

PRINCIPALS

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M E M O R A N D U M

DATE: July 18, 2008

TO: Mr. Robert Walker
Walker Realty, LLC
2 Lan Drive
Westford, MA 01886

FROM: Robert J. Michaud, P.E. – Managing Principal
Daniel A. Dumais, E.I.T. – Sr. Transportation Engineer

RE: **Proposed Next Generation Children's Center**
348, 350 & 352 Main Street – Acton, Massachusetts



MDM Transportation Consultants, Inc. (MDM) has prepared this traffic impact assessment (TIA) for the proposed 22,000 square-foot Next Generation Children's Center (NGCC) to be located at 348-352 Main Street in Acton, Massachusetts. This memorandum describes existing (baseline) traffic conditions for adjacent roadways, trip generation characteristics of the proposed development, quantifies incremental traffic impacts of the site development on area roadways, and evaluates safety-related conditions at key study locations that provide access to the site.

Key findings of the preliminary traffic assessment are as follows:

- *Existing Traffic Characteristics.* Main Street (Route 27), an urban other principal arterial roadway in the study area, carries approximately 18,760 vehicles per day with peak hour volumes of approximately 1,555 vehicles per hour or less. The critical analysis period (the period of highest roadway volume) is the weekday evening peak hour.
- *Traffic Generation.* Empirical information provided by the NGCC indicates that the site may generate approximately 142 total vehicle-trips (71 entering and 71 exiting) during peak activity periods (morning drop-off and evening pick-up). Employee-related trips will predominately occur before 7 AM and after 6 PM – hours outside the typical commuter peak hours. Additionally, NGCC anticipates sibling enrollment of approximately 20 percent and students of employees to be approximately 5%, consistent with its other facilities in Massachusetts – characteristics that are likely to further reduce vehicle generation.

To present a conservative analysis scenario, potential site trip activity was also evaluated using ITE standard industry trip rates for day care facilities. On this basis, the proposed child-care facility is estimated to generate approximately 226 new vehicle trips (120 entering and 106 exiting) during the weekday morning peak hour and 232 new vehicle trips (109 entering and 123 exiting) during the weekday evening peak hour. ITE-based trip generation estimates for the proposed development are conservatively higher than anticipated based on actual operating experience of NGCC facilities and therefore present a “worst case” analysis scenario for design purposes.

- *Adequate Roadway Capacity.* Adequate capacity is available along Main Street (Route 27) to accommodate projected traffic increases for the proposed development, assuming either trip generation methodology (empirical or ITE-based) described above. Actual observed delays for the left-turns from the Route 2 eastbound off ramps onto Main Street (Route 27) confirm that LOS C or better conditions exist for these critical left-turn movements. Isaac Davis Way (site driveway) will operate with delays of 50 seconds or greater during the evening peak hour. Delays and associated queuing are attributable to left-turns from Isaac Davis Way (approximately 1 vehicle per every two minute or less) and are expected to be managed on-site with no material impact to site parking or circulation.

- *Adequate Sight Lines.* Review of sight lines at Isaac Davis Way, which will provide access/egress to the proposed site, indicates that safe stopping sight distance (SSD) is available for oncoming vehicles to detect, react and stop for vehicles exiting onto Main Street based on regulatory speed limits and measured average and 85th percentile travel speeds. Intersection Sight Distance (ISD) criteria, which are apply to driver convenience exiting Isaac Davis Way (site driveway) are also met. MDM recommends that plantings (shrubs, bushes) and structures (walls, fences, etc.) be maintained at a height of 3 feet or less within the Main Street (Route 27) layout in the vicinity of the Isaac Davis Way (site driveway) to provide unobstructed sight lines.

PROJECT DESCRIPTION

The project site is an approximate 2.4-acre tract of land (3 lots), located at 348-352 Main Street (Route 27) in Acton, Massachusetts. The location of the site relative to adjacent roadways is shown in **Figure 1**. Isaac Davis Way, an existing private roadway, currently services the property via Main Street (Route 27). A metal chain across Isaac Davis Way approximately 100 feet north of Main Street (Route 27) at the NGCC property line currently and will continue to restrict vehicle flow between the site and Hayward Road via Isaac Davis Way. NGCC will widen the existing driveway servicing its site at Isaac Davis Way.

Under the proposed development plan, the NGCC site will be developed to accommodate an approximate 22,000 sf building supported by 86 parking spaces. The NGCC facility will accommodate a maximum student enrollment of 282 children and up to 40 staff, though initial enrollment is likely to be lower as programming is initiated and the NGCC services are marketed. The vast majority of staff is scheduled to arrive prior to the 7 AM program start time and will depart after the 6 PM program end time. Student arrivals are to be scheduled over a 3-hour period in the morning and evening to reduce vehicle impacts and parking demands, consistent with other NGCC facilities. The preliminary site layout prepared by Hancock Associates is presented in **Figure 2**.

EXISTING ROADWAY CHARACTERISTICS

An overview of roadway classification and geometric characteristics is provided below for study roadways and intersections.

Roadways

Main Street (Route 27)

Main Street (Route 27) is generally a north-south roadway under local (Town) jurisdiction. Main Street (Route 27) is classified by the Massachusetts Executive Office of Transportation (EOT) as an Urban Other Principal Arterial roadway and provides one travel lane in each direction and paved shoulder and varies between 25 and 44 feet in the project area. Main Street (Route 27) provides a connection between Acton and the Towns of Maynard and Carlisle. The posted (regulatory) speed limit of along Main Street (Route 27) in the area is 30 miles per hour (mph) to the south of the Route 2 Eastbound on/off ramps and 35 mph to the north of the Route 2 Eastbound on/off ramps. Bituminous sidewalk is located on the western side of Main Street (Route 27) from a point south of the Route 2 Eastbound on/off ramps through the Route 2 Westbound on/off ramp. To the north of the Route 2 Westbound on/off ramps a bituminous sidewalk is located on the eastern side of Main Street with a marked crosswalk near the ramps. Land use along Main Street (Route 27) in the study area includes residential and commercial uses that include but are not limited to Kennedy & Company (landscaping supply), a retail/restaurant Plaza, and a gasoline service station.

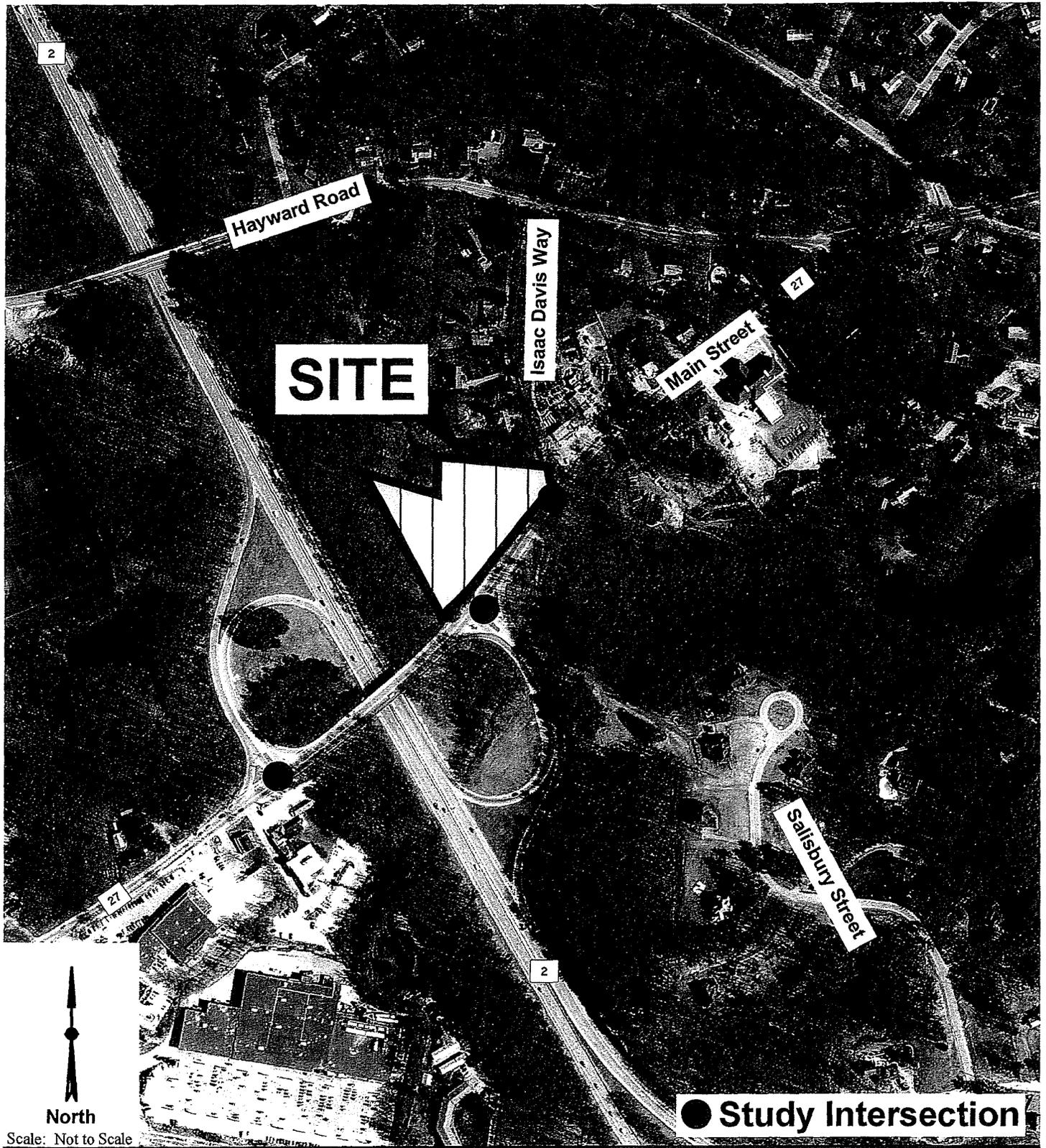
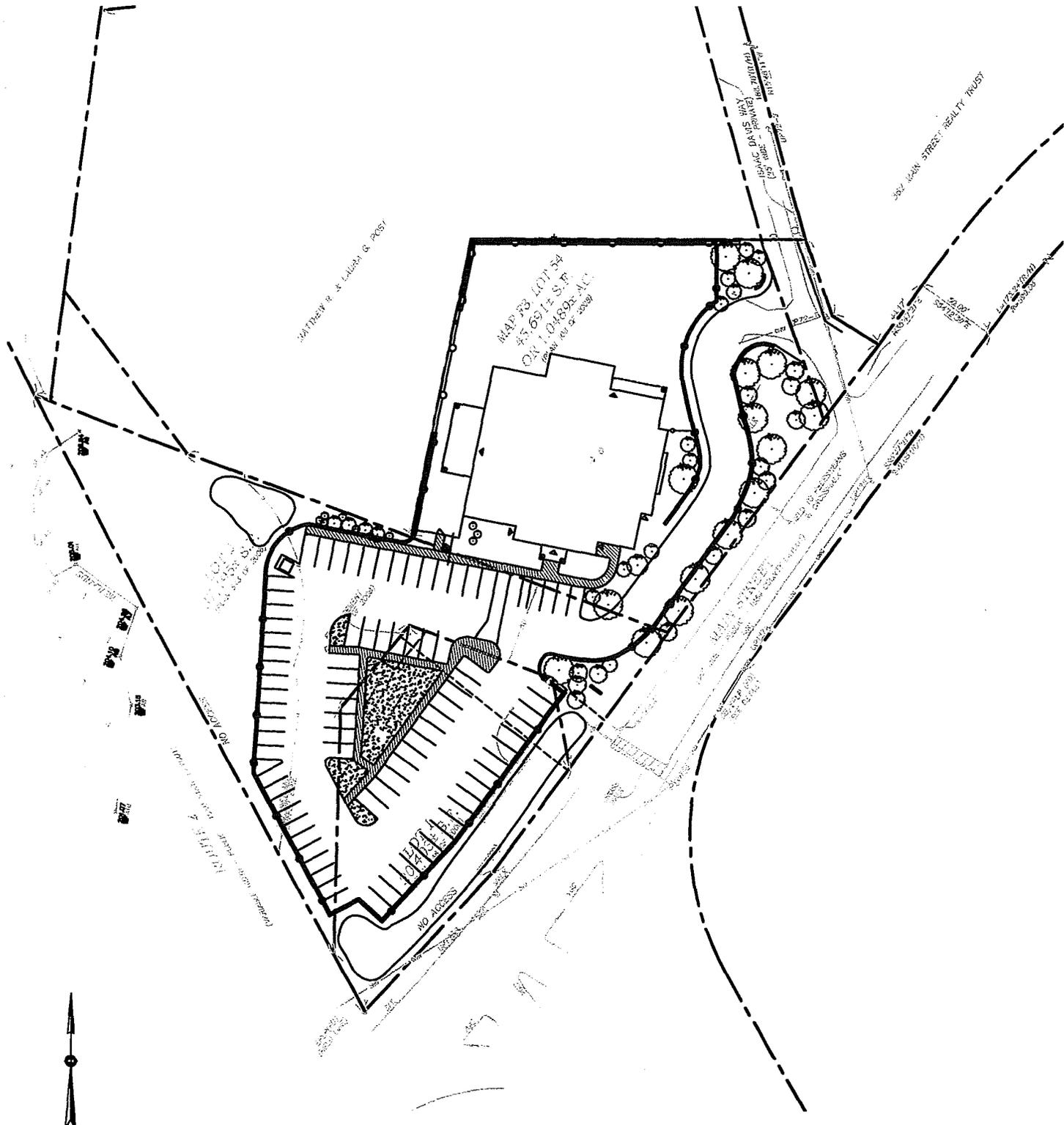


Figure 1

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Site Location



North

Scale: Not to Scale

Source: Joseph D. LaGrasse Associates, Inc.

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Figure 2

Preliminary Site Plan

Isaac Davis Way

Isaac Davis Way is generally a north-south private roadway. Isaac Davis Way connects Hayward Road to the north and Main Street (Route 27) to the south and provides a total pavement width of between 9 and 12 feet. There is no posted (regulatory) speed limit on Isaac Davis Way. A metal chain is currently located across Isaac Davis Way just north of Main Street (Route 27), which discourages the use of said roadway via Main Street (Route 27). Land use is exclusively residential and includes approximately five (5) single family houses.

Intersections

Main Street (Route 27) at Route 2 EB on/off ramps (Exit 42)

The Route 2 EB on/off ramps (Exit 42) meet Main Street (Route 27) to form a "T"-type unsignalized intersection with the Route 2 EB off ramp operating under STOP control. The Main Street (Route 27) approaches to the intersection provide a single general-purpose travel lane in each direction. The Route 2 EB off ramp approach to the intersection operates as exclusive left-turn and right-turn lanes with right turns under "Yield" control. Land use at the intersection consists of Acton Medical Associates (321 Main Street) and land associated with the Route 2 Highway system.

Main Street (Route 27) at Route 2 WB on/off ramps (Exit 42)

The Route 2 WB on/off ramps (Exit 42) meet Main Street (Route 27) to form a "T"-type unsignalized intersection with the Route 2 WB off ramp operating under STOP control. The Main Street (Route 27) approaches to the intersection provide a single general-purpose travel lane in each direction. The Route 2 WB off ramp approach to the intersection operates as exclusive left-turn and right-turn lanes with right turns under "Yield" control. Land use at the intersection consists of a residential house (#348 Main Street) and land associated with the Route 2 Highway system.

Main Street (Route 27) at Isaac Davis Way

Isaac Davis Way (private) meets Main Street (Route 27) to form a "T"-type unsignalized intersection with Isaac Davis Way operating under STOP control. The Main Street (Route 27) approaches to the intersection provide a single general-purpose travel lane in each direction. The Isaac Davis Way approach to the intersection is currently 12 feet wide and serves as the driveway for a vacant residential home located at 352 Main Street (Route 27). Land use at the intersection consists of residential houses and the Kennedy & Company (landscaping supply) to the north.

BASELINE TRAFFIC DATA

This traffic memorandum includes evaluation of area roadways likely to sustain a measurable impact from the proposed development. The study area includes the following unsignalized intersections:

- Main Street (Route 27) at Route 2 EB on/off ramps
- Main Street (Route 27) at Route 2 WB on/off ramps
- Main Street (Route 27) at Isaac Davis Way (Site Driveway)

Traffic Volumes

Traffic volume data were collected at the study area intersections during the weekday morning (7:00 AM - 9:00 AM) and weekday evening (4:00 PM – 6:00 PM) periods to coincide with peak traffic activity of the proposed child-care facility use and the adjacent streets. Traffic data used in this evaluation was collected in May 2008, which represents above-average traffic conditions based on review of MassHighway permanent count station data for the area. No adjustment (reduction) in the observed traffic volumes was made as a conservative measure. An Automated traffic recorder count (ATR) was also conducted in May 2008. Traffic count data and MassHighway permanent count station data are provided in the **Attachments**. The weekday morning and evening peak hours of traffic volumes for the study intersections are shown in **Figure 3**.

Daily traffic volumes along Main Street (Route 27) in the site vicinity were obtained by mechanical methods using an ATR in May 2008. The results of the counts are summarized in **Table 1**, and are discussed below.

Table 1
EXISTING TRAFFIC VOLUME SUMMARY
MAIN STREET (ROUTE 27)

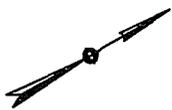
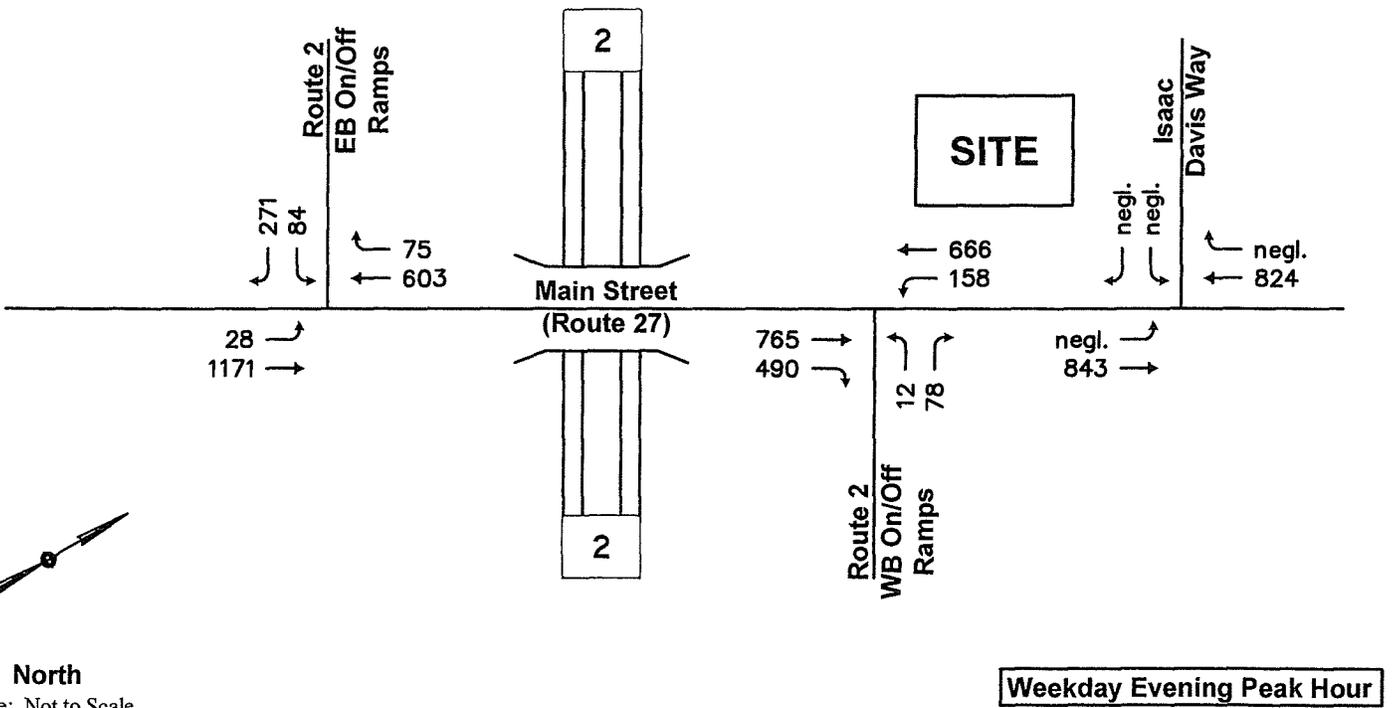
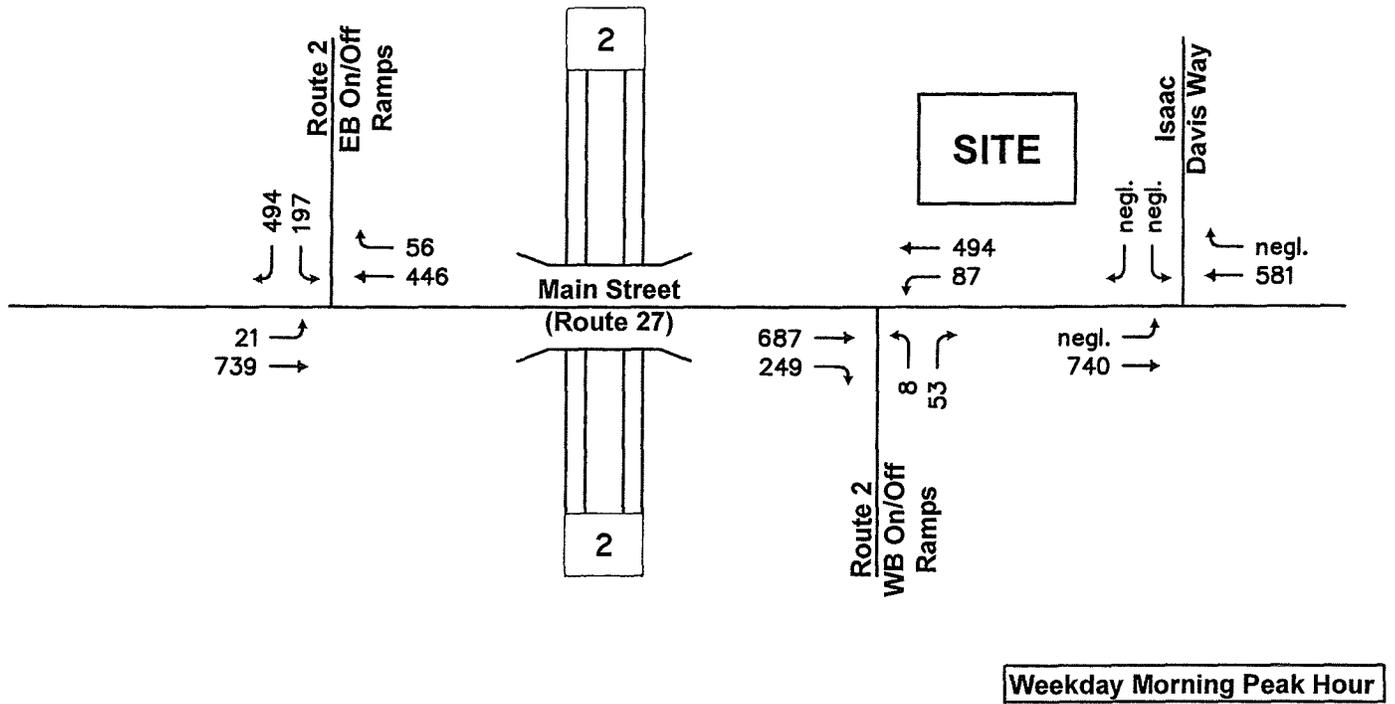
Weekday Daily Volume (vpd) ¹	Weekday AM Peak Hour			Weekday PM Peak Hour		
	Volume (vph) ²	Percent of Daily Traffic ³	Peak Flow Direction	Volume (vph)	Percent of Daily Traffic	Peak Flow Direction
18,760	1,340	7%	54% NB ⁴	1,555	8%	51% SB ⁴

¹Two-way daily traffic expressed in vehicles per day.

²Two-way peak-hour volume expressed in vehicles per hour.

³The percent of daily traffic that occurs during the peak hour.

⁴NB = northbound; SB = southbound



North

Scale: Not to Scale

Figure 3

2008 Existing
Peak Hour Traffic Volumes

As summarized in Table 1:

- The weekday daily traffic volume on Main Street (Route 27) in the site vicinity is approximately 18,760 vehicles per day (vpd). Peak hour traffic flow on Main Street (Route 27) ranges from approximately 1,340 to 1,555 vehicles per hour (vph) representing 7 to 8 percent of daily traffic flow.
- Vehicle flow is skewed towards the northbound direction during the weekday morning peak hour and towards the southbound direction during the weekday evening peak hour consistent with commuter travel and the mixed use nature of Main Street (Route 27) in the project area.

Measured Travel Speeds

Vehicle speeds were obtained for the Main Street (Route 27) northbound and southbound travel directions near the Isaac Davis Way (Site Driveway) by timing vehicles over a known distance and then converting the travel times to speeds. The study was performed on Thursday, May 15, 2008 and consisted of collecting travel times for a minimum of 100 vehicles per travel direction. Collected speed data are provided in the **Attachments**.

**Table 2
MAIN STREET (ROUTE 27) SPEED STUDY RESULTS**

Travel Direction	Posted Speed Limit	Travel Speed	
		Average ¹	85 th Percentile ²
Northbound	35	34	38
Southbound	35	32	35

¹Arithmetic Mean.

²The speed at or below which 85 percent of the vehicles are traveling.

As summarized in Table 2, the mean (average) travel speed on Main Street (Route 27) traveling northbound is 34 mph and the 85th percentile travel speed is 38 mph. In the southbound direction, the mean travel speed is 32 mph and the 85th percentile travel speed is 35 mph. The observed travel speeds are consistent with the posted (regulatory) speed limit of 35 mph on Main Street (Route 27) in the study area.

INTERSECTION CRASH HISTORY

In order to identify crash trends and safety characteristics for study area intersections, crash data were obtained from MassHighway for the Town of Acton for the three-year period 2004 through 2006 (the most recent data currently available from MassHighway). Crash data for the study intersections is summarized in Table 3 with detailed data provided in the Attachments.

Crash rates were calculated for the study intersection as reported in Table 3. This rate quantifies the number of crashes per million entering vehicles. MassHighway has determined the official District 3 (which includes the Town of Framingham) crash rate to be 0.79 for unsignalized intersections. This rate represents MassHighway's "average" crash experience for District 3 communities and serves as a basis for comparing reported crash rates for the study intersections. Where calculated crash rates notably exceed the district average, some form of safety countermeasures may be warranted.

As summarized in Table 3:

- There are a total of forty-five crashes reported at the study intersections during the three year study period. The majority (73%) resulted in property damage type accidents under dry roadway conditions (62%) and approximately 44 percent occurred during the morning or afternoon peak periods. There were no reported fatalities at the study intersections.
- A total of thirty-three (33) crashes were reported for the Main Street (Route 27) and Route 2 eastbound on/off ramp intersection – approximately 11 per year - resulting in a crash rate of 1.09. The reported crashes at the intersection include 6 angle-type (18%), 24 rear-end type (73%) and four other/ unknown type crashes which included two single vehicle accidents. The majority (85%) resulted in property damage type accidents with approximately 45 percent occurring during the peak hours. There were no reported fatalities and two bicycle related crashes at this location.
- A total of twelve (12) crashes were reported for the Main Street (Route 27) and Route 2 westbound on/off ramp intersection – approximately 4 per year - resulting in a crash rate of 0.40. The reported crashes at the intersection include 2 angle-type (17%), 9 rear-end type (75%) and one other/ unknown type crash which included a two vehicle collision under snowy conditions. The majority (58%) resulted in injury type accidents with approximately 41 percent occurring during the peak hours. There were no reported fatalities and no pedestrian/ bicycle related crashes at this location.

In summary, the crash rate at the Main Street (Route 27) intersection with the Route 2 eastbound on/off ramps is above the statewide average for unsignalized intersections. The crash data indicates a high percentage of low-speed; rear-end type collisions resulting in property-damage only.

Table 3
INTERSECTION CRASH SUMMARY – 2004 THROUGH 2006¹

Data Category	Main Street (Route 27) at Route 2 EB on/off ramps	Main Street (Route 27) at Route 2 WB on/off ramps	Main Street (Route 27) at Isaac Davis Way
Traffic Control	Unsignalized	Unsignalized	Unsignalized
Crash Rate ²	1.09	0.40	0.00
MHD Dist. 3 Avg. ³	0.79	0.79	0.79
<i>Year:</i>			
2004	8	4	0
2005	13	2	0
<u>2006</u>	<u>12</u>	<u>6</u>	<u>0</u>
Total	33	12	0
<i>Type:</i>			
Angle	6	2	0
Rear-End	24	9	0
Head-On	0	0	0
Unknown/Other	4	1	0
<i>Severity:</i>			
P. Damage Only	28	5	0
Personal Injury	4	7	0
Fatality	0	0	0
Other/Unknown	1	0	0
<i>Conditions:</i>			
Dry	23	5	0
Wet	8	6	0
Snow	1	1	0
Other/Unknown	1	0	0
<i>Time:</i>			
7:00 to 9:00 AM	7	0	0
4:00 to 6:00 PM	8	5	0
Rest of Day	18	7	0

¹Source: MassHighway Crash Database.

²Crashes per million entering vehicles (MEV)

³District 3 Average Crash Rate

FUTURE NO BUILD TRAFFIC CONDITIONS

Evaluation of the proposed development impacts requires the establishment of a future baseline analysis condition. This section estimates future roadway and traffic conditions with and without the proposed development. For this evaluation, a five-year planning horizon was selected consistent with standard industry practice.

To determine the impact of site-generated traffic volumes on the roadway network under future conditions, baseline traffic volumes in the study area were projected to a future year condition. Traffic volumes on the roadway network at that time, in the absence of the development (that is, the No-Build condition), includes existing traffic, new traffic due to general background traffic growth, and traffic related to specific developments by others that are currently under review at the local and/or state level. Consideration of these factors resulted in the development of No-Build traffic volumes.

The following section provides an overview of future No-Build traffic volumes.

Background Growth

Background traffic includes demand generated by other planned developments in the area as well as demand increases caused by external factors. External factors are general increases in traffic not attributable to a specific development and are determined using historical data.

Nearby permanent count station data published by MassHighway indicates a flat or declining growth rate. For purposes of this evaluation, a 1 percent growth rate was used (5 percent increase over a 5-year horizon). This growth rate is higher than historic rates, and as such is also expected to account for any small fluctuation in traffic as may occur with day to day traffic volumes. MassHighway permanent count station data is provided in the **Attachments**.

Site-Specific Growth

Development of future No-Build traffic volumes also considers traffic generated from specific area developments. Based on consultation with the Town of Acton Planning Department and Massachusetts Environmental Policy Act (MEPA) files for the Town of Acton, the following projects may result in increased traffic volumes through the study area intersections:

- **Kelly's Corner Commercial Development:** There has been discussion to redevelop three parcels at the intersection of Main Street (Route 27) and Massachusetts Avenue (Route 111) with a Pharmacy, a retail building and a drive-up ATM machine on less than two acres. Currently, the site includes a Meineke Motors, a Bank of America (ATM) and the Bowladrome. This project has not formally been submitted to the Town at this time and therefore has not been included. Furthermore, given the relatively small site acreage, the specific uses discussed for the site, and the nearby competition the majority of the traffic generated by the site will be via pass-by trips (trips already on the adjacent roadways) and any change near the intersections of Main Street (Route 27) and the Route 2 ramps (Exit 42) will be accounted for in the background growth rate.
- **525 Main Street:** There has been discussion for an addition to the existing building at the site to include approximately 6,000 additional square feet of office/ light industrial use at the site. Trips associated with this expansion will be accounted for in the background growth rate.
- **Post Office Square:** This area has been recently approved through local zoning for an expanded floor area ratio (FAR) of 0.2 which doubles the allowable building size in this zone. No formal plans have been submitted at this time and therefore no additional traffic has been added to the study area due to the potential expansion of the Post Office Square.

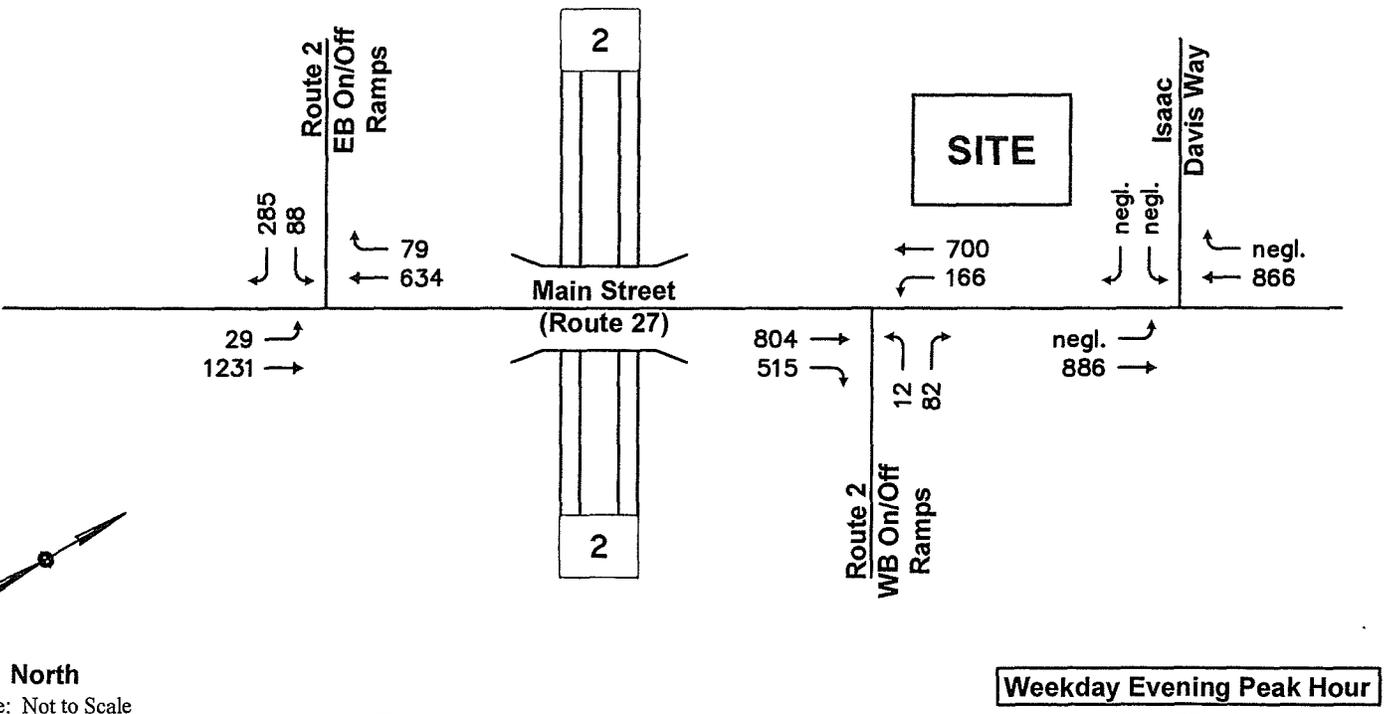
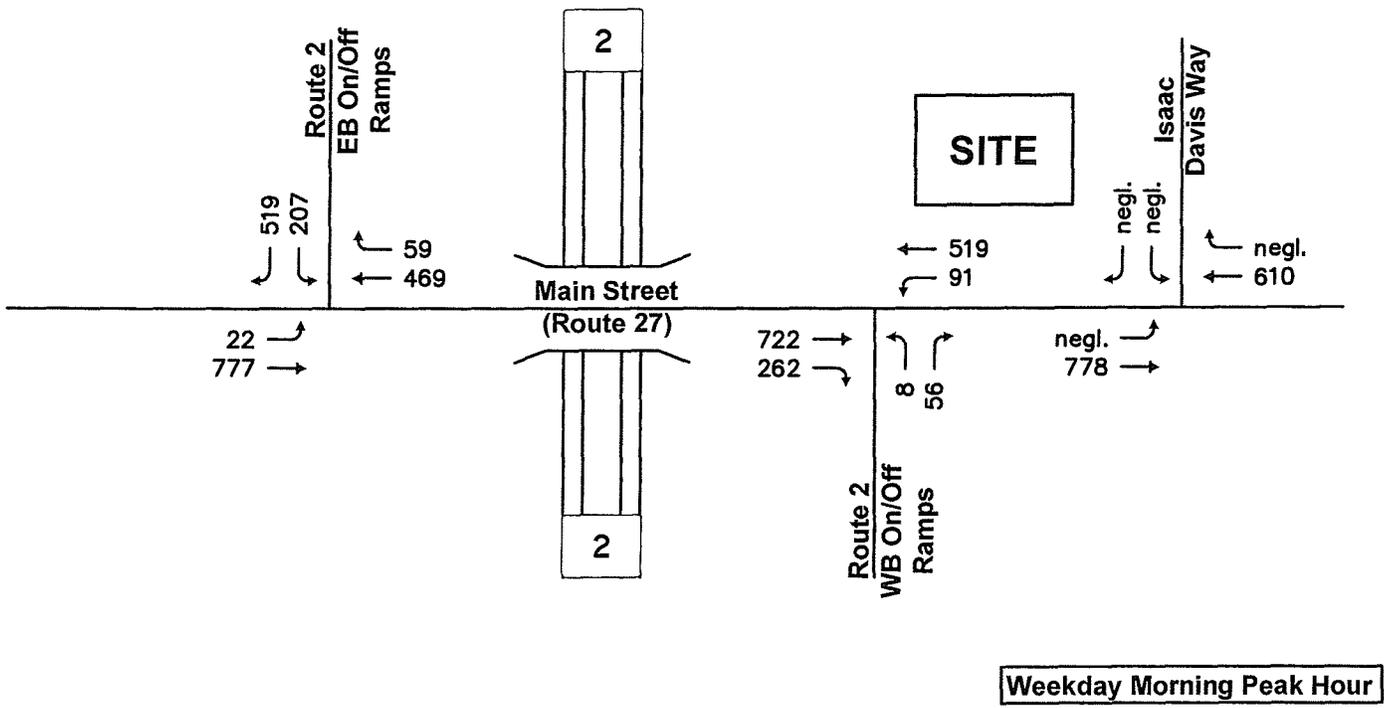
Traffic associated with the specific projects has been considered in determining the future year traffic volumes. However after further evaluation, associated traffic for these projects is reasonably accounted for in the general background traffic growth for the area or the projects are still in the conceptual stages with no formal submissions to the Town at this time.

Future No-Build Traffic Volumes

Future No-Build traffic volumes are developed by increasing the existing (2007) volumes by approximately 5 percent (1 percent compounded annually over 5 years). The resulting No-Build traffic volumes are displayed in **Figure 4**.

FUTURE BUILD TRAFFIC CONDITIONS

Future Build traffic conditions are developed by estimating additional trips associated with the proposed development, estimating likely travel patterns for these new trips and adding the resulting trips to the No-Build traffic networks. Specific methodologies and assumptions used to estimate trips and the trip distribution are discussed below.



North

Scale: Not to Scale

Figure 4

**2013 No-Build
Peak Hour Traffic Volumes**

Trip Generation

The trip generation estimates for the proposed development are provided for the weekday morning and weekday evening periods, which correspond to the critical weekday analysis periods for the proposed use and adjacent street traffic flow.

Empirical information provided by the NGCC indicates that the site may generate approximately 142 total vehicle-trips (71 entering and 71 exiting) during peak activity periods (morning drop-off and evening pick-up). Employee-related trips will predominately occur before 7 AM and after 6 PM – hours outside the typical commuter peak hours. Additionally, NGCC anticipates sibling enrollment of approximately 20 percent, consistent with its other facilities in Massachusetts – a characteristics that is likely to further reduce vehicle generation. A summary of NGCC data provided by the Applicant in a July 11, 2007 letter¹ is provided in the **Attachments**.

To present a conservative analysis scenario, potential site trip activity was also evaluated using ITE standard industry trip rates for day care facilities. New traffic generated by the project was estimated using trip rates published in ITE's *Trip Generation*² for Land Use Codes (LUC) 365 – Day Care Center – a land use that most closely reflect the characteristics of the child-care use at the site. **Table 4** presents a summary of trip-generation estimates based on ITE industry-standard trip rates.

Table 4
TRIP-GENERATION SUMMARY

<u>Period/Direction</u>	<u>Site Trips (ITE Trip Rates)¹</u>
<i>Weekday Morning Peak Hour</i>	
Entering	120
<u>Exiting</u>	<u>106</u>
Total	226
<i>Weekday Evening Peak Hour</i>	
Entering	109
<u>Exiting</u>	<u>123</u>
Total	232
<i>Weekday Daily</i>	1,264

Source: ITE *Trip Generation*, Seventh Edition; 2003

¹Based on ITE LUC 565 (Day Care Center) applied to 282 students

¹ *Traffic Patterns of Next Generation Children's Centers*, prepared by Walter Kelleher, CFO-NGCC, to the Walpole Planning Board dated July, 11, 2007.

² *Trip Generation*, Seventh Edition; Institute of Transportation Engineers; Washington, DC; 2003

As summarized in **Table 4**, ITE-based estimates indicate the proposed development may generate approximately 226 vehicle trips (120 entering and 106 exiting) during the weekday morning peak hour and 232 vehicle trips (109 entering and 123 exiting) during the weekday evening peak hour. On a daily basis, the proposed child-care use is estimated to generate approximately 1,264 vehicle trips on a weekday with 50 percent entering and exiting. Trip generation calculations are provided in the **Attachments**.

Table 5 presents a comparison of trip generation estimates based on ITE methodology and empirical NGCC data. As shown in **Table 5**, ITE-based trip generation estimates result in approximately 80-90 more peak hour vehicle-trips than traffic volumes anticipated by the Applicant. Although the trip-generation estimates provided by the Applicant are more representative of typical peak hour traffic activity for the proposed site, trip generation based on ITE methodology has been included in this assessment to present a conservative analysis.

Table 5
TRIP-GENERATION COMPARISON

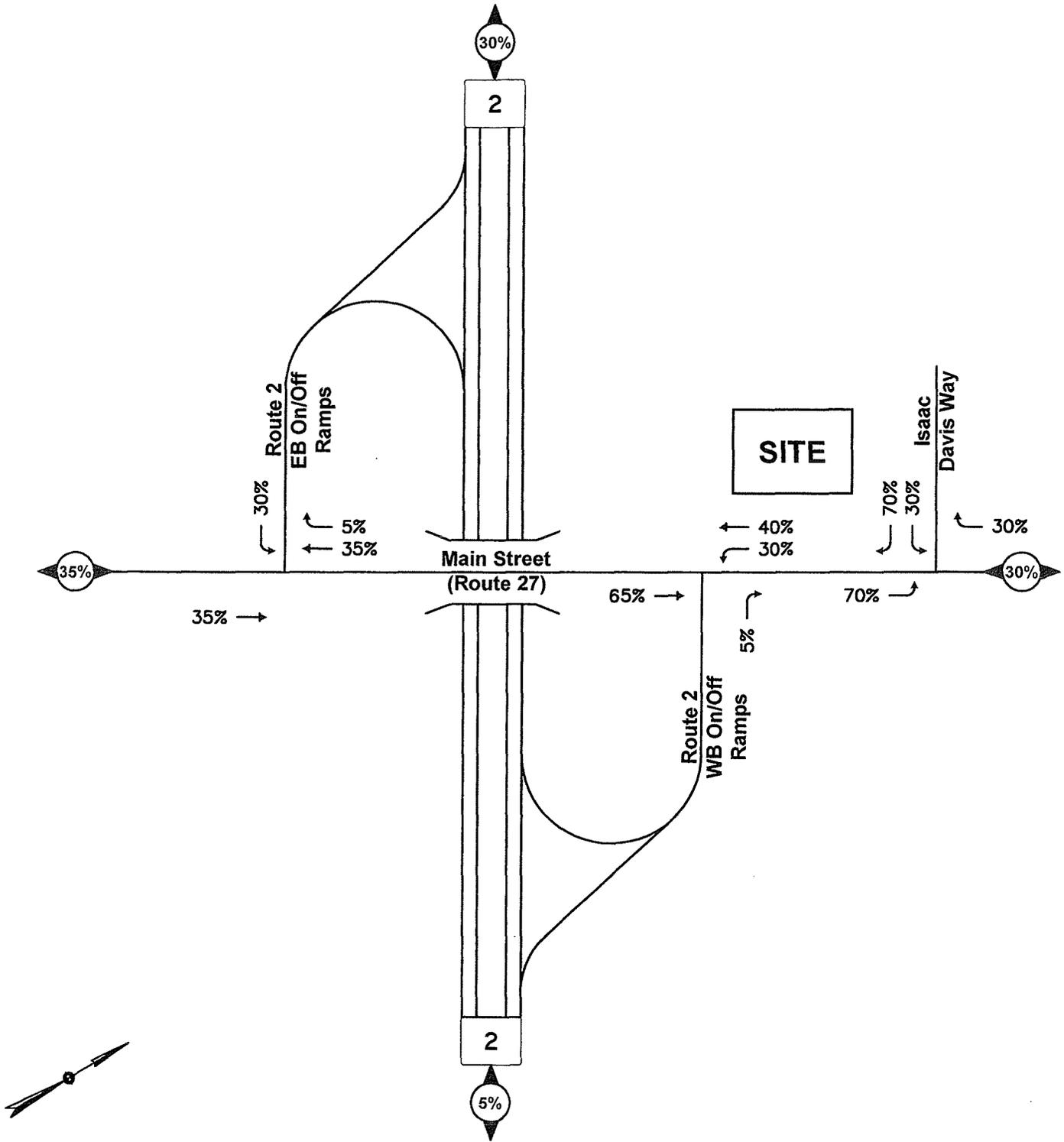
Period/Direction	Site Trips (ITE-Based)¹	Site Trips (Based on NGCC Data)¹	Difference
<i>Weekday Morning Peak Hour</i>			
Total	226	142	+84
<i>Weekday Evening Peak Hour</i>			
Total	232	142	+90

¹Traffic Patterns of Next Generation Children's Centers, prepared by Walter Kelleher, CFO-NGCC, to the Walpole Planning Board dated July, 11, 2007.

In summary, the ITE-based trip generation estimates presented in this traffic assessment assume a maximum occupancy level at the facility. The ITE-based estimates are very conservative relative to anticipated traffic rates based on data from similar facilities as summarized in correspondence provided by the Applicant (see **Attachments**). For comparison purposes, both trip-generation estimates are used in evaluating the potential impacts of the development.

Trip Distribution

The distribution for development-related traffic is based on existing travel patterns of the adjacent roadway system, efficiency of roadways leading to the site, and US Census Journey to Work data for the Town of Acton. The resulting trip distribution is presented in **Figure 5**. Trip distribution assumption calculations are provided in the **Attachments**.



North

Scale: Not to Scale

Figure 5

Trip Distribution

Figure 6 and Figure 7 present projected site-generated traffic volumes based on ITE trip rates and NGCC data, respectively, and projected travel patterns presented in Figure 5.

Build Traffic Volume Networks

Analysis traffic volumes are developed by adding site-generated traffic volumes presented in Figure 6 and Figure 7 to future No-Build traffic volumes at study intersections. The resulting Build traffic volumes used for analysis are shown in Figure 8 and Figure 9 for trip generation based on ITE and NGCC data, respectively.

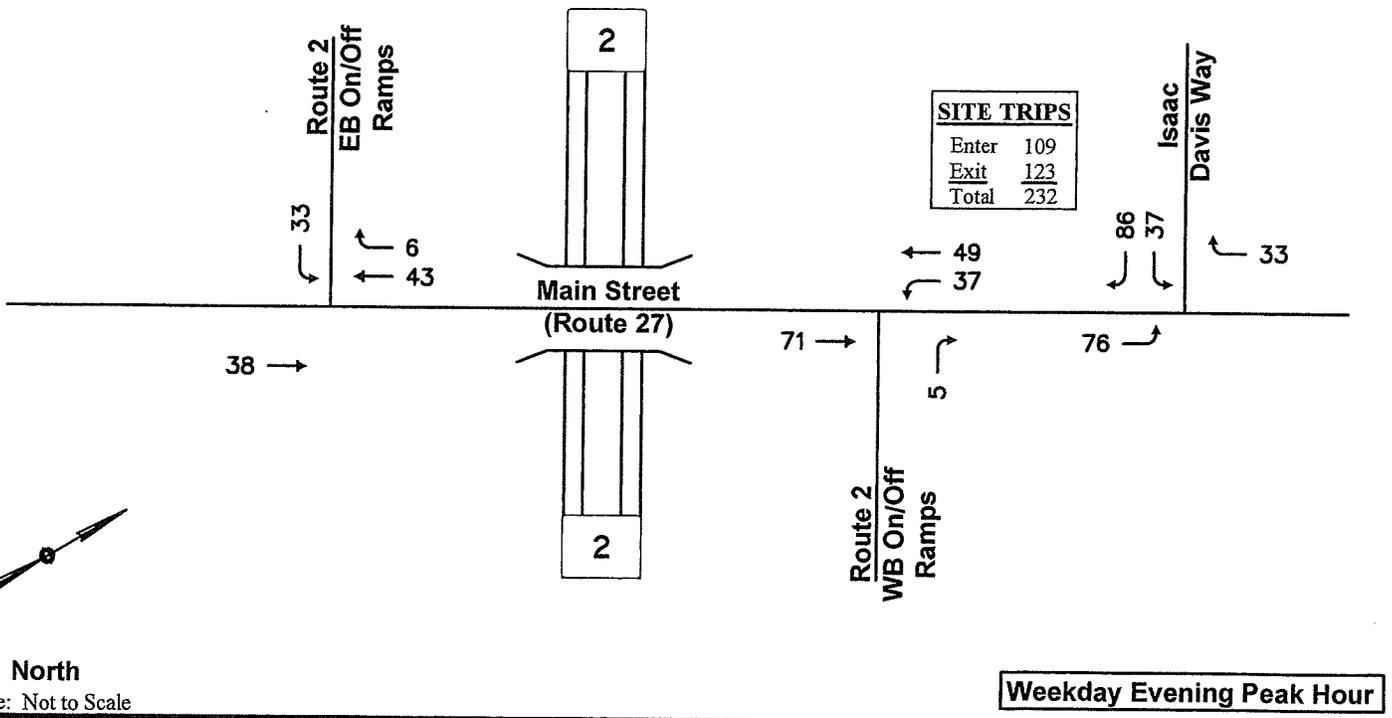
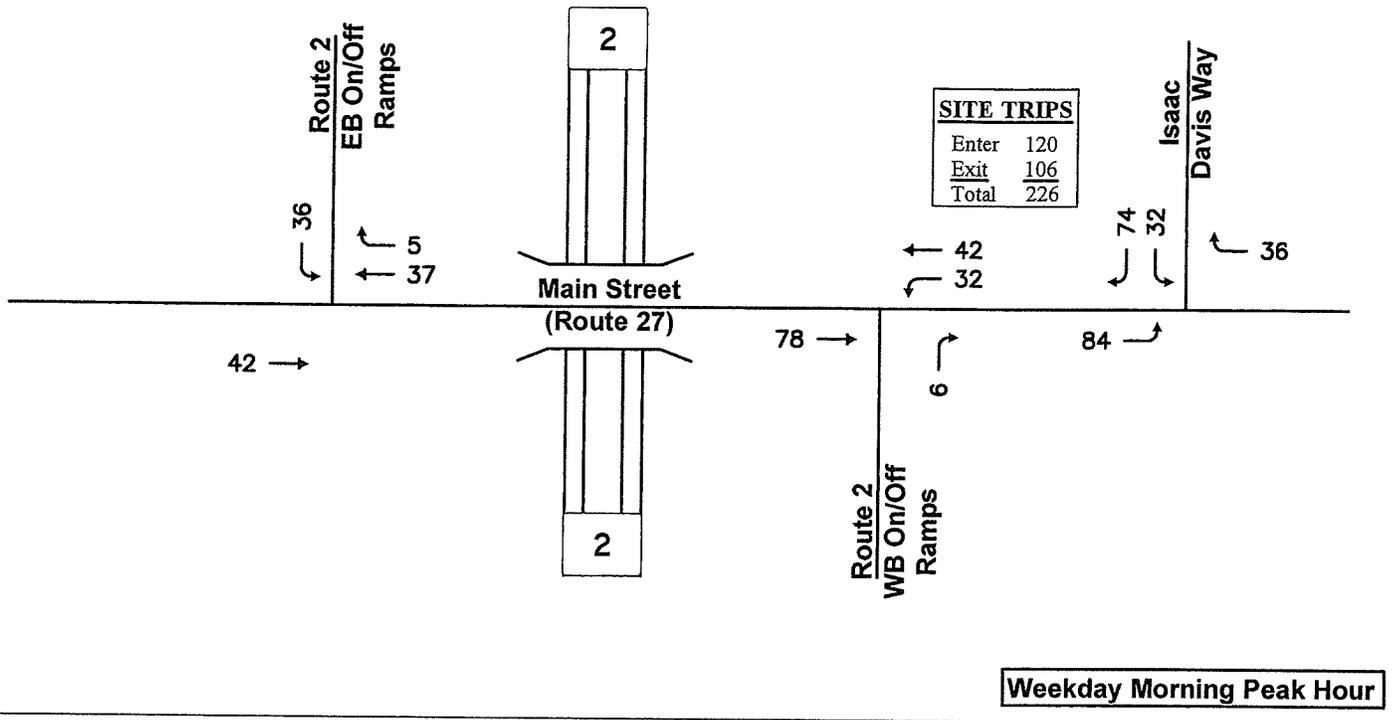
INTERSECTION OPERATIONS

Capacity Analysis Results

Intersection capacity analyses are presented in this section for the Existing, No-Build, and Build traffic-volume conditions. Capacity analyses, conducted in accordance with EOEEA/EOT guidelines, provide an index of how well the roadway facilities serve the traffic demands placed upon them. The operational results provide the basis for recommended access and roadway improvements in the following section.

Capacity analysis of intersections is developed using the Synchro® Version 6 computer software, which implements the methods of the 2000 Highway Capacity Manual (HCM). The resulting analysis presents a level-of-service (LOS) designation for individual intersection movements and (for signalized intersections) for the entire intersection. The LOS is a letter designation that provides a qualitative measure of operating conditions based on several factors including roadway geometry, speeds, ambient traffic volumes, traffic controls, and driver characteristics. Since the LOS of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of LOS, depending on the time of day, day of week, or period of year. A range of six levels of service are defined on the basis of average delay, ranging from LOS A (the least delay) to LOS F (delays greater than 50 seconds for unsignalized movements and delays greater than 80 seconds for signalized movements). The specific control delays and associated LOS designations are presented in the **Appendix**.

LOS analyses were conducted for 2008 Existing, 2013 No-Build, and 2013 Build conditions for the study intersections. The results of the intersection capacity analyses are summarized in **Table 6**.

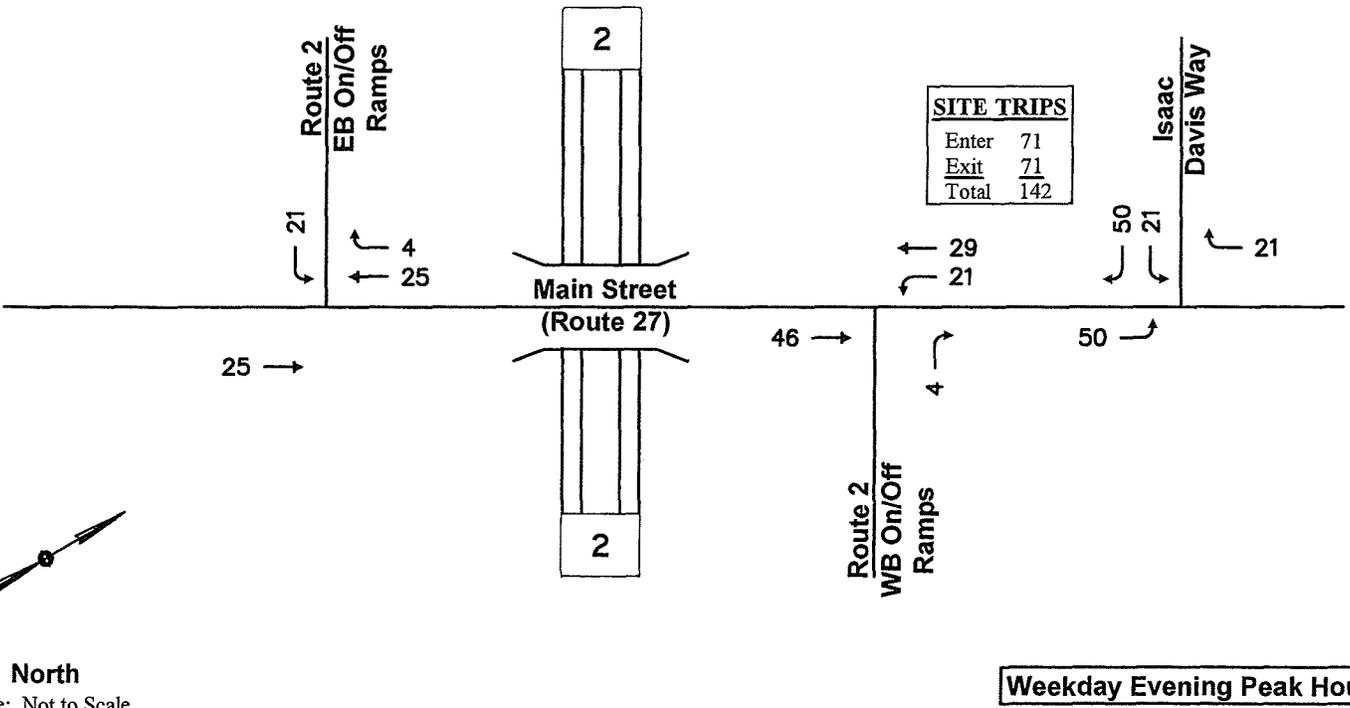
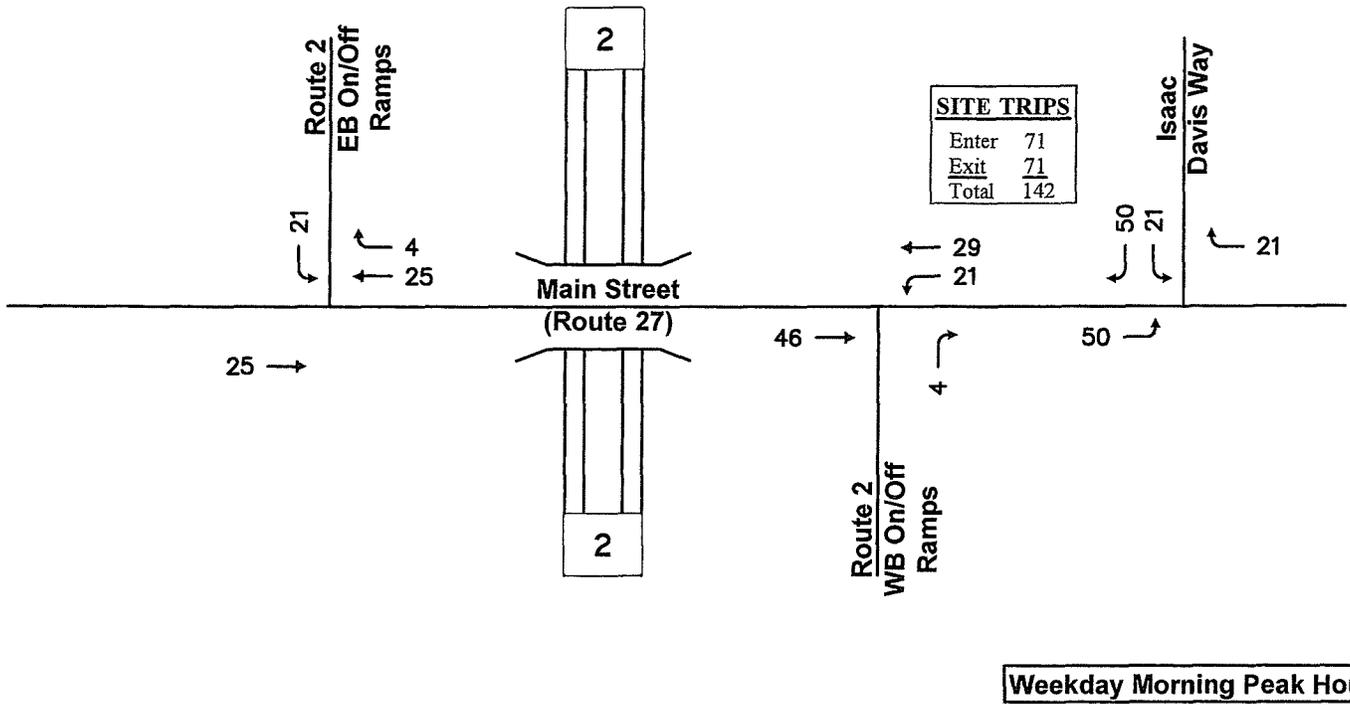


North

Scale: Not to Scale

Figure 6

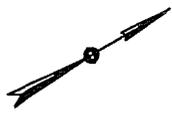
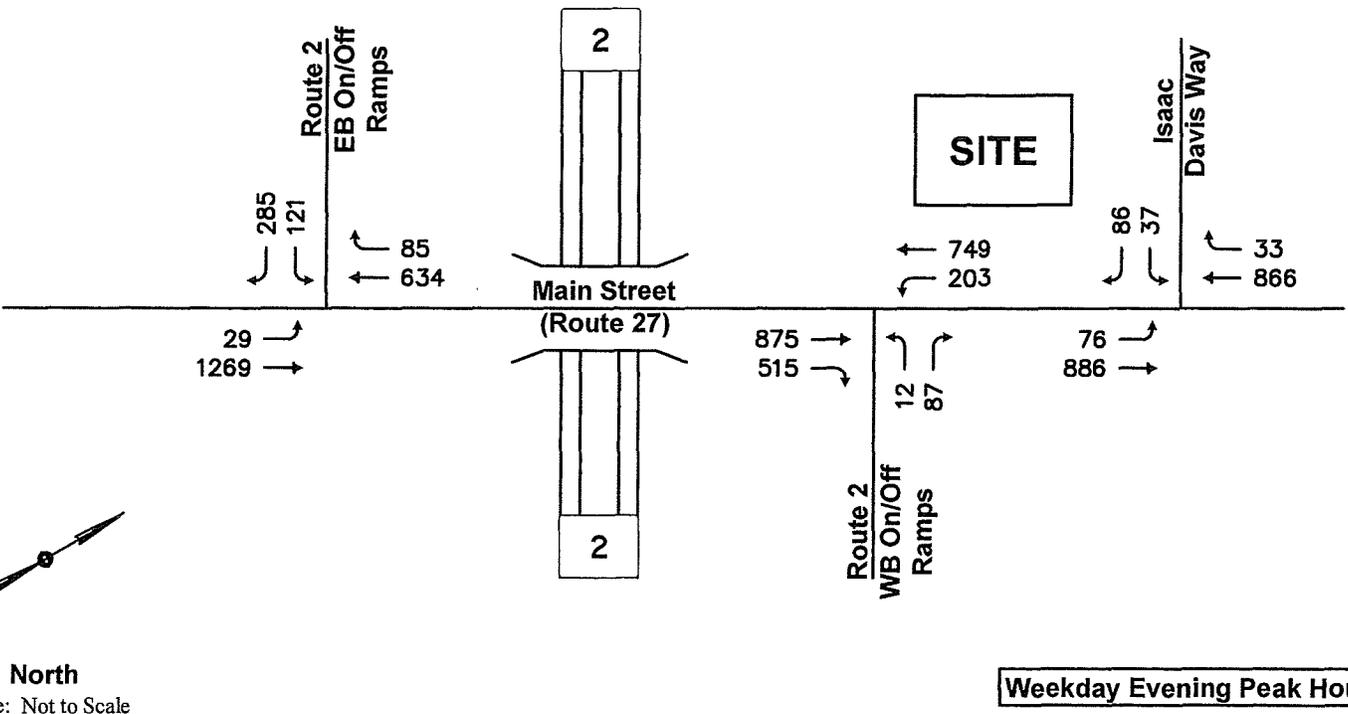
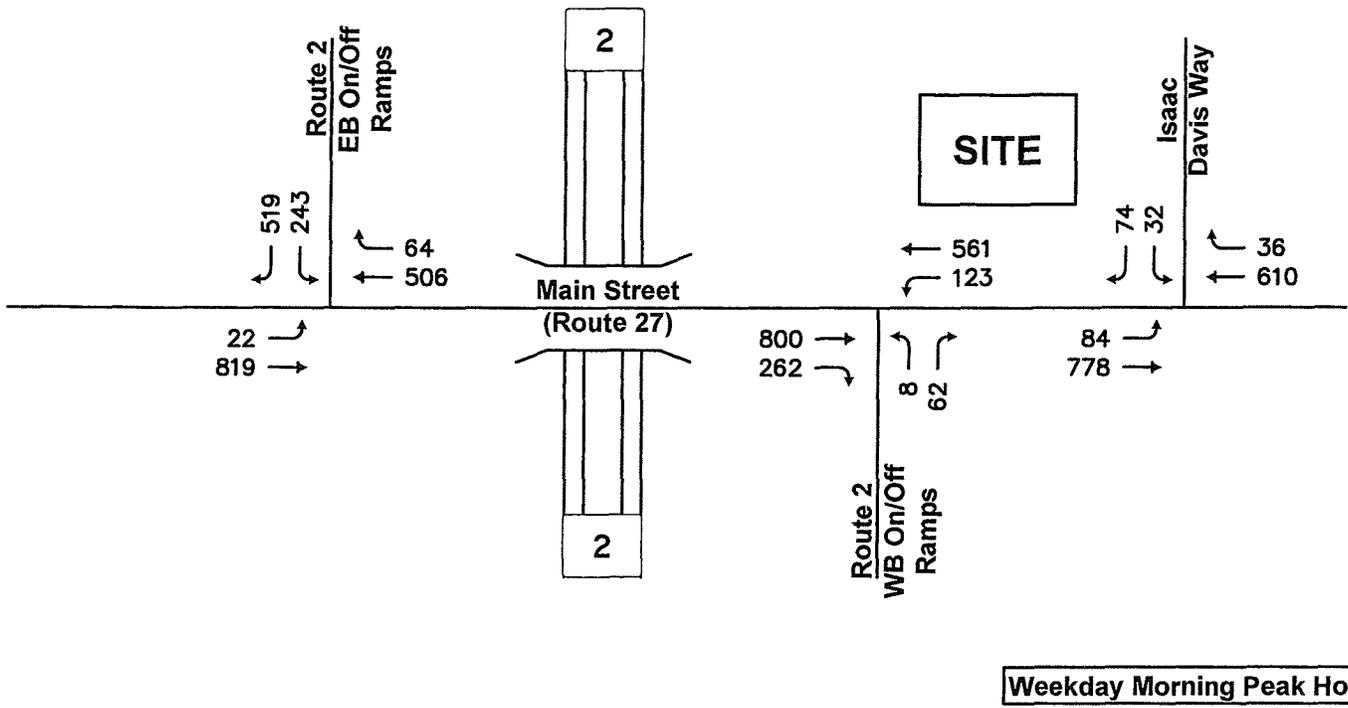
**Site Generated Trips
 (Based on ITE Trip Rates)**



North
 Scale: Not to Scale

Figure 7

**Site Generated Trips
 (Based on NGCC Data)**

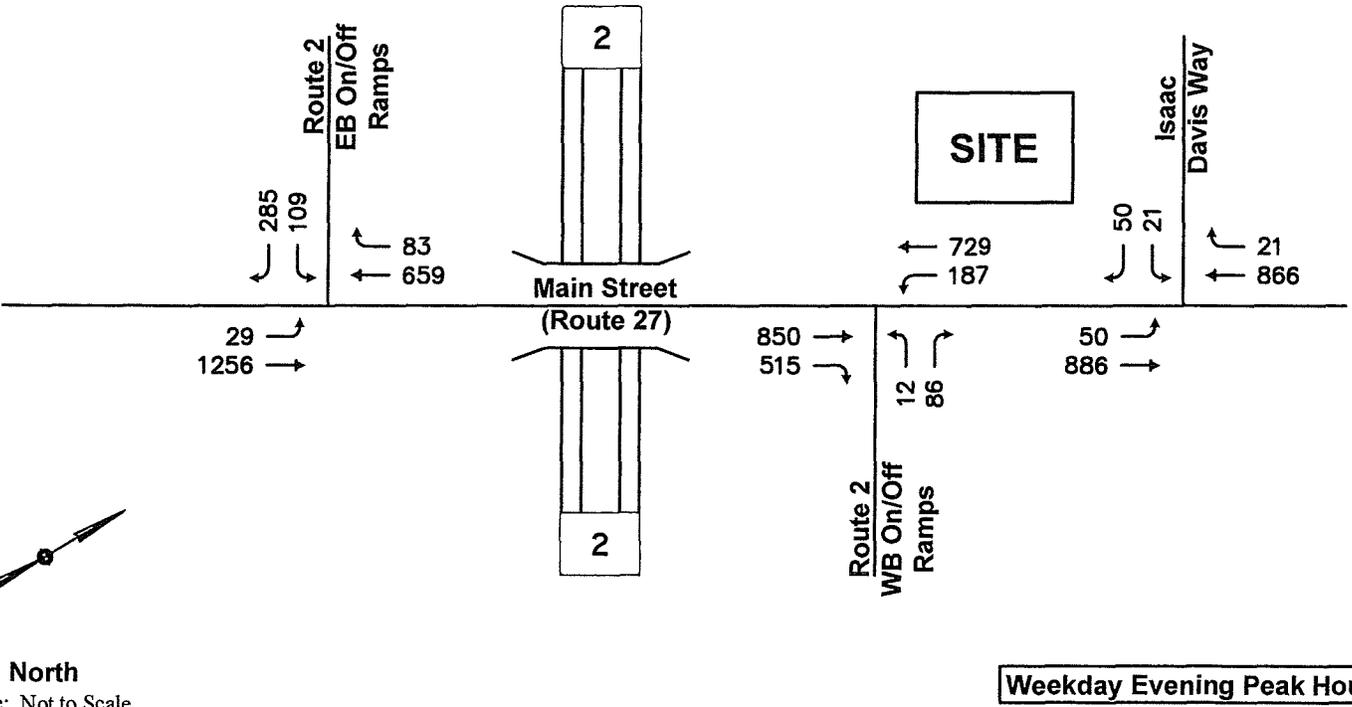
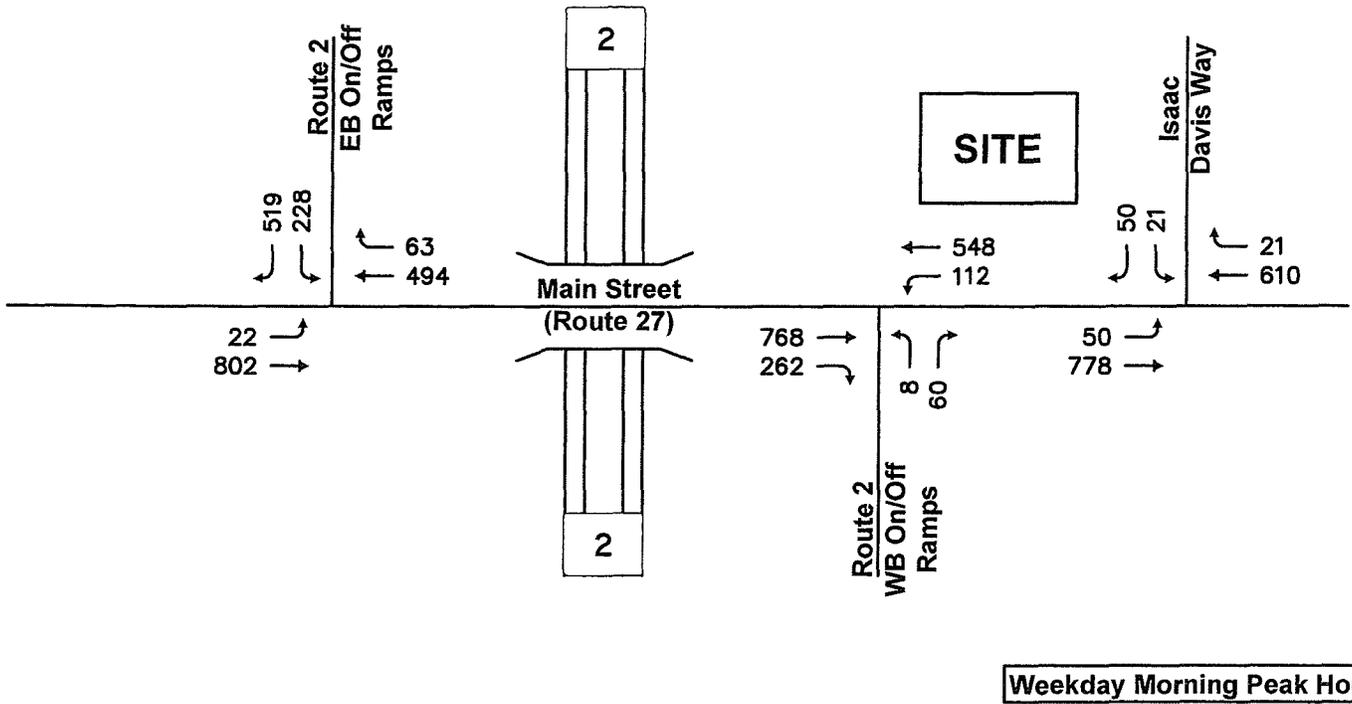


North

Scale: Not to Scale

Figure 8

**2013 Build
 Peak Hour Traffic Volumes
 (Based on ITE Trip Rates)**



North
Scale: Not to Scale

Figure 9

**2013 Build
Peak Hour Traffic Volumes
(Based on NGCC Data)**

Table 6
INTERSECTION CAPACITY ANALYSIS RESULTS

Period	Approach	2008 Existing			2013 No-Build			2013 Build (Based on ITE Trip Rates)			2013 Build (Based on NGCC Data)		
		v/c ¹	Delay ²	LOS ³	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS
<i>Weekday Morning Peak Hour</i>													
<i>Main Street (Route 27) at</i>													
<i>Route 2 EB on/off ramps</i>													
	EB Left Exit	>1.00	>50	F	>1.00	>50	F	>1.00	>50	F	>1.00	>50	F
	EB Right Exit	0.93	49	E	>1.00	>50	F	>1.00	>50	F	>1.00	>50	F
	Northbound	0.02	<5	A	0.02	<5	A	0.03	<5	A	<5	<5	A
<i>Main Street (Route 27) at</i>													
<i>Route 2 WB on/off ramps</i>													
	WB Left Exit	0.08	41	E	0.09	46	E	0.12	>50	F	0.11	>50	F
	WB Right Exit	0.16	17	C	0.18	18	C	0.22	20	C	0.20	19	C
	Southbound	0.11	<5	A	0.12	<5	A	0.17	<5	A	0.15	<5	A
<i>Isaac Davis Way at</i>													
<i>Proposed Site Driveway</i>													
	EB Left/Right Exit	0.00	<5	A	0.00	<5	A	0.51	37	E	0.30	26	D
	Northbound	0.00	<5	A	0.00	<5	A	0.10	<5	A	0.06	<5	A
<i>Weekday Evening Peak Hour</i>													
<i>Main Street (Route 27) at</i>													
<i>Route 2 EB on/off ramps</i>													
	EB Left Exit	>1.00	>50	F	>1.00	>50	F	>1.00	>100	F	>1.00	>50	F
	EB Right Exit	0.61	24	C	0.67	29	D	0.72	33	D	0.70	31	D
	Northbound	0.03	<5	A	0.03	<5	A	0.04	<5	A	0.45	<5	A
<i>Main Street (Route 27) at</i>													
<i>Route 2 WB on/off ramps</i>													
	WB Left Exit	0.24	>50	F	0.28	>50	F	0.41	>50	F	0.35	>50	F
	WB Right Exit	0.27	22	C	0.31	24	C	0.36	28	D	0.34	27	D
	Southbound	0.19	5	A	0.21	5	A	0.27	7	A	0.24	6	A
<i>Isaac Davis Way at</i>													
<i>Proposed Site Driveway</i>													
	EB Left/Right Exit	0.00	<5	A	0.00	<5	A	0.95	>50	F	0.50	>50	F
	Northbound	0.00	<5	A	0.00	<5	A	0.11	<5	A	0.07	<5	A

¹Volume-to-capacity ratio

²Average control delay per vehicle (in seconds)

³Level of service

⁴n/a = not applicable

As summarized in **Table 6**:

- Under future conditions left turns from the Route 2 Eastbound and Westbound off ramps will continue to operate with delays of 50 seconds or greater during the morning and evening peak hours regardless of the proposed Daycare Facility.
- Under Build conditions, the mainline travel along Main Street (Route 27) at its intersections with the Route 2 ramps and the Isaac Davis Way (site driveway) will remain well below capacity at LOS A during both the weekday morning and weekday evening peak hours.
- Under Build conditions Isaac Davis Way (site driveway) will operate with relatively long but manageable delays during the evening peak hour. The Main Street (Route 27) approaches will continue to operate with minimal delay. Delays and associated queuing are attributable to left-turns on Isaac Davis Way (approximately 1 vehicle per every two minute or less) and are expected to be managed on-site with no material impact to site parking or circulation.

In summary, there will be no material change in operations of the study intersections under future conditions with and without the project. However, based on the calculated delay at the Route 2 eastbound on/off ramps field observation data was collected during the critical peak hour.

Observed Intersection Delays

Field observations were made at the Main Street (Route 27) intersection with the Route 2 EB off ramp during the morning peak hour to determine actual average delays for vehicles turning left and right onto Main Street (Route 27). The morning peak hour was selected as it represents the critical peak hour for the Route 2 eastbound off ramp in terms of traffic volume and calculated delay. The observed delay data are presented in the **Attachments**, which were used to compare actual field conditions to those calculated using Synchro® modeling presented above.

Field measurements indicated that, on average, vehicles attempting to depart from the Route 2 eastbound off ramp left onto northbound Main Street (Route 27) were delayed an average of 20 seconds during the morning peak hour, results that correlate to LOS C operations. Vehicles attempting to depart from the route 2 eastbound off ramp right onto southbound Main Street (Route 27) were delayed an average of 6 seconds during the morning peak hour, results that correlate to a LOS C operations. While vehicles are occasionally delayed more than 60 seconds, average delay times are well below that value. The maximum number of vehicles queued at the intersection was 8 vehicles during the morning peak hour.

When compared to the calculated delays in the capacity analysis results above, these measured average delay conditions indicate that the computer-based vehicle delay results provide an overly conservative analysis. Calculated average delays suggest the minor street approach at the Main Street (Route 27) and Route 2 eastbound on/off ramps intersection operates a LOS F for left turning vehicles and LOS E for right turning vehicles during the morning peak hours; observed average delays are significantly lower and correspond to LOS C or better for left turning vehicles and LOS A or better for right turning vehicles. This finding suggests that ample capacity exists at the study area intersection of Main Street (Route 27) and Route 2 eastbound on/off ramp to support the anticipated traffic generated by the site. A comparison of calculated versus observed vehicle delays is presented in Table 7.

Table 7
AVERAGE VEHICLE DELAY COMPARISON WEEKDAY MORNING PEAK HOUR

Intersection	Calculated Delay (seconds)	LOS	Actual Delay (seconds)	LOS
<i>Main Street (Route 27) at Route 2 EB off ramp</i>				
Eastbound Left Turns (Stop-Control)	>50	F	20	C
Eastbound Right Turns (Yield-Control)	49	E	6	A

In summary, the proposed development is expected to have a minimal impact on the study area intersections as there will be minimal change in level of service and operations of the study intersections under future conditions with and without the development, with an increase of approximately 1 vehicle per every two minute or less on the Route 2 eastbound off ramp. In general, adequate capacity is available under future Build conditions to accommodate the site use.

SIGNAL WARRANT ANALYSIS

A preliminary signal warrants analysis has been performed to determine the need for a traffic signal at the Main Street (Route 27) intersection with the proposed Route 2 eastbound on/off ramps. The warrants reviewed for this assessment are based on the Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition. MDM has reviewed available traffic data for the intersection and has conducted an initial warrants analysis for two MUTCD warrant criteria: Warrant 2 (Four Hour Volumes) and Warrant 3 (Peak Hour Volumes). Existing volumes do not meet Warrant 2 but do meet the Warrant 3 criteria. See **Attachments** for signal warrant worksheets.

In summary, based on available existing traffic volume data, signalization is not strongly supported or recommended at this time. Furthermore, the intersection is under control of the Massachusetts Highway Department (MHD) and would need to satisfy Warrant 1 (Eight Hour Volumes) which is the signal warrant most typically used by MHD in justifying traffic signal installation. The Route 2 eastbound off ramp approach currently has a left and a right turn lane; however, for the analysis only the left turn volume is typically considered in the traffic signal warrant analysis for this type of approach based on MHD preferred analysis requirements. Additional data would be required to provide an eight hour warrant.

SIGHT LINE EVALUATION

Recognizing that Isaac Davis Way will provide access for the site, an evaluation of sight lines was conducted to verify that minimum recommended sight distances are available to exit onto Main Street (Route 27). The evaluation documents existing sight distances for vehicles exiting Isaac Davis Way with comparison to recommended guidelines for posted speed limits and measured travel speeds.

The American Association of State Highway and Transportation Officials' (AASHTO) standards³ reference two types of sight distance which are relevant at the Isaac Davis Way intersection with Main Street (Route 27): stopping sight distance (SSD) and intersection sight distance (ISD). Sight lines for critical vehicle movements at the Main Street (Route 27) and Isaac Davis Way intersection were compared to minimum SSD and ISD for the regulatory speed limit and measured travel speeds along Main Street (Route 27) in the site vicinity.

Stopping Sight Distance

Sight distance is the length of roadway visible to the motorist to a fixed object. The minimum sight distance available on a roadway should be sufficiently long enough to enable a below-average operator, traveling at or near a regulatory speed limit, to stop safely before reaching a stationary object in its path, in this case, a vehicle exiting from Isaac Davis Way onto Main Street (Route 27). The SSD criteria are defined by AASHTO based on design and operating speeds, anticipated driver behavior and vehicle performance, as well as physical roadway conditions. SSD includes the length of roadway traveled during the perception and reaction time of a driver to an object, and the distance traveled during brake application on wet, level pavements. Adjustment factors are applied to account for roadway grades.

SSD was estimated in the field using AASHTO standards for driver's eye (3.5 feet) and object height equivalent to the taillight height of a passenger car (2.0 feet) for the northbound and southbound Main Street (Route 27) approaches to Isaac Davis Way. **Table 8** presents a summary of the available SSD for the Main Street (Route 27) roadway segment approaching Isaac Davis Way and AASHTO's recommended SSD for the posted (regulatory) 35 mph speed limit and observed average and 85th percentile travel speeds. Sight distance calculations are provided in the **Attachments**.

³ *A policy on Geometric Design of Highways and Streets*, American Association of State Highway and Transportation Officials (AASHTO), 2004.

Table 8
Stopping Sight Distance Summary
Main Street (Route 27) Approaches to Isaac Davis Way

Approach/ Travel Direction	Available Stopping Sight Distance	AASHTO Recommended ¹		
		Posted Speed (35 mph)	Average Travel Speed	85 th Percentile Travel Speed
Northbound	800 + Feet	250 Feet	240 Feet	280 Feet
Southbound	760 ± Feet	250 Feet	220 Feet	250 Feet

¹Recommended sight distance based on AASHTO, A Policy on Geometric Design of Highways and Streets. Based on driver height of eye of 3.5 feet to object height of 2.0 feet and adjustments for roadway grade.

²Average Speed is 34 mph NB and 32 mph SB.

³85th Percentile travel speed is 38 mph NB and 35 mph SB

As summarized in **Table 8** analysis results indicate that the existing available sight lines exceed AASHTO's recommended SSD criteria for both travel directions along Main Street (Route 27) based on the regulatory speed limit and observed average and 85th percentile travel speeds.

Intersection Sight Distance

Clear sight lines provide sufficient sight distance for a stopped driver on a minor-road approach to depart from the intersection and enter or cross the major road. As stated under AASHTO's Intersection Sight Distance (ISD) considerations, "...If the available sight distance for an entering ... vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to avoid collisions...To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road." AASHTO's ISD criteria are defined into several "cases". Each case depends on the type of traffic control at the intersection (e.g. no control, Yield sign, Stop sign, and signal control), and the specific vehicle maneuver in question (crossing, right- or left-turn). AASHTO Cases B1 (left turns) and B2 (right turns) from Isaac Davis Way were utilized in determining the recommended intersection sight distance summarized in **Table 9** below.

Available ISD was estimated in the field using AASHTO standards for driver's eye (3.5 feet), object height (3.5 feet) and decision point (14.5 feet from marked edge lines) for the northbound and southbound directions along Main Street (Route 27). **Table 9** presents a summary of the available ISD for the departure from Isaac Davis Way and AASHTO's recommended ISD for the regulatory speed limit and measured travel speeds.

Table 9
Intersection Sight Distance Summary
Isaac Davis Way Departure to Main Street (Route 27)

Approach/ Travel Direction	Available Intersection Sight Distance	AASHTO Recommended ¹		
		Posted Speed (35 mph)	Average Travel Speed	85 th Percentile Travel Speed
<i>Looking North</i>	400 ± Feet	250 Feet	220 Feet	250 Feet
<i>Looking South</i>	800 + Feet	250 Feet	240 Feet	280 Feet

¹Recommended sight distance based on AASHTO, A Policy on Geometric Design of Highways and Streets. Based on driver height of eye of 3.5 feet to object height of 2.0 feet and adjustments for roadway grade.

²Average Speed is 34 mph NB and 32 mph SB.

³85th Percentile travel speed is 38 mph NB and 35 mph SB

The results of the ISD analysis presented in **Table 9** indicate that the existing available sight lines looking north and south from Isaac Davis Way onto Main Street (Route 27) exceed the recommended sight line requirements from AASHTO for the posted speed limit and observed travel speeds. MDM recommends that plantings (shrubs, bushes) and structures (walls, fences, etc.) be maintained at a height of 3 feet or less within the Main Street (Route 27) layout in the vicinity of the Isaac Davis Way (site driveway) to provide unobstructed sight lines.

CONCLUSIONS AND RECOMMENDATIONS

In summary, adequate capacity is available along Main Street (Route 27) to accommodate projected traffic increases for the proposed development. Observed delays for the left-turns from the Route 2 eastbound off ramp intersection with Main Street indicated that LOS C or better conditions exist for this critical movement, and that ample capacity will be available to accommodate NGCC trips. Based on observed delay at the critical intersection ample capacity exists in the study area to accommodate the project.

If feasible the Isaac Davis Way should be widened to provide an 18 foot approach and a 16 foot departure to Main Street (Route 27). This would provide the ability for right turning vehicles to by-pass a vehicle queued on Isaac Davis Way which is turning left onto Main Street (Route 27). A STOP sign and painted STOP line is recommended on the Isaac Davis Way approach to Main Street (Route 27).

Safe stopping sight distance (SSD) is available for oncoming vehicles to detect, react and stop for vehicles exiting onto Main Street (Route 27) from Isaac Davis Way (site driveway) based on the regulatory speed limit and observed average and 85th percentile travel speeds. MDM recommends that plantings (shrubs, bushes) and structures (walls, fences, etc.) be maintained at a height of 3 feet or less within the Main Street (Route 27) layout in the vicinity of the Isaac Davis Way (site driveway) to provide unobstructed sight lines.

Attachments

- Traffic Volume Data
- Seasonal Data
- Speed Study
- Crash Data
- Growth Data
- ITE Trip Generation Calculations
- Applicant's Letter to Planning Board
- Trip Distribution Calculations
- Capacity Analyses
- Delay Observations
- Signal Warrant Work Sheets
- Stopping Sight Distance Calculations

□ Traffic Volume Data

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Main Street (Route 27)
north of Route 2 Ramps
City/State: Acton, MA
Client: MDM/D. Martin

Start Time	SB		NB		Combined		13-May-08 Tue					
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.						
12:00	3	148	15	154	18	302						
12:15	7	128	7	153	14	281						
12:30	6	140	5	154	11	294						
12:45	4	20	172	588	7	34	150	611	11	54	322	1199
01:00	1	140	6	169	7	309						
01:15	5	122	4	138	9	260						
01:30	4	134	4	146	8	280						
01:45	1	11	152	548	3	17	166	619	4	28	318	1167
02:00	3	128	1	150	4	278						
02:15	2	152	0	146	2	298						
02:30	3	173	3	168	6	341						
02:45	1	9	169	622	3	7	174	638	4	16	343	1260
03:00	3	138	3	168	6	306						
03:15	3	170	4	158	7	328						
03:30	0	192	6	178	6	370						
03:45	1	7	194	694	4	17	196	700	5	24	390	1394
04:00	4	185	1	172	5	357						
04:15	6	186	3	168	9	354						
04:30	2	200	5	170	7	370						
04:45	1	13	205	776	12	21	190	700	13	34	395	1476
05:00	6	194	9	172	15	366						
05:15	12	210	16	188	28	398						
05:30	14	208	32	194	46	402						
05:45	23	55	173	785	44	101	214	768	67	156	387	1553
06:00	39	194	36	200	75	394						
06:15	72	158	63	182	135	340						
06:30	93	132	128	158	221	290						
06:45	128	332	120	604	152	379	160	700	280	711	280	1304
07:00	196	123	184	156	380	279						
07:15	177	121	153	140	330	261						
07:30	108	116	190	121	298	237						
07:45	133	614	121	481	196	723	110	527	329	1337	231	1008
08:00	126	70	162	110	288	180						
08:15	138	75	187	73	325	148						
08:30	114	78	176	74	290	152						
08:45	139	517	71	294	204	729	59	316	343	1246	130	610
09:00	120	53	199	124	319	177						
09:15	140	56	164	60	304	116						
09:30	121	28	151	58	272	86						
09:45	114	495	26	163	160	674	52	294	274	1169	78	457
10:00	111	35	150	58	261	93						
10:15	130	18	144	24	274	42						
10:30	126	18	137	34	263	52						
10:45	114	481	18	89	158	589	25	141	272	1070	43	230
11:00	136	13	126	11	262	24						
11:15	133	12	160	15	293	27						
11:30	156	8	165	13	321	21						
11:45	144	569	4	37	155	606	8	47	299	1175	12	84
Total	3123	5681	3897	6061	7020	11742						
Percent	44.5%	48.4%	55.5%	51.6%								
Day Total		8804		9958		18762						
Peak Vol.	07:00	04:45	08:15	05:15	07:00	05:15						
P.H.F.	614	817	766	796	1337	1581						
	0.783	0.973	0.939	0.930	0.880	0.983						

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Main Street (Route 27)
north of Route 2 Ramps
City/State: Acton, MA
Client: MDM/D. Martin

Start Time	SB		NB		Combined		14-May-08 Wed					
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.						
12:00	7	155	6	174	13	329						
12:15	3	135	3	140	6	275						
12:30	3	144	4	154	7	298						
12:45	6	19	125	559	4	17	136	604	10	36	261	1163
01:00	2	132	3	161	5	293						
01:15	0	131	4	152	4	283						
01:30	2	118	2	172	4	290						
01:45	1	5	145	526	3	12	168	653	4	17	313	1179
02:00	3	134	2	146	5	280						
02:15	4	148	0	184	4	332						
02:30	1	158	2	155	3	313						
02:45	1	9	184	624	3	7	190	675	4	16	374	1299
03:00	2	172	1	191	3	363						
03:15	2	165	2	150	4	315						
03:30	0	178	4	212	4	390						
03:45	2	6	178	693	3	10	178	731	5	16	356	1424
04:00	1	200	2	191	3	391						
04:15	8	178	1	167	9	345						
04:30	1	188	6	186	7	374						
04:45	5	15	156	722	11	20	180	724	16	35	336	1446
05:00	7	224	10	166	17	390						
05:15	9	210	19	187	28	397						
05:30	14	160	36	207	50	367						
05:45	18	48	190	784	58	123	220	780	76	171	410	1564
06:00	48	212	52	200	100	412						
06:15	70	170	76	194	146	364						
06:30	82	129	120	188	202	317						
06:45	106	306	129	640	152	400	156	738	258	706	285	1378
07:00	162	113	156	168	318	281						
07:15	165	99	172	130	337	229						
07:30	112	100	190	114	302	214						
07:45	117	556	94	406	192	710	120	532	309	1266	214	938
08:00	144	103	164	100	308	203						
08:15	130	70	176	82	306	152						
08:30	128	74	200	72	328	146						
08:45	122	524	77	324	202	742	68	322	324	1266	145	646
09:00	136	59	171	76	307	135						
09:15	148	48	166	80	314	128						
09:30	116	54	156	38	272	92						
09:45	94	494	33	194	140	633	42	236	234	1127	75	430
10:00	122	26	137	55	259	81						
10:15	134	26	144	30	278	56						
10:30	110	12	152	27	262	39						
10:45	163	529	17	81	141	574	15	127	304	1103	32	208
11:00	124	16	135	18	259	34						
11:15	148	15	138	17	286	32						
11:30	156	10	173	13	329	23						
11:45	170	598	4	45	150	596	8	56	320	1194	12	101
Total	3109	5598	3844	6178	6953	11776						
Percent	44.7%	47.5%	55.3%	52.5%								
Day Total		8707		10022		18729						
Peak	11:00	05:00	08:15	05:30	08:30	05:15						
Vol.	598	784	749	821	1273	1586						
P.H.F.	0.879	0.875	0.927	0.933	0.944	0.962						

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Main Street (Route 27)
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City/State: Acton, MA
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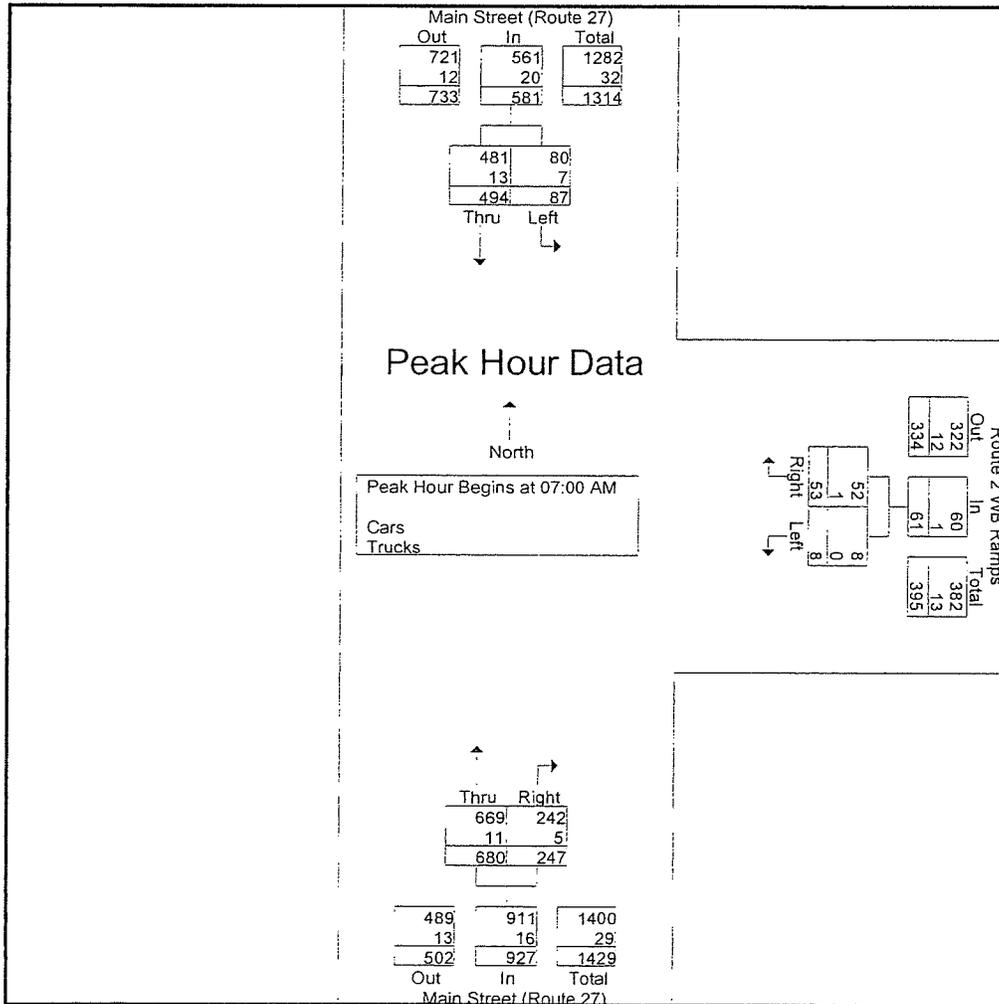
Start Time	SB		NB		Combined		15-May-08 Thu
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	
12:00	7	186	13	189	20	375	
12:15	6	140	6	188	12	328	
12:30	4	180	2	174	6	354	
12:45	0	146	6	170	6	316	1373
01:00	6	142	5	162	11	304	
01:15	2	144	2	154	4	298	
01:30	2	132	4	176	6	308	
01:45	3	132	3	176	6	308	1218
02:00	4	164	3	140	7	304	
02:15	1	168	4	166	5	334	
02:30	3	176	0	184	3	360	
02:45	2	188	0	196	2	384	1382
03:00	2	172	0	166	2	338	
03:15	0	176	2	202	2	378	
03:30	2	198	3	174	5	372	
03:45	1	163	4	185	5	348	1436
04:00	3	181	3	201	6	382	
04:15	6	180	3	194	9	374	
04:30	2	204	4	196	6	400	
04:45	6	174	13	174	19	348	1504
05:00	4	213	9	175	13	388	
05:15	10	209	17	174	27	383	
05:30	24	184	34	198	58	382	
05:45	34	173	49	207	83	380	1533
06:00	42	173	65	178	107	351	
06:15	73	173	84	206	157	379	
06:30	68	148	112	164	180	312	
06:45	110	293	130	156	263	286	1328
07:00	173	132	148	156	321	288	
07:15	176	122	152	154	328	276	
07:30	112	132	166	118	278	250	
07:45	126	587	106	186	539	217	1031
08:00	147	107	176	116	323	223	
08:15	141	100	186	79	327	179	
08:30	109	84	182	104	291	188	
08:45	97	494	68	76	285	144	734
09:00	152	59	191	95	343	154	
09:15	128	56	168	60	296	116	
09:30	122	53	148	66	270	119	
09:45	126	528	41	182	308	107	496
10:00	115	27	160	56	275	83	
10:15	120	21	119	40	239	61	
10:30	110	24	130	29	240	53	
10:45	123	468	17	148	271	43	240
11:00	122	16	146	19	268	35	
11:15	145	12	138	20	283	32	
11:30	128	12	164	13	292	25	
11:45	149	544	17	142	291	27	119
Total	3048	5955	3823	6439	6871	12394	
Percent	44.4%	48.0%	55.6%	52.0%			
Day Total		9003		10262		19265	
Peak	07:00	04:30	08:15	05:30	07:45	05:00	
Vol.	587	800	747	789	1253	1533	
P.H.F.	0.834	0.939	0.978	0.953	0.913	0.958	

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N/S: Main Street (Route 27)
 E: Route 2 WB Ramps
 City/State: Acton, MA
 Client: MDM/D. Martin

File Name : 03809A
 Site Code : 442
 Start Date : 5/13/2008
 Page No : 1

Start Time	Main Street (Route 27) From North			Route 2 WB Ramps From East			Main Street (Route 27) From South			Int. Total
	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	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	155	25	180	27	1	28	53	158	211	419
07:15 AM	145	20	165	8	1	9	67	152	219	393
07:30 AM	87	20	107	10	2	12	77	179	256	375
07:45 AM	107	22	129	8	4	12	50	191	241	382
Total Volume	494	87	581	53	8	61	247	680	927	1569
% App. Total	85	15		86.9	13.1		26.6	73.4		
PHF	.797	.870	.807	.491	.500	.545	.802	.890	.905	.936
Cars	481	80	561	52	8	60	242	669	911	1532
% Cars	97.4	92.0	96.6	98.1	100	98.4	98.0	98.4	98.3	97.6
Trucks	13	7	20	1	0	1	5	11	16	37
% Trucks	2.6	8.0	3.4	1.9	0	1.6	2.0	1.6	1.7	2.4



Transportation Data Corporation
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N/S: Main Street (Route 27)
 E: Route 2 WB Ramps
 City/State: Acton, MA
 Client: MDM/D. Martin

File Name : 03809A
 Site Code : 442
 Start Date : 5/13/2008
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	Main Street (Route 27) From North		Route 2 WB Ramps From East		Main Street (Route 27) From South		Int. Total
	Thru	Left	Right	Left	Right	Thru	
07:00 AM	155	25	27	1	53	158	419
07:15 AM	145	20	8	1	67	152	393
07:30 AM	87	20	10	2	77	179	375
07:45 AM	107	22	8	4	50	191	382
Total	494	87	53	8	247	680	1569
08:00 AM	105	19	15	4	61	155	359
08:15 AM	120	18	8	0	58	181	385
08:30 AM	85	17	17	5	64	168	356
08:45 AM	107	17	18	6	50	186	384
Total	417	71	58	15	233	690	1484
Grand Total	911	158	111	23	480	1370	3053
Apprch %	85.2	14.8	82.8	17.2	25.9	74.1	
Total %	29.8	5.2	3.6	0.8	15.7	44.9	
Cars	894	147	109	23	463	1340	2976
% Cars	98.1	93	98.2	100	96.5	97.8	97.5
Trucks	17	11	2	0	17	30	77
% Trucks	1.9	7	1.8	0	3.5	2.2	2.5

Start Time	Main Street (Route 27) From North			Route 2 WB Ramps From East			Main Street (Route 27) From South			Int. Total
	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	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	155	25	180	27	1	28	53	158	211	419
07:15 AM	145	20	165	8	1	9	67	152	219	393
07:30 AM	87	20	107	10	2	12	77	179	256	375
07:45 AM	107	22	129	8	4	12	50	191	241	382
Total Volume	494	87	581	53	8	61	247	680	927	1569
% App. Total	85	15		86.9	13.1		26.6	73.4		
PHF	.797	.870	.807	.491	.500	.545	.802	.890	.905	.936
Cars	481	80	561	52	8	60	242	669	911	1532
% Cars	97.4	92.0	96.6	98.1	100	98.4	98.0	98.4	98.3	97.6
Trucks	13	7	20	1	0	1	5	11	16	37
% Trucks	2.6	8.0	3.4	1.9	0	1.6	2.0	1.6	1.7	2.4

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N/S: Main Street (Route 27)
 E: Route 2 WB Ramps
 City/State: Acton, MA
 Client: MDM/D. Martin

File Name : 03809A
 Site Code : 442
 Start Date : 5/13/2008
 Page No : 1

Groups Printed- Trucks

Start Time	Main Street (Route 27) From North		Route 2 WB Ramps From East		Main Street (Route 27) From South		Int. Total
	Thru	Left	Right	Left	Right	Thru	
	07:00 AM	5	1	1	0	0	
07:15 AM	3	2	0	0	0	0	5
07:30 AM	1	2	0	0	1	6	10
07:45 AM	4	2	0	0	4	2	12
Total	13	7	1	0	5	11	37
08:00 AM	1	1	0	0	4	3	9
08:15 AM	2	0	0	0	0	3	5
08:30 AM	1	2	1	0	3	8	15
08:45 AM	0	1	0	0	5	5	11
Total	4	4	1	0	12	19	40
Grand Total	17	11	2	0	17	30	77
Apprch %	60.7	39.3	100	0	36.2	63.8	
Total %	22.1	14.3	2.6	0	22.1	39	

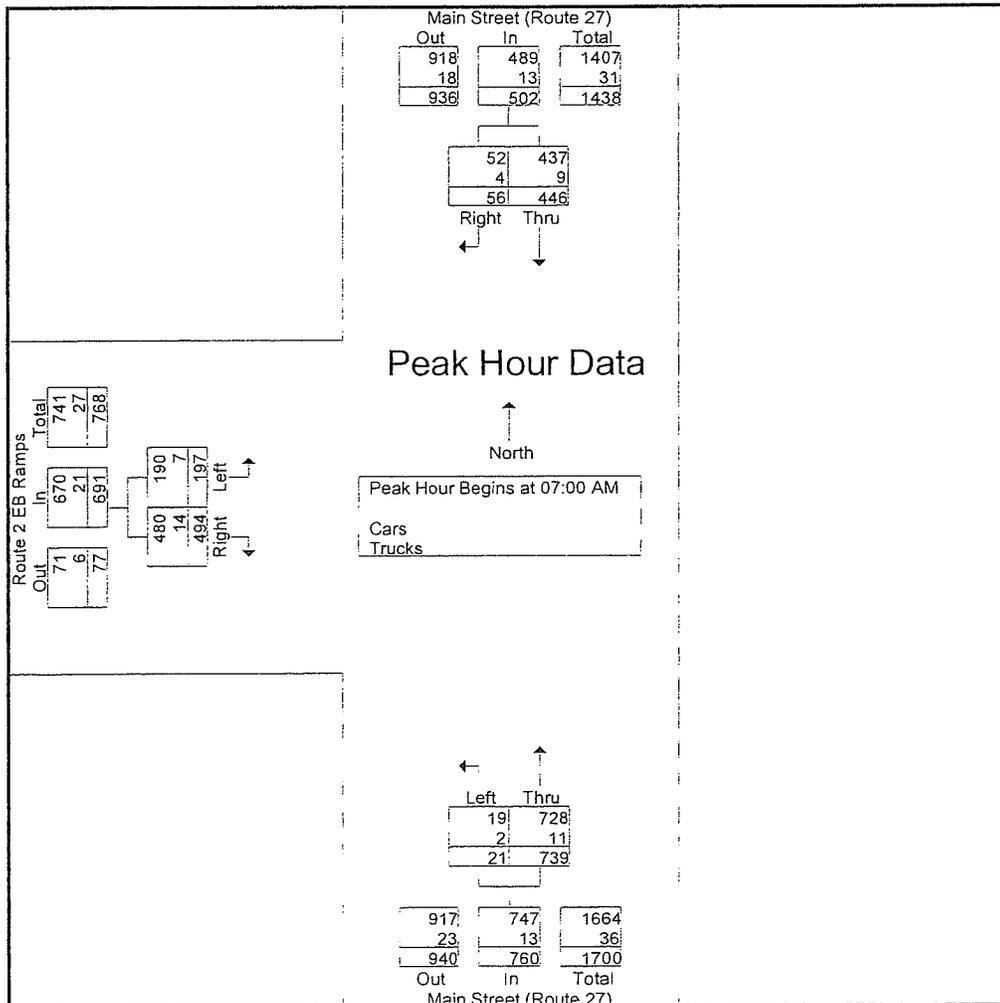
Start Time	Main Street (Route 27) From North			Route 2 WB Ramps From East			Main Street (Route 27) From South			Int. Total
	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:45 AM										
07:45 AM	4	2	6	0	0	0	4	2	6	12
08:00 AM	1	1	2	0	0	0	4	3	7	9
08:15 AM	2	0	2	0	0	0	0	3	3	5
08:30 AM	1	2	3	1	0	1	3	8	11	15
Total Volume	8	5	13	1	0	1	11	16	27	41
% App. Total	61.5	38.5		100	0		40.7	59.3		
PHF	.500	.625	.542	.250	.000	.250	.688	.500	.614	.683

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N/S: Main Street (Route 27)
 W: Route 2 EB Ramps
 City/State: Acton, MA
 Client: MDM/D. Martin

File Name : 03809B
 Site Code : 442
 Start Date : 5/13/2008
 Page No : 1

Start Time	Main Street (Route 27) From North			Main Street (Route 27) From South			Route 2 EB Ramps From West			Int. Total
	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	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	11	141	152	162	9	171	94	53	147	470
07:15 AM	29	121	150	176	3	179	110	43	153	482
07:30 AM	7	80	87	216	2	218	134	45	179	484
07:45 AM	9	104	113	185	7	192	156	56	212	517
Total Volume	56	446	502	739	21	760	494	197	691	1953
% App. Total	11.2	88.8		97.2	2.8		71.5	28.5		
PHF	.483	.791	.826	.855	.583	.872	.792	.879	.815	.944
Cars	52	437	489	728	19	747	480	190	670	1906
% Cars	92.9	98.0	97.4	98.5	90.5	98.3	97.2	96.4	97.0	97.6
Trucks	4	9	13	11	2	13	14	7	21	47
% Trucks	7.1	2.0	2.6	1.5	9.5	1.7	2.8	3.6	3.0	2.4



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N/S: Main Street (Route 27)
 W: Route 2 EB Ramps
 City/State: Acton, MA
 Client: MDM/D. Martin

File Name : 03809B
 Site Code : 442
 Start Date : 5/13/2008
 Page No : 1

Groups Printed- Cars - Trucks								
Start Time	Main Street (Route 27) From North		Main Street (Route 27) From South			Route 2 EB Ramps From West		Int. Total
	Right	Thru	Thru	Left	Right	Left		
07:00 AM	11	141	162	9	94	53	470	
07:15 AM	29	121	176	3	110	43	482	
07:30 AM	7	80	216	2	134	45	484	
07:45 AM	9	104	185	7	156	56	517	
Total	56	446	739	21	494	197	1953	
08:00 AM	6	94	172	5	133	37	447	
08:15 AM	19	97	191	9	143	46	505	
08:30 AM	12	87	189	3	127	47	465	
08:45 AM	11	114	192	4	117	51	489	
Total	48	392	744	21	520	181	1906	
Grand Total	104	838	1483	42	1014	378	3859	
Apprch %	11	89	97.2	2.8	72.8	27.2		
Total %	2.7	21.7	38.4	1.1	26.3	9.8		
Cars	100	822	1448	39	992	358	3759	
% Cars	96.2	98.1	97.6	92.9	97.8	94.7	97.4	
Trucks	4	16	35	3	22	20	100	
% Trucks	3.8	1.9	2.4	7.1	2.2	5.3	2.6	

Start Time	Main Street (Route 27) From North			Main Street (Route 27) From South			Route 2 EB Ramps From West			Int. Total
	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	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	11	141	152	162	9	171	94	53	147	470
07:15 AM	29	121	150	176	3	179	110	43	153	482
07:30 AM	7	80	87	216	2	218	134	45	179	484
07:45 AM	9	104	113	185	7	192	156	56	212	517
Total Volume	56	446	502	739	21	760	494	197	691	1953
% App. Total	11.2	88.8		97.2	2.8		71.5	28.5		
PHF	.483	.791	.826	.855	.583	.872	.792	.879	.815	.944
Cars	52	437	489	728	19	747	480	190	670	1906
% Cars	92.9	98.0	97.4	98.5	90.5	98.3	97.2	96.4	97.0	97.6
Trucks	4	9	13	11	2	13	14	7	21	47
% Trucks	7.1	2.0	2.6	1.5	9.5	1.7	2.8	3.6	3.0	2.4

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N/S: Main Street (Route 27)
 W: Route 2 EB Ramps
 City/State: Acton, MA
 Client: MDM/D. Martin

File Name : 03809B
 Site Code : 442
 Start Date : 5/13/2008
 Page No : 1

Groups Printed- Trucks

Start Time	Main Street (Route 27) From North		Main Street (Route 27) From South			Route 2 EB Ramps From West		Int. Total
	Right	Thru	Thru	Left	Right	Left		
07:00 AM	0	2	0	0	1	3	6	
07:15 AM	2	4	1	0	2	0	9	
07:30 AM	0	1	5	0	4	3	13	
07:45 AM	2	2	5	2	7	1	19	
Total	4	9	11	2	14	7	47	
08:00 AM	0	1	5	0	0	3	9	
08:15 AM	0	3	3	0	2	1	9	
08:30 AM	0	3	8	0	2	6	19	
08:45 AM	0	0	8	1	4	3	16	
Total	0	7	24	1	8	13	53	
Grand Total	4	16	35	3	22	20	100	
Apprch %	20	80	92.1	7.9	52.4	47.6		
Total %	4	16	35	3	22	20		

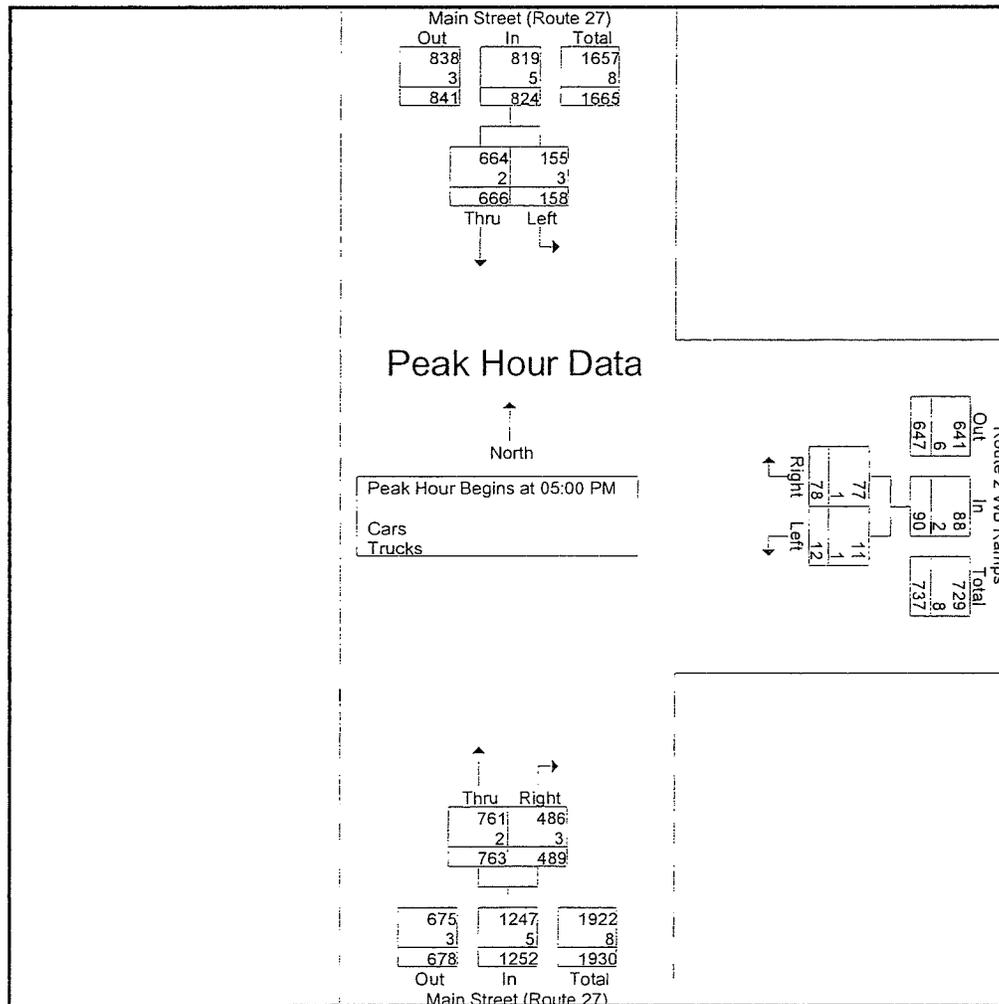
Start Time	Main Street (Route 27) From North			Main Street (Route 27) From South			Route 2 EB Ramps From West			Int. Total
	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:45 AM										
07:45 AM	2	2	4	5	2	7	7	1	8	19
08:00 AM	0	1	1	5	0	5	0	3	3	9
08:15 AM	0	3	3	3	0	3	2	1	3	9
08:30 AM	0	3	3	8	0	8	2	6	8	19
Total Volume	2	9	11	21	2	23	11	11	22	56
% App. Total	18.2	81.8		91.3	8.7		50	50		
PHF	.250	.750	.688	.656	.250	.719	.393	.458	.688	.737

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N/S: Main Street (Route 27)
 E: Route 2 WB Ramps
 City/State: Acton, MA
 Client: MDM/D. Martin

File Name : 03809AaA
 Site Code : 442
 Start Date : 5/13/2008.
 Page No : 1

Start Time	Main Street (Route 27) From North			Route 2 WB Ramps From East			Main Street (Route 27) From South			Int. Total
	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	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	159	47	206	19	1	20	130	171	301	527
05:15 PM	183	41	224	19	4	23	116	182	298	545
05:30 PM	171	33	204	21	1	22	125	199	324	550
05:45 PM	153	37	190	19	6	25	118	211	329	544
Total Volume	666	158	824	78	12	90	489	763	1252	2166
% App. Total	80.8	19.2		86.7	13.3		39.1	60.9		
PHF	.910	.840	.920	.929	.500	.900	.940	.904	.951	.985
Cars	664	155	819	77	11	88	486	761	1247	2154
% Cars	99.7	98.1	99.4	98.7	91.7	97.8	99.4	99.7	99.6	99.4
Trucks	2	3	5	1	1	2	3	2	5	12
% Trucks	0.3	1.9	0.6	1.3	8.3	2.2	0.6	0.3	0.4	0.6



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N/S: Main Street (Route 27)
 E: Route 2 WB Ramps
 City/State: Acton, MA
 Client: MDM/D. Martin

File Name : 03809AA
 Site Code : 442
 Start Date : 5/13/2008
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	Main Street (Route 27) From North		Route 2 WB Ramps From East		Main Street (Route 27) From South		Int. Total
	Thru	Left	Right	Left	Right	Thru	
04:00 PM	149	38	11	4	106	171	479
04:15 PM	139	45	16	2	84	159	445
04:30 PM	145	64	17	3	112	174	515
04:45 PM	155	37	12	6	102	181	493
Total	588	184	56	15	404	685	1932
05:00 PM	159	47	19	1	130	171	527
05:15 PM	183	41	19	4	116	182	545
05:30 PM	171	33	21	1	125	199	550
05:45 PM	153	37	19	6	118	211	544
Total	666	158	78	12	489	763	2166
Grand Total	1254	342	134	27	893	1448	4098
Apprch %	78.6	21.4	83.2	16.8	38.1	61.9	
Total %	30.6	8.3	3.3	0.7	21.8	35.3	
Cars	1248	339	131	25	887	1440	4070
% Cars	99.5	99.1	97.8	92.6	99.3	99.4	99.3
Trucks	6	3	3	2	6	8	28
% Trucks	0.5	0.9	2.2	7.4	0.7	0.6	0.7

Start Time	Main Street (Route 27) From North			Route 2 WB Ramps From East			Main Street (Route 27) From South			Int. Total
	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	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	159	47	206	19	1	20	130	171	301	527
05:15 PM	183	41	224	19	4	23	116	182	298	545
05:30 PM	171	33	204	21	1	22	125	199	324	550
05:45 PM	153	37	190	19	6	25	118	211	329	544
Total Volume	666	158	824	78	12	90	489	763	1252	2166
% App. Total	80.8	19.2		86.7	13.3		39.1	60.9		
PHF	.910	.840	.920	.929	.500	.900	.940	.904	.951	.985
Cars	664	155	819	77	11	88	486	761	1247	2154
% Cars	99.7	98.1	99.4	98.7	91.7	97.8	99.4	99.7	99.6	99.4
Trucks	2	3	5	1	1	2	3	2	5	12
% Trucks	0.3	1.9	0.6	1.3	8.3	2.2	0.6	0.3	0.4	0.6

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N/S: Main Street (Route 27)
 E: Route 2 WB Ramps
 City/State: Acton, MA
 Client: MDM/D. Martin

File Name : 03809A.A
 Site Code : 442
 Start Date : 5/13/2008
 Page No : 1

Groups Printed- Trucks

Start Time	Main Street (Route 27) From North		Route 2 WB Ramps From East		Main Street (Route 27) From South		Int. Total
	Thru	Left	Right	Left	Right	Thru	
04:00 PM	4	0	0	0	2	1	7
04:15 PM	0	0	1	0	0	1	2
04:30 PM	0	0	0	1	1	1	3
04:45 PM	0	0	1	0	0	3	4
Total	4	0	2	1	3	6	16
05:00 PM	0	1	0	0	0	0	1
05:15 PM	1	0	0	0	1	0	2
05:30 PM	1	0	0	0	1	1	3
05:45 PM	0	2	1	1	1	1	6
Total	2	3	1	1	3	2	12
Grand Total	6	3	3	2	6	8	28
Apprch %	66.7	33.3	60	40	42.9	57.1	
Total %	21.4	10.7	10.7	7.1	21.4	28.6	

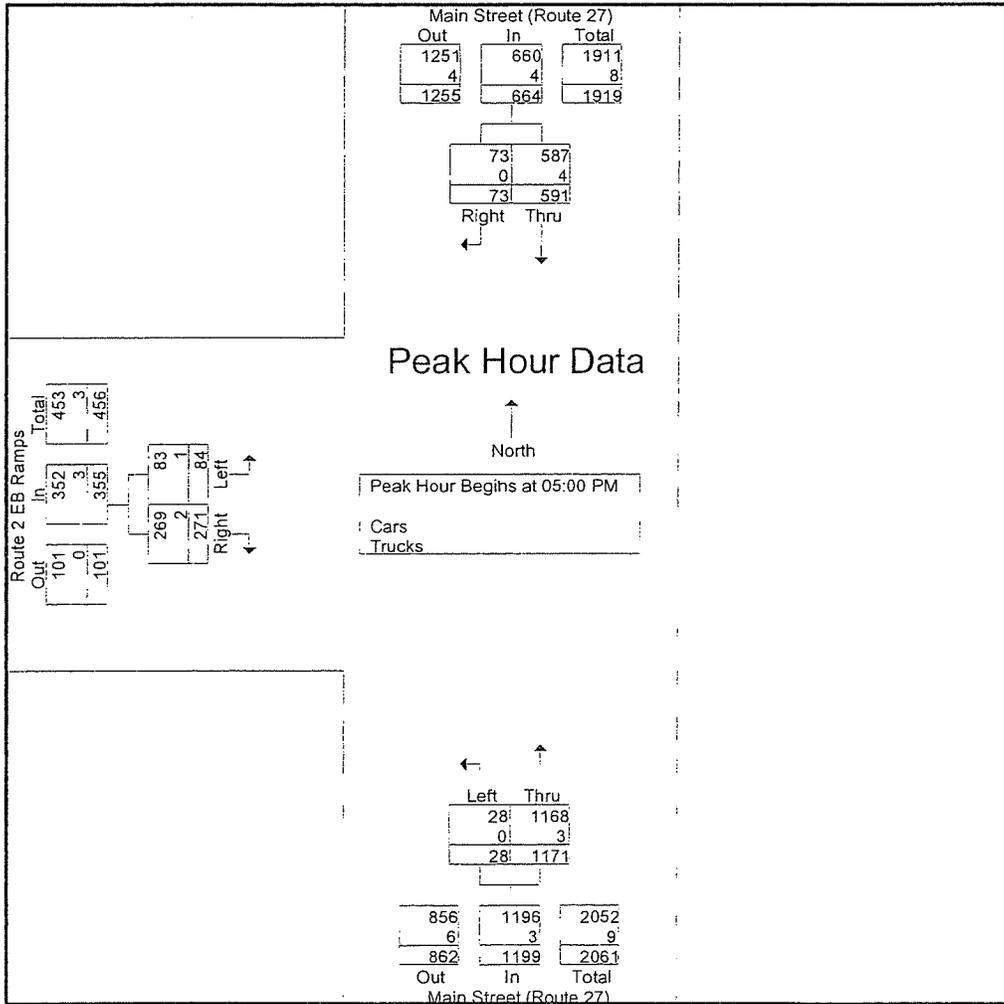
Start Time	Main Street (Route 27) From North			Route 2 WB Ramps From East			Main Street (Route 27) From South			Int. Total
	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:00 PM										
04:00 PM	4	0	4	0	0	0	2	1	3	7
04:15 PM	0	0	0	1	0	1	0	1	1	2
04:30 PM	0	0	0	0	1	1	1	1	2	3
04:45 PM	0	0	0	1	0	1	0	3	3	4
Total Volume	4	0	4	2	1	3	3	6	9	16
% App. Total	100	0		66.7	33.3		33.3	66.7		
PHF	.250	.000	.250	.500	.250	.750	.375	.500	.750	.571

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N/S: Main Street (Route 27)
 W: Route 2 EB Ramps
 City/State: Acton, MA
 Client: MDM/D. Martin

File Name : 03809BB
 Site Code : 442
 Start Date : 5/13/2008
 Page No : 1

Start Time	Main Street (Route 27) From North			Main Street (Route 27) From South			Route 2 EB Ramps From West			Int. Total
	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	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	20	139	159	292	5	297	48	14	62	518
05:15 PM	17	158	175	279	8	287	74	19	93	555
05:30 PM	20	155	175	293	9	302	74	24	98	575
05:45 PM	16	139	155	307	6	313	75	27	102	570
Total Volume	73	591	664	1171	28	1199	271	84	355	2218
% App. Total	11	89		97.7	2.3		76.3	23.7		
PHF	.913	.935	.949	.954	.778	.958	.903	.778	.870	.964
Cars	73	587	660	1168	28	1196	269	83	352	2208
% Cars	100	99.3	99.4	99.7	100	99.7	99.3	98.8	99.2	99.5
Trucks	0	4	4	3	0	3	2	1	3	10
% Trucks	0	0.7	0.6	0.3	0	0.3	0.7	1.2	0.8	0.5



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 Client: MDM/D. Martin

File Name : 03809BB
 Site Code : 442
 Start Date : 5/13/2008
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	Main Street (Route 27) From North		Main Street (Route 27) From South		Route 2 EB Ramps From West		Int. Total
	Right	Thru	Thru	Left	Right	Left	
04:00 PM	16	133	271	7	46	9	482
04:15 PM	13	132	230	6	53	13	447
04:30 PM	13	133	283	2	63	6	500
04:45 PM	18	142	266	9	60	18	513
Total	60	540	1050	24	222	46	1942
05:00 PM	20	139	292	5	48	14	518
05:15 PM	17	158	279	8	74	19	555
05:30 PM	20	155	293	9	74	24	575
05:45 PM	16	139	307	6	75	27	570
Total	73	591	1171	28	271	84	2218
Grand Total	133	1131	2221	52	493	130	4160
Apprch %	10.5	89.5	97.7	2.3	79.1	20.9	
Total %	3.2	27.2	53.4	1.2	11.9	3.1	
Cars	133	1122	2209	52	489	129	4134
% Cars	100	99.2	99.5	100	99.2	99.2	99.4
Trucks	0	9	12	0	4	1	26
% Trucks	0	0.8	0.5	0	0.8	0.8	0.6

Start Time	Main Street (Route 27) From North			Main Street (Route 27) From South			Route 2 EB Ramps From West			Int. Total
	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	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	20	139	159	292	5	297	48	14	62	518
05:15 PM	17	158	175	279	8	287	74	19	93	555
05:30 PM	20	155	175	293	9	302	74	24	98	575
05:45 PM	16	139	155	307	6	313	75	27	102	570
Total Volume	73	591	664	1171	28	1199	271	84	355	2218
% App. Total	11	89		97.7	2.3		76.3	23.7		
PHF	.913	.935	.949	.954	.778	.958	.903	.778	.870	.964
Cars	73	587	660	1168	28	1196	269	83	352	2208
% Cars	100	99.3	99.4	99.7	100	99.7	99.3	98.8	99.2	99.5
Trucks	0	4	4	3	0	3	2	1	3	10
% Trucks	0	0.7	0.6	0.3	0	0.3	0.7	1.2	0.8	0.5

Transportation Data Corporation
 Mario Perone, mperone1@verizon.net
 Tel. (781) 587-0086 Fax (781) 587-0189

N/S: Main Street (Route 27)
 W: Route 2 EB Ramps
 City/State: Acton, MA
 Client: MDM/D. Martin

File Name : 03809BB
 Site Code : 442
 Start Date : 5/13/2008
 Page No : 1

Groups Printed- Trucks

Start Time	Main Street (Route 27) From North		Main Street (Route 27) From South			Route 2 EB Ramps From West		Int. Total
	Right	Thru	Thru	Left	Right	Left		
04:00 PM	0	4	3	0	0	0	7	
04:15 PM	0	0	1	0	0	0	1	
04:30 PM	0	1	2	0	1	0	4	
04:45 PM	0	0	3	0	1	0	4	
Total	0	5	9	0	2	0	16	
05:00 PM	0	0	0	0	1	0	1	
05:15 PM	0	1	1	0	0	0	2	
05:30 PM	0	2	1	0	0	0	3	
05:45 PM	0	1	1	0	1	1	4	
Total	0	4	3	0	2	1	10	
Grand Total	0	9	12	0	4	1	26	
Apprch %	0	100	100	0	80	20		
Total %	0	34.6	46.2	0	15.4	3.8		

Start Time	Main Street (Route 27) From North			Main Street (Route 27) From South			Route 2 EB Ramps From West			Int. Total
	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	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	4	4	3	0	3	0	0	0	7
04:15 PM	0	0	0	1	0	1	0	0	0	1
04:30 PM	0	1	1	2	0	2	1	0	1	4
04:45 PM	0	0	0	3	0	3	1	0	1	4
Total Volume	0	5	5	9	0	9	2	0	2	16
% App. Total	0	100		100	0		100	0		
PHF	.000	.313	.313	.750	.000	.750	.500	.000	.500	.571

□ Seasonal Data

SECTION I - CONTINUOUS COUNTING STATION MONTHLY AVERAGE DAILY TRAFFIC

YR														May	Sub Average	
														Adjustment to Year		
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR			
02	7,778	7,900	8,405	8,864	9,000	9,406	9,155	9,222	9,071	8,745	8,700	7,516	8,647	0.96		
	8%	-3%	2%	4%	4%	2%	7%	3%	5%	9%	1%	4%	4%			
03	8,381	7,671	8,589	9,207	9,373	9,575	9,792	9,501	9,482	9,500	8,753	7,808	8,969	0.96		
	-13%	7%	-3%	-11%	-1%	-1%	-13%	-9%	-10%	-11%	-5%	4%	-6%			
05	7,333	8,200	8,308	8,194	9,300	9,439	8,516	8,669	8,559	8,500	8,300	8,100	8,452	0.91		
	6%	-4%	3%	4%	-6%	-4%	-4%	-1%	-1%	-2%	-3%	-3%	-1%			
06	7,800	7,909	8,517	8,504	8,752	9,024	8,197	8,580	8,507	8,291	8,019	7,838	8,328	0.95		
												Growth	-0.21%	0.94	Sub Average	
STATION 403 - CONCORD - RTE.2 - 0.2 km EAST OF CONCORD ROTARY																
YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR			
02	44,954	45,810	46,721	48,169	49,311	51,680	47,639	48,050	48,219	49,947	45,640	45,000	47,595	0.97		
	0%	-5%	-1%	-2%	-2%	0%	-7%	-3%	-2%	-2%	7%	7%	-1%			
03	44,737	43,740	46,023	47,402	48,225	51,537	44,070	46,781	47,154	49,000	48,980	48,000	47,137	0.98		
	1%	5%	2%	2%	0%	4%	5%	0%	1%	0%	-6%	-4%	1%			
04	45,000	46,000	46,867	48,260	48,136	53,710	46,206	46,905	47,793	49,000	46,023	45,983	47,490	0.99		
	-9%	-5%	-3%	-4%	-2%	-5%	-3%	-1%	-4%	0%	-2%	-6%	-4%			
05	41,051	43,677	45,426	46,370	46,939	51,129	44,632	46,318	46,004	49,000	45,178	43,329	45,754	0.97		
	8%	0%	2%	-2%	-1%	-3%	-3%	-2%	0%	0%	0%	0%	0%			
06	44,150	43,659	46,395	45,607	46,453	49,481	43,449	45,449	45,925	49,000	44,963	43,417	45,662	0.98		
												Growth	-1.02%	0.98	Sub Average	
STATION 4089 - MARLBOROUGH - RTE.1-495 - NORTH OF RTE.1-290																
YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR			
02	77,668	92,058	87,824	96,397	103,604	107,137	111,880	116,046	103,409	102,673	93,211	93,000	98,742	0.95		
	0%	-2%	4%	-1%	-8%	-6%	0%	-1%	0%	-1%	4%	-1%	-1%			
03	77,926	90,000	91,000	95,000	95,435	100,796	111,611	115,416	102,927	101,626	96,652	92,000	97,532	1.02		
	10%	-2%	0%	-2%	7%	5%	3%	0%	-7%	-2%	-3%	4%	1%			
05	86,000	88,000	91,400	93,441	102,364	106,066	115,416	115,922	96,206	99,993	93,582	95,470	98,655	0.96		
	7%	7%	4%	4%	-2%	0%	-6%	-2%	9%	-1%	0%	-5%	1%			
06	91,632	93,896	94,654	97,548	99,848	106,518	107,960	113,530	104,483	99,380	93,184	90,801	99,453	1.00		
												Growth	0.05%	0.98	Sub Average	
STATION 4172 - ACTON - RTE.2 - 1.6 km WEST OF RTE.27																
YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR			
02	36,353	37,058	38,281	39,159	40,388	39,770	36,773	39,939	37,226	40,848	37,179	37,000	38,331	0.95		
	-6%	-4%	-5%	-1%	-2%	1%	5%	-4%	7%	2%	2%	-3%	-1%			
03	34,042	35,512	36,375	38,809	39,678	40,000	38,757	38,417	39,804	41,741	38,098	35,900	38,094	0.96		
	5%	5%	7%	3%	1%	5%	0%	3%	9%	4%	3%	4%	4%			
04	35,765	37,276	38,911	40,010	40,194	42,010	38,646	39,710	43,483	43,584	39,252	37,476	39,693	0.99		
												Growth	1.79%	0.97	Sub Average	
														Average Adjustment Factor (May)	0.97	
														Average Yearly Growth Calculated	0.15%	
														Yearly Growth Factor Used	1.0%	

MADT
ITALICS = ESTIMATED DATA

MASSACHUSETTS HIGHWAY DEPARTMENT - STATEWIDE TRAFFIC DATA COLLECTION

2007 WEEKDAY SEASONAL FACTORS *

* Note: These are weekday factors. The average of the factors for the year will not equal 1, as weekend data are not considered.

FACTOR GROUP	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
GROUP 1 - WEST INTERSTATE	0.95	0.91	0.85	0.85	0.87	0.86	0.91	0.96	0.90	0.88	0.90	0.91
GROUP 2 - RURAL MAJOR COLLECTOR (R-5)	1.11	1.07	1.07	0.98	0.92	0.88	0.88	0.86	0.89	0.93	1.01	1.04
GROUP 3A - RECREATIONAL **(1-4) See below	1.26	1.20	1.18	1.04	0.96	0.86	0.78	0.79	0.93	0.99	1.07	1.12
GROUP 3B - RECREATIONAL *** (5) See below	1.22	1.18	1.20	1.04	0.96	0.88	0.73	0.74	0.99	1.02	1.12	1.17
GROUP 4 - I-495 INTERSTATE	1.05	1.03	1.03	0.95	0.93	0.87	0.86	0.83	0.89	0.93	0.93	0.96
GROUP 5 - EAST INTERSTATE	1.02	0.99	0.97	0.94	0.95	0.91	0.92	0.92	0.94	0.94	0.98	0.99
GROUP 6 - URBAN ARTERIALS, COLLECTORS & RURAL ARTERIALS (R-2, R-3)	1.03	0.99	0.97	0.92	0.91	0.90	0.92	0.91	0.92	0.93	0.97	0.97
GROUP 7 - I-84 PROXIMITY (STA. 17)	0.84	1.15	1.17	1.08	1.10	1.02	1.01	0.96	1.06	1.06	1.11	1.15
GROUP 8 - I-295 PROXIMITY (STA. 6590)	0.95	1.01	0.96	0.92	0.89	0.88	0.91	0.86	0.91	0.93	0.95	0.92
GROUP 9 - I-195 PROXIMITY (STA. 7)	1.10	1.03	1.00	0.94	0.91	0.87	0.84	0.82	0.88	0.93	1.03	0.99

RECREATIONAL: (ALL YEARS)

**GROUP 3A:

- 1. CAPE COD (ALL TOWNS)
- 2. PLYMOUTH (SOUTH OF RTE. 3A)

7014, 7079, 7080, 7090, 7091, 7092, 7093, 7094, 7095, 7096, 7097, 7108, 7178

3. MARTHA'S VINEYARD

4. NANTUCKET

***GROUP 3B:

5. PERMANENTS 2 & 189

1066, 1067, 1083, 1084, 1085, 1086, 1087, 1088, 1089, 1090, 1091, 1092,

1093, 1094, 1095, 1096, 1097, 1098, 1099, 1100, 1101, 1102, 1103, 1104,

1105, 1106, 1107, 1108, 1113, 1114, 1116, 2196, 2197, 2198

2007 AXLE CORRECTION FACTORS

ROUND OFF

ROAD INVENTORY
FUNCTIONAL
CLASSIFICATION

AXLE
CORRECTION
FACTOR

0 - 999.....10
> 1,000.....100

RURAL

1 0.90

2 0.93

3 0.98

0,5,6 0.98

URBAN

1 0.96

2,3 0.97

5 0.99

0,6 0.99

I-84 0.83

Apply I-84 factor to stations: 3290, 3921, 3929

□ Speed Study

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

Spot Speed Study
Main Street (Route 27)
Acton, MA

File Name : 442 Spot Speed Study
Site Code : 44200001
Start Date : 5/15/2008
Page No : 1

#	NB	SB
1	32	30
2	34	36
3	38	29
4	33	27
5	40	32
6	42	36
7	40	36
8	38	33
9	38	28
10	34	33
11	35	30
12	30	30
13	30	26
14	25	35
15	22	30
16	33	34
17	39	33
18	36	30
19	34	31
20	33	29
21	29	29
22	34	32
23	42	30
24	36	34
25	34	34
26	28	34
27	23	35
28	46	29
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54	33	25
55	35	29
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57	32	34
58	33	33
59	32	35
60	30	38
61	33	33
62	35	27
63	32	35
64	33	28
65	31	32
66	29	33

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

File Name : 442 Spot Speed Study
Site Code : 44200001
Start Date : 5/15/2008
Page No : 2

#	NB	SB
67	38	31
68	40	30
69	36	36
70	36	36
71	38	27
72	34	33
73	28	31
74	29	39
75	33	34
76	29	33
77	34	31
78	33	33
79	24	26
80	35	34
81	30	36
82	30	31
83	25	26
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85	38	32
86	36	31
87	38	33
88	33	34
89	31	37
90	37	34
91	37	37
92	34	34
93	34	36
94	35	33
95	39	29
96	36	34
97	38	28
98	34	37
99	33	33
100	32	34
101	40	34
102	34	29
103	37	
104	45	
105	42	
106	38	
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MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

File Name : 442 Spot Speed Study
 Site Code : 44200001
 Start Date : 5/15/2008
 Page No : 4

#	NB	SB
203		
204		
205		
206		
207		
208		
209		
210		
211		
212		
213		
214		

Class	Vehicle Count	Average Speed	True		10 MPH Pace Speed	Number in Pace	Percent in Pace	Number of Vehicles Over 35 MPH	Percent of Vehicles Over 35 MPH
			Median (50th Percentile)	85 Percentile					
NB	111	34	34	38	29 - 38	87	78	39	35
SB	102	32	32	35	28 - 37	91	89	14	14
Summary	213	33	33	37	29 - 38	175	82	53	25

□ Crash Data

MassHighway

CRASH RATE WORKSHEET

CITY/TOWN : Acton, MA

COUNT DATE : May-08

MHD USE ONLY

DISTRICT : 3

UNSIGNALIZED :

SIGNALIZED :

Source #

~ INTERSECTION DATA ~

MAJOR STREET : Main Street (Route 27)

ST #

MINOR STREET(S) : Isaac Davis Way

ST #

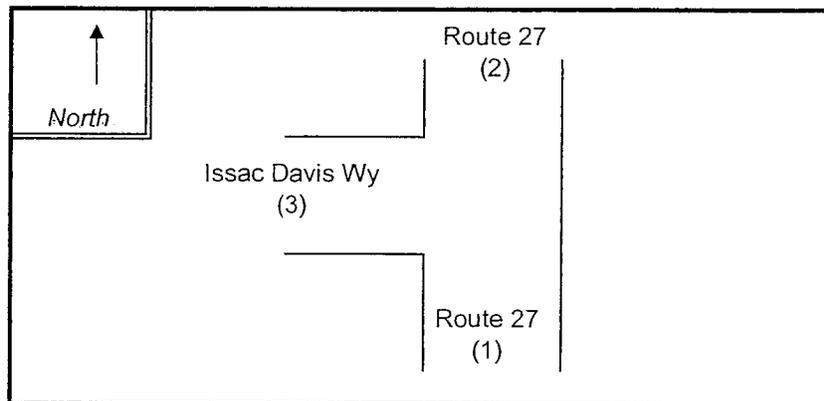
ST #

ST #

ST #

ST #

**INTERSECTION
DIAGRAM**
(Label Approaches)



INTERSECTION
REF #

(1)

Peak Hour Volumes

APPROACH :	1	2	3	4	5	Total Entering Vehicles
DIRECTION :	NB	SB	EB	WB		
VOLUMES (AM/PM) :	843	824				1,667

" K " FACTOR : APPROACH ADT : ADT = TOTAL VOL/"K" FACT.

TOTAL # OF ACCIDENTS : # OF YEARS : AVERAGE # OF ACCIDENTS (A) :

CRASH RATE CALCULATION :

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

Comments : _____

Project Title & Date: 442 - Acton (May 2008)

MassHighway

CRASH RATE WORKSHEET

CITY/TOWN : Acton, MA COUNT DATE : May-08

MHD USE ONLY

DISTRICT : 3 UNSIGNALIZED : SIGNALIZED :

Source #

~ INTERSECTION DATA ~

MAJOR STREET : Main Street (Route 27)

ST #

MINOR STREET(S) : Route 2 EB on/off ramps

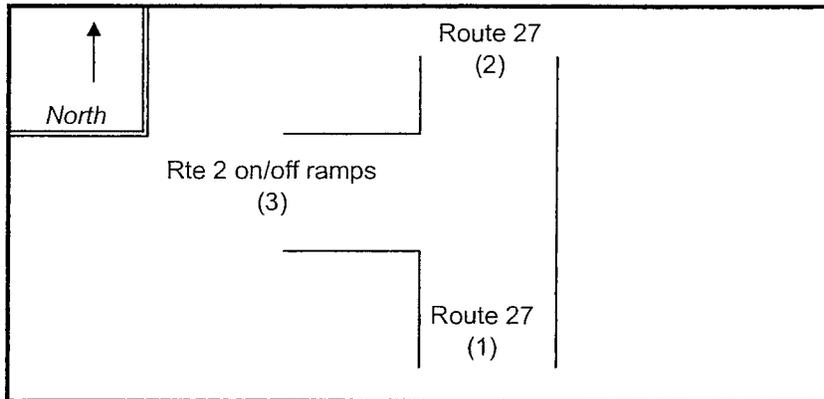
ST #

ST #

ST #

ST #

**INTERSECTION
DIAGRAM**
(Label Approaches)



INTERSECTION
REF #

(1)

Peak Hour Volumes

APPROACH :	1	2	3	4	5	Total Entering Vehicles
DIRECTION :	NB	SB	EB	WB		
VOLUMES (AM/PM) :	1,199	664	355			2,218

" K " FACTOR : APPROACH ADT : ADT = TOTAL VOL/"K" FACT.

TOTAL # OF ACCIDENTS : # OF YEARS : AVERAGE # OF ACCIDENTS (A) :

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

Comments : _____

Project Title & Date: 442 - Acton (May 2008)

MassHighway

CRASH RATE WORKSHEET

CITY/TOWN : Acton, MA

COUNT DATE : May-08

MHD USE ONLY

DISTRICT : 3

UNSIGNALIZED :

SIGNALIZED :

Source #

~ INTERSECTION DATA ~

MAJOR STREET : Main Street (Route 27)

ST #

MINOR STREET(S) : Route 2 WB on/off ramps

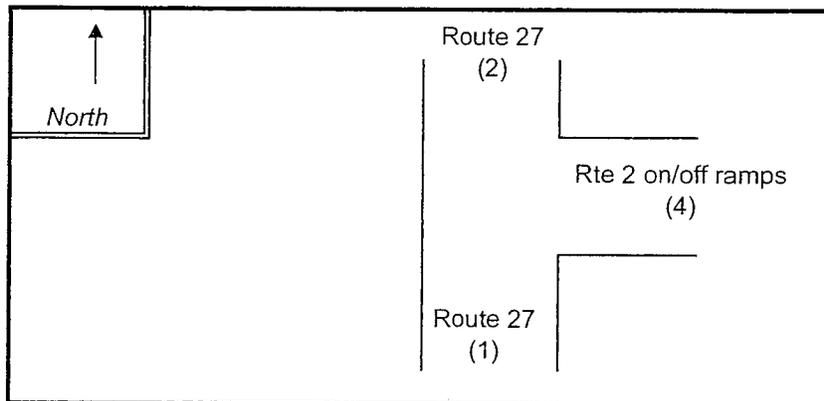
ST #

ST #

ST #

ST #

**INTERSECTION
DIAGRAM**
(Label Approaches)



INTERSECTION
REF #

(1)

Peak Hour Volumes

APPROACH :	1	2	3	4	5	Total Entering Vehicles
DIRECTION :	NB	SB	EB	WB		
VOLUMES (AM/PM) :	1,252	824		90		2,166

" K " FACTOR :

APPROACH ADT :

ADT = TOTAL VOL/"K" FACT.

TOTAL # OF
ACCIDENTS :

OF
YEARS :

AVERAGE # OF
ACCIDENTS (A) :

CRASH RATE CALCULATION :

RATE =

$$\frac{(A * 1,000,000)}{(ADT * 365)}$$

Comments :

Project Title & Date: 442 - Acton (May 2008)



MassHighway Crash Report for ACTON in the year 2004

Crash Number	City/Town Name	Crash Date	Crash Time	Crash Severity	Number of Vehicles	Total Nonfatal Injuries	Total Fatal Injuries	Manner of Collision	Vehicles Travel Direction	Most Harmful Events	Road Surface Condition	Ambient Light	Weather Condition	All Roadway Intersection	Distance from Nearest Intersection	Distance from Nearest Interchange	Distance from Nearest Exit	Distance from Nearest Landmark	Access
1696469	ACTON	05-Feb-2004	9:44 AM	Non-fatal Injuy	2	1	0	Not reported	V1:Southbound / V2:Northbound	V1: Collision with utility pole / V2: Collision with motor vehicle in traffic	Snow	Daylight	Snow	MAIN STREET / Rte 2 W					
1715140	ACTON	02-Apr-2004	8:57 AM	Property damage only (none injured)	2	0	0	Not reported	V1:Not reported / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Not reported	Not reported	Not Reported	MAIN STREET Rte 27 N / RT 2 EAST OFF RAMP Rte 2 E					
1705662	ACTON	16-Mar-2004	11:35 AM	Property damage only (none injured)	2	0	0	Rear-end	V1:Eastbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Cloudy	MAIN STREET Rte 27 S / ROUTE 2 Rte 2					
1728291	ACTON	05-May-2004	2:50 PM	Property damage only (none injured)	2	0	0	Angle	V1:Eastbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear	MAIN STREET Rte 27 S / Rte 2 E					
1654131	ACTON	27-Aug-2004	5:30 PM	Property damage only (none injured)	2	0	0	Rear-end	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	Dry	Daylight	Clear		27 MAIN STREET Rte 2				27 MAIN STREET Rte 2
1740442	ACTON	03-Jun-2004	3:36 PM	Property damage only (none injured)	2	0	0	Rear-end	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Wet	Daylight	Clear		321 MAIN STREET				321 MAIN STREET
1755878	ACTON	12-Jul-2004	3:50 PM	Property damage only (none injured)	2	0	0	Rear-end	V1:Eastbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear/Cloudy		321 MAIN STREET / Rte 2				321 MAIN STREET
1729327	ACTON	14-Apr-2004	2:59 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Wet	Daylight	Rain		321 MAIN STREET Rte 27 W				321 MAIN STREET Rte 27 W
1611250	ACTON	08-Nov-2004	5:15 PM	Property damage only (none injured)	2	0	0	Rear-end	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	Dry	Dark - roadway not lighted	Clear		MAIN STREET Rte 2		Exit 42 on Rte 2		MAIN STREET Rte 2
1663006	ACTON	08-Oct-2004	6:15 PM	Property damage only (none injured)	3	0	0	Rear-end	V1:Northbound / V2:Southbound / V3:Northbound	V1: Not reported / V2: Not reported / V3: Not reported	Dry	Dark - lighted roadway	Clear		MAIN STREET Rte 27 N / Rte 2				MAIN STREET Rte 27 N
1652663	ACTON	25-Oct-2004	5:10 PM	Non-fatal Injuy	2	1	0	Rear-end	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Dark - roadway not lighted	Clear		Rte 2 W / Rte 27				Rte 2 W
1652487	ACTON	13-Dec-2004	7:10 PM	Non-fatal Injuy	2	1	0	Rear-end	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Dark - roadway not lighted	Clear		Rte 2 W / Rte 27				Rte 2 W



MassHighway Crash Report for YEAR 2005

Crash Number	City/Town Name	Crash Date	Crash Time	Crash Severity	Number of Vehicles	Total Fatal Injuries	Total Major Injuries	Manner of Collision	Vehicles Travel Directions	Most Harmful Events	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	From Nearest Milemarker	On From Mile	Distance to Next Landmark	Address	X Coordinate	Y Coordinate			
1906538	ACTON	14-Jun-2005	1:35 PM	Property damage only (none injured)	2	0	0	Angle	V1 Southbound / V2 Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear	MAIN STREET Rte 22 S / RAMP-RT 2 EB TO RT 27										
1906592	ACTON	27-Jan-2005	4:10 PM	Property damage only (none injured)	2	0	0	Angle	V1 Southbound / V2 Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear	MAIN STREET Rte 22 S / RAMP-RT 2 EB TO RT 27										
1947164	ACTON	18-Oct-2005	4:55 PM	Property damage only (none injured)	2	0	0	Angle	V1 Eastbound / V2 Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear	MAIN STREET Rte 22 S / Rte 2 E										
1931532	ACTON	06-Aug-2005	2:10 PM	Property damage only (none injured)	2	0	0	Rear-end	V1 Southbound / V2 Southbound	Collision with motor vehicle in traffic	Dry	Daylight	Clear	Rte 2 / Rte 27 S					321 MAIN ST OFF RAMP TO RT 2					
1911326	ACTON	02-Jul-2005	5:03 PM	Non-fatal injury	1	1	0	Angle	V1 Not Reported	V1: Collision with cyclist (bicyclist, motorcycle, unicycle, skateboard)	Dry	Daylight	Cloudy	Rte 2 E / MAIN STREET Rte 27 S										
1915120	ACTON	27-Jul-2005	12:00 AM	Property damage only (none injured)	2	0	0	Rear-end	V1 Eastbound / V2 Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear	Rte 2 E / MAIN STREET Rte 27 S										
1948572	ACTON	28-Feb-2005	0:00 AM	Non-fatal injury	2	1	0	Rear-end	V1 Southbound / V2 Southbound	V1: Not reported / V2: Not reported	Dry	Daylight	Clear	Rte 27 / Rte 2										
1931490	ACTON	31-Aug-2005	6:25 AM	Property damage only (none injured)	2	0	0	Rear-end	V1 Southbound / V2 Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Wet	Dawn	Cloudy	Rte 22 S / MAIN STREET					RT 27 OFF RAMP					
1982125	ACTON	25-Nov-2005	9:38 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	V1 Eastbound	V1: Collision with ditch	Dry	Daylight	Clear		25 feet E from Intersection W MAIN STREET Rte 22 / RAMP-RT 2 EB TO RT 27					W MAIN STREET Rte 27	204152313320113	014032070527208		
1880318	ACTON	07-May-2005	4:45 PM	Property damage only (none injured)	2	0	0	Rear-end	V1 Northbound / V2 Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear		321 MAIN STREET					321 MAIN STREET	20411642278451929	014066450525612		
1906568	ACTON	21-Jun-2005	8:33 AM	Property damage only (none injured)	2	0	0	Rear-end	V1 Southbound / V2 Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear		321 MAIN STREET					321 MAIN STREET	204116027845070	014066450525612		
1838414	ACTON	25-Jan-2005	11:55 AM	Non-fatal injury	3	1	0	Rear-end	V1 Not reported / V2 Not reported	V3: Collision with parked motor vehicle	Wet	Daylight	Clear		328 MAIN STREET					348 MAIN STREET	204331020243106	014205082402014		
1962164	ACTON	24-Nov-2005	11:33 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	V1 Northbound	V1: Collision with guardrail	Snow	Daylight	Cloudy		MAIN STREET Rte 22 N / RAMP-RT 27 TO RT 2 EB					MAIN STREET Rte 22 N	204225011052026	0141494405238276		
2044043	ACTON	12-Aug-2005	3:40 AM	Not Reported	2	0	0	Rear-end	V1 Eastbound / V2 Eastbound	V1: Not reported / V2: Not reported	Dry	Daylight	Clear		Rte 2					Rte 2	204006310730608	0143061721224270		
1900327	ACTON	21-Apr-2005	3:30 PM	Property damage only (none injured)	2	0	0	Rear-end	V1 Westbound / V2 Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear		Rte 2 / Rte 22					Rte 2	2042271411600049	014188383051020		

MASS HIGHWAY		MassHighway Crash Report for YEAR 2006																				
Crash Number	City/Town Name	Crash Date	Crash Time	Crash Severity	Number of Vehicles	Total Injuries	Total Fatalities	Manner of Collision	Vehicles Travel Directions	Most Harmful Events	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	4 from Nearest Milepost	From Nearest East	Distance from Nearest Landmark	Non-Motorist Type	X Coordinate	Y Coordinate	
200785	ACTON	25-Mar-2006	5:30 AM	Unknown	2	0	0	Not reported	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	Dry	Daylight	Clear	MAIN STREET / RAMP-RT 22 TO RT 2 EB						204225 571052825	014149 646023626	
201152	ACTON	15-Apr-2006	5:22 PM	Property damage only (non-injured)	2	0	0	Rear-end	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear	MAIN STREET / Rte 2 / MAIN STREET Rte 22						204226 764046802	014150 588236669	
204197	ACTON	25-May-2006	2:44 AM	Property damage only (non-injured)	2	0	0	Rear-end	V1:Southbound / V2:Southbound / V1:Westbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V1: Not reported / V2: Not reported	Dry	Daylight	Clear/Clear	MAIN STREET Rte 22 / Rte 2	MAIN STREET Rte 22 / RAMP-RT 27 TO RT 2 EB Rte 2					204225 571052825	014148 646023626	
213223	ACTON	28-Jun-2006	4:00 AM	Non-fatal injury (Property damage only (non-injured))	2	1	0	Rear-end	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Cloudy	Rte 22 MAIN STREET Rte 22						204227 141609046	014160 283051808	
2140415	ACTON	03-Dec-2006	1:47 PM	Property damage only (non-injured)	2	0	0	Rear-end	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear	Rte 2 / MAIN STREET Rte 22						204226 764046802	014150 588236669	
2050358	ACTON	05-Jan-2006	9:01 AM	Property damage only (non-injured)	3	0	0	Rear-end	V1:Eastbound / V2:Eastbound / V3:Not reported	V1: Not reported / V2: Not reported / V3: Not reported	Wet	Daylight	Cloudy	Rte 2 / Rte 22								
2031226	ACTON	02-May-2006	10:52 AM	Property damage only (non-injured)	2	0	0	Anch	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Wet	Daylight	Rain/Cloudy	Rte 2 E / Rte 27 S / MAIN STREET						204226 764046802	014150 588236669	
2031192	ACTON	09-Mar-2006	4:48 PM	Property damage only (non-injured)	2	0	0	Rear-end	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Wet	Daylight	Rain	Rte 2 W / MAIN STREET						204237 141609046	014160 283051808	
2018838	ACTON	13-Mar-2006	4:52 PM	Property damage only (non-injured)	2	0	0	Rear-end	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Wet	Daylight	Cloudy/Cloudy	Rte 2 W / MAIN STREET / Rte 2						204237 141609046	014160 283051808	
2125008	ACTON	28-Nov-2006	2:40 PM	Property damage only (non-injured)	2	0	0	Rear-end	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Wet	Daylight	Rain	Rte 22 / Rte 2						204226 764046802	014150 588236669	
207226	ACTON	21-Jul-2006	3:02 PM	Non-fatal injury	2	1	0	Rear-end	V1:Westbound / V2:Westbound	V1: Unknown / V2: Other	Dry	Daylight	Clear/Clear	Rte 27 W / MAIN STREET								
2184167	ACTON	11-Oct-2006	6:24 PM	Non-fatal injury (Property damage only (non-injured))	2	1	0	Rear-end	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Wet	Dark - Lighted roadway	Rain/Rain	10thel S/10th Intersection 321 MAIN STREET / Rte 2						204224 572097142	014148 609074784	
208390 / 2108208	ACTON	07-Jun-2006	5:03 PM	Property damage only (non-injured)	1	0	0	Side-swipe, same direction	V1:Southbound	V1: Collision with cyclist (Bicycle, scooter, moped, motor cycle, motor cycle, motor cycle)	Dry	Daylight	Clear/Clear	321 MAIN STREET Rte 27 S	345 MAIN STREET / Rte 27						204116 820081115	014086 852025520
	ACTON	18-Oct-2006	12:02 PM	Not Reported	2	0	0	Anch	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Wet	Daylight	Clear/Rain							204226 764046802	014261 030283010	
1880226	ACTON	05-Jan-2006	4:20 PM	Property damage only (non-injured)	2	0	0	Anch	V1:Westbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Wet	Daylight	Cloudy	MAIN STREET Rte 22 / RAMP-RT 27 TO RT 2 WB Rte 2						204237 141609046	014160 283051808	
2026320	ACTON	16-May-2006	4:00 AM	Non-fatal injury	2	1	0	Rear-end	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	Not reported	Daylight	Rain	MAIN STREET Rte 27 N / RAMP-RT 2 EB TO RT 22 Rte 2						204226 764046802	014150 588236669	
1890248	ACTON	11-Jan-2006	8:22 AM	Property damage only (non-injured)	2	0	0	Rear-end	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Cloudy	Rte 2 / MAIN STREET Rte 27						204226 764046802	014150 588236669	
2050242	ACTON	01-May-2006	5:40 AM	Property damage only (non-injured)	2	0	0	Rear-end	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	Dry	Daylight	Clear	Rte 2 / RAMP-RT 2 EB TO RT 27						204026 372706502	014229 172264555	

□ Growth Data

SECTION I - CONTINUOUS COUNTING STATION MONTHLY AVERAGE DAILY TRAFFIC

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	May Adjustment to Year
02	7,778	7,900	8,405	8,864	9,000	9,406	9,155	9,222	9,071	8,745	8,700	7,516	8,647	0.96
	8%	-3%	2%	4%	4%	2%	7%	3%	5%	9%	1%	4%	4%	
03	8,381	7,671	8,589	9,207	9,373	9,575	9,792	9,501	9,482	9,500	8,753	7,808	8,969	0.96
	-13%	7%	-3%	-11%	-1%	-1%	-13%	-9%	-10%	-11%	-5%	4%	-6%	
05	7,333	8,200	8,308	8,194	9,300	9,439	8,516	8,669	8,559	8,500	8,300	8,100	8,452	0.91
	6%	-4%	3%	4%	-6%	-4%	-4%	-1%	-1%	-2%	-3%	-3%	-1%	
06	7,800	7,909	8,517	8,504	8,752	9,024	8,197	8,580	8,507	8,291	8,019	7,838	8,328	0.95
												Growth	-0.21%	0.94 Sub Average

STATION 403 - CONCORD - RTE.2 - 0.2 km EAST OF CONCORD ROTARY

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	May Adjustment to Year
02	44,954	45,810	46,721	48,169	49,311	51,680	47,639	48,050	48,219	49,947	45,640	45,000	47,595	0.97
	0%	-5%	-1%	-2%	-2%	0%	-7%	-3%	-2%	-2%	7%	7%	-1%	
03	44,737	43,740	46,023	47,402	48,225	51,537	44,070	46,781	47,154	49,000	48,980	48,000	47,137	0.98
	1%	5%	2%	2%	0%	4%	5%	0%	1%	0%	-6%	-4%	1%	
04	45,000	46,000	46,867	48,260	48,136	53,710	46,206	46,905	47,793	49,000	46,023	45,983	47,490	0.99
	-9%	-5%	-3%	-4%	-2%	-5%	-3%	-1%	-4%	0%	-2%	-6%	-4%	
05	41,051	43,677	45,426	46,370	46,939	51,129	44,632	46,318	46,004	49,000	45,178	43,329	45,754	0.97
	8%	0%	2%	-2%	-1%	-3%	-3%	-2%	0%	0%	0%	0%	0%	
06	44,150	43,659	46,395	45,607	46,453	49,481	43,449	45,449	45,925	49,000	44,963	43,417	45,662	0.98
												Growth	-1.02%	0.98 Sub Average

STATION 4089 - MARLBOROUGH - RTE.I-495 - NORTH OF RTE.I-290

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	May Adjustment to Year
02	77,668	92,058	87,824	96,397	103,604	107,137	111,880	116,046	103,409	102,673	93,211	93,000	98,742	0.95
	0%	-2%	4%	-1%	-8%	-6%	0%	-1%	0%	-1%	4%	-1%	-1%	
03	77,926	90,000	91,000	95,000	95,435	100,796	111,611	115,416	102,927	101,626	96,652	92,000	97,532	1.02
	10%	-2%	0%	-2%	7%	5%	3%	0%	-7%	-2%	-3%	4%	1%	
05	86,000	88,000	91,400	93,441	102,364	106,066	115,416	115,922	96,206	99,993	93,582	95,470	98,655	0.96
	7%	7%	4%	4%	-2%	0%	-6%	-2%	9%	-1%	0%	-5%	1%	
06	91,632	93,896	94,654	97,548	99,848	106,518	107,960	113,530	104,483	99,380	93,184	90,801	99,453	1.00
												Growth	0.05%	0.98 Sub Average

STATION 4172 - ACTON - RTE.2 - 1.6 km WEST OF RTE.27

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	May Adjustment to Year
02	36,353	37,058	38,281	39,159	40,388	39,770	36,773	39,939	37,226	40,848	37,179	37,000	38,331	0.95
	-6%	-4%	-5%	-1%	-2%	1%	5%	-4%	7%	2%	2%	-3%	-1%	
03	34,042	35,512	36,375	38,809	39,678	40,000	38,757	38,417	39,804	41,741	38,098	35,900	38,094	0.96
	5%	5%	7%	3%	1%	5%	0%	3%	9%	4%	3%	4%	4%	
04	35,765	37,276	38,911	40,010	40,194	42,010	38,646	39,710	43,483	43,584	39,252	37,476	39,693	0.99
												Growth	1.79%	0.97 Sub Average

Average Adjustment Factor (May) 0.97

Average Yearly Growth Calculated 0.15%
Yearly Growth Factor Used 1.0%

MADT

ITALICS = ESTIMATED DATA

**2005-2006
TRAFFIC GROWTH SUMMARY FOR CONTINUOUS COUNTING STATIONS**

ALL DISTRICTS

<i>DISTRICT</i>	<i># OF STATIONS</i>	<i>2005 RURAL</i>	<i>2006 RURAL</i>	<i>% CHANGE</i>	<i>2005 URBAN</i>	<i>2006 URBAN</i>	<i>% CHANGE</i>
1	8	52,006	51,760	-0.5	35,298	36,225	2.6
2	7	12,639	12,052	-4.6	164,417	162,283	-1.3
3	13	124,081	124,121	0.0	701,142	703,557	0.3
4	29	160,386	164,526	2.6	2,648,681	2,667,583	0.7
5	<u>19</u>	<u>167,157</u>	<u>166,283</u>	-0.5	<u>873,981</u>	<u>867,220</u>	-0.8
TOTAL	76	516,269	518,742	0.5	4,423,519	4,436,868	0.3
TOTAL URBAN AND RURAL 2005 4,939,788							
TOTAL URBAN AND RURAL 2006 4,955,610							
% CHANGE 0.3							

2005-2006

TRAFFIC GROWTH SUMMARY FOR CONTINUOUS COUNTING STATIONS

DISTRICT 1

STATION	URBAN/RURAL	2005 AADT	2006 AADT	% CHANGE
1	U2	19,705	20,693	5.0
40	R2	24,808	25,487	2.7
125	R5	1,190	1,169	-1.8
130	R3	3,133	3,100	-1.1
140	R5	2,901	2,862	-1.3
162	U2	15,593	15,532	-0.4
203	R5	2,324	2,248	-3.3
1179	R2	17,650	16,894	-4.3
	TOTAL URBAN	35,298	36,225	2.6
	TOTAL RURAL	<u>52,006</u>	<u>51,760</u>	-0.5
	TOTAL URBAN AND RURAL	87,304	87,985	0.8

DISTRICT 2

STATION	URBAN/RURAL	2005 AADT	2006 AADT	% CHANGE
11	U5	11,304	10,963	-3.0
37	U1	33,731	33,027	-2.1
280	U5	12,602	12,807	1.6
2163	U1	31,430	31,900	1.5
2264	R3	9,072	8,482	-6.5
2265	R5	3,567	3,570	0.1
2797	U1	75,350	73,586	-2.3
	TOTAL URBAN	164,417	162,283	-1.3
	TOTAL RURAL	<u>12,639</u>	<u>12,052</u>	-4.6
	TOTAL URBAN AND RURAL	177,056	174,335	-1.5

DISTRICT 3

STATION	URBAN/RURAL	2005 AADT	2006 AADT	% CHANGE
5	R3	8,452	8,328	-1.5
307	U2	50,569	49,534	-2.0
310	U2	30,201	30,682	1.6
3180	U1	80,301	79,930	-0.5
3291	U1	70,549	72,404	2.6
3293	U1	27,322	29,564	8.2
3295	R1	32,646	32,686	0.1
3321	U1	77,688	77,614	-0.1
3326	U1	92,189	93,062	0.9
4089	U1	98,655	99,453	0.8
4164	U1	91,629	89,781	-2.0
4797	R1	82,983	83,107	0.1
6125	U1	82,039	81,533	-0.6
	TOTAL URBAN	701,142	703,557	0.3
	TOTAL RURAL	<u>124,081</u>	<u>124,121</u>	0.0
	TOTAL URBAN AND RURAL	825,223	827,678	0.3

2005-2006

TRAFFIC GROWTH SUMMARY FOR CONTINUOUS COUNTING STATIONS

DISTRICT 4

STATION	URBAN/RURAL	2005 AADT	2006 AADT	% CHANGE
12	U5	8,570	8,585	0.2
18	U1	69,236	68,507	-1.1
35	U2	47,786	47,605	-0.4
403	U2	45,754	45,662	-0.2
407	U4	26,358	26,385	0.1
550	U4	43,863	43,459	-0.9
614	U1	127,086	128,877	1.4
4097	U1	159,914	159,713	-0.1
4121	U1	131,257	132,287	0.8
4137	U1	134,845	136,666	1.4
4391	U1	148,990	148,698	-0.2
4423	U1	134,979	136,338	1.0
4803	U1	157,440	157,024	-0.3
5007	U1	89,587	93,007	3.8
5010	R1	70,749	70,102	-0.9
5022	U1	134,462	136,421	1.5
5048	R1	80,096	85,224	6.4
5073	U1	129,310	132,553	2.5
5087	U1	55,708	56,460	1.3
5088	U1	71,701	72,264	0.8
5099	U1	132,094	133,387	1.0
5127	U4	15,047	14,766	-1.9
5128	R3	9,541	9,200	-3.6
5234	U1	62,130	61,693	-0.7
6255	U2	134,629	135,967	1.0
6386	U1	193,296	200,621	3.8
8011	U1	168,909	171,830	1.7
8087	U2	56,251	54,548	-3.0
8099	U1	169,479	164,260	-3.1
	TOTAL URBAN	2,648,681	2,667,583	0.7
	TOTAL RURAL	<u>160,386</u>	<u>164,526</u>	2.6
	TOTAL URBAN AND RURAL	2,809,067	2,832,109	0.8

DISTRICT 5

STATION	URBAN/RURAL	2005 AADT	2006 AADT	% CHANGE
3	U2	9,678	9,753	0.8
7	R1	36,245	36,406	0.4
15	U2	52,387	51,037	-2.6
20	R2	33,482	34,188	2.1
650	U1	109,787	108,362	-1.3
703	U3	13,522	13,524	0.0
707	R2	44,170	43,865	-0.7
708	R2	53,260	51,824	-2.7
709	U3	20,396	19,513	-4.3
6084	U1	88,786	87,512	-1.4
6089	U1	93,430	92,146	-1.4
6090	U1	86,658	87,299	0.7
6091	U1	88,228	87,357	-1.0
6210	U5	7,503	7,269	-3.1
6330	U1	67,098	68,624	2.3
6590	U1	44,928	44,830	-0.2
6630	U1	66,627	67,098	0.7
7318	U2	97,109	95,174	-2.0
7351	U5	27,844	27,722	-0.4
	TOTAL URBAN	873,981	867,220	-0.8
	TOTAL RURAL	<u>167,157</u>	<u>166,283</u>	-0.5
	TOTAL URBAN AND RURAL	1,041,138	1,033,503	-0.7

□ ITE Trip Generation Calculations

Institute of Transportation Engineers (ITE)
Land Use Code (LUC) 565 - Day Care Center

Average Vehicle Trips Ends vs: Students
Independent Variable (X): 282.00

AVERAGE WEEKDAY DAILY

T = 4.48 * (X)
T = 4.48 * 282.00
T = 1263.36
T = 1,264 vehicle trips
with 50% (632 vpd) entering and 50% (632 vpd) exiting. Total Trips

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.80 (X)
T = 0.80* 282.00
T = 225.60
T = 226 vehicle trips
with 53% (120 vpd) entering and 47% (106 vpd) exiting. Total Trips

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.82 (X)
T = 0.82* 0.00
T = 231.24
T = 232 vehicle trips
with 47% (109 vpd) entering and 53% (123 vpd) exiting. Total Trips

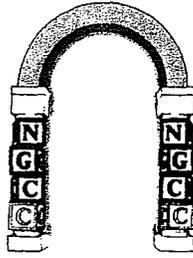
SATURDAY DAILY

T = 0.39 * (X)
T = 0.39 * 282
T = 109.98
T = 110 vehicle trips
with 50% (55 vpd) entering and 50% (55 vpd) exiting. Total Trips

SATURDAY MIDDAY PEAK HOUR OF GENERATOR

T = 0.11 * (X)
T = 0.11 * 282
T = 31.02
T = 31 vehicle trips
with 63% (20 vph) entering and 37% (11 vph) exiting. Total Trips

□ Applicant's Letter to Planning Board



Next Generation Children's Centers
A Leader in Early Childhood Education

TO: ACTON PLANNING BOARD

FROM: WALTER KELLEHER, CFO-NGCC

SUBJECT: TRAFFIC PATTERNS OF NEXT GENERATION CHILDREN'S CENTERS

DATE: JULY 11, 2007

First, let me say that Next Generation Children's Centers Inc. is a good neighbor. We are not open late. We close most days at 6:00 PM. The exception is our monthly Director's meeting. We are not open on the weekends (The exception would be special occasions such as graduation or a child I.D. drive). We meticulously care for our beautiful facilities, both inside and out, and we keep our landscaping beautiful and inviting. NGCC will provide the highest quality childcare for your townspeople and their neighbors. NGCC will create over 50 jobs for the area and make a positive contribution to the town tax base as well as providing a much-needed service for the community.

Traffic patterns vary slightly from center to center. However, they have many areas of commonality. Based upon the averages of our existing eight centers in similar communities, the traffic patterns are as follows:

- The vast majority of our families in a community-based center are people who live near our centers or who are already driving by our center. Most commuters will travel less than 5 minutes from their normal commuting pattern to go to a childcare center.
- The number of children when the center is at total capacity: **262 children**
The center will not be full for at least **three years**, but it is best to use a maximum calculation for traffic analysis. The center's enrollment will build over a period of time and will not cause an overwhelming influx of vehicles into the area.

Next Generation Children's Centers Inc.
Corporate Offices
307 Boston Post Road Sudbury, MA 01776

- The average percentage of siblings in all of our centers is **19.5%** of the total enrollment. Therefore **20%** is not an unreasonable supposition. This reduces the total number of trips by **20%** or **52** trips in the morning and **52** trips in the evening. Employee's children reduce the number of trips by another **5%** or **13** trips in the morning and **13** trips in the evening. Therefore the maximum number of morning parent trips would be **199** and the number of evening parent trips would be **199** trips when the center is at total capacity. This does not consider any carpooling.
- Without knowing in advance as to what our enrollment structure would look like, we can only use our experience and expertise in similar sized centers in towns with similar demographics.
 - **98%** of our children are dropped off between 7:00 AM and 10:00 A.M. and picked up between 3:00 PM and 6:00 P.M.
 - The pattern is well distributed throughout the three-hour period.
 - The average is **60** trips per hour or **15** trips per **15** minutes in a center with a **240** child enrollment. The Acton average will be **66** trips per hour or **17** trips per **15** minutes.
 - The average drop off time in the morning is significantly shorter than the afternoon. (**8** minutes in the morning and **14** minutes in the evening).
- There will be **44** assigned teachers and **3** floating teachers or program managers in the Acton center. Adding the **2** Co-Directors and **1** assistant and **2** cooks, the total is **52** employees maximum in the center at one time when the center is at full occupancy. The majority of the teachers and management arrive in the morning **before** the arrival of the children. Our teachers park in an assigned area farthest from the entrance. We reserve between **30 to 50** parking spots close to the entrance for parent parking. Per the state regulations for early childhood providers, each parent must accompany their children into the center and to their classroom and sign them in and out.
- Our **ideal** setup for parking is for **50** reserved parking spots for employees and **30 to 50** parking spots reserved for parents.
- All three of our 20,000 square foot prototypes have less than 100 parking spots and function well without parking problems or customer complaints. We believe that the proposed **82** parking spots give us more than enough spots to cover any contingencies.

Thank you for your consideration.

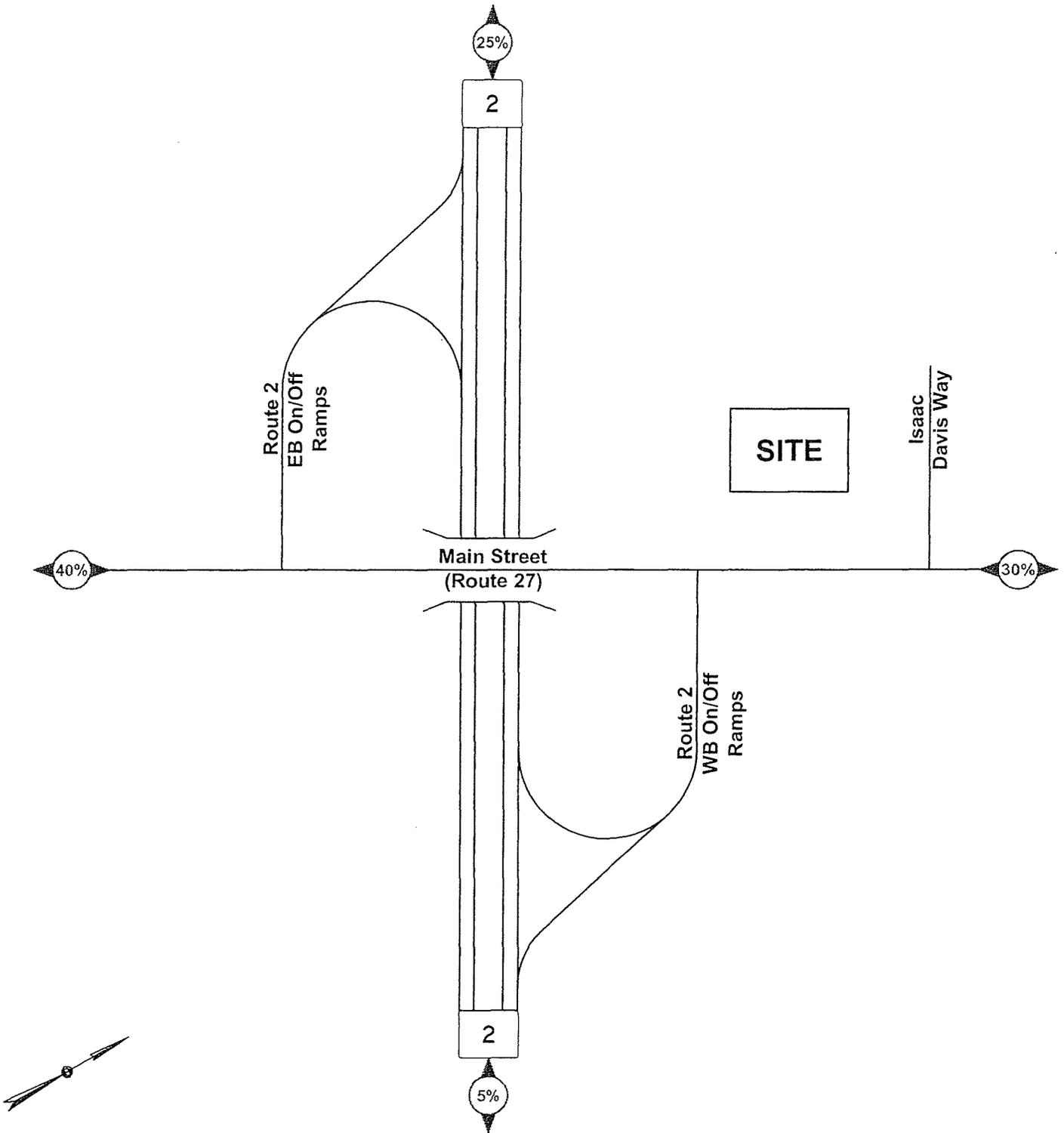
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 Corporate Offices
 307 Boston Post Road Sudbury, MA 01776

□ Trip Distribution Calculations

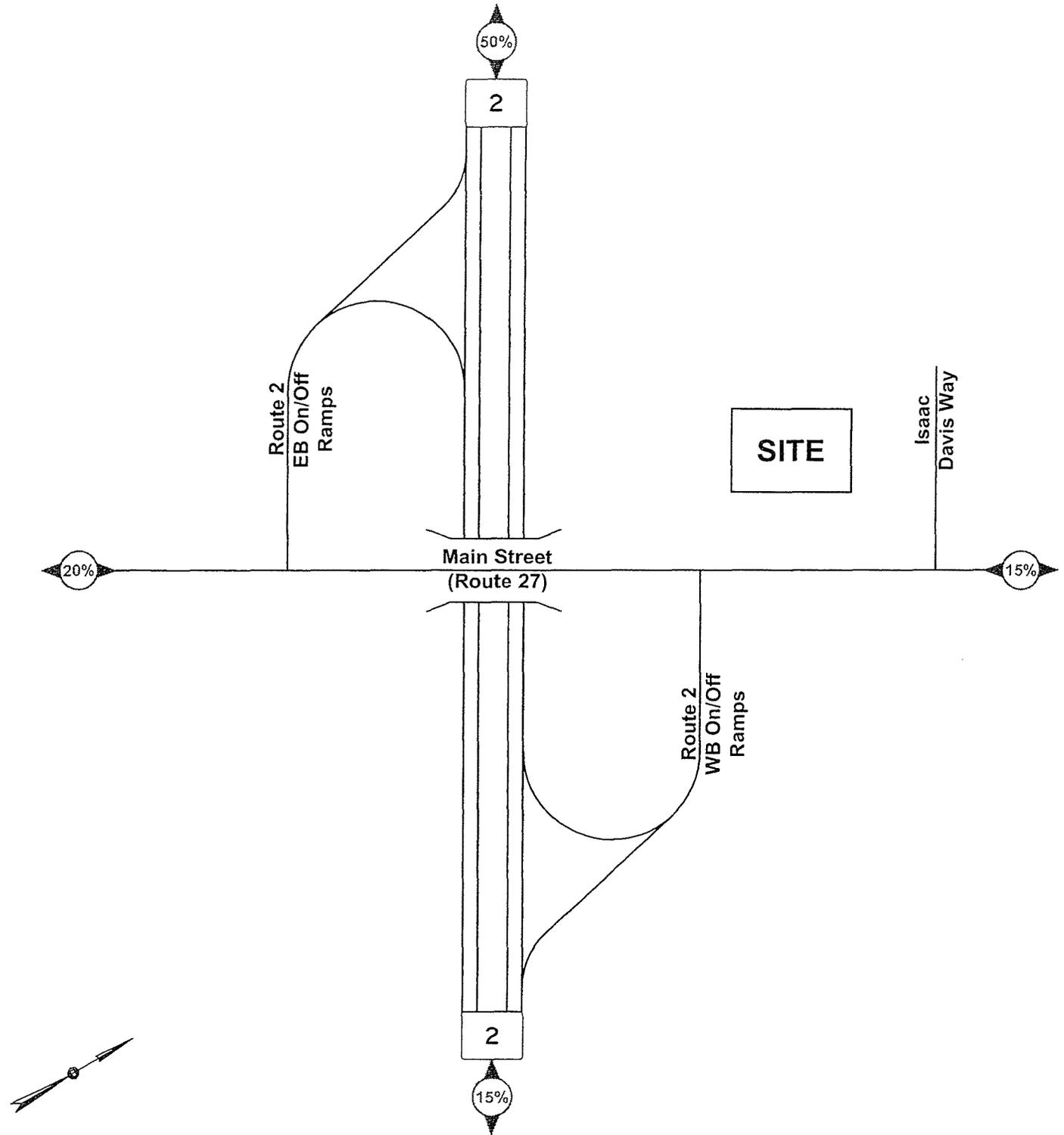
**Residence MCD/County to Workplace MCD/County Flows for Massachusetts: 2000
Sorted by Workplace State-County, or State-County-County Subdivision (in 12 states)**

Residence State-County-MCD Name	Workplace State-County-MCD Name	Count			To Site
Burlington town Middlesex Co. MA	Acton town Middlesex Co. MA	43	0.4%	2W	
Wellesley town Norfolk Co. MA	Acton town Middlesex Co. MA	43	0.4%	2W	
Lynn city Essex Co. MA	Acton town Middlesex Co. MA	44	0.4%	2W	
Needham town Norfolk Co. MA	Acton town Middlesex Co. MA	44	0.4%	2W	
Bedford town Middlesex Co. MA	Acton town Middlesex Co. MA	48	0.4%	2W	
Gardner city Worcester Co. MA	Acton town Middlesex Co. MA	48	0.4%	2E	
Stoneham town Middlesex Co. MA	Acton town Middlesex Co. MA	48	0.4%	2W	
Tewksbury town Middlesex Co. MA	Acton town Middlesex Co. MA	49	0.4%	2E	
Wilmington town Middlesex Co. MA	Acton town Middlesex Co. MA	50	0.4%	2E	
Milford town Worcester Co. MA	Acton town Middlesex Co. MA	51	0.4%	2E	
Brookline town Norfolk Co. MA	Acton town Middlesex Co. MA	52	0.4%	2W	
Hudson town Hillsborough Co. NH	Acton town Middlesex Co. MA	52	0.4%	2E	
Winchendon town Worcester Co. MA	Acton town Middlesex Co. MA	52	0.4%	2E	
Carlisle town Middlesex Co. MA	Acton town Middlesex Co. MA	53	0.5%	27S	
Lancaster town Worcester Co. MA	Acton town Middlesex Co. MA	56	0.5%	2E	
Watertown city Middlesex Co. MA	Acton town Middlesex Co. MA	56	0.5%	2W	
Franklin city Norfolk Co. MA	Acton town Middlesex Co. MA	60	0.5%	2E	
Tyngsbor. town Middlesex Co. MA	Acton town Middlesex Co. MA	62	0.5%	2E	
Medford city Middlesex Co. MA	Acton town Middlesex Co. MA	66	0.6%	2W	
Sudbury town Middlesex Co. MA	Acton town Middlesex Co. MA	68	0.6%	27N	
Cambridge city Middlesex Co. MA	Acton town Middlesex Co. MA	69	0.6%	2W	
Shrewsbury town Worcester Co. MA	Acton town Middlesex Co. MA	69	0.6%	2E	
Northbor. town Worcester Co. MA	Acton town Middlesex Co. MA	71	0.6%	2E	
Andover town Essex Co. MA	Acton town Middlesex Co. MA	72	0.6%	2E	
Hudson town Middlesex Co. MA	Acton town Middlesex Co. MA	73	0.6%	2E	
Lexington town Middlesex Co. MA	Acton town Middlesex Co. MA	75	0.6%	2W	
Newton city Middlesex Co. MA	Acton town Middlesex Co. MA	75	0.6%	2W	
Woburn city Middlesex Co. MA	Acton town Middlesex Co. MA	76	0.6%	2W	
Haverhill city Essex Co. MA	Acton town Middlesex Co. MA	89	0.8%	2E	
Arlington town Middlesex Co. MA	Acton town Middlesex Co. MA	90	0.8%	2W	
Natick town Middlesex Co. MA	Acton town Middlesex Co. MA	94	0.8%	27N	
Belmont town Middlesex Co. MA	Acton town Middlesex Co. MA	99	0.8%	2W	
Clinton town Worcester Co. MA	Acton town Middlesex Co. MA	104	0.9%	2E	
Lunenburg town Worcester Co. MA	Acton town Middlesex Co. MA	108	0.9%	2E	
Worcester city Worcester Co. MA	Acton town Middlesex Co. MA	108	0.9%	2W	
Somerville city Middlesex Co. MA	Acton town Middlesex Co. MA	111	0.9%	2W	
Malden city Middlesex Co. MA	Acton town Middlesex Co. MA	117	1.0%	2E	
Dracut town Middlesex Co. MA	Acton town Middlesex Co. MA	125	1.1%	2E	
Shirley town Middlesex Co. MA	Acton town Middlesex Co. MA	133	1.1%	2E	
Ayer town Middlesex Co. MA	Acton town Middlesex Co. MA	144	1.2%	2E	
Nashua city Hillsborough Co. NH	Acton town Middlesex Co. MA	151	1.3%	2E	
Fitchburg city Worcester Co. MA	Acton town Middlesex Co. MA	153	1.3%	2E	
Harvard town Worcester Co. MA	Acton town Middlesex Co. MA	159	1.4%	2E	
Townsend town Middlesex Co. MA	Acton town Middlesex Co. MA	165	1.4%	2W	
Waltham city Middlesex Co. MA	Acton town Middlesex Co. MA	179	1.5%	2E	
Groton town Middlesex Co. MA	Acton town Middlesex Co. MA	182	1.5%	2E	
Framingham town Middlesex Co. MA	Acton town Middlesex Co. MA	193	1.6%	2W	
Stow town Middlesex Co. MA	Acton town Middlesex Co. MA	193	1.6%	27N	
Pepperell town Middlesex Co. MA	Acton town Middlesex Co. MA	198	1.7%	2E	
Concord town Middlesex Co. MA	Acton town Middlesex Co. MA	209	1.8%	2W	
Marlbor. city Middlesex Co. MA	Acton town Middlesex Co. MA	212	1.8%	2E	

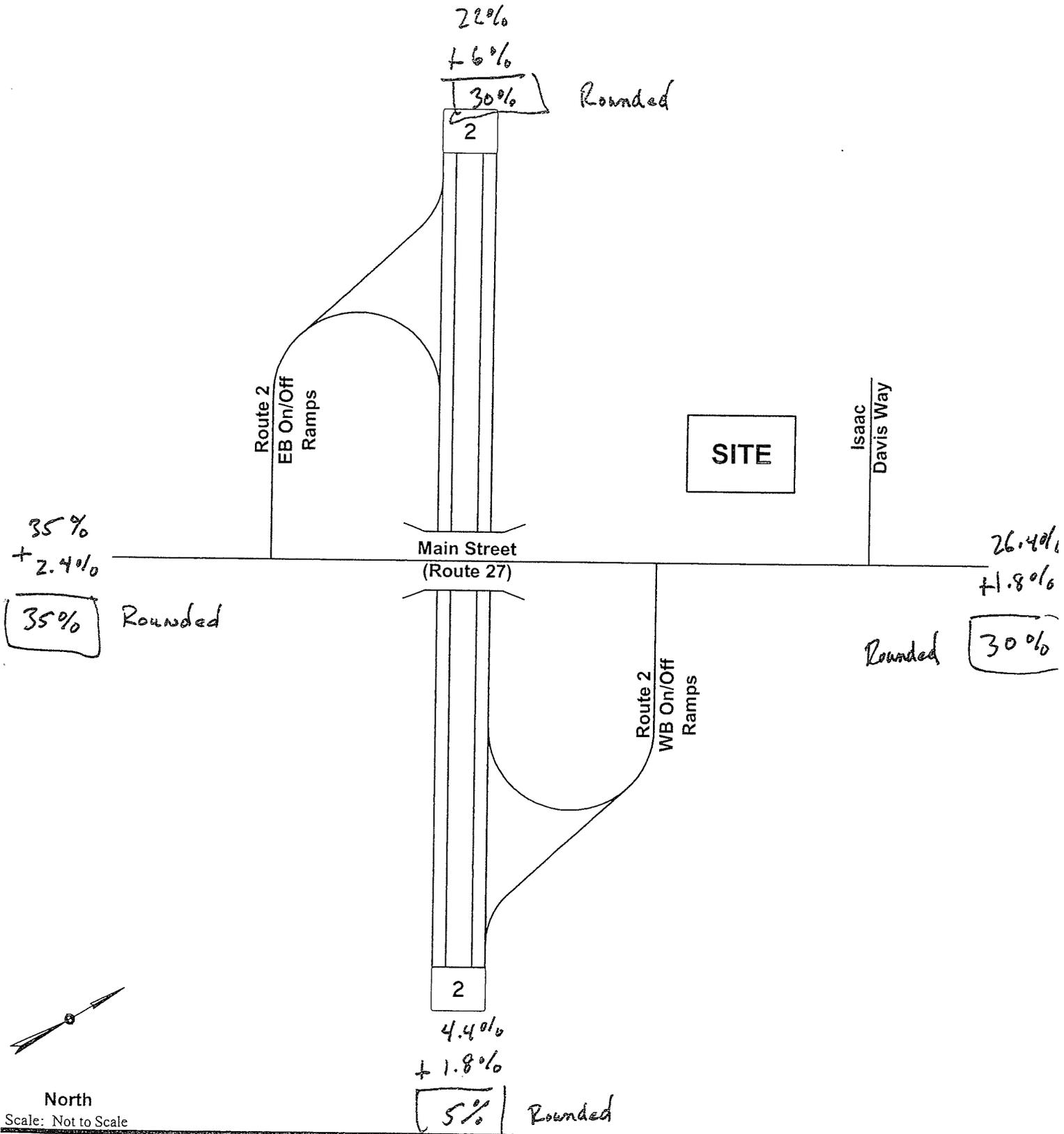
Billerica town Middlesex Co. MA	Acton town Middlesex Co. MA	222	1.9%	2E	
Boston city Suffolk Co. MA	Acton town Middlesex Co. MA	236	2.0%	2W	
Boxbor. town Middlesex Co. MA	Acton town Middlesex Co. MA	251	2.1%	27N	
Littleton town Middlesex Co. MA	Acton town Middlesex Co. MA	295	2.5%	2E	
Westford town Middlesex Co. MA	Acton town Middlesex Co. MA	330	2.8%	2E	
Lowell city Middlesex Co. MA	Acton town Middlesex Co. MA	338	2.9%	2E	
Leominster city Worcester Co. MA	Acton town Middlesex Co. MA	345	2.9%	2E	
Chelmsford town Middlesex Co. MA	Acton town Middlesex Co. MA	357	3.0%	2E	
Maynard town Middlesex Co. MA	Acton town Middlesex Co. MA	371	3.2%	27N	
Acton town Middlesex Co. MA	Acton town Middlesex Co. MA	2418	20.5%		27S
	Total	11774	100.0%		



North
Scale: Not to Scale



North
Scale: Not to Scale



MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Trip Distribution Calculations

<u>Trips</u>	282 Students	⇒ 88%
	40 Employee's	⇒ 12%
	322 Total	

□ Capacity Analyses

LEVEL OF SERVICE METHODOLOGY

Capacity analysis of intersections is developed using the Synchro® computer software, which implements the methods of the 2000 Highway Capacity Manual (HCM). The resulting analysis presents a level-of-service (LOS) designation for individual intersection movements and (for signalized intersections) for the entire intersection. The LOS is a letter designation that provides a qualitative measure of operating conditions based on several factors including roadway geometry, speeds, ambient traffic volumes, traffic controls, and driver characteristics. Since the LOS of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of LOS, depending on the time of day, day of week, or period of year. A range of six levels of service are defined on the basis of average delay, ranging from LOS A (the least delay) to LOS F (delays greater than 50 seconds for unsignalized movements, and greater than 80 seconds for signalized movements).

Signalized Intersection Performance Measures

The six LOS designations for signalized intersections may be described as follows:

- *LOS A* describes operations with low control delay; most vehicles do not stop at all.
- *LOS B* describes operations with relatively low control delay. However, more vehicles stop than LOS A.
- *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.
- *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.
- *LOS E* describes operations with high control delay values. Individual cycle failures are frequent occurrences.
- *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.

The LOS for signalized intersections are calculated using the operational analysis methodology of the 2000 *Highway Capacity Manual*.¹ This method assesses the effects of signal type, timing, phasing, and 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 is a measure of 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 A1** 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 A1
LEVEL-OF-SERVICE CRITERIA
FOR SIGNALIZED INTERSECTIONS¹

Level of Service	Control (Signal) Delay per Vehicle (Seconds)
A	≤10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	>80.0

¹Source: *Highway Capacity Manual 2000*; Transportation Research Board; Washington, DC; 2000.

¹*Highway Capacity Manual 2000*; Transportation Research Board; Washington, DC; 2000.

Unsignalized Intersection Performance Measures

The six LOS designations for unsignalized intersections may be described as follows:

- *LOS A* represents a condition with little or no control delay to minor street traffic.
- *LOS B* represents a condition with short control delays to minor street traffic.
- *LOS C* represents a condition with average control delays to minor street traffic.
- *LOS D* represents a condition with long control delays to minor street traffic.
- *LOS E* represents operating conditions at or near capacity level, with very long control delays to minor street traffic.
- *LOS F* represents a condition where minor street demand volume exceeds capacity of an approach lane, with extreme control delays resulting.

The LOS designations of unsignalized intersections are determined by application of a procedure described in the 2000 *Highway Capacity Manual*.² LOS 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. Definitions for LOS at unsignalized intersections are also given in the *Highway Capacity Manual 2000*. **Table A2** summarizes the relationship between LOS and average control delay.

Table A2
LEVEL-OF-SERVICE CRITERIA FOR
UNSIGNALIZED INTERSECTIONS¹

Level of Service	Average Control Delay (seconds per vehicle)
A	≤ 10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	>50.0

¹Source: *Highway Capacity Manual 2000*, Transportation Research Board; Washington, DC; 2000.

² ibid

HCM Unsignalized Intersection Capacity Analysis
 1: Isaac Davis Way & Main Street (Route 27)

2008 Existing Conditions
 Morning Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	0	0	740	581	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	0	779	612	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1391	612	612			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1391	612	612			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	158	497	977			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	0	779	612			
Volume Left	0	0	0			
Volume Right	0	0	0			
cSH	1700	977	1700			
Volume to Capacity	0.00	0.00	0.36			
Queue Length 95th (ft)	0	0	.0			
Control Delay (s)	0.0	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	0.0	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization		42.3%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 2: Route 2 WB off ramp & Main Street (Route 27)

2008 Existing Conditions
 Morning Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	8	53	687	249	87	494
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	9	56	731	265	93	526
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1574	863			731	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1574	863			731	
tC, single (s)	6.4	6.2			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.3	
p0 queue free %	92	84			89	
cM capacity (veh/h)	109	354			847	
Direction, Lane #	WB 1	WB 2	NB 1	SB 1		
Volume Total	9	56	996	618		
Volume Left	9	0	0	93		
Volume Right	0	56	265	0		
cSH	109	354	1700	847		
Volume to Capacity	0.08	0.16	0.59	0.11		
Queue Length 95th (ft)	6	14	0	9		
Control Delay (s)	40.8	17.1	0.0	2.8		
Lane LOS	E	C		A		
Approach Delay (s)	20.2		0.0	2.8		
Approach LOS	C					
Intersection Summary						
Average Delay			1.8			
Intersection Capacity Utilization			95.5%		ICU Level of Service	F
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 3: Route 2 EB off ramp & Main Street (Route 27)

2008 Existing Conditions
 Morning Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	197	494	21	739	446	56
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	210	526	22	786	474	60
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1335	504	534			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1335	504	534			
tC, single (s)	6.4	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.3			
p0 queue free %	0	7	98			
cM capacity (veh/h)	164	566	994			
Direction, Lane #	EB 1	EB 2	NB 1	SB 1		
Volume Total	210	526	809	534		
Volume Left	210	0	22	0		
Volume Right	0	526	0	60		
cSH	164	566	994	1700		
Volume to Capacity	1.28	0.93	0.02	0.31		
Queue Length 95th (ft)	304	294	2	0		
Control Delay (s)	218.2	49.4	0.6	0.0		
Lane LOS	F	E	A			
Approach Delay (s)	97.5		0.6	0.0		
Approach LOS	F					
Intersection Summary						
Average Delay			34.7			
Intersection Capacity Utilization			73.4%		ICU Level of Service	D
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 1: Isaac Davis Way & Main Street (Route 27)

2008 Existing Conditions
 Evening Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	0	0	843	824	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	0	887	867	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1755	867	867			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1755	867	867			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	95	355	785			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	0	887	867			
Volume Left	0	0	0			
Volume Right	0	0	0			
cSH	1700	785	1700			
Volume to Capacity	0.00	0.00	0.51			
Queue Length 95th (ft)	0	0	0			
Control Delay (s)	0.0	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	0.0	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization		47.7%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 2: Route 2 WB off ramp & Main Street (Route 27)

2008 Existing Conditions
 Evening Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	12	78	765	490	158	666
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	12	79	773	495	160	673
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2012	1020			773	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2012	1020			773	
tC, single (s)	6.5	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.2	
p0 queue free %	76	73			81	
cM capacity (veh/h)	50	288			842	
Direction, Lane #	WB 1	WB 2	NB 1	SB 1		
Volume Total	12	79	1268	832		
Volume Left	12	0	0	160		
Volume Right	0	79	495	0		
cSH	50	288	1700	842		
Volume to Capacity	0.24	0.27	0.75	0.19		
Queue Length 95th (ft)	20	27	0	17		
Control Delay (s)	97.6	22.1	0.0	4.6		
Lane LOS	F	C		A		
Approach Delay (s)	32.2		0.0	4.6		
Approach LOS	D					
Intersection Summary						
Average Delay			3.1			
Intersection Capacity Utilization			127.3%		ICU Level of Service	H
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 3: Route 2 EB off ramp & Main Street (Route 27)

2008 Existing Conditions
 Evening Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	84	271	28	1171	603	75
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	88	282	29	1220	628	78
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1945	667	706			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1945	667	706			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	39	97			
cM capacity (veh/h)	69	460	901			
Direction, Lane #	EB 1	EB 2	NB 1	SB 1		
Volume Total	88	282	1249	706		
Volume Left	88	0	29	0		
Volume Right	0	282	0	78		
cSH	69	460	901	1700		
Volume to Capacity	1.26	0.61	0.03	0.42		
Queue Length 95th (ft)	174	101	3	0		
Control Delay (s)	297.2	24.4	1.2	0.0		
Lane LOS	F	C	A			
Approach Delay (s)	89.0		1.2	0.0		
Approach LOS	F					
Intersection Summary						
Average Delay			14.8			
Intersection Capacity Utilization			95.5%	ICU Level of Service		F
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 1: Isaac Davis Way & Main Street (Route 27)

2013 No-Build Conditions
 Morning Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	0	0	778	610	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	0	819	642	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1461	642	642			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1461	642	642			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	143	478	952			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	0	819	642			
Volume Left	0	0	0			
Volume Right	0	0	0			
cSH	1700	952	1700			
Volume to Capacity	0.00	0.00	0.38			
Queue Length 95th (ft)	0	0	0			
Control Delay (s)	0.0	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	0.0	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization		44.3%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 2: Route 2 WB off ramp & Main Street (Route 27)

2013 No-Build Conditions
 Morning Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	8	56	722	262	91	519
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	9	60	768	279	97	552
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1653	907			768	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1653	907			768	
tC, single (s)	6.4	6.2			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.3	
p0 queue free %	91	82			88	
cM capacity (veh/h)	96	334			820	
Direction, Lane #						
	WB 1	WB 2	NB 1	SB 1		
Volume Total	9	60	1047	649		
Volume Left	9	0	0	97		
Volume Right	0	60	279	0		
cSH	96	334	1700	820		
Volume to Capacity	0.09	0.18	0.62	0.12		
Queue Length 95th (ft)	7	16	0	10		
Control Delay (s)	45.9	18.1	0.0	3.0		
Lane LOS	E	C		A		
Approach Delay (s)	21.6		0.0	3.0		
Approach LOS	C					
Intersection Summary						
Average Delay			1.9			
Intersection Capacity Utilization			99.6%		ICU Level of Service	F
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 3: Route 2 EB off ramp & Main Street (Route 27)

2013 No-Build Conditions
 Morning Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	207	519	22	777	469	59
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	220	552	23	827	499	63
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1404	530	562			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1404	530	562			
tC, single (s)	6.4	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.3			
p0 queue free %	0	0	98			
cM capacity (veh/h)	149	547	971			
Direction, Lane #	EB 1	EB 2	NB 1	SB 1		
Volume Total	220	552	850	562		
Volume Left	220	0	23	0		
Volume Right	0	552	0	63		
cSH	149	547	971	1700		
Volume to Capacity	1.48	1.01	0.02	0.33		
Queue Length 95th (ft)	365	368	2	0		
Control Delay (s)	304.5	68.6	0.6	0.0		
Lane LOS	F	F	A			
Approach Delay (s)	135.8		0.6	0.0		
Approach LOS	F					
Intersection Summary						
Average Delay			48.3			
Intersection Capacity Utilization			76.8%		ICU Level of Service	D
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 1: Isaac Davis Way & Main Street (Route 27)

2013 No-Build Conditions
 Evening Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	0	0	886	866	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	0	933	912	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1844	912	912			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1844	912	912			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	83	335	756			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	0	933	912			
Volume Left	0	0	0			
Volume Right	0	0	0			
cSH	1700	756	1700			
Volume to Capacity	0.00	0.00	0.54			
Queue Length 95th (ft)	0	0	0			
Control Delay (s)	0.0	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	0.0	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization		50.0%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 2: Route 2 WB off ramp & Main Street (Route 27)

2013 No-Build Conditions
 Evening Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	12	82	804	515	166	700
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	12	83	812	520	168	707
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2115	1072			812	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2115	1072			812	
tC, single (s)	6.5	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.2	
p0 queue free %	72	69			79	
cM capacity (veh/h)	43	269			814	
Direction, Lane #	WB 1	WB 2	NB 1	SB 1		
Volume Total	12	83	1332	875		
Volume Left	12	0	0	168		
Volume Right	0	83	520	0		
cSH	43	269	1700	814		
Volume to Capacity	0.28	0.31	0.78	0.21		
Queue Length 95th (ft)	24	32	0	19		
Control Delay (s)	120.4	24.2	0.0	5.0		
Lane LOS	F	C		A		
Approach Delay (s)	36.5		0.0	5.0		
Approach LOS	E					
Intersection Summary						
Average Delay			3.4			
Intersection Capacity Utilization		133.1%		ICU Level of Service		H
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 3: Route 2 EB off ramp & Main Street (Route 27)

2013 No-Build Conditions
 Evening Peak Hour

Movement						
	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	88	285	29	1231	634	79
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	92	297	30	1282	660	82
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2044	702	743			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2044	702	743			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	33	97			
cM capacity (veh/h)	60	440	874			
Direction, Lane #	EB 1	EB 2	NB 1	SB 1		
Volume Total	92	297	1312	743		
Volume Left	92	0	30	0		
Volume Right	0	297	0	82		
cSH	60	440	874	1700		
Volume to Capacity	1.53	0.67	0.03	0.44		
Queue Length 95th (ft)	204	122	3	0		
Control Delay (s)	419.1	28.5	1.5	0.0		
Lane LOS	F	D	A			
Approach Delay (s)	120.7		1.5	0.0		
Approach LOS	F					
Intersection Summary						
Average Delay			20.0			
Intersection Capacity Utilization			99.6%	ICU Level of Service		F
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 1: Isaac Davis Way & Main Street (Route 27)

2013 Build Conditions - ITE
 Morning Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	32	74	84	778	610	36
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	34	78	88	819	642	38
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1657	661	680			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1657	661	680			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	66	83	90			
cM capacity (veh/h)	98	466	922			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	112	907	680			
Volume Left	34	88	0			
Volume Right	78	0	38			
cSH	219	922	1700			
Volume to Capacity	0.51	0.10	0.40			
Queue Length 95th (ft)	65	8	0			
Control Delay (s)	37.4	2.5	0.0			
Lane LOS	E	A				
Approach Delay (s)	37.4	2.5	0.0			
Approach LOS	E					
Intersection Summary						
Average Delay			3.8			
Intersection Capacity Utilization		96.2%		ICU Level of Service	F	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 2: Route 2 WB off ramp & Main Street (Route 27)

2013 Build Conditions - ITE
 Morning Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	8	62	800	262	123	561
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	9	66	851	279	131	597
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1849	990			851	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1849	990			851	
tC, single (s)	6.4	6.2			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.3	
p0 queue free %	88	78			83	
cM capacity (veh/h)	69	299			762	
Direction, Lane #	WB 1	WB 2	NB 1	SB 1		
Volume Total	9	66	1130	728		
Volume Left	9	0	0	131		
Volume Right	0	66	279	0		
cSH	69	299	1700	762		
Volume to Capacity	0.12	0.22	0.66	0.17		
Queue Length 95th (ft)	10	21	0	15		
Control Delay (s)	64.8	20.4	0.0	4.2		
Lane LOS	F	C		A		
Approach Delay (s)	25.5		0.0	4.2		
Approach LOS	D					
Intersection Summary						
Average Delay			2.6			
Intersection Capacity Utilization		107.7%		ICU Level of Service		G
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 3: Route 2 EB off ramp & Main Street (Route 27)

2013 Build Conditions - ITE
 Morning Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	243	519	22	819	506	64
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	259	552	23	871	538	68
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1490	572	606			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1490	572	606			
tC, single (s)	6.4	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.3			
p0 queue free %	0	0	97			
cM capacity (veh/h)	131	517	934			
Direction, Lane #	EB 1	EB 2	NB 1	SB 1		
Volume Total	259	552	895	606		
Volume Left	259	0	23	0		
Volume Right	0	552	0	68		
cSH	131	517	934	1700		
Volume to Capacity	1.97	1.07	0.03	0.36		
Queue Length 95th (ft)	515	418	2	0		
Control Delay (s)	517.6	86.7	0.7	0.0		
Lane LOS	F	F	A			
Approach Delay (s)	224.1		0.7	0.0		
Approach LOS	F					
Intersection Summary						
Average Delay			78.9			
Intersection Capacity Utilization			80.9%		ICU Level of Service	D
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 1: Isaac Davis Way & Main Street (Route 27)

2013 Build Conditions - ITE
 Evening Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	37	86	76	886	866	33
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	39	91	80	933	912	35
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2022	929	946			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2022	929	946			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	32	72	89			
cM capacity (veh/h)	58	327	733			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	129	1013	946			
Volume Left	39	80	0			
Volume Right	91	0	35			
cSH	136	733	1700			
Volume to Capacity	0.95	0.11	0.56			
Queue Length 95th (ft)	165	9	0			
Control Delay (s)	128.1	3.2	0.0			
Lane LOS	F	A				
Approach Delay (s)	128.1	3.2	0.0			
Approach LOS	F					
Intersection Summary						
Average Delay			9.5			
Intersection Capacity Utilization		115.8%		ICU Level of Service		H
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 2: Route 2 WB off ramp & Main Street (Route 27)

2013 Build Conditions - ITE
 Evening Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	12	87	875	515	203	749
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	12	88	884	520	205	757
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2311	1144			884	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2311	1144			884	
tC, single (s)	6.5	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.2	
p0 queue free %	59	64			73	
cM capacity (veh/h)	29	244			765	
Direction, Lane #	WB 1	WB 2	NB 1	SB 1		
Volume Total	12	88	1404	962		
Volume Left	12	0	0	205		
Volume Right	0	88	520	0		
cSH	29	244	1700	765		
Volume to Capacity	0.41	0.36	0.83	0.27		
Queue Length 95th (ft)	33	39	0	27		
Control Delay (s)	195.8	27.8	0.0	6.8		
Lane LOS	F	D		A		
Approach Delay (s)	48.1		0.0	6.8		
Approach LOS	E					
Intersection Summary						
Average Delay			4.6			
Intersection Capacity Utilization			141.4%		ICU Level of Service	H
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 3: Route 2 EB off ramp & Main Street (Route 27)

2013 Build Conditions - ITE
 Evening Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	121	285	29	1269	677	85
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	126	297	30	1322	705	89
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2132	749	794			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2132	749	794			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	28	96			
cM capacity (veh/h)	53	413	836			
Direction, Lane #	EB 1	EB 2	NB 1	SB 1		
Volume Total	126	297	1352	794		
Volume Left	126	0	30	0		
Volume Right	0	297	0	89		
cSH	53	413	836	1700		
Volume to Capacity	2.39	0.72	0.04	0.47		
Queue Length 95th (ft)	321	139	3	0		
Control Delay (s)	799.1	33.0	1.7	0.0		
Lane LOS	F	D	A			
Approach Delay (s)	261.3		1.7	0.0		
Approach LOS	F					
Intersection Summary						
Average Delay			43.9			
Intersection Capacity Utilization		103.4%		ICU Level of Service	G	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 1: Isaac Davis Way & Main Street (Route 27)

2013 Build Conditions - NGCC
 Morning Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	21	50	50	778	610	21
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	22	53	53	819	642	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1577	653	664			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1577	653	664			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	81	89	94			
cM capacity (veh/h)	115	471	934			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	75	872	664			
Volume Left	22	53	0			
Volume Right	53	0	22			
cSH	246	934	1700			
Volume to Capacity	0.30	0.06	0.39			
Queue Length 95th (ft)	31	4	0			
Control Delay (s)	25.9	1.5	0.0			
Lane LOS	D	A				
Approach Delay (s)	25.9	1.5	0.0			
Approach LOS	D					
Intersection Summary						
Average Delay			2.0			
Intersection Capacity Utilization		91.3%		ICU Level of Service		F
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 2: Route 2 WB off ramp & Main Street (Route 27)

2013 Build Conditions - NGCC
 Morning Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	8	60	768	262	112	548
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	9	64	817	279	119	583
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1778	956			817	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1778	956			817	
tC, single (s)	6.4	6.2			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.3	
p0 queue free %	89	80			85	
cM capacity (veh/h)	78	313			785	
Direction, Lane #	WB 1	WB 2	NB 1	SB 1		
Volume Total	9	64	1096	702		
Volume Left	9	0	0	119		
Volume Right	0	64	279	0		
cSH	78	313	1700	785		
Volume to Capacity	0.11	0.20	0.64	0.15		
Queue Length 95th (ft)	9	19	0	13		
Control Delay (s)	56.9	19.4	0.0	3.8		
Lane LOS	F	C		A		
Approach Delay (s)	23.8		0.0	3.8		
Approach LOS	C					
Intersection Summary						
Average Delay			2.3			
Intersection Capacity Utilization			104.7%		ICU Level of Service	G
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 3: Route 2 EB off ramp & Main Street (Route 27)

2013 Build Conditions - NGCC
 Morning Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	228	519	22	802	494	63
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	243	552	23	853	526	67
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1459	559	593			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1459	559	593			
tC, single (s)	6.4	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.3			
p0 queue free %	0	0	98			
cM capacity (veh/h)	137	527	945			
Direction, Lane #	EB 1	EB 2	NB 1	SB 1		
Volume Total	243	552	877	593		
Volume Left	243	0	23	0		
Volume Right	0	552	0	67		
cSH	137	527	945	1700		
Volume to Capacity	1.77	1.05	0.02	0.35		
Queue Length 95th (ft)	454	402	2	0		
Control Delay (s)	428.0	80.6	0.7	0.0		
Lane LOS	F	F	A			
Approach Delay (s)	186.6		0.7	0.0		
Approach LOS	F					
Intersection Summary						
Average Delay			65.8			
Intersection Capacity Utilization			79.2%		ICU Level of Service	D
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 1: Isaac Davis Way & Main Street (Route 27)

2013 Build Conditions - NGCC
 Evening Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	21	50	50	886	866	21
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	22	53	53	933	912	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1961	923	934			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1961	923	934			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	66	84	93			
cM capacity (veh/h)	66	330	741			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	75	985	934			
Volume Left	22	53	0			
Volume Right	53	0	22			
cSH	150	741	1700			
Volume to Capacity	0.50	0.07	0.55			
Queue Length 95th (ft)	59	6	0			
Control Delay (s)	50.5	2.1	0.0			
Lane LOS	F	A				
Approach Delay (s)	50.5	2.1	0.0			
Approach LOS	F					
Intersection Summary						
Average Delay			2.9			
Intersection Capacity Utilization		98.4%		ICU Level of Service		F
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 2: Route 2 WB off ramp & Main Street (Route 27)

2013 Build Conditions - NGCC
 Evening Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	12	86	850	515	187	729
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	12	87	859	520	189	736
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2233	1119			859	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2233	1119			859	
tC, single (s)	6.5	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.2	
p0 queue free %	65	66			76	
cM capacity (veh/h)	34	253			782	
Direction, Lane #	WB 1	WB 2	NB 1	SB 1		
Volume Total	12	87	1379	925		
Volume Left	12	0	0	189		
Volume Right	0	87	520	0		
cSH	34	253	1700	782		
Volume to Capacity	0.35	0.34	0.81	0.24		
Queue Length 95th (ft)	29	37	0	24		
Control Delay (s)	159.9	26.5	0.0	6.0		
Lane LOS	F	D		A		
Approach Delay (s)	42.8		0.0	6.0		
Approach LOS	E					
Intersection Summary						
Average Delay			4.1			
Intersection Capacity Utilization		138.2%		ICU Level of Service	H	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 3: Route 2 EB off ramp & Main Street (Route 27)

2013 Build Conditions - NGCC
 Evening Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	109	285	29	1256	659	83
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	114	297	30	1308	686	86
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2098	730	773			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2098	730	773			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	30	96			
cM capacity (veh/h)	55	424	851			
Direction, Lane #	EB 1	EB 2	NB 1	SB 1		
Volume Total	114	297	1339	773		
Volume Left	114	0	30	0		
Volume Right	0	297	0	86		
cSH	55	424	851	1700		
Volume to Capacity	2.05	0.70	0.04	0.45		
Queue Length 95th (ft)	278	131	3	0		
Control Delay (s)	645.9	31.0	1.6	0.0		
Lane LOS	F	D	A			
Approach Delay (s)	201.1		1.6	0.0		
Approach LOS	F					
Intersection Summary						
Average Delay			33.6			
Intersection Capacity Utilization		102.1%		ICU Level of Service		G
Analysis Period (min)			15			

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

Route 2 EB Off Ramp
Main Street (Route 27)
Acton, MA

File Name : 442 Delay Study RT 2 WB Off Ramp
Site Code : 00442001
Start Date : 5/23/2008
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L n.	No.	Joined Queue	Released From Queue	Delay
1	1	7:00:00 AM	7:00:05 AM	5
1	2	7:00:06 AM	7:00:15 AM	9
1	3	7:00:11 AM	7:00:17 AM	6
1	4	7:01:03 AM	7:01:10 AM	7
1	5	7:02:35 AM	7:02:41 AM	6
1	6	7:03:53 AM	7:04:20 AM	27
1	7	7:04:14 AM	7:04:32 AM	18
1	8	7:04:41 AM	7:05:04 AM	23
1	9	7:04:56 AM	7:05:24 AM	28
1	10	7:06:18 AM	7:06:47 AM	29
1	11	7:06:33 AM	7:06:52 AM	19
1	12	7:06:50 AM	7:06:57 AM	7
1	13	7:07:37 AM	7:07:41 AM	4
1	14	7:09:13 AM	7:09:38 AM	25
1	15	7:09:34 AM	7:09:47 AM	13
1	16	7:09:35 AM	7:10:21 AM	46
1	17	7:12:59 AM	7:13:07 AM	8
1	18	7:13:23 AM	7:13:35 AM	12
1	19	7:13:26 AM	7:13:37 AM	11
1	20	7:14:35 AM	7:14:41 AM	6
1	21	7:14:43 AM	7:14:52 AM	9
1	22	7:16:18 AM	7:16:44 AM	26
1	23	7:16:44 AM	7:17:19 AM	35
1	24	7:17:00 AM	7:17:22 AM	22
1	25	7:18:13 AM	7:18:18 AM	5
1	26	7:19:00 AM	7:19:03 AM	3
1	27	7:19:27 AM	7:19:37 AM	10
1	28	7:19:31 AM	7:19:46 AM	15
1	29	7:19:36 AM	7:20:16 AM	40
1	30	7:20:19 AM	7:20:26 AM	7
1	31	7:20:20 AM	7:20:38 AM	18
1	32	7:20:42 AM	7:20:53 AM	11
1	33	7:21:09 AM	7:21:15 AM	6
1	34	7:21:40 AM	7:22:08 AM	28
1	35	7:21:55 AM	7:22:21 AM	26
1	36	7:22:05 AM	7:22:43 AM	38
1	37	7:22:17 AM	7:22:57 AM	40
1	38	7:23:47 AM	7:24:07 AM	20
1	39	7:23:53 AM	7:24:18 AM	25
1	40	7:24:04 AM	7:24:28 AM	24
1	41	7:24:10 AM	7:24:44 AM	34
1	42	7:24:15 AM	7:24:58 AM	43
1	43	7:24:32 AM	7:25:05 AM	33
1	44	7:24:32 AM	7:25:26 AM	54
1	45	7:24:33 AM	7:25:32 AM	59
1	46	7:25:07 AM	7:26:05 AM	58
1	47	7:25:16 AM	7:26:07 AM	51
1	48	7:25:16 AM	7:26:12 AM	56
1	49	7:25:38 AM	7:26:22 AM	44
1	50	7:25:40 AM	7:26:28 AM	48
1	51	7:26:26 AM	7:26:29 AM	3
1	52	7:26:54 AM	7:26:57 AM	3
1	53	7:27:26 AM	7:27:37 AM	11
1	54	7:27:39 AM	7:27:54 AM	15
1	55	7:28:29 AM	7:28:31 AM	2
1	56	7:29:17 AM	7:29:27 AM	10
1	57	7:29:41 AM	7:29:48 AM	7
1	58	7:29:51 AM	7:29:59 AM	8
1	59	7:30:27 AM	7:30:49 AM	22
1	60	7:30:30 AM	7:30:59 AM	29

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280

Marlborough, MA 01752

Route 2 EB Off Ramp
Main Street (Route 27)
Acton, MA

File Name : 442 Delay Study RT 2 WB Off Ramp

Site Code : 00442001

Start Date : 5/23/2008

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L	No.	Joined Queue	Released From Queue	Delay
1	61	7:30:31 AM	7:31:05 AM	34
1	62	7:30:43 AM	7:31:10 AM	27
1	63	7:30:58 AM	7:31:18 AM	20
1	64	7:31:19 AM	7:31:26 AM	7
1	65	7:31:21 AM	7:31:30 AM	9
1	66	7:31:26 AM	7:31:49 AM	23
1	67	7:31:28 AM	7:32:10 AM	42
1	68	7:31:30 AM	7:32:15 AM	45
1	69	7:31:52 AM	7:32:18 AM	26
1	70	7:33:04 AM	7:33:07 AM	3
1	71	7:33:21 AM	7:33:27 AM	6
1	72	7:34:10 AM	7:34:19 AM	9
1	73	7:34:25 AM	7:34:43 AM	18
1	74	7:34:25 AM	7:34:49 AM	24
1	75	7:34:38 AM	7:35:05 AM	27
1	76	7:34:44 AM	7:35:16 AM	32
1	77	7:34:55 AM	7:35:18 AM	23
1	78	7:35:00 AM	7:35:18 AM	18
1	79	7:35:43 AM	7:35:57 AM	14
1	80	7:36:02 AM	7:36:13 AM	11
1	81	7:36:38 AM	7:36:50 AM	12
1	82	7:36:43 AM	7:37:02 AM	19
1	83	7:36:43 AM	7:37:09 AM	26
1	84	7:37:10 AM	7:37:12 AM	2
1	85	7:37:40 AM	7:37:51 AM	11
1	86	7:37:42 AM	7:37:54 AM	12
1	87	7:37:44 AM	7:38:05 AM	21
1	88	7:37:45 AM	7:38:17 AM	32
1	89	7:37:49 AM	7:38:27 AM	38
1	90	7:38:09 AM	7:38:33 AM	24
1	91	7:38:41 AM	7:38:51 AM	10
1	92	7:39:00 AM	7:39:05 AM	5
1	93	7:39:28 AM	7:39:59 AM	31
1	94	7:39:32 AM	7:40:03 AM	31
1	95	7:39:51 AM	7:40:10 AM	19
1	96	7:40:37 AM	7:40:48 AM	11
1	97	7:40:39 AM	7:40:49 AM	10
1	98	7:40:54 AM	7:41:11 AM	17
1	99	7:40:55 AM	7:41:19 AM	24
1	100	7:41:16 AM	7:41:24 AM	8
1	101	7:41:18 AM	7:41:28 AM	10
1	102	7:41:18 AM	7:41:32 AM	14
1	103	7:41:48 AM	7:42:19 AM	31
1	104	7:42:28 AM	7:42:41 AM	13
1	105	7:42:32 AM	7:42:46 AM	14
1	106	7:42:43 AM	7:42:52 AM	9
1	107	7:42:56 AM	7:43:13 AM	17
1	108	7:42:59 AM	7:43:15 AM	16
1	109	7:43:00 AM	7:43:22 AM	22
1	110	7:43:01 AM	7:44:10 AM	69
1	111	7:43:01 AM	7:44:12 AM	71
1	112	7:43:41 AM	7:44:19 AM	38
1	113	7:44:40 AM	7:45:06 AM	26
1	114	7:45:29 AM	7:45:36 AM	7
1	115	7:46:40 AM	7:46:52 AM	12
1	116	7:47:27 AM	7:48:03 AM	36
1	117	7:47:48 AM	7:48:05 AM	17
1	118	7:48:23 AM	7:48:32 AM	9
1	119	7:48:50 AM	7:49:01 AM	11
1	120	7:48:59 AM	7:49:36 AM	37
1	121	7:49:37 AM	7:50:05 AM	28

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

File Name : 442 Delay Study RT 2 WB Off Ramp

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Route 2 EB Off Ramp
Main Street (Route 27)
Acton, MA

L	No.	Joined Queue	Released From Queue	Delay
1	122	7:49:41 AM	7:50:13 AM	32
1	123	7:49:47 AM	7:50:17 AM	30
1	124	7:50:13 AM	7:50:18 AM	5
1	125	7:50:34 AM	7:50:35 AM	1
1	126	7:50:56 AM	7:51:09 AM	13
1	127	7:50:57 AM	7:51:18 AM	21
1	128	7:51:38 AM	7:51:42 AM	4
1	129	7:51:45 AM	7:51:54 AM	9
1	130	7:52:00 AM	7:52:07 AM	7
1	131	7:52:31 AM	7:52:51 AM	20
1	132	7:52:42 AM	7:52:56 AM	14
1	133	7:54:44 AM	7:54:53 AM	9
1	134	7:54:45 AM	7:55:00 AM	15
1	135	7:54:46 AM	7:55:11 AM	25
1	136	7:55:27 AM	7:55:33 AM	6
1	137	7:55:55 AM	7:56:00 AM	5
1	138	7:56:10 AM	7:56:14 AM	4
1	139	7:57:08 AM	7:57:16 AM	8
1	140	7:57:13 AM	7:57:21 AM	8
1	141	7:57:23 AM	7:57:40 AM	17
1	142	7:58:06 AM	7:58:17 AM	11
1	143	7:58:43 AM	7:58:45 AM	2
1	144	7:58:44 AM	7:58:54 AM	10
1	145	7:59:57 AM	8:00:06 AM	9
2	1	7:00:07 AM	7:00:09 AM	2
2	2	7:00:08 AM	7:00:10 AM	2
2	3	7:00:49 AM	7:01:00 AM	11
2	4	7:00:51 AM	7:01:02 AM	11
2	5	7:00:52 AM	7:01:05 AM	13
2	6	7:01:15 AM	7:01:16 AM	1
2	7	7:01:18 AM	7:01:18 AM	0
2	8	7:01:38 AM	7:01:41 AM	3
2	9	7:01:41 AM	7:01:47 AM	6
2	10	7:01:43 AM	7:01:49 AM	6
2	11	7:01:46 AM	7:01:51 AM	5
2	12	7:01:57 AM	7:02:01 AM	4
2	13	7:02:03 AM	7:02:08 AM	5
2	14	7:02:04 AM	7:02:09 AM	5
2	15	7:02:11 AM	7:02:13 AM	2
2	16	7:02:14 AM	7:02:26 AM	12
2	17	7:02:16 AM	7:02:26 AM	10
2	18	7:02:33 AM	7:02:42 AM	9
2	19	7:02:39 AM	7:02:47 AM	8
2	20	7:02:42 AM	7:02:48 AM	6
2	21	7:02:45 AM	7:02:50 AM	5
2	22	7:02:46 AM	7:02:54 AM	8
2	23	7:02:56 AM	7:03:00 AM	4
2	24	7:02:59 AM	7:03:14 AM	15
2	25	7:03:17 AM	7:03:19 AM	2
2	26	7:03:42 AM	7:03:44 AM	2
2	27	7:03:51 AM	7:03:55 AM	4
2	28	7:03:57 AM	7:03:58 AM	1
2	29	7:04:07 AM	7:04:12 AM	5
2	30	7:04:13 AM	7:04:16 AM	3
2	31	7:04:18 AM	7:04:22 AM	4
2	32	7:04:20 AM	7:04:24 AM	4
2	33	7:04:29 AM	7:04:33 AM	4
2	34	7:04:29 AM	7:04:35 AM	6
2	35	7:04:42 AM	7:04:43 AM	1
2	36	7:04:47 AM	7:04:52 AM	5
2	37	7:04:49 AM	7:04:57 AM	8

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280

Marlborough, MA 01752

Route 2 EB Off Ramp
Main Street (Route 27)
Acton, MA

File Name : 442 Delay Study RT 2 WB Off Ramp

Site Code : 00442001

Start Date : 5/23/2008

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L	No.	Joined Queue	Released From Queue	Delay
2	38	7:05:04 AM	7:05:05 AM	1
2	39	7:05:05 AM	7:05:11 AM	6
2	40	7:05:07 AM	7:05:13 AM	6
2	41	7:05:15 AM	7:05:25 AM	10
2	42	7:05:17 AM	7:05:27 AM	10
2	43	7:05:20 AM	7:05:29 AM	9
2	44	7:05:31 AM	7:05:33 AM	2
2	45	7:05:48 AM	7:05:50 AM	2
2	46	7:05:58 AM	7:06:00 AM	2
2	47	7:06:01 AM	7:06:04 AM	3
2	48	7:06:03 AM	7:06:13 AM	10
2	49	7:06:09 AM	7:06:20 AM	11
2	50	7:06:25 AM	7:06:28 AM	3
2	51	7:06:26 AM	7:06:28 AM	2
2	52	7:06:27 AM	7:06:42 AM	15
2	53	7:06:44 AM	7:06:45 AM	1
2	54	7:06:46 AM	7:06:48 AM	2
2	55	7:06:48 AM	7:06:49 AM	1
2	56	7:07:10 AM	7:07:11 AM	1
2	57	7:07:12 AM	7:07:13 AM	1
2	58	7:07:28 AM	7:07:29 AM	1
2	59	7:07:31 AM	7:07:34 AM	3
2	60	7:07:36 AM	7:07:42 AM	6
2	61	7:07:59 AM	7:08:03 AM	4
2	62	7:08:30 AM	7:08:38 AM	8
2	63	7:08:45 AM	7:08:46 AM	1
2	64	7:08:48 AM	7:08:57 AM	9
2	65	7:08:51 AM	7:09:03 AM	12
2	66	7:08:52 AM	7:09:05 AM	13
2	67	7:08:52 AM	7:09:06 AM	14
2	68	7:09:18 AM	7:09:18 AM	0
2	69	7:09:19 AM	7:09:20 AM	1
2	70	7:09:21 AM	7:09:22 AM	1
2	71	7:09:37 AM	7:09:40 AM	3
2	72	7:10:04 AM	7:10:17 AM	13
2	73	7:10:22 AM	7:10:25 AM	3
2	74	7:10:26 AM	7:10:26 AM	0
2	75	7:10:37 AM	7:10:38 AM	1
2	76	7:10:42 AM	7:10:47 AM	5
2	77	7:10:43 AM	7:10:49 AM	6
2	78	7:10:54 AM	7:11:00 AM	6
2	79	7:10:56 AM	7:11:05 AM	9
2	80	7:10:56 AM	7:11:07 AM	11
2	81	7:10:59 AM	7:11:08 AM	9
2	82	7:11:00 AM	7:11:12 AM	12
2	83	7:11:06 AM	7:11:20 AM	14
2	84	7:11:09 AM	7:11:23 AM	14
2	85	7:11:13 AM	7:11:26 AM	13
2	86	7:11:14 AM	7:11:29 AM	15
2	87	7:11:15 AM	7:11:29 AM	14
2	88	7:11:17 AM	7:11:29 AM	12
2	89	7:11:45 AM	7:11:46 AM	1
2	90	7:11:48 AM	7:11:56 AM	8
2	91	7:11:50 AM	7:11:58 AM	8
2	92	7:11:51 AM	7:12:01 AM	10
2	93	7:12:19 AM	7:12:37 AM	18
2	94	7:12:26 AM	7:12:48 AM	22
2	95	7:12:26 AM	7:12:53 AM	27
2	96	7:12:42 AM	7:13:03 AM	21
2	97	7:12:42 AM	7:13:09 AM	27
2	98	7:12:43 AM	7:13:14 AM	31

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

Route 2 EB Off Ramp
Main Street (Route 27)
Acton, MA

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L n.	No.	Joined Queue	Released From Queue	Delay
2	99	7:12:44 AM	7:13:17 AM	33
2	100	7:12:47 AM	7:13:24 AM	37
2	101	7:13:06 AM	7:13:27 AM	21
2	102	7:13:25 AM	7:13:32 AM	7
2	103	7:13:25 AM	7:13:37 AM	12
2	104	7:13:31 AM	7:13:38 AM	7
2	105	7:13:35 AM	7:13:39 AM	4
2	106	7:13:39 AM	7:13:41 AM	2
2	107	7:13:46 AM	7:13:47 AM	1
2	108	7:14:08 AM	7:14:10 AM	2
2	109	7:14:19 AM	7:14:21 AM	2
2	110	7:14:24 AM	7:14:25 AM	1
2	111	7:14:44 AM	7:14:46 AM	2
2	112	7:14:49 AM	7:14:53 AM	4
2	113	7:14:51 AM	7:14:55 AM	4
2	114	7:15:04 AM	7:15:05 AM	1
2	115	7:15:15 AM	7:15:17 AM	2
2	116	7:15:16 AM	7:15:20 AM	4
2	117	7:15:27 AM	7:15:29 AM	2
2	118	7:15:32 AM	7:15:41 AM	9
2	119	7:15:57 AM	7:15:58 AM	1
2	120	7:16:00 AM	7:16:07 AM	7
2	121	7:16:04 AM	7:16:16 AM	12
2	122	7:16:14 AM	7:16:30 AM	16
2	123	7:16:17 AM	7:16:42 AM	25
2	124	7:16:17 AM	7:16:48 AM	31
2	125	7:16:19 AM	7:16:53 AM	34
2	126	7:16:38 AM	7:17:03 AM	25
2	127	7:16:46 AM	7:17:24 AM	38
2	128	7:16:58 AM	7:17:26 AM	28
2	129	7:17:03 AM	7:17:29 AM	26
2	130	7:17:04 AM	7:17:30 AM	26
2	131	7:18:20 AM	7:18:22 AM	2
2	132	7:18:25 AM	7:18:27 AM	2
2	133	7:18:27 AM	7:18:28 AM	1
2	134	7:18:28 AM	7:18:37 AM	9
2	135	7:18:40 AM	7:18:41 AM	1
2	136	7:18:42 AM	7:18:44 AM	2
2	137	7:19:20 AM	7:19:23 AM	3
2	138	7:19:24 AM	7:19:28 AM	4
2	139	7:19:45 AM	7:19:49 AM	4
2	140	7:19:52 AM	7:19:53 AM	1
2	141	7:20:02 AM	7:20:03 AM	1
2	142	7:20:23 AM	7:20:28 AM	5
2	143	7:20:39 AM	7:20:41 AM	2
2	144	7:20:41 AM	7:20:42 AM	1
2	145	7:20:51 AM	7:20:55 AM	4
2	146	7:21:25 AM	7:21:26 AM	1
2	147	7:22:01 AM	7:22:11 AM	10
2	148	7:22:03 AM	7:22:13 AM	10
2	149	7:22:04 AM	7:22:26 AM	22
2	150	7:22:23 AM	7:22:28 AM	5
2	151	7:22:24 AM	7:22:31 AM	7
2	152	7:23:04 AM	7:23:06 AM	2
2	153	7:23:14 AM	7:23:15 AM	1
2	154	7:23:27 AM	7:23:29 AM	2
2	155	7:23:33 AM	7:23:36 AM	3
2	156	7:23:54 AM	7:24:08 AM	14
2	157	7:23:56 AM	7:24:11 AM	15
2	158	7:23:57 AM	7:24:13 AM	16
2	159	7:23:59 AM	7:24:26 AM	27

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

Route 2 EB Off Ramp
Main Street (Route 27)
Acton, MA

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L	No.	Joined Queue	Released From Queue	Delay
2	160	7:24:00 AM	7:24:30 AM	30
2	161	7:24:01 AM	7:24:34 AM	33
2	162	7:24:05 AM	7:24:36 AM	31
2	163	7:24:07 AM	7:24:40 AM	33
2	164	7:24:24 AM	7:24:49 AM	25
2	165	7:24:25 AM	7:25:01 AM	36
2	166	7:24:25 AM	7:25:03 AM	38
2	167	7:24:39 AM	7:25:09 AM	30
2	168	7:24:59 AM	7:25:11 AM	12
2	169	7:25:08 AM	7:25:13 AM	5
2	170	7:25:10 AM	7:25:14 AM	4
2	171	7:25:20 AM	7:25:21 AM	1
2	172	7:25:23 AM	7:25:24 AM	1
2	173	7:25:34 AM	7:25:37 AM	3
2	174	7:26:11 AM	7:26:16 AM	5
2	175	7:26:24 AM	7:26:27 AM	3
2	176	7:26:30 AM	7:26:31 AM	1
2	177	7:26:49 AM	7:26:50 AM	1
2	178	7:26:51 AM	7:26:53 AM	2
2	179	7:26:53 AM	7:26:55 AM	2
2	180	7:26:57 AM	7:26:58 AM	1
2	181	7:27:01 AM	7:27:02 AM	1
2	182	7:27:04 AM	7:27:05 AM	1
2	183	7:27:28 AM	7:27:30 AM	2
2	184	7:27:36 AM	7:27:38 AM	2
2	185	7:27:40 AM	7:27:42 AM	2
2	186	7:27:43 AM	7:27:45 AM	2
2	187	7:27:46 AM	7:27:47 AM	1
2	188	7:27:50 AM	7:27:52 AM	2
2	189	7:27:52 AM	7:27:55 AM	3
2	190	7:27:55 AM	7:27:57 AM	2
2	191	7:28:01 AM	7:28:02 AM	1
2	192	7:28:03 AM	7:28:04 AM	1
2	193	7:28:26 AM	7:28:28 AM	2
2	194	7:28:50 AM	7:29:00 AM	10
2	195	7:28:52 AM	7:29:03 AM	11
2	196	7:29:04 AM	7:29:05 AM	1
2	197	7:29:06 AM	7:29:08 AM	2
2	198	7:29:28 AM	7:29:29 AM	1
2	199	7:29:57 AM	7:30:02 AM	5
2	200	7:30:02 AM	7:30:03 AM	1
2	201	7:30:05 AM	7:30:08 AM	3
2	202	7:30:07 AM	7:30:09 AM	2
2	203	7:30:08 AM	7:30:12 AM	4
2	204	7:30:09 AM	7:30:14 AM	5
2	205	7:30:22 AM	7:30:24 AM	2
2	206	7:30:26 AM	7:30:26 AM	0
2	207	7:30:47 AM	7:30:48 AM	1
2	208	7:30:56 AM	7:30:57 AM	1
2	209	7:31:02 AM	7:31:04 AM	2
2	210	7:31:07 AM	7:31:08 AM	1
2	211	7:31:08 AM	7:31:09 AM	1
2	212	7:31:17 AM	7:31:20 AM	3
2	213	7:31:20 AM	7:31:21 AM	1
2	214	7:31:23 AM	7:31:23 AM	0
2	215	7:31:24 AM	7:31:25 AM	1
2	216	7:31:41 AM	7:31:52 AM	11
2	217	7:31:43 AM	7:31:54 AM	11
2	218	7:31:58 AM	7:31:59 AM	1
2	219	7:32:01 AM	7:32:06 AM	5
2	220	7:32:06 AM	7:32:08 AM	2

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

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L	No.	Joined Queue	Released From Queue	Delay
2	221	7:32:26 AM	7:32:32 AM	6
2	222	7:32:33 AM	7:32:35 AM	2
2	223	7:32:57 AM	7:32:57 AM	0
2	224	7:32:58 AM	7:32:58 AM	0
2	225	7:33:53 AM	7:34:00 AM	7
2	226	7:34:06 AM	7:34:10 AM	4
2	227	7:34:12 AM	7:34:12 AM	0
2	228	7:34:20 AM	7:34:21 AM	1
2	229	7:34:24 AM	7:34:42 AM	18
2	230	7:34:32 AM	7:34:56 AM	24
2	231	7:34:37 AM	7:35:00 AM	23
2	232	7:34:42 AM	7:35:01 AM	19
2	233	7:34:45 AM	7:35:03 AM	18
2	234	7:34:45 AM	7:35:08 AM	23
2	235	7:35:11 AM	7:35:14 AM	3
2	236	7:35:15 AM	7:35:20 AM	5
2	237	7:35:15 AM	7:35:22 AM	7
2	238	7:35:16 AM	7:35:26 AM	10
2	239	7:35:16 AM	7:35:33 AM	17
2	240	7:35:32 AM	7:35:48 AM	16
2	241	7:35:52 AM	7:35:54 AM	2
2	242	7:36:06 AM	7:36:15 AM	9
2	243	7:36:10 AM	7:36:16 AM	6
2	244	7:36:12 AM	7:36:24 AM	12
2	245	7:36:40 AM	7:36:47 AM	7
2	246	7:36:42 AM	7:36:48 AM	6
2	247	7:36:51 AM	7:36:52 AM	1
2	248	7:36:53 AM	7:36:54 AM	1
2	249	7:36:55 AM	7:36:57 AM	2
2	250	7:36:58 AM	7:36:59 AM	1
2	251	7:37:05 AM	7:37:07 AM	2
2	252	7:37:43 AM	7:37:47 AM	4
2	253	7:37:50 AM	7:37:51 AM	1
2	254	7:38:20 AM	7:38:21 AM	1
2	255	7:38:24 AM	7:38:28 AM	4
2	256	7:38:29 AM	7:38:34 AM	5
2	257	7:38:36 AM	7:38:40 AM	4
2	258	7:38:41 AM	7:38:43 AM	2
2	259	7:38:45 AM	7:38:46 AM	1
2	260	7:38:56 AM	7:38:58 AM	2
2	261	7:38:58 AM	7:38:59 AM	1
2	262	7:39:01 AM	7:39:06 AM	5
2	263	7:39:02 AM	7:39:08 AM	6
2	264	7:39:04 AM	7:39:10 AM	6
2	265	7:39:13 AM	7:39:20 AM	7
2	266	7:39:15 AM	7:39:22 AM	7
2	267	7:39:18 AM	7:39:25 AM	7
2	268	7:39:52 AM	7:39:55 AM	3
2	269	7:40:05 AM	7:40:06 AM	1
2	270	7:40:12 AM	7:40:12 AM	0
2	271	7:40:21 AM	7:40:22 AM	1
2	272	7:40:27 AM	7:40:46 AM	19
2	273	7:40:32 AM	7:40:47 AM	15
2	274	7:40:33 AM	7:40:50 AM	17
2	275	7:40:34 AM	7:40:51 AM	17
2	276	7:40:41 AM	7:40:53 AM	12
2	277	7:40:57 AM	7:40:58 AM	1
2	278	7:41:03 AM	7:41:06 AM	3
2	279	7:41:05 AM	7:41:13 AM	8
2	280	7:41:09 AM	7:41:20 AM	11
2	281	7:41:20 AM	7:41:24 AM	4

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

Route 2 EB Off Ramp
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Acton, MA

File Name : 442 Delay Study RT 2 WB Off Ramp
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L n.	No.	Joined Queue	Released From Queue	Delay
2	282	7:41:23 AM	7:41:28 AM	5
2	283	7:41:27 AM	7:41:31 AM	4
2	284	7:41:30 AM	7:41:34 AM	4
2	285	7:41:33 AM	7:41:36 AM	3
2	286	7:41:35 AM	7:41:40 AM	5
2	287	7:41:39 AM	7:41:43 AM	4
2	288	7:41:41 AM	7:41:44 AM	3
2	289	7:41:42 AM	7:41:45 AM	3
2	290	7:41:58 AM	7:42:15 AM	17
2	291	7:42:08 AM	7:42:16 AM	8
2	292	7:42:09 AM	7:42:20 AM	11
2	293	7:42:11 AM	7:42:22 AM	11
2	294	7:42:26 AM	7:42:28 AM	2
2	295	7:42:29 AM	7:42:31 AM	2
2	296	7:42:36 AM	7:42:44 AM	8
2	297	7:42:38 AM	7:42:45 AM	7
2	298	7:42:50 AM	7:42:50 AM	0
2	299	7:42:52 AM	7:42:53 AM	1
2	300	7:43:11 AM	7:43:16 AM	5
2	301	7:43:18 AM	7:43:19 AM	1
2	302	7:43:21 AM	7:43:23 AM	2
2	303	7:43:27 AM	7:43:30 AM	3
2	304	7:43:31 AM	7:43:32 AM	1
2	305	7:43:39 AM	7:43:43 AM	4
2	306	7:43:42 AM	7:43:55 AM	13
2	307	7:43:42 AM	7:43:58 AM	16
2	308	7:44:08 AM	7:44:09 AM	1
2	309	7:44:11 AM	7:44:13 AM	2
2	310	7:44:33 AM	7:44:36 AM	3
2	311	7:44:39 AM	7:44:45 AM	6
2	312	7:44:53 AM	7:44:59 AM	6
2	313	7:45:08 AM	7:45:09 AM	1
2	314	7:45:10 AM	7:45:12 AM	2
2	315	7:45:13 AM	7:45:15 AM	2
2	316	7:45:17 AM	7:45:18 AM	1
2	317	7:45:21 AM	7:45:22 AM	1
2	318	7:45:23 AM	7:45:24 AM	1
2	319	7:45:25 AM	7:45:26 AM	1
2	320	7:45:28 AM	7:45:30 AM	2
2	321	7:45:31 AM	7:45:32 AM	1
2	322	7:45:32 AM	7:45:34 AM	2
2	323	7:45:35 AM	7:45:38 AM	3
2	324	7:45:47 AM	7:45:48 AM	1
2	325	7:45:59 AM	7:45:59 AM	0
2	326	7:46:05 AM	7:46:13 AM	8
2	327	7:46:08 AM	7:46:16 AM	8
2	328	7:46:14 AM	7:46:18 AM	4
2	329	7:46:16 AM	7:46:21 AM	5
2	330	7:46:32 AM	7:46:34 AM	2
2	331	7:46:35 AM	7:46:42 AM	7
2	332	7:46:38 AM	7:46:53 AM	15
2	333	7:46:39 AM	7:46:56 AM	17
2	334	7:46:41 AM	7:47:01 AM	20
2	335	7:46:46 AM	7:47:04 AM	18
2	336	7:47:04 AM	7:47:06 AM	2
2	337	7:47:08 AM	7:47:11 AM	3
2	338	7:47:30 AM	7:47:31 AM	1
2	339	7:47:33 AM	7:47:34 AM	1
2	340	7:47:36 AM	7:47:37 AM	1
2	341	7:47:45 AM	7:47:53 AM	8
2	342	7:47:55 AM	7:48:00 AM	5

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

Route 2 EB Off Ramp
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L n.	No.	Joined Queue	Released From Queue	Delay
2	343	7:48:00 AM	7:48:05 AM	5
2	344	7:48:23 AM	7:48:24 AM	1
2	345	7:48:25 AM	7:48:26 AM	1
2	346	7:48:51 AM	7:48:53 AM	2
2	347	7:48:54 AM	7:48:55 AM	1
2	348	7:48:57 AM	7:48:58 AM	1
2	349	7:49:09 AM	7:49:10 AM	1
2	350	7:49:18 AM	7:49:18 AM	0
2	351	7:49:22 AM	7:49:23 AM	1
2	352	7:49:24 AM	7:49:26 AM	2
2	353	7:49:38 AM	7:49:39 AM	1
2	354	7:49:51 AM	7:49:54 AM	3
2	355	7:49:55 AM	7:49:57 AM	2
2	356	7:49:58 AM	7:50:01 AM	3
2	357	7:49:58 AM	7:50:02 AM	4
2	358	7:49:58 AM	7:50:04 AM	6
2	359	7:50:06 AM	7:50:08 AM	2
2	360	7:50:09 AM	7:50:19 AM	10
2	361	7:50:10 AM	7:50:25 AM	15
2	362	7:50:12 AM	7:50:27 AM	15
2	363	7:50:43 AM	7:50:44 AM	1
2	364	7:50:49 AM	7:50:50 AM	1
2	365	7:50:53 AM	7:50:58 AM	5
2	366	7:50:55 AM	7:50:58 AM	3
2	367	7:51:02 AM	7:51:11 AM	9
2	368	7:51:14 AM	7:51:15 AM	1
2	369	7:51:17 AM	7:51:18 AM	1
2	370	7:51:20 AM	7:51:20 AM	0
2	371	7:51:32 AM	7:51:42 AM	10
2	372	7:51:33 AM	7:51:47 AM	14
2	373	7:51:33 AM	7:51:48 AM	15
2	374	7:51:34 AM	7:51:51 AM	17
2	375	7:51:35 AM	7:51:53 AM	18
2	376	7:51:41 AM	7:51:56 AM	15
2	377	7:52:03 AM	7:52:06 AM	3
2	378	7:52:23 AM	7:52:24 AM	1
2	379	7:52:25 AM	7:52:27 AM	2
2	380	7:52:46 AM	7:52:54 AM	8
2	381	7:52:52 AM	7:52:57 AM	5
2	382	7:52:53 AM	7:52:59 AM	6
2	383	7:52:57 AM	7:53:05 AM	8
2	384	7:52:58 AM	7:53:07 AM	9
2	385	7:52:58 AM	7:53:12 AM	14
2	386	7:53:00 AM	7:53:15 AM	15
2	387	7:53:14 AM	7:53:21 AM	7
2	388	7:53:29 AM	7:53:32 AM	3
2	389	7:53:35 AM	7:53:36 AM	1
2	390	7:53:37 AM	7:53:38 AM	1
2	391	7:53:44 AM	7:53:45 AM	1
2	392	7:54:15 AM	7:54:23 AM	8
2	393	7:54:17 AM	7:54:27 AM	10
2	394	7:54:19 AM	7:54:30 AM	11
2	395	7:54:20 AM	7:54:32 AM	12
2	396	7:54:43 AM	7:54:44 AM	1
2	397	7:54:51 AM	7:54:54 AM	3
2	398	7:54:55 AM	7:54:56 AM	1
2	399	7:54:57 AM	7:54:59 AM	2
2	400	7:55:00 AM	7:55:02 AM	2
2	401	7:55:01 AM	7:55:02 AM	1
2	402	7:55:03 AM	7:55:04 AM	1
2	403	7:55:07 AM	7:55:08 AM	1

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

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L n.	No.	Joined Queue	Released From Queue	Delay
2	404	7:55:10 AM	7:55:10 AM	0
2	405	7:55:17 AM	7:55:18 AM	1
2	406	7:55:30 AM	7:55:34 AM	4
2	407	7:55:34 AM	7:55:34 AM	0
2	408	7:55:45 AM	7:55:46 AM	1
2	409	7:55:50 AM	7:55:51 AM	1
2	410	7:56:04 AM	7:56:05 AM	1
2	411	7:56:07 AM	7:56:11 AM	4
2	412	7:56:21 AM	7:56:24 AM	3
2	413	7:56:25 AM	7:56:35 AM	10
2	414	7:56:37 AM	7:56:39 AM	2
2	415	7:56:40 AM	7:56:41 AM	1
2	416	7:56:42 AM	7:56:44 AM	2
2	417	7:56:53 AM	7:56:54 AM	1
2	418	7:57:25 AM	7:57:26 AM	1
2	419	7:57:30 AM	7:57:40 AM	10
2	420	7:57:38 AM	7:57:42 AM	4
2	421	7:57:48 AM	7:57:51 AM	3
2	422	7:57:55 AM	7:57:56 AM	1
2	423	7:57:58 AM	7:58:05 AM	7
2	424	7:58:02 AM	7:58:07 AM	5
2	425	7:58:18 AM	7:58:19 AM	1
2	426	7:58:19 AM	7:58:19 AM	0
2	427	7:58:22 AM	7:58:22 AM	0
2	428	7:58:29 AM	7:58:30 AM	1
2	429	7:58:31 AM	7:58:32 AM	1
2	430	7:58:45 AM	7:58:46 AM	1
2	431	7:58:46 AM	7:58:47 AM	1
2	432	7:58:48 AM	7:58:49 AM	1
2	433	7:58:58 AM	7:59:04 AM	6
2	434	7:59:06 AM	7:59:06 AM	0
2	435	7:59:25 AM	7:59:27 AM	2
2	436	7:59:28 AM	7:59:29 AM	1
2	437	7:59:30 AM	7:59:36 AM	6
2	438	7:59:43 AM	7:59:45 AM	2
2	439	7:59:52 AM	7:59:53 AM	1
2	440	7:59:59 AM	8:00:00 AM	1
2	441	8:00:01 AM	8:00:02 AM	1

Summary Information:

7:00:00 AM - 8:01:00 AM	Left Turns	Right Turns
Total Vehicle Count:	145	441
Delayed Vehicle Count:	145	441
Through Vehicle Count:	0	0
Average Stopped Time:	19.86	6.481
Maximum Stopped Time:	71	38
Min. Secs. for Delay:	0	0
Average Queue:	0.80	0.795
Queue Density:	1.80	1.940
Maximum Queue:	5	8
Delay in Vehicle Hour:	0.80	0.794993
Total Delay:	2880	2858

□ Signal Warrant Work Sheets

TRAFFIC SIGNAL WARRANT CRITERIA

The 2003 Edition of the *Manual on Uniform Traffic Control Devices* (MUTCD) contains a total of eight (8) signal warrants which are described below:

Warrant 1 - Eight-Hour Vehicular Volume

Condition A: *Minimum Vehicular Volume*, is intended for application where a large volume of intersecting traffic at an intersection is the principal reason for signal installation.

Condition B: *Interruption of Continuous Traffic*, applies when the existing traffic volume on the major street is at a level such that traffic on a minor intersecting street suffers excessive delay or conflict.

The warrant stipulates the need for a signal if, for eight (8) hours of an average day, any of the following conditions are met:

- The major and minor street volumes meet or exceed the requirements of Table 1.
- The major and minor street volumes meet or exceed the requirements of Table 2.
- The major and minor street volumes meet or exceed 80% of both Table 1 & 2 requirements.

**TABLE 1 - Eight-Hour Vehicular Volumes for MUTCD Warrant 1
Condition A: *Minimum Vehicular Volume***

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)	Vehicles per hour on higher volume minor street approach (one direction only)
Major Street	Minor Street		
1	1	500	150
2 or more	1	600	150
2 or more	2 or more	600	200
1	2 or more	500	200

**TABLE 2 - Eight-Hour Vehicular Volumes for MUTCD Warrant 1
Condition B: *Interruption of Continuous Traffic***

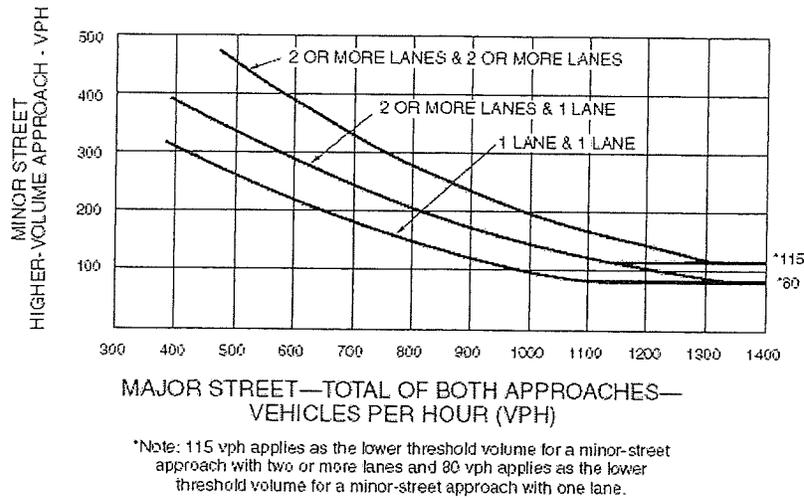
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)	Vehicles per hour on higher volume minor street approach (one direction only)
Major Street	Minor Street		
1	1	750	75
2 or more	1	900	75
2 or more	2 or more	900	100
1	2 or more	750	100

Warrant 2 - Four-Hour Vehicular Volumes

This warrant is intended for application where the volume of intersecting traffic at an intersection is the principal reason for signal installation.

This warrant is satisfied when, for any four (4) hours of an average day, the existing volumes on the major and minor street meet or exceed the requirements of the following figure:

Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



Warrant 3 - Peak Hour

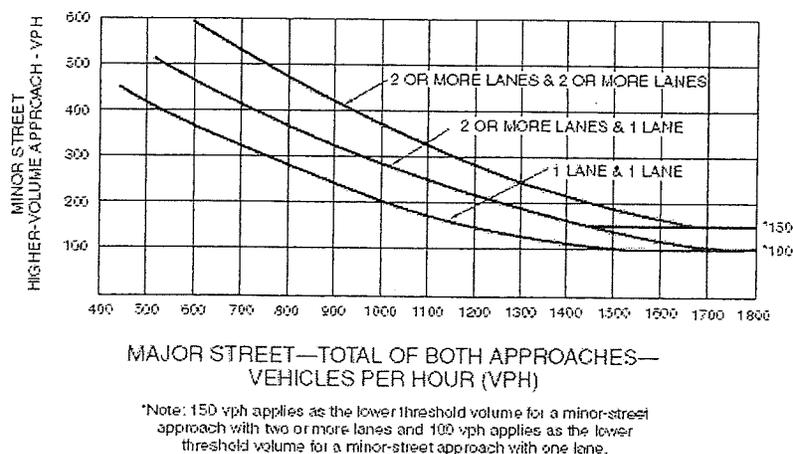
This warrant is intended for application where traffic conditions are such that for a minimum of one hour of an average day, minor street traffic suffers undue delay when entering or crossing the major street. This warrant shall be applied only in unusual cases.

This warrant is satisfied when, for any one (1) hour of an average day, the criteria for either of the following two categories are met:

Category A: Each of three conditions relating to total stopped delay, minor street approach volume, and total entering volume are met.

Category B: The traffic volume on the major and minor streets meet or exceed the requirements of the following figure:

Figure 4C-3. Warrant 3, Peak Hour



Warrant 4 - Pedestrian Volume

This warrant is intended for application where traffic volumes on a major street are so heavy that pedestrians experience excessive delay in crossing the major street. This warrant applies when both of the following conditions exist:

- The pedestrian volume crossing a major street during an average day is 100 persons or more for each of any four (4) hours, or 190 or more during any one (1) hour period.
- Fewer than 60 gaps per hour in the traffic stream must exist for use by pedestrians.

Warrant 5 - School Crossing

This warrant is intended for application where school children crossing the major street is the principal reason to install a traffic signal.

A signal may be warranted at an established school crossing if there are insufficient gaps in the traffic stream for children to utilize to cross the street, as determined in an engineering study. To be satisfied, the number of adequate gaps in traffic during the period when children are crossing must be less than the number of minutes during the same period, and there are a minimum of twenty (20) students crossing during the highest crossing hour. Since this warrant usually only applies for very short time periods during the day, the signal may not be necessary if a crossing guard or other similar measure is provided during school crossing times.

Warrant 6 - Coordinated Signal System

This warrant is intended for application where signal installation would facilitate proper platooning of vehicles within a coordinated signal system.

This warrant applies if adjacent signals do not provide the necessary degree of platooning in a progressive signal system. Additionally, this warrant should not be applied where the resulting spacing of traffic signals would be less than 300m (1,000 ft).

Warrant 7 - Crash Experience

This warrant is intended for application where the severity and frequency of crashes at an intersection is the principal reason for installation of a traffic control signal.

This warrant is satisfied if alternative measures have failed, there have been five or more accidents at an intersection in one year which are correctable by signal control, and traffic volumes satisfy 80% of either Condition A or Condition B of Warrant 1.

Warrant 8 - Roadway Network

This warrant is intended for application where traffic flow at the intersection of two or more routes on a roadway network needs to be improved.

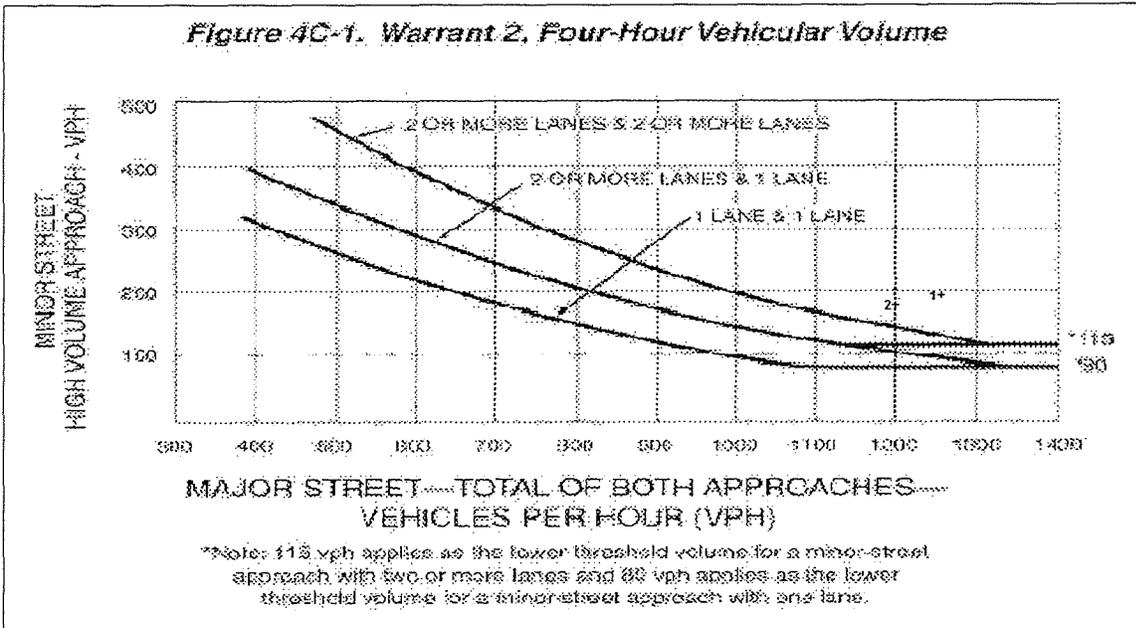
This warrant is satisfied if the intersection has a total entering volume of at least 1,000 vph during the peak hour of a typical weekday while a 5-year projected volume meets one or more of Warrants 1, 2, and 3 during an average weekday or has an entering volume of at least 1,000 vph for each of any five (5) hours of a non-normal business day (Saturday or Sunday).

MUTCD Traffic Signal Warrant #2 Analysis

Project Name 442 - Acton
Date 2008 Existing Volumes

	Street Name	Direction
Major 1	Main Street	NB
Major 2	Main Street	SB
Minor 1	Route 2 off ramp	EB
Minor 2	0	0

Node	Time Period	Major St. 1 Approach Volume	Major St. 2 Approach Volume	Total Major St. Volume	Minor St. 1 Approach Volume	Minor St. 2 Approach Volume	Higher Minor St. Volume
1	7:00-8:00 AM	760	502	1262	197	0	197
2	8:00-9:00 AM	765	440	1205	181	0	181
3	4:00-5:00 PM	1074	600	1674	46	0	46
4	5:00-6:00 PM	1199	664	1863	84	0	84



□ Stopping Sight Distance Calculations

Stopping Sight Distance

Main Street (Route 27) at Isaac Davis Way (Proposed Site Driveway)

Posted Travel Speed

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	35	128.625	117.4	246.0
Direction 2	SB	35	128.625	117.4	246.0

<u>INPUTS</u>	<u>Direction 1</u>	<u>Direction 2</u>
Travel Direction	NB	SB
Speed	35	35
Grade	0	0
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = $1.47 \times t \times V$

Brake Distance = $V^2 / (30 \times ((a/32.2)+G))$

Where:

t = reaction time (sec)

V = travel speed (mph)

G= roadway grade

a - deceleration rate (ft/sec²)

Stopping Sight Distance

Main Street (Route 27) at Isaac Davis Way (Proposed Site Driveway)

Average Travel Speed

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	34	124.95	110.8	235.7
Direction 2	SB	32	117.6	98.1	215.7

INPUTS

Direction 1

Direction 2

Travel Direction	NB	SB
Speed	34	32
Grade	0	0
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = $1.47 \times t \times V$

Brake Distance = $V^2 / (30 \times ((a/32.2)+G))$

Where:

t = reaction time (sec)

V = travel speed (mph)

G= roadway grade

a - deceleration rate (ft/sec²)

Stopping Sight Distance

Main Street (Route 27) at Isaac Davis Way (Proposed Site Driveway)

85th Percentile Travel Speed

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	38	139.65	138.4	278.0
Direction 2	SB	35	128.625	117.4	246.0

INPUTS

Direction 1

Direction 2

Travel Direction	NB	SB
Speed	38	35
Grade	0	0
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = $V^2 / (30 \times ((a/32.2)+G))$

Where:

t = reaction time (sec)

V = travel speed (mph)

G = roadway grade

a = deceleration rate (ft/sec²)

