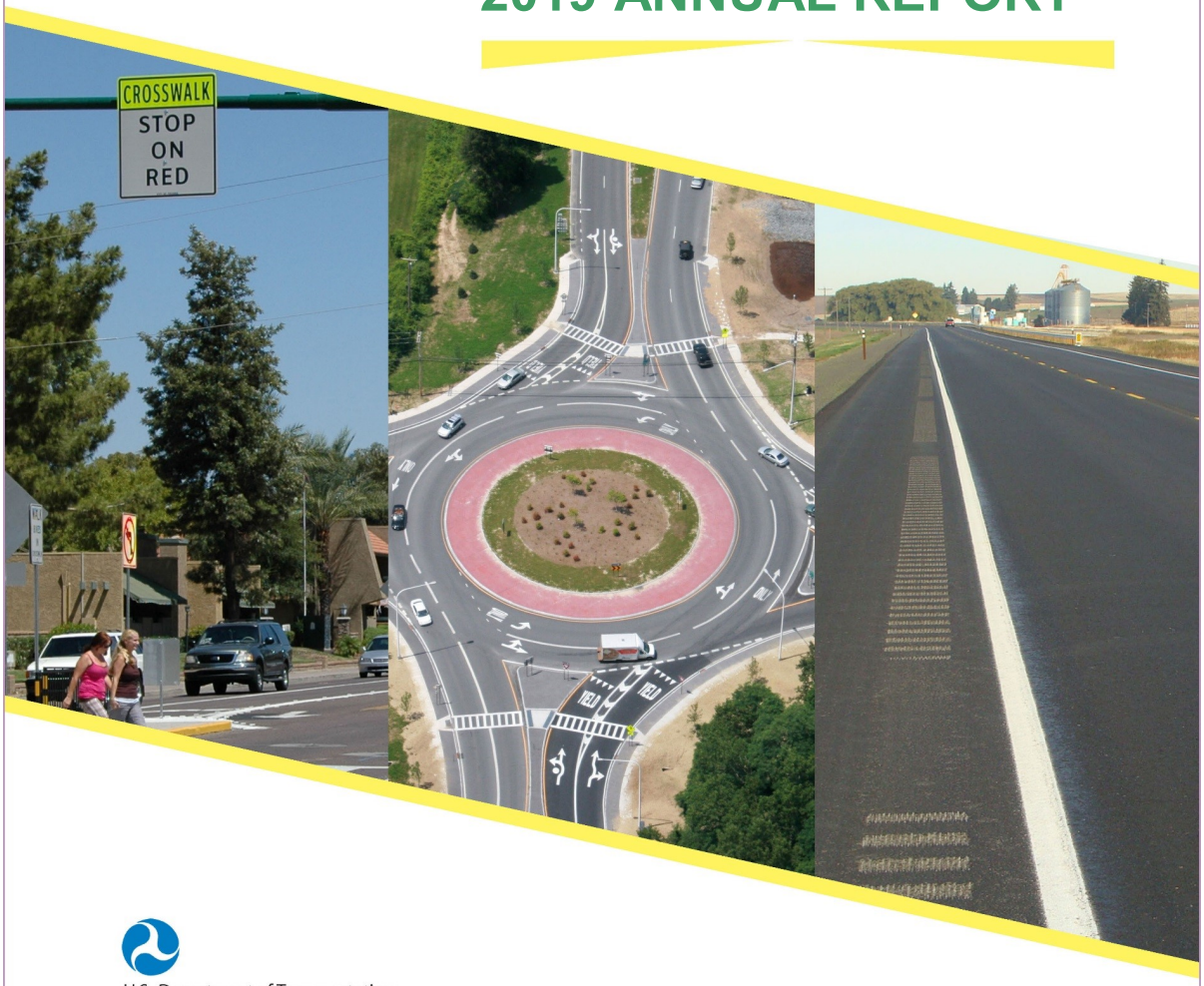
MASSACHUSETTS

HIGHWAY SAFETY IMPROVEMENT PROGRAM

2019 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

A Massachusetts HSIP Task Force was established in 2009 to develop guidelines for HSIP-eligible projects and programs. The Task Force consisted of FHWA, MassDOT Highway, MassDOT Planning and MARPA (Massachusetts Association of Regional Planning Agencies)/MPOs. Criteria for HSIP projects were defined. The Task Force does not select individual projects but rather determined thresholds for eligibility. 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). This has lead to the majority of projects being "hot spots". However, feedback from FHWA, other states and latest research has shown that systemic projects have a huge impact on reducing overall fatalities and injuries. As such, in the coming year, MassDOT intends to reinvigorate the HSIP Task Force so that the project selection for HSIP can be more fluid and nimble and responsive to the needs of SHSP strategies and ensure project readiness and ability of projects to be advertised in a timely manner.

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 consisted of FHWA, MassDOT Highway, MassDOT Planning and MARPA (Massachusetts Association of Regional Planning Agencies)/MPOs. It was determined that a n HSIP eligible project was defined as 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. The equivalent property damage only (EPDO) calculations were changed this past year to reflect the FHWA methodology for crash costs. Rather than the previous system of 10 points for a fatal crash, 5 points for an injury crash and 1 point for a property damage only crash, the new EPDO calculations are based on weighted average costs of crashes. So as not to be chasing fatal crashes only, the combined weighting of fatal and injury crashes is 21 times that of a property damage only crash. https://www.mass.gov/files/documents/2019/03/01/dot-2016TopCrashLocationsRpt.pdf. To view the HSIP eligible clusters, go to: https://gis.massdot.state.ma.us/topcrashlocations/ . However, this changed this past year.

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.

In the coming year, MassDOT intends to reinvigorate the HSIP Task Force so that the project selection for HSIP can be more fluid and nimble and responsive to the needs of SHSP strategies.

Where is HSIP staff located within the State DOT?

Engineering

Our Safety team is centralized and sits in headquarters. The Safety team is within the Traffic and Safety Engineering Section.

How are HSIP funds allocated in a State?

- Formula via MPOs
- Other-combination

The HSIP Task Force (soon to be revitalized) created guidelines for HSIP eligible projects. Approximately 27% of the HSIP funds are allocated to the MPOs and divided up amongst the region according to a set FHWA / MARPA formula. The remaining HSIP funds are spent mostly on hot spot locations (based on HSIP eligible sites defined by HSIP guidelines). Relatively few systemic projects are being programmed/advertised because of the R-O-W process required in MA which makes it more difficult. However, our network screening process will be completed and implemented as part of our new crash analytics program (called IMPACT) and, furthermore, this coming year the HSIP Task Force is being revitalized and new processes and eligibility guidelines will be developed.

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

Working with the 13 Regional Planning Agencies (RPAs) and the 13 Metropolitan Planning Organizations (MPOs) that encompass the entire geographic area of the Commonwealth of Massachusetts, HSIP funds are allocated not only to projects that are eligible within the statewide Highway Safety Improvements Program but also to eligible projects programmed by the MPOs, which may include local roads and tribal roads. Because most of the project proponents in the Commonwealth are municipalities, these projects are locally initiated, driven, and coordinated with MassDOT through the project initiation and development process. There is close coordination between our Traffic Safety division staff and RPA staff on the sharing of data and identifying crash cluster locations and prioritizing safety improvements to assist local entities and the MPOs in making sound safety investment decisions. Approximately 27% of the HSIP funds are allocated to the MPOs for project selection.

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

- Design
- Districts/Regions
- Maintenance
- Operations
- Planning
- Traffic Engineering/Safety

Describe coordination with internal partners.

The existing 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). It should be noted that the HSIP guidelines (http://www.massdot.state.ma.us/Portals/8/docs/traffic/HSIP/HSIP%20Criteria%20Updates%2011_15_17.pdf) are currently being updated to reflect an approach more inline with the Highway Safety Manual methodology. Furthermore, to have a more nimble process that is more responsive to safety needs, the task force is being revitalized and new guidelines will be prepared. This will take place this coming year.

Identify which external partners are involved with HSIP planning.

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

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. The SHSP was updated and approved in December 2018 and involved participation from over 200 participants from more than 25 agencies (including all of those external partners mentioned in the response to Question 9) and entities and the strategies identified in the SHSP are those that can be used for the HSIP eligible projects. Furthermore, all HSIP-eligible projects require Road Safety Audits which ensures coordination with external partners. Project selection has a significant amount of external input through the MPO public process. Some specific programs are based 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.

As stated earlier, there is an existing HSIP Task Force that develops the HSIP guidelines and identifies eligibility of HSIP projects (but does not select the specific projects). 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 selection of the individual regional HSIP projects is done at the MPO level through the very public MPO process involving MassDOT and many external partners. The selection of the statewide HSIP projects is based on a data driven process (EPDO) using the strategies identified in the HSIP.

Program Methodology

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

Yes
FileName:
HSIP Criteria Updates.pdf

This will be updated this coming year through the newly revitalized HSIP Task Force.

Select the programs that are administered under the HSIP.

- HRRR
- Intersection
- Median Barrier
- Sign Replacement And Improvement
- Other-Data

The programs checked as administered under HSIP were those that had projects associated with them. In reality, an strategies included in the SHSP, that are eligible for HSIP funding, are administered under the HSIP program at MassDOT. However, this question responded to those that were funded projects in this year's program. Technically, our STIP only has two categories: intersections and other safety but we attempted to provide more details here.

Program: HRRR

Date of Program Methodology:2/3/2015

What is the justification for this program?

- Other-subject to HRRR rule

What is the funding approach for this program?

Funding set-aside

What data types were used in the program methodology?

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?

- Crash frequency
- Crash rate
- 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

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).

Relative Weight in Scoring

Other-readiness factor of HRRR eligible projects:100
Total Relative Weight:100

Program: Intersection

Date of Program Methodology:10/1/2014

What is the justification for this program?

- Other-PLaning provided Safety Section witn an "Intersection" set aside

What is the funding approach for this program?

Competes with all projects

What data types were used in the program methodology?

Crashes	Exposure	Roadway
Other-EPDO		

What project identification methodology was used for this program?

- 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

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).

Relative Weight in Scoring

Other-HSIP eligibility criteria and project readiness:100
Total Relative Weight:100

Program: Median Barrier

Date of Program Methodology:3/1/2010

What is the justification for this program?

- Addresses SHSP priority or emphasis area

What is the funding approach for this program?

Competes with all projects

What data types were used in the program methodology?

Crashes	Exposure	Roadway
Fatal and serious injury crashes only	Traffic	Median width

What project identification methodology was used for this program?

- Crash frequency

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?

How are projects under this program advanced for implementation?

- Other-District recommended and initiated

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).

Relative Weight in Scoring

Available funding:100
Total Relative Weight:100

Program: Sign Replacement And Improvement

Date of Program Methodology:12/31/2014

What is the justification for this program?

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

What is the funding approach for this program?

Competes with all projects

What data types were used in the program methodology?

Crashes	Exposure	Roadway
		Other-cycle of sign improvements based on

What project identification methodology was used for this program?

- 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?

How are projects under this program advanced for implementation?

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

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

Available funding:1
Other-readiness:2

Program: Other-Data

Date of Program Methodology:10/1/2004

What is the justification for this program?

- FHWA focused approach to safety

What is the funding approach for this program?

Competes with all projects

What data types were used in the program methodology?

Crashes	Exposure	Roadway

Other-Data quality need

What project identification methodology was used for this program?

- Other-Need based on outdated system and changes to roadway file

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

How are projects under this program advanced for implementation?

- Other-determined need based on changes to outdated systems

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).

Relative Weight in Scoring

Available funding:100
Total Relative Weight:100

What percentage of HSIP funds address systemic improvements?

6

HSIP funds are used to address which of the following systemic improvements?

- Add/Upgrade/Modify/Remove Traffic Signal
- Cable Median Barriers

While some would include sign projects in systemic, in MassDOT these were listed as systemwide because all interstate and controlled access roadway signing projects are on a cycle so that is more of a systemwide approach. The cable barrier and flashing yellow arrow were projects that were more systemically selected. MassDOT would strongly like to do significantly more systemic projects (specifically for pedestrian safety and curve warning). This will being explored with the newly reinvigorated HSIP Task Force.

What process is used to identify potential countermeasures?

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

Road Safety Audits are a necessary prerequisite for all HSIP funded infrastructure projects.

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 connected vehicles and ITS technologies as part of the safety solution. However, no HSIP funds were spent on the V2I technologies during this Federal Fiscal Year. Previously, MassDOT worked with WAZE to install beacons in our tunnel system to aid driver navigation where GPS is lost. (Although no Federal funds were used for this). As drivers have become more reliant on their GPS/smart phones for directions, there are more crashes occurring in our tunnels where GPS connectivity was lost and drivers were confused. The beacon technology is providing for an open platform seamless connection to navigation systems and recently Google Maps started using the beacons as well. MassDOT signed on for the EDC Use of Crowdsourcing in Operations. There are aspects of this that will help with Safety as well. 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. This started in 2009 and has been increasing in use, where appropriate. New for this year, MassDOT contracted with INRIX and obtained RITIS to make use of speed and volume data to be used on our projects and in Planning features. We continue to look forward to other technologies that will enhance safety and reduce fatalities and injuries on the public roadways. New in this year, MassDOT is working on Every Day Counts (EDC) Use of Crowdsourcing in Operations. This involves use of ITS in operations which does impact safety as well.

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 uses both the predictive methodology and the empirical-Bayes method described in the Highway Safety Manual to support administrating the HSIP. MassDOT is in the process of updating the network screening process to consider the difference between expected and predicted crashes using HSM methodologies and Massachusetts-specific safety performance functions.

During RSAs (especially for HSIP projects), MassDOT uses HSM methodologies so expected crash frequency can be used for discussion, diagnosis, and countermeasure selection.

MassDOT also uses HSM methodologies to evaluate HSIP projects at the site-, project-, and countermeasure level. The empirical-Bayes method is used to estimate the number of crashes expected in the after period had no change occurred to compare with what was observed in the after period.

Project Implementation

Funds Programmed

Reporting period for HSIP funding.

Federal Fiscal Year

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

FUNDING CATEGORY	PROGRAMMED	OBLIGATED	% OBLIGATED/PROGRAMMED
HSIP (23 U.S.C. 148)	$25,319,060	$26,649,107	105.25%
HRRR Special Rule (23 U.S.C. 148(g)(1))	$2,484,220	$2,471,701	99.5%
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)	$9,287,656	$9,769,620	105.19%
State and Local Funds	$5,411,169	$5,678,050	104.93%
Other funds	$0	$653,186	0%
Totals	$42,502,105	$45,221,664	106.4%

Information provided by MassDOT FAPRO office

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

1%

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

1%

Only 1 of the 14 HSIP projects were on local roads (accounting for approximately 1% of HSIP funding). While we do have a set aside of approximately 30% of all HSIP funds going to the MPOs for project selection, the projects selected were on State highway. HSIP eligibility is not based on jurisdiction and any HSIP eligible project may be selected and programmed. With the new HSIP Task Force in place and the ability to provide for systemic, low cost projects, we anticipate an increase in HSIP projects along local roads.

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

1%

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

1%

There was one non-infrastructure safety program funded with HSIP this year and that was for a "Crash - Injury Data Linkage Project" for $222,222. Furthermore, we have several ongoing projects that were funded in previous years. We used to have a higher percentage of HSIP going to non-infrastructure projects but due to FAST Act, the use of HSIP on non-infrastructure became much more restricted. We hope that this will change and that once again we can program/obligate HSIP funds based on effectiveness which will cover the 4 Es (engineering, education, enforcement and emergency response) and better align with strategies identified in the SHSP.

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%

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 are struggling to 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.

There are steps we have taken to resolve these issues. With regards to readiness, we actually anticipated the need for a HRRR project and started working on one in advance of the notification. In addition, a Project Manager from the MassDOT Design Section will be providing assistance to push projects along. With regards to the difficulties we face for systemic project, MassDOT Traffic and Safety Engineering has been meeting with FHWA ROW Section and MassDOT ROW Section to prepare a white paper and try to resolve ROW issues with regards to low cost systemic projects. Furthermore, with the reinvigoration of an HSIP Task Force, the hope is that these issues will get resolved more expeditiously.

General Listing of Projects

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

PROJECT NAME	IMPROVEMENT CATEGORY	SUBCATEGORY	OUTPUTS	OUTPUT TYPE	HSIP PROJECT COST($)	TOTAL PROJECT COST($)	FUNDING CATEGORY	LAND USE/AREA TYPE	FUNCTIONAL CLASSIFICATION	AADT	SPEED	OWNERSHIP	METHOD FOR SITE SELECTION	SHSP EMPHASIS AREA	SHSP STRATEGY
600518 - HINGHAM- INTERSECTION IMPROVEMENTS AT DERBY STREET, WHITING STREET (ROUTE 53) AND GARDNER STREET	Intersection geometry	Intersection geometrics - miscellaneous/other/unspecified	1	Intersections	$805749	$4042738	HSIP (23 U.S.C. 148)	Urban	Minor Arterial	0	30	State Highway Agency	Spot	Bicyclists	Improve design and engineering of bicycle facilities on and off roadways
605740 - WORCESTER- INTERSECTION IMPROVEMENTS AT WINTHROP STREET & PROVIDENCE STREET, VERNON STREET & GRANITE STREET	Intersection geometry	Intersection geometrics - modify intersection corner radius	5	Intersections	$412478	$3853940	HSIP (23 U.S.C. 148)	Urban	Minor Arterial	0	30	City or Municipal Highway Agency	Spot	Intersections	Incorporate safety elements into intersection design and maintenance
607337 - PEMBROKE- INTERSECTION IMPROVEMENTS AND RELATED WORK AT WASHINGTON STREET (ROUTE 53) AND PLEASANT STREET	Intersection traffic control	Intersection traffic control - other	1	Intersections	$410359	$2264709	HSIP (23 U.S.C. 148)	Urban	Minor Arterial	0	45	State Highway Agency	Spot	Intersections	Incorporate safety elements into intersection design and maintenance
607435 - BARNSTABLE- INTERSECTION IMPROVEMENTS @ FALMOUTH ROAD (ROUTE 28) & OSTERVILLE-WEST BARNSTABLE ROAD	Pedestrians and bicyclists	Miscellaneous pedestrians and bicyclists	1	Intersections	$916541	$3751728	HSIP (23 U.S.C. 148)	Urban	Principal Arterial-Other	0	50	State Highway Agency	Spot	Bicyclists	Improve design and engineering of bicycle facilities on and off roadways
607917 - AUBURN TO WORCESTER- GUIDE & TRAFFIC SIGN REPLACEMENT	Roadway signs and traffic control	Sign sheeting - upgrade or replacement	11.88	Miles	$4791159	$5323510	HSIP (23 U.S.C. 148)	Urban	Principal Arterial-Interstate	0	65	State Highway Agency	systemwide	Older Drivers	Develop infrastructure improvements that accommodat

PROJECT NAME	IMPROVEMENT CATEGORY	SUBCATEGORY	OUTPUTS	OUTPUT TYPE	HSIP PROJECT COST($)	TOTAL PROJECT COST($)	FUNDING CATEGORY	LAND USE/AREA TYPE	FUNCTIONAL CLASSIFICATION	AADT	SPEED	OWNERSHIP	METHOD FOR SITE SELECTION	SHSP EMPHASIS AREA	SHSP STRATEGY
ON A SECTION OF INTERSTATE 290															e the needs of older road users
607919 - BOLTON TO LOWELL-GUIDE & TRAFFIC SIGN REPLACEMENT ON A SECTION OF INTERSTATE 495	Roadway signs and traffic control	Sign sheeting - upgrade or replacement	18.3	Miles	$3957120	$4396800	HSIP (23 U.S.C. 148)	Urban	Principal Arterial-Interstate	0	65	State Highway Agency	systemwide	Older Drivers	Develop infrastructure improvements that accommodate the needs of older road users
608013 - QUINCY-INTERSECTION IMPROVEMENTS @ SEA STREET & QUINCY SHORE DRIVE	Intersection geometry	Intersection geometrics - miscellaneous/other/unspecified	1	Intersections	$2126697	$2362997	HSIP (23 U.S.C. 148)	Urban	Minor Arterial	0	30	State Park, Forest, or Reservation Agency	Spot	Intersections	Incorporate safety elements into intersection design and maintenance
608188 - GARDNER-LEOMINSTER-STERLING-INTERSECTION IMPROVEMENTS AT 3 LOCATIONS	Intersection geometry	Intersection geometry - other	3	Locations	$1854760	$2585219	HSIP (23 U.S.C. 148)	Urban	Multiple/Varies	0	45	State Highway Agency	Spot	Intersections	Incorporate safety elements into intersection design and maintenance
608204 - ATTLEBORO TO NORWOOD-GUIDE AND TRAFFIC SIGN REPLACEMENT ON A SECTION OF I-95	Roadway signs and traffic control	Sign sheeting - upgrade or replacement		Signs	$6112938	$6792153	HSIP (23 U.S.C. 148)	Urban	Principal Arterial-Interstate	0	65	State Highway Agency	systemwide	Older Drivers	Develop infrastructure improvements that accommodate the needs of older road users
608295 - DISTRICT 5-IMPLEMENTATION OF FLASHING YELLOW ARROW AT VARIOUS TRAFFIC SIGNALS	Intersection traffic control	Modify traffic signal - add flashing yellow arrow	9	Locations	$881664	$979626	HSIP (23 U.S.C. 148)	N/A	Multiple/Varies	0		both State and local	Systemic	Intersections	Incorporate safety elements into intersection design and maintenance
608833 - NANTUCKET-IMPROVEMENTS ON MILESTONE ROAD	Roadway	Roadway - other	4	Intersections	$2484220	$2760245	HRRR Special Rule (23 U.S.C. 148(g)(1))	Rural	Major Collector	0	45	State Highway Agency	Spot	Intersections	Incorporate safety elements into intersection design and maintenance

2019 Massachusetts Highway Safety Improvement Program

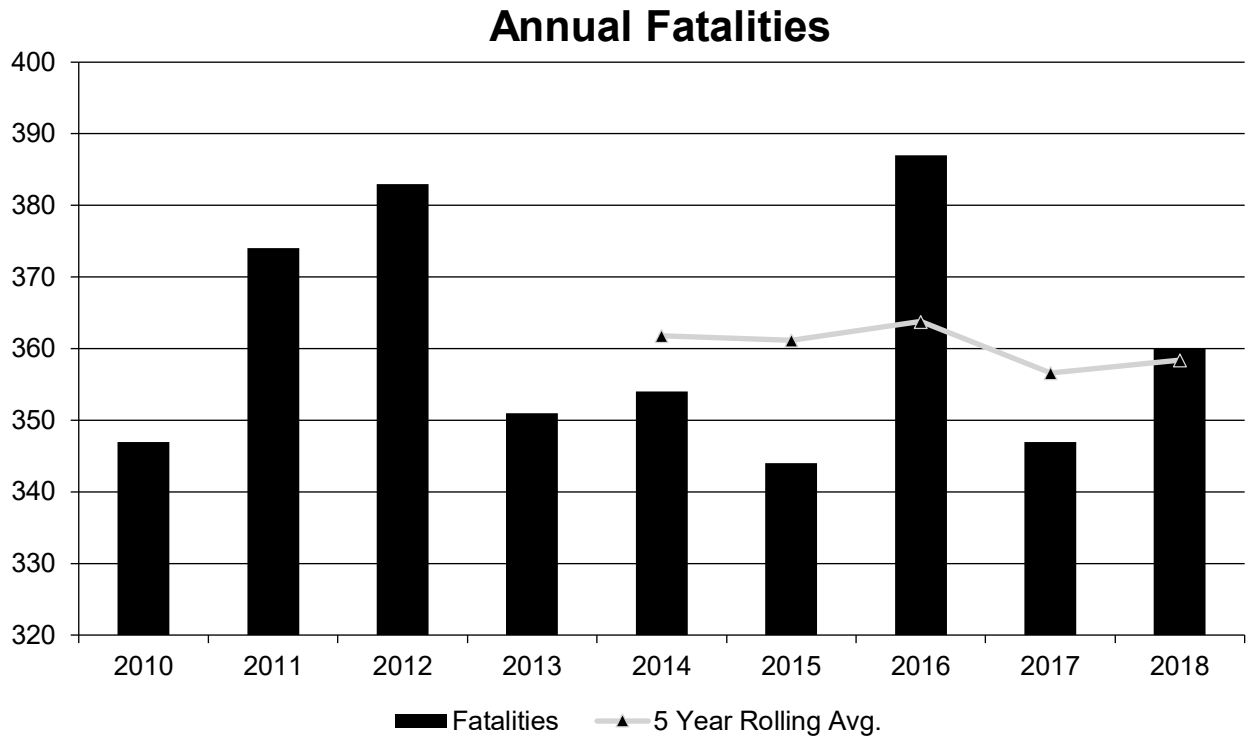
PROJECT NAME	IMPROVEMENT CATEGORY	SUBCATEGORY	OUTPUTS	OUTPUT TYPE	HSIP PROJECT COST($)	TOTAL PROJECT COST($)	FUNDING CATEGORY	LAND USE/AREA TYPE	FUNCTIONAL CLASSIFICATION	AADT	SPEED	OWNERSHIP	METHOD FOR SITE SELECTION	SHSP EMPHASIS AREA	SHSP STRATEGY
608893 - NORTON - TAUNTON - MEDIAN CABLE BARRIER INSTALLATION ON I-495	Roadside	Barrier - cable	4	Miles	$846694	$940771	HSIP (23 U.S.C. 148)	Urban	Principal Arterial-Interstate	0	65	State Highway Agency	Systemic	Lane Departure	Incorporate safety elements into roadway design and maintenance
ISA-DPH - Statewide - ISA with DPH on Crash-Injury Data Linkage on Mass. Roadways	Non-infrastructure	Data/traffic records	1	improved linked crash data set	$200000	$222222.22	HSIP (23 U.S.C. 148)	N/A	N/A	0		Crash data for ALL roadways	No specific site, all crash data	Data	
607916 - FALL RIVER TO RANDOLPH-GUIDE & TRAFFIC SIGN REPLACEMENT ON A SECTION OF ROUTE 24	Roadway signs and traffic control	Sign sheeting - upgrade or replacement	36.6	Miles	$2002900.5	$2225445	HSIP (23 U.S.C. 148)	Urban	Principal Arterial-Interstate	0		State Highway Agency	systemwide	Older Drivers	Develop infrastructure improvements that accommodate the needs of older road users

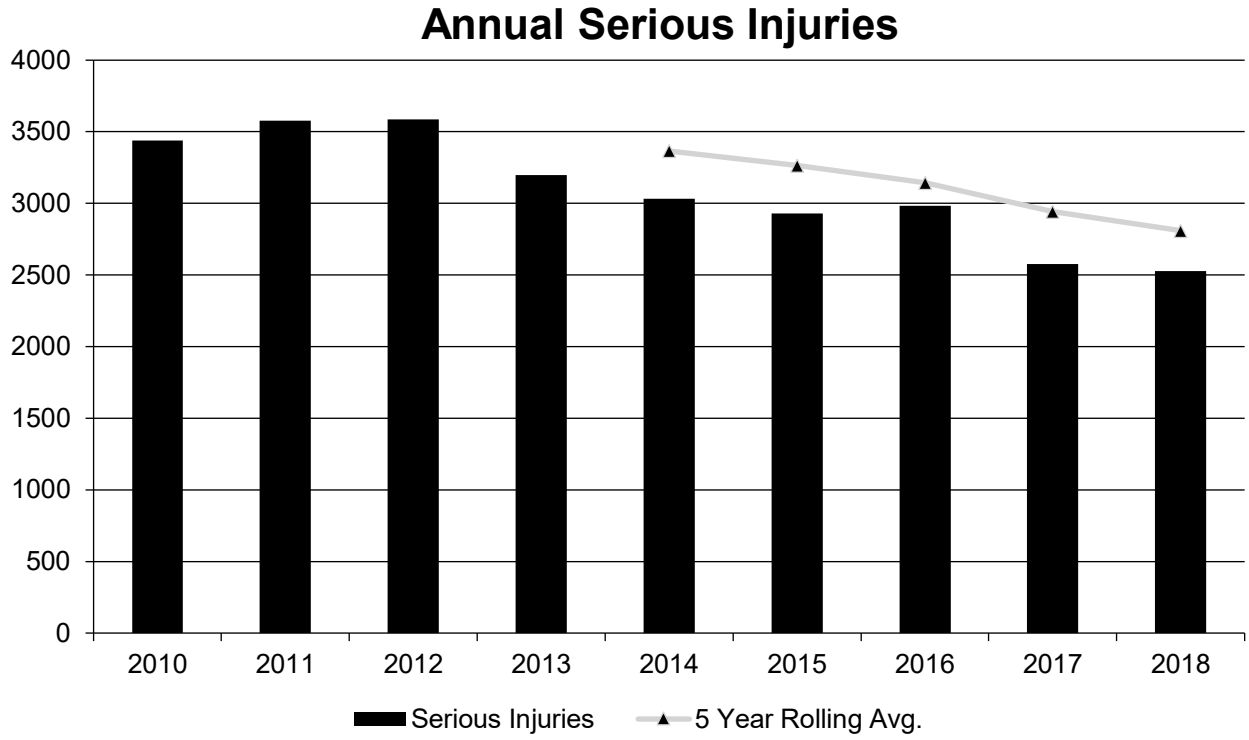
Safety Performance

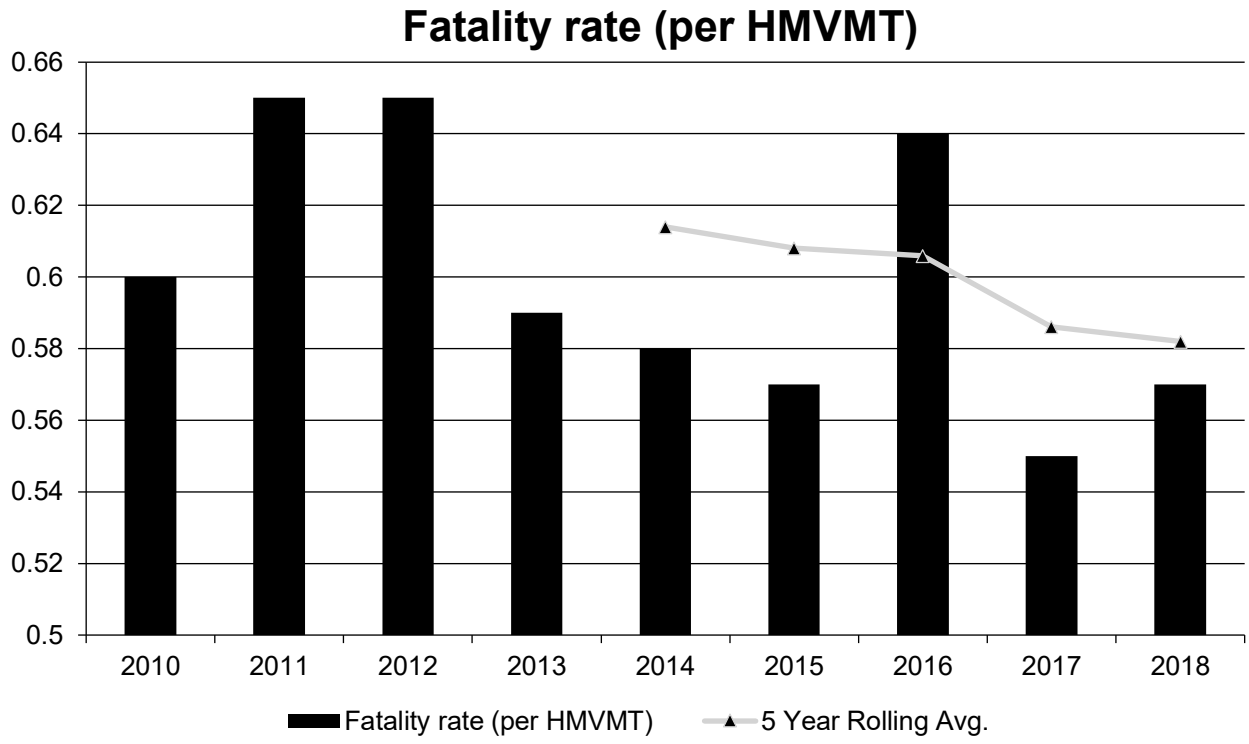
General Highway Safety Trends

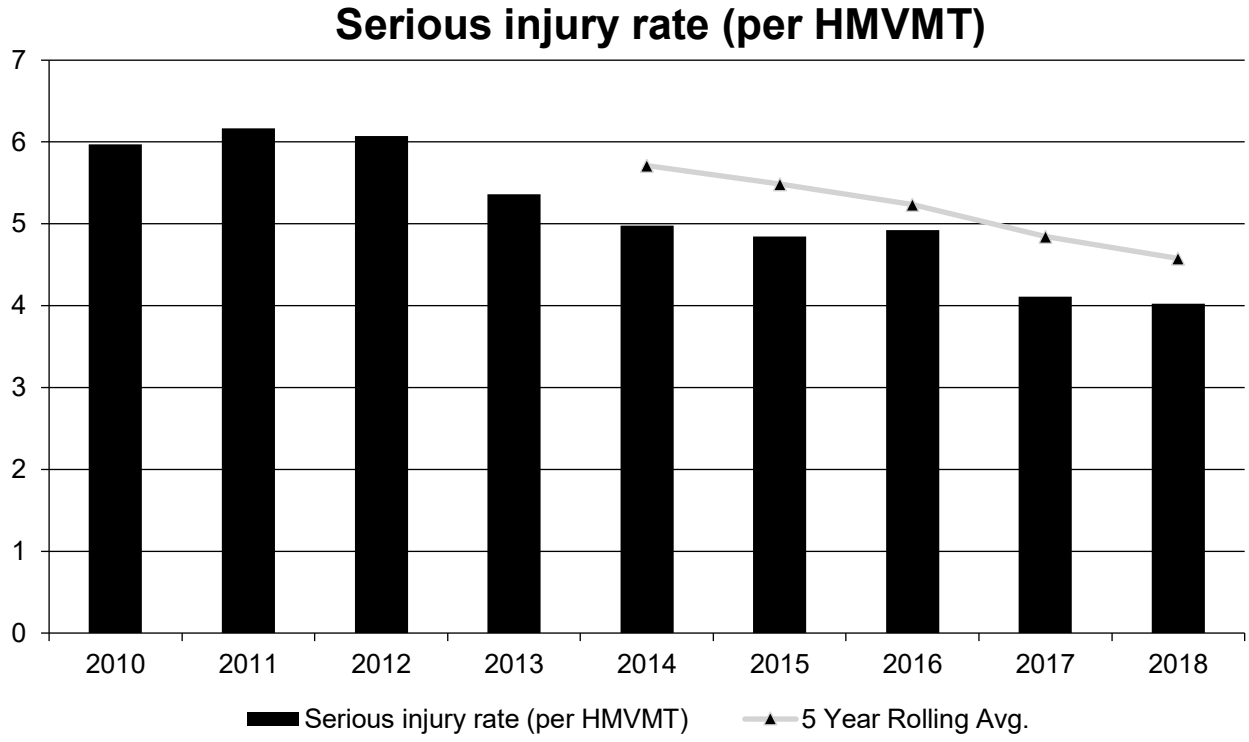
Present data showing the general highway safety trends in the State for the past five years.

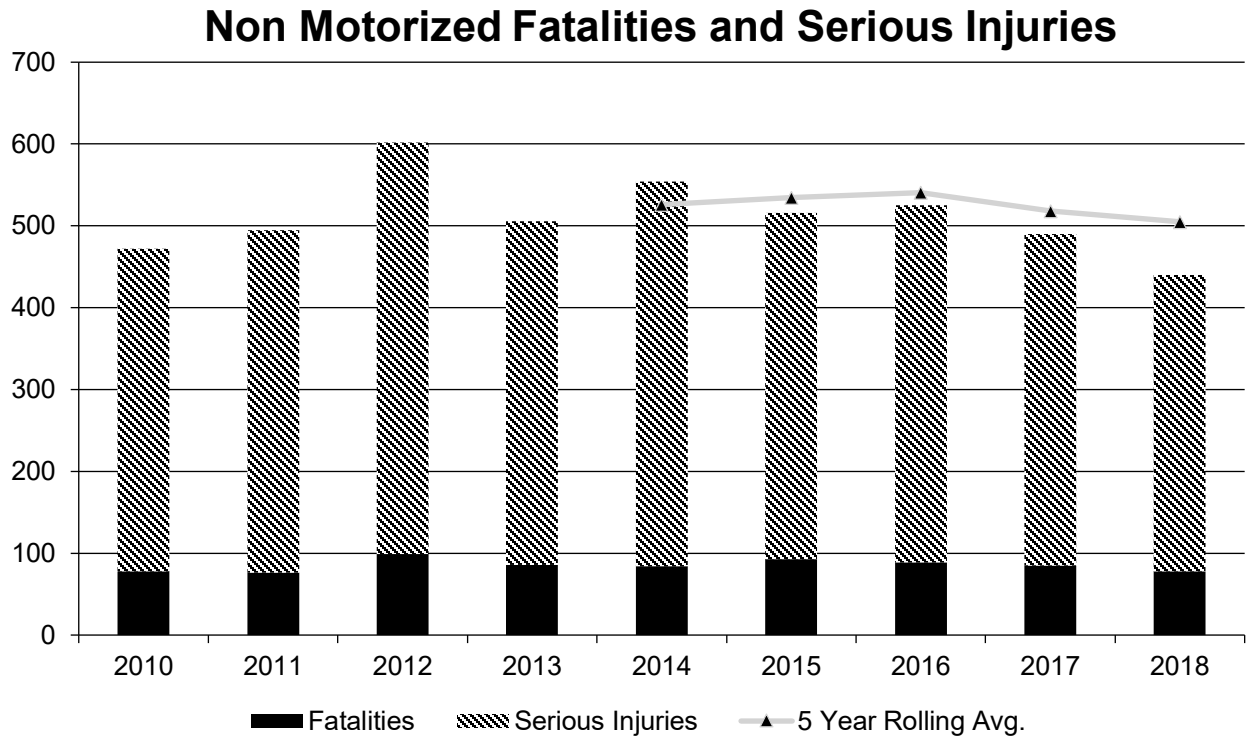
PERFORMANCE MEASURES	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fatalities	347	374	383	351	354	344	387	347	360
Serious Injuries	3,437	3,577	3,587	3,197	3,031	2,931	2,983	2,575	2,529
Fatality rate (per HMVMT)	0.600	0.650	0.650	0.590	0.580	0.570	0.640	0.550	0.570
Serious injury rate (per HMVMT)	5.975	6.169	6.076	5.365	4.977	4.848	4.926	4.109	4.024
Number non-motorized fatalities	78	76	99	86	84	93	89	85	78
Number of non-motorized serious injuries	394	419	503	420	470	423	436	405	362


Annual Fatalities
400
390
380
370
360
350
340
330
320
2010
2011
2012
2013
2014
2015
2016
2017
2018
Fatalities
5 Year Rolling Avg.


Annual Serious Injuries
4000
3500
3000
2500
2000
1500
1000
500
0
2010
2011
2012
2013
2014
2015
2016
2017
2018
Serious Injuries
5 Year Rolling Avg.


Fatality rate (per HMVMT)
0.66
0.64
0.62
0.6
0.58
0.56
0.54
0.52
0.5
2010
2011
2012
2013
2014
2015
2016
2017
2018
Fatality rate (per HMVMT)
5 Year Rolling Avg.


Serious injury rate (per HMVMT)
7
6
5
4
3
2
1
0
2010
2011
2012
2013
2014
2015
2016
2017
2018
Serious injury rate (per HMVMT)
5 Year Rolling Avg.



2018 file is not yet closed so data are incomplete and will be updated next year withy the final numbers.

Describe fatality data source.

FARS

While we use FARS as our source, we do have the FARS analyst provide us with updated information for 2018 that is not yet available on the FARS website. MassDOT now has additional staff time to help in the processing of information needed for FARS so that FARS can be updated in a more timely manner.

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

Year 2017

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 (RPA) - Interstate	3	13.6	0.36	1.63
Rural Principal Arterial (RPA) - Other Freeways and Expressways	0.6	2.4		
Rural Principal Arterial (RPA) - Other	4.2	10.8		3.56
Rural Minor Arterial	5.4	20.4	1.3	4.73

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 Minor Collector	2.4	10.4	2.15	9.25
Rural Major Collector	6.4	31.4	1.35	6.65
Rural Local Road or Street	7.6	26.8	1.41	4.94
Urban Principal Arterial (UPA) - Interstate	53.4	58.8	0.33	0.36
Urban Principal Arterial (UPA) - Other Freeways and Expressways	12.2	27.8	0.2	
Urban Principal Arterial (UPA) - Other	96.6	202	0.81	1.79
Urban Minor Arterial	76.2	203.4	0.71	2.12
Urban Minor Collector	1.2			
Urban Major Collector	20.4	91	0.57	2.84
Urban Local Road or Street	67.6	77	0.84	0.97
Other	0			
unknown (not geocoded)	0	146.4		

Year 2017

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	149.4	877.4	0.46	2.72
County Highway Agency				
Town or Township Highway Agency				
City or Municipal Highway Agency				
State Park, Forest, or Reservation Agency	0.4	1	0.49	1.22
Local Park, Forest or Reservation Agency				
Other State Agency	8.4	63.4	0.92	6.98
Other Local Agency				
Private (Other than Railroad)	3.8	32.8	15.32	132.05
Railroad				
State Toll Authority				
Local Toll Authority				
Other Public Instrumentality (e.g. Airport, School, University)				
Indian Tribe Nation			0	0
Local Highway Agency	185.4	1,790.6	0.76	7.35
unknown (not geocoded)	9.4	175.6		
Federal				
County				
Federal	0	0.6	0	1.25

- 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 used for other years) and then checked against VMT information provided by the MassDOT Planning Office..

- 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.
- 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”
- A category for Unknown functional classification was added so that no fatal or serious injury crashes would be excluded from this analysis. These are data points with unknown functional classification because the crash could not be located to a point and the FARS analyst was unsure how to code (or the statewide crash system did not contain coordinates and therefore was unable to link to roadway data). Similarly, there is an unknown category for jurisdiction for those fatalities and serious injuries that were not able to be located and therefore not able to be linked to the roadway data.
- Less than 0.1% of the VMTs of Massachusetts roads have no jurisdiction category for the years of 2011-13 and therefore were not accounted for in the analysis.
- The category of “City OR Town Highway Agency” was added because Massachusetts does not make a distinction between these roads.
- The category for Other State Agency includes crashes from the Department of Conservations, Massport, and State Inst.
- The category for Private includes crashes that occurred on Private roads as well as those that occurred on Unaccepted roads.
- The category of Other Federal Agency (military, institutional, , etc) includes crashes from Federal Park, Department of Defense, US Army Corps, Federal Inst., Other Federal, US Army, and US Navy.
- The category of Other Public Instrumentality includes crashes that occurred on State College/University property.
- For 2008 & 2009, there were no VMTs available for Rural Principal Arterial (RPA) Other Freeways and Expressways, therefore, crashes in this category were combined with Rural Principal Arterial (RPA) Other so rates could be calculated.
- For 2008, there was no VMT value for Urban Major Collector, therefore, crashes in this category used the VMT for Urban Collector (combined major + minor) VMT value so rates could be calculated.

Safety Performance Targets

Safety Performance Targets

Calendar Year 2020 Targets *

Number of Fatalities:347.0

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

Per FHWA guidance, our target setting process began with a trend line projection based on the most recent available data. Based on 5 year rolling averages, the number of fatalities in Massachusetts over the last 7 years, (2012 – 2018), has been relatively stable fluctuating less than 1 percent (between 358.4 and 361.6) with the exception of 2016, when the 5 year average reached 363.8. In December 2018, the SHSP was signed by the which includes some proposed legislation that could have a marked improvement in highway safety, such as primary seat belt law and hands-free only use of electronic devices while driving. The SHSP also contains strategies that include a mix of

engineering, enforcement, education, awareness and emergency response strategies, as well as data enhancements to better track highway safety. These external factors, along with continued construction of HSIP and other safety projects and continued education and enforcement programs may have an impact on the number of fatalities and serious injuries on the roadways in Massachusetts With these considerations and initiatives, we anticipate the 5 year average fatalities for 2016-2020 will be 347, a nearly 3% drop from the 2014-2018 5 year rolling average of 358.4. This target was developed in coordination with the Executive Office of Public Safety and Security – Highway Safety Division (EOPSS/HS) (required to submit targets to NHTSA), the MassDOT Office of Transportation Planning (OTP) working closely with the MPOs, and the Office of Performance Management and Innovation (OPMI, which produces an annual performance report called Tracker that serves the public and State Legislature). Moreover, it should be noted that our overarching goal is towards zero deaths and we will continue to work towards that goal by implementing SHSP strategies.

Number of Serious Injuries:2689.0

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

FHWA guidance, we began with a trend line and considered external factors and planned implementation projects to inform the targets. Based on this, the predicted number of serious injuries for 2016-2020 five year rolling average would be 2,689 per year, down from 2,809.8 for 2014-2018 yearly average and equal to a 4 percent reduction. The external factors, described in the fatalities section, also apply to injuries, and will impact the number of serious injuries on our roadways. Furthermore, there is also a data issue which may impact reporting levels On January 1, 2019, our statewide crash system changed the data attributes to describe the injury severity. The term used to be “incapacitating injury” now the term is “suspect serious injury” and there are definitions provided to police agencies for a suspected serious injury that would make it easier and more objective to report on injury severity. It is unclear how this will impact the trends. As a result, the 4 percent decrease in serious injuries was selected as it generally follows the trendline. This target was developed in coordination with EOPSS/HSD (required to submit targets to NHTSA), the MassDOT OTP working closely with the MPOs, and OPMI (which produces an annual performance report called Tracker that serves the public and State Legislature). Moreover, it should be noted that our overarching goal is towards zero deaths and serious injuries, and we will continue to work towards that goal.

Fatality Rate:0.560

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

The fatality rate is calculated using the 5 year target for fatalities and the projected vehicle miles traveled (VMT) to obtain the 2016-2020 fatality rate. MassDOT Planning projects a linear 0.3% annual increase in VMTs every year. Therefore, the fatality rate from 2014-2018 of 0.58 fatalities per 100 million vehicle miles traveled will decrease to 0.56 fatalities per 100 million vehicle miles traveled in 2016-2020 which reflects a 4% reduction. The long term goal is towards zero deaths, so the long term fatality rate target is 0.0 fatalities per 100 million VMTs.

Serious Injury Rate:4.300

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

The serious injury rate is calculated using the 5 year target for serious injuries and the projected vehicle miles traveled (VMT) to obtain the 2016-2020 fatality rate goal. MassDOT Planning projects a linear 0.3% annual increase in VMTs every year. Therefore, the serious injury rate from 2014-2018 of 4.57 serious injuries per 100 million vehicle miles traveled will drop to 4.30 serious injuries per 100 million vehicle miles traveled in 2016-2020 which reflects a nearly 6% drop. The long term goal is towards zero deaths and injuries, so the long term serious injury rate is 0.0 serious injuries per 100 million VMTs.

Total Number of Non-Motorized Fatalities and Serious Injuries:505.4

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 forecast and then consider external factors and planned implementation in order to set targets. Using historical data to create a trend line, the predicted number of fatalities and serious injuries for non-motorists for the 2016-2020 yearly average see an increase from the 2014-2018 yearly average of 505.4 (this target includes bicyclists and pedestrians, and excludes skaters, not reported, train/trolley passengers, and other, from the query for statewide data for serious injuries). However, even though the fatalities and injuries has been trending upwards, Massachusetts is actively working on strategies to ameliorate non-motorist fatality and injuries, while promoting and encouraging walking and cycling. In fact, the past two years of closed crash data do indicate the trend may be changing. Therefore, the goal is to reverse the trend of increasing fatalities and injuries and move towards zero deaths and injuries. To do this, we have set the goal identical to the 2014-2018 5 year rolling average of 505.4. The 2018 Strategic Highway Safety Plan, the 2019 Statewide Pedestrian Plan and the 2019 Statewide Bicycle Plan identify new multi-disciplined and multi-agency strategies to implement to eliminate fatalities and serious injuries of people walking and bicycling. There also may be some implementation of low-cost systemic projects related to pedestrian safety in an effort to further drive down 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.

Please note that 2018 data are draft and expected to change. Typically, the statewide crash file closes approximately two years later. Presently, 2017 is our most current closed year. However, the safety performance targets were based on the preliminary information.

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

There is a performance target working group committee comprised of MassDOT Planning, Office of Performance Management and Innovation (OPMI), Traffic and Safety Engineering, MPOs, FHWA and others. The committee has met to discuss and review the proposed targets. In addition, MassDOT regularly meets with the Highway Safety Division Office to review performance targets so that the targets are aligned in both the Highway Safety Plan (submitted to NHTSA) and the HSIP report. Furthermore, the targets are reviewed by the Office of Secretary of Transportation and published in MassDOT's Tracker system for the State Legislature and the public.

Does the State want to report additional optional targets?

No

Describe progress toward meeting the State's 2018 Safety Performance Targets (based on data available at the time of reporting). For each target, include a discussion of any reasons for differences in the actual outcomes and targets.

Fatalities: The target for fatalities was 352 annual fatalities (5 year rolling average) in 2018. The actual number, based on the available information was 358.4 annual fatalities. We did not achieve our target on this measure. However, we are below the baseline (the most recent actual 5 year rolling average fatality county) of 361 that was presented in the 2017 Annual HSIP Report. There are a number of reasons why the number of fatalities have not met our targets but are below the baseline. While none are known definitively, it is possible that the following could have contributed to the lower than expected drop in fatalities:

- The statewide Strategic Highway Safety Plan (SHSP) was completed in December 2018, so strategies implemented as a result of the SHSP (such as hands free and primary seat belt law legislation and systemic infrastructure projects to name a few) will not be reflected in this respective reporting time frame.
- The data on the 2016 fatalities were not finalized when the trends were established for the 2018 5-year rolling average. Therefore, it was not known at that time that the number of fatalities would be higher than anticipated and would serve as an outlier year.

Serious Injury: The target was 2,896 annual serious injuries (5 year rolling average) in 2018. The actual number based on the available information was 2,809.8 annual serious injuries. We did achieve our target on this measure. The drop in the total number of serious injuries met our target, unlike the drop in fatalities. One of the differences between the reduction in fatalities and the reduction in serious injuries is due to the 2016 numbers. While 2016 was an outlier year for fatalities (and was higher than previous and subsequent years), that was not the case for serious injuries. Because the targets include 5-year rolling averages, the outlier 2016 data will continue to have an impact through 2020 on fatalities but not serious injuries.

Fatality Rate: The target for fatality rate was 0.61 annual fatalities per 100 million vehicle miles traveled (5-year rolling average) in 2018. The actual rate based on the available information was 0.582 annual fatalities per 100 million vehicle miles traveled (5 year rolling average). We did achieve our target on this measure. The fatality rate is dependent upon fatalities and vehicle miles traveled. Although the total for fatalities did not meet the targets, the vehicle miles traveled were higher than anticipated so the rate was lower and the fatality rate met the target.

Serious Injury Rate: The target for serious injury rate was 5.010 annual fatalities per 100 million vehicle miles traveled (5-year rolling average) in 2018. The actual rate based on the available information was 4.577 annual serious injuries per 100 million vehicle miles traveled (5-year rolling average). We did achieve our target on this measure. The rate is dependent upon serious injuries and vehicle miles traveled. The serious injuries rate met the target and the vehicle miles traveled were higher than anticipated so the rate was lower.

Total Number of Non-Motorized Fatalities and Serious Injuries: The target for Non-Motorist fatalities and serious injuries was 540.8 in 2018. The actual number was 505.0. We did achieve our target on this measure. Prior to the 2017 Annual HSIP report, we had been experiencing an increase in fatalities and serious injuries of non-motorists. Based on that, the target was set for the number to remain the same and not increase. Recently, significant focus has been placed on pedestrians and bicyclists. There are several factors that we believe have contributed to the decrease in the numbers compared to this target including: 1) implementation of statewide safety campaigns; 2)the awareness and enforcement of laws involving bicyclist and pedestrian roadway safety; and 3) the continued focus on Complete Streets Program and respective projects and other infrastructure related to bicycle and pedestrian safety and amenities. In addition, several cities in Massachusetts have signed onto or incorporated the Vision Zero philosophy and implemented changes to better accommodate bicyclists and pedestrians. While these activities may help to explain the drop in non-motorized fatalities and serious injuries, it is critical we stay focused as the number of people walking and

bicycling will most likely increase which increases the exposure (although this does also increase awareness of other transportation modes).

Applicability of Special Rules

Does the HRRR special rule apply to the State for this reporting period?
No

The rural fatality rate (including rural collectors and local roadways) for 2011-2015 was 1.75 fatalities per 100 MVMT (103 fatalities / 5.88637 BVMT). The rural fatality rate (including rural collectors and local roadways) for 2013-2017 was 1.39 fatalities per 100 MVMT (82 fatalities / 5.90703 BVMT). This indicates a drop and therefore, MA is NOT subject to the HRRR Rule.

Provide the number of older driver and pedestrian fatalities and serious injuries 65 years of age and older for the past seven years.

PERFORMANCE MEASURES	2011	2012	2013	2014	2015	2016	2017
Number of Older Driver and Pedestrian Fatalities	69	80	72	59	65	76	48
Number of Older Driver and Pedestrian Serious Injuries	284	319	272	271	281	297	264

The fatal information comes from FARS and the serious injury information comes from the Statewide Crash Data System. In both cases it is older drivers who themselves were fatally or seriously injured (this does NOT include if an older driver fatally or seriously injured someone else).

Evaluation

Program Effectiveness

How does the State measure effectiveness of the HSIP?

- Benefit/Cost Ratio
- Change in fatalities and serious injuries

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

Question 46 contains evaluations of HSIP-funded projects completed in 2013 and 2014. Three years of before and after crash data were used to evaluate each project. Additionally, Empirical Bayes (EB) was used where possible to compare the number of crashes observed in the after period to the expected number. Where EB was not possible due to lack of SPFs, crash rates were used to estimate the expected number of crashes in the after period, producing a naïve before/after estimate. In total, 18 projects were evaluated, with 11 focused on intersection and interchange improvements, 5 on roadside improvements, and 2 on roadway improvements.

In total, the 18 projects that were evaluated are estimated to produce an annual benefit of $5.6 million due to the reduction in crashes. Over 20 years at a seven percent annual discount rate, the projects are estimated to have a total benefit/cost ratio of 1.63:1. Additionally, these projects averaged a reduction of 13.8 fatal and injury crashes per year during the three years of observed after data.

While this is not a "measure of effectiveness" , it should be pointed out that MassDOT now tracks trends of the emphasis areas by looking at five year averages on the SHSP emphasis areas that are available. We present this in a public-facing dashboard. https://apps.impact.dot.state.ma.us/cdp/dashboard-view/24 . In the dashboard, there are three tabs. The first tab is for the 5 safety performance targets. The second tab is the 5 year rolling average fatalities and fatality rates for the emphasis areas. The third tab is for the 5 year rolling average for serious injuries and serious injury rates for each of the emphasis areas.

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

- # RSAs completed
- HSIP Obligations

MassDOT is implementing DDSA into alternative selection for HSIP-funded projects. This effort was piloted on numerous projects throughout the state (primarily intersection projects). Additionally, MassDOT is developing tools and guidance to incorporate DDSA within and outside of HSIP. The agency is developing a safety alternative analysis guide which focuses on state-specific SPFs and crash-costs and also includes a list of state-preferred CMFs. MassDOT is also developing and incorporating a state-specific SPICE tool to assist with identifying safety-motivated intersection design alternatives.

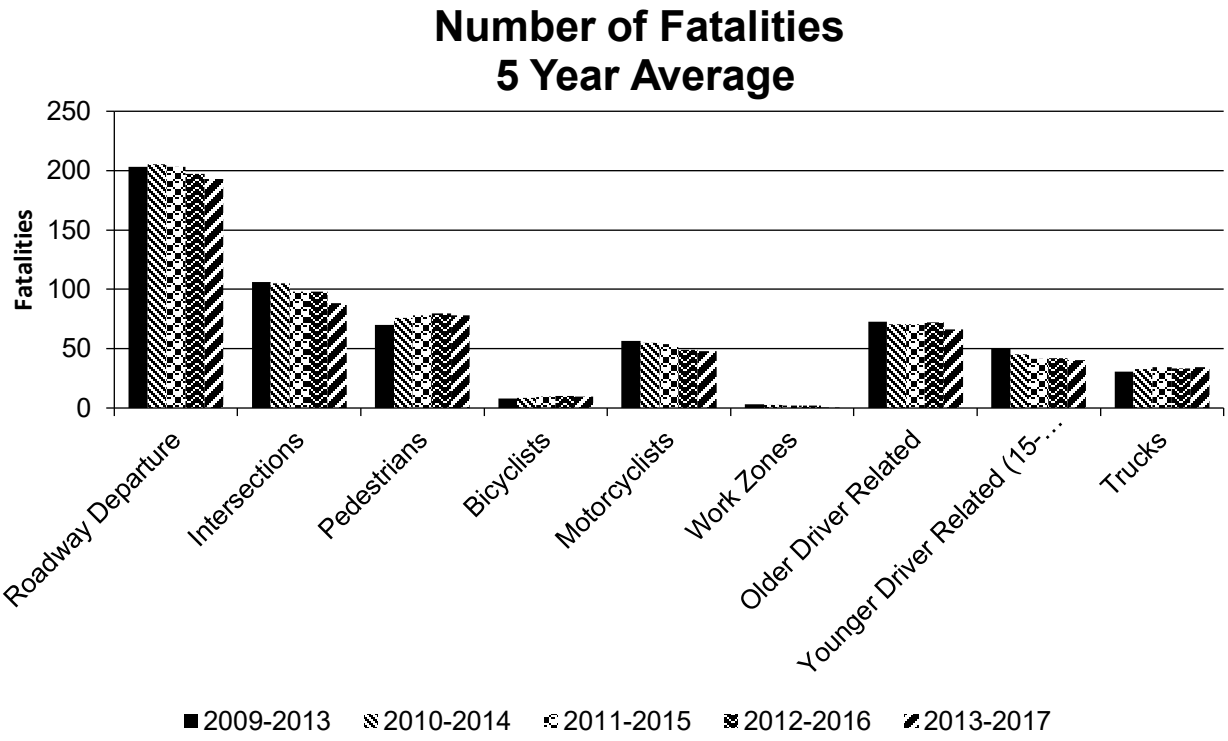
MassDOT is also automating the network screening process for roadway segments using the EB process. This process includes annual calibration of SPFs and developing a state-specific network screening tool which interfaces with ESRI roads and highways.

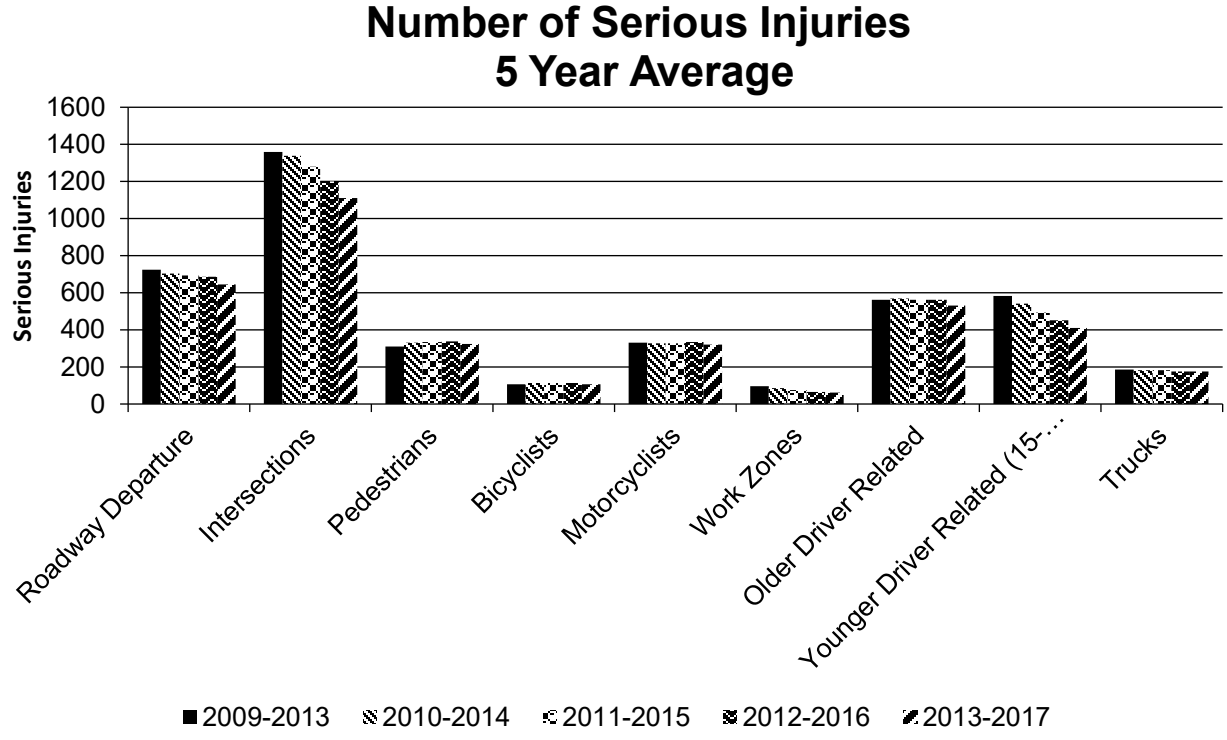
Effectiveness of Groupings or Similar Types of Improvements

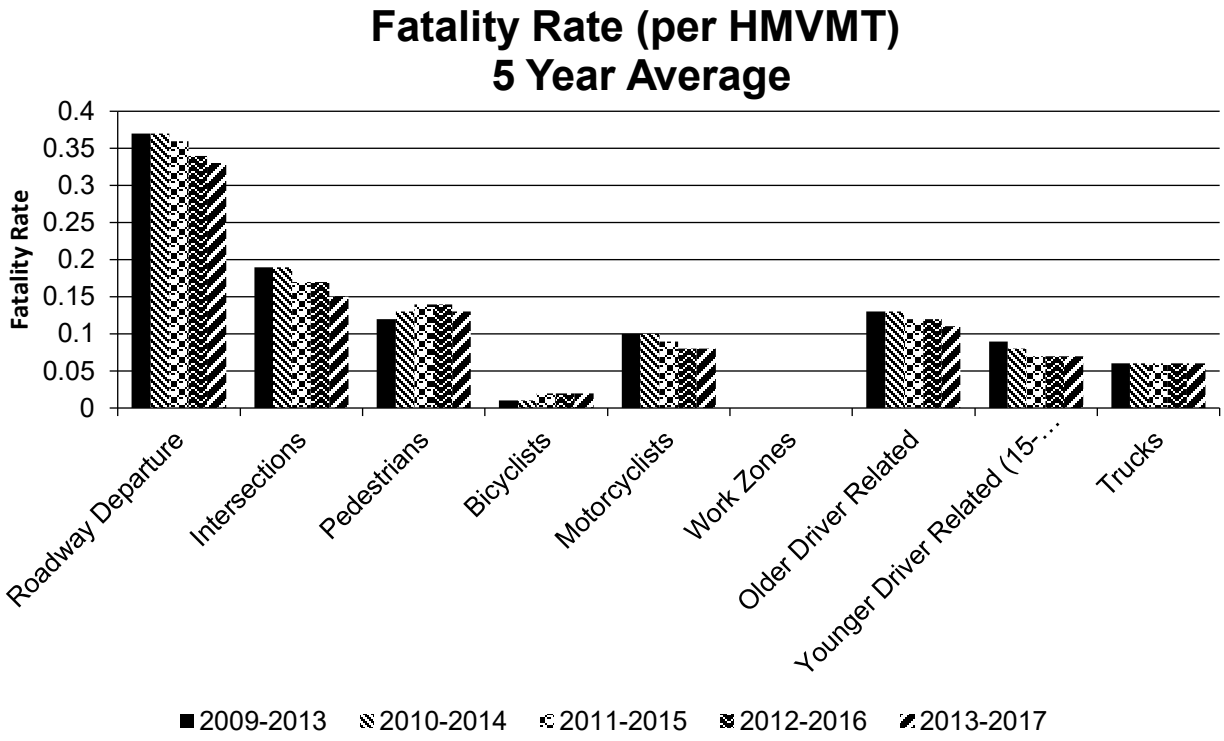
Present and describe trends in SHSP emphasis area performance measures.

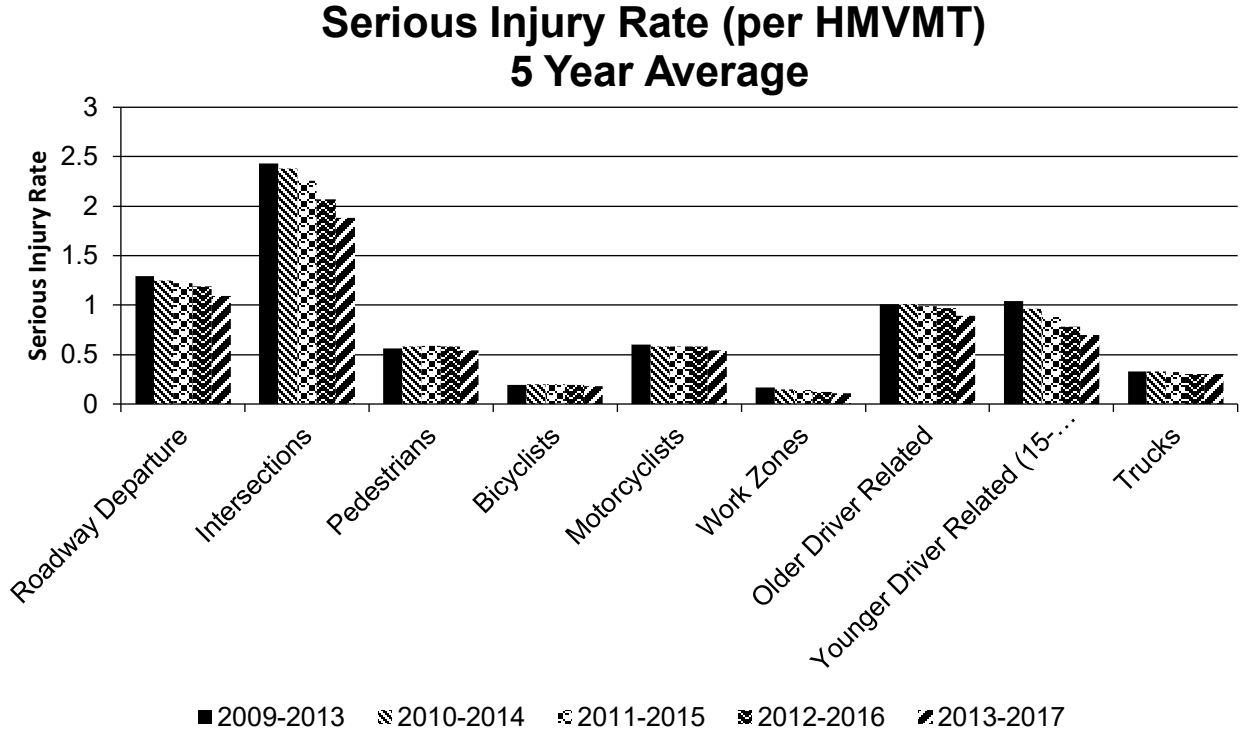
Year 2017

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)
Roadway Departure		193	645.6	0.33	1.09
Intersections		88.2	1,111.4	0.15	1.88
Pedestrians		78	323.8	0.13	0.54
Bicyclists		9.4	107	0.02	0.18
Motorcyclists		48	320	0.08	0.54
Work Zones		0.6	61.2	0	0.11
Older Driver Related		66.4	529.6	0.11	0.89
Younger Driver Related (15-20)		40.2	411	0.07	0.7
Trucks		34.6	175.6	0.06	0.3


Number of Fatalities
5 Year Average
Fatalities
250
200
150
100
50
0
Roadway Departure
Intersections
Pedestrians
Bicyclists
Motorcyclists
Work Zones
Older Driver Related
Younger Driver Related (15-…
Trucks
2009-2013
2010-2014
2011-2015
2012-2016
2013-2017


Number of Serious Injuries
5 Year Average
Serious Injuries
1600
1400
1200
1000
800
600
400
200
0
Roadway Departure
Intersections
Pedestrians
Bicyclists
Motorcyclists
Work Zones
Older Driver Related
Younger Driver Related (15-…
Trucks
2009-2013
2010-2014
2011-2015
2012-2016
2013-2017





The fatality rates and serious injury rates are based on the fatalities and serious injuries for each emphasis area and the total statewide VMTs.

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

No

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 OTHER INJURY BEFORE	ALL OTHER INJURY AFTER	TOTAL BEFORE	TOTAL AFTER	EVALUATION RESULTS (BENEFIT/COST RATIO)
Attleboro - Ramp Improvements	Urban Principal Arterial (UPA) - Interstate	Interchange design	Interchange design - other	10.00	14.00					3.00	4.00	13.00	18.00	-3.28
Yarmouth - Old Town Hosue Road/Forest Street Intersection Realignment	Urban Minor Arterial	Intersection geometry	Intersection geometrics - realignment to align offset cross streets	9.00	9.00					3.00	2.00	12.00	11.00	0.48
West Bridgewater - Route 106 at Route 28 Intersection Improvements	Urban Principal Arterial (UPA) - Other	Intersection traffic control	Intersection traffic control - other	52.00	73.00					9.00	15.00	61.00	88.00	-1.78
Oak Bluffs - Intersection Improvements at Edgartown-Vineyard Haven Road and Barnes Road	Urban Principal Arterial (UPA) - Other	Intersection traffic control	Modify control - all-way stop to roundabout	4.00	5.00					1.00	1.00	5.00	6.00	0.33
Freetown - Roundabout at County/Chace/Mason Road Intersection	Urban Minor Arterial	Intersection traffic control	Modify control - two-way stop to roundabout	15.00	16.00			1.00		6.00	1.00	22.00	17.00	5.75
Pittsfield - Route 7 Corridor Improvements	Urban Principal Arterial (UPA) - Other	Intersection traffic control	Modify traffic signal timing - general retiming	95.00	84.00			4.00	1.00	22.00	20.00	121.00	105.00	4.82
Worcester - Belmont Street East Improvements	Urban Principal Arterial (UPA) - Other Freeways and Expressways	Intersection traffic control	Modify traffic signal timing - general retiming	160.00	112.00			3.00	2.00	42.00	23.00	205.00	137.00	2.71
Northborough - Route 20 Signal Improvements	Urban Principal Arterial (UPA) - Other	Intersection traffic control	Modify traffic signal timing - general retiming	80.00	61.00					6.00	9.00	86.00	70.00	1.97
Southwick - Route 10/202 Reconsutrction	Urban Principal Arterial (UPA) - Other	Intersection traffic control	Modify traffic signal timing - general retiming	73.00	53.00					13.00	19.00	86.00	72.00	0.22
Lancaster - Route 70 at Old Union Turnpike Roundabout	Urban Minor Arterial	Intersection traffic control	Modify control - two-way stop to roundabout	24.00	6.00			3.00		11.00		38.00	6.00	11.58

LOCATION	FUNCTIONAL CLASS	IMPROVEMENT CATEGORY	IMPROVEMENT TYPE	PDO BEFORE	PDO AFTER	FATALITY BEFORE	FATALITY AFTER	SERIOUS INJURY BEFORE	SERIOUS INJURY AFTER	ALL OTHER INJURY BEFORE	ALL OTHER INJURY AFTER	TOTAL BEFORE	TOTAL AFTER	EVALUATION RESULTS (BENEFIT/COST RATIO)
Fairhaven - Huttlestone Avenue/Route 6 Intersection Improvements	Urban Principal Arterial (UPA) - Other	Intersection traffic control	Modify control - two-way stop to roundabout	76.00	52.00			1.00		20.00	11.00	97.00	63.00	9.53
Agawam - Reconstruction of Route 159 (Main St) from Connecticut State Line to Route 75	Urban Minor Arterial	Shoulder treatments		69.00	50.00					15.00	13.00	84.00	63.00	0.43
Bedford/Billerica/Chelmsford - Route 3 High Tension Cable System Installation	Urban Principal Arterial (UPA) - Other Freeways and Expressways	Roadside	Barrier - cable	2.00				1.00				3.00		1.55
Danvers - I-95 Median Cable Barrier	Urban Principal Arterial (UPA) - Interstate	Roadside	Barrier - cable	76.00	81.00			3.00	2.00	27.00	22.00	106.00	105.00	1.25
Taunton/Lakeville - Route 140 Cable Barrier	Urban Principal Arterial (UPA) - Other Freeways and Expressways	Roadside	Barrier - cable	28.00	82.00	2.00	1.00	3.00	6.00	17.00	34.00	50.00	123.00	-0.13
Winchendon - Route 140 Resurfacing and Improvements	Urban Principal Arterial (UPA) - Other	Roadway	Pavement surface - miscellaneous	13.00	25.00	1.00	1.00	1.00		4.00	10.00	19.00	36.00	-2.39
Westminster - South Street Reconstruction	Urban Major Collector	Roadway	Pavement surface - miscellaneous	7.00	5.00						4.00	7.00	9.00	0.18
West Bridgewater - Route 24 Glare Screen on Tangents	Urban Principal Arterial (UPA) - Other Freeways and Expressways	Roadway delineation	Roadway delineation - other	278.00	308.00	1.00	2.00	25.00	14.00	134.00	148.00	438.00	472.00	-1.98

Compliance Assessment

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

12/31/2018

What are the years being covered by the current SHSP?

From: 2012 To: 2016

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

2023

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

ROAD TYPE	MIRE NAME (MIRE NO.)	NON LOCAL PAVED ROADS - SEGMENT		NON LOCAL PAVED ROADS - INTERSECTION		NON LOCAL PAVED ROADS - RAMPS		LOCAL PAVED ROADS		UNPAVED ROADS	
		NON-STATE	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE	
ROADWAY SEGMENT	Segment Identifier (12)	0.385508437181418	0.644203441596086					0.00709939148073022	0.00035493990004125	0.358974358974359	0.00524200869983974
	Route Number (8)	1	1								
	Route/Street Name (9)	0.994720104684956	0.999321295759512								
	Federal Aid/Route Type (21)	0.992605103391610	0.987839882357932								
	Rural/Urban Designation (20)	1	1					1	1		
	Surface Type (23)	1	1					1	1		
	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)	0.998265394622723	0.999632368536403								
	Functional Class (19)	1	1					100	100	100	100
	Median Type (54)	0.998174099602866	0.998769848564116								
	Access Control (22)	0.177005827665434	0.999349575102866								

ROAD TYPE	MIRE NAME (MIRE NO.)	NON LOCAL PAVED ROADS - SEGMENT		NON LOCAL PAVED ROADS - INTERSECTION		NON LOCAL PAVED ROADS - RAMPS		LOCAL PAVED ROADS		UNPAVED ROADS	
		NON-STATE	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE	
	One/Two Way Operations (91)	1	1								
	Number of Through Lanes (31)	0.998341473805937	0.99470469295703					0.970588235294118	0.969168193547768		
	Average Annual Daily Traffic (79)	0.963588502913833	0.976754379763302					0.820486815415821	0.969168193547768		
	AADT Year (80)	0.963588502913833	0.976754379763302								
	Type of Governmental Ownership (4)	1	1					1	1	1	1
INTERSECTION	Unique Junction Identifier (120)			1							
	Location Identifier for Road 1 Crossing Point (122)			1							
	Location Identifier for Road 2 Crossing Point (123)			1							
	Intersection/Junction Geometry (126)			1							
	Intersection/Junction Traffic Control (131)			0.172300853901041							
	AADT for Each Intersecting Road (79)			0.9636							
	AADT Year (80)			0.9636							
	Unique Approach Identifier (139)			1							
INTERCHANGE/RAMP	Unique Interchange Identifier (178)										
	Location Identifier for Roadway at Beginning of Ramp Terminal (197)										
	Location Identifier for Roadway at										

ROAD TYPE	MIRE NAME (MIRE NO.)	NON LOCAL PAVED ROADS - SEGMENT		NON LOCAL PAVED ROADS - INTERSECTION		NON LOCAL PAVED ROADS - RAMPS		LOCAL PAVED ROADS		UNPAVED ROADS	
		NON-STATE	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE	
	Ending Ramp Terminal (201)										
	Ramp Length (187)					1	1				
	Roadway Type at Beginning of Ramp Terminal (195)										
	Roadway Type at End Ramp Terminal (199)										
	Interchange Type (182)										
	Ramp AADT (191)					0.986437141366719	0.973990417522245				
	Year of Ramp AADT (192)					0.986437141366719	0.973990417522245				
	Functional Class (19)					1	1				
	Type of Governmental Ownership (4)					1	1				
Totals (Average Percent Complete):		**0.92**	**0.98**	**0.89**	**0.00**	**0.45**	**0.45**	**11.87**	**11.88**	**20.67**	**20.60**

*Based on Functional Classification

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 is in relatively good shape. Our largest deficiencies are with the intersections. To overcome that, we assembled an intersection collection tool (using HSIP funds) and two procured two contracts with University of Massachusetts students (using HSIP funds) to collect the intersection MIRE FDE. There are approximately 70,000 intersections to be collected and, based on recent performance measures, each intersections takes approximately 12 minutes. We are approximately 18% complete with intersections and anticipate completion in less than one year.
While AADTs are available on nearly 96% of all roadways (State owned and non-state owned), we are looking into a process in place to have some quality control. A committee has been established to perform this review which impacts HPMS, Safety and other.

Did the State conduct an HSIP program assessment during the reporting period?

No

When does the State plan to complete its next HSIP program assessment.

2020

Optional Attachments

Program Structure:

HSIP Criteria Updates.pdf
Project Implementation:

Safety Performance:

Evaluation:

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.