

V. SAFETY OF THE MERRIMACK VALLEY TRANSPORTATION NETWORK

This section of the Plan examines highway and transit (railroad crossing) crash data for the region. Increasing the level of safety of the traveling public is of paramount importance to the Merrimack Valley MPO and one of the primary goals of this document. The data and analyses in this section will be used by the MPO to identify locations where further study and ultimately further action needs to be taken to correct observed safety problems. This section also provides information on two safety initiatives that are being administered by the Executive Office of Transportation: The Safe Routes to School Program and the Massachusetts Strategic Highway Safety Plan (SHSP).

State Safety Initiatives

Massachusetts Strategic Highway Safety Plan

In July 2005, Congress reauthorized SAFETEA-LU and included a new “core” program, the Highway Safety Improvement Program (HSIP). This program is designed “to achieve a significant reduction in traffic fatalities and serious injuries on all public roads”. Funds may be used for projects on any public road or publicly owned bicycle and pedestrian pathway or trail. To obligate HSIP funds, states must perform the following tasks:

- Develop and implement a State Strategic Highway Safety Plan;
- Produce a program of projects or strategies;
- Evaluate the plan on a regular basis; and
- Submit an annual report to the Secretary.

Each state must have a strategic highway safety plan that identifies and analyzes safety problems and opportunities in order to use HSIP funds for new eligible activities. The plan is required to include a crash data system that can perform problem identification and countermeasure analysis.

The annual support to the Secretary of Transportation must include a description of not less than 5 percent of locations exhibiting the most severe safety needs, with an assessment of potential remedies for the identified hazardous locations, estimated costs associated with remedies, and impediments to implementation other than cost.

The funding split for projects developed under this program is 90% federal/10% state, although there are certain activities that will be 100% federally funded. However, funding for such projects initiated by communities will come from an MPO’s federal “target” funds.

During 2005 and 2006, the Massachusetts Highway Department worked with local and regional stakeholders to develop the SHSP. The document reviewed a range of data regarding crashes that involved fatalities and incapacitating injuries. It found that Massachusetts fared worse than the nation in crashes that involved vehicles leaving a travel lane, and crashes involving pedestrians and bicyclists.

The Massachusetts SHSP also recommended a strategy to work with the regional planning agencies and other stakeholders to identify top lane departure locations and work at the local

and regional levels to develop and implement location-specific strategies to mitigate the safety deficiencies.

The City of Haverhill has been working with a designer to implement improvements at the Route 110/Route 495 interchange under this program. However, funding for such projects will still come from a region's federal "target" funds.

Massachusetts Safe Routes to School Program

One of the new transportation programs included in SAFETEA-LU was the Safe Routes to School Program. This initiative was developed by FHWA was intended to provide a comprehensive approach to improving bicycle and pedestrian transportation to and from the nation's schools. Since 1969, the percentage of children across the nation that walk to school has fallen from 42% to 16% and the percentage that bicycle to school has dropped as well. As the FHWA notes in its description of this program:

This decline in walking and bicycling has had an adverse effect on traffic congestion and air quality around schools, as well as pedestrian and bicycle safety. In addition, a growing body of evidence has shown that children who lead sedentary lifestyles are at risk for a variety of health problems such as obesity, diabetes, and cardiovascular disease. Safety issues are a big concern for parents, who consistently cite traffic danger as a reason why their children are unable to bicycle or walk to school.

The Safe Routes to School Program in Massachusetts is managed by the Executive Office of Transportation. **MassRIDES**, the Commonwealth's travel options program in September 2005. **MassRIDES** offers schools technical support to customize programs, training, and evaluate programs.

The Safe Routes to School program in Massachusetts focuses on five key elements:

- Education, to teach children and parents about their transportation choices, important bicycling and walking safety skills, and creating awareness among drivers in the vicinity of schools.
- Encouragement, by using events and activities to promote healthy transportation alternatives such as walking, bicycling, riding the bus or even carpooling.
- Enforcement of traffic laws in the vicinity of schools (enforcement of speeds, yielding to pedestrians in crossings, and proper walking and bicycling behaviors), and initiating community enforcement such as crossing guard programs.
- Engineering activities to provide operational and physical improvements to the infrastructure surrounding schools that lower speeds, reduce potential conflicts with traffic, and establish safer and fully accessible crossings, walkways, trails, and bikeways.
- Evaluation, which allows local officials to monitor progress and documenting trends through data collection before and after Safe Routes activities.

In recent years, officials from the Lawrence have sought assistance to improve safety and access to certain elementary schools in the city. Their concern is largely focused on conflicts between pedestrians and vehicles in the vicinity of these schools. Similarly, Salisbury officials have sought to improve pedestrian access to the new Salisbury Elementary School that is located off Route. The Safe Route to Schools program provides these and other communities with resources to meet their goals in improving access to their schools.

Merrimack Valley Region Highway Safety

In the 2003 Regional Transportation Plan, MVPC reviewed the state's *Top 1000 High Crash Locations Report (1997-1999)* in an effort to identify any locations within the region that may have safety issues. That report identified 61 intersections and interchanges located in the Merrimack Valley region, with the majority of these (35) located in Lawrence and Haverhill. The remaining intersections and interchanges were located in Amesbury (3), Andover (5), Methuen (12), and North Andover (6).

For the 2007 Plan, MVPC staff reviewed MHD crash data from 2003 – 2005 to identify high crash locations in all 15 cities and towns in the Valley thereby enabling the MPO to identify high crash locations in all of these communities. Over 21,000 crash summaries were reviewed and coded by staff in an effort to identify high crash intersections and interchanges. More importantly, over 600 intersections and interchanges in the Valley were included in this analysis.

Interchanges

While the interstate roadway network comprises a relatively small proportion of the nation's road mileage, it carries a disproportionate share of the vehicle miles traveled. Not surprisingly, many of the highest crash locations in the region were located at the interchanges located on I-93, I-95, I-495 and Route 213 which, while not an interstate roadway, exhibits many the characteristics of an interstate in terms of access control and traffic volumes. Table V-1 presents a list of the crash locations at the 34 interchanges along the interstates within the region as well as on Route 213. Please note that 36 interchange locations are shown in the table and that is because the staff coded crashes at two locations at Exit 50 along Route I-495 and Exit 3 of Route 213.

Included in Table V-1 is the Equivalent Property Damage Only (EPDO) score for each crash location. This measure was developed by MassHighway to identify those locations where more serious crashes occurred. In this system, fatal crashes are assigned a score of 10, while crashes involving injuries are scored a five. All property damage only crashes are assigned the base score of one.

Table V-1
Number of Crashes at Interchanges in the Merrimack Valley Region
2003 - 2005

Intersection/Interchange	Community	Crash Severity				Crash Type						Total	EPDO Score
		Fatal	Inj.	Property Damage	Unknown	Angle	Head on	Rear End	Side Swipe	Single Vehicle	Other		
Rt. 93 / Rt. 110 (Exit 46)	Methuen	1	74	200	8	43	2	170	43	16	9	283	580
I-495 / Rt. 125 (Exit 51)	Haverhill		29	83	7	7	2	85	9	14	2	119	228
Rt. 28 / Rt. 213 (Exit 2)	Methuen		30	80	6	22		74	6	9	5	116	230
I-93 (Exit 44) / I-495 (Exit 40)	Andover	1	24	51	8	10	1	38	8	23	4	84	181
Rt. 93 / Pelham St. (Exit 47)	Methuen		22	49	0	17	1	33	4	15	1	71	159
I-495 / River St. (Exit 49)	Haverhill		13	48	8	5	2	50	5	3	4	69	113
I-495 / Rt. 28 (Exit 41)	Andover		19	28	1	17		17	3	10	1	48	123
Rt. 495 / Merrimack St (Exit 46)	Methuen		9	38	1	19		19	6	3	1	48	83
I-93 / River Rd. (Exit 45)	Andover	1	10	20	10	6		26	3	4	2	41	80
Interstate Rt. 495 / Massachusetts Av. (Exit 43)	North Andover		13	23	1	9		26	1	1	0	37	88
Rt. 93 / Rt. 213 (Exit 48)	Methuen		13	22	1	2		21	2	10	1	36	87
Rt. 495 / Rt. 213 (Exit 47)	Methuen	1	8	24	3	1		17	3	14	1	36	74
Rt. 213 / Pleasant Valley St.(Exit 4)	Methuen	1	10	19	1	6	1	18	0	6	0	31	79
Rt. 95 / Rt. 113 (Exit 57)	Newburyport		13	15	2	11		17	1	1	0	30	80
Rt. 213 / Howe St. (Exit 3)	Methuen		4	25	0	8	1	12	1	6	1	29	45
I-495 / Rt. 110 (Exit 52)	Haverhill	1	13	12	2	10	1	9	0	5	3	28	87
I-93 / Rt. 133 (Exit 43)	Andover		6	18	2	6		13	0	7	0	26	48
I-495 / Rt. 125 Connector (Exit 48)	Haverhill		8	12	3	2		10	4	5	2	23	52
Rt. 495 / Rt. 114 (Exit 42)	Lawrence		11	12	0	4	1	12	1	4	1	23	67
I-495 / Rt. 97 - Broadway (Exit 50)	Haverhill		5	13	2	7		5	1	3	4	20	38
Rt. 495 / Merrimack St (Exit 44)	Lawrence		7	11	1	8	1	7	0	3	0	19	46
I-95 / Rt 110 (Exit 58)	Amesbury		1	11	1	3		7	2	1	0	13	16
I-93 North / Dascomb Rd. (Exit 42, I-93 North)	Andover		3	9	1	6		1	1	5	0	13	24
I-93 South / Frontage Rd. (Exit 42, I-93 South)	Andover		7	5	1	3		8	0	2	0	13	40
I-495 / Rt. 97 - Monument St. (Exit 50)	Haverhill		3	8	2	3	1	7	2		0	13	23
Rt. 495 / Broad St. (Exit 53)	Merrimac		3	7	1	1	1	4	0	4	2	11	22
Rt. 133 / Rt. 95 (Exit 54)	Georgetown		1	8	0	2		4	1	1	1	9	13
I-495 / Rt. 110 (Exit 55)	Amesbury		4	4	0	2		3	0	2	1	8	24
Interstate Rt. 95 / Topsfield Rd. (Exit 52)	Boxford			4	4		3	1	0	4	0	8	4
I-495 / Rt. 150 (Exit 54)	Amesbury		2	5	0	1		3	0	2	1	7	15
Interstate Rt. 95 / Rt. 97 (Exit 53)	Boxford		2	4	1	2	1	3	0	1	0	7	14
Interstate Rt. 95 / Endicott Rd. (Exit 51)	Boxford		1	2	2	1		4	0		0	5	7
Rt. 213 / Rt. 93 (Exit 1)	Methuen		4	1	0			4	0	1	0	5	21
Rt. 95 / Rt. 286 (Exit 60)	Salisbury		1	3	0	1		3	0		0	4	8
Rt. 495 / Marston St. (Exit 45)	Lawrence		1	1	1			1	0	1	1	3	6

The interchanges of I-93 with I-495 in Andover and I-93 with the Lowell Street (Routes 110/113) traffic circle in Methuen were the locations of the greatest number and most severe crashes between 2003 and 2005. Both of these interchanges underwent comprehensive study with recommended improvement alternatives as part of the *I-93 Corridor Study*, completed in 2003. The Massachusetts Highway Department is now conducting a more detailed study of the Route 110/113 Rotary in an effort to identify a preferred improvement alternative that can be carried forward to the environmental review and design stage. It is expected that this study will be completed during the summer of 2007.

The I93 Corridor Study also included recommendations to improve many of the other interchanges. These included:

- Removing the weave at the interchange of Route 213 and I-93 in Methuen (Exit 48)
- Adding a Right Turn Lane to the Eastbound Pelham Street approach at Exit 47
- Removing the Route 133 westbound onramp to I-93 southbound in Andover (Exit 43)

- Implementing the interchange signalization improvements contained in the PWED project at Dascomb Road (Exit 42)

MassHighway is also conducting a study of the Route I-495 corridor in the Northern Middlesex and Merrimack Valley regions. This study has already noted that a high percentage of the interchanges along this section of the roadway appeared on the state's *Top 1000 High Crash Locations Report*.

Table V-1 shows the interchanges at Route 125 (Exit 51) and River Street (Exit 49) in Haverhill had high numbers of crashes. It should be kept in mind that the number of crashes at these and the other interchanges include those that occurred on the highway within 200 feet of the on and off ramps. Preliminary analyses of the volume and safety data have led the consultant to believe that the interchange improvements that will come out of the study are likely to both improve safety and reduce congestion on the highway.

What is also interesting to note from Table V-1 is the number of crashes that took place at the Route 213/Route 28 interchange in Methuen. Short acceleration lanes from the Route 28 southbound onramp to Route 213 eastbound and congestion along Route 28 north of Route 213 that often backs up to this interchange are likely contributors to this situation.

Finally, it must be pointed out that while Table VI-1 tells us how many crashes occurred at each interchange in 2003-2005, it does not show the crash rate, which is the number of crashes per million vehicles entering the interchange. This measure allows us to compare the relative safety of each interchange and facilitate the prioritization of improvement projects.

Recommendations:

- Implement the recommendations made in the I-93 Corridor Study
- Conduct a study of traffic and safety conditions along Route 213 in Methuen with an emphasis on the Route 213/Route 28 interchange extending north to the New Hampshire state line.
- Implement recommended short-term and long-term improvements that will be identified in the Route I-495 Corridor Study
- Calculate crash rates at interchanges and intersections in the region.

Intersections

Table V-2 shows those intersections in the region that were the site of at least 10 crashes in 2003-2005. These intersections were selected for review based on the functional classification of the roadways that were intersecting. In general, any intersection of a collector roadway with another collector or higher order roadway (i.e. arterial and NHS road) was included in the analysis. Additional intersections were included based on staff review of the crash data for each community.

**Table V-2
Number of Crashes at Intersections in the Merrimack Valley Region
2003 – 2005**

Intersection	Community	Severity				Manner of Crash						Total	EPDO Score
		Fatal	Inj.	Property Damage	Not Known	Angle	Head on	Rear End	Side Swipe	Single Vehicle	Other		
Lafayette Sq.	Haverhill		16	65	5	48	3	15	10	4	6	86	145
Rt. 125 / Ginty Blvd.-Bailey Blvd.	Haverhill		27	45	3	43	6	13	6	2	5	75	180
Rt. 113 / Jackson St.-Howe St.	Methuen		12	46	2	25	1	24	7	3	0	60	106
Rt. 125 / Merrimack St.-Water St.	Haverhill		14	35	8	19	1	27	5	4	1	57	105
Rt. 125 / Winter St.-Summer St.	Haverhill		8	44	5	21		14	13	6	3	57	84
Rt. 28 / Rosewood St.	Methuen		13	38	1	30	1	17	2	2	0	52	103
Rt. 28 / Hampshire St.-Charles St.	Methuen		15	29	2	13		23	6	3	1	46	104
Rt. 125 / Massachusetts Ave.	North Andover		18	27	0	22	1	18	2	1	1	45	117
Main St. / Plaistow Rd.	Haverhill		12	23	2	19	3	11	2	1	1	37	83
River St. / Lowell Ave.	Haverhill		5	26	5	12	1	18	3		2	36	51
Rt. 28 / Rt. 133-Poor St.	Andover		10	23	2	18	3	8	4	1	1	35	73
River St. / Washington St.-Railroad Ave,	Haverhill		5	23	7	6	2	12	10	2	3	35	48
Lowell St. / Haverhill St.	Methuen		9	26	0	5		22	7		1	35	71
Rt. 114 / Rt. 133 -Peters St.	North Andover		12	22	0	23	3	5	0	1	2	34	82
Merrimack St. / Essex-Emerson-Washington	Haverhill		4	25	4	12	1	7	4	6	3	33	45
Rt. 110 / Burnham Rd.-Green St.	Methuen		10	22	1	20		12	1		0	33	72
Dascomb Rd. / Frontage Rd.	Andover		12	18	2	15	3	10	1	1	2	32	78
Rt. 114 / Andover Bypass	North Andover		16	16	0	4	1	17	3	4	3	32	96
Rt. 28 / Stevens St. - Harding St.	Andover		8	21	2	21		6	3	1	0	31	61
Rt. 125 / Primrose St.	Haverhill		6	23	2	19		2	6	3	1	31	53
Lawrence St. / Park St.	Methuen		5	24	0	19		6	1	2	1	29	49
Old Town Center	North Andover		3	26	0	25	1	1	2		0	29	41
Rt. 114 / Andover St.	North Andover		10	17	2	9	1	13	1	3	2	29	67
Rt. 97 / Rt. 113 / Elm Park	Groveland		7	18	3	13	1	9	0	2	3	28	53
Rt. 125 / Kenoza Ave.-Fourth Ave,-4th Ave.	Haverhill		6	18	4	14	1	6	4	3	0	28	48
Water St. / Ginty Blvd.-Mill St.	Haverhill		11	15	2	7	1	16	2	2	0	28	70
Market St. / Parker St.	Lawrence		9	13	6	6	3	11	5	2	1	28	58
Rt. 110 / Lawrence St-Saltonstall St.	Haverhill		5	21	1	17	1	6	1	2	0	27	46

**Table V-2
Number of Crashes at Intersections in the Merrimack Valley Region
2003 – 2005 (cont.)**

Intersection	Community	Severity				Manner of Crash						Total	EPDO Score
		Fatal	Inj.	Property Damage	Not Known	Angle	Head on	Rear End	Side Swipe	Single Vehicle	Other		
Rt. 125 / Cushing Rd.-Rt. 121A	Haverhill		2	23	2	16		6	3	2	0	27	33
Rt. 114 / S. Union St.-Exeter St.	Lawrence		8	13	6	14	4	3	3	1	2	27	53
Rt. 28 / Central St.-Elm St.-High St.	Andover		5	20	1	11		7	4	2	2	26	45
Andover St. / Parker St.-Winthrop Ave.	Lawrence		5	17	4	8	1	7	4	3	3	26	42
Hampshire St. / Methuen St.	Lawrence		11	10	5	18		3	0	1	4	26	65
Rt. 110 / Clarkes Rd.-Elm St.	Amesbury		5	19	1	7		12	2	2	2	25	44
Rt. 133 / Shawsheen Rd.-Beacon St.	Andover		5	18	2	13	3	7	0	2	0	25	43
Merrimack St. / Parker St.-Amesbury St.	Lawrence		6	15	4	7		6	3	5	4	25	45
Merrimack St. / S Union St.	Lawrence		13	9	3	9		10	2	2	2	25	74
Rt. 28 / Andover St.	Lawrence		11	8	6	13		5	2	3	2	25	63
S. Union St. / Market St.	Lawrence		11	11	3	10		7	1	1	6	25	66
East St. / Prospect St.-Milk St.	Methuen		7	18	0	18	1	3	1	1	1	25	53
Merrimack St. / Winter St.-Summer St.	Newburyport		4	19	2	17	1	2	2	3	0	25	39
Rt. 110 / Merrill St.-Rabbit St.	Salisbury		6	15	4	13		7	0	2	3	25	45
Winter St. / Emerson St.-White St.-How St.	Haverhill		3	19	2	13		6	3	2	0	24	34
Rt. 125 / Rosemont St.-Jaffarian Rd.	Haverhill		5	18	1	6	1	16	0		1	24	43
Amesbury St. / Essex St.	Lawrence		12	6	6	16	1	3	1	2	1	24	66
Rt. 1 / Rt. 133	Rowley		7	16	1	9		11	3	1	0	24	51
Lincoln Ave. / Groveland-Orchid-Coffin	Haverhill		8	15	0	15	1	7	0		0	23	55
Rt. 110 / Main St.	Amesbury		5	16	1	13	2	4	2	1	0	22	41
Franklin St. / Methuen St.	Lawrence		12	7	3	14		0	2	3	3	22	67
Rt. 28 / Osgood St.	Methuen		6	16	0	12		6	1	2	1	22	46
Toll Rd. / Main St.	Salisbury		6	15	1	17		4	0		1	22	45
Rt. 125 / Ferry St.-South Central St.	Haverhill		5	14	2	13	1	6	0	1	0	21	39
Rt. 125 / Middlesex St.	Haverhill		4	16	1	10		5	1	3	2	21	36
Parker St. / Salem St.	Lawrence		4	14	3	10		7	4		0	21	34
Rt. 97 / Salem St.	Groveland		4	15	1	7		8	2	1	2	20	35
Rt. 110 / Amesbury Line Rd.-Brandy Brow	Haverhill		6	12	2	13		2	2	2	1	20	42
Rt. 97 / Primrose St.	Haverhill		6	12	2	10	1	3	1	2	3	20	42
Canal St. / Union St,	Lawrence		7	7	6	3		12	0	2	3	20	42
Lawrence St. / Park St.-Bunker Hill Rd.	Lawrence		8	8	4	5	2	4	5	3	1	20	48

**Table V-2
Number of Crashes at Intersections in the Merrimack Valley Region
2003 – 2005 (cont.)**

Intersection	Community	Severity				Manner of Crash						Total	EPDO Score
		Fatal	Inj.	Property Damage	Not Known	Angle	Head on	Rear End	Side Swipe	Single Vehicle	Other		
Rt. 110 / May St.-Margin St.	Lawrence		6	10	4	3	1	7	3	2	4	20	40
Rt. 28 / Manchester St.-Daisy St.	Lawrence		5	10	5	10	1	5	4		0	20	35
Lowell St. / Milton St.	Lawrence		11	7	2	14	2	1	1	2	0	20	62
Lawrence St. / East St.	Methuen		11	8	1	8		4	1	5	2	20	63
Rt. 113 / Low St.-Woodman St.	Newburyport		2	10	8	7	1	10	1		1	20	20
Rt. 1 / State St.	Newburyport		4	15	1	5		4	9	2	0	20	35
Rt. 114 / Waverly Rd.-Cotuit St.	North Andover		8	12	0	8		6	4	1	1	20	52
Rt. 1 / Rt. 110-Rt. 1A	Salisbury		3	13	4	8		9	2	1	0	20	28
Rt. 133 / High St.	Andover		5	13	1	10	1	5	0	3	0	19	38
North St.-Rt. 97 / Rt. 133-Main St.	Georgetown		3	14	2	10	1	2	4		2	19	29
Essex St. / Locust St.-Granite St.	Haverhill		7	11	1	15	1	0	1	1	1	19	46
Rt. 28 / Essex St.	Lawrence		6	9	4	4		8	2	2	3	19	39
Rt. 125 / Sutton St.	North Andover		6	11	2	13		3	2	1	0	19	41
Rt. 110 / Rt. 150 (Hillside)	Amesbury		4	13	1	9	3	6	0		0	18	33
Rt. 150 / Highland St.	Amesbury		4	14	0	14		1	1	1	1	18	34
Rt. 133 / Riverina Rd.	Andover		4	13	1	15		0	2	1	0	18	33
Essex St. / High St.	Haverhill		3	14	1	8	1	2	4	2	1	18	29
Rt. 125 / Elm St.-Salem St.	Haverhill		3	14	1	10		2	4	1	1	18	29
Rt. 125 Connector / Ward Hill Ave.	Haverhill		6	11	1	5		10	0	2	1	18	41
Haverhill St. / Lawrence St.	Lawrence		7	8	3	8		6	3	1	0	18	43
Rt. 1 / Low St.-Pond St.	Newburyport		5	10	3	7	1	8	1	1	0	18	35
Chickering Rd. / Andover St.-Peters St.	North Andover		6	11	1	3	3	9	2	1	0	18	41
Rt. 125 / Main St.	North Andover		4	14	0	7		10	0	1	0	18	34
Rt. 125 / Rt. 28	Andover		4	11	2	4		8	1	4	0	17	31
Manchester St. / May St. (Rotary).	Lawrence		4	11	2	3	1	8	0	2	3	17	31
Hampshire St. / Lowell St.	Lawrence		6	7	4	10	1	1	4		1	17	37
Rt. 110 / Ames St.	Lawrence		5	9	3	10		2	1	1	3	17	34
Rt. 28 / Rt. 110	Lawrence		6	8	3	8		5	1	1	2	17	38
Water St. / Melrose St.	Lawrence		8	5	4	12		2	1	1	1	17	45
Park St. / Exchange St.	Lawrence		8	6	3	13	1	0	0		3	17	46
East St. / Jackson St.	Methuen		6	10	1	8	1	4	0	2	2	17	40

**Table V-2
Number of Crashes at Intersections in the Merrimack Valley Region
2003 – 2005 (cont.)**

Intersection	Community	Severity				Manner of Crash						Total	EPDO Score
		Fatal	Inj.	Property Damage	Not Known	Angle	Head on	Rear End	Side Swipe	Single Vehicle	Other		
Elm St. / Woodland St.	Methuen		7	10	0	9		6	0	1	1	17	45
Hampstead St. / North St.	Methuen		6	11	0	12		2	1	2	0	17	41
Lowell St. / N. Lowell St.	Methuen		3	11	3	6		5	4	1	1	17	26
Rt. 110 / Woodland St.	Methuen		5	11	1	8		6	1	1	1	17	36
Rt. 113 / Milk St.	Methuen		5	11	1	7	1	7	1		1	17	36
Rt. 28 / Chestnut St.	Andover		1	13	2	6		4	2	2	2	16	18
Rt. 125 / Boston Rd.-Cross Rd.	Haverhill		4	11	1	5	2	7	2		0	16	31
Rt. 125 / White St.-Arlington St.	Haverhill		2	13	1	2		8	3	3	0	16	23
Rt. 97 / Forest St.	Haverhill		4	12	0	3	2	7	1	2	1	16	32
Rt. 97 / Lake St.	Haverhill		3	12	1	9		4	3		0	16	27
Park St. / Spruce St.	Lawrence		6	9	1	12		1	1		2	16	39
Berkeley St. / Swan St.	Lawrence		3	9	4	9		2	2	1	2	16	24
Park St. / Bruce St.	Lawrence		6	10	0	11	1	0	1		3	16	40
Lawrence St. / Osgood St.	Methuen		3	11	2	2	1	12	0		1	16	26
Chickering Rd. / Osgood St.	North Andover	1	9	5	1	3	1	8	0	2	2	16	60
Osgood St. / Massachusetts Ave.	North Andover		4	12	0	14	1	0	0	1	0	16	32
Rt 110 / Rocky Hill Rd.	Amesbury		1	14	0	6		7	0	2	0	15	19
Rt. 28 / School St.- Wheeler St. - Chapel St.	Andover		2	12	1	4	1	9	0		1	15	22
Rt. 125 / Kingsbury Ave-South Prospect St.	Haverhill		4	11	0	6		6	0	3	0	15	31
Center St. / Hampshire St.	Lawrence		6	7	2	11		0	1		3	15	37
Haverhill St. / Amesbury St.	Lawrence		7	7	1	10	1	2	1	1	0	15	42
Haverhill St. / Hampshire St.	Lawrence		4	9	2	7		5	1		2	15	29
Union St. / General St.-Garden St.	Lawrence		3	10	2	6	2	3	1	1	2	15	25
Rt. 113 / Forest St.	Methuen		3	12	0	7		3	0	5	0	15	27
Waverly St. / Massachusetts Ave.	North Andover		6	9	0	4		8	0	2	1	15	39
Rt. 97 / Carleton St.	Haverhill		5	9	0	9		3	1		1	14	34
Amesbury St. / Canal St.	Lawrence		3	11	0	7	1	4	1	1	0	14	26
Amesbury St. / Common St.	Lawrence		5	8	1	9		2	2		1	14	33
Andover St. / S. Union St.	Lawrence		8	4	2	9		2	2	1	0	14	44
Hampshire St. / Park St.	Lawrence		8	2	4	11		2	0		1	14	42
Rt. 28 / Mt. Vernon St.	Lawrence		4	8	2	4		6	3	1	0	14	28

**Table V-2
Number of Crashes at Intersections in the Merrimack Valley Region
2003 – 2005 (cont.)**

Intersection	Community	Severity				Manner of Crash						Total	EPDO Score
		Fatal	Inj.	Property Damage	Not Known	Angle	Head on	Rear End	Side Swipe	Single Vehicle	Other		
Rt. 28 / Water St.-Canal St.	Lawrence		5	6	3	9	1	3	1		0	14	31
Trenton St. / Buswell St.	Lawrence		6	2	6	11		1	0		2	14	32
Butler St. / Warren St.	Lawrence		7	4	3	11	1	0	0	1	1	14	39
Lawrence St. / Maple St.	Lawrence		6	7	1	8	1	3	0	1	1	14	37
Park St. / Trenton St.	Lawrence		6	6	2	10		0	0	3	1	14	36
Swan St. / Prospect St.	Methuen		5	9	0	12		2	0		0	14	34
Swan St. / Jackson St.	Methuen		3	11	0	8	1	2	1	1	1	14	26
Main St. / High St.-Willow St.	Salisbury		3	10	1	6		4	2	1	1	14	25
Boardman St. / Groveland St.	Haverhill		3	10	0	10		1	1		1	13	25
Rt. 97 / Locust St.	Haverhill		2	11	0	8		4	0	1	0	13	21
E Haverhill St. / Prospect St	Lawrence		4	8	1	9		1	1	1	1	13	28
Jackson St. / Avon St.	Lawrence		5	6	2	9		3	1		0	13	31
Bennington St. / Alder St.	Lawrence		3	7	3	8		0	3	1	1	13	22
Rt. 28 / Tremont St.	Lawrence		4	8	1	8	1	1	1		2	13	28
Chestnut St. / Short St.	Lawrence		6	4	3	13		0	0		0	13	34
Lowell St. / Oakland Ave,	Methuen		4	8	1	8		3	1	1	0	13	28
Great Pond Rd. / Osgood St.	North Andover		4	8	1	8		2	2	1	0	13	28
Rt. 114 / Mill Rd.	North Andover		2	9	2	7		5	0	1	0	13	19
Shawsheen Rd. / Stevens St.	Andover		3	8	1	4		4	0	3	1	12	23
White St. / Cedar St.-Vine St.	Haverhill		2	8	2	7		3	2		0	12	18
Hilldale Ave. / Monument St.	Haverhill		2	9	1	6		2	1	2	1	12	19
Rt. 97 / Hale St. - Stevens St.	Haverhill		1	10	1	5		6	0	1	0	12	15
Canal St. / Franklin St.	Lawrence		1	11	0	6		3	0	1	2	12	16
Jackson St. / Berkeley St.	Lawrence		4	3	5	7		4	0		1	12	23
Lowell St. / Margin St,	Lawrence		7	3	2	6		3	2		1	12	38
Prospect St. / General St.	Lawrence		1	8	3	3		7	0		2	12	13
Rt. 28 / Cross St.	Lawrence		2	7	3	2		9	1		0	12	17
Rt. 28 / Salem St.	Lawrence		3	8	1	2		5	4		1	12	23
Salem St. / Market St.-Blanchard St.	Lawrence		4	7	1	7		3	0	1	1	12	27
Salem St. / S. Union St.	Lawrence		7	5	0	11		1	0		0	12	40
Berkeley St. / Bruce St.	Lawrence		5	5	2	11		0	0		1	12	30

**Table V-2
Number of Crashes at Intersections in the Merrimack Valley Region
2003 – 2005 (cont.)**

Intersection	Community	Severity				Manner of Crash						Total	EPDO Score
		Fatal	Inj.	Property Damage	Not Known	Angle	Head on	Rear End	Side Swipe	Single Vehicle	Other		
Marston St. / Commonwealth Dr.	Lawrence		7	4	1	8		1	2		1	12	39
Essex St. / Warren St.	Lawrence		7	5	0	8		0	1		3	12	40
Union St. / Island St.	Lawrence		2	9	1	7		3	0		2	12	19
Methuen St. / Mill St.	Lawrence		1	7	4	9		0	1		2	12	12
Park St. / Saunders St.	Lawrence		4	3	5	5		1	0	2	4	12	23
Park St. / Walnut St.	Lawrence		6	5	1	11		0	0	1	0	12	35
Haverhill St. / Forest St.	Methuen		1	11	0	9		1	2		0	12	16
Howe St. / Hampstead St.-Archibald St.	Methuen		1	10	1	7		4	1		0	12	15
Rt. 1A / Hanover St.-Rolfe ln.	Newbury		3	8	1	7	1	4	0		0	12	23
Rt. 125 / Hillside Rd.	North Andover		2	10	0	11		0	1		0	12	20
Rt. 1A / Rt. 133	Rowley		2	10	0	1	2	7	0	1	1	12	20
Rt. 133 / Greenwood St.-Lovejoy Rd.	Andover		3	7	1	9		2	0		0	11	22
Monument St. / North Broadway	Haverhill		3	7	1	4		6	1		0	11	22
Rt. 108 / Rt. 110	Haverhill		3	8	0	2		7	1	1	0	11	23
Rt. 125 / Boston Rd.-Old Ferry Rd.	Haverhill		1	9	1	6	1	2	1		1	11	14
Rt. 125 / Hanscom Rd.	Haverhill		5	5	1	2		6	2		1	11	30
Rt. 125 / Rt. 125Connector	Haverhill		6	5	0	2		5	2	2	0	11	35
Concord St. / North Ave.	Haverhill		5	4	2	4		5	1		1	11	29
Franklin St. / Lowell St.	Lawrence		6	3	2	2	1	2	3	2	1	11	33
Milton St. / Essex St.	Lawrence		4	3	4	7	1	0	0	1	2	11	23
Lawrence St. / Fern St.	Lawrence		4	6	1	6		2	0	2	1	11	26
Newbury St. / Elm St.	Lawrence		2	4	5	10		1	0		0	11	14
Parker St. / Bailey St.	Lawrence		1	8	2	5		4	0	1	1	11	13
Hampshire Rd. / Cross St.	Methuen		3	8	0	3		4	0	4	0	11	23
Rt. 28 / Center St.	Methuen			11	0	3		3	3	1	1	11	11
Merrimack St. / Green St.	Newburyport		1	9	1	6		3	1		1	11	14
Pond St. / Greenleaf St.	Newburyport		2	7	2	8	1	1	0		1	11	17
Rt. 125 / Park St.	North Andover		4	7	0	8		3	0		0	11	27
Rt. 1 / Central St.	Rowley		5	6	0	6	2	1	0	1	1	11	31
Rt. 1 / Rt. 286	Salisbury		4	5	2	3		4	2		2	11	25
Elm St. / Monroe St.-Bay St.	Amesbury			9	1	4	1	4	0		1	10	9

**Table V-2
Number of Crashes at Intersections in the Merrimack Valley Region
2003 – 2005 (cont.)**

Intersection	Community	Severity				Manner of Crash						Total	EPDO Score
		Fatal	Inj.	Property Damage	Not Known	Angle	Head on	Rear End	Side Swipe	Single Vehicle	Other		
River Rd. / North St.	Andover		5	5	0	7		3	0		0	10	30
Rt. 133 / Haggetts Pond Rd.	Andover		4	6	0	9		1	0		0	10	26
Rt. 133 / York St	Andover		4	6	0	8		0	2		0	10	26
River Rd. / Federal St.	Andover		2	8	0	7		3	0		0	10	18
Rt. 133 / Main St.	Boxford		2	8	0	8		1	0	1	0	10	18
Rt. 97 / Center St.	Groveland		3	7	0	4		1	3	1	1	10	22
Salem St. / Washington St.	Groveland		7	2	1	5		1	2	2	0	10	37
Groveland St. / Keeley Rd.-Broadway	Haverhill		1	9	0	9		1	0		0	10	14
Rt. 110 / Forest St.	Haverhill		2	8	0	5	1	4	0		0	10	18
Rt. 110 / Concord-Lakeland-Stanley	Haverhill		5	5	0	4		5	0	1	0	10	30
Rt. 125 / Laurel Ave.	Haverhill		3	7	0	2	1	5	0	2	0	10	22
Mill St. / Boardman St.	Haverhill		2	5	3	5		3	0	2	0	10	15
Amesbury St. / Methuen St.	Lawrence		4	5	1	5		2	0	1	2	10	25
Beacon St. / Glenn St.-Amherst St.	Lawrence		7	3	0	6	2	1	0		1	10	38
Essex St. / Franklin St.	Lawrence		4	4	2	5		1	3		1	10	24
Ferry St. / E. Haverhill St.	Lawrence		1	6	3	8		2	0		0	10	11
Marston st. / Ferry St.-Training School St.	Lawrence		5	4	1	6	1	1	1	1	0	10	29
Prospect St. / Haverhill St.	Lawrence		2	7	1	7	1	1	0		1	10	17
Rt. 28 / Lowell St.	Lawrence		5	3	2	2		2	4	1	1	10	28
Park St. / Saratoga St.	Lawrence		4	4	2	9		0	0		1	10	24
Willow St. / Alder St.	Lawrence		6	2	2	7		1	0	1	1	10	32
Rt. 114 / Chickering St.	Lawrence		5	5	0	9		1	0		0	10	30
Rt. 1 / Hanover St.-Middle St.	Newbury		2	6	2	6		1	1	2	0	10	16
Merrimack St. / State St.-Water st.	Newburyport			10	0			6	1	3	0	10	10
Osgood St. / Pleasant St.-Park St.-Court St.	North Andover			10	0	9		0	0	1	0	10	10
Sutton St. / Main St.	North Andover		3	6	1	3	1	3	2		1	10	21
Massachusetts Av. / Greene St.	North Andover		1	9	0	6		4	0		0	10	14
Rt. 1 / Weathersfield St.	Rowley	2	6	2	0	7		0	1	1	0	10	52

Review of High Crash Intersection Locations

Described below is a brief description of the 20 intersections that experienced 30 or more crashes in 2003-2005 and a review of the status of any studies or construction projects (impending, under construction or recently completed).

Lafayette Sq.: This is really two intersections linked by the roadway named Lafayette Square. Both intersections were reconstructed and signalized as part of a MassHighway project that was completed in 2006. The number of crashes at this intersection increased in 2005, but City officials have reported that the number of crashes at this location have dropped as drivers have become more familiar with the new alignments and traffic control.

Rt. 125 / Ginty Blvd.-Bailey Blvd -- Rt. 125 / Water St. – Merrimack St.; Rt. 125 / Winter St. – Summer St.: MVPC has been asked by City officials to review the operational characteristics of the above intersections in the corridor that extends from City Hall down to the Basilliere Bridge. The focus of the study is to relieve congestion and reevaluate pedestrian control at the signalized intersections. MVPC conducted an operational analysis of the Water Street/Merrimack Street/Route 125 intersection in 2004, which found capacity problems were contributing to the safety problems. The three signals at these intersections are interconnected to relieve congestion during peak periods, but frequent actuation of the pedestrian phases at these signals interrupts the designed progression and creates significant delays on the minor street approaches.

Rt. 113 / Jackson St.-Howe St.: Improvements have been made to this location as part of the development of the Loop and the construction of pharmacy in the northeast quadrant of the intersection. Heavy peak period traffic volumes create delays on the Pleasant Valley Street approach to the intersection, sometime backing traffic up to the Route 213 eastbound on/off ramps.

Rt. 28 / Rosewood St.: This signalized intersection also serves as the site driveway to the Village Mall. The geometry of Broadway at the Rosewood Street intersection is such that it has two through/general purpose lanes in each direction. Northbound left-turning vehicles into the shopping mall driveway oppose high volume through traffic in the southbound direction for many hours of the day in this highly developed commercial area. Congestion on Route 28 north of the intersection also impacts this location.

Rt. 28 / Hampshire St.-Charles St.: Methuen Square: Irregular geometry, one-way street configuration Visibility of the signal to traffic on the southbound (Route 28) approach. This intersection is less than 200 feet north of the Route 28 / Osgood Street intersection, which also showed a high number of crashes (22).

Rt. 125 / Massachusetts Ave.: This signalized intersection accomodates a high volume of left turning traffic from Route 125 northbound onto Massachusetts Avenue westbound. Sight distance may be an issue on the southeast quadrant of the intersection.

Main St. / Plaistow Rd.: Congestion in the Route 125 Corridor, particularly during the AM peak period, are partially responsible for the number of crashes at this location. Delays on Route 125 just south of this location often cause traffic to back up through the intersection.

Left-turning vehicles from Main St. southbound to Plaistow Road are permitted on the green phase, but vehicles must merge with traffic traveling north on Route 125. Recent changes to signal phasing have reduced off-peak delays.

River St. / Lowell Ave.: This signalized intersection was reconstructed in 2005 to provide a new northbound approach to access a pharmacy. At the same time, a former restaurant located in the northwest quadrant of the intersection was redeveloped as a pharmacy, increasing the number of trips entering Lowell Avenue near its approach to River Street. The intersection is also only 350 feet from the I-495 northbound off-ramp to Route 110. This intersection will be evaluated as part of the MassHighway Route I-495 Corridor Study.

Rt. 28 / Rt. 133-Poor St. (Shawsheen Square): Andover officials have suggested initiating a project that would make improvements to Route 28 from Shawsheen Plaza north to Route I-495. Congestion at this intersection is a problem during AM and PM peak periods, with traffic on the southbound Route 28 approach experiencing the greatest delay. The narrow approach on Route 28 also creates problems.

River St. / Washington St.-Railroad Ave.: Located at the western end of the downtown, this intersection includes the intersection of Washington Street, which provides access the Haverhill Commuter Rail Station. Crashes at this location are down due to the 2004 closing of the Comeau Bridge, which constitutes the northbound approach to the intersection. This intersection is to be studied as part of the Haverhill Parking Facility Preliminary Engineering Study, which will be completed in 2007.

Lowell St. / Haverhill St.: Located just east of the Route 110/113 Rotary. This intersection was examined as part of the Route I-93 Corridor Traffic Study and is included in MassHighway Department's Route 110/113 Rotary Study. Alternatives developed in both studies call for the realignment or even the elimination of this intersection.

Rt. 114 / Rt. 133 - Peters St. This intersection was studied by MVPC for the Town of North Andover as part of the 2003 Comprehensive Development Plan. That document recommended that the (see CDP to finish).

Merrimack St. / Essex-Emerson-Washington (Washington Square): This is really two intersections (Emerson/Washington; Washington/Essex) located in front of Haverhill Post Office and the MVRTA Haverhill Transit Station. High parking turnover at the Post Office, frequent pedestrian crossings throughout the Square area and poor sight-distance on the Essex Street eastbound and Emerson Street southbound approaches combine to create and This intersection is to be studied as part of the Haverhill Parking Facility Preliminary Engineering Study, which will be completed in 2007.

Rt. 110 / Burnham Rd.-Green St.: The Merrimack Plaza sits at the southeast corner of this signalized intersection, with site driveways onto Burnham Road and Route 110. There are also other driveways to businesses located in close proximity to the intersection.

Dascomb Rd. / Frontage Rd: Studied as part of the Route I-93 Corridor Study, Lowell Junction Interchange Study and the adjacent I-93 southbound off ramp/Frontage Road and Dascomb Road/ I-93 northbound off-ramp intersections are slated for signalization through a PWED project.

Rt. 114 / Andover Bypass: This intersection is being reviewed by the MVPC as part of the Route 114 Corridor Study. Volume on the Route 114 southbound approach is particularly high as this section of the highway has the highest non-interstate traffic volumes in the region.

Rt. 28 / Stevens St. - Harding St: Route 28 exhibits a moderate uphill grade from north to south. The intersection is signalized with the Harding Street approach located slightly south of the Stevens Street approach. The Harding Street approach enters the intersection with a significant downhill grade. This intersection will be reconstructed as part of the Route 28 – Main Street reconstruction project that should begin construction late this year or in the spring of 2008.

Rt. 125 / Primrose St.: This intersection is located just south of the Route 125 / I-495 interchange. Numerous business driveways located just east of the location create conflicts with the heavy traffic volumes using the roadway.

Recommendations:

- Monitor crash history at the 20 high crash intersections and determine if additional analyses are warranted
- Implement safety recommendations made in Route 114 Corridor Study.
- Include analyses of the safety conditions at intersections with a high number of crashes in the UPWP
- Work with MassHighway in improving the crash database and in implementing the recommendations contained in the Strategic Highway Safety Plan.

Fatal Crashes

The MassHighway crash data showed that there were 59 fatal crashes in the Merrimack Valley during 2003, 2004 and 2005. Only 11 of these occurred at the intersections and interchanges evaluated in the region. Table V-3 below identifies the locations of all the fatal crashes that took place on the transportation network.

Thirty-one of the other 59 crashes took place on the region's interstate highways. This is not surprising given the high traffic volumes and vehicle speeds on these roadways. The most (21) crashes occurred on Route I-495. Route I-93 was next with 6 crashes and Route I-95 had four. Thirty four of the 59 crashes were single vehicle crashes. Removing the pedestrian crashes from this group, 20 fatal crashes involved single vehicle collisions with fixed objects (e.g. utility poles, fences, embankments) or were rollovers.

Table V- 3
Fatal Crashes in the Merrimack Valley Region
2003 - 2005

City/Town Name	Facility	Manner of Collision	Location
METHUEN	Williams Street	Single vehicle crash	14 Williams Street
LAWRENCE	Union Street	Head-on	Duck Bridge
LAWRENCE	Swan Street	Single vehicle crash	38 Swan Street
METHUEN	Salem Street	Angle	Salem Street/Hampshire Road
AMESBURY	Route I-95	Rear-end	Near Exit 58B
AMESBURY	Route I-95	Single vehicle crash	Near Exit 58B
GEORGETOWN	Route I-95	Single vehicle crash	Near Exit 54B
GEORGETOWN	Route I-95	Single vehicle crash	Near Exit 54B
ANDOVER	Route I-93	Angle	Exit 45
ANDOVER	Route I-93	Angle	Near Exit 44A
ANDOVER	Route I-93	Single vehicle crash	Near Exit 44B
METHUEN	Route I-93	Sideswipe, same direction	Near Pelham Street
METHUEN	Route I-93	Single vehicle crash	Near Exit 47
METHUEN	Route I-93	Single vehicle crash	Exit 46
AMESBURY	Route I-495	Rear-end	Near Exit 54
ANDOVER	Route I-495	Angle	Near Exit 40A
ANDOVER	Route I-495	Rear-end	Near Exit 40A
ANDOVER	Route I-495	Rear-end	Near Exit 44
ANDOVER	Route I-495	Single vehicle crash	Exit 40
ANDOVER	Route I-495	Single vehicle crash	Near Exit 40A
HAVERTHILL	Route I-495	Sideswipe, same direction	I-495 NB
HAVERTHILL	Route I-495	Single vehicle crash	Near Exit 52
HAVERTHILL	Route I-495	Single vehicle crash	Near Exit 51
HAVERTHILL	Route I-495	Single vehicle crash	Near Exit 47
HAVERTHILL	Route I-495	Single vehicle crash	I-495 SB
HAVERTHILL	Route I-495	Unknown	Near Exit 49
LAWRENCE	Route I-495	Single vehicle crash	Near Exit 45
MERRIMAC	Route I-495	Single vehicle crash	Near Exit 53
METHUEN	Route I-495	Angle	Near Exit 47
METHUEN	Route I-495	Rear-end	Near Exit 46
METHUEN	Route I-495	Rear-end	I-495 SB
METHUEN	Route I-495	Single vehicle crash	Near Exit 47
SALISBURY	Route I-495	Single vehicle crash	Near Exit 60
ANDOVER	Route I-495	Single vehicle crash	Near Exit 40A
METHUEN	Route I-495	Single vehicle crash	Exit 47
HAVERTHILL	Route 97	Single vehicle crash	MHD Garage
ANDOVER	Route 28	Angle	511 Main Street
ANDOVER	Route 28	Single vehicle crash	390 North Main Streete
METHUEN	Route 213	Single vehicle crash	Near Exit 4
METHUEN	Route 213	Angle	Exit 4
HAVERTHILL	Route 125	Head-on	Oxford Avenue
HAVERTHILL	Route 125	Single vehicle crash	36 Knipe Road
NORTH ANDOVER	Route 125	Single vehicle crash	Sutton Street
SALISBURY	Route 110	Angle	Scholtz Street
METHUEN	Route 110	Single vehicle crash	615 Lowell Stret
HAVERTHILL	Route 110	Angle	Exit 42
HAVERTHILL	Route 110	Angle	Elliott Street
ROWLEY	Route 1	Angle	Wethersfield Street
ROWLEY	Route 1	Angle	Wethersfield Street
METHUEN	Pelham Street	Single vehicle crash	127 Pelham Street
ANDOVER	North Street	Single vehicle crash	Near Brookside Drive
GEORGETOWN	North Street	Single vehicle crash	247 North Street
HAVERTHILL	North Avenue	Single vehicle crash	491 North Ave.
AMESBURY	Merrill Steet	Head-on	
HAVERTHILL	Kenoza Street	Single vehicle crash	639 Knoza Street
LAWRENCE	Essex Street	Single vehicle crash	Newbury Street
LAWRENCE	Essex Street	Single vehicle crash	350 Essex Street
ROWLEY	Central Street	Sideswipe, opposite direction	
METHUEN	Berkeley Street	Single vehicle crash	186 Berkely Street

Off the interstate system, four fatal crashes occurred on Route 110, and three took place on Route 125. The intersection of Wethersfield Street and Route 1 in Rowley was the site of two fatal crashes in less than three months in 2005. Improvements at this intersection have been made. Essex Street in Lawrence also was the site of two fatal crashes.

Interstate 495

Based on the relative number of lane-miles for the three interstates in the region, one would expect that there would be just slightly more than twice as many crashes on I-495 than there would be on I-93. However, there were over three times as many fatal crashes on I-495 than on Route I-93. Of the 21 fatal crashes that took place on I-495, over half involved a vehicle either rolling over (4), hitting a fixed object (5), striking a parked/stopped motor vehicle (2), or a pedestrian (1).

On I-93 and I-95 combined, there were no fatal crashes involving vehicles striking a stopped/parked vehicle or fixed object while seven such fatal crashes took place on I-495. One possible explanation for this is that the vertical and horizontal alignments on I-495 are far more variable than they are for the other two roadways, which are very straight and fairly level. Safety issues at the interchanges and elsewhere along the highway are being considered in the state's Route I-495 Corridor Study

Pedestrian and Bicycle Crashes

Table V-4 below shows a community-by-community summary of the number of crashes in the region involving pedestrians. As one would expect, most of the pedestrian crashes occurred in the largest and most densely developed communities in the region, Lawrence and Haverhill. 64% of the pedestrian crashes counted in the Valley took place in these two communities.

Of the 59 fatal crashes that took place on the region's transportation network in 2003-2005, 14 or 23.7% were pedestrian crashes. Interestingly, the most fatalities (4) were not found in either Lawrence or Haverhill but in Methuen, which is also a large community with a densely developed downtown and surrounding neighborhoods. While there were 75 crashes involving pedestrians in Haverhill, only one resulted in a fatality. Andover had a fairly low number (14) of pedestrian crashes given its size, but three of these were fatal.

**Table V-4
Pedestrian Crashes in the Merrimack Valley Region
2003 - 2005**

Community	Crashes	Crashes w/ Injury	Crashes w/ Fatality
Amesbury	10	9	0
Andover	14	5	3
Boxford	1	1	0
Georgetown	1	1	0
Groveland	3	2	0
Haverhill	75	54	1
Lawrence	101	56	3
Merrimac	2	2	0
Methuen	31	21	4
Newbury	0	0	0
Newburyport	15	12	1
North Andover	16	3	2
Rowley	1	1	0
Salisbury	2	1	0
West Newbury	1	0	0
TOTAL	273	168	14

Table V-5 shows a similar summary for the bike crashes that occurred in the region. There was only 1 fatal bicycle crash during 2003-2005, which occurred in Newbury. Again, the majority of the other crashes involving bicyclists took place in Lawrence and Haverhill.

**Table V-5
Bicycle Crashes in the Merrimack Valley Region
2003 – 2005**

Community	Crashes	Crashes w/ Injury	Crashes w/ Fatality
Amesbury	2	2	0
Andover	6	0	0
Boxford	0	0	0
Georgetown	2	1	0
Groveland	1	0	0
Haverhill	48	29	0
Lawrence	53	30	0
Merrimac	0	0	0
Methuen	19	9	0
Newbury	1	1	1
Newburyport	14	11	0
North Andover	10	3	0
Rowley	3	2	0
Salisbury	2	1	0
West Newbury	0	0	0
TOTAL	161	89	1

At-Grade Roadway-Rail Crossings within the Region

One of the crucial high-risk locations on the regional transportation network is at roadway-railway crossings. These locations are of particular importance in the Merrimack Valley region as high-speed commuter rail service is operated along two rail lines; the Haverhill Main Line that runs through Andover, Lawrence, North Andover and Haverhill as well as the Eastern Route that runs through Rowley, Newbury and Newburyport. In addition, the Haverhill Main Line carries a heavy amount of freight traffic to New Hampshire and Maine.

Available data shows that there are 23 crossings of roadways with active rail lines in the region and approximately 13 crossings of roadways with rail lines no longer in use. The lines no longer in use include the section of the Eastern Route located north of Newburyport as well as the Amesbury branch off that line. Another abandoned line is located in Merrimac. Finally, sections of the Manchester and Lawrence Branch of the old B&M Railroad in Lawrence and Methuen have been abandoned.

Table V-6 presents a listing of all of the inactive or abandoned railroads that have at-grade crossings with roadways within the region. Also listed in the table are the average daily traffic (ADT) volumes carried on the roadway and the distances of the M&L line from the New Hampshire border, and the distance of the M&L and B&M spurs from their merge points with rail lines.

**Table V-6
Region's At-Grade Roadway-Rail Crossings (Inactive Railroad Lines)**

City	Roadway	F.C. ^a	ADT ^b	RR Line	RR Serves	Tr ^c
Salisbury	Cushing St.	Local	558	B&M Spur	None	0
Salisbury	Bartlett St.	UC	1,000	B&M Spur	None	0
Methuen	Union St.	Local	500	M&L	None	0
Lawrence	Haverhill St.	xRPA	22,900	M&L	None	0
Lawrence	Essex St.	UMA	12,500	M&L	None	0
Lawrence	Water St.	UMA	19,600	M&L	None	0
Lawrence	Broadway	UOPA	26,000	M&L	None	0
Lawrence	Amesbury St.	UMA	8,162	M&L Spur	None	0
Lawrence	Appleton St.	Local	50	M&L Spur	None	0
Lawrence	Jackson St.	Local	0	M&L Spur	None	0
Lawrence	Mill St.	Local	50	M&L Spur	None	0
Lawrence	Canal St.	UMA	2,003	M&L Spur	None	0
Lawrence	Union St.	UMA	11,282	M&L Spur	None	0

^aFC = Roadway functional class: xRPA = Urban extension of a Rural Principal Arterial; UOPA = Urban Other Principal Arterial; UMA = Urban Minor Arterial; UC = Urban Collector.

^bADT = Average Daily Traffic volume on roadway at or near crossing, in vehicles per day. Source: MHD and MVPC; italics are estimates.

^cTr = scheduled weekday daily passenger train trips.

The active railroad lines within the region include the Haverhill MBTA line and the old B&M line on the same railroad to the north of the Haverhill station (all of which is owned by PA), which is used by AMTRAK and PA freight trains; a spur off of the line in Lawrence to the

Riverfront Industrial Park; the Newburyport MBTA line, with at-grade roadway crossings in Rowley and Newbury; and the spur off of the PA (MBTA/PA) line in the Lowell Junction industrial area of Andover, which heads to Lowell, crossing Gillette Way and Lowell Junction Road. The Federal Railroad Administration (FRA) classifies the Haverhill MBTA/B&M line as a Class 3 rail, which means that a maximum operating speed of 40 mph is allowed for freight trains and a maximum of 60 mph is allowed for passenger trains. Table V-7 presents a listing of all of the active railroads that have at-grade crossings with roadways within the region. In addition to the items listed in the table including roadway ADTs and the distances of lines from the New Hampshire border or end of the line, are items such as the railroad users and the number of weekday daily passenger train trips at each crossing.

**Table V-7
Region's At-Grade Roadway-Rail Crossings (Active Railroad Lines)**

City	Roadway	F.C. ^a	ADT ^b	RR	Dist. ^c	Railroad Serves ^d	Tr ^e
Lawrence	Merrimac St.	UMA	9,500	Spur	3.4	PA	0
Lawrence	S. Broadway	UOPA	18,900	Spur	0.1	PA	0
Lawrence	Beacon St.	UMA	6,300	Spur	0.8	PA	0
Lawrence	Glenn St.	Local	2,000	Spur	1.1	PA	0
Lawrence	Shepard St.	Local	2,100	Spur	1.2	PA	0
Haverhill	Rosemont St.	UMA	6,100	PA	0.9	PA, ATRK	8
Haverhill	Cross Rd.	UC	880	PA	5.8	PA, ATRK, MBTA	34
N. Andover	North Main St.	Local	500	PA	8.9	PA, ATRK, MBTA	34
N. Andover	Sutton St.	xRPA	16,500	PA	9.0	PA, ATRK, MBTA	34
N. Andover	Marblehead St.	Local	2,600	PA	9.3	PA, ATRK, MBTA	34
Lawrence	Andover St.	Local	14,000	PA	10.8	PA, ATRK, MBTA	34
Andover	Pearson St.	Local	1,800	PA	13.6	PA, ATRK, MBTA	36
Andover	Essex St.	UMA	7,300	PA	13.6	PA, ATRK, MBTA	36
Andover	Austin Ave.	Local	50	PA	14.1	PA, ATRK, MBTA	36
Andover	Andover St.	UMA	10,000	PA	15.8	PA, ATRK, MBTA	36
Andover	Tewksbury St.	UC	2,000	PA	15.8	PA, ATRK, MBTA	36
Andover	Lowell Jct. Rd.	Local	6,200	PA	16.5	PA, ATRK, MBTA	36
Andover	Lowell Jct. Rd.	Local	6,200	PA	0.0	PA	0
Andover	Gillette Way	Local	1,000	PA	0.1	PA	0
Newbury	Hanover St.	RMC	3,538	MBTA	0.7	MBTA	26
Newbury	Boston Rd.	RMC	780	MBTA	1.3	MBTA	26
Newbury	Hay St.	RMC	560	MBTA	2.0	MBTA	26
Rowley	Railroad Ave.	Local	200	MBTA	5.3	MBTA	26

^aFC = Roadway functional class: xRPA = Urban extension of a Rural Principal Arterial; UOPA = Urban Other Principal Arterial; UMA = Urban Minor Arterial; UC = Urban Collector; RMC = Rural Minor Collector.

^bADT = Average Daily Traffic volume on roadway at or near crossing, in vehicles per day. Source: MHD and MVPC; italics are estimates.

^cDistance in miles along railroad line from end of line or from state line to roadway crossing. Distance of M&L line from NH state line (3.6 mile total to merge with B&M line); distance of B&M spur in Lawrence from merge with B&M line; distance of Haverhill B&M line from NH state line (MBTA service ends at Haverhill train station 3.5 miles from NH state line); distance of Newburyport MBTA line from end of line at Newburyport station (5.5 mile total to Ipswich town line); and distance of abandoned B&M line spur in Lowell Junction area from the merge with the active B&M line.

^dRailroad line users: PA = PanAm Rail Systems Freight trains, ATRK = AMTRAK Downeaster, MBTA = Massachusetts Bay Transportation Company commuter rail trains.

^eTr = scheduled weekday daily passenger train trips including AMTRAK (4 inbound & 4 outbound) and MBTA. Does not include freight train trips.

The Haverhill MBTA line has the most at-grade roadway crossings in this region and is the most active for passenger rail traffic. The highest volume roadways that the rail line crosses are urban arterials including Sutton Street in North Andover and Andover Street in Andover. The line also crosses Andover Street in Lawrence, which is functionally classified as a local road, despite the heavy volume of traffic that it carries.

The inventory taken of all of the region's at-grade roadway-railroad crossings by use of the aerial photographs included an examination of the existence of traffic control or warning devices such as STOP bars, gates, and flashing lights. Also a basic survey of the crossing geometry was taken including the number of travel lanes on the roadway, the number of railroad tracks at the crossing, the horizontal alignment between the roadway and the railroad tracks, and the distance to clear the crossing on the roadway, taken from gate to gate, or STOP bar to STOP bar, where no gates exist. Table V-8 presents a listing of the inactive rail line crossings and their associated geometries.

**Table V-8
Region's At-Grade Roadway-Rail Crossing Traffic Control & Geometry
(Inactive Railroad Lines)**

City	Roadway that Railroad Crosses	Traffic Controls			Railroad and Road Geometry			
		Flashers?	Gates?	STOP BARS?	# of Lns ^a	# of Trks ^b	Align-ment ^c	Dist-ance ^d
Salisbury	Cushing St.	No	No	No	2	1	45°	-
Salisbury	Bartlett St.	No	No	No	2	1	55°	-
Methuen	Union St.	No	No	No	2	1	35°	-
Lawrence	Haverhill St.	No	No	No	2	2	70°	-
Lawrence	Essex St.	No	No	No	2	1	80°	-
Lawrence	Water St.	Yes	Yes	No	2	1	90°	25'
Lawrence	Broadway	Yes	Yes	No	2	1	10°	180'
Lawrence	Amesbury St.	No	No	No	4	1	90°	-
Lawrence	Appleton St.	No	No	No	2	1	90°	-
Lawrence	Jackson St.	No	No	No	2	1	90°	-
Lawrence	Mill St.	No	No	No	2	1	90°	-
Lawrence	Canal St.	No	No	No	2	1	30°	-
Lawrence	Union St.	No	No	No	2	1	30°	-

^aNumber of vehicle travel lanes on roadway at crossing.

^bNumber of railroad tracks in parallel at crossing.

^cAlignment between roadway and railroad tracks; range is between 5 and 90 degrees.

^dDistance for vehicle to clear crossing from gate to gate (in feet). Add 20 feet for a passenger vehicle, when figuring total distance to cross, including vehicle length. Distance for Merrimac Street is from STOP BAR to STOP BAR.

Most of the crossings of roadways with inactive rail lines have little or no warning devices, with the exception of M&L line crossings with Broadway and Water Street in Lawrence, where there are gates and flashing lights. The crossing on Merrimac Street has pavement markings, but no flashers or gates. Because the tracks cross Broadway at such an acute angle (10°), the distance to clear the crossing, from gate to gate is approximately 180 feet. Even though the Right-of-Way still may exist for the old M&L spur to the Canal Street industrial area, tracks do not currently exist across Amesbury Street, Appleton Street, Mill Street, Canal

Street, and Union Street, however old tracks exist on either side of these roadways, excepting Union Street.

Table V-9 presents a listing of the active rail line crossings and their associated geometries.

**Table V-9
Region's At-Grade Roadway-Rail Crossing Traffic Control & Geometry
(Active Railroad Lines)**

City	Roadway that Railroad Crosses	Traffic Controls			Railroad and Road Geometry			
		Flashers?	Gates?	STOP BARS?	# of Lns ^a	# of Trks ^b	Align-ment ^c	Dist-ance ^d
Lawrence	Merrimac St.	No	No	Yes	2	2	85°	35'
Lawrence	S. Broadway	No	No	No	2	1	45°	-
Lawrence	Beacon St.	No	No	No	2	1	35°	-
Lawrence	Glenn St.	No	No	No	2	1	30°	-
Lawrence	Shepard St.	No	No	No	2	1	85°	-
Haverhill	Rosemont St.	Yes	Yes	No	2	2	70°	50'
Haverhill	Cross Rd.	Yes	Yes	No	2	2	45°	50'
N. Andover	North Main St.	Yes	Yes	No	2	2	70°	40'
N. Andover	Sutton St.	Yes	Yes	Yes	2	2	20°	230'
N. Andover	Marblehead St.	Yes	Yes	Yes	2	2	55°	55'
Lawrence	Andover St.	Yes	Yes	No	2	4	80°	75'
Andover	Pearson St.	Yes	Yes	Yes	2	1	70°	30'
Andover	Essex St.	Yes	Yes	Yes	2	1	70°	25'
Andover	Austin Ave.	Yes	No	No	1	1	90°	45'
Andover	Andover St.	Yes	Yes	Yes	2	1	90°	25'
Andover	Tewksbury St.	Yes	Yes	Yes	2	1	40°	45'
Andover	Lowell Jct. Rd.	Yes	Yes	Yes	2	1	75°	25'
Andover	Lowell Jct. Rd.	No	No	No	2	2	35°	-
Andover	Gillette Way	No	No	No	2	1	20°	-
Newbury	Hanover St.	Yes	Yes	Yes	2	2	80°	45'
Newbury	Boston Rd.	Yes	Yes	Yes	2	2	85°	40'
Newbury	Hay St.	Yes	Yes	Yes	2	1	70°	40'
Rowley	Railroad Ave.	Yes	Yes	Yes	2	1	70°	30'

^aNumber of vehicle travel lanes on roadway at crossing.

^bNumber of railroad tracks in parallel at crossing. On Haverhill B&M line, double tracks merge to single track in Andover, 12.7 miles from the NH state line. On Newburyport B&M line, double tracks merge to single track in Newbury immediately north of Hay Street, 2.0 miles from the end of the line at Newburyport station.

^cAlignment between roadway and railroad tracks; range is between 5 and 90 degrees.

^dDistance for vehicle to clear crossing from gate to gate (in feet). Add 20 feet for a passenger vehicle, when figuring total distance to cross, including vehicle length.

All of the MBTA railroad crossings with roadways in the region, except one, have both flashing lights and gates as warning devices for vehicles. The one exception is Austin Avenue in Andover, which is a low volume roadway that serves as an access to St. Augustine cemetery. This crossing only has flashing lights. Most all the railroad and roadway crossings on the Haverhill and Newburyport MBTA lines have perpendicular or nearly perpendicular alignments between the roadway and the railroad tracks. Exceptions to this include the Sutton Street and Marblehead Street crossings in North Andover and the Tewksbury Street crossing in Andover. Because the Sutton Street crossing has such an acute alignment (20°) between

the railroad and the roadway, the gates are set approximately 230 feet apart from one another, which necessitates a long clearance time interval of flashing lights and bells before the gates can come down.

The Federal Railroad Administration (FRA), of the United States Department of Transportation, has compiled a National Inventory File of all of the at-grade highway-rail crossings within the United States and their associated crash history. The inventory includes all active or recently active (within the last 10 years) highway-rail crossings. The FRA admits that data records for certain crossings may not be completely current, due to a State or a railroad not recently providing information to the agency. This results in inactive railroad lines being included within the inventory. The inactive lines that were included in the Merrimack Valley include the recently inactive M&L branch in Lawrence, the Canal Street B&M industrial spur in Lawrence, and the Salisbury B&M spur to the Amesbury industrial area.

Based on the FRA inventory, there are a total of 1,131 rail crossings with roadways within the state of Massachusetts, and 137 of them are within Essex County. Of the 137 within Essex County, 36 are located within the Merrimack Valley planning region, and are listed on V-10, below.

The FRA has estimated the probability of crashes occurring at highway-rail crossings using a computer model, the Web Accident Prediction System (WBAPS, Version 1.0). The WBAPS accident prediction formula is based upon two independent factors, including: (1) basic data about the crossing's physical or operating characteristics, and (2) five years of accident history at the crossing. There are certain factors that are not included, most notably sight-distance, highway congestion, bus or hazardous material traffic, local traffic, and passenger exposure.

The FRA hopes that this basic model can assist State highway and planning authorities in identifying and allocating where appropriate resources should be directed for physical and safety improvements or enhancements and also alert law enforcement agencies as to where specialized attention should be given for traffic enforcement. The FRA acknowledges that the model data "nominates crossings for further on-the-ground review by knowledgeable highway traffic engineers and specialists". Table IV-10 lists the at-grade rail crossings within the Merrimack Valley by ranking of predicted collisions.

**Table V-10
Predicted Collisions at the Region's At-Grade Roadway-Rail Crossings**

County & (State) Rank	City	Roadway that Railroad Crosses	Predicted Annual Collision^a	5-yr Hist. Coll^b	WD^c	No. of Trk^d	Trn Spd^e	Tr^f
1(9)	N. Andover	Sutton St.	0.092205	2	GT	2	40	10
4(33)	Lawrence	Andover St.	0.053487	1	GT	4	35	15
5(42)	N. Andover	Marblehead St.	0.047123	1	GT	2	40	10
6(44)	Lawrence	S. Broadway	0.045792	0	SP	1	35	15
9(64)	Haverhill	Rosemont St.	0.040587	1	GT	1	40	7
20(128)	Lawrence	Amesbury St.	0.027862	0	XB	1	15	2
38(241)	Lawrence	Merrimac St.	0.017726	0	SP	1	15	2
40(258)	Andover	Essex St.	0.017033	0	GT	1	40	10
41(259)	Andover	Andover St.	0.017033	0	GT	1	40	10
44(309)	Haverhill	Cross Road	0.015244	0	GT	2	40	10
50(389)	Andover	Austin Ave.	0.012145	0	FL	1	40	10
51(467)	N. Andover	N. Main St.	0.009797	0	GT	2	40	9
52(469)	Lawrence	Beacon St.	0.009724	0	SP	1	15	2
53(483)	Andover	Pearson St.	0.009335	0	GT	1	40	10
54(520)	Andover	Tewksbury St.	0.008375	0	GT	1	40	10
55(561)	Rowley	Railroad Ave.	0.007304	0	GT	1	30	24
56(569)	Andover	Lowell Jct. Rd.	0.007090	0	GT	1	40	12
57(620)	Lawrence	Shepard St.	0.005732	0	SP	1	15	2
58(621)	Lawrence	S. Canal St.	0.005732	0	SP	1	11	2
59(622)	Lawrence	Glenn St.	0.005732	0	SP	1	15	2
60(722)	Lawrence	Broadway	0.002646	0	XB	1	20	0
74(779)	Salisbury	Cushing St.	0.000445	0	XB	1	15	0
75(780)	Salisbury	Bartlett St.	0.000445	0	XB	1	15	0
99(900)	Newbury	Hanover St.	0.000351	0	GT	2	30	0
100(904)	Lawrence	Water St.	0.000302	0	GT	2	20	0
101(905)	Newbury	Hay St.	0.000302	0	GT	1	30	0
105(943)	Methuen	Union St.	0.000206	0	SP	1	20	0
106(944)	Lawrence	Haverhill St.	0.000206	0	SP	2	20	0
107(945)	Lawrence	Essex St.	0.000206	0	SP	1	20	0
131(1100)	Lawrence	Canal St.	0.000170	0	SP	4	15	0
132(1101)	Lawrence	Appleton St.	0.000170	0	SP	1	20	0
133(1102)	Lawrence	Union St.	0.000170	0	SP	1	20	0
134(1103)	Lawrence	Mill St.	0.000170	0	SP	2	20	0
135(1105)	Lawrence	Jackson St.	0.000170	0	SP	1	20	0
136(1129)	Newbury	Boston St.	0.000086	0	GT	2	30	0
		<i>Region Total</i>	0.461103	5				
		<i>County Total</i>	1.582158	9				
		<i>State Total</i>	13.420000	52				

^aPredicted annual collision is the probability that a collision will occur on any given year. For example, a predicted collision of 0.10 indicates that there is a 10 percent chance of a collision occurring in any year, or one collision occurring over a ten-year span. Shaded crossings have rail lines that are no longer active.

^bThe five-year history of roadway-rail collisions at this location, between 1997 and 2001.

^cWD = train warning devices for traffic control: GT = gates; FL = flashing lights; XB = crossbucks; SP= special protection (i.e. flagman). ^dTrk % = percentage of trucks using the road.

^eTrn Spd= train speed in miles per hour. ^fTr = daily train trips including freight train trips.

According to the FRA collision prediction model, there are approximately 13 collisions that are anticipated to occur at at-grade roadway-rail crossings within the state on any given year, of which approximately 1 1/2 will occur within Essex County, and 1/2 will occur at within the Merrimack Valley region. The predicted annual collision rate of 1/2 collisions (or approximately 50% probability) for the Merrimack Valley can actually be translated into a 100% probability of one collision occurring every two years, which is significantly less than the historical average rate of one collision per year. A contributing factor to the low predictive rate may be the low train traffic volume that was input into the model. For example, the FRA has estimated that there are 10 train trips at roadway crossings with the MBTA Haverhill railroad line. In many crossings on this line, the actual weekday daily trip count of passenger train traffic is somewhere between 34 and 36 trips, without counting the freight train traffic. Also, the Newburyport MBTA line had no daily train trips through the crossings in Newbury in the FRA's WBAPS model. There are actually approximately 26 daily train trips during a weekday on this line.

The crossing within the Merrimack Valley region where a collision is most likely to take place is the Sutton Street crossing in North Andover, which is also ranked first in all of Essex County and ninth overall in the state, according to the FRA. This crossing has some of the heaviest volumes of train traffic and vehicular traffic meeting at a crossing in the region. The crossing is also one of the longest for vehicles to cross at 230 feet, due to the acute alignment (20°) of the railroad tracks with the roadway. The crossing has a predicted annual collision rate of 0.092205 or a 9.2 percent probability that a collision will occur on any given year, according to the FRA's WBAPS model. This predictive rate translates to an approximate 100 percent probability that one collision will occur every eleven years. This is far below the historical trend of collisions at this crossing, which may be due to inputs into the model using the low estimate of trains at the crossing (10), which has 36 scheduled passenger train crossings, and the low estimate of ADT on Sutton Street (7,900 vpd), which MassHighway recorded at 16,500 vpd in 2001. The crossing experienced two collisions within the five-year history between 1997 and 2001 and two more collisions within the five years prior to that. All of these collisions resulted in property damage only. For the two most recent collisions, one involved a PA train that struck a vehicle abandoned on the tracks, late at night in April of 2000. The operator of the vehicle was charged with operating under the influence of alcohol. The other collision, in June of 1997, involved an MBTA commuter rail train and a commuter bus, whose driver had the vehicle caught between the gates and which resulted in only the passenger-side mirror being clipped. In both cases, the warning devices at the crossing were working properly. On December 11, 2002, a fatal collision occurred between a car and a commuter train when a gate fell on the hood of the car and the driver drove forward through the gate. The driver and passenger of the car were the two fatalities. It was determined that all warning devices were working properly and the train engineer applied the brakes, which were working properly, upon seeing the vehicle move through the gates and that the collision was due to driver error. After the collision, the MBTA began distributing pamphlets to drivers at the crossing that encouraged basic safety. The MBTA Safety Department and Commuter Rail Trespass Prevention Task Force investigated the crossing and made 14 recommendations for improving it. Among the recommendations are: replacing the 8-inch diameter flashing red lights with 12-inch ones, adding signs and reflectors, having the Town of North Andover paint crossbuck warnings in the road, and bringing back the train whistle at the crossing.

The crossing of Andover Street with the railroad tracks in Lawrence has the next highest probability of a collision occurring, with a predicted rate of 0.053487 collisions per year. The low predictive rate from the model is again most likely due to the low volume of train traffic that was used as input. The model had 15 daily train crossings when in fact there are at least 36 passenger-train crossings on a weekday. This crossing has experienced one vehicular collision with an MBTA commuter rail train in the five-year period between 1997 and 2001, and a vehicular collision with a PA freight train, late at night, in the five years prior to that. Both collisions involved property damage only and the trains were both traveling less than 10 mph. This crossing has 4 train tracks across it and trains typically travel at very low speeds. Andover Street is a local road that carries approximately 14,000 vpd. It is an east/west road that connects to major arterials, Broadway (Route 28) and Winthrop Street (Route 114).

The crossing of Marblehead Street with the railroad tracks in North Andover is the third highest ranked crossing in the region with a predicted collision rate of 0.053487 collisions per year. This crossing has experienced one collision with a train in the ten-year period ending in 2001. The collision occurred in April of 1997 and involved a pedestrian and an MBTA commuter train, which resulted in a fatal injury to the pedestrian.

Railway – Roadway Crashes in the Merrimack Valley Region 2002-2006

In addition to the crash that took place at the Sutton Street crossing in North Andover in 2002, there were crashes at the Andover Street crossing in Lawrence and at the Rosemont street crossing in Haverhill. The crash at Andover Street was not surprising given the predicted crash probability as described above. The crash at Rosemont Street in 2002 was the second at that location in two years.

Safety Assurance Program

The FRA promotes safety on the nation's railroads by the enforcement of safety regulations and monitoring of operations of railroads. The Agency directs more than 415 Federal safety inspectors in 36 offices nationwide and 159 State inspectors in 30 States. The year of 2001 marked an all-time low for rail-related incidents on record. Between 1978 and 2001, the number of reported train accidents dropped from 10,991 to 2,965 across the nation. The grade crossing safety record has improved as well. In 1990, there were a total of 698 fatalities at crossings, and in 2001, the number of fatalities was down to 419, despite increases in both roadway and rail traffic, during that period. Improvement has resulted by a variety of sources, including public investment in warning devices and a greater awareness of the risks at crossings by the roadway users, caused by the combined efforts of railroad managers and employees, FRA, the States, the Department of Transportation partners (Federal Highway Administration, Federal Transit Administration, Federal Motor Carrier Safety Administration, and the National Highway Traffic Safety Administration), and Operation Lifesaver, Inc.

The railroads have the responsibility for complying with the standards that the FRA sets by doing inspections and tests to ensure that they do. The FRA has set up a Safety Assurance and Compliance Program (SACP) that finds the root causes of safety problems and then develops solutions by cooperative involvement with railroad management and employees. The program also focuses inspections and enforcement tools on the most serious safety risks revealed by inspections and accident data.

In Massachusetts, an AMTRAK SACP partnership was created with the MBTA to facilitate the installation of Advanced Civil Speed Enforcement System (ACSES) onboard equipment on commuter locomotives and control cars. These positive train control systems, such as collision avoidance systems, should reduce collisions even further. The FRA facilitated weekly progress meetings, including equipment vendors, to move the project forward.