MASSACHUSETTS

HIGHWAY SAFETY IMPROVEMENT PROGRAM

2017 ANNUAL REPORT

U.S. Department of Transportation
Federal Highway Administration

Photo source: Federal Highway Administration

Table of Contents

Disclaimer

Protection of Data from Discovery Admission into Evidence

23 U.S.C. 148(h)(4) states “Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for any purpose relating to this section [HSIP], shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location identified or addressed in the reports, surveys, schedules, lists, or other data.”

23 U.S.C. 409 states “Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or railway-highway crossings, pursuant to sections 130, 144, and 148 of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.”

Executive Summary

In 2009, under Safetea-LU, Massachusetts began obligating funds from the HSIP funding category, only after an HSIP Task Force was developed and HSIP guidelines were implemented. Through MAP-21 and now, through FAST Act, this program continues. HSIP projects and programs were, and continue to be, identified through our Strategic Highway Safety Plan (SHSP) and consist of a combination of high crash locations, systemic projects and programs identified through the various emphasis areas of the SHSP. The program funds projects on all public roadways, not just State Highways, and it uses a data driven process to identify and select the projects and programs. The HSIP is a much needed program to bring down our fatalities and injuries in order to achieve our Towards Zero Death goal. This report summarizes the HSIP management and structure in Massachusetts as well as describing the selected HSIP programs and projects. New for this year, our report includes an evaluation of our HSIP program.

Introduction

The Highway Safety Improvement Program (HSIP) is a core Federal-aid program with the purpose of achieving a significant reduction in fatalities and serious injuries on all public roads. As per 23 U.S.C. 148(h) and 23 CFR 924.15, States are required to report annually on the progress being made to advance HSIP implementation and evaluation efforts. The format of this report is consistent with the HSIP Reporting Guidance dated December 29, 2016 and consists of five sections: program structure, progress in implementing highway safety improvement projects, progress in achieving safety outcomes and performance targets, effectiveness of the improvements and compliance assessment.

Program Structure

Program Administration

Describe the general structure of the HSIP in the State.

A Massachusetts HSIP Task Force was established in 2009 to develop guidelines for HSIP-eligible projects and programs. The Task Force consists of FHWA, MassDOT Highway, MassDOT Planning and MARPA (Massachusetts Association of Regional Planning Agencies)/MPOs. An HSIP eligible project is one that contains a hot spot crash location (a cluster in which the total number of "equivalent property damage only" crashes in the cluster is within the top 5% of all clusters in a specific region), systemic fixes or any strategy, activity or project on a public road that is consistent with the data-driven State Strategic Highway Safety Plan (SHSP) and corrects or improves a hazardous road location or feature or addresses a highway safety problem. In the past, HSIP projects included infrastructure fixes, enhanced enforcement, awareness campaigns, data or other types. However, with FAST Act, only infrastructure fixes, enhanced enforcement in work zones and data improvements are allowed. More details can be found at http://www.massdot.state.ma.us/Portals/8/docs/traffic/HSIP/HSIP%20Criteria%20Updates.pdf. To see the HSIP eligible clusters, go to: http://services.massdot.state.ma.us/maptemplate/TopCrashLocations/.

MassDOT Federal Aid Programming and Reimbursement Office and MassDOT Planning allocate the funds into various categories for the Statewide Transportation Improvement Program (STIP), including Statewide HSIP funds and HSIP funds for each of the regions. HSIP projects are then selected based on the HSIP guidelines, the MPO processes, priority and readiness (regardless of roadway jurisdiction). Once an HSIP project has been identified on the STIP, an early requirement is a Road Safety Audit which helps to guide the recommended improvements.

Where is HSIP staff located within the State DOT?

Other-Traffic Engineering and Safety

Enter additional comments here to clarify your response for this question or add supporting information.

There are no dedicated staff for the HSIP. This is just one of the many tasks done by the Safety Section within Traffic Engineering and Safety. However, there is assistance from staff within Planning, Operations, Project Management, District Offices and MPOs.

How are HSIP funds allocated in a State?

Other-combination

Enter additional comments here to clarify your response for this question or add supporting information.

MassDOT Federal Aid Programming and Reimbursement Office and MassDOT Planning allocate the funds into various categories for the Statewide Transportation Improvement Program (STIP), including Statewide HSIP funds and HSIP funds for each of the regions. HSIP projects are then selected based on the HSIP guidelines, the MPO processes, priority and readiness (regardless of roadway jurisdiction). Once an HSIP project has been identified on the STIP, an early requirement is a Road Safety Audit which helps to guide the recommended improvements.

Describe how local and tribal roads are addressed as part of HSIP.

The HSIP project selection criteria were based on locations being identified as top crash locations (based on the number and severity of crashes) regardless of road ownership. Additionally, programs were established to reduce injuries and fatalities based on several key focus areas based on our Strategic Highway Safety Plan, regardless of roadway jurisdiction. There is an ongoing Bicycle - Pedestrian safety program that works at the community level to address enforcement, education, awareness and infrastructure and in most cases, these areas are focused on locally owned roads. There were HSIP projects that addressed the specific needs of locally owned roadways based on the data showing that a high percentage of the fatality and injury lane departure crashes occurred on locally owned roadways. Finally, other eligible projects / programs were selected based on HSIP-eligible criteria such as statewide improvements to data or assistance with SHSP. These programs impact safety on all roadways regardless of roadway jurisdiction. This resulted in over $7 million HSIP dollar spent on local roads projects.

Identify which internal partners (e.g., State departments of transportation (DOTs) Bureaus, Divisions) are involved with HSIP planning.

Design
Planning
Maintenance
Operations
Other-Please note that while the Governors Highway Safety Office is a partner with the HSIP, the agency is not internal to MassDOT

Enter additional comments here to clarify your response for this question or add supporting information.

Describe coordination with internal partners.

The HSIP Task Force consists of seven members: 2 FHWA representatives (one from Massachusetts Division Office in Planning and one from the Massachusetts Division Office in Safety), 2 representatives from MassDOT Highway Division (Chief Engineer and Safety Engineer), one from MassDOT Office of Transportation Planning and two representatives from the Regional Planning Agencies (RPAs), the technical arm of the Metropolitan Planning Organizations (MPOs). The initial role of the Task Force was to establish HSIP guidelines based on input and feedback from others. The continuing role of the Task Force is to meet annually or as needed, ("meetings" could be via email or in person) to review and update the HSIP guidelines. The HSIP Task Force does not select the individual projects / programs. Program and project selection occurs both in MassDOT HQ and at the regional MPO level (MassDOT District and MassDOT Planning sit on the MPOs). There is funding set aside for each MPO. The statewide HSIP, administered through MassDOT HQ,

involves systemic projects and high crash locations as well as programs and strategies based on the SHSP. The programs and strategies from the SHSP are developed through the SHSP Emphasis Area teams with input from many (both internal and external).

Identify which external partners are involved with HSIP planning.

Regional Planning Organizations (e.g. MPOs, RPOs, COGs)
Governors Highway Safety Office
Local Government Agency
Law Enforcement Agency
Academia/University
FHWA
Other-SHSP Emphasis area team members
Other-Advocacy groups
Other-Public Health

Enter additional comments here to clarify your response for this question or add supporting information.

Strategies identified in the SHSP are HSIP eligible so our internal and external partners assist with development of the strategies in the SHSP. Furthermore, once programs are identified, our internal and external partners help to refine specific projects

Describe coordination with external partners.

All HSIP projects must be based on strategies identified in the SHSP which has been developed with the assistance from our internal and external partners. Furthermore, all HSIP-eligible projects require Road Safety Audits which ensures coordination with external partners. However, other than those two elements, there is no formal structure of external coordination. Rather, external coordination is on an Ad Hoc basis as needed. As an example of this is when we were developing the pedestrian/bicyclist safety campaign (a Statewide HSIP program), we developed a committee consisting of Governors Highway Safety Office, Public Health, MPOs, advocacy groups, local police and community officials, etc. to assist with the specifics and to guide the program.

Have any program administration practices used to implement the HSIP changed since the last reporting period?

No

Are there any other aspects of HSIP Administration on which the State would like to elaborate?

No

Program Methodology

Does the State have an HSIP manual or similar that clearly describes HSIP planning, implementation and evaluation processes?

2017 Massachusetts Highway Safety Improvement Program
Yes

To upload a copy of the State processes, attach files below.

File Name:
HSIP Criteria Updates.pdf

Select the programs that are administered under the HSIP.

Intersection
Roadway Departure
Sign Replacement And Improvement
HRRR

Enter additional comments here to clarify your response for this question or add supporting information.

There are many more programs administered under HSIP. However, the boxes checked are those that had projects/programs this year (although some were continuation programs). For the previous few years, Massachusetts has installed cable median barrier along thirteen divided roadways with traversable medians (based on width, grade, crash history, etc). There were no cable barrier projects for this year. Furthermore. Massachusetts is actively working on implementation of a dynamic Wrong Way Driving detection system to reduce the number of wrong way crashes. This will be implemented next year so more information and details will be made available then.

While pedestrian safety and bicycle safety are both major components to our HSIP program (both Emphasis Areas in our SHSP), we have not added any new pedestrian or bicyclists safety programs for this year. Our programs are continuations from previous years so will not be discussed here. Furthermore, with the increase in non-motorists crashes, we have developed new non-motorists programs (which will be reported on in next year's HSIP report) including a statewide marketing program to address non-motorist safety and improvements to address pedestrian crossings along bus routes since the majority of pedestrian fatalities and injuries occur along bus routes.

Program: HRRR

Date of Program Methodology: 2/3/2015

What is the justification for this program? [Check all that apply]

Other-subject to HRRR rule

What is the funding approach for this program? [Check one]

Funding set-aside

What data types were used in the program methodology? [Check all that apply]

Crashes	Exposure	Roadway
All crashes Fatal and serious injury crashes only Other-EPDO		Functional classification Other-rural/urban boundary

What project identification methodology was used for this program? [Check all that apply]

Crash frequency
Equivalent property damage only (EPDO Crash frequency)
Crash rate

Are local roads (non-state owned and operated) included or addressed in this program?

Yes

Are local road projects identified using the same methodology as state roads?

Yes

Describe the methodology used to identify local road projects as part of this program.

How are projects under this program advanced for implementation?

Other-HRRR eligibility

Select the processes used to prioritize projects for implementation. For the methods selected, indicate the relative importance of each process in project prioritization. Enter either the weights or numerical rankings. If weights are entered, the sum must equal 100. If ranks are entered, indicate ties by giving both processes the same rank and skip the next highest rank (as an example: 1, 2, 2, 4).

Other-readiness factor of HRRR eligible projects : 100

Enter additional comments here to clarify your response for this question or add supporting information.
It should be noted that there are relatively few HRRR eligible roadways. Approximately 12% of the lane miles and 2% of the vehicle miles traveled are rural local or collector roadways and approximately 4% of the fatalities occur on these roadway. The roadways that are eligible for HRRR funds are only a portion of these roadways. Ideally, HRRR funds would be spent on systemic fixes. However, in Massachusetts, we must have roadway layouts to prove that all work will occur within the public way. Oftentimes these roadways do not have layout plans and there is no survey to verify all work will be conducted within the right of way. Given the tight time frame from when we are notified that the HRRR rule applies to us and the time in which the project must be advertised, we are limited with the type of work that can place. Therefore, our project selection is based on data (crash rates, EPDO, etc) but also based on readiness. The jurisdiction of the project is not a factor in project selection. In fact, nearly all of the miles in the HRRR projects for this fiscal year are under local jurisdiction.

2017 Massachusetts Highway Safety Improvement Program

Program: Intersection

Date of Program Methodology: 12/31/2015

What is the justification for this program? [Check all that apply]

Addresses SHSP priority or emphasis area

What is the funding approach for this program? [Check one]

Competes with all projects

What data types were used in the program methodology? [Check all that apply]

Crashes	Exposure	Roadway
All crashes Other-EPDO		

What project identification methodology was used for this program? [Check all that apply]

Equivalent property damage only (EPDO Crash frequency)

Are local roads (non-state owned and operated) included or addressed in this program?

Yes

Are local road projects identified using the same methodology as state roads?

Yes

Describe the methodology used to identify local road projects as part of this program.

How are projects under this program advanced for implementation?

Other-MPO
Other-statewide selection based on ranking and readiness

Select the processes used to prioritize projects for implementation. For the methods selected, indicate the relative importance of each process in project prioritization. Enter either the weights or numerical rankings. If weights are entered, the sum must equal 100. If ranks are entered, indicate ties by giving both processes the same rank and skip the next highest rank (as an example: 1, 2, 2, 4).

Rank of Priority Consideration

Other-PROJECT READINESS : 1

Enter additional comments here to clarify your response for this question or add supporting information.

All intersection locations selected must meet HSIP eligibility (top 5%) based on EPDO within each MPO. A map of the HSIP eligible locations can be found at: http://gis.massdot.state.ma.us/maptemplate/topcrashlocations. We recently completed development of SPF for 3 legged and 4 legged signalized and unsignalized intersections so we will be refining the HSIP eligibility within the next year or two. It would be extremely beneficial to be using the systemic approach for intersection improvements (this was tried back in 2010 when FHWA advised us on a program for unsignalized intersection sign and marking upgrades) but was met with a lot of resistance due to right of way issues. We hope to resolve that issue so we can include the systemic approach to improving the safety of intersections.

Program: Roadway Departure

Date of Program Methodology: 12/31/2013

What is the justification for this program? [Check all that apply]

Addresses SHSP priority or emphasis area

What is the funding approach for this program? [Check one]

Competes with all projects

What data types were used in the program methodology? [Check all that apply]

Crashes	Exposure	Roadway
All crashes		
Fatal and serious injury crashes only		

What project identification methodology was used for this program? [Check all that apply]

Crash frequency
Equivalent property damage only (EPDO Crash frequency)
Crash rate
Other-crash frequency of this particular crash type

Are local roads (non-state owned and operated) included or addressed in this program?

Yes

Are local road projects identified using the same methodology as state roads?

Yes

Describe the methodology used to identify local road projects as part of this program.

How are projects under this program advanced for implementation?

Other-MPO for some projects and readiness for statewide HSIP projects

Select the processes used to prioritize projects for implementation. For the methods selected, indicate the relative importance of each process in project prioritization. Enter either the weights or numerical rankings. If weights are entered, the sum must equal 100. If ranks are entered, indicate ties by giving both processes the same rank and skip the next highest rank (as an example: 1, 2, 2, 4).

Other-readiness : 1

Enter additional comments here to clarify your response for this question or add supporting information.
SPFs have been developed for two lane and multi-lane arterials and collectors in rural and urban areas and divided and undivided. However, the SPFs were based on the volumes contained in the road inventory file and the volumes, at the time the SPFs were developed, needed to be refined. The MassDOT Planning Section and MassDOT Traffic Counting Section are working to improve the volume data so that SPFs can be updated and used as part of the screening process. This will improve the selection of HSIP projects to better reduce fatalities and injuries along the roadways.

Program: Sign Replacement And Improvement

Date of Program Methodology: 12/31/2014

What is the justification for this program? [Check all that apply]

Other-Specifically called out in 23 U.S.C.148(a)(6)

What is the funding approach for this program? [Check one]

Competes with all projects

What data types were used in the program methodology? [Check all that apply]

Crashes	Exposure	Roadway
		Other-cycle of sign improvements based on

What project identification methodology was used for this program? [Check all that apply]

Other-cycle of sign upgrades
Other-on secondary roads, it is systemwide per district

Are local roads (non-state owned and operated) included or addressed in this program?

No

Are local road projects identified using the same methodology as state roads?

Yes

Describe the methodology used to identify local road projects as part of this program.

How are projects under this program advanced for implementation?

Other-secondary roadways are systemwide and done by district
Other-interstates and principal arterials are selected by State Sign Engineer based on a cycle of replacements

Select the processes used to prioritize projects for implementation. For the methods selected, indicate the relative importance of each process in project prioritization. Enter either the weights or numerical rankings. If weights are entered, the sum must equal 100. If ranks are entered, indicate ties by giving both processes the same rank and skip the next highest rank (as an example: 1, 2, 2, 4).

Available funding : 1

Other-readiness : 2

Enter additional comments here to clarify your response for this question or add supporting information.

What percentage of HSIP funds address systemic improvements?

0

HSIP funds are used to address which of the following systemic improvements? Please check all that apply.

Enter additional comments here to clarify your response for this question or add supporting information.

During this Federal Fiscal Year, we do not have any systemic projects that were obligated. We have system-wide projects (such as retroreflective sign upgrades along secondary roadways and guide and traffic sign upgrades) but these are not systemic projects. In the past, we have used the systemic approach for cable barrier installations (based on certain median widths, grades and roadway volumes), flashing yellow arrow installations (based on lane configuration and signal phasing) and stop controlled intersection sign/marking upgrades (based on intersection geometry). However, we do not have any systemic projects for this year. We have been trying

to work with FHWA on a low cost short-term systemic approach but have met resistance regarding right-of-way issues. We were informed we cannot implement low cost short-term systemic countermeasures (like signs and pavement markings) without verification of all work being done within public layout. If no layout plans are available then survey would be required. Requiring survey, rather than certification from the road owner, means that the low cost systemic projects will no longer be low cost nor short term in nature. MassDOT had drafted a white paper explaining a process that could be used so that these types of systemic projects could be implemented. However, this approach was rejected. We are still looking for ways around this issue so that we can implement systemic projects in the future because, according to FHWA, "using the systemic approach agencies can better meet the requirements for the Highway Safety Improvement Program, identifying highway safety improvement projects on the basis of both crash experience and crash potential to reduce fatal and serious injury crashes on all public roads."

What process is used to identify potential countermeasures? [Check all that apply]

Engineering Study
Road Safety Assessment
Crash data analysis
Data-driven safety analysis tools (HSM, CMF Clearinghouse, SafetyAnalyst, usRAP)
Stakeholder input

Enter additional comments here to clarify your response for this question or add supporting information.

Does the State HSIP consider connected vehicles and ITS technologies?

Yes

Describe how the State HSIP considers connected vehicles and ITS technologies.

MassDOT definitely considers vehicle to infrastructure technologies with regards to safety. However, no HSIP funds were spent on the V2I technologies during this Federal Fiscal Year. It should be noted that MassDOT has been working with WAZE to install beacons in our tunnel system. As drivers become more reliant on their GPS/smart phones for directions, there are more crashes occurring in our tunnels where GPS connectivity is lost and drivers are confused. The beacon technology will provide for an open platform seamless connection to navigation systems. While this is V2I technology, the beacons are being installed with no Federal dollars. WAZE is also being used as a pilot in our highway operations center as a means to improve incident response time. Initial results are proving this to be the case. MassDOT has been implementing smart work zone technologies that are designed to provide real time feedback to drivers regarding travel times and congestion information, incidents, temporary closures and other information that will enhance the safety of road users and workers. We continue to look forward to other technologies that will enhance safety and reduce fatalities and injuries on the public roadways.

Does the State use the Highway Safety Manual to support HSIP efforts?

Yes

Please describe how the State uses the HSM to support HSIP efforts.

MassDOT has successfully used the Highway Safety Manual when evaluating design alternatives and design exceptions for HSIP projects. HSM methodologies have been used by MassDOT to evaluate HSIP projects and programs (conversion of signalized intersection to roundabouts, cable barrier installation, installation of traffic signals and traffic signal upgrades). With the assistance from consultants, MassDOT has developed SPFs for 4 intersection types (3- and 4-legged signalized intersections and 3- and 4-legged stop controlled intersections) as well as certain segments types for the various functional classifications. While MassDOT intends to broaden the use of the Highway Safety Manual, we are also working with our Traffic Counting Section and the MassDOT Planning office to improve the traffic volume data so that network screening can be performed and SPFs can more easily be refined.

Have any program methodology practices used to implement the HSIP changed since the last reporting period?

No

Are there any other aspects of the HSIP methodology on which the State would like to elaborate?

No

Project Implementation

Funds Programmed

Reporting period for HSIP funding.

Federal Fiscal Year

Enter additional comments here to clarify your response for this question or add supporting information.

Enter the programmed and obligated funding for each applicable funding category.

FUNDING CATEGORY	PROGRAMMED	OBLIGATED	% OBLIGATED/PROGRAMMED
HSIP (23 U.S.C. 148)	$30,888,696	$26,077,237	84.42%
HRRR Special Rule (23 U.S.C. 148(g)(1))	$3,381,466	$7,252,948	214.49%
Penalty Funds (23 U.S.C. 154)	$0	$0	0%
Penalty Funds (23 U.S.C. 164)	$0	$0	0%
RHCP (for HSIP purposes) (23 U.S.C. 130(e)(2))	$0	$0	0%
Other Federal-aid Funds (i.e. STBG, NHPP)	$53,612,490	$64,886,509	121.03%
State and Local Funds	$17,210,918	$19,961,835	115.98%
Totals	$105,093,570	$118,178,529	112.45%

Enter additional comments here to clarify your response for this question or add supporting information.

The above report of obligated funds was based on a run from FHWA's Fiscal Management Information System for activity between 10/1/2015 - 9/30/2016 and does not reflect the corrections that were made subsequent to the time period. As an example, a project was inadvertently initially obligated as HRRR but should have been general HSIP and other projects were inadvertently initially obligated as HSIP but were subsequently corrected to HRRR. These modifications were not reflected in the query of 2016 projects with activity during 2016.

How much funding is programmed to local (non-state owned and operated) or tribal safety projects?

30%

How much funding is obligated to local or tribal safety projects?

33%

Enter additional comments here to clarify your response for this question or add supporting information.

Projects are selected based on HSIP eligibility and readiness regardless of roadway jurisdiction. Of the $36,582,362 Federal HSIP funds programmed on the STIP, $10,002,567 of that was for locally owned roadway projects (including all 3 of the High Risk Rural Road projects). It should be noted that $3,438,500 of the programed Federal HSIP funds was for a placeholder for SHSP strategies on programs or projects that come up and could be allocated on any roadway as needed and was not included in the percentage calculation. Therefore, it is the locally programmed projects using Federal HSIP funds ($10,002,567) divided by $33,143,862 ($36,582,362 - $3,438,500) which equals 30%. Of the $31,056,509 obligated Federal HSIP funds, $10,152,899 were obligated for projects under local jurisdiction.

How much funding is programmed to non-infrastructure safety projects?

5%

How much funding is obligated to non-infrastructure safety projects?

2%

Enter additional comments here to clarify your response for this question or add supporting information.

Typically, MassDOT maintains a line item placeholder on the STIP for "Various safety strategies to be determined based on the 2013 SHSP and updates". This line item is typically used for projects/programs that are shorter in duration to plan and implement (non-infrastructure, low cost systemic, etc.). The line item included $3,438,500 of Federal HSIP funds. It was conservatively estimated that half of the funds in that line item would go towards non-infrastructure projects/programs. With the passing of FAST Act, the use of HSIP funds for non-infrastructure was much more restrictive and therefore, only a small portion of Federal HSIP funds was obligated on non-infrastructure projects. There was $331,687.22 obligated towards a contract extension for technical assistance with the HSIP and $153,000 obligated towards privacy screens and work zone related safety materials. Therefore, $484,687 out of $31,056,509 (1.6%) was obligated on non-infrastructure projects.

How much funding was transferred in to the HSIP from other core program areas during the reporting period under 23 U.S.C. 126?

0%

How much funding was transferred out of the HSIP to other core program areas during the reporting period under 23 U.S.C. 126?

0%

Enter additional comments here to clarify your response for this question or add supporting information.

Discuss impediments to obligating HSIP funds and plans to overcome this challenge in the future.

There are two main impediments to obligating HSIP funds. One is project readiness. If a programmed project is not able to advertise (for any number of reasons), it is very difficult to just swap in another HSIP project because there are limited projects that already designed and ready to advertise. This could be because projects are rarely designed unless they are already programmed on the STIP and even then, they are designed and reviewed to meet the advertising date. So if a programmed project is not able to advertise, we are often left with a hole to try and fill in a replacement project.

The second major impediment to obligating HSIP funds is that we cannot develop low cost-short term systemic projects here in Massachusetts. We are not able to have local communities self-certify that project work all occurs within the public way. This must only be done with layout plans or survey. Therefore, any simple pavement marking and/or signage project (typically the low cost/short term type systemic projects) must include a survey which adds time and expense and precludes the short term / low cost projects.

Based on the above two factors, it sometimes makes it challenging for MassDOT to obligate funds. This is especially true in cases in which we have short notice such as for High Risk Rural Roads Projects when we are informed 18 months before they must be obligated that we fall within the rule and must obligate a certain amount of money. It is too short of a time frame to develop a project (including ROW, environmental processes, etc.) so we struggle with what can be done.

Does the State want to elaborate on any other aspects of it's progress in implementing HSIP projects?

No

General Listing of Projects

List the projects obligated using HSIP funds for the reporting period.

													RELATIONSHIP TO SHSP	
PROJECT NAME	**IMPROVEMENT CATEGORY**	**SUBCATEGORY**	**OUTPUTS**	**OUTPUT TYPE**	**HSIP PROJECT COST($)**	**TOTAL PROJECT COST($)**	**FUNDING CATEGORY**	**FUNCTIONAL CLASSIFICATION**	**AADT**	**SPEED**	**OWNERSHIP**	**METHOD FOR SITE SELECTION**	**EMPHASIS AREA**	**STRATEGY**
(607246) ERVING-INTERSECTION IMPROVEMENTS AT ROUTE 2 & 2A	Intersection geometry	Intersection geometrics - modify skew angle	2	Intersections	$59389	$551584.2	HSIP (23 U.S.C. 148)	Rural Principal Arterial - Other	8,863	50	State Highway Agency	Spot	Intersections	Incorporate safety elements into intersection design and maintainence.
(606620) Raynham to Bolton-Guide & Traffic Sign Replacement on I-495	Roadway signs and traffic control	Roadway signs (including post) - new or updated	50.688	Miles	$1828608	$7138686	HSIP (23 U.S.C. 148)	Urban Principal Arterial - Interstate	105,810	65	State Highway Agency	Spot	Older Drivers	Incorporate safety elements into roadway design and maintainence.
(608033) Barnstable - Lighting & Landscaping off the at the Mid-Cape Highway (Route 6) Eastbound Exit Ramp & Route 149	Lighting	Site lighting - interchange	1	Interchanges	$447643	$459905.6	HSIP (23 U.S.C. 148)	Urban Principal Arterial - Other Freeways and Expressways	12,350	35	State Highway Agency	Spot	Roadway Departure	Incorporate safety elements into roadway design and maintainence.
(607755) Weymouth - Intersection and Signal Improvements at 2 Locations: SR 53 (Washington Street) at Mutton Lane & Pleasant Street	Intersection geometry	Auxiliary lanes - add two-way left-turn lane	2	Intersections	$1053342.76	$1101707	HSIP (23 U.S.C. 148)	Urban Minor Arterial	31,146	35	State Highway Agency	Spot	Intersections	Incorporate safety elements into intersection design and maintainence.
(605385) Springfield - Signal and Intersection Improvements at Roosevelt Avenue and Island Pond Road, Roosevelt Avenue and Alden Street	Intersection geometry	Intersection geometrics - modify skew angle	1	Intersections	$1491489	$2458045	HSIP (23 U.S.C. 148)	Urban Principal Arterial - Other	16,600	30	Town or Township Highway Agency	Spot	Intersections	Incorporate safety elements into intersection design and maintainence.
(607735) HSI-002S(935)X South Hadley - Signal and Intersection Improvements at Route 202(Granby Road) and Route 33(Lyman Street)	Intersection geometry	Auxiliary lanes - add auxiliary through lane	1	Intersections	$955333.04	$1061481.16	HSIP (23 U.S.C. 148)	Urban Principal Arterial - Other	36,211	40	State Highway Agency	Spot	Intersections	Incorporate safety elements into intersection design and maintainence.
(608169) HSI-002S(922)X Dudley - Sign and Pavement Marking Installation and Upgrades and related work on Dresser Hill Road (Route 31)	Roadway signs and traffic control	Curve-related warning signs and flashers	4.1	Miles	$458855.89	$50983988	HRRR Special Rule (23 U.S.C. 148(g)(1))	Rural Major Collector	2,900	40	Town or Township Highway Agency	Spot	Lane Departure	Incorporate safety elements into roadway design and maintainence.
(606207) CM/HSI/TAP-002S(926)X Spencer - Rehabiliation on Route 9 (Main Street) from High Street to Grove Street	Intersection geometry	Auxiliary lanes - add left-turn lane	2	Intersections	$957506.94	$3122905	HSIP (23 U.S.C. 148)	Rural Major Collector	20,515	30	Town or Township Highway Agency	Spot	Intersections	Incorporate safety elements into intersection design and maintainence.

													RELATIONSHIP TO SHSP	
PROJECT NAME	**IMPROVEMENT CATEGORY**	**SUBCATEGORY**	**OUTPUTS**	**OUTPUT TYPE**	**HSIP PROJECT COST($)**	**TOTAL PROJECT COST($)**	**FUNDING CATEGORY**	**FUNCTIONAL CLASSIFICATION**	**AADT**	**SPEED**	**OWNERSHIP**	**METHOD FOR SITE SELECTION**	**EMPHASIS AREA**	**STRATEGY**
(606910) HSI/CM/STP/TAP-002S(943)X New Bedford - Corridor Improvements and Related Work on Coggeshall Street, from Purchase Street to Mitchell Avenue	Intersection geometry	Auxiliary lanes - add left-turn lane	0.66	Miles	$763680	$3847368.1	HSIP (23 U.S.C. 148)	Urban Principal Arterial - Other	8,271	30	State Highway Agency	Spot	Intersections	Incorporate safety elements into intersection design and maintainence.
(608168) HSI-002S(948)X Douglas - Resurfacing and Related Work on Webster Street (Route 16), from T.L. (MM 2.8) to Main street (MM 6.9)	Roadway delineation	Improve retroreflectivity	4.1	Miles	$2880378	$3200420.2	HRRR Special Rule (23 U.S.C. 148(g)(1))	Rural Major Collector	5,915	45	Town or Township Highway Agency	Spot	Roadway Departure	Incorporate safety elements into roadway design and maintainence.
(607900) HSI/CM-002S(927)X -Pittsfield-Traffic signal and intersection improvements at Center street and West Housatonic street (Route 20).	Intersection geometry	Intersection geometrics - modify intersection corner radius	1	Intersections	$928971.7	$2372226.15	HSIP (23 U.S.C. 148)	Urban Minor Arterial	15,329	30	Town or Township Highway Agency	Spot	Roadway Departure	Incorporate safety elements into roadway design and maintainence.
(606118) New Bedford - Reconstruction of Route 18 (JFK HIGHWAY), from Cove street to Griffin Court (PHASE II).	Roadway	Roadway - other	6	Intersections	$298804.5	$9157334.25	HSIP (23 U.S.C. 148)	Urban Principal Arterial - Other	29,985	45	Town or Township Highway Agency	Spot	Pedestrians	Integrate pedestrian safety activities with other plans.
(607176) HSI-002S(963)X;NHP(NHS)-002S(963)X;STP(TE)-002S(963)X;STP-002S(963)X Shrewsbury-Northborough-Westborough-Resurfacing and related work on Route 9.	Roadway	Roadway - other	6.711	Miles	$362192.97	$12404615.7	HSIP (23 U.S.C. 148)	Rural Principal Arterial - Other Freeways and Expressways	50,494	55	State Highway Agency	Spot	Roadway Departure	Incorporate safety elements into roadway design and maintainence.
(604699) HSI-002S(959);CM-002S(959);STP-002S(959) Sterling-Intersection improvements at Route 12 and Chocksett road.	Roadway	Roadway narrowing (road diet, roadway reconfiguration)	1	Intersections	$470920.86	$4332104.5	HSIP (23 U.S.C. 148)	Rural Major Collector	20,300	55	State Highway Agency	Spot	Lane Departure	Incorporate safety elements into roadway design and maintainence.
(608170) HSI-002S(925)X Sturbridge-sign and pavement marking installation and upgrades,limited roadway improvements and related work on Brookfield road (Route148),from I-90 to Brookfield T.L.	Roadway delineation	Improve retroreflectivity	1.94	Miles	$673138.13	$747931.25	HRRR Special Rule (23 U.S.C. 148(g)(1))	Rural Major Collector	7,723	50	Town or Township Highway Agency	Spot	Lane Departure	Incorporate safety elements into roadway design and maintainence.

													RELATIONSHIP TO SHSP	
PROJECT NAME	**IMPROVEMENT CATEGORY**	**SUBCATEGORY**	**OUTPUTS**	**OUTPUT TYPE**	**HSIP PROJECT COST($)**	**TOTAL PROJECT COST($)**	**FUNDING CATEGORY**	**FUNCTIONAL CLASSIFICATION**	**AADT**	**SPEED**	**OWNERSHIP**	**METHOD FOR SITE SELECTION**	**EMPHASIS AREA**	**STRATEGY**
(604864) HSI/CM-002S(941)X Westborough-Intersection and Signal Improvements at Route 9 and Lyman Street	Intersection geometry	Auxiliary lanes - add auxiliary through lane	1	Intersections	$3212764.49	$7681882.5	HSIP (23 U.S.C. 148)	Urban Principal Arterial - Other	60,700	55	State Highway Agency	Spot	Intersections	Incorporate safety elements into intersection design and maintainence.
(607539) HSI-002S(961)X Shelburne - Intersection Improvements at Route 2 and Colrain/Shelburne Road	Roadside	Drainage improvements	0.383	Miles	$1216429.96	$1351588.85	HSIP (23 U.S.C. 148)	Rural Principal Arterial - Other	15,253	50	State Highway Agency	Spot	Intersections	Incorporate safety elements into intersection design and maintainence.
(607495) HSI -002S-(972)X -District 4 & 5 - Retroreflective Sign Upgrade on Secondary Roads	Roadway signs and traffic control	Roadway signs (including post) - new or updated	0	Miles	$945208	$1050168.63	HSIP (23 U.S.C. 148)	Urban Minor Arterial	0	0	State Highway Agency	Systemic	Older Drivers	Incorporate safety elements into roadway design and maintainence.
(607409) Lexington - Reconstruction on Massachusetts Avenue, from Marrett Road to Pleasant Street	Intersection traffic control	Modify traffic signal timing - general retiming	3	Intersections	$2622423.83	$3848030.96	HSIP (23 U.S.C. 148)	Urban Principal Arterial - Other	20,370	35	State Highway Agency	Spot	Intersections	Incorporate safety elements into intersection design and maintainence.
(607753) HSI-002S(954)X -Barnstable - Intersection and Signal Improvements at Route 28 (Falmouth Road & Strawberry Hill Road)	Intersection traffic control	Modify traffic signal timing - left-turn phasing (permissive to protected-only)	1	Intersections	$879601.47	$977334.96	HSIP (23 U.S.C. 148)	Urban Principal Arterial - Other	18,800	45	State Highway Agency	Spot	Intersections	Incorporate safety elements into intersection design and maintainence.
(608407) Lawrence - Traffic Signal and ADA Improvements on Common Street and Lowell Street	Intersection traffic control	Modify traffic signal timing - signal coordination	1	Intersections	$875340	$2371197	HSIP (23 U.S.C. 148)	Urban Minor Arterial	5,280	30	Town or Township Highway Agency	Spot	Intersections	Incorporate safety elements into intersection design and maintainence.
(607918) HSI-002S(974)X District 5 - Guide & Traffic Sign Replacement & Related Work on a Section of US Route 6 (Mid-Cape Highway)	Roadway signs and traffic control	Roadway signs (including post) - new or updated	33.89	Miles	$1784174.4	$2002898	HSIP (23 U.S.C. 148)	Urban Principal Arterial - Other	56,130	55	State Highway Agency	Spot	Older Drivers	Incorporate safety elements into roadway design and maintainence.
(606036) Brockton - Signal & Intersection Improvements at Route 123 /(Belmont Street/Linwood Street/Lorraine Avenue))	Intersection geometry	Intersection geometrics - realignment to align offset cross streets	1	Intersections	$506895.3	$3468003.6	HSIP (23 U.S.C. 148)	Urban Principal Arterial - Other	24,500	35	State Highway Agency	Spot	Intersections	Incorporate safety elements into intersection design and maintainence.
(601630) Weymouth-Abington - Reconstruction & Widening on Route 18 (Main Street) from Highland Place to Route 139 (4.0 miles) includes replacing W-32-013,	Roadway	Roadway widening - add lane(s) along segment	4.31	Miles	$926325	$56746003	HSIP (23 U.S.C. 148)	Urban Principal Arterial - Other	39,730	45	State Highway Agency	Spot	Roadway Departure	Incorporate safety elements into roadway design and maintainence.

													RELATIONSHIP TO SHSP	
PROJECT NAME	**IMPROVEMENT CATEGORY**	**SUBCATEGORY**	**OUTPUTS**	**OUTPUT TYPE**	**HSIP PROJECT COST($)**	**TOTAL PROJECT COST($)**	**FUNDING CATEGORY**	**FUNCTIONAL CLASSIFICATION**	**AADT**	**SPEED**	**OWNERSHIP**	**METHOD FOR SITE SELECTION**	**EMPHASIS AREA**	**STRATEGY**
Route 18 over the Old Colony Railroad (MBTA)														

Enter additional comments here to clarify your response for this question or add supporting information.

Please note, any project listed with an ADT of 0 denotes a project with multiple locations ((607495) HSI -002S-(972)X -District 4 & 5 - Retroreflective Sign Upgrade on Secondary Roads).

Please note, all ADTs for intersections are the major roadway + the minor roadway.

Please note, all speed limits are posted speeds or default speed limits (if none are posted)

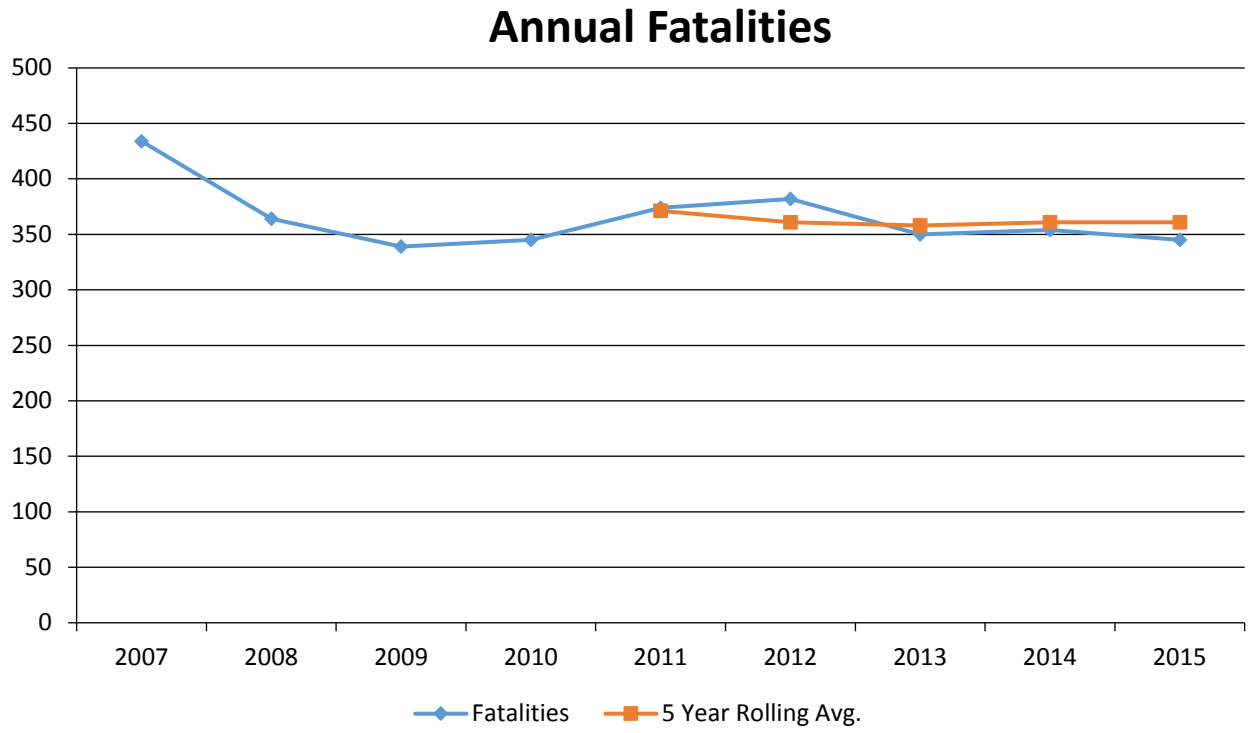
Please note, Total costs are the total Federal Participating Construction Costs

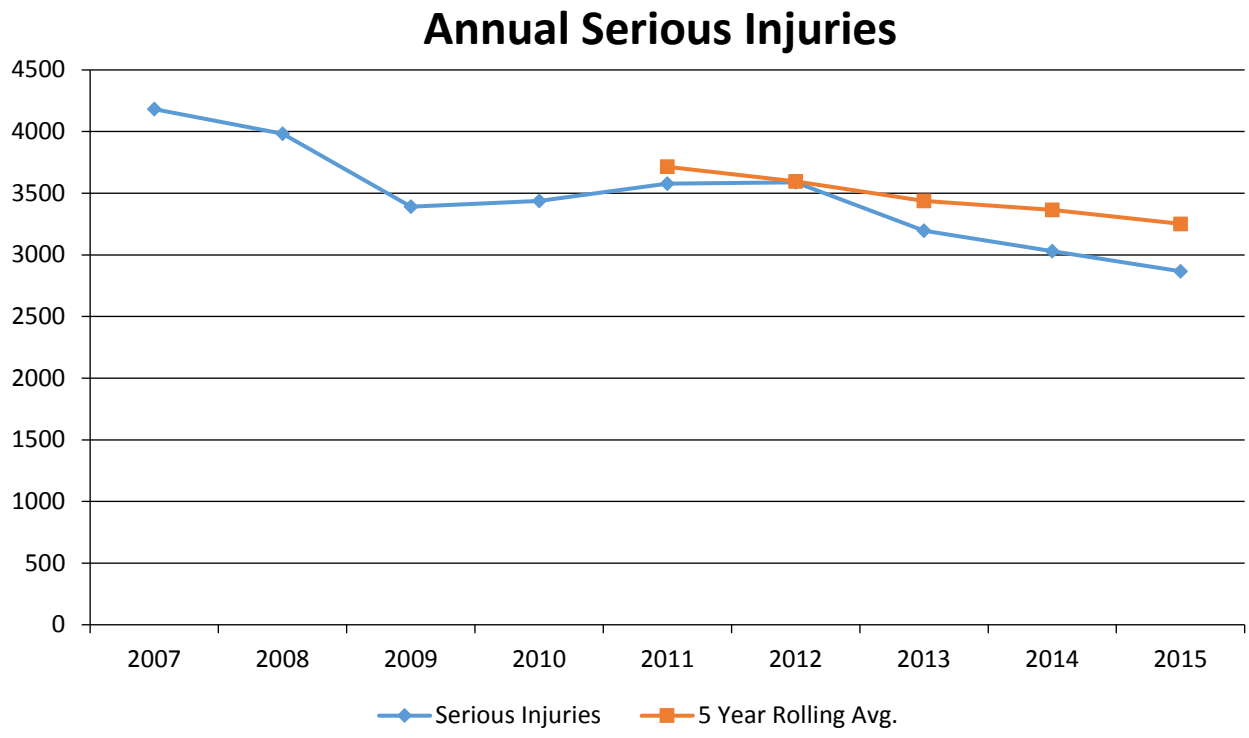
Safety Performance

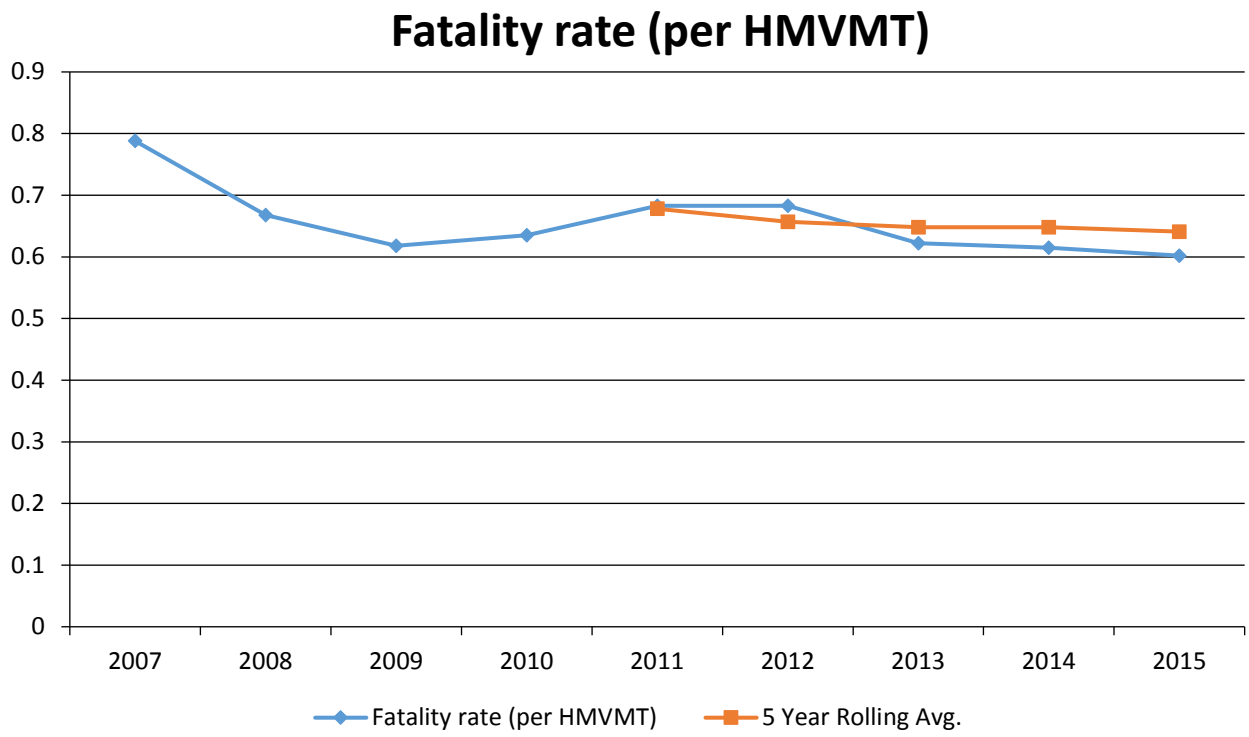
General Highway Safety Trends

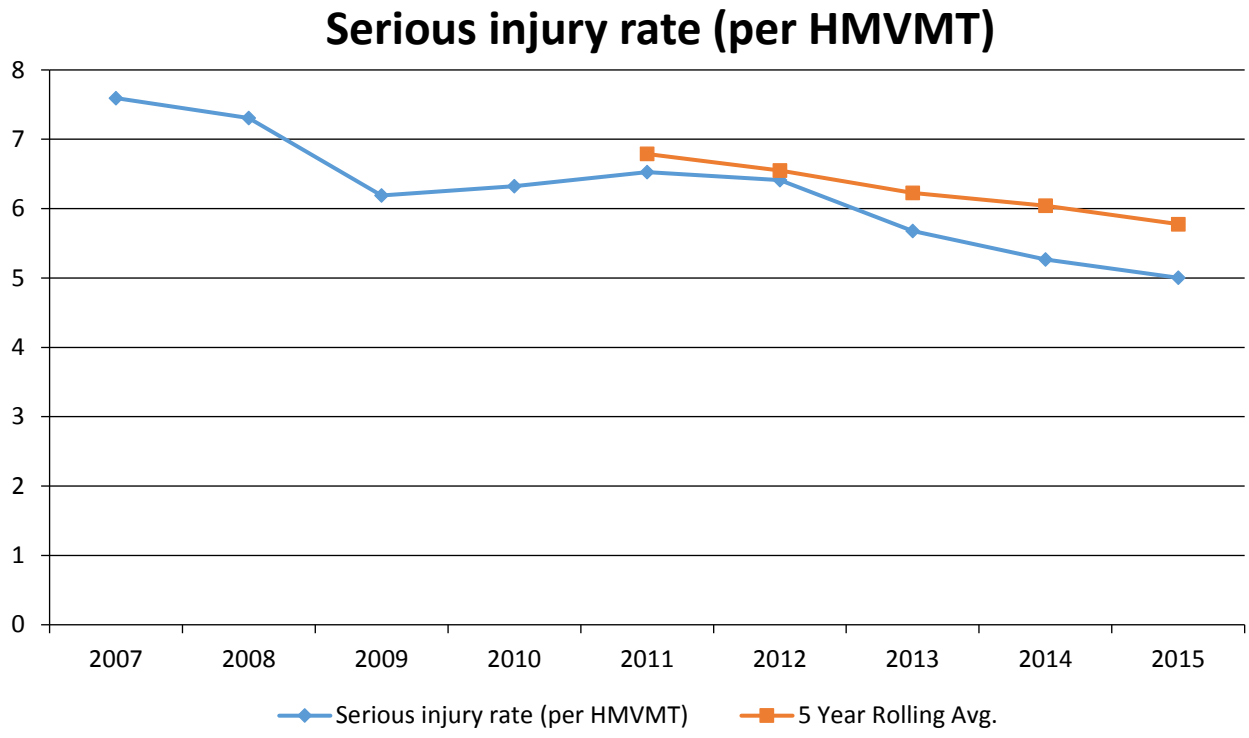
Present data showing the general highway safety trends in the State for the past five years.

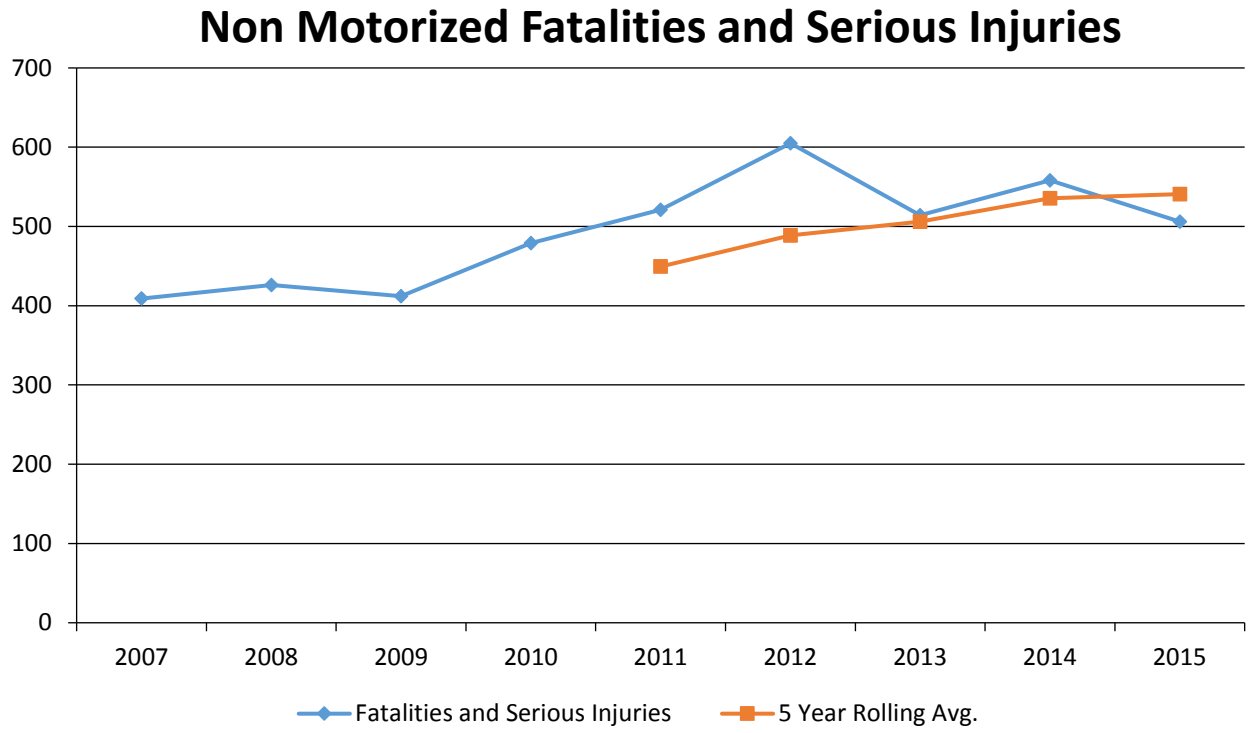
PERFORMANCE MEASURES	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fatalities	434	364	339	345	374	382	350	354	345
Serious Injuries	4,182	3,983	3,392	3,437	3,577	3,587	3,197	3,031	2,867
Fatality rate (per HMVMT)	0.788	0.668	0.618	0.635	0.683	0.683	0.622	0.615	0.602
Serious injury rate (per HMVMT)	7.594	7.308	6.188	6.322	6.528	6.412	5.677	5.267	5.003
Number non-motorized fatalities	78	94	55	85	81	102	94	88	97
Number of non-motorized serious injuries	331	332	357	394	440	503	420	470	409


Annual Fatalities
500
450
400
350
300
250
200
150
100
50
0
2007
2008
2009
2010
2011
2012
2013
2014
2015
Fatalities
5 Year Rolling Avg.


Annual Serious Injuries
4500
4000
3500
3000
2500
2000
1500
1000
500
0
2007
2008
2009
2010
2011
2012
2013
2014
2015
Serious Injuries
5 Year Rolling Avg.


Fatality rate (per HMVMT)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
2007
2008
2009
2010
2011
2012
2013
2014
2015
Fatality rate (per HMVMT)
5 Year Rolling Avg.


Serious injury rate (per HMVMT)
8
7
6
5
4
3
2
1
0
2007
2008
2009
2010
2011
2012
2013
2014
2015
Serious injury rate (per HMVMT)
5 Year Rolling Avg.



Enter additional comments here to clarify your response for this question or add supporting information.

The serious injury data is based on the statewide Crash Database System (CDS). However, the 2015 data are not yet finalized. Duplicates have not yet been removed, a small number of reports could still be entered. However, the file is mostly complete so it was used. Also, the 2015 fatal data is based on the draft FARS data and will be updated when the final closeout is made available.

Describe fatality data source.

FARS

Enter additional comments here to clarify your response for this question or add supporting information.

We use FARS data. However, because of the significant differences between what is published on the FARS website (draft information) vs. the final FARS information, one may not be able to query the FARS website and obtain the same results as what we have used from the final FARS dataset (which we obtained from FARS unit).

To the maximum extent possible, present this data by functional classification and ownership.

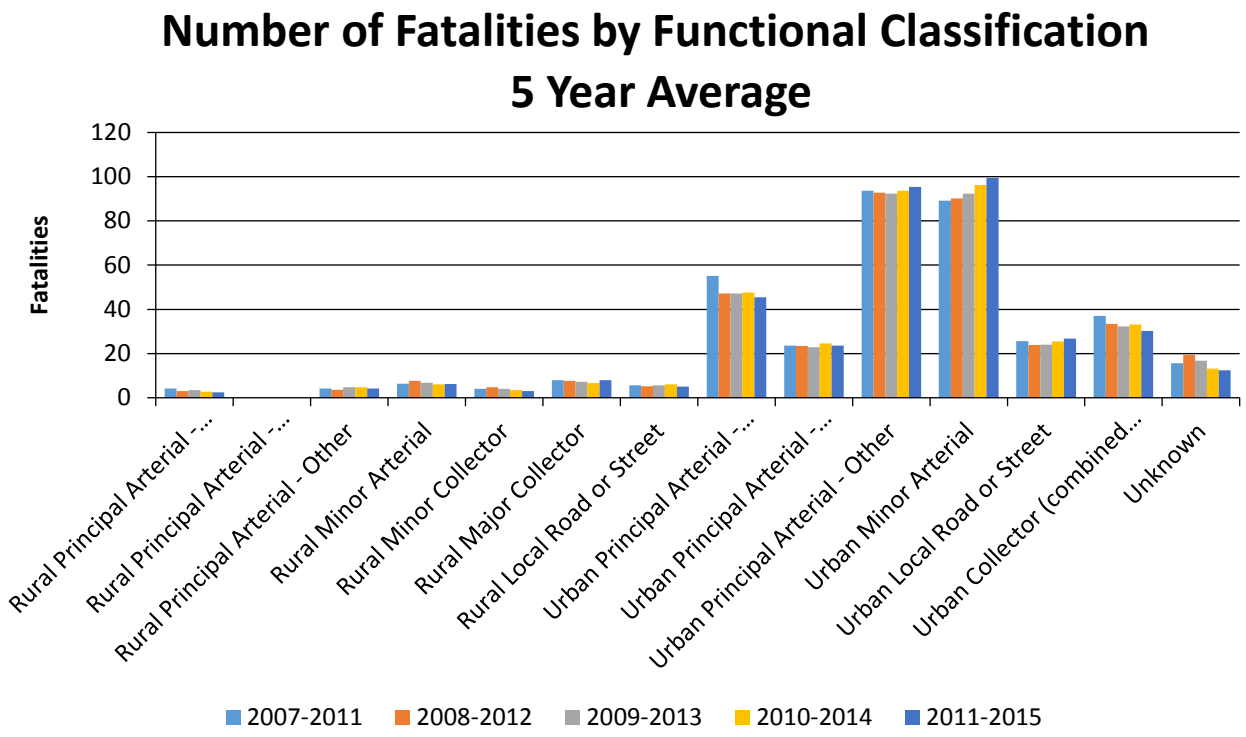
Year 2015

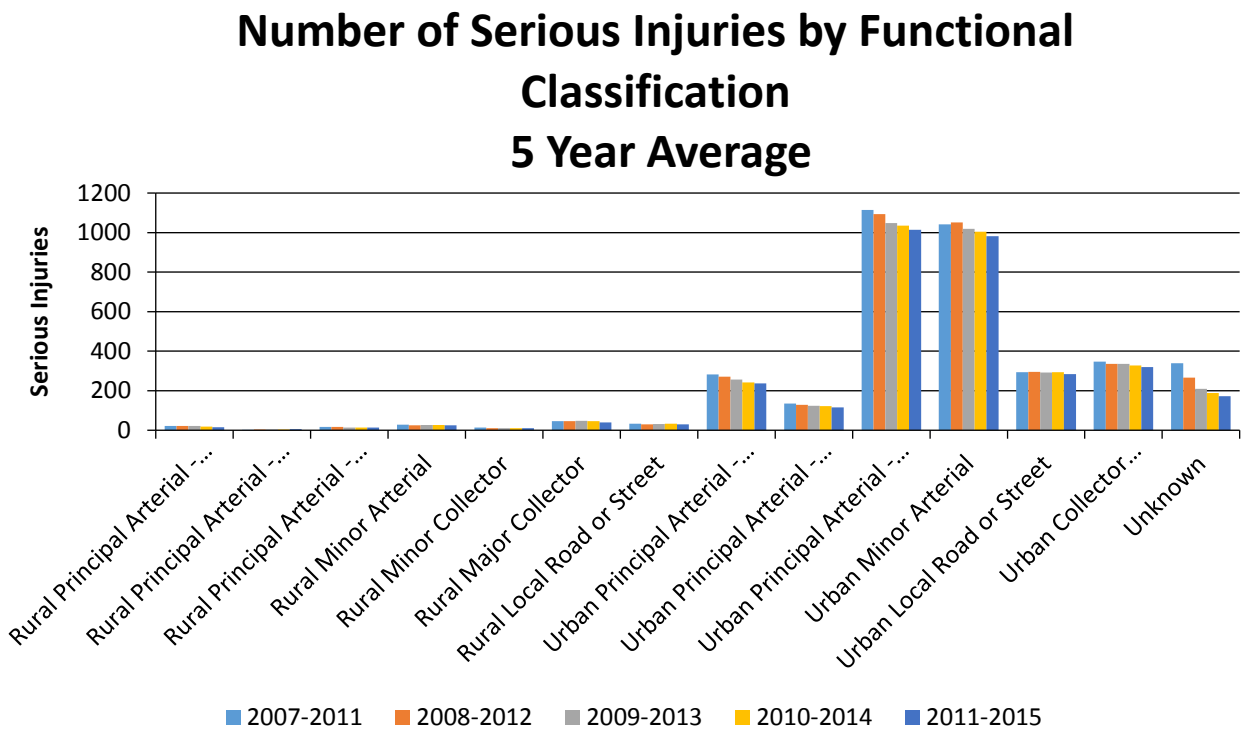
Functional Classification	Number of Fatalities (5-yr avg)	Number of Serious Injuries (5-yr avg)	Fatality Rate (per HMVMT) (5-yr avg)	Serious Injury Rate (per HMVMT) (5-yr avg)
Rural Principal Arterial - Interstate	2.4	15.2	0.29	1.85

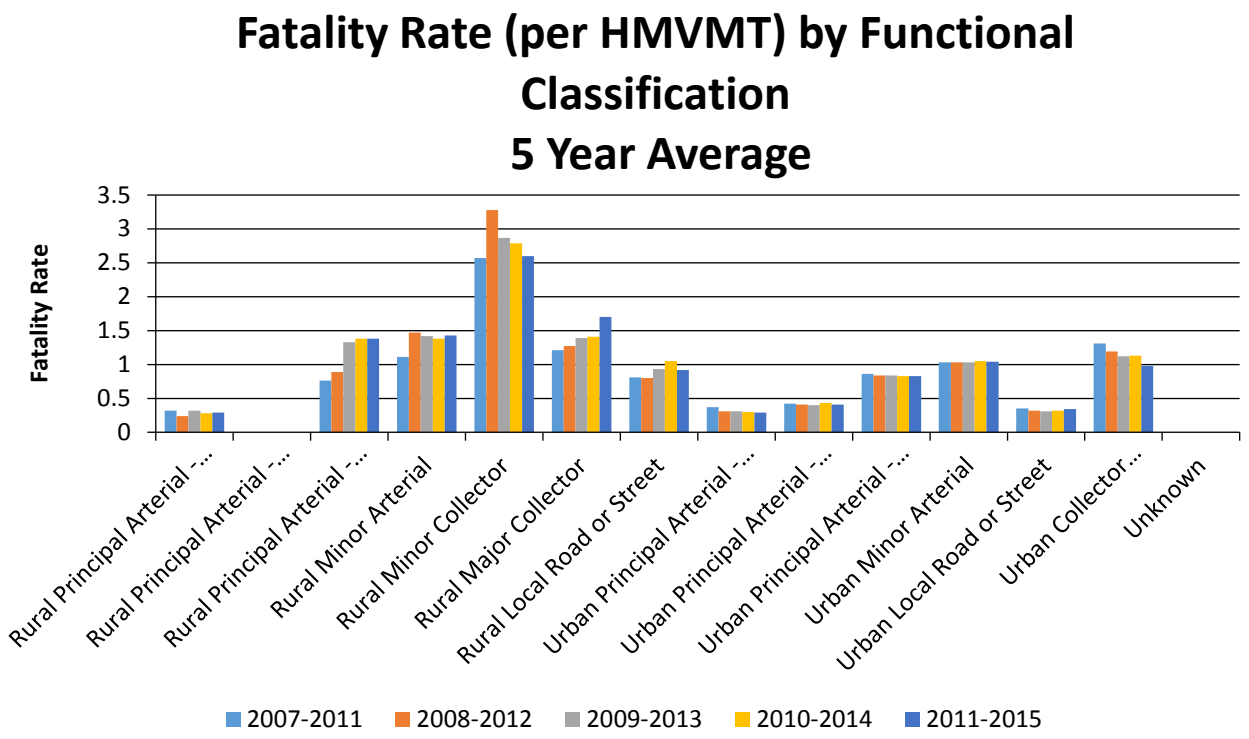
Functional Classification	Number of Fatalities (5-yr avg)	Number of Serious Injuries (5-yr avg)	Fatality Rate (per HMVMT) (5-yr avg)	Serious Injury Rate (per HMVMT) (5-yr avg)
Rural Principal Arterial - Other Freeways and Expressways	0	5	0	4.4
Rural Principal Arterial - Other	4.2	13	1.38	4.23
Rural Minor Arterial	6.2	25	1.43	5.79
Rural Minor Collector	3	10.2	2.6	8.8
Rural Major Collector	8	40	1.7	8.68
Rural Local Road or Street	5	29	0.92	5.21
Urban Principal Arterial - Interstate	45.4	237.6	0.29	1.49
Urban Principal Arterial - Other Freeways and Expressways	23.6	115.8	0.41	2
Urban Principal Arterial - Other	95.4	1,014.2	0.83	8.82
Urban Minor Arterial	99.4	981.8	1.04	10.36
Urban Minor Collector				
Urban Major Collector				
Urban Local Road or Street	26.8	284	0.34	3.61
Urban Collector (combined major + minor)	30.2	320.2	0.98	10.46
Unknown	12.4	172.4	0	0

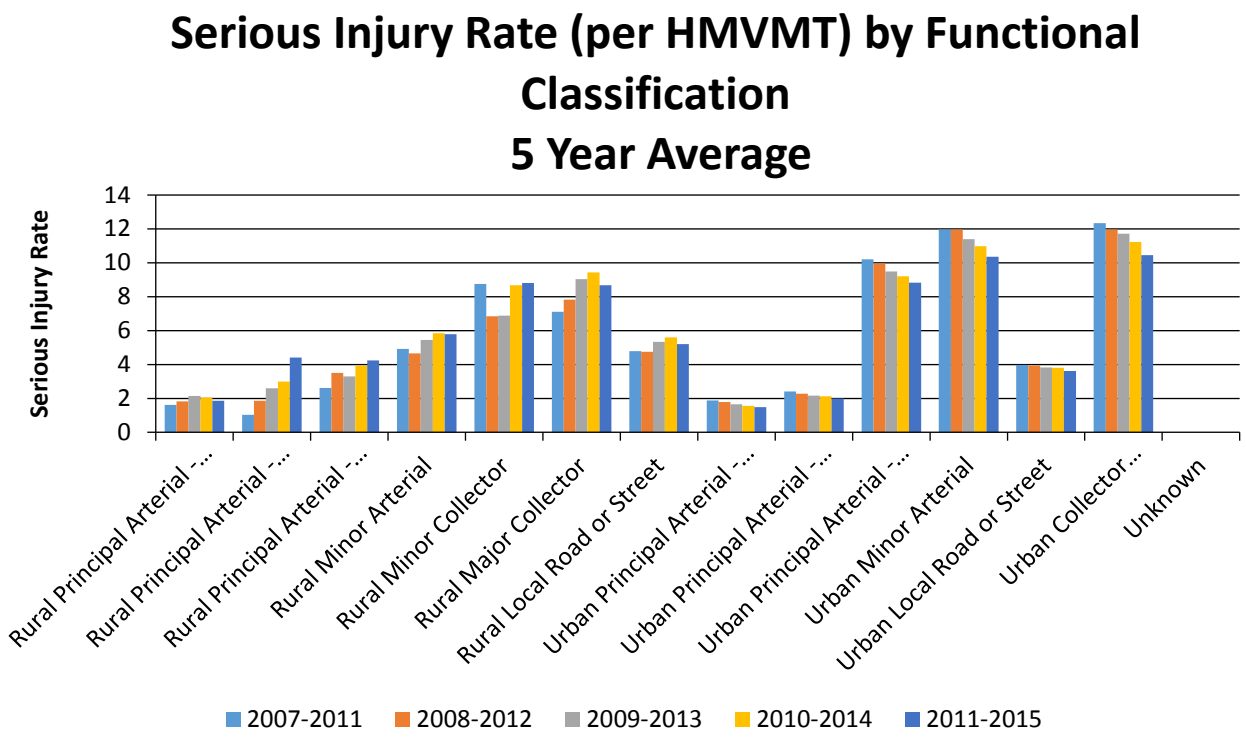
Year 2015

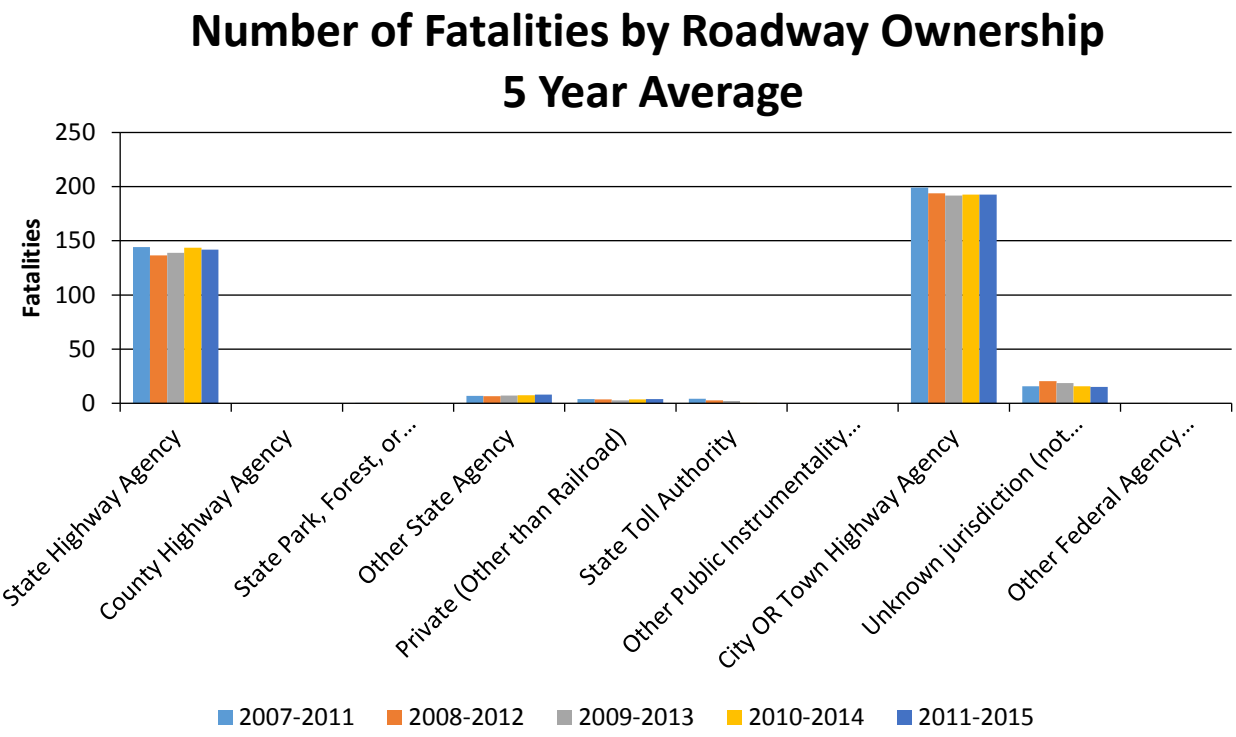
Roadways	Number of Fatalities (5-yr avg)	Number of Serious Injuries (5-yr avg)	Fatality Rate (per HMVMT) (5-yr avg)	Serious Injury Rate (per HMVMT) (5-yr avg)
State Highway Agency	142	918	0.46	2.95
County Highway Agency				
Town or Township Highway Agency				
City of Municipal Highway Agency				
State Park, Forest, or Reservation Agency	0.2	1	0.24	1.22
Local Park, Forest or Reservation Agency				
Other State Agency	8	71	0.9	7.98
Other Local Agency				
Private (Other than Railroad)	4	35.4	0.33	2.9
Railroad				
State Toll Authority				
Local Toll Authority				
Other Public Instrumentality (e.g. Airport, School, University)	0	0.6	0	4.57
Indian Tribe Nation				
City OR Town Highway Agency	192.6	2,038.6	0.84	8.95
Unknown jurisdiction (not geocoded)	15.2	197.6	0	0
Other Federal Agency (military, institutional, etc)				

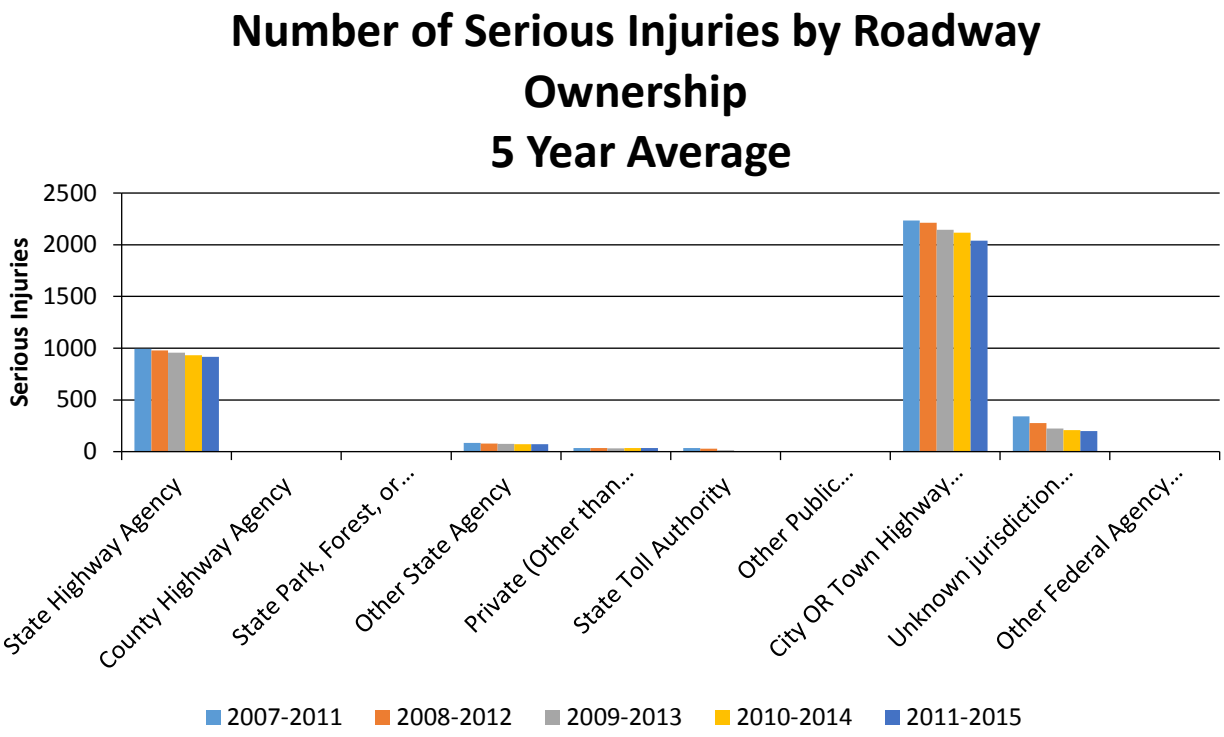

Number of Fatalities by Functional Classification
5 Year Average
Fatalities
120
100
80
60
40
20
0
Rural Principal Arterial -...
Rural Principal Arterial -...
Rural Principal Arterial - Other
Rural Minor Arterial
Rural Minor Collector
Rural Major Collector
Rural Local Road or Street
Urban Principal Arterial -...
Urban Principal Arterial -...
Urban Principal Arterial - Other
Urban Minor Arterial
Urban Local Road or Street
Urban Collector (combined...
Unknown
2007-2011
2008-2012
2009-2013
2010-2014
2011-2015

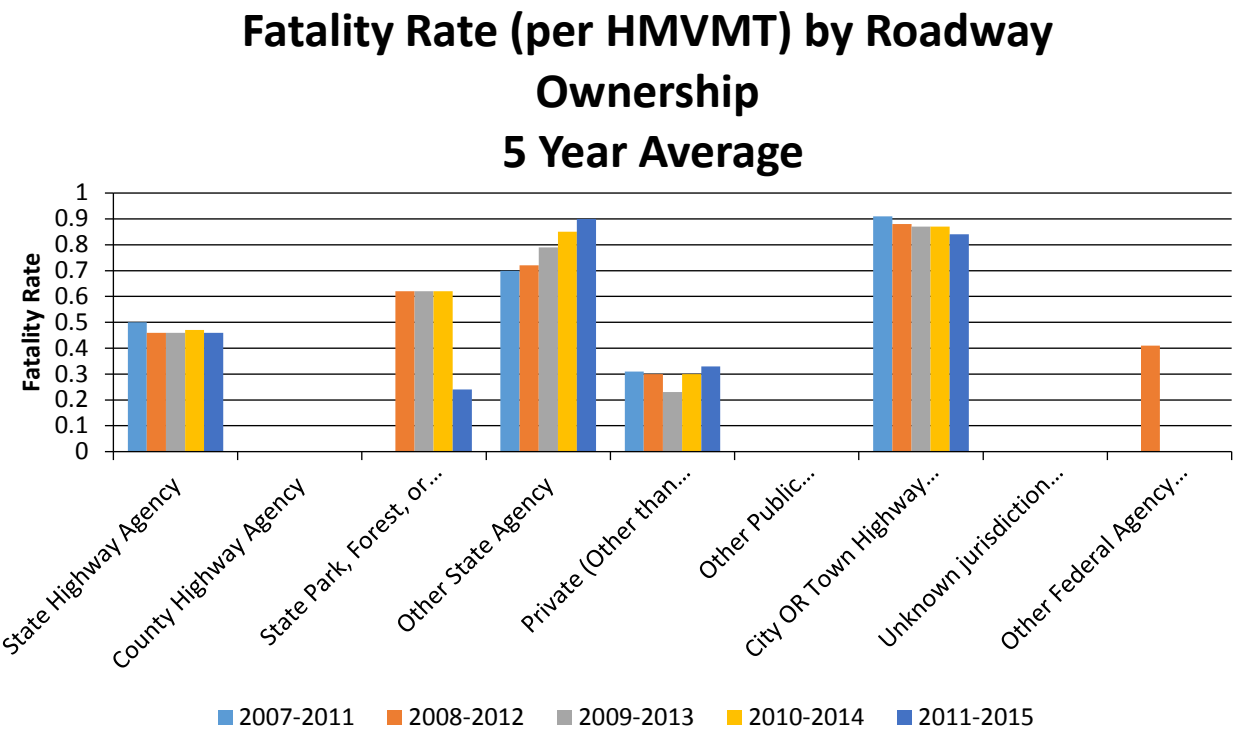

Number of Serious Injuries by Functional Classification
5 Year Average
Serious Injuries
1200
1000
800
600
400
200
0
Rural Principal Arterial -...
Rural Principal Arterial -...
Rural Principal Arterial -...
Rural Minor Arterial
Rural Minor Collector
Rural Major Collector
Rural Local Road or Street
Urban Principal Arterial -...
Urban Principal Arterial -...
Urban Principal Arterial -...
Urban Minor Arterial
Urban Local Road or Street
Urban Collector...
Unknown
2007-2011
2008-2012
2009-2013
2010-2014
2011-2015

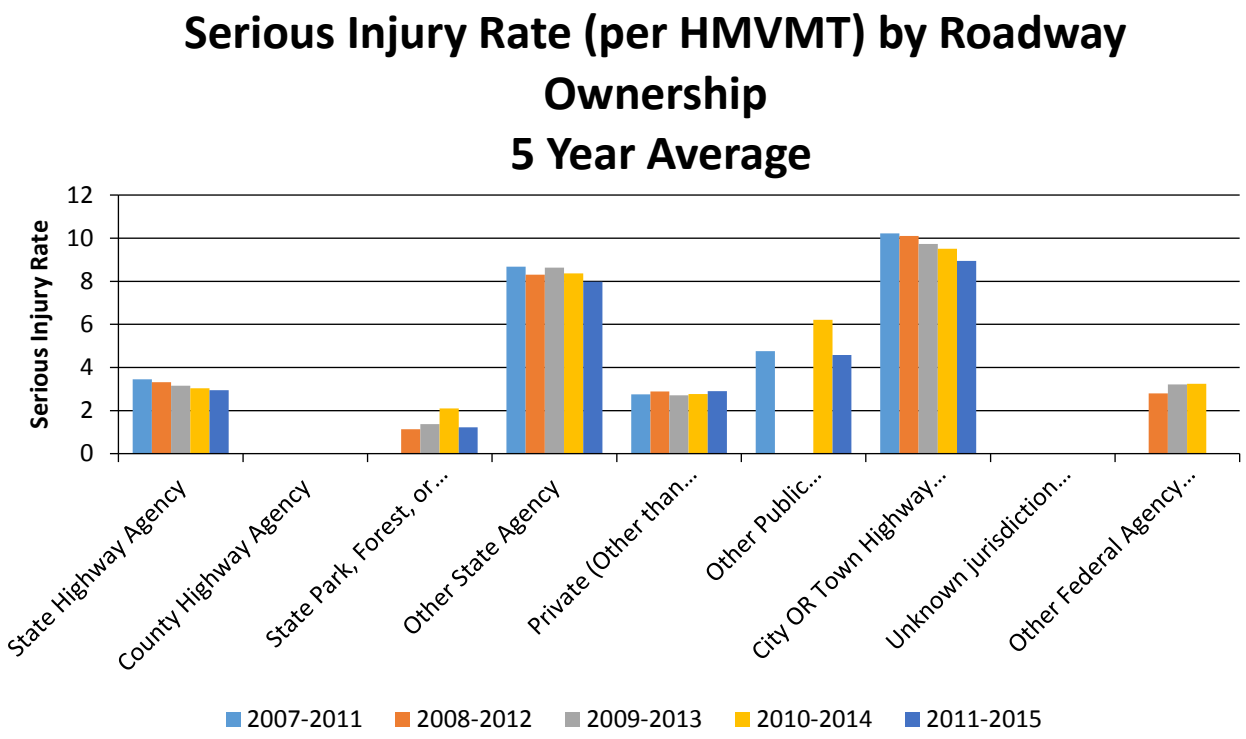

Fatality Rate (per HMVMT) by Functional Classification
5 Year Average
Fatality Rate
3.5
3
2.5
2
1.5
1
0.5
0
Rural Principal Arterial -...
Rural Principal Arterial -...
Rural Principal Arterial -...
Rural Minor Arterial
Rural Minor Collector
Rural Major Collector
Rural Local Road or Street
Urban Principal Arterial -...
Urban Principal Arterial -...
Urban Principal Arterial -...
Urban Minor Arterial
Urban Local Road or Street
Urban Collector...
Unknown
2007-2011
2008-2012
2009-2013
2010-2014
2011-2015


Serious Injury Rate (per HMVMT) by Functional Classification
5 Year Average
Serious Injury Rate
14
12
10
8
6
4
2
0
Rural Principal Arterial -...
Rural Principal Arterial -...
Rural Principal Arterial -...
Rural Minor Arterial
Rural Minor Collector
Rural Major Collector
Rural Local Road or Street
Urban Principal Arterial -...
Urban Principal Arterial -...
Urban Principal Arterial -...
Urban Minor Arterial
Urban Local Road or Street
Urban Collector...
Unknown
2007-2011
2008-2012
2009-2013
2010-2014
2011-2015


Number of Fatalities by Roadway Ownership
5 Year Average
Fatalities
250
200
150
100
50
0
State Highway Agency
County Highway Agency
State Park, Forest, or...
Other State Agency
Private (Other than Railroad)
State Toll Authority
Other Public Instrumentality...
City OR Town Highway Agency
Unknown jurisdiction (not...
Other Federal Agency...
2007-2011
2008-2012
2009-2013
2010-2014
2011-2015


Number of Serious Injuries by Roadway Ownership
5 Year Average
Serious Injuries
2500
2000
1500
1000
500
0
State Highway Agency
County Highway Agency
State Park, Forest, or...
Other State Agency
Private (Other than...
State Toll Authority
Other Public...
City OR Town Highway...
Unknown jurisdiction...
Other Federal Agency...
2007-2011
2008-2012
2009-2013
2010-2014
2011-2015


Fatality Rate (per HMVMT) by Roadway Ownership
5 Year Average
Fatality Rate
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
State Highway Agency
County Highway Agency
State Park, Forest, or...
Other State Agency
Private (Other than...
Other Public...
City OR Town Highway...
Unknown jurisdiction...
Other Federal Agency...
2007-2011
2008-2012
2009-2013
2010-2014
2011-2015



- **Enter additional comments here to clarify your response for this question or add supporting information.**

  Vehicle mile traveled data are taken from the Federal Highway Administration Office of Policy Information website https://www.fhwa.dot.gov/policyinformation/statistics/2007/vm2.cfm (link shown for 2007 but also used 2008-2015). This information was used for the VMTs for functional classification. The VMTs for jurisdiction were based on information provided by MassDOT Planning and is based on a brand new tool.
- The fatality data for functional classification came from FARS and the fatality data for jurisdiction was obtained from the Statewide Crash Database System (CDS). The serious injury data for functional classification and for jurisdiction was obtained from CDS.
- Prior to 2010, crash data for Rural Principal Arterial Other Freeways and Expressways were combined with the Rural Principal Arterial Other category because there was no distinction being made between these two categories in the volume data. For simplicity, numbers are being reported in the Rural Principal Arterial Other for 2007-2009.
- Although the crash data is separated by urban major and minor collector, the VMTs are not and therefore, the two categories were combined.
- Prior to 2009, the Massachusetts Turnpike Authority and MassHighway Department were separate entities. In 2009 they were consolidated into MassDOT and the jurisdiction reflects as such “State Highway Agency”
-

Are there any other aspects of the general highway safety trends on which the State would like to elaborate?

No

Safety Performance Targets

Calendar Year 2018 Targets *

Number of Fatalities 352.0

Describe the basis for established target, including how it supports SHSP goals.

FHWA guidance is to start with a trend line then consider external factors and planned implementation in order to set targets. Based on the trend line, the predicted number of fatalities for 2014-2018 yearly average would be 352.3 per year, down from 361 for 2011-2015 yearly average. There are certainly external factors, some specific to Massachusetts and others that are applicable nation-wide, that will impact the trend line (positively and negatively). Examples include: a recent State recreational marijuana law (in the process of implementation), a reduction in the prima facie speed limit law for thickly settled areas , anticipated changes in other roadway safety laws in the near future, increasing trend of distraction by all road users, advent of new vehicle-vehicle and vehicle-infrastructure safety-related technology with more common every-day use, and others. Meanwhile, MassDOT has been implementing strategies and countermeasures identified in the SHSP. An evaluation of specific HSIP-funded projects completed prior to 2013 indicated that fatal and injury crashes have been reduced by 36 percent compared to what was to be expected had the safety improvements not been implemented. While an evaluation of all HSIP projects is not yet possible, this shows that implementation of safety countermeasures does have a significant impact on the number of fatalities. As the countermeasures evolve and become more efficient, effective and better integrated, the fatalities are expected to further decrease. Therefore, the external factors and countermeasure implementation will impact the trend line. However, for this first effort at safety performance target setting, Massachusetts will stick with the trend line as a prediction of 352.3 annual fatalities per year for 2014-2018. Through coordinated processes with our Annual Performance Report (Tracker) and the update of our SHSP (to be completed in 2018), we anticipate proposing future targets that take external factors into account. Moreover, it should be noted that our goal is towards zero deaths and we will continue to work towards that goal.

Number of Serious Injuries 2896.0

Describe the basis for established target, including how it supports SHSP goals.

FHWA guidance is to start with a trend line then consider external factors and planned implementation in order to set targets. Based on the trend line, the predicted number of serious injuries for 2014-2018 yearly average would be 2895.9 per year, down from 3251.8 for 2011-2015 yearly average. There are certainly external factors, some specific to Massachusetts and others that are applicable nation-wide, that will impact the trend line (positively and negatively). Examples include: a required change in

reporting and definition of serious injuries on the crash report, a recent State recreational marijuana law (in the process of implementation), a reduction in the prima facie speed limit law for thickly settled areas, anticipated changes in other roadway safety laws in the near future, increasing trend of distraction by all road users, advent of new vehicle-vehicle and vehicle-infrastructure safety-related technology with more common every-day use and others. Meanwhile, MassDOT has been implementing strategies and countermeasures identified in the SHSP. An evaluation of specific HSIP-funded projects completed prior to 2013 indicated that fatal and injury crashes have been reduced by 36 percent compared to what was to be expected had the safety improvements not been implemented. While an evaluation of all HSIP projects is not yet possible, this shows that implementation of safety countermeasures does have a significant impact on the number of serious injuries. Therefore, the external factors and countermeasure implementation will impact the trend line. However, for this first effort at safety performance target setting, Massachusetts will stick with the trend line as a prediction of 2895.9 annual serious injuries per year for 2014-2018. Through coordinated processes with our Annual Performance Report (Tracker) and the update of our SHSP (to be completed in 2018), we anticipate proposing future targets that take external factors into account. Moreover, it should be noted that our goal is towards zero deaths and we will continue to work towards that goal.

Fatality Rate 0.610

Describe the basis for established target, including how it supports SHSP goals.

Similar to the process for simply using the trend line as our target for fatalities in Massachusetts, our first target setting for annual fatality rate (fatalities per 100 million vehicles miles traveled) for 2014-2018 data, will simply use the trend line although that is not our goal. Our goal continues to be towards zero deaths. The predicted fatality rate for 2014-2018 yearly average would be 0.611 per year, down from 0.641 for 2011-2015 yearly average. As mentioned for the previous measures, there are external factors and implementation of safety countermeasures that will impact the rate change, but for the first target stetting we are simply showing the trend line projections. In the coming year we will work to refine this target and coordinate it based on related efforts (e.g. our Annual Performance Report and the SHSP update).

Serious Injury Rate 5.010

Describe the basis for established target, including how it supports SHSP goals.

Similar to the process for simply using the trend line as our target for serious injuries in Massachusetts, our first target setting for annual serious injury rate (serious injuiries per 100 million vehicles miles traveled) for 2014-2018 data, will simply use the trend line although that is not our goal. Our goal continues to be towards zero deaths. The predicted serious injury rate for 2014-2018 yearly average would be 5.01 per year, down from 5.78 for 2011-2015 yearly average. AS mentioned for the previous measures, there are external factors and implementation of safety countermeasures that will impact the rate change but for the first target stetting we are simply showing the trend line projections. In the coming year we will work to refine this target and

coordinate it based on related efforts (e.g. our Annual Performance Report and the SHSP update).

Total Number of Non-Motorized Fatalities and Serious Injuries	540.8

Describe the basis for established target, including how it supports SHSP goals.

As with all the other target setting measures, FHWA's guidance is to start with a trend line then consider external factors and planned implementation in order to set targets. If one were to simply use the trend line, the predicted number of fatalities and serious injuries for non-motorists for 2014-2018 yearly average would be 618.9 per year, UP from 540.8 for 2011-2015 yearly average. As mentioned earlier, there are certainly external factors that would impact the trend line (positively and negatively) and implementing countermeasures also impacts the projections. MassDOT and other agencies and entities are building infrastructure to promote and increase active transportation which increases the exposure of the non-motorists. It should be clear that the target is towards zero deaths/injuries and not an increase. With 1 in 4 fatalities on Massachusetts roadways involving non-motorists and an apparent increase in walking and cycling (although non-motorist vehicle miles traveled cannot yet be quantified), Massachusetts is upping efforts to stem that trend. Several projects and multi-agency programs have been implemented (after the Federal Fiscal Year reporting period for this report ended) that will hopefully help to turn the trend. As the Strategic Highway Safety Plan is developed over the next year and the Pedestrian Emphasis Area and Bicyclist Emphasis Area are refined, new multi-disciplined and multi-agency strategies will be developed and implemented. There will also be an increased effort to attempt to resolve some issues so that systemic projects could be implemented which would help to bring down the non-motorist fatalities and serious injuries. Therefore, although our current trend line shows a projected increase in non-motorist fatalities and serious injuries, our goal is to reverse the trend and move towards zero deaths by dramatically reducing the numbers. In the coming year we will work to refine this target and coordinate it based on related efforts (e.g. our Annual Performance Report and the SHSP update). So while the trend line indicates 618.9 fatalities and serious injuries for non-motorists for 2014-2018 yearly average, Massachusetts' short term target is to stem the trend of increasing fatalities and injuries and therefore, is using the current 5 year average of 540.8 non-motorist serious injuries or fatalities 2014-2018.

Enter additional comments here to clarify your response for this question or add supporting information.

Describe efforts to coordinate with other stakeholders (e.g. MPOs, SHSO) to establish safety performance targets.

The Transportation Manager's Group (TMG) performance measures subcommittee was established in 2016 and is comprised of Regional Planning Agency (the technical arm for each MPO) representatives, MassDOT and FHWA to coordinate the establishment of state performance measure targets and potential MPO adoption of those targets. The subcommittee meets on a monthly basis to discuss progress made on target setting and to obtain input from the RPA staff. The subcommittee has discussed and reviewed the

establishment of MassDOT's safety performance measures and will continue to work with the MPOs on the adoption of their targets to ensure that the regional targets are complimentary to the Commonwealth's measures. In December 2016, FHWA brought in a consultant to facilitate a statewide discuss on safety performance target setting with MassDOT, Executive Office of Public Safety and Security (the SHSO Massachusetts), MPOs and others. In that meeting, Massachusetts was praised for the collaborative work between MassDOT and the SHSO (our agencies regularly meet to discuss and coordinate trend line data and targets) and between MassDOT and the MPOs. This collaboration will continue.

Does the State want to report additional optional targets?

No

Enter additional comments here to clarify your response for this question or add supporting information.

Applicability of Special Rules

Does the HRRR special rule apply to the State for this reporting period?

Yes

Enter additional comments here to clarify your response for this question or add supporting information.

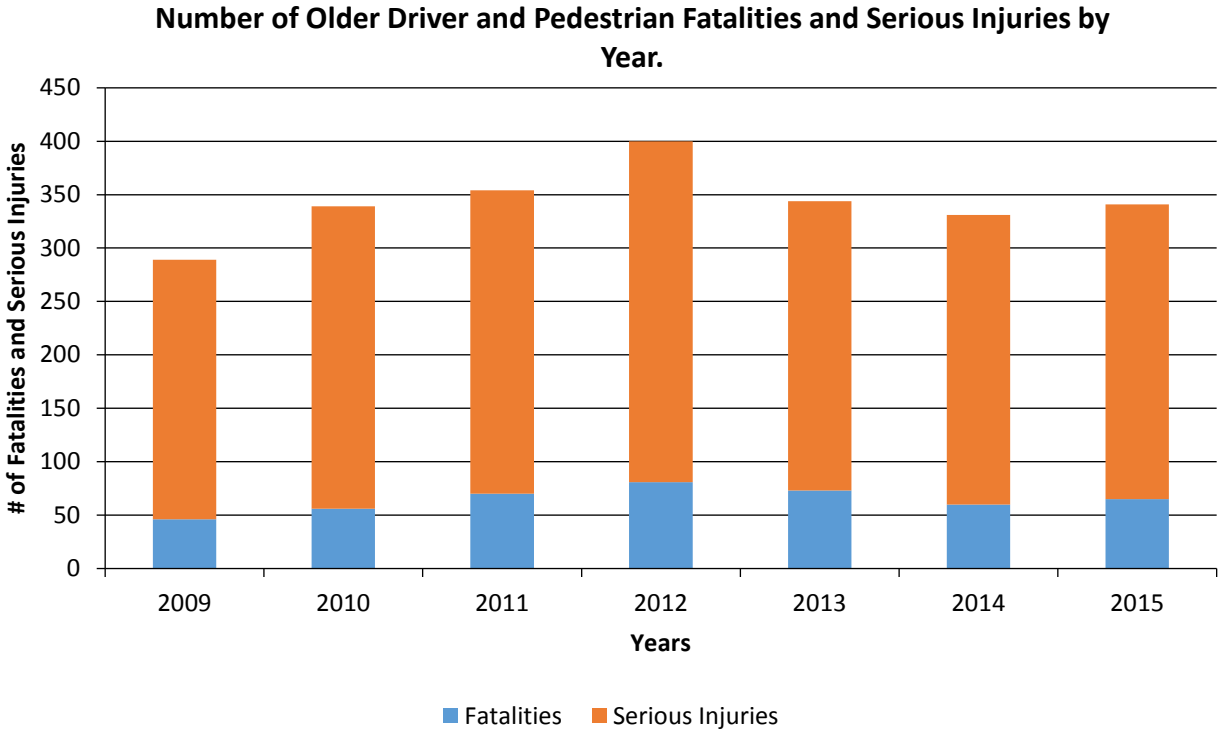
MassDOT received a memo from FHWA on January 13, 2017 stating that Massachusetts is subject to the High Risk Rural Road Rule because 2011-2015 has a higher rural fatality rate than 2009-2013 and therefore Massachusetts must obligate $2,273,676 in Federal Fiscal Year 2018. Ideally, these funds would be spent on lower cost systemic projects. However, as previously explained in response to other questions in this report, Massachusetts has a difficult time developing systemic projects because of right-of-way issues. Therefore, our HRRR projects are mostly restricted to spot improvements. HRRR eligible roads were screened for EPDO and Milestone Road in Nantucket was identified as a viable HRRR project for 2018. Shortly thereafter, a road safety audit was performed and countermeasures identified. The proposed safety enhancements include pavement markings and signs along Milestone Road and the adjoining bike path as well as upgrading three intersections. Design is under way.

It should be noted that Massachusetts was subject to the HRRR Rule in the previous year as well. For Federal Fiscal Year 2017, rural collector roadways in three communities will get signage and marking upgrades as well as other safety enhancements to minimize the road departures along these roadways (totally approximately $1.1 million). Additionally, approximately $350,000 will be used to upgrade a crash geocoding and analytics tools that will help to better identify crashes along rural roads (well all roads) and to simplify the crash analytics process so HRRR projects could be better identified and police departments and others can use to analyze crash data (particularly helpful in more rural areas). An additional $900,000 will be spent on design contracts to advance several HRRR eligible projects.

Massachusetts was also subject to the HRRR Rule for Federal Fiscal Year 2016 and the projects are described in this report.

Provide the number of older driver and pedestrian fatalities and serious injuries for the past seven years.

PERFORMANCE MEASURES	2009	2010	2011	2012	2013	2014	2015
Number of Older Driver and Pedestrian Fatalities	46	56	70	81	73	60	65
Number of Older Driver and Pedestrian Serious Injuries	243	283	284	319	271	271	276



Enter additional comments here to clarify your response for this question or add supporting information.

Evaluation

Program Effectiveness

How does the State measure effectiveness of the HSIP?

Other-combination

Enter additional comments here to clarify your response for this question or add supporting information.

MassDOT utilizes most of these measures for evaluations in varying contexts. For site-level evaluations, effectiveness is measured using the change in fatalities and serious injuries (along with the change in total crashes, fatal plus injury crashes, and target crashes). For project-level evaluations, both changes in fatal and serious injury crashes and benefit/cost ratios are used. Benefit/cost ratios are used on countermeasure-level evaluations, as these provide the most useful information for future consideration of the countermeasure.

When possible, these evaluations are done using the empirical Bayes before-after methodology, ideally with a comparison group. This method accounts for regression-to-the-mean and changes in traffic volume between the before and after period. If the data requirements for EB are prohibitive, naïve before-after analyses are used, adjusted for traffic volume or using a comparison group if possible. Both provide the ability to compare the crashes observed in the after period with the amount expected. This measure can be used to both estimate a Crash Modification Factor for use in the Commonwealth and calculate benefits for a the calculation of a benefit-cost ratio.

We have not yet considered the effectiveness on lives saved of certain HSIP program-level projects, such as crash data improvements, marketing campaigns, SHSP assistance, etc.

Based on the measures of effectiveness selected previously, describe the results of the State's program level evaluations.

MassDOT has evaluated, using Empirical-Bayes Before-After methodology, nearly all HSIP funded projects completed prior to 2013. Summing the results of these evaluations indicates that these projects have resulted in the prevention of 67 fatal or injury crashes, 36 percent less than would be expected had the projects not been implemented. Having observed 122 fatal or injury crashes compared to 189.4 expected for 23 projects with an average evaluation period of 3.6 years, this comes to roughly 18.5 fatal or injury crashes per year in the evaluation periods for these projects.

MassDOT's HSIP efforts have predominantly focused on roadway departure crashes and intersection safety. Countermeasure evaluations have been performed to analyze the effect of these project types. Below is a brief discussion of these results, while more detailed dialogue can be found in Question 44.

MassDOT's roadway departure efforts have been focused on preventing cross-median crashes, which tend to be of high severity. To lower the frequency of these crashes, MassDOT has made an effort to identify divided highway segments with open, traversable medians with the potential for cross-median crashes. Median cable barrier has been installed at these sites. Roughly 40 miles of roadway have been treated with median cable barrier, which, though sounding like a small number, accounts for more than half of the miles of limited-access divided highway with open median in the Commonwealth. MassDOT's countermeasure evaluation of the

treatment has indicated that cross median crashes have been decreased by 72 percent on these segments. It is anticipated that this treatment will result in the prevention of 3 fatal cross-median crashes and 20 incapacitating injury cross-median crashes over 20 years on these treated segments.

From a statewide perspective, Massachusetts has seen a steady decline in the total and rate of fatal and incapacitating injury roadway departure crashes.

The majority of MassDOT's HSIP funded projects are related to intersection improvements. For this evaluation period, most of these have been sorted into three countermeasure evaluations: conversion from minor stop-control to roundabout, conversion from minor stop-control to signalized intersection, and improvements to already signalized intersections. Evaluations have shown that these projects have successfully reduced multi-vehicle crashes, specifically angle crashes. They have also shown reductions in fatal-plus-injury crashes. MassDOT has shown that a $1 million investment in signalized intersection improvements can prevent 7 fatal, incapacitating, or non-incapacitating injury crashes over 20 years. If $1 million is used to convert a minor-stop control intersection to a roundabout, that money should prevent 2 fatal or incapacitating injury crashes over 20 years, whereas if a signal is installed it can prevent over 100 overall crashes.

From a statewide perspective, Massachusetts has seen good news regarding fatal and incapacitating injury crashes at intersections. The recent trend seen in moving 5-year average of fatal crashes and fatal crash rate at intersections has started to decrease, a change from the small yet steady increase seen between 2008 and 2013. Meanwhile, the trend of incapacitating injury crashes at intersections has continued its steady decrease.

Massachusetts has seen steady decreases in roadway departure and intersection fatal or incapacitating injury crashes. However, we have recently seen increases in fatal and incapacitating injury crashes involving non-motorists (pedestrians and cyclists). As a result, while Massachusetts continues to focus on roadway departure and intersection crashes, we are increasing our efforts to focus resources on making our roadway network safer for all road users including pedestrians and bicyclists.

What other indicators of success does the State use to demonstrate effectiveness and success of the Highway Safety Improvement Program?

RSAs completed
Increased awareness of safety and data-driven process
HSIP Obligations

Enter additional comments here to clarify your response for this question or add supporting information.

As per MassDOT's Traffic and Safety Engineering 25% Design Submission Guidelines, "If all or a portion of the project area is considered HSIP-eligible, the Safety Review shall be replaced with a Road Safety Audit (RSA) for the specific area. The Road Safety Audit shall be conducted in accordance with MassDOT Road Safety Audit Guidelines and shall be conducted prior to developing the 25% Design Plans." We do track and publish the number of RSAs conducted during the year and, this year, 61 RSAs were completed. The requirement for an RSA not only helps to guide a project with the most appropriate corrective safety measures but also helps to raise awareness of roadway safety. The value of including RSAs in the early phases of a project has been realized over and over again to the point where oftentimes designers are conducting RSAs, even when not

required. Therefore, increasing the number of RSAs has increased awareness of safety and of the data driven process.

Are there any significant programmatic changes that have occurred since the last reporting period?

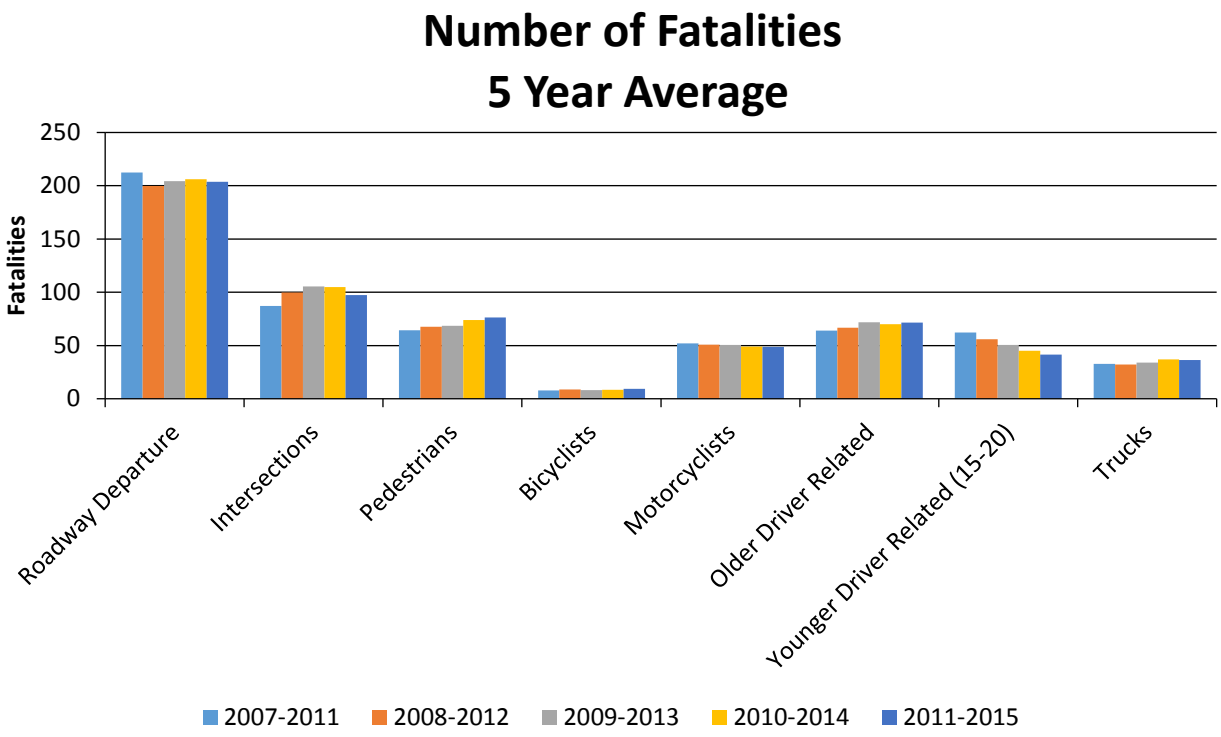
No

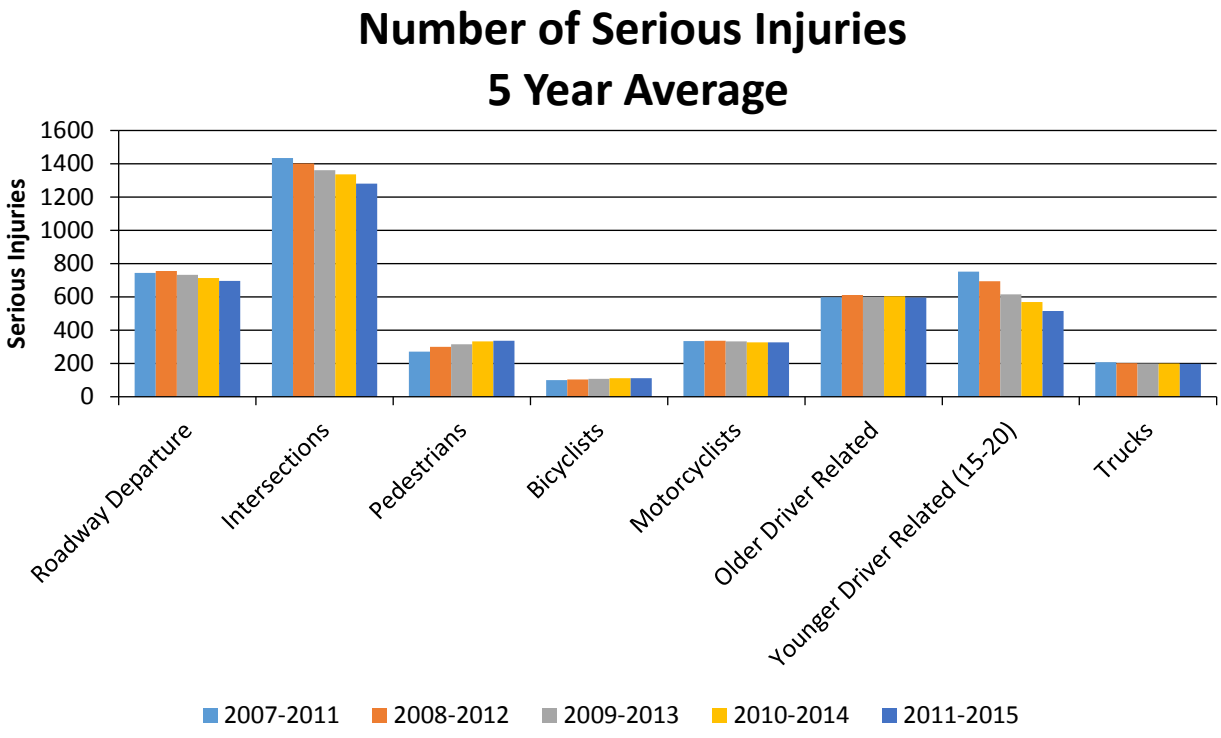
Effectiveness of Groupings or Similar Types of Improvements

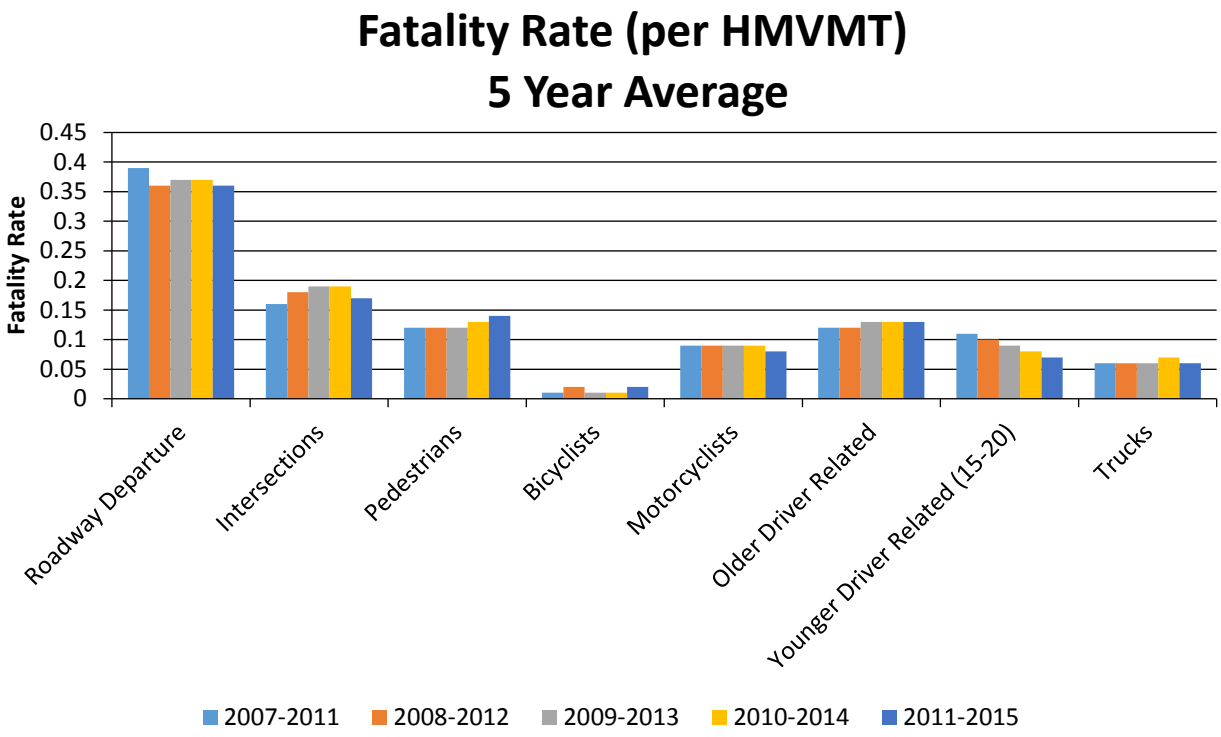
Present and describe trends in SHSP emphasis area performance measures.

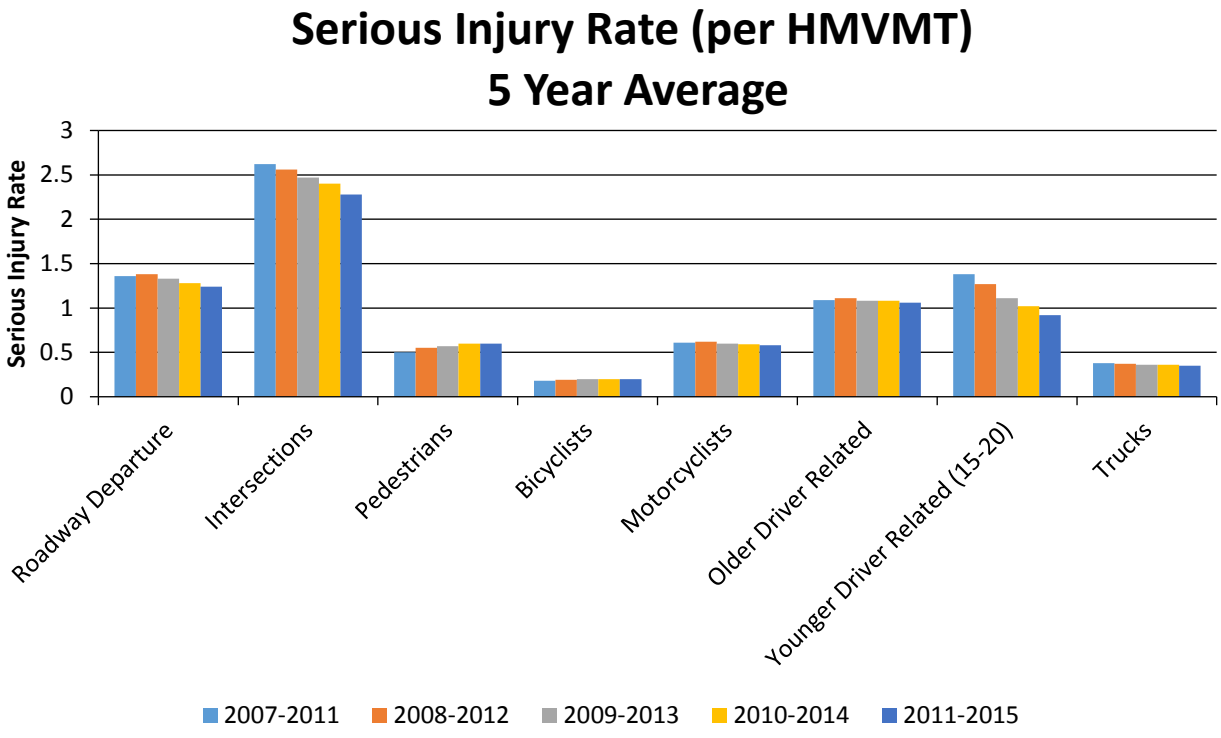
Year 2015

SHSP Emphasis Area	Targeted Crash Type	Number of Fatalities (5-yr avg)	Number of Serious Injuries (5-yr avg)	Fatality Rate (per HMVMT) (5-yr avg)	Serious Injury Rate (per HMVMT) (5-yr avg)	Other 1	Other 2	Other 3
Roadway Departure	Run-off-road	203.8	696.8	0.36	1.24			
Intersections	Intersections	97.4	1,280.2	0.17	2.28			
Pedestrians	Vehicle/pedestrian	76.4	336.2	0.14	0.6			
Bicyclists	Vehicle/bicycle	9.4	112.2	0.02	0.2			
Motorcyclists	motorcyclist involved crashes	48.8	326	0.08	0.58			
Older Driver Related	crashes involving older drivers	71.6	595.2	0.13	1.06			
Younger Driver Related (15-20)	crashes involving younger drivers	41.4	516	0.07	0.92			
Trucks	Truck-related	36.2	197.8	0.06	0.35			


Number of Fatalities
5 Year Average
Fatalities
250
200
150
100
50
0
Roadway Departure
Intersections
Pedestrians
Bicyclists
Motorcyclists
Older Driver Related
Younger Driver Related (15-20)
Trucks
2007-2011
2008-2012
2009-2013
2010-2014
2011-2015


Number of Serious Injuries
5 Year Average
Serious Injuries
1600
1400
1200
1000
800
600
400
200
0
Roadway Departure
Intersections
Pedestrians
Bicyclists
Motorcyclists
Older Driver Related
Younger Driver Related (15-20)
Trucks
2007-2011
2008-2012
2009-2013
2010-2014
2011-2015





Enter additional comments here to clarify your response for this question or add supporting information.

Note that Roadway Departure includes both intersection and non-intersection.

"Trucks" also include buses and for the fatalities the 2007-2010 data comes from FARS and the 2011-2015 comes from MCMIS.

Work zone data for serious injuries was not compiled due to the quality of the data in this field and is listed as 0

Has the State completed any countermeasure effectiveness evaluations during the reporting period?

Yes

Please provide the following summary information for each countermeasure effectiveness evaluation.

CounterMeasures:	Median Cable Barrier
Description:	The Massachusetts Department of Transportation (MassDOT) has performed a safety evaluation of four-strand high tension median cable barriers installed in previously open medians along 21 segments on 9 sections totaling 33 miles of limited-access urban and suburban freeways and expressways throughout the state, with the intention of developing a Crash Modification Factor (CMF) for the treatment and performing an economic analysis to assess the treatment's viability.
Target Crash Type:	Cross median
Number of Installations:	
Number of Installations:	
Miles Treated:	33
Years Before:	3.0
Years After:	3.33
Methodology:	Before/after using empirical Bayes or Full Bayes
Results:	The effect of the median cable barrier on cross-median crashes was evaluated using an Empirical-Bayes Before/After with Comparison group methodology. The analysis indicated that the treatment results in a 72% reduction in cross-median crashes on divided freeway non-interchange segments. This means the treatment has a CMF of 0.28 with a standard error of 0.11. It is estimated that over the 20-year lifetime of the treatment

sites the median cable barrier will prevent 3 fatal cross-median crashes on the treated sites, along with an additional 20 cross-median crashes resulting in an incapacitating injury.

The reduction in cross-median crashes, though somewhat offset by an increase in property-damage only (PDO) crashes due to reported barrier strikes (which are likely previously unreported roadway departures), results in a benefit-to-cost ratio of 2.05 to 1 for the treated sites, given a 20 year lifespan for the system, meaning that for every $1 spent on median cable barrier, the department should expect a return of $2.05. The increase in PDO run-off road left crashes leads to increased maintenance costs for the system as well as decreased societal benefits due to the costs of the crashes. These results are consistent with findings of other states, including Nebraska, Washington, and Texas, when adjusting for differences in construction and maintenance costs due to the relatively low mileage installed in Massachusetts.

File Name: Median Cable Barrier.pdf

CounterMeasures: General Signalized Intersection Improvements

Description: The Massachusetts Department of Transportation (MassDOT) has performed a safety evaluation of the improvement of 34 signalized intersections (21 4-leg and 13 3-leg) throughout the Commonwealth. These intersection improvements included signal equipment and timing upgrades, pedestrian, bicycle, and ADA improvements, pavement resurfacing, and signage and pavement marking upgrades. Some intersections were also treated with adding protected/permitted or protected left-turn phasing and the addition of

2017 Massachusetts Highway Safety Improvement Program

Target Crash Type:	Intersections
Number of Installations:	34
Number of Installations:	34
Miles Treated:	
Years Before:	3.56
Years After:	3.09
Methodology:	Before/after using empirical Bayes or Full Bayes
Results:	The empirical-Bayes before-after methodology was used to estimate CMFs for these intersection improvements. A total of 34 urban/suburban arterial intersections, including 21 4-leg intersections and 13 3-leg intersections, were analyzed, with an average of 3.6 before-years and 3.1 after-years per site. Prior to the conversion, there were a total of 789 multi-vehicle crashes (191 FI and 598 property-damage only [PDO]), 301 angle crashes (94 FI and 207 PDO), and 353 rear end crashes (78 FI and 275 PDO). Along with angle and rear end crashes, multi-vehicle crashes also consisted of sideswipe and head-on crashes. The samples of 3-leg intersections and 4-leg intersections were initially evaluated separately, but the similarity in results led to the two samples being combined for an overall evaluation. The summary of the significant findings, along with their standard errors (SE), can be found below in Table 1 of the attached memo. Spaces marked with X indicate that the finding was not statistically significant at the $\alpha = 0.05$ level. Note that a crash reduction as a result of a treatment is equal to 1 minus the CMF multiplied by 100% [% crash reduction = 100% x (1-CMF), so if CMF = 0.48, a 52% reduction can be expected]. A benefit-cost ratio was also estimated for these intersection improvements. With the average improvement costing roughly $700,000 per intersection, the benefit-cost ratio was calculated to be 1.8 assuming a 20 year lifetime and a discount rate of 1%, showing a return of $1.80 in benefits from crash reduction for every $1 invested. Note that these benefits only include safety benefits and

	ignore operational benefits gained from these improvements.
File Name:	Signal Improvements.pdf
CounterMeasures:	Minor Leg Stop Control Intersection to Roundabout
Description:	The Massachusetts Department of Transportation (MassDOT) has performed a safety evaluation for conversion of 5 four-leg intersections, with stop-control on the minor approaches, to modern roundabouts.
Target Crash Type:	Intersections
Number of Installations:	5
Number of Installations:	5
Miles Treated:	
Years Before:	4.2
Years After:	2.8
Methodology:	Before/after using empirical Bayes or Full Bayes
Results:	The result of the evaluation was a CMF of 0.16 (with a standard error of 0.08) for multi-vehicle fatal or injury crashes, showing an 84% decrease in crashes of this type. A CMF of 0.48 (with a standard error of 0.10) was estimated for all multi-vehicle crashes, indicating a 52% reduction in multi-vehicle crashes at the intersection. It is projected that there will be a reduction of 159 fatal or injury crashes at these intersections over a period of 20 years. Because left-turn crashes are a major contributor to the crashes at intersections and intersections are an emphasis area for MassDOT, the effect of roundabouts on angle crashes was also evaluated. This analysis found a CMF of 0.37 (63% reduction) for all angle crashes and 0.07 (93% reduction) for fatal or injury angle crashes. An economic evaluation was also performed to estimate the benefit/cost ratio of the conversion of four-leg minor stop control intersections to roundabouts. For the five treated sites, it was calculated that over a 20-year period the benefit-to-cost ratio of the roundabout conversion

	was 3.6 to 1, meaning that for every $1 spent on roundabout conversions, the Department will see a return of $3.60. It should be noted that these are only safety benefits and do not account for operational benefits accrued from the conversion, as such, the benefit/cost ratio is likely greater than 3.6 to 1.
File Name:	TWSC to Roundabouts.pdf
CounterMeasures:	Minor Leg Stop Control Intersection to Signalized Intersection
Description:	The Massachusetts Department of Transportation (MassDOT) has performed a safety evaluation for the conversion of six urban intersections from minor approach stop-control to traffic signal control (1 three-legged and 5 four-legged). These intersection improvement projects also included pedestrian, bicyclist and ADA improvements, pavement resurfacing, and, for some, widening and the addition of left and/or right turn lanes.
Target Crash Type:	Intersections
Number of Installations:	6
Number of Installations:	6
Miles Treated:	
Years Before:	3.5
Years After:	3.33
Methodology:	Before/after using empirical Bayes or Full Bayes
Results:	The empirical-Bayes before-after methodology was used to estimate CMFs for multi-vehicle crashes for the minor approach stop-control to traffic signal control conversion. Six sites were used for the analysis with intersections in Worcester, Leominster, Tewksbury, Northborough, Yarmouth, and Pittsfield. There was an average of 3.8 years per site and a total of 130 multi-vehicle crashes (68% angle and 26% rear end) in the before period and an average of 4 years per site and a total of 64 multi-vehicle crashes (28% angle and 61% rear end) in the after period. There were only 11 single-vehicle crashes observed for all sites throughout the entire study period,

so no reliable analysis could be performed for those crashes.

Converting from minor approach stop-control to signalization is estimated to result in a CMF of 0.57 (with a standard error [S.E.] of 0.09) in all multi-vehicle crashes (meaning multi-vehicle crashes are expected to be reduced by 43%), a CMF of 0.46 (S.E. = 0.17) for multi-vehicle fatal and injury crashes, and a CMF of 0.64 (S.E. = 0.11) for multi-vehicle property damage-only crashes. CMFs were also estimated for angle crashes, resulting in a CMF of 0.24 (S.E. = 0.06) for all angle crashes and 0.21 (S.E. = 0.06) for angle property damage-only crashes. Rear end crashes are expected to increase; however, these increases were not statistically significant.

An economic evaluation was performed to estimate the benefit-to-cost ratio of the conversion of minor approach stop-control intersections to signalized intersections. The average cost of these intersection improvements was ~$1 million in 2016 dollars, with roughly 10% to 20% coming from the signal itself. For the six sites, assuming a 1% discount rate, it is estimated that over a 20-year period the benefit-to-cost ratio is 1.2 to 1, meaning that for every $1 spent for this type of intersection improvement MassDOT can expect to see a return of $1.20. This economic analysis accounts solely for safety benefits, construction costs, and power costs (operational benefits and signal maintenance were not included). Operational benefits are likely significant, as traffic analyses performed as part of the Functional Design Reports for these projects anticipated improvements to peak-hour level-of-service at all of these intersections.

File Name: TWSC to Signal.pdf

Project Effectiveness

Provide the following information for previously implemented projects that the State evaluated this reporting period.

LOCATION	FUNCTIONAL CLASS	IMPROVEMENT CATEGORY	IMPROVEMENT TYPE	PDO BEFORE	PDO AFTER	FATALITY BEFORE	FATALITY AFTER	SERIOUS INJURY BEFORE	SERIOUS INJURY AFTER	ALL INJURY BEFORE	ALL INJURY AFTER	TOTAL BEFORE	TOTAL AFTER	EVALUATION RESULTS (BENEFIT/COST RATIO)
Worcester - Cambridge St and Southbridge St	Urban Principal Arterial - Other	Intersection traffic control	Modify traffic signal - modernization/replacement	77.00	52.00				3.00	22.00	11.00	99.00	66.00	1.03
Leominster - Central St and Willard St	Urban Principal Arterial - Other	Intersection traffic control	Intersection traffic control - other	18.00	10.00			1.00		2.00	1.00	21.00	11.00	2.96
Northampton - Bridge Road and Look Memorial Park	Urban Principal Arterial - Other	Intersection traffic control	Modify control - two-way stop to roundabout	8.00	11.00	1.00				7.00	4.00	16.00	15.00	3.67
Greenfield - 8 intersections	Urban Principal Arterial - Other	Intersection traffic control	Modify traffic signal timing - general retiming	45.00	45.00			3.00	2.00	28.00	19.00	76.00	66.00	0.89
Tewksbury - East St & Livingston St	Urban Minor Arterial	Intersection traffic control	Intersection traffic control - other	12.00	15.00					5.00	2.00	17.00	17.00	0.34
Barnstable - Meetinghouse Way & US 6 EB Ramps	Urban Minor Arterial	Intersection traffic control	Modify control - two-way stop to roundabout	6.00	6.00					2.00	2.00	8.00	8.00	0.71
Easton - MA 106 & MA 123	Urban Principal Arterial - Other	Intersection traffic control	Modify traffic signal timing - general retiming	26.00	25.00			3.00	1.00	7.00	4.00	36.00	30.00	1.40
Metheun - MA 213	Urban Principal Arterial - Other Freeways and Expressways	Roadside	Barrier - cable	25.00	29.00					10.00	17.00	35.00	46.00	-1.14
Fairhaven - Alden Rd & Bridge St	Urban Minor Arterial	Intersection traffic control	Modify traffic signal timing - general retiming	22.00	40.00					7.00	13.00	29.00	53.00	-2.60
Middleboro - I495	Urban Principal Arterial - Interstate	Roadside	Barrier - cable	17.00	24.00			2.00	1.00	6.00	10.00	25.00	35.00	2.47
Agawam - MA 57	Urban Principal Arterial - Other Freeways and Expressways	Roadside	Barrier - cable	15.00	24.00	3.00		1.00	1.00	11.00	13.00	30.00	38.00	1.04
West Springfield/Holyoke/Easthampton/Northampton - I91	Urban Principal Arterial - Interstate	Roadside	Barrier - cable	135.00	230.00	2.00	1.00	10.00	7.00	45.00	67.00	192.00	305.00	2.34
Pittsfield - North St & Lower Wahconah St	Urban Principal Arterial - Other	Intersection traffic control	Intersection traffic control - other	11.00	5.00					2.00	1.00	13.00	6.00	1.37
New Bedford/Lakeville/Fairhaven - I 195 & MA-140	Urban Principal Arterial - Other Freeways and Expressways	Roadside	Barrier - cable	37.00	74.00		1.00	4.00	4.00	23.00	30.00	64.00	109.00	1.84
Lexington - US 2	Urban Principal Arterial - Other Freeways and Expressways	Roadside	Barrier - cable	22.00	15.00					14.00	10.00	36.00	25.00	3.50

LOCATION	FUNCTIONAL CLASS	IMPROVEMENT CATEGORY	IMPROVEMENT TYPE	PDO BEFORE	PDO AFTER	FATALITY BEFORE	FATALITY AFTER	SERIOUS INJURY BEFORE	SERIOUS INJURY AFTER	ALL INJURY BEFORE	ALL INJURY AFTER	TOTAL BEFORE	TOTAL AFTER	EVALUATION RESULTS (BENEFIT/COST RATIO)
Deerfield/Whately - US 5/MA-10 Interchange with I-91	Urban Minor Arterial	Intersection geometry	Auxiliary lanes - add left-turn lane	11.00	12.00			2.00	1.00	3.00	2.00	16.00	15.00	6.12
Sandwich - US 6	Urban Principal Arterial - Other Freeways and Expressways	Roadside	Barrier - cable	40.00	55.00		1.00	5.00	4.00	18.00	31.00	63.00	91.00	3.29
Dartmouth - I195	Urban Principal Arterial - Interstate	Roadside	Barrier - cable	65.00	58.00	1.00	1.00	4.00	5.00	46.00	44.00	116.00	108.00	5.49
Bernardston - I91	Urban Principal Arterial - Interstate	Roadside	Barrier- metal	6.00	14.00				1.00	1.00	5.00	7.00	20.00	-1.73
Danvers - MA-128, Interchanges 22 & 23	Urban Principal Arterial - Other Freeways and Expressways	Interchange design	Acceleration / deceleration / merge lane	177.00	206.00			5.00	5.00	60.00	67.00	242.00	278.00	-0.26
Worcester - I290 Ramps with MA-70	Urban Minor Arterial	Intersection geometry	Intersection geometrics - miscellaneous/other/unspecified	39.00	29.00	1.00		3.00		25.00	7.00	68.00	36.00	3.29
West Springfield - Westfield Rd	Urban Principal Arterial - Other	Intersection traffic control	Modify traffic signal timing - general retiming	47.00	14.00					4.00	3.00	51.00	17.00	0.91
North Adams	Urban Major Collector	Intersection traffic control	Modify traffic signal timing - general retiming	67.00	46.00					24.00	6.00	91.00	52.00	4.79

Enter additional comments here to clarify your response for this question or add supporting information.

The crash data for the projects listed above are provided for 3 before years and 3 after years, meaning all were completed during or before 2012. The functional class indicates the highest classification of the roadways included in the project. If multiple countermeasures were included, the improvement category indicates the most important one of a project. The benefit-cost ratios, with the exception of the Danvers project which was done using a naïve analysis, were derived from empirical Bayes before-after analyses, which completed for parts of or the whole of most projects. These were performed at the site-, project-, or countermeasure-level across different projects, and focused both on total and fatal plus injury crashes as well as specific target crash types.

The benefit-cost ratios listed above show that the majority of projects in the Commonwealth that used HSIP funding provided valuable return on investment.

Are there any other aspects of the overall HSIP effectiveness on which the State would like to elaborate?

No

Compliance Assessment

What date was the State's current SHSP approved by the Governor or designated State representative?

09/30/2013

What are the years being covered by the current SHSP?

From: 2004 To: 2011

When does the State anticipate completing it's next SHSP update?

2018

Enter additional comments here to clarify your response for this question or add supporting information.

MassDOT has already begun the process of updating the SHSP to produce a formal report and already has a consultant onboard to assist with this process. However, it should be known that every year, MassDOT reviews the crash data for the emphasis areas.

Provide the current status (percent complete) of MIRE fundamental data elements collection efforts using the table below.

	NON LOCAL PAVED ROADS - SEGMENT		NON LOCAL PAVED ROADS - INTERSECTION		NON LOCAL PAVED ROADS - RAMPS		LOCAL PAVED ROADS		UNPAVED ROADS	
MIRE NAME (MIRE NO.)	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE
ROADWAY SEGMENT										
Segment Identifier (12)	0.2521	0.4795					0.0197	0.0006	0	0
Route Number (8)	1	1								
Route/Street Name (9)	0.9999	1								
Federal Aid/Route Type (21)	0.9962	0.9924								
Rural/Urban Designation (20)	0.9999	1					1	1		
Surface Type (23)	0.9906	0.9992					0.9369	0.9559		
Begin Point Segment Descriptor (10)	1	1					1	1	1	1
End Point Segment Descriptor (11)	1	1					1	1	1	1
Segment Length (13)	1	1								
Direction of Inventory (18)	0.9917	0.9997								
Functional Class (19)	1	1					1	1	1	1

MIRE NAME (MIRE NO.)	NON LOCAL PAVED ROADS - SEGMENT		NON LOCAL PAVED ROADS - INTERSECTION		NON LOCAL PAVED ROADS - RAMPS		LOCAL PAVED ROADS		UNPAVED ROADS	
	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE
Median Type (54)	1	1								
Access Control (22)	1	1								
One/Two Way Operations (91)	1	1								
Number of Through Lanes (31)	0.9976	0.9945					0.9793	0.994		
Average Annual Daily Traffic (79)	0.952	0.9765					0.028	0.0009		
AADT Year (80)	0.952	0.9765								
Type of Governmental Ownership (4)	1	1					1	1	1	1
INTERSECTION										
Unique Junction Identifier (120)			0	0						
Location Identifier for Road 1 Crossing Point (122)			0	0						
Location Identifier for Road 2 Crossing Point (123)			0	0						
Intersection/Junction Geometry (126)			0	0						
Intersection/Junction Traffic Control (131)			0	0						
AADT for Each Intersecting Road (79)			0	0						
AADT Year (80)			0	0						
Unique Approach Identifier (139)			0	0						
INTERCHANGE/RAMP										
Unique Interchange Identifier (178)					0	0				
Location Identifier for Roadway at Beginning of Ramp Terminal (197)					0	0				
Location Identifier for Roadway at Ending Ramp Terminal (201)					0	0				
Ramp Length (187)					0	0				

MIRE NAME (MIRE NO.)	NON LOCAL PAVED ROADS - SEGMENT		NON LOCAL PAVED ROADS - INTERSECTION		NON LOCAL PAVED ROADS - RAMPS		LOCAL PAVED ROADS		UNPAVED ROADS	
	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE
Roadway Type at Beginning of Ramp Terminal (195)					0	0				
Roadway Type at End Ramp Terminal (199)					0	0				
Interchange Type (182)					0	0				
Ramp AADT (191)					0.9094	0.7417				
Year of Ramp AADT (192)					0.9094	0.7417				
Functional Class (19)					1	1				
Type of Governmental Ownership (4)					1	1				
Totals (Average Percent Complete):	**0.95**	**0.97**	**0.00**	**0.00**	**0.35**	**0.32**	**0.77**	**0.77**	**0.80**	**0.80**

Enter additional comments here to clarify your response for this question or add supporting information.

Notes

1. Unique Segment ID - Many segments have duplicate unique road inventory segment ID's.For State owned roads there are 25,065 duplicate segment ID's and 46 missing values.
2. Direction of Inventory - Not present in the inventory. Estimates use the Route Direction Field
3. Type of Government Ownership - Jurisdiction field was used
4. All calculations based of the Road Inventory Feature Class in the Roads & Highway Geodatabase dated July 21, 2017.
5. MassDOT is currently working on an Intersection Inventory
6. Ramps are included in MassDOT's road inventory file, but are missing several FDE's
7. The quality of MassDOT's FDE attribute values were not validated

Describe actions the State will take moving forward to meet the requirement to have complete access to the MIRE fundamental data elements on all public roads by September 30, 2026.

MassDOT historically has maintained a statewide, all public roads network as part of their road inventory program. MassDOT is currently developing a MIRE FDE compliant intersection inventory for non-local and local paved roads (defined by functional classification). The spatial location of the intersections can be generated from MassDOT's road inventory network. Additional data collection efforts are required to populate the required MIRE FDE attributes. A web base data collection tool is being developed to facilitate the collection of the additional elements. A pilot project will be conducted in the summer of 2017 to better understand the level of effort required to populate a statewide intersection inventory. Then the data will be populated with a combination of assistance from interns and local communities.

MassDOT's road inventory databaes includes ramps. However, not all of the required MIRE FDE attributes are currently available. Like the intersection inventory, MassDOT intends to development web based data collection tool to collect the additional MIRE FDE's.

Provide the suspected serious injury identifier, definition and attributes used by the State for both the crash report form and the crash database using the table below. Please also indicate whether or not these elements are compliant with the MMUCC 4th edition criteria for data element P5. Injury Status, suspected serious injury.

CRITERIA	SUSPECTED SERIOUS INJURY IDENTIFIER(NAME)	MMUCC 4TH EDITION COMPLIANT *	SUSPECTED SERIOUS INJURY DEFINITION	MMUCC 4TH EDITION COMPLIANT *	SUSPECTED SERIOUS INJURY ATTRIBUTES(DESCRIPTORS)	MMUCC 4TH EDITION COMPLIANT *
Crash Report Form	Injury Status	No	N/A	No	N/A	No
Crash Report Form Instruction Manual	Injury Status	No	The level of injury severity for a person involved in the crash	No	Fatal Non-Fatal injury - Incapacitating Non-Fatal injury - Non Incapacitating Non Fatal injury - Possible Non Fatal Injury - No injury Non Fatal injury - Unknown	No
Crash Database	Injury Status	No	N/A	No	N/A	No
Crash Database Data Dictionary	N/A	No	N/A	No	N/A	No

Please describe the actions the State is taking to become compliant by April 15, 2019.

Enter additional comments here to clarify your response for this question or add supporting information.

Did the State conduct an HSIP program assessment during the reporting period?
No

When does the State plan to complete it’s next HSIP program assessment.

2019

Enter additional comments here to clarify your response for this question or add supporting information.

The focus in 2018 will be on development of the SHSP. Because the staffing resources are the same, the HSIP program assessment will have to wait until completion of the SHSP update.

Optional Attachments

Program Structure:

HSIP Criteria Updates.pdf

Project Implementation:

Safety Performance:

Evaluation:

Median Cable Barrier.pdf
Signal Improvements.pdf
TWSC to Roundabouts.pdf
TWSC to Signal.pdf

Compliance Assessment:

Glossary

5 year rolling average	means the average of five individuals, consecutive annual points of data (e.g. annual fatality rate).
Emphasis area	means a highway safety priority in a State's SHSP, identified through a data-driven, collaborative process.
Highway safety improvement project	means strategies, activities and projects on a public road that are consistent with a State strategic highway safety plan and corrects or improves a hazardous road location or feature or addresses a highway safety problem.
HMVMT	means hundred million vehicle miles traveled.
Non-infrastructure projects	are projects that do not result in construction. Examples of non-infrastructure projects include road safety audits, transportation safety planning activities, improvements in the collection and analysis of data, education and outreach, and enforcement activities.
Older driver special rule	applies if traffic fatalities and serious injuries per capita for drivers and pedestrians over the age of 65 in a State increases during the most recent 2-year period for which data are available, as defined in the Older Driver and Pedestrian Special Rule Interim Guidance dated February 13, 2013.
Performance measure	means indicators that enable decision-makers and other stakeholders to monitor changes in system condition and performance against established visions, goals, and objectives.
Programmed funds	mean those funds that have been programmed in the Statewide Transportation Improvement Program (STIP) to be expended on highway safety improvement projects.
Roadway Functional Classification	means the process by which streets and highways are grouped into classes, or systems, according to the character of service they are intended to provide.
Strategic Highway Safety Plan (SHSP)	means a comprehensive, multi-disciplinary plan, based on safety data developed by a State Department of Transportation in accordance with 23 U.S.C. 148.
Systematic	refers to an approach where an agency deploys countermeasures at all locations across a system.
Systemic safety improvement	means an improvement that is widely implemented based on high risk roadway features that are correlated with specific severe crash types.
Transfer	means, in accordance with provisions of 23 U.S.C. 126, a State may transfer from an apportionment under section 104(b) not to exceed 50 percent of the amount apportioned for the fiscal year to any other apportionment of the State under that section.