Massachusetts HSIP

Implementation Plan



PREPARED FOR

massDOT
Massachusetts Department of Transportation

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Photo by Michael Baccin on Unsplash

Introduction

The purpose of the Federal Highway Administration (FHWA) Highway Safety Improvement Program (HSIP) is to reduce fatalities and serious injuries on all public roads. This core Federal-aid program distributes funding to the States for them to administer primarily on infrastructure safety projects. Massachusetts receives approximately $47.4 million in Federal HSIP funds every year, which are administered by the Massachusetts Department of Transportation (MassDOT).

MassDOT first submitted an HSIP Implementation Plan in 2021 by choice in order to reevaluate investment decisions and determine the most effective way to allocate HSIP funds. The Plan was updated in 2023, 2024, and 2025 because MassDOT did not meet or make significant progress towards meeting the annual safety performance targets. These plans included a review of safety trends, historical HSIP project performance, estimation of future HSIP project benefits, and recommendations for improving the HSIP; this version is an update to that plan. The updated plan provides a status on actions recommended in the 2025 plan while identifying additional opportunities for improving the effectiveness of MassDOT's HSIP implementation. The plan begins with a review of recent safety performance to identify where MassDOT could focus their efforts. Following the review of statewide safety performance is a review of recent project effectiveness to determine what types of projects are most and least effective for MassDOT from both a safety performance and cost effectiveness standpoint. The plan then includes a summary of the potential benefits of planned State Transportation Improvement Program (STIP) projects for 2025 and 2026 which will include HSIP dollars, helping to determine what role the HSIP can play in helping MassDOT reach their safety targets. Finally, the plan includes a review of previous recommendations for MassDOT to improve the administration and effectiveness of the HSIP, as well as recommending new strategies to address ongoing needs, notably MassDOT's triggering of the Older Drivers and Pedestrians Special Rule.

Massachusetts completed an update of their Strategic Highway Safety Plan (SHSP) in 2023. In this SHSP, Massachusetts adopted the Safe System Approach to guide transportation decision making. Figure 1 summarizes the principles and elements of the Safe System Approach. The SHSP's six core initiatives and 31 actions align with the approach. As such, the HSIP should be guided by the Safe System Approach as well.



Figure 1. Safe System Approach principles and elements.[1]

Safety Trends

To guide the Massachusetts HSIP into the future, it is important to look to the past and establish context for recent safety performance in the Commonwealth. The following sections review trends in fatal and suspected serious injuries resulting from traffic crashes in recent years. These measures will serve as a baseline against which MassDOT should consider the distribution of their safety funds. As of the time of this writing, several crash data are not yet finalized and crashes may still be added, removed, or edited. Particularly, MassDOT still considers suspected serious injuries for 2022 to 2024 in draft form, while fatalities for 2023 and 2024 are still draft. Additionally, NHTSA considers 2023 FARS data to be in draft. The plots and analysis in this document reflect the current data obtained from MassDOT's Safety Data Tool IMPACT[2] as of August 8th, 2025.

Overall Crashes Per Year

Figure 2 shows the annual and five-year average number of fatal injuries in Massachusetts from 2016 to 2024. The five-year rolling average fatal injuries shown in Figure 2 indicates a recent increasing trend, primarily driven by abnormally high fatal injury frequency in 2021 and 2022. The lower number of fatalities observed in 2023 were followed by an increase in 2024 fatalities which resulted in the highest five-year average in the past nine years. The decrease from 2022 to 2023 aligns with recent national trends, as national fatalities have fallen from a recent high of 42,721 fatalities in 2022 to 40,901 in 2023 (4 percent decrease)[3]. However, the National Highway Traffic Safety Administration (NHTSA) published a projection of 39,345 fatalities for 2024, a 4 percent decrease from 2023[4]. This diverges from the trends in Massachusetts, which saw a 7 percent increase in fatalities from 2023 to 2024.

[1] https://highways.dot.gov/safety/zero-deaths
[2] https://apps.impact.dot.state.ma.us/cdp/home
[3] https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813705
[4] https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813710

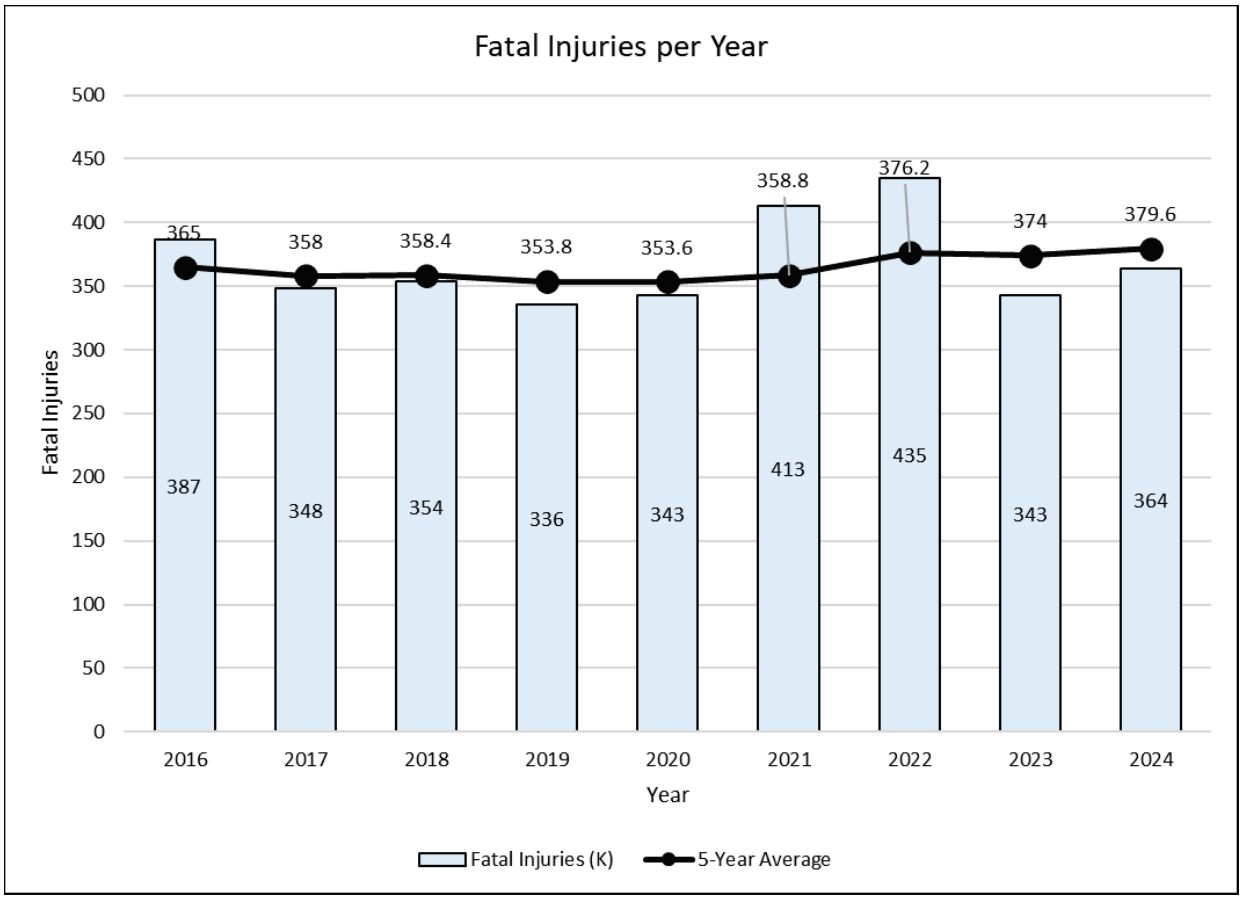


Figure 2. Fatal injury trend for Massachusetts from 2016 to 2024.

Figure 3 shows the annual and five-year average number of suspected serious injuries in Massachusetts from 2016 to 2024. Massachusetts has seen a reduction in the five-year average suspected serious injuries from 3,146 in 2016 to 2,770 in 2024. While there was a recent year-over-year increase in annual suspected serious injuries from 2,365 in 2020 to 2,903 in 2021, and 3,015 in 2022, this trend ended in 2022. The most recent two years have shown a downward trend. In 2023, 2,863 suspected serious injuries were reported, which continued to decrease in 2024 with 2,703. The five-year average of suspected serious injuries also decreased from 2023 to 2024. Recall that these data are still in draft forms, so any conclusions related to these trends are subject to change as the data are finalized.

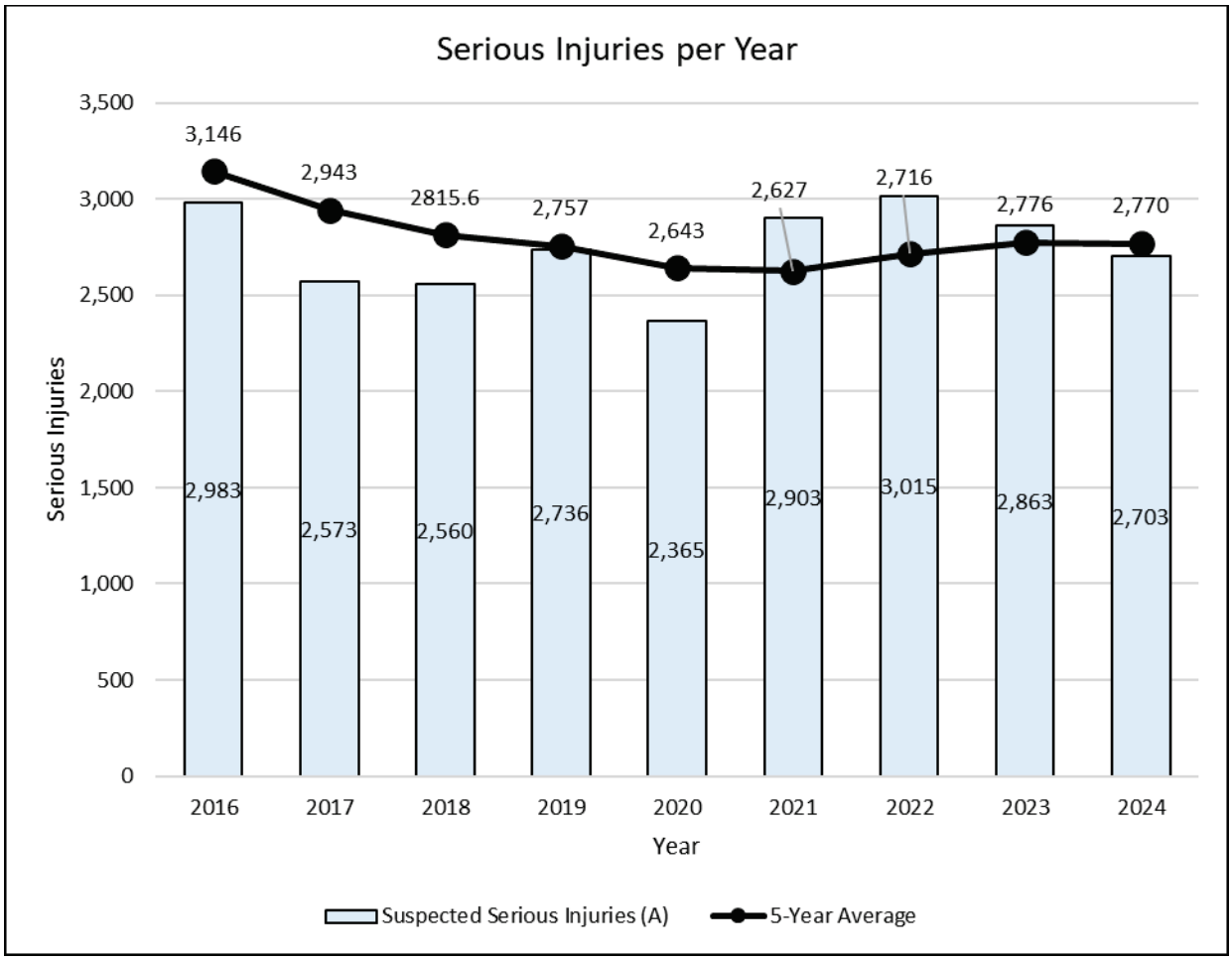


Figure 3. Suspected serious injury trend for Massachusetts from 2016 to 2024.

From 2023 to 2024, Massachusetts saw an increase in fatal injuries and a decrease in suspected serious injuries (including reported annual injuries and five-year average). The recent increase in fatalities indicates there is still much that can be done to improve road user safety. Massachusetts is striving to reverse this trend and produce reductions in fatalities and suspected serious injuries, in pursuit of MassDOT's goal of zero guided by the Safe System Approach. It is worth noting that, as of this writing[5], MassDOT observed reductions in serious injuries in 2023 and 2024. Optimistically, this is the start of a downward trend for those injuries in Massachusetts. The remainder of this section breaks down crash data to begin to identify potential areas of improvement.

[5] August 19, 2025

SHSP Emphasis Areas (EAs)

Massachusetts completed the third update of its SHSP in 2023 and is making progress on implementing many of the included strategies.[6] Framed within the context of the Safe System Approach, this SHSP did not explicitly include EAs; however, MassDOT members and stakeholders formed committees and conducted EA-focused meetings. Additionally, the IMPACT dashboard tracks the following EAs from the 2018 SHSP update:

- Lane Departure,
- Impaired Driving,
- Occupant Protection,
- Speeding and Aggressive Driving,
- Intersection Crashes,
- Pedestrians,
- Older Drivers,
- Motorcycle Crashes,
- Younger Drivers,
- Large Truck-Involved Crashes,
- Driver Distraction,
- Bicyclists,
- Safety of Persons Working on Roadways, and
- At-Grade Rail Crossings.

Figure 4 shows the five-year average number of fatalities and suspected serious injuries by SHSP EA for 2020 through 2024. MassDOT extracted these values from the IMPACT dashboard[7]. Intersection-related crashes accounted for the highest average number of fatalities and suspected serious injuries, while rail-highway grade crossings accounted for the fewest. Lane departure, older-driver related, occupant protection, and young-driver related crashes rank the next highest in fatalities and suspected serious injuries after intersection-related. Note that these EAs are not mutually exclusive, so fatalities and suspected serious injuries may be counted in multiple categories. For instance, a lane departure injury involving an impaired driver who is unbelted would be counted in the “Lane Departure”, “Impaired Driving”, and “Occupant Protection” EAs.

[6] Massachusetts SHSP (2023 Update): https://www.mass.gov/doc/massachusetts-shsp-2023/download
[7] https://apps.crashdata.dot.mass.gov/cdp/dashboard-view/24

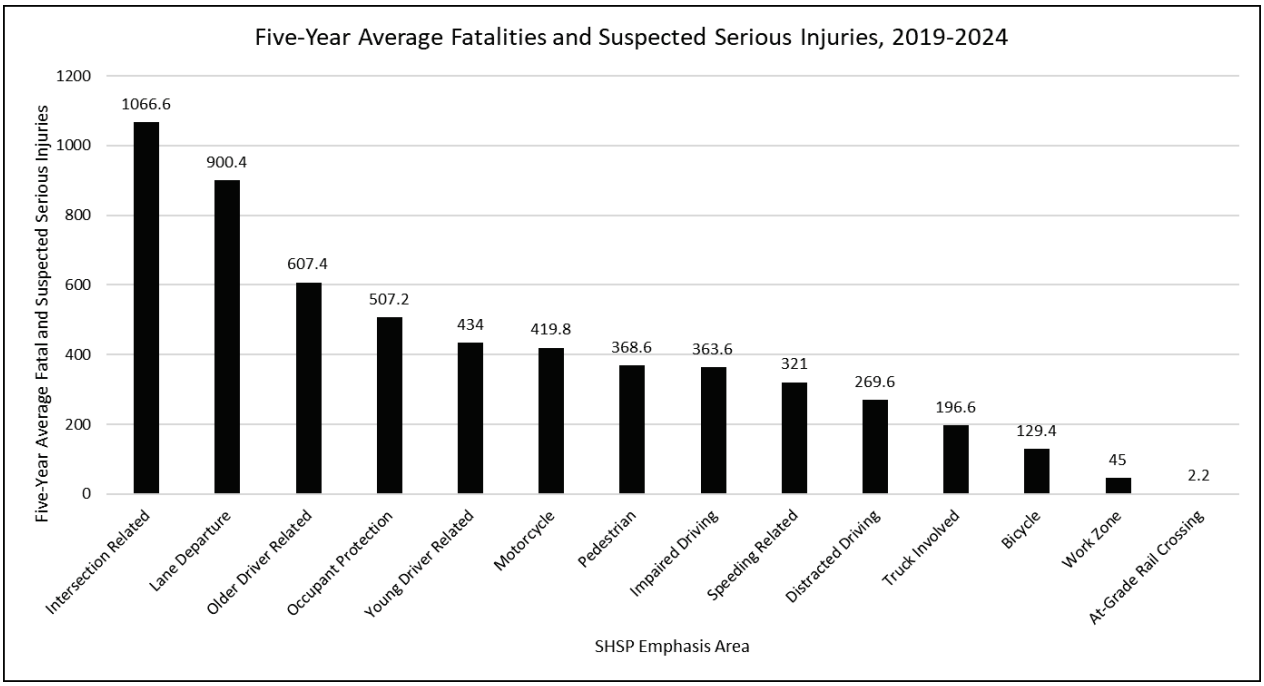


Figure 4. Annual average of fatal and suspected serious injuries from 2020 to 2024 by SHSP EA.

For ease of interpreting the annual crash trends associated with each EA, Figure 5 through Figure 7 organize the list of EAs into three groups, based loosely on the magnitude of the fatal injury trends over the five-year period. The three groups are as follows:

- Group 1: Intersection, Lane Departure, Older Drivers, Occupant Protection, and Young Drivers.
- Group 2: Motorcycle, Pedestrian, Impaired Drivers, Speeding-Related, Driver Distraction, and Truck-Involved.
- Group 3: Bicycle, Safety of Persons Working on Roadways, and At-Grade Rail Crossings.

Note that the EAs are only divided into these groups to improve the ease of reading and interpreting the fatal and suspected serious injury trends in the figures below. It is important to keep in mind the relationships between the EAs. For instance, speeding is often a contributing factor in lane departure fatalities, so increases in speeding behaviors may be correlated with increases in fatal lane departure crash frequency. In this vein, note the differences in the scale of the plots when comparing trends for EAs shown in different plots. Additionally, it is important to realize that the suspected serious injury trend may be quite different than the fatal injury trend for the same EA. This may be for several reasons, including the increased randomness that a crash results in a fatality and the absence of a detailed investigation process for serious injury crashes (compared to that which occurs for fatal crashes). As such, the totals were broken down in later tables for consideration of the individual fatal and suspected serious injury trends (see Table 1 and Table 2).

The first group of EAs resulted in, on average, the highest numbers of fatal injuries over the study period. Figure 5 shows the five-year rolling average fatal and suspected serious injuries for each of the EAs in Group 1. These trends are driven primarily by suspected serious injuries, as they account for a large proportion of the total for each EA. Intersection Related and Lane Departure showed an increasing trend from 2021 to 2023 but have trended downward since. The remaining emphasis areas – Older Driver, Occupant Protection, and Young Driver have shown slightly increasing trends since 2021.

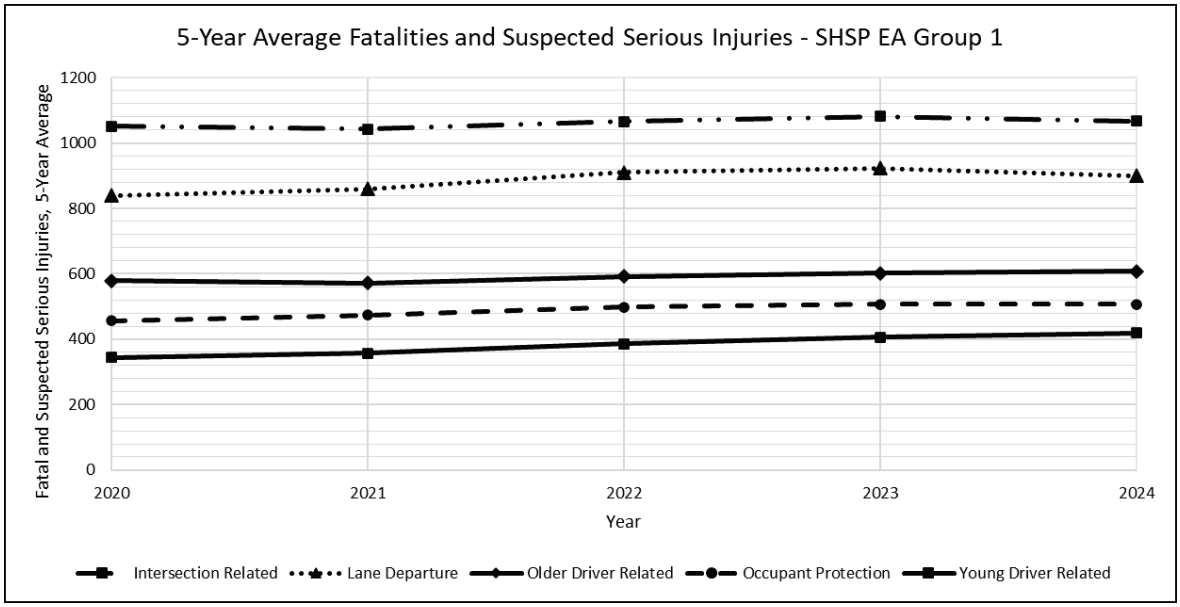


Figure 5. Five-year average fatal and suspected serious injuries by Group 1 Massachusetts SHSP EA.

Figure 6 shows the trends for combined fatalities and suspected serious injuries for the second group of SHSP EAs (Motorcycles, Pedestrians, Impaired Drivers, Speeding-Related, Driver Distraction, and Truck-Involved Crashes). Overall, Driver Distraction and Truck-Involved EAs have remained relatively stable, with Speeding, Impaired Driving, Pedestrians, and Motorcycles each showing increases in recent years.

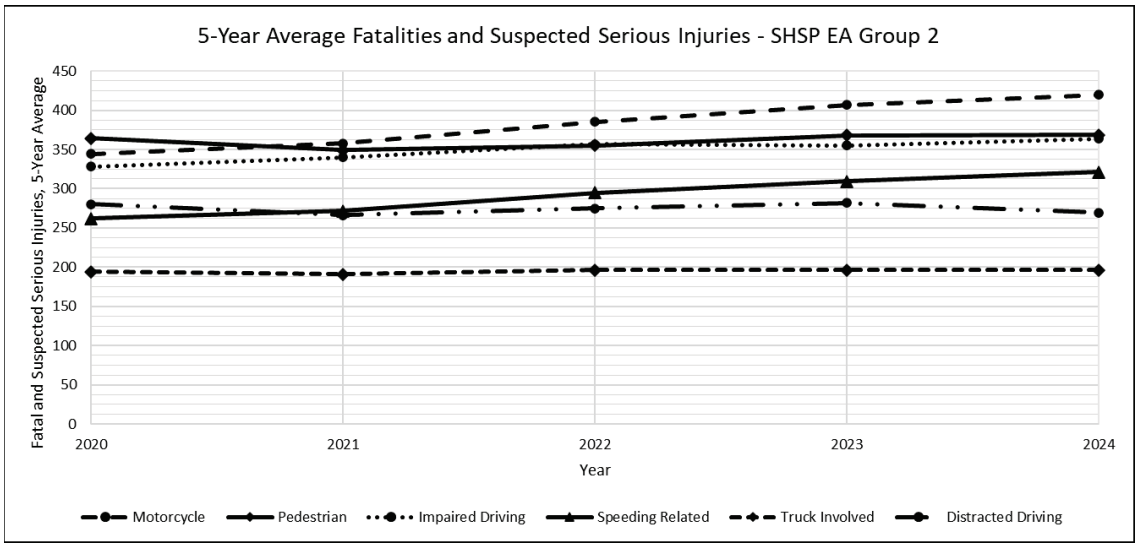


Figure 6. Five-year average fatal and suspected serious injuries by Group 2 Massachusetts SHSP EA.

Figure 7 shows the combined trends for fatalities and suspected serious injuries for EA Group 3. Note that Bicycle fatalities and suspected serious injuries have been trending upward since 2021. Conversely, Work Zone fatalities and suspected serious injuries have consistently trended downward in recent years. The Rail-Crossing EA has too small of a sample to have a meaningful trend.

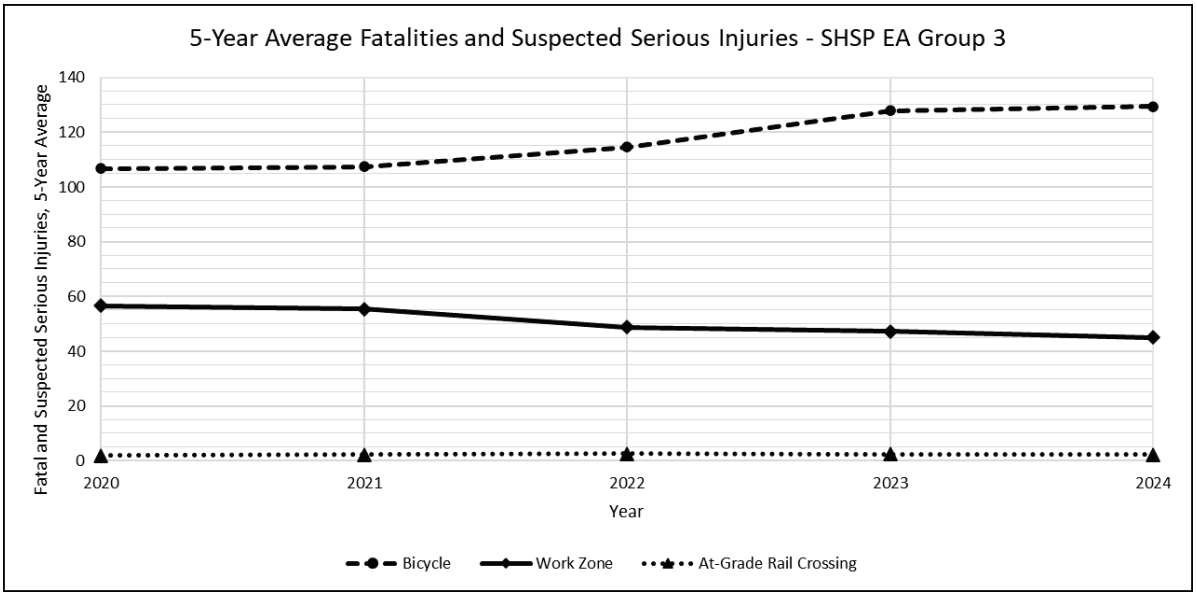


Figure 7. Five-year average fatal and suspected serious injuries by Group 3 Massachusetts SHSP EA.

Table 1 shows a breakdown of the aggregate fatal and suspected serious injury distributions across all EAs from 2020 through 2024. Note that EAs are not mutually exclusive. For example, a given fatality could result from a crash that involved both speeding and lane departure. Therefore, the columns in Table 1 sum to more than 100 percent. The three EAs accounting for the highest proportions of fatalities and suspected serious injuries are Intersection Related, Lane Departure, and Older Driver crashes. Of note, Lane Departure, Impaired Driving, Occupant Protection, Speeding, Older Driver, and Pedestrian crashes make up a much higher proportion of fatal injuries than suspected serious injuries. Conversely, Intersection Related crashes make up a higher proportion of suspected serious injuries (35 percent) than fatal injuries (22 percent). The remaining EAs make up roughly similar proportions of fatal and suspected serious injuries.

Table 1. Percent of fatalities and suspected serious injuries for each Massachusetts SHSP EA for the period from 2020 to 2024.

SHSP EA	Percent Fatal Injuries	Percent Suspected Serious Injuries	Percent Fatal + Suspected Serious Injuries
Intersection Related	22%	35%	34%
Lane Departure	44%	26%	29%
Older Driver Related	24%	19%	19%
Occupant Protection	29%	14%	16%
Young Driver Related	12%	14%	14%
Motorcycle	17%	13%	13%
Pedestrian	19%	11%	12%
Impaired Driving	32%	9%	12%
Speeding Related	29%	8%	10%
Distracted Driving	10%	8%	9%
Truck Involved	9%	6%	6%
Bicycle	2%	4%	4%
Work Zone	1%	1%	1%
Grade Crossing	<1%	<1%	<1%

Table 2 summarizes the trends for fatalities and suspected serious injuries for each EA, focused primarily on 2022 through 2024 compared to previous years dating back to 2020. Fatalities and suspected serious injuries increased for several EAs compared to previous years, including Occupant Protection, Motorcycle, Older Driver, Impaired Driver, Pedestrian, Speeding, Truck-Involved, and Bicyclist. On the other hand, Intersection Related, Lane Departure, Younger Driver, Distracted Driver, and Work Zone fatalities and suspected serious injuries have decreased from previous years. At-Grade Rail Crossing fatalities and serious injuries remained relatively flat. Notably, the proportion of fatalities involving impaired driving and speeding are much higher than their respective proportion of suspected serious injuries. This does not mean anything about the crash outcomes themselves; rather, MassDOT is aware of significant underreporting of impaired driving and speeding in non-fatal crashes, which results in this lower proportion for suspected serious injuries and an overall muted understanding of the problems of impaired driving and speeding.

Table 2. Summary of EA trends.

EA	Fatal and Suspected Serious Injury Trend
Intersection Related	Stable
Lane Departure	Increasing
Older Driver Related	Increasing
Occupant Protection	Increasing
Young Driver Related	Increasing
Impaired Driving	Increasing
Motorcyclist	Increasing
Pedestrian	Increasing
Speeding Related	Increasing
Distracted Driving	Stable
Truck Involved	Stable
Bicyclist	Increasing
Work Zone	Decreasing
At-Grade Rail Crossing	Stable

There are four key takeaways from these results:

1. MassDOT has seen increasing trends in fatalities and suspected serious injuries for several EAs, including lane departure, older driver, occupant protection, young driver, impaired driving, motorcyclist, pedestrian, speeding related, and bicyclist. These are concerning trends that MassDOT should focus on reversing. There is likely correlation between lane departure and impaired driving, so addressing one should address the other.
2. MassDOT has observed stable or decreasing trends in fatalities and suspected serious injuries for the remaining EAs, including intersection related, distracted driving, truck-involved, at-grade rail crossing, and work zone crashes.
3. Significant differences between proportions of fatalities and suspected serious injuries for several emphasis areas, including speeding and impaired driving, point toward suspected underreporting issues for those behaviors in non-fatal crashes. While fatalities account for a relatively smaller number of crashes, the investigative nature of fatal crashes lends credence to the underlying factors such as speed and impairment. As such, the fatal crash trends, while containing fewer observations, may be more reliable indicators of issues related to those emphasis areas rather than the combined trend of fatalities and suspected serious injuries.
4. The Infrastructure Investment and Jobs Act (IIJA) broadened the list of projects eligible for HSIP funds to include non-infrastructure projects, such as education and enforcement campaigns. This means that MassDOT will be able to use HSIP funds to support campaigns targeting behavioral crashes, such as speeding, impaired driving, and distracted driving crashes. MassDOT can work with their partners at the Governor's Highway Safety Bureau to determine how to optimize funding for such campaigns. However, based on the distribution of fatal and suspected serious injuries by EA, MassDOT should focus HSIP funds on intersection, lane departure, older driver, and non-motorized (bicycle and pedestrian) crashes.

Geographic and Jurisdictional Distribution

One way to examine the geographic distribution of fatal and suspected serious injuries is to check the jurisdiction responsible for the roads where the crashes occurred. As a comparison, MassDOT included the average distribution of vehicle miles traveled (VMT) based on the five most recent years with available data: 2020, 2021, 2022, 2023 and 2024 (available at MassDOT's VMT Data Viewer[8]). Where the proportion of fatal and/or suspected serious injuries was notably higher than the proportion of VMT, MassDOT considers those features overrepresented and thus should be considered for focused safety campaigns.

Jurisdiction

Figure 8 compares the five-year average proportion of fatalities for 2020 through 2024 to the average proportional distribution of VMT for 2020 through 2024. The figure shows that City or Town roadways accounted for about half of the fatalities in the study period, which is slightly overrepresented compared to the 44 percent distribution of VMT for which those roads account.

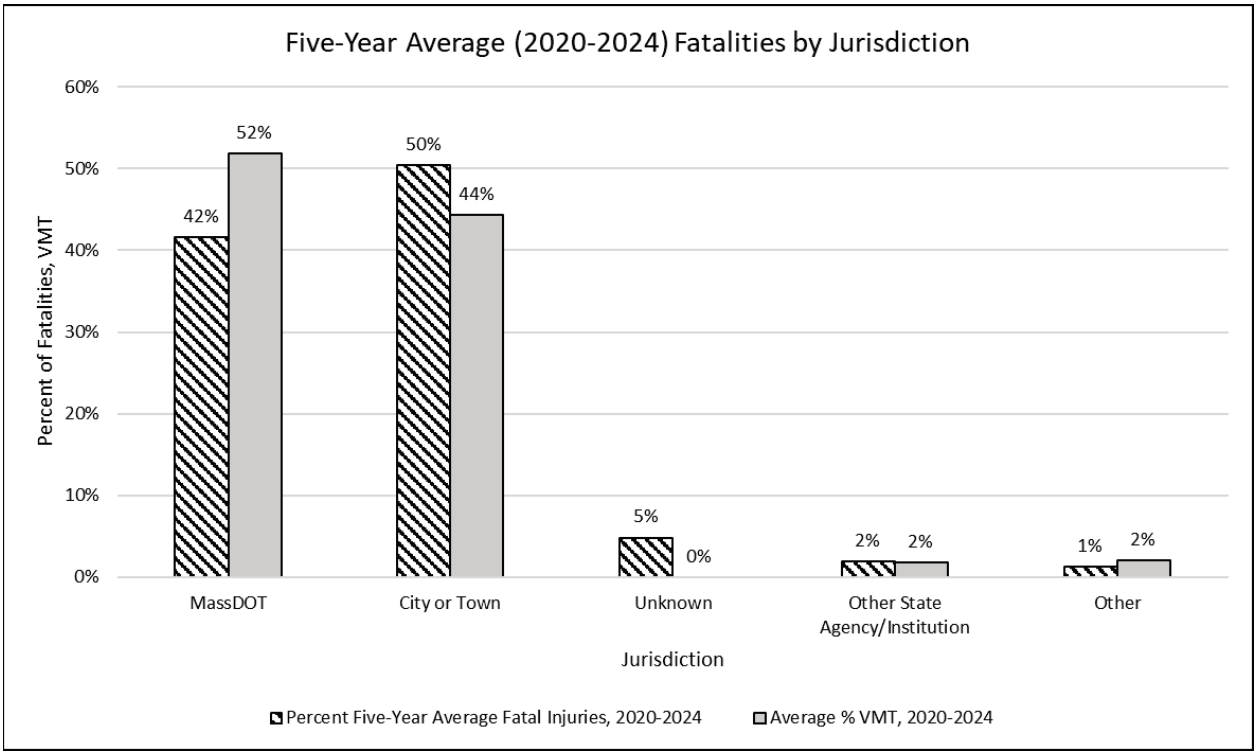


Figure 8. Five-year annual average fatal injuries by Massachusetts jurisdiction.

[8] https://gis.massdot.state.ma.us/dataviewers/vmt/

Similarly, Figure 9 summarizes the distribution of suspected serious injuries by jurisdiction compared to the VMT distribution. This plot also shows City or Town roads accounting for the majority of suspected serious injuries, though in this case, the overrepresentation is even more pronounced, as those roads account for 64 percent of suspected serious injuries compared to just 44 percent of VMT.

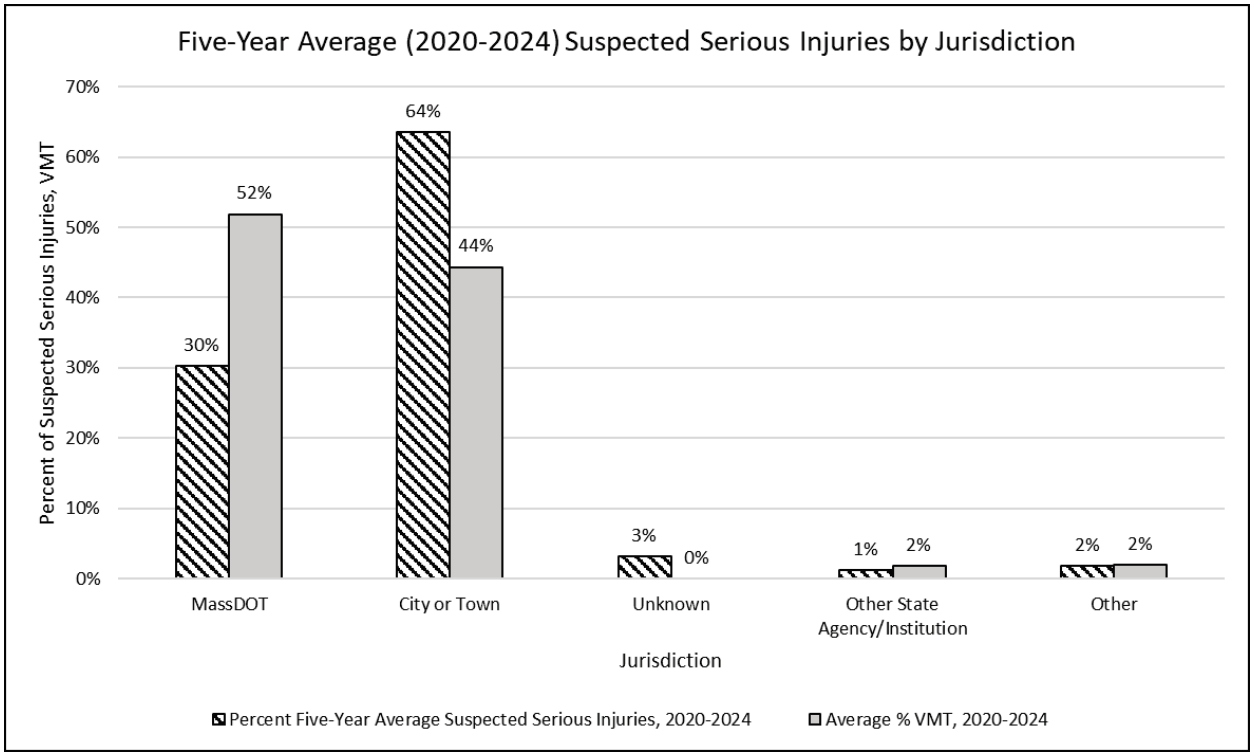


Figure 9. Five-year annual average suspected serious injuries by Massachusetts jurisdiction.

Table 3 shows a breakdown of the aggregate fatal and suspected serious injury distributions across the different jurisdiction types for 2020 through 2024. City and Town roads account for the majority of fatal and suspected serious injuries, followed by MassDOT roads. All other jurisdictions make up a very small percentage of fatalities and suspected serious injuries. It is noteworthy that the proportion of fatalities and suspected serious injuries on City or Town roads is 18-percent higher than the proportion of VMT, indicating overrepresentation on those roadways. These results reinforce the need for MassDOT to address safety on all public roads, not just those under MassDOT's jurisdiction.

Table 3. Percent of fatalities and suspected serious injuries for each jurisdiction for the period from 2020 to 2024.

Jurisdiction of Roadway	Percent Fatal Injuries	Percent Suspected Serious Injuries	Percent Fatal + Suspected Serious Injuries	Percent VMT[9]
City or Town	50%	64%	62%	44%
MassDOT	42%	30%	32%	52%
Unknown	5%	3%	3%	0%
Other State Agency	2%	1%	1%	2%
Other	1%	2%	2%	2%

[9] https://gis.massdot.state.ma.us/dataviewers/vmt/

MassDOT Districts

One can also view the distribution of severe crashes by MassDOT's six Districts (see Figure 10).

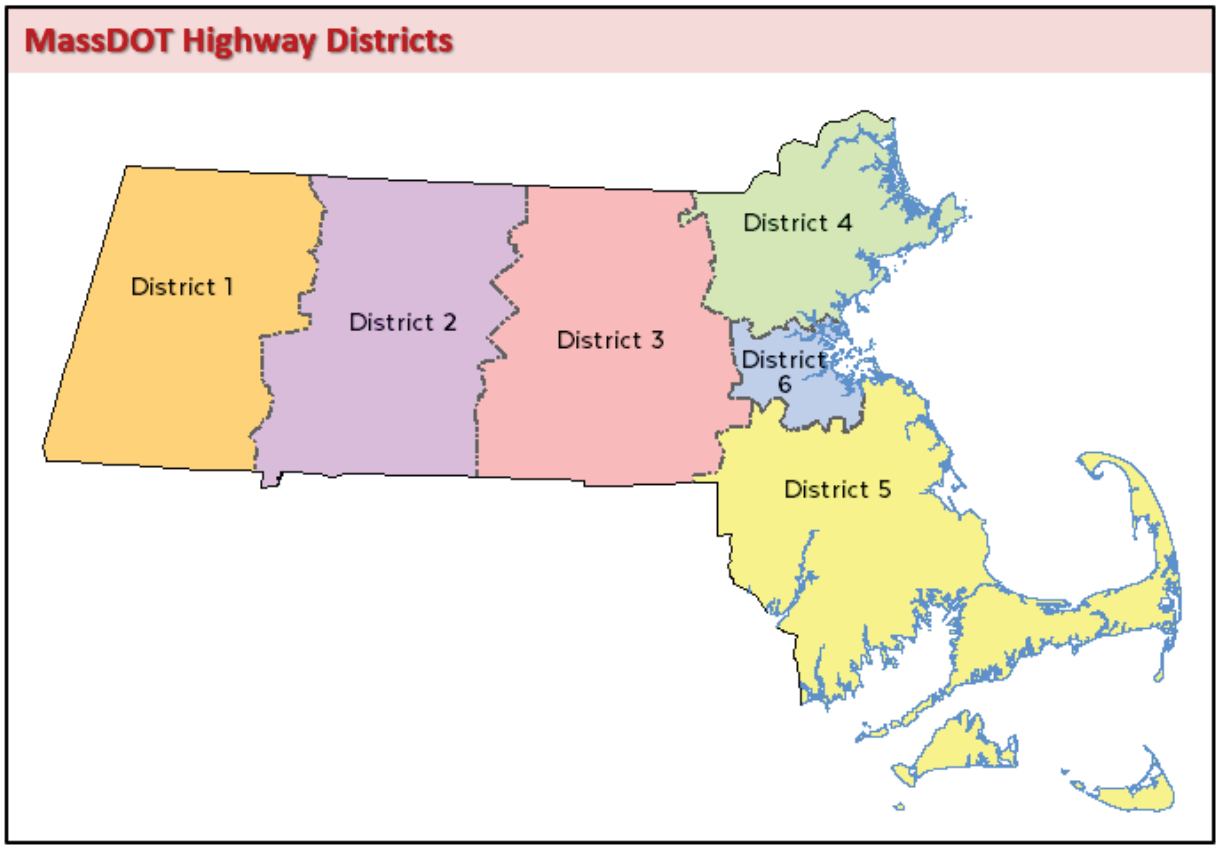


Figure 10. Map displaying MassDOT's highway districts. Source: Massachusetts Bureau of Geographic Information.[10]

Figure 11 and Figure 12 illustrate the five-year average fatal and suspected serious injury distributions across each of the Districts from 2020 through 2024. For both measures, District 5 (southeastern Massachusetts) has the largest proportion of injuries, while District 1 has the lowest. Two additional noteworthy findings are that District 2 accounts for 17 percent of fatalities, but only 12 percent of suspected serious injuries; while District 4 accounts for 19 percent of fatalities but 24 percent of suspected serious injuries. Also of note, the proportional distribution of injuries and VMT are generally similar, but the proportion of fatalities in District 2 is 7 percent higher than the proportion of VMT.

[10] https://www.mass.gov/info-details/massgis-data-massdot-highway-districts

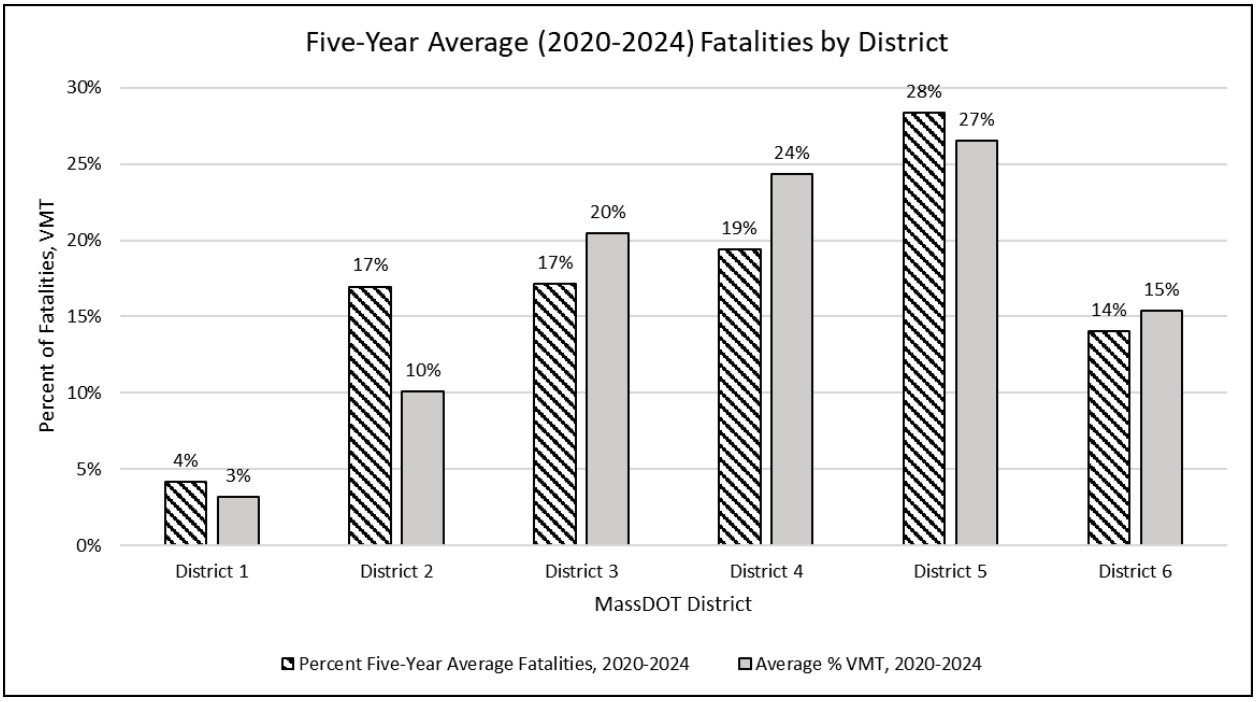


Figure 11. Five-year annual average fatal injuries by MassDOT District.

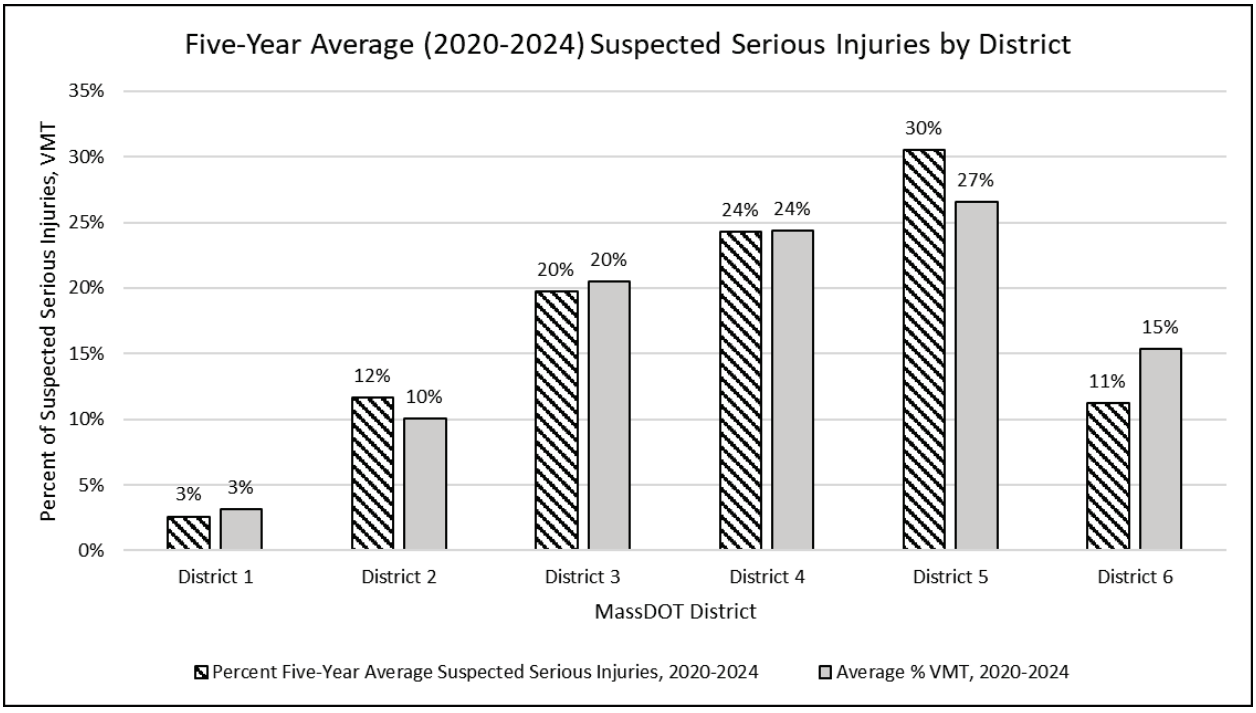


Figure 12. Five-year annual average suspected serious injuries by MassDOT District.

Table 4 summarizes the aggregate fatal and suspected serious injury distributions across the Districts for the five-year period (2020-2024). District 5 accounts for the highest proportion of fatal and suspected serious injuries (30 percent), District 4 the second highest (24 percent), while District 1 accounts for the lowest proportion (3 percent). There is little discord between the distribution of fatalities and serious injuries and VMT, with the largest overrepresentation between the two being 3 percent (District 5). As such, no districts are significantly overrepresented with regards to the combined sum of fatal and suspected serious injuries.

Table 4. Percent of fatalities and suspected serious injuries for each MassDOT District for the period from 2020 to 2024.

MassDOT District	Percent Fatal Injuries	Percent Suspected Serious Injuries	Percent Fatal + Suspected Serious Injuries	Percent of VMT (2020-2024)
District 1	4%	3%	3%	3%
District 2	17%	12%	12%	10%
District 3	17%	20%	19%	20%
District 4	19%	24%	24%	24%
District 5	28%	30%	30%	27%
District 6	14%	11%	12%	15%

Regional Planning Agencies

Massachusetts has 13 regional planning agencies (RPAs), which are multi-jurisdictional regional planning organizations. The RPAs, shown in Figure 13, are:

- Berkshire Regional Planning Commission (BRPC).
- Cape Cod Commission (CCC).
- Central Massachusetts Regional Planning Commission (CMRPC).
- Franklin Regional Council of Governments (FRCOG).
- Metropolitan Area Planning Council (MAPC).
- Montachusett Regional Planning Commission (MRPC).
- Martha's Vineyard Commission (MVC).
- Merrimack Valley Planning Commission (MVPC).
- Northern Middlesex Council of Governments (NMCOG).
- Nantucket Planning and Economic Development Commission (NPEDC).
- Old Colony Planning Council (OCPC).
- Pioneer Valley Planning Commission (PVPC).
- Southeastern Regional Planning and Economic Development District (SRPEDD).

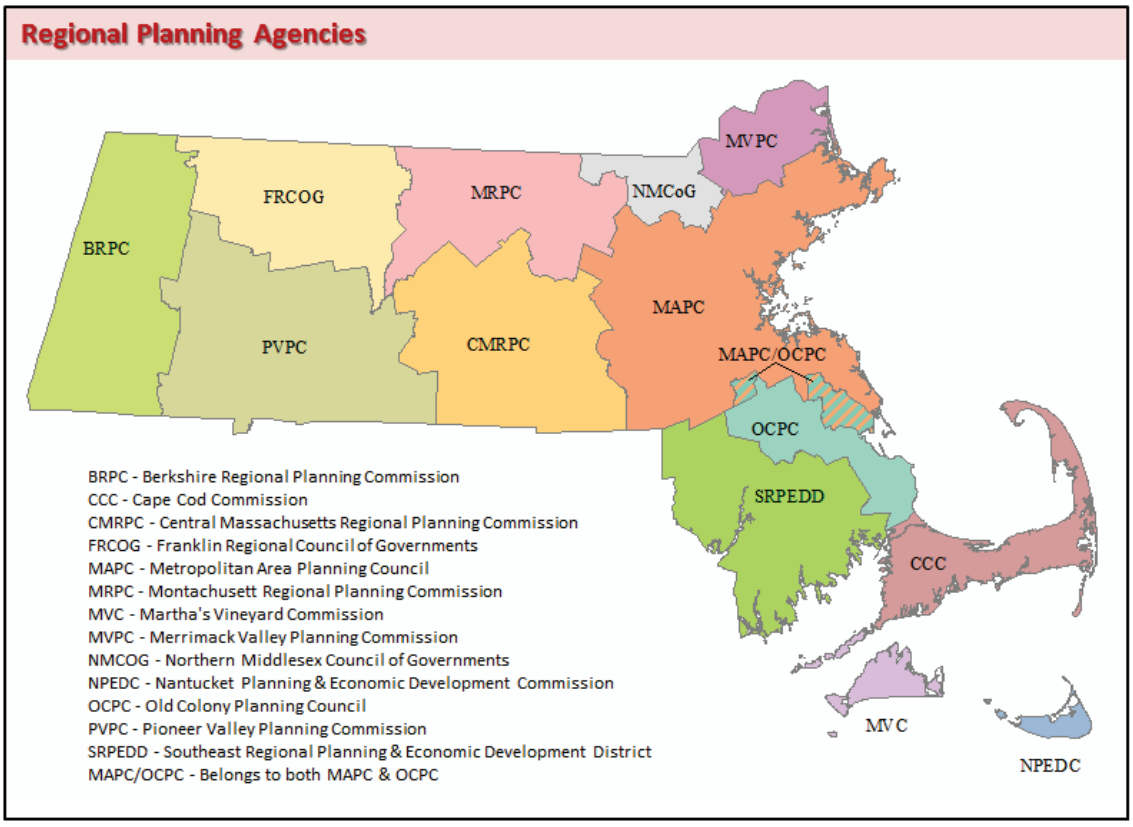


Figure 13. Map displaying Massachusetts RPAs. Source: Massachusetts Bureau of Geographic Information.[11]

[11] https://www.mass.gov/info-details/massgis-data-regional-planning-agencies

Figure 14 shows the distribution of the five-year average number of fatalities for 2020 through 2024 by RPA; VMT is included as a comparison. The MAPC accounts for the highest proportion of fatalities (32 percent), while the MVC and NPEDC account for the lowest (less than 1 percent). Notably, the PVPC was overrepresented, accounting for 15 percent of fatalities compared to just 9 percent of VMT.

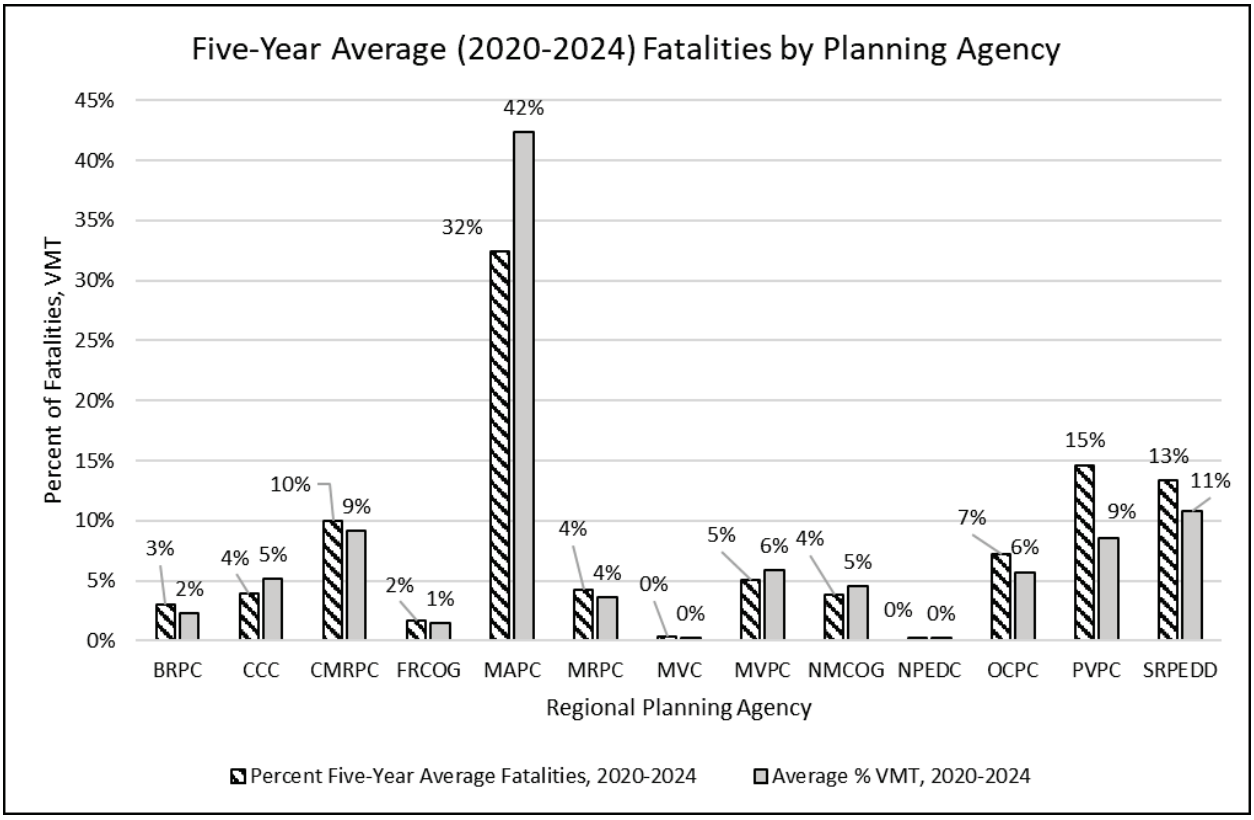


Figure 14. Five-year annual average of fatal injuries from 2020 to 2024 by regional planning agency.

Similarly, Figure 15 summarizes the distribution of suspected serious injuries and VMT by RPA. Again, the MAPC accounts for the highest proportion of injuries (35 percent) while the MVC and NRPED account for the lowest (less than 1 percent). No RPAs were notably overrepresented compared to VMT.

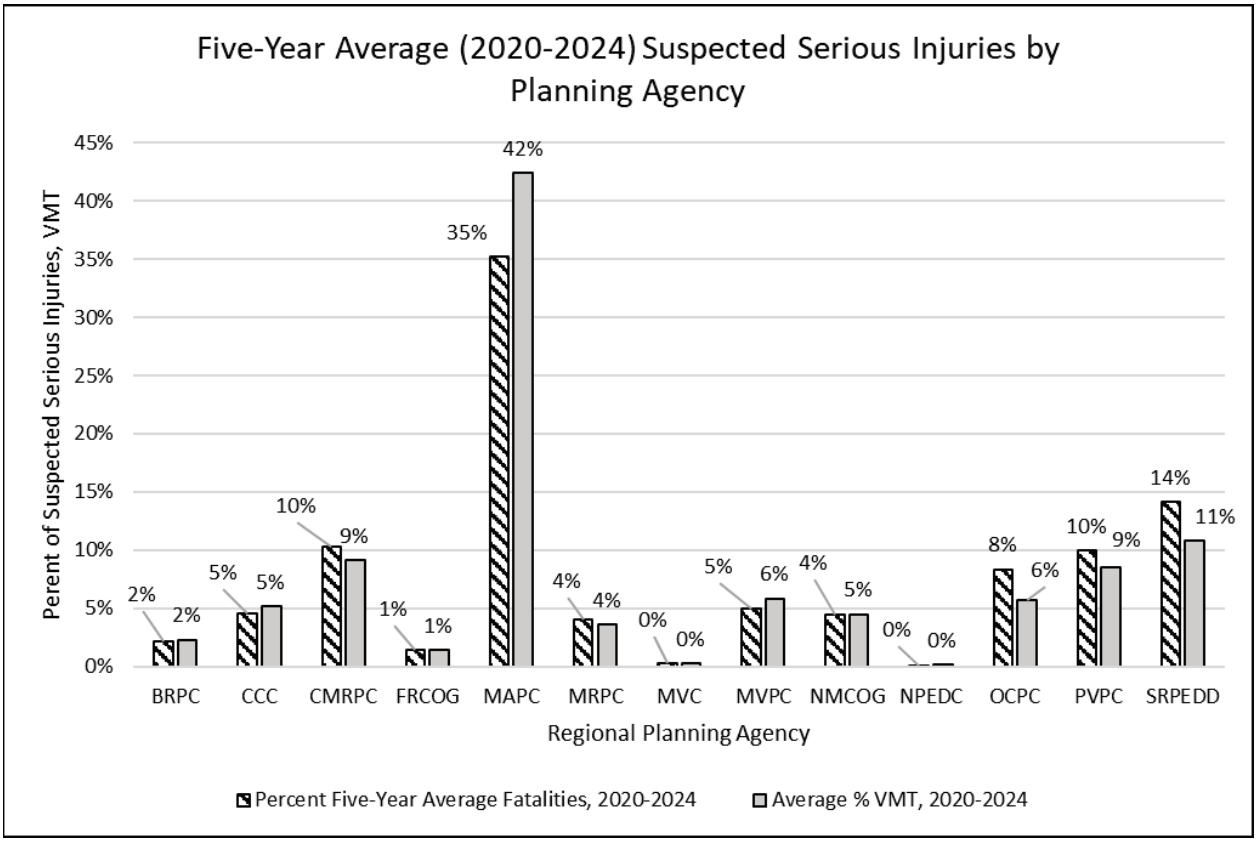


Figure 15. Five-year annual average of suspected serious injuries from 2020 to 2024 by regional planning agency.

Table 5 summarizes the aggregate fatal and suspected serious injury distributions across the RPAs for 2020 through 2024. Combined, the MAPC accounts for the largest proportion of fatal and suspected serious injuries (35 percent), while the MVC and NPEDC account for the lowest proportion (less than 1 percent). The proportion of fatal and suspected serious injuries in the MAPC is underrepresented with 7 percent fewer than the proportion of VMT. SRPEDD, PVPC, and OCPC are slightly overrepresented in fatal and suspected serious injuries compared to VMT.

Table 5. Percent of fatalities and suspected serious injuries for each Massachusetts RPA for the period from 2020 to 2024.

Massachusetts RPA	Percent Fatal Injuries	Percent Suspected Serious Injuries	Percent Fatal + Suspected Serious Injuries	Percent of VMT
BRPC	3%	2%	2%	2%
CCC	4%	5%	4%	5%
CMRPC	10%	10%	10%	9%
FRCOG	2%	1%	1%	1%
MAPC	32%	35%	35%	42%
MRPC	4%	4%	4%	4%
MVC	<1%	<1%	<1%	<1%
MVPC	5%	5%	5%	6%
NMCOG	4%	4%	4%	5%
NPEDC	<1%	<1%	<1%	<1%
OCPC	7%	8%	8%	6%
PVPC	15%	10%	11%	9%
SRPEDD	13%	14%	14%	11%

Area Type

Finally, MassDOT examined the distribution of severe injuries in urban areas and rural areas. Figure 16 compares the distribution of the five-year average fatalities for 2020 through 2024 by area type to the distribution of VMT. The overwhelming majority of fatalities occurred on urban roads (89 percent), though this proportion is underrepresented compared to the proportion of VMT (95 percent). Note that there are several "blank" results over the past five years which has led to some unknowns regarding fatalities and suspected serious injuries by area type.

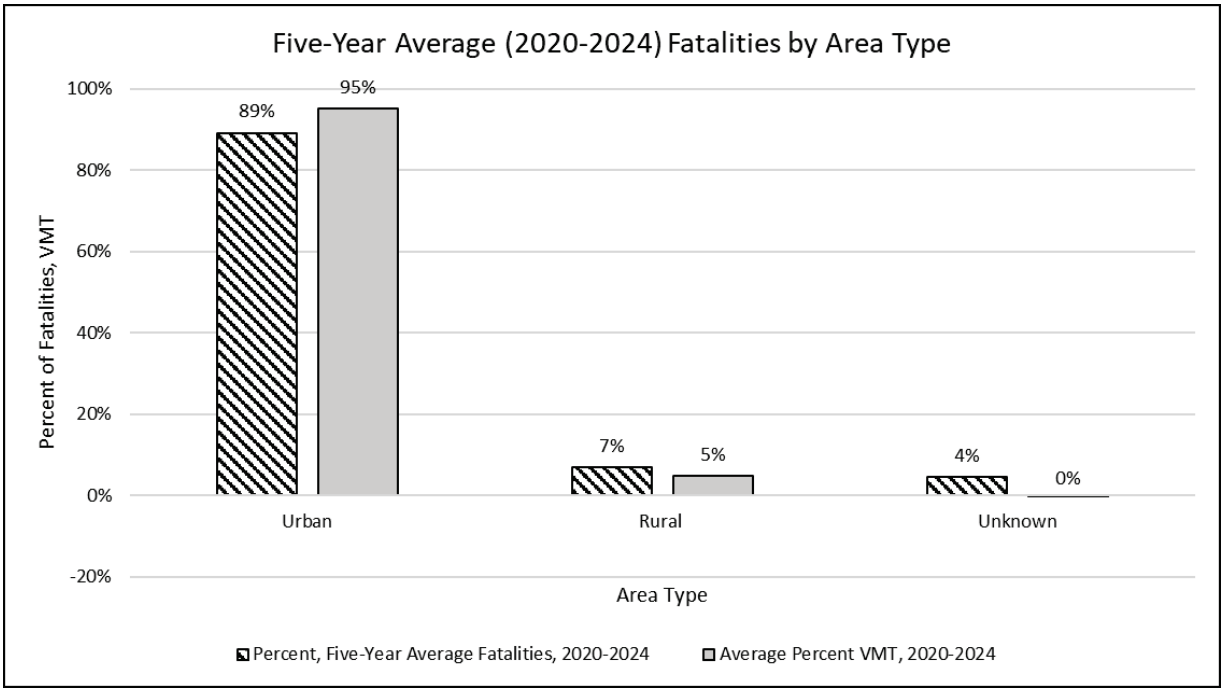


Figure 16. Five-year annual average fatal injuries by area type, 2020 to 2024.

Figure 17 compares the distribution of suspected serious injuries by area type to the distribution of VMT for the years 2020 through 2024. Note that the distributions are nearly identical, with 94 percent of suspected serious injuries occurring on urban roadways compared to 95 percent of VMT.

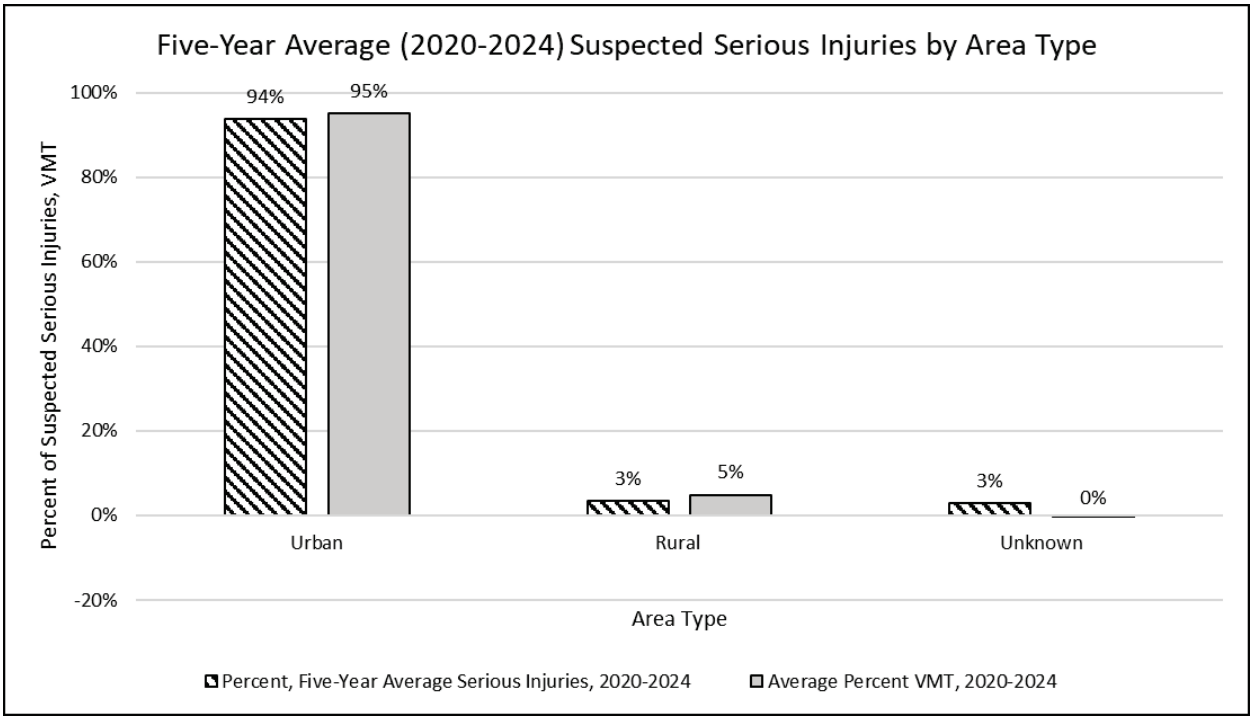


Figure 17. Five-year annual average suspected serious injuries by area type, 2020 to 2024.

Table 6 shows a breakdown of the aggregate fatal and suspected serious injury distributions for rural and urban area types for 2020 through 2024. The distribution of fatal and suspected serious injuries and VMT by area type are nearly identical, with 93 percent of fatal and suspected serious injuries and 95 percent of VMT occurring on urban roads, 4 percent of fatal and suspected serious injuries and 5 percent of VMT occurring on rural roads.

Table 6. Percent of fatalities and suspected serious injuries by area type for the period from 2020 to 2024.[12]

Area Type	Percent Fatal Injuries	Percent Suspected Serious Injuries	Percent Fatal + Suspected Serious Injuries	Percent of VMT
Rural	7%	3%	4%	5%
Urban	89%	94%	93%	95%
Unknown	4%	3%	3%	0%

[12] This table presents absolute totals and is not normalized against area type mileage.

Manner of Collision

The "Manner of Collision" field provides detail on the type of crash and can help to identify potential mitigation strategies. Figure 18 and Figure 19 present the annual breakdown by manner of collision for both fatal and suspected serious injuries in Massachusetts. In both figures, single-vehicle crashes represent the highest number of injuries, though this is somewhat more pronounced for the fatal injuries shown in Figure 18. Note that in MassDOT crash data, single-vehicle crashes include a wide range of crashes, including those involving lane departures, striking fixed objects, as well as collisions in which vehicles strike vulnerable road users.

Head-on crashes result in the second-highest number of fatalities, followed closely by angle crashes, then rear-end, other/unknown, and sideswipe crashes. Most of these crash types have stayed relatively consistent in terms of fatal injuries over the study period.

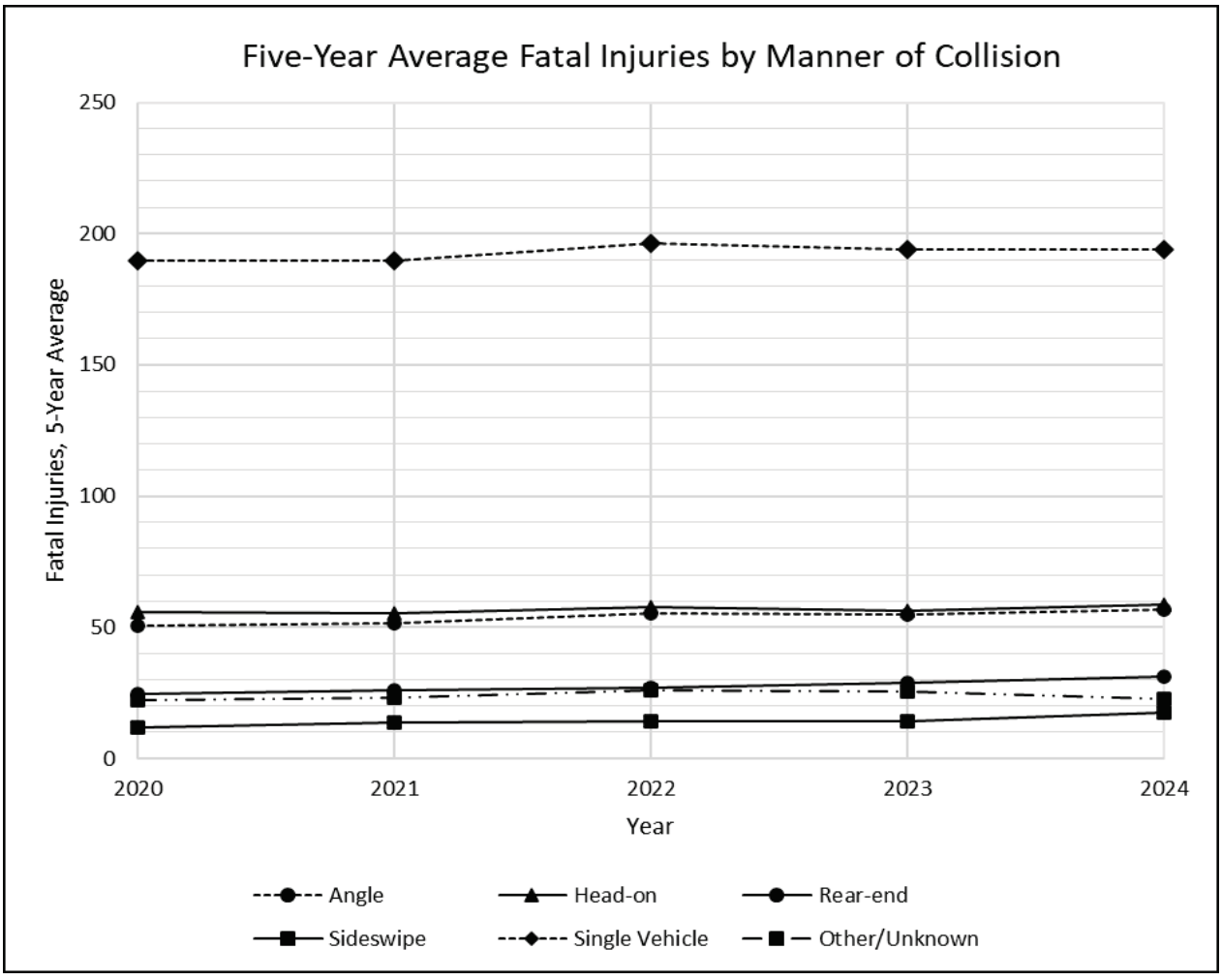


Figure 18. Five-year annual average of Massachusetts fatal injuries by manner of collision.

After single-vehicle crashes, angle crashes result in the second-highest number of suspected serious injuries, followed by rear-end crashes, then head-on crashes, sideswipe crashes, and other/unknown crashes. Suspected serious injuries from single vehicle crashes have steadily increased from 2021 to 2024, while suspected serious injuries for rear-end crashes have consistently decreased during that time. Suspected serious injuries for angle crashes remained relatively stable, while head-on and sideswipe crashes increased slightly for the study period. Of note, other/unknown crashes have steadily increased from 2020 to 2024, pointing toward potential issues with reporting.

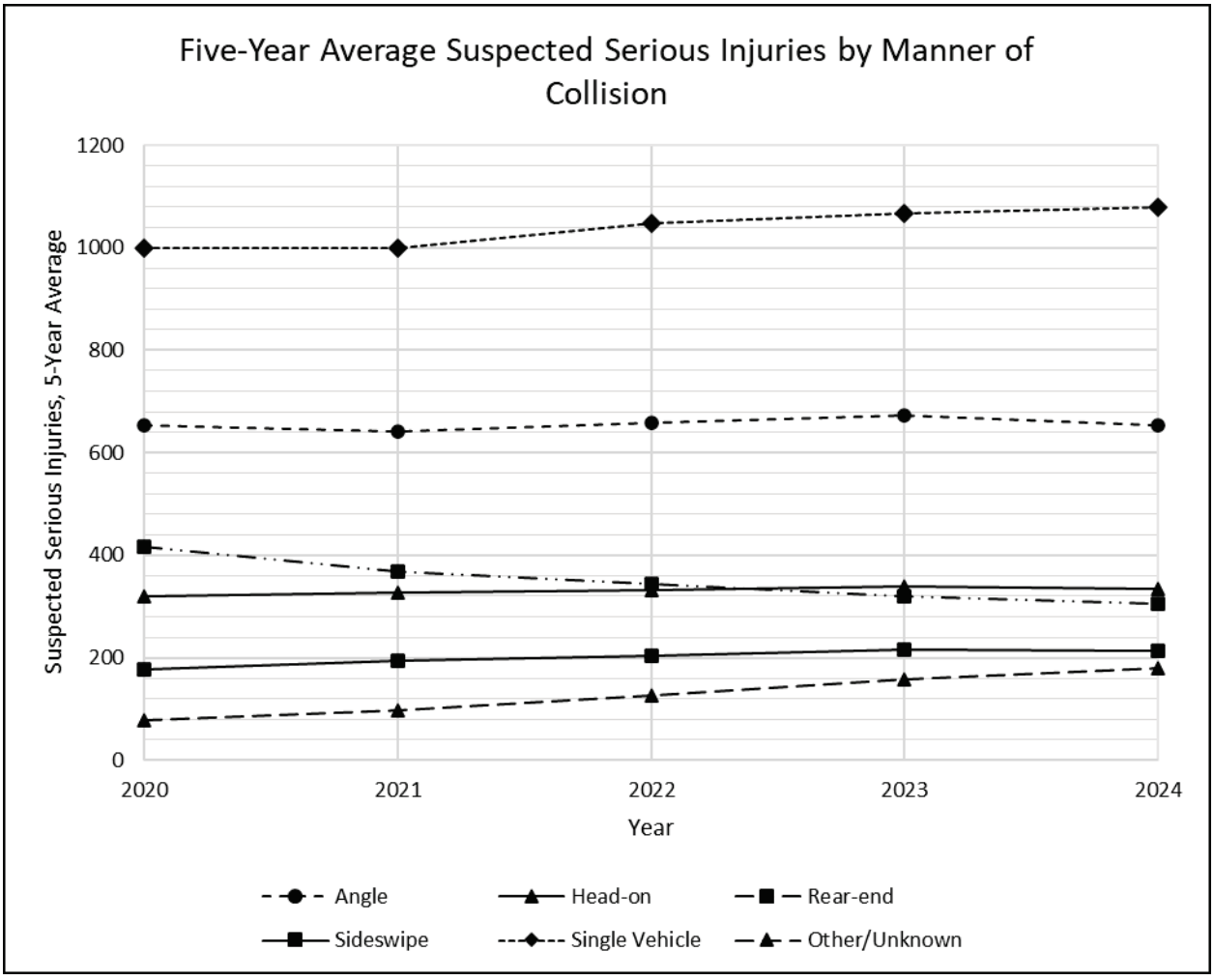


Figure 19. Five-year annual average of Massachusetts suspected serious injuries by manner of collision.

Table 7 shows a breakdown of the aggregated fatal and suspected serious injury distributions for manner of collision for 2020 through 2024. Single-vehicle crashes account for the plurality of fatalities and suspected serious injuries, with angle crashes accounting for the second-highest proportion. Single vehicle and head-on crashes account for a much larger proportion of fatal and suspected serious injuries (40 percent and 13 percent, respectively) compared to their proportion of all crashes (24 percent and 2 percent, respectively). Rear-end and sideswipe crashes have a lower proportion of fatal and suspected serious injuries (11 percent and 7 percent, respectively) compared to their portion of all crashes (25 percent and 16 percent, respectively). Angle crashes and other/unknown have similar proportions of fatal and suspected serious injuries compared to their respective proportions of all crashes.

Table 7. Percent of fatalities and suspected serious injuries by manner of collision for the period from 2020 to 2024.

Manner of Collision	Percent Fatal Injuries	Percent Suspected Serious Injuries	Percent Fatal + Suspected Serious Injuries	Proportion of All Crashes
Single vehicle	51%	39%	40%	24%
Angle	15%	24%	23%	24%
Head-on	15%	12%	13%	2%
Rear-end	8%	11%	11%	25%
Sideswipe	5%	8%	7%	16%
Other/Unknown	6%	7%	6%	9%

Equity

The Massachusetts 2023 SHSP introduced a focus on equity in highway safety. Data included in the SHSP and the completed Vulnerable Road User (VRU) Safety Assessment[13] reveal racial disparities in motor vehicle and pedestrian deaths[14]. While Black people account for only 6.5 percent of the population in Massachusetts, they account for 7.8 percent of pedestrian deaths and 8.4 percent of motor vehicle fatalities in the State. Further, Black pedestrians had rates of injury-related hospital stays three-times higher, on average, than White pedestrians[13]. The overrepresentation of the Black populace in fatal crashes may be linked to historical infrastructure design and investment (or underinvestment), especially in Black communities. This correlates with larger issues related to health equity investigated by the Massachusetts Health Policy Commission (HPC). The HPC considers transportation a social determinant of health[15]. As such, MassDOT strives to produce more equitable health outcomes through addressing transportation issues, identified using data, in historically underserved communities.

This is especially relevant for vulnerable road user safety. Figure 20 shows that more than 80 percent of vulnerable road user fatalities and suspected serious injuries occur within 5 miles of home. Further, more than half of pedestrian fatal and suspected serious injuries occur within a mile of home. Additionally, 50 percent of fatal and suspected serious injury pedestrian crashes occurred in a racial and environmental justice plus (REJ+) community.[13]

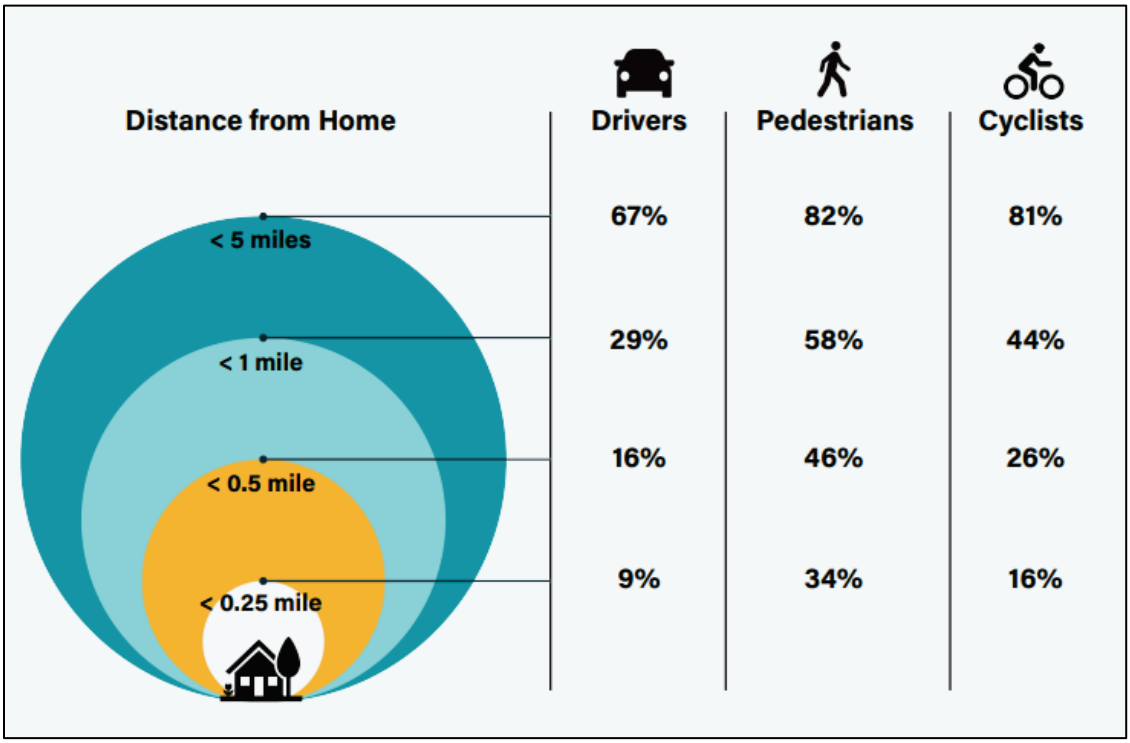


Figure 20. Distribution of persons involved in fatal and suspected serious injury crashes by distance from home.[13]

[13] https://www.mass.gov/doc/2023-massachusetts-vulnerable-road-user-assessment/download
[14] https://www.mass.gov/doc/massachusetts-shsp-2023/download
[15] https://www.mass.gov/info-details/health-equity

Summary of Crash Trends

The purpose of this section was to summarize recent severe crash trends in Massachusetts. MassDOT can review this section and consider the distribution of severe injury crashes, particularly across geographic regions and by SHSP EA, when programming safety improvement projects in the State. Note again that some of the data discussed in this section, including many of the fatality trends, are from before and the beginning of the COVID-19 pandemic and therefore do not reflect the changes in highway safety outcomes since the pandemic. Based on the crash statistics from 2016 to 2024 presented in this section, the following are prominent trends and crash types related to fatal and suspected serious injury crashes:

- Lane departure crashes produce the highest number of fatalities of any Massachusetts SHSP EA, but intersection-related crashes produce the highest number of suspected serious injuries.
- The increasing fatalities and serious injuries due to speeding and impaired driving crashes are concerning. Massachusetts should work to reverse this trend. Addressing trends in other EAs, including lane departure, should also help to reverse the speeding and impaired driving trend.
- City and Town maintained roads experience a significantly higher proportion of fatalities and suspected serious injuries compared to the proportion of VMT.
- Proportional distribution of fatalities and suspected serious injuries are generally in line for Districts, planning agencies, and area type.
- The Black populace, those living in REJ+ communities, and non-motorists appear to have less equitable transportation outcomes than the rest of the State.

Ultimately, these trends and distributions can guide MassDOT's HSIP priorities and funding decisions.

Historical Project Evaluation

To increase the effectiveness of Massachusetts's HSIP, it is important for MassDOT to understand what types of projects have and have not been effective at providing safety benefits and reducing fatal injury and suspected serious injury crashes. To do this, MassDOT aggregated HSIP project evaluation results included in HSIP reports from 2017 to 2025[16,17,18,19,20,21,22,23,24] – a total of 95 evaluated projects. For evaluation purposes, MassDOT reports projects only when 3 years of crash data are "closed" after the completion of the project. For instance, the projects reported in the 2022 HSIP report were completed in 2017, as the 2020 crash data were closed in 2022. MassDOT reported 3 years of before crashes and 3 years of after crashes for each project. Note that crash data are yet to be finalized for the years 2022 through 2025, so evaluations including those years may be subject to change as those data are refined.

As part of each HSIP report, MassDOT estimates annual benefits, converts those benefits to a service life benefit in dollars, and compares the benefits to costs for a benefit-cost ratio (B/C). MassDOT omitted 3 projects from the 2024 evaluation process because less than 10 percent of the project received HSIP funds.

This section describes evaluation results at the project level and the countermeasure level, including all evaluated projects reported in HSIP reports since 2017.

Project Evaluations

The costs of the projects discussed in this section include total costs, not just HSIP dollars. While an ideal approach would isolate the effects of the HSIP dollars only, this is not feasible given that the non-HSIP funded components of a project will also affect safety performance. Including total project costs gives a general sense of the benefit to cost (B/C) ratio for the program, but unfairly evaluates split-funded projects, which often include significant operational and other components to the project. As such, MassDOT also includes HSIP B/C ratio calculations – comparing the safety benefits to the HSIP funds for the project. Note the HSIP B/C ratio may overrepresent the efficiency of the HSIP, particularly if there are safety benefits from other non-HSIP-funded components of the projects.

[16] https://highways.dot.gov/safety/hsip/hsip-state-reports-2017
[17] https://highways.dot.gov/safety/hsip/hsip-state-reports-2018
[18] https://highways.dot.gov/safety/hsip/hsip-state-reports-2019
[19] https://highways.dot.gov/safety/hsip/hsip-state-reports-2020
[20] https://highways.dot.gov/sites/fhwa.dot.gov/files/2021_MA_HSIP_Report.pdf
[21] https://highways.dot.gov/sites/fhwa.dot.gov/files/2023-08/MA-HSIP-2022.pdf
[22] https://highways.dot.gov/sites/fhwa.dot.gov/files/2024-04/HSIP%28Massachusetts%29%202023%20Report.pdf
[23] https://highways.dot.gov/sites/fhwa.dot.gov/files/2025-03/HSIP_Report_MASSACHUSETTS_2024_508.pdf
[24] Massachusetts 2025 HSIP report is under development as of this writing.

For this report, MassDOT assigned projects into the following general categories based on the improvement(s):

- Cross-section modifications – adjusting lane width, shoulder width, and lane assignments.
- Delineation – signage and pavement marking additions or improvements.
- Flashing yellow arrow (FYA) – reconfiguration of the signal to include FYA on at least one approach.
- Guardrail installation – installation of or upgrades to roadside barrier along at least one side of the roadway.
- High-friction surface treatment (HFST) – installation of specialized HFST friction improvements.
- Intersection geometry improvements – redesigning an intersection to address skew and other geometric issues.
- Median barrier – installation of or upgrades to median barrier.
- Ramp and interchange improvements – projects including improvements to access control ramps or interchanges.
- Roundabout – installation of a roundabout intersection.
- Signalized intersection improvements – changes and improvements at signalized intersections, including adding turn lanes, updating signal equipment, and modifying signal timing.
- Two-way stop control (TWSC) to signalized intersection – traffic control conversions from minor stop-control intersections to signalized intersections.
- VRU projects – projects in which the primary focus is on pedestrian and bicycle infrastructure improvements.

Table 8 lists the number of projects, project costs, fatal and suspected serious injury (KA) crashes, and fatal and all injury (KABC) crashes per year for the 3 years before and 3 years after. Note this table provides naïve before-after analysis – a simple way of reporting the changes in safety performance from a project using crashes before and after implementation of the project. Naïve analyses do not account for changes in traffic volume, regression to the mean, and other factors which may affect safety performance over time. Later tables provide more statistically rigorous results based on more reliable methods to account for other factors over time. A review of the naïve data in Table 8 shows that all project categories except for HFST[25] had either no change in or a decrease in the frequency of KA crashes. However, when looking at KABC crashes, fewer (8 of 13) project categories produced naïve reductions in KABC crash frequency, including:

- Delineation.
- FYAs.
- HFST.
- Intersection Signing and Pavement Marking Improvements.
- Roundabouts.
- Signalized Intersection Improvements.
- TWSC to Signalized Intersections.
- VRU Projects.

[25] While HFST had an increase in KA crashes, there were no KA crashes in the before period, and ultimately there were so few crashes observed the result it not statistically significant.

Table 8. Summary of HSIP project evaluations for projects.

Project Type	Number of Projects	Total Cost (HSIP funds) of Projects	KA Crashes per year, Before	KA Crashes per year, After	Percent Reduction of KA Crashes	KABC Crashes per year, Before	KABC Crashes per year, After	Percent Reduction of KABC Crashes
Cross-Section Modifications	11	$ 12,915,975.28	6.7	5.3	20%	74.3	84.0	-13%
Delineation	6	$ 5,655,251.03	88.7	76.7	14%	1073.0	930.0	13%
FYA	1	$ 377,586.81	1.0	0.3	67%	15.3	8.3	46%
Guardrail Installation	1	$ 468,902.75	2.3	1.0	57%	9.3	11.0	-18%
HFST	1	$ 2,816,356.63	0.0	1.0	n/a	4.7	1.3	71%
Intersection Geometry Improvements	8	$ 6,428,719.46	1.7	1.0	40%	13.7	13.7	0%
Intersection Signing and Pavement Marking Improvements	1	$ 1,560,844.00	0.0	0.0	n/a	12.7	5.7	55%
Median Barrier	15	$ 19,617,941.56	15.3	12.3	20%	100.0	115.0	-15%
Ramp and Interchange Improvements	2	$ 33,959,699.11	1.7	1.7	0%	22.7	25.3	-12%
Roundabout	9	$ 11,488,227.62	2.3	0.0	100%	28.7	11.7	59%
Signalized Intersection Improvements	34	$ 44,053,927.87	17.7	11.0	38%	253.3	216.3	15%
TWSC to Signalized Intersection	12	$ 11,766,204.39	5.3	3.0	44%	50.3	32.7	35%
VRU Projects	6	$ 5,150,663.73	8.0	7.0	13%	120.0	77.3	36%
All Projects	**107**	**$ 156,260,300.24**	**150.7**	**120.3**	**20%**	**1778.0**	**1532.3**	**14%**

MassDOT also evaluates HSIP projects using methods to estimate the expected number of crashes in the after period. Where possible, MassDOT uses Empirical Bayes (EB) to estimate the expected number of crashes in the after period; however, if EB could not be used, MassDOT used the before crash rate and after period AADT to estimate the number of expected crashes in the after period. Table 9 summarizes the comparison of expected (or estimated) and observed crashes per year by project type. In the case of median barrier improvements, this focuses on cross-median crashes, while VRU projects focus on pedestrian or bicycle crashes. Benefit calculations were done on an individual project level, so the crash costs used may vary within the category. For instance, a project type may show an overall increase in KABC crashes, yet still represent a positive benefit because the increase in KABC crashes on one project within the category may have a lower average severity than reductions observed in other projects in the category.

Delineation improvements, FYA, and VRU projects were the most cost efficient with regard to the HSIP B/C ratio; Delineation Improvements and FYA were also the most efficient with regard to total B/C ratio. In terms of percent reduction, HFST produced the largest reduction in KABC crashes (67 percent), followed by roundabouts (58 percent), and intersection signing and pavement marking improvements (53 percent). Unfortunately, cross-section improvements, guardrail installation, intersection geometry improvements, and ramp and interchange improvements were associated with increases in KABC crashes, though this may be due to the fact that there were so few of these projects, and in some cases included improvements to address a specific, more severe target crash type while potentially resulting in an increase in less severe other crashes[26] - individual project reviews show that generally, the desired reduction in target crashes was achieved for most. Additionally, these categories include several projects that were not primarily safety projects; rather HSIP funds were included to incorporate targeted safety improvements as part of a larger capital project.

[26] A detailed retrospective review of these projects shows that generally, Massachusetts did observe reduction in the targeted crash type. For instance, while a median guardrail project reflected an increase in crashes, head-on and sideswipe-opposite direction crashes were significantly reduced.

Table 10 summarizes effectiveness by annual reduction per million dollars. Most project categories expect a reduction of more than 1 KABC crash per year per $1 million in HSIP dollars, which works out to an HSIP BCR of 8.3. Those that did not meet that threshold include cross-section modifications, guardrail installation, intersection geometry improvements, median barrier, signalized intersection improvements, and ramp and interchange improvements.

Table 9. Summary of HSIP project types comparing expected with observed after period crashes.

Project Type	Number of Projects	Expected KABC Crashes per Year, After	Observed KABC Crashes per Year, After	Reduced KABC Crashes per Year	Expected Crashes per Year, After	Observed Crashes per Year, After	Reduced Crashes per Year	Service Life Benefits	B/C	HSIP B/C
Cross-Section Modifications[27]	11	70.0	81.3	-11.2	379.4	439.7	-60.1	$(60,765,332)	-1.19	-4.70
Delineation Improvements	6	1038.5	883.3	155.2	4030.3	3470.2	560.2	$800,785,696	141.60	141.60
FYA	1	15.3	8.3	7.0	71.7	47.3	24.3	$19,913,203	52.74	52.74
Guardrail Installation	1	9.8	11.0	-1.2	21.2	28.0	-6.8	$(7,953,556)	-16.96	-16.96
HFST	1	5.1	1.7	3.4	14.7	8.0	6.7	$10,814,809	3.84	3.84
Intersection Geometry Improvements	8	11.4	11.7	-0.3	87.7	57.8	29.8	$5,218,254	0.39	0.81
Intersection Signing and Pavement Marking Improvements	1	12.0	5.7	6.4	59.6	36.0	23.6	$30,800,094	10.00	19.73
Median Barrier	15	20.2	11.8	8.4	82.3	49.4	33.6	$61,327,326	1.77	3.13
Geometric Ramp and Interchange Improvements[28]	2	22.9	26.0	-3.1	84.4	101.2	-16.8	$(11,406,693)	-0.33	-0.34
Roundabout	9	25.8	10.8	14.9	92.6	58.1	34.6	$105,646,224	4.70	9.20
Signalized Intersection Improvements	34	233.1	198.8	34.4	900.1	812.1	88.9	$144,596,911	1.07	3.28
TWSC to Signalized Intersection	12	45.2	33.6	11.8	160.6	127.6	33.2	$41,990,868	1.10	3.57
VRU Projects	6	107.7	77.0	30.7	327.7	274.6	53.0	$155,313,329	10.96	30.15
Total	**107**	**1617.1**	**1361.1**	**256.3**	**6312.4**	**5510.0**	**804.0**	**1,296,281,133**	**3.65**	**8.30**

[27] These projects include pavement widening, lane widening, shoulder widening, modifications to auxiliary lanes, and centerline buffer areas; the B/C is representative of total cost.

[28] Projects were primarily operational improvements with some safety funding; only safety benefits are included in B/C calculations.

Table 10. Summary of HSIP project type reductions from expectation per project.

Project Type	Number of Projects	Total Cost	HSIP Cost	Reduced KABC Crashes per Year	Reduced KABC Crashes per Year per Million HSIP Dollars	Reduced All Severity Crashes per Year	Reduced All Severity Crashes per Year per Million HSIP Dollars
Cross-Section Modifications	11	$51,260,570	$12,915,975	-11.2	-0.87	-60.1	-4.66
Delineation Improvements	6	$5,655,251	$5,655,251	155.2	27.44	560.2	99.06
FYA	1	$377,587	$377,587	7.0	18.57	24.3	64.46
Guardrail Installation	1	$468,903	$468,903	-1.2	-2.64	-6.8	-14.50
HFST	1	$2,816,357	$2,816,357	3.4	1.22	6.7	2.36
Intersection Geometry Improvements	8	$13,232,999	$6,428,719	-0.3	-0.05	29.8	4.63
Intersection Signing and Pavement Marking Improvements	1	$3,079,663	$1,560,844	6.4	4.10	23.6	15.12
Median Barrier	15	$34,565,750	$19,617,942	8.4	0.43	33.6	1.72
Ramp and Interchange Improvements	2	$34,125,608	$33,959,699	-3.1	-0.09	-16.8	-0.49
Roundabout	9	$22,475,802	$11,488,228	14.9	1.30	34.6	3.01
Signalized Intersection Improvements	34	$134,656,808	$44,053,928	34.4	0.78	88.9	2.02
TWSC to Signalized Intersection	12	$38,283,478	$11,766,204	11.8	1.00	33.2	2.82
VRU Projects	6	$14,172,742	$5,150,664	30.7	5.95	53.0	10.29
Total	**107**	**$355,171,516**	**$156,260,300**	**256.3**	**1.64**	**804.0**	**5.15**

Overall, the evaluated HSIP projects returned a B/C of 3.65, meaning every $1 spent towards an HSIP project in Massachusetts returns an estimated $3.65 in societal benefits from crash reductions. For comparison, FHWA estimated a national B/C for the HSIP to be between 4.35 and 6.51[29]. When focusing solely on HSIP dollars, the return on investment is even better, producing a B/C ratio of 8.3, meaning every $1 of HSIP dollars produces $8.30 in societal benefits from crash reductions.

MassDOT is always striving to increase the effectiveness of the program. The purpose of this plan is to help MassDOT achieve such a goal. MassDOT has been taking steps along these lines in the form of programming more cost-efficient systemic safety projects and verifying that in mixed-fund projects, HSIP funds are only used for proven safety improvements.

Note that Table 9 and Table 10 do not account for all HSIP expenditures, only those that could be evaluated at the project level. Some expenditures, such as those for signage improvements and safety data improvements, were not evaluated by MassDOT. However, data improvements are known to provide significant benefits, as more accurate safety data and analysis methods improve MassDOT's ability to provide targeted safety improvements. While MassDOT has not evaluated the effectiveness of these projects, they are eligible for HSIP funds per the United States Code (U.S.C.) to maintain minimum retroreflectivity standards, regardless of whether these projects fall under an SHSP EA[30].

Countermeasure Evaluations

MassDOT has also developed crash modification factors (CMFs) for five common countermeasures, which have been documented in previous HSIP reports:

- TWSC conversions to roundabouts – a CMF of 0.16 for KABC multi-vehicle crashes and a CMF of 0.48 for all-severity multi-vehicle crashes, resulting in a B/C of 8.0.
- TWSC conversions to signalized intersections – a CMF of 0.57 for all-severity multi-vehicle crashes, a CMF of 0.46 for KABC multi-vehicle crashes, and a CMF of 0.64 for property damage-only (PDO) multi-vehicle crashes, resulting in a B/C of 2.3.
- Median cable barrier – a CMF of 0.28 for cross-median crashes, resulting in a B/C of 5.23.
- Hot-spot signalized intersection improvements – a CMF of 0.81 for all-severity multi-vehicle crashes and a CMF of 0.67 for KABC multi-vehicle crashes, resulting in a B/C of 4.0.
- FYA – several CMFs were estimated using a before-after analysis with comparison groups[31]. This included separate CMFs by severity for crashes involving left-turning vehicles (LT) and left-turning and opposing-through vehicles (LTOT). Table 11 summarizes the CMF results. Additionally, the study developed B/C ratios using the before-after results. Nearly all tested scenarios revealed a B/C greater than 1.0, with some as high as 18.1:1 to 21.2:1 for the lowest-cost FYA treatment.

[29] https://highways.dot.gov/safety/hsip/hsip-2016-national-summary-report/benefit-cost-analysis-hsip
[30] https://highways.dot.gov/safety/hsip/highway-safety-improvement-program-eligibility-guidance
[31] Tainter, F., Fitzpatrick, C., and Hannon, T. (2023). Evaluating the Safety Impacts of Flashing Yellow Permissive Left-Turn Indications in Massachusetts: Approach-Level Analysis. Report No. 23-036. Massachusetts Department of Transportation, Boston, MA.

Table 11. Summary of FYA CMFs.[31]

Crash Type	Crash Category	Treatment Group, Before	Treatment Group, After	Comparison Group, Before	Comparison Group, After	CMF[32]
LT	All Crashes	387	352	96	88	0.871
LT	KABC Crashes	134	120	30	35	*0.718*
LT	Severe Crash Types	363	321	85	80	0.915
LTOT	All Crashes	318	265	61	64	*0.767*
LTOT	KABC Crashes	116	102	24	33	**0.592**
LTOT	Severe Crash Types	313	262	58	62	*0.755*

Evaluation Takeaways

Based on these evaluation results, the following are key takeaways:

- MassDOT's HSIP has increased in economic effectiveness, now aligning with national experience reported in 2019. MassDOT should continue to look for opportunities to increase the return on investment for HSIP dollars.
- Of the countermeasures evaluated to produce a CMF, roundabouts are the most effective evaluated HSIP projects in Massachusetts, significantly reducing injury crashes where they are installed and producing a high rate of return on safety dollars. MassDOT's Intersection Control Evaluation (ICE) policy encourages the construction of more roundabouts (guided by data-driven analysis), as they provide additional benefits aside from the noted safety benefits. MassDOT's ICE policy is a consistent and data-driven approach to evaluate the potential performance of intersection control strategies[33]. Because of these other benefits, MassDOT should continue to use multiple funding sources for roundabouts, not just HSIP funds. Note that while the B/C ratios documented for these projects are relatively high, other States have seen higher B/C ratios for roundabouts. This is likely due to the high cost of construction in Massachusetts, the inclusion of less effective multilane roundabouts, and the fact that the reported B/C ratios in this plan include all costs, not just safety dollars.
- FYA continues to be an economically effective method of reducing injury crashes at signalized intersections. Given MassDOT has implemented FYA in all MassDOT signals where feasible, MassDOT should encourage their adoption by local agencies.
- While converting stop-controlled intersections to signalized intersections has proven to be effective, there are more efficient methods of spending safety dollars in Massachusetts to address safety at those intersections. For example, roundabouts in Massachusetts returned a B/C of 8.0, compared to the B/C of 2.28 for converting to signalization. MassDOT should use the ICE policy to determine the most appropriate alternative when modifying traffic control at a stop-controlled intersection.
- General safety improvements at signalized intersections have proven to be effective at reducing crashes and providing a safety benefit. These projects include a wide range of countermeasures, including new signal hardware, potential additions of through and/or turn lanes, pedestrian and

[32] *Statistically significant at the 90 percent confidence level.* **Statistically significant at the 95 percent confidence level.**

[33] https://www.mass.gov/info-details/massdot-intersection-control-evaluation-ice

bicycle accommodations, and ADA elements, all of which are needed but tend to drive up cost. As a result, their B/C ratios, while effective, are relatively low due to the expense of the projects and the "hot-spot" nature of the improvement.

- Though only one evaluated project used HFST, the effectiveness of this project should encourage MassDOT to use HSIP dollars for more of these projects. This is especially effective for locations where wet road crashes are an issue, as FHWA markets a potential 52-percent reduction in wet road crashes with the installation of the treatment[34]. The B/C ratio of 3.89 is lower than the national value of 6.0 for curves and 18.7 for ramps identified by Merritt et al. (2020)[35]. The likely source of this discrepancy is that this was one of the first HFST projects in Massachusetts – such projects will presumably become more efficient in the future as lessons are learned by MassDOT and contractors.

[34] https://highways.dot.gov/safety/proven-safety-countermeasures/pavement-friction-management
[35] https://www.fhwa.dot.gov/publications/research/safety/20061/20061.pdf

Future Project Benefits

MassDOT HSIP dollars can be spent on projects in all STIP categories, though the three most commonly categories are Safety, Intersection, and Vulnerable Road Users. This section describes the anticipated benefits as well as estimated lives saved, and serious injuries prevented for programmed HSIP and VRU projects for 2025 and 2026.

Methodology

MassDOT used the methodology in MassDOT's *Safety Alternatives Analysis Guide*[36] to estimate the potential benefits of most HSIP projects for the 2025 and 2026 STIP. The guide follows a three-step procedure to estimating project benefits:

1. Estimate future no-build crash frequency.
2. Estimate the expected change in safety performance.
3. Estimate the monetary value of societal safety benefits which will be gained from the reduction in crashes. Note this does not include operational, environmental, and other non-safety benefits derived from the projects.

Additionally, MassDOT used the following assumptions for this analysis:

- All projects were assumed to have a 20-year analysis period, and a 7-percent annual discount factor was applied to convert the annual safety benefits to a total benefit in the present year value.
- MassDOT used average crash costs from Massachusetts for 2024, taken from a recent crash cost update by MassDOT[37].
- MassDOT used average severity distributions for crashes from 2020 through 2024 statewide to estimate lives saved and serious injuries prevented. Based on data queried from IMPACT, Massachusetts averaged 0.013 fatalities and 0.094 suspected serious injuries per FI crash.
- The cost reflects the HSIP dollars which are programmed for the project. Importantly, the benefits included in the B/C ratio only include safety benefits – most of these projects were built using a more all-encompassing B/C ratio, including savings from user delay, emissions, and other impacts. To look deeper into split-funding projects, MassDOT also included a B/C ratio comparing safety benefits to total costs.
- In almost all cases, MassDOT used the most recent 3 years of complete crash data to establish baseline safety performance. Note that in some cases, the crash data were not final, so results may change slightly.
- Where possible, MassDOT applied CMFs from the State-preferred list to estimate the change in safety performance. When no CMF was available, MassDOT referred to FHWA's CMF Clearinghouse or used predictive models from the Highway Safety Manual to estimate future safety performance. Finally, if no research was available to estimate the crash reduction, MassDOT used a conservative estimate of the potential reduction.
- Though programmed, MassDOT did not estimate potential lives saved and serious injuries prevented from guide sign improvement projects. As such, this section only reflects remaining HSIP projects.

[36] https://www.mass.gov/doc/massdot-safety-alternatives-analysis-guide/download
[37] https://www.mass.gov/doc/crash-costs-methodology/download

For 2025 and 2026, MassDOT has 18 hot-spot, 4 systemic, and 6 systematic projects programmed. Of those, 16 hot-spot and 3 systemic projects had sufficient information available to estimate benefits, the results of which are summarized in the following sections.

Hot-Spot Projects

Most of MassDOT's proposed HSIP projects for 2025 and 2026 are hot-spot projects, meaning they address an area with a cluster of historical crashes. The improvements are usually large-scale capital improvement projects with significant equipment upgrades, potential changes to the cross-section, resurfacing, and, in some cases, right-of-way acquisition; often the safety improvements are only a small component of the larger overall project. This means the projects usually cost in the millions of dollars and have mixed sources of funding, including HSIP. For instance, the HSIP hot-spot projects for 2025 and 2026 had an average cost of $17.6 million per project, though only $5.5 million per project is funded with the HSIP. Given the methodology includes the estimation of safety benefits only (not other benefits such as operations), MassDOT elected to compare those safety benefits to the HSIP component of the project cost.

Table 12 summarizes the analysis results for the 16 proposed hot-spot projects in 2025 and 2026. Again, the methodology used to estimate crash reductions and related monetary benefits was based on the MassDOT *Safety Alternatives Analysis Guide*. For each project's service life, MassDOT estimated:

- Total number of crashes reduced.
- Fatal and injury crashes reduced.
- Number of lives saved.
- Number of serious injuries prevented.
- Monetary safety benefits.
- HSIP B/C ratio.
- Total B/C ratio.

Table 12. Summary of service life benefits and HSIP B/C for hot-spot projects.

Project Number	Project Description	Total Crashes Reduced	Fatal and Injury Crashes Reduced	Lives Saved	Serious Injuries Prevented	Present Value HSIP Cost	Present Value Safety Benefits	HSIP B/C
605857	Norwood- Intersection Improvements and Related Work at Rte 1 & University Ave/Everett St	139.2	42.6	0.5	4.0	$2,636,336	$10,841,542	4.11
607342	Milton- Intersection Improvements at Rte 28 (Randolph Ave) & Chickatawbut Rd	109.2	156.6	2.0	14.7	$9,080,341	$35,362,836	3.89
608051	Wilmington- Reconstruction On Rte 38 (Main St), From Rte 62 to the Woburn C.L.	201.4	41.0	0.5	3.8	$3,000,000	$14,702,487	4.90
608095	North Andover- Corridor Improvements on Rte 114, Between Waverly Rd & Willow/Mill St	423.2	156.6	2.0	14.7	$13,193,974	$49,067,200	3.72
608759	Swansea- Traffic Signal and Safety Improvements at Three Intersections on Rte 6	406.6	170.8	2.2	16.0	$12,663,827	$41,719,711	3.29
608778	Southbridge- Intersection Improvements at Central St, Foster St, Hook St & Hamilton St	60.2	10.6	0.1	1.0	$1,000,000	$3,946,649	3.95
608940	Weston- Intersection Improvements Boston Post Rd (Rte 20) at Wellesley St	173.6	34.0	0.4	3.2	$3,237,804	$8,701,508	2.69
609065	Holyoke- Resurfacing and Related Work on Cabot St & Race St (Center City Connector)	368.0	105.6	1.4	9.9	$2,583,870	$37,075,081	14.35
609440	Abington- Intersection Improvements at Hancock St & Chestnut St	131.6	72.2	0.9	6.8	$4,990,761	$15,905,880	3.19
609532	Chelsea- Targeted Safety Improvements and Related Work on Broadway, From Williams St to City Hall Ave	413.2	166.8	2.1	15.6	$9,807,515	$51,494,745	5.25
610823	Quincy- Intersection Improvements at Willard St & Ricciuti Dr	136.0	14.4	0.2	1.3	$1,885,353	$4,391,139	2.33
611974	Medford- Intersection Improvements at Main St/South St, Main St/Mystic Valley Pkway Ramps & Main St/Mystic Ave	174.6	56.4	0.7	5.3	$8,837,920	$13,816,051	1.56
611979	Avon- Intersection Improvements at Rte 28, Spring St & Harrison Blvd	245.0	104.0	1.3	9.7	$5,935,197	$23,615,500	3.98
611986	Mashpee- Corridor Improvements & Related Work on Rte 151, From the Falmouth T.L. to Old Barnstable Rd (Phase 2)	46.6	29.2	0.4	2.7	$4,500,000	$6,896,541	1.53
613052	Mansfield- Corridor Improvements on Chauncy St (Rte 106) From State Rte 140 to Copeland Dr	174.6	46.2	0.6	4.3	$3,615,201	$9,391,798	2.60
613129	Nantucket- Intersection Improvements at Milestone Rd & Polpis Rd and Extension of 'Sconset Bikepath	25.0	4.2	0.1	0.4	$1,752,321	$1,203,293	0.69
	Total Results	**3,228**	**1,211**	**16**	**114**	**$88,720,420**	**$327,131,961**	**3.69**

The results in Table 12 show that the 16 hot-spot projects could prevent an estimated 3,228 total crashes and 1,211 fatal or injury crashes during the 20-year analysis period. This is an average of 202 all-severity crashes and 76 fatal or injury crashes per project. On a per crash basis, $27,485 in HSIP funds was found to prevent one all-severity crash and $73,262 in HSIP funds was found to prevent one fatal or injury crash. For comparison, MassDOT's *Safety Alternatives Analysis Guide*[38] lists the average cost of a fatal or injury crash at $441,000.

The proposed hot-spot projects account for $88.7 million in planned HSIP spending for 2025 and 2026. Using data-driven safety analysis, MassDOT expects these projects to produce $327.1 million in safety benefits over the 20-year analysis period, providing an overall HSIP B/C of 3.69 for the hot-spot improvement projects. Of the 16 projects evaluated, one was found to produce an HSIP B/C of less than 1.0, two were found to have a B/C between 1.0 and 2.0, and none were found to have a negative B/C ratio. Based on these findings, MassDOT anticipates that all hot-spot projects will produce some safety benefit. As a reminder, these calculations only consider safety benefits, disregarding benefits from other components of the projects. As such, these projects have lower B/C ratios than those in the HSIP portfolio which are primarily safety projects.

MassDOT used the statewide average injury severity distribution to estimate the number of fatalities and suspected serious injuries for each fatal or injury crash. After applying these proportions to the estimated reduction in fatal and serious injury crashes and projecting over a 20-year service life, the 16 hot-spot projects are projected to save a total of 16 lives and prevent 114 suspected serious injuries. Monetarily, this converts to an average of approximately $5.5 million in HSIP funds to save one life over 20 years and approximately $778,250 in HSIP funds to prevent one suspected serious injury over 20 years. For comparison, MassDOT considers the average cost of a fatal crash at $16.3 million and the average cost of a suspected serious injury crash at $941,300.

Systemic Projects

MassDOT programmed seven systemic projects for 2025 and 2026:

- 613604 – District 5 – Vulnerable Road User safety project near bus stops
- 613605 – District 4 – District 6 – Vulnerable Road User safety project near bus stops
- 613606 – District 1 – District 2 – District 3 – Vulnerable Road User safety project near bus stops
- S12899 – AWSC Conversion - 2025
- S12900 – AWSC Conversion - 2026
- S12885 – RRFBs - 2025
- S12886 – RRFBs - 2026

Table 13 summarizes the analysis results for the seven systemic projects in 2025 and 2026. In general, these projects are fully funded with HSIP dollars. Previous HSIP Implementation Plans describe the methodologies used to estimate the benefits of these projects.

[38] https://www.mass.gov/doc/massdot-safety-alternatives-analysis-guide/download

Table 13. Summary of service life benefits and HSIP B/C for systemic projects.

STIP Program	Project Number	Project Description	Total Crashes Reduced	Fatal and Injury Crashes Reduced	Lives Saved	Serious Injuries Prevented	Present Value HSIP Cost	Present Value Benefits	HSIP B/C
Safety Improvements	613604	District 5- VRU Systemic Safety Project near Bus Stops	3.1	2.5	0.12	0.49	$1,462,395	$1,885,310	1.29
Safety Improvements	613605	District 4- District 6- VRU Systemic Safety Project near Bus Stops	2.9	2.3	0.11	0.45	$1,741,890	$1,729,205	0.99
Safety Improvements	613606	District 1- District 2- District 3- VRU Systemic Safety Project near Bus Stops	4.5	3.7	0.18	0.71	$2,155,611	$2,747,794	1.27
Safety Improvements	S12899	AWSC Conversion - 2025	338.8	112.7	1.4	10.6	$397,270	$28,785,106	72.46
Safety Improvements	S12900	AWSC Conversion - 2026	891.5	296.7	3.8	27.8	$1,045,447	$75,750,278	72.46
Safety Improvements	S12885	RRFBs - 2025	40.2	33.3	1.6	6.4	$2,496,250	$22,226,717	8.90
Safety Improvements	S12886	RRFBs - 2026	17.0	14.1	0.7	2.7	$1,057,235	$9,381,422	8.87
		Total Results	**1,298**	**465**	**8**	**49**	**$10,356,099**	**$142,505,832**	**13.76**

The seven systemic projects are expected to produce $142.5 million in safety benefits for an HSIP cost of $10.4 million, producing a B/C ratio of 13.76. Economically, the projects will cost approximately $7,978 to reduce one all-severity crash, $22,271 to reduce one fatal or injury crash, $1.3 million per life saved, and $211,349 per serious injury prevented. Consider these in the context of the average crash costs referenced previously:

- $121,400 for an all-severity crash.
- $441,000 for a fatal or injury crash.
- $941,300 for a suspected serious injury crash.
- $16,257,800 for a fatal crash.

The cost effectiveness of these projects is buoyed by the proposed AWSC and RRFB projects, both of which include improvements at dozens of locations. These demonstrate the value of systemic projects.

Summary of Future Project Benefits

Table 14 summarizes the expected safety benefits of future projects for 2025 and 2026 by project type. The systemic projects are predicted to be significantly more cost efficient than the hot-spot projects. When combined, the total effects of STIP projects including HSIP funds are expected to produce a B/C ratio of 4.74, returning $4.74 in safety benefits for every $1 in HSIP funds.

Table 14. Summary of HSIP benefits and HSIP B/C by project type.

Project Type	Total Crashes Reduced	Fatal and Injury Crashes Reduced	Lives Saved	Serious Injuries Prevented	Present Value HSIP Costs	Present Value Benefits	HSIP B/C
Hot-Spot	3,228	1,211	16	114	$88,720,420	$327,131,961	3.69
Systemic	1,298	465	8	49	$10,356,099	$142,505,832	13.76
Total	**4,526**	**1,676**	**24**	**163**	**$99,076,519**	**$469,637,793**	**4.74**

Accounting for All Costs

The above analyses compared the safety benefits to only HSIP funding, assuming that all safety benefits derived from the project came solely from those components funded by the HSIP. A different way of calculating B/C ratio is to compare the safety benefits to all costs. The following tables describe the results by project type, including:

- Table 15 summarizes total B/C ratio for hot-spot projects.
- Table 16 summarizes total B/C ratio for systemic projects.
- Table 17 summarizes total B/C ratio by project type.

Per the results below, hot-spot projects are expected to return $1.11 in safety benefits for every $1 spent in total funds and systemic projects are expected to return $12.91 in safety benefits for every $1 in total funds. In total, all HSIP projects are expected to return $5.05 in safety benefits for every $1.00 in funds. As expected, this B/C ratio is much lower than when only considering HSIP dollars. Once again, note that this only considers the safety benefits of projects; additional operational, accessibility, emissions, and other benefits are also generated by these projects, but not quantified in this plan. Additionally, some projects have a small percentage of HSIP compared to total funding to reflect the project is primarily a different type of project.

Table 15. Summary of service life safety benefits and total B/C ratio for hot-spot projects.

Project Number	Project Description	Total Crashes Reduced	Fatal and Injury Crashes Reduced	Lives Saved	Serious Injuries Prevented	Present Value Total Cost	Present Value Safety Benefits	Total B/C
605857	Norwood- Intersection Improvements and Related Work at Rte 1 & University Ave/Everett St	139.2	42.6	0.5	4.0	$28,699,272	$10,841,542	0.38
607342	Milton- Intersection Improvements at Rte 28 (Randolph Ave) & Chickatawbut Rd	109.2	156.6	2.0	14.7	$12,560,511	$35,362,836	2.82
608051	Wilmington- Reconstruction On Rte 38 (Main St), From Rte 62 to the Woburn C.L.	201.4	41.0	0.5	3.8	$47,391,194	$14,702,487	0.31
608095	North Andover- Corridor Improvements on Rte 114, Between Waverly Rd & Willow/Mill St	423.2	156.6	2.0	14.7	$65,698,758	$49,067,200	0.75
608759	Swansea- Traffic Signal and Safety Improvements at Three Intersections on Rte 6	406.6	170.8	2.2	16.0	$18,323,335	$41,719,711	2.28
608778	Southbridge- Intersection Improvements at Central St, Foster St, Hook St & Hamilton St	60.2	10.6	0.1	1.0	$9,784,051	$3,946,649	0.40
608940	Weston- Intersection Improvements Boston Post Rd (Rte 20) at Wellesley St	173.6	34.0	0.4	3.2	$4,337,827	$8,701,508	2.01
609065	Holyoke- Resurfacing and Related Work on Cabot St & Race St (Center City Connector)	368.0	105.6	1.4	9.9	$9,225,500	$37,075,081	4.02
609440	Abington- Intersection Improvements at Hancock St & Chestnut St	131.6	72.2	0.9	6.8	$8,603,684	$15,905,880	1.85
609532	Chelsea- Targeted Safety Improvements and Related Work on Broadway, From Williams St to City Hall Ave	413.2	166.8	2.1	15.6	$11,682,483	$51,494,745	4.41
610823	Quincy- Intersection Improvements at Willard St & Ricciuti Dr	136.0	14.4	0.2	1.3	$3,328,660	$4,391,139	1.32
611974	Medford- Intersection Improvements at Main St/South St, Main St/Mystic Valley Pkway Ramps & Main St/Mystic Ave	174.6	56.4	0.7	5.3	$10,438,587	$13,816,051	1.32
611979	Avon- Intersection Improvements at Rte 28, Spring St & Harrison Blvd	245.0	104.0	1.3	9.7	$7,429,101	$23,615,500	3.18
611986	Mashpee- Corridor Improvements & Related Work on Rte 151, From the Falmouth T.L. to Old Barnstable Rd (Phase 2)	46.6	29.2	0.4	2.7	$41,023,807	$6,896,541	0.17
613052	Mansfield- Corridor Improvements on Chauncy St (Rte 106) From State Rte 140 to Copeland Dr	174.6	46.2	0.6	4.3	$11,407,302	$9,391,798	0.82
613129	Nantucket- Intersection Improvements at Milestone Rd & Polpis Rd and Extension of 'Sconset Bikepath	25.0	4.2	0.1	0.4	$3,482,427	$1,203,293	0.35
Total Results		**3,228**	**1,211**	**16**	**114**	**$293,416,499**	**$327,131,961**	**1.11**

Table 16. Summary of service life benefits and total B/C for systemic projects.

STIP Program	Project Number	Project Description	Total Crashes Reduced	Fatal and Injury Crashes Reduced	Lives Saved	Serious Injuries Prevented	Present Value Total Cost	Present Value Benefits	Total B/C
Safety Improvements	613604	District 5- VRU Systemic Safety Project near Bus Stops	3.1	2.5	0.12	0.49	$1,462,395	$1,885,310	1.29
Safety Improvements	613605	District 4- District 6- VRU Systemic Safety Project near Bus Stops	2.9	2.3	0.11	0.45	$2,021,090	$1,729,205	0.86
Safety Improvements	613606	District 1- District 2- District 3- VRU Systemic Safety Project near Bus Stops	4.5	3.7	0.18	0.71	$2,554,526	$2,747,794	1.08
Safety Improvements	S12899	AWSC Conversion - 2025	338.8	112.7	1.4	10.6	$397,270	$28,785,106	72.46
Safety Improvements	S12900	AWSC Conversion - 2026	891.5	296.7	3.8	27.8	$1,045,447	$75,750,278	72.46
Safety Improvements	S12885	RRFBs - 2025	40.2	33.3	1.6	6.4	$2,496,250	$22,226,717	8.90
Safety Improvements	S12886	RRFBs - 2026	17.0	14.1	0.7	2.7	$1,057,235	$9,381,422	8.87
		Total Results	**1,298**	**465**	**8**	**49**	**$11,034,214**	**$142,505,832**	**12.91**

Table 17. Summary of expected benefits and total B/C by project type.

Project Type	Total Crashes Reduced	Fatal and Injury Crashes Reduced	Lives Saved	Serious Injuries Prevented	Present Value Total Cost	Present Value Benefits	B/C
Hot-Spot	3,228	1,211	16	114	$293,416,499	$327,131,961	1.11
Systemic	1,298	465	8	49	$11,034,214	$142,505,832	12.91
Total	**4,526**	**1,676**	**24**	**163**	**$304,450,713**	**$469,637,793**	**1.54**

Proposed Distribution of Funds

MassDOT summarized the distribution of programmed funds for proposed HSIP and Vulnerable User Safety STIP project funds regarding geographic distribution. Note that this only includes years 2025 and 2026 and thus represents a snapshot of funding distribution; proportional distribution fluctuates year-to-year for the MassDOT HSIP. Table 18 summarizes the distribution of HSIP funds by MassDOT District in comparison to the distribution of fatal and suspected serious injuries. Note that as of now, Districts 2 and 3 are expected to receive a lower proportion of HSIP funds compared to their historical share of fatalities and injuries, while District 6 is expected to receive a slightly higher proportion of HSIP funds compared to the fatal and serious injury distribution. However, the statewide systemic efforts include improvements in all Districts, which will elevate the proportional distribution.

Table 18. Planned distribution of HSIP funds by MassDOT District.[39]

District	Planned Percent of HSIP Dollars (Percent Disregarding Statewide Line Items)	Current Percent of Fatal and Suspected Serious Injuries (2020-2024)
1	0% (0%)	3%
2	4% (5%)	12%
3	7% (9%)	19%
4	26% (31%)	24%
5	29% (34%)	30%
6	19% (22%)	12%
Statewide	14% (n/a)	n/a

Similarly, Table 19 describes the programmed distribution of HSIP and Vulnerable User Safety (VUS) STIP project funds by RPA. There is little disparity between the regional distribution of HSIP dollars and the percentage of serious injuries. Note that smaller planning agencies (e.g., NPEDC, MVC) have fewer projects, so they may aggregate projects for several years, thus rather than receiving annual funding they fund projects every few years.

[39] Based on STIP programmed line items for 2025 and 2026. “Statewide” efforts include statewide systemic projects as well as line items for adjustments, awards, and change orders.

Table 19. Planned distribution of HSIP funds by MassDOT region.[40]

Massachusetts RPA	Planned Percent of HSIP Dollars	Current Percent of Fatal and Suspected Serious Injuries
BRPC	0%	2%
CCC	1%	4%
CMRPC	6%	10%
FRCOG	0%	1%
MAPC	36%	35%
MRPC	0%	4%
MVC	0%	<1%
MVPC	11%	5%
NMCOG	0%	4%
NPEDC	1%	<1%
OCPC	8%	8%
PVPC	3%	11%
SRPEDD	12%	14%
Multiple	8%	n/a
Statewide	14%	n/a

Finally, Table 20 summarizes the HSIP projects by SHSP EA. Note that MassDOT associates projects with multiple EAs. For instance, a proposed intersection project to upgrade signal equipment may include the construction of bike boxes, sidewalks, and pedestrian signals at the intersection. As such, MassDOT considers this project for the "Intersection Related", "Pedestrian", and "Bicyclist" EAs. This aligns with crashes, which can also be assigned to more than one EA. Additionally, while these EAs are infrastructure focused, the projects often build in forgiveness that will help to address behavioral EAs. For instance, while median cable barrier primarily addresses lane departure crashes, it also prevents impaired or distracted drivers from crossing the median and causing a head-on crash. Further, projects such as enhanced signs, signals, and markings can help older and younger drivers.

[40] Based on STIP programmed line items for 2025 and 2026. "Statewide" efforts include statewide systemic projects as well as line items for adjustments, awards, and change orders.

Table 20. List of STIP HSIP projects with EAs.

Project Number	Project Description	Emphasis Areas
605857	Norwood - Intersection Improvements and Related Work at Route 1 & University Avenue/Everett Street	Intersection, Pedestrian, Bicycle
607342	Milton- Intersection Improvements at Route 28 (Randolph Avenue) & Chickatawbut Road	Intersection
608045	Milford- Rehabilitation on Route 16, from Route 109 to Beaver Street	Intersection, Pedestrian
608051	Wilmington- Reconstruction on Route 38 (Main Street), from Route 62 to the Woburn C.L.	Intersection, Pedestrian, Bicycle
608095	North andover- Corridor Improvements on Route 114, Between Waverly Road and Willow/Mill Street	Intersection, Pedestrian, Bicycle
608759	Swansea- Traffic Signal and Safety Improvements at Three Intersections on Route 6	Intersection, Pedestrian, Bicycle
608778	Southbridge- Intersection Improvements at Central Street, Foster Street, Hook Street and Hamilton Street	Intersection, Pedestrian, Bicycle
608940	Weston- Intersection Improvements Boston Post Road (Route 20) at Wellesley Street	Intersection, Pedestrian, Bicycle
609065	Holyoke- Resurfacing and Related Work on Cabot Street and Race Street (Center City Connector)	Intersection, Pedestrian, Bicycle
609440	Abington- Intersection Improvements at Hancock Street and Chestnut Street	Intersection
609532	Chelsea- Targeted Safety Improvements and Related Work on Broadway, from Williams Street to City Hall Avenue	Intersection, Pedestrian, Bicycle
610714	Bourne to Braintree- Guide and Traffic Sign Replacement on a Section of Route 3	Older Driver
610715	New Bedford to Taunton- Guide and Traffic Sign Replacement on a Section of Route 140	Older Driver
610717	Uxbridge to Worcester- Guide and Traffic Sign Replacement on a Section of Route 146	Older Driver
610823	Quincy- Intersection Improvements at Willard Street and Ricciuti Drive	Intersection, Pedestrian
611952	Harvard- Littleton- Acton- Concord- Guide and Traffic Sign Replacement on a Section of Route 2	Older Driver
611953	Springfield- Chicopee- Guide and Traffic Sign Replacement on a Section of Interstate 291	Older Driver
611954	Boston- Guide and Traffic Sign Replacement on I-90/I-93 Within Central Artery/Tunnel System	Older Driver
611974	Medford- Intersection Improvements at Main Street/South Street, Main Street/Mystic Valley Parkway Ramps and Main Street/Mystic Avenue	Intersection, Pedestrian, Bicycle
611979	Avon- Intersection Improvements at Route 28, Spring Street and Harrison Boulevard	Intersection
612599	Lynn- Targeted Safety and Multimodal Improvements (Playbook Priority Corridors)	Pedestrian, Bicycle

Project Number	Project Description	Emphasis Areas
613052	Mansfield- Corridor Improvements on Chauncy Street (Route 106) from State Route 140 to Copeland Drive	Intersection, Pedestrian, Bicycle
613604	District 5- VRU Systemic Safety Project Near Bus Stops	Pedestrian
613605	District 4- District 6- VRU Systemic Safety Project Near Bus Stops	Pedestrian
613606	District 1- District 2- District 3- VRU Systemic Safety Project Near Bus Stops	Pedestrian
S12885	SHSP Strategies Implementation to Address Emphasis Areas (Safety Program - 2025)	Pedestrian
S12886	SHSP Strategies Implementation to Address Emphasis Areas (Safety Program - 2026)	Pedestrian
S12891	VRU Systemic Safety Near Bus Stops - 2026	Pedestrian, Bicycle
S12899	SHSP Strategies Implementation to Address Emphasis Areas (Intersection Program - 2025)	Intersection
S12900	SHSP Strategies Implementation to Address Emphasis Areas (Intersection Program - 2026)	Intersection

Table 21 summarizes HSIP expenditures by EA in comparison to fatal and suspected serious injuries. Note that because both projects and crashes can be assigned to multiple EAs, the total sum of percentages for each column exceeds 100 percent. Intersection projects account for the largest proportion of HSIP funds, followed by pedestrian and bicyclist. This is primarily due to MassDOT's inclusion of pedestrian and bicycle improvements in nearly all projects. Finally, Older Driver projects make up roughly 12 percent of funds due to signage improvements to assist with wayfinding. Notably, MassDOT has not programmed funds for any lane departure funds in the upcoming years. Additionally, while certain EAs do not have any projects specifically programmed, there will be secondary effects on those EAs. For instance, projects including pedestrian and bicycle treatments also function as traffic calming recommendations, reducing the likelihood of speeding-related severe crashes. Similarly, while guide sign improvement projects are primarily focused on older drivers, Recall this is simply a snapshot and MassDOT has recently completed some lane departure projects and has programmed several more in future STIP years.

Table 21. Distribution of HSIP funds by SHSP EA.

SHSP EA	Number of Projects	HSIP and VUS STIP Dollars Associated	Percent of Total HSIP and VUS STIP Funds Dollars	Percent Fatal + Suspected Serious Injuries
Intersection Related	23	$91,390,042	66%	34%
Lane Departure	0	$0	0%	29%
Older Driver Related	6	$16,634,964	12%	19%
Occupant Protection	0	$0	0%	16%
Young Driver Related	0	$0	0%	14%
Motorcyclist	0	$0	0%	13%
Impaired Driving	0	$0	0%	12%
Pedestrian	25	$95,004,518	68%	12%
Speeding-Related	0	$0	0%	10%
Distracted Driving	0	$0	0%	9%
Truck Involved	0	$0	0%	6%
Bicyclist	18	$78,011,590	56%	4%
Work Zone	0	$0	0%	1%
At-Grade Rail Crossing	0	$0	0%	<1%

Program Status and Future Plans

Ultimately, this HSIP Implementation Plan is being updated to consider how MassDOT can improve the effectiveness of the HSIP, contribute more towards developing a Safe System, and meet safety performance targets. The following is the list of recommendations, primarily from previous plans, with status updates for each recommendation and how the recommendation will be advanced in future program years. In some cases, previous recommendations overlapped so MassDOT looked for opportunities to consolidate similar suggestions.

Safe System Approach and Program Management

- Use the HSIP to champion the Safe System Approach in Massachusetts, highlighting how its principles and elements should be considered in all projects and programs. This includes adding context-based speed limit selection and speed management countermeasures in most if not all projects.
    - **Status Update:** MassDOT adopted the Safe System Approach at an executive level, so this will filter down to the entire project planning and development process. Further, Massachusetts's 2023 SHSP update included the adoption of the Safe System Approach, which will guide all HSIP efforts. MassDOT is also taking efforts to implement speed management and context-based speed decisions in all projects, but especially HSIP projects. MassDOT is increasing proactive safety by programming additional systemic projects. MassDOT's Complete Streets approach considers all users in design. MassDOT released the "Learn about speed management" webpage, which includes information about the role of speed in traffic safety. Additionally, this webpage includes materials related to speed limit setting and selecting target speeds for design. Finally, FHWA has worked with MassDOT to incorporate the Safe System Roadway Design Hierarchy into their RSA processes.
    - **Moving Forward:**
        - MassDOT will continue monitoring opportunities to implement new FHWA Safe System tools, including the Roadway Design Hierarchy and the Policy-based and Project-based alignment frameworks, to impact program-level and project-level decisions. These resources will help MassDOT advance their implementation of the Safe System Approach.
- MassDOT should consider identifying opportunities to advance the Safe Speed element of the Safe System approach by integrating target speed setting in HSIP projects (as well as all projects), encouraging use of the Roadway Treatment Technical Toolkit, being consistent with the application of their Complete Streets program, and programming systemic projects focused on speed management.
    - **Status Update**: MassDOT identified rural gateways as a risk factor in speed-related crashes and prioritized five locations to test out a new kind of quick hit project focused on systemic speed management. Additionally, MassDOT has incorporated target speed setting into all projects through their design guidelines.
    - **Moving Forward:**
        - MassDOT should continue ongoing plans to create a new project that will systemically address speed management at five locations in Districts 1, 2, and 3. This project will advertise as a low-cost project in 2026.

        - MassDOT will develop a method to systemically identify areas in need of speed management countermeasures and develop potential guidance on how to plan for and select speed management countermeasures for those locations.
- MassDOT's HSIP should focus on reducing fatal and suspected serious injury crashes. This includes both hot-spot and systemic screening and project selection methods.
    - **Status Update:** Massachusetts's 2023 SHSP update included the adoption of the Safe System Approach, which prioritizes a proactive approach to reducing fatalities and serious injuries. MassDOT has also recently updated their network screening models for fatal and serious injury crashes and now focuses their systemic projects on these models' outputs. MassDOT worked with FHWA to incorporate the Safe System Approach Design Hierarchy into their RSA processes, further focusing on solutions that save lives.
    - **Moving Forward:**
        - Guided by the new 2023 SHSP, MassDOT should continue to focus on reducing fatalities and serious injuries in a proactive manner, programming more and more systemic projects.
        - MassDOT should also seek to develop a methodology for identifying priority locations along freeways.
        - MassDOT should incorporate tools from NCHRP Research Report 1111 to improve the RSA and diagnosis process to better identify solutions targeting fatal and serious injury crashes.
- MassDOT's HSIP should focus on lane departure crashes, intersection crashes, and pedestrian crashes. Infrastructure improvements for these EAs should have carryover effects on other EAs in Massachusetts such as impaired driving, speeding, and occupant protection.
    - **Status Update:** MassDOT's Complete Streets policy encourages the consideration of all users in each transportation project, resulting in pedestrian and bicycle improvements in most projects. Complete Streets and the MassDOT Speed Management policy also encourage the selection of context-sensitive speeds to govern design. Further, MassDOT completed their VRU Safety Assessment in 2023 and now have dedicated funding for VRU safety projects. Additionally, the risk-based network screening maps in the IMPACT tool provide sites to originate systemic projects for these EAs. MassDOT has also expanded their ongoing Focus on Reducing Rural Roadway Departures (FoRRRwD) program to cover 20 additional communities in District 3 using leftover program funds from Districts 1 and 2. Finally, MassDOT has programmed systemic projects improving safety at intersections as well as for pedestrians.
    - **Moving Forward:**
        - MassDOT will continue to program new rounds of pedestrian crossing improvements adjacent to bus stops and pedestrian signal projects for high priority communities. MassDOT will also consider material procurement projects for local agencies to address pedestrian safety (e.g., RRFBs).
        - MassDOT should use the updated risk-based network screening maps to prioritize communities for specified safety projects under each 2023 SHSP emphasis area.

- MassDOT should work closely with MPOs to identify projects and programs to reduce both infrastructure and behavioral risk factors. Consider opportunities to fund behavioral safety projects and programs in the future to target issues such as impaired driving, speeding, and occupant protection. The IIJA now allows HSIP funds to be used for "specified safety projects" (e.g., non-infrastructure projects which support the SHSP).
    - **Status Update:** MassDOT updated the risk-based network screening maps to prioritize communities for specified safety projects under each 2023 SHSP emphasis area. With the enactment of IIJA and allowance of HSIP funding for non-infrastructure projects, MassDOT programs speed feedback and other such projects using HSIP funds. Using state funds, MassDOT is piloting a large-scale citywide seat belt awareness and educational campaign with Brockton on the dangers of being unrestrained. MassDOT is also evaluating campaigns targeting speeding and distracted driving, using probe telematics data to monitor changes in driver behavior in target communities. Currently, MassDOT is wrapping up a Distracted Driving program in Holyoke, just started a Pedestrian Safety campaign in Chelse, and is planning a Speeding program in Leominster starting in the spring of 2026.
    - **Moving Forward:**
        - MassDOT should work closely with MPOs to identify projects and programs to address risks.
        - MassDOT should evaluate the state-funded public awareness campaign on seat belt use in Brockton to determine the impact of the program. Using the conclusions of this evaluation, MassDOT should replicate this public awareness campaign elsewhere using HSIP funds for top risk communities.
- In an effort to use the HSIP to advance safety across the State, MassDOT should identify opportunities to support local agencies interested in pursuing Safe Streets and Roads for All (SS4A) grants, as well as other State and Federal grants.
    - **Status Update:** All planning agencies have received SS4A grants. MassDOT's IMPACT tool provides ready access to safety data for agencies preparing their grants.
    - **Moving Forward:**
        - MassDOT should work with local agencies to determine if additional improvements in IMPACT may help better facilitate SS4A (and similar) grant application development.
- The USDOT announced the SAFE ROADS initiative focused on improving safety on non-freeway/expressway arterials through more reliable operations and reduced distractions[41]. The initial ask of MassDOT under this initiative is to identify a list of priority arterial corridors to be "addressed" within the upcoming Fiscal Year (FY26). MassDOT has already reviewed recent network screening results to identify potential priority corridors. Additionally, MassDOT compared this list to 2026 STIP Projects, and reported the list of corridors which appeared on both lists as those which will be addressed by the end of FY26. MassDOT may also report any additional sites which will receive an RSA or similar safety study or assessment during FY26. MassDOT is prepared to modify their approach as needed based on further guidance from FHWA or USDOT.

[41] https://highways.dot.gov/safety/safe-roads

Geography and Jurisdiction

- MassDOT's HSIP should include projects for both MassDOT- and locally-maintained roads.
    - **Status Update:** MassDOT continues using HSIP funds for material procurement projects to support systemic projects on local roads. MassDOT is also working with their regional planning partners to address safety concerns on local roads. For example, MassDOT's FoRRRwD program specifically targets rural locally-owned roads and MassDOT has an upcoming program that will provide pedestrian crossing enhancements at bus stops along municipality-owned roads.
    - **Moving Forward:**
        - MassDOT developed *A Safety Action Planning Primer for Massachusetts Communities*[42] to assist MPOs and local communities in developing local road safety plans. MassDOT should continue to market this resource to raise awareness among local agencies.
        - MassDOT is planning a 2026 project implementing VRU safety countermeasures adjacent to bus stops on local roads.

Countermeasures

- MassDOT should continue to encourage the use of innovative intersections to address traffic safety issues, particularly at stop-controlled intersections. MassDOT's ICE policy will help determine the most appropriate alternative.
    - **Status Update:** The adoption of MassDOT's ICE policy encourages the consideration of roundabouts and other reduced conflict intersections in nearly all intersection projects. MassDOT is delivering a systemic AWSC project targeting high-risk TWSC intersections to reduce the likelihood of severe angle crashes.
    - **Moving Forward:**
        - MassDOT's should continue monitor the effectiveness of their AWSC program to refine their process as more are implemented.
- The sole HSIP-funded HFST project showed that HFST has the potential to improve safety performance in certain conditions. MassDOT should explore opportunities to develop a systemic or systematic HFST project, as these projects tend to be cost-effective, particularly when addressing multiple sites at once.
    - **Status Update:** MassDOT encountered issues related to immediate post-installation care of HFST installations.
    - **Moving Forward:**
        - MassDOT should work with FHWA to revise HFST contracts to support post-installation maintenance.
        - MassDOT should review and document noteworthy practices for longer-term maintenance of HFST installations.

Project Programming, Delivery, and Evaluation

- Systemic safety projects show the potential for substantial returns on investment. As such, MassDOT should continue the use of systemic projects in the HSIP. MassDOT's risk-based network screening maps in IMPACT will help users identify sites for such projects.

[42] https://www.mass.gov/doc/safety-action-planning-primer-for-massachusetts-communities/download

    - **Status Update:** MassDOT has increased their systemic project programming, most recently launching a project enhancing VRU facilities adjacent to high-risk bus stops, expanding their four-foot bike passing buffer sign program, and adding District 3 to their roadway departure systemic initiative. Additionally, MassDOT identified material procurement as a method to overcome obstacles to implementing systemic projects on the local system. MassDOT has an ongoing effort to use HSIP funds in 20 communities in District 3 using HSIP funds for procurement.
    - **Moving Forward**:
        - MassDOT should continue its plans to systemically address pedestrian enhancements at locally-maintained signals within the top communities for VRUs. If successful, expand the program to additional communities.
- Continue to pilot and experiment with material procurement projects to increase local road systemic safety projects.
    - **Status Update:** As mentioned earlier, MassDOT programmed and delivered a material procurement project, providing local agencies with speed feedback signs on high-risk rural roads and in school zones. MassDOT also programmed and started delivering their first round of systemic RRFB and AWSC projects in 2025.
    - **Moving Forward:**
        - MassDOT should continue its plans to expand this program. With funds already in place within contracts to continue planned RRFB and AWSC distribution projects in 2026.
- MassDOT should look for opportunities to incorporate low-cost safety countermeasures and Safe System concepts in other STIP projects. The example rumble strip addition showed that the addition of low-cost safety countermeasures to already planned projects can produce significant returns on investment for the small additional cost. Alternatively, MassDOT could allow for flexibility of the use of HSIP funds in the STIP so HSIP funds can be used outside of the Intersection and Safety categories. Additionally, MassDOT should continue to use the IMPACT risk-based network screening maps to incorporate low-cost targeted countermeasures in all projects, not just safety projects.
    - **Status Update:** MassDOT has worked with the Pavement division to encourage the review of IMPACT risk-based network screening maps to identify opportunities to incorporate targeted low-cost countermeasures into already programmed pavement and other projects. Additionally, the results in Table 12 suggest that the HSIP components of larger transportation projects produce highly cost-effective safety benefits. MassDOT updated their network screening maps and posted them in IMPACT. To promote FHWA's Proven Safety Countermeasures (PSCs), MassDOT includes related information in all RSA data packages.
    - MassDOT completed its effort to create a master map which overlays risk-based and crash-based network screening results with crash clusters, equity data, and other data sources to make it easier to identify opportunities to incorporate systemic improvements in other programs. The map can be found on IMPACT as well as MAPIT (MassDOT's project intake tool).
    - **Moving Forward:**

        - MassDOT is pilot testing AI tools to calculate stopping sight distance, passing sight distance, guardrail needs, and six other features using LiDAR data. The results of the screening will be incorporated into resurfacing projects to address.
- Implement relevant recommendations and findings from the 2023 VRU Safety Assessment. This includes considering equity for all users and communities in project programming and programming more proactive, systemic VRU projects.
    - **Status Update:** MassDOT completed the VRU Safety Assessment in 2023. A key finding of the VRU Safety Assessment was the increased risk present for vulnerable road users adjacent to bus stops. MassDOT programmed systemic projects to implement VRU safety improvements adjacent to bus stops on high-risk corridors. MassDOT also programmed systemic RRFB projects at high-risk crossing locations.
    - **Moving Forward:**
        - Additionally, though not using HSIP funds, MassDOT is addressing pedestrian safety at locally owned signalized intersections in top risk VRU communities. MassDOT should continue to enhance pedestrian safety systemically for VRU top risk pedestrian communities.
- Analysis of future projects suggested most hot-spot projects selected for 2025 and 2026 are expected to be economically efficient, producing B/C ratios greater than 1.0.
    - **Status Update:** MassDOT has developed and established the use of the Safety Alternatives Analysis Guide in practice.
    - **Moving Forward:**
        - MassDOT should use the Safety Alternatives Analysis Guide to verify hot-spot projects are expected to produce sufficient safety returns.
        - MassDOT should continue to split fund projects with HSIP and other funds. MassDOT should invest the HSIP portion for the safety component of projects while recognizing there are other purposes and needs for projects.

Conclusion

MassDOT continues to administer their HSIP with the goal of achieving zero fatalities and serious injuries in Massachusetts. This HSIP Implementation Plan helps MassDOT continue to improve the HSIP through an overview of recent safety trends, a summary of historic project evaluations, a review of future project benefits, an update on program status, and recommended strategies and actions to increase program efficiency and effectiveness.

Key takeaways from this plan include:

- Massachusetts continues to experience an unacceptable number of fatalities and serious injuries due to highway crashes, which MassDOT is coordinating with their partners to address.
- MassDOT continues to program systemic and hot-spot projects where BCR suggests the projects will be effective. While this plan shows seven systemic and material procurement projects are programmed, MassDOT recently programmed and completed several more (as documented in the 2023 HSIP Implementation Plan), compared to three such preliminary projects documented in the 2021 HSIP Implementation Plan. Projects programmed for 2025 and 2026 are projected to save 24 lives and prevent 163 serious injuries over their service lives.
- While MassDOT listed several strategies and recommendations moving forward, key actions include:
    - Delivering proposed systemic and material procurement projects, learning from those projects, and refining the programming and delivery of similar future projects.
    - Continuing to develop and program projects addressing VRU safety. The systemic approach and material procurement will be useful as MassDOT expands their VRU safety focus.
    - Expanding the consideration of safety in all projects, especially through encouraging the installation of low-cost safety countermeasures in infrastructure improvements.
    - Identifying opportunities to expand the Safe System Approach in Massachusetts, especially through the implementation of Safe Speeds on the roadway system.
    - Supporting local agencies in their development of safety action plans and pursuit of grant funding to make roadways in their jurisdiction safer for all users. Continuing to support local road safety projects through material procurement, technical support, and other means.

MassDOT's Highway Safety Department will work with their partners and stakeholders to perform the actions and implement the strategies identified in this plan, refining their HSIP processes to continue on the road to zero fatalities.