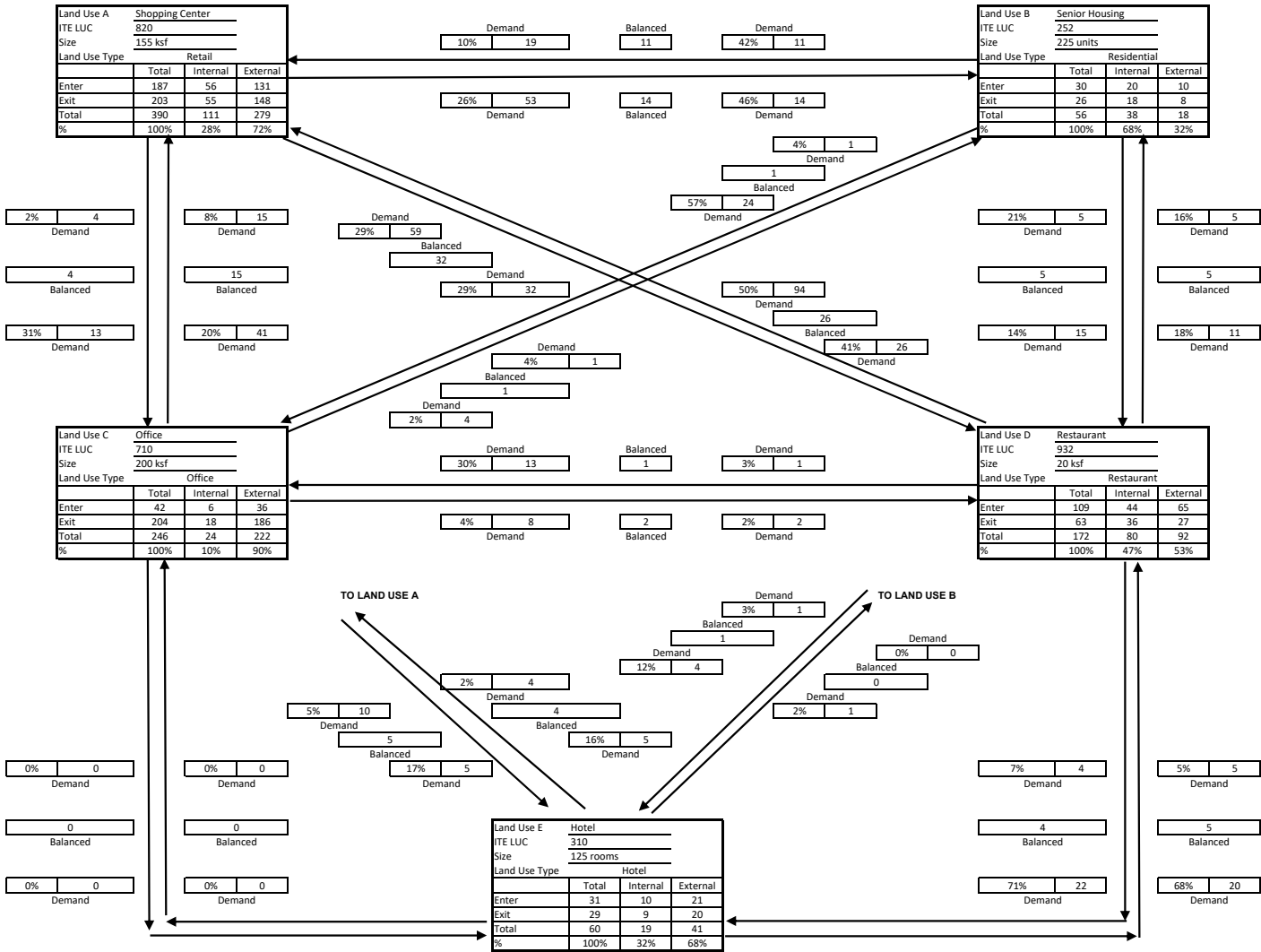
Net External Trips for Multi-Use Development						
Land Use	A	B	C	D	E	Total
Enter	46	14	199	36	31	326
Exit	24	22	9	30	11	96
<b>Total External Trips</b>	70	36	208	66	42	422
Single-Use Trip Gen. Est.	100	44	264	116	54	578
<b>Net Internal Trips</b>	30	8	56	50	12	156

Internal Capture: 27%

**Multi-Use Trip Generation Calculation**

Analyst: EA  
Date: 10/24/2017

Project Name: 146 Dascomb Road Site Redevelopment  
Time Period: Weekday PM Peak Hour



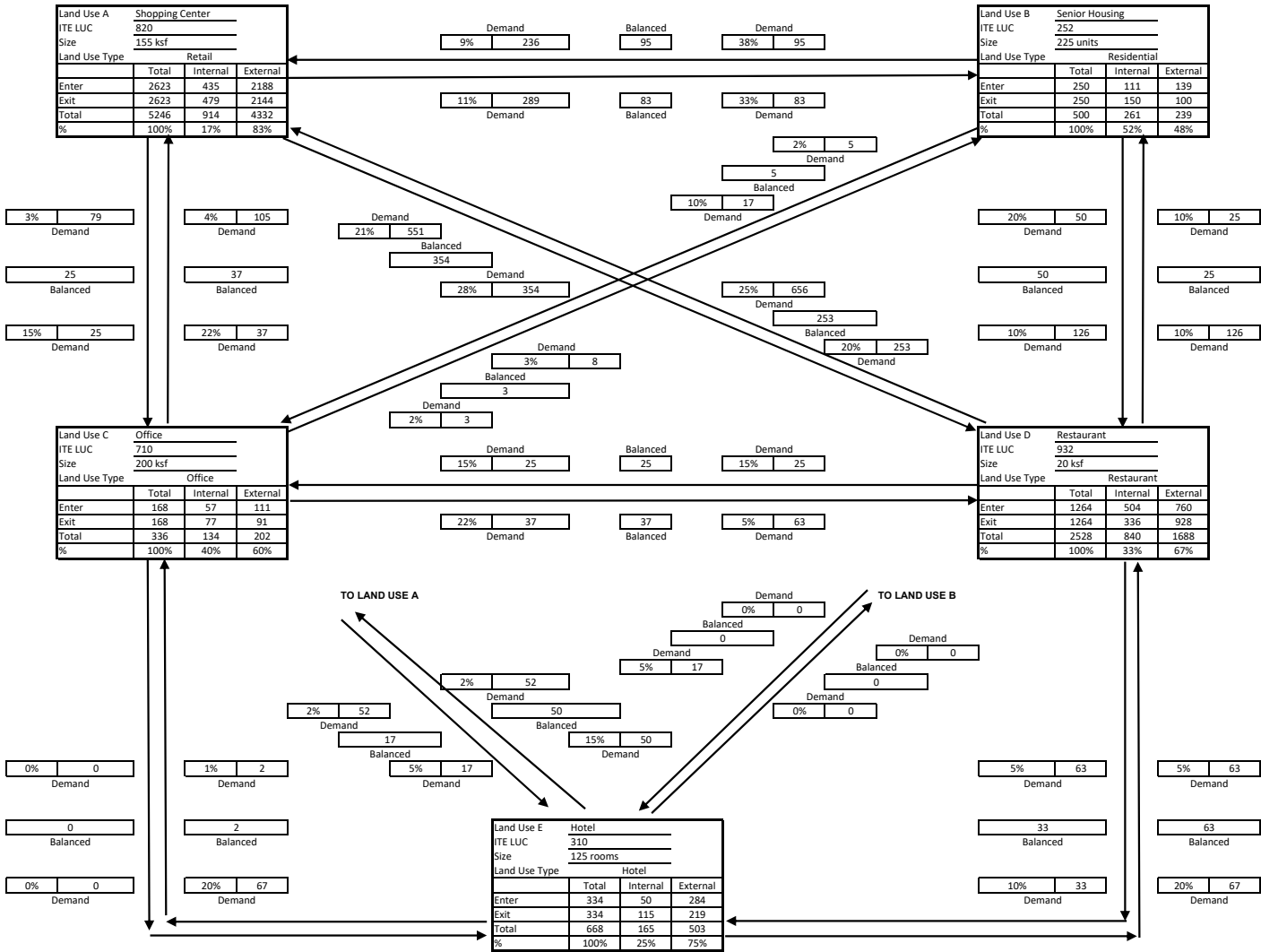
Net External Trips for Multi-Use Development							
Land Use	A	B	C	D	E	Total	
Enter	131	10	36	65	21	263	
Exit	148	8	186	27	20	389	
Total	279	18	222	92	41	652	
Single-Use Trip Gen. Est.	390	56	246	172	60	924	
							Internal Capture 29%



**Multi-Use Trip Generation Calculation**

Analyst: EA  
Date: 10/24/2017

Project Name: 146 Dascomb Road Site Redevelopment  
Time Period: Saturday Daily



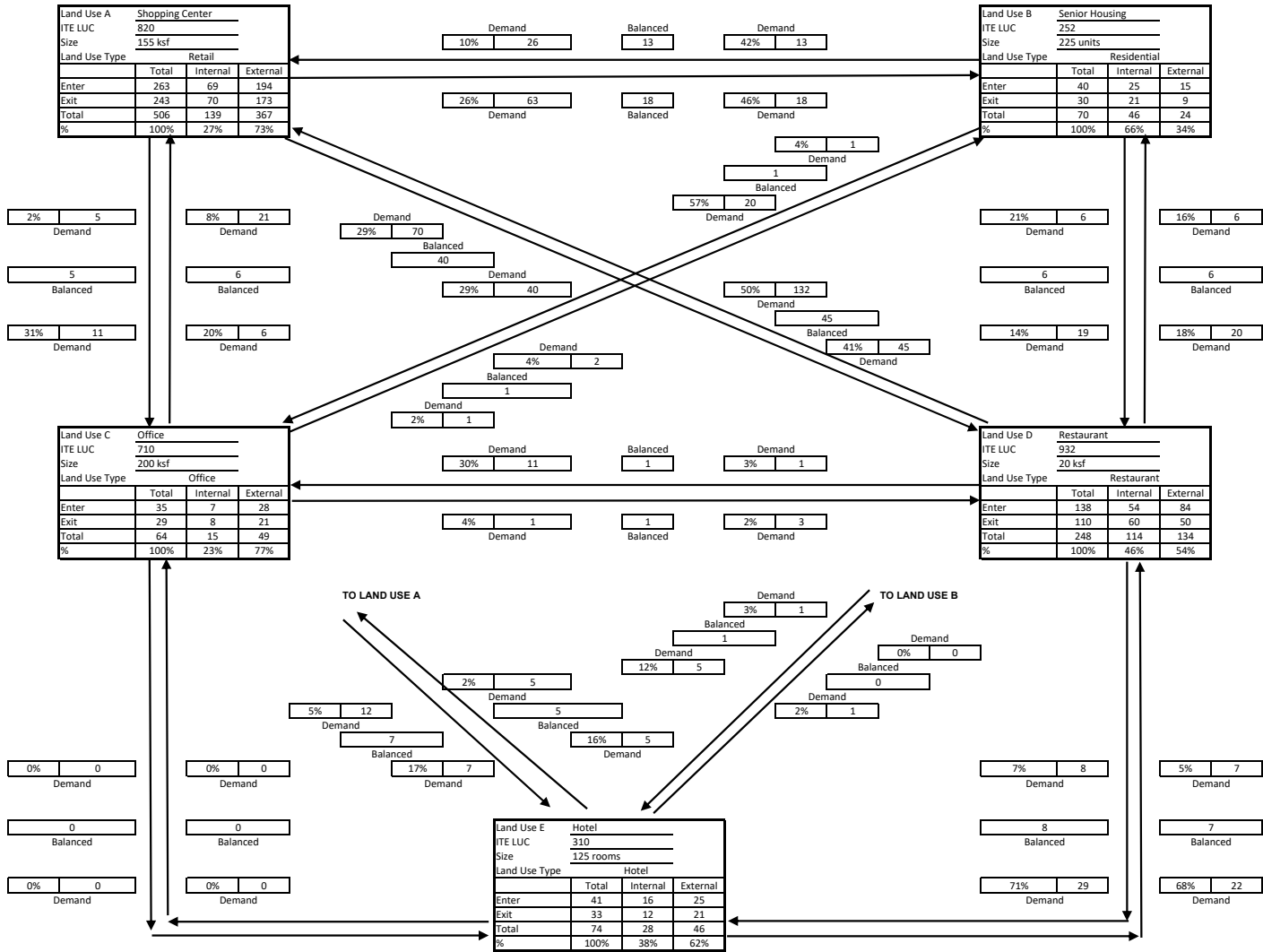
Net External Trips for Multi-Use Development						
Land Use	A	B	C	D	E	Total
Enter	2188	139	111	760	284	3482
Exit	2144	100	91	928	219	3482
Total	4332	239	202	1688	503	6964
Single-Use Trip Gen. Est.	5246	500	336	2528	668	9278
						25%

Internal Capture

**Multi-Use Trip Generation Calculation**

Analyst: EA  
Date: 10/24/2017

Project Name: 146 Dascomb Road Site Redevelopment  
Time Period: Saturday Midday Peak Hour



Land Use	A	B	C	D	E	Total
Enter	194	15	28	84	25	346
Exit	173	9	21	50	21	274
Total	367	24	49	134	46	620
Single-Use Trip Gen. Est.	506	70	64	248	74	962
<b>Internal Capture</b>						<b>36%</b>

**Attachment I**

Trip Distribution









**Attachment J**

MUTCD Traffic Signal Warrant Analysis





Dascomb Road / Smith Drive



RAW DATA INPUT				
VOLUMES				
Time	Smith SB	Smith NB	Dascomb WB	Dascomb EB
6-7 AM				
7-8 AM	33		930	935
8-9 AM	44		916	758
9-10 AM	73		731	618
10-11 AM	94		604	625
11-12 PM	97		628	609
12-1 PM	65		659	614
1-2 PM	78		674	659
2-3 PM	81		767	768
3-4 PM	117		987	920
4-5 PM	87		1008	993
5-6 PM	68		1098	1054
6-7 PM	53		906	947

SEASONALLY ADJUSTED DATA				
VOLUMES				
Time	Smith SB	Smith NB	Dascomb WB	Dascomb EB
6-7 AM	0	0	0	0
7-8 AM	0	33	930	935
8-9 AM	0	44	916	758
9-10 AM	0	73	731	618
10-11 AM	0	94	604	625
11-12 PM	0	97	628	609
12-1 PM	0	65	659	614
1-2 PM	0	78	674	659
2-3 PM	0	81	767	768
3-4 PM	0	117	987	920
4-5 PM	0	87	1008	993
5-6 PM	0	68	1098	1054
6-7 PM	0	53	906	947

SITE-GENERATED DATA				
VOLUMES				
Time	Smith SB	Smith NB	Dascomb WB	Dascomb EB
6-7 AM				
7-8 AM		16	171	46
8-9 AM		16	171	46
9-10 AM		31	25	12
10-11 AM		42	32	14
11-12 PM		51	39	16
12-1 PM		230	174	48
1-2 PM		63	42	16
2-3 PM		65	41	15
3-4 PM		64	41	15
4-5 PM		121	68	24
5-6 PM		121	68	24
6-7 PM		58	40	15

BUILD DATA				
VOLUMES				
Time	Smith SB	Smith NB	Dascomb WB	Dascomb EB
6-7 AM	0	0	0	0
7-8 AM	0	49	1101	981
8-9 AM	0	60	1087	804
9-10 AM	0	104	756	630
10-11 AM	0	136	636	639
11-12 PM	0	148	667	625
12-1 PM	0	295	833	662
1-2 PM	0	141	716	675
2-3 PM	0	146	808	783
3-4 PM	0	181	1028	935
4-5 PM	0	208	1076	1017
5-6 PM	0	189	1166	1078
6-7 PM	0	111	946	962

Seasonal Adjustment: 0.0%

SENIOR ADULT HOUSING TRIPS				
VOLUMES				
Time	Smith SB	Smith NB	Dascomb WB	Dascomb EB
6-7 AM				
7-8 AM	2	5		2
8-9 AM	2	5		2
9-10 AM	1	4		2
10-11 AM	1	4		2
11-12 PM	1	4		2
12-1 PM	1	6		2
1-2 PM	1	4		2
2-3 PM	1	4		2
3-4 PM	1	4		2
4-5 PM	1	2		1
5-6 PM	1	2		1
6-7 PM	1	4		2

In: 170      Out: 122  
 13            21  
 8             7  
 WB: 28%    EB: 10%  
 128           66

HOTEL TRIPS				
VOLUMES				
Time	Smith SB	Smith NB	Dascomb WB	Dascomb EB
6-7 AM				
7-8 AM	0	0	0	0
8-9 AM	0	0	0	0
9-10 AM	0	0	0	0
10-11 AM	0	0	0	0
11-12 PM	0	0	0	0
12-1 PM	0	0	0	0
1-2 PM	0	0	0	0
2-3 PM	0	0	0	0
3-4 PM	0	0	0	0
4-5 PM	0	0	0	0
5-6 PM	0	0	0	0
6-7 PM	0	0	0	0

In: 209      Out: 148  
 29            10  
 19            19  
 WB: 100%   EB: 0%  
 113           90

OFFICE TRIPS				
VOLUMES				
Time	Smith SB	Smith NB	Dascomb WB	Dascomb EB
6-7 AM				
7-8 AM		3	150	37
8-9 AM		3	150	37
9-10 AM		20	3	1
10-11 AM		20	3	1
11-12 PM		20	3	1
12-1 PM		188	130	31
1-2 PM		20	3	1
2-3 PM		20	3	1
3-4 PM		20	3	1
4-5 PM		82	27	7
5-6 PM		82	27	7
6-7 PM		20	3	1

In: 631      Out: 694  
 187           7  
 34            176  
 WB: 80%    EB: 20%  
 189           328

RETAIL/RESTAURANT TRIPS				
VOLUMES				
Time	Smith SB	Smith NB	Dascomb WB	Dascomb EB
6-7 AM				
7-8 AM		11	16	7
8-9 AM		11	16	7
9-10 AM		10	18	9
10-11 AM		21	25	11
11-12 PM		30	32	13
12-1 PM		41	38	15
1-2 PM		42	35	13
2-3 PM		44	34	12
3-4 PM		43	34	12
4-5 PM		38	39	16
5-6 PM		38	39	16
6-7 PM		37	33	12

In: 1638      Out: 1684  
 59            31  
 129           108  
 WB: 20%    EB: 27%  
 1262           1406



85th Percentile > 40 mph? **OR** Population <10,000 people? N

**Warrant 1** - One of the Following Conditions Must Be Met for any 8 hours of an average day (Table 4C-1)

**Individual Option:**

**Condition A: Minimum Vehicular Volume  
100%**

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	2	600	0	2082	1891	1386	1275	1292	1495	1391	1591	1963	2093	2244	1908
Minor	2	200	0	49	60	104	136	148	295	141	146	181	208	189	111
Met?			NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO

**OR**

**Condition B: Interruption of Continuous Traffic  
100%**

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	2	900	0	2082	1891	1386	1275	600	1495	1391	1591	1963	2093	2244	1908
Minor	2	100	0	49	60	104	136	148	295	141	146	181	208	189	111
Met?			NO	NO	NO	YES	YES	NO	YES	YES	YES	YES	YES	YES	YES

Result: YES

**Combination Option:**

**Condition A: Minimum Vehicular Volume  
80%**

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	2	480	0	2082	1891	1386	1275	1292	1495	1391	1591	1963	2093	2244	1908
Minor	2	160	0	49	60	104	136	148	295	141	146	181	208	189	111
Met?			NO	NO	NO	NO	NO	NO	YES	NO	NO	YES	YES	YES	NO

**AND**

**Condition B: Interruption of Continuous Traffic  
80%**

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	2	720	0	2082	1891	1386	1275	1292	1495	1391	1591	1963	2093	2244	1908
Minor	2	80	0	49	60	104	136	148	295	141	146	181	208	189	111
Met?			NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Result: NO



**Warrant 2 - Four-Hour Vehicular Volume (must be met for any 4 hours of an average day)**

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	2	Figure 4C-1	0	2082	1891	1386	1275	1292	1495	1391	1591	1963	2093	2244	1908
Minor	2	Figure 4C-1	0	49	60	104	136	148	295	141	146	181	208	189	111
Met?			NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO

Result: NO

**Warrant 3 - Peak Hour Volume (must be met for 1 hour of an average day)**

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	2	Figure 4C-3	0	2082	1891	1386	1275	1292	1495	1391	1591	1963	2093	2244	1908
Minor	2	Figure 4C-3	0	49	60	104	136	148	295	141	146	181	208	189	111
Met?			NO	YES	YES	NO	NO	NO	YES	NO	YES	YES	YES	YES	YES

Result: YES

**Warrants 4 to 8: Not Evaluated**

Dascomb Road / Interstate 93 NB Ramps



RAW DATA INPUT				
VOLUMES				
Time	Minor SB	Minor NB	Major WB	Major EB
6-7 AM				
7-8 AM		390	622	407
8-9 AM		375	687	378
9-10 AM		301	403	233
10-11 AM		249	348	157
11-12 PM		253	290	218
12-1 PM		294	308	197
1-2 PM		315	329	233
2-3 PM		309	500	292
3-4 PM		382	581	315
4-5 PM		412	548	445
5-6 PM		370	646	552
6-7 PM		433	444	404

SEASONALLY ADJUSTED DATA				
VOLUMES				
Time	Minor SB	Minor NB	Major WB	Major EB
6-7 AM	0	0	0	0
7-8 AM	0	390	622	407
8-9 AM	0	375	687	378
9-10 AM	0	301	403	233
10-11 AM	0	249	348	157
11-12 PM	0	253	290	218
12-1 PM	0	294	308	197
1-2 PM	0	315	329	233
2-3 PM	0	309	500	292
3-4 PM	0	382	581	315
4-5 PM	0	412	548	445
5-6 PM	0	370	646	552
6-7 PM	0	433	444	404

SITE-GENERATED DATA				
VOLUMES				
Time	Minor SB	Minor NB	Major WB	Major EB
6-7 AM				
7-8 AM				
8-9 AM				
9-10 AM				
10-11 AM				
11-12 PM				
12-1 PM				
1-2 PM				
2-3 PM				
3-4 PM				
4-5 PM				
5-6 PM				
6-7 PM				

BUILD DATA				
VOLUMES				
Time	Minor SB	Minor NB	Major WB	Major EB
6-7 AM	0	0	0	0
7-8 AM	0	390	622	407
8-9 AM	0	375	687	378
9-10 AM	0	301	403	233
10-11 AM	0	249	348	157
11-12 PM	0	253	290	218
12-1 PM	0	294	308	197
1-2 PM	0	315	329	233
2-3 PM	0	309	500	292
3-4 PM	0	382	581	315
4-5 PM	0	412	548	445
5-6 PM	0	370	646	552
6-7 PM	0	433	444	404

Seasonal Adjustment: 0.0%

Assumptions:

	Entering	Exiting
AM Adj.	0	0
AM Gen.	0	0
PM Adj.	0	0
PM Gen.	0	0



85th Percentile > 40 mph? **OR** Population <10,000 people? N

**Warrant 1 - One of the Following Conditions Must Be Met for any 8 hours of an average day (Table 4C-1)**

**Individual Option:**

**Condition A: Minimum Vehicular Volume**  
**100%**

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	500	0	1029	1065	636	505	508	505	562	792	896	993	1198	848
Minor	1	150	0	390	375	301	249	253	294	315	309	382	412	370	433
Met?			NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

**OR**

**Condition B: Interruption of Continuous Traffic**  
**100%**

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	750	0	1029	1065	636	505	600	505	562	792	896	993	1198	848
Minor	1	75	0	390	375	301	249	253	294	315	309	382	412	370	433
Met?			NO	YES	YES	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES

Result: YES

**Combination Option:**

**Condition A: Minimum Vehicular Volume**  
**80%**

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	400	0	1029	1065	636	505	508	505	562	792	896	993	1198	848
Minor	1	120	0	390	375	301	249	253	294	315	309	382	412	370	433
Met?			NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

**AND**

**Condition B: Interruption of Continuous Traffic**  
**80%**

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	600	0	1029	1065	636	505	508	505	562	792	896	993	1198	848
Minor	1	60	0	390	375	301	249	253	294	315	309	382	412	370	433
Met?			NO	YES	YES	YES	NO	NO	NO	NO	YES	YES	YES	YES	YES

Result: YES





**Warrant 2 - Four-Hour Vehicular Volume (must be met for any 4 hours of an average day)**

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	Figure 4C-1	0	1029	1065	636	505	508	505	562	792	896	993	1198	848
Minor	1	Figure 4C-1	0	390	375	301	249	253	294	315	309	382	412	370	433
Met?			NO	YES	YES	YES	NO	NO	YES	YES	YES	YES	YES	YES	YES

Result: YES

**Warrant 3 - Peak Hour Volume (must be met for 1 hour of an average day)**

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	Figure 4C-3	0	1029	1065	636	505	508	505	562	792	896	993	1198	848
Minor	1	Figure 4C-3	0	390	375	301	249	253	294	315	309	382	412	370	433
Met?			NO	YES	YES	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES

Result: YES

**Warrants 4 to 8: Not Evaluated**

Frontage Road / Interstate 93 SB Ramps



RAW DATA INPUT				
Time	VOLUMES			
	I-93 EB	I-93 WB	Frontage NB	Frontage SB
6-7 AM				
7-8 AM		486	255	198
8-9 AM		473	243	136
9-10 AM		374	97	83
10-11 AM		279	56	67
11-12 PM		307	59	129
12-1 PM		306	85	104
1-2 PM		323	86	84
2-3 PM		383	92	230
3-4 PM		390	101	230
4-5 PM		434	116	316
5-6 PM		421	119	291
6-7 PM		288	107	167

SEASONALLY ADJUSTED DATA				
Time	VOLUMES			
	I-93 EB	I-93 WB	Frontage NB	Frontage SB
6-7 AM	0	0	0	0
7-8 AM	0	486	255	198
8-9 AM	0	473	243	136
9-10 AM	0	374	97	83
10-11 AM	0	279	56	67
11-12 PM	0	307	59	129
12-1 PM	0	306	85	104
1-2 PM	0	323	86	84
2-3 PM	0	383	92	230
3-4 PM	0	390	101	230
4-5 PM	0	434	116	316
5-6 PM	0	421	119	291
6-7 PM	0	288	107	167

SITE-GENERATED DATA				
Time	VOLUMES			
	I-93 EB	I-93 WB	Frontage NB	Frontage SB
6-7 AM				
7-8 AM		52	0	0
8-9 AM		55	0	0
9-10 AM		20	0	0
10-11 AM		25	0	0
11-12 PM		30	0	0
12-1 PM		73	0	0
1-2 PM		28	0	0
2-3 PM		26	0	0
3-4 PM		27	0	0
4-5 PM		70	0	0
5-6 PM		72	0	0
6-7 PM		26	0	0

BUILD DATA				
Time	VOLUMES			
	I-93 EB	I-93 WB	Frontage NB	Frontage SB
6-7 AM	0	0	0	0
7-8 AM	0	538	255	198
8-9 AM	0	528	243	136
9-10 AM	0	394	97	83
10-11 AM	0	304	56	67
11-12 PM	0	337	59	129
12-1 PM	0	379	85	104
1-2 PM	0	351	86	84
2-3 PM	0	409	92	230
3-4 PM	0	417	101	230
4-5 PM	0	504	116	316
5-6 PM	0	493	119	291
6-7 PM	0	314	107	167

Seasonal Adjustment: 0.0%

SENIOR ADULT HOUSING TRIPS				
Time	VOLUMES			
	I-93 EB	I-93 WB	Frontage NB	Frontage SB
6-7 AM				
7-8 AM				
8-9 AM				
9-10 AM				
10-11 AM				
11-12 PM				
12-1 PM				
1-2 PM				
2-3 PM				
3-4 PM				
4-5 PM		9		
5-6 PM		9		
6-7 PM				

In: 170  
 WB: 10%

HOTEL TRIPS				
Time	VOLUMES			
	I-93 EB	I-93 WB	Frontage NB	Frontage SB
6-7 AM				
7-8 AM				
8-9 AM				
9-10 AM				
10-11 AM				
11-12 PM				
12-1 PM		18		
1-2 PM		1		
2-3 PM		1		
3-4 PM		1		
4-5 PM		35		
5-6 PM		35		
6-7 PM				

In: 209  
 WB: 35%

OFFICE TRIPS				
Time	VOLUMES			
	I-93 EB	I-93 WB	Frontage NB	Frontage SB
6-7 AM				
7-8 AM		45		
8-9 AM		45		
9-10 AM		2		
10-11 AM		2		
11-12 PM		2		
12-1 PM		24		
1-2 PM				
2-3 PM				
3-4 PM				
4-5 PM				
5-6 PM				
6-7 PM				

In: 631  
 WB: 15%

RETAIL/RESTAURANT TRIPS				
Time	VOLUMES			
	I-93 EB	I-93 WB	Frontage NB	Frontage SB
6-7 AM				
7-8 AM		7		
8-9 AM		10		
9-10 AM		18		
10-11 AM		23		
11-12 PM		28		
12-1 PM		31		
1-2 PM		27		
2-3 PM		25		
3-4 PM		26		
4-5 PM		26		
5-6 PM		28		
6-7 PM		26		

In: 1638  
 WB: 20%



85th Percentile > 40 mph? **OR** Population <10,000 people? N

**Warrant 1** - One of the Following Conditions Must Be Met for any 8 hours of an average day (Table 4C-1)

**Individual Option:**

**Condition A: Minimum Vehicular Volume**  
**100%**

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	500	0	453	379	180	123	188	189	170	322	331	432	410	274
Minor	1	150	0	538	528	394	304	337	379	351	409	417	504	493	314
Met?			NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

**OR**

**Condition B: Interruption of Continuous Traffic**  
**100%**

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	750	0	453	379	180	123	600	189	170	322	331	432	410	274
Minor	1	75	0	538	528	394	304	337	379	351	409	417	504	493	314
Met?			NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Result: NO

**Combination Option:**

**Condition A: Minimum Vehicular Volume**  
**80%**

Street	Lanes	Minimum Volume	ATR Data													
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM	
Major	1	400	0	453	379	180	123	188	189	170	322	331	432	410	274	
Minor	1	120	0	538	528	394	304	337	379	351	409	417	504	493	314	
Met?			NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES	NO

**AND**

**Condition B: Interruption of Continuous Traffic**  
**80%**

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	600	0	453	379	180	123	188	189	170	322	331	432	410	274
Minor	1	60	0	538	528	394	304	337	379	351	409	417	504	493	314
Met?			NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Result: NO



**Warrant 2** - Four-Hour Vehicular Volume (must be met for any 4 hours of an average day)

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	Figure 4C-1	0	453	379	180	123	188	189	170	322	331	432	410	274
Minor	1	Figure 4C-1	0	538	528	394	304	337	379	351	409	417	504	493	314
Met?			NO	YES	YES	NO	NO	NO	NO	NO	YES	YES	YES	YES	NO

Result: YES

**Warrant 3** - Peak Hour Volume (must be met for 1 hour of an average day)

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	Figure 4C-3	0	453	379	180	123	188	189	170	322	331	432	410	274
Minor	1	Figure 4C-3	0	538	528	394	304	337	379	351	409	417	504	493	314
Met?			NO	YES	YES	NO	NO	NO	NO	NO	NO	NO	YES	YES	NO

Result: YES

**Warrants 4 to 8:** Not Evaluated

## **Attachment K**

Intersection Capacity and Queue Analyses



2016 Existing Conditions



Lanes, Volumes, Timings  
 1: Shawsheen Street & East Street/Dascomb Road

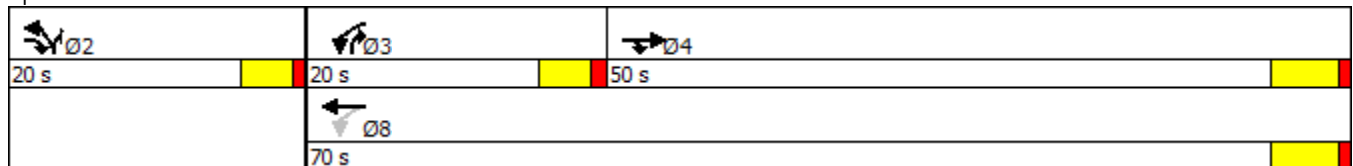
2016 Existing Conditions  
 Weekday Morning

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	526	54	465	467	48	466
Future Volume (vph)	526	54	465	467	48	466
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1717	1432	1694	1701	1646	1516
Flt Permitted			0.221		0.950	
Satd. Flow (perm)	1717	1432	394	1701	1646	1516
Satd. Flow (RTOR)		58				245
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	7%	9%	3%	8%	6%	3%
Shared Lane Traffic (%)						
Turn Type	NA	pt+ov	pm+pt	NA	Prot	pt+ov
Protected Phases	4	2 4	3	8	2	2 3
Permitted Phases			8			
Detector Phase	4	2 4	3	8	2	2 3
Switch Phase						
Minimum Initial (s)	10.0		6.0	10.0	6.0	
Minimum Split (s)	15.5		10.5	15.5	10.5	
Total Split (s)	50.0		20.0	70.0	20.0	
Total Split (%)	55.6%		22.2%	77.8%	22.2%	
Maximum Green (s)	44.5		15.5	64.5	15.5	
Yellow Time (s)	4.5		3.5	4.5	3.5	
All-Red Time (s)	1.0		1.0	1.0	1.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.5		4.5	5.5	4.5	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0		2.0	4.0	2.0	
Recall Mode	Min		None	Min	None	

Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 72.9  
 Natural Cycle: 70  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Shawsheen Street & East Street/Dascomb Road



Queues  
 1: Shawsheen Street & East Street/Dascomb Road

2016 Existing Conditions  
 Weekday Morning













	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	566	58	500	502	52	501
v/c Ratio	0.79	0.06	0.93	0.43	0.19	0.63
Control Delay	27.0	1.2	39.4	6.5	31.0	13.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.0	1.2	39.4	6.5	31.0	13.2
Queue Length 50th (ft)	229	0	129	95	21	81
Queue Length 95th (ft)	351	9	#351	147	58	231
Internal Link Dist (ft)	1155			220	920	
Turn Bay Length (ft)		125	200			175
Base Capacity (vph)	1101	1097	566	1467	367	813
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	0.51	0.05	0.88	0.34	0.14	0.62

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.










HCM 2010 Signalized Intersection Summary  
 1: Shawsheen Street & East Street/Dascomb Road

2016 Existing Conditions  
 Weekday Morning

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	526	54	465	467	48	466		
Future Volume (veh/h)	526	54	465	467	48	466		
Number	4	14	3	8	5	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1776	1743	1845	1759	1792	1845		
Adj Flow Rate, veh/h	566	58	500	502	52	501		
Adj No. of Lanes	1	1	1	1	1	1		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93		
Percent Heavy Veh, %	7	9	3	8	6	3		
Cap, veh/h	761	935	537	1173	346	599		
Arrive On Green	0.43	0.43	0.18	0.67	0.20	0.20		
Sat Flow, veh/h	1776	1482	1757	1759	1707	1568		
Grp Volume(v), veh/h	566	58	500	502	52	501		
Grp Sat Flow(s),veh/h/ln	1776	1482	1757	1759	1707	1568		
Q Serve(g_s), s	20.5	1.2	11.5	10.2	1.9	15.5		
Cycle Q Clear(g_c), s	20.5	1.2	11.5	10.2	1.9	15.5		
Prop In Lane		1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	761	935	537	1173	346	599		
V/C Ratio(X)	0.74	0.06	0.93	0.43	0.15	0.84		
Avail Cap(c_a), veh/h	1033	1162	577	1483	346	599		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	18.4	5.4	14.0	5.9	25.1	21.5		
Incr Delay (d2), s/veh	2.5	0.0	20.7	0.4	0.1	9.5		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	10.4	0.7	13.2	5.0	0.9	11.1		
LnGrp Delay(d),s/veh	20.9	5.5	34.7	6.3	25.2	30.9		
LnGrp LOS	C	A	C	A	C	C		
Approach Vol, veh/h	624			1002	553			
Approach Delay, s/veh	19.4			20.4	30.4			
Approach LOS	B			C	C			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4				8
Phs Duration (G+Y+Rc), s		20.0	18.2	38.3				56.5
Change Period (Y+Rc), s		4.5	4.5	5.5				5.5
Max Green Setting (Gmax), s		15.5	15.5	44.5				64.5
Max Q Clear Time (g_c+I1), s		17.5	13.5	22.5				12.2
Green Ext Time (p_c), s		0.0	0.2	10.3				14.2
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			22.7					
HCM 2010 LOS			C					

Lanes, Volumes, Timings  
 2: Dascomb Road & HP Driveway

2016 Existing Conditions  
 Weekday Morning

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	14	978	930	13	2	2
Future Volume (vph)	14	978	930	13	2	2
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.998		0.932	
Flt Protected		0.999			0.976	
Satd. Flow (prot)	0	1749	2029	0	1383	0
Flt Permitted		0.999			0.976	
Satd. Flow (perm)	0	1749	2029	0	1383	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	5%	6%	0%	50%	0%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Control Type: Unsignalized						

Intersection

Int Delay, s/veh 0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↗		↘	
Traffic Vol, veh/h	14	978	930	13	2	2
Future Vol, veh/h	14	978	930	13	2	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	0	5	6	0	50	0
Mvmt Flow	15	1052	1000	14	2	2












Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	1000	0	1000
Stage 1	-	-	1000
Stage 2	-	-	1082
Critical Hdwy	4.1	-	6.2
Critical Hdwy Stg 1	-	-	5.9
Critical Hdwy Stg 2	-	-	5.9
Follow-up Hdwy	2.2	-	3.3
Pot Cap-1 Maneuver	700	-	298
Stage 1	-	-	291
Stage 2	-	-	264
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	700	-	298
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	291
Stage 2	-	-	250

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	58.2
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	700	-	-	-	72
HCM Lane V/C Ratio	0.022	-	-	-	0.06
HCM Control Delay (s)	10.3	0	-	-	58.2
HCM Lane LOS	B	A	-	-	F
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2

Lanes, Volumes, Timings  
3: Smith Drive & Dascomb Road

2016 Existing Conditions  
Weekday Morning

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	960	20	60	934	9	32
Future Volume (vph)	960	20	60	934	9	32
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.997					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1926	0	1491	1852	1685	1334
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	1926	0	1491	1852	1685	1334
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	5%	0%	13%	6%	0%	13%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 1.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	960	20	60	934	9	32
Future Vol, veh/h	960	20	60	934	9	32
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	80	-	0	135
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	5	0	13	6	0	13
Mvmt Flow	1032	22	65	1004	10	34













Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1054
Stage 1	-	-	1043
Stage 2	-	-	1133
Critical Hdwy	-	4.23	6.4
Critical Hdwy Stg 1	-	-	5.4
Critical Hdwy Stg 2	-	-	5.4
Follow-up Hdwy	-	2.317	3.5
Pot Cap-1 Maneuver	-	620	52
Stage 1	-	-	342
Stage 2	-	-	310
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	620	47
Mov Cap-2 Maneuver	-	-	47
Stage 1	-	-	342
Stage 2	-	-	278

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	38.1
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	47	265	-	-	620	-
HCM Lane V/C Ratio	0.206	0.13	-	-	0.104	-
HCM Control Delay (s)	100.5	20.6	-	-	11.5	-
HCM Lane LOS	F	C	-	-	B	-
HCM 95th %tile Q(veh)	0.7	0.4	-	-	0.3	-

Lanes, Volumes, Timings  
4: Dascomb Road & Frontage Road

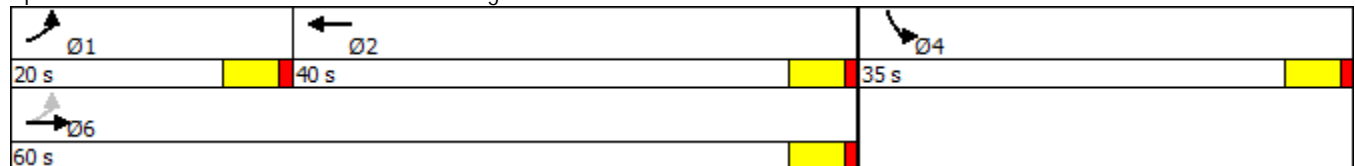
2016 Existing Conditions  
Weekday Morning

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	394	598	616	439	195	378
Future Volume (vph)	394	598	616	439	195	378
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1719	1810	3438	1561	1986	1711
Flt Permitted	0.223				0.950	
Satd. Flow (perm)	404	1810	3438	1561	1986	1711
Satd. Flow (RTOR)				318		402
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	5%	5%	5%	0%	3%	7%
Shared Lane Traffic (%)						
Turn Type	pm+pt	NA	NA	Free	Prot	Free
Protected Phases	1	6	2		4	
Permitted Phases	6			Free		Free
Detector Phase	1	6	2		4	
Switch Phase						
Minimum Initial (s)	10.0	10.0	6.0		6.0	
Minimum Split (s)	15.0	15.0	11.0		11.0	
Total Split (s)	20.0	60.0	40.0		35.0	
Total Split (%)	21.1%	63.2%	42.1%		36.8%	
Maximum Green (s)	15.0	55.0	35.0		30.0	
Yellow Time (s)	4.0	4.0	4.0		4.0	
All-Red Time (s)	1.0	1.0	1.0		1.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	5.0	5.0	5.0		5.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0		2.0	
Recall Mode	Min	Min	None		None	

Intersection Summary

Cycle Length: 95  
 Actuated Cycle Length: 55.4  
 Natural Cycle: 60  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Dascomb Road & Frontage Road











## Queues

2016 Existing Conditions

## 4: Dascomb Road &amp; Frontage Road

Weekday Morning













						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	419	636	655	467	207	402
v/c Ratio	0.73	0.56	0.67	0.30	0.54	0.23
Control Delay	17.7	8.8	21.9	0.5	27.1	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.7	8.8	21.9	0.5	27.1	0.3
Queue Length 50th (ft)	59	100	102	0	64	0
Queue Length 95th (ft)	#216	218	168	0	132	0
Internal Link Dist (ft)		120	920		695	
Turn Bay Length (ft)	150			130		
Base Capacity (vph)	616	1698	2228	1561	1103	1711
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	0.68	0.37	0.29	0.30	0.19	0.23

## Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.












HCM 2010 Signalized Intersection Summary  
4: Dascomb Road & Frontage Road

2016 Existing Conditions  
Weekday Morning

								
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations								
Traffic Volume (veh/h)	394	598	616	439	195	378		
Future Volume (veh/h)	394	598	616	439	195	378		
Number	1	6	2	12	7	14		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1810	1810	1810	1900	1918	1847		
Adj Flow Rate, veh/h	419	636	655	0	207	0		
Adj No. of Lanes	1	1	2	1	1	1		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94		
Percent Heavy Veh, %	5	5	5	0	3	7		
Cap, veh/h	641	1165	1135	533	268	230		
Arrive On Green	0.21	0.64	0.33	0.00	0.15	0.00		
Sat Flow, veh/h	1723	1810	3529	1615	1827	1570		
Grp Volume(v), veh/h	419	636	655	0	207	0		
Grp Sat Flow(s),veh/h/ln	1723	1810	1719	1615	1827	1570		
Q Serve(g_s), s	6.4	9.2	7.5	0.0	5.2	0.0		
Cycle Q Clear(g_c), s	6.4	9.2	7.5	0.0	5.2	0.0		
Prop In Lane	1.00			1.00	1.00	1.00		
Lane Grp Cap(c), veh/h	641	1165	1135	533	268	230		
V/C Ratio(X)	0.65	0.55	0.58	0.00	0.77	0.00		
Avail Cap(c_a), veh/h	822	2083	2518	1183	1147	986		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00		
Uniform Delay (d), s/veh	7.6	4.7	13.2	0.0	19.6	0.0		
Incr Delay (d2), s/veh	0.5	0.1	0.2	0.0	1.8	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	3.0	4.5	3.6	0.0	2.7	0.0		
LnGrp Delay(d),s/veh	8.1	4.8	13.4	0.0	21.4	0.0		
LnGrp LOS	A	A	B		C			
Approach Vol, veh/h		1055	655		207			
Approach Delay, s/veh		6.1	13.4		21.4			
Approach LOS		A	B		C			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	15.0	20.8		12.0		35.8		
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0		
Max Green Setting (Gmax), s	15.0	35.0		30.0		55.0		
Max Q Clear Time (g_c+I1), s	8.4	9.5		7.2		11.2		
Green Ext Time (p_c), s	0.4	6.2		0.3		6.7		
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			10.3					
HCM 2010 LOS			B					

Lanes, Volumes, Timings  
 5: I-93 NB Ramps & Dascomb Road

2016 Existing Conditions  
 Weekday Morning

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	422	371	74	643	412	160
Future Volume (vph)	422	371	74	643	412	160
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.937					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	2018	0	1805	1900	1930	1777
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	2018	0	1805	1900	1930	1777
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	0%	0%	0%	6%	3%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 141.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻		↻	↻	↻	↻
Traffic Vol, veh/h	422	371	74	643	412	160
Future Vol, veh/h	422	371	74	643	412	160
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	200	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	0	0	0	0	6	3
Mvmt Flow	435	382	76	663	425	165

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	435
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.1
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.2
Pot Cap-1 Maneuver	-	-	1135
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1135
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	\$ 513.2
HCM LOS			F













Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	174	619	-	-	1135	-
HCM Lane V/C Ratio	2.441	0.266	-	-	0.067	-
HCM Control Delay (s)	\$ 707.5	12.9	-	-	8.4	-
HCM Lane LOS	F	B	-	-	A	-
HCM 95th %tile Q(veh)	35.8	1.1	-	-	0.2	-

Notes

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

Lanes, Volumes, Timings  
 6: Frontage Road & I-93 SB Ramps

2016 Existing Conditions  
 Weekday Morning

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Traffic Volume (vph)	472	90	296	535	84	91
Future Volume (vph)	472	90	296	535	84	91
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950					0.977
Satd. Flow (prot)	1930	1830	2027	1553	0	3437
Flt Permitted	0.950					0.977
Satd. Flow (perm)	1930	1830	2027	1553	0	3437
Confl. Bikes (#/hr)		1				
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	6%	0%	0%	4%	0%	5%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 33.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗		↖↑
Traffic Vol, veh/h	472	90	296	535	84	91
Future Vol, veh/h	472	90	296	535	84	91
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	Yield	-	None
Storage Length	0	0	-	0	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	6	0	0	4	0	5
Mvmt Flow	497	95	312	563	88	96

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	537	312	0	0	312	0
Stage 1	312	-	-	-	-	-
Stage 2	225	-	-	-	-	-
Critical Hdwy	6.69	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.49	-	-	-	-	-
Critical Hdwy Stg 2	5.89	-	-	-	-	-
Follow-up Hdwy	3.557	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	~ 481	733	-	-	1260	-
Stage 1	731	-	-	-	-	-
Stage 2	781	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 445	733	-	-	1260	-
Mov Cap-2 Maneuver	~ 445	-	-	-	-	-
Stage 1	731	-	-	-	-	-
Stage 2	723	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	92.6		0		3.9
HCM LOS	F				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	445	733	1260	-
HCM Lane V/C Ratio	-	-	1.116	0.129	0.07	-
HCM Control Delay (s)	-	-	108.2	10.6	8.1	0.1
HCM Lane LOS	-	-	F	B	A	A
HCM 95th %tile Q(veh)	-	-	17.3	0.4	0.2	-

Notes

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

# HCS7 Freeway Merge Report

## Project Information

Analyst	ERP	Date	9/19/2017
Agency	MassDOT	Analysis Year	2016
Jurisdiction	4	Time Period Analyzed	Weekday AM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	35.0
Segment Length (L) / Acceleration Length (L <sub>A</sub> ), ft	1500	220
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	6827	619
Peak Hour Factor (PHF)	0.92	0.90
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	7795	722
Capacity (c), pc/h	7050	2000
Volume-to-Capacity Ratio (v/c)	1.21	0.36

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	1348.5	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	-
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	900	Speed Index (M <sub>s</sub> )	-
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	2700
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	-	On-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	-
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FM</sub> )	0.555	Outer Lanes Freeway Speed (S <sub>o</sub> ), mi/h	56.1
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	5095	Ramp Junction Speed (S), mi/h	-
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	5817	Average Density (D), pc/mi/ln	-
Level of Service (LOS)	F		

# HCS7 Freeway Diverge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2016
Jurisdiction	4	Time Period Analyzed	Weekday AM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	30.0
Segment Length (L) / Deceleration Length (L <sub>D</sub> ), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	6827	562
Peak Hour Factor (PHF)	0.92	0.95
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	7795	621
Capacity (c), pc/h	7050	1900
Volume-to-Capacity Ratio (v/c)	1.11	0.33

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	-
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	-	Speed Index (D <sub>S</sub> )	-
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	2700
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	900	Off-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	-
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FD</sub> )	0.537	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	64.7
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	5095	Ramp Junction Speed (S), mi/h	-
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	-	Average Density (D), pc/mi/ln	-
Level of Service (LOS)	F		



# HCS7 Freeway Merge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2016
Jurisdiction	4	Time Period Analyzed	Weekday AM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	35.0
Segment Length (L) / Acceleration Length (L <sub>A</sub> ), ft	1500	1350
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	4004	445
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	4572	508
Capacity (c), pc/h	7050	2000
Volume-to-Capacity Ratio (v/c)	0.72	0.25

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	1114.7	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	22.7
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	1100	Speed Index (M <sub>s</sub> )	0.334
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	1765
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	-	On-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	57.3
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FM</sub> )	0.614	Outer Lanes Freeway Speed (S <sub>o</sub> ), mi/h	60.4
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	2807	Ramp Junction Speed (S), mi/h	58.3
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	3315	Average Density (D), pc/mi/ln	29.0
Level of Service (LOS)	C		

# HCS7 Freeway Diverge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2016
Jurisdiction	4	Time Period Analyzed	Weekday AM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	30.0
Segment Length (L) / Deceleration Length (L <sub>D</sub> ), ft	1500	850
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	4004	572
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	4572	653
Capacity (c), pc/h	7050	1900
Volume-to-Capacity Ratio (v/c)	0.65	0.34

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	23.0
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	-	Speed Index (D <sub>s</sub> )	0.552
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	1505
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	1100	Off-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	52.3
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FD</sub> )	0.616	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	69.3
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	3067	Ramp Junction Speed (S), mi/h	56.9
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	-	Average Density (D), pc/mi/ln	26.8
Level of Service (LOS)	C		

Lanes, Volumes, Timings  
 1: Shawsheen Street & East Street/Dascomb Road

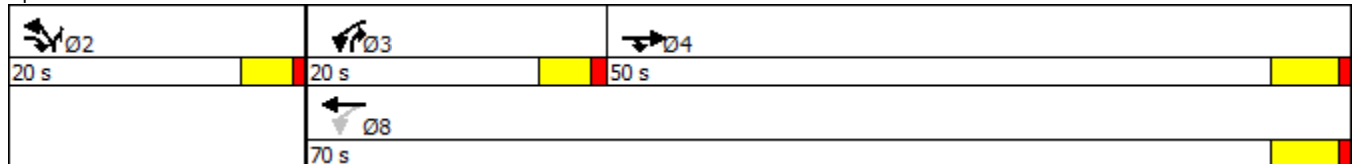
2016 Existing Conditions  
 Weekday Evening

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	528	30	446	673	69	529
Future Volume (vph)	528	30	446	673	69	529
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1818	1516	1728	1818	1728	1546
Flt Permitted			0.211		0.950	
Satd. Flow (perm)	1818	1516	384	1818	1728	1546
Satd. Flow (RTOR)		32				244
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	1%	3%	1%	1%	1%	1%
Shared Lane Traffic (%)						
Turn Type	NA	pt+ov	pm+pt	NA	Prot	pt+ov
Protected Phases	4	2 4	3	8	2	2 3
Permitted Phases			8			
Detector Phase	4	2 4	3	8	2	2 3
Switch Phase						
Minimum Initial (s)	10.0		6.0	10.0	6.0	
Minimum Split (s)	15.5		10.5	15.5	10.5	
Total Split (s)	50.0		20.0	70.0	20.0	
Total Split (%)	55.6%		22.2%	77.8%	22.2%	
Maximum Green (s)	44.5		15.5	64.5	15.5	
Yellow Time (s)	4.5		3.5	4.5	3.5	
All-Red Time (s)	1.0		1.0	1.0	1.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.5		4.5	5.5	4.5	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0		2.0	4.0	2.0	
Recall Mode	Min		None	Min	None	

Intersection Summary







Cycle Length: 90  
 Actuated Cycle Length: 72  
 Natural Cycle: 70  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Shawsheen Street & East Street/Dascomb Road



Queues  
1: Shawsheen Street & East Street/Dascomb Road

2016 Existing Conditions  
Weekday Evening













						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	568	32	480	724	74	569
v/c Ratio	0.76	0.03	0.92	0.60	0.23	0.69
Control Delay	25.7	1.4	37.8	8.9	30.7	15.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.7	1.4	37.8	8.9	30.7	15.5
Queue Length 50th (ft)	227	0	118	163	29	107
Queue Length 95th (ft)	338	7	#326	244	77	296
Internal Link Dist (ft)	1155			220	920	
Turn Bay Length (ft)		125	200			175
Base Capacity (vph)	1178	1145	565	1584	390	857
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	0.03	0.85	0.46	0.19	0.66

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.










HCM 2010 Signalized Intersection Summary  
 1: Shawsheen Street & East Street/Dascomb Road

2016 Existing Conditions  
 Weekday Evening

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	528	30	446	673	69	529		
Future Volume (veh/h)	528	30	446	673	69	529		
Number	4	14	3	8	5	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1881	1845	1881	1881	1881	1881		
Adj Flow Rate, veh/h	568	32	480	724	74	569		
Adj No. of Lanes	1	1	1	1	1	1		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93		
Percent Heavy Veh, %	1	3	1	1	1	1		
Cap, veh/h	832	1012	555	1252	364	588		
Arrive On Green	0.44	0.44	0.16	0.67	0.20	0.20		
Sat Flow, veh/h	1881	1568	1792	1881	1792	1599		
Grp Volume(v), veh/h	568	32	480	724	74	569		
Grp Sat Flow(s),veh/h/ln	1881	1568	1792	1881	1792	1599		
Q Serve(g_s), s	18.4	0.6	10.2	16.0	2.6	15.5		
Cycle Q Clear(g_c), s	18.4	0.6	10.2	16.0	2.6	15.5		
Prop In Lane		1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	832	1012	555	1252	364	588		
V/C Ratio(X)	0.68	0.03	0.87	0.58	0.20	0.97		
Avail Cap(c_a), veh/h	1097	1233	624	1590	364	588		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	17.0	4.9	12.7	6.9	25.3	23.7		
Incr Delay (d2), s/veh	1.5	0.0	10.3	0.6	0.1	28.8		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	9.8	0.4	6.5	8.3	1.3	16.4		
LnGrp Delay(d),s/veh	18.5	4.9	23.0	7.5	25.4	52.5		
LnGrp LOS	B	A	C	A	C	D		
Approach Vol, veh/h	600			1204	643			
Approach Delay, s/veh	17.8			13.7	49.4			
Approach LOS	B			B	D			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4				8
Phs Duration (G+Y+Rc), s		20.0	17.1	39.2				56.3
Change Period (Y+Rc), s		4.5	4.5	5.5				5.5
Max Green Setting (Gmax), s		15.5	15.5	44.5				64.5
Max Q Clear Time (g_c+I1), s		17.5	12.2	20.4				18.0
Green Ext Time (p_c), s		0.0	0.3	13.3				18.3
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			24.1					
HCM 2010 LOS			C					

Lanes, Volumes, Timings  
 2: Dascomb Road & HP Driveway

2016 Existing Conditions  
 Weekday Evening

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	6	1051	1091	4	3	28
Future Volume (vph)	6	1051	1091	4	3	28
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.877	
Flt Protected					0.995	
Satd. Flow (prot)	0	1819	2108	0	1471	0
Flt Permitted					0.995	
Satd. Flow (perm)	0	1819	2108	0	1471	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	1%	2%	50%	100%	4%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Control Type: Unsignalized						

Intersection

Int Delay, s/veh 0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↗		↘	
Traffic Vol, veh/h	6	1051	1091	4	3	28
Future Vol, veh/h	6	1051	1091	4	3	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	1	2	50	100	4
Mvmt Flow	7	1142	1186	4	3	30












Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	1186	0	1186
Stage 1	-	-	1186
Stage 2	-	-	1155
Critical Hdwy	4.1	-	6.24
Critical Hdwy Stg 1	-	-	6.4
Critical Hdwy Stg 2	-	-	6.4
Follow-up Hdwy	2.2	-	3.336
Pot Cap-1 Maneuver	596	-	228
Stage 1	-	-	188
Stage 2	-	-	196
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	596	-	228
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	188
Stage 2	-	-	190

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	51.6
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	596	-	-	-	110
HCM Lane V/C Ratio	0.011	-	-	-	0.306
HCM Control Delay (s)	11.1	0	-	-	51.6
HCM Lane LOS	B	A	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	1.2

Lanes, Volumes, Timings  
 3: Smith Drive & Dascomb Road

2016 Existing Conditions  
 Weekday Evening

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1043	11	23	1077	18	50
Future Volume (vph)	1043	11	23	1077	18	50
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.999					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	2003	0	1428	1925	1589	1396
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	2003	0	1428	1925	1589	1396
Confl. Bikes (#/hr)		1				
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	1%	9%	18%	2%	6%	8%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Control Type: Unsignalized



Intersection

Int Delay, s/veh 2.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻		↻	↻	↻	↻
Traffic Vol, veh/h	1043	11	23	1077	18	50
Future Vol, veh/h	1043	11	23	1077	18	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	80	-	0	135
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	1	9	18	2	6	8
Mvmt Flow	1146	12	25	1184	20	55

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1152
Stage 1	-	-	1152
Stage 2	-	-	1234
Critical Hdwy	-	4.28	6.46
Critical Hdwy Stg 1	-	-	5.46
Critical Hdwy Stg 2	-	-	5.46
Follow-up Hdwy	-	2.362	3.554
Pot Cap-1 Maneuver	-	549	36
Stage 1	-	-	296
Stage 2	-	-	270
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	549	34
Mov Cap-2 Maneuver	-	-	34
Stage 1	-	-	296
Stage 2	-	-	258

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	73.4
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	34	234	-	-	549	-
HCM Lane V/C Ratio	0.582	0.235	-	-	0.046	-
HCM Control Delay (s)	208	25	-	-	11.9	-
HCM Lane LOS	F	D	-	-	B	-
HCM 95th %tile Q(veh)	2	0.9	-	-	0.1	-

Lanes, Volumes, Timings  
4: Dascomb Road & Frontage Road

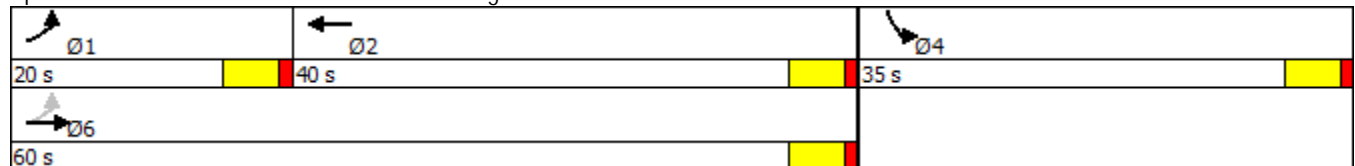
2016 Existing Conditions  
Weekday Evening

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	347	746	684	246	238	416
Future Volume (vph)	347	746	684	246	238	416
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1752	1881	3539	1546	2025	1777
Flt Permitted	0.202				0.950	
Satd. Flow (perm)	373	1881	3539	1546	2025	1777
Satd. Flow (RTOR)				160		433
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	3%	1%	2%	1%	1%	3%
Shared Lane Traffic (%)						
Turn Type	pm+pt	NA	NA	Free	Prot	Free
Protected Phases	1	6	2		4	
Permitted Phases	6			Free		Free
Detector Phase	1	6	2		4	
Switch Phase						
Minimum Initial (s)	10.0	10.0	6.0		6.0	
Minimum Split (s)	15.0	15.0	11.0		11.0	
Total Split (s)	20.0	60.0	40.0		35.0	
Total Split (%)	21.1%	63.2%	42.1%		36.8%	
Maximum Green (s)	15.0	55.0	35.0		30.0	
Yellow Time (s)	4.0	4.0	4.0		4.0	
All-Red Time (s)	1.0	1.0	1.0		1.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	5.0	5.0	5.0		5.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0		2.0	
Recall Mode	Min	Min	None		None	

Intersection Summary

Cycle Length: 95  
 Actuated Cycle Length: 56.8  
 Natural Cycle: 55  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Dascomb Road & Frontage Road









## Queues

2016 Existing Conditions

## 4: Dascomb Road &amp; Frontage Road

Weekday Evening













						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	361	777	713	256	248	433
v/c Ratio	0.70	0.69	0.68	0.17	0.57	0.24
Control Delay	16.9	12.0	21.7	0.2	26.8	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.9	12.0	21.7	0.2	26.8	0.3
Queue Length 50th (ft)	50	147	106	0	74	0
Queue Length 95th (ft)	#186	339	196	0	161	0
Internal Link Dist (ft)		120	920		695	
Turn Bay Length (ft)	150			130		
Base Capacity (vph)	602	1733	2263	1546	1110	1777
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	0.60	0.45	0.32	0.17	0.22	0.24

## Intersection Summary

- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.












HCM 2010 Signalized Intersection Summary  
4: Dascomb Road & Frontage Road

2016 Existing Conditions  
Weekday Evening

								
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations								
Traffic Volume (veh/h)	347	746	684	246	238	416		
Future Volume (veh/h)	347	746	684	246	238	416		
Number	1	6	2	12	7	14		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1845	1881	1863	1881	1956	1918		
Adj Flow Rate, veh/h	361	777	712	0	248	0		
Adj No. of Lanes	1	1	2	1	1	1		
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96		
Percent Heavy Veh, %	3	1	2	1	1	3		
Cap, veh/h	613	1202	1235	558	313	274		
Arrive On Green	0.19	0.64	0.35	0.00	0.17	0.00		
Sat Flow, veh/h	1757	1881	3632	1599	1863	1631		
Grp Volume(v), veh/h	361	777	712	0	248	0		
Grp Sat Flow(s),veh/h/ln	1757	1881	1770	1599	1863	1631		
Q Serve(g_s), s	5.6	13.2	8.5	0.0	6.6	0.0		
Cycle Q Clear(g_c), s	5.6	13.2	8.5	0.0	6.6	0.0		
Prop In Lane	1.00			1.00	1.00	1.00		
Lane Grp Cap(c), veh/h	613	1202	1235	558	313	274		
V/C Ratio(X)	0.59	0.65	0.58	0.00	0.79	0.00		
Avail Cap(c_a), veh/h	783	1999	2394	1082	1080	945		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00		
Uniform Delay (d), s/veh	7.8	5.8	13.7	0.0	20.7	0.0		
Incr Delay (d2), s/veh	0.3	0.2	0.2	0.0	1.7	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	2.7	6.8	4.1	0.0	3.5	0.0		
LnGrp Delay(d),s/veh	8.2	6.0	13.9	0.0	22.4	0.0		
LnGrp LOS	A	A	B		C			
Approach Vol, veh/h		1138	712		248			
Approach Delay, s/veh		6.7	13.9		22.4			
Approach LOS		A	B		C			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	15.0	23.1		13.7		38.1		
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0		
Max Green Setting (Gmax), s	15.0	35.0		30.0		55.0		
Max Q Clear Time (g_c+I1), s	7.6	10.5		8.6		15.2		
Green Ext Time (p_c), s	0.4	7.6		0.3		8.4		
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			11.0					
HCM 2010 LOS			B					

Lanes, Volumes, Timings  
 5: I-93 NB Ramps & Dascomb Road

2016 Existing Conditions  
 Weekday Evening

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	552	432	94	557	373	349
Future Volume (vph)	552	432	94	557	373	349
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.941					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	2006	0	1752	1881	2006	1830
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	2006	0	1752	1881	2006	1830
Confl. Bikes (#/hr)		2				2
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	1%	1%	3%	1%	2%	0%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 122.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻		↻	↻	↻	↻
Traffic Vol, veh/h	552	432	94	557	373	349
Future Vol, veh/h	552	432	94	557	373	349
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	200	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	1	1	3	1	2	0
Mvmt Flow	569	445	97	574	385	360

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	569
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.13
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.227
Pot Cap-1 Maneuver	-	-	998
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	998
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.3	\$ 398
HCM LOS			F













Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	153	525	-	-	998	-
HCM Lane V/C Ratio	2.513	0.685	-	-	0.097	-
HCM Control Delay (s)	\$ 746.6	25.5	-	-	9	-
HCM Lane LOS	F	D	-	-	A	-
HCM 95th %tile Q(veh)	33.3	5.2	-	-	0.3	-

Notes

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

Lanes, Volumes, Timings  
 6: Frontage Road & I-93 SB Ramps

2016 Existing Conditions  
 Weekday Evening

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Traffic Volume (vph)	421	18	119	471	91	200
Future Volume (vph)	421	18	119	471	91	200
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950					0.985
Satd. Flow (prot)	2006	1727	2007	1583	0	3532
Flt Permitted	0.950					0.985
Satd. Flow (perm)	2006	1727	2007	1583	0	3532
Confl. Bikes (#/hr)		1				
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	2%	6%	1%	2%	0%	1%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 20.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	421	18	119	471	91	200
Future Vol, veh/h	421	18	119	471	91	200
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	Yield	-	None
Storage Length	0	0	-	0	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	6	1	2	0	1
Mvmt Flow	463	20	131	518	100	220

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	441	131	0	0	131	0
Stage 1	131	-	-	-	-	-
Stage 2	310	-	-	-	-	-
Critical Hdwy	7.33	6.29	-	-	4.1	-
Critical Hdwy Stg 1	6.13	-	-	-	-	-
Critical Hdwy Stg 2	6.53	-	-	-	-	-
Follow-up Hdwy	3.519	3.357	-	-	2.2	-
Pot Cap-1 Maneuver	513	906	-	-	1467	-
Stage 1	872	-	-	-	-	-
Stage 2	676	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	482	906	-	-	1467	-
Mov Cap-2 Maneuver	482	-	-	-	-	-
Stage 1	872	-	-	-	-	-
Stage 2	623	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	58.8		0		2.5
HCM LOS	F				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	482	906	1467	-
HCM Lane V/C Ratio	-	-	0.96	0.022	0.068	-
HCM Control Delay (s)	-	-	60.9	9.1	7.6	0.2
HCM Lane LOS	-	-	F	A	A	A
HCM 95th %tile Q(veh)	-	-	12	0.1	0.2	-



# HCS7 Freeway Merge Report

## Project Information

Analyst	ERP	Date	9/19/2017
Agency	MassDOT	Analysis Year	2016
Jurisdiction	4	Time Period Analyzed	Weekday PM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	35.0
Segment Length (L) / Acceleration Length (L <sub>A</sub> ), ft	1500	1350
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	4937	562
Peak Hour Factor (PHF)	0.92	0.89
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	5637	663
Capacity (c), pc/h	7050	2000
Volume-to-Capacity Ratio (v/c)	0.89	0.33

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	1375.8	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	27.7
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	900	Speed Index (M <sub>s</sub> )	0.431
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	2339
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	-	On-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	55.1
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FM</sub> )	0.585	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	58.2
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	3298	Ramp Junction Speed (S), mi/h	56.2
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	3961	Average Density (D), pc/mi/ln	37.4
Level of Service (LOS)	C		

# HCS7 Freeway Diverge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2016
Jurisdiction	4	Time Period Analyzed	Weekday PM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	30.0
Segment Length (L) / Deceleration Length (L <sub>D</sub> ), ft	1500	970
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	4937	439
Peak Hour Factor (PHF)	0.92	0.95
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	5637	485
Capacity (c), pc/h	7050	1900
Volume-to-Capacity Ratio (v/c)	0.80	0.26

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	26.1
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	-	Speed Index (D <sub>s</sub> )	0.537
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	2076
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	900	Off-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	52.6
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FD</sub> )	0.597	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	67.1
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	3561	Ramp Junction Speed (S), mi/h	57.1
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	-	Average Density (D), pc/mi/ln	32.9
Level of Service (LOS)	C		

# HCS7 Freeway Merge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2016
Jurisdiction	4	Time Period Analyzed	Weekday PM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	35.0
Segment Length (L) / Acceleration Length (L <sub>A</sub> ), ft	1500	210
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	6305	526
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	7199	601
Capacity (c), pc/h	7050	2000
Volume-to-Capacity Ratio (v/c)	1.11	0.30

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	1190.6	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	-
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	1100	Speed Index (M <sub>s</sub> )	-
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	2700
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	-	On-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	-
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FM</sub> )	0.578	Outer Lanes Freeway Speed (S <sub>o</sub> ), mi/h	56.1
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	4499	Ramp Junction Speed (S), mi/h	-
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	5100	Average Density (D), pc/mi/ln	-
Level of Service (LOS)	F		

# HCS7 Freeway Diverge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2016
Jurisdiction	4	Time Period Analyzed	Weekday PM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	30.0
Segment Length (L) / Deceleration Length (L <sub>D</sub> ), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity













Volume (V <sub>i</sub> ), veh/h	6305	719
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	7199	821
Capacity (c), pc/h	7050	1900
Volume-to-Capacity Ratio (v/c)	1.02	0.43

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	-
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	-	Speed Index (D <sub>s</sub> )	-
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	2700
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	1100	Off-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	-
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FD</sub> )	0.542	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	64.7
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	4499	Ramp Junction Speed (S), mi/h	-
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	-	Average Density (D), pc/mi/ln	-
Level of Service (LOS)	F		

Lanes, Volumes, Timings  
 1: Shawsheen Street & East Street/Dascomb Road

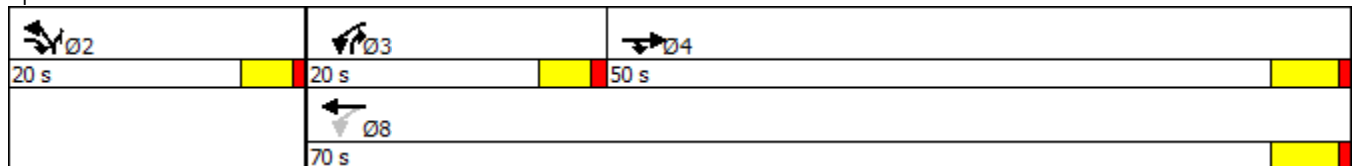
2016 Existing Conditions  
 Saturday MIDDAY

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	404	47	353	386	57	477
Future Volume (vph)	404	47	353	386	57	477
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1818	1561	1711	1749	1631	1546
Flt Permitted			0.312		0.950	
Satd. Flow (perm)	1818	1561	562	1749	1631	1546
Satd. Flow (RTOR)		50				353
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	0%	2%	5%	7%	1%
Shared Lane Traffic (%)						
Turn Type	NA	pt+ov	pm+pt	NA	Prot	pt+ov
Protected Phases	4	2 4	3	8	2	2 3
Permitted Phases			8			
Detector Phase	4	2 4	3	8	2	2 3
Switch Phase						
Minimum Initial (s)	10.0		6.0	10.0	6.0	
Minimum Split (s)	15.5		10.5	15.5	10.5	
Total Split (s)	50.0		20.0	70.0	20.0	
Total Split (%)	55.6%		22.2%	77.8%	22.2%	
Maximum Green (s)	44.5		15.5	64.5	15.5	
Yellow Time (s)	4.5		3.5	4.5	3.5	
All-Red Time (s)	1.0		1.0	1.0	1.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.5		4.5	5.5	4.5	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0		2.0	4.0	2.0	
Recall Mode	Min		None	Min	None	

Intersection Summary







Cycle Length: 90  
 Actuated Cycle Length: 56.1  
 Natural Cycle: 60  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Shawsheen Street & East Street/Dascomb Road















Queues  
1: Shawsheen Street & East Street/Dascomb Road

2016 Existing Conditions  
Saturday MIDDAY

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	430	50	376	411	61	507
v/c Ratio	0.65	0.05	0.65	0.37	0.21	0.57
Control Delay	20.7	1.4	10.0	6.0	25.2	7.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.7	1.4	10.0	6.0	25.2	7.0
Queue Length 50th (ft)	107	0	41	49	17	28
Queue Length 95th (ft)	243	9	99	116	57	126
Internal Link Dist (ft)	1155			220	920	
Turn Bay Length (ft)		125	200			175
Base Capacity (vph)	1480	1334	707	1675	482	1008
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	0.29	0.04	0.53	0.25	0.13	0.50
Intersection Summary						




HCM 2010 Signalized Intersection Summary  
 1: Shawsheen Street & East Street/Dascomb Road

2016 Existing Conditions  
 Saturday MIDDAY

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	404	47	353	386	57	477		
Future Volume (veh/h)	404	47	353	386	57	477		
Number	4	14	3	8	5	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1881	1900	1863	1810	1776	1881		
Adj Flow Rate, veh/h	430	50	376	411	61	507		
Adj No. of Lanes	1	1	1	1	1	1		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94		
Percent Heavy Veh, %	1	0	2	5	7	1		
Cap, veh/h	680	985	552	1070	420	649		
Arrive On Green	0.36	0.36	0.16	0.59	0.25	0.25		
Sat Flow, veh/h	1881	1615	1774	1810	1691	1599		
Grp Volume(v), veh/h	430	50	376	411	61	507		
Grp Sat Flow(s),veh/h/ln	1881	1615	1774	1810	1691	1599		
Q Serve(g_s), s	11.8	0.8	7.5	7.5	1.8	15.5		
Cycle Q Clear(g_c), s	11.8	0.8	7.5	7.5	1.8	15.5		
Prop In Lane		1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	680	985	552	1070	420	649		
V/C Ratio(X)	0.63	0.05	0.68	0.38	0.15	0.78		
Avail Cap(c_a), veh/h	1341	1552	713	1870	420	649		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	16.5	4.9	10.6	6.7	18.3	16.1		
Incr Delay (d2), s/veh	1.4	0.0	0.9	0.3	0.1	5.6		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	6.4	0.6	3.7	3.7	0.8	8.5		
LnGrp Delay(d),s/veh	17.9	4.9	11.5	7.1	18.4	21.7		
LnGrp LOS	B	A	B	A	B	C		
Approach Vol, veh/h	480			787	568			
Approach Delay, s/veh	16.5			9.2	21.3			
Approach LOS	B			A	C			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4				8
Phs Duration (G+Y+Rc), s		20.0	14.4	28.1				42.4
Change Period (Y+Rc), s		4.5	4.5	5.5				5.5
Max Green Setting (Gmax), s		15.5	15.5	44.5				64.5
Max Q Clear Time (g_c+I1), s		17.5	9.5	13.8				9.5
Green Ext Time (p_c), s		0.0	0.3	8.8				9.8
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			14.9					
HCM 2010 LOS			B					

Lanes, Volumes, Timings  
2: Dascomb Road & HP Driveway

2016 Existing Conditions  
Saturday MIDDAY

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	881	737	0	0	2
Future Volume (vph)	0	881	737	0	0	2
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected						
Satd. Flow (prot)	0	1801	2071	0	1644	0
Flt Permitted						
Satd. Flow (perm)	0	1801	2071	0	1644	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	2%	4%	0%	0%	0%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Control Type: Unsignalized						



Intersection

Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↗		↘	
Traffic Vol, veh/h	0	881	737	0	0	2
Future Vol, veh/h	0	881	737	0	0	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	2	4	0	0	0
Mvmt Flow	0	918	768	0	0	2












Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	768	0	768
Stage 1	-	-	768
Stage 2	-	-	918
Critical Hdwy	4.1	-	6.2
Critical Hdwy Stg 1	-	-	5.4
Critical Hdwy Stg 2	-	-	5.4
Follow-up Hdwy	2.2	-	3.3
Pot Cap-1 Maneuver	855	-	405
Stage 1	-	-	461
Stage 2	-	-	392
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	855	-	405
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	461
Stage 2	-	-	392

Approach	EB	WB	SB
HCM Control Delay, s	0	0	13.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	855	-	-	-	405
HCM Lane V/C Ratio	-	-	-	-	0.005
HCM Control Delay (s)	0	-	-	-	13.9
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

Lanes, Volumes, Timings  
 3: Smith Drive & Dascomb Road

2016 Existing Conditions  
 Saturday MIDDAY

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	865	16	63	721	16	57
Future Volume (vph)	865	16	63	721	16	57
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.998					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1984	0	1636	1888	1685	1507
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	1984	0	1636	1888	1685	1507
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	0%	3%	4%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	865	16	63	721	16	57
Future Vol, veh/h	865	16	63	721	16	57
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	80	-	0	135
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	0	3	4	0	0
Mvmt Flow	892	16	65	743	16	59













Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	908
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.13
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.227
Pot Cap-1 Maneuver	-	-	746
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	746
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	26.6
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	84	340	-	-	746	-
HCM Lane V/C Ratio	0.196	0.173	-	-	0.087	-
HCM Control Delay (s)	58	17.8	-	-	10.3	-
HCM Lane LOS	F	C	-	-	B	-
HCM 95th %tile Q(veh)	0.7	0.6	-	-	0.3	-

Lanes, Volumes, Timings  
4: Dascomb Road & Frontage Road

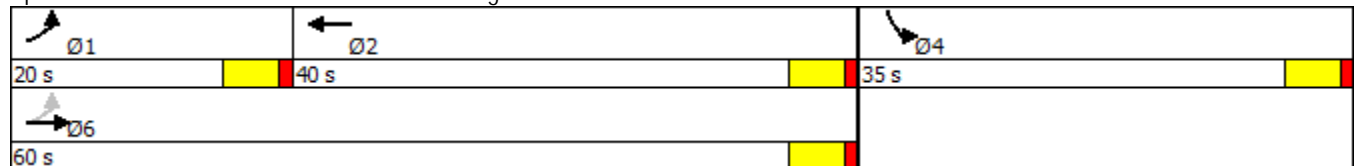
2016 Existing Conditions  
Saturday Midday

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	323	599	437	167	74	347
Future Volume (vph)	323	599	437	167	74	347
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1752	1881	3539	1546	2025	1743
Flt Permitted	0.330				0.950	
Satd. Flow (perm)	609	1881	3539	1546	2025	1743
Satd. Flow (RTOR)				171		365
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	3%	1%	2%	1%	1%	5%
Shared Lane Traffic (%)						
Turn Type	pm+pt	NA	NA	Free	Prot	Free
Protected Phases	1	6	2		4	
Permitted Phases	6			Free		Free
Detector Phase	1	6	2		4	
Switch Phase						
Minimum Initial (s)	10.0	10.0	6.0		6.0	
Minimum Split (s)	15.0	15.0	11.0		11.0	
Total Split (s)	20.0	60.0	40.0		35.0	
Total Split (%)	21.1%	63.2%	42.1%		36.8%	
Maximum Green (s)	15.0	55.0	35.0		30.0	
Yellow Time (s)	4.0	4.0	4.0		4.0	
All-Red Time (s)	1.0	1.0	1.0		1.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	5.0	5.0	5.0		5.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0		2.0	
Recall Mode	Min	Min	None		None	

Intersection Summary

Cycle Length: 95  
 Actuated Cycle Length: 38  
 Natural Cycle: 40  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Dascomb Road & Frontage Road









## Queues

2016 Existing Conditions














## 4: Dascomb Road &amp; Frontage Road

Saturday MIDDAY

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	340	631	460	176	78	365
v/c Ratio	0.45	0.44	0.48	0.11	0.21	0.21
Control Delay	5.6	5.2	14.8	0.1	17.7	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.6	5.2	14.8	0.1	17.7	0.3
Queue Length 50th (ft)	30	68	48	0	17	0
Queue Length 95th (ft)	68	146	92	0	48	0
Internal Link Dist (ft)		120	920		695	
Turn Bay Length (ft)	150			130		
Base Capacity (vph)	902	1881	3083	1546	1627	1743
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	0.38	0.34	0.15	0.11	0.05	0.21
Intersection Summary						












HCM 2010 Signalized Intersection Summary  
4: Dascomb Road & Frontage Road

2016 Existing Conditions  
Saturday Midday

								
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations			 					
Traffic Volume (veh/h)	323	599	437	167	74	347		
Future Volume (veh/h)	323	599	437	167	74	347		
Number	1	6	2	12	7	14		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1845	1881	1863	1881	1956	1882		
Adj Flow Rate, veh/h	340	631	460	0	78	0		
Adj No. of Lanes	1	1	2	1	1	1		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Percent Heavy Veh, %	3	1	2	1	1	5		
Cap, veh/h	786	1245	1009	456	162	139		
Arrive On Green	0.25	0.66	0.29	0.00	0.09	0.00		
Sat Flow, veh/h	1757	1881	3632	1599	1863	1600		
Grp Volume(v), veh/h	340	631	460	0	78	0		
Grp Sat Flow(s),veh/h/ln	1757	1881	1770	1599	1863	1600		
Q Serve(g_s), s	4.0	6.8	4.3	0.0	1.6	0.0		
Cycle Q Clear(g_c), s	4.0	6.8	4.3	0.0	1.6	0.0		
Prop In Lane	1.00			1.00	1.00	1.00		
Lane Grp Cap(c), veh/h	786	1245	1009	456	162	139		
V/C Ratio(X)	0.43	0.51	0.46	0.00	0.48	0.00		
Avail Cap(c_a), veh/h	1006	2598	3111	1406	1404	1205		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00		
Uniform Delay (d), s/veh	5.0	3.4	11.7	0.0	17.3	0.0		
Incr Delay (d2), s/veh	0.1	0.1	0.1	0.0	0.8	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.8	3.4	2.1	0.0	0.8	0.0		
LnGrp Delay(d),s/veh	5.1	3.5	11.8	0.0	18.1	0.0		
LnGrp LOS	A	A	B		B			
Approach Vol, veh/h		971	460		78			
Approach Delay, s/veh		4.1	11.8		18.1			
Approach LOS		A	B		B			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	15.0	16.3		8.5		31.3		
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0		
Max Green Setting (Gmax), s	15.0	35.0		30.0		55.0		
Max Q Clear Time (g_c+I1), s	6.0	6.3		3.6		8.8		
Green Ext Time (p_c), s	0.4	5.1		0.1		5.3		
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			7.2					
HCM 2010 LOS			A					

Lanes, Volumes, Timings  
 5: I-93 NB Ramps & Dascomb Road

2016 Existing Conditions  
 Saturday MIDDAY

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	221	452	69	315	289	134
Future Volume (vph)	221	452	69	315	289	134
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.909					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1938	0	1736	1881	1967	1830
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	1938	0	1736	1881	1967	1830
Confl. Peds. (#/hr)		1	1			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	1%	4%	1%	4%	0%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 15.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	221	452	69	315	289	134
Future Vol, veh/h	221	452	69	315	289	134
Conflicting Peds, #/hr	0	1	1	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	200	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	1	1	4	1	4	0
Mvmt Flow	235	481	73	335	307	143

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	236
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.14
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.236
Pot Cap-1 Maneuver	-	-	1319
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1319
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-














Approach	EB	WB	NB
HCM Control Delay, s	0	1.4	52.6
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	327	807	-	-	1319	-
HCM Lane V/C Ratio	0.94	0.177	-	-	0.056	-
HCM Control Delay (s)	72.1	10.4	-	-	7.9	-
HCM Lane LOS	F	B	-	-	A	-
HCM 95th %tile Q(veh)	9.6	0.6	-	-	0.2	-



Lanes, Volumes, Timings  
 6: Frontage Road & I-93 SB Ramps

2016 Existing Conditions  
 Saturday MIDDAY

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						  
Traffic Volume (vph)	380	13	49	438	24	48
Future Volume (vph)	380	13	49	438	24	48
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950					0.984
Satd. Flow (prot)	1948	1830	2027	1568	0	3416
Flt Permitted	0.950					0.984
Satd. Flow (perm)	1948	1830	2027	1568	0	3416
Confl. Bikes (#/hr)		1				
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	5%	0%	0%	3%	8%	2%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh	5.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	380	13	49	438	24	48
Future Vol, veh/h	380	13	49	438	24	48
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	Yield	-	None
Storage Length	0	0	-	0	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	5	0	0	3	8	2
Mvmt Flow	396	14	51	456	25	50

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	126	51	0	0	51	0
Stage 1	51	-	-	-	-	-
Stage 2	75	-	-	-	-	-
Critical Hdwy	6.675	6.2	-	-	4.22	-
Critical Hdwy Stg 1	5.475	-	-	-	-	-
Critical Hdwy Stg 2	5.875	-	-	-	-	-
Follow-up Hdwy	3.5475	3.3	-	-	2.276	-
Pot Cap-1 Maneuver	854	1023	-	-	1514	-
Stage 1	963	-	-	-	-	-
Stage 2	931	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	839	1023	-	-	1514	-
Mov Cap-2 Maneuver	839	-	-	-	-	-
Stage 1	963	-	-	-	-	-
Stage 2	915	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	13		0		2.5
HCM LOS	B				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	839	1023	1514	-
HCM Lane V/C Ratio	-	-	0.472	0.013	0.017	-
HCM Control Delay (s)	-	-	13.1	8.6	7.4	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	2.6	0	0.1	-

# HCS7 Freeway Merge Report

## Project Information

Analyst	ERP	Date	9/19/2017
Agency	MassDOT	Analysis Year	2016
Jurisdiction	4	Time Period Analyzed	Saturday MID
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	35.0
Segment Length (L) / Acceleration Length (L <sub>A</sub> ), ft	1500	1350
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	4100	462
Peak Hour Factor (PHF)	0.92	0.89
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	4681	545
Capacity (c), pc/h	7050	2000
Volume-to-Capacity Ratio (v/c)	0.74	0.27

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	1146.0	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	23.0
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	900	Speed Index (M <sub>s</sub> )	0.338
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	1872
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	-	On-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	57.2
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FM</sub> )	0.600	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	60.1
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	2809	Ramp Junction Speed (S), mi/h	58.2
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	3354	Average Density (D), pc/mi/ln	29.9
Level of Service (LOS)	C		

# HCS7 Freeway Diverge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2016
Jurisdiction	4	Time Period Analyzed	Saturday MID
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	30.0
Segment Length (L) / Deceleration Length (L <sub>D</sub> ), ft	1500	970
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	4100	393
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	4681	449
Capacity (c), pc/h	7050	1900
Volume-to-Capacity Ratio (v/c)	0.66	0.24

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	22.0
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	-	Speed Index (D <sub>S</sub> )	0.533
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	1600
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	900	Off-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	52.7
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FD</sub> )	0.622	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	69.0
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	3081	Ramp Junction Speed (S), mi/h	57.3
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	-	Average Density (D), pc/mi/ln	27.2
Level of Service (LOS)	C		

# HCS7 Freeway Merge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2016
Jurisdiction	4	Time Period Analyzed	Saturday MID
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	35.0
Segment Length (L) / Acceleration Length (L <sub>A</sub> ), ft	1500	1350
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	3719	521
Peak Hour Factor (PHF)	0.92	0.90
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	4246	608
Capacity (c), pc/h	7050	2000
Volume-to-Capacity Ratio (v/c)	0.69	0.30

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	1066.4	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	21.9
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	1100	Speed Index (M <sub>s</sub> )	0.324
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	1635
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	-	On-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	57.5
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FM</sub> )	0.615	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	60.9
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	2611	Ramp Junction Speed (S), mi/h	58.6
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	3219	Average Density (D), pc/mi/ln	27.6
Level of Service (LOS)	C		

# HCS7 Freeway Diverge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2016
Jurisdiction	4	Time Period Analyzed	Saturday MID
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	30.0
Segment Length (L) / Deceleration Length (L <sub>D</sub> ), ft	1500	850
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	3719	421
Peak Hour Factor (PHF)	0.92	0.87
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	4246	508
Capacity (c), pc/h	7050	1900
Volume-to-Capacity Ratio (v/c)	0.60	0.27

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	21.2
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	-	Speed Index (D <sub>S</sub> )	0.539
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	1383
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	1100	Off-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	52.6
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FD</sub> )	0.630	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	69.8
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	2863	Ramp Junction Speed (S), mi/h	57.2
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	-	Average Density (D), pc/mi/ln	24.7
Level of Service (LOS)	C		



2027 No-Build Conditions



Lanes, Volumes, Timings  
1: Shawsheen Street & East Street/Dascomb Road

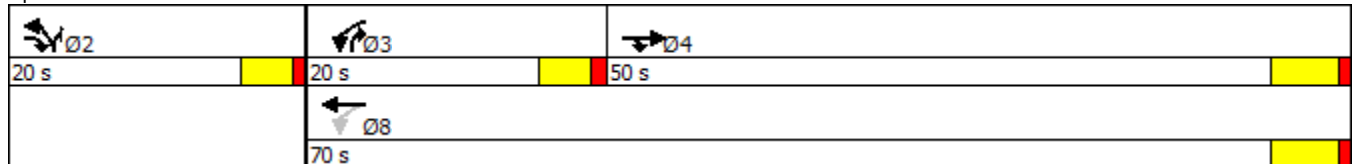
2027 No-Build Conditions  
Weekday Morning

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	567	57	491	496	51	492
Future Volume (vph)	567	57	491	496	51	492
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1717	1432	1694	1701	1646	1516
Flt Permitted			0.189		0.950	
Satd. Flow (perm)	1717	1432	337	1701	1646	1516
Satd. Flow (RTOR)		61				217
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	7%	9%	3%	8%	6%	3%
Shared Lane Traffic (%)						
Turn Type	NA	pt+ov	pm+pt	NA	Prot	pt+ov
Protected Phases	4	2 4	3	8	2	2 3
Permitted Phases			8			
Detector Phase	4	2 4	3	8	2	2 3
Switch Phase						
Minimum Initial (s)	10.0		6.0	10.0	6.0	
Minimum Split (s)	15.5		10.5	15.5	10.5	
Total Split (s)	50.0		20.0	70.0	20.0	
Total Split (%)	55.6%		22.2%	77.8%	22.2%	
Maximum Green (s)	44.5		15.5	64.5	15.5	
Yellow Time (s)	4.5		3.5	4.5	3.5	
All-Red Time (s)	1.0		1.0	1.0	1.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.5		4.5	5.5	4.5	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0		2.0	4.0	2.0	
Recall Mode	Min		None	Min	None	

Intersection Summary







Cycle Length: 90  
Actuated Cycle Length: 77.5  
Natural Cycle: 90  
Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Shawsheen Street & East Street/Dascomb Road



Queues  
1: Shawsheen Street & East Street/Dascomb Road

2027 No-Build Conditions  
Weekday Morning













						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	610	61	528	533	55	529
v/c Ratio	0.83	0.06	1.02	0.45	0.20	0.67
Control Delay	29.8	1.1	64.2	6.8	32.0	16.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.8	1.1	64.2	6.8	32.0	16.4
Queue Length 50th (ft)	259	0	~204	105	23	116
Queue Length 95th (ft)	392	9	#427	160	61	278
Internal Link Dist (ft)	1155			220	920	
Turn Bay Length (ft)		125	200			175
Base Capacity (vph)	1012	1048	517	1413	337	776
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	0.60	0.06	1.02	0.38	0.16	0.68

Intersection Summary

- ~ 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.










HCM 2010 Signalized Intersection Summary  
 1: Shawsheen Street & East Street/Dascomb Road

2027 No-Build Conditions  
 Weekday Morning

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	567	57	491	496	51	492		
Future Volume (veh/h)	567	57	491	496	51	492		
Number	4	14	3	8	5	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1776	1743	1845	1759	1792	1845		
Adj Flow Rate, veh/h	610	61	528	533	55	529		
Adj No. of Lanes	1	1	1	1	1	1		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93		
Percent Heavy Veh, %	7	9	3	8	6	3		
Cap, veh/h	783	936	535	1208	325	597		
Arrive On Green	0.44	0.44	0.19	0.69	0.19	0.19		
Sat Flow, veh/h	1776	1482	1757	1759	1707	1568		
Grp Volume(v), veh/h	610	61	528	533	55	529		
Grp Sat Flow(s),veh/h/ln	1776	1482	1757	1759	1707	1568		
Q Serve(g_s), s	23.8	1.3	15.0	11.1	2.2	15.5		
Cycle Q Clear(g_c), s	23.8	1.3	15.0	11.1	2.2	15.5		
Prop In Lane		1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	783	936	535	1208	325	597		
V/C Ratio(X)	0.78	0.07	0.99	0.44	0.17	0.89		
Avail Cap(c_a), veh/h	971	1092	535	1394	325	597		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	19.4	5.8	18.0	5.7	27.6	23.6		
Incr Delay (d2), s/veh	3.8	0.0	35.2	0.4	0.1	14.5		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	12.3	0.8	17.0	5.5	1.0	13.5		
LnGrp Delay(d),s/veh	23.2	5.8	53.2	6.1	27.7	38.0		
LnGrp LOS	C	A	D	A	C	D		
Approach Vol, veh/h	671			1061	584			
Approach Delay, s/veh	21.6			29.5	37.0			
Approach LOS	C			C	D			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4				8
Phs Duration (G+Y+Rc), s		20.0	20.0	41.4				61.4
Change Period (Y+Rc), s		4.5	4.5	5.5				5.5
Max Green Setting (Gmax), s		15.5	15.5	44.5				64.5
Max Q Clear Time (g_c+I1), s		17.5	17.0	25.8				13.1
Green Ext Time (p_c), s		0.0	0.0	10.1				15.8
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			29.1					
HCM 2010 LOS			C					

Lanes, Volumes, Timings  
 2: Dascomb Road & HP Driveway

2027 No-Build Conditions  
 Weekday Morning

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	14	1045	985	13	2	2
Future Volume (vph)	14	1045	985	13	2	2
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.998		0.932	
Flt Protected		0.999			0.976	
Satd. Flow (prot)	0	1749	2029	0	1383	0
Flt Permitted		0.999			0.976	
Satd. Flow (perm)	0	1749	2029	0	1383	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	5%	6%	0%	50%	0%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↗		↘	
Traffic Vol, veh/h	14	1045	985	13	2	2
Future Vol, veh/h	14	1045	985	13	2	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	0	5	6	0	50	0
Mvmt Flow	15	1124	1059	14	2	2












Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	1059	0	1059
Stage 1	-	-	1059
Stage 2	-	-	1154
Critical Hdwy	4.1	-	6.2
Critical Hdwy Stg 1	-	-	6.6
Critical Hdwy Stg 2	-	-	6.6
Follow-up Hdwy	2.2	-	3.3
Pot Cap-1 Maneuver	665	-	275
Stage 1	-	-	221
Stage 2	-	-	194
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	665	-	275
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	208
Stage 2	-	-	182

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	102.8
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	665	-	-	-	41
HCM Lane V/C Ratio	0.023	-	-	-	0.105
HCM Control Delay (s)	10.5	0	-	-	102.8
HCM Lane LOS	B	A	-	-	F
HCM 95th %tile Q(veh)	0.1	-	-	-	0.3

Lanes, Volumes, Timings  
3: Smith Drive & Dascomb Road

2027 No-Build Conditions  
Weekday Morning

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1027	20	60	990	9	32
Future Volume (vph)	1027	20	60	990	9	32
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.997					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1926	0	1491	1852	1685	1334
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	1926	0	1491	1852	1685	1334
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	5%	0%	13%	6%	0%	13%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 1.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻		↻	↻	↻	↻
Traffic Vol, veh/h	1027	20	60	990	9	32
Future Vol, veh/h	1027	20	60	990	9	32
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	80	-	0	135
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	5	0	13	6	0	13
Mvmt Flow	1104	22	65	1065	10	34













Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1126
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.23
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.317
Pot Cap-1 Maneuver	-	-	582
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	582
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	46
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	38	240	-	-	582	-
HCM Lane V/C Ratio	0.255	0.143	-	-	0.111	-
HCM Control Delay (s)	129.5	22.5	-	-	12	-
HCM Lane LOS	F	C	-	-	B	-
HCM 95th %tile Q(veh)	0.8	0.5	-	-	0.4	-

Lanes, Volumes, Timings  
4: Dascomb Road & Frontage Road

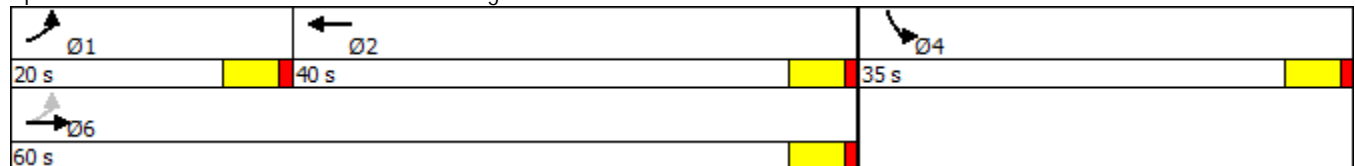
2027 No-Build Conditions  
Weekday Morning

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	423	636	650	454	206	400
Future Volume (vph)	423	636	650	454	206	400
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1719	1810	3438	1561	1986	1711
Flt Permitted	0.201				0.950	
Satd. Flow (perm)	364	1810	3438	1561	1986	1711
Satd. Flow (RTOR)				312		426
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	5%	5%	5%	0%	3%	7%
Shared Lane Traffic (%)						
Turn Type	pm+pt	NA	NA	Free	Prot	Free
Protected Phases	1	6	2		4	
Permitted Phases	6			Free		Free
Detector Phase	1	6	2		4	
Switch Phase						
Minimum Initial (s)	10.0	10.0	6.0		6.0	
Minimum Split (s)	15.0	15.0	11.0		11.0	
Total Split (s)	20.0	60.0	40.0		35.0	
Total Split (%)	21.1%	63.2%	42.1%		36.8%	
Maximum Green (s)	15.0	55.0	35.0		30.0	
Yellow Time (s)	4.0	4.0	4.0		4.0	
All-Red Time (s)	1.0	1.0	1.0		1.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	5.0	5.0	5.0		5.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0		2.0	
Recall Mode	Min	Min	None		None	

Intersection Summary

Cycle Length: 95  
 Actuated Cycle Length: 58.5  
 Natural Cycle: 50  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Dascomb Road & Frontage Road











## Queues

2027 No-Build Conditions

## 4: Dascomb Road &amp; Frontage Road

Weekday Morning














						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	450	677	691	483	219	426
v/c Ratio	0.77	0.59	0.70	0.31	0.57	0.25
Control Delay	21.9	9.4	23.1	0.5	28.7	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.9	9.4	23.1	0.5	28.7	0.3
Queue Length 50th (ft)	82	114	111	0	70	0
Queue Length 95th (ft)	#277	251	181	0	144	0
Internal Link Dist (ft)		120	920		695	
Turn Bay Length (ft)	150			130		
Base Capacity (vph)	584	1665	2093	1561	1036	1711
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	0.77	0.41	0.33	0.31	0.21	0.25

## Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.












HCM 2010 Signalized Intersection Summary  
4: Dascomb Road & Frontage Road

2027 No-Build Conditions  
Weekday Morning

								
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations			 					
Traffic Volume (veh/h)	423	636	650	454	206	400		
Future Volume (veh/h)	423	636	650	454	206	400		
Number	1	6	2	12	7	14		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1810	1810	1810	1900	1918	1847		
Adj Flow Rate, veh/h	450	677	691	0	219	0		
Adj No. of Lanes	1	1	2	1	1	1		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94		
Percent Heavy Veh, %	5	5	5	0	3	7		
Cap, veh/h	621	1166	1175	552	281	241		
Arrive On Green	0.20	0.64	0.34	0.00	0.15	0.00		
Sat Flow, veh/h	1723	1810	3529	1615	1827	1570		
Grp Volume(v), veh/h	450	677	691	0	219	0		
Grp Sat Flow(s),veh/h/ln	1723	1810	1719	1615	1827	1570		
Q Serve(g_s), s	7.3	10.5	8.2	0.0	5.7	0.0		
Cycle Q Clear(g_c), s	7.3	10.5	8.2	0.0	5.7	0.0		
Prop In Lane	1.00			1.00	1.00	1.00		
Lane Grp Cap(c), veh/h	621	1166	1175	552	281	241		
V/C Ratio(X)	0.72	0.58	0.59	0.00	0.78	0.00		
Avail Cap(c_a), veh/h	795	2009	2429	1141	1106	951		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00		
Uniform Delay (d), s/veh	8.2	5.0	13.4	0.0	20.2	0.0		
Incr Delay (d2), s/veh	1.5	0.2	0.2	0.0	1.8	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	3.5	5.1	3.9	0.0	3.0	0.0		
LnGrp Delay(d),s/veh	9.7	5.2	13.6	0.0	22.0	0.0		
LnGrp LOS	A	A	B		C			
Approach Vol, veh/h		1127	691		219			
Approach Delay, s/veh		7.0	13.6		22.0			
Approach LOS		A	B		C			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	15.0	21.9		12.6		36.9		
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0		
Max Green Setting (Gmax), s	15.0	35.0		30.0		55.0		
Max Q Clear Time (g_c+I1), s	9.3	10.2		7.7		12.5		
Green Ext Time (p_c), s	0.4	6.7		0.3		7.3		
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			10.8					
HCM 2010 LOS			B					

Lanes, Volumes, Timings  
 5: I-93 NB Ramps & Dascomb Road

2027 No-Build Conditions  
 Weekday Morning

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	445	397	78	678	436	169
Future Volume (vph)	445	397	78	678	436	169
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.936					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	2016	0	1805	1900	1930	1777
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	2016	0	1805	1900	1930	1777
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	0%	0%	0%	6%	3%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 177.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻		↻	↻	↻	↻
Traffic Vol, veh/h	445	397	78	678	436	169
Future Vol, veh/h	445	397	78	678	436	169
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	200	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	0	0	0	0	6	3
Mvmt Flow	459	409	80	699	449	174

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	459	1319
Stage 1	-	-	459
Stage 2	-	-	860
Critical Hdwy	-	4.1	6.46
Critical Hdwy Stg 1	-	-	5.46
Critical Hdwy Stg 2	-	-	5.46
Follow-up Hdwy	-	2.2	3.554
Pot Cap-1 Maneuver	-	1113	~ 170
Stage 1	-	-	628
Stage 2	-	-	~ 408
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	1113	~ 158
Mov Cap-2 Maneuver	-	-	~ 158
Stage 1	-	-	628
Stage 2	-	-	~ 379

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	\$ 646.4
HCM LOS			F













Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	158	600	-	-	1113	-
HCM Lane V/C Ratio	2.845	0.29	-	-	0.072	-
HCM Control Delay (s)	\$ 891.7	13.4	-	-	8.5	-
HCM Lane LOS	F	B	-	-	A	-
HCM 95th %tile Q(veh)	40.6	1.2	-	-	0.2	-

Notes

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

Lanes, Volumes, Timings  
6: Frontage Road & I-93 SB Ramps

2027 No-Build Conditions  
Weekday Morning

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Traffic Volume (vph)	501	95	313	572	89	96
Future Volume (vph)	501	95	313	572	89	96
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950					0.976
Satd. Flow (prot)	1930	1830	2027	1553	0	3434
Flt Permitted	0.950					0.976
Satd. Flow (perm)	1930	1830	2027	1553	0	3434
Confl. Bikes (#/hr)		1				
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	6%	0%	0%	4%	0%	5%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 48.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗		↖↑
Traffic Vol, veh/h	501	95	313	572	89	96
Future Vol, veh/h	501	95	313	572	89	96
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	Yield	-	None
Storage Length	0	0	-	0	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	6	0	0	4	0	5
Mvmt Flow	527	100	329	602	94	101

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	567	329	0	0	329	0
Stage 1	329	-	-	-	-	-
Stage 2	238	-	-	-	-	-
Critical Hdwy	6.69	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.49	-	-	-	-	-
Critical Hdwy Stg 2	5.89	-	-	-	-	-
Follow-up Hdwy	3.557	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	~ 461	717	-	-	1242	-
Stage 1	718	-	-	-	-	-
Stage 2	769	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 424	717	-	-	1242	-
Mov Cap-2 Maneuver	~ 424	-	-	-	-	-
Stage 1	718	-	-	-	-	-
Stage 2	707	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	133.2		0		4
HCM LOS	F				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	424	717	1242	-
HCM Lane V/C Ratio	-	-	1.244	0.139	0.075	-
HCM Control Delay (s)	-	-	156.4	10.8	8.1	0.1
HCM Lane LOS	-	-	F	B	A	A
HCM 95th %tile Q(veh)	-	-	21.9	0.5	0.2	-

Notes

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

# HCS7 Freeway Merge Report

## Project Information

Analyst	ERP	Date	9/19/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Weekday AM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	35.0
Segment Length (L) / Acceleration Length (L <sub>A</sub> ), ft	1500	220
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	7212	654
Peak Hour Factor (PHF)	0.92	0.90
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	8234	763
Capacity (c), pc/h	7050	2000
Volume-to-Capacity Ratio (v/c)	1.28	0.38

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	1451.2	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	-
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	900	Speed Index (M <sub>s</sub> )	-
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	2700
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	-	On-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	-
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FM</sub> )	0.549	Outer Lanes Freeway Speed (S <sub>o</sub> ), mi/h	56.1
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	5534	Ramp Junction Speed (S), mi/h	-
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	6297	Average Density (D), pc/mi/ln	-
Level of Service (LOS)	F		

# HCS7 Freeway Diverge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Weekday AM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	30.0
Segment Length (L) / Deceleration Length (L <sub>D</sub> ), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	7212	594
Peak Hour Factor (PHF)	0.92	0.95
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	8234	657
Capacity (c), pc/h	7050	1900
Volume-to-Capacity Ratio (v/c)	1.17	0.35

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	-
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	-	Speed Index (D <sub>s</sub> )	-
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	2700
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	900	Off-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	-
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FD</sub> )	0.524	Outer Lanes Freeway Speed (S <sub>o</sub> ), mi/h	64.7
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	5534	Ramp Junction Speed (S), mi/h	-
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	-	Average Density (D), pc/mi/ln	-
Level of Service (LOS)	F		



# HCS7 Freeway Merge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Weekday AM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	35.0
Segment Length (L) / Acceleration Length (L <sub>A</sub> ), ft	1500	1350
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	4230	470
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	4830	537
Capacity (c), pc/h	7050	2000
Volume-to-Capacity Ratio (v/c)	0.76	0.27

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	1176.1	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	24.0
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	1100	Speed Index (M <sub>s</sub> )	0.353
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	1884
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	-	On-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	56.9
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FM</sub> )	0.610	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	60.0
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	2946	Ramp Junction Speed (S), mi/h	58.0
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	3483	Average Density (D), pc/mi/ln	30.8
Level of Service (LOS)	C		

# HCS7 Freeway Diverge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Weekday AM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	30.0
Segment Length (L) / Deceleration Length (L <sub>D</sub> ), ft	1500	850
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	4230	604
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	4830	690
Capacity (c), pc/h	7050	1900
Volume-to-Capacity Ratio (v/c)	0.69	0.36

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	24.2
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	-	Speed Index (D <sub>s</sub> )	0.555
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	1623
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	1100	Off-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	52.2
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FD</sub> )	0.608	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	68.9
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	3207	Ramp Junction Speed (S), mi/h	56.8
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	-	Average Density (D), pc/mi/ln	28.3
Level of Service (LOS)	C		

Lanes, Volumes, Timings  
1: Shawsheen Street & East Street/Dascomb Road

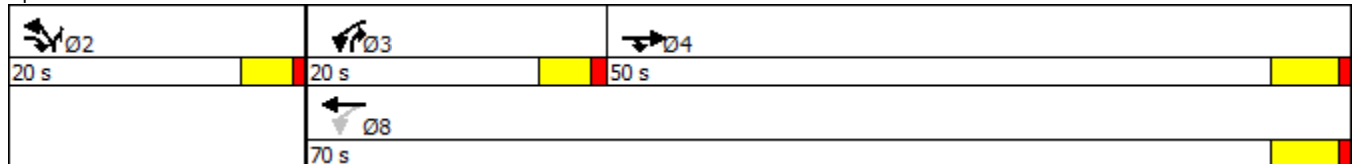
2027 No-Build Conditions  
Weekday Evening

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	565	32	470	724	73	559
Future Volume (vph)	565	32	470	724	73	559
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1818	1516	1728	1818	1728	1546
Flt Permitted			0.178		0.950	
Satd. Flow (perm)	1818	1516	324	1818	1728	1546
Satd. Flow (RTOR)		34				218
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	1%	3%	1%	1%	1%	1%
Shared Lane Traffic (%)						
Turn Type	NA	pt+ov	pm+pt	NA	Prot	pt+ov
Protected Phases	4	2 4	3	8	2	2 3
Permitted Phases			8			
Detector Phase	4	2 4	3	8	2	2 3
Switch Phase						
Minimum Initial (s)	10.0		6.0	10.0	6.0	
Minimum Split (s)	15.5		10.5	15.5	10.5	
Total Split (s)	50.0		20.0	70.0	20.0	
Total Split (%)	55.6%		22.2%	77.8%	22.2%	
Maximum Green (s)	44.5		15.5	64.5	15.5	
Yellow Time (s)	4.5		3.5	4.5	3.5	
All-Red Time (s)	1.0		1.0	1.0	1.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.5		4.5	5.5	4.5	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0		2.0	4.0	2.0	
Recall Mode	Min		None	Min	None	

Intersection Summary







Cycle Length: 90  
 Actuated Cycle Length: 76.7  
 Natural Cycle: 80  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Shawsheen Street & East Street/Dascomb Road



Queues  
1: Shawsheen Street & East Street/Dascomb Road

2027 No-Build Conditions  
Weekday Evening













						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	608	34	505	778	78	601
v/c Ratio	0.80	0.03	1.00	0.63	0.24	0.74
Control Delay	28.5	1.3	58.5	9.7	31.6	19.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.5	1.3	58.5	9.7	31.6	19.1
Queue Length 50th (ft)	251	0	~162	185	32	145
Queue Length 95th (ft)	374	7	#402	277	80	#395
Internal Link Dist (ft)	1155			220	920	
Turn Bay Length (ft)		125	200			175
Base Capacity (vph)	1076	1089	513	1526	356	823
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	0.57	0.03	0.98	0.51	0.22	0.73

Intersection Summary

- ~ 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.










HCM 2010 Signalized Intersection Summary  
 1: Shawsheen Street & East Street/Dascomb Road

2027 No-Build Conditions  
 Weekday Evening

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	565	32	470	724	73	559		
Future Volume (veh/h)	565	32	470	724	73	559		
Number	4	14	3	8	5	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1881	1845	1881	1881	1881	1881		
Adj Flow Rate, veh/h	608	34	505	778	78	601		
Adj No. of Lanes	1	1	1	1	1	1		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93		
Percent Heavy Veh, %	1	3	1	1	1	1		
Cap, veh/h	857	1020	545	1278	349	579		
Arrive On Green	0.46	0.46	0.17	0.68	0.19	0.19		
Sat Flow, veh/h	1881	1568	1792	1881	1792	1599		
Grp Volume(v), veh/h	608	34	505	778	78	601		
Grp Sat Flow(s),veh/h/ln	1881	1568	1792	1881	1792	1599		
Q Serve(g_s), s	20.7	0.6	11.0	18.0	2.9	15.5		
Cycle Q Clear(g_c), s	20.7	0.6	11.0	18.0	2.9	15.5		
Prop In Lane		1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	857	1020	545	1278	349	579		
V/C Ratio(X)	0.71	0.03	0.93	0.61	0.22	1.04		
Avail Cap(c_a), veh/h	1053	1183	595	1526	349	579		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	17.4	5.0	13.7	7.0	26.9	25.4		
Incr Delay (d2), s/veh	2.1	0.0	19.2	0.7	0.1	47.8		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	11.1	0.4	8.2	9.3	1.4	20.3		
LnGrp Delay(d),s/veh	19.5	5.0	32.8	7.7	27.0	73.2		
LnGrp LOS	B	A	C	A	C	F		
Approach Vol, veh/h	642			1283	679			
Approach Delay, s/veh	18.7			17.6	67.9			
Approach LOS	B			B	E			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4				8
Phs Duration (G+Y+Rc), s		20.0	17.8	41.7				59.5
Change Period (Y+Rc), s		4.5	4.5	5.5				5.5
Max Green Setting (Gmax), s		15.5	15.5	44.5				64.5
Max Q Clear Time (g_c+I1), s		17.5	13.0	22.7				20.0
Green Ext Time (p_c), s		0.0	0.3	13.6				20.2
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			31.0					
HCM 2010 LOS			C					

Lanes, Volumes, Timings  
 2: Dascomb Road & HP Driveway

2027 No-Build Conditions  
 Weekday Evening

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	6	1117	1166	4	3	28
Future Volume (vph)	6	1117	1166	4	3	28
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.877	
Flt Protected					0.995	
Satd. Flow (prot)	0	1819	2108	0	1471	0
Flt Permitted					0.995	
Satd. Flow (perm)	0	1819	2108	0	1471	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	1%	2%	50%	100%	4%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Control Type: Unsignalized						

Intersection

Int Delay, s/veh 0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↗		↘	
Traffic Vol, veh/h	6	1117	1166	4	3	28
Future Vol, veh/h	6	1117	1166	4	3	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	1	2	50	100	4
Mvmt Flow	7	1214	1267	4	3	30












Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	1267	0	2494
Stage 1	-	-	1267
Stage 2	-	-	1227
Critical Hdwy	4.1	-	7.4
Critical Hdwy Stg 1	-	-	6.4
Critical Hdwy Stg 2	-	-	6.4
Follow-up Hdwy	2.2	-	4.4
Pot Cap-1 Maneuver	555	-	16
Stage 1	-	-	169
Stage 2	-	-	178
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	555	-	15
Mov Cap-2 Maneuver	-	-	15
Stage 1	-	-	169
Stage 2	-	-	171

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	65.2
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	555	-	-	-	92
HCM Lane V/C Ratio	0.012	-	-	-	0.366
HCM Control Delay (s)	11.6	0	-	-	65.2
HCM Lane LOS	B	A	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	1.4

Lanes, Volumes, Timings  
3: Smith Drive & Dascomb Road

2027 No-Build Conditions  
Weekday Evening

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1109	11	22	1152	18	50
Future Volume (vph)	1109	11	22	1152	18	50
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.999					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	2003	0	1428	1925	1589	1396
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	2003	0	1428	1925	1589	1396
Confl. Bikes (#/hr)		1				
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	1%	9%	18%	2%	6%	8%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Control Type: Unsignalized



Intersection

Int Delay, s/veh 2.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1109	11	22	1152	18	50
Future Vol, veh/h	1109	11	22	1152	18	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	80	-	0	135
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	1	9	18	2	6	8
Mvmt Flow	1219	12	24	1266	20	55













Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1231
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.28
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.362
Pot Cap-1 Maneuver	-	-	514
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	514
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	94.6
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	28	212	-	-	514	-
HCM Lane V/C Ratio	0.706	0.259	-	-	0.047	-
HCM Control Delay (s)	280.2	27.8	-	-	12.3	-
HCM Lane LOS	F	D	-	-	B	-
HCM 95th %tile Q(veh)	2.3	1	-	-	0.1	-

Lanes, Volumes, Timings  
4: Dascomb Road & Frontage Road

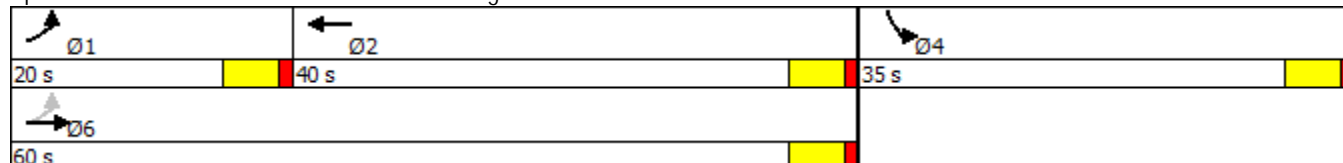
2027 No-Build Conditions  
Weekday Evening

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	370	789	729	260	251	446
Future Volume (vph)	370	789	729	260	251	446
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1752	1881	3539	1546	2025	1777
Flt Permitted	0.183				0.950	
Satd. Flow (perm)	338	1881	3539	1546	2025	1777
Satd. Flow (RTOR)				160		465
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	3%	1%	2%	1%	1%	3%
Shared Lane Traffic (%)						
Turn Type	pm+pt	NA	NA	Free	Prot	Free
Protected Phases	1	6	2		4	
Permitted Phases	6			Free		Free
Detector Phase	1	6	2		4	
Switch Phase						
Minimum Initial (s)	10.0	10.0	6.0		6.0	
Minimum Split (s)	15.0	15.0	11.0		11.0	
Total Split (s)	20.0	60.0	40.0		35.0	
Total Split (%)	21.1%	63.2%	42.1%		36.8%	
Maximum Green (s)	15.0	55.0	35.0		30.0	
Yellow Time (s)	4.0	4.0	4.0		4.0	
All-Red Time (s)	1.0	1.0	1.0		1.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	5.0	5.0	5.0		5.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0		2.0	
Recall Mode	Min	Min	None		None	

Intersection Summary

Cycle Length: 95  
 Actuated Cycle Length: 60.4  
 Natural Cycle: 55  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Dascomb Road & Frontage Road









## Queues

2027 No-Build Conditions

## 4: Dascomb Road &amp; Frontage Road

Weekday Evening













						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	385	822	759	271	261	465
v/c Ratio	0.74	0.71	0.70	0.18	0.60	0.26
Control Delay	21.4	12.9	22.7	0.2	28.9	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.4	12.9	22.7	0.2	28.9	0.4
Queue Length 50th (ft)	67	169	125	0	86	0
Queue Length 95th (ft)	#240	385	213	0	178	0
Internal Link Dist (ft)		120	920		695	
Turn Bay Length (ft)	150			130		
Base Capacity (vph)	571	1675	2128	1546	1043	1777
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	0.67	0.49	0.36	0.18	0.25	0.26

## Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.












HCM 2010 Signalized Intersection Summary  
4: Dascomb Road & Frontage Road

2027 No-Build Conditions  
Weekday Evening

								
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations								
Traffic Volume (veh/h)	370	789	729	260	251	446		
Future Volume (veh/h)	370	789	729	260	251	446		
Number	1	6	2	12	7	14		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1845	1881	1863	1881	1956	1918		
Adj Flow Rate, veh/h	385	822	759	0	261	0		
Adj No. of Lanes	1	1	2	1	1	1		
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96		
Percent Heavy Veh, %	3	1	2	1	1	3		
Cap, veh/h	590	1204	1282	579	325	285		
Arrive On Green	0.19	0.64	0.36	0.00	0.17	0.00		
Sat Flow, veh/h	1757	1881	3632	1599	1863	1631		
Grp Volume(v), veh/h	385	822	759	0	261	0		
Grp Sat Flow(s),veh/h/ln	1757	1881	1770	1599	1863	1631		
Q Serve(g_s), s	6.3	15.1	9.4	0.0	7.3	0.0		
Cycle Q Clear(g_c), s	6.3	15.1	9.4	0.0	7.3	0.0		
Prop In Lane	1.00			1.00	1.00	1.00		
Lane Grp Cap(c), veh/h	590	1204	1282	579	325	285		
V/C Ratio(X)	0.65	0.68	0.59	0.00	0.80	0.00		
Avail Cap(c_a), veh/h	753	1917	2295	1037	1036	906		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00		
Uniform Delay (d), s/veh	8.5	6.2	14.0	0.0	21.4	0.0		
Incr Delay (d2), s/veh	0.6	0.3	0.2	0.0	1.8	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	3.0	7.6	4.6	0.0	3.9	0.0		
LnGrp Delay(d),s/veh	9.1	6.5	14.1	0.0	23.2	0.0		
LnGrp LOS	A	A	B		C			
Approach Vol, veh/h		1207	759		261			
Approach Delay, s/veh		7.3	14.1		23.2			
Approach LOS		A	B		C			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	15.0	24.6		14.4		39.6		
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0		
Max Green Setting (Gmax), s	15.0	35.0		30.0		55.0		
Max Q Clear Time (g_c+I1), s	8.3	11.4		9.3		17.1		
Green Ext Time (p_c), s	0.4	8.2		0.4		9.2		
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			11.5					
HCM 2010 LOS			B					

Lanes, Volumes, Timings  
 5: I-93 NB Ramps & Dascomb Road

2027 No-Build Conditions  
 Weekday Evening

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	582	458	99	588	401	369
Future Volume (vph)	582	458	99	588	401	369
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.941					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	2006	0	1752	1881	2006	1830
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	2006	0	1752	1881	2006	1830
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	1%	1%	3%	1%	2%	0%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 161.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻		↻	↻	↻	↻
Traffic Vol, veh/h	582	458	99	588	401	369
Future Vol, veh/h	582	458	99	588	401	369
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	200	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	1	1	3	1	2	0
Mvmt Flow	600	472	102	606	413	380

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	600
Stage 1	-	-	600
Stage 2	-	-	810
Critical Hdwy	-	-	4.13
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	-	-	2.227
Pot Cap-1 Maneuver	-	-	972
Stage 1	-	-	548
Stage 2	-	-	438
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	972
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	548
Stage 2	-	-	392

Approach	EB	WB	NB
HCM Control Delay, s	0	1.3	\$ 523.5
HCM LOS			F













Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	137	505	-	-	972	-
HCM Lane V/C Ratio	3.018	0.753	-	-	0.105	-
HCM Control Delay (s)	\$ 976.9	30.8	-	-	9.1	-
HCM Lane LOS	F	D	-	-	A	-
HCM 95th %tile Q(veh)	38.6	6.5	-	-	0.4	-

Notes

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

Lanes, Volumes, Timings  
 6: Frontage Road & I-93 SB Ramps

2027 No-Build Conditions  
 Weekday Evening

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Traffic Volume (vph)	452	19	126	502	96	211
Future Volume (vph)	452	19	126	502	96	211
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950					0.985
Satd. Flow (prot)	2006	1727	2007	1583	0	3532
Flt Permitted	0.950					0.985
Satd. Flow (perm)	2006	1727	2007	1583	0	3532
Confl. Bikes (#/hr)		1				
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	2%	6%	1%	2%	0%	1%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 23.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗		↗↑
Traffic Vol, veh/h	452	19	126	502	96	211
Future Vol, veh/h	452	19	126	502	96	211
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	Yield	-	None
Storage Length	0	0	-	0	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	6	1	2	0	1
Mvmt Flow	497	21	138	552	105	232

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	465	138	0	0	138	0
Stage 1	138	-	-	-	-	-
Stage 2	327	-	-	-	-	-
Critical Hdwy	6.63	6.29	-	-	4.1	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.357	-	-	2.2	-
Pot Cap-1 Maneuver	541	898	-	-	1458	-
Stage 1	888	-	-	-	-	-
Stage 2	704	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	- 496	898	-	-	1458	-
Mov Cap-2 Maneuver	- 496	-	-	-	-	-
Stage 1	888	-	-	-	-	-
Stage 2	646	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	67.4		0		2.5
HCM LOS	F				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	496	898	1458	-
HCM Lane V/C Ratio	-	-	1.001	0.023	0.072	-
HCM Control Delay (s)	-	-	69.8	9.1	7.7	0.2
HCM Lane LOS	-	-	F	A	A	A
HCM 95th %tile Q(veh)	-	-	13.7	0.1	0.2	-

Notes

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



# HCS7 Freeway Merge Report

## Project Information

Analyst	ERP	Date	9/19/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Weekday PM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	35.0
Segment Length (L) / Acceleration Length (L <sub>A</sub> ), ft	1500	1350
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	5215	594
Peak Hour Factor (PHF)	0.92	0.89
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	5954	701
Capacity (c), pc/h	7050	2000
Volume-to-Capacity Ratio (v/c)	0.94	0.35

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	1451.8	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	29.2
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	900	Speed Index (M <sub>s</sub> )	0.475
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	2501
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	-	On-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	54.1
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FM</sub> )	0.580	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	57.3
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	3453	Ramp Junction Speed (S), mi/h	55.3
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	4154	Average Density (D), pc/mi/ln	40.1
Level of Service (LOS)	D		

# HCS7 Freeway Diverge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Weekday PM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	30.0
Segment Length (L) / Deceleration Length (L <sub>D</sub> ), ft	1500	970
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	5215	464
Peak Hour Factor (PHF)	0.92	0.95
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	5954	513
Capacity (c), pc/h	7050	1900
Volume-to-Capacity Ratio (v/c)	0.84	0.27

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	27.4
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	-	Speed Index (D <sub>s</sub> )	0.539
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	2242
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	900	Off-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	52.6
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FD</sub> )	0.588	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	66.5
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	3712	Ramp Junction Speed (S), mi/h	57.1
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	-	Average Density (D), pc/mi/ln	34.8
Level of Service (LOS)	C		

# HCS7 Freeway Merge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Weekday PM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	35.0
Segment Length (L) / Acceleration Length (L <sub>A</sub> ), ft	1500	210
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	6661	556
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	7605	635
Capacity (c), pc/h	7050	2000
Volume-to-Capacity Ratio (v/c)	1.17	0.32

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	1284.8	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	-
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	1100	Speed Index (M <sub>s</sub> )	-
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	2700
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	-	On-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	-
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FM</sub> )	0.572	Outer Lanes Freeway Speed (S <sub>o</sub> ), mi/h	56.1
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	4905	Ramp Junction Speed (S), mi/h	-
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	5540	Average Density (D), pc/mi/ln	-
Level of Service (LOS)	F		

# HCS7 Freeway Diverge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Weekday PM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	30.0
Segment Length (L) / Deceleration Length (L <sub>D</sub> ), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	6661	760
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	7605	868
Capacity (c), pc/h	7050	1900
Volume-to-Capacity Ratio (v/c)	1.08	0.46

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	-
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	-	Speed Index (D <sub>S</sub> )	-
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	2700
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	1100	Off-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	-
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FD</sub> )	0.530	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	64.7
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	4905	Ramp Junction Speed (S), mi/h	-
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	-	Average Density (D), pc/mi/ln	-
Level of Service (LOS)	F		

Lanes, Volumes, Timings  
1: Shawsheen Street & East Street/Dascomb Road

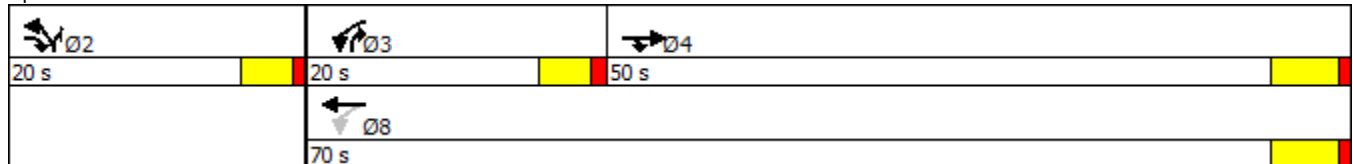
2027 No-Build Conditions  
Saturday MIDDAY

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↙	↑	↙	↗
Traffic Volume (vph)	435	50	373	416	60	504
Future Volume (vph)	435	50	373	416	60	504
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1818	1561	1711	1749	1631	1546
Flt Permitted			0.282		0.950	
Satd. Flow (perm)	1818	1561	508	1749	1631	1546
Satd. Flow (RTOR)		53				324
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	0%	2%	5%	7%	1%
Shared Lane Traffic (%)						
Turn Type	NA	pt+ov	pm+pt	NA	Prot	pt+ov
Protected Phases	4	2 4	3	8	2	2 3
Permitted Phases			8			
Detector Phase	4	2 4	3	8	2	2 3
Switch Phase						
Minimum Initial (s)	10.0		6.0	10.0	6.0	
Minimum Split (s)	15.5		10.5	15.5	10.5	
Total Split (s)	50.0		20.0	70.0	20.0	
Total Split (%)	55.6%		22.2%	77.8%	22.2%	
Maximum Green (s)	44.5		15.5	64.5	15.5	
Yellow Time (s)	4.5		3.5	4.5	3.5	
All-Red Time (s)	1.0		1.0	1.0	1.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.5		4.5	5.5	4.5	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0		2.0	4.0	2.0	
Recall Mode	Min		None	Min	None	

Intersection Summary







Cycle Length: 90  
 Actuated Cycle Length: 60  
 Natural Cycle: 60  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Shawsheen Street & East Street/Dascomb Road









Queues  
1: Shawsheen Street & East Street/Dascomb Road

2027 No-Build Conditions  
Saturday MIDDAY

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	463	53	397	443	64	536
v/c Ratio	0.68	0.05	0.72	0.40	0.21	0.61
Control Delay	22.4	1.4	13.6	6.6	26.1	9.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.4	1.4	13.6	6.6	26.1	9.0
Queue Length 50th (ft)	133	0	53	64	19	45
Queue Length 95th (ft)	264	9	125	126	62	171
Internal Link Dist (ft)	1155			220	920	
Turn Bay Length (ft)		125	200			175
Base Capacity (vph)	1396	1285	665	1640	450	982
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	0.33	0.04	0.60	0.27	0.14	0.55
Intersection Summary						










HCM 2010 Signalized Intersection Summary  
 1: Shawsheen Street & East Street/Dascomb Road

2027 No-Build Conditions  
 Saturday Midday

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations	↑	↑	↑	↑	↑	↑		
Traffic Volume (veh/h)	435	50	373	416	60	504		
Future Volume (veh/h)	435	50	373	416	60	504		
Number	4	14	3	8	5	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1881	1900	1863	1810	1776	1881		
Adj Flow Rate, veh/h	463	53	397	443	64	536		
Adj No. of Lanes	1	1	1	1	1	1		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94		
Percent Heavy Veh, %	1	0	2	5	7	1		
Cap, veh/h	714	997	550	1101	403	636		
Arrive On Green	0.38	0.38	0.16	0.61	0.24	0.24		
Sat Flow, veh/h	1881	1615	1774	1810	1691	1599		
Grp Volume(v), veh/h	463	53	397	443	64	536		
Grp Sat Flow(s),veh/h/ln	1881	1615	1774	1810	1691	1599		
Q Serve(g_s), s	13.2	0.8	8.1	8.3	2.0	15.5		
Cycle Q Clear(g_c), s	13.2	0.8	8.1	8.3	2.0	15.5		
Prop In Lane		1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	714	997	550	1101	403	636		
V/C Ratio(X)	0.65	0.05	0.72	0.40	0.16	0.84		
Avail Cap(c_a), veh/h	1286	1489	689	1793	403	636		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	16.6	4.9	11.0	6.6	19.6	17.7		
Incr Delay (d2), s/veh	1.4	0.0	1.9	0.3	0.1	9.5		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	7.1	0.6	4.1	4.2	0.9	10.3		
LnGrp Delay(d),s/veh	18.1	5.0	12.8	7.0	19.7	27.2		
LnGrp LOS	B	A	B	A	B	C		
Approach Vol, veh/h	516			840	600			
Approach Delay, s/veh	16.7			9.7	26.4			
Approach LOS	B			A	C			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4				8
Phs Duration (G+Y+Rc), s		20.0	14.9	30.2				45.1
Change Period (Y+Rc), s		4.5	4.5	5.5				5.5
Max Green Setting (Gmax), s		15.5	15.5	44.5				64.5
Max Q Clear Time (g_c+I1), s		17.5	10.1	15.2				10.3
Green Ext Time (p_c), s		0.0	0.3	9.5				10.9
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			16.7					
HCM 2010 LOS			B					

Lanes, Volumes, Timings  
 2: Dascomb Road & HP Driveway

2027 No-Build Conditions  
 Saturday MIDDAY

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	939	787	0	0	2
Future Volume (vph)	0	939	787	0	0	2
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected						
Satd. Flow (prot)	0	1801	2071	0	1644	0
Flt Permitted						
Satd. Flow (perm)	0	1801	2071	0	1644	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	2%	4%	0%	0%	0%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Control Type: Unsignalized						



Intersection

Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↗		↘	
Traffic Vol, veh/h	0	939	787	0	0	2
Future Vol, veh/h	0	939	787	0	0	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	2	4	0	0	0
Mvmt Flow	0	978	820	0	0	2












Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	820	0	1798
Stage 1	-	-	820
Stage 2	-	-	978
Critical Hdwy	4.1	-	6.4
Critical Hdwy Stg 1	-	-	5.4
Critical Hdwy Stg 2	-	-	5.4
Follow-up Hdwy	2.2	-	3.5
Pot Cap-1 Maneuver	818	-	89
Stage 1	-	-	436
Stage 2	-	-	368
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	818	-	89
Mov Cap-2 Maneuver	-	-	89
Stage 1	-	-	436
Stage 2	-	-	368

Approach	EB	WB	SB
HCM Control Delay, s	0	0	14.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	818	-	-	-	378
HCM Lane V/C Ratio	-	-	-	-	0.006
HCM Control Delay (s)	0	-	-	-	14.6
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

Lanes, Volumes, Timings  
3: Smith Drive & Dascomb Road

2027 No-Build Conditions  
Saturday MIDDAY

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	923	16	63	771	16	57
Future Volume (vph)	923	16	63	771	16	57
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.998					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1984	0	1636	1888	1685	1507
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	1984	0	1636	1888	1685	1507
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	0%	3%	4%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 1.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻		↻	↻	↻	↻
Traffic Vol, veh/h	923	16	63	771	16	57
Future Vol, veh/h	923	16	63	771	16	57
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	80	-	0	135
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	0	3	4	0	0
Mvmt Flow	952	16	65	795	16	59













Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1885
Stage 1	-	-	960
Stage 2	-	-	925
Critical Hdwy	-	4.13	6.4
Critical Hdwy Stg 1	-	-	5.4
Critical Hdwy Stg 2	-	-	5.4
Follow-up Hdwy	-	2.227	3.5
Pot Cap-1 Maneuver	-	708	79
Stage 1	-	-	375
Stage 2	-	-	389
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	708	72
Mov Cap-2 Maneuver	-	-	72
Stage 1	-	-	375
Stage 2	-	-	353

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	30.1
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	72	314	-	-	708	-
HCM Lane V/C Ratio	0.229	0.187	-	-	0.092	-
HCM Control Delay (s)	69.3	19.1	-	-	10.6	-
HCM Lane LOS	F	C	-	-	B	-
HCM 95th %tile Q(veh)	0.8	0.7	-	-	0.3	-

Lanes, Volumes, Timings  
4: Dascomb Road & Frontage Road

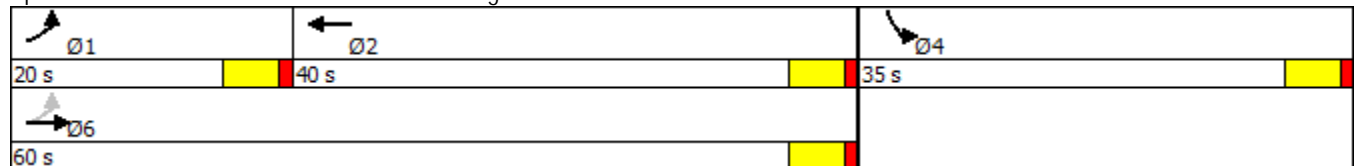
2027 No-Build Conditions  
Saturday Midday

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	344	636	464	176	78	370
Future Volume (vph)	344	636	464	176	78	370
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1752	1881	3539	1546	2025	1743
Flt Permitted	0.328				0.950	
Satd. Flow (perm)	605	1881	3539	1546	2025	1743
Satd. Flow (RTOR)				169		389
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	3%	1%	2%	1%	1%	5%
Shared Lane Traffic (%)						
Turn Type	pm+pt	NA	NA	Free	Prot	Free
Protected Phases	1	6	2		4	
Permitted Phases	6			Free		Free
Detector Phase	1	6	2		4	
Switch Phase						
Minimum Initial (s)	10.0	10.0	6.0		6.0	
Minimum Split (s)	15.0	15.0	11.0		11.0	
Total Split (s)	20.0	60.0	40.0		35.0	
Total Split (%)	21.1%	63.2%	42.1%		36.8%	
Maximum Green (s)	15.0	55.0	35.0		30.0	
Yellow Time (s)	4.0	4.0	4.0		4.0	
All-Red Time (s)	1.0	1.0	1.0		1.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	5.0	5.0	5.0		5.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0		2.0	
Recall Mode	Min	Min	None		None	

Intersection Summary

Cycle Length: 95  
 Actuated Cycle Length: 38.9  
 Natural Cycle: 40  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Dascomb Road & Frontage Road









## Queues

2027 No-Build Conditions













## 4: Dascomb Road &amp; Frontage Road

Saturday MIDDAY

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	362	669	488	185	82	389
v/c Ratio	0.48	0.46	0.50	0.12	0.22	0.22
Control Delay	5.9	5.4	14.9	0.2	18.4	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.9	5.4	14.9	0.2	18.4	0.3
Queue Length 50th (ft)	33	75	52	0	18	0
Queue Length 95th (ft)	74	162	100	0	52	0
Internal Link Dist (ft)		120	920		695	
Turn Bay Length (ft)	150			130		
Base Capacity (vph)	895	1881	3035	1546	1604	1743
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	0.40	0.36	0.16	0.12	0.05	0.22
Intersection Summary						












HCM 2010 Signalized Intersection Summary  
4: Dascomb Road & Frontage Road

2027 No-Build Conditions  
Saturday MIDDAY

								
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations								
Traffic Volume (veh/h)	344	636	464	176	78	370		
Future Volume (veh/h)	344	636	464	176	78	370		
Number	1	6	2	12	7	14		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1845	1881	1863	1881	1956	1882		
Adj Flow Rate, veh/h	362	669	488	0	82	0		
Adj No. of Lanes	1	1	2	1	1	1		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Percent Heavy Veh, %	3	1	2	1	1	5		
Cap, veh/h	774	1252	1052	475	166	142		
Arrive On Green	0.25	0.67	0.30	0.00	0.09	0.00		
Sat Flow, veh/h	1757	1881	3632	1599	1863	1600		
Grp Volume(v), veh/h	362	669	488	0	82	0		
Grp Sat Flow(s),veh/h/ln	1757	1881	1770	1599	1863	1600		
Q Serve(g_s), s	4.3	7.5	4.6	0.0	1.7	0.0		
Cycle Q Clear(g_c), s	4.3	7.5	4.6	0.0	1.7	0.0		
Prop In Lane	1.00			1.00	1.00	1.00		
Lane Grp Cap(c), veh/h	774	1252	1052	475	166	142		
V/C Ratio(X)	0.47	0.53	0.46	0.00	0.49	0.00		
Avail Cap(c_a), veh/h	989	2540	3041	1374	1372	1178		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00		
Uniform Delay (d), s/veh	5.2	3.5	11.7	0.0	17.7	0.0		
Incr Delay (d2), s/veh	0.2	0.1	0.1	0.0	0.8	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.9	3.8	2.3	0.0	0.9	0.0		
LnGrp Delay(d),s/veh	5.3	3.7	11.8	0.0	18.5	0.0		
LnGrp LOS	A	A	B		B			
Approach Vol, veh/h		1031	488		82			
Approach Delay, s/veh		4.3	11.8		18.5			
Approach LOS		A	B		B			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	15.0	17.1		8.6		32.1		
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0		
Max Green Setting (Gmax), s	15.0	35.0		30.0		55.0		
Max Q Clear Time (g_c+I1), s	6.3	6.6		3.7		9.5		
Green Ext Time (p_c), s	0.4	5.5		0.1		5.8		
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			7.3					
HCM 2010 LOS			A					

Lanes, Volumes, Timings  
 5: I-93 NB Ramps & Dascomb Road

2027 No-Build Conditions  
 Saturday MIDDAY

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	233	481	73	332	308	142
Future Volume (vph)	233	481	73	332	308	142
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.909					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1938	0	1736	1881	1967	1830
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	1938	0	1736	1881	1967	1830
Confl. Peds. (#/hr)		1	1			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	1%	4%	1%	4%	0%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 14.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻		↻	↻	↻	↻
Traffic Vol, veh/h	233	481	73	332	308	142
Future Vol, veh/h	233	481	73	332	308	142
Conflicting Peds, #/hr	0	1	1	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	200	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	1	1	4	1	4	0
Mvmt Flow	248	512	78	353	328	151

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	249
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.14
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.236
Pot Cap-1 Maneuver	-	-	1305
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1305
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-













Approach	EB	WB	NB
HCM Control Delay, s	0	1.4	50.6
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	349	794	-	-	1305	-
HCM Lane V/C Ratio	0.939	0.19	-	-	0.06	-
HCM Control Delay (s)	69	10.6	-	-	7.9	-
HCM Lane LOS	F	B	-	-	A	-
HCM 95th %tile Q(veh)	9.8	0.7	-	-	0.2	-



Lanes, Volumes, Timings  
6: Frontage Road & I-93 SB Ramps

2027 No-Build Conditions  
Saturday MIDDAY

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Traffic Volume (vph)	406	14	52	467	25	51
Future Volume (vph)	406	14	52	467	25	51
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950					0.984
Satd. Flow (prot)	1948	1830	2027	1568	0	3416
Flt Permitted	0.950					0.984
Satd. Flow (perm)	1948	1830	2027	1568	0	3416
Confl. Bikes (#/hr)		1				
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	5%	0%	0%	3%	8%	2%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh	5.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	406	14	52	467	25	51
Future Vol, veh/h	406	14	52	467	25	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	Yield	-	None
Storage Length	0	0	-	0	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	5	0	0	3	8	2
Mvmt Flow	423	15	54	486	26	53

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	133	54	0	0	54	0
Stage 1	54	-	-	-	-	-
Stage 2	79	-	-	-	-	-
Critical Hdwy	6.675	6.2	-	-	4.22	-
Critical Hdwy Stg 1	5.475	-	-	-	-	-
Critical Hdwy Stg 2	5.875	-	-	-	-	-
Follow-up Hdwy	3.5475	3.3	-	-	2.276	-
Pot Cap-1 Maneuver	846	1019	-	-	1510	-
Stage 1	960	-	-	-	-	-
Stage 2	927	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	831	1019	-	-	1510	-
Mov Cap-2 Maneuver	831	-	-	-	-	-
Stage 1	960	-	-	-	-	-
Stage 2	910	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	13.5		0		2.4
HCM LOS	B				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	831	1019	1510	-
HCM Lane V/C Ratio	-	-	0.509	0.014	0.017	-
HCM Control Delay (s)	-	-	13.7	8.6	7.4	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	2.9	0	0.1	-

# HCS7 Freeway Merge Report

## Project Information

Analyst	ERP	Date	9/19/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Saturday MID
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	35.0
Segment Length (L) / Acceleration Length (L <sub>A</sub> ), ft	1500	1350
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	4331	488
Peak Hour Factor (PHF)	0.92	0.89
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	4945	576
Capacity (c), pc/h	7050	2000
Volume-to-Capacity Ratio (v/c)	0.78	0.29

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	1209.1	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	24.3
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	900	Speed Index (M <sub>s</sub> )	0.359
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	1998
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	-	On-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	56.7
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FM</sub> )	0.596	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	59.6
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	2947	Ramp Junction Speed (S), mi/h	57.7
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	3523	Average Density (D), pc/mi/ln	31.9
Level of Service (LOS)	C		

# HCS7 Freeway Diverge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Saturday MID
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	30.0
Segment Length (L) / Deceleration Length (L <sub>D</sub> ), ft	1500	970
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	4331	415
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	4945	474
Capacity (c), pc/h	7050	1900
Volume-to-Capacity Ratio (v/c)	0.70	0.25

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	23.2
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	-	Speed Index (D <sub>s</sub> )	0.536
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	1721
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	900	Off-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	52.7
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FD</sub> )	0.615	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	68.5
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	3224	Ramp Junction Speed (S), mi/h	57.3
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	-	Average Density (D), pc/mi/ln	28.8
Level of Service (LOS)	C		

# HCS7 Freeway Merge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Saturday MID
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	35.0
Segment Length (L) / Acceleration Length (L <sub>A</sub> ), ft	1500	1350
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	3929	550
Peak Hour Factor (PHF)	0.92	0.90
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	4486	642
Capacity (c), pc/h	7050	2000
Volume-to-Capacity Ratio (v/c)	0.73	0.32

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	1125.0	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	23.3
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	1100	Speed Index (M <sub>s</sub> )	0.343
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	1732
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	-	On-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	57.1
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FM</sub> )	0.614	Outer Lanes Freeway Speed (S <sub>o</sub> ), mi/h	60.6
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	2754	Ramp Junction Speed (S), mi/h	58.2
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	3396	Average Density (D), pc/mi/ln	29.4
Level of Service (LOS)	C		

# HCS7 Freeway Diverge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Saturday MID
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	30.0
Segment Length (L) / Deceleration Length (L <sub>D</sub> ), ft	1500	850
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	3929	445
Peak Hour Factor (PHF)	0.92	0.87
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	4486	537
Capacity (c), pc/h	7050	1900
Volume-to-Capacity Ratio (v/c)	0.64	0.28

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	22.4
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	-	Speed Index (D <sub>S</sub> )	0.541
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	1489
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	1100	Off-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	52.6
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FD</sub> )	0.623	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	69.4
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	2997	Ramp Junction Speed (S), mi/h	57.2
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	-	Average Density (D), pc/mi/ln	26.1
Level of Service (LOS)	C		



## 2027 Build Conditions



Lanes, Volumes, Timings  
1: Shawsheen Street & East Street/Dascomb Road

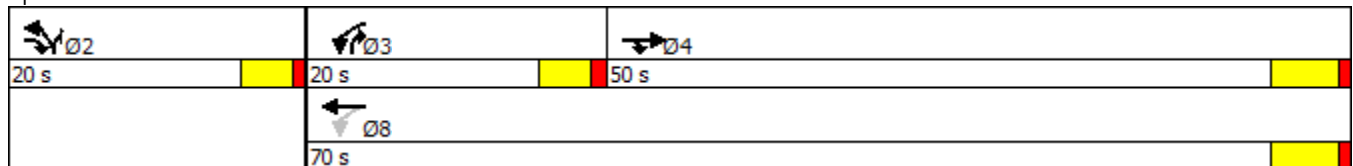
2027 Build Conditions  
Weekday Morning

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↘	↑	↘	↘
Traffic Volume (vph)	599	57	499	504	51	524
Future Volume (vph)	599	57	499	504	51	524
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1717	1432	1694	1701	1646	1516
Flt Permitted			0.172		0.950	
Satd. Flow (perm)	1717	1432	307	1701	1646	1516
Satd. Flow (RTOR)		61				198
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	7%	9%	3%	8%	6%	3%
Shared Lane Traffic (%)						
Turn Type	NA	pt+ov	pm+pt	NA	Prot	pt+ov
Protected Phases	4	2 4	3	8	2	2 3
Permitted Phases			8			
Detector Phase	4	2 4	3	8	2	2 3
Switch Phase						
Minimum Initial (s)	10.0		6.0	10.0	6.0	
Minimum Split (s)	15.5		10.5	15.5	10.5	
Total Split (s)	50.0		20.0	70.0	20.0	
Total Split (%)	55.6%		22.2%	77.8%	22.2%	
Maximum Green (s)	44.5		15.5	64.5	15.5	
Yellow Time (s)	4.5		3.5	4.5	3.5	
All-Red Time (s)	1.0		1.0	1.0	1.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.5		4.5	5.5	4.5	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0		2.0	4.0	2.0	
Recall Mode	Min		None	Min	None	

Intersection Summary







Cycle Length: 90  
Actuated Cycle Length: 80.9  
Natural Cycle: 90  
Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Shawsheen Street & East Street/Dascomb Road



Queues  
1: Shawsheen Street & East Street/Dascomb Road

2027 Build Conditions  
Weekday Morning













						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	644	61	537	542	55	563
v/c Ratio	0.85	0.06	1.10	0.46	0.19	0.74
Control Delay	31.3	1.1	91.5	6.9	32.6	20.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.3	1.1	91.5	6.9	32.6	20.6
Queue Length 50th (ft)	283	0	~241	108	25	157
Queue Length 95th (ft)	428	9	#460	164	61	#342
Internal Link Dist (ft)	1155			220	920	
Turn Bay Length (ft)		125	200			175
Base Capacity (vph)	960	1037	487	1374	320	764
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	0.67	0.06	1.10	0.39	0.17	0.74

Intersection Summary

- ~ 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.










HCM 2010 Signalized Intersection Summary  
 1: Shawsheen Street & East Street/Dascomb Road

2027 Build Conditions  
 Weekday Morning

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	599	57	499	504	51	524		
Future Volume (veh/h)	599	57	499	504	51	524		
Number	4	14	3	8	5	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1776	1743	1845	1759	1792	1845		
Adj Flow Rate, veh/h	644	61	537	542	55	563		
Adj No. of Lanes	1	1	1	1	1	1		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93		
Percent Heavy Veh, %	7	9	3	8	6	3		
Cap, veh/h	804	947	518	1219	318	585		
Arrive On Green	0.45	0.45	0.19	0.69	0.19	0.19		
Sat Flow, veh/h	1776	1482	1757	1759	1707	1568		
Grp Volume(v), veh/h	644	61	537	542	55	563		
Grp Sat Flow(s),veh/h/ln	1776	1482	1757	1759	1707	1568		
Q Serve(g_s), s	25.9	1.3	15.5	11.4	2.3	15.5		
Cycle Q Clear(g_c), s	25.9	1.3	15.5	11.4	2.3	15.5		
Prop In Lane		1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	804	947	518	1219	318	585		
V/C Ratio(X)	0.80	0.06	1.04	0.44	0.17	0.96		
Avail Cap(c_a), veh/h	951	1070	518	1365	318	585		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	19.5	5.6	19.5	5.7	28.4	25.5		
Incr Delay (d2), s/veh	4.7	0.0	49.6	0.4	0.1	27.8		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	13.6	0.8	18.9	5.5	1.1	17.0		
LnGrp Delay(d),s/veh	24.3	5.7	69.1	6.0	28.5	53.3		
LnGrp LOS	C	A	F	A	C	D		
Approach Vol, veh/h	705			1079	618			
Approach Delay, s/veh	22.7			37.4	51.1			
Approach LOS	C			D	D			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4				8
Phs Duration (G+Y+Rc), s		20.0	20.0	43.1				63.1
Change Period (Y+Rc), s		4.5	4.5	5.5				5.5
Max Green Setting (Gmax), s		15.5	15.5	44.5				64.5
Max Q Clear Time (g_c+I1), s		17.5	17.5	27.9				13.4
Green Ext Time (p_c), s		0.0	0.0	9.7				16.8
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			36.6					
HCM 2010 LOS			D					

Lanes, Volumes, Timings  
 2: Dascomb Road & HP Driveway

2027 Build Conditions  
 Weekday Morning

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	14	1109	1001	13	2	2
Future Volume (vph)	14	1109	1001	13	2	2
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.998		0.932	
Flt Protected		0.999			0.976	
Satd. Flow (prot)	0	1748	2029	0	1383	0
Flt Permitted		0.999			0.976	
Satd. Flow (perm)	0	1748	2029	0	1383	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	5%	6%	0%	50%	0%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Control Type: Unsignalized						

Intersection

Int Delay, s/veh 0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↗		↘	
Traffic Vol, veh/h	14	1109	1001	13	2	2
Future Vol, veh/h	14	1109	1001	13	2	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	0	5	6	0	50	0
Mvmt Flow	15	1192	1076	14	2	2












Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	1076	0	1076
Stage 1	-	-	1076
Stage 2	-	-	1223
Critical Hdwy	4.1	-	6.2
Critical Hdwy Stg 1	-	-	5.9
Critical Hdwy Stg 2	-	-	5.9
Follow-up Hdwy	2.2	-	3.3
Pot Cap-1 Maneuver	656	-	269
Stage 1	-	-	266
Stage 2	-	-	223
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	656	-	269
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	266
Stage 2	-	-	208

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	82
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	656	-	-	-	51
HCM Lane V/C Ratio	0.023	-	-	-	0.084
HCM Control Delay (s)	10.6	0	-	-	82
HCM Lane LOS	B	A	-	-	F
HCM 95th %tile Q(veh)	0.1	-	-	-	0.3

Lanes, Volumes, Timings  
3: Smith Drive & Dascomb Road

2027 Build Conditions  
Weekday Morning

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1020	91	300	984	31	102
Future Volume (vph)	1020	91	300	984	31	102
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.989					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1916	0	1491	1852	1685	1334
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	1916	0	1491	1852	1685	1334
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	5%	0%	13%	6%	0%	13%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 43.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻		↻	↻	↻	↻
Traffic Vol, veh/h	1020	91	300	984	31	102
Future Vol, veh/h	1020	91	300	984	31	102
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	80	-	0	135
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	5	0	13	6	0	13
Mvmt Flow	1097	98	323	1058	33	110

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1195
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.23
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.317
Pot Cap-1 Maneuver	-	-	547
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	547
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.8	\$ 778.3
HCM LOS			F













Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	6	230	-	-	547	-
HCM Lane V/C Ratio	5.556	0.477	-	-	0.59	-
HCM Control Delay (s)	\$ 3227.1	34.1	-	-	20.6	-
HCM Lane LOS	F	D	-	-	C	-
HCM 95th %tile Q(veh)	5.6	2.4	-	-	3.8	-

Notes

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

Lanes, Volumes, Timings  
4: Dascomb Road & Frontage Road

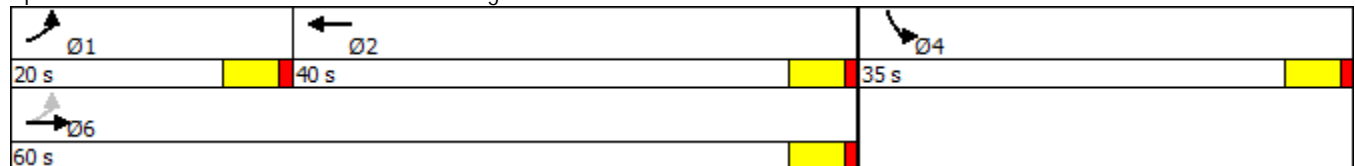
2027 Build Conditions  
Weekday Morning

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	449	673	830	460	204	454
Future Volume (vph)	449	673	830	460	204	454
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1719	1810	3438	1561	1986	1711
Flt Permitted	0.148				0.950	
Satd. Flow (perm)	268	1810	3438	1561	1986	1711
Satd. Flow (RTOR)				247		483
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	5%	5%	5%	0%	3%	7%
Shared Lane Traffic (%)						
Turn Type	pm+pt	NA	NA	Free	Prot	Free
Protected Phases	1	6	2		4	
Permitted Phases	6			Free		Free
Detector Phase	1	6	2		4	
Switch Phase						
Minimum Initial (s)	10.0	10.0	6.0		6.0	
Minimum Split (s)	15.0	15.0	11.0		11.0	
Total Split (s)	20.0	60.0	40.0		35.0	
Total Split (%)	21.1%	63.2%	42.1%		36.8%	
Maximum Green (s)	15.0	55.0	35.0		30.0	
Yellow Time (s)	4.0	4.0	4.0		4.0	
All-Red Time (s)	1.0	1.0	1.0		1.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	5.0	5.0	5.0		5.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0		2.0	
Recall Mode	Min	Min	None		None	

Intersection Summary

Cycle Length: 95  
 Actuated Cycle Length: 64.7  
 Natural Cycle: 60  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Dascomb Road & Frontage Road











## Queues

2027 Build Conditions

## 4: Dascomb Road &amp; Frontage Road

Weekday Morning














						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	478	716	883	489	217	483
v/c Ratio	0.92	0.60	0.75	0.31	0.59	0.28
Control Delay	42.9	9.4	23.5	0.5	32.2	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.9	9.4	23.5	0.5	32.2	0.4
Queue Length 50th (ft)	128	131	156	0	78	0
Queue Length 95th (ft)	#384	281	245	0	160	0
Internal Link Dist (ft)		120	920		695	
Turn Bay Length (ft)	150			130		
Base Capacity (vph)	519	1552	1899	1561	940	1711
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	0.92	0.46	0.46	0.31	0.23	0.28

## Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.












HCM 2010 Signalized Intersection Summary  
4: Dascomb Road & Frontage Road

2027 Build Conditions  
Weekday Morning

								
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations			 					
Traffic Volume (veh/h)	449	673	830	460	204	454		
Future Volume (veh/h)	449	673	830	460	204	454		
Number	1	6	2	12	7	14		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1810	1810	1810	1900	1918	1847		
Adj Flow Rate, veh/h	478	716	883	0	217	0		
Adj No. of Lanes	1	1	2	1	1	1		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94		
Percent Heavy Veh, %	5	5	5	0	3	7		
Cap, veh/h	567	1212	1338	628	275	236		
Arrive On Green	0.19	0.67	0.39	0.00	0.15	0.00		
Sat Flow, veh/h	1723	1810	3529	1615	1827	1570		
Grp Volume(v), veh/h	478	716	883	0	217	0		
Grp Sat Flow(s),veh/h/ln	1723	1810	1719	1615	1827	1570		
Q Serve(g_s), s	8.2	12.0	11.7	0.0	6.4	0.0		
Cycle Q Clear(g_c), s	8.2	12.0	11.7	0.0	6.4	0.0		
Prop In Lane	1.00			1.00	1.00	1.00		
Lane Grp Cap(c), veh/h	567	1212	1338	628	275	236		
V/C Ratio(X)	0.84	0.59	0.66	0.00	0.79	0.00		
Avail Cap(c_a), veh/h	703	1791	2165	1017	986	847		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00		
Uniform Delay (d), s/veh	9.6	5.0	14.0	0.0	22.8	0.0		
Incr Delay (d2), s/veh	6.5	0.2	0.2	0.0	1.9	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	4.7	5.8	5.6	0.0	3.3	0.0		
LnGrp Delay(d),s/veh	16.0	5.2	14.2	0.0	24.7	0.0		
LnGrp LOS	B	A	B		C			
Approach Vol, veh/h		1194	883		217			
Approach Delay, s/veh		9.5	14.2		24.7			
Approach LOS		A	B		C			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	15.6	26.6		13.4		42.2		
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0		
Max Green Setting (Gmax), s	15.0	35.0		30.0		55.0		
Max Q Clear Time (g_c+I1), s	10.2	13.7		8.4		14.0		
Green Ext Time (p_c), s	0.4	7.9		0.3		9.3		
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			12.7					
HCM 2010 LOS			B					

Lanes, Volumes, Timings  
 5: I-93 NB Ramps & Dascomb Road

2027 Build Conditions  
 Weekday Morning

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	466	411	77	755	535	168
Future Volume (vph)	466	411	77	755	535	168
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.937					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	2018	0	1805	1900	1930	1777
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	2018	0	1805	1900	1930	1777
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	0%	0%	0%	6%	3%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 317.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻		↻	↻	↻	↻
Traffic Vol, veh/h	466	411	77	755	535	168
Future Vol, veh/h	466	411	77	755	535	168
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	200	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	0	0	0	0	6	3
Mvmt Flow	480	424	79	778	552	173

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	480
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.1
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.2
Pot Cap-1 Maneuver	-	-	1093
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1093
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	\$ 1089.3
HCM LOS			F













Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	137	584	-	-	1093	-
HCM Lane V/C Ratio	4.026	0.297	-	-	0.073	-
HCM Control Delay (s)	\$ 1427	13.7	-	-	8.6	-
HCM Lane LOS	F	B	-	-	A	-
HCM 95th %tile Q(veh)	55.5	1.2	-	-	0.2	-

Notes

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

Lanes, Volumes, Timings  
 6: Frontage Road & I-93 SB Ramps

2027 Build Conditions  
 Weekday Morning

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Traffic Volume (vph)	552	94	314	593	88	97
Future Volume (vph)	552	94	314	593	88	97
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950					0.977
Satd. Flow (prot)	1930	1830	2027	1553	0	3437
Flt Permitted	0.950					0.977
Satd. Flow (perm)	1930	1830	2027	1553	0	3437
Confl. Bikes (#/hr)		1				
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	6%	0%	0%	4%	0%	5%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 66.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	552	94	314	593	88	97
Future Vol, veh/h	552	94	314	593	88	97
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	Yield	-	None
Storage Length	0	0	-	0	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	6	0	0	4	0	5
Mvmt Flow	581	99	331	624	93	102

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	567	331	0	0	331	0
Stage 1	331	-	-	-	-	-
Stage 2	236	-	-	-	-	-
Critical Hdwy	6.69	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.49	-	-	-	-	-
Critical Hdwy Stg 2	5.89	-	-	-	-	-
Follow-up Hdwy	3.557	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	~ 461	715	-	-	1240	-
Stage 1	716	-	-	-	-	-
Stage 2	771	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	~ 424	715	-	-	1240	-
Mov Cap-2 Maneuver	~ 424	-	-	-	-	-
Stage 1	716	-	-	-	-	-
Stage 2	709	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	178.6		0		3.9
HCM LOS	F				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	424	715	1240	-
HCM Lane V/C Ratio	-	-	1.37	0.138	0.075	-
HCM Control Delay (s)	-	-	207.2	10.8	8.1	0.1
HCM Lane LOS	-	-	F	B	A	A
HCM 95th %tile Q(veh)	-	-	27.5	0.5	0.2	-

Notes

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

# HCS7 Freeway Merge Report

## Project Information

Analyst	ERP	Date	9/19/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Weekday AM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	35.0
Segment Length (L) / Acceleration Length (L <sub>A</sub> ), ft	1500	220
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	7271	675
Peak Hour Factor (PHF)	0.92	0.90
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	8302	788
Capacity (c), pc/h	7050	2000
Volume-to-Capacity Ratio (v/c)	1.29	0.39

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	1471.1	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	-
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	900	Speed Index (M <sub>s</sub> )	-
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	2700
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	-	On-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	-
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FM</sub> )	0.548	Outer Lanes Freeway Speed (S <sub>o</sub> ), mi/h	56.1
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	5602	Ramp Junction Speed (S), mi/h	-
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	6390	Average Density (D), pc/mi/ln	-
Level of Service (LOS)	F		

# HCS7 Freeway Diverge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Weekday AM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	30.0
Segment Length (L) / Deceleration Length (L <sub>D</sub> ), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	7271	653
Peak Hour Factor (PHF)	0.92	0.95
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	8302	722
Capacity (c), pc/h	7050	1900
Volume-to-Capacity Ratio (v/c)	1.18	0.38

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	-
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	-	Speed Index (D <sub>S</sub> )	-
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	2700
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	900	Off-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	-
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FD</sub> )	0.519	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	64.7
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	5602	Ramp Junction Speed (S), mi/h	-
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	-	Average Density (D), pc/mi/ln	-
Level of Service (LOS)	F		



# HCS7 Freeway Merge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Weekday AM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	35.0
Segment Length (L) / Acceleration Length (L <sub>A</sub> ), ft	1500	1350
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	4347	482
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	4963	550
Capacity (c), pc/h	7050	2000
Volume-to-Capacity Ratio (v/c)	0.78	0.28

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	1207.4	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	24.7
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	1100	Speed Index (M <sub>s</sub> )	0.365
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	1945
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	-	On-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	56.6
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FM</sub> )	0.608	Outer Lanes Freeway Speed (S <sub>o</sub> ), mi/h	59.8
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	3018	Ramp Junction Speed (S), mi/h	57.7
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	3568	Average Density (D), pc/mi/ln	31.8
Level of Service (LOS)	C		

# HCS7 Freeway Diverge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Weekday AM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	30.0
Segment Length (L) / Deceleration Length (L <sub>D</sub> ), ft	1500	850
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	4347	721
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	4963	823
Capacity (c), pc/h	7050	1900
Volume-to-Capacity Ratio (v/c)	0.70	0.43

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	25.0
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	-	Speed Index (D <sub>S</sub> )	0.567
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	1664
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	1100	Off-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	52.0
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FD</sub> )	0.598	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	68.7
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	3299	Ramp Junction Speed (S), mi/h	56.6
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	-	Average Density (D), pc/mi/ln	29.2
Level of Service (LOS)	C		

Lanes, Volumes, Timings  
 1: Shawsheen Street & East Street/Dascomb Road

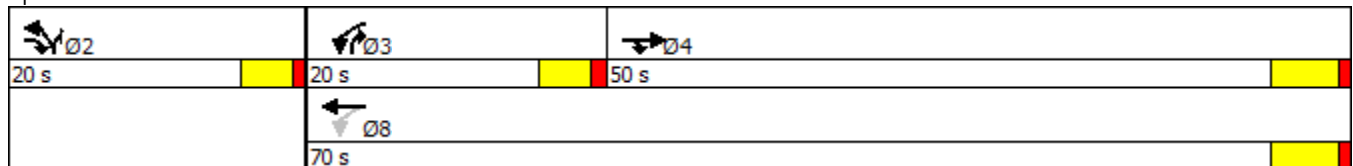
2027 Build Conditions  
 Weekday Evening

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	596	31	511	765	72	590
Future Volume (vph)	596	31	511	765	72	590
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1818	1516	1728	1818	1728	1546
Flt Permitted			0.158		0.950	
Satd. Flow (perm)	1818	1516	287	1818	1728	1546
Satd. Flow (RTOR)		33				200
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	1%	3%	1%	1%	1%	1%
Shared Lane Traffic (%)						
Turn Type	NA	pt+ov	pm+pt	NA	Prot	pt+ov
Protected Phases	4	2 4	3	8	2	2 3
Permitted Phases			8			
Detector Phase	4	2 4	3	8	2	2 3
Switch Phase						
Minimum Initial (s)	10.0		6.0	10.0	6.0	
Minimum Split (s)	15.5		10.5	15.5	10.5	
Total Split (s)	50.0		20.0	70.0	20.0	
Total Split (%)	55.6%		22.2%	77.8%	22.2%	
Maximum Green (s)	44.5		15.5	64.5	15.5	
Yellow Time (s)	4.5		3.5	4.5	3.5	
All-Red Time (s)	1.0		1.0	1.0	1.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.5		4.5	5.5	4.5	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0		2.0	4.0	2.0	
Recall Mode	Min		None	Min	None	

Intersection Summary







Cycle Length: 90  
 Actuated Cycle Length: 79.7  
 Natural Cycle: 80  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Shawsheen Street & East Street/Dascomb Road



Queues  
1: Shawsheen Street & East Street/Dascomb Road

2027 Build Conditions  
Weekday Evening













						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	641	33	549	823	77	634
v/c Ratio	0.82	0.03	1.14	0.66	0.23	0.79
Control Delay	29.8	1.4	105.3	10.4	32.2	23.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.8	1.4	105.3	10.4	32.2	23.4
Queue Length 50th (ft)	272	0	~250	204	33	184
Queue Length 95th (ft)	404	7	#488	308	79	#453
Internal Link Dist (ft)	1155			220	920	
Turn Bay Length (ft)		125	200			175
Base Capacity (vph)	1027	1066	483	1488	340	788
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	0.62	0.03	1.14	0.55	0.23	0.80

Intersection Summary

- ~ 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.









HCM 2010 Signalized Intersection Summary  
 1: Shawsheen Street & East Street/Dascomb Road

2027 Build Conditions  
 Weekday Evening

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	596	31	511	765	72	590		
Future Volume (veh/h)	596	31	511	765	72	590		
Number	4	14	3	8	5	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1881	1845	1881	1881	1881	1881		
Adj Flow Rate, veh/h	641	33	549	823	77	634		
Adj No. of Lanes	1	1	1	1	1	1		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93		
Percent Heavy Veh, %	1	3	1	1	1	1		
Cap, veh/h	862	1008	553	1310	331	590		
Arrive On Green	0.46	0.46	0.18	0.70	0.18	0.18		
Sat Flow, veh/h	1881	1568	1792	1881	1792	1599		
Grp Volume(v), veh/h	641	33	549	823	77	634		
Grp Sat Flow(s),veh/h/ln	1881	1568	1792	1881	1792	1599		
Q Serve(g_s), s	23.5	0.6	15.2	19.8	3.1	15.5		
Cycle Q Clear(g_c), s	23.5	0.6	15.2	19.8	3.1	15.5		
Prop In Lane		1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	862	1008	553	1310	331	590		
V/C Ratio(X)	0.74	0.03	0.99	0.63	0.23	1.07		
Avail Cap(c_a), veh/h	996	1120	553	1444	331	590		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	18.7	5.5	17.8	6.9	29.2	26.5		
Incr Delay (d2), s/veh	3.0	0.0	36.0	0.9	0.1	58.7		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	12.8	0.4	18.2	10.4	1.5	23.2		
LnGrp Delay(d),s/veh	21.7	5.5	53.8	7.8	29.3	85.2		
LnGrp LOS	C	A	D	A	C	F		
Approach Vol, veh/h	674			1372	711			
Approach Delay, s/veh	20.9			26.2	79.1			
Approach LOS	C			C	E			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4				8
Phs Duration (G+Y+Rc), s		20.0	20.0	44.0				64.0
Change Period (Y+Rc), s		4.5	4.5	5.5				5.5
Max Green Setting (Gmax), s		15.5	15.5	44.5				64.5
Max Q Clear Time (g_c+I1), s		17.5	17.2	25.5				21.8
Green Ext Time (p_c), s		0.0	0.0	13.0				21.6
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			38.6					
HCM 2010 LOS			D					

Lanes, Volumes, Timings  
2: Dascomb Road & HP Driveway

2027 Build Conditions  
Weekday Evening

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	6	1179	1248	4	3	28
Future Volume (vph)	6	1179	1248	4	3	28
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.877	
Flt Protected					0.995	
Satd. Flow (prot)	0	1819	2108	0	1471	0
Flt Permitted					0.995	
Satd. Flow (perm)	0	1819	2108	0	1471	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	1%	2%	50%	100%	4%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Control Type: Unsignalized						

Intersection

Int Delay, s/veh	1.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↗		↘	
Traffic Vol, veh/h	6	1179	1248	4	3	28
Future Vol, veh/h	6	1179	1248	4	3	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	1	2	50	100	4
Mvmt Flow	7	1282	1357	4	3	30












Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	1357	0	2652
Stage 1	-	-	1357
Stage 2	-	-	1295
Critical Hdwy	4.1	-	7.4
Critical Hdwy Stg 1	-	-	6.4
Critical Hdwy Stg 2	-	-	6.4
Follow-up Hdwy	2.2	-	4.4
Pot Cap-1 Maneuver	513	-	12
Stage 1	-	-	150
Stage 2	-	-	163
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	513	-	11
Mov Cap-2 Maneuver	-	-	11
Stage 1	-	-	150
Stage 2	-	-	155

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	93
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	513	-	-	-	72
HCM Lane V/C Ratio	0.013	-	-	-	0.468
HCM Control Delay (s)	12.1	0	-	-	93
HCM Lane LOS	B	A	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	1.9

Lanes, Volumes, Timings  
 3: Smith Drive & Dascomb Road

2027 Build Conditions  
 Weekday Evening

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1087	95	195	1131	121	325
Future Volume (vph)	1087	95	195	1131	121	325
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.989					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1972	0	1428	1925	1589	1396
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	1972	0	1428	1925	1589	1396
Confl. Bikes (#/hr)		1				
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	1%	9%	18%	2%	6%	8%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Control Type: Unsignalized



Intersection

Int Delay, s/veh 331.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻		↻	↻	↻	↻
Traffic Vol, veh/h	1087	95	195	1131	121	325
Future Vol, veh/h	1087	95	195	1131	121	325
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	80	-	0	135
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	1	9	18	2	6	8
Mvmt Flow	1195	104	214	1243	133	357

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	2918
Stage 1	-	-	1247
Stage 2	-	-	1671
Critical Hdwy	-	4.28	6.46
Critical Hdwy Stg 1	-	-	5.46
Critical Hdwy Stg 2	-	-	5.46
Follow-up Hdwy	-	2.362	3.554
Pot Cap-1 Maneuver	-	483	~ 16
Stage 1	-	-	266
Stage 2	-	-	164
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	483	~ 9
Mov Cap-2 Maneuver	-	-	~ 9
Stage 1	-	-	266
Stage 2	-	-	~ 91

Approach	EB	WB	NB
HCM Control Delay, s	0	2.7	\$ 2184.8
HCM LOS			F













Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	9	206	-	-	483	-
HCM Lane V/C Ratio	14.774	1.734	-	-	0.444	-
HCM Control Delay (s)	\$ 7006.2	\$ 389.8	-	-	18.3	-
HCM Lane LOS	F	F	-	-	C	-
HCM 95th %tile Q(veh)	18.2	24.4	-	-	2.2	-

Notes

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

Lanes, Volumes, Timings  
4: Dascomb Road & Frontage Road

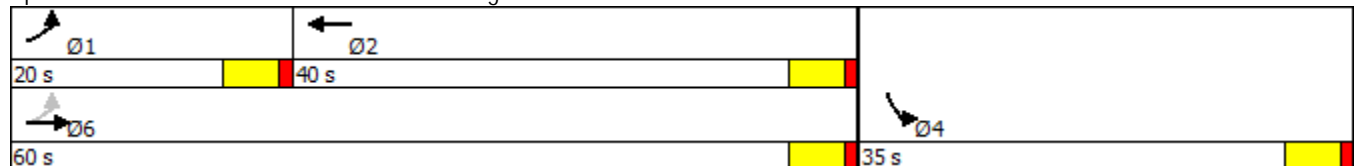
2027 Build Conditions  
Weekday Evening

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	470	942	835	253	246	493
Future Volume (vph)	470	942	835	253	246	493
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1752	1881	3539	1546	2025	1777
Flt Permitted	0.152				0.950	
Satd. Flow (perm)	280	1881	3539	1546	2025	1777
Satd. Flow (RTOR)				135		514
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	3%	1%	2%	1%	1%	3%
Shared Lane Traffic (%)						
Turn Type	pm+pt	NA	NA	Free	Prot	Free
Protected Phases	1	6	2		4	
Permitted Phases	6			Free		Free
Detector Phase	1	6	2		4	
Switch Phase						
Minimum Initial (s)	10.0	10.0	6.0		6.0	
Minimum Split (s)	15.0	15.0	11.0		11.0	
Total Split (s)	20.0	60.0	40.0		35.0	
Total Split (%)	21.1%	63.2%	42.1%		36.8%	
Maximum Green (s)	15.0	55.0	35.0		30.0	
Yellow Time (s)	4.0	4.0	4.0		4.0	
All-Red Time (s)	1.0	1.0	1.0		1.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	5.0	5.0	5.0		5.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0		2.0	
Recall Mode	Min	Min	None		None	

Intersection Summary

Cycle Length: 95  
 Actuated Cycle Length: 67.9  
 Natural Cycle: 60  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Dascomb Road & Frontage Road









## Queues

2027 Build Conditions

## 4: Dascomb Road &amp; Frontage Road

Weekday Evening














						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	490	981	870	264	256	514
v/c Ratio	0.95	0.81	0.72	0.17	0.63	0.29
Control Delay	48.9	16.2	23.1	0.2	33.3	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.9	16.2	23.1	0.2	33.3	0.4
Queue Length 50th (ft)	138	259	161	0	91	0
Queue Length 95th (ft)	#417	536	246	0	194	0
Internal Link Dist (ft)		120	920		695	
Turn Bay Length (ft)	150			130		
Base Capacity (vph)	516	1555	1882	1546	922	1777
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	0.95	0.63	0.46	0.17	0.28	0.29

## Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.












HCM 2010 Signalized Intersection Summary  
4: Dascomb Road & Frontage Road

2027 Build Conditions  
Weekday Evening

								
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations			 					
Traffic Volume (veh/h)	470	942	835	253	246	493		
Future Volume (veh/h)	470	942	835	253	246	493		
Number	1	6	2	12	7	14		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1845	1881	1863	1881	1956	1918		
Adj Flow Rate, veh/h	490	981	870	0	256	0		
Adj No. of Lanes	1	1	2	1	1	1		
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96		
Percent Heavy Veh, %	3	1	2	1	1	3		
Cap, veh/h	573	1252	1395	630	315	275		
Arrive On Green	0.19	0.67	0.39	0.00	0.17	0.00		
Sat Flow, veh/h	1757	1881	3632	1599	1863	1631		
Grp Volume(v), veh/h	490	981	870	0	256	0		
Grp Sat Flow(s),veh/h/ln	1757	1881	1770	1599	1863	1631		
Q Serve(g_s), s	9.0	22.0	11.9	0.0	8.0	0.0		
Cycle Q Clear(g_c), s	9.0	22.0	11.9	0.0	8.0	0.0		
Prop In Lane	1.00			1.00	1.00	1.00		
Lane Grp Cap(c), veh/h	573	1252	1395	630	315	275		
V/C Ratio(X)	0.85	0.78	0.62	0.00	0.81	0.00		
Avail Cap(c_a), veh/h	680	1716	2054	928	927	811		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00		
Uniform Delay (d), s/veh	10.2	7.1	14.7	0.0	24.1	0.0		
Incr Delay (d2), s/veh	8.0	1.1	0.2	0.0	2.0	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	5.5	11.6	5.8	0.0	4.3	0.0		
LnGrp Delay(d),s/veh	18.2	8.2	14.8	0.0	26.1	0.0		
LnGrp LOS	B	A	B		C			
Approach Vol, veh/h		1471	870		256			
Approach Delay, s/veh		11.5	14.8		26.1			
Approach LOS		B	B		C			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	16.3	28.8		15.2		45.1		
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0		
Max Green Setting (Gmax), s	15.0	35.0		30.0		55.0		
Max Q Clear Time (g_c+I1), s	11.0	13.9		10.0		24.0		
Green Ext Time (p_c), s	0.4	9.9		0.3		11.6		
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			14.1					
HCM 2010 LOS			B					

Lanes, Volumes, Timings  
5: I-93 NB Ramps & Dascomb Road

2027 Build Conditions  
Weekday Evening

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	673	515	97	636	452	362
Future Volume (vph)	673	515	97	636	452	362
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.941					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	2006	0	1752	1881	2006	1830
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	2006	0	1752	1881	2006	1830
Confl. Bikes (#/hr)		2				2
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	1%	1%	3%	1%	2%	0%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 256.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻		↻	↻	↻	↻
Traffic Vol, veh/h	673	515	97	636	452	362
Future Vol, veh/h	673	515	97	636	452	362
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	200	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	1	1	3	1	2	0
Mvmt Flow	694	531	100	656	466	373

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	694
Stage 1	-	-	694
Stage 2	-	-	856
Critical Hdwy	-	-	4.13
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	-	-	2.227
Pot Cap-1 Maneuver	-	-	897
Stage 1	-	-	496
Stage 2	-	-	~ 416
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	897
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	496
Stage 2	-	-	~ 370

Approach	EB	WB	NB
HCM Control Delay, s	0	1.3	\$ 861.8
HCM LOS			F













Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	111	446	-	-	897	-
HCM Lane V/C Ratio	4.198	0.837	-	-	0.111	-
HCM Control Delay (s)	\$ 1517.9	42.6	-	-	9.5	-
HCM Lane LOS	F	E	-	-	A	-
HCM 95th %tile Q(veh)	48	8.1	-	-	0.4	-

Notes

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

Lanes, Volumes, Timings  
 6: Frontage Road & I-93 SB Ramps

2027 Build Conditions  
 Weekday Evening

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Traffic Volume (vph)	492	19	126	595	94	213
Future Volume (vph)	492	19	126	595	94	213
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950					0.985
Satd. Flow (prot)	2006	1727	2007	1583	0	3531
Flt Permitted	0.950					0.985
Satd. Flow (perm)	2006	1727	2007	1583	0	3531
Confl. Bikes (#/hr)		1				
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	2%	6%	1%	2%	0%	1%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 30.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗		↗↑
Traffic Vol, veh/h	492	19	126	595	94	213
Future Vol, veh/h	492	19	126	595	94	213
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	Yield	-	None
Storage Length	0	0	-	0	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	6	1	2	0	1
Mvmt Flow	541	21	138	654	103	234

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	462	138	0	0	138	0
Stage 1	138	-	-	-	-	-
Stage 2	324	-	-	-	-	-
Critical Hdwy	6.63	6.29	-	-	4.1	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.357	-	-	2.2	-
Pot Cap-1 Maneuver	543	898	-	-	1458	-
Stage 1	888	-	-	-	-	-
Stage 2	706	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	- 499	898	-	-	1458	-
Mov Cap-2 Maneuver	- 499	-	-	-	-	-
Stage 1	888	-	-	-	-	-
Stage 2	649	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	90.1		0		2.5
HCM LOS	F				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	499	898	1458	-
HCM Lane V/C Ratio	-	-	1.083	0.023	0.071	-
HCM Control Delay (s)	-	-	93.2	9.1	7.7	0.2
HCM Lane LOS	-	-	F	A	A	A
HCM 95th %tile Q(veh)	-	-	17.1	0.1	0.2	-

Notes

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



# HCS7 Freeway Merge Report

## Project Information

Analyst	ERP	Date	9/19/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Weekday PM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	35.0
Segment Length (L) / Acceleration Length (L <sub>A</sub> ), ft	1500	1350
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	5237	687
Peak Hour Factor (PHF)	0.92	0.89
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	5979	811
Capacity (c), pc/h	7050	2000
Volume-to-Capacity Ratio (v/c)	0.96	0.41

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	1480.7	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	30.0
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	900	Speed Index (M <sub>s</sub> )	0.506
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	2517
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	-	On-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	53.4
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FM</sub> )	0.579	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	57.2
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	3462	Ramp Junction Speed (S), mi/h	54.7
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	4273	Average Density (D), pc/mi/ln	41.4
Level of Service (LOS)	D		

# HCS7 Freeway Diverge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Weekday PM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	30.0
Segment Length (L) / Deceleration Length (L <sub>D</sub> ), ft	1500	970
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	5237	486
Peak Hour Factor (PHF)	0.92	0.95
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	5979	537
Capacity (c), pc/h	7050	1900
Volume-to-Capacity Ratio (v/c)	0.85	0.28

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	27.6
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	-	Speed Index (D <sub>S</sub> )	0.541
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	2253
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	900	Off-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	52.6
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FD</sub> )	0.586	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	66.4
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	3726	Ramp Junction Speed (S), mi/h	57.1
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	-	Average Density (D), pc/mi/ln	34.9
Level of Service (LOS)	C		

# HCS7 Freeway Merge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Weekday PM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	35.0
Segment Length (L) / Acceleration Length (L <sub>A</sub> ), ft	1500	210
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	6699	604
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	7649	690
Capacity (c), pc/h	7050	2000
Volume-to-Capacity Ratio (v/c)	1.18	0.34

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	1306.0	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	-
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	1100	Speed Index (M <sub>s</sub> )	-
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	2700
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	-	On-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	-
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FM</sub> )	0.570	Outer Lanes Freeway Speed (S <sub>o</sub> ), mi/h	56.1
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	4949	Ramp Junction Speed (S), mi/h	-
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	5639	Average Density (D), pc/mi/ln	-
Level of Service (LOS)	F		

# HCS7 Freeway Diverge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Weekday PM
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	30.0
Segment Length (L) / Deceleration Length (L <sub>D</sub> ), ft	1500	0
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	6699	798
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	7649	911
Capacity (c), pc/h	7050	1900
Volume-to-Capacity Ratio (v/c)	1.08	0.48

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	-
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	-	Speed Index (D <sub>S</sub> )	-
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	2700
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	1100	Off-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	-
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FD</sub> )	0.527	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	64.7
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	4949	Ramp Junction Speed (S), mi/h	-
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	-	Average Density (D), pc/mi/ln	-
Level of Service (LOS)	F		

Lanes, Volumes, Timings  
1: Shawsheen Street & East Street/Dascomb Road

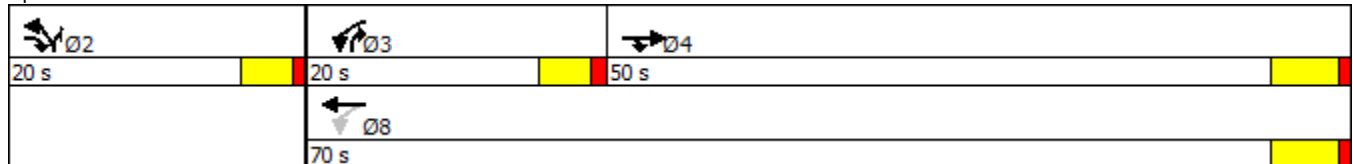
2027 Build Conditions  
Saturday MIDDAY

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	482	48	407	450	58	550
Future Volume (vph)	482	48	407	450	58	550
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1818	1561	1711	1749	1631	1546
Flt Permitted			0.246		0.950	
Satd. Flow (perm)	1818	1561	443	1749	1631	1546
Satd. Flow (RTOR)		51				283
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	0%	2%	5%	7%	1%
Shared Lane Traffic (%)						
Turn Type	NA	pt+ov	pm+pt	NA	Prot	pt+ov
Protected Phases	4	2 4	3	8	2	2 3
Permitted Phases			8			
Detector Phase	4	2 4	3	8	2	2 3
Switch Phase						
Minimum Initial (s)	10.0		6.0	10.0	6.0	
Minimum Split (s)	15.5		10.5	15.5	10.5	
Total Split (s)	50.0		20.0	70.0	20.0	
Total Split (%)	55.6%		22.2%	77.8%	22.2%	
Maximum Green (s)	44.5		15.5	64.5	15.5	
Yellow Time (s)	4.5		3.5	4.5	3.5	
All-Red Time (s)	1.0		1.0	1.0	1.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.5		4.5	5.5	4.5	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0		2.0	4.0	2.0	
Recall Mode	Min		None	Min	None	

Intersection Summary







Cycle Length: 90  
Actuated Cycle Length: 66.4  
Natural Cycle: 65  
Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Shawsheen Street & East Street/Dascomb Road



Queues  
1: Shawsheen Street & East Street/Dascomb Road

2027 Build Conditions  
Saturday MIDDAY













						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	513	51	433	479	62	585
v/c Ratio	0.73	0.05	0.82	0.42	0.20	0.69
Control Delay	24.3	1.3	22.4	7.0	28.0	13.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.3	1.3	22.4	7.0	28.0	13.1
Queue Length 50th (ft)	188	0	75	89	22	82
Queue Length 95th (ft)	298	8	#146	137	64	265
Internal Link Dist (ft)	1155			220	920	
Turn Bay Length (ft)		125	200			175
Base Capacity (vph)	1278	1216	607	1580	403	928
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	0.40	0.04	0.71	0.30	0.15	0.63

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.









HCM 2010 Signalized Intersection Summary  
 1: Shawsheen Street & East Street/Dascomb Road

2027 Build Conditions  
 Saturday Midday

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	482	48	407	450	58	550		
Future Volume (veh/h)	482	48	407	450	58	550		
Number	4	14	3	8	5	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1881	1900	1863	1810	1776	1881		
Adj Flow Rate, veh/h	513	51	433	479	62	585		
Adj No. of Lanes	1	1	1	1	1	1		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94		
Percent Heavy Veh, %	1	0	2	5	7	1		
Cap, veh/h	756	1011	546	1143	379	621		
Arrive On Green	0.40	0.40	0.16	0.63	0.22	0.22		
Sat Flow, veh/h	1881	1615	1774	1810	1691	1599		
Grp Volume(v), veh/h	513	51	433	479	62	585		
Grp Sat Flow(s),veh/h/ln	1881	1615	1774	1810	1691	1599		
Q Serve(g_s), s	15.5	0.8	9.0	9.2	2.0	15.5		
Cycle Q Clear(g_c), s	15.5	0.8	9.0	9.2	2.0	15.5		
Prop In Lane		1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	756	1011	546	1143	379	621		
V/C Ratio(X)	0.68	0.05	0.79	0.42	0.16	0.94		
Avail Cap(c_a), veh/h	1210	1401	651	1687	379	621		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	17.0	5.0	11.8	6.4	21.6	20.4		
Incr Delay (d2), s/veh	1.5	0.0	4.6	0.3	0.1	22.5		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	8.3	0.6	5.0	4.6	1.0	14.5		
LnGrp Delay(d),s/veh	18.5	5.0	16.4	6.7	21.7	42.9		
LnGrp LOS	B	A	B	A	C	D		
Approach Vol, veh/h	564			912	647			
Approach Delay, s/veh	17.3			11.3	40.9			
Approach LOS	B			B	D			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4				8
Phs Duration (G+Y+Rc), s		20.0	15.9	33.3				49.2
Change Period (Y+Rc), s		4.5	4.5	5.5				5.5
Max Green Setting (Gmax), s		15.5	15.5	44.5				64.5
Max Q Clear Time (g_c+I1), s		17.5	11.0	17.5				11.2
Green Ext Time (p_c), s		0.0	0.3	10.3				12.5
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			21.9					
HCM 2010 LOS			C					

Lanes, Volumes, Timings  
 2: Dascomb Road & HP Driveway

2027 Build Conditions  
 Saturday MIDDAY

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1032	855	0	0	2
Future Volume (vph)	0	1032	855	0	0	2
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected						
Satd. Flow (prot)	0	1801	2071	0	1644	0
Flt Permitted						
Satd. Flow (perm)	0	1801	2071	0	1644	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	2%	4%	0%	0%	0%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Control Type: Unsignalized						



Intersection

Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↗		↘	
Traffic Vol, veh/h	0	1032	855	0	0	2
Future Vol, veh/h	0	1032	855	0	0	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	2	4	0	0	0
Mvmt Flow	0	1075	891	0	0	2












Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	891	0	1966
Stage 1	-	-	891
Stage 2	-	-	1075
Critical Hdwy	4.1	-	6.4
Critical Hdwy Stg 1	-	-	5.4
Critical Hdwy Stg 2	-	-	5.4
Follow-up Hdwy	2.2	-	3.5
Pot Cap-1 Maneuver	769	-	70
Stage 1	-	-	404
Stage 2	-	-	331
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	769	-	70
Mov Cap-2 Maneuver	-	-	70
Stage 1	-	-	404
Stage 2	-	-	331

Approach	EB	WB	SB
HCM Control Delay, s	0	0	15.5
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	769	-	-	-	344
HCM Lane V/C Ratio	-	-	-	-	0.006
HCM Control Delay (s)	0	-	-	-	15.5
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0

Lanes, Volumes, Timings  
3: Smith Drive & Dascomb Road

2027 Build Conditions  
Saturday MIDDAY

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	893	139	280	743	112	231
Future Volume (vph)	893	139	280	743	112	231
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.982					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1956	0	1636	1888	1685	1507
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	1956	0	1636	1888	1685	1507
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	0%	3%	4%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 107

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻		↻	↻	↻	↻
Traffic Vol, veh/h	893	139	280	743	112	231
Future Vol, veh/h	893	139	280	743	112	231
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	80	-	0	135
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	0	3	4	0	0
Mvmt Flow	921	143	289	766	115	238

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	2335
Stage 1	-	-	992
Stage 2	-	-	1343
Critical Hdwy	-	4.13	6.4
Critical Hdwy Stg 1	-	-	5.4
Critical Hdwy Stg 2	-	-	5.4
Follow-up Hdwy	-	2.227	3.5
Pot Cap-1 Maneuver	-	651	~ 41
Stage 1	-	-	362
Stage 2	-	-	246
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	651	~ 23
Mov Cap-2 Maneuver	-	-	~ 23
Stage 1	-	-	362
Stage 2	-	-	137

Approach	EB	WB	NB
HCM Control Delay, s	0	4.1	\$ 735.5
HCM LOS			F













Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	23	301	-	-	651	-
HCM Lane V/C Ratio	5.02	0.791	-	-	0.443	-
HCM Control Delay (s)	\$ 2148.6	50.4	-	-	14.9	-
HCM Lane LOS	F	F	-	-	B	-
HCM 95th %tile Q(veh)	14.5	6.3	-	-	2.3	-

Notes

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

Lanes, Volumes, Timings  
4: Dascomb Road & Frontage Road

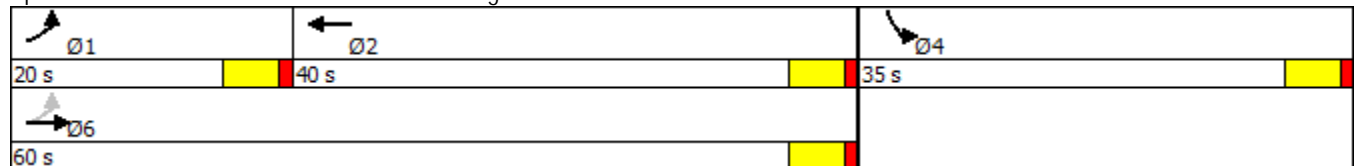
2027 Build Conditions  
Saturday Midday

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	392	732	599	170	76	425
Future Volume (vph)	392	732	599	170	76	425
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1752	1881	3539	1546	2025	1743
Flt Permitted	0.257				0.950	
Satd. Flow (perm)	474	1881	3539	1546	2025	1743
Satd. Flow (RTOR)				127		447
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	3%	1%	2%	1%	1%	5%
Shared Lane Traffic (%)						
Turn Type	pm+pt	NA	NA	Free	Prot	Free
Protected Phases	1	6	2		4	
Permitted Phases	6			Free		Free
Detector Phase	1	6	2		4	
Switch Phase						
Minimum Initial (s)	10.0	10.0	6.0		6.0	
Minimum Split (s)	15.0	15.0	11.0		11.0	
Total Split (s)	20.0	60.0	40.0		35.0	
Total Split (%)	21.1%	63.2%	42.1%		36.8%	
Maximum Green (s)	15.0	55.0	35.0		30.0	
Yellow Time (s)	4.0	4.0	4.0		4.0	
All-Red Time (s)	1.0	1.0	1.0		1.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	5.0	5.0	5.0		5.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0		2.0	
Recall Mode	Min	Min	None		None	

Intersection Summary

Cycle Length: 95  
 Actuated Cycle Length: 43.1  
 Natural Cycle: 45  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Dascomb Road & Frontage Road









## Queues

2027 Build Conditions














## 4: Dascomb Road &amp; Frontage Road

Saturday MIDDAY

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	413	771	631	179	80	447
v/c Ratio	0.58	0.52	0.57	0.12	0.23	0.26
Control Delay	8.5	5.8	16.1	0.2	21.0	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.5	5.8	16.1	0.2	21.0	0.4
Queue Length 50th (ft)	39	96	75	0	20	0
Queue Length 95th (ft)	122	213	140	0	57	0
Internal Link Dist (ft)		120	920		695	
Turn Bay Length (ft)	150			130		
Base Capacity (vph)	825	1860	2862	1546	1496	1743
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	0.50	0.41	0.22	0.12	0.05	0.26
Intersection Summary						












HCM 2010 Signalized Intersection Summary  
4: Dascomb Road & Frontage Road

2027 Build Conditions  
Saturday Midday

								
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations			 					
Traffic Volume (veh/h)	392	732	599	170	76	425		
Future Volume (veh/h)	392	732	599	170	76	425		
Number	1	6	2	12	7	14		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1845	1881	1863	1881	1956	1882		
Adj Flow Rate, veh/h	413	771	631	0	80	0		
Adj No. of Lanes	1	1	2	1	1	1		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Percent Heavy Veh, %	3	1	2	1	1	5		
Cap, veh/h	724	1295	1234	558	158	136		
Arrive On Green	0.23	0.69	0.35	0.00	0.08	0.00		
Sat Flow, veh/h	1757	1881	3632	1599	1863	1600		
Grp Volume(v), veh/h	413	771	631	0	80	0		
Grp Sat Flow(s),veh/h/ln	1757	1881	1770	1599	1863	1600		
Q Serve(g_s), s	5.1	9.5	6.2	0.0	1.8	0.0		
Cycle Q Clear(g_c), s	5.1	9.5	6.2	0.0	1.8	0.0		
Prop In Lane	1.00			1.00	1.00	1.00		
Lane Grp Cap(c), veh/h	724	1295	1234	558	158	136		
V/C Ratio(X)	0.57	0.60	0.51	0.00	0.51	0.00		
Avail Cap(c_a), veh/h	923	2344	2806	1268	1266	1087		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00		
Uniform Delay (d), s/veh	5.8	3.6	11.4	0.0	19.3	0.0		
Incr Delay (d2), s/veh	0.3	0.2	0.1	0.0	0.9	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	2.5	4.8	3.0	0.0	1.0	0.0		
LnGrp Delay(d),s/veh	6.0	3.8	11.5	0.0	20.2	0.0		
LnGrp LOS	A	A	B		C			
Approach Vol, veh/h		1184	631		80			
Approach Delay, s/veh		4.6	11.5		20.2			
Approach LOS		A	B		C			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	15.0	20.4		8.8		35.4		
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0		
Max Green Setting (Gmax), s	15.0	35.0		30.0		55.0		
Max Q Clear Time (g_c+I1), s	7.1	8.2		3.8		11.5		
Green Ext Time (p_c), s	0.4	7.2		0.1		7.7		
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			7.5					
HCM 2010 LOS			A					

Lanes, Volumes, Timings  
 5: I-93 NB Ramps & Dascomb Road

2027 Build Conditions  
 Saturday MIDDAY

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	285	523	71	399	370	137
Future Volume (vph)	285	523	71	399	370	137
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.913					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1947	0	1736	1881	1967	1830
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	1947	0	1736	1881	1967	1830
Confl. Peds. (#/hr)		1	1			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	1%	4%	1%	4%	0%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh 43.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻		↻	↻	↻	↻
Traffic Vol, veh/h	285	523	71	399	370	137
Future Vol, veh/h	285	523	71	399	370	137
Conflicting Peds, #/hr	0	1	1	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	200	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	1	1	4	1	4	0
Mvmt Flow	303	556	76	424	394	146

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	304
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.14
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.236
Pot Cap-1 Maneuver	-	-	1246
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1246
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.2	153.6
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	295	739	-	-	1246	-
HCM Lane V/C Ratio	1.334	0.197	-	-	0.061	-
HCM Control Delay (s)	206.4	11.1	-	-	8.1	-
HCM Lane LOS	F	B	-	-	A	-
HCM 95th %tile Q(veh)	19.8	0.7	-	-	0.2	-













Notes

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



Lanes, Volumes, Timings  
 6: Frontage Road & I-93 SB Ramps

2027 Build Conditions  
 Saturday MIDDAY

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Traffic Volume (vph)	458	14	52	509	24	52
Future Volume (vph)	458	14	52	509	24	52
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950					0.984
Satd. Flow (prot)	1948	1830	2027	1568	0	3419
Flt Permitted	0.950					0.984
Satd. Flow (perm)	1948	1830	2027	1568	0	3419
Confl. Bikes (#/hr)		1				
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	5%	0%	0%	3%	8%	2%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection

Int Delay, s/veh	6.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	458	14	52	509	24	52
Future Vol, veh/h	458	14	52	509	24	52
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	Yield	-	None
Storage Length	0	0	-	0	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	5	0	0	3	8	2
Mvmt Flow	477	15	54	530	25	54

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	131	54	0	0	54	0
Stage 1	54	-	-	-	-	-
Stage 2	77	-	-	-	-	-
Critical Hdwy	6.675	6.2	-	-	4.22	-
Critical Hdwy Stg 1	5.475	-	-	-	-	-
Critical Hdwy Stg 2	5.875	-	-	-	-	-
Follow-up Hdwy	3.5475	3.3	-	-	2.276	-
Pot Cap-1 Maneuver	848	1019	-	-	1510	-
Stage 1	960	-	-	-	-	-
Stage 2	929	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	834	1019	-	-	1510	-
Mov Cap-2 Maneuver	834	-	-	-	-	-
Stage 1	960	-	-	-	-	-
Stage 2	913	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	14.7		0		2.3
HCM LOS	B				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	834	1019	1510	-
HCM Lane V/C Ratio	-	-	0.572	0.014	0.017	-
HCM Control Delay (s)	-	-	14.9	8.6	7.4	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	3.7	0	0.1	-

# HCS7 Freeway Merge Report

## Project Information

Analyst	ERP	Date	9/19/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Saturday MID
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	35.0
Segment Length (L) / Acceleration Length (L <sub>A</sub> ), ft	1500	1350
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	4360	515
Peak Hour Factor (PHF)	0.92	0.89
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	4978	608
Capacity (c), pc/h	7050	2000
Volume-to-Capacity Ratio (v/c)	0.79	0.30

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	1223.0	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	24.6
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	900	Speed Index (M <sub>s</sub> )	0.365
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	2016
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	-	On-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	56.6
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FM</sub> )	0.595	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	59.5
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	2962	Ramp Junction Speed (S), mi/h	57.6
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	3570	Average Density (D), pc/mi/ln	32.3
Level of Service (LOS)	C		

# HCS7 Freeway Diverge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Saturday MID
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	30.0
Segment Length (L) / Deceleration Length (L <sub>D</sub> ), ft	1500	970
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	4360	444
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	4978	507
Capacity (c), pc/h	7050	1900
Volume-to-Capacity Ratio (v/c)	0.71	0.27

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	23.4
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	-	Speed Index (D <sub>S</sub> )	0.539
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	1735
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	900	Off-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	52.6
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FD</sub> )	0.612	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	68.4
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	3243	Ramp Junction Speed (S), mi/h	57.2
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	-	Average Density (D), pc/mi/ln	29.0
Level of Service (LOS)	C		

# HCS7 Freeway Merge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Saturday MID
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	35.0
Segment Length (L) / Acceleration Length (L <sub>A</sub> ), ft	1500	1350
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	3965	573
Peak Hour Factor (PHF)	0.92	0.90
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	4527	669
Capacity (c), pc/h	7050	2000
Volume-to-Capacity Ratio (v/c)	0.74	0.33

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	1139.5	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	23.6
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	1100	Speed Index (M <sub>s</sub> )	0.349
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	1752
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	-	On-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	57.0
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FM</sub> )	0.613	Outer Lanes Freeway Speed (S <sub>o</sub> ), mi/h	60.5
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	2775	Ramp Junction Speed (S), mi/h	58.1
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	3444	Average Density (D), pc/mi/ln	29.8
Level of Service (LOS)	C		

# HCS7 Freeway Diverge Report

## Project Information

Analyst	ERP	Date	9/18/2017
Agency	MassDOT	Analysis Year	2027
Jurisdiction	4	Time Period Analyzed	Saturday Midday
Project Description	#146 Dascomb Road Site Redevelopment Project		

## Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	65.0	30.0
Segment Length (L) / Deceleration Length (L <sub>D</sub> ), ft	1500	850
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

## Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

## Demand and Capacity

Volume (V <sub>i</sub> ), veh/h	3965	481
Peak Hour Factor (PHF)	0.92	0.87
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f <sub>HV</sub> )	0.952	0.952
Flow Rate (v <sub>i</sub> ), pc/h	4527	581
Capacity (c), pc/h	7050	1900
Volume-to-Capacity Ratio (v/c)	0.64	0.31

## Speed and Density

Upstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Density in Ramp Influence Area (D <sub>R</sub> ), pc/mi/ln	22.6
Distance to Upstream Ramp (L <sub>UP</sub> ), ft	-	Speed Index (D <sub>S</sub> )	0.545
Downstream Equilibrium Distance (L <sub>EQ</sub> ), ft	-	Flow Outer Lanes (v <sub>OA</sub> ), pc/h/ln	1499
Distance to Downstream Ramp (L <sub>DOWN</sub> ), ft	1100	Off-Ramp Influence Area Speed (S <sub>R</sub> ), mi/h	52.5
Prop. Freeway Vehicles in Lane 1 and 2 (P <sub>FD</sub> )	0.620	Outer Lanes Freeway Speed (S <sub>O</sub> ), mi/h	69.4
Flow in Lanes 1 and 2 (v <sub>12</sub> ), pc/h	3028	Ramp Junction Speed (S), mi/h	57.1
Flow Entering Ramp-Infl. Area (v <sub>R12</sub> ), pc/h	-	Average Density (D), pc/mi/ln	26.4
Level of Service (LOS)	C		



2027 Build with Mitigation Conditions



Lanes, Volumes, Timings  
1: Shawsheen Street & East Street/Dascomb Road

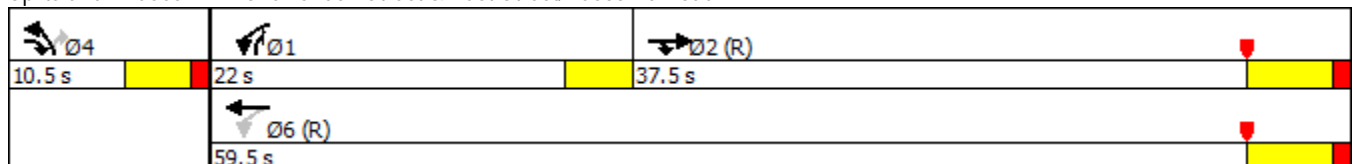
2027 Build with Mitigation Conditions  
Weekday Morning

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↙	↑	↙	↗
Traffic Volume (vph)	599	57	499	504	51	524
Future Volume (vph)	599	57	499	504	51	524
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1717	1432	1694	1701	1646	1516
Flt Permitted			0.226		0.950	
Satd. Flow (perm)	1717	1432	403	1701	1646	1516
Satd. Flow (RTOR)		61				171
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	7%	9%	3%	8%	6%	3%
Shared Lane Traffic (%)						
Turn Type	NA	pt+ov	pm+pt	NA	Prot	pm+ov
Protected Phases	2	2 4	1	6	4	1
Permitted Phases			6			4
Detector Phase	2	2 4	1	6	4	1
Switch Phase						
Minimum Initial (s)	10.0		6.0	10.0	6.0	6.0
Minimum Split (s)	15.5		9.5	15.5	10.5	9.5
Total Split (s)	37.5		22.0	59.5	10.5	22.0
Total Split (%)	53.6%		31.4%	85.0%	15.0%	31.4%
Maximum Green (s)	32.0		18.5	54.0	6.0	18.5
Yellow Time (s)	4.5		3.5	4.5	3.5	3.5
All-Red Time (s)	1.0		0.0	1.0	1.0	0.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5		3.5	5.5	4.5	3.5
Lead/Lag	Lag		Lead			Lead
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0		2.0	4.0	2.0	2.0
Recall Mode	C-Min		None	C-Min	None	None

Intersection Summary







Cycle Length: 70  
 Actuated Cycle Length: 70  
 Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow  
 Natural Cycle: 75  
 Control Type: Actuated-Coordinated

Splits and Phases: 1: Shawsheen Street & East Street/Dascomb Road



Queues  
1: Shawsheen Street & East Street/Dascomb Road

2027 Build with Mitigation Conditions  
Weekday Morning













						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	644	61	537	542	55	563
v/c Ratio	0.74	0.06	0.83	0.39	0.39	0.85
Control Delay	22.2	1.9	25.2	4.1	38.9	27.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.2	1.9	25.2	4.1	38.9	27.6
Queue Length 50th (ft)	229	0	81	82	23	140
Queue Length 95th (ft)	#419	12	#241	112	56	#314
Internal Link Dist (ft)	1155			220	920	
Turn Bay Length (ft)		125				175
Base Capacity (vph)	872	964	675	1390	141	688
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	0.74	0.06	0.80	0.39	0.39	0.82

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.












HCM 2010 Signalized Intersection Summary  
 1: Shawsheen Street & East Street/Dascomb Road

2027 Build with Mitigation Conditions  
 Weekday Morning

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	599	57	499	504	51	524		
Future Volume (veh/h)	599	57	499	504	51	524		
Number	2	12	1	6	7	14		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1776	1743	1845	1759	1792	1845		
Adj Flow Rate, veh/h	644	61	537	542	55	563		
Adj No. of Lanes	1	1	1	1	1	1		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93		
Percent Heavy Veh, %	7	9	3	8	6	3		
Cap, veh/h	948	791	629	1357	146	972		
Arrive On Green	0.53	0.53	0.38	1.00	0.09	0.09		
Sat Flow, veh/h	1776	1482	1757	1759	1707	1568		
Grp Volume(v), veh/h	644	61	537	542	55	563		
Grp Sat Flow(s),veh/h/ln	1776	1482	1757	1759	1707	1568		
Q Serve(g_s), s	18.6	1.4	10.6	0.0	2.1	6.0		
Cycle Q Clear(g_c), s	18.6	1.4	10.6	0.0	2.1	6.0		
Prop In Lane		1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	948	791	629	1357	146	972		
V/C Ratio(X)	0.68	0.08	0.85	0.40	0.38	0.58		
Avail Cap(c_a), veh/h	948	791	764	1357	146	972		
HCM Platoon Ratio	1.00	1.00	2.00	2.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	11.9	7.9	7.8	0.0	30.2	6.2		
Incr Delay (d2), s/veh	3.9	0.2	6.9	0.9	0.6	0.6		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	10.0	0.6	5.7	0.3	1.0	10.9		
LnGrp Delay(d),s/veh	15.8	8.1	14.6	0.9	30.8	6.8		
LnGrp LOS	B	A	B	A	C	A		
Approach Vol, veh/h	705			1079	618			
Approach Delay, s/veh	15.2			7.7	8.9			
Approach LOS	B			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	16.6	42.9		10.5		59.5		
Change Period (Y+Rc), s	3.5	5.5		4.5		5.5		
Max Green Setting (Gmax), s	18.5	32.0		6.0		54.0		
Max Q Clear Time (g_c+I1), s	12.6	20.6		8.0		2.0		
Green Ext Time (p_c), s	0.5	7.4		0.0		16.8		
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			10.2					
HCM 2010 LOS			B					

Lanes, Volumes, Timings  
2: Dascomb Road & HP Driveway

2027 Build with Mitigation Conditions  
Weekday Morning

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			 		 	
Traffic Volume (vph)	14	1109	1001	13	2	2
Future Volume (vph)	14	1109	1001	13	2	2
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt			0.998		0.932	
Flt Protected		0.999			0.976	
Satd. Flow (prot)	0	1748	3288	0	1383	0
Flt Permitted		0.999			0.976	
Satd. Flow (perm)	0	1748	3288	0	1383	0
Peak Hour Factor	0.87	0.87	0.90	0.90	0.50	0.50
Heavy Vehicles (%)	0%	5%	6%	0%	50%	0%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Control Type: Unsignalized						

Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↕↗		↘	
Traffic Vol, veh/h	14	1109	1001	13	2	2
Future Vol, veh/h	14	1109	1001	13	2	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	87	87	90	90	50	50
Heavy Vehicles, %	0	5	6	0	50	0
Mvmt Flow	16	1275	1112	14	4	4

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	1112	0	556
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.1	-	6.9
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.2	-	3.3
Pot Cap-1 Maneuver	635	-	480
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	635	-	480
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	146
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	635	-	-	-	33
HCM Lane V/C Ratio	0.025	-	-	-	0.242
HCM Control Delay (s)	10.8	0	-	-	146
HCM Lane LOS	B	A	-	-	F
HCM 95th %tile Q(veh)	0.1	-	-	-	0.8

Lanes, Volumes, Timings  
3: Smith Drive & Dascomb Road

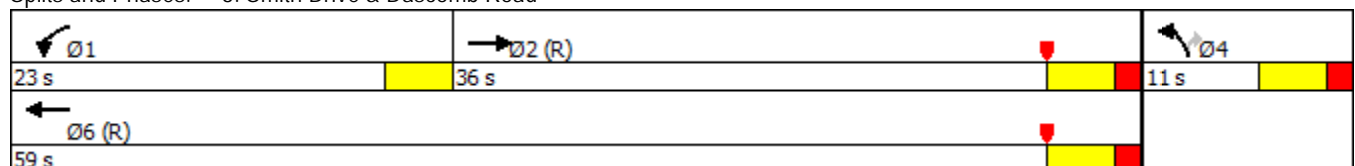
2027 Build with Mitigation Conditions  
Weekday Morning

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗
Traffic Volume (vph)	1031	80	232	991	24	54
Future Volume (vph)	1031	80	232	991	24	54
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.989					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3298	0	1544	3292	1745	1382
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3298	0	1544	3292	1745	1382
Satd. Flow (RTOR)	15					58
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	5%	0%	13%	6%	0%	13%
Shared Lane Traffic (%)						
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	2		1	6	4	
Permitted Phases						4
Detector Phase	2		1	6	4	4
Switch Phase						
Minimum Initial (s)	10.0		6.0	10.0	6.0	6.0
Minimum Split (s)	15.0		9.5	15.0	11.0	11.0
Total Split (s)	36.0		23.0	59.0	11.0	11.0
Total Split (%)	51.4%		32.9%	84.3%	15.7%	15.7%
Maximum Green (s)	31.0		19.5	54.0	6.0	6.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.5		0.0	1.5	1.5	1.5
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		3.5	5.0	5.0	5.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0		2.0	2.0	2.0	2.0
Recall Mode	C-Min		None	C-Min	None	None

Intersection Summary

Cycle Length: 70  
 Actuated Cycle Length: 70  
 Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow  
 Natural Cycle: 60  
 Control Type: Actuated-Coordinated

Splits and Phases: 3: Smith Drive & Dascomb Road














Queues  
3: Smith Drive & Dascomb Road

2027 Build with Mitigation Conditions  
Weekday Morning

	→	↙	←	↘	↗
Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1195	249	1066	26	58
v/c Ratio	0.63	0.75	0.38	0.17	0.34
Control Delay	13.6	33.9	4.2	32.7	15.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	13.6	33.9	4.2	32.7	15.3
Queue Length 50th (ft)	188	91	98	11	0
Queue Length 95th (ft)	271	166	120	32	32
Internal Link Dist (ft)	385		545	920	
Turn Bay Length (ft)		310			200
Base Capacity (vph)	1883	430	2840	149	171
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.63	0.58	0.38	0.17	0.34
Intersection Summary					

HCM 2010 Signalized Intersection Summary  
 3: Smith Drive & Dascomb Road

2027 Build with Mitigation Conditions  
 Weekday Morning

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	1031	80	232	991	24	54		
Future Volume (veh/h)	1031	80	232	991	24	54		
Number	2	12	1	6	7	14		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1816	1900	1681	1792	1900	1681		
Adj Flow Rate, veh/h	1109	86	249	1066	26	58		
Adj No. of Lanes	2	0	1	2	1	1		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93		
Percent Heavy Veh, %	5	5	13	6	0	13		
Cap, veh/h	1823	141	282	2684	125	99		
Arrive On Green	1.00	1.00	0.35	1.00	0.07	0.07		
Sat Flow, veh/h	3336	251	1601	3495	1810	1429		
Grp Volume(v), veh/h	589	606	249	1066	26	58		
Grp Sat Flow(s),veh/h/ln	1725	1771	1601	1703	1810	1429		
Q Serve(g_s), s	0.0	0.0	10.2	0.0	1.0	2.8		
Cycle Q Clear(g_c), s	0.0	0.0	10.2	0.0	1.0	2.8		
Prop In Lane		0.14	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	969	995	282	2684	125	99		
V/C Ratio(X)	0.61	0.61	0.88	0.40	0.21	0.59		
Avail Cap(c_a), veh/h	969	995	446	2684	155	123		
HCM Platoon Ratio	2.00	2.00	2.00	2.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	0.87	0.87	1.00	1.00		
Uniform Delay (d), s/veh	0.0	0.0	22.0	0.0	30.8	31.6		
Incr Delay (d2), s/veh	2.8	2.8	6.9	0.4	0.3	2.1		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.8	0.8	5.0	0.1	0.5	1.1		
LnGrp Delay(d),s/veh	2.8	2.8	28.8	0.4	31.1	33.7		
LnGrp LOS	A	A	C	A	C	C		
Approach Vol, veh/h	1195			1315	84			
Approach Delay, s/veh	2.8			5.8	32.9			
Approach LOS	A			A	C			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	15.8	44.3		9.8		60.2		
Change Period (Y+Rc), s	3.5	5.0		5.0		5.0		
Max Green Setting (Gmax), s	19.5	31.0		6.0		54.0		
Max Q Clear Time (g_c+I1), s	12.2	2.0		4.8		2.0		
Green Ext Time (p_c), s	0.2	13.4		0.0		16.2		
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			5.3					
HCM 2010 LOS			A					



Lanes, Volumes, Timings  
4: Site Driveway/Frontage Road & Dascomb Road

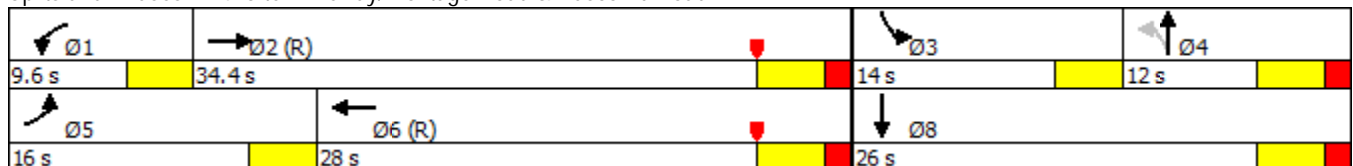
2027 Build with Mitigation Conditions  
Weekday Morning

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	427	647	11	42	788	460	7	22	26	204	26	428
Future Volume (vph)	427	647	11	42	788	460	7	22	26	204	26	428
Lane Util. Factor	0.97	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997				0.850		0.918				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3335	1805	0	1770	3438	1561	1770	1710	0	1752	1863	1711
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	3335	1805	0	1770	3438	1561	1863	1710	0	1752	1863	1711
Satd. Flow (RTOR)		2				354		28				455
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	5%	5%	2%	2%	5%	0%	2%	2%	2%	3%	2%	7%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA	Free	Perm	NA		Prot	NA	Free
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases						Free	4					Free
Detector Phase	5	2		1	6		4	4		3	8	
Switch Phase												
Minimum Initial (s)	6.0	10.0		6.0	10.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	9.5	15.0		9.5	15.0		11.0	11.0		9.5	11.0	
Total Split (s)	16.0	34.4		9.6	28.0		12.0	12.0		14.0	26.0	
Total Split (%)	22.9%	49.1%		13.7%	40.0%		17.1%	17.1%		20.0%	37.1%	
Maximum Green (s)	12.5	29.4		6.1	23.0		7.0	7.0		10.5	21.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.0	1.5		0.0	1.5		1.5	1.5		0.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.5	5.0		3.5	5.0		5.0	5.0		3.5	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag		Lead		
Lead-Lag Optimize?		Yes										
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Recall Mode	None	C-Min		None	C-Min		None	None		None	None	

Intersection Summary











Cycle Length: 70  
 Actuated Cycle Length: 70  
 Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow, Master Intersection  
 Natural Cycle: 75  
 Control Type: Actuated-Coordinated

Splits and Phases: 4: Site Driveway/Frontage Road & Dascomb Road



Queues  
4: Site Driveway/Frontage Road & Dascomb Road

2027 Build with Mitigation Conditions  
Weekday Morning























										
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	454	700	45	838	489	7	51	217	28	455
v/c Ratio	0.78	0.71	0.29	0.60	0.31	0.04	0.28	0.83	0.07	0.27
Control Delay	46.9	16.1	33.0	21.5	0.4	29.4	21.8	49.4	7.3	1.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.9	16.1	33.0	21.5	0.4	29.4	21.8	49.4	7.3	1.7
Queue Length 50th (ft)	112	79	18	188	0	3	9	23	2	23
Queue Length 95th (ft)	#169	#463	m26	225	0	14	39	#182	m7	44
Internal Link Dist (ft)		545		920			920		695	
Turn Bay Length (ft)	110		160		130					150
Base Capacity (vph)	609	985	157	1388	1561	186	196	271	558	1711
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.71	0.29	0.60	0.31	0.04	0.26	0.80	0.05	0.27

Intersection Summary

- # 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.

HCM 2010 Signalized Intersection Summary  
 4: Site Driveway/Frontage Road & Dascomb Road

2027 Build with Mitigation Conditions  
 Weekday Morning

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	427	647	11	42	788	460	7	22	26	204	26	428
Future Volume (veh/h)	427	647	11	42	788	460	7	22	26	204	26	428
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1810	1810	1900	1863	1810	1900	1863	1863	1900	1845	1863	1847
Adj Flow Rate, veh/h	454	688	12	45	838	0	7	23	28	217	28	0
Adj No. of Lanes	2	1	0	1	2	1	1	1	0	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	5	5	5	2	5	0	2	2	2	3	2	7
Cap, veh/h	539	871	15	89	1305	613	199	53	65	258	496	418
Arrive On Green	0.21	0.65	0.65	0.10	0.76	0.00	0.07	0.07	0.07	0.15	0.27	0.00
Sat Flow, veh/h	3343	1774	31	1774	3438	1615	1377	766	932	1757	1863	1570
Grp Volume(v), veh/h	454	0	700	45	838	0	7	0	51	217	28	0
Grp Sat Flow(s),veh/h/ln	1672	0	1805	1774	1719	1615	1377	0	1698	1757	1863	1570
Q Serve(g_s), s	9.1	0.0	19.5	1.7	8.0	0.0	0.3	0.0	2.0	8.4	0.8	0.0
Cycle Q Clear(g_c), s	9.1	0.0	19.5	1.7	8.0	0.0	0.3	0.0	2.0	8.4	0.8	0.0
Prop In Lane	1.00		0.02	1.00		1.00	1.00		0.55	1.00		1.00
Lane Grp Cap(c), veh/h	539	0	886	89	1305	613	199	0	118	258	496	418
V/C Ratio(X)	0.84	0.00	0.79	0.51	0.64	0.00	0.04	0.00	0.43	0.84	0.06	0.00
Avail Cap(c_a), veh/h	597	0	886	155	1305	613	241	0	170	264	559	471
HCM Platoon Ratio	1.33	1.33	1.33	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.75	0.00	0.75	0.66	0.66	0.00	1.00	0.00	1.00	0.80	0.80	0.00
Uniform Delay (d), s/veh	26.6	0.0	9.6	30.7	6.2	0.0	30.5	0.0	31.2	29.1	19.1	0.0
Incr Delay (d2), s/veh	6.8	0.0	5.4	1.1	1.6	0.0	0.0	0.0	0.9	16.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.7	0.0	10.8	0.9	3.8	0.0	0.1	0.0	1.0	5.3	0.4	0.0
LnGrp Delay(d),s/veh	33.4	0.0	15.0	31.8	7.8	0.0	30.5	0.0	32.2	45.4	19.1	0.0
LnGrp LOS	C		B	C	A		C		C	D	B	
Approach Vol, veh/h		1154			883			58			245	
Approach Delay, s/veh		22.2			9.0			32.0			42.4	
Approach LOS		C			A			C			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6		8				
Phs Duration (G+Y+Rc), s	7.0	39.4	13.8	9.9	14.8	31.6		23.6				
Change Period (Y+Rc), s	3.5	5.0	3.5	5.0	3.5	5.0		5.0				
Max Green Setting (Gmax), s	6.1	29.4	10.5	7.0	12.5	23.0		21.0				
Max Q Clear Time (g_c+I1), s	3.7	21.5	10.4	4.0	11.1	10.0		2.8				
Green Ext Time (p_c), s	0.0	4.4	0.0	0.1	0.2	6.0		0.2				
<b>Intersection Summary</b>												
HCM 2010 Ctrl Delay			19.6									
HCM 2010 LOS			B									

Lanes, Volumes, Timings  
5: I-93 NB Ramps & Dascomb Road

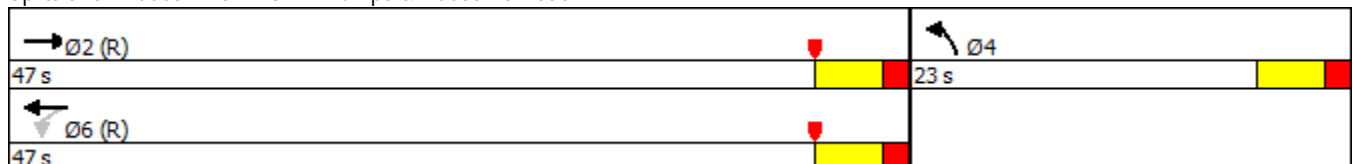
2027 Build with Mitigation Conditions  
Weekday Morning

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↙	↑	↖	↗
Traffic Volume (vph)	466	411	77	755	535	168
Future Volume (vph)	466	411	77	755	535	168
Lane Util. Factor	1.00	1.00	1.00	1.00	0.97	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1837	1561	1805	1900	3303	1568
Flt Permitted			0.443		0.950	
Satd. Flow (perm)	1837	1561	842	1900	3303	1568
Satd. Flow (RTOR)		409				173
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	0%	0%	0%	6%	3%
Shared Lane Traffic (%)						
Turn Type	NA	Free	Perm	NA	Prot	Free
Protected Phases	2			6	4	
Permitted Phases		Free	6			Free
Detector Phase	2		6	6	4	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	6.0	
Minimum Split (s)	15.0		15.0	15.0	11.0	
Total Split (s)	47.0		47.0	47.0	23.0	
Total Split (%)	67.1%		67.1%	67.1%	32.9%	
Maximum Green (s)	42.0		42.0	42.0	18.0	
Yellow Time (s)	3.5		3.5	3.5	3.5	
All-Red Time (s)	1.5		1.5	1.5	1.5	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.0		5.0	5.0	5.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0		2.0	2.0	2.0	
Recall Mode	C-Min		C-Min	C-Min	None	

Intersection Summary







Cycle Length: 70  
 Actuated Cycle Length: 70  
 Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow  
 Natural Cycle: 50  
 Control Type: Actuated-Coordinated

Splits and Phases: 5: I-93 NB Ramps & Dascomb Road



Queues  
5: I-93 NB Ramps & Dascomb Road

2027 Build with Mitigation Conditions  
Weekday Morning













						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	480	424	79	778	552	173
v/c Ratio	0.41	0.27	0.15	0.64	0.76	0.11
Control Delay	12.1	0.3	6.7	11.6	32.6	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.1	0.3	6.7	11.6	32.6	0.1
Queue Length 50th (ft)	157	0	12	182	113	0
Queue Length 95th (ft)	m233	m0	32	321	158	0
Internal Link Dist (ft)	920			795	920	
Turn Bay Length (ft)		200	200		200	200
Base Capacity (vph)	1169	1561	536	1209	849	1568
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	0.41	0.27	0.15	0.64	0.65	0.11

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM 2010 Signalized Intersection Summary  
5: I-93 NB Ramps & Dascomb Road

2027 Build with Mitigation Conditions  
Weekday Morning

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	466	411	77	755	535	168		
Future Volume (veh/h)	466	411	77	755	535	168		
Number	2	12	1	6	7	14		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1792	1845		
Adj Flow Rate, veh/h	480	0	79	778	552	0		
Adj No. of Lanes	1	1	1	1	2	1		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97		
Percent Heavy Veh, %	0	0	0	0	6	3		
Cap, veh/h	1253	1065	672	1253	655	310		
Arrive On Green	0.88	0.00	0.66	0.66	0.20	0.00		
Sat Flow, veh/h	1900	1615	929	1900	3312	1568		
Grp Volume(v), veh/h	480	0	79	778	552	0		
Grp Sat Flow(s),veh/h/ln	1900	1615	929	1900	1656	1568		
Q Serve(g_s), s	3.3	0.0	2.5	16.5	11.2	0.0		
Cycle Q Clear(g_c), s	3.3	0.0	5.8	16.5	11.2	0.0		
Prop In Lane		1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	1253	1065	672	1253	655	310		
V/C Ratio(X)	0.38	0.00	0.12	0.62	0.84	0.00		
Avail Cap(c_a), veh/h	1253	1065	672	1253	852	403		
HCM Platoon Ratio	1.33	1.33	1.00	1.00	1.00	1.00		
Upstream Filter(I)	0.60	0.00	1.00	1.00	1.00	0.00		
Uniform Delay (d), s/veh	1.7	0.0	5.7	6.9	27.0	0.0		
Incr Delay (d2), s/veh	0.5	0.0	0.4	2.3	4.9	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.7	0.0	0.7	9.2	5.6	0.0		
LnGrp Delay(d),s/veh	2.2	0.0	6.1	9.2	31.9	0.0		
LnGrp LOS	A		A	A	C			
Approach Vol, veh/h	480			857	552			
Approach Delay, s/veh	2.2			8.9	31.9			
Approach LOS	A			A	C			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		51.2		18.8		51.2		
Change Period (Y+Rc), s		5.0		5.0		5.0		
Max Green Setting (Gmax), s		42.0		18.0		42.0		
Max Q Clear Time (g_c+I1), s		5.3		13.2		18.5		
Green Ext Time (p_c), s		6.7		0.6		6.2		
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			13.9					
HCM 2010 LOS			B					

Lanes, Volumes, Timings  
6: Frontage Road & I-93 SB Ramps

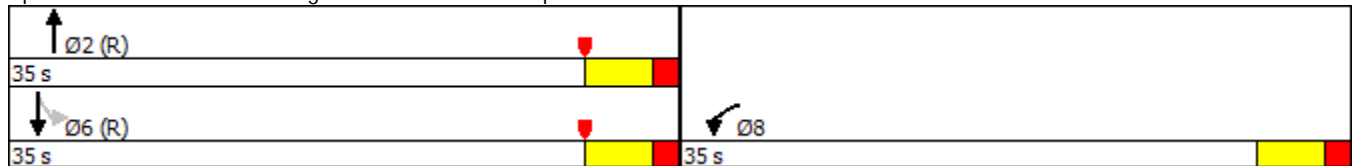
2027 Build with Mitigation Conditions  
Weekday Morning

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	552	94	314	593	88	97
Future Volume (vph)	552	94	314	593	88	97
Lane Util. Factor	0.97	1.00	1.00	1.00	0.95	0.95
Frt		0.850		0.850		
Flt Protected	0.950					0.977
Satd. Flow (prot)	3303	1615	2027	1553	0	3437
Flt Permitted	0.950					0.730
Satd. Flow (perm)	3303	1615	2027	1553	0	2568
Satd. Flow (RTOR)		99		624		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	6%	0%	0%	4%	0%	5%
Shared Lane Traffic (%)						
Turn Type	Prot	Free	NA	Free	Perm	NA
Protected Phases	8		2			6
Permitted Phases		Free		Free	6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	6.0		10.0		10.0	10.0
Minimum Split (s)	11.0		15.0		15.0	15.0
Total Split (s)	35.0		35.0		35.0	35.0
Total Split (%)	50.0%		50.0%		50.0%	50.0%
Maximum Green (s)	30.0		30.0		30.0	30.0
Yellow Time (s)	3.5		3.5		3.5	3.5
All-Red Time (s)	1.5		1.5		1.5	1.5
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.0		5.0		5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0		2.0		2.0	2.0
Minimum Gap (s)	2.0		2.0		2.0	2.0
Time Before Reduce (s)	2.0		2.0		2.0	2.0
Time To Reduce (s)	0.0		0.0		0.0	0.0
Recall Mode	None		C-Min		C-Min	C-Min

Intersection Summary






Cycle Length: 70  
 Actuated Cycle Length: 70  
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow  
 Natural Cycle: 40  
 Control Type: Actuated-Coordinated

Splits and Phases: 6: Frontage Road & I-93 SB Ramps



Queues  
6: Frontage Road & I-93 SB Ramps

2027 Build with Mitigation Conditions  
Weekday Morning

					
Lane Group	WBL	WBR	NBT	NBR	SBT
Lane Group Flow (vph)	581	99	331	624	195
v/c Ratio	0.72	0.06	0.27	0.40	0.12
Control Delay	29.5	0.1	10.7	2.6	6.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	29.5	0.1	10.7	2.6	6.7
Queue Length 50th (ft)	118	0	90	72	16
Queue Length 95th (ft)	153	0	m111	141	35
Internal Link Dist (ft)	920		695		645
Turn Bay Length (ft)	200	200			
Base Capacity (vph)	1415	1615	1244	1553	1576
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.41	0.06	0.27	0.40	0.12














Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



HCM 2010 Signalized Intersection Summary  
6: Frontage Road & I-93 SB Ramps

2027 Build with Mitigation Conditions  
Weekday Morning

								
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations	 					 		
Traffic Volume (veh/h)	552	94	314	593	88	97		
Future Volume (veh/h)	552	94	314	593	88	97		
Number	3	18	2	12	1	6		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1792	1900	1976	1827	1900	1852		
Adj Flow Rate, veh/h	581	0	331	0	93	102		
Adj No. of Lanes	2	1	1	1	0	2		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Percent Heavy Veh, %	6	0	0	4	5	5		
Cap, veh/h	702	342	1275	1002	693	1043		
Arrive On Green	0.21	0.00	0.65	0.00	0.65	0.65		
Sat Flow, veh/h	3312	1615	1976	1553	916	1700		
Grp Volume(v), veh/h	581	0	331	0	94	101		
Grp Sat Flow(s),veh/h/ln	1656	1615	1976	1553	931	1601		
Q Serve(g_s), s	11.7	0.0	5.0	0.0	2.9	1.7		
Cycle Q Clear(g_c), s	11.7	0.0	5.0	0.0	7.9	1.7		
Prop In Lane	1.00	1.00		1.00	0.98			
Lane Grp Cap(c), veh/h	702	342	1275	1002	703	1033		
V/C Ratio(X)	0.83	0.00	0.26	0.00	0.13	0.10		
Avail Cap(c_a), veh/h	1419	692	1275	1002	703	1033		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	0.00	0.84	0.00	1.00	1.00		
Uniform Delay (d), s/veh	26.4	0.0	5.3	0.0	6.9	4.7		
Incr Delay (d2), s/veh	1.0	0.0	0.4	0.0	0.4	0.2		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	5.4	0.0	2.8	0.0	0.9	0.8		
LnGrp Delay(d),s/veh	27.3	0.0	5.7	0.0	7.3	4.9		
LnGrp LOS	C		A		A	A		
Approach Vol, veh/h	581		331			195		
Approach Delay, s/veh	27.3		5.7			6.1		
Approach LOS	C		A			A		
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		50.2				50.2		19.8
Change Period (Y+Rc), s		5.0				5.0		5.0
Max Green Setting (Gmax), s		30.0				30.0		30.0
Max Q Clear Time (g_c+I1), s		7.0				9.9		13.7
Green Ext Time (p_c), s		2.2				2.1		1.1
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			17.1					
HCM 2010 LOS			B					

Lanes, Volumes, Timings  
1: Shawsheen Street & East Street/Dascomb Road

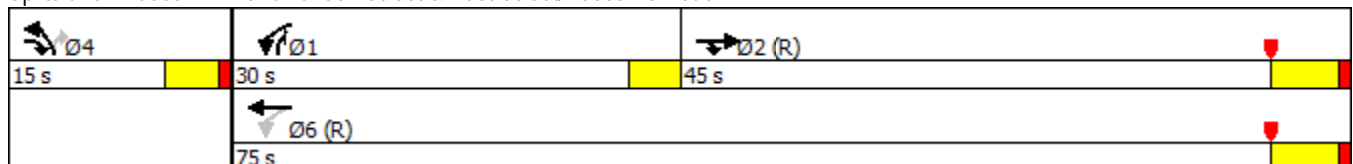
2027 Build with Mitigation Conditions  
Weekday Evening

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↘	↑	↘	↗
Traffic Volume (vph)	596	31	511	765	72	590
Future Volume (vph)	596	31	511	765	72	590
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1818	1516	1728	1818	1728	1546
Flt Permitted			0.217		0.950	
Satd. Flow (perm)	1818	1516	395	1818	1728	1546
Satd. Flow (RTOR)		31				160
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	1%	3%	1%	1%	1%	1%
Shared Lane Traffic (%)						
Turn Type	NA	pt+ov	pm+pt	NA	Prot	pm+ov
Protected Phases	2	2 4	1	6	4	1
Permitted Phases			6			4
Detector Phase	2	2 4	1	6	4	1
Switch Phase						
Minimum Initial (s)	10.0		6.0	10.0	6.0	6.0
Minimum Split (s)	15.5		9.5	15.5	10.5	9.5
Total Split (s)	45.0		30.0	75.0	15.0	30.0
Total Split (%)	50.0%		33.3%	83.3%	16.7%	33.3%
Maximum Green (s)	39.5		26.5	69.5	10.5	26.5
Yellow Time (s)	4.5		3.5	4.5	3.5	3.5
All-Red Time (s)	1.0		0.0	1.0	1.0	0.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5		3.5	5.5	4.5	3.5
Lead/Lag	Lag		Lead			Lead
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0		2.0	4.0	2.0	2.0
Recall Mode	C-Min		None	C-Min	None	None

Intersection Summary







Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 62 (69%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow  
 Natural Cycle: 70  
 Control Type: Actuated-Coordinated

Splits and Phases: 1: Shawsheen Street & East Street/Dascomb Road



Queues  
 1: Shawsheen Street & East Street/Dascomb Road

2027 Build with Mitigation Conditions  
 Weekday Evening













						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	641	33	549	823	77	634
v/c Ratio	0.70	0.03	0.78	0.54	0.48	0.89
Control Delay	24.6	3.0	16.9	3.1	48.5	34.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.6	3.0	16.9	3.1	48.5	34.2
Queue Length 50th (ft)	298	0	77	30	42	233
Queue Length 95th (ft)	#473	11	#159	43	85	#394
Internal Link Dist (ft)	1155			220	920	
Turn Bay Length (ft)		125				175
Base Capacity (vph)	914	1025	729	1512	201	738
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	0.70	0.03	0.75	0.54	0.38	0.86

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.












HCM 2010 Signalized Intersection Summary  
 1: Shawsheen Street & East Street/Dascomb Road

2027 Build with Mitigation Conditions  
 Weekday Evening

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	596	31	511	765	72	590		
Future Volume (veh/h)	596	31	511	765	72	590		
Number	2	12	1	6	7	14		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1881	1845	1881	1881	1881	1881		
Adj Flow Rate, veh/h	641	33	549	823	77	634		
Adj No. of Lanes	1	1	1	1	1	1		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93		
Percent Heavy Veh, %	1	3	1	1	1	1		
Cap, veh/h	1039	866	651	1453	209	1070		
Arrive On Green	0.55	0.55	0.36	1.00	0.12	0.12		
Sat Flow, veh/h	1881	1568	1792	1881	1792	1599		
Grp Volume(v), veh/h	641	33	549	823	77	634		
Grp Sat Flow(s),veh/h/ln	1881	1568	1792	1881	1792	1599		
Q Serve(g_s), s	20.8	0.9	13.6	0.0	3.6	10.5		
Cycle Q Clear(g_c), s	20.8	0.9	13.6	0.0	3.6	10.5		
Prop In Lane		1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	1039	866	651	1453	209	1070		
V/C Ratio(X)	0.62	0.04	0.84	0.57	0.37	0.59		
Avail Cap(c_a), veh/h	1039	866	854	1453	209	1070		
HCM Platoon Ratio	1.00	1.00	2.00	2.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	13.7	9.2	8.5	0.0	36.7	6.7		
Incr Delay (d2), s/veh	2.7	0.1	4.8	1.6	0.4	0.6		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	11.5	0.4	6.9	0.6	1.8	15.9		
LnGrp Delay(d),s/veh	16.4	9.3	13.2	1.6	37.1	7.3		
LnGrp LOS	B	A	B	A	D	A		
Approach Vol, veh/h	674			1372	711			
Approach Delay, s/veh	16.1			6.3	10.5			
Approach LOS	B			A	B			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	19.8	55.2		15.0		75.0		
Change Period (Y+Rc), s	3.5	5.5		4.5		5.5		
Max Green Setting (Gmax), s	26.5	39.5		10.5		69.5		
Max Q Clear Time (g_c+I1), s	15.6	22.8		12.5		2.0		
Green Ext Time (p_c), s	0.7	11.8		0.0		26.0		
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			9.8					
HCM 2010 LOS			A					

Lanes, Volumes, Timings  
2: Dascomb Road & HP Driveway

2027 Build with Mitigation Conditions  
Weekday Evening

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			 		 	
Traffic Volume (vph)	6	1179	1248	4	3	28
Future Volume (vph)	6	1179	1248	4	3	28
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt					0.876	
Flt Protected					0.996	
Satd. Flow (prot)	0	1819	3417	0	1480	0
Flt Permitted					0.996	
Satd. Flow (perm)	0	1819	3417	0	1480	0
Peak Hour Factor	0.91	0.91	0.89	0.89	0.86	0.86
Heavy Vehicles (%)	0%	1%	2%	50%	100%	4%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Control Type: Unsignalized						

HCM 2010 TWSC  
2: Dascomb Road & HP Driveway

2027 Build with Mitigation Conditions  
Weekday Evening

Intersection

Int Delay, s/veh	2.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↕		↗	
Traffic Vol, veh/h	6	1179	1248	4	3	28
Future Vol, veh/h	6	1179	1248	4	3	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	91	91	89	89	86	86
Heavy Vehicles, %	0	1	2	50	100	4
Mvmt Flow	7	1296	1402	4	3	33

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1402	0	-	0	2711	701
Stage 1	-	-	-	-	1402	-
Stage 2	-	-	-	-	1309	-
Critical Hdwy	4.1	-	-	-	8.1	6.96
Critical Hdwy Stg 1	-	-	-	-	7.3	-
Critical Hdwy Stg 2	-	-	-	-	6.9	-
Follow-up Hdwy	2.2	-	-	-	4.45	3.338
Pot Cap-1 Maneuver	493	-	-	-	6	378
Stage 1	-	-	-	-	99	-
Stage 2	-	-	-	-	133	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	493	-	-	-	6	378
Mov Cap-2 Maneuver	-	-	-	-	6	-
Stage 1	-	-	-	-	99	-
Stage 2	-	-	-	-	126	-

Approach	EB		WB		SB
HCM Control Delay, s	0.1		0		156.9
HCM LOS					F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	493	-	-	-	54
HCM Lane V/C Ratio	0.013	-	-	-	0.668
HCM Control Delay (s)	12.4	0	-	-	156.9
HCM Lane LOS	B	A	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	2.7

Lanes, Volumes, Timings  
3: Smith Drive & Dascomb Road

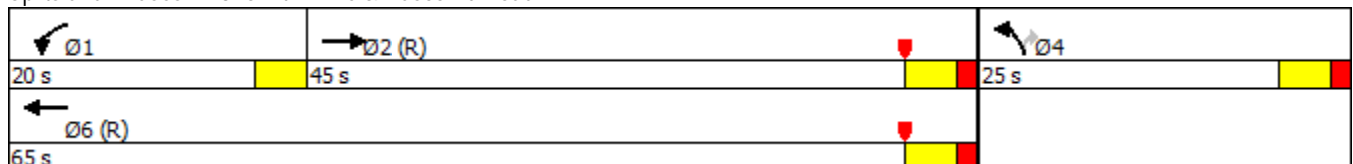
2027 Build with Mitigation Conditions  
Weekday Evening

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗
Traffic Volume (vph)	1105	77	107	1150	102	230
Future Volume (vph)	1105	77	107	1150	102	230
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.990					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3403	0	1479	3421	1646	1446
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3403	0	1479	3421	1646	1446
Satd. Flow (RTOR)	10					253
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	1%	9%	18%	2%	6%	8%
Shared Lane Traffic (%)						
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	2		1	6	4	
Permitted Phases						4
Detector Phase	2		1	6	4	4
Switch Phase						
Minimum Initial (s)	10.0		6.0	10.0	6.0	6.0
Minimum Split (s)	15.0		9.5	15.0	11.0	11.0
Total Split (s)	45.0		20.0	65.0	25.0	25.0
Total Split (%)	50.0%		22.2%	72.2%	27.8%	27.8%
Maximum Green (s)	40.0		16.5	60.0	20.0	20.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.5		0.0	1.5	1.5	1.5
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		3.5	5.0	5.0	5.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0		2.0	2.0	2.0	2.0
Recall Mode	C-Min		None	C-Min	None	None

Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 6 (7%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow  
 Natural Cycle: 55  
 Control Type: Actuated-Coordinated

Splits and Phases: 3: Smith Drive & Dascomb Road



Queues  
3: Smith Drive & Dascomb Road












2027 Build with Mitigation Conditions  
Weekday Evening

	→	↙	←	↘	↗
Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1299	118	1264	112	253
v/c Ratio	0.63	0.63	0.48	0.58	0.65
Control Delay	14.8	49.8	3.3	49.2	13.0
Queue Delay	0.2	0.0	0.0	0.0	0.1
Total Delay	15.0	49.8	3.3	49.2	13.1
Queue Length 50th (ft)	227	63	61	61	0
Queue Length 95th (ft)	420	121	96	109	65
Internal Link Dist (ft)	385		545	920	
Turn Bay Length (ft)		310			200
Base Capacity (vph)	2064	272	2640	365	518
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	166	0	0	0	12
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.68	0.43	0.48	0.31	0.50
Intersection Summary					



HCM 2010 Signalized Intersection Summary  
 3: Smith Drive & Dascomb Road

2027 Build with Mitigation Conditions  
 Weekday Evening

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	1105	77	107	1150	102	230		
Future Volume (veh/h)	1105	77	107	1150	102	230		
Number	2	12	1	6	7	14		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1871	1900	1610	1863	1792	1759		
Adj Flow Rate, veh/h	1214	85	118	1264	112	253		
Adj No. of Lanes	2	0	1	2	1	1		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91		
Percent Heavy Veh, %	1	1	18	2	6	8		
Cap, veh/h	1915	134	141	2474	324	284		
Arrive On Green	0.76	0.76	0.18	1.00	0.19	0.19		
Sat Flow, veh/h	3466	236	1533	3632	1707	1495		
Grp Volume(v), veh/h	639	660	118	1264	112	253		
Grp Sat Flow(s),veh/h/ln	1778	1830	1533	1770	1707	1495		
Q Serve(g_s), s	15.2	15.2	6.7	0.0	5.1	14.8		
Cycle Q Clear(g_c), s	15.2	15.2	6.7	0.0	5.1	14.8		
Prop In Lane		0.13	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	1010	1039	141	2474	324	284		
V/C Ratio(X)	0.63	0.63	0.83	0.51	0.35	0.89		
Avail Cap(c_a), veh/h	1010	1039	281	2474	379	332		
HCM Platoon Ratio	1.33	1.33	2.00	2.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	0.91	0.91	1.00	1.00		
Uniform Delay (d), s/veh	6.6	6.6	36.0	0.0	31.6	35.6		
Incr Delay (d2), s/veh	3.0	3.0	4.4	0.7	0.2	20.6		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	8.1	8.3	3.0	0.2	2.4	7.7		
LnGrp Delay(d),s/veh	9.6	9.6	40.5	0.7	31.8	56.1		
LnGrp LOS	A	A	D	A	C	E		
Approach Vol, veh/h	1299			1382	365			
Approach Delay, s/veh	9.6			4.1	48.7			
Approach LOS	A			A	D			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	11.8	56.1		22.1		67.9		
Change Period (Y+Rc), s	3.5	5.0		5.0		5.0		
Max Green Setting (Gmax), s	16.5	40.0		20.0		60.0		
Max Q Clear Time (g_c+I1), s	8.7	17.2		16.8		2.0		
Green Ext Time (p_c), s	0.1	13.9		0.2		21.1		
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			11.8					
HCM 2010 LOS			B					

Lanes, Volumes, Timings  
4: Site Driveway/Frontage Road & Dascomb Road

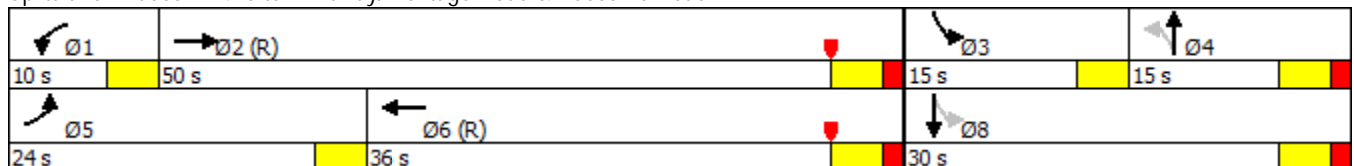
2027 Build with Mitigation Conditions  
Weekday Evening

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	432	885	18	49	786	253	19	38	57	246	39	454
Future Volume (vph)	432	885	18	49	786	253	19	38	57	246	39	454
Lane Util. Factor	0.97	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997				0.850		0.911				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3400	1875	0	1770	3539	1546	1770	1697	0	1787	1863	1777
Flt Permitted	0.950			0.950			0.730			0.443		
Satd. Flow (perm)	3400	1875	0	1770	3539	1546	1360	1697	0	833	1863	1777
Satd. Flow (RTOR)		2				212		59				473
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	3%	1%	2%	2%	2%	1%	2%	2%	2%	1%	2%	3%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA	Free	Perm	NA		pm+pt	NA	Free
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases						Free	4			8		Free
Detector Phase	5	2		1	6		4	4		3	8	
Switch Phase												
Minimum Initial (s)	6.0	10.0		6.0	10.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	9.5	15.0		9.5	15.0		11.0	11.0		9.5	11.0	
Total Split (s)	24.0	50.0		10.0	36.0		15.0	15.0		15.0	30.0	
Total Split (%)	26.7%	55.6%		11.1%	40.0%		16.7%	16.7%		16.7%	33.3%	
Maximum Green (s)	20.5	45.0		6.5	31.0		10.0	10.0		11.5	25.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.0	1.5		0.0	1.5		1.5	1.5		0.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.5	5.0		3.5	5.0		5.0	5.0		3.5	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag		Lead		
Lead-Lag Optimize?		Yes		Yes								
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Recall Mode	None	C-Min		None	C-Min		None	None		None	None	

Intersection Summary











Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow, Master Intersection  
 Natural Cycle: 90  
 Control Type: Actuated-Coordinated

Splits and Phases: 4: Site Driveway/Frontage Road & Dascomb Road



Queues  
4: Site Driveway/Frontage Road & Dascomb Road

2027 Build with Mitigation Conditions  
Weekday Evening























										
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	450	941	51	819	264	20	99	256	41	473
v/c Ratio	0.74	0.84	0.39	0.52	0.17	0.18	0.51	0.81	0.10	0.27
Control Delay	53.2	19.6	52.5	17.2	0.2	41.3	28.2	39.1	13.5	1.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.2	19.6	52.5	17.2	0.2	41.3	28.2	39.1	13.5	1.2
Queue Length 50th (ft)	133	544	30	173	0	11	22	48	7	21
Queue Length 95th (ft)	191	#772	m62	274	0	32	69	#82	19	28
Internal Link Dist (ft)		545		920			920		695	
Turn Bay Length (ft)	110		160		130					150
Base Capacity (vph)	774	1118	135	1590	1546	151	241	322	517	1777
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.84	0.38	0.52	0.17	0.13	0.41	0.80	0.08	0.27

Intersection Summary

- # 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.

HCM 2010 Signalized Intersection Summary  
 4: Site Driveway/Frontage Road & Dascomb Road

2027 Build with Mitigation Conditions  
 Weekday Evening

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	432	885	18	49	786	253	19	38	57	246	39	454
Future Volume (veh/h)	432	885	18	49	786	253	19	38	57	246	39	454
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1881	1900	1863	1863	1881	1863	1863	1900	1881	1863	1918
Adj Flow Rate, veh/h	450	922	19	51	819	0	20	40	59	256	41	0
Adj No. of Lanes	2	1	0	1	2	1	1	1	0	1	1	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	1	1	2	2	1	2	2	2	1	2	3
Cap, veh/h	522	1020	21	85	1595	720	188	54	80	338	459	402
Arrive On Green	0.31	1.00	1.00	0.02	0.15	0.00	0.08	0.08	0.08	0.13	0.25	0.00
Sat Flow, veh/h	3408	1836	38	1774	3539	1599	1360	681	1004	1792	1863	1631
Grp Volume(v), veh/h	450	0	941	51	819	0	20	0	99	256	41	0
Grp Sat Flow(s),veh/h/ln	1704	0	1874	1774	1770	1599	1360	0	1685	1792	1863	1631
Q Serve(g_s), s	11.2	0.0	0.0	2.6	19.2	0.0	1.2	0.0	5.2	11.5	1.5	0.0
Cycle Q Clear(g_c), s	11.2	0.0	0.0	2.6	19.2	0.0	1.2	0.0	5.2	11.5	1.5	0.0
Prop In Lane	1.00		0.02	1.00		1.00	1.00		0.60	1.00		1.00
Lane Grp Cap(c), veh/h	522	0	1042	85	1595	720	188	0	134	338	459	402
V/C Ratio(X)	0.86	0.00	0.90	0.60	0.51	0.00	0.11	0.00	0.74	0.76	0.09	0.00
Avail Cap(c_a), veh/h	776	0	1042	128	1595	720	231	0	187	338	517	453
HCM Platoon Ratio	2.00	2.00	2.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.73	0.00	0.73	0.77	0.77	0.00	1.00	0.00	1.00	0.84	0.84	0.00
Uniform Delay (d), s/veh	30.3	0.0	0.0	43.4	29.2	0.0	38.7	0.0	40.5	31.6	26.1	0.0
Incr Delay (d2), s/veh	3.4	0.0	9.7	1.9	0.9	0.0	0.1	0.0	4.8	7.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.5	0.0	2.8	1.3	9.6	0.0	0.5	0.0	2.6	6.3	0.8	0.0
LnGrp Delay(d),s/veh	33.7	0.0	9.7	45.4	30.1	0.0	38.8	0.0	45.3	38.8	26.2	0.0
LnGrp LOS	C		A	D	C		D		D	D	C	
Approach Vol, veh/h		1391			870			119			297	
Approach Delay, s/veh		17.5			31.0			44.2			37.1	
Approach LOS		B			C			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6		8				
Phs Duration (G+Y+Rc), s	7.8	55.0	15.0	12.2	17.3	45.6		27.2				
Change Period (Y+Rc), s	3.5	5.0	3.5	5.0	3.5	5.0		5.0				
Max Green Setting (Gmax), s	6.5	45.0	11.5	10.0	20.5	31.0		25.0				
Max Q Clear Time (g_c+I1), s	4.6	2.0	13.5	7.2	13.2	21.2		3.5				
Green Ext Time (p_c), s	0.0	11.5	0.0	0.1	0.6	5.9		0.5				
<b>Intersection Summary</b>												
HCM 2010 Ctrl Delay			25.2									
HCM 2010 LOS			C									

Lanes, Volumes, Timings  
5: I-93 NB Ramps & Dascomb Road

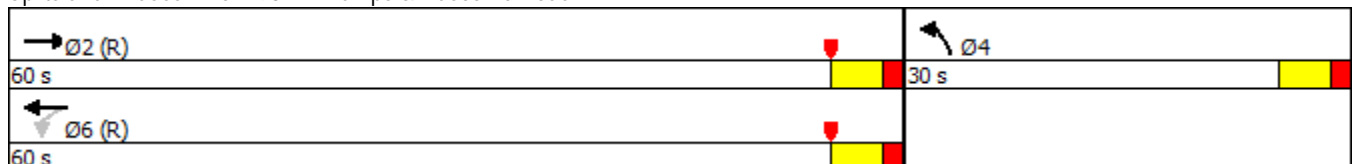
2027 Build with Mitigation Conditions  
Weekday Evening

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↙	↑	↖	↗
Traffic Volume (vph)	673	515	97	636	452	362
Future Volume (vph)	673	515	97	636	452	362
Lane Util. Factor	1.00	1.00	1.00	1.00	0.97	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1818	1546	1752	1881	3433	1615
Flt Permitted			0.327		0.950	
Satd. Flow (perm)	1818	1546	603	1881	3433	1615
Satd. Flow (RTOR)		275				373
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	1%	1%	3%	1%	2%	0%
Shared Lane Traffic (%)						
Turn Type	NA	Free	Perm	NA	Prot	Free
Protected Phases	2			6	4	
Permitted Phases		Free	6			Free
Detector Phase	2		6	6	4	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	6.0	
Minimum Split (s)	15.0		15.0	15.0	11.0	
Total Split (s)	60.0		60.0	60.0	30.0	
Total Split (%)	66.7%		66.7%	66.7%	33.3%	
Maximum Green (s)	55.0		55.0	55.0	25.0	
Yellow Time (s)	3.5		3.5	3.5	3.5	
All-Red Time (s)	1.5		1.5	1.5	1.5	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.0		5.0	5.0	5.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0		2.0	2.0	2.0	
Recall Mode	C-Min		C-Min	C-Min	None	

Intersection Summary







Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 56 (62%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow  
 Natural Cycle: 45  
 Control Type: Actuated-Coordinated

Splits and Phases: 5: I-93 NB Ramps & Dascomb Road



Queues  
5: I-93 NB Ramps & Dascomb Road

2027 Build with Mitigation Conditions  
Weekday Evening













						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	694	531	100	656	466	373
v/c Ratio	0.54	0.34	0.24	0.50	0.74	0.23
Control Delay	5.9	0.3	7.2	8.2	41.8	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.9	0.3	7.2	8.2	41.8	0.3
Queue Length 50th (ft)	102	0	17	144	130	0
Queue Length 95th (ft)	m173	m0	46	259	171	0
Internal Link Dist (ft)	920			795	920	
Turn Bay Length (ft)		200	200		200	200
Base Capacity (vph)	1281	1546	424	1325	953	1615
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	0.54	0.34	0.24	0.50	0.49	0.23

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM 2010 Signalized Intersection Summary  
5: I-93 NB Ramps & Dascomb Road

2027 Build with Mitigation Conditions  
Weekday Evening

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	673	515	97	636	452	362		
Future Volume (veh/h)	673	515	97	636	452	362		
Number	2	12	1	6	7	14		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1881	1881	1845	1881	1863	1900		
Adj Flow Rate, veh/h	694	0	100	656	466	0		
Adj No. of Lanes	1	1	1	1	2	1		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97		
Percent Heavy Veh, %	1	1	3	1	2	0		
Cap, veh/h	1368	1162	432	1368	557	261		
Arrive On Green	0.49	0.00	0.73	0.73	0.16	0.00		
Sat Flow, veh/h	1881	1599	740	1881	3442	1615		
Grp Volume(v), veh/h	694	0	100	656	466	0		
Grp Sat Flow(s),veh/h/ln	1881	1599	740	1881	1721	1615		
Q Serve(g_s), s	22.6	0.0	7.4	13.2	11.8	0.0		
Cycle Q Clear(g_c), s	22.6	0.0	30.0	13.2	11.8	0.0		
Prop In Lane		1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	1368	1162	432	1368	557	261		
V/C Ratio(X)	0.51	0.00	0.23	0.48	0.84	0.00		
Avail Cap(c_a), veh/h	1368	1162	432	1368	956	449		
HCM Platoon Ratio	0.67	0.67	1.00	1.00	1.00	1.00		
Upstream Filter(I)	0.44	0.00	1.00	1.00	1.00	0.00		
Uniform Delay (d), s/veh	12.1	0.0	14.3	5.2	36.6	0.0		
Incr Delay (d2), s/veh	0.6	0.0	1.3	1.2	1.3	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	11.9	0.0	1.7	7.2	5.7	0.0		
LnGrp Delay(d),s/veh	12.7	0.0	15.6	6.4	37.9	0.0		
LnGrp LOS	B		B	A	D			
Approach Vol, veh/h	694			756	466			
Approach Delay, s/veh	12.7			7.6	37.9			
Approach LOS	B			A	D			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		70.4		19.6		70.4		
Change Period (Y+Rc), s		5.0		5.0		5.0		
Max Green Setting (Gmax), s		55.0		25.0		55.0		
Max Q Clear Time (g_c+I1), s		24.6		13.8		32.0		
Green Ext Time (p_c), s		7.5		0.8		7.0		
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			16.8					
HCM 2010 LOS			B					

Lanes, Volumes, Timings  
6: Frontage Road & I-93 SB Ramps

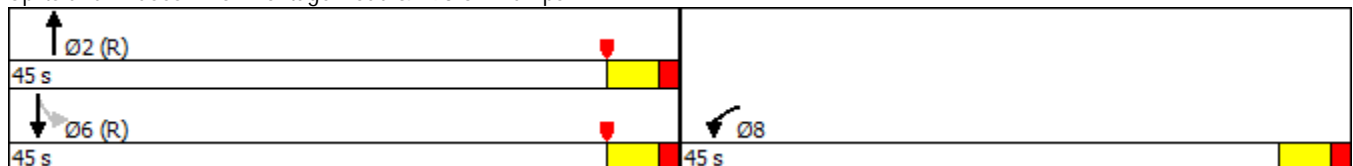
2027 Build with Mitigation Conditions  
Weekday Evening

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	492	19	126	595	94	213
Future Volume (vph)	492	19	126	595	94	213
Lane Util. Factor	0.97	1.00	1.00	1.00	0.95	0.95
Frt		0.850		0.850		
Flt Protected	0.950					0.985
Satd. Flow (prot)	3433	1524	2007	1583	0	3531
Flt Permitted	0.950					0.819
Satd. Flow (perm)	3433	1524	2007	1583	0	2936
Satd. Flow (RTOR)		21		654		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	2%	6%	1%	2%	0%	1%
Shared Lane Traffic (%)						
Turn Type	Prot	Free	NA	Free	Perm	NA
Protected Phases	8		2			6
Permitted Phases		Free		Free	6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	6.0		10.0		10.0	10.0
Minimum Split (s)	11.0		15.0		15.0	15.0
Total Split (s)	45.0		45.0		45.0	45.0
Total Split (%)	50.0%		50.0%		50.0%	50.0%
Maximum Green (s)	40.0		40.0		40.0	40.0
Yellow Time (s)	3.5		3.5		3.5	3.5
All-Red Time (s)	1.5		1.5		1.5	1.5
Lost Time Adjust (s)	0.0		0.0			0.0
Total Lost Time (s)	5.0		5.0			5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0		2.0		2.0	2.0
Recall Mode	None		C-Min		C-Min	C-Min

Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 15 (17%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow  
 Natural Cycle: 40  
 Control Type: Actuated-Coordinated

Splits and Phases: 6: Frontage Road & I-93 SB Ramps










## Queues

2027 Build with Mitigation Conditions














## 6: Frontage Road &amp; I-93 SB Ramps

Weekday Evening

					
Lane Group	WBL	WBR	NBT	NBR	SBT
Lane Group Flow (vph)	541	21	138	654	337
v/c Ratio	0.74	0.01	0.10	0.41	0.17
Control Delay	39.5	0.0	3.0	4.4	6.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	39.5	0.0	3.0	4.4	6.1
Queue Length 50th (ft)	148	0	11	129	32
Queue Length 95th (ft)	189	0	24	151	58
Internal Link Dist (ft)	920		695		645
Turn Bay Length (ft)	200	200			
Base Capacity (vph)	1525	1524	1358	1583	1987
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.35	0.01	0.10	0.41	0.17
Intersection Summary					

HCM 2010 Signalized Intersection Summary  
 6: Frontage Road & I-93 SB Ramps

2027 Build with Mitigation Conditions  
 Weekday Evening

								
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations	 					 		
Traffic Volume (veh/h)	492	19	126	595	94	213		
Future Volume (veh/h)	492	19	126	595	94	213		
Number	3	18	2	12	1	6		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1792	1956	1863	1900	1887		
Adj Flow Rate, veh/h	541	0	138	0	103	234		
Adj No. of Lanes	2	1	1	1	0	2		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91		
Percent Heavy Veh, %	2	6	1	2	1	1		
Cap, veh/h	639	283	1376	1113	662	1564		
Arrive On Green	0.19	0.00	0.70	0.00	0.70	0.70		
Sat Flow, veh/h	3442	1524	1956	1583	851	2311		
Grp Volume(v), veh/h	541	0	138	0	170	167		
Grp Sat Flow(s),veh/h/ln	1721	1524	1956	1583	1444	1631		
Q Serve(g_s), s	13.7	0.0	2.0	0.0	1.9	3.0		
Cycle Q Clear(g_c), s	13.7	0.0	2.0	0.0	3.9	3.0		
Prop In Lane	1.00	1.00		1.00	0.61			
Lane Grp Cap(c), veh/h	639	283	1376	1113	1080	1147		
V/C Ratio(X)	0.85	0.00	0.10	0.00	0.16	0.15		
Avail Cap(c_a), veh/h	1530	677	1376	1113	1080	1147		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	0.00	0.84	0.00	1.00	1.00		
Uniform Delay (d), s/veh	35.4	0.0	4.3	0.0	4.5	4.4		
Incr Delay (d2), s/veh	1.2	0.0	0.1	0.0	0.3	0.3		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	6.6	0.0	1.1	0.0	1.5	1.4		
LnGrp Delay(d),s/veh	36.6	0.0	4.4	0.0	4.8	4.7		
LnGrp LOS	D		A		A	A		
Approach Vol, veh/h	541		138			337		
Approach Delay, s/veh	36.6		4.4			4.8		
Approach LOS	D		A			A		
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		68.3				68.3		21.7
Change Period (Y+Rc), s		5.0				5.0		5.0
Max Green Setting (Gmax), s		40.0				40.0		40.0
Max Q Clear Time (g_c+I1), s		4.0				5.9		15.7
Green Ext Time (p_c), s		1.9				1.9		1.1
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			21.7					
HCM 2010 LOS			C					

Lanes, Volumes, Timings  
 1: Shawsheen Street & East Street/Dascomb Road

2027 Build with Mitigation Conditions  
 Saturday MIDDAY

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	482	48	407	450	58	550
Future Volume (vph)	482	48	407	450	58	550
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1818	1561	1711	1749	1631	1546
Flt Permitted			0.278		0.950	
Satd. Flow (perm)	1818	1561	501	1749	1631	1546
Satd. Flow (RTOR)		51				197
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	0%	2%	5%	7%	1%
Shared Lane Traffic (%)						
Turn Type	NA	pt+ov	pm+pt	NA	Prot	pm+ov
Protected Phases	2	2 4	1	6	4	1
Permitted Phases			6			4
Detector Phase	2	2 4	1	6	4	1
Switch Phase						
Minimum Initial (s)	10.0		6.0	10.0	6.0	6.0
Minimum Split (s)	15.5		9.5	15.5	10.5	9.5
Total Split (s)	33.0		24.0	57.0	13.0	24.0
Total Split (%)	47.1%		34.3%	81.4%	18.6%	34.3%
Maximum Green (s)	27.5		20.5	51.5	8.5	20.5
Yellow Time (s)	4.5		3.5	4.5	3.5	3.5
All-Red Time (s)	1.0		0.0	1.0	1.0	0.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5		3.5	5.5	4.5	3.5
Lead/Lag	Lag		Lead			Lead
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0		2.0	4.0	2.0	2.0
Recall Mode	Min		None	Min	None	None

Intersection Summary







Cycle Length: 70  
 Actuated Cycle Length: 51.2  
 Natural Cycle: 60  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Shawsheen Street & East Street/Dascomb Road

24 s	33 s	13 s
57 s		













Queues  
1: Shawsheen Street & East Street/Dascomb Road

2027 Build with Mitigation Conditions  
Saturday MIDDAY

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	513	51	433	479	62	585
v/c Ratio	0.69	0.05	0.59	0.33	0.25	0.81
Control Delay	20.3	2.4	7.0	3.4	28.8	19.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.3	2.4	7.0	3.4	28.8	19.2
Queue Length 50th (ft)	138	0	35	49	19	94
Queue Length 95th (ft)	290	12	108	93	59	235
Internal Link Dist (ft)	1155			220	920	
Turn Bay Length (ft)		125				175
Base Capacity (vph)	1124	1159	962	1543	311	972
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	0.46	0.04	0.45	0.31	0.20	0.60
Intersection Summary						












HCM 2010 Signalized Intersection Summary  
 1: Shawsheen Street & East Street/Dascomb Road

2027 Build with Mitigation Conditions  
 Saturday MIDDAY

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	482	48	407	450	58	550		
Future Volume (veh/h)	482	48	407	450	58	550		
Number	2	12	1	6	7	14		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1881	1900	1863	1810	1776	1881		
Adj Flow Rate, veh/h	513	51	433	479	62	585		
Adj No. of Lanes	1	1	1	1	1	1		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94		
Percent Heavy Veh, %	1	0	2	5	7	1		
Cap, veh/h	755	648	596	1163	278	904		
Arrive On Green	0.40	0.40	0.17	0.64	0.16	0.16		
Sat Flow, veh/h	1881	1615	1774	1810	1691	1599		
Grp Volume(v), veh/h	513	51	433	479	62	585		
Grp Sat Flow(s),veh/h/ln	1881	1615	1774	1810	1691	1599		
Q Serve(g_s), s	11.6	1.0	6.5	6.7	1.6	8.5		
Cycle Q Clear(g_c), s	11.6	1.0	6.5	6.7	1.6	8.5		
Prop In Lane		1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	755	648	596	1163	278	904		
V/C Ratio(X)	0.68	0.08	0.73	0.41	0.22	0.65		
Avail Cap(c_a), veh/h	999	858	991	1800	278	904		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	12.8	9.6	8.5	4.5	18.8	6.7		
Incr Delay (d2), s/veh	1.6	0.1	0.6	0.3	0.1	1.3		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	6.3	0.5	3.1	3.3	0.8	8.4		
LnGrp Delay(d),s/veh	14.4	9.7	9.2	4.8	18.9	8.0		
LnGrp LOS	B	A	A	A	B	A		
Approach Vol, veh/h	564			912	647			
Approach Delay, s/veh	14.0			6.9	9.0			
Approach LOS	B			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	12.5	26.3		13.0		38.8		
Change Period (Y+Rc), s	3.5	5.5		4.5		5.5		
Max Green Setting (Gmax), s	20.5	27.5		8.5		51.5		
Max Q Clear Time (g_c+I1), s	8.5	13.6		10.5		8.7		
Green Ext Time (p_c), s	0.6	7.2		0.0		12.0		
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			9.4					
HCM 2010 LOS			A					

Lanes, Volumes, Timings  
2: Dascomb Road & HP Driveway

2027 Build with Mitigation Conditions  
Saturday MIDDAY

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			 		 	
Traffic Volume (vph)	0	1032	855	0	0	2
Future Volume (vph)	0	1032	855	0	0	2
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt					0.865	
Flt Protected						
Satd. Flow (prot)	0	1801	3355	0	1644	0
Flt Permitted						
Satd. Flow (perm)	0	1801	3355	0	1644	0
Peak Hour Factor	0.94	0.94	0.99	0.99	0.25	0.25
Heavy Vehicles (%)	0%	2%	4%	0%	0%	0%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Control Type: Unsignalized						

Intersection							
Int Delay, s/veh	0						
Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations		↔	↕↔		↕		
Traffic Vol, veh/h	0	1032	855	0	0	2	
Future Vol, veh/h	0	1032	855	0	0	2	
Conflicting Peds, #/hr	0	0	0	0	0	0	
Sign Control	Free	Free	Free	Free	Stop	Stop	
RT Channelized	-	None	-	Yield	-	None	
Storage Length	-	-	-	-	0	-	
Veh in Median Storage, #	-	0	0	-	0	-	
Grade, %	-	0	0	-	0	-	
Peak Hour Factor	94	94	99	99	25	25	
Heavy Vehicles, %	0	2	4	0	0	0	
Mvmt Flow	0	1098	864	0	0	8	

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	864	0	-	0	1962	432
Stage 1	-	-	-	-	864	-
Stage 2	-	-	-	-	1098	-
Critical Hdwy	4.1	-	-	-	6.6	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	787	-	-	-	63	577
Stage 1	-	-	-	-	378	-
Stage 2	-	-	-	-	322	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	787	-	-	-	63	577
Mov Cap-2 Maneuver	-	-	-	-	63	-
Stage 1	-	-	-	-	378	-
Stage 2	-	-	-	-	322	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	787	-	-	-	577
HCM Lane V/C Ratio	-	-	-	-	0.014
HCM Control Delay (s)	0	-	-	-	11.3
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

Lanes, Volumes, Timings  
3: Smith Drive & Dascomb Road

2027 Build with Mitigation Conditions

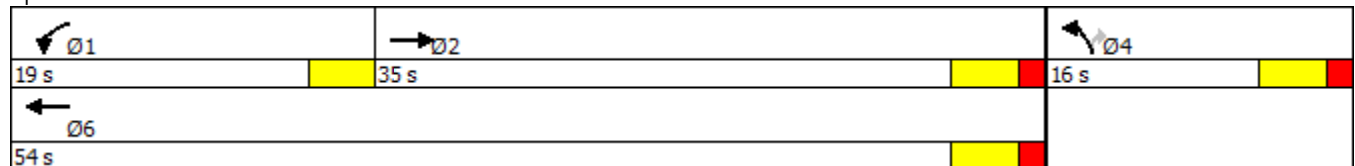
Saturday MIDDAY

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗
Traffic Volume (vph)	921	111	158	768	87	127
Future Volume (vph)	921	111	158	768	87	127
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.984					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3374	0	1694	3355	1745	1561
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3374	0	1694	3355	1745	1561
Satd. Flow (RTOR)	23					131
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	0%	3%	4%	0%	0%
Shared Lane Traffic (%)						
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	2		1	6	4	
Permitted Phases						4
Detector Phase	2		1	6	4	4
Switch Phase						
Minimum Initial (s)	10.0		6.0	10.0	6.0	6.0
Minimum Split (s)	16.0		12.0	16.5	12.0	12.0
Total Split (s)	35.0		19.0	54.0	16.0	16.0
Total Split (%)	50.0%		27.1%	77.1%	22.9%	22.9%
Maximum Green (s)	30.0		15.5	49.0	11.0	11.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.5		0.0	1.5	1.5	1.5
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		3.5	5.0	5.0	5.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0		2.0	2.0	2.0	2.0
Recall Mode	Min		None	Min	None	None

Intersection Summary

Cycle Length: 70  
 Actuated Cycle Length: 52.1  
 Natural Cycle: 50  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 3: Smith Drive & Dascomb Road
















Queues  
3: Smith Drive & Dascomb Road

2027 Build with Mitigation Conditions  
Saturday MIDDAY

	→	↙	←	↘	↗
Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1063	163	792	90	131
v/c Ratio	0.58	0.50	0.32	0.33	0.37
Control Delay	14.1	27.3	3.9	27.6	9.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	14.1	27.3	3.9	27.6	9.3
Queue Length 50th (ft)	135	46	43	26	0
Queue Length 95th (ft)	258	114	79	75	43
Internal Link Dist (ft)	385		545	920	
Turn Bay Length (ft)		310			200
Base Capacity (vph)	2124	548	2967	401	459
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.50	0.30	0.27	0.22	0.29
Intersection Summary					

HCM 2010 Signalized Intersection Summary  
3: Smith Drive & Dascomb Road

2027 Build with Mitigation Conditions  
Saturday MIDDAY

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	921	111	158	768	87	127		
Future Volume (veh/h)	921	111	158	768	87	127		
Number	2	12	1	6	7	14		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1867	1900	1845	1827	1900	1900		
Adj Flow Rate, veh/h	949	114	163	792	90	131		
Adj No. of Lanes	2	0	1	2	1	1		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97		
Percent Heavy Veh, %	2	2	3	4	0	0		
Cap, veh/h	1454	175	210	2268	226	202		
Arrive On Green	0.46	0.46	0.12	0.65	0.12	0.12		
Sat Flow, veh/h	3283	383	1757	3563	1810	1615		
Grp Volume(v), veh/h	528	535	163	792	90	131		
Grp Sat Flow(s),veh/h/ln	1773	1799	1757	1736	1810	1615		
Q Serve(g_s), s	10.4	10.4	4.1	4.6	2.1	3.5		
Cycle Q Clear(g_c), s	10.4	10.4	4.1	4.6	2.1	3.5		
Prop In Lane		0.21	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	809	820	210	2268	226	202		
V/C Ratio(X)	0.65	0.65	0.78	0.35	0.40	0.65		
Avail Cap(c_a), veh/h	1181	1198	604	3775	442	394		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	9.5	9.5	19.2	3.5	18.2	18.8		
Incr Delay (d2), s/veh	0.3	0.3	2.3	0.0	0.4	1.3		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	5.1	5.1	2.1	2.2	1.1	1.6		
LnGrp Delay(d),s/veh	9.8	9.8	21.6	3.5	18.6	20.1		
LnGrp LOS	A	A	C	A	B	C		
Approach Vol, veh/h	1063			955	221			
Approach Delay, s/veh	9.8			6.6	19.5			
Approach LOS	A			A	B			
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	8.9	25.5		10.6		34.4		
Change Period (Y+Rc), s	3.5	5.0		5.0		5.0		
Max Green Setting (Gmax), s	15.5	30.0		11.0		49.0		
Max Q Clear Time (g_c+I1), s	6.1	12.4		5.5		6.6		
Green Ext Time (p_c), s	0.1	8.2		0.2		10.9		
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			9.4					
HCM 2010 LOS			A					

Lanes, Volumes, Timings  
4: Site Driveway/Frontage Road & Dascomb Road

2027 Build with Mitigation Conditions

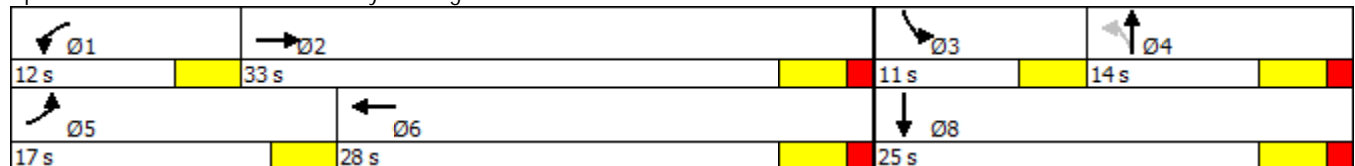
Saturday Midday

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	352	668	28	75	524	170	25	40	64	76	47	378
Future Volume (vph)	352	668	28	75	524	170	25	40	64	76	47	378
Lane Util. Factor	0.97	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.994				0.850		0.908				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3400	1869	0	1770	3539	1546	1770	1691	0	2025	1863	1743
Flt Permitted	0.950			0.950			0.800			0.950		
Satd. Flow (perm)	3400	1869	0	1770	3539	1546	1490	1691	0	2025	1863	1743
Satd. Flow (RTOR)		4				273		67				398
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	3%	1%	2%	2%	2%	1%	2%	2%	2%	1%	2%	5%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA	Free	Perm	NA		Prot	NA	Free
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases						Free	4					Free
Detector Phase	5	2		1	6		4	4		3	8	
Switch Phase												
Minimum Initial (s)	6.0	10.0		6.0	10.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	9.5	15.0		9.5	15.0		11.0	11.0		9.5	11.0	
Total Split (s)	17.0	33.0		12.0	28.0		14.0	14.0		11.0	25.0	
Total Split (%)	24.3%	47.1%		17.1%	40.0%		20.0%	20.0%		15.7%	35.7%	
Maximum Green (s)	13.5	28.0		8.5	23.0		9.0	9.0		7.5	20.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.0	1.5		0.0	1.5		1.5	1.5		0.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.5	5.0		3.5	5.0		5.0	5.0		3.5	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag		Lead		
Lead-Lag Optimize?		Yes		Yes								
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Recall Mode	None	Min		None	None		None	None		None	None	

Intersection Summary











Cycle Length: 70  
 Actuated Cycle Length: 58.4  
 Natural Cycle: 65  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Site Driveway/Frontage Road & Dascomb Road



Queues  
4: Site Driveway/Frontage Road & Dascomb Road

2027 Build with Mitigation Conditions  
Saturday MIDDAY

										
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	371	732	79	552	179	26	109	80	49	398
v/c Ratio	0.57	0.73	0.32	0.43	0.12	0.13	0.38	0.30	0.10	0.23
Control Delay	28.0	24.5	31.8	17.2	0.2	29.0	18.0	31.7	19.3	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.0	24.5	31.8	17.2	0.2	29.0	18.0	31.7	19.3	0.3
Queue Length 50th (ft)	71	261	30	84	0	10	16	30	15	0
Queue Length 95th (ft)	115	#528	71	141	0	31	59	72	39	0
Internal Link Dist (ft)		545		920			920		695	
Turn Bay Length (ft)	110		160		130					150
Base Capacity (vph)	923	1003	302	1664	1546	269	361	305	749	1743
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.73	0.26	0.33	0.12	0.10	0.30	0.26	0.07	0.23























Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

HCM 2010 Signalized Intersection Summary  
 4: Site Driveway/Frontage Road & Dascomb Road

2027 Build with Mitigation Conditions

Saturday Midday

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	352	668	28	75	524	170	25	40	64	76	47	378
Future Volume (veh/h)	352	668	28	75	524	170	25	40	64	76	47	378
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1880	1900	1863	1863	1881	1863	1863	1900	1956	1863	1882
Adj Flow Rate, veh/h	371	703	29	79	552	0	26	42	67	80	49	0
Adj No. of Lanes	2	1	0	1	2	1	1	1	0	1	1	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	1	1	2	2	1	2	2	2	1	2	5
Cap, veh/h	499	799	33	134	1327	600	264	65	104	142	445	382
Arrive On Green	0.15	0.45	0.45	0.08	0.38	0.00	0.10	0.10	0.10	0.08	0.24	0.00
Sat Flow, veh/h	3408	1793	74	1774	3539	1599	1351	648	1033	1863	1863	1600
Grp Volume(v), veh/h	371	0	732	79	552	0	26	0	109	80	49	0
Grp Sat Flow(s),veh/h/ln	1704	0	1867	1774	1770	1599	1351	0	1680	1863	1863	1600
Q Serve(g_s), s	5.9	0.0	20.1	2.4	6.5	0.0	1.0	0.0	3.5	2.3	1.2	0.0
Cycle Q Clear(g_c), s	5.9	0.0	20.1	2.4	6.5	0.0	1.0	0.0	3.5	2.3	1.2	0.0
Prop In Lane	1.00		0.04	1.00		1.00	1.00		0.61	1.00		1.00
Lane Grp Cap(c), veh/h	499	0	832	134	1327	600	264	0	169	142	445	382
V/C Ratio(X)	0.74	0.00	0.88	0.59	0.42	0.00	0.10	0.00	0.64	0.56	0.11	0.00
Avail Cap(c_a), veh/h	817	0	929	268	1446	653	344	0	269	248	662	568
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	23.0	0.0	14.2	25.2	13.0	0.0	23.2	0.0	24.4	25.1	16.7	0.0
Incr Delay (d2), s/veh	0.8	0.0	8.3	1.5	0.1	0.0	0.1	0.0	1.5	1.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.8	0.0	12.1	1.2	3.2	0.0	0.4	0.0	1.7	1.3	0.6	0.0
LnGrp Delay(d),s/veh	23.9	0.0	22.6	26.7	13.1	0.0	23.3	0.0	25.9	26.4	16.8	0.0
LnGrp LOS	C		C	C	B		C		C	C	B	
Approach Vol, veh/h		1103			631			135			129	
Approach Delay, s/veh		23.0			14.8			25.4			22.8	
Approach LOS		C			B			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6		8				
Phs Duration (G+Y+Rc), s	7.8	30.1	7.8	10.7	11.7	26.1		18.4				
Change Period (Y+Rc), s	3.5	5.0	3.5	5.0	3.5	5.0		5.0				
Max Green Setting (Gmax), s	8.5	28.0	7.5	9.0	13.5	23.0		20.0				
Max Q Clear Time (g_c+I1), s	4.4	22.1	4.3	5.5	7.9	8.5		3.2				
Green Ext Time (p_c), s	0.0	3.0	0.0	0.2	0.4	5.2		0.5				
<b>Intersection Summary</b>												
HCM 2010 Ctrl Delay			20.6									
HCM 2010 LOS			C									

Lanes, Volumes, Timings  
5: I-93 NB Ramps & Dascomb Road

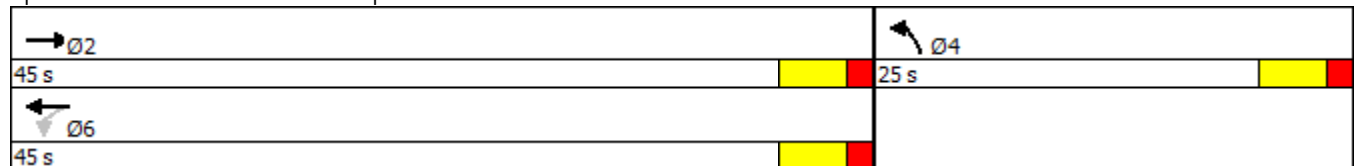
2027 Build with Mitigation Conditions  
Saturday MIDDAY

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	285	523	71	399	370	137
Future Volume (vph)	285	523	71	399	370	137
Lane Util. Factor	1.00	1.00	1.00	1.00	0.97	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1818	1546	1736	1881	3367	1615
Flt Permitted			0.575		0.950	
Satd. Flow (perm)	1818	1546	1050	1881	3367	1615
Satd. Flow (RTOR)		556				146
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	1%	4%	1%	4%	0%
Shared Lane Traffic (%)						
Turn Type	NA	Free	Perm	NA	Prot	Free
Protected Phases	2			6	4	
Permitted Phases		Free	6			Free
Detector Phase	2		6	6	4	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	6.0	
Minimum Split (s)	15.0		15.0	15.0	11.0	
Total Split (s)	45.0		45.0	45.0	25.0	
Total Split (%)	64.3%		64.3%	64.3%	35.7%	
Maximum Green (s)	40.0		40.0	40.0	20.0	
Yellow Time (s)	3.5		3.5	3.5	3.5	
All-Red Time (s)	1.5		1.5	1.5	1.5	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.0		5.0	5.0	5.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0		2.0	2.0	2.0	
Recall Mode	Min		Min	Min	None	

Intersection Summary







Cycle Length: 70  
 Actuated Cycle Length: 31.1  
 Natural Cycle: 40  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 5: I-93 NB Ramps & Dascomb Road















Queues  
5: I-93 NB Ramps & Dascomb Road

2027 Build with Mitigation Conditions  
Saturday MIDDAY

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	303	556	76	424	394	146
v/c Ratio	0.41	0.36	0.18	0.56	0.44	0.09
Control Delay	8.7	0.7	7.3	10.5	11.8	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.7	0.7	7.3	10.5	11.8	0.1
Queue Length 50th (ft)	30	0	7	46	24	0
Queue Length 95th (ft)	77	0	25	111	63	0
Internal Link Dist (ft)	920			795	920	
Turn Bay Length (ft)		200	200		200	200
Base Capacity (vph)	1815	1546	1048	1878	2221	1615
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	0.17	0.36	0.07	0.23	0.18	0.09
Intersection Summary						

HCM 2010 Signalized Intersection Summary  
5: I-93 NB Ramps & Dascomb Road

2027 Build with Mitigation Conditions  
Saturday Midday

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	285	523	71	399	370	137		
Future Volume (veh/h)	285	523	71	399	370	137		
Number	2	12	1	6	7	14		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1881	1881	1827	1881	1827	1900		
Adj Flow Rate, veh/h	303	0	76	424	394	0		
Adj No. of Lanes	1	1	1	1	2	1		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94		
Percent Heavy Veh, %	1	1	4	1	4	0		
Cap, veh/h	734	624	568	734	742	355		
Arrive On Green	0.39	0.00	0.39	0.39	0.22	0.00		
Sat Flow, veh/h	1881	1599	1051	1881	3375	1615		
Grp Volume(v), veh/h	303	0	76	424	394	0		
Grp Sat Flow(s),veh/h/ln	1881	1599	1051	1881	1688	1615		
Q Serve(g_s), s	3.0	0.0	1.5	4.5	2.6	0.0		
Cycle Q Clear(g_c), s	3.0	0.0	4.5	4.5	2.6	0.0		
Prop In Lane		1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	734	624	568	734	742	355		
V/C Ratio(X)	0.41	0.00	0.13	0.58	0.53	0.00		
Avail Cap(c_a), veh/h	2935	2495	1798	2935	2633	1260		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	0.00		
Uniform Delay (d), s/veh	5.7	0.0	7.3	6.2	8.8	0.0		
Incr Delay (d2), s/veh	0.1	0.0	0.0	0.3	0.2	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.5	0.0	0.4	2.3	1.2	0.0		
LnGrp Delay(d),s/veh	5.8	0.0	7.3	6.4	9.1	0.0		
LnGrp LOS	A		A	A	A			
Approach Vol, veh/h	303			500	394			
Approach Delay, s/veh	5.8			6.6	9.1			
Approach LOS	A			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		15.0		10.6		15.0		
Change Period (Y+Rc), s		5.0		5.0		5.0		
Max Green Setting (Gmax), s		40.0		20.0		40.0		
Max Q Clear Time (g_c+I1), s		5.0		4.6		6.5		
Green Ext Time (p_c), s		3.1		0.7		3.1		
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			7.2					
HCM 2010 LOS			A					



Lanes, Volumes, Timings  
6: Frontage Road & I-93 SB Ramps

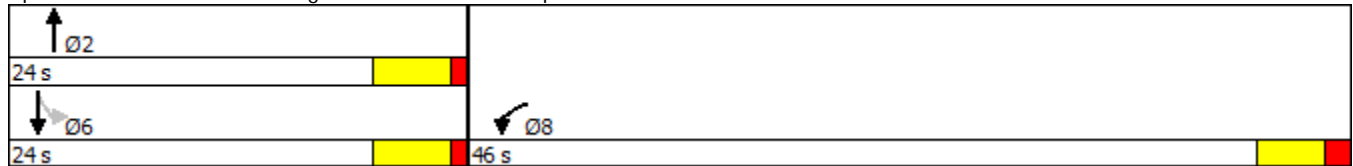
2027 Build with Mitigation Conditions  
Saturday MIDDAY

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	458	14	52	509	24	52
Future Volume (vph)	458	14	52	509	24	52
Lane Util. Factor	0.97	1.00	1.00	1.00	0.95	0.95
Frt		0.850		0.850		
Flt Protected	0.950					0.984
Satd. Flow (prot)	3335	1615	2027	1568	0	3419
Flt Permitted	0.950					0.877
Satd. Flow (perm)	3335	1615	2027	1568	0	3047
Satd. Flow (RTOR)		15		530		
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	5%	0%	0%	3%	8%	2%
Shared Lane Traffic (%)						
Turn Type	Prot	Free	NA	Free	Perm	NA
Protected Phases	8		2			6
Permitted Phases		Free		Free	6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	6.0		10.0		10.0	10.0
Minimum Split (s)	11.0		15.0		15.0	15.0
Total Split (s)	46.0		24.0		24.0	24.0
Total Split (%)	65.7%		34.3%		34.3%	34.3%
Maximum Green (s)	41.0		19.0		19.0	19.0
Yellow Time (s)	3.5		4.0		4.0	4.0
All-Red Time (s)	1.5		1.0		1.0	1.0
Lost Time Adjust (s)	0.0		0.0			0.0
Total Lost Time (s)	5.0		5.0			5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0		2.0		2.0	2.0
Recall Mode	None		Min		Min	Min

Intersection Summary

Cycle Length: 70  
 Actuated Cycle Length: 28.3  
 Natural Cycle: 40  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 6: Frontage Road & I-93 SB Ramps








## Queues

2027 Build with Mitigation Conditions














## 6: Frontage Road &amp; I-93 SB Ramps

Saturday MIDDAY

					
Lane Group	WBL	WBR	NBT	NBR	SBT
Lane Group Flow (vph)	477	15	54	530	79
v/c Ratio	0.49	0.01	0.08	0.34	0.07
Control Delay	10.1	0.0	6.9	0.6	6.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	10.1	0.0	6.9	0.6	6.8
Queue Length 50th (ft)	27	0	5	0	3
Queue Length 95th (ft)	47	0	16	0	11
Internal Link Dist (ft)	920		695		645
Turn Bay Length (ft)	200	200			
Base Capacity (vph)	3335	1615	1364	1568	2051
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.14	0.01	0.04	0.34	0.04
Intersection Summary					

HCM 2010 Signalized Intersection Summary  
6: Frontage Road & I-93 SB Ramps

2027 Build with Mitigation Conditions  
Saturday MIDDAY

								
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations	 					 		
Traffic Volume (veh/h)	458	14	52	509	24	52		
Future Volume (veh/h)	458	14	52	509	24	52		
Number	3	18	2	12	1	6		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1810	1900	1976	1845	1900	1829		
Adj Flow Rate, veh/h	477	0	54	0	25	54		
Adj No. of Lanes	2	1	1	1	0	2		
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96		
Percent Heavy Veh, %	5	0	0	3	2	2		
Cap, veh/h	778	376	758	601	486	933		
Arrive On Green	0.23	0.00	0.38	0.00	0.38	0.38		
Sat Flow, veh/h	3343	1615	1976	1568	706	2515		
Grp Volume(v), veh/h	477	0	54	0	45	34		
Grp Sat Flow(s),veh/h/ln	1672	1615	1976	1568	1557	1581		
Q Serve(g_s), s	3.3	0.0	0.5	0.0	0.0	0.4		
Cycle Q Clear(g_c), s	3.3	0.0	0.5	0.0	0.4	0.4		
Prop In Lane	1.00	1.00		1.00	0.56			
Lane Grp Cap(c), veh/h	778	376	758	601	812	606		
V/C Ratio(X)	0.61	0.00	0.07	0.00	0.06	0.06		
Avail Cap(c_a), veh/h	5258	2540	1440	1143	1332	1152		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	0.00	1.00	0.00	1.00	1.00		
Uniform Delay (d), s/veh	8.9	0.0	5.1	0.0	5.1	5.1		
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.0	0.0	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.6	0.0	0.2	0.0	0.2	0.2		
LnGrp Delay(d),s/veh	9.2	0.0	5.1	0.0	5.1	5.1		
LnGrp LOS	A		A		A	A		
Approach Vol, veh/h	477		54			79		
Approach Delay, s/veh	9.2		5.1			5.1		
Approach LOS	A		A			A		
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		15.0				15.0		11.1
Change Period (Y+Rc), s		5.0				5.0		5.0
Max Green Setting (Gmax), s		19.0				19.0		41.0
Max Q Clear Time (g_c+I1), s		2.5				2.4		5.3
Green Ext Time (p_c), s		0.4				0.4		0.9
<b>Intersection Summary</b>								
HCM 2010 Ctrl Delay			8.3					
HCM 2010 LOS			A					