

Devens Traffic Monitoring Program 2010 Five-Year Traffic Report Devens, Massachusetts

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EXECUTIVE SUMMARY

Introduction

This 2010 Traffic Study Report is the eighth in a series of Traffic Monitoring Reports conducted for Devens and the surrounding communities. The purpose of this study is to observe and quantify current traffic patterns in and around Devens, resulting from the redevelopment of the former military base. This study focuses on comparing current traffic volumes with those projected in the 1994 Environmental Impact Report (EIR) and those observed in previous Reuse Plan Traffic Monitoring Reports. In addition, this study projects traffic volumes based on known future development and identifies when build-out thresholds are expected to be eclipsed.

The study area was identified as part of the EIR and comports with the previous studies. The areas included are the communities of Shirley, Ayer, Harvard, Lancaster, Lunenburg, Groton, Littleton, and Boxborough.

Data Collection

Traffic data were collected during the Spring of 2010 in the study area in order to develop an understanding of traffic operations at critical roadways and intersections within the study area. The following data were collected for this study:

- Intersection turning movement and vehicle classification counts within Devens and outside of Devens during the AM (7-9 AM) and PM (4-6 PM) peak periods;
- Vehicle volume and classification counts (48 hours and 7 days) along roadways both within Devens and in the surrounding communities;
- Origin-Destination Survey at Devens' entry and exit points;
- Transportation Survey of Devens residents and local business employees;
- Commuter Rail Ridership counts from the Massachusetts Bay Transportation Authority (MBTA);
- Noise measurements at 13 locations within the study area.

Findings

To evaluate the 2010 conditions, the traffic volume data and capacity analysis results were compared to previous reports, including the 2006 and 1996 (baseline) report. The findings are summarized below:

- Traffic volumes on roadways outside of Devens have generally remained consistent between 2006 and 2010; however there are isolated roadways and intersections which have shown an increase in traffic volumes since 2006.

- Devens roadways experienced traffic growth similar to the region from 2006 to 2008; however Devens has experienced traffic stabilization since 2008, as exhibited by the traffic volumes recorded at Devens Gates (Figure ES-1).

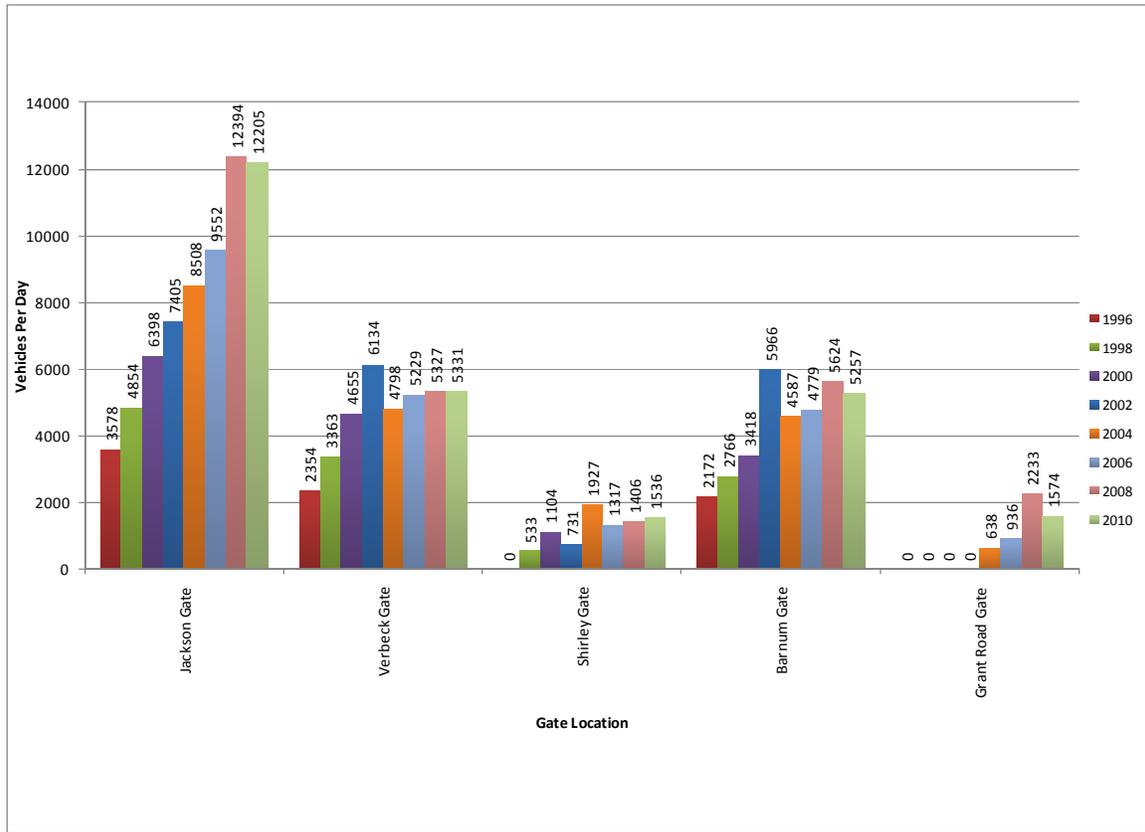


Figure ES-1: Average Weekday Daily Traffic – Devens Gates

- The average total weekday daily truck traffic volumes through all Devens gates are at the lowest level since 2000. Verbeck Gate and Shirley Gate experienced the only increase in truck traffic, while the other three gates experienced a 25 to 55 percent reduction in truck traffic since 2006. The reduction in truck traffic at Devens gates is most likely the result of the reduction in construction activity in Devens and partial vacancy of the industrial park.
- The percentage of vehicles which enter Devens gates and use Devens roadways as cut-through routes has increased from 25% in 2005 to 32% in 2010. Furthermore, cut-through vehicle frequencies tend to peak during the AM and PM peak hours, which suggests drivers are finding Devens roadways as desirable cut-through routes when commuting to and from work.
- A transportation survey was distributed to Devens residents and business employees. This survey focused on collecting information on resident and business trip patterns to and from work. The following summarize the results of the survey (67 residential and 320 business employee):

1. Ninety percent drive, 6 percent carpool, 2 percent bicycle, 1 percent drive to transit, and 1 percent walk to work;
 2. Fifty-seven percent of Devens residents and business employees commute to and from work during the peak hour;
 3. Forty-five percent of Devens residents work east of Devens;
 4. Twenty-two percent of Devens business employees live east of Devens;
 5. Route 2 is the preferred route to travel to and from work for both residents and business employees.
- Massachusetts Bay Transportation Authority (MBTA) Fitchburg Commuter Rail serving the Devens area (with stations located in Ayer, Shirley, North Leominster, and Fitchburg) has experienced steadily increased ridership. The percentage increase in daily boardings increased significantly (20%-70%) at three of the four stations between February 2005 and February 2009.
 - The occupied development in Devens has decreased from 3,965,578 square feet in 2008 to 3,662,758 square feet in 2010. Although Devens experienced an increase of more than 900,000 square feet of occupied new construction since 2008, there has also been an increase of more than 1.2 million square feet in commercial property vacancies.
 - Daily vehicle trips generated by Devens development were estimated using Institute of Transportation Engineers (ITE) trip generation rates. The current 3.6 million square feet of development is estimated to generate 33,396 daily vehicle trips in 2010. When compared to the actual trips generated counted through Devens gates (17, 614), this indicates that Devens development is generating off-site traffic at a rate of 53% of what a comparable development would generate.
 - Based on discussions with the MassDevelopment Real Estate Office, much of the remaining development in Devens will consist of smaller research and development land uses. It is assumed that development at Devens will proceed, on average, at 225,000 square feet per year, mainly consisting of research and development type facilities. Based on measured traffic volume data, the current development, and projected development patterns noted above, the EIR trip threshold of 59,625 trips per day would not be reached until 2031 (Figure ES-2). Implementation of traffic demand management techniques (TDM) projects this threshold to be met in 2037.

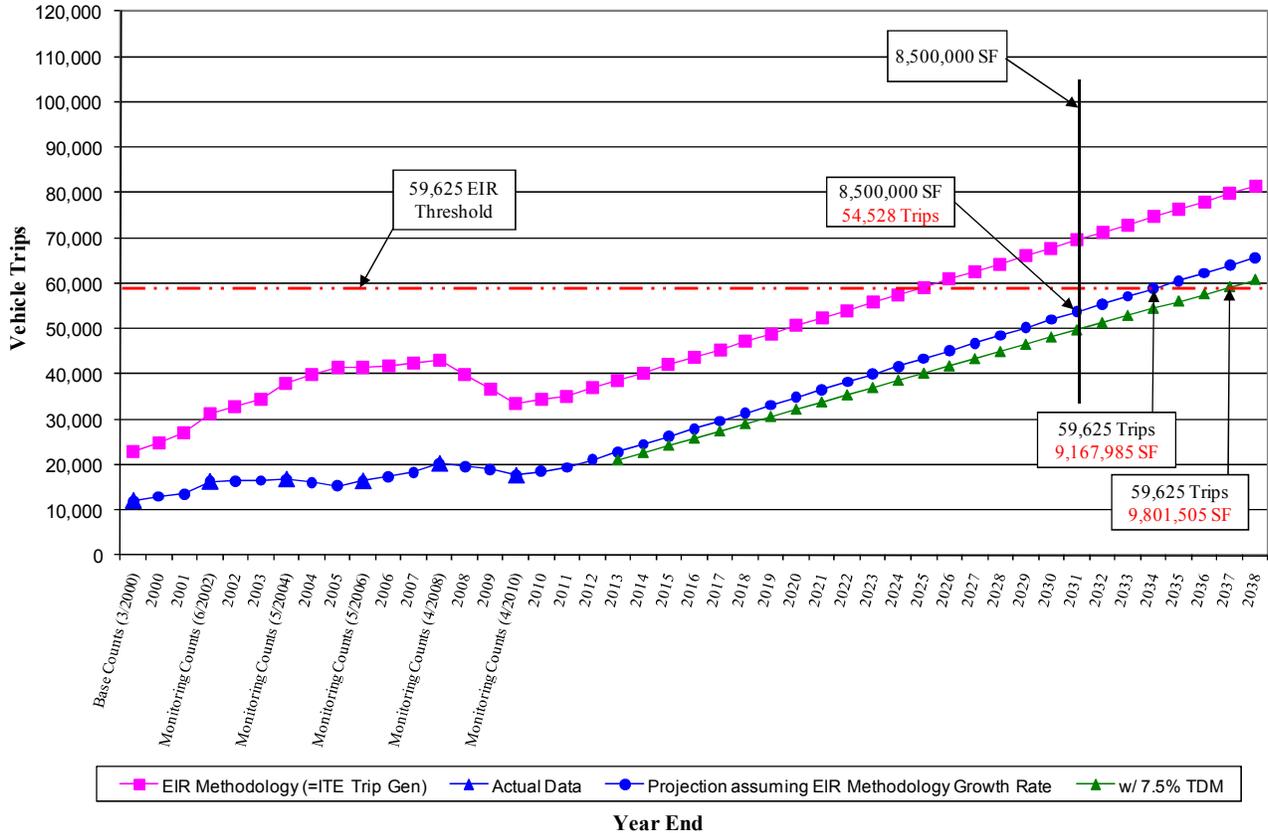


Figure ES-2: Devens Build-Out Summary by Year - Trips

- Intersection Level of Service analysis was performed at 14 study intersections for the AM and PM peak hours using methodologies explained in the 2000 Highway Capacity Manual. The results indicate that seven of the fourteen analyzed intersections experience no change in level of service from 1996 to 2010. Five study intersections deteriorated by only one level of service from 1996 to 2010 and two intersections have deteriorated by more than one level of service from 1996 to 2010. While it was observed that some intersections experience additional degradation in level of service since 2008, it is likely not to be attributed to development at Devens since the area of occupied development at Devens has decreased since 2008.
- Noise measurements were conducted at 13 sites in the study area in June, 2010. While the purpose of the study is to compare the traffic sound levels in the communities, only a few of the measurement locations were consistently dominated by the sound from traffic. A comparison of three locations near Route 2 indicates that there has generally been a modest decrease in the ambient background (L90) between the years 2000 and 2010. While there have been increases at specific locations and community conditions, the study offers no indication that the community noise levels due to traffic have generally increased as a result of the Fort Devens disposal and reuse.

1. INTRODUCTION

1.1. Project Purpose and Goals

The 1995 Devens Final Environmental Impact Report was issued by the Department of the Army for the disposal and reuse of Fort Devens as a mixed use planned community, currently known as Devens. MassDevelopment (formerly known as the Massachusetts Government Land Bank) is the exclusive public agency responsible for the maintenance, control, and redevelopment of the community and has committed to a traffic monitoring program to study the traffic growth resulting from development within Devens. The purpose of this study is to monitor the traffic volumes associated with current development patterns at Devens and to project future traffic operations in the communities surrounding Devens resulting from planned or potential development within Devens.

Devens By-Laws limit the total development in Devens to 8.5 million square feet and the EIR limits the daily vehicle trips to 59,265. Since the EIR was published in 1994, MassDevelopment has continued their commitment to mitigate traffic impacts associated with development in Devens through continued traffic monitoring efforts. This study is the third 5-Year Traffic Monitoring Report which takes a comprehensive look at current traffic conditions and makes traffic projections related to continued development at Devens. In addition, bi-yearly traffic monitoring studies have continued to establish a baseline of area wide traffic volumes and growth for comparison with the traffic issues projected in each 5-Year Report. This report utilizes data and information presented in the 2005 Traffic Monitoring Report, the 2008 Biennial Report, and the EIR and Re-Use Plan for evaluating historical traffic trends in the area.

Included in this study is a noise analysis that compares current noise levels with those identified in the EIR.

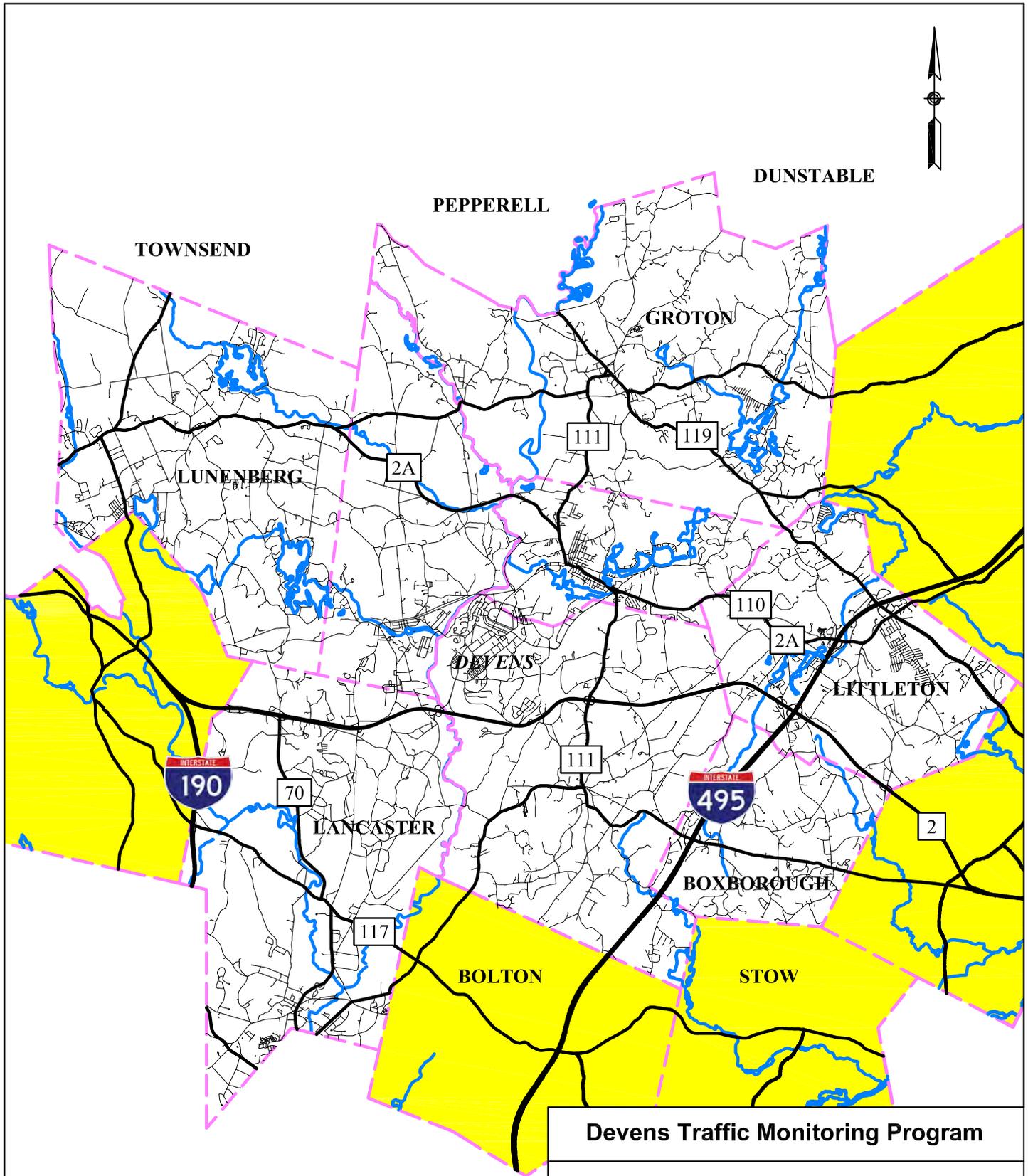
1.2. Study Area

The study area is based on those established in the two previous Devens 5-Year Traffic Reports (Figure 1-1). Devens is located completely within the host towns on Ayer, Shirley, Lancaster, and Harvard, Massachusetts. The bordering towns of Boxborough, Groton, Littleton, and Lunenburg were included in the study area as potential impact communities.

1.3. Scope of Work

The following tasks were completed in this study:

- Conduct comprehensive traffic volumes counts;
- Conduct vehicle Origin-Destination Survey to identify Devens cut-through traffic;
- Conduct a comprehensive Devens Resident and Business Employee Survey to identify journey-to-work patterns;
- Conduct a Build-Out Analysis for Devens;
- Update Devens-Area Traffic Model;



Devens Traffic Monitoring Program

Figure 1-1
Study Area
April 2010

Scale: NTS
Basemap Source: MassGIS



- Conduct Level of Service Analyses for Existing Conditions, No-Build Condition, and two Future Build Scenarios.
- Conduct Noise Analysis.

1.4. Project Coordination

Communities within the study area were contacted to gain an understanding of development patterns external to Devens and possible impacts on regional traffic. Each community was asked to provide information related to the type of current and planned development. The following communities provided responses relative to the planned and proposed developments within their towns:

- Ayer;
- Boxborough;
- Groton;
- Harvard;
- Lancaster;
- Littleton;
- Lunenburg;
- Shirley

The Montachusett Regional Planning Commission (MRPC), the Metropolitan Area Planning Commission, and MassDOT Office of Transportation Planning were also contacted regarding historic growth information and any planned development or transportation infrastructure projects.

2. TRAFFIC DATA COLLECTION AND RESEARCH

2.1. Overview

Current traffic data was collected in the study area in order to develop an understanding of existing traffic conditions at critical roadways and intersections in the study area, both internal and external to Devens. The following traffic data was collected for this study:

- Intersection turning movement and vehicle classification counts within Devens (herein referred to as 'internal') and outside of Devens (herein referred to as 'external');
- Roadway volume and vehicle classification counts internal and external to Devens;
- Origin-Destination Survey at Devens Gates;
- Transportation Survey of Devens residents and local business employees;
- Transit Ridership counts from the Massachusetts Bay Transportation Authority (MBTA).

2.2. Intersection Turning Movement Counts

Existing intersection traffic volumes were collected during weekday AM (7-9) and PM (4-6) peak periods at locations consistent with the previous Traffic Monitoring studies. The intersection numbering system used in this study has been maintained from previous studies for consistency.

Intersection turning movement counts were completed at locations both internal (Figure 2-1) and external (Figure 2-2) to Devens, as required by the Memorandum of Understanding with the Massachusetts Highway Department.

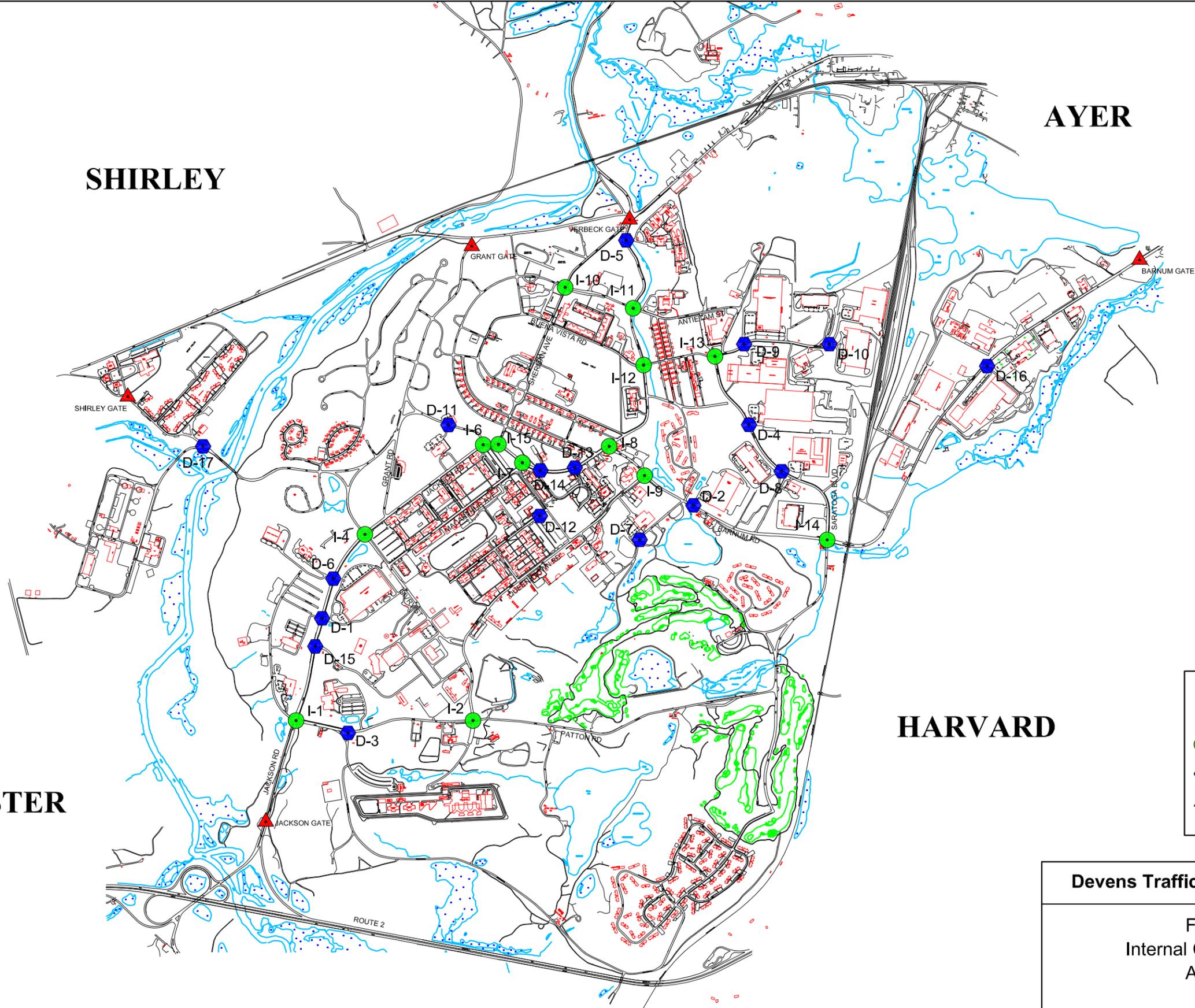
2.2.1. Internal Counts

Intersection turning movement counts and vehicle classification for locations within Devens proper were completed between April 27 and April 28, 2010 from 7AM to 9AM and 4PM to 6PM at the following locations:

ID	Intersection	Date
I-1	Jackson Road/Patton Road	4/27/2010
I-2	Patton Road/Givry Street	4/28/2010
I-3	<i>Eliminated</i>	
I-4	Jackson Road/Givry Street	4/28/2010
I-5	<i>Eliminated</i>	
I-6	Jackson Road/Pine Road	4/28/2010
I-7	Jackson Road/MacArthur Road	4/28/2010
I-8	Jackson Road/Barnum Road	4/27/2010
I-9	Queenstown Street/Barnum Road	4/27/2010
I-10	Antietam Street/Sherman Avenue	4/27/2010
I-11	Antietam Street/Jackson Road	4/27/2010
I-12	Buena Vista Street/Jackson Road	4/27/2010

SHIRLEY

AYER



LANCASTER

HARVARD

LEGEND

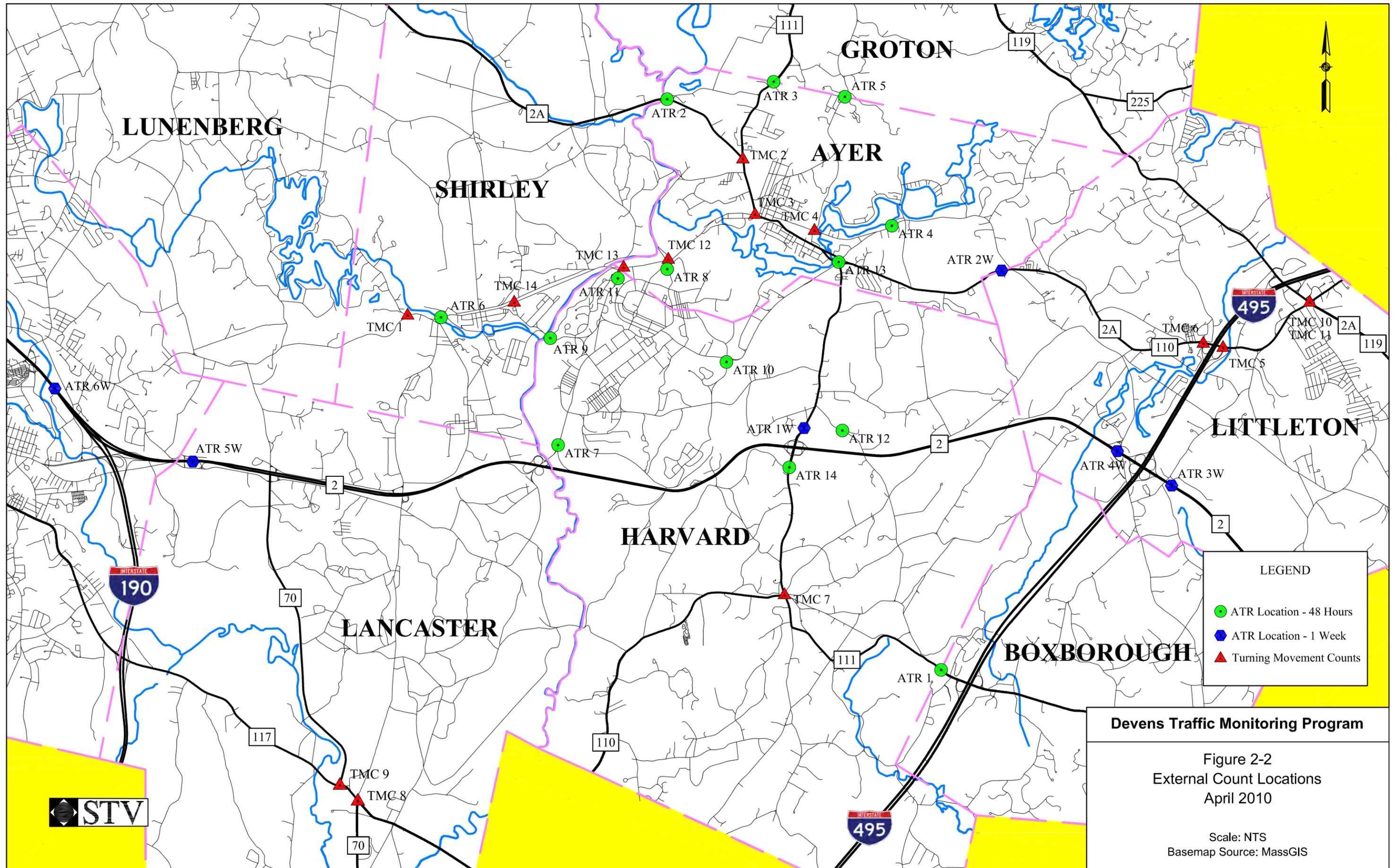
-  Intersection Count Location
-  Driveway Count Location
-  O-D Station

Devens Traffic Monitoring Program

Figure 2-1
Internal Count Locations
April 2010

Scale: NTS
Basemap Source: MassGIS





I-13	Buena Vista Street/Saratoga Boulevard/Independence Drive	4/27/2010
I-14	Patton Road/Barnum Road/Saratoga Boulevard	4/27/2010
I-15	Jackson Road / Sherman Avenue	4/27/2010

It is noted that locations I-3, Givry Street/MacArthur Avenue, and I-5, Givry Road/MacArthur Avenue no longer exist due to roadway realignment.

Driveway turning movement counts and vehicle classification were completed at 16 business driveways within Devens to identify trip generation characteristics of the respective businesses. Counts were made between April 27 and April 28, 2010 from 7AM to 9AM and 4PM to 6PM at the following locations:

ID	Business Driveway	Date
D-1	American Superconductor - 64 Jackson Road	4/28/2010
D-2	Aneheuser Busch - 235 Barnum Road	4/28/2010
D-3	FBOP - Federal Medical Facility	4/28/2010
D-4	Gillette - 66 Saratoga Boulevard	4/28/2010
D-5	Job Corps - MacArthur Avenue	4/28/2010
D-6	Netstal / Xinetics - 53 & 57 Jackson Road	4/28/2010
D-7	Parker-Hannifin - 14 Robbins Pond Road	4/28/2010
D-8	Ryerson - 45 Saratoga Boulevard	4/28/2010
D-9	Sonoco - 18 Independence Boulevard	4/28/2010
D-10	Southern Container - 51 Independence Boulevard	4/28/2010
D-11	Xinetics - 115 Jackson Road	4/28/2010
D-12	Army Enclave at Quebec Street and 10th Mountain Division Road	4/28/2010
D-13	Devens Common - Ryans Way	4/28/2010
D-14	Devens Common - Andrews Parkway	4/28/2010
D-15	Bristol-Meyer Squibb - 38 Jackson Road	4/28/2010
D-16	Evergreen Solar - 112 Barnum Road	4/27/2010
D-17	Army Enclave at Lovell Road	4/27/2010

The AM and PM peak hour intersection turning movement counts at locations internal to Devens are shown in Figure 2-3 and Figure 2-4, respectively.

2.2.2. External Counts

Intersection turning movement counts and vehicle classification at locations in the towns surrounding Devens were completed between April 27 and April 28, 2010 at the following locations:

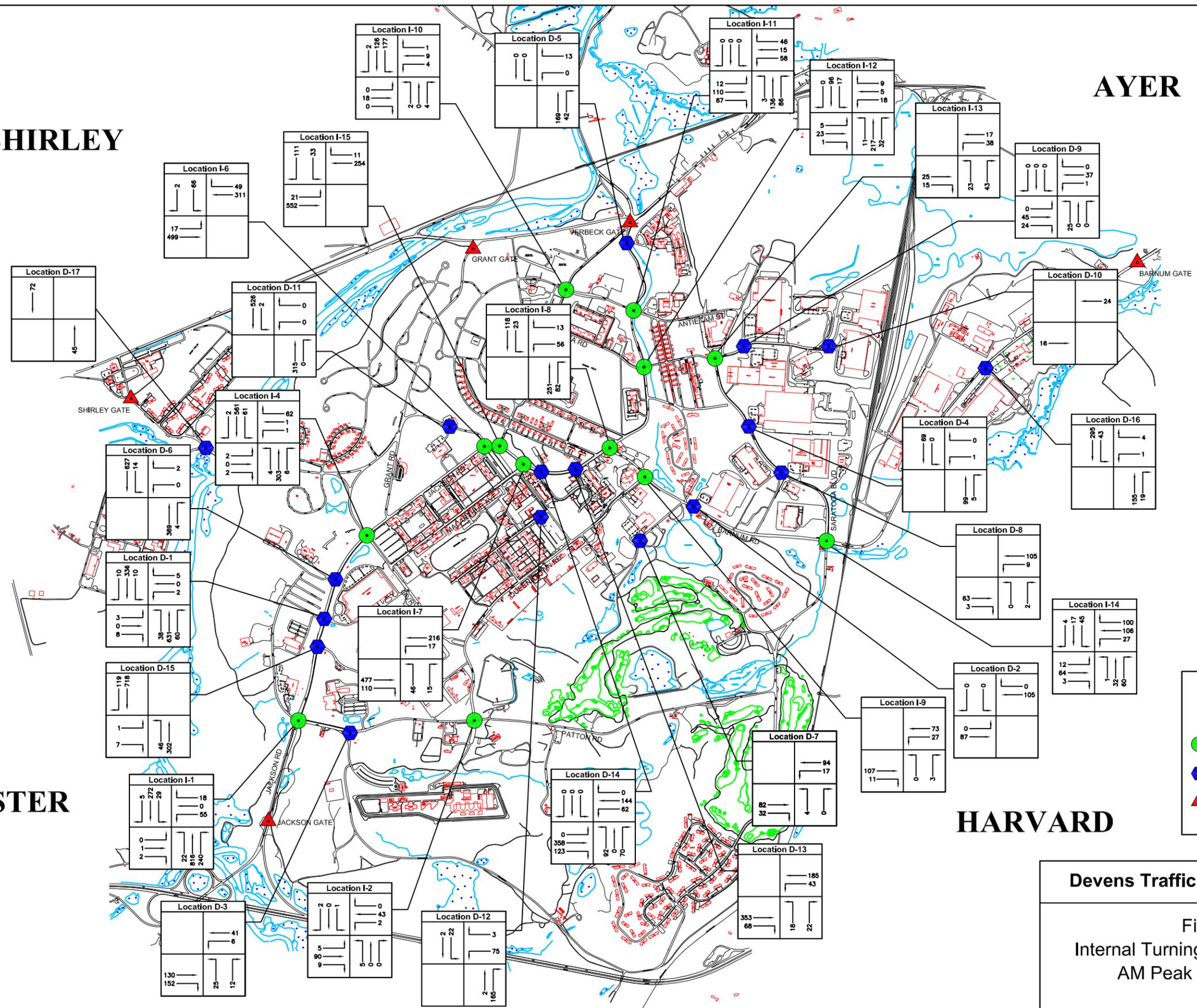
ID	Intersection	Town	Date
1	Front Street/Lancaster Street/Leominster Road/Center Road	Shirley	4/28/2010
2	Park Street/Fitchburg Road/Groton School Road	Ayer	4/28/2010

SHIRLEY

AYER

LANCASTER

HARVARD



LEGEND

- Intersection Count Location
- Driveway Count Location
- ▲ O-D Station

Devens Traffic Monitoring Program

Figure 2-3
Internal Turning Movement Volumes
AM Peak 2010 Conditions

Scale: NTS
Basemap Source: MassGIS

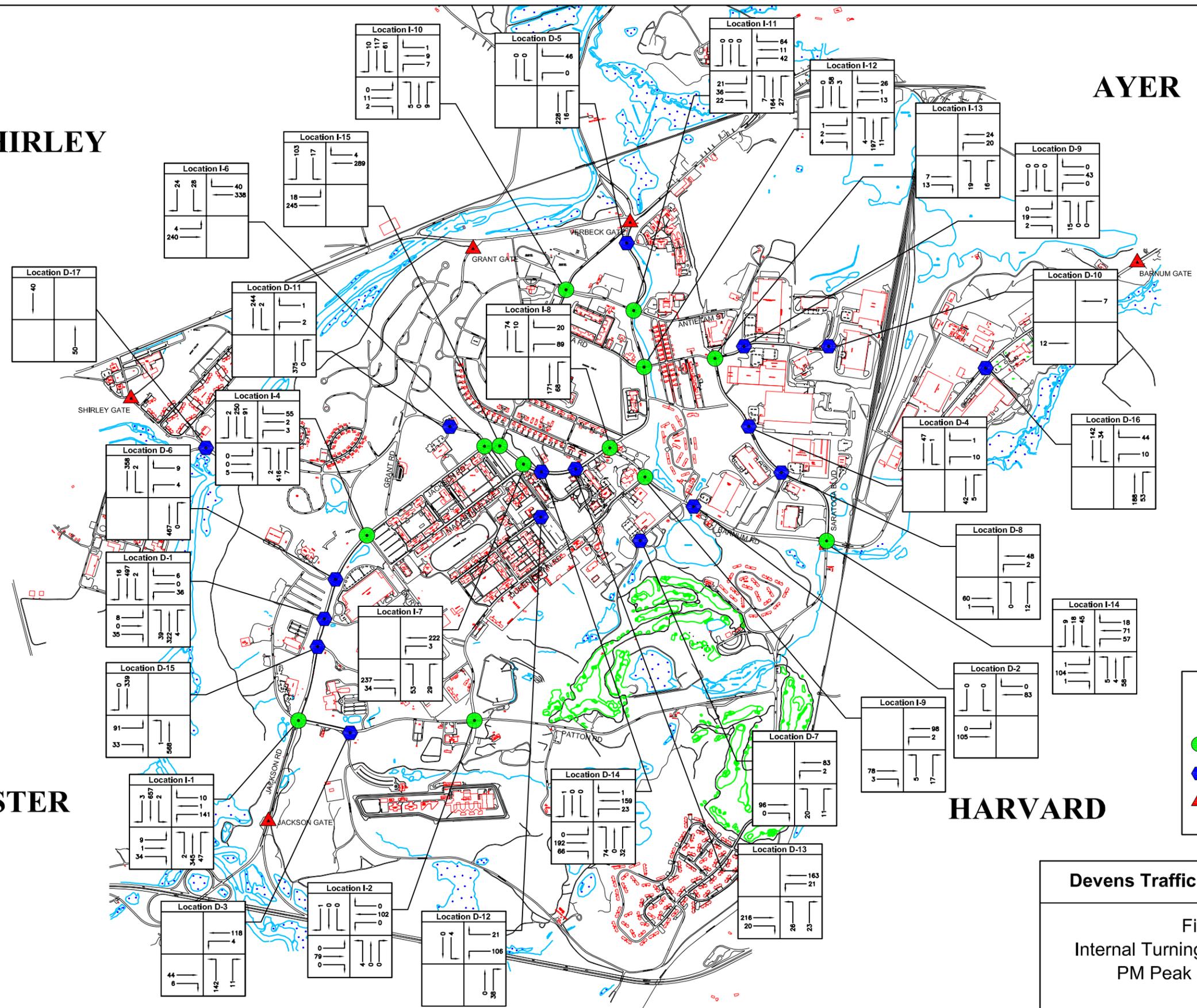


SHIRLEY

AYER

LANCASTER

HARVARD



LEGEND

- Intersection Count Location
- Driveway Count Location
- ▲ O-D Station

Devens Traffic Monitoring Program

Figure 2-4
Internal Turning Movement Volumes
PM Peak 2010 Conditions

Scale: NTS
Basemap Source: MassGIS

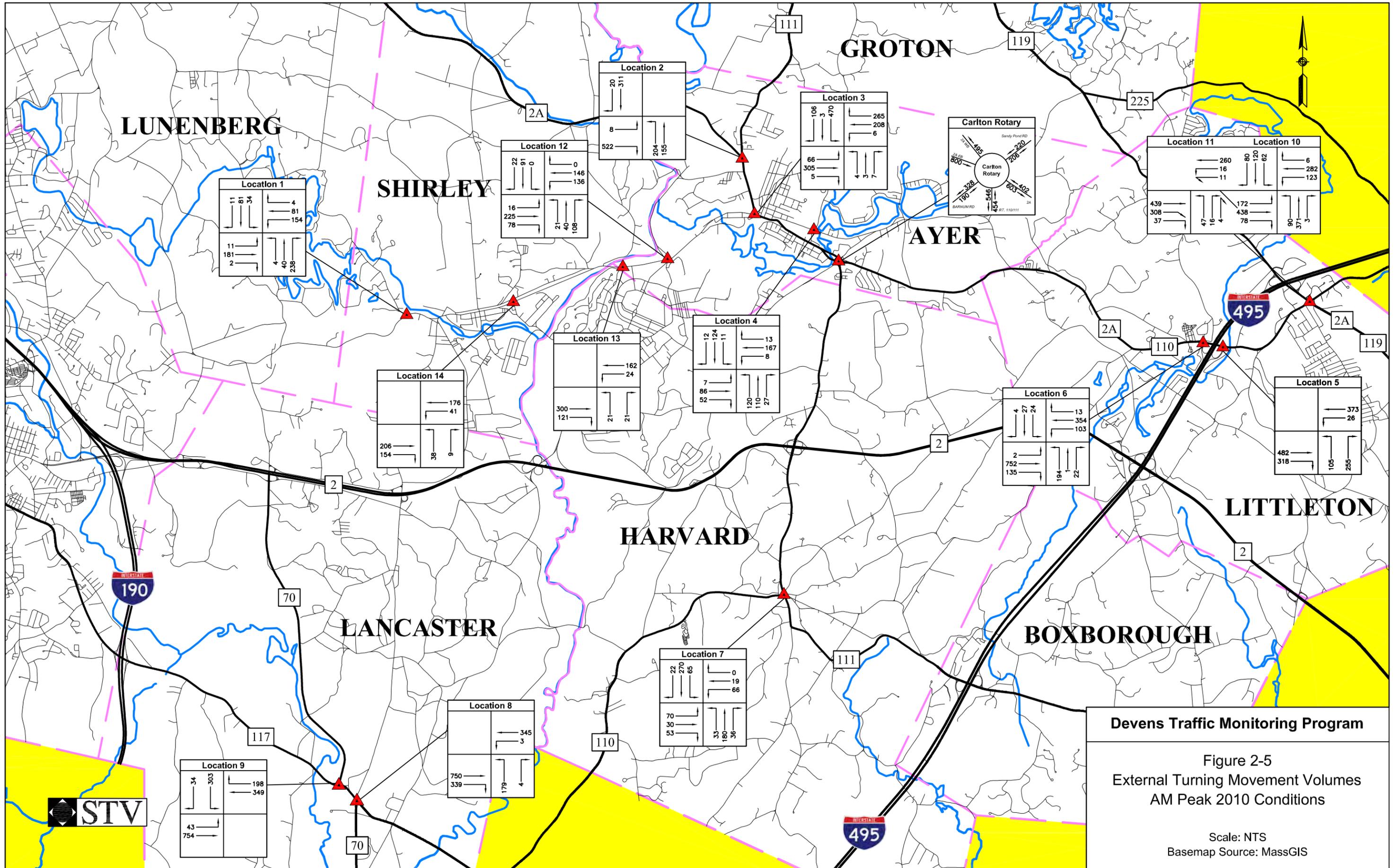


3	Park Street/Main Street/West Main Street	Ayer	4/28/2010
4	Groton-Harvard Road/Central Avenue	Ayer	4/28/2010
5	Route 2A-110/I-495 Exit 30 Northbound (NB) Ramps	Littleton	4/27/2010
6	Route 2A-110/I-495 Exit 30 Southbound (SB) Ramps	Littleton	4/27/2010
7	Route 110-111 (Ayer Road)/Route 110 (Still River Road)/Route 111	Harvard	4/27/2010
8	Route 70/117 (Seven Bridge Road)	Lancaster	4/27/2010
9	Route 70/117 (Lunenburg Road)	Lancaster	4/27/2010
10	Route 110 (King Street)/Route 119/Route 2A (Great Road)	Littleton Common	4/27/2010
11	Route 2A-110 (King Street)/Goldsmith Street	Littleton Common	4/27/2010
12	Verbeck Gate/MacPherson Road	Ayer	4/28/2010
13	Grant Road/West Main Street	Ayer	4/28/2010
14	Hospital Road/Front Street	Shirley	4/28/2010

The AM and PM peak hour intersection turning movement counts at locations external to Devens are shown in Figure 2-5 and Figure 2-6, respectively.

2.3.Average Daily Traffic Counts

Automatic traffic recorder (ATR) machines were used to collect 48-hour and 7-day traffic volume and vehicle classification counts on study roadways consistent with the previous studies. ATR were configured to collect heavy vehicle volumes, including the 13 different Federal Highway Administration (FHWA) vehicle classifications. The FHWA vehicles that were classified as trucks include buses, 2 Axle 6 Tire, 3 Axle Single, 4 Axle Single, <5 Axle Double, 5 Axle Double, >6 Axle Double, <6 Axle Multi, 6 Axle Multi and >6 Axle Multi vehicles. Table 2-1 provides average weekday daily traffic volumes (AWDT) and peak hour traffic volumes on the study roadways.



LUNENBERG

SHIRLEY

GROTON

AYER

LITTLETON

HARVARD

LANCASTER

BOXBOROUGH

Location 1

11	81	34	4
11	181	2	4
40	238	154	81
16	225	78	0

Location 2

20	311	8	522
204	155	265	208
106	470	66	305
3	6	5	7

Location 3

106	3	265	208
66	305	5	7
12	124	13	167
7	86	52	120

Carlton Rotary

2108	495	220	206
800	328	190	516
2108	495	220	206
800	328	190	516

Location 11 **Location 10**

260	80	120	62
16	11	6	282
439	308	37	47
172	438	78	90

Location 14

176	41	206	154
38	9	21	21
12	124	13	167
7	86	52	120

Location 13

162	24	300	121
21	21	22	270
22	270	65	0
70	30	53	33

Location 4

12	124	13	167
7	86	52	120
22	270	65	0
70	30	53	33

Location 6

4	27	24	13
2	752	135	194
13	354	103	22
34	303	198	349

Location 5

373	26	482	318
105	255	750	339
34	303	198	349
43	754	179	4

Location 9

34	303	198	349
43	754	179	4
22	270	65	0
70	30	53	33

Location 8

345	3	750	339
179	4	22	270
22	270	65	0
70	30	53	33

Location 7

22	270	65	0
70	30	53	33
345	3	750	339
179	4	22	270



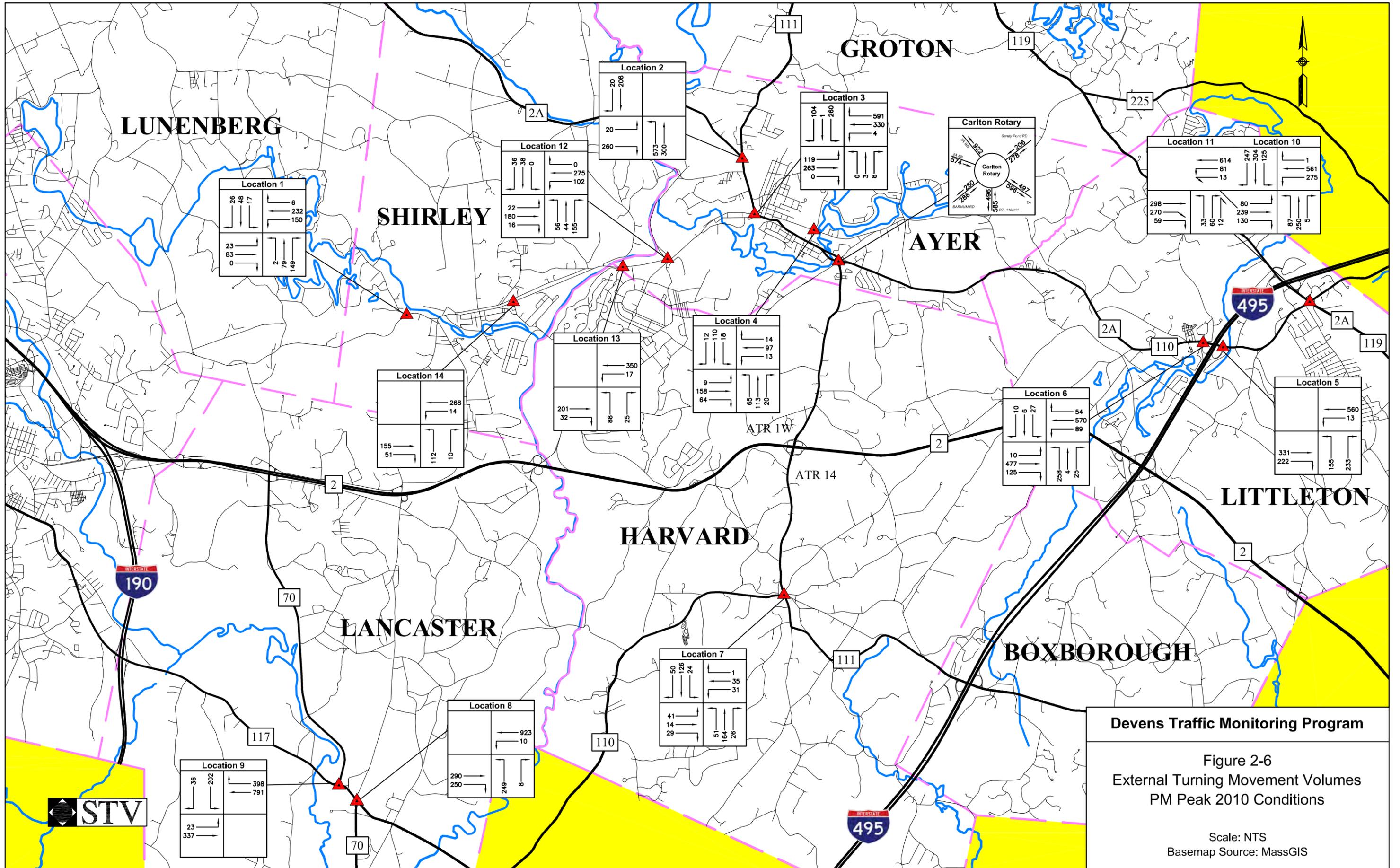


Table 2-1: Average Weekday ATR Counts

Location Number	Location	Count Dates	AWDT 2010	AM Peak Hour 2010	PM Peak Hour 2010
48-Hour ATR Counts					
1	Route 111 at Boxborough /Harvard Town Line	4/27/2010-4/28/2010	4,968	526	496
2	Route 2A at Ayer/Shirley Town Line	4/27/2010-4/28/2010	9,397	788	986
3	Route 111 t Ayer/Groton Town Line	4/27/2010-4/28/2010	6,684	544	578
4	Sandy Pond Road east of Central Avenue, Ayer	4/27/2010-4/28/2010	5,760	482	530
5	Groton-Harvard Road at Ayer/Groton Town Line	5/5/2010-5/6/2010	4,838	440	431
6	Front Street west of Ayer Street, Shirley	4/27/2010-4/28/2010	5,291	416	445
7	Jackson Gate				
	From Route 2 WB Off Ramp to Jackson Road NB	4/27/2010-4/28/2010	2,062	382	147
	From Route 2 EB Off Ramp to Jackson Road NB	4/27/2010-4/28/2010	4,505	693	268
	From Jackson Road SB to Route 2 WB On Ramp	4/27/2010-4/28/2010	4,299	204	519
	From Jackson Road SB to Route 2 EB On Ramp	4/27/2010-4/28/2010	2,110	190	254
8	Verbeck Gate	4/27/2010-4/28/2010	5,331	457	462
9	Shirley Gate	4/27/2010-4/28/2010	1,536	194	160
10	Barnum Gate	4/27/2010-4/28/2010	5,257	400	430
11	Grant Road Gate	5/5/2010-5/6/2010	1,574	190	153
12	Poor Farm Road east of Route 110/111, Harvard	4/27/2010-4/28/2010	1,453	147	133
13	Carlton Rotary				
	Route 2A/110 east of rotary	4/27/2010-4/28/2010	13,744	1,005	1,093
	Sandy Pond Road north of rotary	4/27/2010-4/28/2010	5,236	426	484
	Route 2A/111 west of rotary (WB)	4/27/2010-4/28/2010	9,102	495	922
	Route 2A/111 west of rotary (EB)	4/27/2010-4/28/2010	8,670	802	574
	Barnum Road south of rotary	4/27/2010-4/28/2010	6,314	518	536
	Route 110/111 south of rotary	4/27/2010-4/28/2010	12,864	1,000	1,081
14	Route 110/111 south of Route 2, Harvard	4/27/2010-4/28/2010	7,886	733	696
7-Day ATR Counts					
1	Route 110-111 north of Route 2, Harvard	5/1/2010-5/7/2010	15,606	1,303	1,285
2	Route 2A-110 at Littleton/Ayer Town Line	5/4/2010-5/10/2010	11,362	902	1,019
3	Route 2 east of I-495, Littleton	4/26/2010-5/2/2010	42,787	3,774	3,688
4	Route 2 west of I-495, Littleton	4/26/2010-5/2/2010, 5/7/2010-5/13/2010	53,297	4,580	4,583
5	Route 2 west of Route 70, Lancaster	4/26/2010-5/2/2010	58,973	4,712	4,788
6	Route 2 west of I-190, Leominster	4/26/2010-5/2/2010	71,220	5,213	5,758

2.4.Origin-Destination Survey

An origin-destination survey of vehicle entering and existing Devens was performed to identify trip patterns and the amount of traffic using Devens roadways as cut-through routes. License plate numbers (e.g., alpha numeric “strings”) of each vehicle entering and exiting through the five Devens Gates were recorded from 6AM to 6 PM on May 4, 2010. In addition to the last three alpha numeric characters of the license plate number, the 15-minute interval during the twelve hour period was recorded so that the data could be entered into a database and matched by time and location to determine each vehicles origin and destination. Results of the origin-destination survey can be found below.

2.5.Devens Resident and Business Employee Transportation Survey

A transportation survey was distributed to Devens residents and business employees by MassDevelopment (see Appendix). The objective of the survey was to collect information on resident and business employee trip patterns, focusing on trips to and from work. Surveyed individuals were asked to provide information on mode selection and typical route selection, such as gate choice, so that future trips may be assigned more accurately to the roadway system.

A total of 387 survey forms (67 residential and 320 business employee) were returned. The results show that Jackson Gate is the preferred access point to Devens (Figure 2-7) and that personal automobiles continue to be the preferred mode of transportation (Figure 2-8) for Devens residents and business employees.

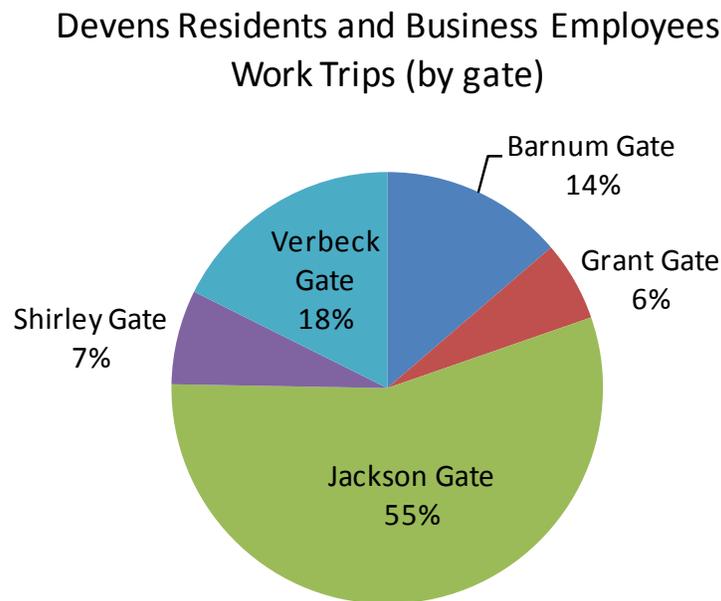


Figure 2-7: Devens Transportation Survey Results – Travel to Work (by Gate)

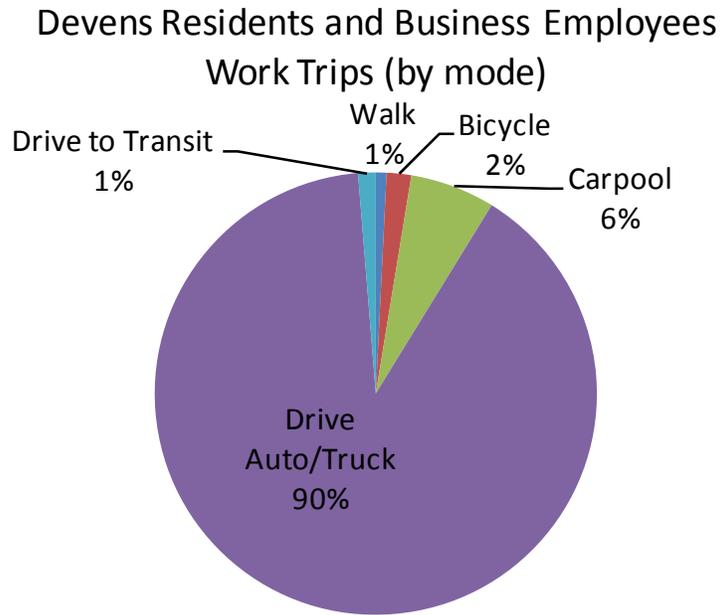


Figure 2-8: Devens Transportation Survey Results– Travel to Work (by Mode)

2.6. Transit Ridership

Devens and its surrounding communities are served by the Massachusetts Bay Transportation Authority (MBTA) Fitchburg Commuter Rail Line, with stations located in Ayer, Shirley, North Leominster, and Fitchburg. Transit ridership data indicates daily boardings have steadily increased to a nearly 1,500 passengers within the study area (Table 2-2). The percentage increase in daily boardings increased significantly at three of the four stations between February 2005 and February 2009. Some of this increased ridership may be attributed to increased gasoline prices; however it is encouraging that daily ridership was maintained in 2009 when gasoline prices were nearly equal to those in 2005. The decrease in daily boardings at Shirley Station may be attributed to the limited parking supply. Passengers who may normally board at Shirley Station often arrive to a full parking lot and consequently drive into Ayer or Littleton to park and board the train.

Table 2-2: MBTA Commuter Rail Daily Boardings at Devens Area Stations

Station	Feb-99	Feb-00	Feb-01	Feb-02	Feb-03	Feb-04	Feb-05	Apr-06	Jun-07	Feb-08	Feb-09	% Change 2/05 to 2/09
Ayer	186	190	228	194	209	245	292	336	327	427	490	68%
Shirley	162	171	151	115	116	130	180	179	191	218	144	-20%
N. Leominster	217	200	208	185	176	186	311	321	357	408	366	18%
Fitchburg	201	231	209	240	236	195	307	363	386	440	462	50%
Total	766	792	796	734	737	756	1090	1199	1261	1493	1462	34%

Source: Massachusetts Bay Transportation Authority

Transit ridership is increasing at a greater rate than regional automobile traffic, which indicates public transit is an attractive mode of transportation for regional commuters. Approximately 6 percent of Devens residents use transit to commute to work, but less than 1 percent of Devens business employees use transit to commute to Devens, which is consistent with those results provided in the 2005 Study.

2.7. Background Traffic Growth

Background traffic growth is a result of development which occurs external to Devens. Previous 5 year reports and current regional planning studies by MassDOT and Metropolitan Regional Planning Commission (MRPC) typically use a growth rate of 1.77% per year. This figure is based on a MRPC study which evaluated traffic growth from 1979 to 1997. Regional traffic growth has generally been observed to be increasing at rates slower than this (no growth or 0.5% per year), however no other growth rate is widely used in the region. The lack of published regional traffic growth rate prohibits this study from identifying a more accurate background growth rate, thus 1.77% is retained for consistency with previous 5 year reports and other current regional planning studies. The use of 1.77% annual traffic growth is believed to be conservative.

2.8. Regional Development

Regional development, both internal and external to Devens is a primary contributor to regional traffic volumes. In order to gain an understanding of current development trends and how they can be applied to the project, the following communities and agencies within the vicinity of Devens were contacted:

- MassDevelopment Real Estate Office
- MassDOT Office of Transportation Planning
- Montachusett Regional Planning Commission (MRPC)
- Metropolitan Area Planning Council
- Towns of Ayer, Boxborough, Groton, Harvard, Lancaster, Littleton, Lunenburg, and Shirley.

The MassDevelopment Real Estate Office provided residential, commercial, and industrial statistics for existing development, potential expansion, and planned development (see Build-out Analysis).

Conversations with MassDOT and MRPC indicate there are no major transportation or development projects planned for the region. The only project currently on the TIP within the study area is a parking garage near the MBTA commuter rail station in Ayer. Other known regional projects include \$200 million for improvements along the Fitchburg Commuter Rail Line aimed at reducing travel times (discussed more below), and Crosby Corner roadway reconstruction aimed at reducing traffic congestion on Route 2 in Concord. While these projects are not located within the study area, they have potential to alter regional traffic patterns in the future.

Town planners for each surrounding community were contacted to collect information related to the type and status of current developments and any future planned development. The following information was obtained:

- Ayer – No response received
- Boxborough
 - 104,475 s.f. of various commercial developments under construction and planned
- Groton
 - Academy Hill – 94 residential units consisting of single-family homes, condominiums, and multifamily homes (approx. 25% occupied)
 - Rocky Hill - 84 residential units consisting of single-family homes, condominiums, and multifamily homes (approx. 25% occupied)
 - Shaws Plaza and surrounding areas– various commercial developments permitted; however construction has stalled due to financial instability.
- Harvard – No significant projects planned
- Lancaster
 - 58 condominium townhomes off of High Street Extension (60% built out)
 - 115 single-family homes off of Sterling Road (90% built out)
 - 36 condominium townhomes off of Deershorn Road
 - 84 single-family homes off of Sterling Road
 - Ascetic Hill Park (industrial park) off of Lunenburg Road (Preliminary Subdivision Plan approved)
- Littleton
 - Reconstructed IBM facility at 550 – 560 King Street (completed June 2010)
 - 108-unit 40B project “Village on the Common” has halted construction, gone to auction, and high bidder backed out. Nothing is currently proposed for the site.
- Lunenburg
 - 238 residential units off of Lakefront Avenue
 - 204 apartment rental unit 40R development off of Youngs Road
- Shirley– No significant projects planned

Based on this information, it is expected that development in the near future will occur mainly in North Lancaster, which has blossomed in the last 5-10 years with new businesses, ranging from industrial and commercial to recreational and medical. The 1.77 percent annual growth rate selected is considered conservative given the relative few projects capable of impacting regional traffic patterns.

3. Traffic Trends

In order to gain an understanding of the traffic trends in the study area, the existing 2010 traffic volumes and classifications were compared to those reported in previous Devens Traffic Monitoring Reports. Specifically, the following traffic trends were analyzed:

- Devens driveway volumes
- Internal and External location AWDT Volumes
- Devens Gate AWDT Volumes
- Devens Gate Truck Traffic Volumes
- Origin - Destination Survey
- Residential and Employee Mode Selection

Comparisons herein are generally relative to the 2005 Devens Traffic Monitoring Study, rather than the 2008 Biennial Traffic Report. It is noted that major construction activity within Devens generated an atypically high number of construction-related truck and vehicle trips in 2008. Thus, the 2008 traffic volumes are considered skewed higher as a result of short-term construction activity.

3.1. Devens Driveway Volumes

Driveway turning movement counts at 16 business driveways within Devens were compared to those reported in the 2000 and 2005 Devens Traffic Monitoring report (Table 3-1). Turning movement count data for five driveways (D-12 to D-16) was not collected previously, thus it is only provided for informational purposes only and for future comparisons.

Driveway volumes overall have increased by 22% between 2005 and 2010. Much of this growth is explained by the increased trip generation by Parker-Hannifin (+35 peak hour trips), American Superconductor (+81 peak hour trips), and FBOP – Federal Medical Facility (+105 peak hour trips). While five driveways are shown to have decreased driveway volumes, the decrease is relatively minor. Xinetics and Gillette experienced the most significant decrease in trips between 2005 and 2010, which can likely be potentially be attributed to a reduction in production at these business due to expiring lease agreements and possible relocations.

Table 3-1: Devens Business Driveway Count Comparison (2000-2010)

Driveway Turning Movement Counts	AM Peak Hour				PM Peak Hour				
	2000	2005	2010	Difference 2005-2010	2000	2005	2010	Difference 2005-2010	
D-1	American Superconductor - 64 Jackson Road	NA	21	77	56	NA	23	48	25
D-2	Aneheuser Busch - 235 Barnum Road	NA	7	0	-7	NA	5	0	-5
D-3	FBOP - Federal Medical Facility	195	164	195	31	109	89	163	74
D-4	Gillette - 66 Saratoga Boulevard	20	18	6	-12	17	34	17	-17
D-5	Job Corps - MacArthur Avenue	35	62	55	-7	55	72	62	-10
D-6	Netstal / Xinetics - 53 & 57 Jackson Road	27	15	20	5	24	15	15	0
D-7	Parker-Hannifin - 14 Robbins Pond Road	22	28	53	25	32	23	33	10
D-8	Ryerson - 45 Saratoga Boulevard	18	10	14	4	10	0	15	15
D-9	Sonoco - 18 Independence Boulevard	NA	75	50	-25	NA	23	17	-6
D-10	Southern Container - 51 Independence Boulevard	NA	11	40	29	NA	11	19	8
D-11	Xinetics - 115 Jackson Road	NA	20	2	-18	NA	18	5	-13
D-12	Army Enclave at Quebec Street and 10th Mountain Division Road	NA	NA	265		NA	NA	169	
D-13	Devens Common - Ryans Way	NA	NA	151		NA	NA	90	
D-14	Devens Common - Andrews Parkway	NA	NA	347		NA	NA	195	
D-15	Bristol-Meyer Squibb - 38 Jackson Road	NA	NA	173		NA	NA	125	
D-16	Evergreen Solar - 112 Barnum Road	NA	NA	67		NA	NA	141	
D-17	Army Enclave at Lovell Road	NA	NA	117		NA	NA	90	

For comparison reasons, the existing driveway count data were compared against estimated trip generations rates based on rates provided in the Institute of Transportation Engineers (ITE) Trip Generation, 8th Edition. A discussion on this is provided in sections below.

3.2.Average Weekday Daily Traffic -External Locations

Average weekday daily volume counts on study roadways were compared to those reported in previous Devens Traffic Monitoring report (Figure 3-1, Table 3-2, 3-3, 3-4). Traffic volumes on roadways external to Devens have remained generally consistent between 2006 and 2010. While individual study roadways have experienced either an increase or decrease in volume, collectively, the study roadways have experienced a traffic growth rate of approximately -1.0% per year since 2006. When compared to the typical MassDOT and MRCP annual growth of 1.77% (based on traffic trends from 1979 to 1997), the current traffic growth in the Devens area indicates regional traffic growth has slowed to a “no growth” condition or potentially negative growth.

Many of the study roadways have stabilized or experienced minor fluctuations in traffic volumes since 2006 (Figure 3-1). However, some study roadways have experienced rather significant volume growth since 2006, notably Route 2A at Ayer/Shirley Town Line (20% growth since 2006) and Route 111 at Ayer/Groton Town Line (10% growth since 2006).

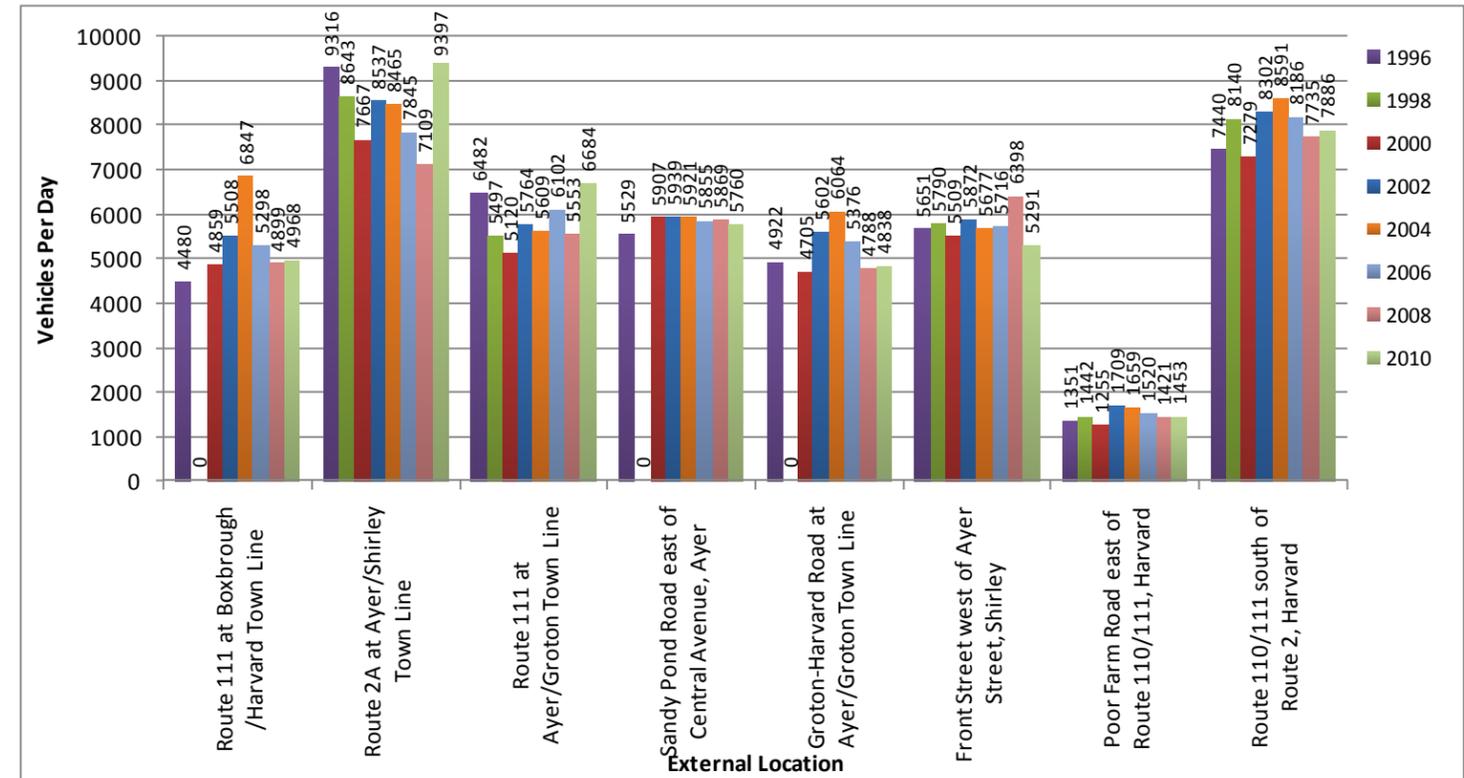


Figure 3-1: Average Weekday Daily Traffic – 48 Hour Count Locations

Table 3-2: Average Weekday Daily Traffic (AWDT) – External Locations (48 Hour Counts)

Location Number	Location	AWDT 1996	AWDT 1998	AWDT 2000	AWDT 2002	AWDT 2004	AWDT 2006	AWDT 2008	AWDT 2010
48-Hour ATR Counts									
1	Route 111 at Boxborough /Harvard Town Line	4,480	n/a	4,859	5,508	6,847	5,298	4,899	4,968
2	Route 2A at Ayer/Shirley Town Line	9,316	8,643	7,667	8,537	8,465	7,845	7,109	9,397
3	Route 111 t Ayer/Groton Town Line	6,482	5,497	5,120	5,764	5,609	6,102	5,553	6,684
4	Sandy Pond Road east of Central Avenue, Ayer	5,529	n/a	5,907	5,939	5,921	5,855	5,869	5,760
5	Groton-Harvard Road at Ayer/Groton Town Line	4,922	n/a	4,705	5,602	6,064	5,376	4,788	4,838
6	Front Street west of Ayer Street, Shirley	5,651	5,790	5,509	5,872	5,677	5,716	6,398	5,291
7	Jackson Gate	3,578	4,854	6,398	7,405	8,508	9,552	12,394	12,205
	From Route 2 WB Off Ramp to Jackson Road NB							2,024	2,062
	From Route 2 EB Off Ramp to Jackson Road NB							4,296	4,505
	From Jackson Road SB to Route 2 WB On Ramp							4,285	4,299
	From Jackson Road SB to Route 2 EB On Ramp							1,784	2,110
8	Verbeck Gate	2,354	3,363	4,655	6,134	4,798	5,229	5,327	5,331
9	Shirley Gate	n/a	533	1,104	731	1,927	1,317	1,406	1,536
10	Barnum Gate	2,172	2,766	3,418	5,966	4,587	4,779	5,624	5,257
11	Grant Road Gate	n/a	n/a	n/a	n/a	638	936	2,233	1,574
12	Poor Farm Road east of Route 110/111, Harvard	1,351	1,442	1,255	1,709	1,659	1,520	1,421	1,453
13	Carlton Rotary								
	Route 2A/110 east of rotary	14,472	15,229	14,131	17,677	16,258	16,722	15,338	13,744
	Sandy Pond Road north of rotary	4,701	6,505	3,798	4,301	5,030	5,178	5,022	5,236
	Route 2A/111 west of rotary (WB)	10,355	10,650	9,629	10,352	10,806	10,080	9,583	9,102
	Route 2A/111 west of rotary (EB)	9,951	10,394	9,483	9,796	10,101	9,370	9,152	8,670
	Barnum Road south of rotary	3,186	2,694	3,418	5,966	5,326	5,920	7,749	6,314
	Route 110/111 south of rotary	13,837	14,533	13,475	15,677	16,127	10,715	14,417	12,864
14	Route 110/111 south of Route 2, Harvard	7,440	8,140	7,279	8,302	8,591	8,186	7,735	7,886

Table 3-3: AM Peak Hour Traffic – External Locations (48 Hour Counts)

Location Number	Location	AM Peak Hour 1996	AM Peak Hour 1998	AM Peak Hour 2000	AM Peak Hour 2002	AM Peak Hour 2004	AM Peak Hour 2006	AM Peak Hour 2008	AM Peak Hour 2010
48-Hour ATR Counts									
1	Route 111 at Boxbrough /Harvard Town Line	448	n/a	540	552	715	516	550	526
2	Route 2A at Ayer/Shirley Town Line	852	740	723	743	816	728	697	788
3	Route 111 t Ayer/Groton Town Line	596	540	426	469	580	496	500	544
4	Sandy Pond Road east of Central Avenue, Ayer	445	n/a	502	498	471	481	519	482
5	Groton-Harvard Road at Ayer/Groton Town Line	473	n/a	546	549	500	552	482	440
6	Front Street west of Ayer Street, Shirley	412	403	429	495	441	456	541	416
7	Jackson Gate	324	462	812	770	836	951	1,236	1,469
	From Route 2 WB Off Ramp to Jackson Road NB							236	382
	From Route 2 EB Off Ramp to Jackson Road NB							689	693
	From Jackson Road SB to Route 2 WB On Ramp							203	204
	From Jackson Road SB to Route 2 EB On Ramp							120	190
8	Verbeck Gate	217	264	470	492	441	454	417	457
9	Shirley Gate	n/a	48	70	53	232	132	245	194
10	Barnum Gate	159	193	260	384	418	366	529	400
11	Grant Road Gate	n/a	n/a	n/a	n/a	67	97	249	190
12	Poor Farm Road east of Route 110/111, Harvard	129	162	132	180	168	154	146	147
13	Carlton Rotary								
	Route 2A/110 east of rotary	1,023	978	1,071	1,215	1,158	1,097	1,052	1,005
	Sandy Pond Road north of rotary	307	441	325	403	433	433	423	426
	Route 2A/111 west of rotary (WB)	537	459	519	488	622	546	513	495
	Route 2A/111 west of rotary (EB)	1,056	1,054	1,034	1,040	940	890	852	802
	Barnum Road south of rotary	220	181	260	384	401	403	575	518
	Route 110/111 south of rotary	1,075	1,148	1,121	1,202	1,346	796	1,254	1,000
14	Route 110/111 south of Route 2, Harvard	658	678	672	695	783	738	738	733

Table 3-4: PM Peak Hour Traffic – External Locations (48 Hour Counts)

Location Number	Location	PM Peak Hour 1996	PM Peak Hour 1998	PM Peak Hour 2000	PM Peak Hour 2002	PM Peak Hour 2004	PM Peak Hour 2006	PM Peak Hour 2008	PM Peak Hour 2010
48-Hour ATR Counts									
1	Route 111 at Boxbrough /Harvard Town Line	538	n/a	530	549	714	603	534	496
2	Route 2A at Ayer/Shirley Town Line	905	787	704	805	789	762	698	986
3	Route 111 t Ayer/Groton Town Line	554	541	406	483	554	529	490	578
4	Sandy Pond Road east of Central Avenue, Ayer	538	n/a	575	550	551	563	588	530
5	Groton-Harvard Road at Ayer/Groton Town Line	438	n/a	453	493	536	483	448	431
6	Front Street west of Ayer Street, Shirley	492	458	471	482	506	495	550	445
7	Jackson Gate	369	434	579	631	853	926	1,188	1,188
	From Route 2 WB Off Ramp to Jackson Road NB							220	147
	From Route 2 EB Off Ramp to Jackson Road NB							184	268
	From Jackson Road SB to Route 2 WB On Ramp							668	519
	From Jackson Road SB to Route 2 EB On Ramp							206	254
8	Verbeck Gate	206	252	380	506	421	488	512	462
9	Shirley Gate	n/a	53	122	36	179	138	150	160
10	Barnum Gate	172	224	367	430	454	462	470	430
11	Grant Road Gate	n/a	n/a	n/a	n/a	72	92	264	153
12	Poor Farm Road east of Route 110/111, Harvard	147	152	124	164	152	140	148	133
13	Carlton Rotary								
	Route 2A/110 east of rotary	1,248	1,257	1,133	1,326	1,324	1,414	1,281	1,093
	Sandy Pond Road north of rotary	456	558	320	363	449	494	440	484
	Route 2A/111 west of rotary (WB)	1,232	1,182	1,043	1,137	1,142	1,086	1,072	922
	Route 2A/111 west of rotary (EB)	611	555	581	507	636	604	572	574
	Barnum Road south of rotary	261	170	367	430	532	598	709	536
	Route 110/111 south of rotary	1,222	1,269	1,098	1,210	1,338	944	1,260	1,081
14	Route 110/111 south of Route 2, Harvard	760	766	600	640	736	764	735	696

Traffic volumes on Route 2 continue to show stabilizing and decreasing volume growth trends since 2006 (Figure 3-2 and Table 3-5). This is consistent with many observed regional and statewide roadways.

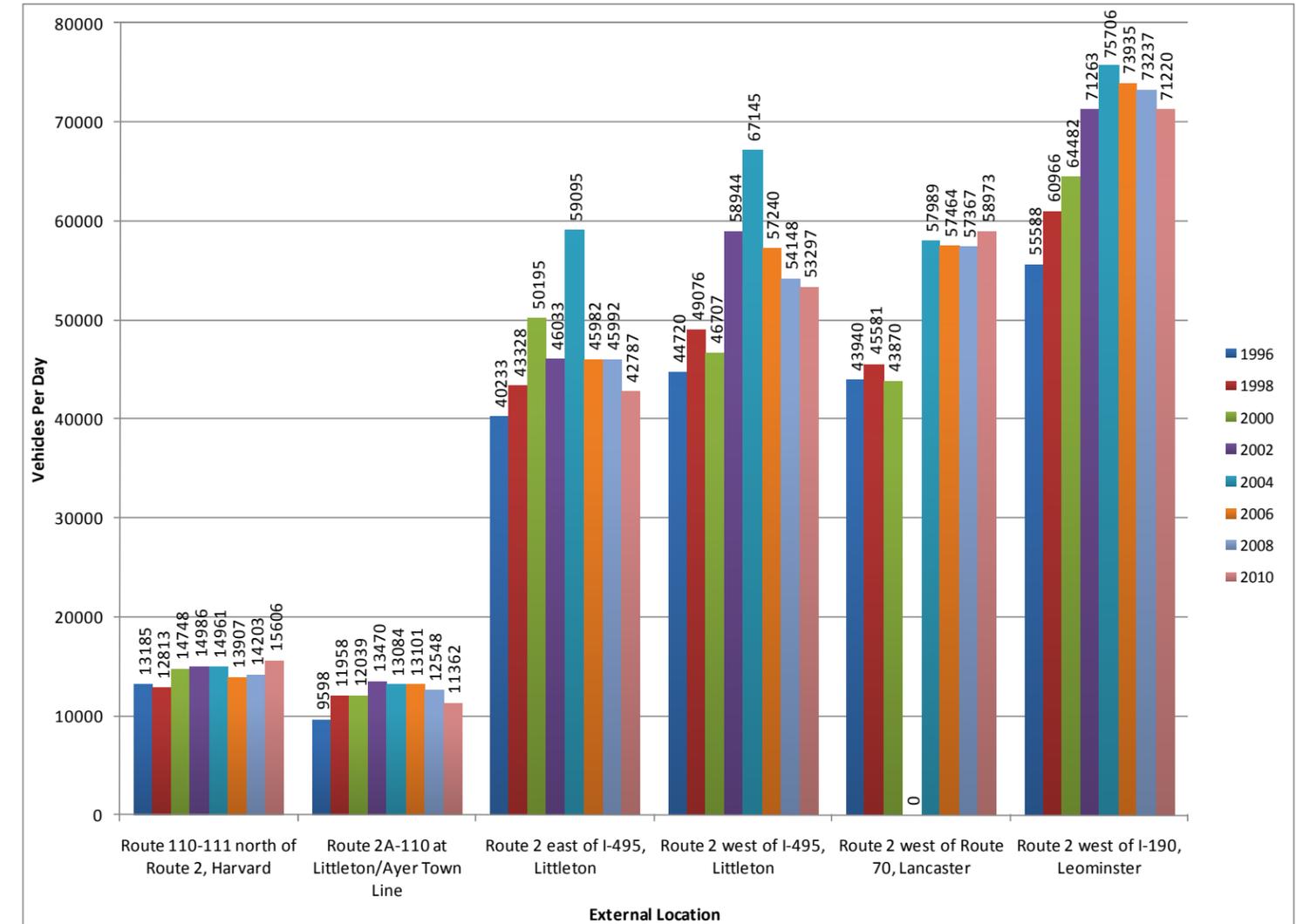


Figure 3-2: Average Weekday Daily Traffic – 7 Day Count Locations

1.1.Total Intersection Volumes – External Locations

Traffic volumes at intersection locations external to Devens have stabilized since 2006 (Table 3-6 and Table 3-7). Since 2006, the total AM and PM Peak Hour intersection volumes have decreased by approximately 2% and 6%, respectively. This stabilization in intersection volumes is consistent with the AWDT trends observed in the region.

Table 3-5: Average Weekday Daily Traffic (AWDT) – External Locations (7 Day Counts)

Location Number	Location	ADT 1996	ADT 1998	ADT 2000	ADT 2002	ADT 2004	ADT 2006	ADT 2008	ADT 2010	AWDT 1996	AWDT 1998	AWDT 2000	AWDT 2002	AWDT 2004	AWDT 2006	AWDT 2008	AWDT 2010
1	Route 110-111 north of Route 2, Harvard	11,912	11,524	13,258	13,471	13,378	12,758	12574 ^E	14,511	13,185	12,813	14,748	14,986	14,961	13,907	14203 ^F	15,606
2	Route 2A-110 at Littleton/Ayer Town Line ^A	8,567	10,681	12,039	12,126	11,721	11,376	10,987	10,233	9,598	11,958	12,039	13,470	13,084	13,101	12,548	11,362
3	Route 2 east of I-495, Littleton	36,141	38,979	43,851	42,076	52,876	41,970	41,136	40,131	40,233	43,328	50,195	46,033	59,095	45,982	45,992	42,787
4	Route 2 west of I-495, Littleton ^B	40,510	44,620	42,485	51,083	60,066	52,484	48,340	49,552	44,720	49,076	46,707	58,944	67,145	57,240	54,148	53,297
5	Route 2 west of Route 70, Lancaster	41,441	41,981	NA	NA	51,628	53,198	51,902	54,266	43,940	45,581	43,870	NA	57,989	57,464	57,367	58,973
6	Route 2 west of I-190, Leominster ^C	51,857	55,982	58,650	64,339	70,414	69,094	67,698	66,889	55,588	60,966	64,482	71,263	75,706	73,935	73,237	71,220
Location Number	Location	AM Peak Hour 1996	AM Peak Hour 1998	AM Peak Hour 2000	AM Peak Hour 2002	AM Peak Hour 2004	AM Peak Hour 2006	AM Peak Hour 2008	AM Peak Hour 2010	PM Peak Hour 1996	PM Peak Hour 1998	PM Peak Hour 2000	PM Peak Hour 2002	PM Peak Hour 2004	PM Peak Hour 2006	PM Peak Hour 2008	PM Peak Hour 2010
1	Route 110-111 north of Route 2, Harvard	1,083	969	1,201	1,252	1,156	1,150	1,227	1,303	1,169	1,092	1,237	1,222	1,230	1,185	1268 ^F	1,285
2	Route 2A-110 at Littleton/Ayer Town Line ^A	799	890	1,030	1,054	1,004	958	947	902	725	911	940	1,003	1,111	1,060	1,017	1,019
3	Route 2 east of I-495, Littleton	3,886	3,896	4,374	4,064	5,430	4,217	4,230	3,774	3,872	3,964	5,133	3,962	4,860	4,025	4,055	3,688
4	Route 2 west of I-495, Littleton ^B	4,096	4,666	4,486	4,931	6,120	5,008	5,127	4,580	4,008	4,080	4,052	5,028	5,787	4,914	4,762	4,583
5	Route 2 west of Route 70, Lancaster	4,143	4,610	^D	^D	6,040	4,830	5,029	4,712	3,858	3,868	^D	NA	4,443	4,966	4,693	4,788
6	Route 2 west of I-190, Leominster ^C	4,701	5,417	5,556	5,567	6,150	5,998	6,050	5,213	4,625	5,082	5,313	5,766	6,135	6,058	5,935	5,758
Location Number	Location	Saturday Peak Hour 1996	Saturday Peak Hour 1998	Saturday Peak Hour 2000	Saturday Peak Hour 2002	Saturday Peak Hour 2004	Saturday Peak Hour 2006	Saturday Peak Hour 2008	Saturday Peak Hour 2010	Saturday Peak Hour 1996	Saturday Peak Hour 1998	Saturday Peak Hour 2000	Saturday Peak Hour 2002	Saturday Peak Hour 2004	Saturday Peak Hour 2006	Saturday Peak Hour 2008	Saturday Peak Hour 2010
1	Route 110-111 north of Route 2, Harvard	10,175	9,209	10,641	11,167	10,916	11,307	10,234	13,367	880	764	875	933	958	1,000	896	1,133
2	Route 2A-110 at Littleton/Ayer Town Line ^A	6,597	8,270	NA	10,033	9,659	9,003	8,235	7,799	553	653	NA	814	776	704	681	606
3	Route 2 east of I-495, Littleton	27,235	30,428	28,399	34,232	44,822	34,039	31,001	39,368	2,047	2,240	2,227	2,454	3,294	2,595	2,396	2,918
4	Route 2 west of I-495, Littleton ^B	30,194	37,623	33,015	38,747	40,606	42,099	38,749	41,038	2,383	2,972	2,341	2,954	3,011	3,134	2,992	3,103
5	Route 2 west of Route 70, Lancaster	35,527	35,321	^D	^D	30,552	45,817	39,025	46,279	2,553	2,732	^D	^D	2,237	3,341	2,855	3,311
6	Route 2 west of I-190, Leominster ^C	43,925	^D	46,368	53,238	62,260	62,440	58,145	60,836	3,174	^D	3,592	4,198	4,695	4,680	4,490	4,399
Location Number	Location	Sunday Peak Hour 1996	Sunday Peak Hour 1998	Sunday Peak Hour 2000	Sunday Peak Hour 2002	Sunday Peak Hour 2004	Sunday Peak Hour 2006	Sunday Peak Hour 2008	Sunday Peak Hour 2010	Sunday Peak Hour 1996	Sunday Peak Hour 1998	Sunday Peak Hour 2000	Sunday Peak Hour 2002	Sunday Peak Hour 2004	Sunday Peak Hour 2006	Sunday Peak Hour 2008	Sunday Peak Hour 2010
1	Route 110-111 north of Route 2, Harvard	7,282	7,403	8,442	11,167	7,926	8,464	8,398	10,185	628	587	828	933	815	800	769	909
2	Route 2A-110 at Littleton/Ayer Town Line ^A	5,380	6,722	NA	10,033	6,969	6,906	5,918	7,026	491	532	NA	814	625	652	532	625
3	Route 2 east of I-495, Littleton	24,582	25,805	27,591	34,232	29,835	29,845	26,984	27,603	1,989	2,149	2,436	2,454	2,583	2,758	2,320	2,411
4	Route 2 west of I-495, Littleton ^B	29,775	29,340	30,834	38,747	44,132	38,089	34,701	39,340	2,499	2,307	2,616	2,954	3,708	3,363	3,139	3,340
5	Route 2 west of Route 70, Lancaster	32,387	30,644	^D	^D	40,889	39,248	37,459	38,713	2,642	2,735	^D	^D	3,429	3,289	3,058	3,266
6	Route 2 west of I-190, Leominster ^C	41,133	40,936	30,834	53,238	52,103	51,540	49,557	51,272	3,310	3,391	3,592	4,198	4,227	4,454	4,428	4,445

- A. 2 day count in 2000
- B. 5 day count in 2002
- C. 6 day count in 2002
- D. Data not available from MHD permanent count locations
- E. 6 day count in 2008
- F. 4 day count in 2008

Table 3-6: Total AM Peak Hour Intersection Volumes – External Locations

Intersection	1996 AM Baseline Pk. Hr. (vph)	1998 AM Pk. Hr. (vph)	2000 AM Pk. Hr. (vph)	2002 AM Pk. Hr. (vph)	2004 AM Pk. Hr. (vph)	2006 AM Pk. Hr. (vph)	2008 AM Pk. Hr. (vph)	2010 AM Pk. Hr. (vph)
1. Front St./Lancaster St./Leominster Rd./Center Rd., Shirley	802	861	803	738	761	815	838	841
2. Park St./Fitchburg Rd./Groton School Rd., Ayer	1210	1241	1157	1239	1146	1196	1238	1220
3. Park St./Main St./West Main St., Ayer	1492	1556	1361	1442	1372	1578	1504	1448
4. Groton-Harvard Rd./Central Ave., Ayer	864	941	880	990	869	782	801	737
5. Route 2A-110 (King St.)/I-495 Exit 30 NB Ramps, Littleton	1555	1703	1833	1941	1482	1462	1472	1559
6. Route 2A-110 (King St.)/I-495 Exit 30 SB Ramps, Littleton	1539	1714	1830	1782	1583	1657	1578	1631
7. Route 110-111 (Ayer Rd.)/Route 110/Route 111, Harvard	818	952	833	823	875	891	949	844
8. Route 70/Route 117 (Seven Bridge Rd.), Lancaster	1452	1582	1616	1597	1564	1621	1760	1620
9. Route 70/Route 117 (Lunenburg Rd.), Lancaster	1471	1581	1652	1649	1608	1664	1818	1681
10. Route 110 (King St.)/Route 119/Route 2A, Littleton Common	2085	2196	2225	2382	2180	1873	1921	1825
11. Route 2A-110 (King St.)/Goldsmith St., Littleton Common	1469	1667	1674	1638	1449	1213	1319	1138
12. Verbeck Gate/MacPherson Rd., Ayer	774	710	888	1014	916	1094	1062	883
13. Grant Rd./West Main St., Ayer	n/a	n/a	n/a	n/a	637	625	777	649
14. Hospital Rd./Front St., Shirley	n/a	n/a	n/a	n/a	668	553	671	624

Table 3-7: Total PM Peak Hour Intersection Volumes – External Locations

Intersection	1996 PM Baseline Pk. Hr. (vph)	1998 PM Pk. Hr. (vph)	2000 PM Pk. Hr. (vph)	2002 PM Pk. Hr. (vph)	2004 PM Pk. Hr. (vph)	2006 PM Pk. Hr. (vph)	2008 PM Pk. Hr. (vph)	2010 PM Pk. Hr. (vph)
1. Front St./Lancaster St./Leominster Rd./Center Rd., Shirley	953	779	847	782	850	776	889	815
2. Park St./Fitchburg Rd./Groton School Rd., Ayer	1353	1523	1447	1487	1482	1450	1414	1381
3. Park St./Main St./West Main St., Ayer	1721	1547	1698	1646	1699	1804	1754	1689
4. Groton-Harvard Rd./Central Ave., Ayer	841	956	904	960	854	796	765	693
5. Route 2A-110 (King St.)/I-495 Exit 30 NB Ramps, Littleton	1675	1711	1656	1927	1737	1893	1647	1514
6. Route 2A-110 (King St.)/I-495 Exit 30 SB Ramps, Littleton	1844	1705	1814	1981	1853	1959	1733	1655
7. Route 110-111 (Ayer Rd.)/Route 110/Route 111, Harvard	869	1135	668	642	710	609	822	592
8. Route 70/Route 117 (Seven Bridge Rd.), Lancaster	1614	1685	1657	1570	1636	1677	1793	1730
9. Route 70/Route 117 (Lunenburg Rd.), Lancaster	1578	1800	1679	1600	1650	1720	1825	1787
10. Route 110 (King St.)/Route 119/Route 2A, Littleton Common	2809	2880	2574	2871	2717	2450	2499	2304
11. Route 2A-110 (King St.)/Goldsmith St., Littleton Common	1758	1724	1588	1840	1683	1521	1600	1440
12. Verbeck Gate/MacPherson Rd., Ayer	726	669	926	959	936	1093	1010	924
13. Grant Rd./West Main St., Ayer	n/a	n/a	n/a	n/a	662	617	890	713
14. Hospital Rd./Front St., Shirley	n/a	n/a	n/a	n/a	604	591	676	610

3.4.Average Weekday Daily Traffic – Devens Gates

Traffic volumes through the Devens Gates are stabilizing at a rate similar to locations external to Devens (Figure 3-1). Since the 2006 5-YearTraffic Report, the average total weekday daily traffic volumes through all Devens gates have increased by approximately 15%. Despite these recent traffic growth trends, the traffic through Devens gates is stabilizing since 2008 (-1.1%) and the distribution of traffic through Devens Gates has remained relatively uniform since 2004 (Table 3-2).

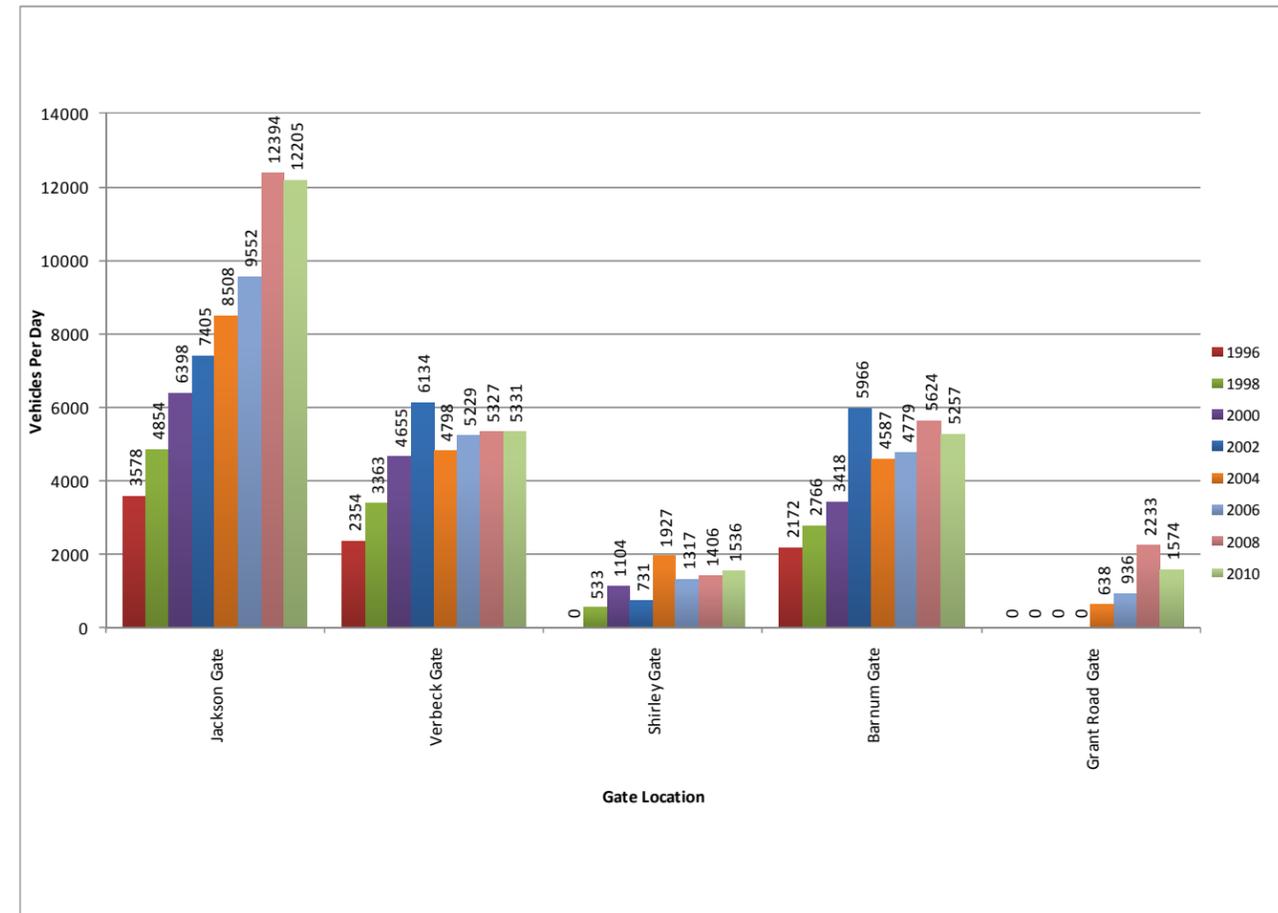


Figure 3-3: Average Weekday Daily Traffic – 7 Day Count Locations

Table 3-8: Average Weekday Daily Traffic (AWDT) – Devens Gates

	1996	1998	2000	2002	2004	2006	2008	2010
	AWDT	AWDT	AWDT	AWDT	AWDT	AWDT	AWDT	AWDT
Barnum Gate	2172	2766	3415	5966	4587	4779	5624	5257
Verbeck Gate	2354	3363	4658	6134	4798	5229	5327	5331
Jackson Gate	3578	4854	6396	7405	8508	9552	12394	12205
Shirley Gate	n/a	533	1104	731	1927	1317	1406	1536
Grant Road Gate	n/a	n/a	n/a	n/a	638	936	2233	1574
Total	8104	11516	15573	20236	20458	21813	26984	25903

Since 2006, the AM peak hour traffic volumes have increased 35.5% and the PM peak hour traffic volumes have increased by 13.6% (Table 3-3). However, the peak hour traffic volumes have been stabilizing since 2008 (+1.3% in the AM and -7.4% in the PM). This recent trend indicates that commuters may be choosing to travel to work during off-peak hours, perhaps to avoid congestion on study area roadways.

Table 3-9: Peak Hour Traffic – Devens Gates

	1996		1998		2000		2002		2004		2006		2008		2010	
	AM Peak	% Total														
Barnum Gate	159	23%	193	20%	260	16%	384	23%	418	21%	366	18%	529	20%	400	15%
Verbeck Gate	217	31%	264	27%	470	29%	492	29%	441	22%	454	23%	417	16%	457	17%
Jackson Gate	324	46%	462	48%	812	50%	770	45%	836	42%	951	48%	1236	46%	1469	54%
Shirley Gate	n/a	n/a	48	5%	70	4%	53	3%	232	12%	132	7%	245	9%	194	7%
Grant Road Gate	n/a	67	3%	97	5%	249	9%	190	7%							
Total	700	100%	967	100%	1612	100%	1699	100%	1994	100%	2000	100%	2676	100%	2710	100%
	1996		1998		2000		2002		2004		2006		2008		2010	
	PM Peak	% Total														
Barnum Gate	172	23%	224	23%	367	25%	430	27%	454	23%	462	22%	470	18%	430	18%
Verbeck Gate	206	28%	252	26%	380	26%	506	32%	421	21%	488	23%	512	20%	462	19%
Jackson Gate	369	49%	434	45%	579	40%	631	39%	853	43%	926	44%	1188	46%	1188	50%
Shirley Gate	n/a	n/a	53	6%	122	8%	36	2%	179	9%	138	7%	150	6%	160	7%
Grant Road Gate	n/a	72	4%	92	4%	264	10%	153	6%							
Total	747	100%	963	100%	1448	100%	1603	100%	1979	100%	2106	100%	2584	100%	2393	100%

3.5. Average Weekday Daily Truck Traffic – Devens Gates

The average total weekday daily truck traffic volumes through all Devens gates are at the lowest level since 2000 (Table 3-4). Verbeck Gate and Shirley Gate experienced the only increase in truck traffic while the other three gates experienced a 25 to 55 percent reduction in truck traffic since 2006, most likely as a result of a reduction in construction activity in Devens and partial vacancy of the industrial park.

Table 3-10: Average Weekday Daily Truck Traffic – Devens Gates

Average Weekday Daily Truck Traffic at Devens Gates							
	1996	1998	2000	2004	2006	2008	2010
Barnum Gate	244	427	546	1245	1304	2003	661
Verbeck Gate	165	102	380	505	286	220	475
Jackson Gate	358	1253	862	1156	1705	2614	801
Shirley Gate	n/a	n/a	n/a	117	30	136	79
Grant Road Gate	n/a	n/a	n/a	95	78	125	59
Total	767	1782	1788	3118	3403	5098	2075

Heavy vehicle volumes have been observed to be increasing at the Jackson Gate and Barnum Gate as a result of improvements targeted to better accommodate truck traffic and establish Jackson Road and Barnum Road as primary truck routes into Devens. Despite the drop in overall truck traffic in Devens, Jackson Gate and Barnum Gate continue to be the preferred entry for trucks into Devens as these two gates combine for 70% of the daily truck traffic. Verbeck Gate is showing an increase in the percentage of daily truck traffic at Devens gates, and it is expected this trend will continue should improvements to Jackson Road be constructed (Jackson Road Phase IV) to establish Jackson Road as the primary truck route from the north.

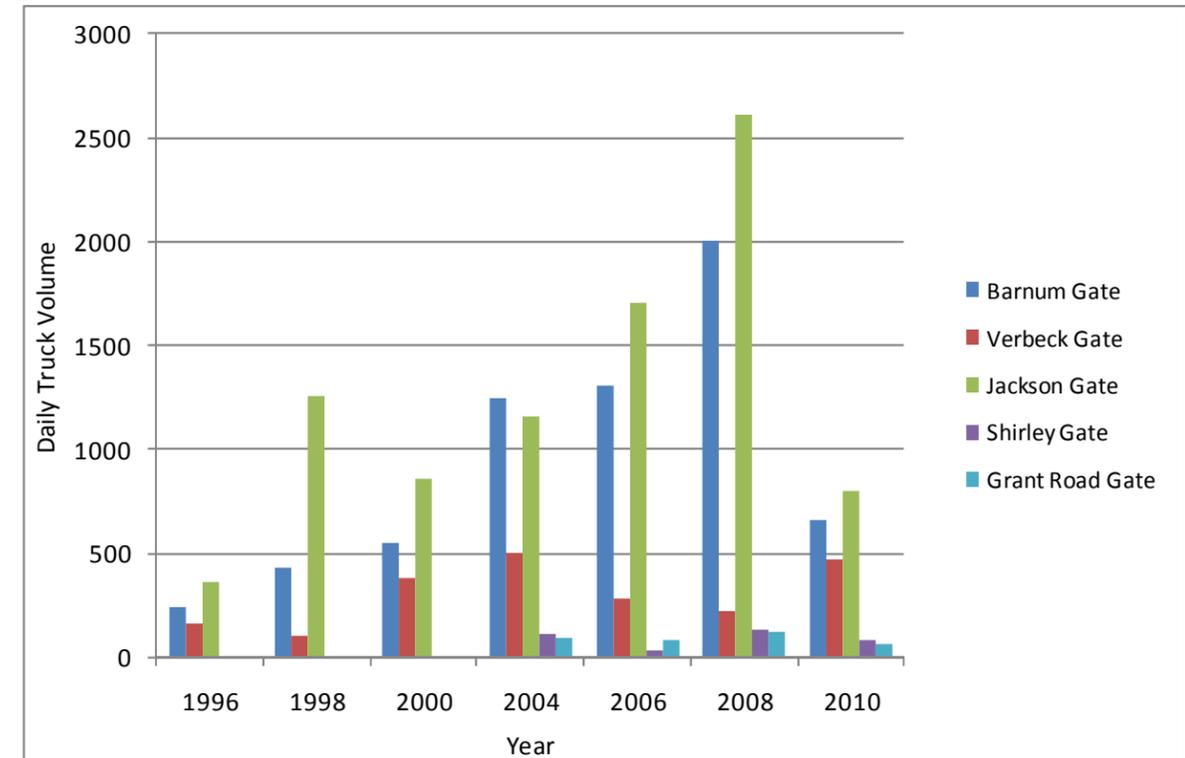


Figure 3-4: Average Weekday Daily Truck Traffic Distribution by Gate

3.6. Origin-Destination Survey

As discussed above, an origin-destination survey was conducted to determine the amount of traffic using Devens roadways as cut-through routes. A cut-through trip is defined as a vehicle trip whereby a vehicle enters and exits Devens gates without making a stop, so as to get to a destination external to Devens. Since it is assumed that cut-through vehicles do not make stops within Devens, cut-through trips are not considered to be generated by Devens developments.

Table 3-5 identifies the total number of entering vehicles, cut-through vehicles, and resulting percentage of cut-through traffic by time of day for years 2005 and 2010. While the total number of entering vehicles recorded over the 12 hour survey period (6AM to 6PM) has increased by 7%, the number of cut-through vehicles has increased by 41%. Thus, the percentage of entering vehicles used Devens roadways as cut-through routes has increased from 25% in 2005 to 32% in 2010. Furthermore, cut-through vehicle frequencies tend to peak during the AM and PM peak hours, which suggests drivers are finding Devens roadways as desirable cut-through routes when commuting to and from work. This increase in cut-through traffic is likely a result of the various roadway improvement projects, such as Jackson Road Phase II which realigned Jackson road as a continuous route through Devens.

Table 3-11: Cut-through Traffic by Hour

Start Time	End Time	Total Number of Entering Vehicles			Total Number of Cut Through Trips			Cut-Through Percentage of Total Trips		
		2000	2005	2010	2000	2005	2010	2000	2005	2010
6 AM	7 AM	739	938	898	81	140	204	11%	15%	23%
7 AM	8 AM	935	1176	1296	160	223	254	17%	19%	20%
8 AM	9 AM	787	1094	1218	136	223	318	17%	20%	26%
9 AM	10 AM	390	566	622	57	131	178	15%	23%	29%
10 AM	11 AM	330	380	480	76	90	196	23%	24%	41%
11 AM	12 PM	358	496	516	62	145	216	17%	29%	42%
12 PM	1 PM	411	672	691	64	146	214	16%	22%	31%
1 PM	2 PM	401	550	601	65	129	221	16%	23%	37%
2 PM	3 PM	398	652	625	72	166	240	18%	25%	38%
3 PM	4 PM	387	607	725	124	203	316	32%	33%	44%
4 PM	5 PM	382	555	667	119	233	291	31%	42%	44%
5 PM	6 PM	338	663	601	27	218	237	8%	33%	39%
	Total	5856	8349	8940	1043	2047	2885	18%	25%	32%

While the volume of cut-through traffic has increased, the distribution of cut-through routes has remained relatively constant (Table 3-6). Jackson Gate continues to be the entry location for the majority of cut-through vehicles (43% of cut-through vehicles originates at Jackson Gate) and the route between Jackson Gate and Verbeck Gate (both directions) continues to experience the highest volume of cut-through traffic (31% of cut-through vehicles). Cut-through traffic patterns do show an increase in cut-through vehicles on the route between Jackson Gate and Barnum Gate (19% of cut-through vehicles in 2005 versus 24% of cut-through vehicles in 2010) and Jackson Gate and Grant Gate (5% of cut-through vehicles in 2005 versus 13% of cut-through vehicles in 2010).

Table 3-12: Cut-through Traffic by Gate

Origin	Destination	2000 Total Number of Cut-Throughs	2005 Total Number of Cut-Throughs	2010 Total Number of Cut-Throughs	2000 Percent Overall	2005 Percent Overall	2010 Percent Overall
Jackson Gate	Verbeck Gate	270	479	367	26%	23%	17%
	Shirley Gate	66	170	154	6%	8%	7%
	Barnum Gate	93	176	260	9%	9%	12%
	Grant Road	NA	44	150	NA	2%	7%
Verbeck Gate	Jackson Gate	287	327	299	28%	16%	14%
	Shirley Gate	15	24	22	1%	1%	1%
	Barnum Gate	49	63	81	5%	3%	4%
	Grant Road	NA	11	29	NA	1%	1%
Shirley Gate	Jackson Gate	47	181	131	5%	9%	6%
	Verbeck Gate	14	35	28	1%	2%	1%
	Barnum Gate	15	33	41	1%	2%	2%
	Grant Road	NA	9	11	NA	0%	1%
Barnum Gate	Jackson Gate	109	212	252	10%	10%	12%
	Verbeck Gate	51	117	87	5%	6%	4%
	Shirley Gate	27	47	37	3%	2%	2%
	Grant Road	NA	12	13	NA	1%	1%
Grant Road	Jackson Gate	NA	67	130	NA	3%	6%
	Verbeck Gate	NA	19	28	NA	1%	1%
	Shirley Gate	NA	7	17	NA	0%	1%
	Barnum Gate	NA	14	23	NA	1%	1%
	Total	1043	2047	2160	100%	100%	100%

3.7. Carlton Rotary

Traffic counts were performed at the Carlton Rotary for a 48-hour period. Due to the physical configuration of the rotary approaches and the logistical requirements of ATR placement, the daily and peak hour unadjusted volumes recorded for each leg of the rotary must be adjusted to report equivalent volumes entering and exiting the rotary. The balanced weekday volumes decreased 8% from 2008 to 2010 and are generally consistent to those volumes counted in 2006 (Table 3-13).

Table 3-13: Carlton Rotary – Weekday Volumes – Entering/Exiting (balanced)

	1996 Entering (vpd)	1998 Entering (vpd)	2000 Entering (vpd)	2002 Entering (vpd)	2004 Entering (vpd)	2006 Entering (vpd)	2008 Entering (vpd)	2010 Entering (vpd)
Route 2A-110, East of Rotary	7,200	7,500	6,994	8,844	8,512	8,248	8,070	7,068
Route 110-111, South of Rotary	7,400	7,200	6,775	7,920	8,571	6,194	7,775	6,960
Barnum Road	1,650	1,200	1,704	3,048	2,740	3,105	3,955	3,337
Route 2A-111 EB, West of Rotary	10,350	10,200	9,489	9,751	10,645	9,300	9,428	9,234
Route 2A-111 WB, West of Rotary	n/a							
Sandy Pond Road	2,650	3,900	2,003	2,337	2,190	2,082	2,203	2,242
Total	29,250	30,000	26,965	31,900	32,659	28,930	31,431	28,841
	1996 Exiting (vpd)	1998 Exiting (vpd)	2000 Exiting (vpd)	2002 Exiting (vpd)	2004 Exiting (vpd)	2006 Exiting (vph)	2008 Exiting (vph)	2010 Exiting (vpd)
Route 2A-110, East of Rotary	7,600	7,500	7,140	8,842	8,181	8,235	7,812	7,103
Route 110-111, South of Rotary	6,750	7,200	6,693	7,764	7,994	4,605	6,865	6,325
Barnum Road	1,550	1,500	1,713	2,921	2,726	2,693	4,100	3,179
Route 2A-111 EB, West of Rotary	n/a							
Route 2A-111 WB, West of Rotary	10,350	11,100	9,625	10,409	10,806	10,318	9,737	9,104
Sandy Pond Road	3,000	2,700	1,794	1,964	2,952	3,079	2,917	3,130
Total	29,250	30,000	26,965	31,900	32,659	28,930	31,431	28,841
	1996 Total (vpd)	1998 Total (vpd)	2000 Total (vpd)	2002 Total (vpd)	2004 Total (vpd)	2006 Total (vpd)	2008 Total (vpd)	2010 Total (vpd)
Route 2A-110, East of Rotary	14,800	15,000	14,134	17,686	16,693	16,483	15,882	14,171
Route 110-111, South of Rotary	14,150	14,400	13,468	15,684	16,565	10,799	14,640	13,285
Barnum Road	3,200	2,700	3,417	5,969	5,466	5,798	8,055	6,516
Route 2A-111 EB, West of Rotary	10,350	10,200	9,489	9,751	10,645	10,101	9,428	9,234
Route 2A-111 WB, West of Rotary	10,350	11,100	9,625	10,409	10,806	10,806	9,737	9,104
Sandy Pond Road	5,650	6,600	3,797	4,301	5,142	5,161	5,120	5,372
Total	58,500	60,000	53,930	63,800	65,318	57,860	62,862	57,682

The balanced AM peak hour volumes decreased 9% from 2008 but are found to be 7% higher than the 2006 volumes (Table 3-13). The balanced PM peak hour volumes are 14% lower than those 2008 and 7% lower than those in 2006 (Table 3-14).

Table 3-14: Carlton Rotary – AM Peak Hour Volumes – Entering/Exiting (balanced)

	1996 AM Peak Entering (vph)	1998 AM Peak Entering (vph)	2000 AM Peak Entering (vph)	2002 AM Peak Entering (vph)	2004 AM Peak Entering (vph)	2006 AM Peak Entering (vph)	2008 AM Peak Entering (vph)	2010 AM Peak Entering (vph)
Route 2A-110, East of Rotary	332	328	658	469	520	436	454	421
Route 110-111, South of Rotary	441	455	586	440	558	357	549	477
Barnum Road	86	85	252	170	205	197	304	200
Route 2A-111 EB, West of Rotary	1,143	1,122	518	999	997	842	862	873
Route 2A-111 WB, West of Rotary	n/a	n/a						
Sandy Pond Road	150	141	186	288	243	229	258	231
Total	2,152	2,131	2,200	2,366	2,522	2,061	2,427	2,202
	1996 AM Peak Exiting (vph)	1998 AM Peak Exiting (vph)	2000 AM Peak Exiting (vph)	2002 AM Peak Exiting (vph)	2004 AM Peak Exiting (vph)	2006 AM Peak Exiting (vph)	2008 AM Peak Exiting (vph)	2010 AM Peak Exiting (vph)
Route 2A-110, East of Rotary	716	639	413	758	668	643	611	603
Route 110-111, South of Rotary	651	661	515	775	820	426	720	546
Barnum Road	141	107	118	216	208	210	354	328
Route 2A-111 EB, West of Rotary	n/a	n/a						
Route 2A-111 WB, West of Rotary	476	426	1,019	509	622	568	538	519
Sandy Pond Road	168	298	135	108	204	214	204	206
Total	2,152	2,131	2,200	2,366	2,522	2,061	2,427	2,202
	1996 AM Peak Total (vph)	1998 AM Peak Total (vph)	2000 AM Peak Total (vph)	2002 AM Peak Total (vph)	2004 AM Peak Total (vph)	2006 AM Peak Total (vph)	2008 AM Peak Total (vph)	2010 AM Peak Total (vph)
Route 2A-110, East of Rotary	1,048	967	1,071	1,227	1,188	1,079	1,065	1,024
Route 110-111, South of Rotary	1,092	1,116	1,101	1,215	1,378	783	1,269	1,023
Barnum Road	227	192	370	386	413	407	658	528
Route 2A-111 EB, West of Rotary	1,143	1,122	518	999	997	940	862	873
Route 2A-111 WB, West of Rotary	476	426	1,019	509	622	622	538	519
Sandy Pond Road	318	439	321	396	676	443	462	437
Total	4,304	4,262	4,400	4,732	5,044	4,122	4,854	4,404

Table 3-15: Carlton Rotary – PM Peak Hour Volumes – Entering/Exiting (balanced)

	1996 PM Peak Entering (vph)	1998 PM Peak Entering (vph)	2000 PM Peak Entering (vph)	2002 PM Peak Entering (vph)	2004 PM Peak Entering (vph)	2006 PM Peak Entering (vph)	2008 PM Peak Entering (vph)	2010 PM Peak Entering (vph)
Route 2A-110, East of Rotary	820	817	359	762	778	828	797	649
Route 110-111, South of Rotary	809	789	438	776	874	632	822	638
Barnum Road	110	110	45	282	312	326	391	312
Route 2A-111 EB, West of Rotary	579	601	1,063	502	713	659	634	634
Route 2A-111 WB, West of Rotary	n/a	n/a						
Sandy Pond Road	169	177	228	175	188	204	218	225
Total	2,487	2,494	2,133	2,497	2,865	2,649	2,862	2,458
	1996 PM Peak Exiting (vph)	1998 PM Peak Exiting (vph)	2000 PM Peak Exiting (vph)	2002 PM Peak Exiting (vph)	2004 PM Peak Exiting (vph)	2006 PM Peak Exiting (vph)	2008 PM Peak Exiting (vph)	2010 PM Peak Exiting (vph)
Route 2A-110, East of Rotary	458	449	703	563	630	609	572	497
Route 110-111, South of Rotary	443	499	678	452	558	346	486	496
Barnum Road	61	75	210	146	254	302	414	250
Route 2A-111 EB, West of Rotary	n/a	n/a						
Route 2A-111 WB, West of Rotary	1,232	1,222	443	1,148	1,142	1,099	1,085	937
Sandy Pond Road	293	249	99	188	281	293	305	278
Total	2,487	2,494	2,133	2,497	2,865	2,649	2,862	2,458
	1996 PM Peak Total (vph)	1998 PM Peak Total (vph)	2000 PM Peak Total (vph)	2002 PM Peak Total (vph)	2004 PM Peak Total (vph)	2006 PM Peak Total (vph)	2008 PM Peak Total (vph)	2010 PM Peak Total (vph)
Route 2A-110, East of Rotary	1,278	1,266	1,062	1,325	1,408	1,437	1,369	1,146
Route 110-111, South of Rotary	1,252	1,288	1,116	1,228	1,432	978	1,307	1,134
Barnum Road	171	185	255	428	566	628	805	562
Route 2A-111 EB, West of Rotary	579	601	1,063	502	713	659	634	634
Route 2A-111 WB, West of Rotary	1,232	1,222	443	1,148	1,142	1,099	1,085	937
Sandy Pond Road	462	426	327	363	469	497	523	503
Total	4,974	4,988	4,266	4,994	5,730	5,298	5,724	4,916

4. Traffic Demand Management

The goal of Traffic Demand Management (TDM) strategies is to reduce single-occupant vehicle (SOV) trips at peak traffic periods. Not only can TDM strategies be used to reduce traffic congestion at peak period, but also reduce air pollution and encourage travel at less congested travel times.

As a requirement of the EIR, once development of Devens reaches a critical mass, MassDevelopment is to establish a Devens Transportation Management Association (TMA). Devens businesses have agreed to become members of the TMA and will be required to implement TDM strategies to reduce SOV trips, such as providing two bus shelters to accommodate shuttle bus service.

A TDM Plan was presented in both the Base Reuse Plan and the Final Environmental Impact Report (FEIR) for the purpose of reducing the number of employee trips in the peak periods to Devens. As required by federal EPA regulations, companies with more than 250 employees are required to file a TDM Plan with MassDEP. It is believed that Evergreen Solar, Bristol-Meyers Squibb, Sonoco, and FBOP Medical Facility each exceed the 250 employee threshold. However, based on conversations with MassDEP Ride Share Program, there are no Devens companies who have filed TDM Plans with MassDEP.

Based on conversations with some of the larger Devens business, some of the businesses have informal carpooling/rideshare programs. This is reflected in transportation survey results, whereby 6 percent of the responses indicate carpooling to work.

A series of potential TDM strategies were identified for the study area in previous 5-Year reports, with the focus on regional commuter traffic demand. The Base Re-Use Plan also includes Transportation Systems Management (TSM) strategies that focus on low-cost improvements to the transportation system. Several of these strategies are still feasible for Devens and could be considered in future TDM Plans. The following areas of TDM appear to have the potential to reduce SOV travel:

- Ridesharing/carpools/vanpools
- Shuttle bus service
- Public transportation (commuter rail)
- Parking Management
- Park and Ride lots
- Non-Vehicle accommodations (bicycle and pedestrian paths)
- Flex-Time and alternative work schedules (including telecommunications)
- Provide on-site amenities (restaurants, day care, cleaners, etc.)

Perhaps the most feasible TDM strategy would involve the advent of a viable reverse commute via the MBTA Commuter Rail in early 2013. Double tracking and other improvements to the Fitchburg Commuter Rail Line would allow Devens business employees to more easily commute to Devens from points east of Devens. The TMA could operate a shuttle service between the

Commuter Rail stations and businesses to accommodate the morning pick-up and evening drop-off.

The EIR identifies a TDM reduction target of 15 percent, but previous 5-Year reports utilized a TDM vehicle reduction rate of 7.5% to be conservative given limited TDM techniques available to Devens employees. Given that TDM techniques are used limitedly by Devens businesses, the future analysis ignores a TDM reduction rate, to be conservative.

5. Build-Out Analysis and Trip Generation/Distribution

5.1. Overview

There has been substantial industrial, commercial, and office facility development at Devens over the past several years, including addition of quality companies such as Bristol Meyers-Squibb and Evergreen Solar. This section focuses on projecting traffic volumes associated with potential/planned future development within Devens.

Devens Base Reuse Plan limits the total development area (i.e., buildings) to 8.5 million square feet. The number of vehicle trips listed in the EIR is 59,265 at the maximum build-out capacity. For the purpose of this study, two build-out scenarios were considered in evaluating the projected development and associated traffic volumes within Devens:

- Scenario 1 represents a development condition whereby the 59,265 daily vehicle trips allowed by the EIR is reached.
- Scenario 2 represents a development condition whereby total development reach 8.5 million square feet as allowed in the Devens Base Reuse Plan.

5.2. Existing Build-Out

Coordination with the MassDevelopment Real Estate Office was required to inventory existing and planned development (build-out) data at Devens. The following information was provided for existing development, potential expansion, and planned development:

- Company Name
- Number of Employees
- Land Use Type
- Existing/Planned Building Footprint (SF)
- Expansion Footprint (SF)

As of January 2010, approximately 3.66 million square feet of total build-out is currently occupied, while 1.49 million square feet of new construction is unoccupied and 2.39 million square feet of build-out is planned for potential expansions (Table 5-1). The total square footage of occupied, unoccupied, and planned build-out (7.54 million square feet) is only 960,000 square feet less than the 8.5 million square feet permitted under Devens By-Laws. Since 2008, the total occupied build-out has decreased by 302,820 square feet.

Table 5-1: Devens Build-Out Summary

Category	Area (Bldg. SF)
Existing Reuse	676,914
New Construction (occupied)	2,985,844
<i>subtotal (occupied development)</i>	3,662,758
New Construction (unoccupied)	1,487,389
Potential Expansions	2,220,062
Current Prospects	166,000
<i>subtotal (future development)</i>	2,386,062
Total Actual and Planned Buildout	7,536,209
Total Buildout Permitted Under Devens By-Laws	8,500,000
Potential Uncommitted Buildout	963,791

Based on discussions with the MassDevelopment Real Estate Office, much of the remaining development will consist of smaller research and development land uses. These developments generally require smaller facilities when compared to the more recent large industrial and manufacturing developments which have been as large as 450,000 square feet. Based on this information, it is assumed that development at Devens will proceed, on average, at 225,000 square feet per year, mainly consisting of research and development type facilities.

5.3.Existing Trip Generation

As discussed above, driveway turning movement counts were completed at 16 business driveways within Devens to develop vehicle trip generation characteristics of the respective businesses. For comparison reasons, ITE trip generation rates were used to calculate the theoretical total weekday vehicle trips, AM peak hour entering and exiting trips, and PM peak hour entering and exiting trips for each development in Devens. The number of vehicle trips assigned to each development is typically based on the square footage of the development category; however for some developments vehicle trips were assigned based on other factors such as number of employees, students, or hotel rooms.

In previous traffic monitoring reports, trip generation rates were estimated using generic land use categories, such as office park and business park. This study utilized more specific land use categories to obtain a more accurate trip generation estimate.

For land uses such as fast food restaurants and gas stations where trips are typically generated by traffic driving by on the way to/from their primary destination, a pass-by factor was applied (bank 20%, fast food 40%, restaurant 15%, service station 45%). It is noted that this pass-by

factor does reduce the amount of traffic generated from locations external to Devens, but it does not reduce the traffic entering and exiting such driveways.

The existing driveway count data was compared against the theoretical trip generations rates estimated based on rates provided in the ITE Trip Generation, 8th Edition (Table 5-2).

Table 5-2: Devens Driveway Trip Generation Comparison

Driveway Turning Movement Counts		AM Peak Hour			PM Peak Hour		
		Existing	ITE Projection	Difference	Existing	ITE Projection	Difference
D-1	American Superconductor - 64 Jackson Road	77	180	-103	48	241	-193
D-2	Aneheuser Busch - 235 Barnum Road	0	94	-94	0	125	-125
D-3	FBOP - Federal Medical Facility	195	218	-23	163	286	-123
D-4	Gillette - 66 Saratoga Boulevard	6	224	-218	17	298	-281
D-5	Job Corps - MacArthur Avenue	55	265	-210	62	251	-189
D-6	Netstal / Xinetics - 53 & 57 Jackson Road	20	78	-58	15	83	-68
D-7	Parker-Hannifin - 14 Robbins Pond Road	53	26	27	33	35	-2
D-8	Ryerson - 45 Saratoga Boulevard	14	99	-85	15	101	-86
D-9	Sonoco - 18 Independence Boulevard	50	165	-115	17	220	-203
D-10	Southern Container - 51 Independence Boulevard	40	162	-122	19	159	-140
D-11	Xinetics - 115 Jackson Road	2	58	-56	5	62	-57
D-12	Army Enclave at Quebec Street and 10th Mountain Division Road	265	18	247	169	86	83
D-13	Devens Common - Ryans Way	151	195	-44	90	305	-215
D-14	Devens Common - Andrews Parkway	347	271	76	195	294	-99
D-15	Bristol-Meyer Squibb - 38 Jackson Road	173	314	-141	125	299	-174
D-16	Evergreen Solar - 112 Barnum Road	67	353	-286	141	334	-193
D-17	Army Enclave at Lovell Road	117	6	111	90	42	48
Total		1632	2727	-1095	1204	3221	-2017

These results indicate that Devens developments are generating traffic rates lower than those published by ITE, which is consistent with previous 5-Year Traffic Monitoring Studies. For the purpose of this study, trip generation rates for existing developments are assumed to remain for future traffic condition projections. To be conservative, trip generation for planned future expansions and proposed developments is based on rates provided in the ITE Trip Generation, 8th Edition.

5.4. Build-Out Projections

As discussed above, the traffic conditions for two development scenarios are analyzed as part of this study. To predict these two scenarios, development conditions and associated traffic volumes were projected out to the 8.5 million square feet of total development threshold and 59,265 daily vehicle trips threshold as defined in the Devens Base Reuse Plan (Figure 5-1 and Figure 5-2).

The Year 2010 total average weekday daily traffic (AWDT) at all five Devens' gates is 25,903 vehicle trips. As discussed above, 32 percent of the total traffic volume is cut-through traffic not generated by Devens development. Therefore, the 2010 AWDT generated by Devens development adjusted for cut-through is 17,614 vehicle trips, which has been retained as the baseline condition for projecting future daily vehicle trips.

Development projections are based on measured traffic volume data and the real estate data provided by the MassDevelopment Real Estate Office. Where insufficient information exists, the following assumptions were made:

1. Annual development will occur at a rate of 225,000 square feet per year, with a corresponding annual trip increase of 1,717 vehicle trips per day.
2. Unplanned development will consist of similar type development, mainly research and development, manufacturing, general office, and general light industrial land uses.

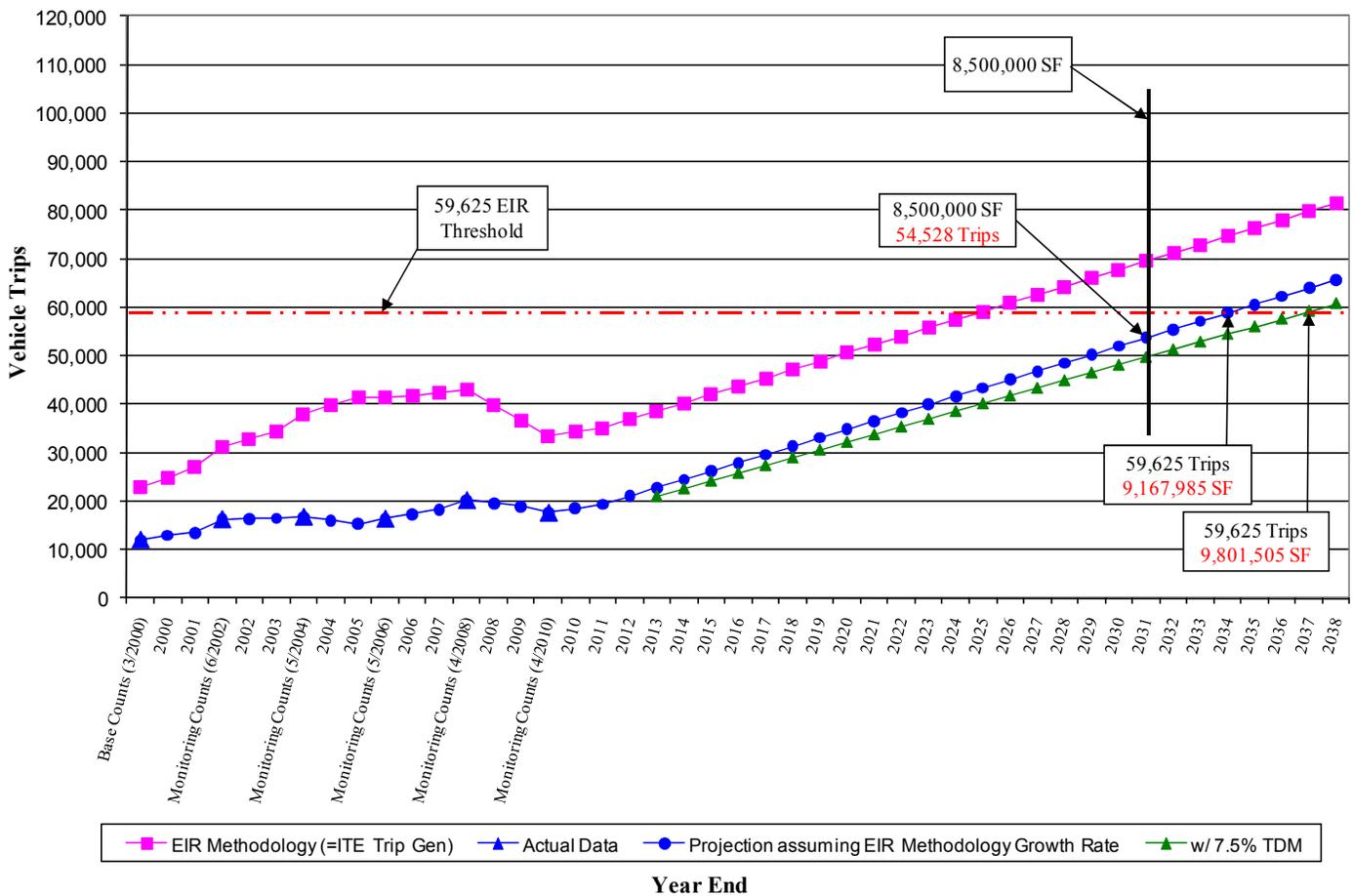


Figure 5-1: Devens Build-Out Summary by Year - Trips

Figure 5-1 above is similar to the graph shown in previous traffic monitoring reports. The trend labeled EIR Methodology represents the historic trip generation based on ITE Trip Generation rates with an assumed straight-line project for future years. The trend labeled Actual Data

shows the historic vehicle trips counted from 2000-2010 then assumes a straight-line projection for future years. The EIR threshold of 59,625 daily vehicle trips (Scenario 1) is projected to be reached in 2034 with 9,167,985 square feet of development. The Scenario 2 build-out limit of 8.5 million square feet is projected to be reached in 2031, with a corresponding 54,528 daily vehicle trips.

The lowest trend shows a projection of actual data assuming Transportation Demand Management (TDM) daily trip reduction of 7.5%. As discussed above, TDM strategies are have not proven to be as prevalent as anticipated; however with the completion of the MBTA Fitchburg Commuter Rail Line improvements in 2013 additional Devens business will have the ability to more easily commute to Devens from points east. Thus, this projection with TDM reduction does not begin until 2013 and is projected to reach the 59,625-trip threshold in 2037.

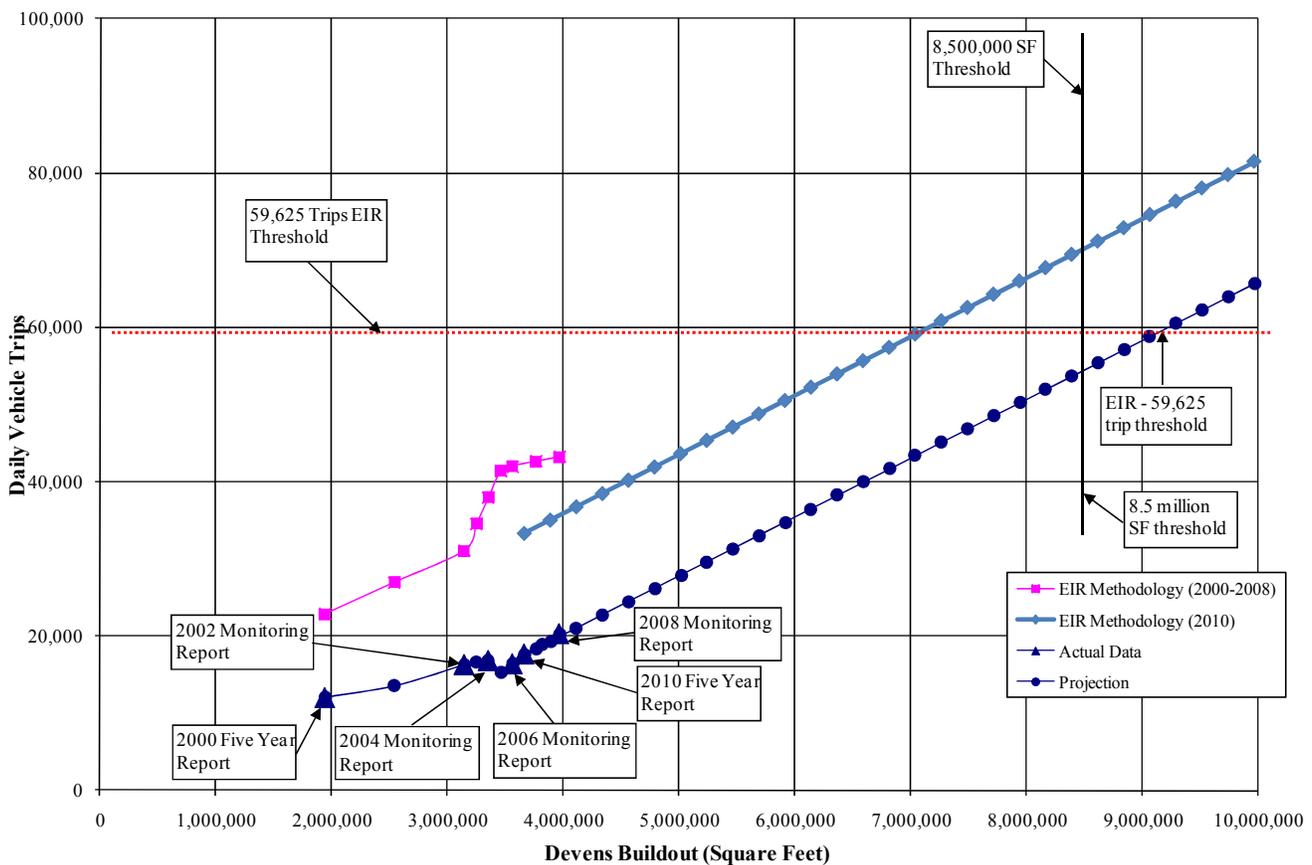


Figure 5-2: Devens Build-Out Summary by Square Feet - Trips

Figure 5-2 above represents a relationship between build-out area and daily vehicle trips. The line labeled EIR Methodology (2000-2008) represents the historic trip generation based on ITE Trip Generation rates as calculated from 2000-2008. The line labeled EIR Methodology (2010) represents the trip generation based on ITE Trip Generation rates as calculated in 2010 and projected forward at a constant yearly rate. The reason for this difference between 2000-2008 EIR Methodology and 2010 Methodology is that different ITE Trip Generation Rates are used for each methodology. EIR Methodology (2000-2008) utilized more generic land uses to develop

trip generation rates, whereas the 2010 EIR Methodology utilized more specific land uses for each development, which accounts for the lower trip rates for equivalent build-out areas. It is believed that utilizing more specific land uses results in more accurate projects, as is demonstrated by the relative closeness of the EIR Methodology 2010 and Actual counts.

5.5. Traffic Analysis Zones

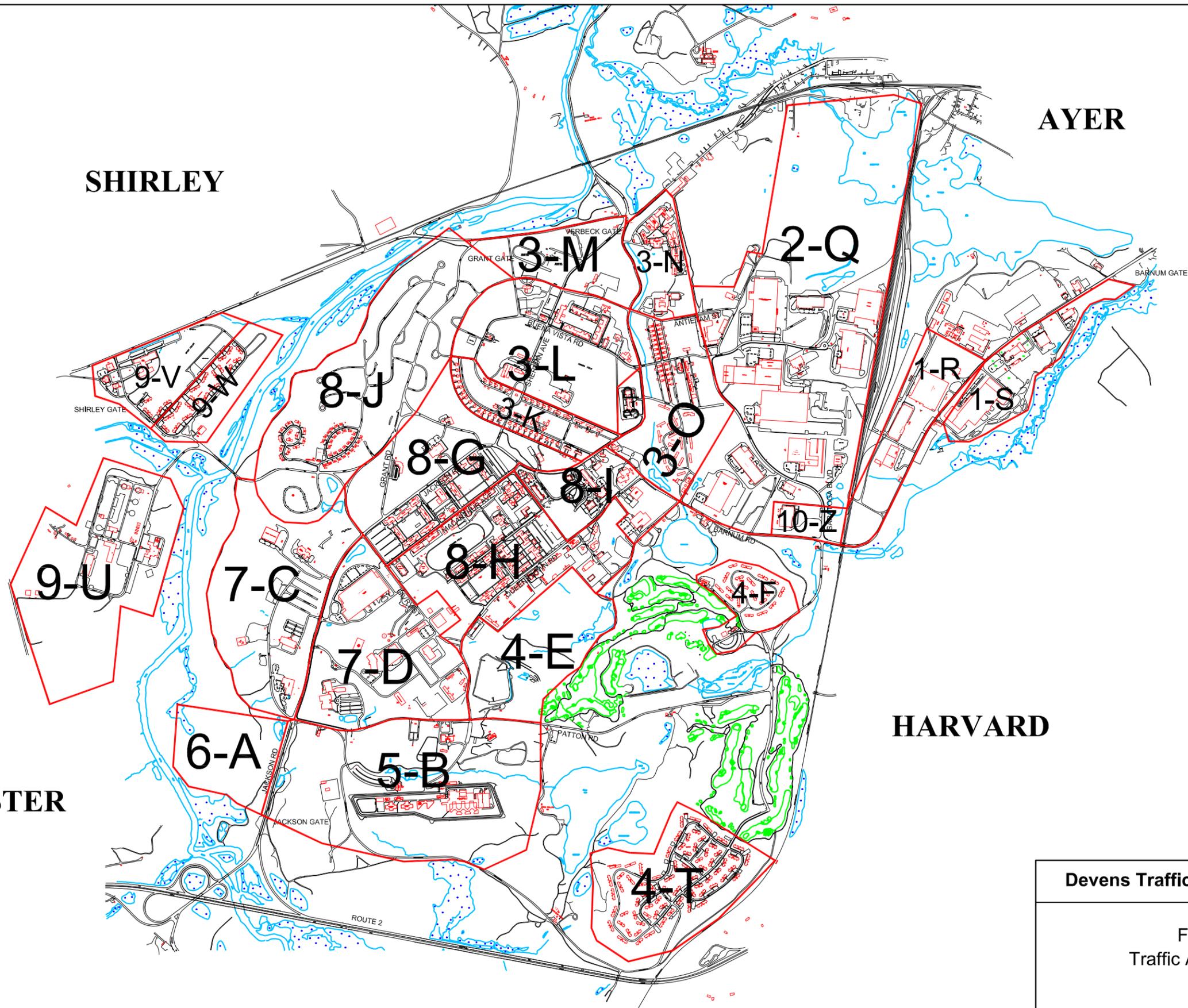
For consistency with the Devens EIR and previous 5-Year Traffic Monitoring Reports, this study retains the Traffic Analysis Zones (TAZs) which were developed to define build-out areas and assist in projecting traffic associated with future developments (Figure 5-3). Existing development areas were aggregated by TAZ in order to establish a baseline condition. Based on the build-out projections discussed above, future build-out areas were established for each TAZ for Scenario 1 and Scenario 2 (Table 5-3) in order to project vehicle trips by TAZ for each scenario. A detailed breakdown of land use type and area for each TAZ is provided in the Appendix.

Table 5-3: Devens Build-Out by Scenario

	Existing	Buildout (SF)	
		Scenario 1	Scenario 2
Zone 1	852,445	1,177,345	1,042,445
Zone 2	731,977	3,148,086	3,073,886
Zone 3	428,276	628,152	489,267
Zone 4	11,615	11,615	11,615
Zone 5	0	0	0
Zone 6	0	0	0
Zone 7	1,156,438	2,968,268	2,848,268
Zone 8	370,032	1,122,544	922,544
Zone 9	111,975	111,975	111,975
Zone 10	0	0	0
Zone 11	0	0	0
Zone 12	0	0	0
Total	3,662,758	9,167,985	8,500,000

Using the areas as projected in Table 5-3, daily trips, AM peak hour trips, and PM peak hour trips were projected for the following four scenarios (Table 5-4). As noted above, trips were calculated using a combination of ITE trip generation rates and rates developed from driveway count data.

1. Existing Trips – Existing Methodology: existing buildings and occupied new construction (2010). Trip generation rates based on driveway count and gate count data.
2. Existing Trips – EIR Methodology: existing buildings and occupied new construction (2010). Trip generation rates based on ITE Trip Generation, 8th Edition.



Devens Traffic Monitoring Program

Figure 5-3
Traffic Analysis Zones

Scale: NTS
Basemap Source: MassGIS



3. Future Trips – Scenario 1: build-out condition where the EIR trip limit (59,625 trips/day) is reached. Trip generation rates based on driveway count data and ITE Trip Generation, 8th Edition.
4. Future Trips – Scenario 2: build-out condition where the Devens By-Law development limit (8.5 million square feet) is reached. Trip generation rates based on driveway count data and ITE Trip Generation, 8th Edition.

Table 5-4: Trip Generation Summary by Scenario

	Existing Trips -- Existing Methodology					Existing Trips -- EIR Methodology				
	AM in	AM out	PM in	PM out	Daily	AM in	AM out	PM in	PM out	Daily
Zone 1	431	52	187	568	2362	609	160	274	674	4478
Zone 2	347	63	76	349	2031	497	120	197	455	3850
Zone 3	516	280	339	653	2960	516	280	339	653	5612
Zone 4	25	29	28	37	339	25	29	28	37	643
Zone 5	158	37	10	153	554	135	83	77	208	1050
Zone 6	0	0	0	0	0	0	0	0	0	0
Zone 7	609	89	112	524	2879	785	197	301	750	5458
Zone 8	748	399	301	573	5690	674	397	461	793	10788
Zone 9	123	112	137	135	799	123	112	137	135	1515
Zone 10	0	0	0	0	0	0	0	0	0	0
Zone 11	0	0	0	0	0	0	0	0	0	0
Zone 12	0	0	0	0	0	0	0	0	0	0
Total	2957	1061	1190	2992	17614	3365	1378	1812	3706	33396
	Future Trips -- Scenario 1					Future Trips -- Scenario 2				
	AM in	AM out	PM in	PM out	Daily	AM in	AM out	PM in	PM out	Daily
Zone 1	232	52	83	215	1780	95	45	72	67	717
Zone 2	1325	261	352	1514	8535	1237	263	355	1412	7836
Zone 3	172	54	61	180	1684	35	26	37	47	471
Zone 4	0	0	0	0	0	0	0	0	0	0
Zone 5	0	0	0	0	0	0	0	0	0	0
Zone 6	0	0	0	0	0	0	0	0	0	0
Zone 7	1088	432	671	832	7957	1020	400	623	788	7492
Zone 8	511	207	264	519	6272	321	168	232	337	4616
Zone 9	0	0	0	0	0	0	0	0	0	0
Zone 10	0	0	0	0	0	0	0	0	0	0
Zone 11	0	0	0	0	0	0	0	0	0	0
Zone 12	0	0	0	0	0	0	0	0	0	0
Total	3327	1006	1430	3259	26229	2708	902	1320	2651	21132
				Cumulative	59625				Cumulative	54528

5.6. Build-Out Analysis/Trip Generation Summary

Using ITE rates, it is estimated that the current Devens development would generate 33,396 daily vehicle trips in 2010. The 2010 daily vehicles traffic counted at the Devens gates adjusted for cut-through is 17,614 vehicle trips. This indicates that Devens development is generating off-site traffic at a rate of 53% of what a comparable development would generate. In 2005, these same results indicated that Devens was generating off-site traffic at a rate of 37% of what a comparable development would generate, which indicate Devens businesses are tending to become more typical to those published in the ITE Trip Generation Manual.

Table 5-5: Trip Generation Summary

	Year 2004/2005	Year 2010	DIFFERENCE
Occupied Development	3,561,634 SF	3,662,758 SF	+101,124 SF
Total Daily Traffic Counts at Devens Gates	20,458 vehicle trips	25,903 vehicle trips	+5445 vehicle trips
Daily Gate Counts Adjusted for Cut-Thru Traffic	15,343 vehicle trips	17,614 vehicle trips	+2271 vehicle trips
Daily Vehicle Trips per 1,000 SF Development	4.31 trips/KSF	4.81 trips/KSF	+0.50 trips/KSF
ITE Estimated Daily Devens Trips	41,435 vehicle trips	33,396 vehicle trips	-8039 vehicle trips

5.7. Trip Distribution

The second step in the transportation planning process consists of distributing the forecasted trips generated within the study area. Trips may be distributed in a manner such that trips enter a region, trips depart a region, or trips remain entirely within a region. Therefore, separate distributions were made for Devens business employees who commute to work within Devens from external locations, for Devens residents who commute to work external to Devens, and for Devens residents who work and reside in Devens.

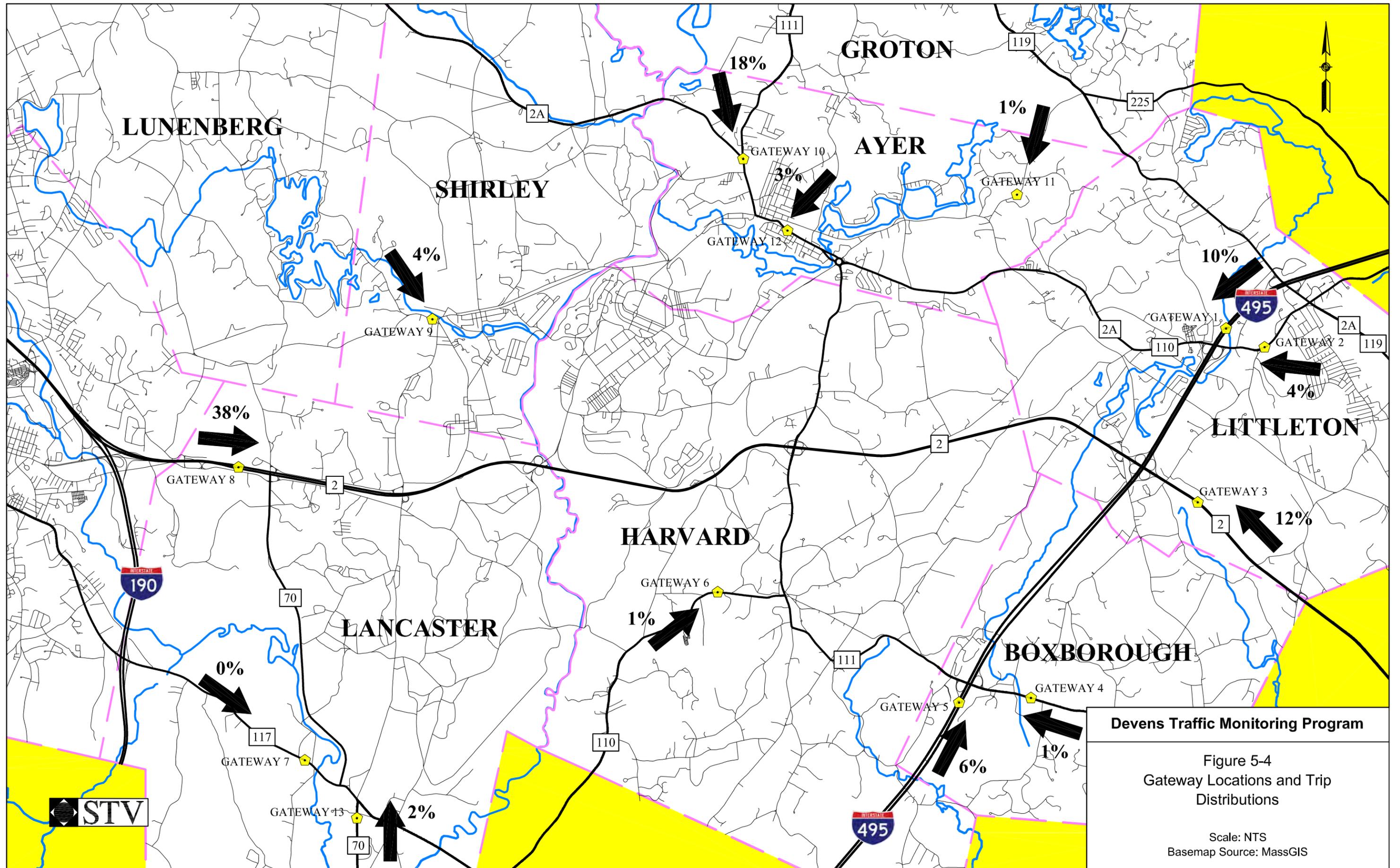
Devens business employee trip distribution was developed from the following sources:

- 2010 Devens Business Employee Transportation Survey
- Existing traffic volumes at Devens gates
- Year 2000 US Census Journey-to-Work Data

Devens resident trip distribution was developed from the following sources:

- 2010 Devens Resident Transportation Survey
- Year 2000 US Census Journey-to-Work Data

Trip distribution methodology is based on the existing traffic volumes at Devens gates and current travel patterns as identified in the Devens Resident and Business Employee Transportation Surveys (Figure 5-4). The existing trip distribution is approximated by assigning the surveyed travel patterns to thirteen “gateway” locations in the towns surrounding Devens. The gateway locations are consistent with previous 5-Year Traffic Monitoring studies and have been located such that employees and residents of Devens must pass through them when traveling to and from Devens. Gateway 8, Route 2 West of Route 70, continues to be the most frequently traveled route to Devens, making up approximately 38% of all trips to Devens.



6. Traffic Model

6.1. Overview

The Devens traffic model created for the 2000 and 2005 5-Year Traffic Monitoring Program was updated with 2010 conditions to assist with the forecasting of future traffic volumes. The model was created using TRAFFIX model software and includes a network of study area roadways and intersections, TAZs, traffic volumes, geometric data, and land use data. The model executes the typical four-step transportation planning process including trip generation, trip distribution, modal split, and trip assignment. In addition to modeling existing 2010 traffic conditions, weekday AM and PM peak hour traffic volumes are forecasted for the year 2031 for each of the following scenarios:

- Existing (year 2010)
- No-Build (year 2031)
- Build Scenario 1 (year 2031)
- Build Scenario 2 (year 2031)

6.2. Traffic Model Development

The Devens traffic model created for the 2000 and 2005 5-Year Traffic Monitoring Program was updated with current 2010 conditions using TRAFFIX model software. Baseline traffic conditions were modeled using the 2005 model with changes in roadway alignment, intersection geometry, traffic volumes, and land uses. Traffic generated from proposed development was added to the model based on the trip distribution characteristics, as described in Section 5.

The Devens traffic model is used to forecast future 2031 No-Build and Build traffic volumes during the AM and PM peak hours (Figure 6-1 through Figure 6-4). As stated above, revisions to the 2005 model were necessary to make more accurate forecasts of future traffic volumes. Major updates are described in detail below.

6.2.1. Intersection Volume Data

The internal and external intersection turning movement counts collected for this study (see Section 2) were entered into the model to represent 2010 traffic conditions. Entered traffic characteristics include AM and PM peak hour volumes, heavy vehicle percentages, and peak hour factors.

6.2.2. Roadway Network

The model roadway network was updated to reflect the 2010 roadway configuration. In addition to updating the roadway network configuration, intersection attributes were updated to reflect operation and geometric changes since the 2005 study. These updates include intersection geometry, number of lanes and widths, traffic control, and presence of on-street parking. The network was modified as follows:

- Front Street/ Lancaster Road/ Leominster Road/ Center Road: Southbound Lancaster Road control has changed from “Stop Sign” to “Yield Sign”.

- Route 2A-110/I-495 Exit 30 Northbound Ramps: Exclusive left-turn lane added to westbound Route 2A.
- Route 2A-110/I-495 Exit 30 Southbound Ramps: Exclusive right-turn lane added to southbound approach of I-495 southbound Ramps. Exclusive left-turn lane added to westbound Route 2A.
- Route 110- 111 (Ayer Road)/ Route 110 (Still River Road)/ Route 111: Changed from two way to four way stop (northbound and southbound Ayer Road). Free right-turn lane added to westbound Route 110.
- Route 110 (King Street)/ Route 119/ Route 2A (Great Road): Northbound and southbound King St. changed from exclusive left plus shared through-right to 2 shared through-turning lanes.
- Verbeck Gate/ MacPherson Road: Exclusive right-turn lane added to northbound MacPherson Road. Southbound MacPherson Road assumed to have additional exclusive left-turn lane.

6.2.3. Traffic Analysis Zones

The 12 traffic analysis zones (TAZs) as established for the Devens EIR and previous 5-Year Traffic Monitoring Reports were retained for consistency. Each TAZ is defined by traffic generation parameters, including land use and trip generation. The TAZs were updated to match current 2010 build-out conditions and were also separately updated to reflect proposed future build-out conditions, according to the Build-Out Analysis (Section 5).

6.2.4. Trip Distribution

This distribution assumes that future generated trips and associated travel patterns will be consistent with existing travel patterns. The thirteen gateway locations used with previous 5-Year Traffic Monitoring studies and have been retained, however gateway utilization has been updated based on the Devens Resident and Business Survey results.

6.2.5. Background Traffic Growth

For this study, background traffic is a result of development which occurs external to Devens. For this reason, traffic growth due to planned and proposed development external to Devens was considered for analysis of future year conditions. Towns within the study area were contacted regarding any developments currently in construction or planning stages. The following summarizes the information obtained through these discussions:

- Lancaster has several residential projects planned and under construction and an industrial park plan has been approved. Development in North Lancaster continues to blossom with new businesses.
- No significant projects are planned in the other study area towns.

While it is believed that regional traffic growth has generally stabilized or trended downward, this study uses a 1.77% annual traffic growth to be consistent with MassDOT and Metropolitan Regional Planning Commission (MRPC) standard transportation planning practices.

6.2.6. Project Traffic

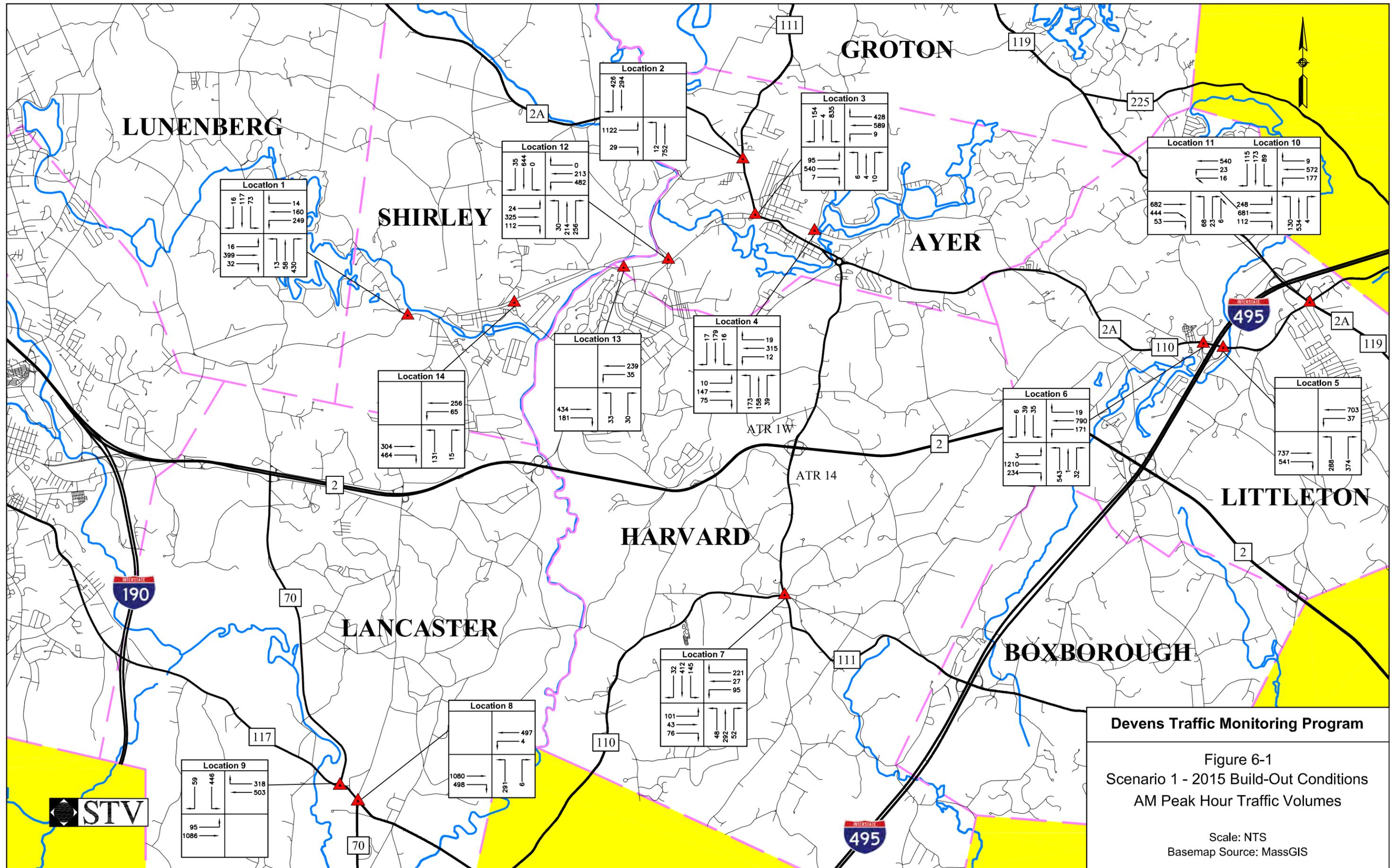
Project traffic includes the additional trips generated by proposed future development, expansion, and reuse of existing buildings internal to Devens. The additional trips generated by projected Devens build-out (Section 5) were applied to the traffic model build conditions.

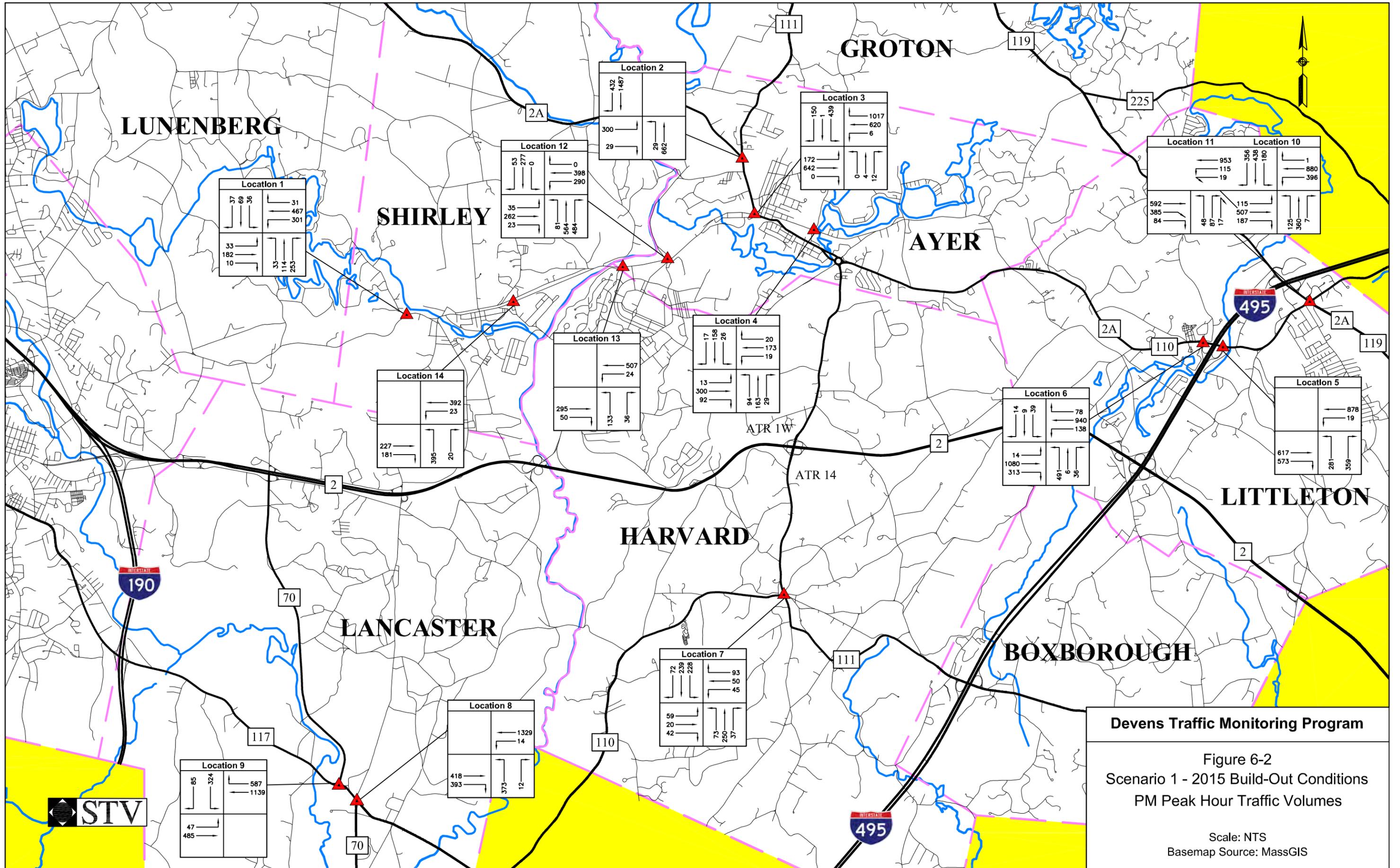
6.2.7. Traffic Assignment

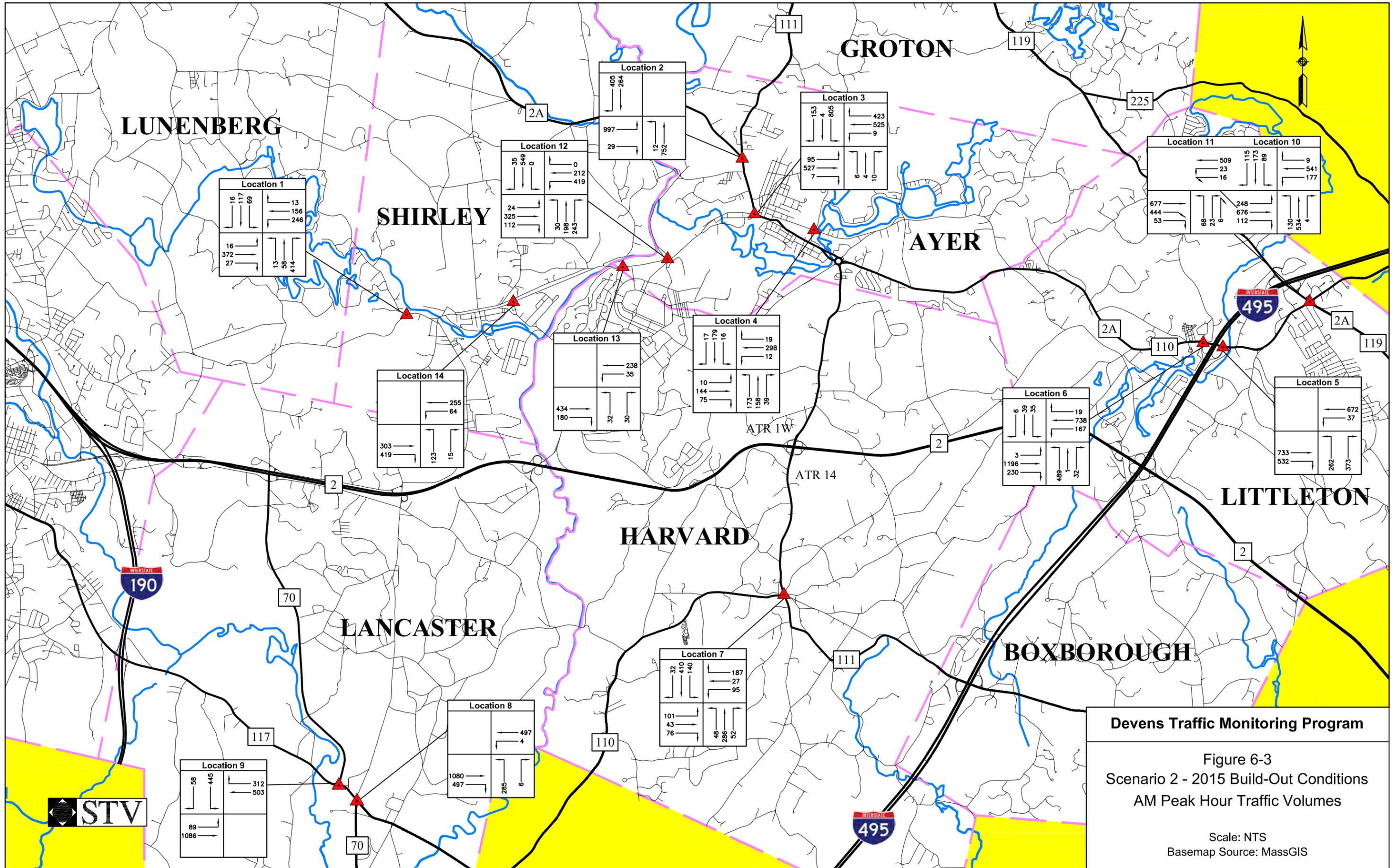
Trips generated by proposed future Devens development were assigned to the study roadway network based on roadway circulation patterns develop from Devens Resident and Employee Survey results and traffic volume data.

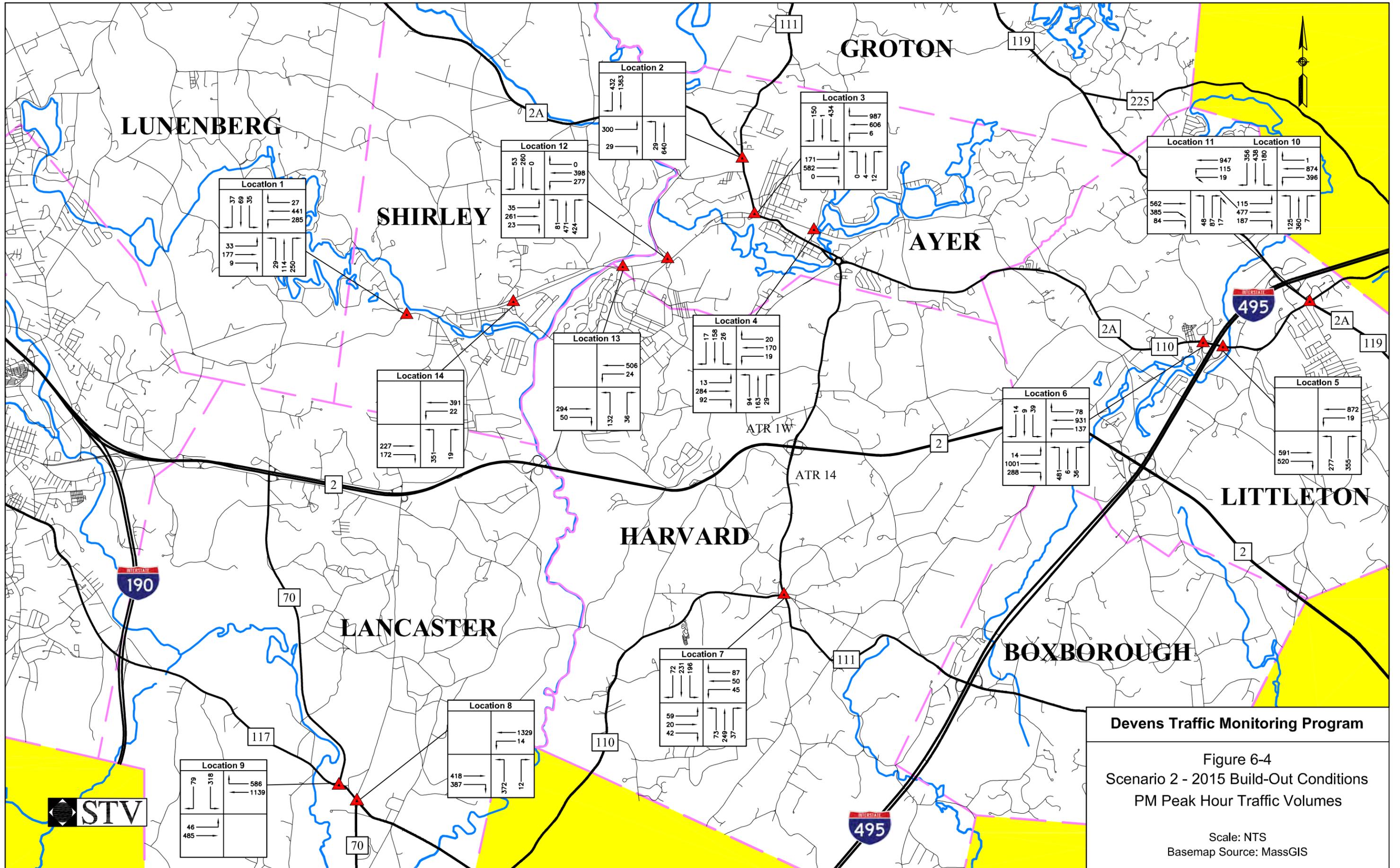
6.2.8. Transportation Mode Split

The Devens Resident and Business Employee Transportation Survey obtained mode selection statistics for trips to and from work. The survey results indicate 90 percent of trips by Devens residents and business employees are made by automobile, 6 percent by carpool, 1 percent by bicycle, and 1 percent by walking. MBTA ridership data indicates commuter rail ridership in the study area has increased 34% since 2005, which indicates that public transportation is increasingly becoming a viable mode of transportation for commuters. All trips generated by proposed future Devens development is assumed to be made by automobile, to be conservative.









7. Model Results Summary

7.1.Overview

A capacity analysis was performed to compare the 2010 existing conditions with future 2020 No-Build and 2020 Build conditions (Scenarios 1 and 2). For each condition, the TRAFFIX model measured the Level of Service (LOS) of each intersection in the study area using the level of service methodology explained in the 2000 Highway Capacity Manual. Descriptions for each levels of service are provided in Table 7-1.

Table 7-1: Level of Service Definitions

Description	Intersection Stopped Delay per Vehicle (sec)	
	Signalized Intersection	Unsignalized Intersection
LOS A describes primarily free flow operations a average travel speeds, usually about 90% of the free-flow speed for the arterial. Stopped delays at signalized and unsignalized intersections are minimal.	<10	<10
LOS B describes reasonably unimpeded operations at average travel speeds, usually about 70% of the free-flow speed for the arterial. More vehicles stop at intersections than with LOS A, causing higher but manageable delays.	10-20	10-15
LOS C describes stable operations, however ability to maneuver and change lanes in mid block locations maybe restricted. Travel speeds are usually 50% of the free-flow speed for the arterial. Delays at intersections will increase from LOS B and cause motorists some tension.	20-35	15-25
LOS D describes a slight breakdown in operation of arterials and intersections. Longer queues will occur and high delays will be evident for some approaches.	35-55	25-35
LOS E characterized by significant delays, low travel speeds, and poor progression. This level of service is considered to be unacceptable by some agencies.	55-80	35-50
LOS F characterizes extremely low arterial speeds, intersection congestion, excessive delays, and extensive queues. This level of service describes a condition that is usually concurrent with oversaturation of a roadway or intersection. This level of service can often be mitigated simply by signal optimization or increasing intersection capacity by adding lanes and storage.	>80	>50

Source: 2000 Highway Capacity Manual, Transportation Research Board

7.2.Existing (2010) Conditions

The existing 2010 conditions were analyzed to serve as the baseline for this study (Table 7-2 and 7-3). In general, the 2010 levels of service are similar to those measured in the 2008 Biennial Traffic Report. The following are notable levels of service changes since 2008:

- Location 1 (Front Street/Lancaster Street/Leominster Road/Center Road): AM and PM peak hour operation have degraded because the southbound (Lancaster Street) approach control was changed from a stop sign in 2008 to a yield sign in 2010.
- Location 3 (Park Street/Main Street/West Main Street): PM peak hour operation improves because volumes on several critical movements (left turns) have decreased from 2008 to 2010.
- Location 4 (Groton-Harvard Road/Central Avenue): AM peak hour operation for the northbound approach has degraded from 2008 to 2010.
- Location 5 (Route 2A-110/I-495 Exit 30 NB Ramps): AM peak hour operation for the northbound left turn has degraded because the eastbound and westbound through traffic volumes increases from 2008 to 2010. PM peak hour operation at Location 5 improves because volumes decreased for all but one (WB through) movement and an exclusive WB left turn lane is provided.
- Location 6 (Route 2A-110/I-495 Exit 30 SB Ramps): PM peak hour operation has improved slightly because two lanes are assumed in 2010 for southbound and westbound movements (compared to one lane in 2008). AM and PM peak hour operation have changed due to geometric improvements since 2008 (including changing from 2-way stop to 4-way stop and a westbound free right turn).
- Location 11 (Route 2A-110(King Street)/Goldsmith Street): PM peak hour operation has improved because volumes at several critical movements have decreased from 2008 to 2010.
- Location 12 (Verbeck Gate/MacPherson Road/West Main Street): PM peak hour operation has improved from 2008 to 2010 because an additional exclusive northbound right turn lane is provided in 2010.
- Location 13 (Grant Road/West Main Street): PM peak hour delay has improved because volumes for most movements have decreased from 2008 to 2010.

Table 7-2: Intersection Capacity Analysis Level of Service Summary – 1996-2010 AM Peak Hour

	1996		1998		2000		2002		2004		2006		2008		2010	
	LOS	Delay														
Location 1 - Front/Lancaster/Leominster/Center																
All movements from Lancaster Northbound	B	6	B	8	D	26	C	15	B	12	B	13	B	14	C	19
All movements from Center Southbound	B	10	C	20	E	48	D	29	C	19	C	23	C	24	F	52
Left turn from Leominster Eastbound	A	2	A	2	A	8	A	7	A	7	A	7	A	7	A	8
Left turn from Front Street Westbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	A	8
Location 2 - Park/Fitchburg/Groton School																
Left/Right from Groton School Southbound (stop control)	F	>120	F	>120	F	102	E	44	C	20	C	20	F	79	F	>120
Left turn from Fitchburg Road Eastbound	A	3	A	3	A	8	A	8	A	9	A	9	A	8	A	8
Location 3 - Park/Main/West Main																
All movements from Park (Mill) Street Northbound	B	9	B	8	n/a	n/a	C	16	B	14	C	15	C	18	C	20
All movements from Park Street Southbound	F	>120														
Left turn from West Main Street Eastbound	A	4	A	5	A	9	A	9	A	9	A	9	A	9	A	9
Left turn from Main Street Westbound	A	3	A	3	n/a	n/a	A	8	A	8	A	8	A	8	A	8
Location 4 - Groton-Harvard/Central																
All movements from Groton-Harvard Northbound	B	8	C	12	C	18	C	18	B	14	B	13	C	21	F	55
All movements from Groton-Harvard Southbound	C	12	F	>120	F	80	F	118	D	26	C	20	B	13	C	18
Left turn from Central Eastbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	A	8
Left turn from Central Westbound	A	3	A	3	A	8	A	8	A	8	A	8	A	7	A	8
Location 5 - Route 2A-110/I-495 Northbound Ramps																
Left turn from Ramps Northbound	C	16	C	19	E	106	E	36	C	23	C	22	C	20	E	35
Right turn from Ramps Northbound	C	15	C	17	F	n/a	F	106	C	23	B	13	C	15	C	20
Left turn from Route 2A-110 Westbound	B	5	B	6	B	11	B	10	A	9	A	9	A	9	A	10
Location 6 - Route 2A-110/I-495 Southbound Ramps																
Left turn from Ramps Northbound	F	>120														
Right turn from Ramps Northbound	B	6	B	8	C	21	C	18	B	13	B	14	B	14	C	15
All movements from Murray St(HartwellAve) Southbound	E	35	F	>120	F	>120	F	>120	F	88	F	76	F	60	F	>120
Left turn from Route 2A-110 Eastbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	A	8
Left turn from Route 2A-110 Westbound	B	6	B	10	B	12	B	12	A	10	B	10	B	10	B	11
Location 7 - Route 110-111(Ayer Road)/Still River																
All movements from Still River Road Eastbound	C	11	C	19	E	47	D	28	C	22	C	20	D	30	B	13
All movements from Still River Road Westbound	C	12	E	30	F	>120	D	31	D	27	D	27	C	23	B	12
Left turn from Ayer Road Northbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	C	17
Left turn from Ayer Road Southbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	C	22

Table 7-2: Intersection Capacity Analysis Level of Service Summary – 1996-2010 AM Peak Hour (Continued)

	1996		1998		2000		2002		2004		2006		2008		2010	
	LOS	Delay														
Unsignalized Intersections																
Location 8 - Route 70/Route 117 (Seven Bridge Rd)																
All movements from Seven Bridge Rd (Rt.117) Eastbound	F	88	A	3	A	< 8	n/a	n/a	n/a	n/a	n/a	n/a	A	8	A	3
All movements from Seven Bridge Road Westbound	B	10	B	8	B	11	B	11	B	11	B	11	B	12	B	11
All movements from Route 70 Northbound	B	7	F	>120	F	>120	F	>120	F	76	F	>120	F	>120	F	>120
All movements from Route 70 Southbound	n/a	n/a	C	17	E	43	n/a	n/a	n/a	n/a	D	26	D	30	n/a	n/a
Location 9 - Route 70 (Lunenburg Road)/Route 117																
All movements from Lunenburg Road Southbound	F	>120														
Left turn from Route 117 Eastbound	A	4	A	4	A	9	A	9	A	8	A	8	A	9	A	9
Location 11 - Route 2A-110/Goldsmith																
All movements from Goldsmith Northbound	F	>120	F	489	F	117	F	69	D	30	C	20	C	22	C	20
Left turn from Route 2A-110 Westbound	B	9	B	10	B	12	B	12	B	10	A	10	A	10	A	9
Location 12 - Verbeck Gate/MacPherson/West Main																
All movements from MacPherson Northbound	B	7	B	6	C	20	F	>120	C	19	E	36	D	27	D	31
All movements from MacPherson Southbound	B	6	B	9	A	< 5	F	62	C	20	D	35	D	33	E	40
All movements from West Main Eastbound			A	2	A	< 5	A	8	A	8	A	8	A	8	A	8
All movements from West Main Westbound	A	4	A	4	A	9	A	9	A	9	A	9	A	9	A	9
Location 13 - Grant/West Main																
All movements from Grant Road Northbound									B	12	B	12	B	14	B	13
Left turn from Front Street (West Main St) Westbound									A	8	A	8	A	9	A	8
Location 14 - Hospital/Front																
All movements from Hospital Road Northbound									B	13	B	12	B	13	C	16
Left turn from Front Street Westbound									A	8	A	8	A	8	A	9
Signalized Intersections																
Location 10 – Rte 110 (King St)/Rte 119 (Great Rd) * (overall)																
Left turn from King St Northbound (or Eastbound)	F	66	F	>120	F	>120	F	>120	F	>120	B	17	B	16	D	43
Through/Right from King St Northbound (or Eastbound)	C	17	D	37			F	>120	F	>120	B	16	B	16	D	43
Left turn from King St Southbound (or Westbound)	D	38	F	>120			E	77	D	48	B	14	B	14	C	33
Through/Right from King St Southbound (or Westbound)	B	13	C	19			C	24	E	62	B	15	B	15	C	33
Left turn from Great Road Westbound (or Northbound)	B	6	B	7			A	6	B	10	A	6	A	6	B	14
Through/Right from Great Road Westbound (or Northbound)	B	7	B	8			C	20	C	29	C	28	C	28	B	17
Left turn from Great Road Eastbound (or Southbound)	A	4	A	4			A	10	B	12	A	8	A	7	A	10
Through/Right from Great Road Eastbound (or Southbound)	B	14	C	17			B	12	F	>120	E	75	F	>120	B	19

Table 7-3: Intersection Capacity Analysis Level of Service Summary – 1996-2010 PM Peak Hour

	1996		1998		2000		2002		2004		2006		2008		2010	
	LOS	Delay														
Location 1 - Front/Lancaster/Leominster/Center																
All movements from Lancaster Northbound	B	9	B	7	C	23	C	17	C	18	C	16	C	18	C	24
All movements from Center Southbound	C	12	B	10	C	24	C	22	D	25	C	23	D	27	E	38
Left turn from Leominster Eastbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	A	8
Left turn from Front Street Westbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	A	8
Location 2 - Park/Fitchburg/Groton School																
Left/Right from Groton School Southbound (stop control)	F	>120	F	54	F	101	F	>120								
Left turn from Fitchburg Road Eastbound	B	6	B	8	B	11	B	10	B	11	A	10	B	10	B	10
Location 3 - Park/Main/West Main																
All movements from Park (Mill) Street Northbound	C	10	D	21			D	26	D	31	D	33	E	38	D	26
All movements from Park Street Southbound	F	>120														
Left turn from West Main Street Eastbound	B	8	C	11	B	10	B	11	B	12	B	13	B	13	B	11
Left turn from Main Street Westbound	A	3	A	3			A	8	A	8	A	8	A	8	A	8
Location 4 - Groton-Harvard/Central																
All movements from Groton-Harvard Northbound	C	10	D	24	D	34	F	64	D	33	C	23	C	22	D	26
All movements from Groton-Harvard Southbound	B	10	D	25	D	34	F	67	C	21	C	24	C	21	C	18
Left turn from Central Eastbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	A	8
Left turn from Central Westbound	A	2	A	3	A	8	A	8	A	8	A	8	A	8	A	8
Location 5 - Route 2A-110/I-495 Northbound Ramps																
Left turn from Ramps Northbound	F	73	F	>120	F	94	F	>120	F	162	F	>120	F	77	F	59
Right turn from Ramps Northbound	B	6	B	7	C	16	C	16	C	18	C	20	C	21	B	14
Left turn from Route 2A-110 Westbound	A	4	A	4	A	9	A	9	A	9	A	9	A	9	A	9
Location 6 - Route 2A-110/I-495 Southbound Ramps																
Left turn from Ramps Northbound	F	>120														
Right turn from Ramps Northbound	B	5	B	6	B	14	B	14	B	14	B	13	B	14	B	12
All movements from Murray St(HartwellAve) Southbound	F	49	E	41	F	78	F	85	F	93	F	>120	F	88	F	82
Left turn from Route 2A-110 Eastbound	A	5	A	5	A	9	A	10	A	10	A	10	A	9	A	9
Left turn from Route 2A-110 Westbound	B	5	B	6	A	9	B	10	B	10	A	10	B	10	A	10
Location 7 - Route 110-111(Ayer Road)/Still River																
All movements from Still River Road Eastbound	C	11	C	11	C	18	C	15	C	21	C	16	D	32	A	10
All movements from Still River Road Westbound	B	9	B	10	C	23	C	18	C	24	C	19	E	35	A	9
Left turn from Ayer Road Northbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	B	11
Left turn from Ayer Road Southbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	A	10

Table 7-3: Intersection Capacity Analysis Level of Service Summary – 1996-2010 PM Peak Hour (Continued)

	1996		1998		2000		2002		2004		2006		2008		2010	
Unsignalized Intersections	LOS	Delay														
Location 8 - Route 70/Route 117 (Seven Bridge Rd)																
All movements from Seven Bridge Rd (Rt.117) Eastbound	F	>120	B	6	A	10	n/a	n/a	n/a	n/a	A	10	B	10	A	3
All movements from Seven Bridge Road Westbound	C	14	A	4	A	9	C	22	A	9	A	9	A	9	A	9
All movements from Route 70 Northbound	A	4	F	>120												
All movements from Route 70 Southbound	B	5	D	22	E	36	n/a	n/a	n/a	n/a	E	37	E	41	n/a	n/a
Location 9 - Route 70 (Lunenberg Road)/Route 117																
All movements from Lunenberg Road Southbound	F	>120														
Left turn from Route 117 Eastbound	B	7	B	9	B	11	B	11	B	11	B	11	B	12	B	12
Location 11 - Route 2A-110/Goldsmith																
All movements from Goldsmith Northbound	F	>120	F	>120	F	58	F	>120	F	156	F	88	F	>120	C	22
Left turn from Route 2A-110 Westbound	B	7	B	7	A	9	B	11	B	10	A	10	B	10	A	9
Location 12 - Verbeck Gate/MacPherson/West Main																
All movements from MacPherson Northbound	B	7	B	8	E	44	F	54	F	56	F	>120	F	>120	D	35
All movements from MacPherson Southbound	B	7	C	12	C	16	C	16	C	20	D	33	C	23	C	18
All movements from West Main Eastbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	A	8
All movements from West Main Westbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	A	8
Location 13 - Grant/West Main																
All movements from Grant Road Northbound									B	13	B	12	C	20	C	16
Left turn from Front Street (West Main St) Westbound									A	8	A	8	A	8	A	8
Location 14 - Hospital/Front																
All movements from Hospital Road Northbound									B	13	B	13	B	12	C	16
Left turn from Front Street Westbound									A	8	A	8	A	8	A	8
Signalized Intersections																
Location 10 – Rte 110 (King St)/Rte 119 (Great Rd) * (overall)																
Left turn from King St Northbound (or Eastbound)	F	>120	F	>120	F	>120	F	95	F	136	F	>120	F	107	C	28
Through/Right from King St Northbound (or Eastbound)	B	7	B	9			B	15	B	16	B	16	C	19	C	28
Left turn from King St Southbound (or Westbound)	B	11	C	17			F	86	B	19	B	15	C	19	E	70
Through/Right from King St Southbound (or Westbound)	B	15	C	17			C	27	D	48	C	33	C	25	E	70
Left turn from Great Road Westbound (or Northbound)	E	60	E	59			F	15	A	10	A	9	A	9	B	19
Through/Right from Great Road Westbound (or Northbound)	D	39	D	37			F	15	F	>120	F	>120	F	>120	C	21
Left turn from Great Road Eastbound (or Southbound)	E	55	F	>120			C	24	A	8	A	7	A	8	C	22
Through/Right from Great Road Eastbound (or Southbound)	E	13	D	32			F	>120	E	59	D	39	E	45	D	38

Based on the results presented above, existing development at Devens has impacted the study area intersections on varying levels. When comparing existing 2010 levels of service to the 1996 baseline conditions, the study area intersections can be classified as unaffected, minimally affected, or affected.

Unaffected intersections include those intersections where the 2010 levels of service remain relatively unchanged from 1996. The unaffected intersections include:

- Location 2 - Park Street/Fitchburg Road/Groton School Road
- Location 7 - Route 110-111 (Ayer Road)/Route 110 (Still River Road)/Route 111
- Location 8 - Route 70/117 (Seven Bridge Road)
- Location 9 - Route 70/117 (Lunenburg Road)
- Location 10 - Route 110 (King Street)/Route 119/Route 2A (Great Road)
- Location 11 - Route 2A-110 (King Street)/Goldsmith Street
- Location 13 - Grant Road/West Main Street

Minimally affected intersections include those intersections where the 2010 levels of service have only degraded by one level of service since 1996. This additional delay may be contributed to several factors, including background regional traffic growth. The minimally affected intersections include:

- Location 1 - Front Street/Lancaster Street/Leominster Road/Center Road
- Location 3 - Park Street/Main Street/West Main Street
- Location 5 - Route 2A-110/I-495 Exit 30 NB Ramps
- Location 6 - Route 2A-110/I-495 Exit 30 SB Ramps
- Location 14 - Hospital Road/Front Street

Affected intersections include those intersections where the 2010 levels of service have degraded by more than one level of service since 1996. Side street traffic at these intersections operate at LOS F during peak hours, which is not uncommon for unsignalized intersections. This additional delay may be contributed to several factors, including background regional traffic growth. The affected intersections include:

- Location 4 - Groton-Harvard Road/Central Avenue
- Location 12 - Verbeck Gate/ MacPherson Road/West Main Street

It is noted that any degrading of level of service since 2008 is likely not attributed to development at Devens since the area of occupied development at Devens has decreased since 2008. It is more likely that degrading of level of service since 2008 is due to isolated increase in traffic volumes associated with development in surrounding cities and towns.

7.3.Future No-Build (2031)

When compared to the existing 2010 conditions, the study area intersections show an increase in delay due to background traffic growth. Compounding existing traffic volumes by 1.77% per year over 21 years results in significant traffic growth, often resulting in LOS F at study intersections (Table 7-4).

Table 7-4: Intersection Level of Service Comparison – Existing versus No-Build

Unsignalized Intersections	AM Peak Hour				PM Peak Hour			
	2010 Existing		2031 No-Build		2010 Existing		2031 No-Build	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Location 1 – Front/Lancaster/Leominster/Center	F	52	F	>120	E	38	F	>120
Location 2 – Park/Fitchburg/Groton School	F	>120	F	>120	F	>120	F	>120
Location 3 – Park/Main/West Main	F	>120	F	>120	F	>120	F	>120
Location 4 – Groton-Harvard/Central	F	55	F	>120	D	26	F	>120
Location 5 – Route 2A-110/I-495 NB Ramps	E	35	F	>120	F	59	F	>120
Location 6 – Route 2A-110/I-495 SB Ramps	F	>120	F	>120	F	>120	F	>120
Location 7 – Route 110-111(Ayer Road)/Still River	C	22	F	>120	B	11	C	19
Location 8 – Route 70/Route 117 (Seven Bridge Road)	F	>120	F	>120	F	>120	F	>120
Location 9 – Route 70 (Lunenburg Road)/Route 117	F	>120	F	>120	F	>120	F	>120
Location 11 – Route 2A-110/Goldsmith	C	20	F	52	C	22	F	100
Location 12 – Verbeck Gate/MacPherson/West Main	E	40	F	>120	D	35	F	>120
Location 13 – Grant/West Main	B	13	C	19	C	16	E	36
Location 14 – Hospital/Front	C	16	D	28	C	16	D	32
Signalized Intersection								
Location 10 – Rte 110 (King St)/Rte 119 (Great Road)	C	25	E	62	D	40	F	>120

The following study intersections are expected to deteriorate to LOS E or LOS F in the AM or PM as a result of anticipated background growth and development.

- Location 4 - Groton-Harvard/Central
- Location 7 - (Route 110-111(Ayer Road)/Still River)
- Location 10 - Route 110 (King Street)/Route 119 (Great Road)
- Location 11 - Route 2A-110/Goldsmith
- Location 12 - Verbeck Gate/MacPherson Road/West Main Street
- Location 13 - Grant/West Main

7.4.Future Build (2031 and 2034) Scenarios 1 and 2

The future Build scenarios include Devens-generated traffic added to the 2031 No-Build volumes (Table 6-1 through 6-4). It is projected that most study intersections will operate at LOS F with or without Devens-generated traffic (Table 7-5 and 7-6), as discussed above. The following intersections are projected to deteriorate to a LOS F as a result of future Devens-generate traffic:

- Location 7 - Route 110-111 (Ayer Road)/Still River
- Location 14 - Hospital/Front

**Table 7-5: Intersection Capacity Analysis Level of Service Summary
Existing versus Build AM Peak Hour**

	2010 Existing		2031 Build Scenario 1		2031 Build Scenario 2	
	LOS	Delay	LOS	Delay	LOS	Delay
Location 1 - Front/Lancaster/Leominster/Center						
All movements from Lancaster Northbound	C	19	F	>120	F	>120
All movements from Center Southbound	F	52	F	>120	F	>120
Left turn from Leominster Eastbound	A	8	A	8	A	8
Left turn from Front Street Westbound	A	8	A	10	A	10
Location 2 - Park/Fitchburg/Groton School						
Left/Right from Groton School Southbound (stop control)	F	>120	F	>120	F	>120
Left turn from Fitchburg Road Eastbound	A	8	A	10	A	10
Location 3 - Park/Main/West Main						
All movements from Park (Mill) Street Northbound	C	20	F	>120	F	>120
All movements from Park Street Southbound	F	>120	F	>120	F	>120
Left turn from West Main Street Eastbound	A	9	B	13	B	12
Left turn from Main Street Westbound	A	8	A	9	A	9
Location 4 - Groton-Harvard/Central						
All movements from Groton-Harvard Northbound	F	55	F	>120	F	>120
All movements from Groton-Harvard Southbound	C	18	F	99	F	86
Left turn from Central Eastbound	A	8	A	8	A	8
Left turn from Central Westbound	A	8	A	8	A	8
Location 5 - Route 2A-110/I-495 Northbound Ramps						
Left turn from Ramps Northbound	E	35	F	>120	F	>120
Right turn from Ramps Northbound	C	20	F	>120	F	>120
Left turn from Route 2A-110 Westbound	A	10	B	14	B	13
Location 6 - Route 2A-110/I-495 Southbound Ramps						
Left turn from Ramps Northbound	F	>120	F	>120	F	>120
Right turn from Ramps Northbound	C	15	D	30	D	29
All movements from Murray St(HartwellAve) Southbound	F	>120	F	>120	F	>120
Left turn from Route 2A-110 Eastbound	A	8	B	11	B	10
Left turn from Route 2A-110 Westbound	B	11	C	23	C	22
Location 7 - Route 110-111(Ayer Road)/Still River						
All movements from Still River Road Eastbound	B	13	E	38	E	36
All movements from Still River Road Westbound	B	12	F	67	F	51
Left turn from Ayer Road Northbound	C	17	F	>120	F	>120
Left turn from Ayer Road Southbound	C	22	F	>120	F	>120

**Table 7-5: Intersection Capacity Analysis Level of Service Summary
Existing versus Build AM Peak Hour (Continued)**

	2010 Existing		2034 Build Scenario 1		2031 Build Scenario 2	
	LOS	Delay	LOS	Delay	LOS	Delay
Unsignalized Intersections						
Location 8 - Route 70/Route 117 (Seven Bridge Rd)						
All movements from Seven Bridge Rd (Rt.117) Eastbound	A	3	A	3	A	3
All movements from Seven Bridge Road Westbound	B	11	C	15	C	15
All movements from Route 70 Northbound	F	>120	F	>120	F	>120
All movements from Route 70 Southbound	n/a	n/a	n/a	n/a	n/a	n/a
Location 9 - Route 70 (Lunenburg Road)/Route 117						
All movements from Lunenburg Road Southbound	F	>120	F	>120	F	>120
Left turn from Route 117 Eastbound	A	9	B	11	B	11
Location 11 - Route 2A-110/Goldsmith						
All movements from Goldsmith Northbound	C	20	F	104	F	92
Left turn from Route 2A-110 Westbound	A	9	B	11	B	11
Location 12 - Verbeck Gate/MacPherson/West Main						
All movements from MacPherson Northbound	D	31	F	>120	F	>120
All movements from MacPherson Southbound	E	40	F	>120	F	>120
All movements from West Main Eastbound	A	8	A	8	A	8
All movements from West Main Westbound	A	9	B	13	B	12
Location 13 - Grant/West Main						
All movements from Grant Road Northbound	B	13	C	20	C	20
Left turn from Front Street (West Main St) Westbound	A	8	A	9	A	9
Location 14 - Hospital/Front						
All movements from Hospital Road Northbound	C	16	F	>120	F	>120
Left turn from Front Street Westbound	A	9	B	13	B	13
Signalized Intersections						
Location 10 – Rte 110 (King St)/Rte 119 (Great Rd) * (overall)						
Left turn from King St Northbound (or Eastbound)	D	43	F	>120	F	>120
Through/Right from King St Northbound (or Eastbound)	D	43	F	>120	F	>120
Left turn from King St Southbound (or Westbound)	C	33	E	70	E	68
Through/Right from King St Southbound (or Westbound)	C	33	E	70	E	68
Left turn from Great Road Westbound (or Northbound)	B	14	D	55	D	54
Through/Right from Great Road Westbound (or Northbound)	B	17	C	31	C	29
Left turn from Great Road Eastbound (or Southbound)	A	10	D	38	C	30
Through/Right from Great Road Eastbound (or Southbound)	B	19	D	38	D	37

**Table 7-6: Intersection Capacity Analysis Level of Service Summary
Existing versus Build PM Peak Hour**

	2010 Existing		2034 Build Scenario 1		2031 Build Scenario 2	
	LOS	Delay	LOS	Delay	LOS	Delay
Location 1 - Front/Lancaster/Leominster/Center						
All movements from Lancaster Northbound	C	24	F	>120	F	>120
All movements from Center Southbound	E	38	F	>120	F	>120
Left turn from Leominster Eastbound	A	8	A	9	A	9
Left turn from Front Street Westbound	A	8	A	9	A	9
Location 2 - Park/Fitchburg/Groton School						
Left/Right from Groton School Southbound (stop control)	F	>120	F	>120	F	>120
Left turn from Fitchburg Road Eastbound	B	10	C	21	C	19
Location 3 - Park/Main/West Main						
All movements from Park (Mill) Street Northbound	D	26	F	>120	F	>120
All movements from Park Street Southbound	F	>120	F	>120	F	>120
Left turn from West Main Street Eastbound	B	11	D	26	C	24
Left turn from Main Street Westbound	A	8	A	9	A	9
Location 4 - Groton-Harvard/Central						
All movements from Groton-Harvard Northbound	D	26	F	>120	F	>120
All movements from Groton-Harvard Southbound	C	18	F	100	F	88
Left turn from Central Eastbound	A	8	A	8	A	8
Left turn from Central Westbound	A	8	A	8	A	8
Location 5 - Route 2A-110/I-495 Northbound Ramps						
Left turn from Ramps Northbound	F	59	F	>120	F	>120
Right turn from Ramps Northbound	B	14	F	63	F	52
Left turn from Route 2A-110 Westbound	A	9	B	13	B	12
Location 6 - Route 2A-110/I-495 Southbound Ramps						
Left turn from Ramps Northbound	F	>120	F	>120	F	>120
Right turn from Ramps Northbound	B	12	C	24	C	22
All movements from Murray St(HartwellAve) Southbound	F	82	F	>120	F	>120
Left turn from Route 2A-110 Eastbound	A	9	B	11	B	11
Left turn from Route 2A-110 Westbound	A	10	C	19	C	17
Location 7 - Route 110-111(Ayer Road)/Still River						
All movements from Still River Road Eastbound	A	10	C	20	C	20
All movements from Still River Road Westbound	A	9	F	86	F	72
Left turn from Ayer Road Northbound	B	11	F	77	F	76
Left turn from Ayer Road Southbound	A	10	F	>120	F	>120

**Table 7-6: Intersection Capacity Analysis Level of Service Summary
Existing versus Build PM Peak Hour (Continued)**

	2010 Existing		2034 Build Scenario 1		2031 Build Scenario 2	
	LOS	Delay	LOS	Delay	LOS	Delay
Unsignalized Intersections						
Location 8 - Route 70/Route 117 (Seven Bridge Rd)						
All movements from Seven Bridge Rd (Rt.117) Eastbound	A	3	A	3	A	3
All movements from Seven Bridge Road Westbound	A	9	B	10	B	10
All movements from Route 70 Northbound	F	>120	F	>120	F	>120
All movements from Route 70 Southbound	n/a	n/a	n/a	n/a	n/a	n/a
Location 9 - Route 70 (Lunenberg Road)/Route 117						
All movements from Lunenberg Road Southbound	F	>120	F	>120	F	>120
Left turn from Route 117 Eastbound	B	12	C	19	C	19
Location 11 - Route 2A-110/Goldsmith						
All movements from Goldsmith Northbound	C	22	F	>120	F	>120
Left turn from Route 2A-110 Westbound	A	9	B	10	B	10
Location 12 - Verbeck Gate/MacPherson/West Main						
All movements from MacPherson Northbound	D	35	F	>120	F	>120
All movements from MacPherson Southbound	C	18	F	>120	F	>120
All movements from West Main Eastbound	A	8	A	8	A	8
All movements from West Main Westbound	A	8	A	9	A	9
Location 13 - Grant/West Main						
All movements from Grant Road Northbound	C	16	E	40	E	39
Left turn from Front Street (West Main St) Westbound	A	8	A	8	A	8
Location 14 - Hospital/Front						
All movements from Hospital Road Northbound	C	16	F	>120	F	>120
Left turn from Front Street Westbound	A	8	A	9	A	9
Signalized Intersections						
Location 10 – Rte 110 (King St)/Rte 119 (Great Rd) * (overall)	<i>D</i>	<i>40</i>	<i>F</i>	<i>>120</i>	<i>F</i>	<i>>120</i>
Left turn from King St Northbound (or Eastbound)	C	28	D	42	D	40
Through/Right from King St Northbound (or Eastbound)	C	28	D	42	D	40
Left turn from King St Southbound (or Westbound)	E	70	F	>120	F	>120
Through/Right from King St Southbound (or Westbound)	E	70	F	>120	F	>120
Left turn from Great Road Westbound (or Northbound)	B	19	E	65	E	61
Through/Right from Great Road Westbound (or Northbound)	C	21	D	51	D	53
Left turn from Great Road Eastbound (or Southbound)	C	22	D	43	D	42
Through/Right from Great Road Eastbound (or Southbound)	D	38	F	>120	F	>120

8. Conclusions

This comprehensive study indicates that regional traffic volumes are generally stabilizing; however there are isolated roadways and intersections with increased traffic volumes. Total daily traffic volumes at Devens gates has increased since 2006 but are showing signs of stabilizing (decreased by 1.1%) since 2008, and the average total weekday daily truck traffic volumes through all of Devens gates are at the lowest level since 2000. Despite the reduction in traffic volume at Devens gates, cut-through traffic volumes have increased by 41% since 2006.

Devens Base Reuse Plan limits 8.5 million square feet of total development in Devens and the EIR limits the daily vehicle trips to 59,265. As of January 2010, approximately 3.66 million square feet of total build-out is currently occupied, while 1.49 million square feet of new construction is unoccupied and 2.39 million square feet of build-out is planned for potential expansions. The total square footage of occupied, unoccupied, and planned build-out (7.54 million square feet) is only 960,000 square feet less than the 8.5 million square feet permitted under Devens By-Laws. The EIR threshold of 59,625 daily vehicle trips is projected to be met in 2034 with a corresponding 9,167,985 square feet of development. The build-out limit of 8.5 million square feet is projected to be reached in 2031, with a corresponding 54,528 daily vehicle trips.

Through the review and approval of the Final EIR in 1995, MassDevelopment is obligated to mitigate traffic impacts resulting from future Devens development. Included in the Final EIR are mitigation measures for possible future congestion at external intersections, including:

- Location 2 - Park Street/Fitchburg Road/Groton School Road in Ayer
- Location 5 - Route 2A-110/I-495 Exit 30 NB Ramps in Littleton
- Location 6 - Route 2A-110/I-495 Exit 30 SB Ramps in Littleton
- Location 3 Park Street/Main Street/West Main Street in Ayer
- Carlton Rotary in Ayer

The level of service analysis of these five locations shows that, when compared to 1996 baseline conditions, levels of service are either no worse or only slightly worse in 2010. Given the recent decline in development and traffic generated by Devens from 2008-2010, it is considered unlikely that development at Devens is responsible for increased delay at study area intersections since 2008.

9. Noise Analysis

9.1. Overview

This section provides a summary of the sound level measurements conducted in June 2010 in support of the Devens Five-Year Traffic Report. Measurements were taken at 13 locations in Devens and surrounding towns of Harvard, Lancaster, Shirley and Ayer. Twelve of these locations correspond to the locations used in the August 1993 baseline noise measurements supporting the Fort Devens Disposal and Reuse EIS. An additional location 13 was analyzed in Harvard near Depot Road at Route 2.

The methodologies and descriptors used in this study are generally consistent with earlier studies to facilitate a comparison of sound levels at community locations since the initial study. The results of the 2010 study are compared to the results of the 1993 baseline study as well as the 2000 and 2005 Five Year study. Additional details of the 1993, 2000, 2005 and 2010 measurement surveys are provided separately in Appendix A7 along with tabular summaries of the measurements. The meteorological conditions observed during the 2010 measurement surveys are also summarized in the Appendix.

The results of the 2010 sound levels are well below the 2005 sound levels. As noted in the 2005 study, the original schedule of the noise field survey was late enough in the summer that it is usually affected and sometimes dominated by the sound of insects (crickets). Since the purpose of the study is to compare the sound generated by area traffic, the influence of insects can obscure the intended comparison. To reduce this risk, the 2010 surveys were made in June compared to the original August study. Full spectrum analysis for some locations was introduced in 2005 to document the influence of insects. In 2010, a full spectrum analysis was made at every measurement for each survey. Also added in 2010 are recorded sound files for many of the measurements. These additional details reflect a new generation of sound level meter capabilities that tends to expand from decade to decade. While the additional details are documented and available for later analysis, if needed, they are not included in the study.

9.2. Noise Methodology

The unit of measure used to describe and quantify sound levels is the decibel (dB). Although the decibel is used to describe a sound field (which can be measured by an instrument) and not noise (which is a qualitative term for unwanted sound), the two terms are often used interchangeably. Since this study is intended to evaluate the potential for noise impact, the term “noise” will generally be used in this report. The fluctuation of the sound field and the duration of noisy events are also important in evaluating noise impact. Several statistical metrics (expressed in dBA) are used in this report to characterize a fluctuating sound field. They include the L90 and Leq metrics. The detailed summary of measured levels are provided in Appendix A7.

Although it is not the purpose of this study to evaluate noise level for compliance with particular criteria, some representative descriptors and criteria are provided here so that a qualitative evaluation may be made of the noise levels that were measured. In the Fort Devens Disposal and Reuse final EIS, EPA classifications of typical weekday daytime A-weighted noise level ranges were provided as a basis on which to compare the measured levels. To be consistent with that study, these ranges, which correspond to various classifications of residential neighborhoods, are shown in Table 9-1.

Table 9-1 Qualitative Descriptors of Urban and Suburban Detached Housing Residential Areas and Approximate Daytime Background Noise Levels (L90)

Description	Typical Range (dBA)	Average
Quiet Suburban Residential	36 to 40 inclusive	38 dBA
Normal Suburban Residential	41 to 45 inclusive	43 dBA
Urban Residential	46 to 50 inclusive	48 dBA
Noisy Urban Residential	51 to 55 inclusive	53 dBA
Very Noisy Urban Residential	56 to 60 inclusive	58 dBA

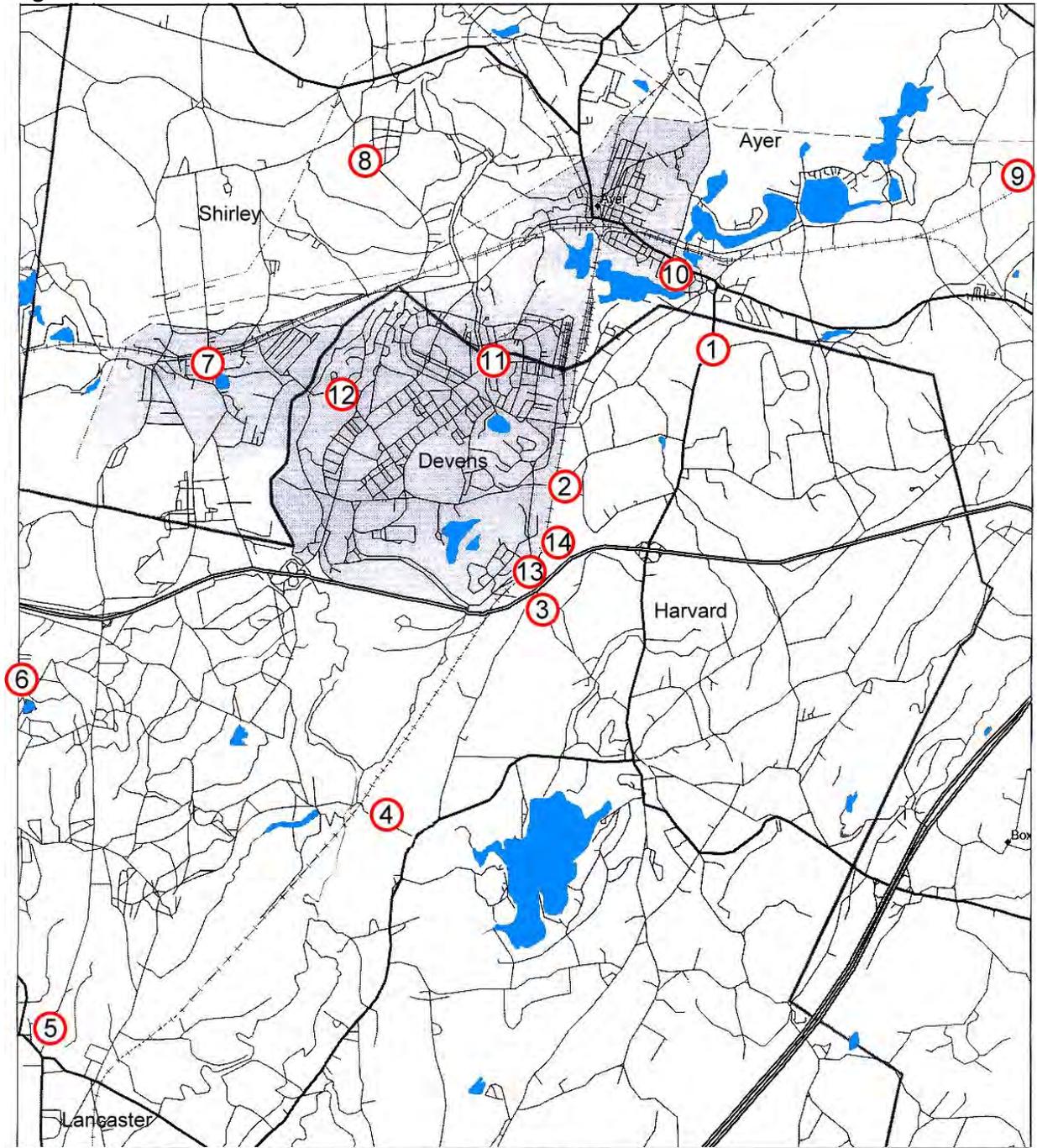
Cited source: EPA

To address noise concerns due to traffic, the Federal Highway Administration (FHWA) noise abatement criteria (NAC) were promulgated. A noise impact is defined as occurring when noise levels approach (within 1 dBA), meet or exceed these criteria. The NAC for exterior areas is provided based on the activity category for the one-hour Leq and L10. The NAC for Category B land is Leq = 67 dBA and L10 = 70 dBA. The B Category addresses most of the area surveyed in this study. It must be understood, however, that the FHWA criteria are generally applied to new highway projects and not to existing noise levels. Therefore, they are addressed here only so that a subjective evaluation may be made of the noise levels that were measured during this assessment.

9.3.Noise Measurement Results

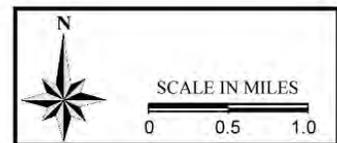
Sound level measurements were measured at 13 locations (Figure 9-1). Four discrete community conditions were surveyed – a weekday during the day and night and a weekend during the day and night. Each measurement was of 20-minute duration. The sources of noise that contributed to each measured level were noted, as were the meteorological conditions under which each measurement was taken. All measurements were made under low wind conditions and in the absence of precipitation. The locations replicate the locations used in the August 1993 baseline noise measurements supporting the Fort Devens Disposal and Reuse EIS. The study also included an additional measurement location that was introduced in the 2000 study in Harvard near Route 2.

Figure 9-1 Noise Measurement Locations



Source of Measurement Locations: Fore Deverens Disposal and Reuse Study, 2000

① Sound Level Measurement Location



The measurement sites consist of various rural and suburban residential neighborhoods throughout the project area. The measurement results are detailed in Appendix A7. A direct comparison of the levels measured in 1993, 2000, 2005 and 2010 is provided in Table 9-3. Some data points are absent from the 1993 data set. The first measurements made at each location are used as the baseline levels for that location. Measured 20-minute Leq noise levels for the daytime conditions ranged from 31 dBA at Site 2 Old Mill Road to 60 dBA at Site 1 Myrick Lane. The Nighttime L90 levels ranged from 27 dBA at several locations to 45 dBA at Location 13 near Route 2.

Table 9-2 Noise Measurement Locations

Location Number	Description	Town
1	Corner of Route 110 and Myrick Lane	Harvard
2	West End of Old Mill Road	Harvard
3	Near #128 Depot Road	Harvard
4	Still River/ Depot Road	Harvard
5	Shirley Road (North Village)	Lancaster
6	Residential Neighborhood near Spectacle Pond	Lancaster
7	Near #27 Tolman Avenue (Shirley Gate)	Shirley
8	Near #80/80A Walker Road	Shirley
9	Near #3 Wagon Road	Ayer
10	Near #8 Marshal Road (at corner of Third Street)	Ayer
11	Near #20 Auman St.	Devens
12	Corner of Locust St. and Hospital St.	Devens
13	Residence at 139 Depot Road	Harvard
14	New Residential Development, Harvard Depot Road	Harvard

The levels measured in 2010 indicate that most of the measured locations fall into the “quiet suburban residential” to “normal suburban residential” classifications. Measured levels at Location 3, 6, and 13 were dominated by Traffic noise from Route 2. Location 1 was dominated by Route 110 noise. These locations exceeded the “normal suburban residential” criteria.

In general, the levels measured in 2010 are lower than the levels measured in previous measurement periods. But only three locations are dominated by traffic on Route 2 (Locations 3, 6, 13). At these locations, the daytime levels measured in 2010 are generally lower than the corresponding measured levels in 2005. Other locations were affected by traffic in the area, but background levels were dominated by other sources such as industry or birdlife and insect

sound. There were specific areas that were significantly different from the baseline year, Location 7 (Leq) is 20 dB lower than the baseline, whereas Location 4 (Leq) is 12 dB higher than the baseline. Such fluctuations are not uncommon, especially when considering the Leq metric. More modest variations are indicated using the background (L90) levels.

The results of the study indicate that the background (L90) levels in the area are generally similar to or lower than the 1993 levels. In this way, the study indicates that the area traffic noise levels have generally not increased significantly by the disposal of Fort Devens and the development of the Devens community.

Table 9-3 Comparison of Noise Levels Measured during 1993, 2000, 2005 and 2010 studies

Location	Time of Day	1993 Noise Levels (dBA)		2000 Noise Levels (dBA)		2005 Noise Levels (dBA)		2010 Noise Levels (dBA)	
		L90	Leq	L90	Leq	L90	Leq	L90	Leq
1 Myrick	Daytime, WD	46	57	+5	+4	+6	+5	+5	+3
	Nighttime, WD	38	51	+2	0	+17	+6	--	-1
	Daytime, WE	46	57	+5	+2	+2	+1	+4	--
	Nighttime, WE	40	51	+4	+2	+19	+9	-8	-8
2 Old Mill	Daytime, WD	34	47	+7	-1	+7	+1	+1	-3
	Nighttime, WD	47	49	-6	-6	+5	+6	-11	-10
	Daytime, WE	35	52	-1	-11	+7	--	-2	-7
	Nighttime, WE	36	38	-3	-3	+14	+13	-6	+5
3 Depot Rd, S	Daytime, WD	50	57	+5	+2	+2	-2	0	0
	Nighttime, WD	43	45	--	+4	+8	+7	-4	+5
	Daytime, WE	48	52	+3	+4	--	-3	-1	+5
	Nighttime, WE	41	49	+1	--	+11	+4	-1	-2
4 Still River	Daytime, WD	39	44	+1	+3	+4	+4	-4	+12
	Nighttime, WD	41	42	-5	+1	+4	+4	-14	-11
	Daytime, WE	34	43	+2	+6	+2	+6	+4	--
	Nighttime, WE	31	33	+5	+4	-6	-4	-2	+3
5 Shirley Rd	Daytime, WD	43	46	-2	--	+5	+5	+1	+6
	Nighttime, WD	40	43	-9	-2	+5	+9	-13	-7
	Daytime, WE	37	43	+4	+4	+3	+2	+8	+5
	Nighttime, WE	34	40	+4	--	+8	+3	-2	+4
6 Spectacle Pd	Daytime, WD	40	46	+7	+6	+3	-1	+3	+1
	Nighttime, WD	32	35	+8	+14	+9	+7	+2	+5
	Daytime, WE	34	42	+7	+3	+2	-1	+3	--
	Nighttime, WE	41	43	-1	+5	+1	-1	-9	-5
7 Tolman Ave	Daytime, WD	47	62	-1	-11	-2	-4	+3	+9
	Nighttime, WD	42	56	-3	-11	-1	-12	-12	-20
	Daytime, WE	41	57	--	-10	-7	-7	+9	-1
	Nighttime, WE	38	54	-1	-14	+4	-10	-7	-9

8 Walker Rd	Daytime, WD	41	49	-5	+6	+4	+7	+8	+2
	Nighttime, WD	42	44	-2	-3	+2	+3	-15	-2
	Daytime, WE	39	44	-4	+12	-1	-1	--	+7
	Nighttime, WE	32	41	+10	+11	+20	+12	-4	-8
9 Wagon Rd	Daytime, WD	36	53	+7	-8	+12	+10	+2	-3
	Nighttime, WD	34	35	+9	+9	+16	+16	+8	+8
	Daytime, WE	38	44	+4	+4	+10	+12	+4	+6
	Nighttime, WE	--	--	40	42	+16	+14	+1	+2
10 Marshal Rd	Daytime, WD	42	48	+2	+1	+3	+3	+4	+2
	Nighttime, WD	46	47	-5	-3	+2	+2	-10	-5
	Daytime, WE	39	43	+4	+8	+3	+3	+7	+7
	Nighttime, WE	48	49	-10	-8	--	--	-12	-8
11 Auman Ave	Daytime, WD	40	55	+3	+11	+4	--	+2	-5
	Nighttime, WD	39	42	+1	+12	--	+8	-2	+5
	Daytime, WE	38	53	--	--	+2	-3	+5	+6
	Nighttime, WE	40	42	+1	+9	--	-1	-1	+6
12 Locust/Hosp	Daytime, WD	37	54	+6	+6	+11	+4	0	-5
	Nighttime, WD	44	45	-4	+15	+3	+2	-12	-7
	Daytime, WE	38	47	-1	+11	+5	+2	+4	+9
	Nighttime, WE	40	45	--	+2	+12	+8	-4	-7
13 Depot Rd, N	Daytime, WD			61	65	-2	-4	-7	-6
	Nighttime, WD			45	50	-2	-2	-4	+2
	Daytime, WE			55	60	+2	-1	-1	-1
	Nighttime, WE			46	50	+5	-8	-1	+3
14 Harv. Depot	Daytime, WD			58	61	-1	-2		
	Nighttime, WD			48	52	+4	+3		
	Daytime, WE			52	58	+1	-4		
	Nighttime, WE			50	57	+4	-2		