MONTACHUSETT
METROPOLITAN PLANNING ORGANIZATION
(MMPO)

Sterling – Princeton - Westminster Route 140 Corridor Profile

Sterling Segment

Prepared by the transportation staffs of the

Montachusett Regional Planning Commission

And the

Central Massachusetts Regional Planning Commission

December 2010

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Route 140 Corridor Profile Document

DEDICATION

Dennis E. Rindone
Princeton Town Administrator
1998-2009

The membership of the Route 140 Safety Improvement Task Force recognizes the dedication and persistence of former Princeton Town Administrator Dennis E. Rindone. Through his vision, the *Route 140 Corridor Profile* transportation study was commenced- a worthy undertaking aimed at improving highway safety. Integral in organizing the effort, he coordinated the Route 140 study endeavor among three communities and two regional planning agencies. Through his ongoing inspiration, the study has been completed.

The Route 140 Safety Improvement Task Force and towns of Princeton, Sterling and Westminster recognize Dennis' work to improve the quality of life in the greater region. Accordingly, the membership dedicates the *Route 140 Corridor Profile* document in his memory.

October 28, 2010. *Photo courtesy of the Holden Landmark.*

ACKNOWLEDGEMENT

The membership of the Route 140 Safety Improvement Task Force wishes to acknowledge the significant and professional contributions of the two regional planning agencies that invited public participation, collected the data, attended numerous public meetings, responded to all questions and created a very complete final report. Montachusett Regional Planning Commission and Central Massachusetts Regional Planning Commission willingly gave their time, resources and professional expertise, creating a document that will be used by the communities of Westminster, Sterling and Princeton in pursuit of the safety improvements demonstrated as needed along the North Central Massachusetts Route 140 corridor. We thank all the contributing staff members of both planning agencies and the staff of MassDOT for the dedication and professional approach to this need and the resulting documentation.

As submitted

Joseph O'Brien, Princeton Board of Selectmen

Richard Sheppard, Sterling Board of Selectmen

John Fairbanks, Westminster Board of Selectmen

October 28, 2010

Route 140
Safety Improvement Task Force
Membership

Town of Princeton

Alex Fiandaca, Citizen-at-Large, Route 140 resident
Glenn Lyons, Highway Superintendent
Joe O’Brien, Board of Selectmen
Ken Whitney, Alternate, Citizen-at-Large, Route 140 resident

Town of Sterling

John Powers, Citizen-at-Large, Route 140 resident
Robert Protano, Alternate, Citizen-at-Large, Route 140 resident
Richard Sheppard, Board of Selectmen
Robert Temple, Highway Foreman

Town of Westminster

Will Ahearn, Highway Superintendent
John Fairbanks, Board of Selectmen
Peter Remelius, Citizen-at-Large, Route 140 resident

Route 140 Task Force Professional Staff

Arthur Frost, MassDOT, Project Development Engineer
Brad Harris, Montachusett RPC, Transportation Project Director
John Lebeaux, Princeton Town Administrator
Rich Rydant, Central Massachusetts RPC, Transportation Project Manager

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1.0 INTRODUCTION

1.1 Transportation Management System "Corridor Profile"

A Corridor Profile correlates the information generated by the transportation Management Systems along a particular highway corridor and analyzes performance-based data, suggests both operational and physical improvements, and may identify candidate projects for further study. Utilizing the range of data and analyses produced by the various Transportation Management Systems maintained in an ongoing manner by the staff of the Montachusett Regional Planning Commission (MRPC) and overseen by the Montachusett Metropolitan Planning Organization (MMPO), Corridor Profile efforts allow for the comprehensive integration and consideration of a wide range of transportation planning factors along MMPO selected segments of the region's federal-aid highway system. Ultimately, a number of suggested improvement options are compiled for the consideration of the communities involved and the Massachusetts Department of Transportation (MassDOT) Highway Division. When consensus is reached, proposed improvement projects have the potential to be selected by the MMPO for programming in the annual Transportation Improvement Program (TIP) document.

The Route 140 Corridor Profile includes the analysis of a range of Management System data, including the following:

> **Traffic Counting:** Daily Automatic Traffic Recorder (ATR) counts and MassDOT Permanent Count Station data and associated historical growth rates;
> **Congestion Management Process (CMP):** Historical and current peak-hour Turning Movement Counts at focus intersections and associated Level of Service (LOS) analyses;
> **Transportation Safety Planning Program:** In-depth vehicle crash research in cooperation with the local Police Departments utilizing a three-year history of reported crashes and subsequent analysis, including the compilation of collision diagrams and crash rates;
> **Pavement Management System (PMS):** Observation of pavement surface distress and extent in the field along with subsequent analysis and calculated condition rating;
> **Bridge Management System (BMS):** Bridge condition data available through MassDOT, a GIS-based inventory of roadway drainage culverts as well as local observations in the field;
> **Freight Planning:** Daily percentage of heavy vehicles utilizing Route 140 roadway segments and peak hour percentage of heavy vehicles;

Depending on local sentiment and available funding, the technical work necessary to compile a Corridor Profile is supplemented by a proactive public outreach effort. This can range from basic meetings with local officials to the formation of a Task Force to guide the study and gauge the sentiment of the host community in a range of venues.

1.2 The Route 140 Safety Improvement Task Force

Former Princeton town administrator Dennis Rindone is credited with establishing the Route 140 Safety Improvement Task Force and serving as the initial secretary to the process. Later, Princeton town administrator John Lebeaux assumed this role. Mr. Rindone's initial idea was for a transportation planning study that would identify potential safety improvements along Route 140 through Princeton. Later, he asked the neighboring communities of Sterling and Westminster to join the effort, modeled after a similar multi-community effort that focused on Route 2. The Route 2 effort led to highway improvements that benefited not only the host communities but the entire greater region as well.

Initialized with local select board approval, the Route 140 Safety Improvement Task Force was established to oversee a transportation planning study of the length of Route 140 through the three communities of Princeton, Sterling and Westminster with a primary emphasis on improving roadway safety, reducing periodic congestion, preserving and improving roadway pavement and drainage as well as investigating how to improve the roadway for bicycle and pedestrian accommodation. Although the first meeting of the Task Force was held in August 2008, pre-planning by Dennis Rindone started over a year earlier. The membership of the Task Force is listed as follows:

Route 140 Safety Improvement Task Force Membership

Town of Princeton

Alex Fiandaca, Citizen-at-Large, Route 140 resident
Glenn Lyons, Highway Superintendent
Joe O'Brien, Board of Selectmen
Ken Whitney, Alternate, Citizen-at-Large, Route 140 resident

Town of Sterling

John Powers, Citizen-at-Large, Route 140 resident
Robert Protano, Alternate, Citizen-at-Large, Route 140 resident
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Peter Remelius, Citizen-at-Large, Route 140 resident

Professional Staff

Arthur Frost, MassDOT, Project Development Engineer

Brad Harris, Montachusett RPC, Transportation Project Director
John Lebeaux, Princeton Town Administrator
Rich Rydant, Central Massachusetts RPC, Transportation Project Manager

Mr. Rindone also worked with local state legislators to gain a line item listing in a 2008 Transportation Bond Bill for $14 million to fund the eventual construction of selected improvements. In light of the economic downturn, community officials need to investigate the potential for tapping a portion of this accepted line item, perhaps for the design of improvements. Further, the Route 140 host communities would likely need to seek funding under the Transportation Improvement Program (TIP), which provides federal-aid funding for transportation improvements on eligible highways, including Route 140. The TIP process is carried out annually by the Montachusett Metropolitan Planning Organization (MMPO) for the towns of Westminster and Sterling and by the Central Massachusetts Metropolitan Planning Organization (CMMPO) for the town of Princeton. A more detailed discussion of the TIP is provided in the final section of this document.

The Selectmen members of the Route 140 Safety Improvement Task Force served as meeting chairs in their respective towns as a series of meetings alternated among Princeton, Sterling and Westminster over the two year period from August 2008 to December 2010. Professional staff from the Montachusett Regional Planning Commission (MRPC), assisting the towns of Sterling and Westminster, and the Central Massachusetts Regional Planning Commission (CMRPC), assisting the town of Princeton, helped lead the study process on behalf of the host communities. Staff from the MassDOT Highway Division District 3 office also participated in the study process.

The members of the Safety Improvement Task Force assisted in getting the word out concerning regular meetings of the Task Force as well as for special local meetings. Special local meetings provided an initial overview to the study process and, later in the study, provided the opportunity to discuss findings and a range of suggested improvement options while addressing host community concerns.

A detailed Technical Appendix has been compiled to accompany the Corridor Profile document and includes records of all meetings of the Safety Improvement Task Force and the special local meetings held in the Route 140 host communities. The Appendix also includes news articles, technical analyses and a broad range of other materials pertinent to the Route 140 Corridor Profile effort.

1.3 Route 140 Corridor Profile: Sterling Segment

This document is a Corridor Profile for the segment of Route 140 in the town of Sterling. A map of the study area is shown in **Figure 1-1**.

The roadway segment of Route 140 in Sterling combine for a total length of 4.25 miles and is a federal-aid highway eligible for federal funding for improvements. It is maintained by the town of Sterling. MassDOT oversees and takes a major role in improvements suggested and eventually implemented along the federal-aid highway system.

This Corridor Profile effort has been completed in cooperation with MRPC as part of the MMPO endorsed Unified Planning Work Programs (UPWPs) for federal fiscal years 2009 and 2010. The UPWP for the Montachusett MPO is a financial programming tool developed annually as part of the federally certified transportation planning process. The UPWP contains task descriptions of the transportation planning program of the MPO, with associated budget information and funding sources for the program year. The purpose of the UPWP is to ensure a comprehensive, cooperative, and continuing (3C) transportation planning process in the Leominster-Fitchburg Urbanized Area and the Montachusett Region. In addition, this document provides for the coordination of planning efforts between communities in the Montachusett Region.

Various tasks outlined in the 2008-2009 and 2009-2010 program years covered the MRPC's participation with the Route 140 Safety Improvement Task Force and the development of the Corridor Profile study. The following table highlights the tasks and associated budgets that contributed to this study. Please note that the total budget figures provided covered numerous planning activities and were not exclusive to this Corridor Profile.

Program Year: *October 1, 2008 to September 30, 2009*		
Task	**Task Title**	**Budget**
2.32	Traffic Count Program	$34,000
2.52	Regional Crash Database	$30,000
3.52	Local Technical Assistance	$23,000

Program Year: *October 1, 2009 to September 30, 2010*		
Task	**Task Title**	**Budget**
3.42	Corridor Profiles	$50,000

Note: These budgets cover work on several planning activities. A breakdown for the Route 140 Corridor Profile has not been developed.

The following provides an overview of the major tasks that were included within the broad scope of the Route 140 Corridor Profile effort:

- Meetings of the Route 140 Safety Improvement Task Force Meetings, alternating between the host communities of Princeton, Sterling and Westminster.
- CMRPC & MRPC coordination on an entire range of *Corridor Profile* aspects, including data collection, analysis and suggested improvement options for the consideration of the Route 140 host communities.

- Vehicle crash analysis completed in cooperation with the Sterling Police Department, 2006 through 2008.
- Completion of an "Environmental Profile" was completed for the entire Route 140 study corridor in Princeton, Sterling and Westminster.
- Compilation and production of a range of maps and graphics for the report document as well as for public outreach purposes.
- Town of Sterling Task Force Members Issues Meeting, May 2009.
- Town of Sterling Public Information Meeting, August 2009
- Drafted range of suggested improvement options for host community consideration.
- Town of Sterling Task Force Members Issues Meeting, July 2010.
- Completion of a detailed *Route 140 Corridor Profile* report document, complete with color graphics and maps, along with an accompanying Technical Appendix.

1.4 Corridor Issues: Sterling Segment

As part of the development process to identify various areas of concern within each community along the Route 140 corridor, Task Force members were asked to highlight issues/problems within their respective town. These concerns would focus on perceived and/or known safety problems as well as other issues that needed to be addressed from the towns' perspective. Task Force members were encouraged to include in their discussions other town departments or personnel that they felt appropriate. In addition, one on one meetings were held between the town and the RPA to review the information provided and to clarify any questions related to the community's concerns. These meetings occurred on May 4th and 12th, 2009 with Sterling and Westminster, respectively. A public input meeting was also held on August 13, 2009 in Sterling at which time the study concept was presented as well as the local issues identified by the Sterling Task Force members.

Within the town of Sterling, the following issues/concerns related to Route 140 were identified by Task Force participants. Issues/concerns are listed starting at the Princeton line (refer to **Figure 1-2**):

1. Ownership of the bridge at the Princeton town line and are the towns responsible for repair?

2. Bus turn around should be paved and widened in Sterling:
    - There is a snow plow turnaround at the Sterling-Princeton line that may also be used by some school buses. It is currently unpaved and deeply rutted making it unsafe for cars attempting to pass slow moving vehicles. There is also a bridge at this location that straddles the town line. It is in need of repair and/or redesign.

3. Beaman Road intersection needs to be 90 degrees:
    - The Beaman Road intersection at 140 is now one-way but can be confusing for casual users of Route 140. Some individuals who live on this short section of road still use it as a two-way, adding to the confusion. Better signage and 90 degree exit would eliminate this hazard. Sight lines need to be improved and drainage from here to the Princeton town line is in need of upgrade.
    - Culvert at Beaman Road and Route 140 needs update – flooding or beaver control.

4. Trim trees at North Oakdale Cutoff for better visibility:
    - North Oakdale Cutoff has a sight line hazard because of trees. Trimming would most likely eliminate.
    - Decision on possible reconstruction of bridge at Houghton Road and North Oakdale Cutoff needs to be made as it could impact this intersection.

5. Lower grade at Antique Plants back to 140 Club:
    - Still River Road has a sight line hazard to the north due to road elevation.

6. Burpee Road needs better delineation. Possible one-way westerly.

7. Route 140/Route 62 intersection redesign with traffic control devices. This location is the site of many minor accidents and extreme traffic congestion during high volume periods in the early morning and late afternoon, early evening time frame. Because a Little League and recreational site is close to this location (Princeton Road at Holden Road) a bicycle lane should be given some consideration leading to the site from at least a half mile in either direction. A culvert is needed at or near the nearby residence.
    - This intersection is ranked #4 in Sterling and #79 in the MRPC region as a dangerous location.

8. Johnson Road needs 90 degrees entry at both ends. Also, trees in this area could be trimmed, but not completely removed:
    - Both ends of Johnson Road need to be redesigned to 90 degree angles to prevent Johnson Road being used as a shortcut to beat slower traffic in either direction. This will prevent the very high speeds sometime incurred on this narrow road. Consider making this a one-way street by town ordinance. Drainage along this section of 140 …to Moore's Corner is poor creating icy conditions in winter months.

9. Fox Run and Crowley Road intersection needs to be a direct crossing and not offset:

- The Fox Run, Crowley Road intersection needs a cut out for cars turning into Fox Run coming from the south. Crowley Road could also be moved to create a true four corners intersection. The state currently owns both sides of Crowley Road at this location. A culvert runs under the road at this location which needs to be enlarged or redesigned to improve the drainage. Ice and snow buildup can be a problem here. Also, sight lines in both directions need to be address.
- Drainage in this location also needs to be improved.

10. John Dee Road needs a 90 degree entry/exit:
    - John Dee Road intersection needs to be at a 90 degree angle to Redemption Rock Trail (Route 140). Upgrade the culvert on both sides of the road in this location (occasional flooding).

11. Clemence Avenue needs an improved sightline, north primarily:
    - Clemence Avenue needs sight line improvement to the south (hill). The drainage from this road to Dana Hill Road is in need of improvement.

12. *(This issues was added by the MRPC after discussion with the Task Force)* The Rte 140 & Rte I-190 southbound OFF ramp intersection experiences a high number of rear end crashes near the right turn YIELD sign on the ramp. Acceleration lane is too short or nonexistent to allow vehicles to properly merge with Route 140 traffic and the two lanes on Route 140 merge into one just north of this intersection. Poor sight distance exists to the left of the ramp caused by the combination of the Route I-190 embankment and large sign, and to the right caused by an embankment. Most likely moving vehicles fail to recognize stopped vehicles early enough at the YIELD sign. Vehicles in the left turn lane of the OFF ramp experience confusion with the four lanes of traffic. The southbound lanes on Route 140 are the most difficult to negotiate.

    There is a safety problem at the Legg Road/Dana Hill Road and Route 140 intersection which is approximately 1,000 feet north of this OFF ramp. There is also vertical curve between the two intersections.

    The northbound ramp does not experience many crashes but left turning vehicles experience confusion with the four lanes of traffic. The southbound lanes on Route 140 are the most difficult to negotiate.

The following issues were raised at the August 13, 2009 Sterling Public Input Meeting:

13. Many septic tanks in front yards.

14. Merrill Road area has drainage and flooding issues.

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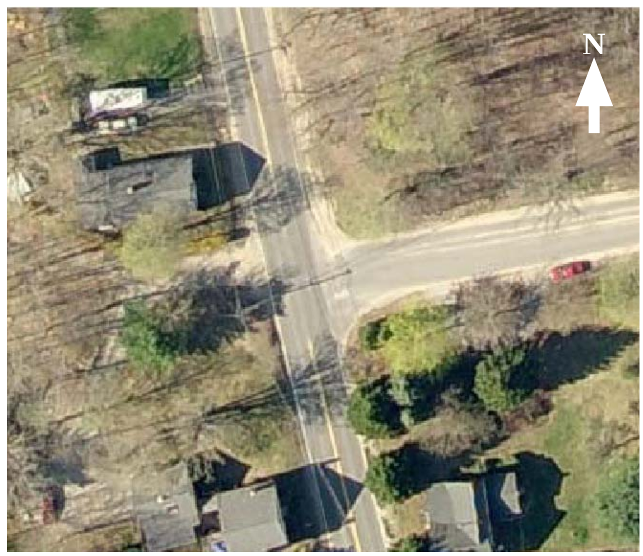
1.5 Intersection Figures: Sterling Segment

Route 140 at Beaman Road

Route 140 and North Oakdale Cutoff

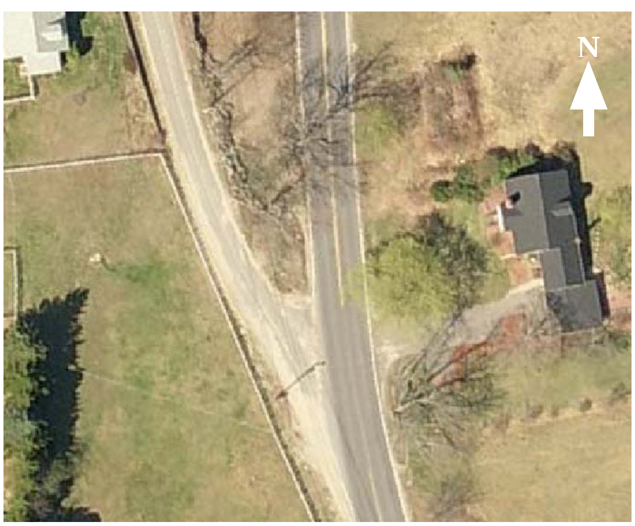


Route 140 and Still River Road

Route 140 and Burpee Road

Route 140 and Route 62

Route 140 and Johnson Road



Route 140 and Johnson Road

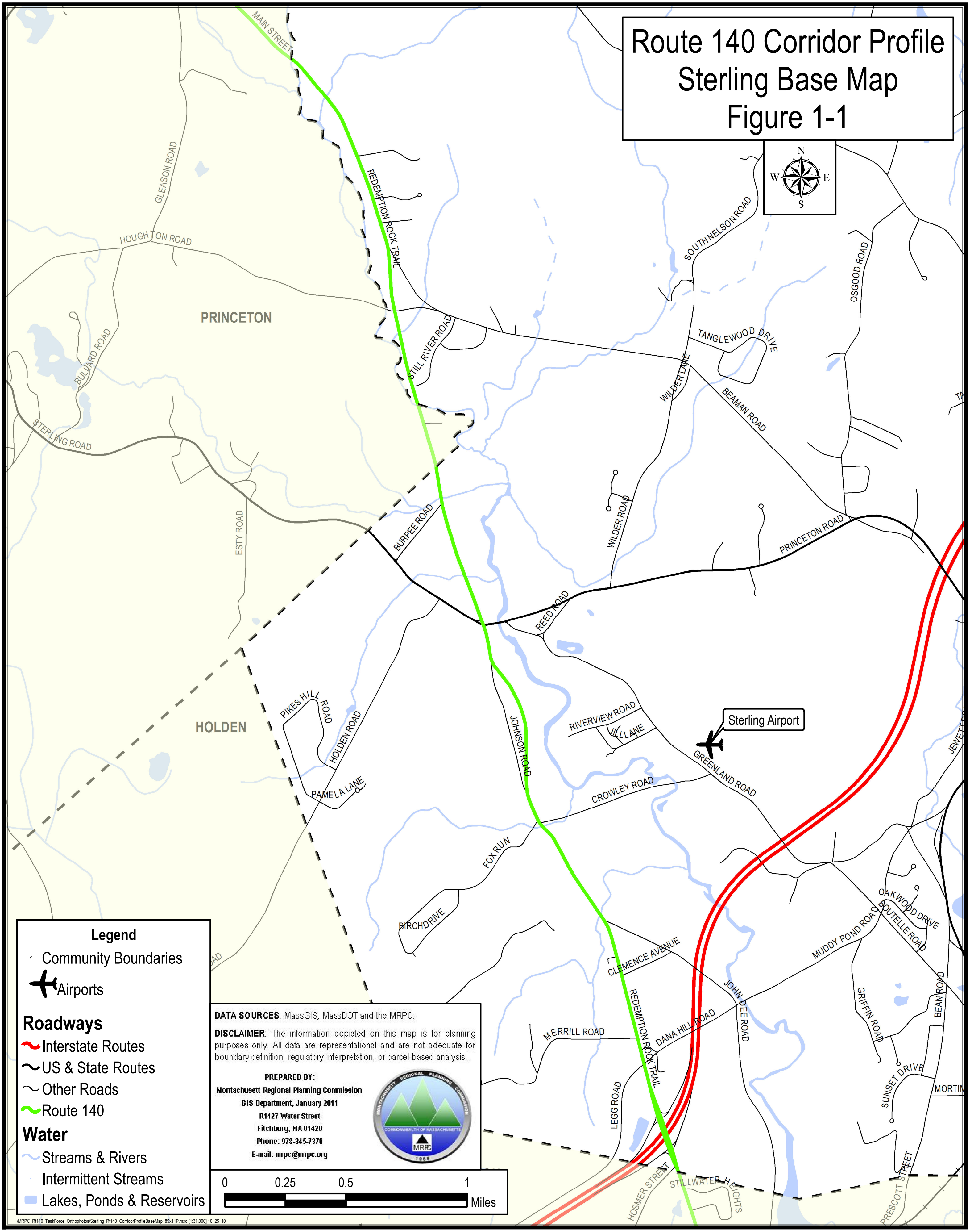
Route 140 and Fox Run and Crowley Road

Route 140 and John Dee Road

Route 140 and Clemence Avenue

Route 140 and Rte I-190

Route 140 and Rte I-190



Route 140 Corridor Profile
Sterling Base Map
Figure 1-1
N
S
E
W
PRINCETON
HOLDEN
MAIN STREET
REDEMPTION ROCK TRAIL
GLEASON ROAD
HOUGHTON ROAD
BULLARD ROAD
STERLING ROAD
ESTY ROAD
STILL RIVER ROAD
BURPEE ROAD
SOUTH NELSON ROAD
OSGOOD ROAD
TANGLEWOOD DRIVE
WILDER LANE
BEAMAN ROAD
WILDER ROAD
PRINCETON ROAD
REED ROAD
PIKES HILL ROAD
HOLDEN ROAD
PAMELA LANE
JOHNSON ROAD
RIVERVIEW ROAD
HILL LANE
Sterling Airport
GREENLAND ROAD
CROWLEY ROAD
FOX RUN
BIRCH DRIVE
CLEMENCE AVENUE
JOHN DEE ROAD
MUDDY POND ROAD
OAKWOOD DRIVE
BOUTELLE ROAD
GRIFFIN ROAD
BEAN ROAD
MERRILL ROAD
DANA HILL ROAD
LEGG ROAD
SUNSET DRIVE
MORTIM
HOSMER STREET
STILLWATER HEIGHTS
PRESCOTT STREET
JEWETT
Legend
Community Boundaries
Airports
Roadways
Interstate Routes
US & State Routes
Other Roads
Route 140
Water
Streams & Rivers
Intermittent Streams
Lakes, Ponds & Reservoirs
DATA SOURCES: MassGIS, MassDOT and the MRPC.
DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.
PREPARED BY:
Montachusett Regional Planning Commission
GIS Department, January 2011
R1427 Water Street
Fitchburg, MA 01420
Phone: 978-345-7376
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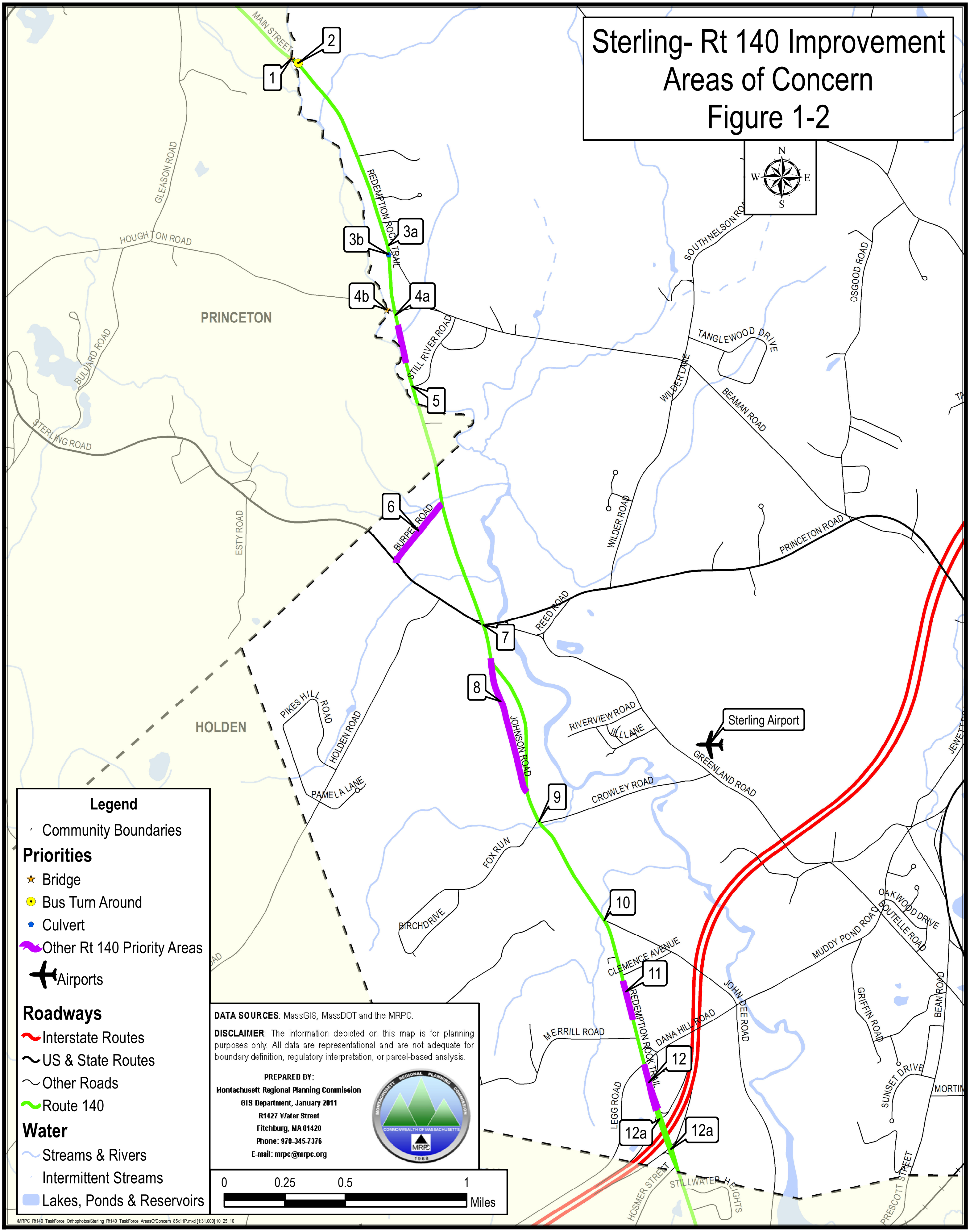

Sterling- Rt 140 Improvement
Areas of Concern
Figure 1-2
N
W
E
S
MAIN STREET
1
2
REDEMPTION ROCK TRAIL
3a
3b
4a
4b
5
6
7
8
9
10
11
12
12a
12a
PRINCETON
HOLDEN
GLEASON ROAD
HOUGHTON ROAD
BULLARD ROAD
STERLING ROAD
ESTY ROAD
STILL RIVER ROAD
BURPEE ROAD
SOUTH NELSON ROAD
OSGOOD ROAD
TANGLEWOOD DRIVE
WILDER LANE
BEAMAN ROAD
WILDER ROAD
PRINCETON ROAD
REED ROAD
JOHNSON ROAD
RIVERVIEW ROAD
JILL LANE
Sterling Airport
GREENLAND ROAD
CROWLEY ROAD
PIKES HILL ROAD
HOLDEN ROAD
PAMELA LANE
FOX RUN
BIRCH DRIVE
CLEMENCE AVENUE
MUDDY POND ROAD
OAKWOOD DRIVE
BOUTELLE ROAD
JOHN DEE ROAD
GRIFFIN ROAD
BEAN ROAD
MERRILL ROAD
DANA HILL ROAD
LEGG ROAD
SUNSET DRIVE
MORTIM
HOSMER STREET
STILLWATER HEIGHTS
PRESCOTT STREET
JEWETT
Legend
Community Boundaries
Priorities
Bridge
Bus Turn Around
Culvert
Other Rt 140 Priority Areas
Airports
Roadways
Interstate Routes
US & State Routes
Other Roads
Route 140
Water
Streams & Rivers
Intermittent Streams
Lakes, Ponds & Reservoirs
DATA SOURCES: MassGIS, MassDOT and the MRPC.
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PREPARED BY:
Montachusett Regional Planning Commission
GIS Department, January 2011
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Miles

2.0 ROUTE 140 ENVIRONS

2.1 Sterling Land Use

The Sterling portion of this corridor consists of a mixture of conservation and residential uses. Water supply protection areas are found throughout the area along Route 140 as well as areas that are to be held as open space. Residential and a few Commercial plots are found along Route 140 and connecting roads.

2.2 Environmental Profiles: DCR, DEP, & NHESP

A number of agencies and programs provide information that helps shed light on the Route 140 corridor environment. A brief description of these agencies and their activities follows.

Department of Conservation and Recreation (DCR)

The mission of DCR is to protect, promote and enhance our common wealth of natural, cultural and recreational resources. Geographic Data layers are managed by divisions within DCR.

- **Division of State Parks and Recreation -**This division protects land and resources on privately and municipally held land through technical assistance, grant and planning programs, policy development, and other services.
- **Forest Stewardship Program -** This non-regulatory program is designed to help landowners protect the inherent ecosystem values of their forest.
- **Division of Water Supply Protection -** Manages and protects the drinking water supply watersheds for Greater Boston.

Figure 2-1 shows a map of the Route 140/Sterling area as generated using DCR information. A buffer area of general interest - a mile wide centered around the roadway - is indicated. Within this we note Water Supply Protection areas where care must be taken to avoid adverse environmental effects. We can also see many residential areas located adjacent to Route 140 and other connecting roads as well as a few Conservation areas nearby.

Department of Environmental Protection (DEP)

MassDEP is responsible for ensuring clean air and water, safe management and recycling of solid and hazardous wastes, timely cleanup of hazardous waste sites and spills, and the preservation of wetlands and coastal resources. It includes:

- **Division of Watershed Management (DWM)**
- **Watershed Planning Program (WPP) -** Contaminated water eliminates drinking water supplies, degrades our recreational water resources and

destroys wildlife habitat. Water that does not soak into the ground is called runoff. Proper manure management and runoff management will protect or improve water quality in any community and watershed. Geographic data layers are from an integrated list from DWM and WPP and include:

- ***Impaired Waterways (due to pathogens, generally from sewage)***
- ***Impaired Waterbodies***
- ***Monitored Waterways***

- **Bureau of Resource Protection (BRP) -** The Wetlands Protection protects wetlands and the public interests they serve, including flood control, prevention of pollution and storm damage, and protection of public and private water supplies, groundwater supply, fisheries, land containing shellfish, and wildlife habitat. These public interests are protected by requiring a careful review of proposed work that may alter wetlands.

Figure 2-2 shows DEP-monitored areas within the one mile zone of interest. We note many areas that are to be held as Open Space in Perpetuity, with no further building or other disruption to affect the roadway area. The East Wachusett Brook and Stillwater River are two Monitored and Impaired waterways crossing the road; we note that we need to be sensitive to these environmental concerns when planning future work on the roadway. Anything that can be done to improve their situation (let alone not worsen it) would be a plus for the immediate area.

<u>National Heritage & Endangered Species Program (NHESP)</u>

The overall goal of the NHESP is the protection of the state's wide range of native biological diversity. NHESP is responsible for the conservation and protection of hundreds of species that are not hunted, fished, trapped, or commercially harvested in the state. Available geographic data layers include:

- **Certified Vernal Pools**
- **Potential Vernal Pools**
- **BioMap Core Habitat -** This depicts the most viable habitats for rare species in Massachusetts.
- **BioMap Supporting Natural Landscape**
- **Priority Habitats of Rare Species –** These are the geographical extents of habitat for all state-listed rare species, both plants and animals. They are officially used under the Massachusetts Endangered Species Act (MESA).

NHESP conservation areas are depicted in the **Figure 2-3** map. Prevalent along the corridor in Sterling are BioMap Core Habitat and Biomap Core Habitat Supporting Landscape areas, these along with Potential Vernal Pools along the water bodies mentioned above should be left undisrupted with any possible road projects.

* DCR Conservation Areas : Route 140, Sterling, MA

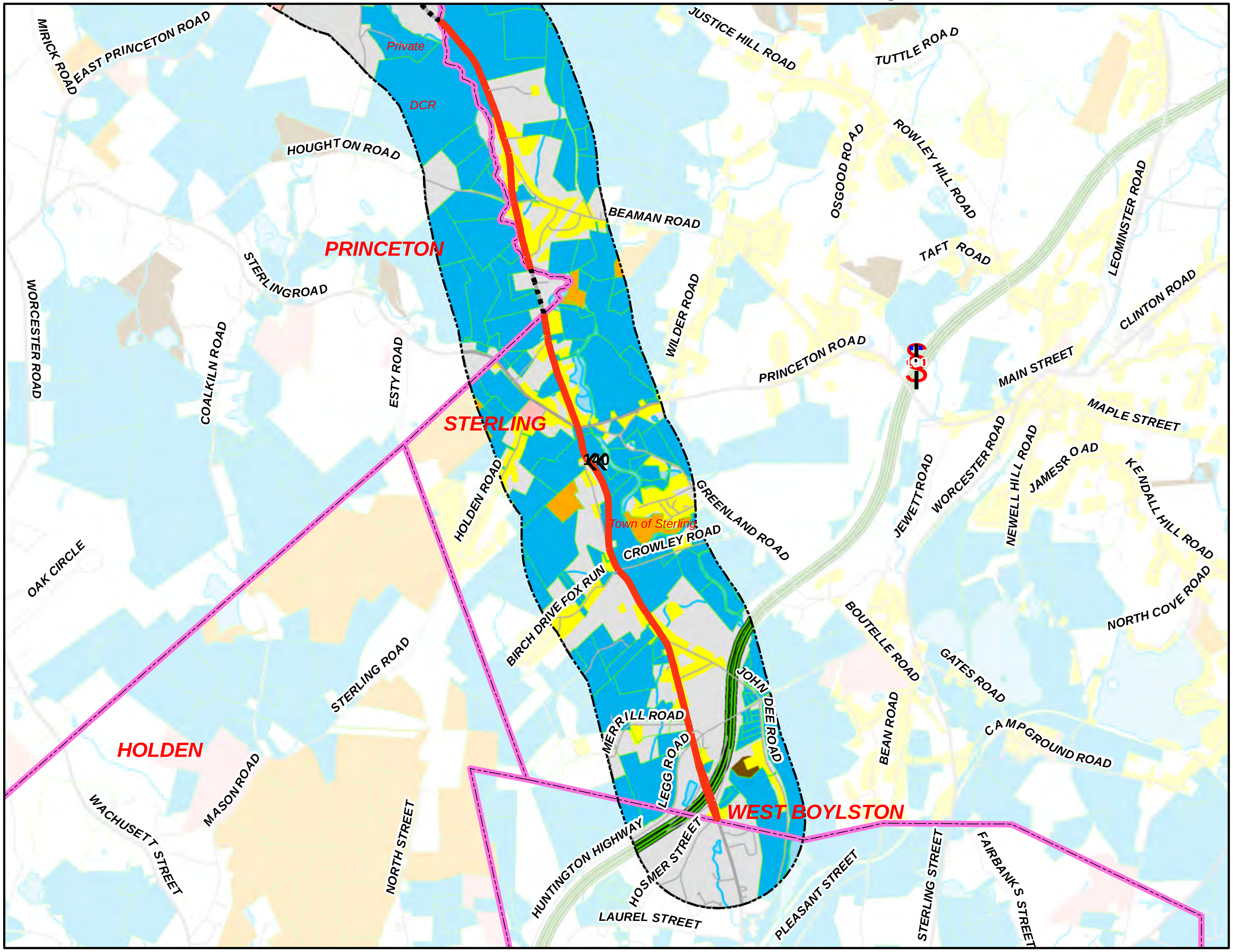
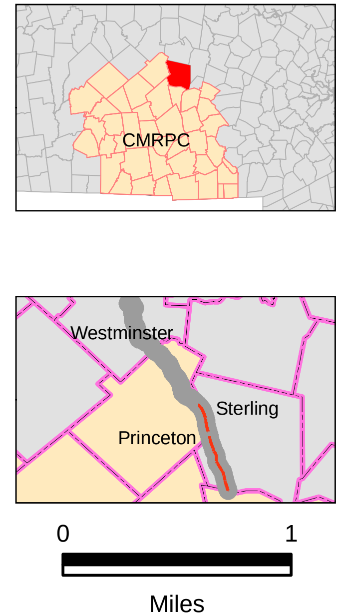


Figure 2-1



March 2009

Legend:

- Water Ways
- Water Bodies
- Town Line
- Study Area .5 Mile Buffer
- Residential

***DCR Conservation :**

- Open Space In Perpetuity
- Conservation (Non Facility)
- Recreation (Facility Based)
- Recreation / Conservation
- Water Supply Protection
- Forest Stewardship Property

* Department of Conservation & Recreation (DCR)

Information depicted on this map is for planning purposes only. Use caution intrepreting positional accuracy. Produced by the GIS Center at CMRPC, 2 Washington Sq. Union Station, Worcester, MA 01604. Source: Data provided by the Central Mass Regional Planning Agency MassGIS/EOEA, MassHwy/EOT

* DEP Monitored Areas : Route 140, Sterling, MA

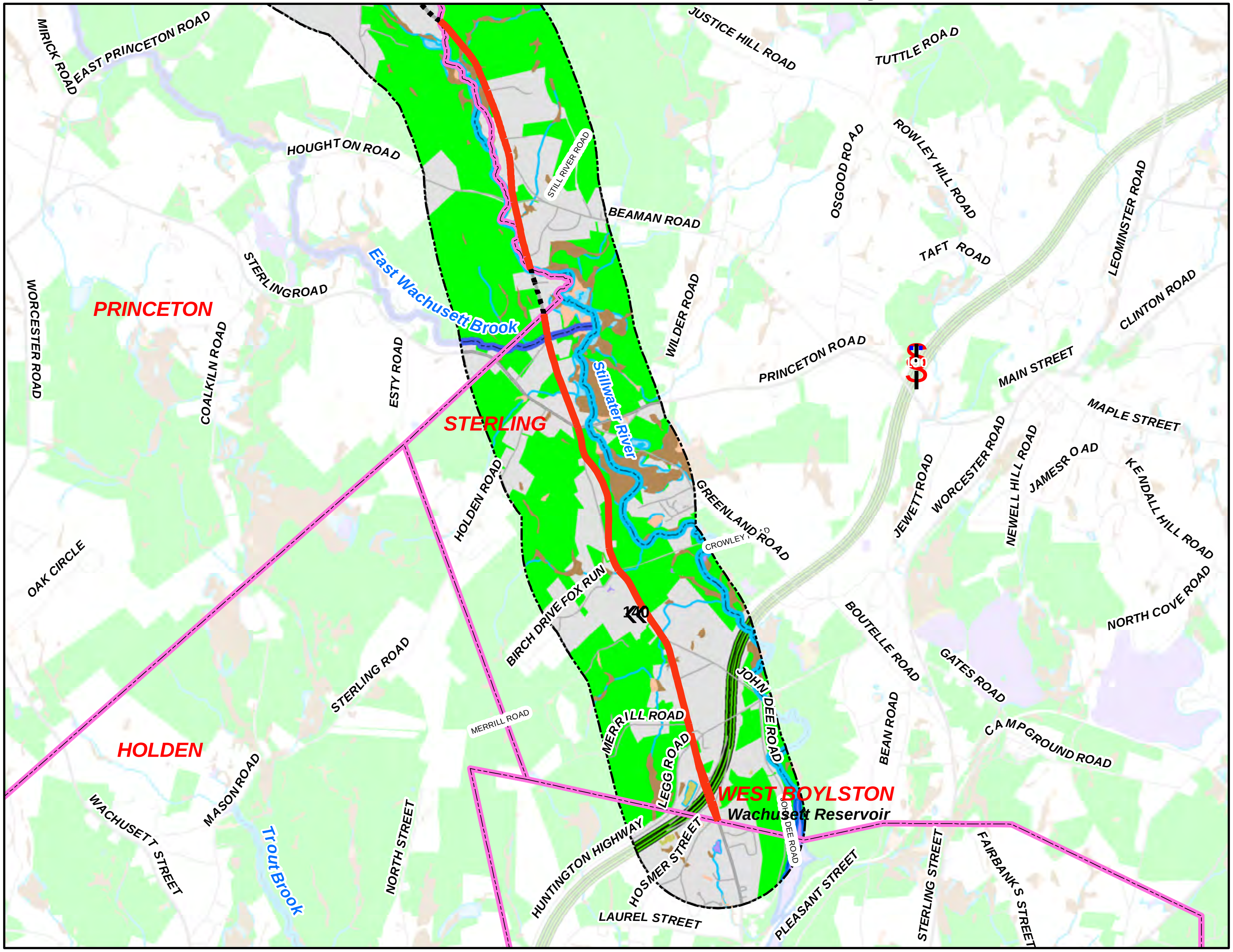
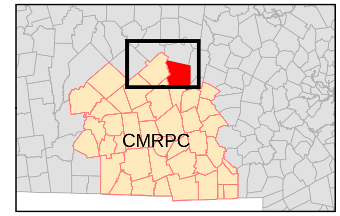
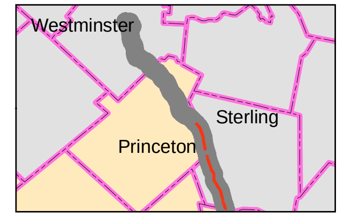


Figure 2-2





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Miles

March 2009

Legend:

- Town Line
- Water Ways
- Water Bodies
- Open Space In Perpetuity
- Study Area .5 Mile Buffer

DEP* Monitored Waterways & Wetlands

- **Impaired Waterway(2005) - Pathogens**
- **Monitored Waterway (2005)**
- Impaired Waterbody (2005)
- DEEP MARSH
- OPEN WATER
- SHRUB SWAMP
- WOODED SWAMP

* Department of Environmental Protection (DEP)

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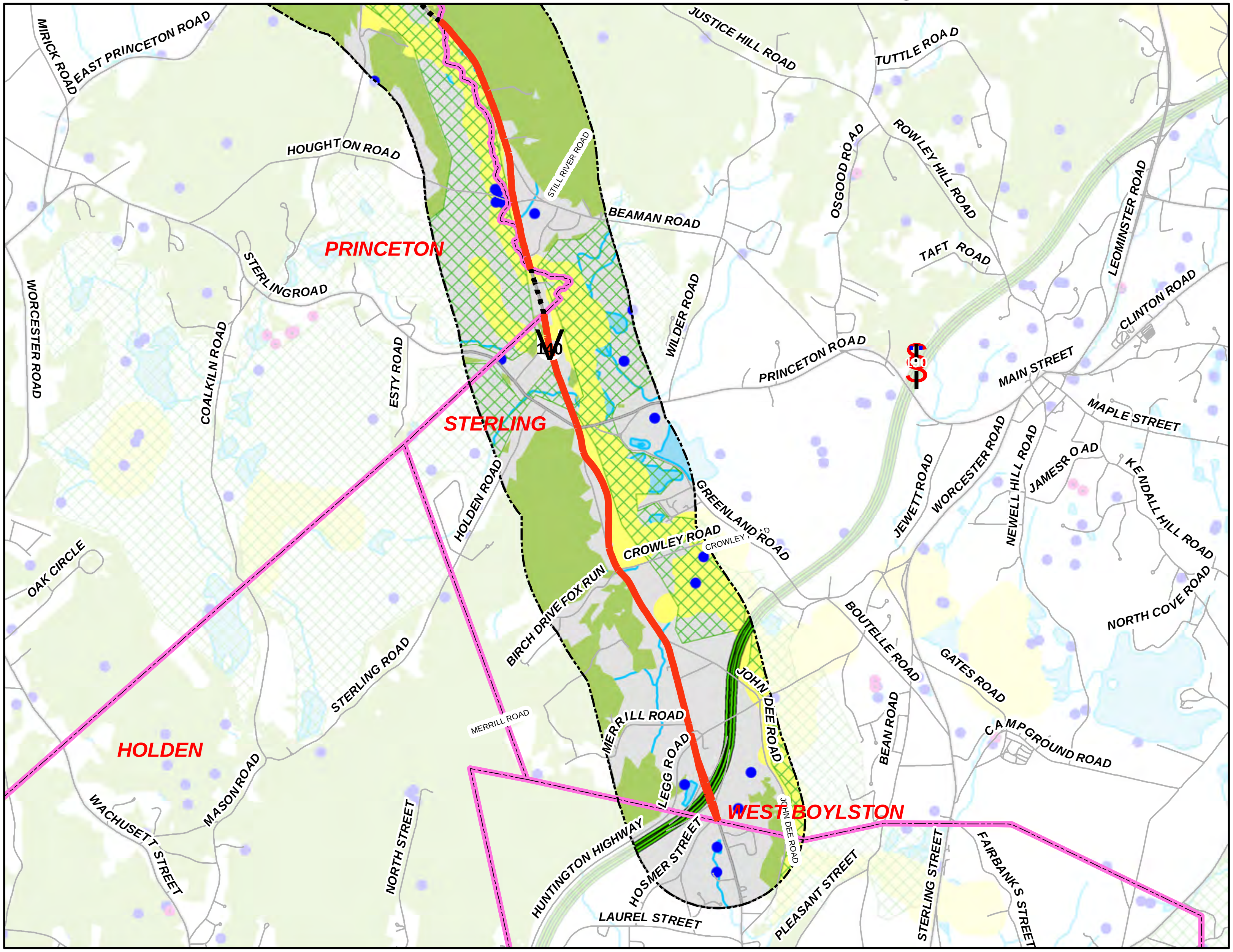
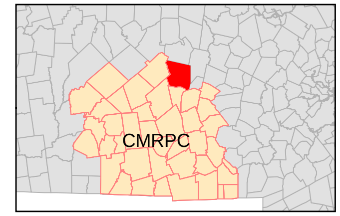
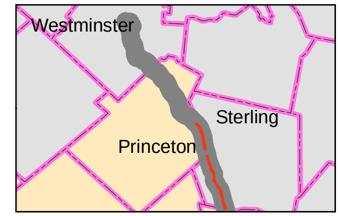
* NHESP Conservation Areas : Route 140, Sterling, MA

Figure 2-3







0 1

Miles

Central Massachusetts Regional Planning Commission

March 2009

Legend:

- Town Line
- Water Ways
- Water Bodies
- Study Area .5 Mile Buffer

* NHESP Conservation Program

- ! Certified VernalPools(2009)
- 3 Potential Vernal Pools(2000)
- BioMap Core Habitat (2008)
- BioMap Core Habitat Supporting Landscape (2008)
- Priority Habitats for Rare Species (2008)

* National Heritage & Endangered Species Program (NHESP)

Information depicted on this map is for planning purposes only. Use caution intrepreting positional accuracy. Produced by the GIS Center at CMRPC, 2 Washington Sq. Union Station, Worcester, MA 01604. Source: Data provided by the Central Mass Regional Planning Agency MassGIS/EOEA, MassHwy/EOT

3.0 TRAFFIC CONGESTION ANALYSIS

3.1 Overview of Traffic Congestion Analysis Methods

The following analysis methods were used to evaluate traffic congestion on Route 140 in Sterling.

Traffic Volume Counts and Projections, and Peak Hour Determination

MRPC staff conducts twenty-four hour (minimum) traffic counts at key locations on a road segment. Besides total traffic volume data, speed and vehicle class data can also be counted. The count data are then analyzed to determine AM and PM peak hours. Once the AM and PM peak hours are determined, peak hour intersection turning movement traffic counts are completed at study area intersections. Projections are then performed on the total volume and peak hour volume data. First, the volumes are adjusted for seasonal variations then a yearly growth factor is applied.

Road Segment & Intersection Peak Hour Level-of-Service (LOS) Analysis

The Level Of Service (LOS) of a roadway traffic facility represents the quality of traffic flow and is used to assess the operation of that traffic facility during peak hours. LOS analyses are based on the methods in the Highway Capacity Manual (2000) (HCM). LOS is defined differently for each type of traffic facility, such as an unsignalized intersection, signalized intersection, two-lane road, or multi-lane road.

Intersection LOS:

LOS criteria are defined by the average amount of delay experienced by a vehicle at the intersection due to the traffic controls (i.e., signs or signals). For unsignalized intersections each approach is assessed independently, since the LOS of the major and minor approaches may differ greatly. LOS E and F indicate unacceptable intersection operation. The table below summarizes the LOS average control delay criteria for intersections controlled by STOP signs and those controlled by traffic signals.

LOS	Average Control Delay (seconds per vehicle)	
	Stop-Controlled	Signalized
A	<10.0	<10.0
B	10.1 – 15.0	10.1 – 20.0
C	15.1 – 25.0	20.1 – 35.0
D	25.1 – 35.0	35.1 – 55.0
E	35.1 – 50.0	55.1 – 80.0
F	>50.0	>80.0

Road Segment LOS:

Is a qualitative measure that describes the operational conditions within a traffic stream. It can be based on service measures that include speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and control delay.

Route 140 serves relatively short trips, the beginning and ending portions of longer trips, and provides access to Route 2 and Route I-190 which are high speed roads. Motorists on Route 140 most likely do not, or should not, expect high travel speeds and mobility is less critical as drivers will tolerate high levels of what is called *Percent Time-Spent-Following* (PTSF) than they would on either Rout 2 or I-190. The table below shows the maximum values of PTSF for roadways like Route 140. PTSF represents the freedom to maneuver and the comfort and convenience of travel without considering average travel speed and travel time.

LOS	Percent Time-Spent-Following
A	≤ 40%
B	> 40-55%
C	> 55-70%
D	> 70-85%
E	> 85%

PTSF describes the LOS for Route 140. PTSF is defined as the average percentage of travel time that vehicles must travel in platoons (3 or more vehicles) behind slower vehicles due to the inability to pass on a two lane highway.

3.2 Historical Traffic Count Observations

Table 3-1 lists Route 140 average daily traffic (ADT) based on the traffic counts the MRPC took at various locations over a thirty year period from 1979 to 2008. The following notable trends can be observed for each community:

- Three of the locations show nearly a three percent annual growth rate:
  - Westminster at the Princeton Town Line (TL) at 2.85% with a total volume increase of 2,500 vehicles
  - Sterling at the Princeton TL at 2.84% with a total volume increase of 3,100 vehicles
  - Sterling south of Route 62 at 2.73% with a total volume increase of 3,350 vehicles
- The Sterling at north of Dana Hill Road location shows a 1.43% decrease in volume:
  - This result includes a 2008 count that is inconsistent with the 1998 and 2004 counts. This indicates that an anomaly most likely took place during that time period that disrupted traffic volume. Furthermore, a 2009 count taken south of Crowley Road (which is north of Dana Hill Road) shows a total volume of 8,500 vehicles which is more in line with the 1998 and 2004 counts.
- Historically no counts were taken just south of the East Main Street (Rte 2A)/Route2 east bound ramp intersection.

TABLE 3-1

Historical Traffic Count Data - Route 140 in Westminster & Sterling

Source: Montachusett Regional Planning Commission Traffic Count Database

YEAR	Westminster At Princeton TL ADT	Approximate Annual Growth Rate	Sterling At Princeton TL ADT	Approximate Annual Growth Rate	Sterling At West Boylston TL ADT	Annual Growth Rate*	Sterling North of Dana Hill ADT	Approximate Annual Growth Rate	Sterling South of Dana Hill ADT	Annual Growth Rate*	Sterling North of Rt. 62 ADT	Annual Growth Rate*	Sterling South of Rt. 62 ADT	Approximate Annual Growth Rate	YEAR
1979	2200		2600		3600										1979
1980															1980
1981															1981
1982	2950														1982
1983		5.20%									3300		4150		1983
1984															1984
1985	2690											19.37%		10.11%	1985
1986															1986
1987	3300								8300		6700		6100		1987
1988	3700														1988
1989															1989
1990															1990
1991				2.31%											1991
1992		2.85%				0.66%				2.59%					1992
1993				2.84%										2.01%	1993
1994	3700													2.73%	1994
1995															1995
1996	3800	1.34%													1996
1997	3900														1997
1998							8200		11000						1998
1999	4200														1999
2000													7900		2000
2001								-0.41%							2001
2002													7600		2002
2003			4500					-1.43%						-1.03%	2003
2004							8000								2004
2005				6.09%									7500		2005
2006	4700				4300			-2.94%							2006
2007			5700												2007
2008							7100								2008

*approximate

3.3 Existing Daily Traffic Volumes

MRPC conducted twenty-four hour automatic traffic counts at the seven Sterling locations listed in **Table 3-2** and shown on **Figure 3-1** during the months of June through October of 2009. The projection procedures described above were applied to the traffic volumes. The peak hour volumes from these counts were used to determine the operational conditions of Route 140.

TABLE 3-2

Route 140: 24 Hour Traffic Volume & AM/PM Splits

						Directional Splits						
	Map ID#	Rank	Major Road (Route 140)	Location	Total Volume 2009	NB Volume	Percent	SB Volume	Percent	Projected 20 Year (2029) Volume	Applied Seasonal Growth Factor	Applied Yearly Growth Factor
Westminster	1	1	Hagar Park Road	S. of E Main Street (Route 2A)	8,261	3,775	46%	4,486	54%	10,355	0.90	0.0167
	2	2	Worcester Road	Between Mile Hill Road & Honeybee Lane	5,887	3,069	52%	2,818	48%	7,379	0.90	0.0167
Sterling	3	5	Redemption Rock Trail	N. of Beaman Road	5,788	2,879	49%	2,909	51%	7,255	0.90	0.0167
	4	4	Redemption Rock Trail	N. of Princeton Rd (Route 62)	6,482	3,176	49%	3,306	51%	8,125	0.90	0.0167
	5	2	Redemption Rock Trail	S. of Princeton Rd (Route 62)	8,703	4,132	47%	4,571	53%	10,909	0.90	0.0167
	6	3	Redemption Rock Trail	S. of Crowley Road	8,484	4,264	50.5%	4,220	49.5%	10,634	0.90	0.0167
	7	1	Redemption Rock Trail	S. of Dana Hill Road	12,584	6,209	49%	6,375	51%	15,773	0.90	0.0167
			Minor Road (Route 62)	Location	Total Volume	EB Volume	Percent	WB Volume	Percent	Projected 20 Year (2029) Volume	Annual Growth Rate	Annual Growth Rate
Sterling	8	2	Princeton Road	E. of Redemption Rock Trail	2,905	1,499	52%	1,406	48%	3,641	0.90	0.0167
	9	1	Princeton Road	W. of Redemption Rock Trail	3,975	1,985	50%	1,990	50%	4,982	0.90	0.0167

In Sterling, daily traffic volumes are highest in between the Route I-190 interchange and the Legg/Dana Hill Road intersection with approximately 12,600 vehicles. Traveling north, daily traffic drops significantly by 4,100 vehicles to approximately 8,500 vehicles just south of Crowley Road and continue to decrease steadily to approximately 5,800 vehicles just north of Beaman Road. This traffic volume remains constant into Westminster as the total volume is approximately 5,900 vehicles in the area of Green's corner. The second most significant decrease in vehicle volume is the nearly 2,400 vehicles that turn onto Route 62 (Princeton Road). The most significant directional split difference occurs south of Route 62 where fifty-three percent of the traffic is traveling south bound and forty-seven of the traffic is traveling north bound. Daily volume is projected to increase approximately twenty-five percent by 2029.

3.4 Route 140 Intersection Peak Hour Traffic Volumes

MRPC conducted AM and PM turning movement counts (TMCs) at each study area intersection in Sterling during the months of May through August of 2009. The projection procedures described above were applied to the TMC traffic volumes. The intersections are shown on **Figure 3-1** and peak hour traffic volumes are listed in **Table 3-3**.

TABLE 3-3
Route 140: Peak Turning Movements Count Volumes & Level-of-Service (LOS)

Community	Route 140 (major road)	At Intersection (minor road)	Volume		LOS on Minor Approaches	
			Existing	Projected 20 Year (2029) Volume	Existing	Projected 20 Year (2029) LOS
	AM Peak					
Westminster	Hagar Park Road	Rt. 2 EB Signal	1,450		NC**	
	Worcester Road	Mile Hill Road	618		B / NA***	
	Worcester Road	Gatehouse Road	567		NA / B	
Sterling	Redemption Rk Trl	Beaman Road	639		NA / B	
	Redemption Rk Trl	Burpee Road	591		B / NA	
	Redemption Rk Trl	**Princeton Road (Rt. 62)**	**1,160**		**E / F**	
	Redemption Rk Trl	Crowley Rd & Fox Run Rd	959	1,201	C / C	C / D
	Redemption Rk Trl	John Dee Road	1,013	1,270	NA / B	NA / C
	Redemption Rk Trl	**I-190 NB Ramps**	**926**		**F (NB LT)**	
	Redemption Rk Trl	I-190 SB Ramps	1,512		C (SB LT)	
	PM Peak					
Westminster	**Hagar Park Road**	**Rt. 2 EB Signal**	1,687	**2,115**	D*	**F***
	Worcester Road	Mile Hill Road	623	781	B / NA	B / NA
	Worcester Road	Gatehouse Road	579	726	NA / B	NA / B
Sterling	Redemption Rk Trl	Beaman Road	649	813	NA / B	NA / B
	Redemption Rk Trl	Burpee Road	641	803	B / NA	B / NA
	Redemption Rk Trl	**Princeton Road (Rt. 62)**	**1,273**	**1,596**	**F / F**	**F / F**
	Redemption Rk Trl	Crowley Rd & Fox Run Rd	774			
	Redemption Rk Trl	John Dee Road	980			
	Redemption Rk Trl	**I-190 NB Ramps**	**1,265**	**1,586**	**F (NB LT)**	**F (NB LT)**
	Redemption Rk Trl	**I-190 SB Ramps**	**1,566**	**1,963**	**E (SB LT)**	**F (SB LT)**

BOLD letters = LOS unacceptable
*intersection (all approaches) LOS
**Not Conducted
***Not Applicable

The complete TMC datasheets can be found in the Technical Appendix.

3.5 Route 140 Intersection Peak Hour LOS Analysis

Table 3-3 above lists the existing and projected LOS for each study area intersection in Sterling. The complete LOS worksheets can be found in the Technical Appendix. The following notable trends can be observed:

- At five of the intersections the highest peak hour for each intersection occurs during the PM period beginning at either 4:45 or 5:00. The highest peak hour for the Crowley Road/Fox Run Road intersection and the John Dee Road intersection is during the AM period beginning at 7:15.
- Existing and projected LOS of intersections with unacceptable LOS:

- Three of the intersections operate at an unacceptable LOS (E-F) during the PM peak period and two of the same intersections operate poorly during the AM peak period:
    - Both minor approaches of the Route 62 intersection operate at an unacceptable LOS during the AM and PM peak periods and are projected to operate at that LOS through year 2029.
    - The OFF ramp left turn at the Route I-190 interchange north bound ramp operates at an unacceptable LOS during the AM and PM peak periods and is projected to operate at that LOS through year 2029.
    - The OFF ramp left turn at the Route I-190 interchange south bound ramp operates at an unacceptable LOS during the PM peak period and is projected to operate at that LOS through year 2029.

- Projected LOS of intersections with acceptable LOS:
  - All have an acceptable LOS and are projected to continue to operate at that LOS through year 2029.

3.6 Route 140 Road Segment Peak Hour LOS Analysis

Table 3-4 lists the existing and projected LOS for each study area road segment in Sterling. The complete LOS worksheets can be found in the Technical Appendix. The following notable trends can be observed:

TABLE 3-4
Route 140: Road Segment LOS

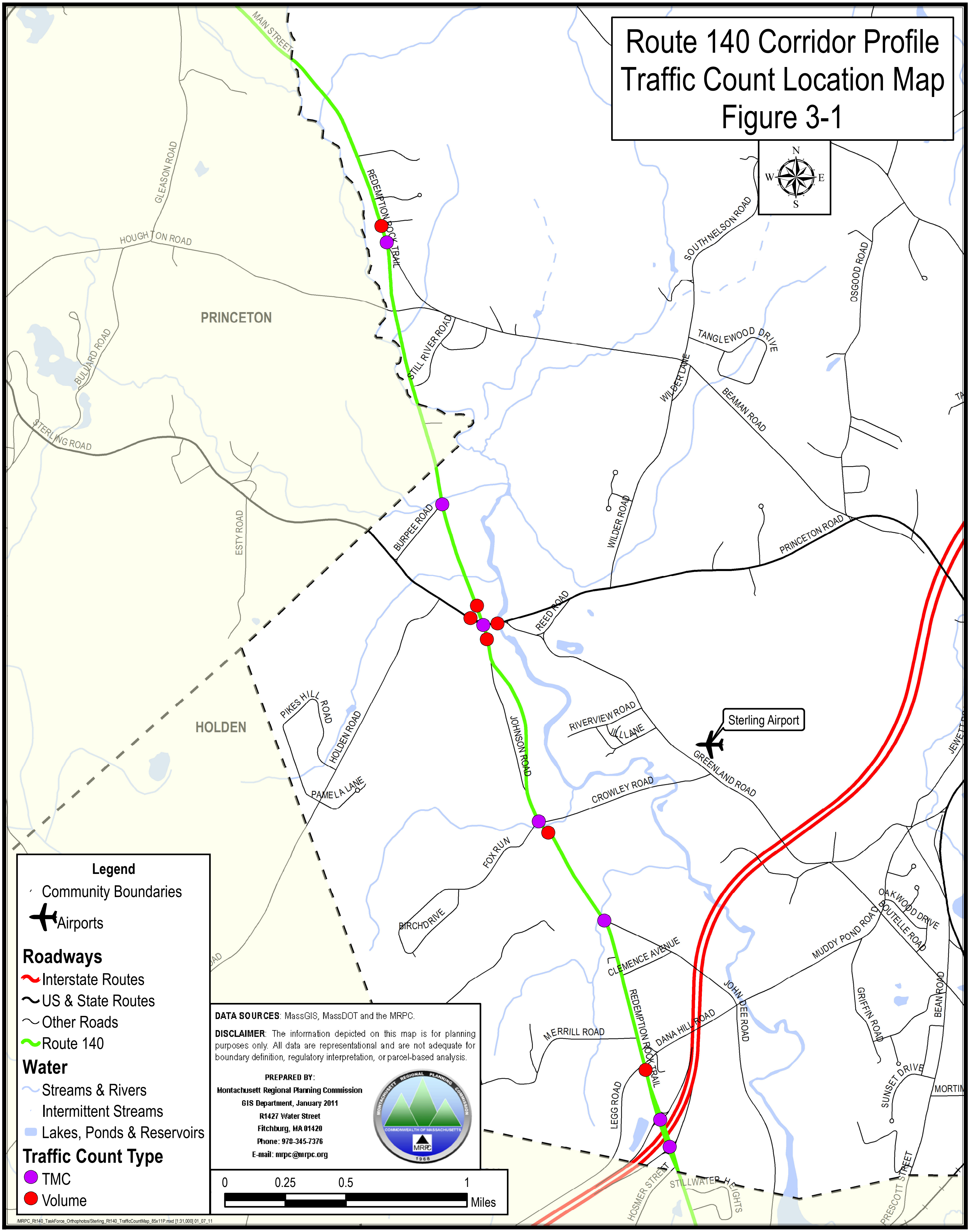
Community	Route 140 Road Segments	Segment Length	# of Existing Lanes	Existing LOS		Projected 20 Year LOS (2029)	
Westminster				AM	PM	AM	PM
	Route 2A to Honey Bee Lane	1.5	2.0		C		D
	Honey Bee Lane to Princeton TL	1.4	2.0		C		C
Sterling							
	Princeton TL to Princeton TL	1.5	2.0		C		C
	Princeton TL to Route 62	0.9	2.0	C		D	
	Route 62 to Merrill Road	2.0	2.0		D		D
	Merrill Road to Route I-190 NB Ramp	0.5	2.0		D		D

- The highest peak hour occurs during the PM period for three road segments – Princeton TL to Princeton TL; Route 62 to Merrill Road; Merrill Road to Route I-190 interchange north bound ramps beginning at either 4:45 or 5:00. The highest peak hour occurs during the AM period for the Princeton TL to Route 62 road segment beginning at 7:00.
- The two LOS reached are:
  LOS **C** - Describes encounters with platoons. Platoon formation will become noticeable and the size and number of platoons will increase while driver

tolerance will begin to decrease. A vehicle will not be delayed in platoons for more than 70% of their travel time.

LOS **D** - Describes unstable traffic flow and driver tolerance approaches its limit. Platoon sizes of 5 to 10 vehicles are common, as vehicles will be delayed in platoons for up to 85% of their travel time.

- Existing LOS:
  - No road segment operates under an unacceptable LOS. However, two road segments reach LOS D where driver tolerance approaches its limit:
    - The Route 62 to Merrill Road road segment
    - The Merrill Road to Route I-190 interchange north bound ramps road segment.
- Projected to year 2029 LOS:
  - No road segment is projected to operate under an unacceptable LOS. However, and additional road segment will reach LOS D where driver tolerance approaches its limit:
    - The Princeton TL to Route 62 road segment will join the Route 62 to Merrill Road and Merrill Road to Route I-190 interchange north bound ramps road segments.


Route 140 Corridor Profile
Traffic Count Location Map
Figure 3-1
N
S
E
W
PRINCETON
HOLDEN
Sterling Airport
MAIN STREET
REDEMPTION ROCK TRAIL
GLEASON ROAD
HOUGHTON ROAD
BULLARD ROAD
STERLING ROAD
ESTY ROAD
STILL RIVER ROAD
BURPEE ROAD
REED ROAD
PRINCETON ROAD
WILDER ROAD
WILDER LANE
BEAMAN ROAD
TANGLEWOOD DRIVE
SOUTH NELSON ROAD
OSGOOD ROAD
PIKES HILL ROAD
HOLDEN ROAD
PAMELA LANE
JOHNSON ROAD
RIVERVIEW ROAD
JILL LANE
GREENLAND ROAD
CROWLEY ROAD
FOX RUN
BIRCH DRIVE
CLEMENCE AVENUE
JOHN DEE ROAD
MUDDY POND ROAD
OAKWOOD DRIVE
BOUTELLE ROAD
GRIFFIN ROAD
BEAN ROAD
MERRILL ROAD
DANA HILL ROAD
LEGG ROAD
SUNSET DRIVE
HOSMER STREET
STILLWATER HEIGHTS
PRESCOTT STREET
Legend
Community Boundaries
Airports
Roadways
Interstate Routes
US & State Routes
Other Roads
Route 140
Water
Streams & Rivers
Intermittent Streams
Lakes, Ponds & Reservoirs
Traffic Count Type
TMC
Volume
DATA SOURCES: MassGIS, MassDOT and the MRPC.
DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.
PREPARED BY:
Montachusett Regional Planning Commission
GIS Department, January 2011
R1427 Water Street
Fitchburg, MA 01420
Phone: 978-345-7376
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0
0.25
0.5
1
Miles

4.0 SAFETY ANALYSIS

4.1 Overview of Safety Analysis Methods

The following analysis methods were used to evaluate traffic safety on Route 140 in Sterling.

Crash Identification Analysis

Safety issues of a roadway traffic facility are analyzed based on identifying relevant crash records from either a local source or by using Massachusetts Department of Transportation (MassDOT) Highway Division crash data. A minimum of three years of crash records is required which are then examined for various trends and characteristics. The safety analysis in this study is based on crash records form the Westminster and Sterling Police Departments. If the analysis reveals a significant safety problem it is followed up by examining the location for safety related issues such as sight distance or geometric issues. Maps and figures are also provided.

MassDOT Highway Safety Improvement Program (HSIP) Eligibility & Crash Clusters

The primary criterion used by MassDOT to determine whether an intersection or road segment is HSIP eligible is that it must have a crash cluster ranked in the top 5% of the crash clusters in a regional planning agency region. In the MRPC region the top 5% of crash clusters obtained a minimum *Equivalent Property Damage Only* (EPDO) point total of 34 points.

MassDOT crash clusters aggregate crashes that occur at a location over a three year period through the use of Geographic Information System (GIS) processes. Crash clusters are then ranked using the EPDO crash severity rating system which gives more weight, or points, to higher severity outcomes of crashes. EPDO rates each crash based on it's crash severity that gives one point (least weight) to a *Property Damage Only* (PDO) crash; five points (more weight) for a crash involving at least one *Non-fatal Injury* (NFI); and ten points (most weight) to a crash that involves at least one *Fatal Injury* (FI). After determining the EPDO point(s) of each crash within a crash cluster, their points are totaled.

EXAMPLE - Crash Cluster HSIP Eligibility: A crash cluster had a crash total of twenty over a three year period. Of the twenty, eighteen were PDO crashes for an EPDO total of eighteen points, two were NFI crashes for an EPDO total of ten points, and there were no FI crashes for an EPDO grand total of twenty eight points. This crash cluster would not be HSIP eligible because it reaches an EPDO point total lower than the minimum of 34 points.

Crash Rate Analysis

This safety analysis method compares the crash rate of an intersection or road segment to a MassDOT average crash rate of either an intersection or a road segment. If the traffic facility has a crash rate above the average crash rate it is considered to have safety issues and should be considered for further safety analysis to develop countermeasures.

For intersections MassDOT has calculated average crash rates for each MassDOT District while statewide average crash rates for road segments were calculated for each roadway functional class.

Intersection Crash Rate Formula

$$\frac{\text{(Average \# of Crashes for 12 Month Period X 1,000,000 Entering Vehicles)}}{\text{(Average Daily Traffic (ADT) Volume X 365 Days)}}$$

Road Segment Crash Rate Formula

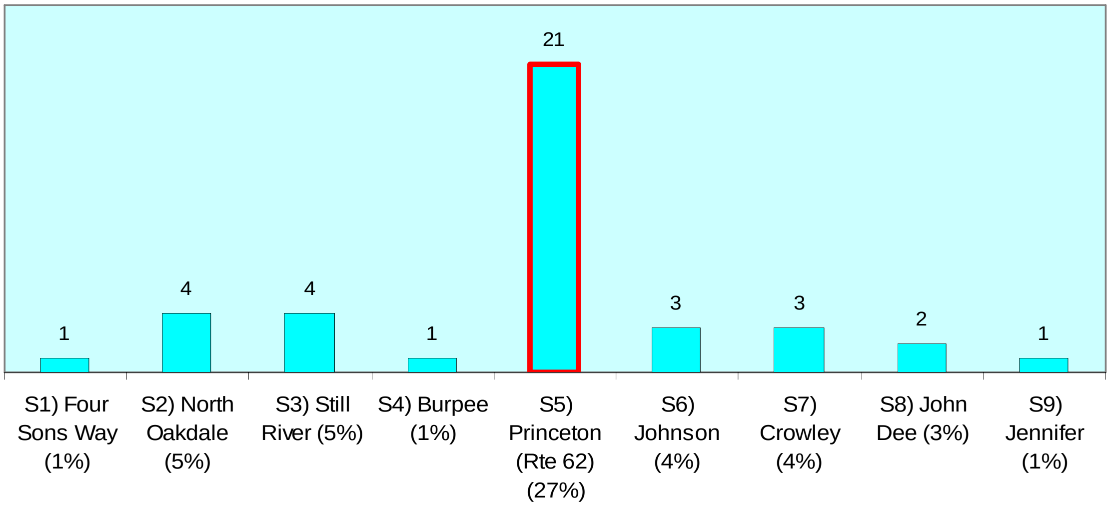
$$\frac{\text{(Average \# of Crashes for 12 Month Period X 1,000,000 Entering Vehicles)}}{\text{(Segment Length in Miles * Average Daily Traffic (ADT) Volume * 365 Days)}}$$

4.2 Crash Identification

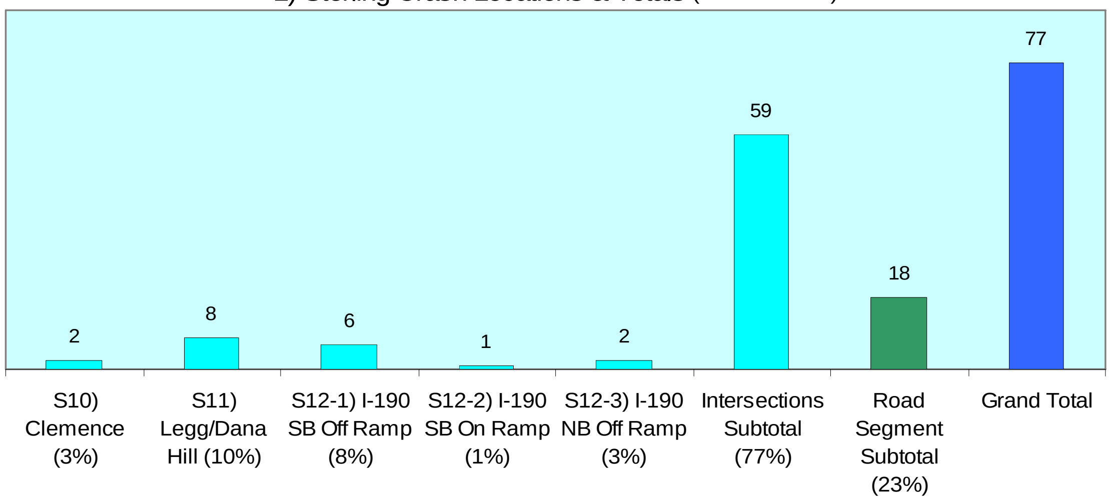
Seventy-seven crashes occurred on Route 140 from September 13, 2005 to September 13, 2008 (**Figure 4-1** below). The Route 140 at Route 62 (Princeton Road) unsignalized intersection was the most prolific crash location with twenty-seven percent (21 crashes) of the crashes. The second highest crash trend was the occurrence of road segment crashes along Route 140 which accounted for twenty-three percent (18 crashes) of the crashes. The remaining forty-nine percent of crashes (38 crashes) were dispersed among thirteen intersections – Legg/Dana Hill Road (10%), I-190 south bound Off Ramp (8%), N Oakdale Cutoff (5%), Still Rive Road (5%), Johnson Road (north) (4%), Crowley Road (4%), John Dee Road (3%), Clemence Ave (3%), I-190 north bound Off Ramp (3%), Four Sons Way (1%), Burpee Road (1%), Jennifer Lane (1%), and I-190 south bound On Ramp (1%). **Figures 4-6.1 & 4-6.2** show the intersections and the distribution of the road segment crashes. **Table 4-1** provides crash data for the road segment crashes.

FIGURE 4-1 (2 parts)

1) Sterling Crash Locations & Totals (north to south)



2) Sterling Crash Locations & Totals (north to south)



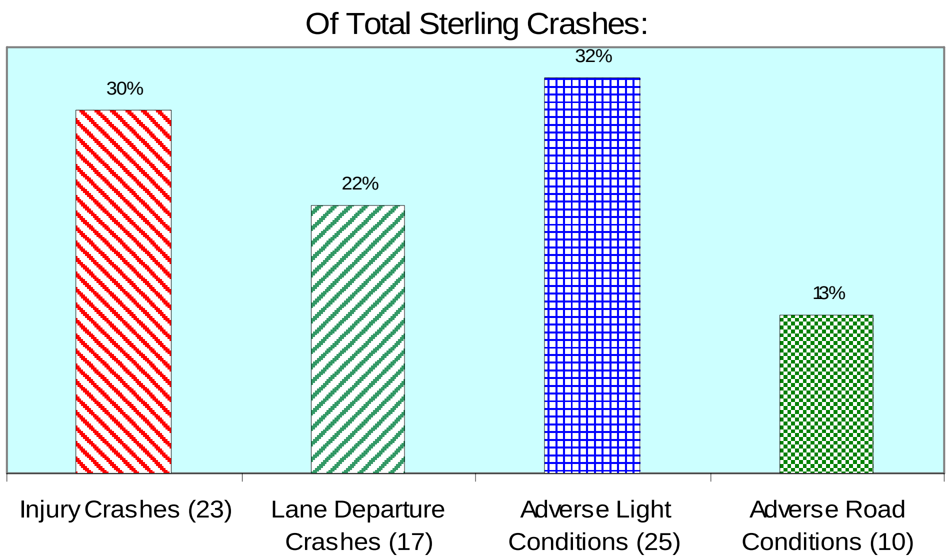
4.3 Crash Trends and Characteristics (**Figure 4-2** below)

<u>Contributing Factors Impacting Crashes</u> (light/road surface/weather related):

- The occurrence of crashes under adverse light conditions accounts for approximately thirty-two percent of the total crashes.
  - Road segment crashes accounted for twenty percent.
  - Still River Road intersection accounted for sixteen percent.
  - No other intersection had more than twelve percent each but none occurred at four intersections.
- A distant second was the occurrence of crashes under adverse road conditions that accounted for thirteen percent of the total crashes.

- Road segment crashes accounted for sixty percent.
- The remaining forty percent occurred at four intersections, each accounted for ten percent.

FIGURE 4-2



Injury Crashes:

- Twenty-three crashes (thirty percent) resulted in injuries.
  - Route 140 at Route 62 intersection accounted for thirty-nine percent.
  - Legg/Dana Hill Road intersection accounted for thirteen percent.
  - Road segment crashes accounted for thirteen percent.
  - No other intersection had more than nine percent each but none occurred at seven intersections.

Lane Departure (LD) Crashes:

- Seventeen crashes (twenty-two percent) were LD crashes.
  - Road segment crashes accounted for fifty-three percent of the LD crashes.
  - Johnson Road (north) intersection accounted for eighteen percent (see NOTE).
  - No other intersection had more than twelve percent each but none occurred at seven intersections (see NOTE).

NOTE: The decision to assign the LD crash designation to crashes that occurred at intersections was based on the following judgment: Although LD crashes are not normally associated with intersections several intersection crash report crash diagrams and crash narratives indicate similar characteristics to LD crashes.

4.4 Conclusions for Further Safety Analysis and Developing Countermeasures

Based on the crash trends and characteristics listed above, further safety analysis will be undertaken as follows:

- The Route 140 at Route 62 intersection is the most prolific location in total crashes and injury crashes. Analysis of this intersection includes a crash diagram with detailed analysis, an intersection crash rate analysis, and potential HSIP eligibility using crash cluster analysis.
- The Route 140 at Route I-190 interchange is a distant second in total crashes. Analysis of this intersection includes a crash diagram with detailed analysis.
- All remaining intersection crashes will be grouped with the road segment crashes.
  - This is due to the low crash numbers at the remaining thirteen intersections and LD crashes also occurred at several intersections as discussed above.
  - The proposed countermeasures, if designed and properly implemented, will most likely improve safety on road segments as well as intersections.
  - Road segment crashes are the second highest crash trend after the Route 140 at 62 intersection.
  - Road segment crashes lead in lane departure crashes, are second in total crashes, and first in crashes occurring under adverse conditions.

Analysis includes figures showing the crash distribution and detailed analysis, and road segment crash rate analyses.

4.5 Crash Analysis of the Route 62 Intersection

Intersection crash rate analysis results:

- The crash rate for this intersection equals **1.36** which is well **ABOVE** the District 3 average crash rate of **0.69** for unsignalized intersections. Since this location has a crash rate above the average crash rate countermeasures need to be developed to address the safety issues to effectively reduce the crash rate. See Technical Appendix for full crash rate analysis.

Potential HSIP eligibility and intersection crash cluster analysis:

- Twenty-one crashes occurred within the area of this intersection over a three year period.
- Of the twenty-one, twelve were PDO crashes for an EPDO total of twelve points, nine were NFI crashes for an EPDO total of forty-five points, and there were no FI crashes for an EPDO grand total of fifty-seven points.

	# of Crashes	EPDO Total
Property Damage Only (PDO)	12	12
Non-fatal Injury (NFI)	9	45
Fatal Injury (FI)	0	0
TOTAL	**21**	**57**

- This potential crash cluster will most likely be HSIP eligible because it reaches an EPDO point total well above the MRPC regional minimum of thirty-four points.

- After further review by MassDOT this intersection will most likely be within the top five percent of the crash clusters within the MRPC region.

Crash analysis results based on Crash Diagram (**Figure 4-3** below, see Technical Appendix for full analysis):

- The east bound approach is the most prolific origin of at-fault vehicles accounting for fifty-seven percent.
- For the east bound approach, rear end crashes are the top crash type at fifty-eight percent while angle crashes account for the remaining forty-two percent.
- For the intersection, angle crashes are the top crash type at forty-three percent while rear end crashes are second at thirty-eight percent.

Summary of Each Approach

APPROACH
LEGEND*

East bound approach

Accounted for fifty-seven percent of total crashes.
Rear End crashes accounted for fifty-eight percent of the crash types.
Angle crashes accounted for forty-two percent of the crash types.

North bound approach

Accounted for twenty-four percent of total crashes.
Left turn move crashes accounted for sixty percent of the crash types.

West bound approach

Accounted for fourteen percent of total crashes.
Angle crashes accounted for one-hundred percent of the crash types.

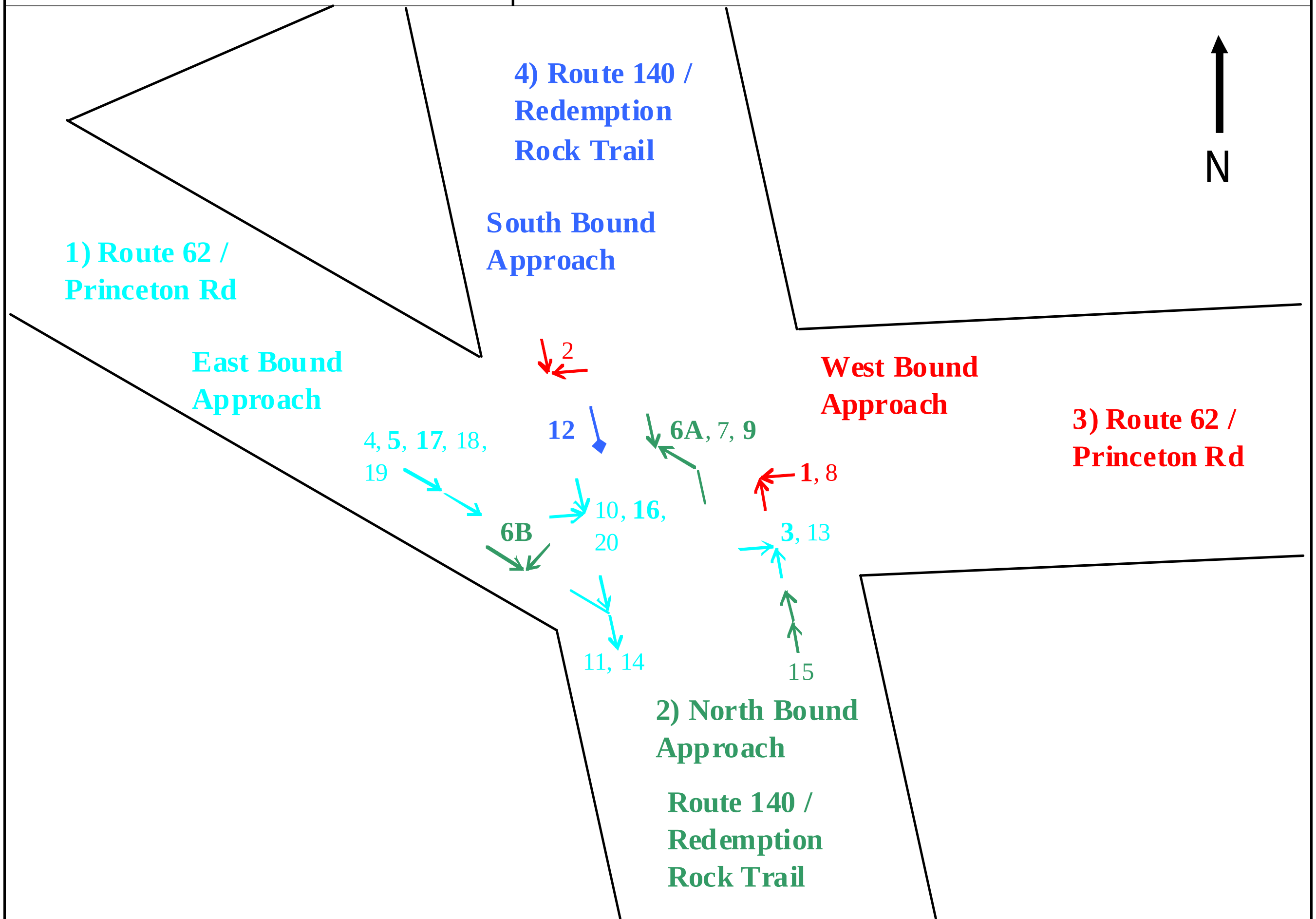
South bound approach

Accounted for only one crash.

*For Crash Diagram below. Each approach is identified by different color. Each crash is identified by the same color of the approach of the at-fault vehicle.

FIGURE 4-3

VEHICLE CRASH DIAGRAM	Town: Sterling
Dates: 9/13/05 - 9/13/08	Location: Route 140 at Rte 62/Princeton Rd



SYMBOLS

Angle
Head On
Turning Move
Fixed Object
Rear End
Sideswipe
Wildlife

SEVERITY CODES

Property damage PD
Personal Injury PI
Fatality F

Light Condition (LC)
1 Daylight
2 Dawn or Dusk
3 Darkness
4 Unknown

Rd Condition (RC)
1 Dry
2 Wet
3 Snow or Icy
4 Unknown

VIOLATIONS (V)
0 No Violations
1 Speed Too Fast
2 Failure To Yield
3 Ran Stop Sign
4 Ran Traffic Signal
5 Following Too Close
6 Improper Passing
7 Wrong Side of Road
8 Improper Turning
9 Improper Backing
10 Had Been Drinking
11 Pedestrian Violation
12 Reckless Driving
13 Improper Light or Brake

#*	DATE	TIME	DAY	SEV	LC	RC	V	#*	DATE	TIME	DAY	SEV	LC	RC	V
1	12/4/2005	9:14	SUN	PI	1	2&3		11	1/23/2007	9:27	TUE	PD	1		
2	2/24/2006	13:57	FRI	PD	1			**12**	4/22/2007	12:01	SUN	PI	1		
3	4/6/2006	17:46	THUR	PI	2			13	6/7/2007	19:06	THUR	PD	2		
4	5/19/2006	7:56	FRI	PD	1			14	9/23/2007	13:57	SUN	PD	1		
5	6/9/2006	7:49	FRI	PI	1			15	10/6/2007	12:53	TUE	PD	1		
6*	8/2/2006	12:40	WED	PI	1			**16**	12/6/2007	12:52	THUR	PI	1		
7	8/17/2006	15:38	THUR	PD	1			**17**	1/11/2008	7:54	FRI	PI	1		
8	9/9/2006	18:44	SAT	PD	3			18	4/2/2008	7:17	WED	PD	1		
9	9/26/2006	16:44	TUE	PI	1			19	9/5/2008	8:27	FRI	PD	1		
10	1/8/2007	9:18	THUR	PD	1			20	9/7/2008	13:58	SUN	PD	1		

BOLD Crash # = Personal Injury *2 crashes

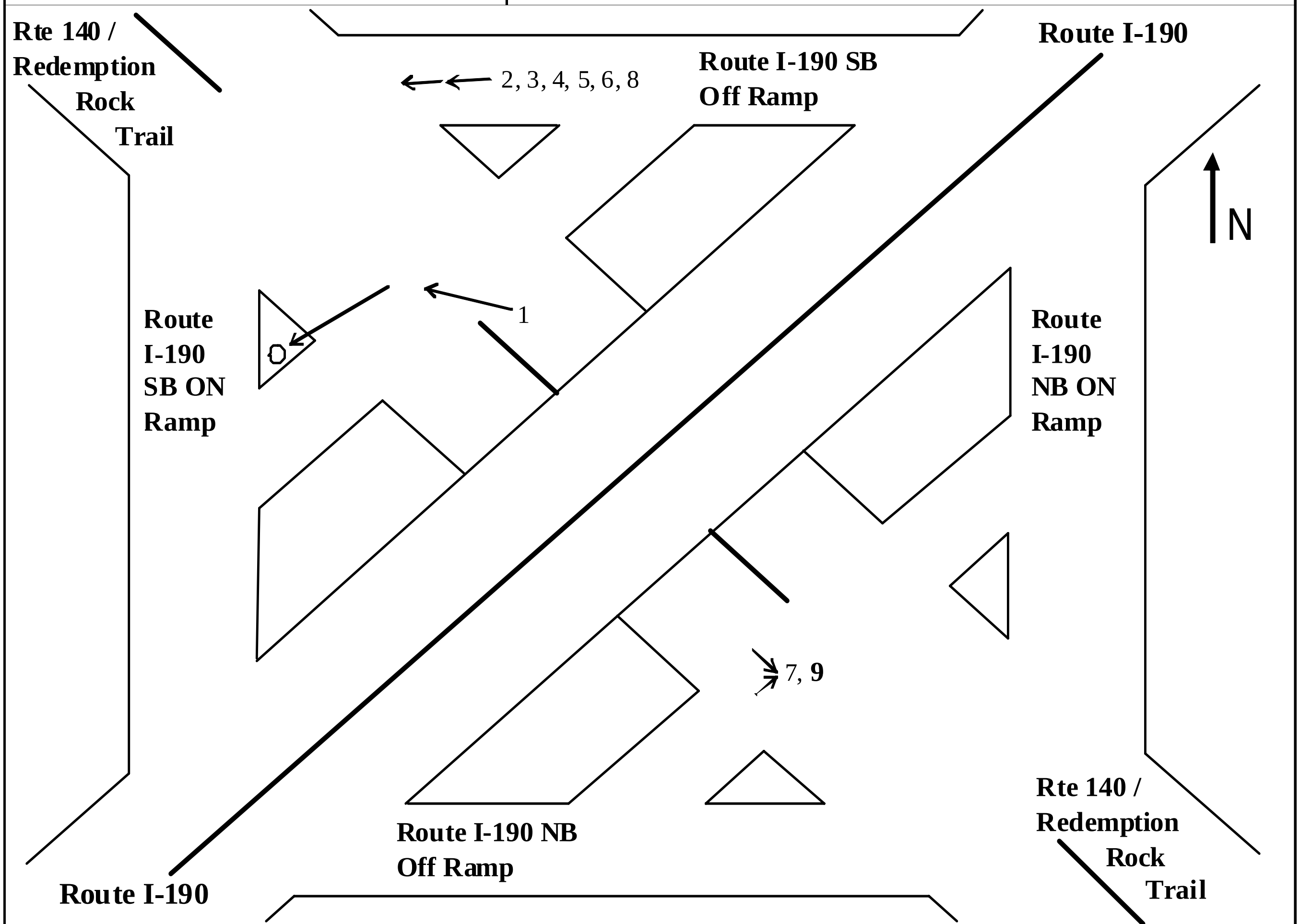
4.6 Crash Analysis of the Route I-190 Ramps

- Intersection crash rate analysis not conducted due to low crash totals.
- Potential HSIP eligibility and intersection crash cluster analysis not conducted due to low EPDO totals.
- Crash analysis results based on **Crash Diagram** (**Figure 4-4** below; see Technical Appendix for full analysis):
  - The Route I-190 south bound right turn Off Ramp near the YIELD sign is the most prolific crash location accounting for seventy-eight percent of the crashes.
  - Rear end crashes accounted for one hundred percent of the crash types for this location.

Route I-190 Interchange at Route 140

FIGURE 4-4

VEHICLE CRASH DIAGRAM	Town: Sterling
Dates: 9/17/05 - 9/17/08	Location: Route 140 at Rte I-190



SYMBOLS

Angle
Head On
Turning Move
Fixed Object
Rear End
Sideswipe
Wildlife

SEVERITY CODES

- Property damage PD
- Personal Injury PI
- Fatality F

Light Condition (LC)

- 1 Daylight
- 2 Dawn or Dusk
- 3 Darkness
- 4 Unknown

Rd Condition (RC)

- 1 Dry
- 2 Wet
- 3 Snow or Icy
- 4 Unknown

VIOLATIONS (V)

- 0 No Violations
- 1 Speed Too Fast
- 2 Failure To Yield
- 3 Ran Stop Sign
- 4 Ran Traffic Signal
- 5 Following Too Close
- 6 Improper Passing
- 7 Wrong Side of Road
- 8 Improper Turning
- 9 Improper Backing
- 10 Had Been Drinking
- 11 Pedestrian Violation
- 12 Reckless Driving
- 13 Improper Light or Brake

#	DATE	TIME	DAY	SEV	LC	RC	V	#*	DATE	TIME	DAY	SEV	LC	RC	V
1	4/19/2006	1:58	WED	PD	3										
2	4/27/2006	7:37	THUR	PD	1										
3	8/2/2006	17:38	WED	PD	1										
4	8/20/2006	12:35	SUN	PD	1										
5	6/18/2007	13:24	MON	PD	1										
6	7/3/2007	17:20	TUE	PD	1										
7	1/23/2008	17:07	WED	PD	3										
8	7/2/2008	17:37	WED	PD	1										
9	9/17/2008	7:44	WED	**PI**	1										

BOLD Crash # = Personal Injury

4.7 Crash Analysis along Route 140 Road Segments

To determine the crash rate as described in section 4.1 above, Route 140 was divided into four road segments (RS) based on functional classification and roadway geometry. See **Figures 4-6.1 & 4-6.2** for road segments and crash distribution.

- **RS-1**: Route 140 from Princeton Town Line (TL) (north) to Princeton TL (middle):
  - RS-1 is classified as a rural minor arterial. For a road segment with this classification the statewide average crash rate is **0.92**. The crash rate for this road segment equals **1.59** which is well **ABOVE** the statewide average crash rate. Since RS-1 has a crash rate above the average crash rate countermeasures need to be developed to address the safety issues to affectively reduce the crash rate.
- **RS-2**: Route 140 from Princeton TL (south) to Route 62:
  - RS-2 is classified as a rural minor arterial. For a road segment with this classification the statewide average crash rate is **0.92**. The crash rate for this road segment equals **2.27** which is well **ABOVE** the statewide average crash rate. Since RS-2 has a crash rate above the average crash rate countermeasures need to be developed to address the safety issues to affectively reduce the crash rate. A focus location for safety improvement is the Route 62 intersection due to the safety issues described above.
- **RS-3**: Route 140 from Route 62 to Merrill Road:
  - RS-3 is classified as a urban principal arterial. For a road segment with this classification the statewide average crash rate is **2.77**. The crash rate for this road segment equals **1.67** which is well **BELOW** the statewide average crash rate. Safety improvement countermeasures need to be focused on LD crashes which accounted for sixty percent of the non Route 62 intersection crashes.
- **RS-4**: Route 140 from Merrill Road to the Route I-190 north bound ramps:
  - RS-4 is classified as a urban principal arterial. For a road segment with this classification the statewide average crash rate is **2.77**. The crash rate for this road segment equals **2.31** which is **BELOW** the statewide average crash rate. All crashes occurred at RS-4 intersections but none rise to the level of a high crash location.

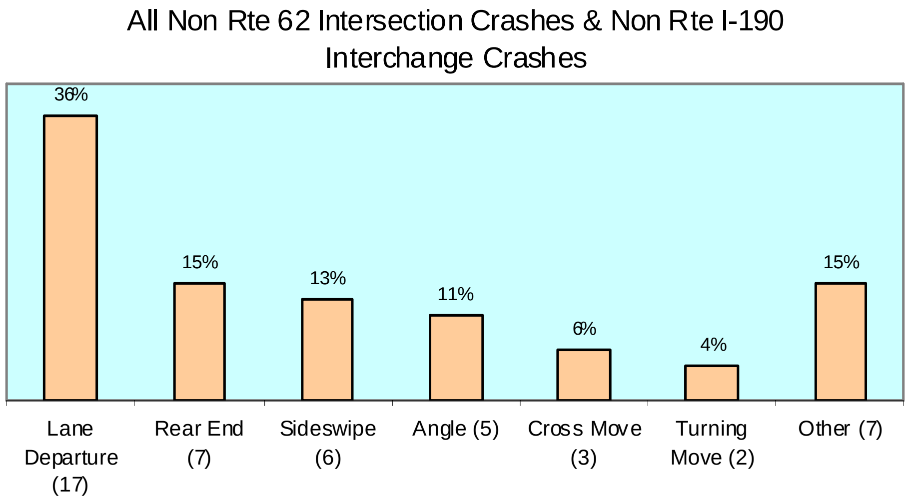
RS-1 through RS-4 non Route 62 intersection and non Route I-190 interchange crash analysis based on distribution as displayed on **Figures 4-6.1 & 4-6.2** and the crash data in **Table 4-1**:

- LD crashes were the most prolific crash occurrence accounting for thirty-six percent of the RS crashes (**Figure 4-5** below):
  - **- RS-3** accounted for the highest percentage at seventy-one percent.
  - RS-1 and RS-4 accounted for two LD crashes each.
  - RS-2 accounted for one LD crash.
- Of the LD crashes:
  - Eighty-two percent (14 crashes) of the vehicles ran off the road and involved a single vehicle only.
  - Fifteen percent (2 crashes) were head on crashes.

- One crash was a sideswipe resulting from the at fault vehicle crossing fully into the oncoming lane.

- Rear end crashes accounted for fifteen percent (**Figure 4-5** below).
  - RS-3 accounted for fifty-seven percent of this crash type
- Single occurrence crash types (combined under *Other*) such as *crash with guardrail* and *rollover* accounted for fifteen percent (**Figure 4-5** below).
  - RS-1 accounted for forty-three percent of the total.

FIGURE 4-5



- Sideswipe crashes accounted for thirteen percent (**Figure 4-5** above).
  - RS-1 accounted for fifty percent of this total.
- Of the total RS crashes, **RS-3** accounted for forty-three percent, RS-1 accounted for thirty-two percent, RS-4 accounted for seventeen percent, and RS-2 accounted for eight percent.
- No non intersection crash location had more than one crash occur.
- The Legg/Dana Hill Road intersection is the highest crash location at seventeen percent while the North Oakdale Cutoff and Still River Road intersections accounted for eight percent each.
- Crash occurrence was more prolific during cold weather months. Sixty-six percent of the crashes occurred between the months of October and March.

TABLE 4-1
Route 140, Town of Sterling
All Non Route 62 (Princeton Road) intersection Crashes & Non Route I-190 Interchange Crashes

Crashes Listed North to South. Begin Date: 9/13/05. End: 9/13/08

	#	Route 140 Location	Road Segment	Date	Day of Week	Time of Day	Type	Severity	Conditions: Weather	Conditions: Light	Conditions: Road
1	S1-1	Four Sons Way	RS-1	6/20/2007		17:45	Rear End	Property Damage		Daylight	
2	SRS-1	Redemption Rock Trl - 382	RS-1	1/8/2006	SUN	10:04	**Ran Off Road (LD)**	Property Damage		Daylight	Snow
3	SRS-2	Redemption Rock Trl - 372	RS-1	12/7/2007	FRI	16:59	**Ran Off Road (LD)**	Property Damage		Darkness	Icy
4	SRS-3	Redemption Rock Trl - 372	RS-1	1/23/2008	WED	9:08	Sideswipe	Property Damage		Daylight	
5	**SRS-4**	Redemption Rock Trl - 372	RS-1	6/12/2008	THUR	15:57	Cross Move with a motor cycle	Personal Injury		Daylight	
6	**S2-1**	North Oakdale Cut Off	RS-1	1/18/2008	FRI	18:36	Single Vehicle Crash	Personal Injury		Darkness	
7	S2-2	North Oakdale Cut Off	RS-1	12/28/2007	FRI	10:36	Sideswipe	Property Damage		Daylight	
8	S2-3	North Oakdale Cut Off	RS-1	4/21/2007	SAT	18:07	Angle	Property Damage		Daylight	
9	**S2-4**	North Oakdale Cut Off	RS-1	10/5/2005	WED	15:00	Angle	Personal Injury		Daylight	
10	SRS-5	Redemption Rock Trl - 343	RS-1	1/1/2006	SUN	1:22	Rear End	Property Damage		Darkness	Snow/ice
11	SRS-6	Redemption Rock Trl - 325	RS-1	10/27/2007	SAT	10:42	Cross Move	Property Damage		Daylight	
12	S3-1	Still River Road	RS-1	1/3/2006	TUE	16:38	Sideswipe	Property Damage		Darkness	
13	S3-2	Still River Road	RS-1	1/3/2006	TUE	16:04	Sideswipe	Property Damage		Darkness	
14	S3-3	Still River Road	RS-1	12/4/2005	SUN	19:11	Rollover	Property Damage		Darkness	Icy
15	S3-4	Still River Road	RS-1	12/16/2005	FRI	17:24	Guardrail	Property Damage		Darkness	Icy
16	SRS-7	Redemption Rock Trl - S of Princeton TL	RS-2	11/28/2007	WED	17:50	Deer	Property Damage		Darkness	
17	SRS-8	Redemption Rock Trl - 279	RS-2	2/2/2007	WED	6:36	**Ran Off Road (LD)**	Property Damage		Daylight	
18	S4-1	Burpee Road	RS-2	7/18/2008	FRI	20:51	NA	Property Damage		Darkness	
19	SRS-9	Redemption Rock Trl - 267	RS-2	11/2/2006	THUR	16:32	Sideswipe	Property Damage		Dusk	
20	**S6-1**	Johnson Road (north)	RS-3	8/29/2007	WED	20:40	**1) Crossed Lane (LD) 2) Ran Off Road (LD)**	Personal Injury		Darkness	Sand
21	**S6-2**	Johnson Road (north)	RS-3	7/17/2006	MON	23:28	**Ran Off Road (LD)**	Personal Injury		Darkness	
22	S6-3	Johnson Road (north)	RS-3	1/1/2006	SUN	8:39	**Ran Off Road (LD)**	Property Damage		Daylight	
23	SRS-10	Redemption Rock Trl - Countryside Café	RS-3	3/24/2007	MON	3:18	**Ran Off Road (LD)**	Property Damage		Daylight	Icy
24	SRS-11	Redemption Rock Trl - 220	RS-3	1/24/2007	WED	5:49	**Ran Off Road (LD)**	Property Damage		Dawn	
25	SRS-12	Redemption Rock Trl - 220	RS-3	7/23/2006	SUN	22:25	**Ran Off Road (motor cycle LD)**	Property Damage		Darkness	
26	**SRS-13**	Redemption Rock Trl - 160	RS-3	6/26/2006	MON	12:03	**Head On (LD)**	Personal Injury		Daylight	

BOLD # = Personal Injury

**S#-# = crash # of crash that occurred at intersection; ***SRS-# = crash # of crash that occurred on road segment

TABLE 4-1 (continued)

Route 140, Town of Sterling

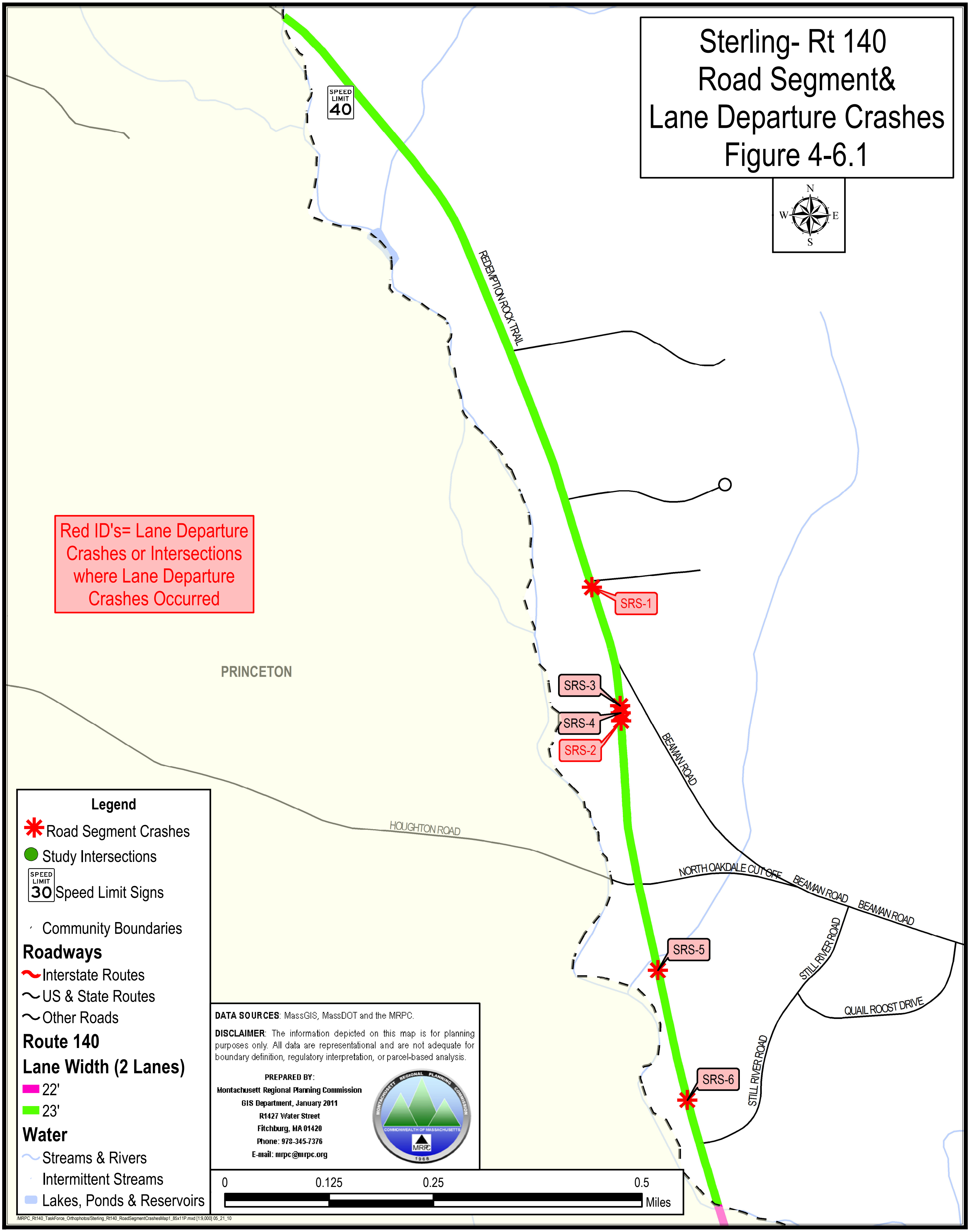
All Non Route 62 (Princeton Road) intersection Crashes & Non Route I-190 Interchange Crashes

Crashes Listed North to South. Begin Date: 9/13/05. End: 9/13/08

	#	Route 140 Location	Road Segment	Date	Day of Week	Time of Day	Type	Severity	Conditions: Weather	Conditions: Light	Conditions: Road
27	S7-1	Crowley Road	RS-3	11/19/2007	MON	17:26	Angle	Property Damage		Darkness	
28	S7-2	Crowley Road	RS-3	9/9/2007	SUN	18:36	**Ran Off Road (LD)**	Property Damage		Daylight	
29	**S7-3**	Crowley Road	RS-3	9/14/2006	THUR	0:01	**Ran Off Road (LD)**	Personal Injury		Darkness	
30	SRS-14	Redemption Rock Trl - 132	RS-3	11/25/2006	SAT	4:54	**Ran Off Road (LD)**	Property Damage		Darkness	Icy
31	SRS-15	Redemption Rock Trl - 132	RS-3	11/26/2006	SUN	5:41	**Ran Off Road (LD)**	Property Damage		Dawn	Icy
32	**SRS-16**	Redemption Rock Trl - 124	RS-3	9/13/2008	SAT	15:35	Motor cycles lost control	Personal Injury		Daylight	
33	**S8-1**	John Dee Road	RS-3	9/24/2006	SUN	7:22	**Ran Off Road (LD)**	Personal Injury		Daylight	
34	S8-2	John Dee Road	RS-3	3/13/2007	TUE	9:21	Rear End	Property Damage		Daylight	
35	**S9-1**	Jennifer Lane	RS-3	12/19/2007	WED	8:31	Rear End	Personal Injury		Daylight	
36	S10-1	Clemence Ave	RS-3	2/22/2008	FRI	18:16	Rear End	Property Damage		Darkness	
37	S10-2	Clemence Ave	RS-3	12/31/2007	MON	7:52	Cross Move	Property Damage		Daylight	Icy
38	SRS-17	Redemption Rock Trl - 73	RS-3	2/8/2008	TUE	7:42	Sideswipe	Property Damage		Daylight	
39	SRS-18	Redemption Rock Trl - 69	RS-3	2/7/2007	WED	10:23	Rear End	Property Damage		Daylight	
40	S11-1	Legg/Dana Hill Road	RS-4	10/6/2005	THUR	7:03	Turning Move	Property Damage		Dawn	
41	S11-2	Legg/Dana Hill Road	RS-4	3/11/2006	SAT	10:50	Rear End	Property Damage		Daylight	
42	**S11-3**	Legg/Dana Hill Road	RS-4	6/2/2006	FRI	12:15	Angle	Personal Injury		Daylight	
43	S11-4	Legg/Dana Hill Road	RS-4	10/20/2006	FRI	14:21	Turning Move	Property Damage		Daylight	
44	**S11-5**	Legg/Dana Hill Road	RS-4	11/25/2006	FRI	15:14	**Head On (LD)**	Personal Injury		Daylight	
45	S11-6	Legg/Dana Hill Road	RS-4	4/6/2007	FRI	15:00	NA	Property Damage		Daylight	
46	S11-7	Legg/Dana Hill Road	RS-4	4/21/2007	SAT	20:52	**Sideswipe (LD)**	Property Damage		Darkness	
47	**S11-8**	Legg/Dana Hill Road	RS-4	8/14/2008	THUR	10:44	Angle	Personal Injury		Daylight	

BOLD # = Personal Injury

**S#-# = crash # of crash that occurred at intersection; ***SRS-# = crash # of crash that occurred on road segment


Sterling- Rt 140
Road Segment&
Lane Departure Crashes
Figure 4-6.1
N
W
E
S
SPEED LIMIT 40
REDEMPTION ROCK TRAIL
Red ID's= Lane Departure Crashes or Intersections where Lane Departure Crashes Occurred
SRS-1
SRS-3
SRS-4
SRS-2
PRINCETON
BEAMAN ROAD
HOUGHTON ROAD
NORTH OAKDALE CUT OFF
BEAMAN ROAD
BEAMAN ROAD
SRS-5
STILL RIVER ROAD
QUAIL ROOST DRIVE
STILL RIVER ROAD
SRS-6
Legend
Road Segment Crashes
Study Intersections
SPEED LIMIT 30 Speed Limit Signs
Community Boundaries
Roadways
Interstate Routes
US & State Routes
Other Roads
Route 140
Lane Width (2 Lanes)
22'
23'
Water
Streams & Rivers
Intermittent Streams
Lakes, Ponds & Reservoirs
DATA SOURCES: MassGIS, MassDOT and the MRPC.
DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.
PREPARED BY:
Montachusett Regional Planning Commission
GIS Department, January 2011
R1427 Water Street
Fitchburg, MA 01420
Phone: 978-345-7376
E-mail: mrpc@mrpc.org
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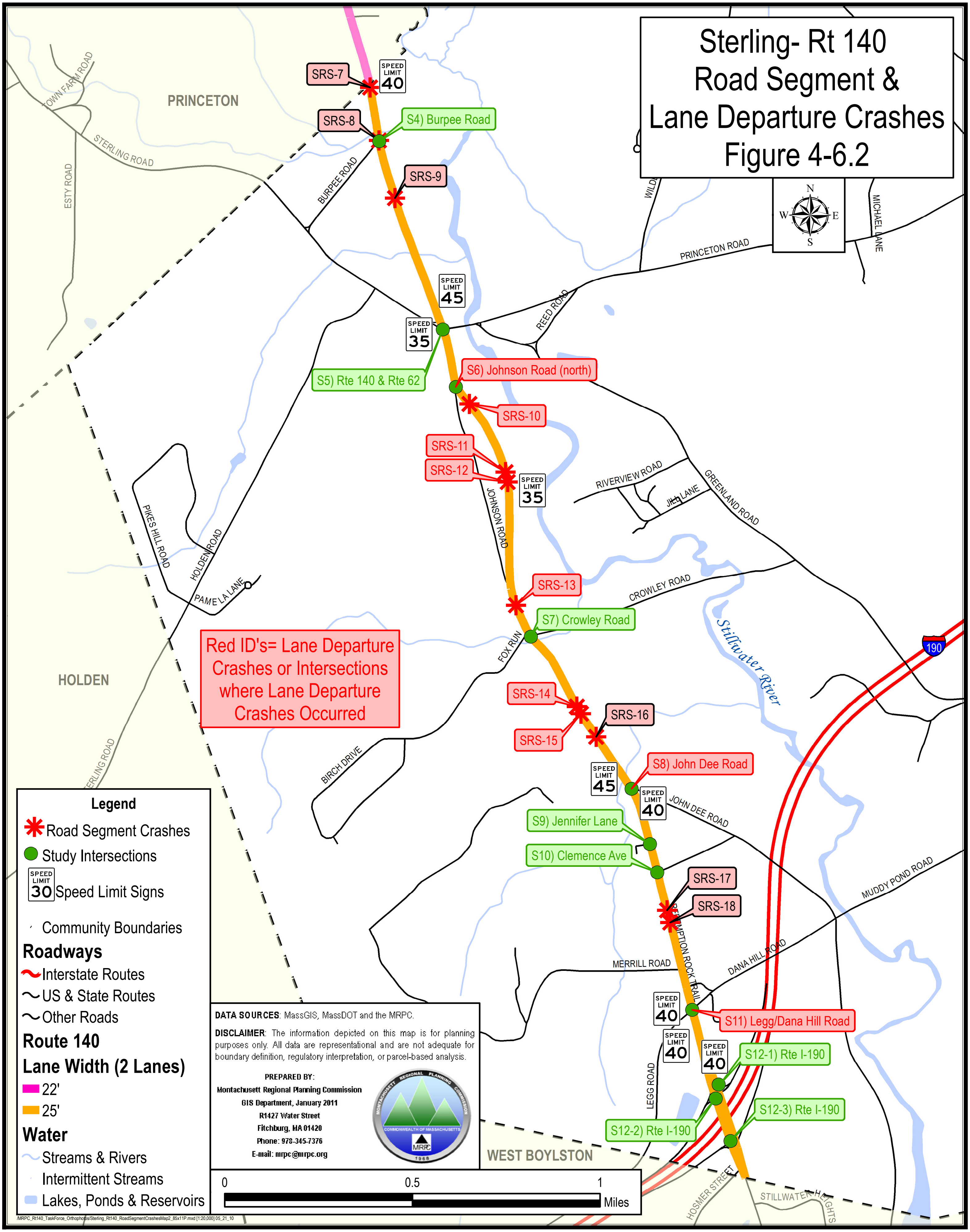
0.125
0.25
0.5
Miles



Sterling- Rt 140
Road Segment &
Lane Departure Crashes
Figure 4-6.2
PRINCETON
HOLDEN
WEST BOYLSTON
Red ID's= Lane Departure Crashes or Intersections where Lane Departure Crashes Occurred
SRS-7
SRS-8
SRS-9
SRS-10
SRS-11
SRS-12
SRS-13
SRS-14
SRS-15
SRS-16
SRS-17
SRS-18
S4) Burpee Road
S5) Rte 140 & Rte 62
S6) Johnson Road (north)
S7) Crowley Road
S8) John Dee Road
S9) Jennifer Lane
S10) Clemence Ave
S11) Legg/Dana Hill Road
S12-1) Rte I-190
S12-2) Rte I-190
S12-3) Rte I-190
SPEED LIMIT 40
SPEED LIMIT 45
SPEED LIMIT 35
TOWN FARM ROAD
STERLING ROAD
ESTY ROAD
BURPEE ROAD
PRINCETON ROAD
REED ROAD
MICHAEL LANE
RIVERVIEW ROAD
JILL LANE
GREENLAND ROAD
JOHNSON ROAD
PIKES HILL ROAD
HOLDEN ROAD
PAMELA LANE
CROWLEY ROAD
FOX RUN
BIRCH DRIVE
JOHN DEE ROAD
MUDDY POND ROAD
DANA HILL ROAD
MERRILL ROAD
REDEMPTION ROCK TRAIL
LEGG ROAD
HOSMER STREET
STILLWATER HEIGHTS
Stillwater River
190
N
S
E
W
Legend
Road Segment Crashes
Study Intersections
SPEED LIMIT 30 Speed Limit Signs
Community Boundaries
Roadways
Interstate Routes
US & State Routes
Other Roads
Route 140
Lane Width (2 Lanes)
22'
25'
Water
Streams & Rivers
Intermittent Streams
Lakes, Ponds & Reservoirs
DATA SOURCES: MassGIS, MassDOT and the MRPC.
DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.
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Phone: 978-345-7376
E-mail: mrpc@mrpc.org
0
0.5
1
Miles

5.0 PAVEMENT MANAGEMENT SYSTEM (PMS)

5.1 Introduction

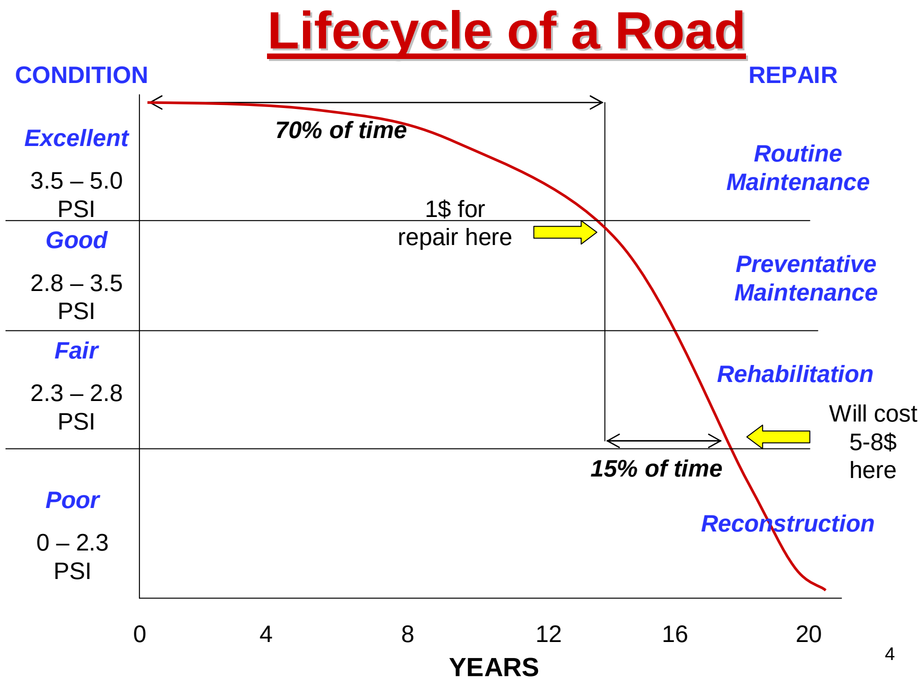
Pavements are the single largest capital investment in any highway system. MRPC in cooperation with MassDOT maintains pavement condition data on all Federal Aid eligible miles of roadway in the Montachusett region in what is known as a Pavement Management System (PMS). The Montachusett Pavement Management System is a tool used to provide an ongoing inventory of pavement conditions along this network in the region. The data maintained is utilized when prioritizing projects for federal funding and assessing current and future needs in our infrastructure.

The existing pavement conditions were not determined to be a major contributing factor to the safety or overall operability of Route 140 in either Westminster or Sterling. However, since both towns are responsible for the maintenance of the road throughout the corridor, analysis was conducted to determine the condition and needs of the pavements in order to recognize the maintenance efforts and associated costs necessary to implement appropriate repairs.

5.2 Concepts

The most recent data on the Rte. 140 study area was collected by MassDOT in 2009 using an Automatic Road Analyzer (ARAN) vehicle mounted with various cameras, lasers and measuring instruments to determine a pavements overall condition. The condition is expressed by assigning a Pavement Serviceability Index (PSI) number from 0 to 5 to segments along the roadway. A PSI of 5 is indicative of optimal pavement conditions, usually a newly paved stretch of road, while a PSI of 0 indicates a road that is failing, to the point of being impassable by an average passenger vehicle. See **Figure 5-1** below for details of the numerical values projected in the PSI.

Figure 5-1



[4]

The graph above displays PSI scores and correlating repair strategies. Also displayed is the red curve representing deterioration of the pavement over time. As shown in the graph the cost of repair increases dramatically at a certain point in a pavements "lifecycle". Ideally routine and preventative maintenance techniques should be applied at strategic times to keep costs low while maintaining an acceptable PSI, however, implementing this principle can prove to be challenging as budgets often do not keep up with a large network of deteriorating roadways.

5.3 Pavement Condition along Corridor

The tables below were derived from MassDOT surveys. Field visits by MRPC staff to survey pavement condition along Rte. 140 in Westminster and Sterling have confirmed the accuracy of these PSI values collected in 2009 and remain relevant to the condition of the roadway at the time of this corridor profile.

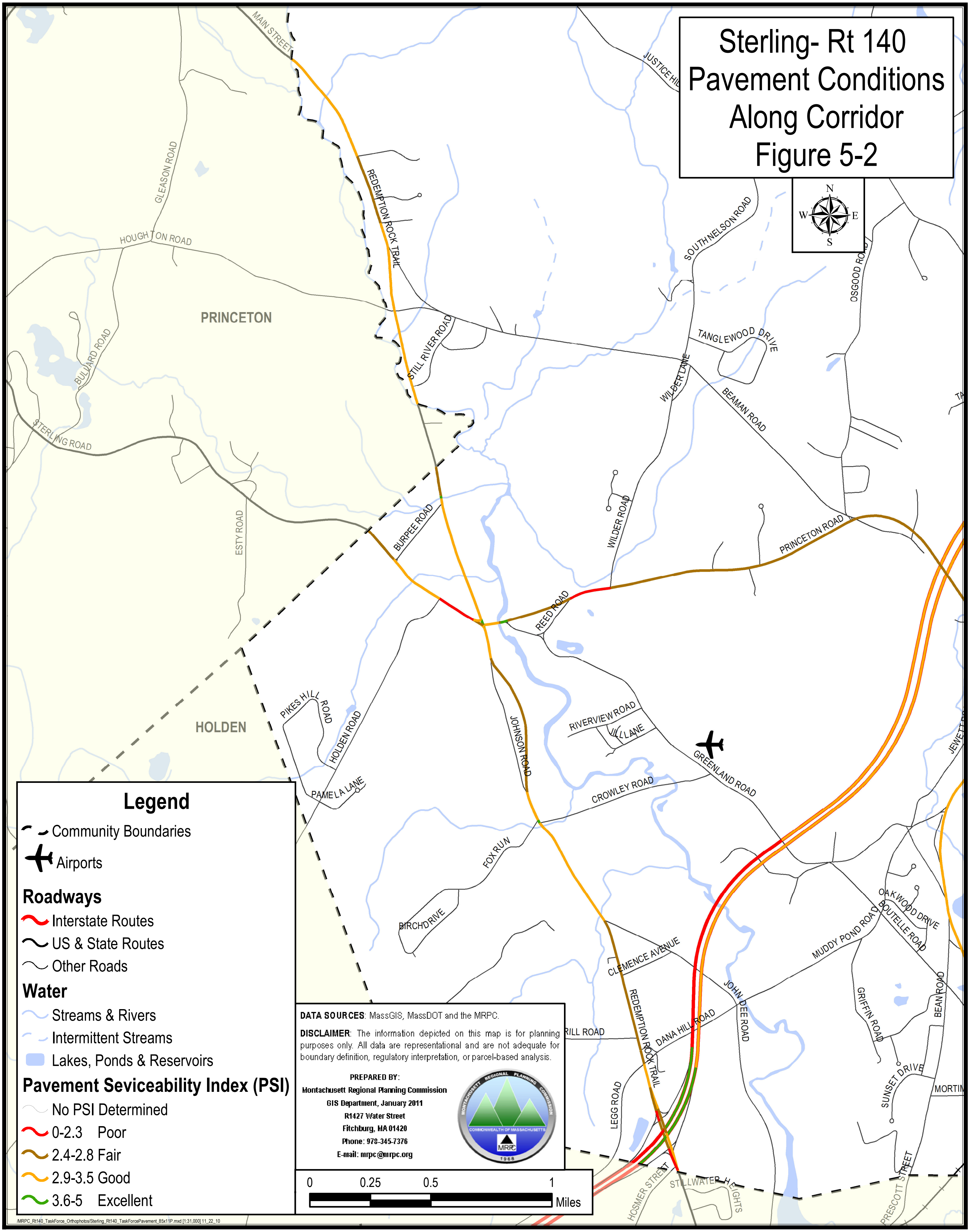
Table 5-1: Pavement Repair Costs

Sterling

Condition	Repair	Sq. Yards Cost	Sq. yards	Projected Cost
Poor	Reconstruction	$45	4,048	$182,160
Fair	Rehabilitation	$18	40,480	$728,640
Good	Preventative Maintenance	$8.50	103,259	$877,702
Excellent	Routine Maintenance	$0.75	16,192	$12,144
				$1,800,646

- Pavement conditions along Route 140 in Sterling range from 2.2 to 3.8 PSI according to MassDOT survey. While the majority of the roadway is considered to be in “good” condition, which suggests applying “preventative maintenance” techniques, there is also a need for both more in depth “rehabilitation” and less intrusive “routine maintenance” along select sections to improve conditions to “excellent”. A small section through Sterling (0.1 mi.) narrowly meets the threshold of “poor” condition correlating to a full depth reconstruction.

The theory behind a pavement management system is that it is far more economical to preserve roads than to delay repairs and reconstruct roads. Hence investing more frequently in system wide preventative maintenance allows for a reduction in the need to perform more costly reconstruction projects which eat up budgets. Route 140 in Sterling is Federal aid eligible but a Local Jurisdiction road. Meaning projects along the road are eligible for funding through the competitive Transportation Improvement Program (TIP) process but general maintenance including regular repair work is the responsibility of the community. Due to the Jurisdiction being classified as town, the 4.1 miles of Rte 140 in Sterling compete with the needs of 85.4 miles of other town maintained roads. Ideally focus should be on investments in routine and preventative maintenance to deter the deterioration of the road surface and delay the need for a complete reconstruction, however, shrinking budgets, the rising cost of materials and accounting for a large network of decaying roads make investing in these low cost road preservation efforts a challenge. Unfortunately to attain Federal monies through the TIP a project would have to conform to Federal design guidelines which, in the case of a Minor Arterial such as this stretch of Rte. 140, would mean widening the road from the current width of 23’ to 25’ to a total width of 30’ to 32’ in order account for adding shoulders. The town needs to be aware of these guidelines and find a means to maintain an acceptable condition of Rte 140.


Sterling- Rt 140
Pavement Conditions
Along Corridor
Figure 5-2
N
W
E
S
PRINCETON
HOLDEN
MAIN STREET
REDEMPTION ROCK TRAIL
GLEASON ROAD
HOUGHTON ROAD
BULLARD ROAD
STERLING ROAD
ESTY ROAD
STILL RIVER ROAD
BURPEE ROAD
JUSTICE HILL
SOUTH NELSON ROAD
OSGOOD ROAD
TANGLEWOOD DRIVE
WILDER LANE
BEAMAN ROAD
WILDER ROAD
PRINCETON ROAD
REED ROAD
PIKES HILL ROAD
HOLDEN ROAD
PAMELA LANE
JOHNSON ROAD
RIVERVIEW ROAD
JILL LANE
GREENLAND ROAD
CROWLEY ROAD
FOX RUN
BIRCH DRIVE
CLEMENCE AVENUE
JOHN DEE ROAD
DANA HILL ROAD
MUDDY POND ROAD
OAKWOOD DRIVE
BOUTELLE ROAD
GRIFFIN ROAD
BEAN ROAD
SUNSET DRIVE
MORTIM
LEGG ROAD
HOSMER STREET
STILLWATER HEIGHTS
PRESCOTT STREET
JEWETT
RILL ROAD
Legend
Community Boundaries
Airports
Roadways
Interstate Routes
US & State Routes
Other Roads
Water
Streams & Rivers
Intermittent Streams
Lakes, Ponds & Reservoirs
Pavement Seviceability Index (PSI)
No PSI Determined
0-2.3 Poor
2.4-2.8 Fair
2.9-3.5 Good
3.6-5 Excellent
DATA SOURCES: MassGIS, MassDOT and the MRPC.
DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.
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Montachusett Regional Planning Commission
GIS Department, January 2011
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Fitchburg, MA 01420
Phone: 978-345-7376
E-mail: mrpc@mrpc.org
0
0.25
0.5
1
Miles

6.0 ROADWAY DRAINAGE: BRIDGE AND CULVERT

In Sterling there is one bridge along the Rte 140 corridor located just North of Burpee Rd. over the Wachusett Brook. This bridge was built in 2003 and is deemed to be in excellent condition. No roadway function or safety problems have been determined to be associated with this structure. **Table 6-1** below displays information about this bridge.

More prevalent along Rte 140 in Sterling are culverts due to there being many smaller stream crossings along the road. An MRPC inventory and condition survey of these culverts has been completed and is detailed in the following pages.

Table 6-1

Sterling Bridge Information

Town	ID Number	Over	Under	Owner	Year Built	AASHTO Rating*	Deficiency
Sterling	S25016	ST140 RDMPTN ROCK	WATER WACHUSETT BROOK	MassDOT	2003	82.6	None

*AASHTO Rating: American Association of State Highway and Transportation Officials

As seen in the tables accompanying the following pictures, and again at the end of this report in the Improvements Section, there are a number of culverts that could benefit from basic and routine cleaning of debris. Also identified in the Improvements Section is the southern intersection of Rte. 140 and Johnson Road. Although no culvert exists at this location, it would benefit from drainage improvements. The runoff coming onto Rte. 140 on either side of the road can reach the driving surface. This location is especially concerning during winter months where icing can occur, making for dangerous driving conditions.

Figures 6-1: Sterling Culverts

West Side	*West Side Railing*	*East Side*
		

Location #	Culvert Type/Material	Observed Condition	Size (Diameter)	Approx. Length	Field Observations, Comments
1	Concrete box	Good/ Some wear on bridge rail/ Some visible rebar inside	17'	26'	Unobstructed, free flowing; Height is 8'

West Side	*West Side*	*East Side*
		

Location #	Culvert Type/Material	Observed Condition	Size (Diameter)	Approx. Length	Field Observations, Comments
2	Corrugated pipe	Good	3' - 4'	25'	1/4 of pipe visible; Tree branches near west side; Slow moving; Debris in stream; Might be clogged

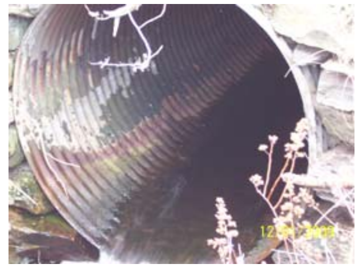
West Side *East Side* *Looking Across from East to West*

Location #	*Culvert Type/Material*	*Observed Condition*	*Size (Diameter)*	*Approx. Length*	*Field Observations, Comments*
3	**Segments of Corrugated Pipe**	**Poor**	**3' in East, 3.5' in West**	**150' +**	Lots of wood debris on West side; East side corrosion; Goes through private property on East side

East Side *West Side* *West Side*

Location #	*Culvert Type/Material*	*Observed Condition*	*Size (Diameter)*	*Approx. Length*	*Field Observations, Comments*
4	**2 Corrugated pipes**	**Fair**	**3.5' - 2.5'**	**26'**	Double pipes are both oval shape; Some debris and sedement on West side

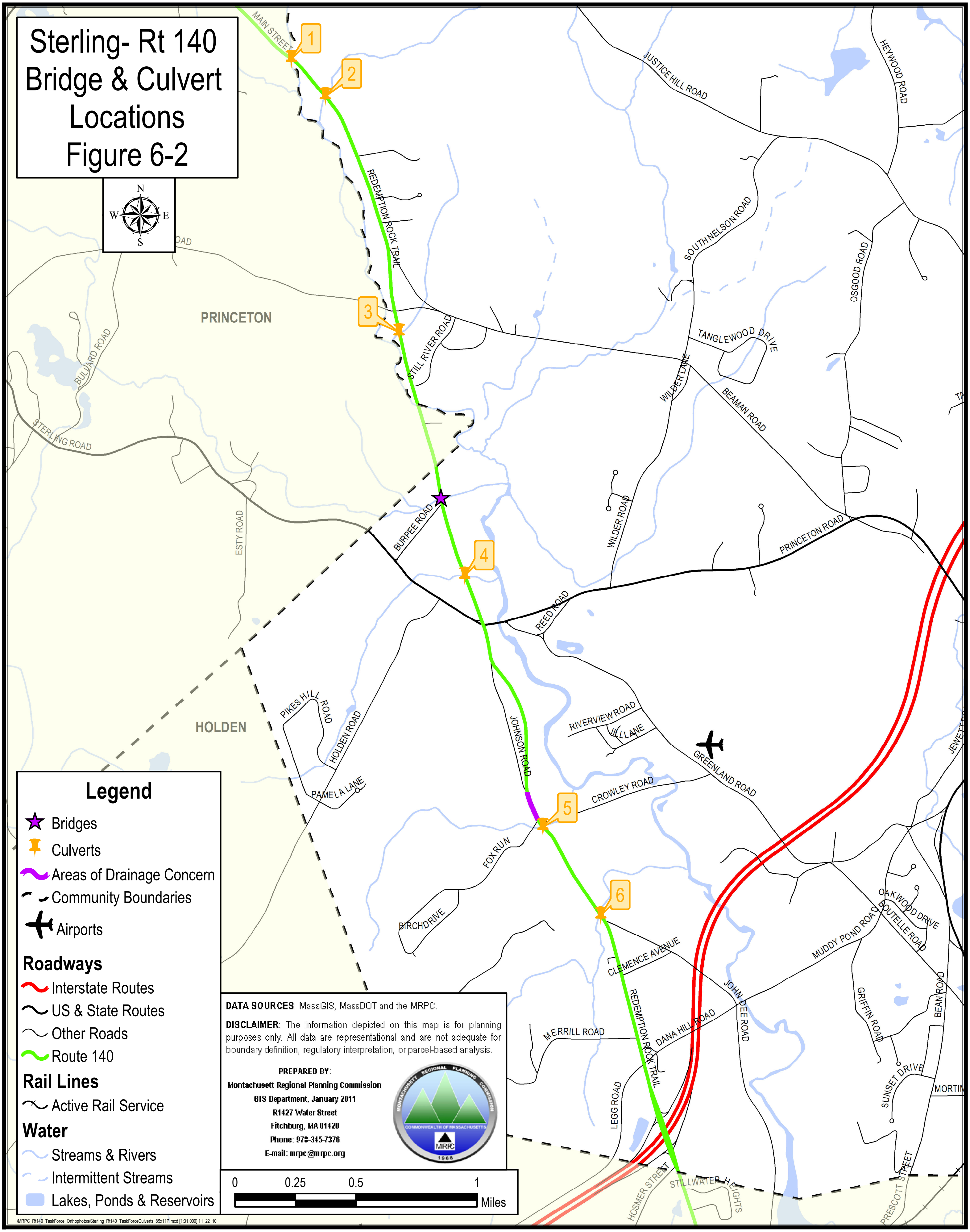
West Side ***West Side*** ***East Side***



Location #	***Culvert Type/Material***	***Observed Condition***	***Size (Diameter)***	***Approx. Length***	***Field Observations, Comments***
5	**Corrugated pipe**	**Poor**	**4'**	**26'**	Free flow; Bottom of pipe rusted throughout

East Side ***East Side*** ***West Side***

Location #	***Culvert Type/Material***	***Observed Condition***	***Size (Diameter)***	***Approx. Length***	***Field Observations, Comments***
6	**Corrugated pipe**	**Good**	**3'**	**27'**	Some debris in stream on West side



Sterling- Rt 140 Bridge & Culvert Locations
Figure 6-2
N
W
E
S
PRINCETON
HOLDEN
1
2
3
4
5
6
MAIN STREET
REDEMPTION ROCK TRAIL
STILL RIVER ROAD
BULLARD ROAD
STERLING ROAD
ESTY ROAD
BURPEE ROAD
JUSTICE HILL ROAD
HEYWOOD ROAD
SOUTH NELSON ROAD
OSGOOD ROAD
TANGLEWOOD DRIVE
WILDER LANE
BEAMAN ROAD
WILDER ROAD
PRINCETON ROAD
REED ROAD
PIKES HILL ROAD
HOLDEN ROAD
PAMELA LANE
JOHNSON ROAD
RIVERVIEW ROAD
JILL LANE
GREENLAND ROAD
CROWLEY ROAD
FOX RUN
BIRCH DRIVE
CLEMENCE AVENUE
JOHN DEE ROAD
MUDDY POND ROAD
OAKWOOD DRIVE
BOUTELLE ROAD
GRIFFIN ROAD
BEAN ROAD
MERRILL ROAD
DANA HILL ROAD
LEGG ROAD
SUNSET DRIVE
MORTIM
HOSMER STREET
STILLWATER HEIGHTS
PRESCOTT STREET
JEWETT
Legend
Bridges
Culverts
Areas of Drainage Concern
Community Boundaries
Airports
Roadways
Interstate Routes
US & State Routes
Other Roads
Route 140
Rail Lines
Active Rail Service
Water
Streams & Rivers
Intermittent Streams
Lakes, Ponds & Reservoirs
DATA SOURCES: MassGIS, MassDOT and the MRPC.
DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.
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GIS Department, January 2011
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E-mail: mrpc@mrpc.org
MONTACHUSETT REGIONAL PLANNING COMMISSION
COMMONWEALTH OF MASSACHUSETTS
MRPC
1968
0
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0.5
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Miles

7.0 MULTI-MODAL CONSIDERATIONS

7.1 Bicycle and Pedestrian

Throughout the development of the Corridor Profile, bicycle and pedestrian accommodations were highlighted as issues to be addressed. Each community felt that it was necessary to examine the role and practicality of bikes and pedestrians along the corridor. The existing layout of the roadway makes it a difficult and potentially dangerous situation for both alternate mode users as well as drivers.

Within the Town of Sterling, Route 140 was divided into five segments as part of the surface width examination. These segments are illustrated in the figures within the *Other Corridor Conditions* chapter and are summarized below.

Segment	From	To	Travel Lanes Width	Shoulder Width
1	Princeton Town Line	Princeton Town Line	23 ft	2 ft
2	Princeton Town Line	Princeton Road (Route 62)	25 ft	2 ft
3	Princeton Road (Route 62)	Crowley Road	25 ft	2 ft
4	Crowley Road	Clemence Avenue	25 ft	2 ft
5	Clemence Avenue	Dana Hill Road	25ft	2 ft

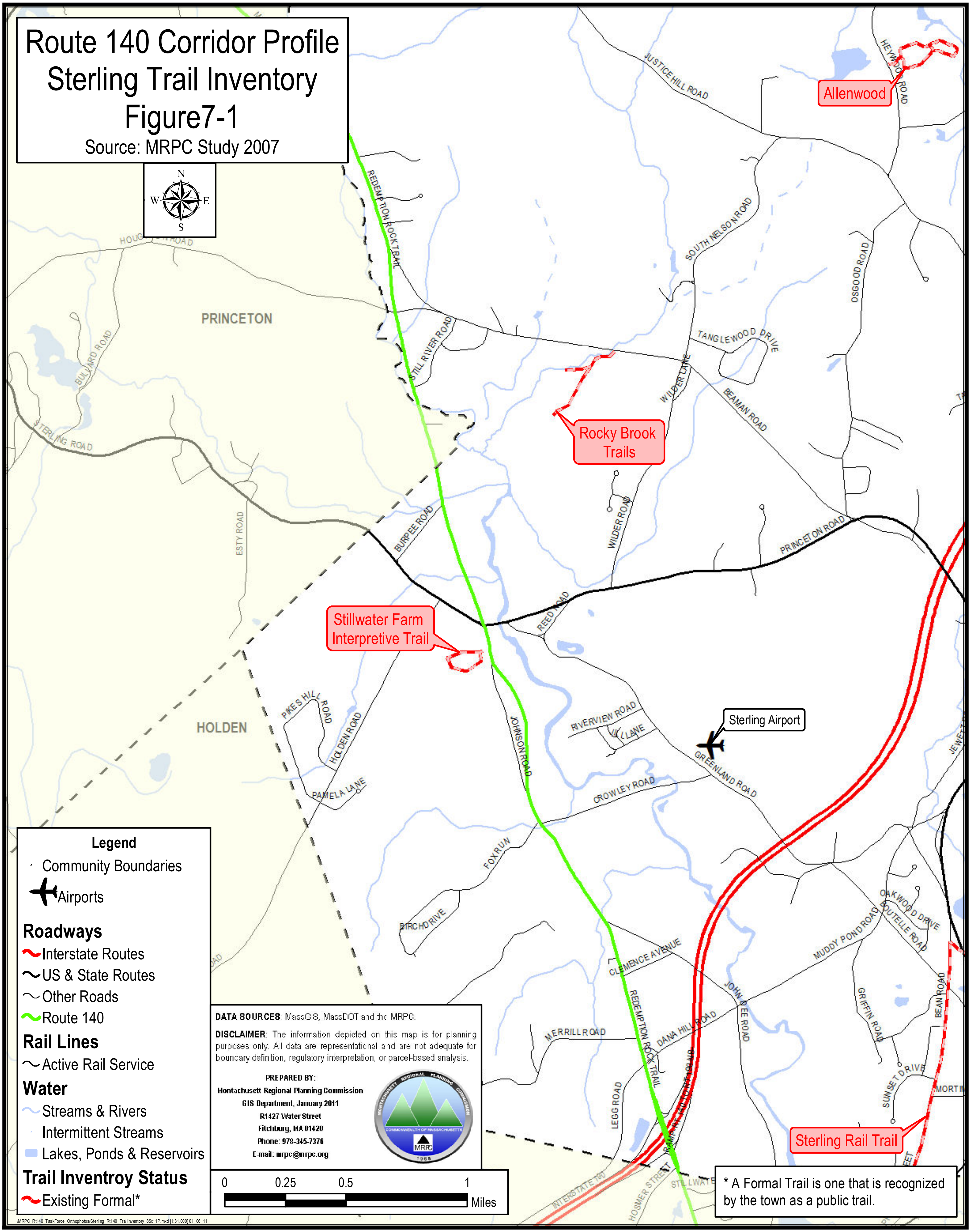
Source: MassDOT Road Inventory File

Field investigations where conducted at two locations on Route 140 in Sterling to verify and compare data contained within the MassDOT Road Inventory File (RIF). Observations indicate that shoulders are almost non-existent north and south of Beaman Road and in the vicinity of Dana Hill Road. Where they are available the width varies from 1 to 2 feet. Actual travel lanes for vehicles are approximately 11 feet in width, almost 1 foot wider than indicated in the RIF. Complete field data is provided in the *Other Corridor Conditions* chapter. Additionally, the vertical and horizontal alignments that are prevalent along the roadway are not conducive to safe travel conditions for bicycles or pedestrians.

The MassDOT Design Guidebook recommends shoulder widths of a minimum of 4 feet to accommodate bicycle and pedestrian use on a shared travel lane. Therefore, outside of the section of Route 140 at the I-190 On and Off ramps where the speed limit is 40 mph, available shoulders to accommodate bike and pedestrian use does not exist. Additionally, due to the number of lanes and the speeds present, bike and pedestrian use near the I-190 interchanges would also be considered dangerous and likely impractical.

A separate trail inventory study was conducted by the MRPC for Sterling in 2007. This inventory includes hiking and biking trails throughout the community that currently exist. A copy of a map produced of formal trails within the community is included below. Please contact the MRPC for a complete copy of the study. The following trails lie within the vicinity of Route 140.

- *Proposed Trail to Wachusett Mountain* – this trail, if developed, would connect Wachusett Mountain to the proposed Stillwater River Trail into West Boylston. This trail runs across Route 140 north of Beaman Road.
- *Stillwater Farm Interpretive Trail* – This trail, located off Route 140 just south of Route 62, makes a small loop on the west side of the roadway.


Route 140 Corridor Profile
Sterling Trail Inventory
Figure7-1
Source: MRPC Study 2007
N
W
E
S
PRINCETON
HOLDEN
STERLING ROAD
BULLARD ROAD
ESTY ROAD
REDEMPTION ROCK TRAIL
STILL RIVER ROAD
BURPEE ROAD
JUSTICE HILL ROAD
SOUTH NELSON ROAD
TANGLEWOOD DRIVE
OSGOOD ROAD
WILDER LANE
BEAMAN ROAD
WILDER ROAD
PRINCETON ROAD
REED ROAD
Allenwood
Rocky Brook
Trails
Stillwater Farm
Interpretive Trail
Sterling Airport
PIKES HILL ROAD
HOLDEN ROAD
PAMELA LANE
JOHNSON ROAD
RIVERVIEW ROAD
GREENLAND ROAD
CROWLEY ROAD
FOX RUN
BIRCH DRIVE
CLEMENCE AVENUE
MUDDY POND ROAD
OAKWOOD DRIVE
BOUTELLE ROAD
JOHN DEE ROAD
GRIFFIN ROAD
BEAN ROAD
MERRILL ROAD
DANA HILL ROAD
LEGG ROAD
SUNSET DRIVE
INTERSTATE 190
HOSMER STREET
Sterling Rail Trail
Legend
Community Boundaries
Airports
Roadways
Interstate Routes
US & State Routes
Other Roads
Route 140
Rail Lines
Active Rail Service
Water
Streams & Rivers
Intermittent Streams
Lakes, Ponds & Reservoirs
Trail Inventroy Status
Existing Formal*
DATA SOURCES: MassGIS, MassDOT and the MRPC.
DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.
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0
0.25
0.5
1
Miles
* A Formal Trail is one that is recognized by the town as a public trail.

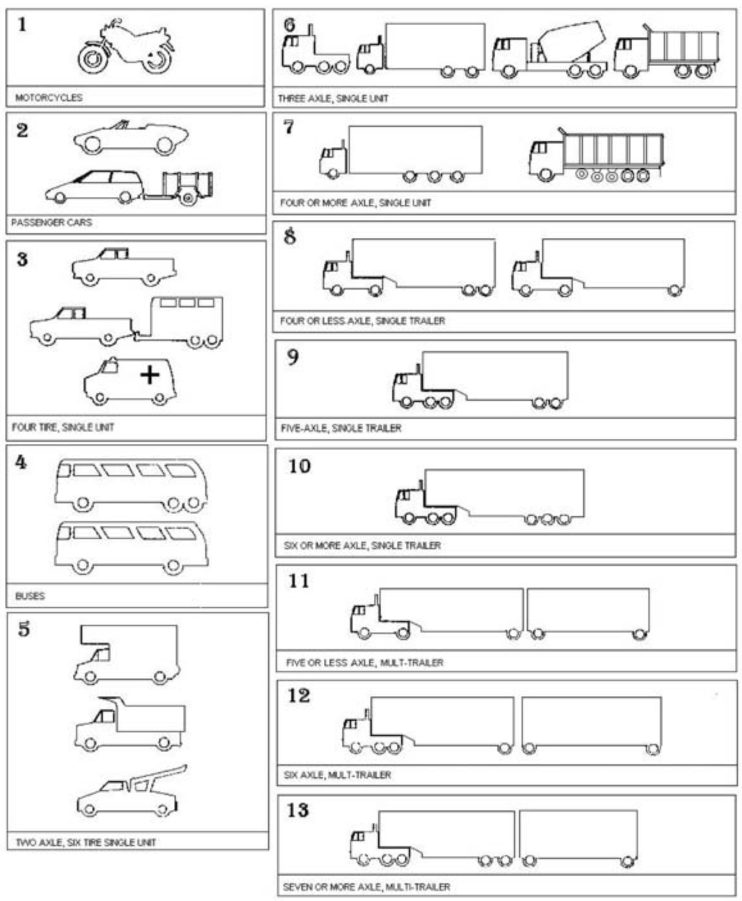
8.0 FREIGHT MOVEMENT

8.1 Heavy Vehicle Percentages

Vehicle classification counts were conducted on Route 140 in Sterling north of Beaman Road and south of Crowley Road to determine the percentage of truck traffic present along the corridor. These counts spanned a Thursday to Monday midday period in order to provide weekday figures for comparison purposes.

Vehicle traffic was collected based upon the 13 vehicle classification categories identified by the FHWA. A graphical representation is provided below.

FHWA Vehicle Classification Scheme F Report



As part of this analysis, heavy truck traffic was taken to include 3 axles, single units and above, i.e. class 6 to 13 as indicated in the above figure. The table below summarizes the percentage of heavy truck traffic as part of the overall traffic volume at each of the two locations for the ½ day Monday and full days of Thursday and Friday.

Rt 140 - North of Beaman Road

	Monday (1/2 Day)			Thursday			Friday			Wkday Daily Totals		
	No. Trucks	Volume	% Trucks	No. Trucks	Volume	% Trucks	No. Trucks	Volume	% Trucks	No. Trucks	Volume	% Trucks
Northbound	22	783	2.81%	30	2775	1.08%	50	2983	1.68%	102	6541	1.56%
Southbound	18	1822	0.99%	35	2835	1.23%	37	2983	1.24%	90	7640	1.18%
Total	40	2605	1.54%	65	5610	1.16%	87	5966	1.46%	192	14181	1.35%

Rt 140 - South of Crowley Road

	Monday (1/2 Day)			Thursday			Friday			Wkday Daily Totals		
	No. Trucks	Volume	% Trucks	No. Trucks	Volume	% Trucks	No. Trucks	Volume	% Trucks	No. Trucks	Volume	% Trucks
Northbound	26	1097	2.37%	36	4186	0.86%	49	4341	1.13%	111	9624	1.15%
Southbound	17	2623	0.65%	30	4132	0.73%	30	4308	0.70%	77	11063	0.70%
Total	43	3720	1.16%	66	8318	0.79%	79	8649	0.91%	188	20687	0.91%

From the data gathered, the percent of heavy truck traffic ranged from a high of 2.81% in the northbound direction to low of 0.65% in the southbound direction. Overall, the percent of truck traffic versus the total traffic volumes averaged less than 2.0% for the weekday period indicating that truck traffic does not appear to be above normal limits for such a roadway. Differences in the number of trucks between the two count locations (as well as the volume differences) can be attributed to the intersection of Route 140/Route 62 located approximately half way between the two locations.

Weekend volumes, for both trucks and total vehicular volumes, are less than those seen on a weekday with heavy truck percentages less than one half (1/2) of one percent.

Rt 140 - North of Beaman Road

	Saturday			Sunday			Weekend Totals		
	No. Trucks	Volume	% Trucks	No. Trucks	Volume	% Trucks	No. Trucks	Volume	% Trucks
Northbound	11	2224	0.49%	7	1986	0.35%	18	4210	0.43%
Southbound	7	2100	0.33%	6	2313	0.26%	13	4413	0.29%
Total	18	4324	0.42%	13	4299	0.30%	31	8623	0.36%

Rt 140 - South of Crowley Road

	Saturday			Sunday			Weekend Totals		
	No. Trucks	Volume	% Trucks	No. Trucks	Volume	% Trucks	No. Trucks	Volume	% Trucks
Northbound	19	3309	0.57%	11	2955	0.37%	30	6264	0.48%
Southbound	5	3103	0.16%	3	3168	0.09%	8	6271	0.13%
Total	24	6412	0.37%	14	6123	0.23%	38	12535	0.30%

9.0 OTHER CORRIDOR PROFILE FINDINGS

The following analyses and inventories were completed to augment the results of the previous chapters. Findings such as poor sight distance, lack of signage, and road width are important to the types of improvements that are needed on Route 140.

9.3 Sight Distance (SD) Analysis: Problem Area Identification

Only conclusions that reveal **inadequate** SD, **adequate but close** SD, or locations that present a related issue are provided here. See the Technical Appendix for complete results of all locations analyzed.

SD Analysis Descriptions

Sight distance is the length of the roadway which is visible to the driver. Sufficient sight distance length is based on either the design speed or the average measured 85th **P**ercentile vehicle travel **S**peed (PS). In other words, if the speeds of all vehicles are ranked from the fastest to the slowest, the 85th PS separates the fastest 15% from the slower 85%. Sight distance analysis for STOP controlled intersections and roadway stopping were completed for this study.

STOP Controlled Intersection:
The driver of a vehicle stopped at a minor approach of an intersection with a STOP sign needs to be able to see a certain distance in both directions along the major road in order to safely turn onto, or cross, the major road. The driver should have an unobstructed view of the area around the intersection. The lengths along the intersecting street should be sufficient enough to allow the driver a safe departure to avoid a crash.

The three intersection movements are:

- RIGHT TURN – needs sufficient sight distance to allow a departing vehicle to complete two maneuvers before being overtaken by an oncoming vehicle traveling in the right lane at or near the posted speed limit or the 85th PS. The vehicle must make a right-turn and then accelerate.
- CROSSOVER – needs sufficient sight distance to allow a departing vehicle to cross two lanes with vehicles coming from both directions traveling at or near the posted speed limit or the 85th PS.
- LEFT TURN – needs sufficient sight distance to allow a departing vehicle to complete three maneuvers before being overtaken by oncoming vehicles from both directions traveling at or near the posted speed limit or the 85th PS. First it must clear the traffic oncoming from the left, then it must enter the traffic flow oncoming from the right, and then accelerate to the posted speed limit.

The right-turn and crossover movements have the same minimum recommended sight distance. The left turn movement requires a longer minimum recommended sight distance from the right.

Stopping Sight Distance on a Roadway:
The minimum sight distance available on the roadway should be sufficiently long enough to enable a vehicle traveling at or near the design speed or the 85^{th} PS to stop before reaching a stationary object in its path. Although greater length is desirable, sight distance at every point along the highway should be at least the minimum required for a below-average operator or vehicle or stop in this distance.

- **Int. # 1: Beaman Road: Stopping SD**

Results: STOPPING

	Measured*	Recommended*	Conclusion
South Bound	400 +	305	Adequate
North Bound	400 +	305	Adequate

*in feet

Geometric & Other Issues:

- Although stopping is adequate, minor vertical and horizontal curves, vegetation, and the location of Beaman Road at the midpoint of the horizontal curve combine to make it difficult for south bound vehicles to discern the path of Route 140.
- There is a tendency for south bound vehicles to depart their travel lane and travel into the opposing north bound lane.
- Vegetation hinders clear view of the **DO NOT ENTER** signs on Beaman Road.

Photos: Geometric & Other Issues

Views from North Bound Approach (looking south)

Vegetation Opposite of Beaman Road on Horizontal Curve that Inhibits the Ability of a Driver to View the Roadway Ahead.

- **Int. # 2: North Oakdale Cutoff: Intersection SD**

Results: STOP Controlled Intersection

	Measured*	Recommended*	Conclusion
Right Turn	233	385	Not Adequate
Left Turn	246	445	Not Adequate
Major Left Turn	400 +	325	Adequate

*in feet

Geometric Issues & Sight Distance Obstructions:

- Low slideslopes and vegetation on both sides of North Oakdale Cutoff affect both STOP controlled movements.

Photos*: Not Adequate Sight Distance Result

For Left Turn & Right Turn

For Left Turn (looking right)

- **140 Club: Intersection SD & On Street Parking**

Results: STOP Controlled Intersection

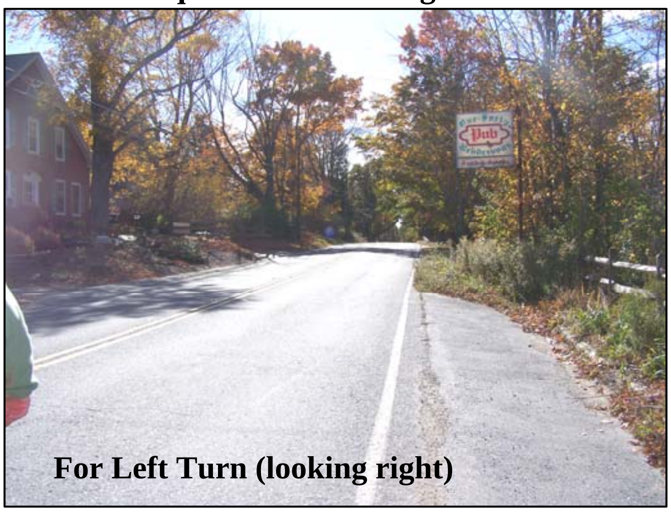
	Measured*	Recommended*	Conclusion
Right Turn	600 +	385	Adequate
Left Turn	470	445	Adequate but Close
Major Left Turn	600 +	325	Adequate

*in feet

Geometric Issues & Sight Distance Obstructions:

- Vertical curve to the south will affect left turn movement at slightly higher travel speeds.

Photo*: Adequate But Close Sight Distance Result



For Left Turn (looking right)

On Street Parking Compromises Safety:

On street parking occurs on both sides of Route 140 usually after nightfall (daytime photos below). Safety is comprised due to:

- The road width prevents adequate on street parking accommodation.
- The vertical curve to the south prevents north bound drivers from being aware of parked vehicles. The response time a driver has to stop or slow down is most likely insufficient for stopping or maneuvering safely.
- After sunset the roadway is dark due to inadequate lighting.
- No advanced warning is provided.

Looking South

Looking North

- **Antique Plants: Intersection and Stopping SD**

Results: STOP Controlled Intersection

	Measured*	Recommended*	Conclusion
Right Turn	582	385	Adequate
Left Turn	418	445	Not Adequate
Major Left Turn	600 +	325	Adequate

Results: STOPPING

	Measured*	Recommended*	Conclusion
South Bound	332	305	Adequate but Close
North Bound	600 +	305	Adequate

*in feet

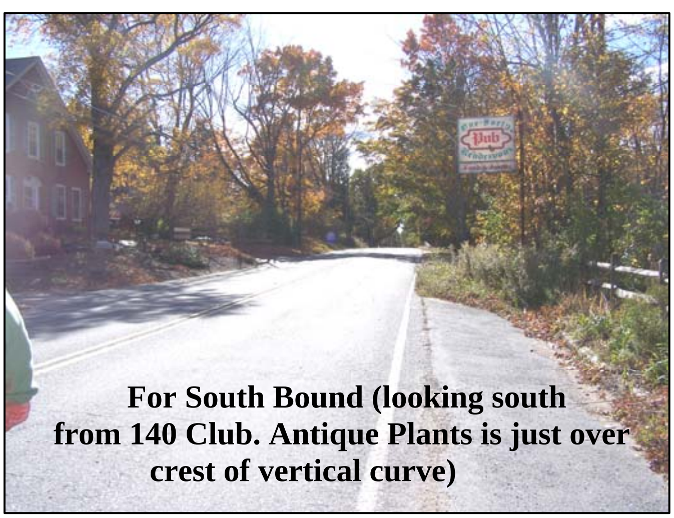
Geometric Issues & Sight Distance Obstructions:

- Vertical curve, vegetation, and pole to the north affect left turn movements.
- Vegetation and pole to the south will affect left movement at somewhat higher travel speeds.
- Vertical curve to the north will affect south bound stopping at slightly higher travel speeds.

Photo*: Not Adequate / Adequate But Close Sight Distance Results


For Left Turn (looking left)

For Left Turn (looking right)


For South Bound (looking south from 140 Club. Antique Plants is just over crest of vertical curve)

- **Int. # 3: Still River Road: Intersection SD**

Results: STOP Controlled Intersection

	Measured*	Recommended*	Conclusion
Right Turn	409	385	Adequate but Close
Left Turn	303	445	Not Adequate
Major Left Turn	600 +	325	Adequate

*in feet

Geometric Issues & Sight Distance Obstructions:

- Vertical curve to the north, vegetation, and poles on both sides of Still River Road affect left turn movements.
- Vegetation and pole to the south will affect right movements at slightly higher travel speeds.

Photo*: Not Adequate / Adequate But Close Sight Distance Results

For Left Turn & Right Turn

For Left Turn (looking right)

- **Int. # 7: Johnson Road (south): Intersection and Stopping SD**

Results: STOP Controlled Intersection

	Measured*	Recommended*	Conclusion
Right Turn	122	335	Not Adequate
Left Turn	486	445	Adequate but Close
Major Left Turn	400 +	285	Adequate
	Results: STOPPING		
	Measured*	Recommended*	Conclusion
South Bound	400 +	250	Adequate
North Bound	331	315	Adequate but Close

*in feet

Geometric Issues & Sight Distance Obstructions:

- Skewed intersection and vegetation on the north side of the intersection affect both STOP controlled movements.
- Vertical curve, horizontal curve, vegetation to the south will affect left turn movements at slightly higher travel speeds.
- Vertical curve, horizontal curve, vegetation to the south will affect north bound stopping at slightly higher travel speeds.

Photo*: Not Adequate / Adequate But Close Sight Distance Results


For Left Turn & Right Turn


For Left Turn (looking right)


For North Bound

- **Int. # 8: Fox Run Road: Intersection and Stopping SD**

Results: STOP Controlled Intersection

	Measured*	Recommended*	Conclusion
Right Turn	156	335	Not Adequate
Left Turn	493	445	Adequate but Close
Major Left Turn	300 +	285	Adequate but Close
Results: STOPPING			
	Measured*	Recommended*	Conclusion
South Bound	300 +	250	Adequate but Close
North Bound	490	305	Adequate

*in feet

Geometric Issues & Sight Distance Obstructions:

- Vegetation on the north side of the intersection affect both STOP controlled movements.
- Vegetation and pole on the south side of the intersection will affect left turn movements at slightly higher travel speeds.
- Vertical curve to the north will affect left turn movement from major road at slightly higher travel speeds.
- Vertical curve to the north will affect south bound stopping at slightly higher travel speeds.

Photo*: Not Adequate / Adequate But Close Sight Distance Results

- **Int # 8: Crowley Road: Intersection SD**

Results: STOP Controlled Intersection

	Measured*	Recommended*	Conclusion
Right Turn	480	335	Adequate
Left Turn	142	445	Not Adequate
Major Left Turn	350 +	325	Adequate but Close

*in feet

Geometric Issues & Sight Distance Obstructions:

- Slight sideslope, vegetation, signs on the north side of the intersection, and the slight vertical curve on the Crowley Road approach affect left turn movements (see note below).
- Vegetation to the south of the intersection will affect left turn movements and left turn movements from major road at slightly higher travel speeds.

NOTE: Left turns are not permitted at this intersection. A **NO LEFT TURN** sign is posted opposite the approach.

Photo*: Not Adequate / Adequate But Close Sight Distance Results

For Left Turn & Right Turn

For Left Turn (looking right)

For Major Left Turn

- ### Int. # 10: Clemence Avenue: Intersection and Stopping SD

Results: STOP Controlled Intersection

	Measured*	Recommended*	Conclusion
Right Turn	160	385	Not Adequate
Left Turn	92	500	Not Adequate
Major Left Turn	300	325	Not Adequate
Results: STOPPING			
	Measured*	Recommended*	Conclusion
South Bound	500 +	360	Adequate
North Bound	299	305	Not Adequate

*in feet

Geometric Issues & Sight Distance Obstructions:

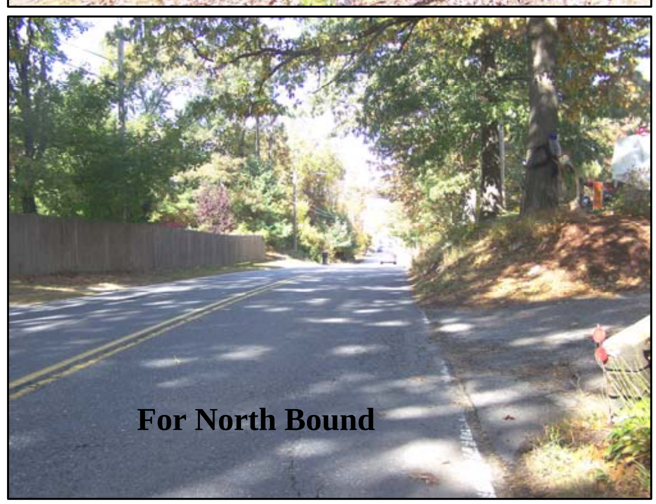
- Vertical curve, sideslope, vegetation on south side of intersection, and sign, vegetation on north side of intersection affect both STOP controlled movements.
- Vertical curve affects left turn movements from major road.
- Vertical curve, sideslope, vegetation on east side of intersection affect north bound stopping.

Photos*: Not Adequate / Adequate But Close Sight Distance Result


For Left Turn & Right Turn

For Left Turn (looking right)


For Major Left Turn**


For North Bound

***All photos were taken in 2009, **Exception: This photo taken in 2010**.

9.2 Traffic Sign Inventory and Key Observations

MRPC conducted traffic sign inventories of regulatory and warning signs and provides key observations to assist in the development of improvement options and setting project priorities. The results are shown on **Figures 9-1.1** and **9-1.2** and listed by location in **Table 9-1** below.

TABLE 9-1

Route 140: Sign Inventory (sorted north to south)

Location or Intersection	Sign	Type of Sign	Approach
Just South of Princeton TL (north)	Speed Limit - 40 MPH	Regulatory	For South Bound Traffic
Between Princeton TL (north) & Beaman Road	No Passing Zone	Warning	For South Bound Traffic
Beaman Road	Do Not Enter	Regulatory	North Bound
Beaman Road	Stop	Regulatory	North Bound
Beaman Road	Do Not Enter	Regulatory	North Bound
Just North of North Oakdale Cutoff	Children	Warning	For North Bound Traffic
Just North of North Oakdale Cutoff	Intersection Warning	Warning	For South Bound Traffic
North Oakdale Cutoff	Stop	Regulatory	West Bound
Just South of North Oakdake Cutoff	Do Not Pass	Regulatory	For South Bound Traffic
Just South of North Oakdake Cutoff	No Passing Zone	Warning	For North Bound Traffic
Just North of Still River Road	No Passing Zone	Warning	For North Bound Traffic
Just North of Still River Road	Do Not Pass	Regulatory	For North Bound Traffic
Just South of Princeton TL (south)	Speed Limit - 40 MPH	Regulatory	For North Bound Traffic
Just South of Burpee Road	Blind Driveway	Warning	For North Bound Traffic
Between Burpee Road & Route 62	No Passing Zone	Warning	For South Bound Traffic
Between Burpee Road & Route 62	Do Not Pass	Regulatory	For South Bound Traffic
Just North of Route 62	Speed Limit - 45 MPH	Regulatory	For North Bound Traffic
Just North of Route 62	No Passing Zone	Warning	For South Bound Traffic
Just North of Route 62	Do Not Pass	Regulatory	For South Bound Traffic
Just North of Route 62	Intersection Warning	Warning	For South Bound Traffic
Just North of Route 62	Slow Children	Warning	For North Bound Traffic
Route 62	Stop	Regulatory	East Bound
Route 62	Stop	Regulatory	East Bound
Route 62	Stop	Regulatory	West Bound
Just South of Route 62	Speed Limit - 35 MPH	Regulatory	For South Bound Traffic
Just North of Johnson Road (north)	Chevron	Warning	For North Bound Traffic
Just North of Johnson Road (north)	Chevron	Warning	For North Bound Traffic
Johnson Road (north)	Stop	Regulatory	East Bound
Between Johnson Rd (north) & Johnson Rd (south)	Speed Limit - 35 MPH	Regulatory	For North Bound Traffic
Just North of Johnson Road (south)	Do Not Pass	Regulatory	For North Bound Traffic
Just North of Johnson Road (south)	No Passing Zone	Warning	For South Bound Traffic
Johnson Road (south)	Stop	Regulatory	East Bound
Fox Run Road	No Signs		
Crowley Road	Stop	Regulatory	West Bound
Across Street from Crowley Road	No Left Turn	Regulatory	West Bound
Just North of John Dee Road	Speed Limit - 45 MPH	Regulatory	For South Bound Traffic
John Dee Road	Stop	Regulatory	North Bound
Just South of John Dee Road	Speed Limit- 40 MPH	Regulatory	For North Bound Traffic
Just South of John Dee Road	No Passing Zone	Warning	For South Bound Traffic
Just South of John Dee Road	No Passing Zone	Warning	For North Bound Traffic
Clemence Avenue	Stop	Regulatory	West Bound

TABLE 9-1 (continued)

Route 140: Sign Inventory (sorted north to south)

Location or Intersection	Sign	Type of Sign	Approach
Just North of Merrill Road	No Passing Zone	Warning	For North Bound Traffic
Just North of Merrill Road (1 of 2)	Do Not Pass	Regulatory	For North Bound Traffic
Just North of Merrill Road (2 of 2)	Intersection Warning	Warning	For North Bound Traffic
Between Merrill Rd & Legg/Dana Hill Rd	Speed Limit - 40 MPH	Regulatory	For South Bound Traffic
Just South of Legg/Dana Hill Road	Speed Limit - 40 MPH	Regulatory	For South Bound Traffic
Just South of Legg/Dana Hill Road	Road Narrows	Warning	For North Bound Traffic
Just North of Route I-190 SB OFF Ramp	Speed Limit - 40 MPH	Regulatory	For North Bound Traffic
Route I-190 SB OFF Ramp	Yield	Regulatory	For South Bound Right Turn Lane
Route I-190 SB OFF Ramp	Stop	Regulatory	For South Bound Left Turn or Thru Lane
Route I-190 SB OFF Ramp	Stop	Regulatory	For South Bound Left Turn or Thru Lane
Route I-190 NB OFF Ramp	Stop	Regulatory	For North Bound Right Turn Lane
Route I-190 NB OFF Ramp	Stop	Regulatory	For North Bound Left Turn or Thru Lane
Route I-190 NB OFF Ramp	Yield	Regulatory	For North Bound Left Turn or Thru Lane

- **Key Observations: Regulatory Signs**

At least three Route 140 intersections may need signage:

- STOP signs are not posted on the minor approach of the Still River Road, Burpee Road, Fox Run Road, and Merrill Road intersections.

- ONE WAY signs are not posted with the existing **DO NOT ENTER** signs on the minor approach of the Beaman Road intersection (photo below).

- A **YIELD** signs exist on the Route I-190 interchange south bound and north bound right turn channelized OFF lanes but lack a matching **YIELD** sign on the opposite side of the lane.

- DO NOT ENTER and **ONE WAY** signs are not posted with the **STOP** signs of the Route I-190 interchange south bound left turn/through OFF lane but the north bound left turn or through OFF lane has one **DO NOT ENTER** sign.

- **Key Observations: Warning Signs**

There is a severe lack of many types of warning signs on Route 140, most notably at the Route 62 intersection which has a severe safety problem. Key examples of the lack of signs are:

- ***Intersection Ahead Signs***: The North Oakdale Cutoff (photo below), Route 62, and Clemence Avenue intersections are the only intersections with these signs. The signs for the North Oakdale Cutoff and Route 62 intersections are located north of the intersections for vehicles heading south. The sign for the Clemence Avenue intersection is located south of the intersection for vehicles heading north.

- ***Curve or Turn Signs***: None exist on this road.
- ***Chevron Signs***: Only two are located on the curve just north of Johnson Road (north) (photo below).

- ***Road Narrows Signs***: One is located just south of Legg/Dana Hill Road for north bound traffic
- ***Shoulder Condition Signs***: None exist on the roadway.
- ***Traffic Signal Ahead***: None exist at the Legg/Dana Hill Road intersection.
- ***Winding Road / Road Slippery When Wet Signs***: None exist along the roadway.

9.3 Qualitative Assessment of the Effectiveness of Existing Pavement Markings and Centerline Reflectors

MRPC reviewed pavement markings and center line reflectors to determine if they effectively direct vehicles and control traffic. There is a severe lack of effectiveness in many sections on Route 140, most notably at the Route 62 intersection which has a severe safety problem. General observations are provided to assist in the development of improvement options and setting project priorities.

- **As of December 10, 2010, Pavement Markings are not Retroreflectorized & Effectiveness Ranges from …**

North of Legg/Dana Hill Road

North of Still River Road

Route 140 at Route 62 Intersection

STOP Lines: Are not effective on the minor street approaches of signalized and STOP controlled intersections.

NOTE: All Photos show existing conditions in 2009 or 2010.

Centerline Retroreflectors are generally …

9.4 Guardrail Inventory and Key Observations

MRPC conducted a guardrail inventory and provides key observations to assist in the development of improvement options and setting project priorities. The inventory results are shown on **Figures 9-2.1** and **Figure 9-2.2** below.

- **Key Observations of Guardrails**

Many guardrails lack retroreflectorized tabs (Westminster photo).

Many guardrail end terminals and treatments do not meet current guidelines (Westminster photo).

9.5 Tree Canopy Inventory

MRPC conducted a tree canopy inventory to assist in the development of improvement options and setting project priorities most particularly for the selective removal of vegetation. The inventory results are shown on **Figures 9-3.1** and **9-3.2** and listed by location in **Table 9-2** below.

The purpose of this inventory is to identify roadway segments that may lack direct sunlight during the winter months due to tree canopies that may block the sun. Tree canopies contribute to the prevention of ice melting on the road.

TABLE 9-2

Route 140: Tree Canopy Inventory

Tree Canopy Name	Begins	Ends
North of N Oakdale Cutoff	1,110' South of Princeton TL	250' North of N Oakdale Cutoff
Johnson Road	515' South of Johnson Road (N) Intersection	37' North of Johnson Road (S) Intersection
Clemence to Merrill Road	43' North of Clemence Road	98' South of Merrill Road

Photos*: Clemence to Merrill Road Tree Canopy

Canopy Begin Point:
Just South of Clemence Avenue

Canopy End Point:
South of Merrill Road

***All photos were taken in 2010**.

9.6 Int. # 5: Route 140 at Route 62 Intersection

Other findings that exist at the Route 140 at Route 62 intersection:

- The east bound approach of Route 62 has four lanes divided by a divisional island. This creates duplicate permitted vehicular movements (photos 1 & 2 below) and conflict points. The most significant vehicular movements are:
  - Two left turns from Route 62 east bound onto Route 140 north bound.
  - Two left turns from Route 140 north bound onto Route 62 east bound.
  - Two right turns from Route 140 south bound onto Route 62 east bound.
- West bound vehicles on Route 62 must share one lane to perform either a through, right turn, or left turn movement (photo 3 below).
- The pavement edge is deeply rutted in many places (photo 3 below).
- Highly blurred delineation between edge of road and off road throughout intersection area of influence.
- Lack of sidewalk and curbing throughout the intersection area of influence.
- Telephone poll on divisional island is unprotected creating a safety hazard.

See the Technical Appendix for further analysis results for this intersection.

Photos: Existing Condition Findings

**1) Four Left Turn Opportunities:
Two from Rte 62 east bound
Two from Rte 140 north bound
Two Right Turn Opportunities:
Both from Rte 140 south bound**

2) Vehicle taking left turn from one of two locations on Rte 62 east bound

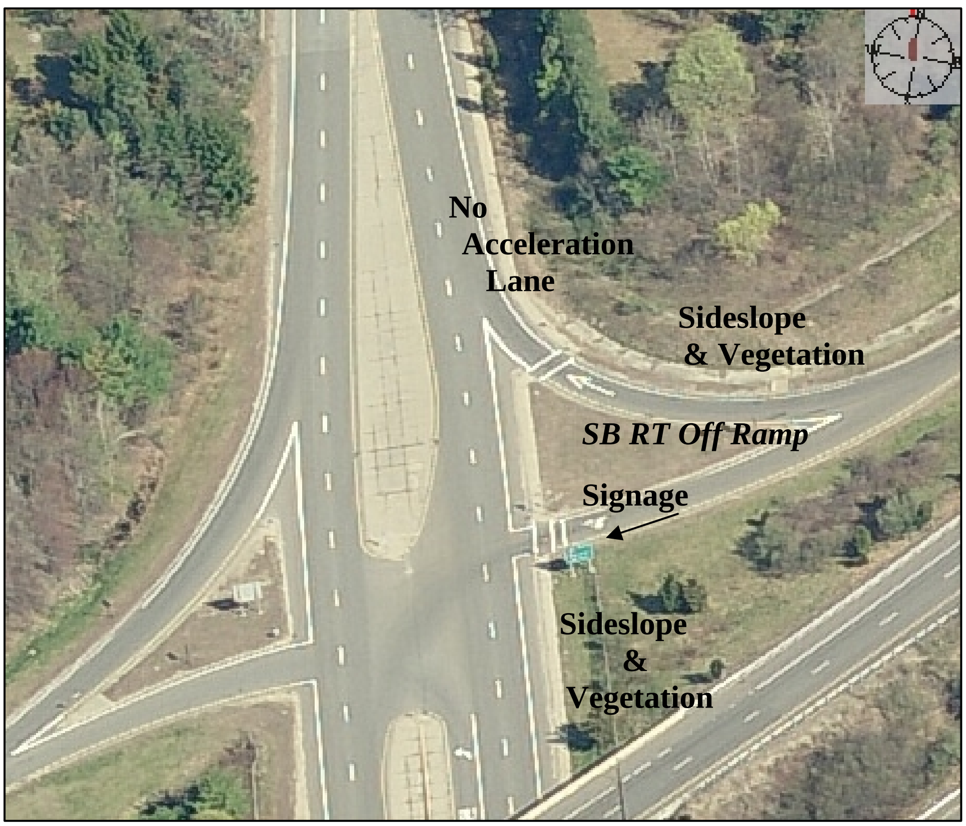
3) All three west bound movements must share a lane

9.7 Route 140 at Route I-190 Interchange

MRPC assessed the existing conditions of the south bound (SB) right turn (RT) off ramp intersection with Route 140. This intersection accounts for nearly eighty percent of the crashes that occur at this interchange (see **Chapter 4.0**). This is most likely the result of the following conditions:

- The sideslope and vegetation on the north side of the off ramp block the view of vehicles that are at the YIELD sign and the off ramp is relatively short after the midpoint of the turn.
- There is no acceleration lane to merge onto Route 140 that would allow vehicles to merge into traffic on Route 140.
- The Route I-190 sideslope and vegetation on the south side of the off ramp limits the sight distance to the south.
- Signage on the south side of the off ramp also limits the sight distance to the south.

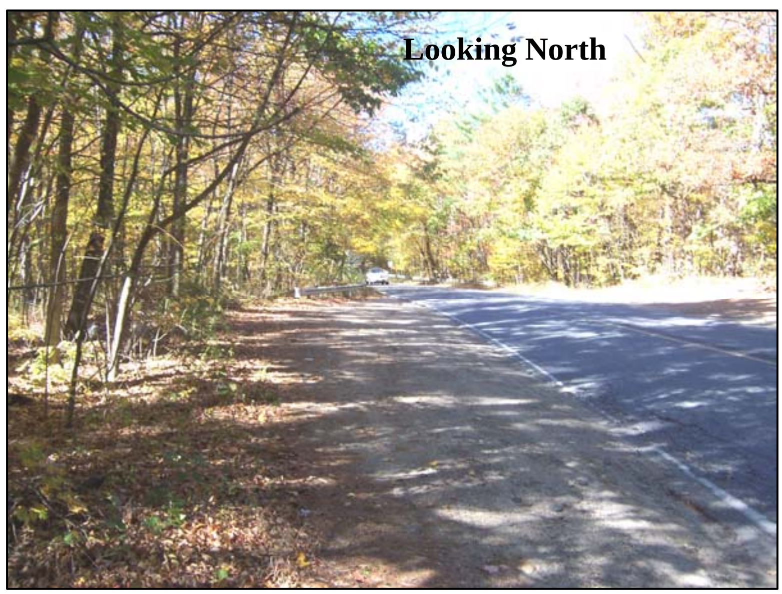
Route I-190 South Bound Off Ramp



9.8 Bus Turnaround at Princeton TL

MRPC assessed the existing conditions of the bus turnaround located at the Princeton TL. The off road turnaround areas on each side of the road are unpaved and deeply rutted. The pavement edge is also deeply rutted in many places. Drivers are most likely unaware of the turnaround as road side vegetation hinders the view and there is no notification or warning through signage or pavement markings that it exists.

Photos: Bus Turnaround



9.9 Sample Locations and Description of Road Widths along the Roadway

Route 140 in Sterling has considerably short widths throughout, mainly due to very short and in many cases non-existent shoulders. Shoulder widths vary from approximately 2 feet to none throughout and change frequently. Shoulders allow access to all users of the road including bicycle and pedestrians. It is important that all users are accounted for when developing a roadway and to ensure that the proper balance of aesthetics of the physical surroundings and safety be accounted for. Below **Table 9-3** displays a survey of widths at two locations along Route 140 that are characteristic of widths throughout the roadway in Sterling. As mentioned in **Chapter 7.0**, the actual width differs from the widths provided in the MassDOT Road Inventory File (RIF). **Figure 9-4** below shows the road widths.

TABLE 9-3

Reference #	Total Width	Lane Width (NB)	Lane Width (SB)	NB Shoulder	SB Shoulder	Notes
1	24'5"	11'1"	11'1''	Non-existant	Non-existant	.35 mi. N. of Beaman Rd.
2	25'4"	11'4"	10'4''	22''	Non-existant	.25 mi. N. of Dana Hill

Due to road widths throughout these sections falling below the recommended widths for this particular classification of road, obstacles may exist in obtaining federal funding for work along these sections without widening the road. Please see Chapter 11.0 for more detail.

9.10 Issues at NEADS (Dogs for Deaf and Disabled Americans) in Princeton

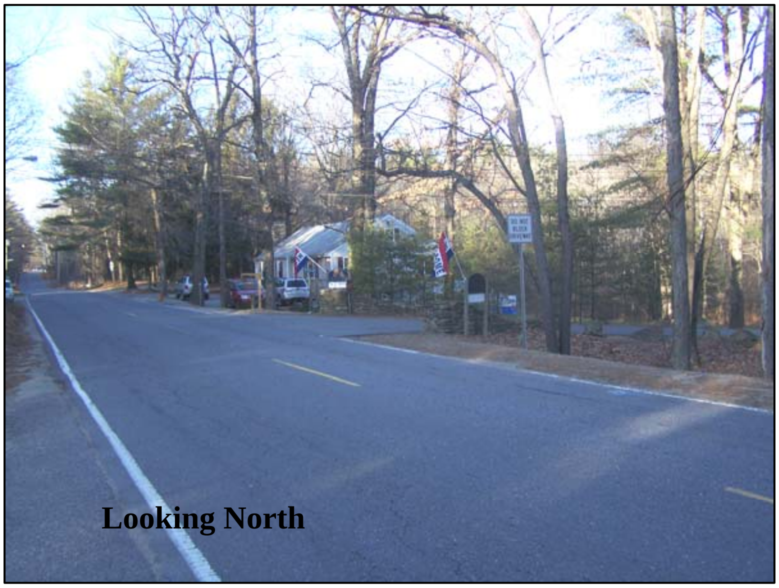
NEADS is located on Route 140 in Princeton in between Still River Road in Sterling to the north and Burpee Road in Sterling to the south. The photos below show the main driveway (marked by two welcome flags and two stone walls) that leads to their main campus and dog training facility which are set well back from Route 140. NEADS also owns the off white house and the red house that flank the driveway.

NEADS concerns:

NEADS considers vehicle travel speed and lack of advanced warning of their location to be concerns. They request that traffic be alerted to the area they are about to enter and slowed as traffic passes through the area as part of a roadway improvement project. Also, they are concerned about the possibility of road widening.

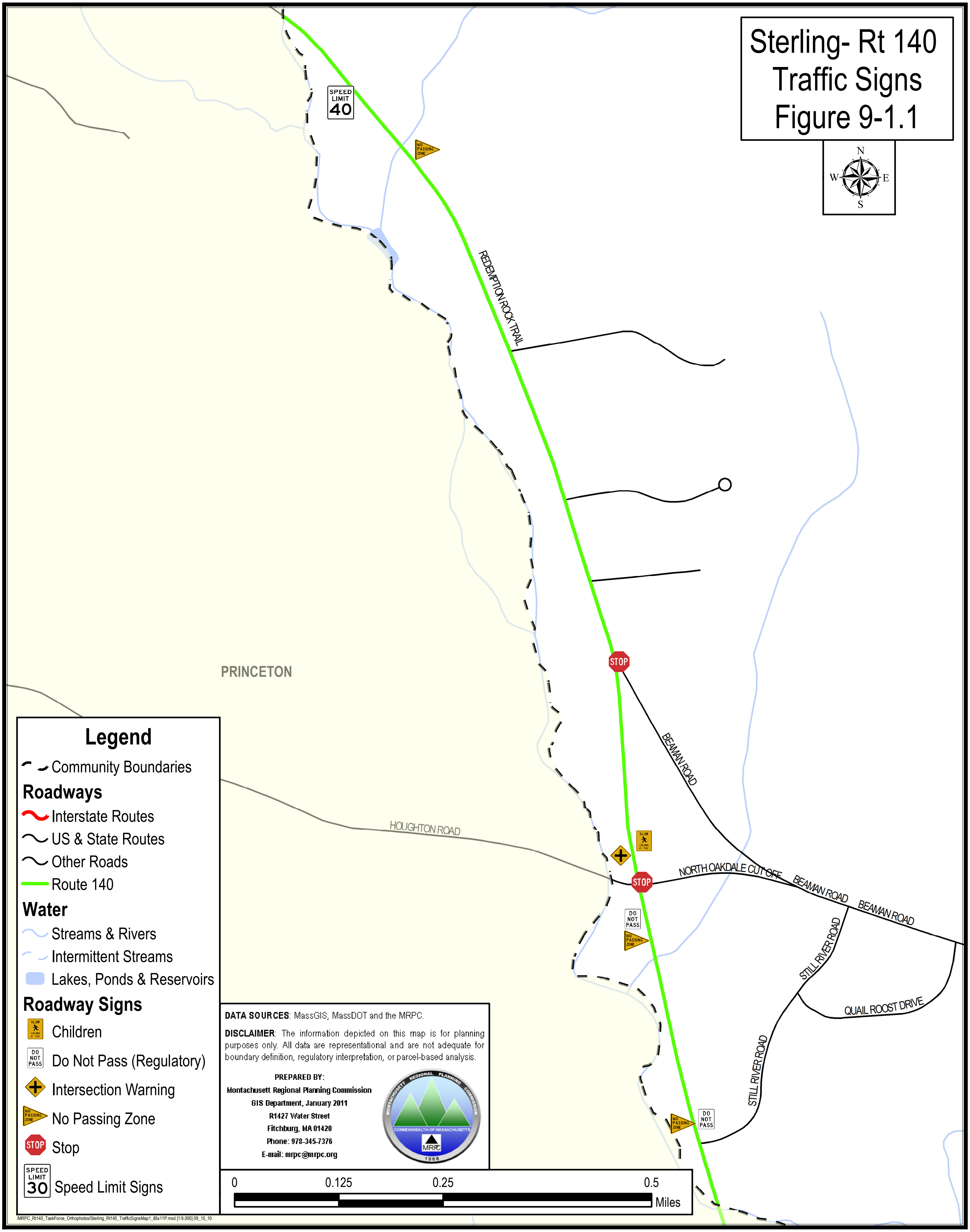
Explanation of concerns:

Clients, staff, and volunteers with disabilities move from building to building by walking along Route 140. These same parties are often accompanied by dogs or puppies. Unsafe conditions exist due to the perceived high vehicle travel speed, and lack of sidewalks, advanced warning signage, and flashing beacons. NEADS is concerned about the possibility of road widening as that would negatively affect their driveways.



Looking North

Looking South



Sterling- Rt 140
Traffic Signs
Figure 9-1.1
N
W
E
S
SPEED LIMIT 40
NO PASSING ZONE
REDEMPTION ROCK TRAIL
PRINCETON
STOP
BEAMAN ROAD
HOUGHTON ROAD
NORTH OAKDALE CUT OFF
BEAMAN ROAD
BEAMAN ROAD
STILL RIVER ROAD
QUAIL ROOST DRIVE
STILL RIVER ROAD
DO NOT PASS
Legend
Community Boundaries
Roadways
Interstate Routes
US & State Routes
Other Roads
Route 140
Water
Streams & Rivers
Intermittent Streams
Lakes, Ponds & Reservoirs
Roadway Signs
Children
Do Not Pass (Regulatory)
Intersection Warning
No Passing Zone
Stop
Speed Limit Signs
DATA SOURCES: MassGIS, MassDOT and the MRPC.
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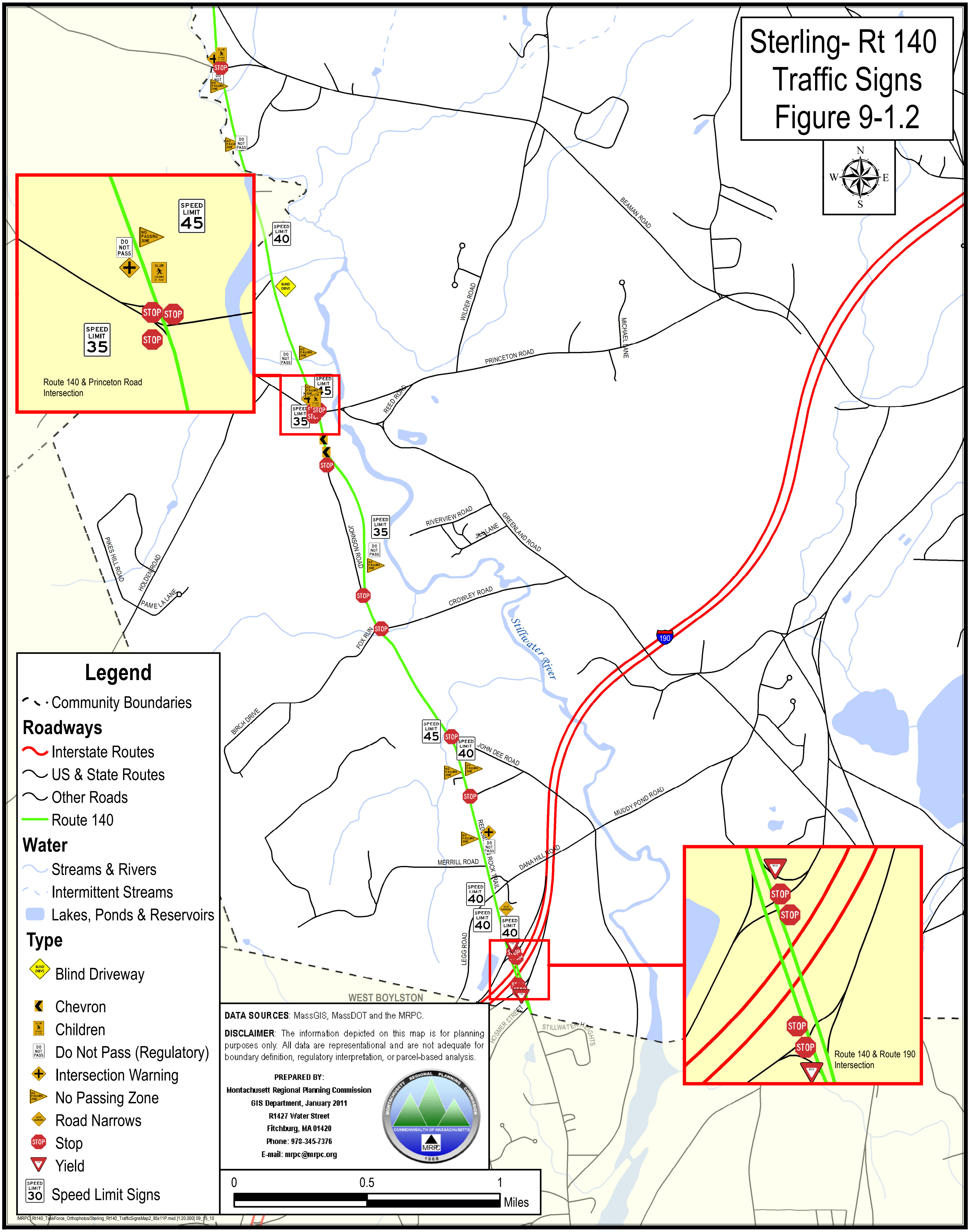
Sterling- Rt 140
Traffic Signs
Figure 9-1.2
N
W
E
S
Route 140 & Princeton Road Intersection
Route 140 & Route 190 Intersection
PRINCETON ROAD
BEAMAN ROAD
WILDER ROAD
MICHAEL LANE
REED ROAD
RIVERVIEW ROAD
JILL LANE
GREENLAND ROAD
JOHNSON ROAD
PIKES HILL ROAD
HOLDEN ROAD
PAMELA LANE
CROWLEY ROAD
FOX RUN
Stillwater River
190
BIRCH DRIVE
JOHN DEE ROAD
MUDDY POND ROAD
DANA HILL ROAD
MERRILL ROAD
REDEMPTION ROCK TRAIL
LEGG ROAD
WEST BOYLSTON
HOSMER STREET
STILLWATER HEIGHTS
Legend
Community Boundaries
Roadways
Interstate Routes
US & State Routes
Other Roads
Route 140
Water
Streams & Rivers
Intermittent Streams
Lakes, Ponds & Reservoirs
Type
Blind Driveway
Chevron
Children
Do Not Pass (Regulatory)
Intersection Warning
No Passing Zone
Road Narrows
Stop
Yield
Speed Limit Signs
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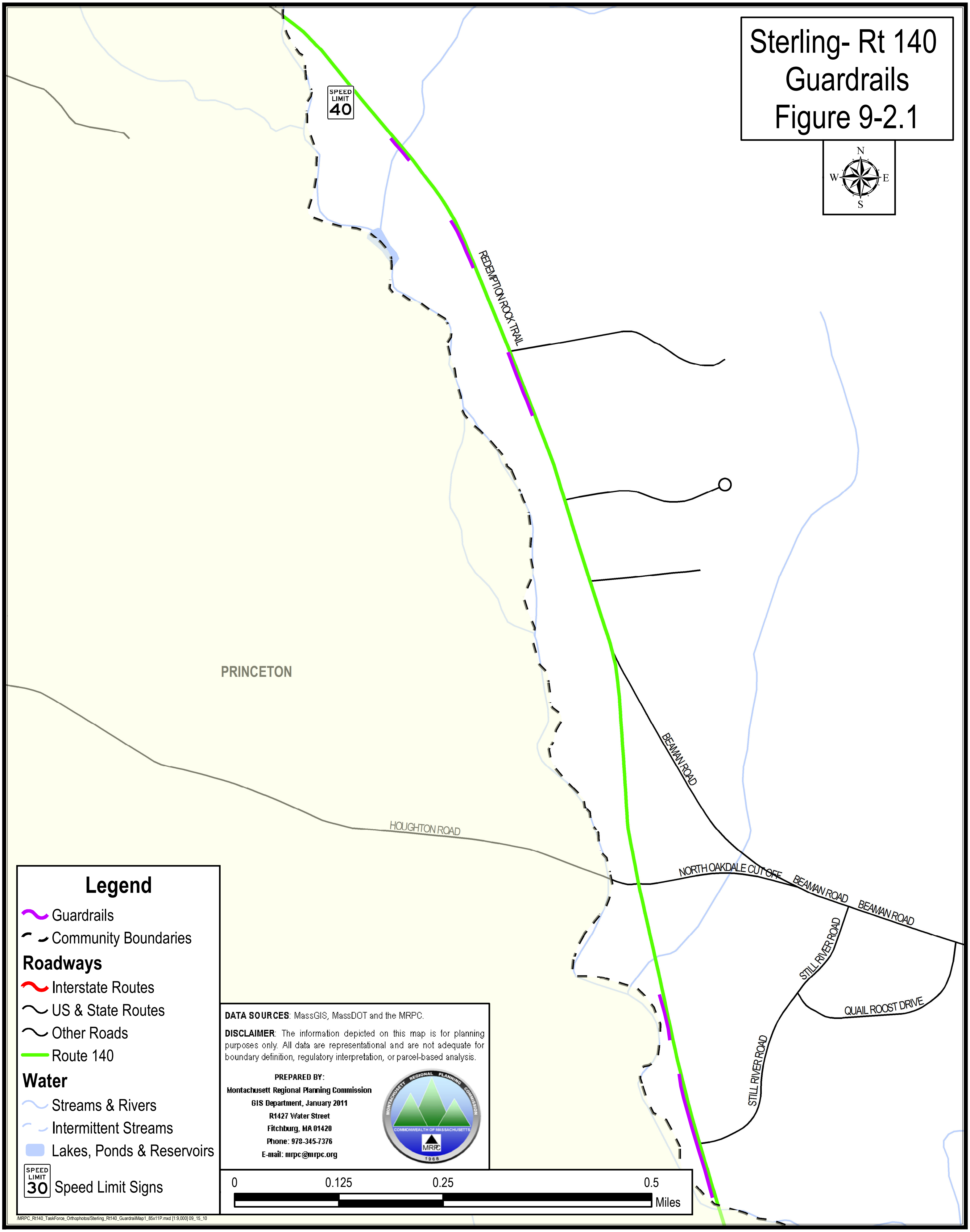
Sterling- Rt 140
Guardrails
Figure 9-2.1
N
W
E
S
SPEED LIMIT 40
REDEMPTION ROCK TRAIL
PRINCETON
BEAMAN ROAD
HOUGHTON ROAD
NORTH OAKDALE CUT OFF
BEAMAN ROAD
BEAMAN ROAD
STILL RIVER ROAD
QUAIL ROOST DRIVE
STILL RIVER ROAD
Legend
Guardrails
Community Boundaries
Roadways
Interstate Routes
US & State Routes
Other Roads
Route 140
Water
Streams & Rivers
Intermittent Streams
Lakes, Ponds & Reservoirs
SPEED LIMIT 30
Speed Limit Signs
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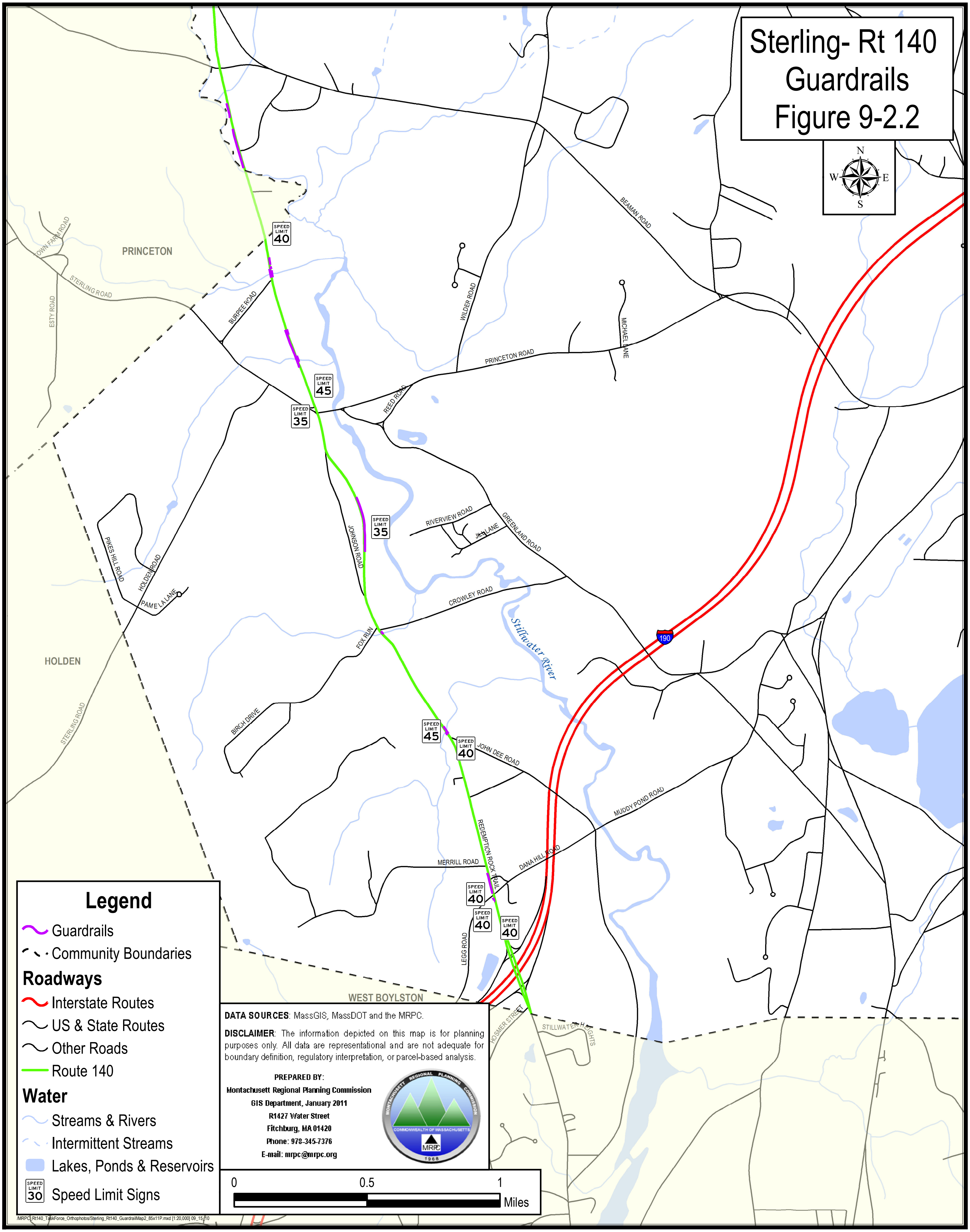

Sterling- Rt 140 Guardrails
Figure 9-2.2
N
S
E
W
PRINCETON
HOLDEN
WEST BOYLSTON
BEAMAN ROAD
WILDER ROAD
MICHAEL LANE
PRINCETON ROAD
BURPEE ROAD
STERLING ROAD
ESTY ROAD
REED ROAD
RIVERVIEW ROAD
JILL LANE
GREENLAND ROAD
JOHNSON ROAD
PIKES HILL ROAD
HOLDEN ROAD
PAMELA LANE
CROWLEY ROAD
FOX RUN
Stillwater River
BIRCH DRIVE
JOHN DEE ROAD
MUDDY POND ROAD
REDEMPTION ROCK TRAIL
MERRILL ROAD
DANA HILL ROAD
LEGG ROAD
HOSMER STREET
STILLWATER HEIGHTS
190
SPEED LIMIT 40
SPEED LIMIT 45
SPEED LIMIT 35
Legend
Guardrails
Community Boundaries
Roadways
Interstate Routes
US & State Routes
Other Roads
Route 140
Water
Streams & Rivers
Intermittent Streams
Lakes, Ponds & Reservoirs
SPEED LIMIT 30
Speed Limit Signs
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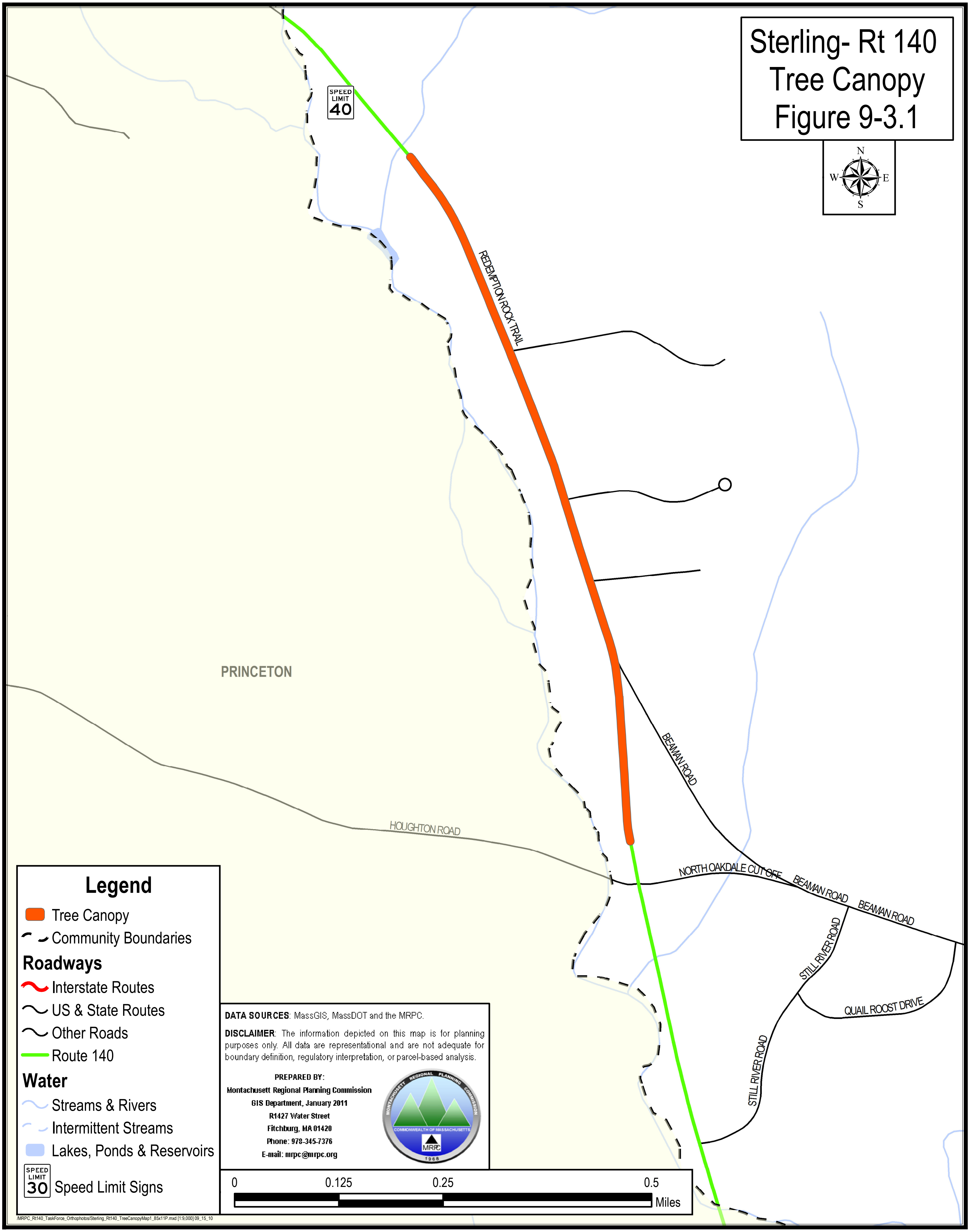

Sterling- Rt 140
Tree Canopy
Figure 9-3.1
N
W
E
S
SPEED LIMIT 40
REDEMPTION ROCK TRAIL
PRINCETON
HOUGHTON ROAD
BEAMAN ROAD
NORTH OAKDALE CUT OFF
BEAMAN ROAD
BEAMAN ROAD
STILL RIVER ROAD
QUAIL ROOST DRIVE
STILL RIVER ROAD
Legend
Tree Canopy
Community Boundaries
Roadways
Interstate Routes
US & State Routes
Other Roads
Route 140
Water
Streams & Rivers
Intermittent Streams
Lakes, Ponds & Reservoirs
SPEED LIMIT 30
Speed Limit Signs
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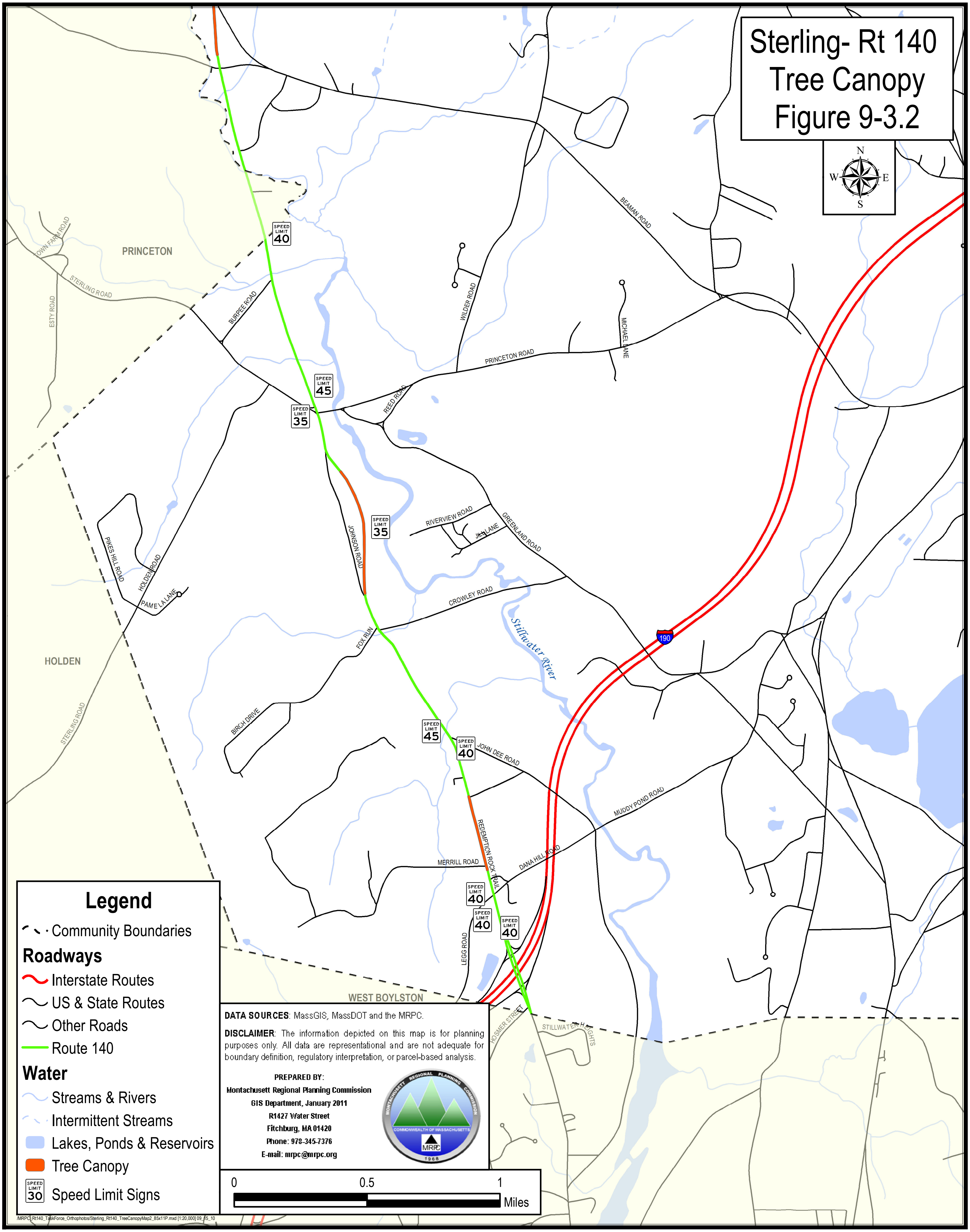

Sterling- Rt 140
Tree Canopy
Figure 9-3.2
N
S
E
W
PRINCETON
HOLDEN
WEST BOYLSTON
STERLING ROAD
ESTY ROAD
BURPEE ROAD
WILDER ROAD
BEAMAN ROAD
MICHAEL LANE
PRINCETON ROAD
REED ROAD
RIVERVIEW ROAD
JILL LANE
GREENLAND ROAD
JOHNSON ROAD
PIKES HILL ROAD
HOLDEN ROAD
PAMELA LANE
CROWLEY ROAD
FOX RUN
Stillwater River
190
BIRCH DRIVE
JOHN DEE ROAD
MUDDY POND ROAD
REDEMPTION ROCK TRAIL
MERRILL ROAD
DANA HILL ROAD
LEGG ROAD
HOSMER STREET
STILLWATER HEIGHTS
SPEED LIMIT 40
SPEED LIMIT 45
SPEED LIMIT 35
Legend
Community Boundaries
Roadways
Interstate Routes
US & State Routes
Other Roads
Route 140
Water
Streams & Rivers
Intermittent Streams
Lakes, Ponds & Reservoirs
Tree Canopy
SPEED LIMIT 30
Speed Limit Signs
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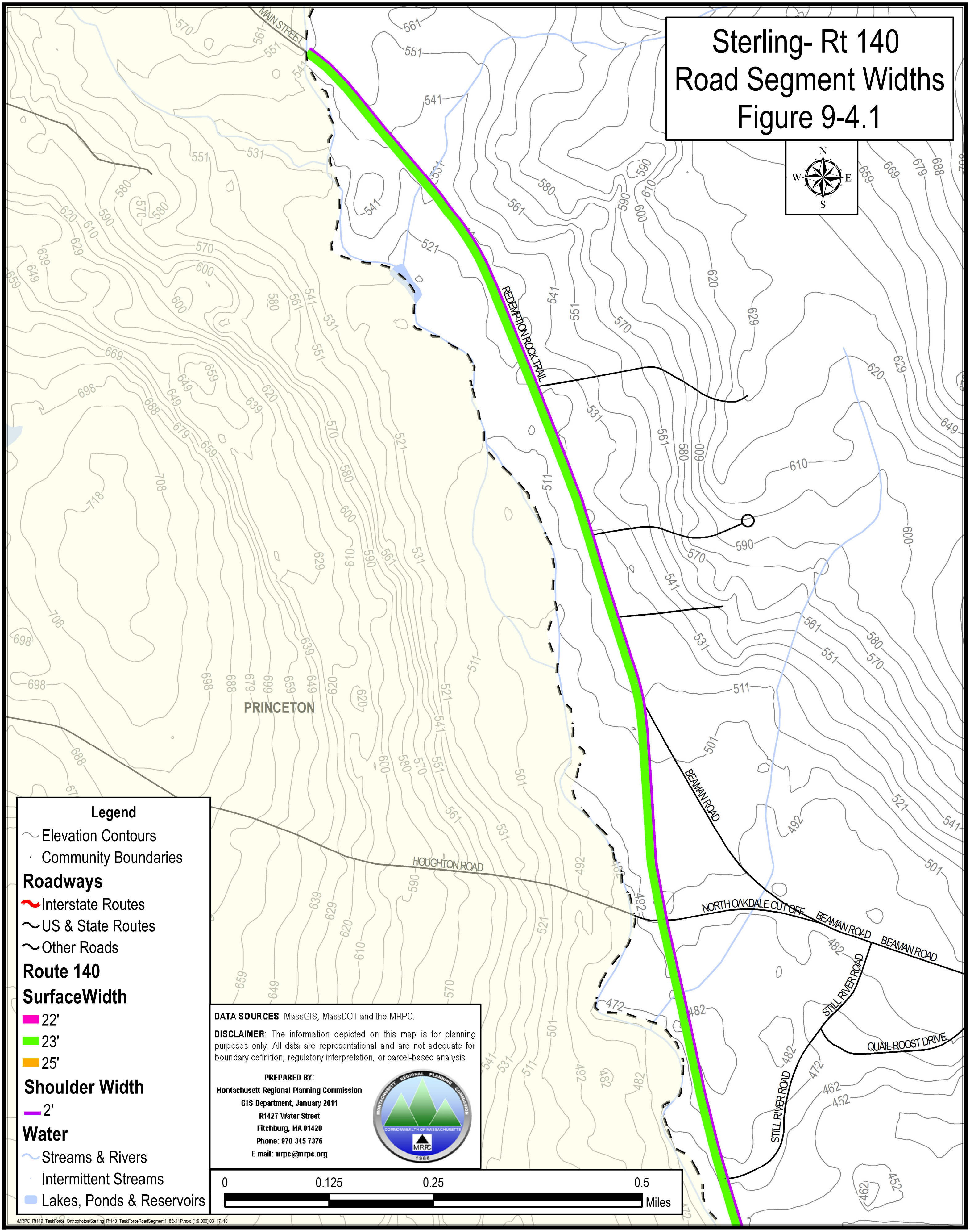

Sterling- Rt 140
Road Segment Widths
Figure 9-4.1
N
S
E
W
MAIN STREET
REDEMPTION ROCK TRAIL
PRINCETON
HOUGHTON ROAD
BEAMAN ROAD
NORTH OAKDALE CUT OFF
STILL RIVER ROAD
QUAIL ROOST DRIVE
Legend
Elevation Contours
Community Boundaries
Roadways
Interstate Routes
US & State Routes
Other Roads
Route 140
SurfaceWidth
22'
23'
25'
Shoulder Width
2'
Water
Streams & Rivers
Intermittent Streams
Lakes, Ponds & Reservoirs
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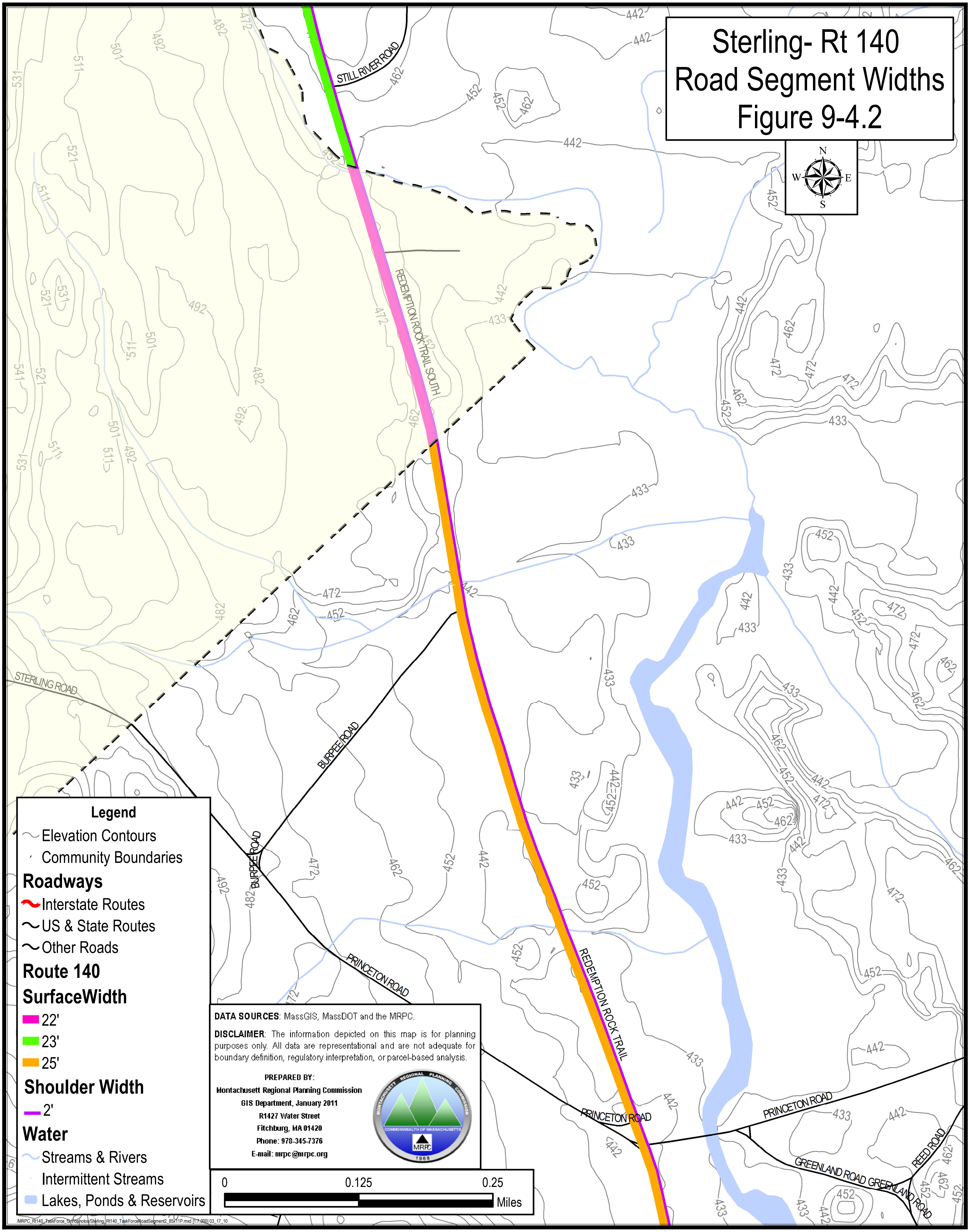
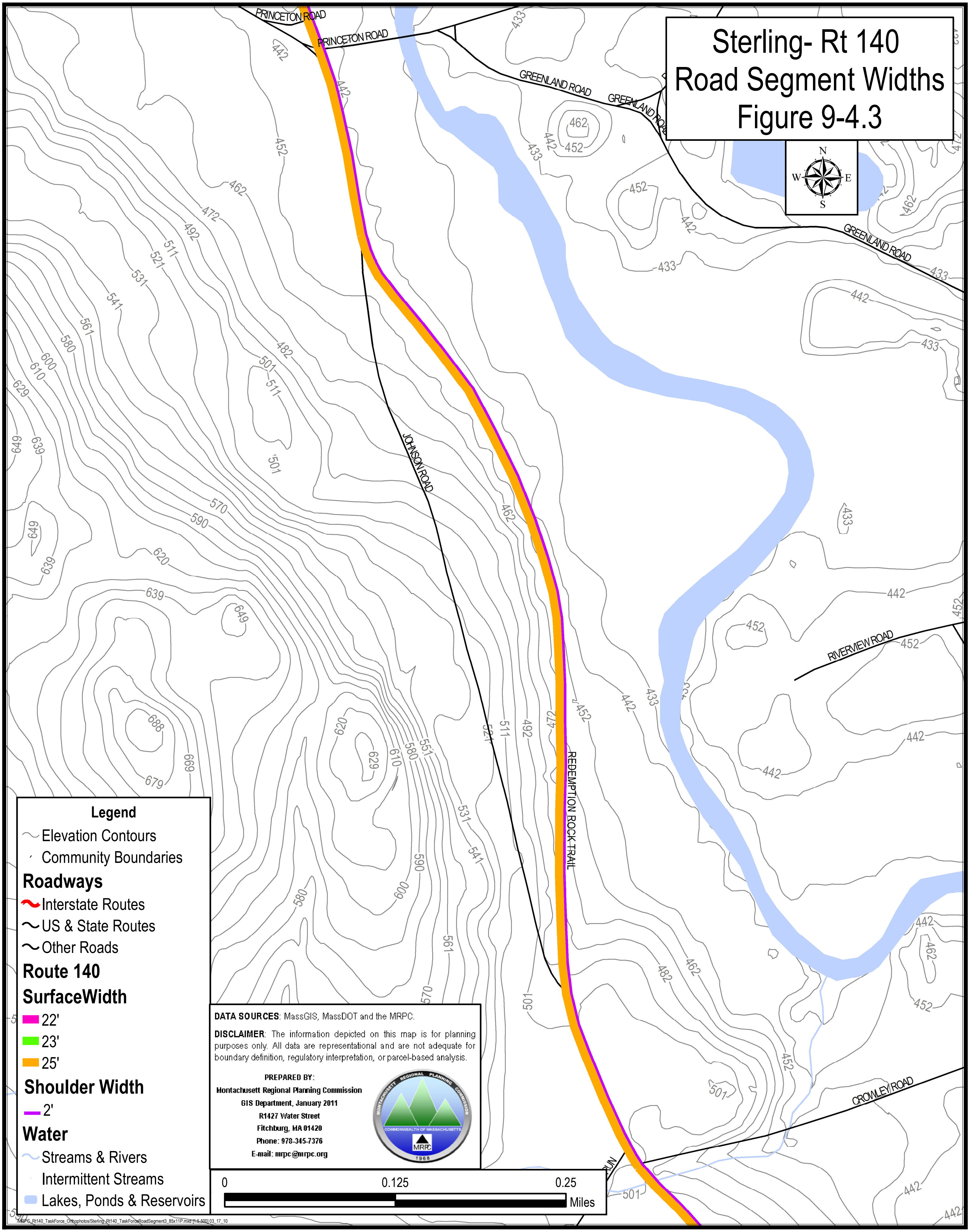
Sterling- Rt 140 Road Segment Widths Figure 9-4.2




Sterling- Rt 140
Road Segment Widths
Figure 9-4.3
N
W
E
S
PRINCETON ROAD
PRINCETON ROAD
GREENLAND ROAD
GREENLAND ROAD
GREENLAND ROAD
JOHNSON ROAD
REDEMPTION ROCK TRAIL
RIVERVIEW ROAD
CROWLEY ROAD
Legend
Elevation Contours
Community Boundaries
Roadways
Interstate Routes
US & State Routes
Other Roads
Route 140
SurfaceWidth
22'
23'
25'
Shoulder Width
2'
Water
Streams & Rivers
Intermittent Streams
Lakes, Ponds & Reservoirs
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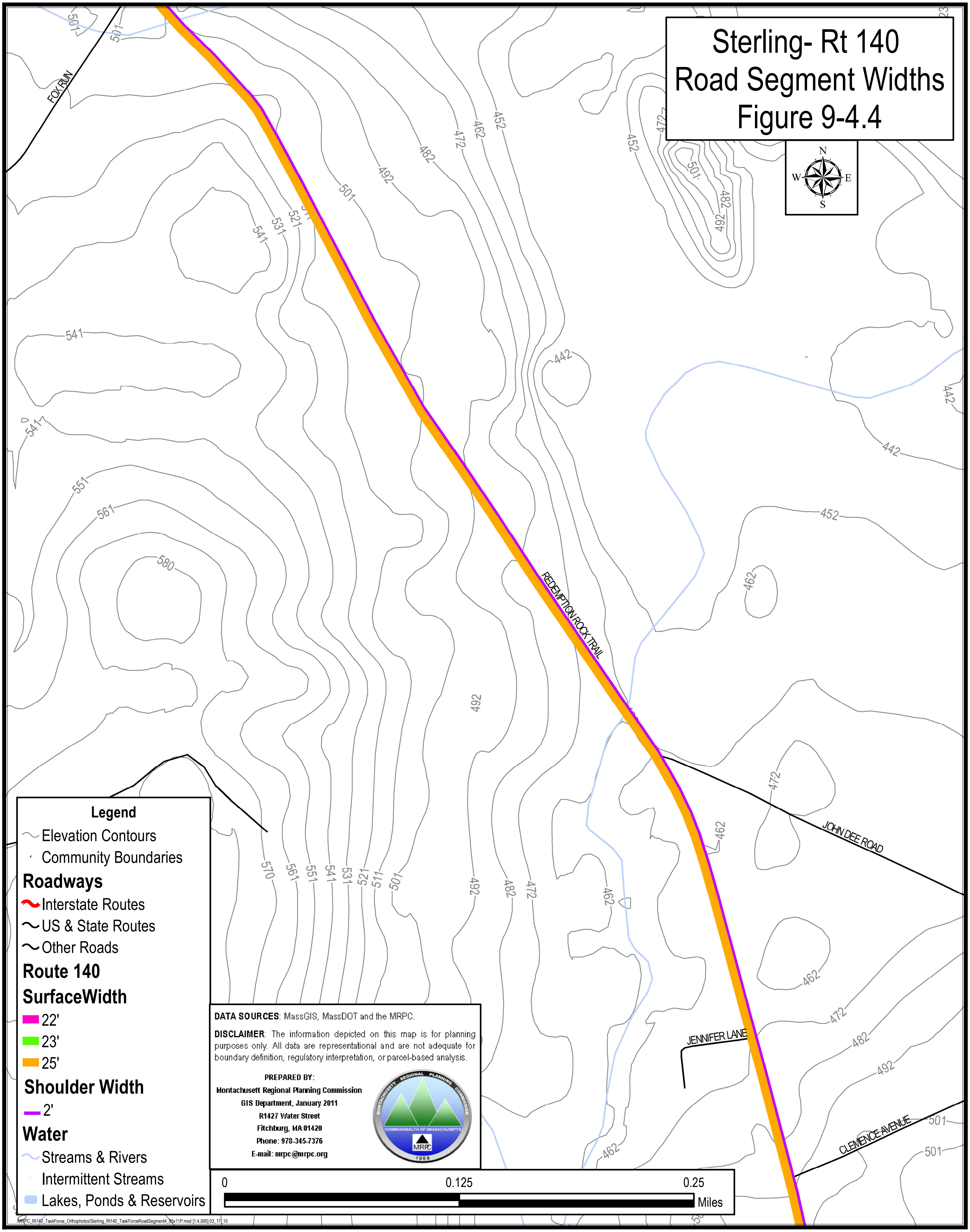

Sterling- Rt 140
Road Segment Widths
Figure 9-4.4
N
W
E
S
FOX RUN
REDEMPTION ROCK TRAIL
JOHN DEE ROAD
JENNIFER LANE
CLEMENCE AVENUE
Legend
Elevation Contours
Community Boundaries
Roadways
Interstate Routes
US & State Routes
Other Roads
Route 140
SurfaceWidth
22'
23'
25'
Shoulder Width
2'
Water
Streams & Rivers
Intermittent Streams
Lakes, Ponds & Reservoirs
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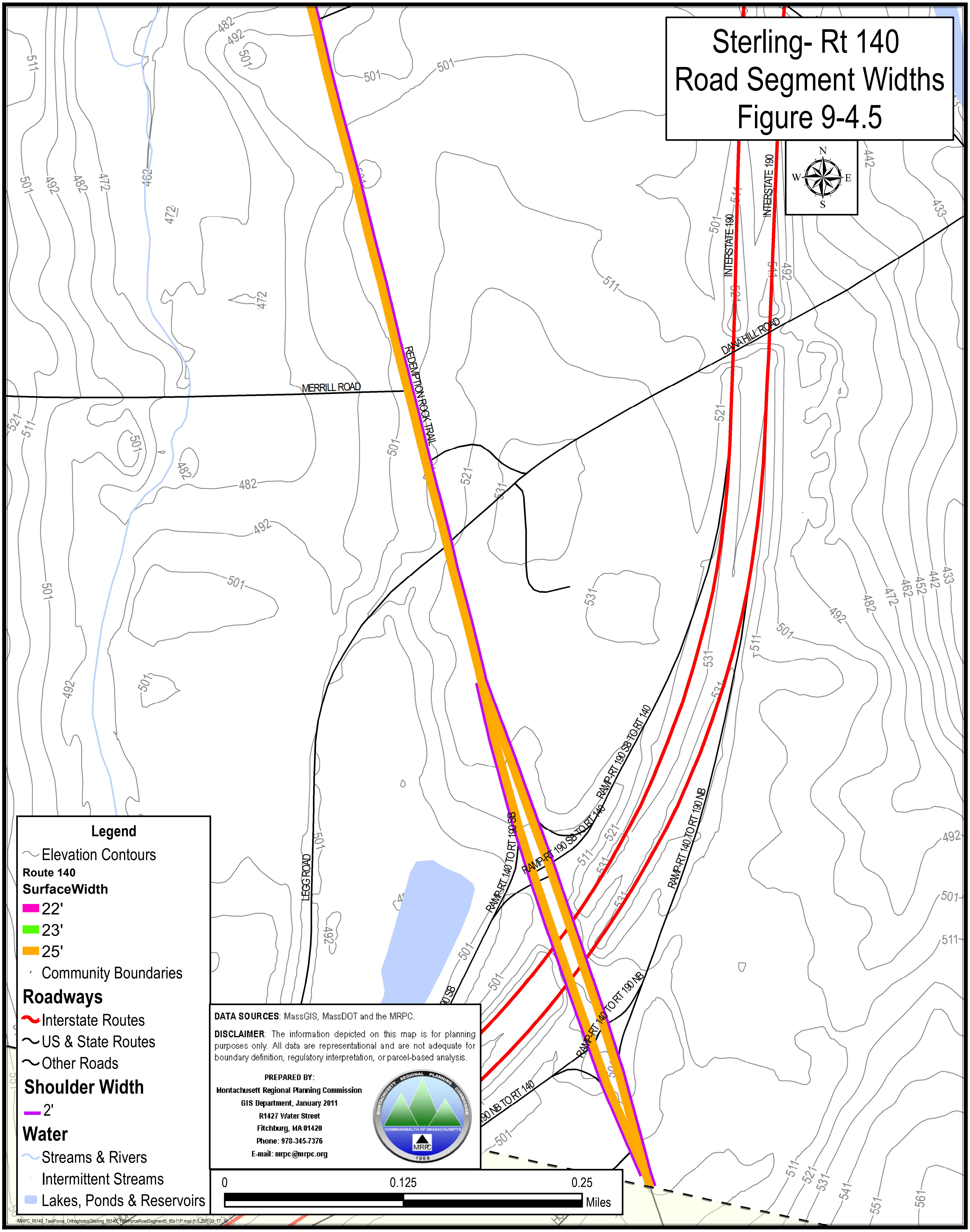
Sterling- Rt 140 Road Segment Widths Figure 9-4.5



DATA SOURCES: MassGIS, MassDOT and the MRPC.

DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.

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10.0 SUGGESTED IMPROVEMENTS

10.1 Introduction

Many alternatives were considered as means to address the safety and functionality of Route 140 in Sterling. Technical data as well as less tangible considerations such as citizen and taskforce input has been accounted for throughout the process. The following tables highlight possible improvement alternatives for consideration at various intersections and road segments within the study area in Sterling. These tables were discussed with members of the taskforce as the corridor profile was taking shape and considered when MRPC was developing final recommendations. The symbols seen in the third column signify the relative comparison of investments and obstacles involved with various improvement considerations at each location.

The Cost Estimates and Timeframe for Implementation columns are derived from consultation with MassDOT District 3 and comparison to similar projects done in the region. The Timeframe for Implementation are estimates for construction time only and do not include initiation steps and design work.

Table 10-1

Sterling Intersection Improvement Alternatives

Intersection Name and Ref. #	Alternative	Improvement	$ = Cost; = Safety Improvements; = Possible Safety Concerns = Environmental Concerns	Noted Concern / Notes	Timeframe for Implementation	Cost Estimates*
INT. #1 Rte. 140 / Beaman Rd.		**Existing**	–	**Intersection meets Rte. 140 at an angle**	–	–
	NA	Convert to "T" (90 degree) intersection	$ $		Medium (1 - 2 Years)	Moderate to High
	NA	Improve drainage	$		Short (Less than a year)	Low
	NA	Consider opening roadway to two-way traffic	$		Short (Less than a year)	Low
INT. #2 Rte. 140 / North Oakdale Cutoff		**Existing**	–	**Sight distance**	–	–
	A	Remove vegetation and lower embankments on both sides of approach	$ $		Medium (1 - 2 Years)	Moderate to High
	B	Moderate sight distance improvements (Remove vegetation etc.)	$	Still not adequate sight distance, should be paired with more advanced warning signs	Very Short	Low
INT. #3 Rte 140 / Still River Rd.		**Existing**	–		–	–
	NA	Remove vegetation on North side of approach	$		Very Short	Low
INT. #4 Rte. 140 / Burpee Rd.		**Existing**	–	**Skewed intersection**	–	–
	A	Convert to "T" (90 degree) intersection	$ $		Medium (1 - 2 Years)	Moderate to High
	B	Convert to one way Westerly * If applicable after 140/62 Improvements implemented	$	Should be combined with conversion to 'T' (90 degree) intersection	Short (Less than a year)	Low
INT. #5 Rte. 140 / Rte. 62		**Existing**	–	**Intersection geometrics**	–	–
	A	Signalize intersection	$ $ *LOS*		Medium (1 - 2 Years)	High
	B	Adding Left and or Right auxilary lanes and bicycle accommodations along with curbing	$ $ *LOS*	Should be combined with signage, pavement markings update	Medium (1 - 2 Years)	Moderate to High
	C	Convert intersection to roundabout	$ $ *LOS*		Medium (1 - 2 Years)	Very High
INT. #6 Rte. 140 / Johnson Rd. (North)		**Existing**	–	**Possibly used as a cutthrough rd. / Intersection geometrics**	–	–
	NA	Convert to "T" (90 degree) intersection			Medium (1 - 2 Years)	Moderate to High
	NA	Add turn lanes on Rte. 140	$	All three suggestions could be consdered together and would mitigate main problems of intersection geometrics and being used at a cut-through Rd.	Medium (1 - 2 Years)	Moderate to High
	NA	Remove Vegetation on opposite side of Johnson Rd. approach			Very Short	Low
INT. #7 Rte. 140 / Johnson Rd. (South)		**Existing**	–	**Possibly used as a cutthrough rd. / Intersection geometrics**	–	–
	NA	Convert to "T" (90 degree) intersection			Medium (1 - 2 Years)	Moderate to High
	NA	Add turn lanes on Rte. 140	$ $	All four suggestions could be consdered together and would mitigate main problems of intersection geometrics and being used at a cut-through Rd.	Medium (1 - 2 Years)	Moderate to High
	NA	Improve drainage			Short (Less than a year)	Low
	NA	Remove Vegetation on North side of intersection			Very Short	Low
INT. #8 Rte. 140 / Fox Run / Crowley Rd.		**Existing**	–	**Alignment of the two minor approaches**	–	–
	A	Align Crowley Rd. to the North directly across Fox Run Rd. If alternate alignment isn't feasable, increase separation between intersections to prevent left turning vehicles on Rte. 140 from blocking traffic exiting from Fox Run Rd. Add turn lanes on Rte. 140	$ $ *LOS*	Further study needed	Medium (1 - 2 Years)	High
	B	Remove Vegetation on North side of Fox Run Rd. / Install warning signs	$		Very Short	Low
		Improve drainage	$	Culvert work	Short (Less than a year)	Low
INT. #9 Rte. 140 / John Dee Rd.		**Existing**	–	**Geometrics**	–	–
	NA	Convert to "T" (90 degree) intersection	$ $		Short (Less than a year)	Low
	NA	Add turn lanes on Rte. 140	$ $ *LOS*		Very Short	Low
	NA	Improve drainage and culvert	$		Medium (1 - 2 Years)	Moderate to High
INT. #10 Rte. 140 / Clemence Ave		**Existing**	–	**Sight distance**	–	–
	NA	Convert to one way Eastbound (Enter Only)	$		Short (Less than a year)	Low
	NA	Clear vegetation to improve sight distance	$		Very Short	Low
	NA	Add Acceleration/Deceleration lanes	$ $		Medium (1 - 2 Years)	Moderate to High

* Cost Estimates: Very Low = >50K; Low = 50 to 250K; Moderate = 250 to 500K; High = 500K to 1Million; Very High = <1 Million

Table 10-2

Sterling Road Segment Improvement Alternatives

Segment	Improvement	$ = Cost; = Safety Improvements; = Environmental Concerns	Noted Concerns	Timeframe for Implementation	Costs
SEGMENT #1 Rte. 140 Princeton TL to Princeton TL (1.5 Mi.)	**Existing**	–	**Sight distance around area of 140 Club and Antique Plants** ***<u>*Existing Width is 23' - 25' including 2' shoulders on either side</u>***	–	–
	Remove roadside vegetation at various locations	$ $ $	Should be coupled with drainage and signage/pavement marking improvements	Long Term (2+ Years)	$3 Million ($2 Million per mile)
	Flatten/ lower sideslops along various locations		Should be coupled with drainage and signage/pavement marking improvements		
	Improve drainage at various locations		Should be coupled with sight distance and signage/pavement marking improvements		
	Upgrade signage/pavement markings/guardrails to reflect existing standards for road segments		Should be coupled with sight distance and drainage improvements		
	Improve bus turnaround	$		Short (Less than a year	Low
	Access Management techniques at 140 Club and lower road grade from this location to Antique Plants	$ $		Medium (1 - 2 Years)	Moderate to High
SEGMENT #2: Rte 140 from Princeton TL to Dana Hill Rd. Int. (2.75 Mi.)	**Existing**	–	**Drainage issues at various points along segment. Stopping Sight distance at points mentioned. Signage and striping improvements could be made** ***<u>*Existing Width is 23' - 25' including 2' shoulders on either side</u>***	–	–
	Remove roadside vegetation at various locations	$ $ $	Should be coupled with drainage and signage/pavement marking improvements	Long Term (2+ Years)	$5.5 Million (2 Million per mile)
	Flatten/ lower sideslops along various locations		Should be coupled with drainage and signage/pavement marking improvements		
	Improve drainage at various locations (notably between Johnson Rd. North and South and between Clemence Ave and Dana Hill Rd.		Should be coupled with sight distance and signage/pavement marking improvements		
	Upgrade signage/pavement markings/guardrails to reflect existing standards for road segments		Should be coupled with sight distance and drainage improvements		

10.2 Improvement Alternatives

Intersection #1: Beaman Road at Route 140

Many Techniques and combinations of improvements were considered at this location including conversion to a “T” intersection from the existing skew with Beaman Road meeting Route 140 at a 90° angle and opening the roadway up to two way traffic.

Intersection # 2: North Oakdale Cutoff at Route 140

A. *Remove vegetation and lower embankments on both sides of approach:* More aggressive improvements addressing drainage and sight distance offer the best results but are considerably more costly.

B. *Moderate sight distance improvements:* Including trimming back trees and brush to increase sight distance.

Intersection #3: Still River Road at Route 140

The recommendation made was to remove or cut back vegetation on the north side of Still River Road to increase sight distance.

Intersection #4: Burpee Road at Route 140

A. *Convert to a “T” intersection:* Eliminating the existing skew

B. *Convert to a “T” intersection and a One Way westerly:* Which would be dependant on the possibility of an improvement project on the nearby Route 62 at Route 140 intersection to the south. Vehicles from Route 62 eastbound have been known to use Burpee Road as a thru-way to access the 62/140 intersection via Route 140 southbound during busy morning commute hours. The reason for this is that this intersection is more easily navigated on the Route 140 approach as opposed to on Route 62. Burpee Road is not suited to serve this function. The conversion to a one way westerly would prevent such use. Eliminating access to Burpee Road eastbound exclusively during peak hours may also be considered. However, if the 62/140 intersection is improved upon in such a way as to mitigate the difficulty of access via Route 62, converting Burpee Road to a one way would not be necessary.

Intersection #5: Route 62 at Route 140

A. *Signalize intersection:* This intersection has satisfied a Signal Warrant Analysis based on only two of eight warrants, Peak Hour Traffic and Roadway Network (see Rte. 140 and Rte. 62 Intersection Operational Conditions; Safety Conditions; Improvement Analysis in Technical Appendix). Safety and operational improvements may be gained through the installation of a traffic signal; however, all factors of conversion to a signalized intersection must be carefully weighed.

B. *Geometric improvements:* Realigning Route 62 eastbound approach further south to create a “T” intersection, adding left and or right auxiliary lanes, bicycle accommodations and curbing would improve safety and to a lesser degree overall operation at this intersection

C. *Conversion to a roundabout:* The benefits of a modern roundabout are numerous (See: Roundabout primer in the Technical Appendix). This intersection could see significant improvements in both safety and operation with the installation of a roundabout.

Intersection #6: Johnson Road (North) at Route 140

A wide range of alternatives have been considered at this location including conversion to a “T” intersection and clearing vegetation to improve sight distance.

Intersection #7: Johnson Road (South) at Route 140

A wide range of alternatives have been considered at this location including conversion to a “T” intersection, clearing vegetation to improve sight distance and making various drainage improvements.

Intersection #8: Fox Run Road, Crowley Road at Route 140

A. *Geometric improvements:* Both increasing the separation between Fox Run and Crowley Roads to form two separate “T” intersections as well as realigning these two minor roads across from each other have been considered as a means to improve the safety at this location.

B. *More moderate improvements:* Including the installation of advanced warning signs and improving drainage have also been considered.

Intersection #9: John Dee Road at Route 140

Conversion to a “T” intersection, the addition of turning lanes on Route 140 and improvements to drainage structures has all been considered.

Intersection #10: Clemence Avenue at Route 140

Conversion to a One Way eastbound (enter only) or adding acceleration and deceleration lanes on Route 140 have been considered along with other minor sight distance improvements.

10.3 Recommendations

After consultation with members of the taskforce and consideration of all study findings, MRPC developed a final list of recommended improvements along the corridor. These recommendations summarized in the table below.

Table 10-3

Sterling		
Suggested Improvements for Intersections & Road Segments		
NOTE	**Intersection Name and Ref. #**	**Preferred Improvement Alternatives**
	INT. #1 Rte. 140 / Beaman Rd.	Convert to "T" (90 degree) intersection
		Improve drainage and selectively remove vegetation opposite of Beaman Rd
		Consider opening roadway to two-way traffic
	INT. #2 Rte. 140 / North Oakdale Cutoff	Remove vegetation and lower embankments on both sides of approach
	INT. #3 Rte 140 / Still River Rd.	Remove vegetation on North side of approach
	INT. #4 Rte. 140 / Burpee Rd.	Convert to "T" (90 degree) intersection
		Convert to one way Westerly
	INT. #5 Rte. 140 / Rte. 62	Convert intersection to roundabout
	INT. #6 Rte. 140 / Johnson Rd. (North)	Convert to "T" (90 degree) intersection
		Remove Vegetation on opposite side of Johnson Rd. approach
	INT. #7 Rte. 140 / Johnson Rd. (South)	Convert to "T" (90 degree) intersection
		Improve drainage
		Remove Vegetation on North side of intersection
	INT. #8 Rte. 140 / Fox Run / Crowley Rd.	Align Crowley Rd. to the North directly across Fox Run Rd.
		Remove Vegetation on North side of Fox Run Rd
		Improve drainage
	INT. #9 Rte. 140 / John Dee Rd.	Convert to "T" (90 degree) intersection
		Improve drainage and culvert
	INT. #10 Rte. 140 / Clemence Ave	Convert to one way Eastbound (Enter Only)
		Clear vegetation to improve sight distance
1	**SEGMENT #1:** Rte. 140 Princeton TL to Princeton TL	Remove roadside vegetation at various locations
		Flatten/ lower sideslops along various locations
		Improve drainage at various locations
		Upgrade signage/pavement markings/guardrails to reflect existing standards for road segments and intersections
		Improve bus turnaround
		Apply Access Management techniques at 140 Club and lower road grade to Antique Plants
1	**SEGMENT #2:** Rte 140 from Princeton TL to Dana Hill Rd. Int.	Remove roadside vegetation at various locations
		Flatten/ lower sideslops along various locations
		Improve drainage at various locations
		Upgrade signage/pavement markings/guardrails to reflect existing standards for road segments and intersections

10.4 Final Recommended Improvements

Intersection # 1: Beaman Road at Route 140

- It is recommended that this location be converted to a “T” intersection to better control traffic merging from Beaman Rd. onto Rte. 140. Additionally, selectively removing vegetation that has grown opposite the Beaman Rd. approach should increase stopping sight distance on Rte 140.

Intersection #2: North Oakdale Cutoff at Route 140

- The selective removal of vegetation and consideration of lowering some embankments on both sides of the North Oakdale Cutoff approach should be considered as low cost improvements that will greatly improve sight distance, which is currently not adequate and is a safety concern. Installation of “Intersection Ahead” advanced warning signs is also recommended on each approach as a measure to advance safety at this location.

Intersection #3: Still River Road at Route 140

- This is another intersection without adequate sight distance which could be improved by selective trimming of vegetation, mainly on the north side of the Still River Rd. approach. Additionally, advanced warning signs should also be considered.

Intersection #4: Burpee Road at Route 140

- It is suggested that improvements in pavement markings and geometrics (conversion to a “T” intersection) be applied at this location to improve its operation and safety. Conversion to a One Way westerly dependant on improvements at the intersection of Route 62 and Route 140.

Intersection #5: Route 62 at Route 140

- Current peak hour LOS at this intersection is “F” for the minor approaches on Rte 62. The existing geometric layout causes driver confusion and as a result there is a significant history of crashes. For optimal improvements in safety and functionality it is recommended that a modern roundabout be installed at this location.

Intersection #6: Johnson Road (North) at Route 140

- It is recommended that this intersection undergo pavement marking, signage and geometric improvements which include converting to a “T” intersection.

Intersection #7: Johnson Road (South) at Route 140

- It is recommended that this intersection undergo pavement marking, signage and geometric improvements which include converting to a “T” intersection. It is also recommended that vegetation be removed from the north side of the minor road approach to improve sight distance which is currently inadequate. Drainage improvements should also be made at this location extending south to prevent runoff on either side of Rte 140 from reaching the roadway and causing dangerous driving conditions.

Intersection #8: Fox Run Road/Crowley Road at Route 140

- Due to safety concerns as a result of the current alignment of this intersection it is recommended that Crowley Rd. be re-aligned to the north to sit directly across from Fox Run Rd. Drainage improvements may be necessary with this scenario. It is also recommended that vegetation on the north side of the intersection be trimmed back to increase sight distance, which is currently inadequate.

Intersection #9: John Dee Road at Route 140

- It is recommended that this location be converted to a “T” intersection. Proper signage and pavement marking improvements should be made as a slight increase in vehicles utilizing this intersection may occur due to possible changes at the intersection of Clemence Ave. at Rte. 140 to the south. Minor culvert and drainage improvements may also be considered.

Intersection #10: Clemence Avenue at Route 140

- Due to hazardous maneuvers encouraged on the minor road approach (Clemence Ave.) caused by a lack of adequate sight distance, coupled with the availability of sufficient access to Rte. 140 north of Clemence Ave. on John Dee Rd. it is recommended that Clemence Ave. be converted to a One Way road in the easterly direction. Vegetation should also be trimmed on both sides of Clemence Ave. to improve sight distance for the case of a vehicle (possibly a resident of Clemence Ave.) utilizing the road to access Rte. 140. Proper signage and pavement marking improvements should accompany these changes.

Road Segment #1: From Princeton Town Line (North) to Princeton Town Line (South)

- Various improvements are recommended for this road segment. In addition to improvements recommended to intersections within the segments, improvements to sight distance, signage, pavement markings, guardrail and drainage at various locations throughout each segment are highlighted Chaper 9.0. It is also recommended that the school bus turnaround at the northern town line with

Princeton be paved and improved. Access management techniques should be applied in the area of the 140 Club and Antique Plants businesses to limit the area in which cars may pull onto and off of Rte. 140.

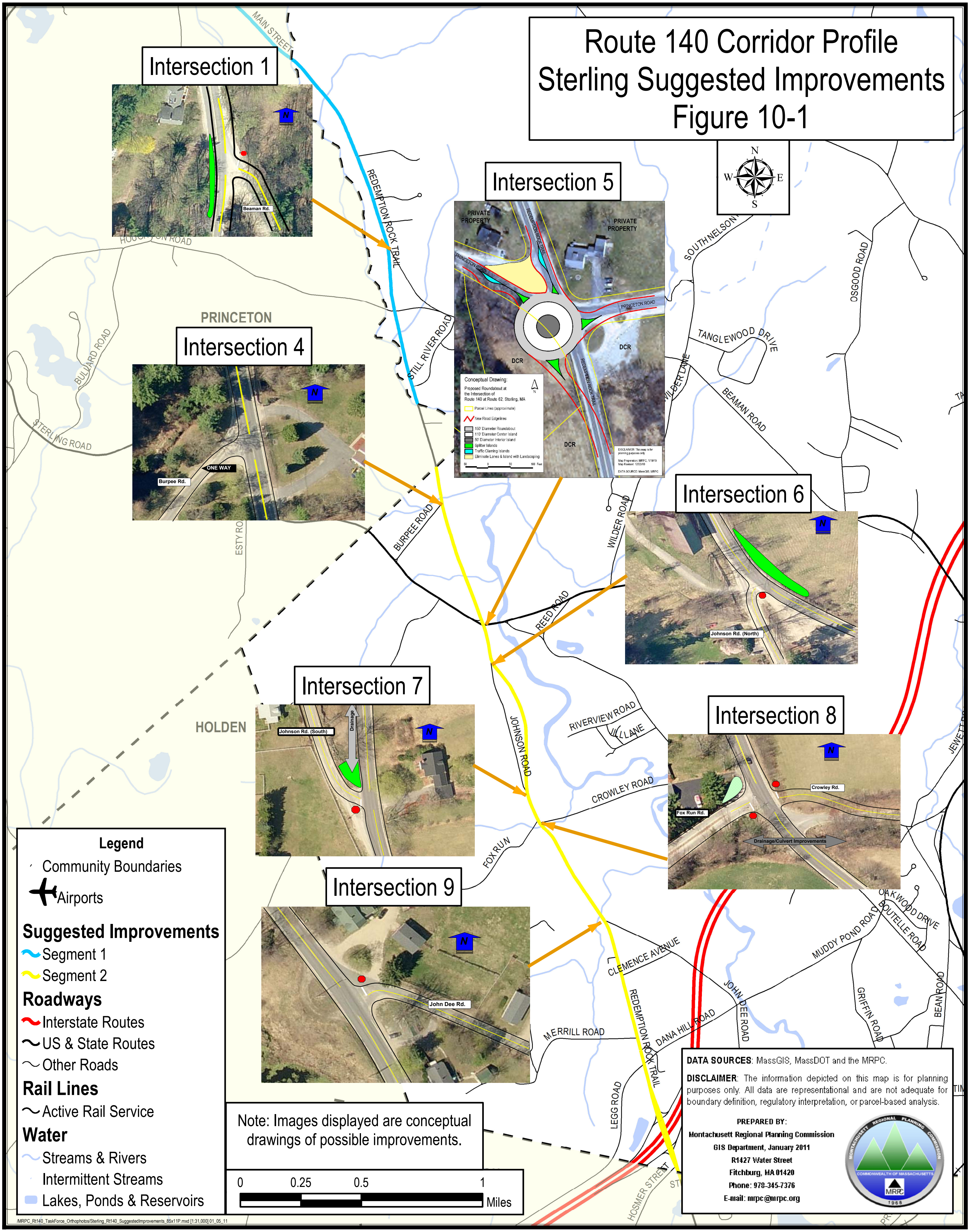
Road Segment #2: From Princeton Town Line (South) to Dana Hill Rd. Intersection

- Various improvements are recommended for these road segments. In addition to improvements recommended to intersections within the segments, improvements to sight distance, signage, pavement markings, guardrail and drainage at various locations throughout each segment are highlighted Chapter 9.0.

10.5 Additional Information

- Improvements at the Route 140/Route 62 intersection will likely impact property under the jurisdiction of the Massachusetts Department of Conservation and Recreation (DCR). Contact with DCR should be established as early as possible in the project development process in order to determine their level of cooperation with any potential improvements to this intersection.

- Improvements along the segment of Route 140 in the vicinity of the Route 140 Club should be coordinated with the establishment. During the development of this study, it was observed that parking for the Club occurred along both sides (shoulders) of Route 140 along the parking lot open curb cut. This can lead to potential problems for both the vehicles on Route 140 as well as the patrons of the establishment. The grade of Route 140 in this area can create “blind spots” for north/south traffic that impedes and reduces potential reaction time for drivers when confronted with vehicles parked along the road edge or pedestrian crossing the roadway. Discussions with the establishment should center on improving the potentially hazardous situation through defined curb cuts for the parking lot, improved lighting at the entrance/exit, advanced warning signs along Route 140 alerting drivers to the condition ahead, elimination of on-street parking and the possible placement of flashing warning lights.



Route 140 Corridor Profile
Sterling Suggested Improvements
Figure 10-1
N
W
E
S
Intersection 1
Beaman Rd.
Intersection 4
Burpee Rd.
ONE WAY
Intersection 5
PRIVATE PROPERTY
PRIVATE PROPERTY
PRINCETON ROAD
DCR
DCR
DCR
Conceptual Drawing:
Proposed Roundabout at the Intersection of Route 140 at Route 62, Sterling, MA
Intersection 6
Johnson Rd. (North)
Intersection 7
Johnson Rd. (South)
Drainage
Intersection 8
Crowley Rd.
Fox Run Rd.
Drainage/Culvert Improvements
Intersection 9
John Dee Rd.
PRINCETON
HOLDEN
MAIN STREET
REDEMPTION ROCK TRAIL
HOUGHTON ROAD
BULLARD ROAD
STERLING ROAD
ESTY ROAD
STILL RIVER ROAD
BURPEE ROAD
REED ROAD
WILDER ROAD
WILDER LANE
BEAMAN ROAD
TANGLEWOOD DRIVE
SOUTH NELSON
OSGOOD ROAD
JOHNSON ROAD
RIVERVIEW ROAD
LILLANE
CROWLEY ROAD
FOX RUN
CLEMENCE AVENUE
MUDDY POND ROAD
OAKWOOD DRIVE
BOUTELLE ROAD
JOHN DEE ROAD
GRIFFIN ROAD
BEAN ROAD
MERRILL ROAD
DANA HILL ROAD
LEGG ROAD
HOSMER STREET
JEWETT
Legend
Community Boundaries
Airports
Suggested Improvements
Segment 1
Segment 2
Roadways
Interstate Routes
US & State Routes
Other Roads
Rail Lines
Active Rail Service
Water
Streams & Rivers
Intermittent Streams
Lakes, Ponds & Reservoirs
Note: Images displayed are conceptual drawings of possible improvements.
0
0.25
0.5
1
Miles
DATA SOURCES: MassGIS, MassDOT and the MRPC.
DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.
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MONTACHUSETT REGIONAL PLANNING COMMISSION
COMMONWEALTH OF MASSACHUSETTS
MRPC
1968

11.0 COMMUNITY PRIORITIES & COSTS

11.1 Community Priorities

Due to limitations in the ability to implement all the improvements suggested in this profile at once, the MRPC and the Taskforce felt it was necessary to prioritize projects for implementation. MRPC staff met with Taskforce members from Sterling to determine these priorities. The following table displays the top priority improvements along the corridor in Sterling as determined and agreed upon by the town taskforce members. Also displayed are estimated costs related to these improvements. Information on funding such projects is available later on in this chapter.

Below Table 11-1 are conceptual drawings of the priority improvements in Sterling. These images are in no means a final design of what the improvement would be but rather one example of what an improvement project at that location could look like.

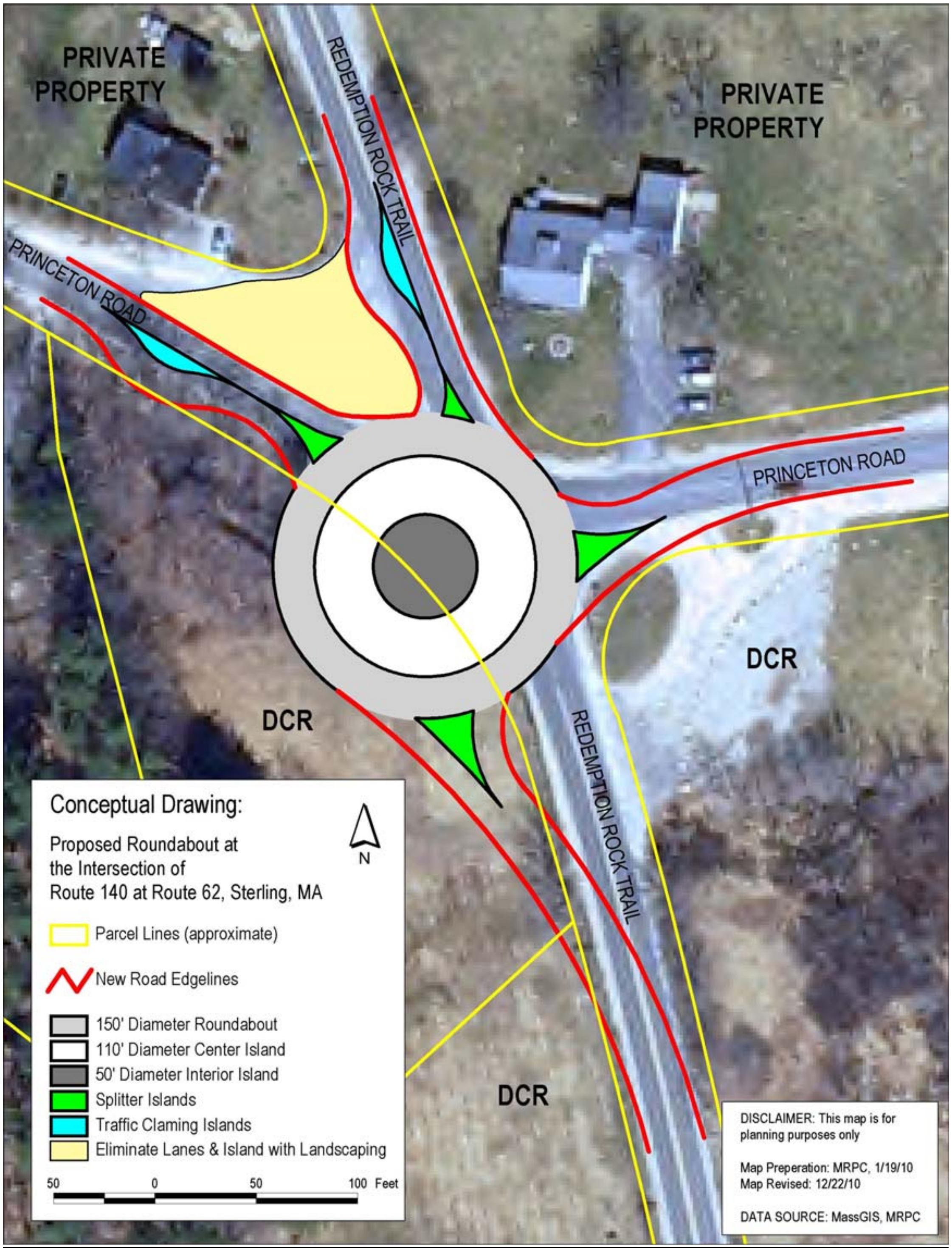
Table 11-1

Sterling					
Community Prioritization of Preferred Improvement Alternatives					
Priority Rank	**Intersection Name and Ref. #**	**Preferred Improvement Alternatives**	**Estimated Cost* (Low to High)**	**Estimated Design Cost (10% to 20%)****	**Other Issues**
Top Priority	**INT. #5** Rte. 140 / Rte. 62	Convert intersection to roundabout	**$1,500,000**	$150,000 $300,000	Involve DCR early in the project development process
Second Priority	**INT. #8** Rte. 140 / Fox Run / Crowley Rd.	Align Crowley Rd to the North directly across Fox Run Rd Remove Vegetation on North side of Fox Run Rd Improve drainage	$500,000 **$1,000,000**	$100,000 $200,000	Involve DCR early in the project development process
		Subtotal Estimate:	$2,000,000 **$2,500,000**	$250,000 $500,000	
	INT. #1 Rte. 140 / Beaman Rd.	Convert to "T" (90 degree) intersection Improve drainage & selectively remove vegetation Consider opening roadway to two-way traffic	**$500,000** (No High)	$50,000 $100,000	
	INT. #2 Rte. 140 / North Oakdale Cutoff	Remove vegetation and lower embankments on both sides of approach	Very Low	NA	
	INT. #3 Rte 140 / Still River Rd.	Remove vegetation on North side of approach	Very Low	NA	
	INT. #4 Rte. 140 / Burpee Rd.	Convert to "T" (90 degree) intersection Convert to one way Westerly	**$500,000** (No High)	$50,000 $100,000	
	INT. #6 Rte. 140 / Johnson Rd. (North)	Convert to "T" (90 degree) intersection Remove Vegetation on opposite side of Johnson Rd. approach	**$500,000** (No High)	$50,000 $100,000	
	INT. #7 Rte. 140 / Johnson Rd. (South)	Convert to "T" (90 degree) intersection Improve drainage Remove Vegetation on North side of intersection	**$500,000** (No High)	$50,000 $100,000	
	INT. #9 Rte. 140 / John Dee Rd.	Convert to "T" (90 degree) intersection Improve drainage & culvert	**$500,000** (No High)	$50,000 $100,000	
	INT. #10 Rte. 140 / Clemence Ave	Convert to one way Eastbound (Enter Only) Clear vegetation to improve sight distance	Very Low	NA	

(continued next page)

Priority Rank	Intersection Name and Ref. #	Preferred Improvement Alternatives	Estimated Cost* (Low to High)	Estimated Design Cost (10% to 20%)**	Other Issues
	SEGMENT #1: Rte. 140 Princeton TL to Princeton TL	Remove roadside vegetation at various locations Flatten/ lower sideslops along various locations Improve drainage at various locations Upgrade signage/pavement markings/guardrails to reflect existing standards for road segments and intersections Improve bus turnaround Apply Access Management techniques at 140 Club and lower road grade to Antique Plants	**$3,000,000** (No High)	$300,000 $600,000	At 140 Club parking condition needs further study
	SEGMENT #2: Rte 140 from Princeton TL to Dana Hill Rd. intersection	Remove roadside vegetation at various locations Flatten/ lower sideslops along various locations Improve drainage at various locations Upgrade signage/pavement markings/guardrails to reflect existing standards for road segments and intersections	**$5,500,000** (No High)	$550,000 $1,100,000	
		Subtotal Estimate:	**$11,000,000** (No High)	$1,100,000 $2,200,000	
		Total Estimate:	$13,000,000 **$13,500,000**	$1,350,000 $2,700,000	
			*includes repaving	**based on higher **Estimated Cost** (**bold numbers**) when applicable	

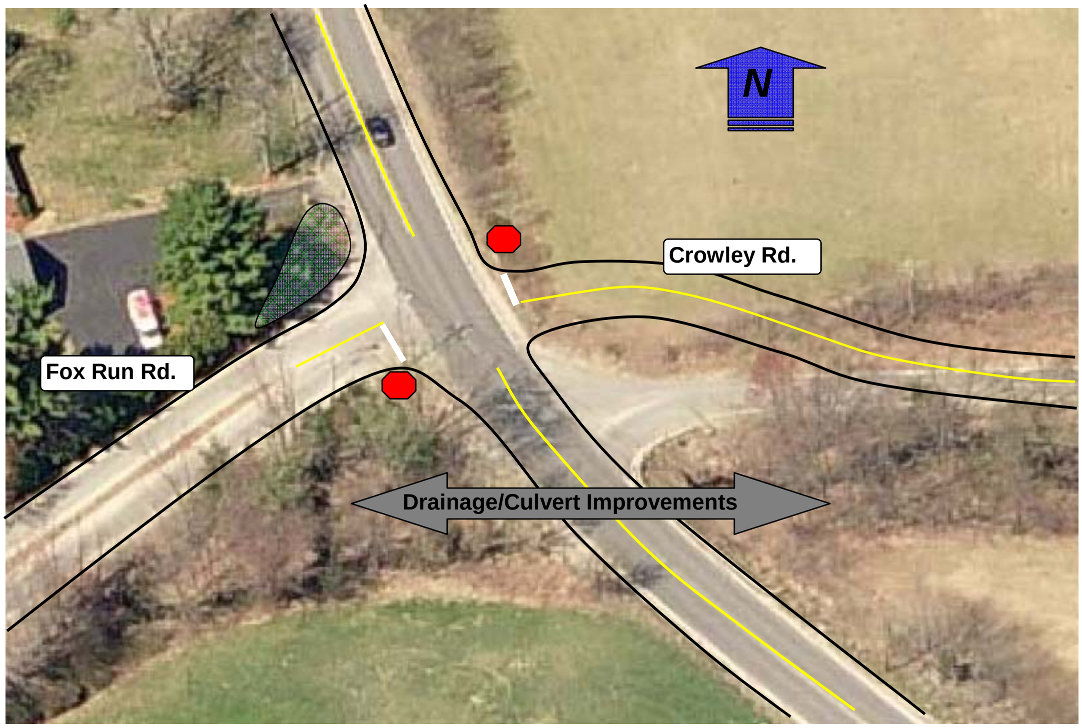
Priority #1: Route 62 at Route 140



Improvements at Route 62:

- Convert intersection to roundabout. (See roundabout information in Technical Appendix)

Priority #2: Fox Run Road, Crowley Road at Route 140



Improvements at Fox Run and Crowley Roads:

- Align Crowley rd. to the north directly across Fox Run Rd.
- Improve drainage as needed
- Remove vegetation on north side of Fox Run Rd.

11.2 Suggested Next Steps

Project Development

Project Development is the process that takes a transportation improvement from concept through construction.

Every year the Montachusett region receives federal and state funds for projects to improve the transportation network in local communities. These funds and projects are prioritized through the Montachusett Metropolitan Planning Organization, a regional advisory group that annually develops the Montachusett Transportation Improvement Program (TIP).

For a community to receive funds, the project must follow a multi-step review and approval process required by the Massachusetts Department of Transportation (MassDOT) Highway Division. This process is summarized in the figure below.

Project proponents are required to follow this process whenever MassDOT Highway Division is involved in the decision-making process. The project development procedures are, therefore, applicable to any of the following situations:

- When MassDOT is the proponent; or
- When MassDOT is responsible for project funding (state or federal-aid projects); or
- When MassDOT controls the infrastructure (projects on state highways).

Projects with local jurisdiction and local funding sources are not required to go though this review process unless the project is located on the National Highway or Federal-Aid Systems.

Project Development Process

	PROCESS	*OUTCOMES*
STEP I	Proplem / Need / Opportunity Identification	1. Project Need Form (PNF)
STEP II	Planning	2. Project Planning Report (If Necessary)
STEP III	Project Initiation	3. Project Initiation Form (PIF) 3. Identification of Appropriate Funding 3. Definition of Appropriate Next Steps 3. Project Review Committee Action
STEP IV	Environmental / Design / ROW Process	4. Plans, Specs and Estimates (PS&E) 4. Environmental Studies and Permits 4. Right-of-Way Plans 4. Permits
STEP V	Programming	5. Regional and State Transportation Improvement Programs (TIP) 5. Programming of Funds
STEP VI	Procurement	6. Construction Bids and Contractor Selection
STEP VII	Construction	7. Build Project
STEP VIII	Project Assessment	

Source: MassDOT Highway Division

The project development process is designed to progressively narrow the projects focus in order to develop a project to addresses identified needs at that location. There should be opportunities for public participation throughout.

The eight steps in the above figure are described in detail in Chapter 2, Project Development Guide of the MassDOT Highway Division Design Guidebook (http://www.mhd.state.ma.us/default.asp?pgid=content/designGuide&sid=about).

In summary, to get a project constructed, a community should:

1. Meet with the District Office of the MassDOT Highway Division to review and discuss the potential project. The District office can provide the community with information and feedback about the possible project's scope, cost, issues, etc.
2. Submit a Project Need Form (PNF), along with any support materials, on the potential project to the District office.
3. After review and feedback from MassDOT Highway Division on the PNF, a Project Initiation Form (PIF), again with any supporting materials, is prepared and submitted to the District office.
4. MassDOT and the Project Review Committee (PRC) act upon the PIF. If the project is approved by the PRC, the community is notified and, if applicable, initiates the design process for the project.
5. The municipality hires a design consultant and also begins work on the right of way plans as well as any permits, local approvals, etc.
6. During this phase the project is incorporated into the regional Transportation Improvement Program (TIP) by the MPO. Placement and prioritization of the project is based upon available funds, evaluation criteria scoring, design status and public support and comments.
7. Design public hearing is held at the 25% design phase.
8. Design progresses to 100% and all plans, specifications and estimates (PS&E) are completed. Project is then ready for advertisement by MassDOT.

Copies of the PNF and PIF can be found in the Technical Appendix of this report.

<u>Montachusett Metropolitan Planning Organization (MMPO)</u>

All urbanized areas with a population greater than 50,000 are required by the U.S. Department of Transportation (USDOT) Federal regulations to designate an MPO for the area. The establishment of an MPO is necessary for the State to receive Federal transportation funds. In the Montachusett Region, the Montachusett Regional Planning Commission (MRPC) serves as staff for the MPO. The MRPC staff annually produces a Transportation Improvement Program (TIP) and Unified Planning Work Program (UPWP). In addition, a Regional Transportation Plan is updated periodically to reflect the changing transportation needs of the area. A 2007 Regional Transportation Plan was prepared and endorsed by the MPO on March 28, 2007 and an update is required by federal regulations every four years. A 2011 RTP is anticipated for endorsement in early 2011.

The MPO in the Montachusett Region (after reorganization in October 2001) is currently comprised of the following signatories:

- Secretary and CEO of the Massachusetts Department of Transportation (MassDOT);
- Administrator of MassDOT Highway Division;
- Chairman of the MRPC;
- Chairman of Montachusett Regional Transit Authority (MART)*;
- Mayor of the City of Fitchburg
- Mayor of the City of Gardner
- Mayor of the City of Leominster
- Four Representatives from the four identified Subregions of towns in the MRPC region

*This member will be represented by one of the Mayors from Fitchburg, Gardner or Leominster.

The MMPO Subregions are composed as such:

Subregion 1 - Athol, Hubbardston, Petersham, Phillipston, Royalston, Templeton, Winchendon;
Subregion 2 - Ashburnham, Ashby, Groton, Townsend, Westminster;
Subregion 3 - Ayer, Harvard, Lunenburg and Shirley;
Subregion 4 - Clinton, Lancaster, Sterling.

These 10 members serve as the MPO Policy Board for the regional "3C" (comprehensive, cooperative, and continuing) transportation planning process.

<u>The Transportation Improvement Program (TIP) – Development and Process</u>

The TIP is a prioritized listing of transportation projects proposed for implementation during the future four federal fiscal years and is updated every year by the MMPO. TIP projects are identified by funding category so that where necessary priorities may be established for projects within each funding program. Unless otherwise noted, the agency responsible for implementing highway projects is the Massachusetts Department of Transportation Highway Division and, for transit projects, the Montachusett Regional Transit Authority.

MRPC staff annually develops the TIP project listing from sources that include the MassDOT's Project Information System, MassDOT Highway Division Districts 2 and 3, local officials, the Montachusett Joint Transportation Committee (MJTC), the Long and Short Range Elements of the Regional Transportation Plan (RTP), and the Montachusett Metropolitan Planning Organization (MPO).

Prioritization of projects is based upon input from MassDOT regarding project design and implementation status, local prioritization from chief elected officials, scoring of the project based upon the Transportation Evaluation Criteria (TEC), fiscal constraints for the Montachusett Region, consensus vote by the MJTC and formal adoption by the MPO. Through out this procedure, input from local citizens are reviewed and considered where appropriate in the prioritization process.

An initial project listing is obtained from MassDOT and the local communities. These projects are then reviewed one by one to ascertain their current status as to design and potential advertising dates. Projects are then scored and evaluated utilizing the Transportation Evaluation Criteria (TEC) developed by the MassDOT. The TEC is a series of criteria to "be applied by the appropriate implementing agency during the project development stage to ensure that our limited budgetary and staff resources are committed to the best proposals; to assist the MPO process of programming federal funding through the regional Transportation Improvement Programs; and to examine existing projects in the pipeline to determine which should ultimately proceed to design and construction." Final scores based upon the TEC then become part of the decision and prioritization process.

From this information, a project listing by fiscal year is developed. This fiscal listing is then compared to the Federal funding target allocation for the region. The listing is then reviewed by state and local officials, as well as the MJTC and the MMPO, to determine fiscal constraint by funding year. Any problems are then identified. Through the MMPO, projects are adjusted and prioritized in order to resolve the identified problems.

In conformance established procedures with the MMPO Public Participation Program (PPP), developed to ensure a "proactive public involvement process ... in developing plans and TIPs, the draft TIP is distributed for a federally mandated 30 day public review and comment period. Following completion of the 30 day review period, any comments or issues received are addressed and reflected in the final TIP. This document is then reviewed by the MJTC, MRPC and MMPO and is recommended for endorsement by the MMPO at a subsequent MMPO meeting.

The fully endorsed TIP is then distributed to Federal, State and local agencies and groups, including FTA, FHWA, the Environmental Protection Agency (EPA) and the Department of Environmental Protection (DEP) again in conformance with the PPP.

At any time during the Federal Fiscal Year, an amendment to the TIP can be developed and endorsed by the MMPO following similar procedures established for the TIP, i.e. a draft amendment is prepared and released for a 30 day public review and comment period, reviewed by the MJTC, MRPC and the MMPO and endorsed if deemed appropriate.

Funding Sources

Several funding sources exist on the federal and state level that may be applicable to the preferred projects identified by the communities within this report. As the municipality begins the project development process, the following funding sources/options may come into play during the design, implementation and construction phases. The community should note that a funding program need not be identified as part of the PNF or PIF process but can be determined as the project limits and scope become defined.

The following is a brief listing of Federal, State and Local funding programs that may be potential sources for road, bridge, trail and sidewalk projects identified in this corridor profile. For further information on some of these programs please contact the MRPC or MassDOT Highway Division.

Federal Sources:

- **National Highway System (NHS) Funds** - The program provides funding for improvements to rural and urban roads that are part of the NHS, including the Interstate System and designated connections to major intermodal terminals. Under certain circumstances, NHS funds may also be used to fund transit improvements in NHS corridors.
- **Surface Transportation Program (STP) Funds** - The Surface Transportation Program provides flexible funding that may be used by States and localities for projects on any Federal-aid highway, including the NHS, bridge projects on any public road, transit capital projects and intracity and intercity bus terminals and facilities.
- **Congestion Mitigation and Air Quality (CMAQ) Improvements Program Funds** - The Congestion Mitigation and Air Quality Improvement Program (CMAQ) provides funding for projects and programs in air quality nonattainment and maintenance areas for ozone, carbon monoxide (CO), and particulate matter (PM-10, PM-2.5) which reduce transportation related emissions. [123 USC 149(a)]
- **Highway Safety Improvement Program (HSIP)** - SAFETEA-LU enacted in August 2005 authorized funding for the Federal surface transportation programs for highways, highway safety, and transit for 2005 to 2009. As part of this legislation, funding was increased in the HSIP and, additionally, required each state to develop a Strategic Highway Safety Plan (SHSP) that addresses the critical "4Es" of highway safety (engineering, enforcement, education, and emergency medical services). The HSIP is a "core funding" program administered by the FHWA, which apportions funds to states for a range of eligible activities focused primarily on infrastructure-related safety improvements. HSIP projects must meet eligibility criteria outlined by the state, FHWA and the MPO’s.
- **Scenic Byways Program Funds** -The program recognizes roads having outstanding scenic, historic, cultural, natural, recreational, and archaeological qualities and provides for designation of these roads as National Scenic Byways, All-American Roads or America's Byways.
- **Transportation, Community and System Preservation (TCSP) Program Funds** - The TCSP Program is intended to address the relationships among transportation community, and system preservation plans and practices and identify private sector-based initiatives to improve those relationships.
- **Transportation Enhancement Program Funds** - The Transportation Enhancements Program strengthens the cultural, aesthetic, and environmental aspects of the Nation's intermodal transportation system. As of November 1, 2010, Massachusetts has revised the TE program development process in order to

eliminate confusion, redundancy and time. The proposed TE projects now enter the MassDOT Highway Division project development process directly. TE project proponents submit a Project Need Form (PNF) then a Project Initiation Form (PIF) to initiate the Highway Division project development process

- **Safe Routes to School (SR2S) Program Funds** -The Safe Routes to School Program enables and encourages children, including those with disabilities, to walk and bicycle to school; to make walking and bicycling to school safe and more appealing; and to facilitate the planning, development and implementation of projects that will improve safety, and reduce traffic, fuel consumption, and air pollution in the vicinity of schools.
- **Recreational Trails Program –** The Recreational Trails Program provides funds to the States to develop and maintain recreational trails and trail-related facilities for both non-motorized and motorized recreational trail uses.

State Sources:

- **Community Development Block Grants (CDBG) Funds** - The CDBG program is a federally funded, competitive grant program designed to help small cities and towns meet a broad range of community development needs.
- **Public Works Economic Development (PWED) Funds** -The PWED program was created by the State Legislature to assist municipalities in funding transportation infrastructure for the purpose of stimulating economic development.
- **Small Town Road Assistance Program (STRAP) Funds** -The STRAP program provides funding for transportation projects that improve public safety and promote economic development in small towns with a population less than 7,000. Eligible costs include: (1) Project design costs; (2) Cost of updating plans, specifications and estimates where preliminary engineering and related planning has already been undertaken; (3) Costs associated with standard construction activities as allowed under M. G. L., Chapter 90. Section 34, Subsection 2(a); (4) Payment for outside engineering services for design and construction provided that engineering services will be performed by a registered professional engineer or a registered land surveyor with a background of satisfactory performance.
- **Community Development Action Grants (CDAG)** -The CDAG program provides funding for publicly owned or managed projects that have a significant impact on the overall economic condition of a city or town, including activities that will significantly improve the conditions of low and moderate income persons through: (a) the support of workforce housing needs across a range of incomes; (b) the generation and/or retention of long term employment; (c) the leveraging of significant private investment; and (d) the improvement of physical conditions
- **Massachusetts Opportunity Relocation and Expansion (MORE) Funds -** The Massachusetts Opportunity Relocation and Expansion (MORE) Jobs Capital Program provides grant funding for public infrastructure improvements needed to support business expansion in the Commonwealth of Massachusetts. The program stimulates job creation and economic growth across the state by providing the public infrastructure development companies need.

Local Sources:

- **Chapter 90 Transportation Funds** -The Chapter 90 Program entitles municipalities to reimbursement of documented expenditures for Capital Improvement Projects for Highway Construction, Preservation and Improvement Projects that create or extend the life of Capital Facilities under the provisions of General Laws Chapter 90, Section 34, Clause 2(a) on approved Projects. Eligible Highway Construction projects include resurfacing, microsurfacing, pug mill mix (cold mix), drainage, intersections, sidewalks, footbridges, berms and curbs, traffic controls and related facilities, right-of-way acquisition, street lighting (excluding operating costs and decorative enhancements), bridges, and tree planting/landscaping in association with a project.
- **Tax Increment Financing (TIF)** -Tax Increment Financing (TIF) is an alluring tool that allows municipalities to promote economic development by earmarking property tax revenue from increases in assessed values within a designated TIF district. The rules for tax increment financing, and even its name, vary across the 48 states in which the practice is authorized. TIF expenditures are often debt financed in anticipation of future tax revenues.
- **Business Improvement Districts (BID)** - Business Improvement Districts (BID) are special assessment districts in which property owners vote to initiate, manage and finance supplemental services or enhancements above and beyond the baseline of services already provided by their local city or town governments. A special assessment, or common area fee, is levied only on property within the district and the assessments are collected and expended within the district for a range of services and/or programs, including marketing and public relations, improving the downtown marketplace or city/town center, capital improvements, public safety enhancements, and special events.
- **Specific local taxes to residential property owners for sidewalk construction and/or repair**
- **Town Meeting Warrant articles/budgetary line items**
- **Subdivision Regulation requirements for developers to construct sidewalks for new residential developments and similar regulations for commercial developments**

Other Possible Funding Sources:
- **Private contributions (foundations, businesses, individuals, etc.)**
- **Local bank grants, loans or bonds**

Other Ideas for Sidewalk/Trail Construction:
- **Donated time and/or materials from local contractors**
- **Volunteers to clear and build trails (Wachusett Greenways model)**
- **Eagle Scout projects**
- **Tax credits for citizens who repair/build public sidewalks in front of their property with their own funds**

Massachusetts Transportation Bond Bill

Former state Representative Lew Evangelidis and state Senator Harriette Chandler announced in mid-2008 that approximately $14 million had be included in the 2008

State Transportation Bond Bill for the purposes of improving Route 140 in Westminster, Sterling and Princeton. Although this line item does not guaranty or earmark specific funds for the design, engineering and construction of Route 140, it does highlight the need for action and begins the process that could lead to funding from the Commonwealth. As presented by Rep. Evangelidis at a prior Route 140 Safety Task Force meeting, the process to receive funds through a state bond bill can be long and cumbersome. The inclusion of Route 140 in the 2008 Bond Bill begins the process of highlighting needs and with further legislative support and work, funds may eventually be realized to assist the towns with design and construction. The communities of the Task Force should continue to work with area legislators to see if some of these funds can be realized for the preferred improvements. Concerted and coordinated efforts by the three communities may be beneficial in obtaining a portion of these funds to implement design and engineering work.

HSIP

As indicated above, several programs have eligibility requirements that must be met before these specific funds can be allocated to the project. In particular, one program HSIP may have the potential to address potential projects outlined in this corridor profile. Discussions with MassDOT, the Montachusett MPO and the MRPC can help to determine project eligibility. The following provides additional information on the HSIP program.

- **What is HSIP?**
  HSIP is the Highway Safety Improvement Program. The Safe, Accountable, Flexible, Efficient Transportation Equity Act - A Legacy for Users (SAFETEA-LU) enacted in August 2005 authorized funding for the Federal surface transportation programs for highways, highway safety, and transit for 2005 to 2009. As part of this legislation, funding was increased in the HSIP and, additionally, required each state to develop a Strategic Highway Safety Plan (SHSP) that addresses the critical "4Es" of highway safety (engineering, enforcement, education, and emergency medical services). The HSIP is a "core funding" program administered by the FHWA, which apportions funds to states for a range of eligible activities focused primarily on infrastructure-related safety improvements. (Source: http://safety.fhwa.dot.gov/safetealu/hsipprocguide1.htm)
- **What is SHSP?**
  The Strategic Highway Safety Plan (SHSP) encourages states to take a multidisciplinary and multi-agency look at highway safety problems and solutions on all public roads, and to share resources to implement countermeasures that will be most effective in terms of reducing deaths and serious injuries. Through the process of developing an SHSP, a state analyzes safety data and establishes strategies to address these problems with a comprehensive set of actions incorporating the "4Es" of safety. States are required to adopt strategic and performance goals in their SHSPs that "focus resources on areas of greatest need." The Massachusetts SHSP was completed in September 2006 and provides a comprehensive framework, and specific goals and objectives, for reducing highway fatalities and serious injuries on all public roads. The statewide

document, developed by MassDOT in a cooperative process, includes input from public and private safety stakeholders. (Source: http://www.mhd.state.ma.us/default.asp?pgid=content/traffic/shsp&sid=level2) The Massachusetts SHSP is also available online at this web link.

- **How is a HSIP Project Determined?**
  As part of the implementation of the HSIP program in Massachusetts, MassDOT has been working with FHWA and the Metropolitan Planning Organizations (MPO's) to establish a selection process for safety projects through a HSIP Task Force. The task force includes personnel from MassDOT, the Massachusetts Association of Regional Planning Agencies (MARPA) and FHWA. This task force will review candidate projects submitted by the MPOs and Regional Planning Agencies (RPAs) based upon criteria established and determined by the task force. All candidate projects will be approved by the HSIP task force.
- **What is an HSIP Eligible Project?**
  Candidate projects submitted by the RPAs to the task force will be reviewed based upon factors such as number of crashes, crash severity, traffic volumes and location, and recommended countermeasures. MassDOT has indicated that HSIP should allow enough flexibility to accomplish a number of goals and should include, but not be limited to, the following:

  - Working on eliminating locations from the Top Intersection Crash Locations
  - Funding lighting projects based upon locations with a high incidence of crashes that occurred under dark, nighttime conditions.
  - Funding Low Cost Safety Improvements based upon the results of Road Safety Audits
  - Reducing pedestrian crash locations by using crash data to select locations
  - Reducing median crossover crashes at high incidence locations
  - Reducing bicycle crash locations by using crash data to select locations
  - Reducing lane departure locations by using crash data to select locations and better understand safety deficiencies
  - Providing funding for public service announcements

Design Considerations and Exceptions

During the development of this corridor profile and safety improvement study, the Task Force clearly indicated from the start that widening of Route 140 was not a viable option, especially within the town of Sterling. Improvements recommended for the road segments of Route 140, i.e. outside of the intersection specific recommendations, may need a design exception approval if federal and state funds are sought. MassDOT adheres to design guidelines recommended by the American Association of State Highway and Transportation Officials (AASHTO) and FHWA when seeking to implement improvement projects. Route 140 throughout its course in Sterling has road surface widths varying from 23 to 25 feet with little or no shoulders. AASHTO/FHWA recommended surface widths for a road of this functional classification (rural major collector) range from 30 to 32 feet (including shoulders). Therefore, in order to be eligible to receive federal funds to improve the safety conditions along Route 140, the town will likely need to seek a design exception from the AASHTO/FHWA recommended guidelines.

The design exception process is outlined in detail in the MassDOT *Design Guidebook* in *Chapter 2 Project Development Section 2.11 Design Exceptions* (http://www.mhd.state.ma.us/downloads/designGuide/CH_2_a.pdf) and is summarized below:

- **Functional Design Report**
  A Functional Design Report (FDR) is a necessary component for all transportation and safety improvement projects submitted to MassDOT for 25 Percent review, including mitigation projects developed through the Massachusetts Environmental Protection Agency (MEPA) process. … Guidelines for the submission of a FDR are included on MassDOT's website.

- **Design Exceptions Report**
  The design guidance contained in this Guidebook is intended to provide project proponents with sufficient flexibility to address the unique and diverse conditions encountered on the Commonwealth's streets and highways; however, there may still be occasions when design exceptions are necessary. For these circumstances, the project proponent must complete a Design Exception Report as part of the FDR, as discussed in Section 2.11 of this chapter, and transmit it to MassDOT with the 25 Percent Design. Guidelines for submitting a Design Exceptions Report are included on MassDOT's website and in Appendix 2-A-11 of this Chapter.

  This Design Guidebook has incorporated AASHTO criteria for Massachusetts' roadway and bridge design. AASHTO criteria are the recognized standard for design based on years of research and empirical data for safe and efficient movement of traffic. Departure from these guidelines requires documentation to support the decision making process.

  The FHWA and MassHighway recognize 13 controlling criteria from AASHTO policy which, if not met, require formal approval of design exceptions. These criteria are:

    - **Roadway and Bridge Criteria**
        - design speed
        - lane width
        - shoulder width
        - horizontal alignment
        - vertical alignment
        - grades
        - stopping sight distance
        - cross slope
        - superelevation
        - horizontal clearance (other than "clear zone")

- **Bridge (Only) Criteria**
    - width
    - structural capacity
    - vertical clearance

  Desirable and minimum standards for most of these controlling criteria are found in various parts of this Guidebook. … Every reasonable effort should be made to design projects within these ranges. When the minimum standards cannot be achieved, documentation and approval of these as design exceptions are required and must be provided in a Functional Design Report. Use of less than minimum standards must be based on sound engineering judgment, weighing relevant contextual constraints, and other relevant factors. The safety and traffic operational goals of the project sill must be met by the facility with the lower standards.

- **Design Exception Triggers**
  If minimum controlling criteria cannot be met, documentation of design exceptions is required for all projects, regardless of functional classification or funding, at the 25 Percent Design stage, to demonstrate that sound engineering judgment was used to design the improvements. Documentation for all MassDOT design exceptions should follow the guidelines included in this manual, … and relevant FHWA Policy and Engineering Directives. The FHWA guidance should be followed regardless of project funding because of its relevance to all roadway and bridge projects, and the need for consistency in processing design exceptions.

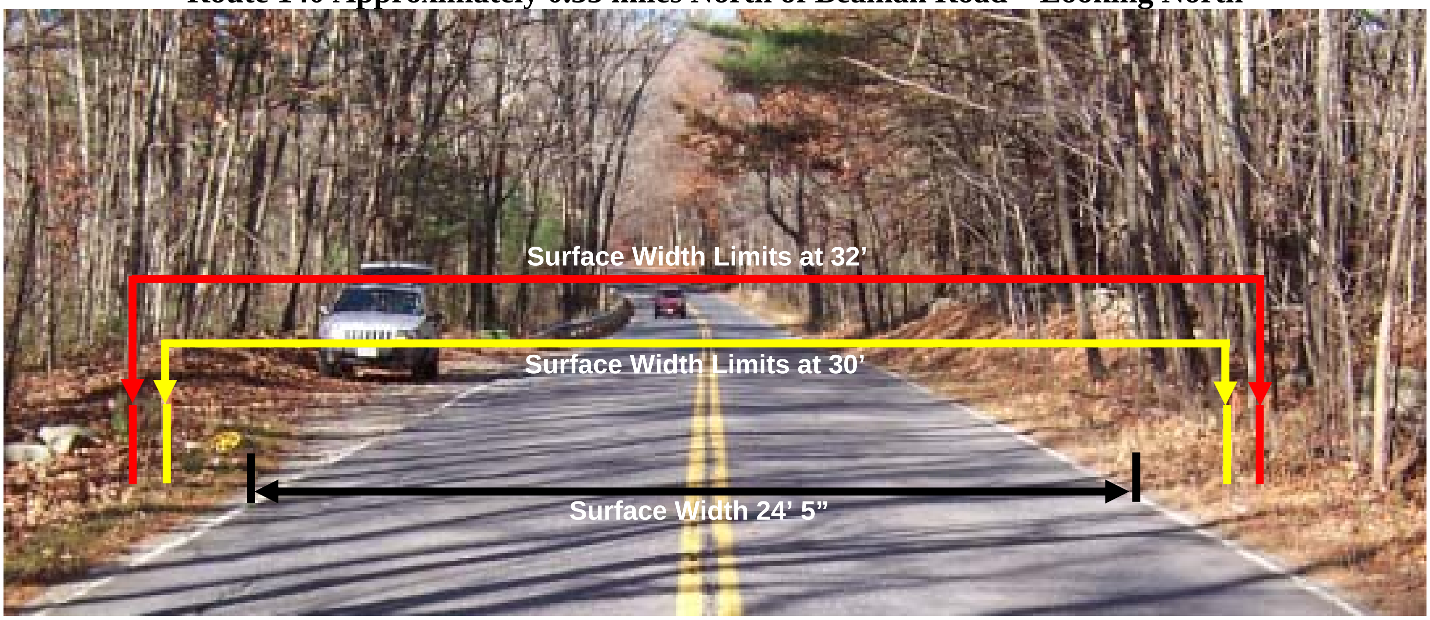
  Any exceptions to full compliance with 521 CMR, *The Rules and Regulations of the Massachusetts Architectural Access Board*, should be identified at this point so the MassDOT can either modify the design approach, or seek the appropriate variance from the Access Board.

- **Approval Process**
  The design exception documentation is normally prepared by the design engineer and forwarded to the District Project Development Engineer. The District Project Development Engineer then coordinates review by the Design Exceptions Committee. All design exceptions must be approved by the Chief Engineer. Design exceptions on all projects which require FHWA review are then forwarded to FHWA for approval. Upon receipt of all approvals, the documentation and the approval letters must be kept in a permanent project file for future reference. The project submittal to the Capital Expenditures Program Office (CEPO) for construction advertising should include a statement such as “design exceptions have been approved for this project and are on file.”

A review of the conditions along Route 140 throughout Sterling by the MRPC appears to indicate that any possible widening of the road surface would be difficult and potentially expensive. Numerous areas exist where cuts or fills would be needed in order to obtain a necessary road foundation and also a number of trees would be impacted. All of which are against the wishes of the town. In addition, during the Sterling public meeting held on August 13, 2009 to discuss issues/problems/concerns along the corridor, several residents indicated concerns any potential widening would have on their septic systems since they are located in their front yards near the roadway itself.

The MRPC conducted field visits to a few locations on Route 140 in an attempt to illustrate the potential impacts and impediments that exist to widening the road surface. The following photos show the current Route 140 layout of 23 to 25 feet with stakes placed off of the existing road surface to indicate where the pavement edge would be for a 30 and/or 32 foot pavement surface.

Route 140 Approximately 0.35 miles North of Beaman Road – Looking North



Current surface width is approximately 24'5'' (as measured in the field). Shoulders are basically non-existent. Increasing the surface width to 30' or 32' would require extensive tree removal, land cutting and filling. Note area of guardrails just to the north where additional work would be needed to relocate rails as well as fill in depression area.

Route 140 Approximately 0.25 miles North of Dana Hill Road – Looking South

Current surface width is approximately 25'4'' (as measured in the field). Shoulder for northbound lane approximately 22". Increasing the surface width to 30' or 32' would require extensive tree removal, utility pole relocation, land cutting and filling. Note area to the south where extensive number of trees as well as land grades that would require cutting and potential retaining walls.

Based upon the desire of the town to not widen Route 140 and the observed conditions along the corridor in the town of Sterling, it is the opinion of the MRPC that a design exception could be sought if the town seeks federal and state funding to address the safety concerns outlined along the road segments of Route 140. Further and more detailed discussions should be held between local officials and MassDOT Highway Division District 3 personnel on this issue.