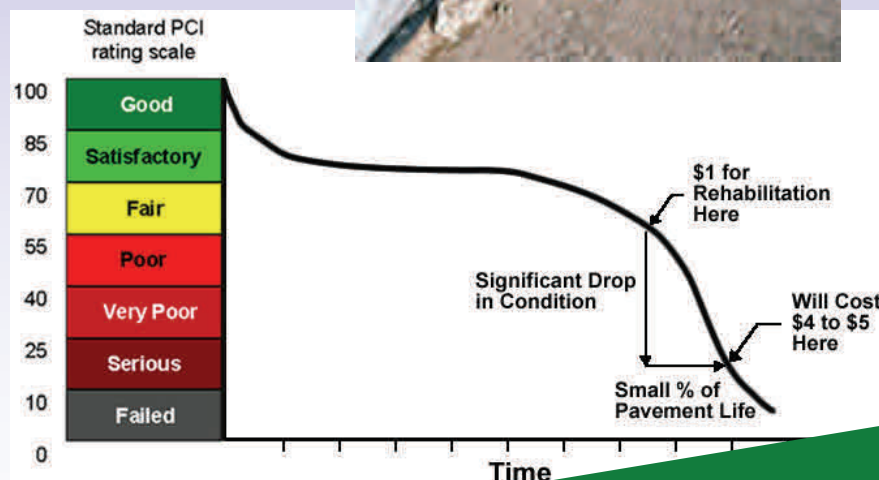




Chapter 7 – Infrastructure

Introduction

Within the transportation system, the infrastructure that makes up and serves the roadway network is critical to its effectiveness and efficiency. Poorly maintained bridges, dams and pavement impact all aspects of movement, from commuting and recreation to freight and emergency services.

Bridges

Throughout the Montachusett region, many of its roads travel over numerous brooks, rivers and water bodies. Within the 22 communities of the Montachusett planning area, some 321 bridges are identified and rated by MassDOT as part of their inventory system. MassDOT has provided a Bridge Rating Table to the MRPC that includes the community where the bridge is located, the road name the bridge is located on, the bridge identification number, functional classification of the road, year built, historical significance, rebuilt date (if applicable), AASHTO (American Association of State Highway and Transportation Officials) rating, and the deficiency status of each bridge, i.e. structurally deficient or functionally obsolete.

Structurally deficient bridges are the main concern in terms of repair priorities. A Structurally deficient bridge is not necessarily unsafe but is deteriorated to a point where it must be closely monitored and inspected or repaired. A bridge that is *functionally obsolete* is also not necessarily unsafe but may not have adequate lane widths, shoulder widths, or vertical clearances to serve current traffic demand.

In order to maintain an efficient movement of goods and people, a responsive and adequately funded bridge maintenance system is essential. Bridge closings and weight restrictions alter traffic patterns by forcing vehicles to find alternate routes frequently leading through residential streets. The result is increased congestion and pollution, potential loss of business, the potential for more accidents and failure of the emergency planning process.

Montachusett Bridges – Current & Historical

Within the Montachusett Region, the 2014 Bridge Rating Table lists 53 bridges as functionally obsolete (FO) and 38 as structurally deficient (SD). This represents approximately 28% (91 of 321) of the Region's total bridges. These numbers are an improvement from numbers presented in the 2012 RTP as in 2012 approximately 34% (107 of 317) of the regions bridges reported were either SD or FO. These improvements are directly related to investments in the network from the implementation of MassDOT's *Accelerated Bridge Program* (ABP).



Statewide since 2008, the number of former MassDOT and DCR structurally deficient bridges has dropped from 543 to 416, a decline of 23%. As of October 1, 2014, the ABP has completed 160 bridge projects, with another 29 bridge projects in construction, and an additional 5 bridge projects scheduled to start construction within the next calendar year. Over the course of the eight year program, well over 250 bridges are planned to be repaired or replaced.

Investments in bridge infrastructure have developed a trend in which the overall condition of bridges in the Montachusett region has improved. In 15 years the percentage of bridges either FO or SD has decreased from 35% in 1999 to 28% in 2014. The effects of the ABP can be seen more dramatically in the decrease in SD bridges from 16% in 2006 to 12% in 2014.

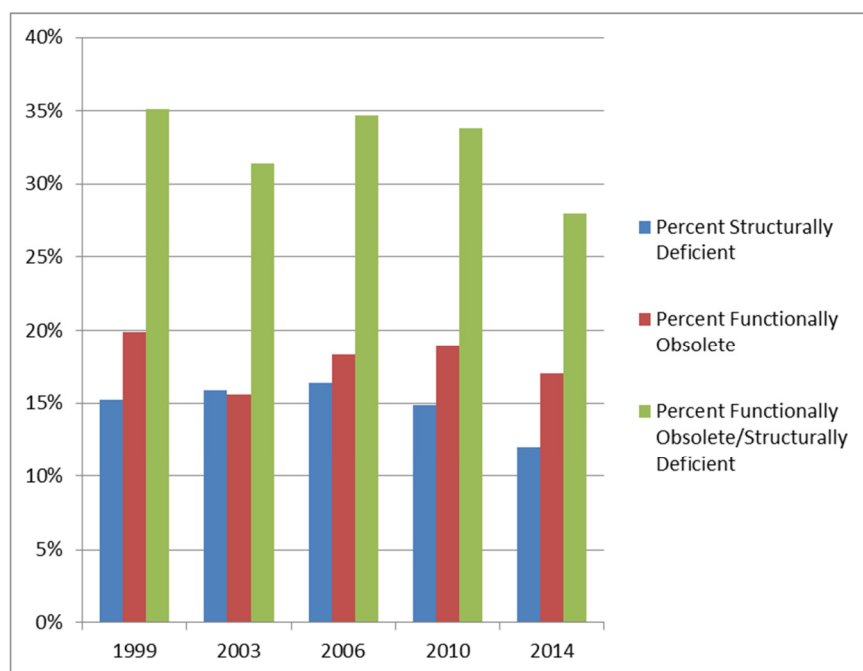
The following table and chart illustrate the percent of functionally obsolete and structurally deficient bridges within the Montachusett Region from in the last 15 years.

Historical Bridge Ratings in MRPC Region

	1999	2003	2006	2010	2014
<i>Percent Structurally Deficient</i>	15%	16%	16%	15%	12%
<i>Percent Functionally Obsolete</i>	20%	16%	18%	19%	17%
<i>Percent Functionally Obsolete/Structurally Deficient</i>	35%	31%	35%	34%	28%

* Percentages accurate within 1%





The following table provides a breakdown of the total bridge numbers by municipality as well as the number of structurally deficient and functionally obsolete bridges in each community from the 2014 Bridge Rating Table.

2014 Bridges – Functionally Obsolete (FO) & Structurally Deficient (SD) by Community

Community	Total	FO	% of Total	SD	% of Total	FO & SD	% of Total
Ashburnham	5	1	20.0%	0	0.0%	1	20.0%
Ashby	6	1	16.7%	0	0.0%	1	16.7%
Athol	22	1	4.5%	8	36.4%	9	40.9%
Ayer	4	1	25.0%	0	0.0%	1	25.0%
Clinton	6	0	0.0%	0	0.0%	0	0.0%
Fitchburg	41	9	22.0%	3	7.3%	12	29.3%
Gardner	32	2	6.3%	4	12.5%	6	18.8%
Groton	5	4	80.0%	0	0.0%	4	80.0%
Harvard	18	8	44.4%	0	0.0%	8	44.4%
Hubbardston	8	0	0.0%	3	37.5%	3	37.5%



Lancaster	15	3	20.0%	1	6.7%	4	26.7%
Leominster	35	7	20.0%	2	5.7%	9	25.7%
Lunenburg	5	1	20.0%	0	0.0%	1	20.0%
Petersham	4	1	25.0%	1	25.0%	2	50.0%
Phillipston	5	0	0.0%	0	0.0%	0	0.0%
Royalston	11	0	0.0%	4	36.4%	4	36.4%
Shirley	6	2	33.3%	1	16.7%	3	50.0%
Sterling	31	1	3.2%	0	0.0%	1	3.2%
Templeton	18	3	16.7%	1	5.6%	4	22.2%
Townsend	14	3	21.4%	3	21.4%	6	42.9%
Westminster	16	0	0.0%	2	12.5%	2	12.5%
Winchendon	14	5	35.7%	5	35.7%	10	71.4%
MRPC Region	321	53	16.5%	38	11.8%	91	28.3%

The following table provides a comparison between the 2006 and 2010 bridge data for each Montachusett community.



2014 vs 2006 Bridges – Functionally Obsolete (FO) & Structurally Deficient (SD) by Community								
Community	Year	Total	FO	% of Total	SD	% of Total	FO & SD	% of Total
Ashburnham	2014	5	1	20.0%	0	0.0%	1	20.0%
	2010	5	0	0.0%	0	0.0%	0	0.0%
	2006	5	0	0.0%	1	20.0%	1	20.0%
Ashby	2014	6	1	16.7%	0	0.0%	1	16.7%
	2010	5	3	60.0%	1	20.0%	4	80.0%
	2006	5	2	40.0%	0	0.0%	2	40.0%
Athol	2014	22	1	4.5%	8	36.4%	9	40.9%
	2010	22	3	13.6%	10	45.5%	13	59.1%
	2006	21	3	14.3%	6	28.6%	9	42.9%
Ayer	2014	4	1	25.0%	0	0.0%	1	25.0%
	2010	4	1	25.0%	0	0.0%	1	25.0%
	2006	4	1	25.0%	0	0.0%	1	25.0%
Clinton	2014	6	0	0.0%	0	0.0%	0	0.0%
	2010	6	0	0.0%	1	16.7%	1	16.7%
	2006	6	0	0.0%	2	33.3%	2	33.3%
Fitchburg	2014	41	9	22.0%	3	7.3%	12	29.3%
	2010	41	9	22.0%	6	14.6%	15	36.6%
	2006	41	7	17.1%	5	12.2%	12	29.3%
Gardner	2014	32	2	6.3%	4	12.5%	6	18.8%
	2010	32	3	9.4%	5	15.6%	8	25.0%
	2006	32	5	15.6%	4	12.5%	9	28.1%
Groton	2014	5	4	80.0%	0	0.0%	4	80.0%
	2010	5	2	40.0%	0	0.0%	2	40.0%
	2006	5	1	20.0%	0	0.0%	1	20.0%
Harvard	2014	18	8	44.4%	0	0.0%	8	44.4%
	2010	18	7	38.9%	1	5.6%	8	44.4%
	2006	18	6	33.3%	2	11.1%	8	44.4%
Hubbardston	2014	8	0	0.0%	3	37.5%	3	37.5%
	2010	8	1	12.5%	2	25.0%	3	37.5%
	2006	8	1	12.5%	1	12.5%	2	25.0%
Lancaster	2014	15	3	20.0%	1	6.7%	4	26.7%
	2010	15	5	33.3%	0	0.0%	5	33.3%
	2006	15	5	33.3%	1	6.7%	6	40.0%
Leominster	2014	35	7	20.0%	2	5.7%	9	25.7%
	2010	34	4	11.8%	2	5.9%	6	17.6%
	2006	35	3	8.6%	4	11.4%	7	20.0%
Lunenburg	2014	5	1	20.0%	0	0.0%	1	20.0%
	2010	5	1	20.0%	0	0.0%	1	20.0%
	2006	5	1	20.0%	1	20.0%	2	40.0%
Petersham	2014	4	1	25.0%	1	25.0%	2	50.0%
	2010	4	1	25.0%	2	50.0%	3	75.0%
	2006	4	1	25.0%	2	50.0%	3	75.0%
Phillipston	2014	5	0	0.0%	0	0.0%	0	0.0%
	2010	5	0	0.0%	1	20.0%	1	20.0%
	2006	5	0	0.0%	1	20.0%	1	20.0%
Royalston	2014	11	0	0.0%	4	36.4%	4	36.4%
	2010	11	0	0.0%	3	27.3%	3	27.3%
	2006	11	0	0.0%	4	36.4%	4	36.4%
Shirley	2014	6	2	33.3%	1	16.7%	3	50.0%
	2010	6	1	16.7%	0	0.0%	1	16.7%
	2006	6	1	16.7%	0	0.0%	1	16.7%
Sterling	2014	31	1	3.2%	0	0.0%	1	3.2%
	2010	31	6	19.4%	1	3.2%	7	22.6%
	2006	31	7	22.6%	4	12.9%	11	35.5%
Templeton	2014	18	3	16.7%	1	5.6%	4	22.2%
	2010	18	2	11.1%	1	5.6%	3	16.7%
	2006	18	2	11.1%	2	11.1%	4	22.2%
Townsend	2014	14	3	21.4%	3	21.4%	6	42.9%
	2010	14	5	35.7%	1	7.1%	6	42.9%
	2006	14	4	28.6%	2	14.3%	6	42.9%
Westminster	2014	16	0	0.0%	2	12.5%	2	12.5%
	2010	14	0	0.0%	6	42.9%	6	42.9%
	2006	15	1	6.7%	7	46.7%	8	53.3%
Winchendon	2014	14	5	35.7%	5	35.7%	10	71.4%
	2010	14	6	42.9%	4	28.6%	10	71.4%
	2006	13	7	53.8%	3	23.1%	10	76.9%
MRPC Region	Year	Total	FO	% of Total	SD	% of Total	FO & SD	% of Total
	2014	321	53	16.5%	38	11.8%	91	28.3%
	2010	317	60	18.9%	47	14.8%	107	33.8%
	2006	317	58	18.3%	52	16.4%	110	34.7%
	8 Year Change	4	-5	-1.8%	-14	-4.6%	-19	-6.4%



Some noticeable changes can be observed in the previous chart. The towns of Ashby, Clinton and Sterling have seen a considerable improvement in bridge infrastructure. Both Groton and Shirley have seen a noticeable decrease in bridge infrastructure condition, however, due to the number of bridges in each of these towns being low, just a few bridges can affect the overall town percentage. Of particular concern are municipalities in which there are a high percentage of structurally deficient bridges. The towns of Athol, Hubbardston, Royalston and Winchendon each have a total of at least 35% of bridges listed as structurally deficient.

Structurally Deficient Bridges

Of the 38 structurally deficient bridges, 12 are currently either scheduled for construction, under construction or have recently been completed. Of the 53 functionally obsolete bridges one belongs in this category.

Bridges Scheduled for construction/under construction/recently completed in the Montachusett Region											
Town	MassDOT Project Number	Over	Under	Owner	Functional Class	Year Built	Year Rebuilt	AASHTO Rating	Deficiency	Estimated Cost	Status
Fitchburg	605094	ST 31 WESTMNST RD	WATER PHILLIPS BROOK	State Highway Agency	Urban Arterial	1947		42.1	SD	\$4,700,000	TIP 2017
Hubbardston	605696	HWY BURNSHIRT RD	WATER BURNSHIRT RIVER	Town Agency	Major Collector	1940		62.5	SD	\$900,000	Construction
Hubbardston	607127	HWY EVERGREEN RD	WATER MASON BROOK	Town Agency	Rural Local	1920	1938	43.4	SD	\$1,700,000	TIP 2017
Lancaster	607114	HWY JACKSON RD	ST 2	State Highway Agency	Urban Local	1951		20	SD	\$6,000,000	TIP 2015
Leominster	603514	HWY WHITNEY ST	WATER MONOOSNOC BROOK	City/Municipal Highway A	Urban Minor Arterial	1913		26.7	SD	\$2,900,000	Construction
Leominster	605104	ST 12 N MAIN ST	ST 2	State Highway Agency	Urban Arterial	1949		17	SD	\$8,200,000	Complete
Royalston	604492	HWY STOCKWELL RD	WATER LAWRENCE BROOK	Town Agency	Rural Local	1939	1985	18.5	SD	\$700,000	Complete
Royalston	604175	HWY NE FITZWLM RD	WATER LAWRENCE BROOK	Town Agency	Rural Local	1936		21.5	SD	\$1,200,000	Complete
Royalston	604515	HWY N FITZWLM RD	WATER LAWRENCE BROOK	Town Agency	Minor Collector	1959		69	SD	\$1,400,000	Complete
Templeton	604366	HWY N MAIN ST	WATER E TEMPLTN PND OTLT	Town Agency	Urban Collector	1938		45.4	SD	\$1,000,000	Complete
Winchendon	604838	HWY HARRIS RD	WATER TARBELL BROOK	Town Agency	Rural Local	1940		49.1	SD	\$3,200,000	TIP 2015
Winchendon	607529	HWY N ROYLSTN RD	WATER TARBELL BROOK	Town Agency	Rural Local	1850	1980	41.8	SD	\$1,500,000	TIP 2017
Leominster	605773	HWY HAMILTON ST	ST 2	State Highway Agency	Urban Minor Arterial	1949		75.5	FO	\$4,400,000	Complete

Priorities – Structurally Deficient Bridges

From the above analysis, 13 of the 38 identified structurally deficient bridges (or 32%) in the Region are scheduled for improvement. The remaining 25 structurally deficient bridges still need to be addressed.

Functionally Obsolete Bridges

As mentioned, functionally obsolete bridges are defined as “a bridge which has no structural deficiencies but does not meet standards to adequately serve current user demands.” These bridges do not necessarily represent a bridge in need of major repair or reconstruction. Within the Montachusett Region, some 53 bridges were identified as such, one of which was recently reconstructed.

Priorities – Functionally Obsolete Bridges

Currently, the remaining 53 functionally obsolete bridges should be monitored by MassDOT.



System Outlook

As mentioned earlier in this section, the major investment in the Accelerated Bridge Program has developed a trend of improved bridge infrastructure in the region. The chart below shows improvements in the bridge network in the region from the 2012 RTP to the 2016 RTP.

Bridge Condition Change					
2012 RTP		Percent of Total	2016 RTP*		Percent of Total
SD	47	15%	SD	26	9%
FO	60	19%	FO	53	17%
* including active/planned projects					

The ABP was necessary because bridge infrastructure throughout the Commonwealth was being neglected, leading to a deteriorating network which cost taxpayers increasing amounts of money. Major resources were infused into our network of bridges to reverse this trend. Even though this program was developed to last 8 years, the debt will not be paid off for years to come. Other transportation priorities will be affected as future funds are diverted to pay off the debt of the ABP. The infrastructure in Massachusetts is extensive and aging. Efficient investments must be made in the system to maintain what exists. It is essential for decision makers to properly invest in maintaining existing infrastructure in the future.

As part of this RTP a Performance Measure has been developed to determine whether this region is meeting goals set forth in this long range plan. Below are applicable Goals, Objectives and Performance Measures which related to the regions bridges.

Goal: System Preservation and Maintenance
<i>Objectives:</i> * Seek to encourage and prioritize preservation projects within communities in order to maintain a state of good repair for all modes. * Continue to monitor, and revise as needed, the Transportation Evaluation Criteria (TEC) to encourage those projects that help to maintain a state of good repair. * Continue the promotion and prioritization of bridge projects throughout the region.
<i>Performance Measures:</i> * Decrease the number of identified "Structurally Deficient" bridges within the region.



Structurally Deficient Bridges in the Massachusetts Region

Town	MassDOT Project Number	Over	Under	Owner	Functional Class	Year Built	Year Rebuilt	AASHTO Rating	Deficiency	Estimated Cost	Status
Athol		HWY MORGAN AVE	WATER S ATHOL PND OUTLET	Town Agency	Rural Local	1979		52.9	SD		
Athol		HWY WASHINGTON AVE	WATER S ATHOL PND OUTLET	Town Agency	Rural Local	1940		49.4	SD		
Athol		HWY EXCHANGE ST	WATER MILLERS RIVER	Town Agency	Urban Minor Arterial	1939	1988	50.5	SD		
Athol		HWY CRESCENT ST	WATER MILLERS RIVER	Town Agency	Urban Minor Arterial	1937		5	SD		
Athol		ST 32 CHESTN HL AV	WATER MILLERS RIVER	Town Agency	Urban Minor Arterial	1850	1921	6.2	SD		
Athol		ST 2 A/MAIN ST	RR BMRR	State Highway Agency	Urban Arterial	1938		35.6	SD		
Athol		ST 2 A/S MAIN ST	WATER WEST BROOK	State Highway Agency	Urban Arterial	1930		68.6	SD		
Athol		HWY DANIEL SHAYS	WATER LAKE ROHNTA OUTLET	State Highway Agency	Urban Arterial	1955		69.7	SD		
Fitchburg		ST 2	WATER WYMAN BROOK	State Highway Agency	Freeway/Expressway	1947		62.6	SD		
Fitchburg	605094	ST 31 WESTMINSTR RD	WATER PHILLIPS BROOK	State Highway Agency	Urban Arterial	1947		42.1	SD	\$4,700,000	TIP 2017
Fitchburg		ST 31 RIVER ST	WATER N NASHUA RIVER	State Highway Agency	Urban Arterial	1900	1952	73.1	SD		
Gardner		ST 2 A/W BROADWAY	WATER BENT TRAVERS POND	State Highway Agency	Urban Minor Arterial	1924	1929	68.9	SD		
Gardner		ST140	RR BMRR	State Highway Agency	Urban Arterial	1980		21.6	SD		
Gardner		HWY PLEASANT ST	RR BMRR	State Highway Agency	Urban Collector	1885	1954	2	SD		
Gardner		HWY CROSS ST	RR BMRR SPUR	State Highway Agency	Urban Collector	1874	1981	51.2	SD		
Hubbardston	605696	HWY BURNSHIRT RD	WATER BURNSHIRT RIVER	Town Agency	Major Collector	1940		62.5	SD	\$900,000	Construction
Hubbardston	607127	HWY EVERGREEN RD	WATER MASON BROOK	Town Agency	Rural Local	1920	1938	43.4	SD	\$1,700,000	TIP 2017
Hubbardston		ST 62 OLD BOSTN TPK	WATER W BR WARE RIVER	Town Agency	Major Collector	1950		34.7	SD		
Lancaster	607114	HWY JACKSON RD	ST 2	State Highway Agency	Urban Local	1951		20	SD	\$6,000,000	TIP 2015
Leominster	603514	HWY WHITNEY ST	WATER MONOOSNOG BROOK	City/Municipal Highway A	Urban Minor Arterial	1913		26.7	SD	\$2,900,000	Construction
Leominster	605104	ST 12 N MAIN ST	ST 2	State Highway Agency	Urban Arterial	1949		17	SD	\$8,200,000	Complete
Petersham		HWY GLN VALLY RD	WATER E BR SWIFT RIVER	Town Agency	Rural Local	1940	1976	18.9	SD		
Royalston	604492	HWY STOCKWELL RD	WATER LAWRENCE BROOK	Town Agency	Rural Local	1939	1985	18.5	SD	\$700,000	Complete
Royalston	604175	HWY NE FITZWLM RD	WATER LAWRENCE BROOK	Town Agency	Rural Local	1936		21.5	SD	\$1,200,000	Complete
Royalston	604515	HWY N FITZWLM RD	WATER LAWRENCE BROOK	Town Agency	Minor Collector	1959		69	SD	\$1,400,000	Complete
Royalston		HWY N FITZWLM RD	WATER LAWRENCE BROOK	Town Agency	Minor Collector	1959		65	SD		
Shirley		HWY LONGLEY RD	WATER MULPUS BROOK	Town Agency	Rural Local	1968		54.9	SD		
Templeton	604366	HWY N MAIN ST	WATER E TEMPLTN PND OTLT	Town Agency	Urban Collector	1938		45.4	SD	\$1,000,000	Complete
Townsend		HWY CANAL ST	WATER SQUANNACOOK RIVER	Town Agency	Urban Collector	1850	1976	48.3	SD		
Townsend		ST119 MAIN ST	WATER PEARL HILL BROOK	State Highway Agency	Urban Minor Arterial	1907	1931	54.3	SD		
Townsend		HWY W MEADOW RD	WATER LOCKE BROOK	Town Agency	Rural Local	1917	1985	68.5	SD		
Westminster		HWY WHITMAN RD	WATER WHITMAN RIVER	Town Agency	Rural Local	1937		39.2	SD		
Westminster		ST 12 ASHBURNHAM ST	WATER PHILLIPS BROOK	State Highway Agency	Rural Minor Arterial	1926		2	SD		
Winchendon	604838	HWY HARRIS RD	WATER TARBELL BROOK	Town Agency	Rural Local	1940		49.1	SD	\$3,200,000	TIP 2015
Winchendon		US202 MAPLE ST	WATER N BR MILLERS RIVER	State Highway Agency	Urban Minor Arterial	1937		38.3	SD		
Winchendon		US202 RIVER ST	WATER MILLERS RIVER	State Highway Agency	Urban Minor Arterial	1932		48.6	SD		
Winchendon		HWY HIGH ST	WATER MILLERS RIVER	Town Agency	Urban Collector	1850	1973	47.7	SD		
Winchendon		HWY N ROYSTON RD	WATER TARBELL BROOK	Town Agency	Rural Local	1850	1980	41.8	SD	\$1,500,000	TIP 2017

Functionally Obsolete Bridges in the Montachusett Region

Town	MassDOT Project Number	Over	Under	Owner	Functional Class	Year Built	Year Rebuilt	AASHTO Rating	Deficiency	Estimated Cost	Status
Ashburnham		HWY DUNN RD	WATER BR MILLERS RIVER	Town Agency	Rural Local	1988		69.9	FO		
Ashby		HWY HOSMER RD	WATER WILLARD BROOK	State Highway Agency	Rural Local	1935		67.4	FO		
Athol		ST 32 CHSTNT HL AV	RR BMRR	State Highway Agency	Urban Minor Arterial	1995		69.8	FO		
Ayer		ST 2 A/E MAIN ST	RR MBTA/BMRR	State Highway Agency	Urban Arterial	1949		71.1	FO		
Fitchburg		ST 31 PRINCETON RD	WATER WHITMANS RIVER	State Highway Agency	Urban Minor Arterial	1929		69.7	FO		
Fitchburg		ST 31 NB RLLSTN ST	HWY BROAD ST	State Highway Agency	Urban Minor Arterial	1997		74.8	FO		
Fitchburg		ST 2 A/LAUREL ST	COMB BMRR & NASHUA RIV	State Highway Agency	Urban Minor Arterial	1899		78.6	FO		
Fitchburg		ST 31 ASHBY RD	WATER FALLULAH BROOK	State Highway Agency	Urban Arterial	1904	1934	48.1	FO		
Fitchburg		HWY FISHER RD	WATER FALLULAH BROOK	City/Municipal Highway A	Urban Local	1909		77.9	FO		
Fitchburg		HWY ROLLSTONE ST	RR BMRR	State Highway Agency	Urban Minor Arterial	1977		74.6	FO		
Fitchburg		HWY AIRPORT RD	WATER N NASHUA RIVER	City/Municipal Highway A	Urban Minor Arterial	1910	1962	59.8	FO		
Fitchburg		HWY SANBORN ST	WATER PHILLIPS BROOK	City/Municipal Highway A	Urban Local	1931		27.8	FO		
Fitchburg		HWY PUTNAM ST	RR BMRR	State Highway Agency	Urban Minor Arterial	1899	1988	74.5	FO		
Gardner		HWY UNION ST	RR PWRR	State Highway Agency	Urban Collector	1908	1986	76.2	FO		
Gardner		ST 2 WB	ST 2 A/W BROADWAY	State Highway Agency	Freeway/Expressway	1969		70.6	FO		
Groton		ST225 W MAIN ST	WATER NASHUA RIVER	State Highway Agency	Urban Minor Arterial	1930		65.2	FO		
Groton		ST119 SOUTH RD	WATER NASHUA RIVER	State Highway Agency	Rural Minor Arterial	1931	2000	67.7	FO		
Groton		HWY PEABODY ST	OTHER DEM RAIL TRAIL	State Highway Agency	Urban Local	2002		79	FO		
Groton		ST111 PLEASANT ST	OTHER DEM RAIL TRAIL	State Highway Agency	Urban Arterial	2002		79.1	FO		
Harvard		ST110 /ST111/AYER	WATER BOWERS BROOK	State Highway Agency	Rural Local	1925		58.3	FO		
Harvard		ST110 /ST111/AYER	ST 2	State Highway Agency	Rural Minor Arterial	1950		55.5	FO		
Harvard		HWY LITTLETON RD	ST 2	State Highway Agency	Minor Collector	1950	1990	74.1	FO		
Harvard		ST 2	HWY CAMP RD	State Highway Agency	Rural Arterial	1951		70.8	FO		
Harvard		ST 2	RR BMRR	State Highway Agency	Freeway/Expressway	1951		58.6	FO		
Harvard		ST 2	HWY DEPOT ST	State Highway Agency	Freeway/Expressway	1951		74.4	FO		
Harvard		HWY JACKSON RD	WATER NASHUA RIVER	State Highway Agency	Urban Local	1951	1983	67.7	FO		
Harvard		I 495 NB	HWY STOW RD	State Highway Agency	Urban Interstate	1963		75.7	FO		
Lancaster		ST117 SEVEN BRG RD	WATER NASHUA RIVER	State Highway Agency	Urban Arterial	1927		73.5	FO		
Lancaster		HWY MILL ST	WATER NASHUA RIVER	Town Agency	Urban Collector	1996		79.1	FO		
Lancaster		ST 70 LUNENBURG RD	ST 2	State Highway Agency	Major Collector	1951		72.6	FO		
Leominster		HWY HAMILTON ST	WATER N NASHUA RIVER	City/Municipal Highway A	Urban Minor Arterial	1955		68.6	FO		
Leominster		HWY ADAMS ST	WATER MONOOSNOC BROOK	City/Municipal Highway A	Urban Local	1904		69.3	FO		
Leominster		HWY MERRIAM AVE	ST 2	State Highway Agency	Urban Minor Arterial	1947	2004	72.2	FO		
Leominster	605773	HWY HAMILTON ST	ST 2	State Highway Agency	Urban Minor Arterial	1949		75.5	FO	\$4,400,000	Complete
Leominster		ST 13 MAIN ST	ST 2	State Highway Agency	Urban Arterial	1949		73.9	FO		
Leominster		I 190 SB	HWY LEOMINSTER CONN	State Highway Agency	Urban Interstate	1977		72.2	FO		
Leominster		ST 2 WB	I 190 SB ON RAMP J	State Highway Agency	Freeway/Expressway	1975		75.5	FO		
Lunenburg		HWY TOWNSND HRBR	WATER Mulpus Brook	Town Agency	Urban Minor Arterial	1937	1994	78.8	FO		
Petersham		HWY QUAKER RD	WATER E BR SWIFT RIVER	Town Agency	Rural Local	1938	1944	62.6	FO		
Shirley		HWY MAIN ST	WATER CATACUNEMAUG BROOK	Town Agency	Urban Minor Arterial	1900		73.3	FO		
Shirley		HWY LOVELL RD	WATER CATACUNEMAUG BROOK	Other State Agencies	Urban Local	1950		62.5	FO		
Sterling		I 190 NB	RR CSX	State Highway Agency	Urban Interstate	1978		79.6	FO		
Templeton		HWY HMLET MLL RD	WATER OTTER RIVER	Town Agency	Urban Local	1938		63.6	FO		
Templeton		ST 2 EB	ST 2 A/PATRIOTS RD	State Highway Agency	Rural Arterial	1969		69	FO		
Templeton		ST 2 WB	ST 2 A/PATRIOTS RD	State Highway Agency	Rural Arterial	1969		68	FO		
Townsend		ST119 MAIN ST	WATER SQUANNACOOK RIVER	State Highway Agency	Urban Minor Arterial	1950		22	FO		
Townsend		ST119 RIVER RD	WATER WILLARD BROOK	State Highway Agency	Major Collector	1908	1931	77.2	FO		
Townsend		ST119 RIVER RD	WATER WILLARD BROOK	State Highway Agency	Major Collector	1908	1931	75.2	FO		
Winchendon		HWY GLENALLAN ST	WATER MILLERS RIVER	Town Agency	Urban Collector	1939		61.3	FO		
Winchendon		HWY BROWN ST	WATER MILLERS RIVER	Town Agency	Urban Local	1964		63.5	FO		
Winchendon		ST 12 SPRING ST	WATER MILLERS RIVER	State Highway Agency	Urban Arterial	1927		75.5	FO		
Winchendon		HWY CAMPGROUND R	WATER BEAMAN BROOK	State Highway Agency	Rural Local	1970		34.3	FO		
Winchendon		HWY MONOM DR WST	WATER N BR MILLERS RIVER	Town Agency	Urban Local	1977		78.7	FO		



Pavement

The *Pavement Management Program* at MRPC consists of surveying all federal aid eligible roadways in the region for the purpose of collecting, maintaining and evaluating pavement condition data for use in transportation plan and project decision making.

There are approximately 666 miles of federal aid eligible roads in the Montachusett region, of which 159 miles are National Highway System (NHS) roads, and 507 miles are Surface Transportation Program (STP) roads. NHS roadways represent all Interstate roadways such as I-190, and I-495 along with a systematic network of principal arterials such as Route 2 and parts of Routes 12, 140 and 2A; NHS roads are regularly surveyed by MassDOT. STP roadways, which include all other numbered routes as well as all urban arterials, urban collectors and rural arterials, are surveyed mostly by the MRPC, MassDOT also regularly collects data on all numbered routes.

The maps at the end of this section show all federal aid eligible miles in the Montachusett region. All roads shown on these maps are surveyed as part of the Montachusett Regional Pavement Management Program.

Pavement Management at MRPC

The principal intention of having a pavement management program at MRPC is for the purpose of including the data in our transportation evaluation criteria (TEC). TEC is a data driven process that is used when putting together documents such as the Transportation Improvement Program (TIP), an annual prioritized listing of transportation and transit projects proposed for implementation during future federal fiscal years for the region. In the Montachusett region the pavement management program will help, along with other programs and data, to develop a more accurate prioritization of transportation needs, and to balance those needs with available funding.

Pavement management systems (PMS) can be viewed at both network and project levels. In a network level PMS an entire network is analyzed to determine which maintenance tasks should be funded. In a project level PMS, individual projects are studied to determine to what extent the roadway needs attention. The MRPC's approach reflects some aspects of each of these levels. Pavement data from the entire federal aid network in the Montachusett region is maintained; this data is gathered along with other evaluation criteria and considered when looking at project level programs such as the TIP. Although both levels will be involved and the same data will be collected and analyzed, the MRPC's use of a PMS may differ from a typical municipality's because it will take more of a project level approach as opposed to a municipality's network level approach. While a city or town Department of Public Works plays



the role of a road manager, the MRPCs desire is to better understand the transportation system of the region and its needs.

The Roadway System

Of the approximately 2,091 miles of roads in the Montachusett region, approximately 507 miles are Surface Transportation Program (STP) eligible roadways and 159 miles are National Highway System (NHS) eligible roadways. This represents 31% of the regions road miles. The remaining 1,425 miles (69%) are state and local aid eligible roads.

They are defined as follows:

National Highway System (NHS) – all interstate roadways and a systematic network of principal arterials spanning the state. In addition, roads connecting the NHS roadways to military bases (known as the Strategic Highway Network) are also considered part of the NHS network. NHS passenger and freight terminals are connected by roadways called NHS connectors.

Surface Transportation Program (STP) – comprised of any functionally classified roadway not part of the NHS network. STP funded roadways include all urban arterials, urban collectors and rural arterials. According to previous funding legislation, rural collectors are STP eligible, but have a limitation on the STP funding amount.

State and Local Aid – includes Chapter 90 and other non-Federal Aid categories. Roadways that fall under this category are comprised of roads functionally classified as local roads.

As stated above, rural collectors are STP eligible but have a funding limitation. The following table provides a breakdown of roads by community by their aid eligibility, NHS, STP or State Aid/Local. The State Aid/Local figures include those rural collector miles that may also be STP eligible

Regional Road Mileage

CENTERLINE MILES

	NHS	STP	TOTAL FED-AID	Local	Total
Ashburnham	0.00	20.16	20.16	76.97	97.13
Ashby	0.00	14.22	14.22	50.54	64.76
Athol	11.49	20.88	32.37	78.78	111.15
Ayer	6.90	9.73	16.63	34.33	50.96
Clinton	4.99	12.56	17.55	33.63	51.18
Fitchburg	18.46	47.12	65.58	135.93	201.51
Gardner	11.00	30.68	41.68	74.76	116.44
Groton	13.04	20.86	33.90	75.56	109.46
Harvard	8.82	10.13	18.95	59.69	78.64
Hubbardston	0.00	21.54	21.54	64.46	86.00
Lancaster	12.22	19.40	31.62	39.49	71.11
Leominster	19.01	42.54	61.55	115.17	176.72
Lunenburg	8.73	25.18	33.91	59.82	93.73
Petersham	0.00	19.48	19.48	59.46	78.94
Phillipston	2.91	8.42	11.33	41.49	52.82
Royalston	0.00	20.90	20.90	50.50	71.40
Shirley	1.05	18.89	19.94	32.25	52.19
Sterling	12.19	31.63	43.82	62.75	106.57
Templeton	5.66	34.83	40.49	60.01	100.50
Townsend	4.07	21.25	25.32	69.58	94.90
Westminster	9.30	34.04	43.34	66.63	109.97
Winchendon	9.15	22.58	31.73	83.56	115.29
TOTAL	158.99	507.02	666.01	1,425.36	2,091.37

Regional Pavement Conditions

The structural conditions of the majority of the Federal Aid eligible roads are determined by MassDOT and MRPC pavement surveys. The condition is expressed by assigning either a Pavement Serviceability Index (PSI) number from 0 to 5 or a Pavement Condition Index number from 0 – 100 (PCI) to segments along the roadway. PSI (MassDOT method) and PCI (MRPC method) is an overall rating of the pavements condition. Conditions are rated as Excellent, Good, Fair and Poor. The following table shows a general correlation between PSI and PCI, condition, repair strategies and associated cost. This average cost has been determined from consultation with MassDOT and other Regional Planning Agencies throughout the State.

Pavement Condition – Cost Breakdown

PSI	PCI	Condition	Associated Repair	Repair Cost Per. Sq. Yard
0 - 2.29	0 - 64	Poor	Reconstruction	\$45
2.3 - 2.79	65 - 84	Fair	Rehabilitation (Mill/Overlay)	\$18
2.8 - 3.49	85 - 94	Good	Preventative Maintenance	\$8.50
3.5 - 5	95 - 100	Excellent	Routine Maintenance	\$0.75

Utilizing this information a general condition of the Montachusett Region's Federal Aid eligible roadway network can be developed. The following lists pavement condition on federal aid eligible roads by town in the region. These federal aid miles are further broken down by Local and State Jurisdiction. Please note that due to the time frame between data collection and report preparation, conditions of the roadways may change. Additionally, mileage listed in the following charts may not reflect mileage listed on the "Total Fed-Aid Miles" column of the Centerline Miles table as a small percentage of roads not eligible for federal aid are included. Therefore, this information should be viewed in general terms regarding needs and condition.

Ashburnham		State Jurisdiction			Local Jurisdiction			Combined			
		Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
	Excellent	0.34	4776	\$3,582	2.55	35835	\$26,876	Routine Maintenance	2.88	40611	\$30,458
	Good	0.66	9289	\$78,957	2.68	36109	\$306,927	Preventative Maintenance	3.34	45397	\$385,875
	Fair	1.52	21461	\$386,298	1.27	17720	\$327,820	Rehabilitation	2.79	39181	\$724,849
	Poor	2.92	3	\$135	1.52	20045	\$902,025	Reconstruction	4.44	20047	\$902,115
	Total	5.44		\$468,972	8.02		\$1,563,648	Total	13.46		\$2,043,296

Ashby		State Jurisdiction			Local Jurisdiction			Combined			
		Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
	Excellent	0.54	7486	\$5,614	0.00	0	\$0	Routine Maintenance	0.54	7486	\$5,614
	Good	2.28	31756	\$269,927	0.00	0	\$0	Preventative Maintenance	2.28	31756	\$269,927
	Fair	6.21	85468	\$1,538,419	0.00	0	\$0	Rehabilitation	6.21	85468	\$1,581,153
	Poor	2.63	39577	\$1,780,960	0.00	0	\$0	Reconstruction	2.63	39577	\$1,780,960
	Total	11.67		\$3,594,920	0.00		\$0	Total	11.67		\$3,637,654

Athol		State Jurisdiction			Local Jurisdiction			Combined			
		Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
	Excellent	4.39	44358	\$33,269	2.89	38639	\$28,979	Routine Maintenance	7.28	82998	\$62,248
	Good	0.74	9655	\$82,065	6.79	102502	\$871,268	Preventative Maintenance	7.53	112157	\$953,332
	Fair	5.27	74224	\$1,336,034	1.84	29063	\$537,659	Rehabilitation	7.11	103287	\$1,910,805
	Poor	1.92	27584	\$1,241,270	8.34	119939	\$5,397,269	Reconstruction	10.26	147523	\$6,638,539
	Total	12.32		\$2,692,638	19.85		\$6,835,175	Total	32.17		\$9,564,925

Ayer		State Jurisdiction			Local Jurisdiction			Combined			
		Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
	Excellent	1.70	23926	\$17,944	2.34	37398	\$28,048	Routine Maintenance	4.04	61323	\$45,993
	Good	0.36	5327	\$45,281	3.84	66826	\$568,024	Preventative Maintenance	4.21	72154	\$613,305
	Fair	0.32	4263	\$76,742	1.61	26258	\$485,782	Rehabilitation	1.93	30522	\$564,656
	Poor	1.61	24085	\$1,083,841	0.74	11482	\$516,706	Reconstruction	2.35	35568	\$1,600,548
Total	4.00		\$1,223,808	8.53		\$1,598,561	Total	12.53		\$2,824,501	

Clinton	State Jurisdiction			Local Jurisdiction			Combined			
	Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
Excellent	0.00	0	\$0	0.51	8402	\$6,301	Routine Maintenance	0.51	8402	\$6,301
Good	0.47	6518	\$55,406	6.94	117100	\$995,352	Preventative Maintenance	7.41	123619	\$1,050,758
Fair	0.67	9421	\$169,577	3.84	58333	\$1,079,169	Rehabilitation	4.51	67754	\$1,253,456
Poor	0.38	5374	\$241,845	4.53	69625	\$3,133,136	Reconstruction	4.91	75000	\$3,374,981
Total	1.52		\$466,828	15.83		\$5,213,958	Total	17.34		\$5,685,496

Fitchburg	State Jurisdiction			Local Jurisdiction			Combined			
	Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
Excellent	8.45	122699	\$92,024	7.34	138314	\$103,735	Routine Maintenance	15.79	261012	\$195,759
Good	1.05	14192	\$120,631	23.06	403968	\$3,433,731	Preventative Maintenance	24.11	418160	\$3,554,363
Fair	2.21	31107	\$559,933	7.05	99192	\$1,835,048	Rehabilitation	9.26	130299	\$2,410,535
Poor	1.27	18188	\$818,455	20.07	308698	\$13,891,424	Reconstruction	21.34	326886	\$14,709,879
Total	12.98		\$1,591,044	57.52		\$19,263,939	Total	70.50		\$20,870,537

Gardner	State Jurisdiction			Local Jurisdiction			Combined			
	Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
Excellent	12.66	189756	\$142,317	2.89	62965	\$47,224	Routine Maintenance	15.55	252722	\$189,541
Good	1.49	21011	\$178,591	14.45	246510	\$2,095,632	Preventative Maintenance	15.94	267520	\$2,273,923
Fair	2.20	34740	\$625,313	6.71	123278	\$2,800,335	Rehabilitation	8.91	158017	\$2,923,317
Poor	0.88	12629	\$568,292	5.15	87453	\$3,935,374	Reconstruction	6.04	100081	\$4,503,666
Total	17.22		\$1,514,513	29.21		\$8,358,565	Total	46.43		\$9,890,448

Groton	State Jurisdiction			Local Jurisdiction			Combined			
	Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
Excellent	0.54	7606	\$5,705	3.61	41636	\$31,227	Routine Maintenance	4.15	49242	\$36,931
Good	2.11	29676	\$252,246	9.90	132126	\$1,123,075	Preventative Maintenance	12.01	161802	\$1,375,321
Fair	0.85	11968	\$215,424	7.54	104309	\$1,929,720	Rehabilitation	8.39	116277	\$2,151,128
Poor	1.92	26979	\$1,214,041	6.34	80217	\$3,609,772	Reconstruction	8.26	107196	\$4,823,813
Total	5.42		\$1,687,415	27.39		\$6,693,795	Total	32.81		\$8,387,194

Harvard	State Jurisdiction			Local Jurisdiction			Combined			
	Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
Excellent	13.86	215548	\$161,661	1.38	18670	\$14,003	Routine Maintenance	15.24	234218	\$175,663
Good	1.51	18065	\$153,554	2.00	27167	\$230,921	Preventative Maintenance	3.51	45232	\$384,475
Fair	0.07	894	\$16,100	2.29	29924	\$553,602	Rehabilitation	2.36	30819	\$570,149
Poor	0.94	11671	\$525,202	1.19	15341	\$690,365	Reconstruction	2.13	27013	\$1,215,567
Total	16.38		\$856,517	6.86		\$1,488,891	Total	23.24		\$2,345,855

Hubbardston	State Jurisdiction			Local Jurisdiction			Combined			
	Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
Excellent	0.00	0	\$0	2.75	38697	\$29,023	Routine Maintenance	2.75	38697	\$29,023
Good	0.00	0	\$0	10.74	148468	\$1,261,978	Preventative Maintenance	10.74	148468	\$1,261,978
Fair	0.00	0	\$0	5.32	68108	\$1,260,004	Rehabilitation	5.32	68108	\$1,260,004
Poor	0.00	0	\$0	2.69	31422	\$1,413,971	Reconstruction	2.69	31422	\$1,413,971
Total	0.00		\$0	21.50		\$3,964,975	Total	21.50		\$3,964,975

Lancaster	State Jurisdiction			Local Jurisdiction			Combined			
	Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
Excellent	11.94	168164	\$126,123	2.76	37691	\$28,269	Routine Maintenance	14.70	205856	\$154,392
Good	0.13	1881	\$15,989	9.22	125439	\$1,066,236	Preventative Maintenance	9.35	127321	\$1,082,225
Fair	0.21	3005	\$54,088	9.08	122265	\$2,261,893	Rehabilitation	9.29	125269	\$2,317,484
Poor	0.04	585	\$26,313	3.72	53429	\$2,404,301	Reconstruction	3.76	54014	\$2,430,614
Total	12.33		\$222,514	24.77		\$5,760,698	Total	37.10		\$5,984,715

Leominster	State Jurisdiction			Local Jurisdiction			Combined			
	Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
Excellent	11.87	167519	\$125,639	7.82	130711	\$98,033	Routine Maintenance	19.69	298229	\$223,672
Good	1.26	20696	\$175,913	12.57	220890	\$1,877,566	Preventative Maintenance	13.84	241586	\$2,053,479
Fair	4.23	55775	\$1,003,946	10.63	175189	\$3,240,992	Rehabilitation	14.85	230964	\$4,272,825
Poor	1.97	29997	\$1,349,848	18.98	316329	\$14,234,788	Reconstruction	20.95	346325	\$15,584,635
Total	19.32		\$2,655,345	50.00		\$19,451,379	Total	69.33		\$22,134,611

Lunenburg	State Jurisdiction			Local Jurisdiction			Combined			
	Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
Excellent	0.07	1081	\$811	7.66	112431	\$84,323	Routine Maintenance	7.73	113513	\$85,134
Good	3.16	45180	\$384,028	8.77	117356	\$997,530	Preventative Maintenance	11.93	162536	\$1,381,558
Fair	1.97	31194	\$561,496	2.93	41615	\$769,880	Rehabilitation	4.90	72809	\$1,346,974
Poor	0.75	11927	\$536,723	8.47	132884	\$5,979,774	Reconstruction	9.22	144811	\$6,516,497
Total	5.94		\$1,483,058	27.84		\$7,831,508	Total	33.78		\$9,330,163

Petersham	State Jurisdiction			Local Jurisdiction			Combined			
	Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
	Excellent	Good	Fair	Poor	Total					
	5.76	81115	\$60,836	0.00	0	\$0	Routine Maintenance	5.76	81115	\$60,836
	2.64	35806	\$304,355	2.29	29288	\$248,946	Preventative Maintenance	4.94	65094	\$553,302
	3.54	47153	\$848,758	3.00	38672	\$715,437	Rehabilitation	6.54	85825	\$1,587,771
	0.45	5967	\$268,520	1.73	22338	\$1,005,191	Reconstruction	2.18	28305	\$1,273,710
Total	12.39		\$1,482,469	7.02		\$1,969,573	Total	19.41		\$3,475,619

Phillipston	State Jurisdiction			Local Jurisdiction			Combined			
	Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
	Excellent	Good	Fair	Poor	Total					
	2.94	24651	\$18,488	0.00	0	\$0	Routine Maintenance	2.94	24651	\$18,488
	1.01	14266	\$121,260	3.06	38272	\$325,315	Preventative Maintenance	4.08	52538	\$446,575
	2.83	38613	\$695,040	0.05	583	\$10,793	Rehabilitation	2.87	39197	\$725,139
	0.21	2765	\$124,413	2.15	25714	\$1,157,117	Reconstruction	2.36	28478	\$1,281,530
Total	6.99		\$959,201	5.26		\$1,493,225	Total	12.25		\$2,471,733

Royalston	State Jurisdiction			Local Jurisdiction			Combined			
	Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
	Excellent	Good	Fair	Poor	Total					
	0.00	0	\$0	0.60	7574	\$5,680	Routine Maintenance	0.60	7574	\$5,680
	0.00	0	\$0	1.17	14424	\$122,601	Preventative Maintenance	1.17	14424	\$122,601
	0.00	0	\$0	6.83	80260	\$1,484,801	Rehabilitation	6.83	80260	\$1,484,801
	0.00	0	\$0	12.37	155398	\$6,992,927	Reconstruction	12.37	155398	\$6,992,927
Total	0.00		\$0	20.95		\$8,606,010	Total	20.95		\$8,606,010

Shirley	State Jurisdiction			Local Jurisdiction			Combined			
	Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
	Excellent	Good	Fair	Poor	Total					
	3.36	47347	\$35,510	2.81	43880	\$32,910	Routine Maintenance	6.18	91227	\$68,420
	0.00	0	\$0	6.46	92686	\$787,832	Preventative Maintenance	6.46	92686	\$787,832
	0.17	2358	\$42,451	3.97	59287	\$1,096,802	Rehabilitation	4.14	61645	\$1,140,432
	0.00	0	\$0	3.21	50169	\$2,257,585	Reconstruction	3.21	50169	\$2,257,585
Total	3.53		\$77,961	16.46		\$4,175,130	Total	19.99		\$4,254,271

Sterling	State Jurisdiction			Local Jurisdiction			Combined			
	Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
	Excellent	Good	Fair	Poor	Total					
	6.56	92404	\$69,303	0.46	5877	\$4,407	Routine Maintenance	7.02	98281	\$73,711
	2.39	34035	\$289,294	15.94	194917	\$1,656,796	Preventative Maintenance	18.34	228952	\$1,946,090
	13.81	194824	\$3,506,841	4.36	59762	\$1,105,605	Rehabilitation	18.17	254587	\$4,709,858
	2.31	30201	\$1,359,061	3.73	44674	\$2,010,339	Reconstruction	6.04	74876	\$3,369,400
Total	25.07		\$5,224,500	24.50		\$4,777,147	Total	49.57		\$10,099,059

Templeton	State Jurisdiction			Local Jurisdiction			Combined			
	Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
	Excellent	Good	Fair	Poor	Total					
	14.06	197969	\$148,477	2.00	28156	\$21,117	Routine Maintenance	16.06	226125	\$169,594
	3.59	51041	\$433,850	7.35	117245	\$996,584	Preventative Maintenance	10.93	168286	\$1,430,434
	2.88	40560	\$730,085	3.00	39230	\$725,752	Rehabilitation	5.88	79790	\$1,476,116
	2.86	40325	\$1,814,620	10.50	143485	\$6,456,817	Reconstruction	13.35	183810	\$8,271,437
Total	23.38		\$3,127,031	22.84		\$8,200,270	Total	46.23		\$11,347,581

Townsend	State Jurisdiction			Local Jurisdiction			Combined			
	Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
	Excellent	Good	Fair	Poor	Total					
	0.59	7655	\$5,741	3.15	42989	\$32,242	Routine Maintenance	3.74	50644	\$37,983
	0.87	11246	\$95,587	5.45	76704	\$651,981	Preventative Maintenance	6.32	87949	\$747,568
	2.81	36216	\$651,890	2.39	33610	\$621,792	Rehabilitation	5.19	69826	\$1,291,790
	2.29	29565	\$1,330,407	2.17	30487	\$1,371,908	Reconstruction	4.46	60051	\$2,702,315
Total	6.56		\$2,083,625	13.15		\$2,677,922	Total	19.71		\$4,779,655

Westminster	State Jurisdiction			Local Jurisdiction			Combined			
	Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
	Excellent	Good	Fair	Poor	Total					
	11.42	158867	\$119,151	1.04	14393	\$10,795	Routine Maintenance	12.46	173260	\$129,945
	3.37	46340	\$393,893	15.50	205497	\$1,746,724	Preventative Maintenance	18.87	251837	\$2,106,564
	4.09	52248	\$940,467	2.92	34246	\$633,558	Rehabilitation	7.01	86495	\$1,600,149
	3.56	49643	\$2,233,936	2.27	32272	\$1,452,253	Reconstruction	5.83	81915	\$3,686,190
Total	22.44		\$3,687,447	21.73		\$3,843,330	Total	44.17		\$7,556,901

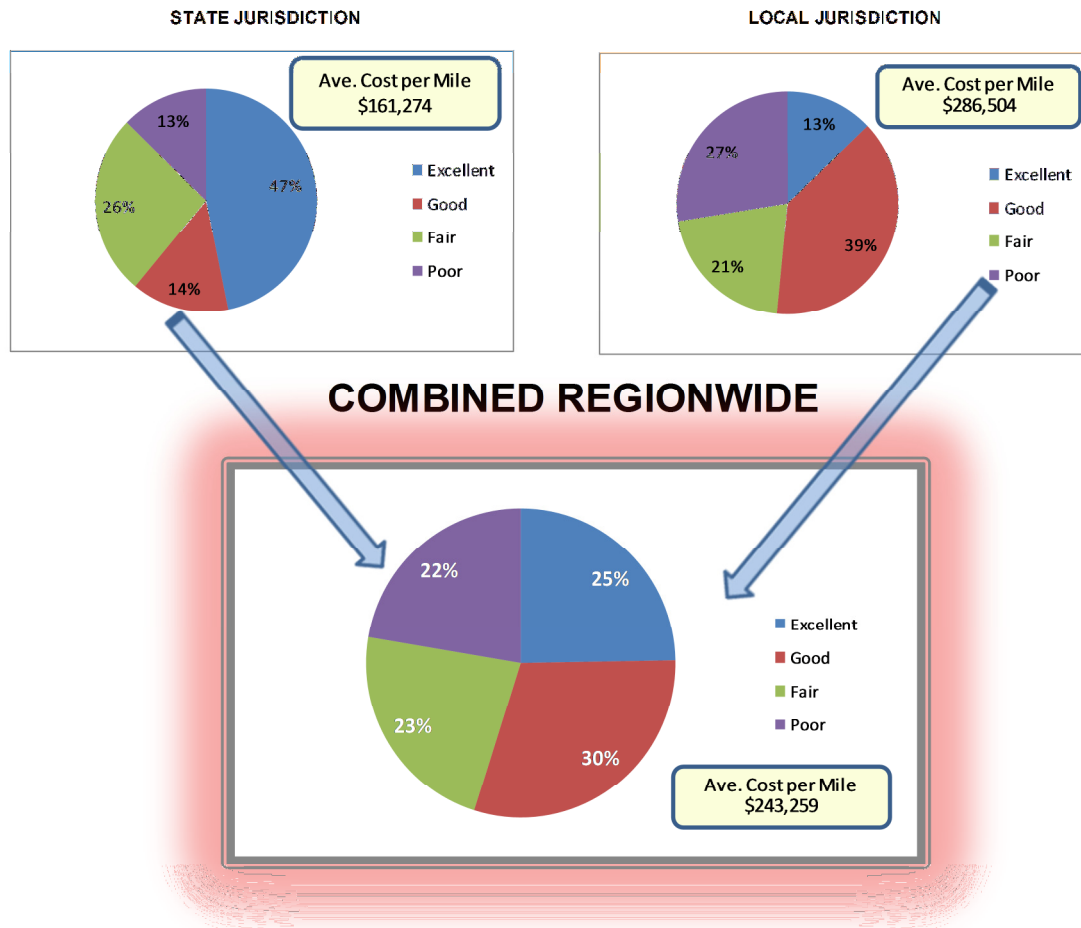
Winchendon	State Jurisdiction			Local Jurisdiction			Combined			
	Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
	Excellent	Good	Fair	Poor	Total					
	0.51	7253	\$5,440	2.09	35334	\$26,501	Routine Maintenance	2.60	42587	\$31,940
	4.04	58365	\$496,099	4.34	61231	\$520,466	Preventative Maintenance	8.39	119596	\$1,016,564
	7.72	112838	\$2,031,091	4.35	68416	\$1,265,689	Rehabilitation	12.07	181254	\$3,353,199
	1.31	18409	\$828,390	1.83	22464	\$1,010,861	Reconstruction	3.14	40872	\$1,839,251
Total	13.58		\$3,361,019	12.60		\$2,823,517	Total	26.19		\$6,240,955

Regionwide	State Jurisdiction			Local Jurisdiction			Combined			
	Miles	Square Yards	Cost	Miles	Square Yards	Cost	Repair Category	Miles	Square Yards	Total
Excellent	111.57	1570180	\$1,177,635	56.65	879591	\$659,694	Routine Maintenance	168.22	2449772	\$1,837,329
Good	33.98	476516	\$4,254,268	171.13	2556339	\$21,906,079	Preventative Maintenance	205.12	3032855	\$26,171,077
Fair	62.70	876161	\$15,682,651	92.37	1327710	\$24,201,538	Rehabilitation	155.07	2203870	\$40,317,617
Poor	30.22	385473	\$17,346,271	121.70	1773865	\$79,823,904	Reconstruction	151.92	2159336	\$97,170,129
Total	238.48		\$38,460,825	441.85		\$126,591,214	Total	680.33		\$165,496,152

In 2010 the Federal Highway Administration (FHWA) recommended that Regional Planning Agencies, such as the MRPC, undertake a study to establish the cost of maintaining the federal aid eligible roadway system, particularly those federal aid eligible roads in which maintenance and repairs are the responsibility of the cities and towns in the region (Local Jurisdiction). MRPC's Pavement Management Program has determined this annually since. In comparing the conditions between Local and State Jurisdiction federal aid eligible roads, it is clear that those federal aid roads routinely maintained by cities and towns are in worse condition than those routinely maintained by the state (State Jurisdiction). In fact the average repair need of \$161,274 per mile on State Jurisdiction roads is 56% less than the \$286,504 per mile average repair need for Local Jurisdiction roads. The Figure below displays the roadway condition averages of both Local and State Jurisdiction federal aid eligible roadways in the region.



Regional Conditions



Funding Projects Region Wide

The difference in condition between Local and State Jurisdiction federal aid roads may mainly be a combination of two factors, the first being that federal aid roads that are State Jurisdiction are a higher Functional Classification than those that are Local Jurisdiction, giving them higher importance when prioritizing projects for funding and the second being the funding available to Municipalities for roadway maintenance (Chapter 90) lagging behind the rising price of such maintenance. Below is a chart showing the Chapter 90 allocations each community in the region received in FY 2015 along with the roadway mileage that that money must maintain.

Chapter 90 Apportionment

Municipality	Local Jurisdiction Miles (Fed Aid and Non-Fed Aid eligible)	Other Jurisdiction Miles	FY 2014 Ch. 90 Apportionment	FY 2015 Ch. 90 Apportionment	% Change
ASHBURNHAM	74.47	9.60	\$347,094	\$346,948	-0.04%
ASHBY	51.97	0.00	\$229,864	\$230,019	0.07%
ATHOL	96.41	18.19	\$501,524	\$500,869	-0.13%
AYER	33.38	12.62	\$273,808	\$244,618	-10.66%
CLINTON	47.24	15.98	\$331,865	\$329,768	-0.63%
FITCHBURG	179.68	50.07	\$1,132,263	\$1,129,125	-0.28%
GARDNER	92.57	22.82	\$601,894	\$603,714	0.30%
GROTON	99.76	28.28	\$504,768	\$506,686	0.38%
HARVARD	64.43	0.00	\$309,298	\$340,137	9.97%
HUBBARDSTON	82.98	21.51	\$363,965	\$362,808	-0.32%
LANCASTER	59.21	11.04	\$313,136	\$312,248	-0.28%
LEOMINSTER	150.54	38.55	\$1,088,720	\$1,081,766	-0.64%
LUNENBURG	83.02	27.44	\$422,130	\$420,461	-0.40%
PETERSHAM	62.25	6.75	\$256,680	\$256,048	-0.25%
PHILLIPSTON	44.76	2.72	\$190,959	\$189,796	-0.61%
ROYALSTON	69.56	20.90	\$285,922	\$285,121	-0.28%
SHIRLEY	43.68	15.98	\$252,643	\$252,873	0.09%
STERLING	84.87	12.33	\$418,357	\$418,121	-0.06%
TEMPLETON	67.73	13.45	\$342,945	\$339,865	-0.90%
TOWNSEND	86.89	16.88	\$426,174	\$425,690	-0.11%
WESTMINSTER	84.33	11.49	\$413,641	\$419,624	1.45%
WINCHENDON	91.00	27.74	\$448,188	\$447,670	-0.12%
REGIONWIDE	1,750.75	384.34	\$9,455,838	\$9,443,975	-0.13%

As part of the 2016 update to the Regional Transportation Plan, an analysis has been done of pavement related TIP projects in the region. A comparison of Local Jurisdiction vs. State Jurisdiction was made that revealed percentage of miles, cost and cost per mile on projects in each category. The list below shows all pavement related TIP projects on the current 2015 – 2018 TIP and those projects constructed and funded through the TIP in the last 15 years.



Pavement Related TIP Projects

Municipality	Project	Year Advertised	Jurisdiction	Miles	Cost	Status
ASHBURNHAM	RECLAMATION & RELATED WORK ON ROUTE 101 (ASHBY ROAD), FROM STOWELL ROAD TO ROUTE 119	2011	Local	3.0	1,619,200	Complete
ATHOL	RESURFACING & RELATED WORK ON ROUTE 32, FROM ROUTE 2 TO ROUTE 2A	2011	State	0.6	\$783,903	Complete
ATHOL	RECONSTRUCTION AND SAFETY IMPROVEMENTS, ROUTE 2A/ROUTE 32 (MAIN STREET)	2005	Local	2.2	\$6,443,173	Complete
ATHOL/PETERSHAM	RESURFACING & RELATED WORK ON ROUTE 2A, FROM ROUTE 32 TO ROUTES 2/202	2014	State	4.0	\$2,199,604	Advertised
ATHOL	RECONSTRUCTION OF WEST ROYALSTON ROAD, FROM SILVER LAKE STREET TO THE ROYALSTON T.L.	2013	Local	2.0	\$1,996,354	Under Construction
ATHOL/PETERSHAM	RESURFACING & RELATED WORK ON ROUTE 32, FROM 1 MILE NORTH OF ROUTE 101 TO ROUTE 2/ROUTE 32 BRIDGE	2012	State	4.0	\$2,464,033	Complete
CLINTON	RESURFACING & RELATED WORK ON ROUTE 110 (HIGH STREET)	2016*	Local	0.6	\$1,200,000	Design
CLINTON	RECONSTRUCTION & RELATED WORK ON WATER STREET AND BOLTON ROAD	2015*	Local	1.2	\$5,554,983	Design
FITCHBURG	RECONSTRUCTION OF NORTH STREET, FROM PEARL STREET TO ROSS STREET	2007	Local	0.3	\$1,775,680	Complete
FITCHBURG/LEOMINSTER	FITCHBURG- LEOMINSTER- IMPROVEMENTS & SIGNALIZATION OF ROUTE 12 (PHASE I & II)	2007	Local	1.7	\$8,490,034	Complete
FITCHBURG	ROADWAY RECONSTRUCTION AND RELATED WORK ON A SECTION OF SUMMER STREET	2004	Local	0.5	\$2,606,107	Complete
FITCHBURG	MILLING & RESURFACING, ROUTE 2A (LUNENBURG STREET) FROM HIGHLAND STREET TO PERKINS STREET	2004	Local/State	0.6	\$468,504	Complete
FITCHBURG/LUNENBURG/LEOMINSTER	RECONSTRUCTION OF SUMMER STREET AND NORTH STREET	2017*	Local	1.8	\$6,944,357	Design
GARDNER	RESURFACING & RELATED WORK ON ROUTE 140	2009	Local	1.6	\$1,794,959	Complete
GARDNER	RESURFACING, GREEN STREET FROM MATTHEWS STREET NORTHERLY TO ROUTE 140	2005	Local	0.8	\$632,341	Complete
GARDNER/WESTMINSTER	ROUTE 140 COLD PLANE OVERLAY, BOX WIDENING, SIGNAL RECONSTRUCTION, CHANNELIZATION GREEN ST. TO SCENIC DR.	2004	State	3.2	\$2,363,847	Complete
GARDNER	RESURFACING & RELATED WORK ON MATTHEW STREET FROM GREEN STREET TO ROUTE 140	2016	Local	1.4	\$724,662	Design
HUBBARDSTON	RECONSTRUCTION OF ROUTE 62 (OLD BOSTON TURNPIKE) FROM BARRE T.L. TO THE PRINCETON T.L.	2008	Local	4.1	\$3,551,769	Complete
HUBBARDSTON	RESURFACING AND RELATED WORK ON BURNSHIRT ROAD	2014	Local	1.8	\$1,333,179	Under Construction
LANCASTER	RESURFACING AND RELATED WORK ON ROUTE 70 (LUNENBURG ROAD) FROM ROUTE 2 TO MM 18.496	2001	Local	2.3	\$378,772	Complete
LEOMINSTER	RESURFACING AND RELATED WORK ON ROUTE 13 (MAIN STREET) FROM LUNENBURG T.L. TO PROSPECT STREET	2003	Local	2.4	\$1,762,918	Complete
LEOMINSTER	RECONSTRUCTION ON ROUTE 13, FROM HAWES STREET TO PROSPECT STREET	2016*	Local	0.6	\$3,188,763	Design
LEOMINSTER	RECONSTRUCTION OF MECHANIC STREET, FROM LAUREL STREET TO THE LEOMINSTER CONNECTOR	2015*	Local	0.8	\$3,291,840	Design
PETERSHAM	RESURFACING & RELATED WORK ON ROUTE 32, FROM BARRE T.L. TO 1 MILE NORTH OF ROUTE 101	2010	State	5.88	\$2,290,386	Complete
ROYALSTON	RECLAMATION OF ATHOL RICHMOND ROAD (ROUTE 32), FROM ELM AVENUE TO THE N.H. S.L.	2009	Local	5.3	\$3,473,902	Complete
SHIRLEY	RESURFACING & BOX WIDENING ON TOWNSEND ROAD, FROM ROUTE 225 TO TOWNSEND T.L.	2006	Local	2.0	\$3,831,089	Complete
TEMPLETON	RECONSTRUCTION OF ROUTE 101 (DUDLEY/PETERSHAM ROAD)	2005	Local	2.1	\$5,044,530	Complete
TEMPLETON	RECONSTRUCTION OF ROUTE 202, FROM PHILLIPSTON T.L. TO WINCHENDON T.L.	2006	State	4.8	\$4,341,128	Complete
TEMPLETON	RECONSTRUCTION OF BALDWINVILLE ROAD, FROM ROUTE 202/68 TO PATRIOTS ROAD	2012	Local	3.6	\$4,310,977	Complete
WESTMINSTER	ROADWAY RECONSTRUCTION ON WEST MAIN STREET FROM ROUTE 2 TO ROUTE 2A (MAIN STREET)	2001	Local	0.7	\$1,388,860	Complete
WESTMINSTER	RECONSTRUCTION ON SOUTH STREET, FROM DAWLEY STREET/CARTER ROAD TO MAIN STREET (ROUTE 2A)	2011	Local	0.5	\$2,503,721	Complete
WINCHENDON	RESURFACING AND RELATED WORK ON A SECTION OF ROUTE 140 (GARDNER ROAD)	2003	Local	2.1	\$551,410	Complete
WINCHENDON	RESURFACING & RELATED WORK ON ROUTE 12, FROM MILL STREET/BEGINNING OF STATE HIGHWAY TO NEW HAMPSHIRE STATE LINE	2017*	Local	2.5	\$1,800,000	Design
WINCHENDON	RESURFACING & IMPROVEMENTS ON ROUTE 140, FROM THE GARDNER T.L. TO TEEL ROAD	2013	Local	2.1	\$1,341,901	Complete
* :Scheduled in current TIP						Source: MassDOT



Projects by Community

Community	Number of Projects	Total Cost	Total Miles
Ashburnham	1	1,619,200	3.0
Athol	5	\$13,887,067	12.8
Clinton	2	6,754,983	1.8
Fitchburg*	5	\$20,284,682	4.9
Gardner*	4	\$5,515,809	7.0
Hubbardston	2	\$4,884,948	5.9
Lancaster	1	378,772	2.3
Leominster*	5	\$23,677,912	7.3
Lunenburg*	1	\$6,944,357	1.8
Petersham*	3	\$6,954,023	13.9
Royalston	1	\$3,473,902	5.3
Shirley	1	\$3,831,089	2.0
Templeton	3	\$13,696,635	10.5
Westminster*	2	\$6,256,428	4.4
Winchendon	3	\$3,693,311	6.8

* = Has projects shared with other communities that are reflected in table

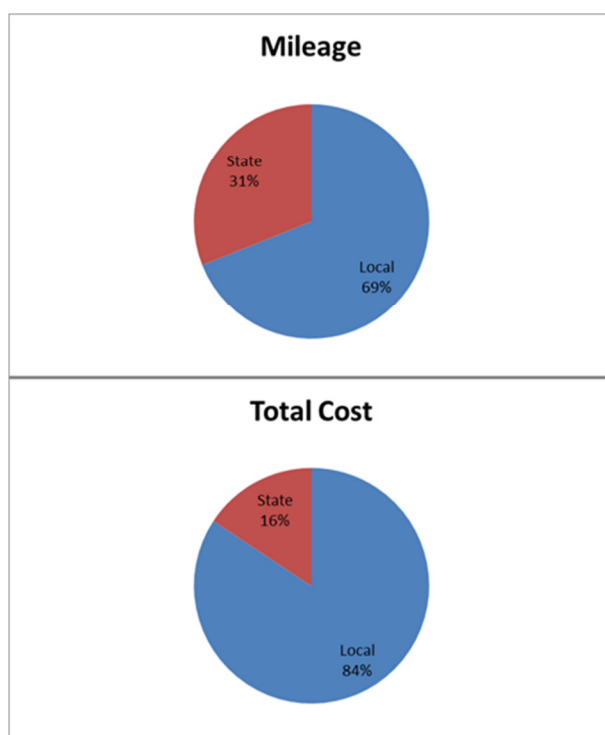
Region wide, roughly 2/3rd of federal aid eligible roadway miles are local jurisdiction roads. This is comparable to the percentage local jurisdiction pavement related TIP projects from the list above. When looking at the overall amount on funds spent on Local Jurisdiction roads however, construction on state roads cost *41% less* per mile than construction on local jurisdiction roads. Again, this reflects the trend of current conditions across the region as local roads are in need of the most extensive repairs. The table and chart below is a breakdown of past projected expenditures on TIP projects through the region.



Jurisdiction Comparison

	Miles	Cost	Cost Per Mile
Local (27 Projects)	49.99	\$77,535,481	\$1,551,020
State (6 Projects)	22.48	\$14,442,901	\$642,478
Combination (1 Project)	0.60	\$468,504	\$780,840
Total (34 Projects)	73.07	\$92,446,886	\$1,265,183

Total Mileage and Cost of Pavement Related TIP Projects



Pavements are often the single largest expense in any municipal road maintenance budget. Chapter 90 allocations often do not provide sufficient funding to maintain local roads at the

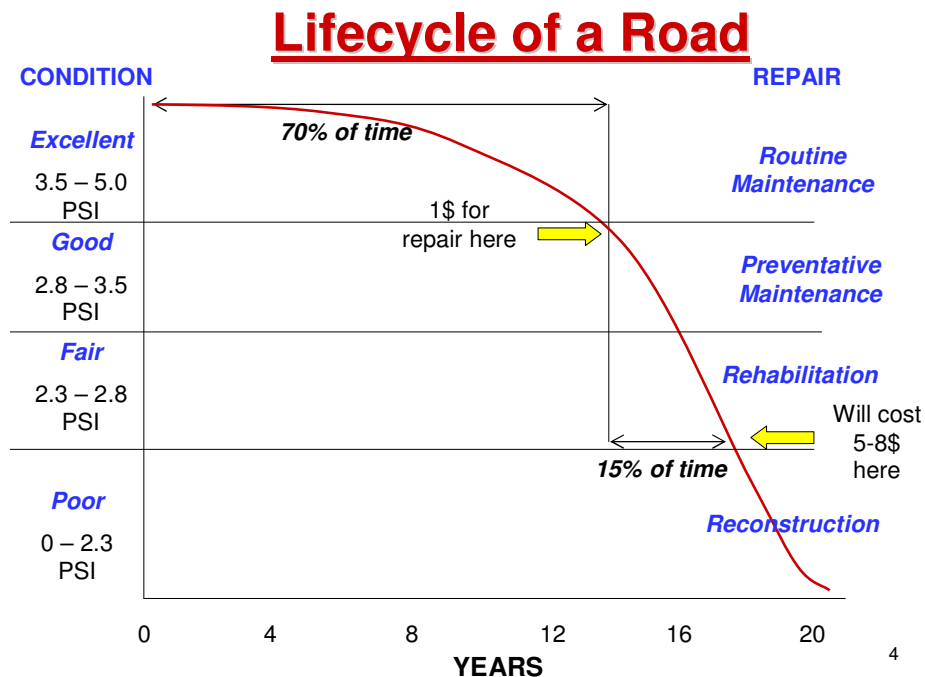


current condition let alone make major improvements. Due to inadequate funding it is recommended that communities routinely target funding for federal aid eligible Local roadways through the Transportation Improvement Program (TIP). It is also encouraged that a Pavement Management Plan be implemented by communities to keep on track of maintenance needs and schedules to contribute to a cost effective approach to maintaining roadways.

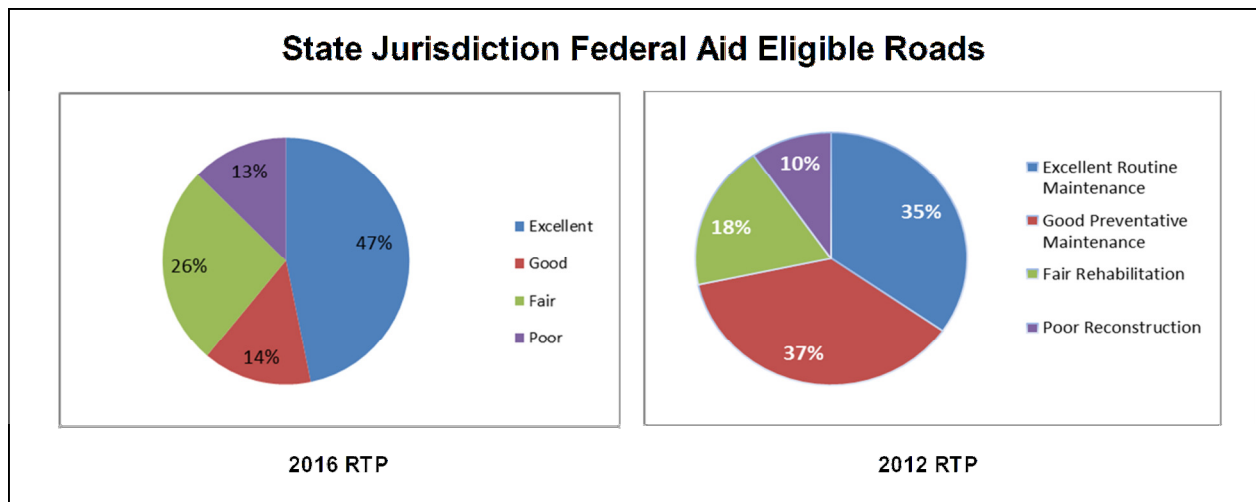
Pavement Performance Measures in the Montachusett Region

The figure below displays the concept of lifecycle cost. A pavements lifecycle is the time between reconstruction periods. Lifecycle cost is the total cost spent on maintenance and repairs for a particular pavement section during its lifecycle. One of the main focuses of pavement management is to keep lifecycle cost low to stretch the dollar in what is commonly an ever decreasing maintenance budget.

Pavement Lifecycle



Due to the rising cost of improvements and the declining funds for preserving existing infrastructure it is challenging to make improvements to the pavement network. Building a historical and measurable database of conditions in the Montachusett region allows for a snapshot of overall conditions which will allow us to determine how the network changes over time.



Above is a comparison of current State Jurisdiction federal aid eligible roads and those same roads reported in the 2012 RTP. Noticeable changes can be seen in the “Excellent” and “Good” condition categories since 2012. The percentage of “Excellent” condition pavements have increased considerably in four years. Also notable is overall percentage of pavements “Excellent” and “Good” combined and overall percentage of those rated “Fair” and “Poor” combined.

Pavement Condition Change					
State Jurisdiction Federal Aid Eligible Roads					
	2012			2016	
Poor	10%	28%	Poor	13%	29%
Fair	18%		Fair	26%	
Good	37%	62%	Good	14%	61%
Excellent	35%		Excellent	47%	

The chart above shows the shift of pavement conditions on State Jurisdiction federal aid eligible roads in the past four years. As part of this RTP a Performance Measure has been developed to determine whether this region is meeting goals set forth in this long range plan. Below are applicable Goals, Objectives and Performance Measures which related to the regions pavements.

Challenges

- How do we maintain infrastructure in a state of good repair?
- How can we employ affordable practices when investing in our transportation network?
- How can we attain a sustainable network of infrastructure?

Moving Forward – Addressing the Challenges

- Direct a proper level of investment to maintaining existing infrastructure to prevent decaying of the network.
- Encourage utilization of best practices such as Pavement Management Systems to ensure available funds are efficiently used.
- Encourage rehabilitation and preventative maintenance in infrastructure before more costly reconstruction is needed.
- Continue to monitor system wide conditions in long range plans to document trends and ensure proper investments are being made.

The transportation system in the Montachusett region largely consists of roads and bridges. Maintaining these assets are a challenge, however, we must understand the importance of a properly functioning and safe system. Meeting the objectives in this long range plan depend largely on the ability to maintain what we already have. Maintaining a state of good repair is a main priority and in our best interest in order to stretch our investments to the greatest benefits. The Performance Measures set forth in this plan are important benchmarks to see if we are meeting our goals.



Action Items

Action	Next Steps	Outcome
Re-vamp a data driven approach to region-wide pavement management.	Develop pavement infrastructure database reflecting current conditions and projecting into the future.	Provide guidance for local and region-wide projects that will improve system-wide conditions.
Encourage system-wide preservation by reporting the conditions and trends in region-wide infrastructure.	Promote investing in infrastructure preservation projects when prioritizing projects for implementation in the region	Improved/sustainable network of transportation infrastructure.

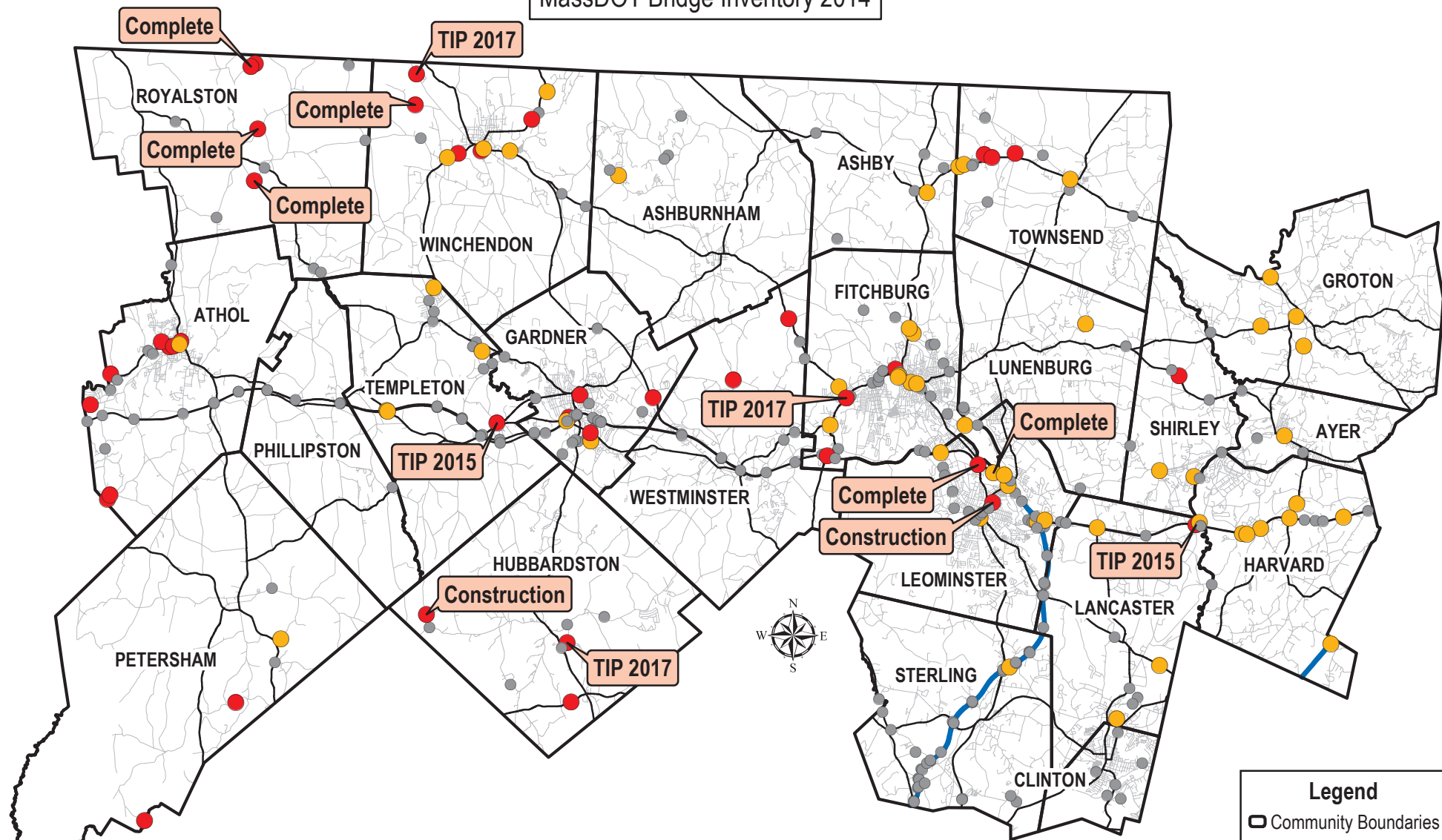


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MRPC: RTP 2016

MassDOT Bridge Inventory 2014



Legend

- Community Boundaries
- Roadways**
 - Interstate Routes
 - US & State Routes
 - Other Roadways
- Bridges**
 - Structurally Deficient
 - Functionally Obsolete
 - Other/Unknown

DATA SOURCES: MassGIS, MassDOT and the MRPC.

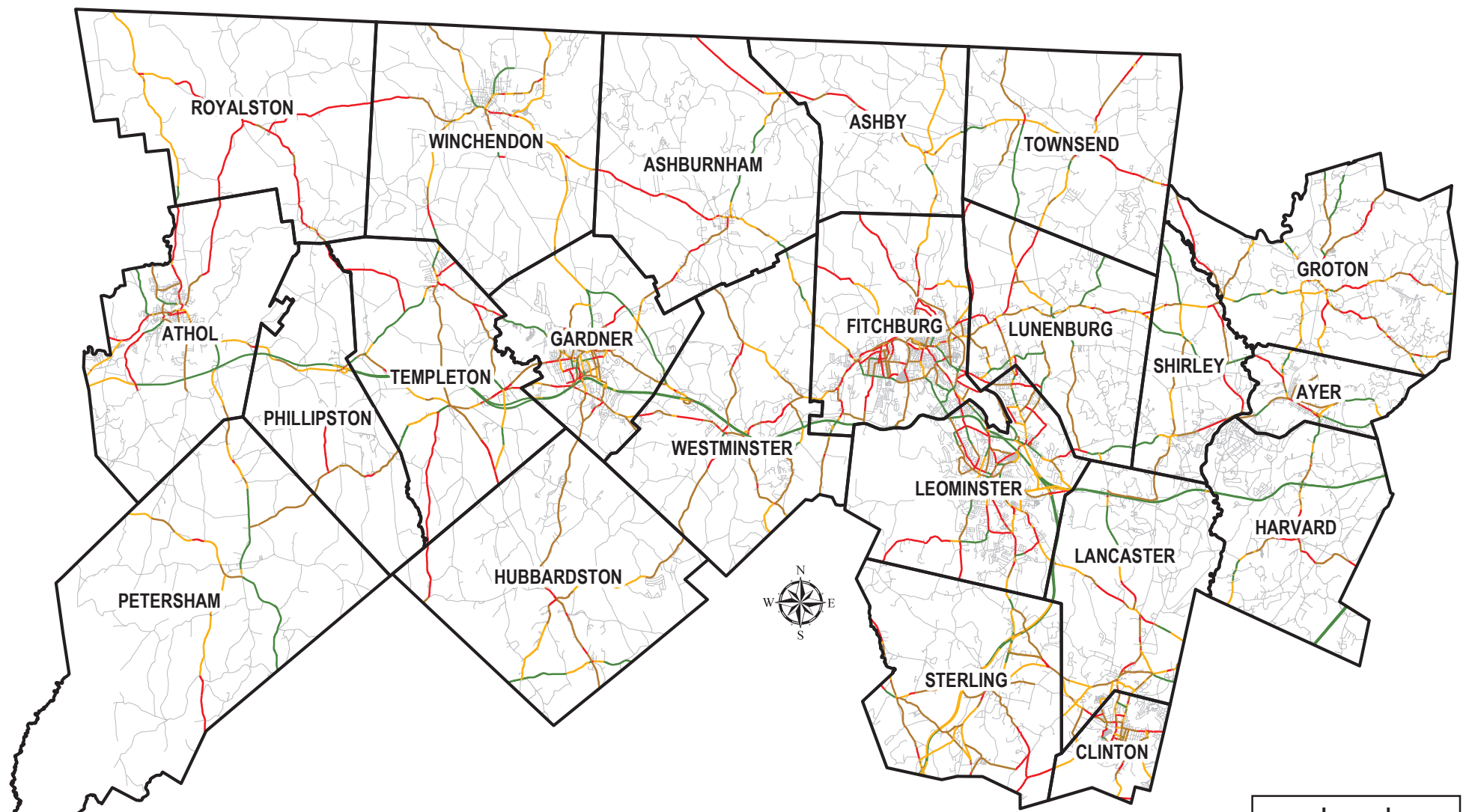
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MRPC: RTP 2016

Pavement Conditions



Legend

- Community Boundaries

Pavement Condition

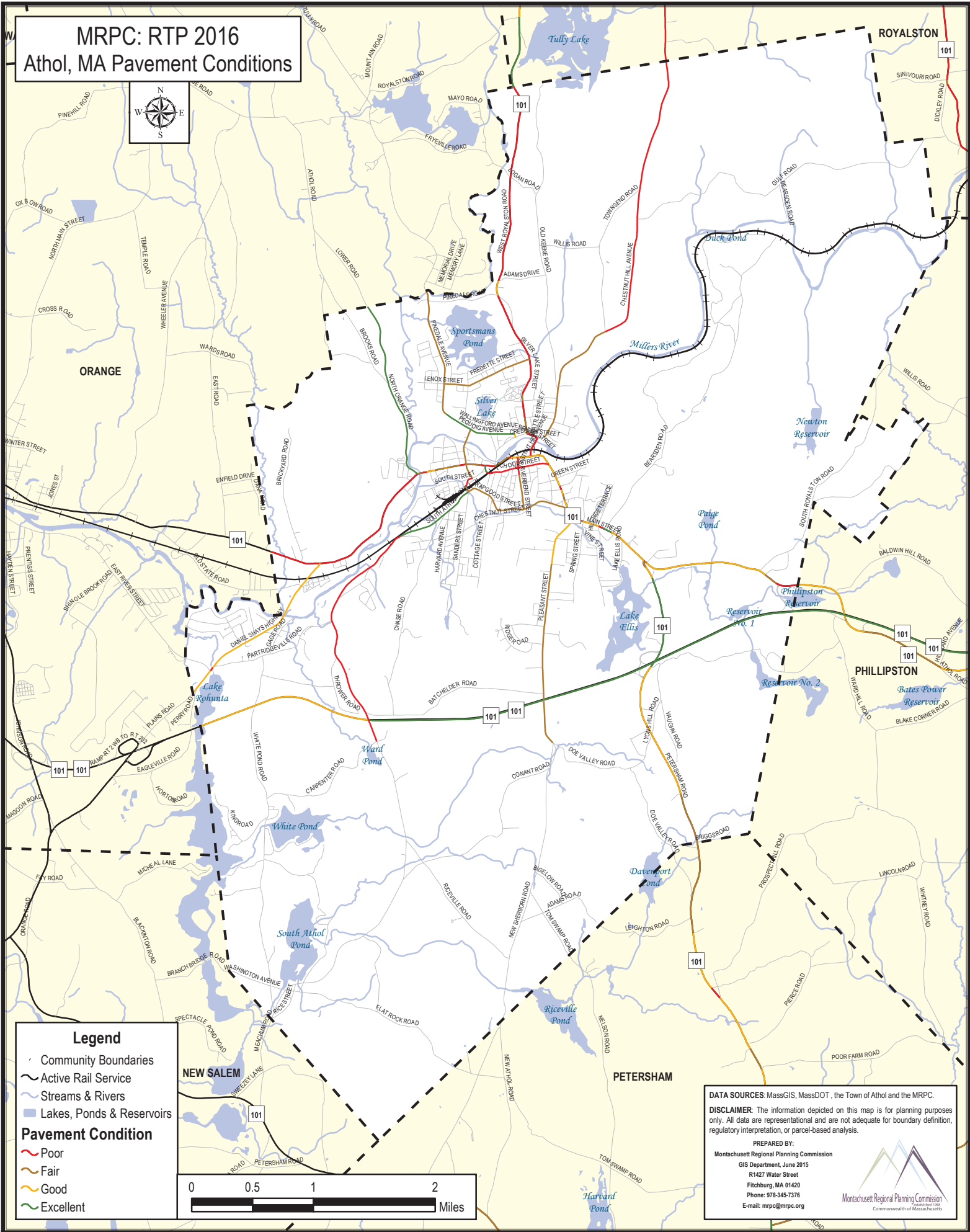
- Poor
- Fair
- Good
- Excellent
- Other Roadways

DATA SOURCES: MassGIS, MassDOT and the MRPC.

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MRPC: RTP 2016 Athol, MA Pavement Conditions



Legend

- Community Boundaries
- Active Rail Service
- Streams & Rivers
- Lakes, Ponds & Reservoirs

Pavement Condition

- Poor
- Fair
- Good
- Excellent

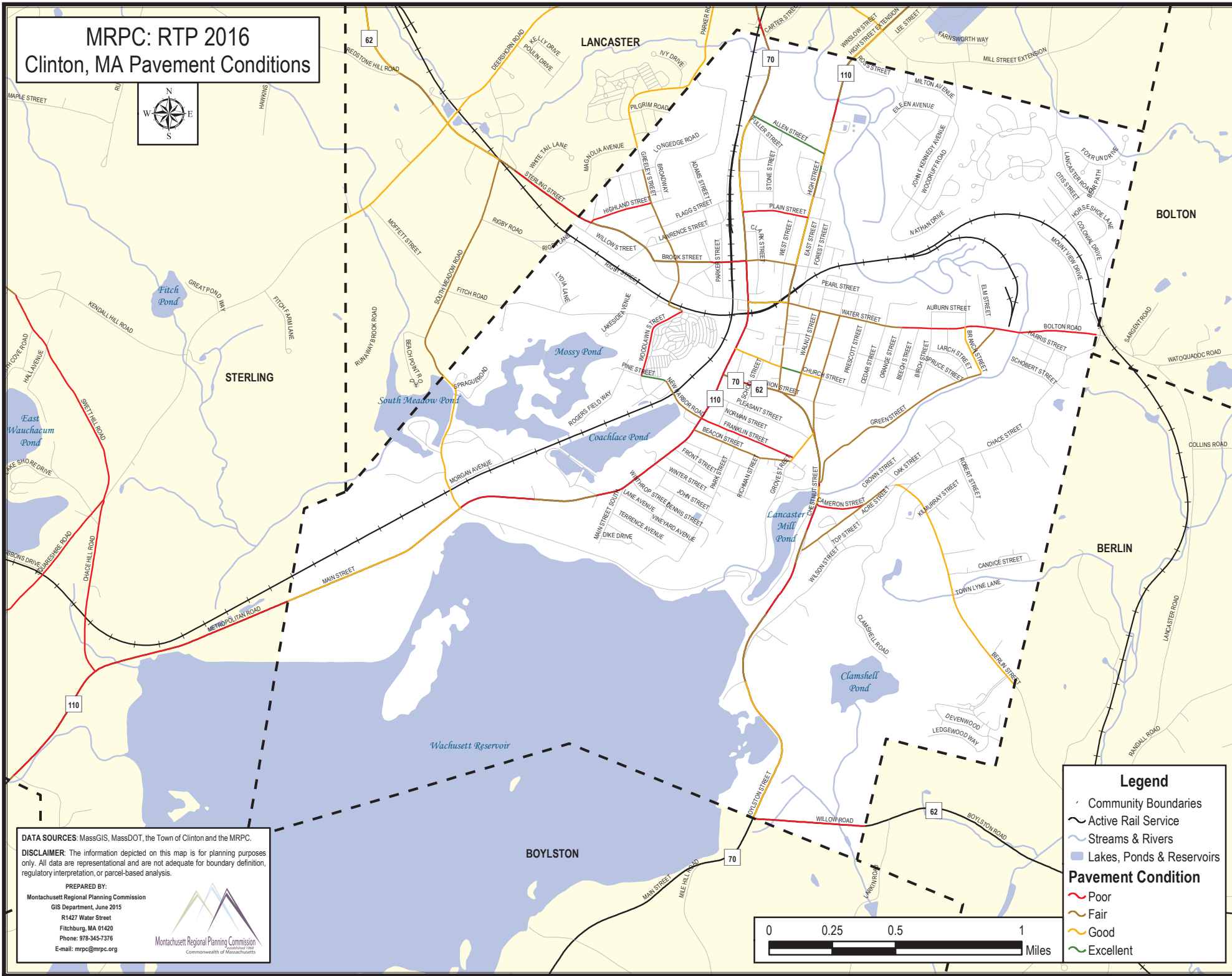


DATA SOURCES: MassGIS, MassDOT, the Town of Athol and the MRPC.
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MRPC: RTP 2016 Clinton, MA Pavement Conditions



DATA SOURCES: MassGIS, MassDOT, the Town of Clinton and the MRPC.

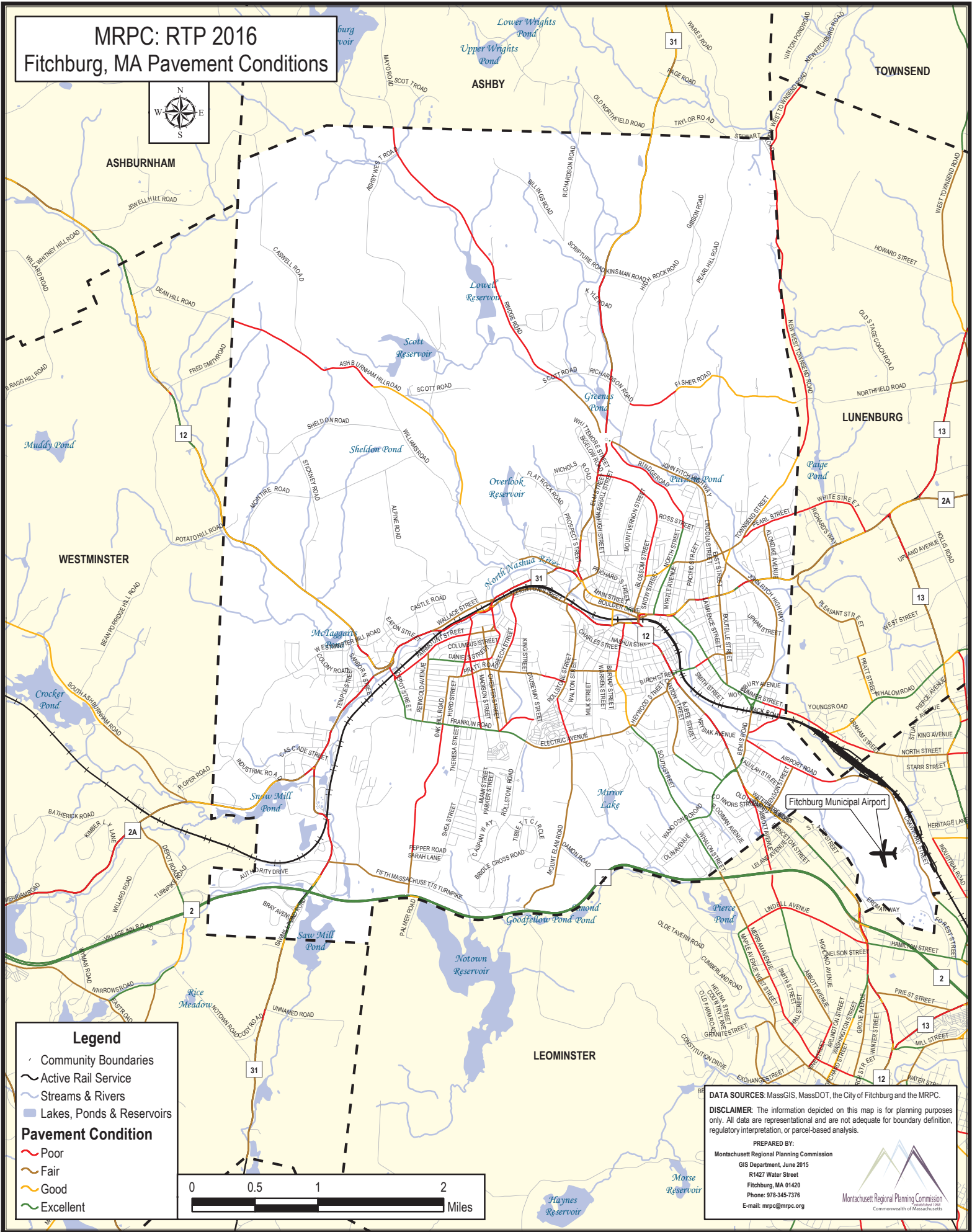
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MRPC: RTP 2016

Fitchburg, MA Pavement Conditions



Legend

- Community Boundaries
- Active Rail Service
- Streams & Rivers
- Lakes, Ponds & Reservoirs

Pavement Condition

- Poor
- Fair
- Good
- Excellent

DATA SOURCES: MassGIS, MassDOT, the City of Fitchburg and the MRPC.

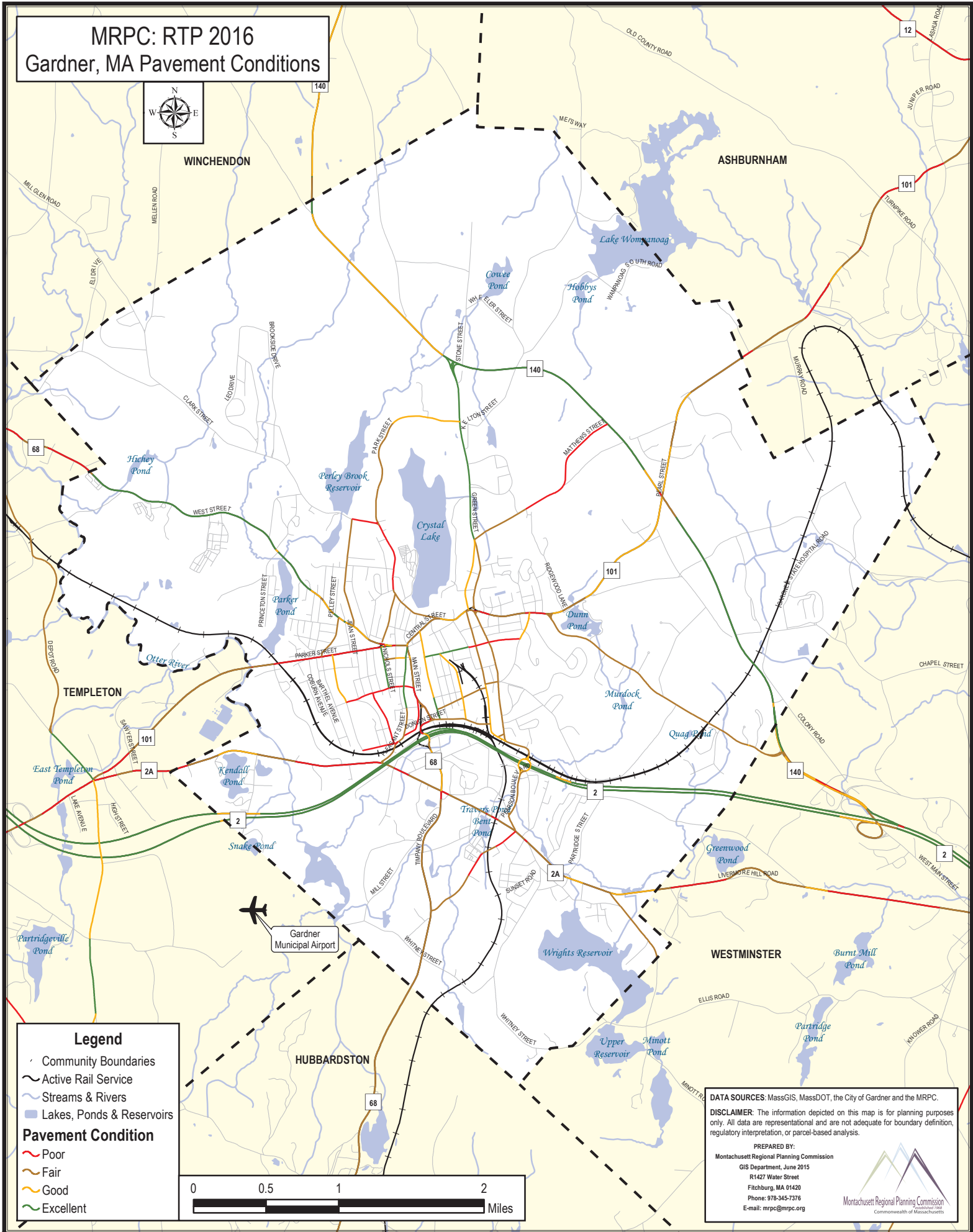
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Montachusett Regional Planning Commission
 Commonwealth of Massachusetts

MRPC: RTP 2016

Gardner, MA Pavement Conditions



Legend

- Community Boundaries
- Active Rail Service
- Streams & Rivers
- Lakes, Ponds & Reservoirs

Pavement Condition

- Poor
- Fair
- Good
- Excellent

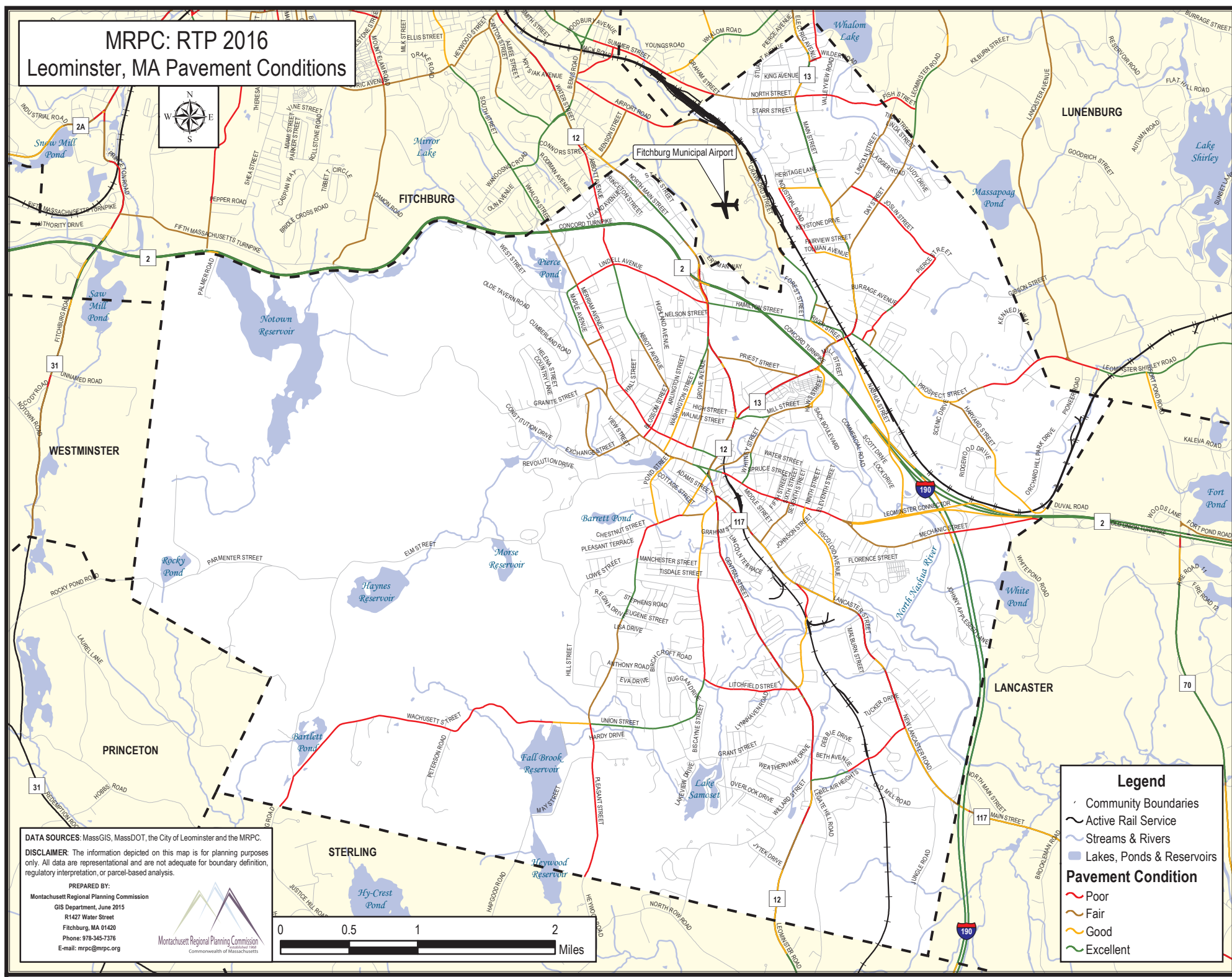


DATA SOURCES: MassGIS, MassDOT, the City of Gardner and the MRPC.
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MRPC: RTP 2016 Leominster, MA Pavement Conditions



DATA SOURCES: MassGIS, MassDOT, the City of Leominster and the MRPC.

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 Commonwealth of Massachusetts



Legend

- Community Boundaries
- Active Rail Service
- Streams & Rivers
- Lakes, Ponds & Reservoirs

Pavement Condition

- Poor
- Fair
- Good
- Excellent