

**APPENDIX B**  
**EXISTING CONDITIONS**



## **SEASONALITY OF TRAFFIC ON I-495**



Memo

To: Ethan Britland, EOT&PW  
From: Fay, Spofford & Thorndike  
Date: 11/08/2007  
Re: Seasonal Variations in Traffic on I-495

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In their response to the weekday peak hour existing level of service conditions on the I-495 corridor, the regional planning agencies in the area expressed concern that seasonal peak traffic was not represented in the existing conditions. They were particularly interested in the potential differences in operations during the summer season's Thursday and Friday peak periods and weekend midday traffic. A similar concern was expressed regarding peak period traffic variations during the fall season.

To address these points, Fay, Spofford & Thorndike (FST) reviewed traffic count data provided by the Executive Office of Transportation and Public Works (EOT&PW), Merrimack Valley Regional Planning Commission (MVPC), and Northern Middlesex Council of Governments (NMCOG), at three locations on I-495 to identify the variability of traffic volumes at different times of the year. The involved locations are I-495 at: Route 133 in Tewksbury, the Salisbury/Amesbury town line, and at Route 4 in Chelmsford. Year 2001 – 2006 traffic count data for these locations was available for the winter (January), spring (April), summer (July – August), and fall (October – December).

Comparisons were made for three different times during the week. The first comparison of seasonal variations in traffic volumes was done for typical weekdays (Tuesday – Thursday), AM (7 – 9) and PM (4 – 6) peak periods. Next, a comparison of traffic volumes for the midday four-hour peak periods, 10 AM – 2 PM, on weekend days for different times of the year was calculated. Finally, a comparison of traffic volumes during AM and PM peak periods, 7 – 9 AM and 4 – 6 PM, on Thursdays and Fridays was analyzed.

Through these analyzes it was found that there is more traffic during certain times in the summer and on Thursday and Friday peak periods than there is during an average peak period, which is the standard practice to use in traffic analysis. Therefore, the level of service and summary of operations that have been presented for existing conditions and future conditions in the I-495 Corridor Study are for an “average” peak period and do not reflect the operations of facilities during higher use periods.

The three different time periods during the week that were analyzed for seasonal variations are discussed below.

Typical Weekday Peak Period Analysis

As presented on Table 1, during the typical weekday AM and PM peak periods, (Tuesdays, Wednesdays, and Thursdays from 7 – 9 AM and 4 – 6 PM) there is more traffic in the summer versus the fall in Amesbury for both peak periods. It was also found that there is 10 percent more traffic volume, or about 200 more vehicles, in the AM peak period and 15 percent more volume, or about 450 more vehicles, in the PM peak period in Amesbury in the summer versus the fall. Comparison data for other seasons was not available or inconclusive.

**Table 1 - Summary of Seasonal Variation Analysis**

<b>Direction of Travel</b>	<b>Time Period</b>	<b>Season</b>	<b>Conclusion</b>
<b><i>I-495 at Salisbury Townline, Amesbury</i></b>			
Both	Typical Weekday AM Peak Periods	Summer vs. Fall	10% (200) more vehicles in the summer.
Both	Typical Weekday PM Peak Periods	Summer vs. Fall	15% (450) more vehicles in the summer.
Both	Weekend Midday Peak Period	Summer vs. Spring & Fall	40% (1200) more vehicles in the summer.
Both	Thursday & Friday AM Peak Period	Summer vs. Spring & Fall	15% (540) more vehicles in the summer.
Both	Thursday & Friday PM Peak Period	Summer vs. Spring & Fall	18% (660) more vehicles in the summer.
<b><i>I-495 at Route 133, Tewksbury</i></b>			
Northbound	Typical Weekday AM Peak Periods	Summer vs. Spring	6% (400) more vehicles in summer.
Northbound	Typical Weekday AM Peak Periods	Summer vs. Fall	2% (300) more vehicles in the summer.
Northbound	Typical Weekday PM Peak Periods	Summer vs. Spring	Less than 1% more traffic in the summer.
Northbound	Typical Weekday PM Peak Periods	Summer vs. Fall	Less than 1% more traffic in the summer.
Northbound	Weekend Midday Peak Period	Summer vs. Spring & Fall	23% (1,000) more vehicles in the summer.
Northbound	Thurs. & Fri. AM & PM Peak Period	Summer vs. Spring & Fall	Approximately the same.
<b><i>I-495 at Route 4, Chelmsford</i></b>			
Northbound	Typical Weekday AM Peak Periods	Fall vs. Winter, Summer, & Spring	4% (270) or more vehicles in the Fall vs. any other season.
Northbound	Typical Weekday PM Peak Periods	Fall vs. Winter, Summer, & Spring	Between 2 – 14% (100 – 900) more vehicles in the Fall vs. any other season.
Northbound	Weekend Midday Peak Period	Summer vs. Fall, Winter, & Spring	20% (900) or more vehicles in the summer vs. any other season.
Northbound	Thurs. & Fri. AM & PM Peak Period	Summer vs. Winter, Spring, & Fall	Approximately the same.

There is 6 percent more traffic, about 400 more vehicles, in the summer as opposed to in the spring in Tewksbury and 2 percent more traffic, about 300 more vehicles, in the summer as opposed to in the fall during the AM peak period. For the PM peak periods there is a one percent change or less between the summer and spring and the summer and fall. Comparison data for the winter was not available.

The traffic volumes in Chelmsford reveal that the highest levels of weekday peak period traffic volumes occur in the fall as opposed to any other season. For the AM peak period there are at least 270 more vehicles, or 4 percent more traffic, in the fall as opposed to the winter, spring, or summer. In the PM peak period there is a range of 2 –14 percent more traffic, 100 – 900 more vehicles, in the fall as opposed to the winter, spring, or summer on I-495 in Chelmsford.

**Thursday and Friday Only Peak Period Analysis**

For AM and PM peak periods on Thursdays and Friday, it was found that there is more traffic in Amesbury during both peak periods in the summer as opposed to the spring or fall (Table 1). For the AM peak period there is at least 15 percent more volume, or 540 vehicles, in the summer on a Thursday or Friday as opposed to the spring or fall. In the PM peak period, there is at least 660 more vehicles or 18 percent more traffic in the summer. Analysis of the other two locations in Tewksbury and Chelmsford found that volumes during these periods were about the same for the spring, summer, fall, and winter with data unavailable for winter in Tewksbury.

## Weekend Midday Peak Period Analysis

The comparison of weekend traffic, peak period from 10 AM – 2 PM on Saturdays and Sundays, found that there is always more traffic in the summer than any other time of year for all three locations. During a midday peak period on the weekend in Amesbury there is more than 40 percent more traffic, or over 1,200 vehicles, in the summer than in the spring or fall. Note, these 1,200 additional vehicles are spread out over the four-hour period and represent travel in both directions. Consequently, while undeniably higher, when this traffic volume increase is placed in context, is not as dramatic as the isolated volume increase could suggest. In Tewksbury there are more than 1,000 vehicles, or 23 percent more traffic, in the summer than in the spring or fall. Finally, in Chelmsford there is 20 percent or more traffic, or almost 900 vehicles, on I-495 on the weekend in the summer as opposed to the winter, spring, or fall. Please note that winter data was not available for the locations in Amesbury or Tewksbury

## Link Level of Service

As part of the completed existing conditions analysis, Link Level of Service (LOS) was analyzed for a limited number of locations. Among these locations LOS was calculated between Exits 54 and 55 in Amesbury for the AM and PM peak period in the northbound and southbound direction of travel. Existing Link LOS on the northbound direction during the AM peak period is LOS A, while it is LOS B during the AM peak period on Fridays in July. The existing PM Link LOS is LOS B in the northbound direction and stays the same on Fridays in July. In the southbound direction, the existing AM Link LOS is LOS B and stays the same for Fridays in July. The PM Link LOS is LOS B in the southbound direction and stays the same in the PM peak on Fridays in July. Finally, Link LOS is LOS C in the northbound direction on the Saturday peak hour in July and LOS B for the southbound direction of travel (Table 1).

From the existing I-495 traffic count data it was found that traffic volumes increase by about 25 percent on a Friday in the summer during the AM and PM peak periods. Applying this 25 percent increase to Link LOS between Exits 36-37 (Chelmsford/Lowell) in the northbound direction and between Exits 34-35 (Chelmsford) in the southbound direction degrades the Link LOS from a LOS D (all locations, directions, and times) to a LOS F, except where it is a LOS E in the AM southbound direction between exits 34-35.

The link analysis shows degradation in LOS to failing (LOS F) or near failing (LOS E) conditions only on the roadway in Chelmsford and Lowell and not in Amesbury, where LOS stays the same or becomes slightly worse but is never worse than a LOS C.

## Conclusions

In conclusion, it was found that there is more traffic volume in the summer than any other time of year on I-495 in Amesbury for typical weekday peak periods, Thursday and Friday peak periods, and during the midday peak period on Saturdays and Sundays. It was also found that there is more traffic in the summer during the weekend midday peak periods for all locations evaluated on I-495 versus any other time of year. It was found that Link LOS degrades on I-495 on Friday peak periods during the summer in Lowell and Chelmsford to a failing or near failing condition. LOS either stays the same or degrades in Amesbury but not below a LOS C.

Based on these seasonally influenced levels of I-495 mainline traffic volumes, the potential exists that some operations at the intersection of I-495 ramps with local street may have peak hour LOS in the summer that is lower than that experienced during the majority of the year.

**Table 2 - Summary of Seasonal Variation Analysis**

<b>Direction of Travel</b>	<b>Time Period</b>	<b>Season</b>	<b>Conclusion</b>
<b><i>Between Exits 54 and 55, Amesbury</i></b>			
Northbound	Link LOS AM Friday Peak Hour	Summer vs. Existing Conditions	LOS B vs. LOS A
Southbound	Link LOS AM Friday Peak Hour	Summer vs. Existing Conditions	LOS B vs. LOS B
Northbound	Link LOS PM Friday Peak Hour	Summer vs. Existing Conditions	LOS B vs. LOS B
Southbound	Link LOS PM Friday Peak Hour	Summer vs. Existing Conditions	LOS B vs. LOS B
Northbound	Link LOS Sat. Midday Peak Hour	July	LOS C
Southbound	Link LOS Sat. Midday Peak Hour	July	LOS B
<b><i>Between Exits 36 – 37, Chelmsford/Lowell</i></b>			
Southbound	(Projected) Link LOS AM Fri. Peak Hour	Summer vs. Existing Conditions	LOS E vs. LOS D
Southbound	(Projected) Link LOS PM Fri. Peak Hour	Summer vs. Existing Conditions	LOS F vs. LOS D
<b><i>Between Exits 34 – 35, Chelmsford</i></b>			
Northbound	(Projected) Link LOS AM Fri. Peak Hour	Summer vs. Existing Conditions	LOS F vs. LOS D
Northbound	(Projected) Link LOS PM Fri. Peak Hour	Summer vs. Existing Conditions	LOS F vs. LOS D



## **PERCENTAGES OF TRUCKS ON I-495**



## **Truck Percentages**

Counts of truck volumes on I-495 at several key locations along the study corridor were undertaken by regional planning agency staff members during 2007. These counts were directional (northbound and southbound) in nature and were taken during the AM and PM peak periods. The resulting volumes were then compared with total peak period traffic volumes at these same locations to determine the percentage of traffic during these peak periods that is comprised of trucks.

Four locations were selected at which to take the counts, which were taken by individuals stationed on overpasses looking down at the traffic below on I-495. Specifically, the count locations were at Hunt Road (Link 32-33) in Chelmsford, Trull Road (Link 38-39) in Tewksbury, Chandler Street (Link 40-41) in Andover, and Locust Street (over Link 52-53 in Merrimac).

The truck count data and the percentage that the counted trucks are of total traffic at the specific locations where the counts occurred are summarized immediately below.

**Numbers and Percentages of Trucks in I-495 Study Area**

	AM		PM	
	NB	SB	NB	SB
Hunt Road (Link 32-33)	10%	10%	6%	5%
Trull Road (Link 38-39)	9%	8%	5%	6%
Chandler Road (Link 40-41)	10%	6%	4%	6%
Locust Street (Link 52-53)	14%	8%	4%	8%
Average (West of I-93)	9.5%	9.0%	5.5%	5.5%
Average (East of I-93)	12.0%	7.0%	4.0%	7.0%

As can be seen from the above, the number of trucks counted during the AM peak hour, with one exception, always exceeded the number of trucks counted during the PM peak hour, in both directions at all four count locations. The one exception was at the Locust Street overpass in Merrimac in the southbound direction. The greatest number of trucks counted was at Hunt Road in Chelmsford on the far western end of the study area, where over 500 trucks in each direction were counted during the AM peak hour. The data above shows that, in general, the number of trucks counted decreased from west to east during in both directions during both the AM and PM peak hours.

Specifically regarding truck percentages, the percentage of trucks on the road was consistently greater during the AM peak hour than the PM peak hour. During the AM peak hour, truck percentages were greater in the northbound direction than in the

southbound direction. The opposite was generally found to be true during the PM peak hour. The highest percentage of trucks occurred during the AM peak hour in the northbound direction at Locust Street in Merrimac, where approximately 14 percent of all vehicles on I-495 headed in that direction were found to be trucks. It must be noted, however, that this percentage is somewhat deceiving as this same location was also that found to have the lowest actual truck count in the northbound direction in the AM peak hour. The high percentage results from the relatively low number of non-truck vehicles traveling on this section of roadway at that time.

The MassHighway website was consulted regarding truck percentages on similar-type highways elsewhere in the Commonwealth. While peak period data is presented, no distinction is made as to whether the peak period given in the data is AM or PM. Nevertheless, a few sample data points from locations throughout the state are presented in the Table below.

**Peak Period Truck Percentages at Selected Locations on Major State Highways**

	<b>Year</b>	<b>Percent Trucks</b>
I -91 Bernardston	2006	10%
Rte. 3 Billerica	2006	2%
I -95 Canton	2006	2%
Rte. 3 Chelmsford	2006	3%
I -195 Fall River	2005	3%
Rte. 2 Fitchburg	2006	7%
I-95 Peabody	2006	3%
I-93 Quincy	2006	3%
I-95 Salisbury	2006	4%
I-84 Sturbridge	2006	18%
I-93 Woburn	2003	2%

As can be seen from the above data, in general the peak period truck percentages at these locations are less than those recently observed on I-495 in the study area. The key exception to this statement is on I-84 in Sturbridge at the Connecticut state line where 18 percent of the peak period traffic in 2006 was found to be trucks. This particular location consistently produced truck percentages in the 15 to 20 percent range over a multi-year period covered by MassHighway’s data collection efforts.

The section of I-495 comprising this study’s area of interest plays an important role in providing a path for regional and interstate movement of goods. This role is reflected in the above average truck percentages found along this section of highway.

**TABLES B-1 THROUGH B-8**



**Table B-1  
2006 Manual Turning Movement Count Locations**

<b>Exit #</b>	<b>Locations</b>	<b>Municipality</b>
31	Route 119 and Exit 31 NB ramps	Littleton
	Route 119 and King Street	Littleton
32	Boston Road at Exit 32 NB ramps	Westford
32	Boston Road at Exit 32 SB ramps	Westford
	Boston Road at Route 110	Westford
	Route 110 and Route 225	Westford
33	Route 4 and Exit 33 NB off-ramp	Chelmsford
33	Route 4 and Exit 33 SB on-ramp	Chelmsford
34	Route 110 and Exit 34 NB on-ramp	Chelmsford
34	Route 110 and Exit 34 NB off-ramp	Chelmsford
34	Route 110 and Exit 34 SB on-ramp	Chelmsford
34	Route 110 and Exit 34 SB off-ramp	Chelmsford
37	Christman Avenue and Exit 37 NB on-ramp	Lowell
37	Woburn Street, Christman Avenue, and Exit 37 NB off-ramp	Lowell
37	Woburn Street and Exit 37 SB ramps	Lowell
39	Route 133 and Exit 39 NB off-ramp	Tewksbury
39	Route 133 and Exit 39 NB on-ramp	Tewksbury
39	Route 133, International Place, and Exit 39 SB off-ramp	Tewksbury
39	Route 133, International Place, and Exit 39 SB on-ramp	Tewksbury
41	495 NB Off-Ramp to Route 28 (N. Main St.) SB @ Route 28 NB and SB to 495 NB	Andover
41	495 NB Off-Ramp @ Route 28 (Union St) NB	Andover
41	Route 28 (Union St) NB @ 495 SB On-Ramp	Andover
41	Route 28 (N. Main St.) SB @ 495 SB On-Ramp	Andover
41	495 SB Off-Ramp to Route 28 (N. Main St.) SB	Andover
42	495 NB Off-Ramp to Route 114 EB @ Route 114 EB and WB On-Ramp to 495 NB	Lawrence
42	495 NB Off-Ramp to Route 114 WB	Lawrence
42	495 SB Off-Ramp to Route 114 WB @ Route 114 EB and WB On-Ramp to 495 SB	Lawrence
42	495 SB Off-Ramp to Route 114 EB	Lawrence
43	Mass Ave and Exit 43 NB ramps	North Andover
43	Loring Street and Exit 43 SB ramps	North Andover
44	Sutton Street and Exit 44 NB ramps	North Andover
44	Merrimack Street and Exit 44 SB ramps	North Andover
46	Route 110 and Exit 46 NB on-ramp	Methuen
46	Route 110 and Exit 46 NB off-ramp	Methuen
48	Industrial Way EB to 495 SB On-Ramp	Haverhill
48	495 SB Off-Ramp @ Route 125 Connector/Industrial Way EB and WB	Haverhill
49	495 NB Off-Ramp to Route 113 EB and WB @ Route 113 EB and WB On-Ramp to 495 NB	Haverhill
49	495 SB Off-Ramp to Route 113 EB and WB	Haverhill
49	Route 113 EB and WB On-Ramp to 495 SB	Haverhill
50	495 NB Off-Ramp to Route 97 EB and WB	Haverhill
50	Route 97 EB and WB On-Ramp to 495 NB	Haverhill
50	495 SB Off-Ramp to Route 97 EB and WB	Haverhill
50	Route 97 EB and WB On-Ramp to 495 SB	Haverhill
51	495 NB Off-Ramp to Route 125 EB @ Route 125 WB On-Ramp to 495 N	Haverhill
51	Route 125 EB On-Ramp to 495 NB @ 495 NB Off-Ramp to Route 125 WB	Haverhill
51	Route 125 WB On-Ramp to 495 SB @ 495 SB Off-Ramp to Route 125 EB	Haverhill
51	495 SB Off-Ramp to Route 125 WB @ Route 125 EB On-Ramp to 495 SB	Haverhill

**Table B-1**  
**2006 Manual Turning Movement Count Locations (cont.)**

<b>Exit #</b>	<b>Locations</b>	<b>Municipality</b>
52	495 NB Off-Ramp @ Route 110 EB and WB	Haverhill
52	Route 110 EB and WB @ 495 NB On-Ramp	Haverhill
52	495 SB Off-Ramp @ Route 110 EB and WB	Haverhill
52	Route 110 EB and WB @ 495 SB On-Ramp	Haverhill
53	495 SB Off-Ramp to Broad St EB and WB @ Broad St EB and WB On-Ramp to 495 SB	Merrimac
53	495 NB Off-Ramp to Broad St EB and WB @ Broad St EB and WB On-Ramp to 495 NB	Merrimac
54	495 NB Off-Ramp @ Route 150 NB and SB	Amesbury
54	Route 150 NB and SB @ 495 NB On-Ramp	Amesbury
54	495 SB Off-Ramp to Route 150 NB and SB @ Route 150 NB and SB On-Ramp to 495 SB	Amesbury
55	495 NB Off-Ramp to Route 110 EB	Amesbury
55	Route 110 WB On-Ramp to 495 SB	Amesbury



**Table B-2  
Existing 2006 AM and PM Peak Hour Levels of Service for Unsignalized Intersections  
Western Segment**

Exit <sup>1</sup>	Approach	Dir. <sup>2</sup>	Mvmt. <sup>3</sup>	AM			PM		
				Delay (s) <sup>4</sup>	LOS	Queue (ft) <sup>5</sup>	Delay (s) <sup>4</sup>	LOS	Queue (ft) <sup>5</sup>
33 NB	Exit ramp	NB	L	50	F	140	54	F	111
	Exit ramp	NB	R	24	C	109	14	B	51
33 SB	Route 4	WB	L	1	A	5	1	A	3
34 NB	Exit ramp	NB	L	20	C	40	88	F	28
	Exit ramp	NB	R	11	B	13	27	D	77
34 SB	Route 110	WB	L	2	A	2	4	A	14
	Exit ramp	SB	L	16	C	9	526	F	269
34 SB	Exit ramp	SB	R	11	B	23	27	C	129
	Route 110	EB	L	1	A	6	7	A	37
37 NB	Exit ramp	NB	L/T	68	F	111	234	F	242
	Exit ramp	NB	R	28	D	145	12	B	34
	Woburn St.	EB	L	15	C	34	18	C	31
	Christman Ave.	SB	L	2	A	7	3	A	10
37 SB	Exit ramp	SB	L	622	F	707	576	F	403
	Exit ramp	SB	R	10	B	17	12	B	26
	Woburn St.	WB	L	6	A	19	6	A	32

<sup>1</sup> Please see Figures 2-1 and 2-2.

<sup>2</sup> Approach direction.

<sup>3</sup> Turning movement.

<sup>4</sup> Average Delay in seconds per vehicle.

<sup>5</sup> Total length of queue in feet.

\*Incalculable.



**Table B-3  
Existing 2006 AM and PM Peak Hour Levels of Service for Unsignalized Intersections  
Eastern Segment**

Exit <sup>1</sup>	Approach	Dir. <sup>2</sup>	Mvmt. <sup>3</sup>	AM			PM		
				Delay (s) <sup>4</sup>	LOS	Queue (ft) <sup>5</sup>	Delay (s) <sup>4</sup>	LOS	Queue (ft) <sup>5</sup>
41 SB	Route 28	NB	R	13	B	26	17	C	49
	Route 28	NB	L	17	C	37	43	E	114
43 NB	Exit ramp	NB	L	159	F	141	83	F	46
	Exit ramp	NB	R	22	C	118	17	C	71
43 SB	Mass. Ave.	EB	L	3	A	10	5	A	19
	Exit ramp	SB	L/R	*	F	*	732	F	867
	Loring St.	WB	L	7	A	38	7	A	28
44 <sup>6</sup> SB	Exit ramp	SB	L	29	D	143	50	E	212
	Exit ramp	SB	R	11	B	34	10	B	14
48 SB	Industrial Way	EB	L	10	B	2	9	A	1
	Exit ramp	NB	L	12	B	3	12	B	1
49 NB	Exit ramp	NB	L	25	D	19	43	E	71
	Exit ramp	NB	R	17	C	98	138	F	672
	Route 113	EB	L	10	B	7	11	B	14
49 SB	Exit ramp	SB	L	30	D	58	61	F	132
	Exit ramp	SB		13	B	12	14	B	14
	Route 113	EB	L	2	A	4	1	A	3
50 <sup>6</sup> SB	Exit ramp	SB	L	93	F	73	126	F	157
	Exit ramp	SB	R	15	B	37	24	C	120
	Route 97	EB	L	9	A	24	10	A	11
52 NB	Exit ramp	NB	L	23	C	48	39	E	106
	Exit ramp	NB	R	11	B	14	21	C	118
	Route 110	WB	L	1	A	3	1	A	2
52 SB	Exit ramp	SB	L	20	C	13	27	D	23
	Exit ramp	SB	R	13	B	33	13	B	36
	Route 110	EB	L	3	A	6	2	A	5
53 NB	Exit ramp	NB	L	9	A	11	11	B	26
	Exit ramp	NB	R	9	A	4	9	A	4
53 SB	Exit ramp	SB	L/R	10	B	8	12	B	27
	Broad St.	WB	L	2	A	2	1	A	2
54 NB	Hunt Rd. S.	NB	L/R	11	B	4	12	B	8
	Route 150	WB	L	1	A	0	0	A	0
54 NB	Exit ramp	SB	L	12	B	5	12	B	5
	Exit ramp	SB	R	10	A	19	10	B	31
	Route 150	EB	L	6	A	7	6	A	7
54 SB	Exit ramp	SB	L	15	C	8	15	C	6
	Exit ramp	SB	R	10	A	4	11	B	11
	Route 150	WB	L	2	A	3	1	A	3

<sup>1</sup> Please see Figures 2-1 and 2-2.

<sup>4</sup> Average Delay in seconds per vehicle.

\*Incalculable.

<sup>2</sup> Approach direction.

<sup>5</sup> Total length of queue in feet.

<sup>3</sup> Turning movement.

<sup>6</sup> Intersection was signalized after the data was collected for existing condition in 2006. It is analyzed as a signalized intersection in the future 2030 case.



**Table B-4**  
**Existing 2006 AM and PM Peak Hour Levels of Service for Signalized Locations –**  
**Western Segment**

Exit <sup>1</sup>	Approach	Dir. <sup>2</sup>	Mvmt. <sup>3</sup>	AM			PM		
				Delay (s) <sup>4</sup>	LOS	Queue (ft) <sup>5</sup>	Delay (s) <sup>4</sup>	LOS	Queue (ft) <sup>5</sup>
32 NB	3Exit ramp	NB	L	17	B	22	20	B	75
	Exit ramp	NB	R	24	C	134	18	B	2
	Exit ramp	NB	ALL	22	C		19	B	-
	Boston Rd.	EB	L	7	A		3	A	
	Boston Rd.	EB	T	7	A	290	3	A	59
	Boston Rd.	EB	ALL	7	A		3	A	-
	Boston Rd.	WB	T	4	A	41	6	A	158
	Boston Rd.	WB	R	4	A		6	A	
	Boston Rd.	WB	ALL	4	A		6	A	-
	<b>INTERSECTION</b>				<b>9</b>	<b>A</b>		<b>7</b>	<b>A</b>
32 SB	Exit ramp	SB	L	17	B	129	19	B	84
	Exit ramp	SB	R	13	B	16	18	B	45
	Exit ramp	SB	ALL	17	B		19	B	-
	Boston Rd.	EB	T	16	B	502 <sup>6</sup>	5	A	105
	Boston Rd.	WB	T	6	A	63	6	A	225
	<b>INTERSECTION</b>				<b>15</b>	<b>B</b>		<b>10</b>	<b>A</b>
38 NB	Exit ramp	SB	L	26	C	109	65	E	220 <sup>6</sup>
	Exit ramp	SB	T	28	C	72	47	D	104
	Exit ramp	SB	R	27	C	62	55	E	182
	Exit ramp	SB	ALL	27	C	-	59	E	-
	Route 38	EB	L	18	B	121 <sup>67</sup>	52	D	316 <sup>6</sup>
	Route 38	EB	T	7	A	91	21	C	261
	Route 38	EB	R	4	A	9 <sup>7</sup>	18	B	50
	Route 38	EB	ALL	9	A	-	28	C	-
	Route 38	WB	L	48	D	65	53	D	127
	Route 38	WB	T	22	C	149	32	C	498 <sup>6</sup>
	Route 38	WB	R	19	B	38	24	C	65
	Route 38	WB	ALL	24	C	-	33	C	-
	Home Depot driveway	NB	L	29	C	106 <sup>6</sup>	65	E	222 <sup>6</sup>
	Home Depot driveway	NB	T	30	C	44	45	D	78
	Home Depot driveway	NB	R	29	C	24	43	D	38
	Home Depot driveway	NB	ALL	29	C	-	54	D	-
	<b>INTERSECTION</b>				<b>24</b>	<b>C</b>	<b>-</b>	<b>40</b>	<b>D</b>

<sup>1</sup> Please see Figures 2-1 and 2-2.

<sup>2</sup> Approach direction.

<sup>3</sup> Turning movement.

<sup>4</sup> Average Delay in seconds per vehicle.

<sup>5</sup> Total length of queue in feet.

<sup>6</sup> 95<sup>th</sup> percentile volume exceeds capacity, queue may be longer.

<sup>7</sup> Volume for 95<sup>th</sup> percentile queue is metered by upstream signal.

**Table B-4  
Existing 2006 AM and PM Peak Hour Levels of Service for Signalized Locations –  
Western Segment (continued)**

Exit <sup>1</sup>	Approach	Dir. <sup>2</sup>	Mvmt. <sup>3</sup>	AM			PM			
				Delay (s) <sup>4</sup>	LOS	Queue (ft) <sup>5</sup>	Delay (s) <sup>4</sup>	LOS	Queue (ft) <sup>5</sup>	
38	SB	Exit ramp	SB	L	29	C	130	29	C	165
		Exit ramp	SB	L/R	29	C	126	34	C	181
		Exit ramp	SB	R	25	C	55	28	C	149
		Exit ramp	SB	ALL	27	C	-	31	C	-
		Route 38	EB	ALL	20	C	248 <sup>6</sup>	36	D	364 <sup>6</sup>
		Route 38	WB	L	8	A	90 <sup>6</sup>	35	C	423 <sup>6</sup>
		Route 38	WB	T	3	A	56	7	A	183
		Route 38	WB	ALL	5	A	-	16	B	-
<b>INTERSECTION</b>				<b>16</b>	<b>B</b>	<b>-</b>	<b>26</b>	<b>C</b>	<b>-</b>	
39	NB	Exit ramp	NB	L	50	D	341	51	D	140
		Exit ramp	NB	R	47	D	331	48	D	75
		Exit ramp	NB	ALL	48	D	-	48	D	-
		Route 133	EB	T/R	4	A	117	1	A	71
		Route 133	WB	L	56	E	61	54	D	92
		Route 133	WB	T	10	B	419	4	A	278
		Route 133	WB	ALL	12	B	-	8	A	-
<b>INTERSECTION</b>				<b>24</b>	<b>C</b>	<b>-</b>	<b>14</b>	<b>B</b>	<b>-</b>	
39	SB	Exit ramp	SB	L	48	D	81	84	F	104 <sup>6</sup>
		Exit ramp	SB	T	79	E	293 <sup>6</sup>	47	D	70
		Exit ramp	SB	R	47	D	87	48	D	90
		Exit ramp	SB	ALL	59	E	-	51	D	-
		Route 133	EB	L	9	A	19	24	C	144 <sup>6</sup>
		Route 133	EB	T/R	16	B	415	13	B	331
		Route 133	EB	ALL	15	B	-	15	B	-
		Route 133	WB	L	20	C	332 <sup>6</sup>	5	A	8 <sup>7</sup>
		Route 133	WB	T/R	3	A	76	9	A	375
		Route 133	WB	ALL	10	B	-	9	A	-
		International Pl.	NB	L	46	D	10	46	D	15
		International Pl.	NB	T	47	D	61	236	F	449 <sup>6</sup>
		International Pl.	NB	R	46	D	41	47	D	54
<b>INTERSECTION</b>				<b>25</b>	<b>C</b>	<b>-</b>	<b>48</b>	<b>D</b>	<b>-</b>	

<sup>1</sup> Please see Figures 2-1 and 2-2.

<sup>2</sup> Approach direction.

<sup>3</sup> Turning movement.

<sup>4</sup> Average Delay in seconds per vehicle.

<sup>5</sup> Total length of queue in feet.

<sup>6</sup> 95<sup>th</sup> percentile volume exceeds capacity, queue may be longer.

<sup>7</sup> Volume for 95<sup>th</sup> percentile queue is metered by upstream signal.

**Table B-5**  
**Existing 2006 AM and PM Peak Hour Levels of Service for Signalized Locations –**  
**Eastern Segment**

Exit <sup>1</sup>	Approach	Dir. <sup>2</sup>	Mvmt. <sup>3</sup>	AM			PM		
				Delay (s) <sup>4</sup>	LOS	Queue (ft) <sup>5</sup>	Delay (s) <sup>4</sup>	LOS	Queue (ft) <sup>5</sup>
42 NB	Exit ramp	SB	R	1	A	0	1	A	0
	Route 114	EB	L	17	B	50	17	B	99
	Route 114	EB	T	0	A	0	0	A	0
	Route 114	EB	ALL	2	A	-	4	A	-
	Route 114	WB	T	5	A	99	7	A	157
	Route 114	WB	R	5	A	24	7	A	96
	Route 114	WB	ALL	5	A	-	7	A	-
	Exit ramp	NB	R	0	A	0	1	A	0
<b>INTERSECTION</b>				<b>3</b>	<b>A</b>	<b>-</b>	<b>5</b>	<b>A</b>	<b>-</b>
42 SB	Route 114	EB	T	7	A	52	11	B	115
	Route 114	WB	L	22	C	191	32	C	393 <sup>6</sup>
	Route 114	WB	T	0	A	0	0	A	0
	Route 114	WB	ALL	10	B	-	18	B	-
	<b>INTERSECTION</b>				<b>7</b>	<b>A</b>	<b>-</b>	<b>13</b>	<b>B</b>
46 NB	Route 110	EB	T/R	25	C	100	25	C	240 <sup>7</sup>
	Route 110	WB	L	9	A	56	7	A	47
	Route 110	WB	T	0	A	0	0	A	0
	Route 110	WB	ALL	1	A	-	1	A	-
	<b>INTERSECTION</b>				<b>10</b>	<b>A</b>	<b>-</b>	<b>14</b>	<b>B</b>
46 NB	Route 110	EB	T/R	2	A	11	1	A	6
	Route 110	WB	L	22	C	34 <sup>7</sup>	20	C	70
	Route 110	WB	T	6	A	184	3	A	75
	Route 110	WB	ALL	29	C	-	5	A	-
	Calumet Rd.	NB	L/R	6	A	116	31	C	75
<b>INTERSECTION</b>				<b>8</b>	<b>A</b>	<b>-</b>	<b>6</b>	<b>A</b>	<b>-</b>
46 NB	Exit ramp	SB	L/T	33	C	99	58	E	347 <sup>6</sup>
	Exit ramp	SB	R	0	A	0	0	A	0
	Exit ramp	SB	ALL	15	B	-	34	C	-
	Route 110	EB	T/R	0	A	0	4	A	44
	Route 110	WB	L	3	A	10	7	A	14
	Route 110	WB	T	4	A	137	7	A	67
	Route 110	WB	ALL	4	A	-	7	A	-
	Gas station driveway	NB	L/R	30	C	53			42
<b>INTERSECTION</b>				<b>6</b>	<b>A</b>	<b>-</b>	<b>17</b>	<b>B</b>	<b>-</b>

<sup>1</sup> Please see Figures 2-1 and 2-2.

<sup>2</sup> Approach direction.

<sup>3</sup> Turning movement.

<sup>4</sup> Average Delay in seconds per vehicle.

<sup>5</sup> Total length of queue in feet.

<sup>6</sup> 95<sup>th</sup> percentile volume exceeds capacity, queue may be longer.

<sup>7</sup> Volume for 95<sup>th</sup> percentile queue is metered by upstream signal.

**Table B-5  
Existing 2006 AM and PM Peak Hour Levels of Service for Signalized Locations –  
Eastern Segment (continued)**

Exit <sup>1</sup>	Approach	Dir. <sup>2</sup>	Mvmt. <sup>3</sup>	AM			PM		
				Delay (s) <sup>4</sup>	LOS	Queue (ft) <sup>5</sup>	Delay (s) <sup>4</sup>	LOS	Queue (ft) <sup>5</sup>
46 SB	Exit ramp	SB	L	29	C	69	24	C	87
	Exit ramp	SB	T	32	C	114	25	C	87
	Exit ramp	SB	R	7	A	31	7	A	26
	Exit ramp	SB	ALL	20	C	-	16	B	-
	Route 110	EB	T/R	20	C	176	23	C	147
	Route 110	EB	R	21	C	174	24	C	140
	Route 110	EB	ALL	20	C	-	23	C	-
	Route 110	WB	L	23	C	124	19	B	53
	Route 110	WB	L/T	28	C	165	24	C	120
	Route 110	WB	ALL	26	C	-	23	C	-
	Merrimack St.	NB	L	29	C	39	29	C	98
	Merrimack St.	NB	T/R	32	C	94	42	D	156
	Merrimack St.	NB	ALL	32	C	-	42	D	-
<b>INTERSECTION</b>				<b>24</b>	<b>C</b>		<b>27</b>	<b>C</b>	
50 NB	Monument St.	SB	L/T	11	B	43	11	B	46
	Monument St.	SB	R	11	B	46	11	B	34
	Monument St.	SB	ALL	11	B	-	11	B	-
	Route 97	EB	L	4	A	15	7	A	32
	Route 97	EB	T/R	7	A	67	12	B	155
	Route 97	EB	ALL	7	A	-	11	B	-
	Route 97	WB	L	20	B	21	25	C	46
	Route 97	WB	T/R	8	A	77	12	B	143
	Route 97	WB	ALL	8	A	-	13	B	-
	Exit ramp	NB	L	11	B	46	15	B	189
	Exit ramp	NB	L/T	11	B	60	14	B	245
	Exit ramp	NB	R	10	B	29	11	B	41
	Exit ramp	NB	ALL	11	B	-	13	B	-
<b>INTERSECTION</b>				<b>9</b>	<b>A</b>	<b>-</b>	<b>13</b>	<b>B</b>	

<sup>1</sup> Please see Figures 2-1 and 2-2.

<sup>2</sup> Approach direction.

<sup>3</sup> Turning movement.

<sup>4</sup> Average Delay in seconds per vehicle.

<sup>5</sup> Total length of queue in feet.

<sup>6</sup> 95<sup>th</sup> percentile volume exceeds capacity, queue may be longer.

<sup>7</sup> Volume for 95<sup>th</sup> percentile queue is metered by upstream signal.



**Table B-6**  
**I-495 AM and PM Level of Service for Merge/Diverge/Weave Locations –**  
**Western Segment**

Interchange	AM		PM	
	Density (pc/mi/ln) <sup>1</sup>	LOS	Density (pc/mi/ln) <sup>1</sup>	LOS
<b>Exit 32: I-495 at Boston Rd.</b>				
I-495 NB off-ramp to Boston Rd.	20	B	18	B
I-495 NB on-ramp to Boston Rd.	30	D	28	C
I-495 SB off-ramp to Boston Rd.	30	D	29	D
I-495 SB on-ramp to Boston Rd.	30	C	26	C
<b>Exit 33: I-495 at Route 4</b>				
I-495 NB off-ramp to Route 4	25	C	23	C
I-495 SB on-ramp to Route 4	30	D	28	D
<b>Exit 34: I-495 at Route 110</b>				
I-495 NB off-ramp to Route 110	28	C	26	C
I-495 SB off-ramp to Route 110	46	F	49	F
I-495 SB on-ramp to Route 110	25	C	32	D
<b>Exit 34-35: I-495 at Route 110-Route 3</b>				
I-495 NB weave to Route 110-Route 3	42	E	46	F
<b>Exit 35: I-495 at 495 NB C-D</b>				
I-495 NB C-D off-ramp to Route 3 SB	16	B	18	B
I-495 NB C-D weave to Route 3	57	F	66	F
I-495 SB C-D off-ramp to Route 3 NB	10	A	10	A
I-495 SB C-D weave to Route 3	35	D	38	E
I-495 SB C-D on-ramp to Route 3 SB	12	B	14	B
I-495 SB on-ramp to 495 SB C-D	33	D	34	D
<b>Exit 36: I-495 at Lowell Connector SB</b>				
I-495 NB C-D on-ramp to Lowell Connector SB	14	B	13	B
I-495 NB C-D on-ramp to Lowell Connector NB	19	B	20	C
I-495 NB on-ramp to 495 NB C-D	7	A	5	A
I-495 SB off-ramp to 495 SB C-D	30	D	30	D
I-495 SB C-D off-ramp to Lowell Connector NB	18	B	17	B
<b>Exit 37: I-495 at Woburn St.</b>				
I-495 NB off-ramp to Woburn St.	47	F	45	F
I-495 NB on-ramp to Woburn St.	29	D	30	D
I-495 SB off-ramp to Woburn St.	26	C	25	C
I-495 SB on-ramp to Woburn St.	32	D	33	D

<sup>1</sup>Density is expressed as passenger car per mile per lane.

**Table B-6  
I-495 AM and PM Level of Service for Merge/Diverge/Weave Locations –  
Western Segment (continued)**

Interchange	AM		PM	
	Density (pc/mi/ln) <sup>1</sup>	LOS	Density (pc/mi/ln) <sup>1</sup>	LOS
<b>Exit 38: I-495 at Route 38</b>				
I-495 NB off-ramp to Route 38	30	D	30	D
I-495 NB on-ramp to Route 38	27	C	27	C
I-495 SB off-ramp to Route 38	24	C	24	C
I-495 SB on-ramp to Route 38	32	D	31	D
<b>Exit 39: I-495 at Route 133</b>				
I-495 NB off-ramp to Route 133	30	D	29	D
I-495 NB on-ramp to Route 133	24	C	28	D
I-495 SB off-ramp to Route 133	31	D	27	C
I-495 SB on-ramp to Route 133	28	D	29	D
<b>Exit 40: I-495 at I-93 SB</b>				
I-495 NB off-ramp to I-93 SB	28	C	30	D
I-495 NB weave to I-93	27	C	34	D
I-495 NB on-ramp to I-93 NB	22	C	30	D
I-495 SB off-ramp to I-93 NB	27	C	21	C
I-495 SB weave to I-93	46	F	37	E
I-495 SB on-ramp to I-93 SB	31	D	27	C

<sup>1</sup>Density is expressed as passenger car per mile per lane.

**Table B-7**  
**I-495 AM and PM Level of Service for Merge/Diverge/Weave Locations –**  
**Eastern Segment**

Interchange	AM		PM	
	Density (pc/mi/ln) <sup>1</sup>	LOS	Density (pc/mi/ln) <sup>1</sup>	LOS
<b>Exit 41: I-495 at Route 28 SB</b>				
I-495 NB off-ramp to Route 28 SB	22	C	27	C
I-495 NB off-ramp to Route 28 NB	17	B	25	C
I-495 SB off-ramp to Route 28	35	D	28	D
I-495 SB on-ramp to Route 28	26	C	21	C
<b>Exit 41-42: I-495 at Route 28-Route 114</b>				
I-495 NB weave to Route 28-Route 114	14	B	29	D
<b>Exit 42: I-495 at Route 114 EB</b>				
I-495 NB off-ramp to Route 114 WB	19	B	26	C
I-495 NB on-ramp to Route 114	18	B	30	D
I-495 SB off-ramp to Route 114 EB	26	C	15	B
I-495 SB on-ramp to Route 114	31	D	20	B
<b>Exit 43-42: I-495 at Loring St.-Route 114 WB</b>				
I-495 SB weave to Loring St.-Route 114 WB	29	D	15	B
<b>Exit 43: I-495 at Mass. Ave.</b>				
I-495 NB off-ramp to Mass. Ave.	21	C	49	F
I-495 NB C-D on-ramp to Mass. Ave.	3	A	9	A
I-495 SB C-D off-ramp to Loring St.	3	A	6	A
I-495 SB on-ramp to 495 SB C-D	24	C	15	B
<b>Exit 44: I-495 at 495 NB C-D</b>				
I-495 NB C-D off-ramp to 495 NB C-D	18	B	29	D
I-495 SB off-ramp to 495 SB C-D	32	D	21	C
<b>Exit 44-45: I-495 at Sutton St.-Marston St.</b>				
I-495 NB C-D weave to Sutton St.-Marston St.	10	A	35	D
I-495 SB C-D weave to Marston St.-Merrimack St.	21	B	18	B
<b>Exit 45: I-495 at Marston St.</b>				
I-495 NB C-D on-ramp to Marston St.	7	A	11	B
I-495 NB on-ramp to 495 NB C-D	17	B	31	D
I-495 SB off-ramp to Marston St.	36	E	21	C

<sup>1</sup>Density is expressed as passenger car per mile per lane.

**Table B-7**  
**I-495 AM and PM Level of Service for Merge/Diverge/Weave Locations –**  
**Eastern Segment (continued)**

Interchange	AM		PM	
	Density (pc/mi/ln) <sup>1</sup>	LOS	Density (pc/mi/ln) <sup>1</sup>	LOS
<b>Exit 46: I-495 at Route 110</b>				
I-495 NB weave to Route 110	18	B	41	F
I-495 SB off-ramp to Route 110	38	F	25	C
I-495 SB on-ramp to Route 110	31	D	19	B
<b>Exit 47: I-495 at Route 213</b>				
I-495 NB off-ramp to Route 213	20	B	31	D
I-495 NB on-ramp to Route 213	21	C	34	D
I-495 SB off-ramp to Route 213	30	D	22	C
I-495 SB on-ramp to Route 213	28	D	18	B
<b>Exit 48: I-495 at Route 125 Connector SB</b>				
I-495 NB off-ramp to Route 125 Connector SB	20	B	29	D
I-495 NB on-ramp to Route 125 Connector NB	17	B	34	D
I-495 SB weave to Route 125 Connector	43	F	27	C
<b>Exit 49: I-495 at Route 113</b>				
I-495 NB off-ramp to Route 113	21	C	34	D
I-495 NB off-ramp to 495 NB C-D	20	B	32	D
I-495 SB C-D off-ramp to Route 113	11	B	7	A
I-495 SB C-D on-ramp to Route 113	16	B	11	B
I-495 SB on-ramp to 495 SB C-D	31	D	19	B
<b>Exit 49-50: I-495 at Route 113-Route 97</b>				
I-495 NB C-D weave to Route 113-Route 97	8	A	25	C
<b>Exit 50: I-495 at Route 97</b>				
I-495 NB C-D on-ramp to Route 97				
I-495 NB on-ramp to 495 NB C-D	8	A	23	C
I-495 SB off-ramp to 495 SB C-D	26	C	19	B
I-495 SB C-D off-ramp to Route 97	17	A	8	B
I-495 SB C-D on-ramp to Route 97	10	A	6	A

<sup>1</sup>Density is expressed as passenger car per mile per lane.

**Table B-7**  
**I-495 AM and PM Level of Service for Merge/Diverge/Weave Locations –**  
**Eastern Segment (continued)**

Interchange	AM		PM	
	Density (pc/mi/ln) <sup>1</sup>	LOS	Density (pc/mi/ln) <sup>1</sup>	LOS
<b>Exit 51: I-495 at Route 125 SB</b>				
I-495 NB off-ramp to Route 125 SB	13	B	23	C
I-495 NB on-ramp to Route 125 SB	13	B	23	C
I-495 NB off-ramp to Route 125 NB	13	B	22	B
I-495 NB on-ramp to Route 125 NB	12	B	16	B
I-495 SB off-ramp to 495 SB C-D	15	B	12	B
I-495 SB C-D off-ramp to Route 125 NB	5	A	7	A
I-495 SB C-D on-ramp to Route 125 NB	5	A	7	A
I-495 SB C-D weave to Route 125				
I-495 SB C-D off-ramp to Route 125 SB	19	B	7	A
I-495 SB C-D on-ramp to Route 125 SB	19	B	13	B
I-495 SB on-ramp to 495 SB C-D	28	D	18	B
<b>Exit 52: I-495 at Route 110</b>				
I-495 NB off-ramp to Route 110	14	B	19	B
I-495 NB on-ramp to Route 110	10	A	14	B
I-495 SB off-ramp to Route 110	14	B	12	B
I-495 SB on-ramp to Route 110	16	B	13	B
<b>Exit 53: I-495 at Broad St.</b>				
I-495 NB off-ramp to Broad St.	14	B	18	B
I-495 NB on-ramp to Broad St.	10	B	12	B
I-495 SB off-ramp to Broad St.	13	B	11	B
I-495 SB on-ramp to Broad St.	13	B	11	B
<b>Exit 54: I-495 at Route 150</b>				
I-495 NB off-ramp to Route 150	14	B	17	B
I-495 NB on-ramp to Route 150	11	B	13	B
I-495 SB off-ramp to Route 150	12	B	13	B
I-495 SB on-ramp to Route 150	12	B	11	B
<b>Exit 55: I-495 at Route 110</b>				
I-495 NB off-ramp to Route 110	14	B	17	B
I-495 NB on-ramp to Route 110	no data	-	12	B
I-495 SB off-ramp to Route 110	no data	-	7	A
I-495 SB on-ramp to Route 110	17	B	15	B

<sup>1</sup>Density is expressed as passenger car per mile per lane.



Table B-8

## I-495 Corridor Study - Deficient Merge/Diverge Analysis Recommended for Improvement

Interchange Number	Interchange Type	City/Town	Ramp Designation	Ramp Design Speed	Connecting Roadway	Required Accel. Length	Actual Accel. Length	Distance to Lengthen	Weaving Distance	Required Decel. Length	Actual Decel. Length	Distance to Lengthen	Impact of Achieving Required Distances
32	Full Diamond	Westford	Ramp D NB On-ramp	45 mph	Boston Road	820 FT	750 FT	70 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
34	Half Cloverleaf	Chelmsford	Ramp A-1 (SB Off-ramp)	30 mph	Chelmsford St (Route 110)	N/A	N/A	N/A	N/A	520 FT	300 FT	220 FT	Can lengthen with little to no impact
34	Half Cloverleaf	Chelmsford	Ramp A-3 (SB On-ramp)	45 mph	Chelmsford St (Route 110)	820 FT	500 FT	320 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
38	Half Diamond Half Cloverleaf	Tewksbury	SE On-ramp	30 mph	Main Street (Route 38)	1,350 FT	900 FT	450 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
39	Half Cloverleaf	Tewksbury	Ramp C NB On-ramp	25 mph	Andover St (Route 133)	1,420 FT	870 FT	550 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
39	Half Cloverleaf	Tewksbury	Ramp B SB On-ramp	25 mph	Andover St (Route 133)	1,420 FT	690 FT	730 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
40B	Full Cloverleaf	Andover	Ramp E NB On-ramp	25 mph	Route 93 SB	1,420 FT	720 FT	700 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
40A	Full Cloverleaf	Andover	Ramp D SB On-ramp	25 mph	Route 93 SB	1,420 FT	1040 FT	380 FT	850 FT	N/A	N/A	N/A	Minimum weave length per TRC212 = 1,000 FT
41	Half Cloverleaf	Lawrence	Ramp F NB On-ramp	25 mph	South Union St (Route 28)	1,420 FT	580 FT	840 FT	N/A	N/A	N/A	N/A	Extend auxiliary lane to next exit ramp
41	Half Cloverleaf	Andover	Ramp C SB On-ramp	25 mph	North Main St (Route 28)	1,420 FT	1340 FT	80 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
42	Half Cloverleaf	Lawrence	Ramp D NB On-ramp	25 mph	I-495 NB	1,420 FT	880 FT	540 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
42	Half Cloverleaf	Lawrence	Ramp A SB On-ramp	25 mph	I-495 SB	1,420 FT	870 FT	550 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
43	Full Diamond	North Andover	Ramp S NB Off-ramp	55 mph	Mass. Ave.	N/A	N/A	N/A	N/A	280 FT	220 FT	60 FT	Can lengthen with little to no impact
47	Trumpet	Methuen	NB Outer loop Off-ramp	50 mph	Route 213	N/A	N/A	N/A	N/A	340 FT	300 FT	40 FT	Can lengthen with little to no impact
47	Trumpet	Methuen	NB Inner loop On-ramp	25 mph	Route 213	1,420 FT	730 FT	690 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
48	Half Diamond	Haverhill	Ramp B NB On-ramp	40 mph	Route 125	1,000 FT	530 FT	470 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
49	Qtr Cloverleaf	Haverhill	Northwest Inner loop SB On-ramp	25 mph	River Street (Rte 110/113)	1,420 FT	700 FT	720 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
50	Half Cloverleaf	Haverhill	Southeast Inner loop NB On-ramp	25 mph	Broadway (Route 97)	1,420 FT	1,040 FT	380 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
51	Full Cloverleaf	Haverhill	Northeast Outer Conn. NB On-ramp	25 mph	Main St (Route 125)	1,420 FT	710 FT	710 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
51	Full Cloverleaf	Haverhill	Southwest Outer Conn. SB On-ramp	30 mph	Main St (Route 125)	1,350 FT	800 FT	550 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
52	Half Cloverleaf	Haverhill	Southeast Outer Conn. NB On-ramp	35 mph	Amesbury Rd (Route 110)	1,230 FT	1,070 FT	160 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
52	Half Cloverleaf	Haverhill	Northwest Outer Conn. SB On-ramp	35 mph	Amesbury Rd (Route 110)	1,230 FT	740 FT	490 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
53	Full Diamond	Merrimac	Ramp D SB On-ramp	25 mph	Broad St	1,420 FT	900 FT	520 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
54	Qtr Cloverleaf	Amesbury	Ramp B-3 NB Off-ramp	25 mph	Route 150 Ext.	N/A	N/A	N/A	N/A	550 FT	280 FT	250 FT	Can lengthen with little to no impact





**FIGURES B-1 THROUGH B-82  
SEE ATTACHED CD**



**MASSHIGHWAY TYPE II NOISE BARRIER PRIORITY  
LIST**





## Type II Priority List

Barrier Priority Number	City/Town	Location		Status
		Roadway		
1	Milton/Quincy	I-93		Constructed
2	Milton	I-93		Constructed
3	Milton/Quincy	I-93		Constructed
4	Boston	I-93		Studied
5	Boston	I-93		Construction 2006 - 2007
6	Lynnfield	I-95		Construction 2006 - 2007
7	Woburn	I-93		Design to Begin Winter 2006 - 2007
8	Wellesley/Newton	I-95		Design to Begin Winter 2006 - 2007
9	Lynnfield	I-95		Construction 2006 - 2007
10	Wakefield	I-95		Constructed
11	Fall River	I-195		Design to Begin Winter 2006 - 2007
12	Wellesley/Newton	I-95		Design to Begin Winter 2006 - 2007
13	Medford	I-93		Design to Begin Winter 2006 - 2007
14	Stoneham	I-93		To Be Studied
15	Boston	I-93		To Be Studied
16	Lowell	I-495		To Be Studied
17	Boston	I-93		To Be Studied
18	Wakefield	I-95		To Be Studied
19	Lynnfield	I-95		To Be Studied
20	Boston	I-93		To Be Studied
21	Wakefield	I-95		To Be Studied
22	Boston	I-93		To Be Studied
23	Lynnfield	I-95		To Be Studied
24	Lynnfield	I-95		To Be Studied
25	Newton	I-95		To Be Studied
26	Woburn/Reading	I-93		To Be Studied
27	Wakefield	I-95		To Be Studied
28	Lynnfield/Wakefield	I-95		To Be Studied
29	Reading	I-95		To Be Studied

30	Chelmsford	I-495	To Be Studied
31	Wakefield	I-95	To Be Studied
32	Wakefield	I-95	To Be Studied
33	Lynnfield/Wakefield	I-95	To Be Studied
34	Chelmsford	I-495	To Be Studied
35	Medford	I-93	To Be Studied
36	Lowell	I-495	To Be Studied
37	Wilmington	I-93	To Be Studied
38	Wilmington	I-93	To Be Studied
39	Wilmington	I-93	To Be Studied
40	Chelmsford	I-495	To Be Studied
41	Reading/Wakefield	I-93	To Be Studied
42	Methuen	I-93	To Be Studied
43	Chelmsford/Westford	I-495	To Be Studied
44	Randolph/Quincy	I-93	To Be Studied
45	Chelmsford	I-495	To Be Studied
46	Chelmsford	I-495	To Be Studied
47	Methuen	I-93	To Be Studied
48	Chelmsford	I-495	To Be Studied
49	Wilmington	I-93	To Be Studied
50	Chelmsford	I-495	To Be Studied
51	Medford	I-93	To Be Studied
52	Medford	I-93	To Be Studied
53	Braintree	I-93	To Be Studied