New Hampshire HSIP Implementation Plan

FY2024

New Hampshire DOT
Department of Transportation

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HSIP Implementation Plan

The New Hampshire Department of Transportation (NHDOT) is required to develop a Highway Safety Improvement Program (HSIP) Implementation Plan because it did not meet or make significant progress on two of the five safety performance measures in 2021 as summarized in Table 1. The five (5) safety performance measures are number of fatalities, rate of fatalities per 100 million vehicle miles traveled (HMVMT), number of serious injuries, rate of serious injuries per HMVMT, and number of non-motorized fatalities and serious injuries. Note the Federal requirement is to meet or make significant progress on at least four of five (23 CFR 924) of the performance measures. The two safety performance measures that New Hampshire did not meet or make significant progress on in 2021 are serious injuries and serious injury rate.

Table 1. Summary of New Hampshire's 2021 Safety Performance Targets.

Performance Measure	2019 Baseline	2021 Target	2021 Five-Year Average	Met Target or Made Significant Progress?
Fatalities	120.0	120.0	114.4	Yes
Fatalities per HMVMT	0.886	0.884	0.864	Yes
Serious Injuries	456.4	456.4	466.4	No
Serious Injuries per HMVMT	3.364	3.353	3.534	No
Non-Motorized Fatalities and Serious Injuries	52.0	45.9	40.6	Yes

To satisfy Federal requirements, a typical HSIP Implementation Plan must[1]:

- Identify roadway features that constitute a hazard to road users.
- Identify highway safety improvement projects on the basis of crash experience, crash potential, or other data-supported means.
- Describe how HSIP funds will be allocated, including projects, activities, and strategies to be implemented.
- Describe how the proposed projects, activities, and strategies funded under the State HSIP will allow the State to make progress toward achieving the safety performance targets.
- Describe the actions the State will undertake to achieve the performance targets.

This Implementation Plan is an update to the 2022 plan and guides HSIP implementation for Fiscal Year (FY) 2024 and future years. It follows FHWA's decision support framework, starting with an overview of historical crash data, expenditures, and project data, followed by the identification of gaps, deficiencies, and noteworthy practices, and concluding with a list of recommendations for the HSIP as well as a list of projects and programs for the coming Federal Fiscal Year (FFY). The decision support framework is summarized in Table 2. Given this update is only one year subsequent to the previous plan, much of its focus is on reviewing progress on recommended actions and identifying additional potential changes to the program, especially after the enactment of the Bipartisan Infrastructure Law (BIL).

[1] https://safety.fhwa.dot.gov/legislationandpolicy/fast/docs/hsip_implementation_plan_guidanceFINAL.pdf

Table 2. The Decision Support Framework for the HSIP Implementation Plan.

Actions	Prompts
Review Fatality and Serious Injury Trends	• Compare Statewide trends vs region, district, county • Compare trends by Strategic Highway Safety Plan (SHSP emphasis area, urban/rural designation, functional class, roadway ownership
Review HSIP Expenditures	• Compare the proportion of HSIP expenditure by SHSP emphasis areas, urban/rural designation, functional classification, roadway ownership to determine if the proportion of fatalities/serious injuries align with where the problems are occurring
Review Historical Project Performance	• Which countermeasures were implemented? • Where were countermeasures implemented? • What crash types were these countermeasures addressing? • Were these countermeasures and crash types identified as a priority in the SHSP? • What was the outcome (i.e., countermeasures effectiveness)?
Identify Gaps or Deficiencies	• Review data and information to determine any gaps and/or deficiencies • Determine program modifications to ensure projects are properly identified, prioritized, and programmed and have the best potential to reduce fatalities/serious injuries
Identify Noteworthy Practices	• Review literature on noteworthy practices that address State-specific crash characteristics • Identify noteworthy practices that have not yet been implemented and consider them in the HSIP
Conduct Stakeholder Outreach	• Engage safety stakeholders in a discussion about program needs and potential solutions
Develop HSIP Implementation Plan	• Use input from gap analysis, literature review, and safety stakeholders as a starting point for development of the HSIP Implementation Plan

Crash Data Analysis

The purpose of the HSIP is to reduce traffic fatalities and serious injuries on public roads. To achieve that goal, NHDOT's administration of the HSIP should be tailored to address where and how fatalities and suspected serious injuries are occurring on New Hampshire's roadways. This section summarizes recent fatality and serious injury trends in New Hampshire. The data summaries include a distribution of fatalities and serious injuries by area type, roadway ownership, regions, NHDOT Districts, and Strategic Highway Safety Plan (SHSP) emphasis areas. NHDOT can allocate HSIP funds for safety projects among these categories using similar distributions as those observed among the crash data.

The data used for this analysis come from the following sources:

- National Highway Traffic Safety Administration (NHTSA) – NHDOT used fatal crash data for 2012 through 2021 from NHTSA's Fatality Analysis Reporting System (FARS)[2] to inform the data analysis in this section.
- New Hampshire Division of Motor Vehicles (DMV) – NHDOT obtained suspected serious injury crash data from the New Hampshire DMV. These data came in separate packages for 2010-2017 and 2017-2022. NHDOT used spatial data analysis to join relevant fields (area type and jurisdiction) from the road inventory to the crash data. Unfortunately, this limited these fields to only geolocated crashes.

[2] https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars

Overall Statistics

New Hampshire's severe (fatal and serious injury) crashes have fluctuated in recent years. Figure 1 shows the annual number and five-year averages of Fatalities on public roads in New Hampshire since 2012. Since 2015, the five-year average number of Fatalities has slowly increased, from 117.6 in 2016 to 120.0 in 2019. However, the five-year average reduced to 118 in 2020 and 114.4 in 2021. Despite the reduction in the five-year average, New Hampshire has seen year-over-year increases in fatalities in 2020 and 2021 compared to 2019. NHDOT is monitoring this trend.

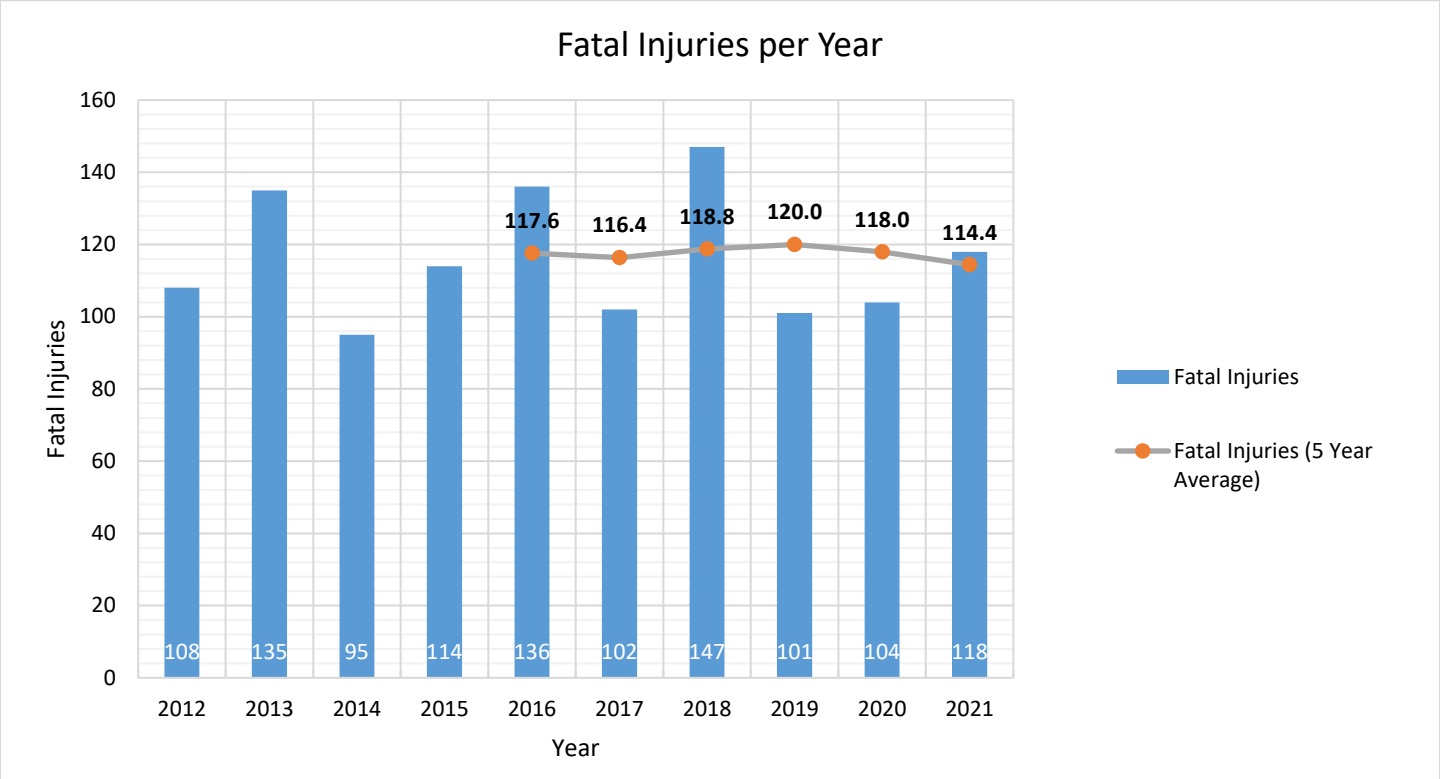

Figure 1. Annual and five-year average number of Fatalities on public roads in New Hampshire.

Figure 2 shows the frequency and five-year average number of suspected serious injury trends in New Hampshire since 2012. In contrast to Fatalities, New Hampshire has seen a steady increase in the five-year average of suspected serious injuries since 2017. Fortunately, 2021 was the first year since 2017 in which there were fewer suspected serious injuries observed than the previous year. NHDOT is monitoring this trend.

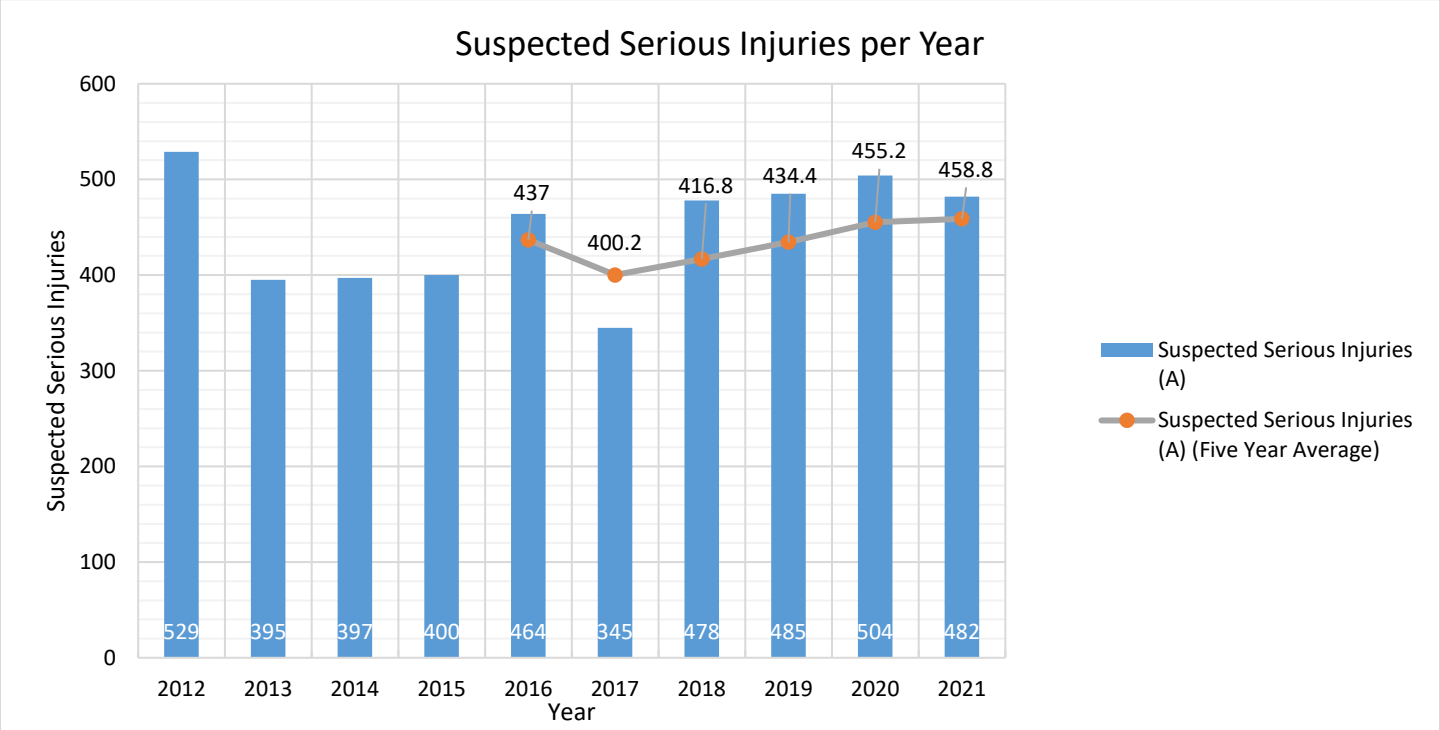

Figure 2. Annual and five-year average number of suspected serious injuries on public roads in New Hampshire.

Figure 3 shows the combined frequency and five-year average number of fatal and suspected serious injuries since 2012. When combined, the five-year average of fatal and suspected serious injuries has increased from 516.6 in 2017 to 573.2 in 2020 and 2021, a temporary stabilization after three straight annual increases. Notably, annual totals fluctuated for the years 2018 through 2021 - NHDOT would like to see these trends reverse moving forward.

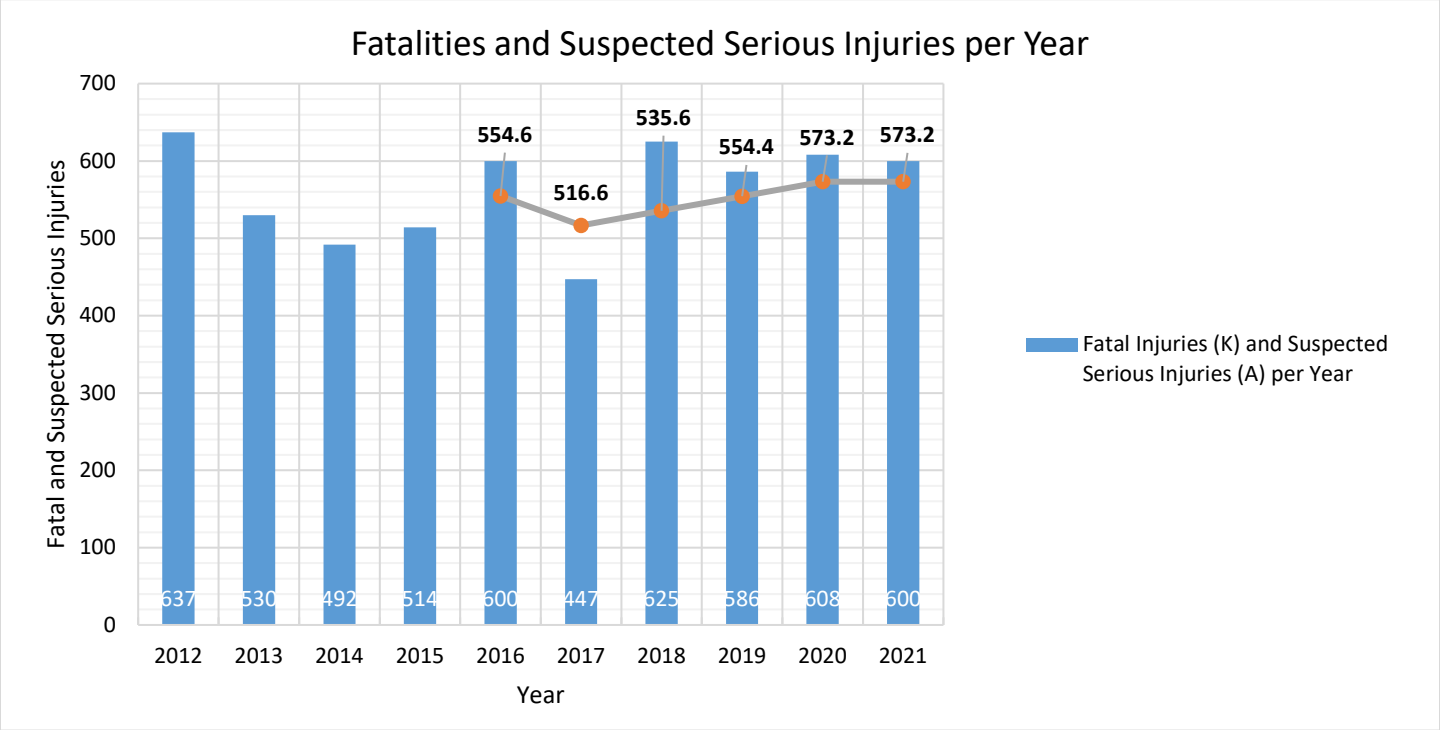

Figure 3. Annual and five-year average number of fatalities and suspected serious injuries on public roads in New Hampshire.

NHDOT's goal is to drive down the frequency and five-year average number of fatal and suspected serious injuries. Given the comparatively low frequency and the randomness of fatalities, NHDOT will use the combined measure of fatal and suspected serious injuries when making funding distribution decisions.

Area Type

The first factor NHDOT considered was the distribution of severe crashes between urban and rural areas. To identify this distribution, NHDOT reviewed the allocation of geolocated crashes among urban and rural roadways. Figure 4 shows that the number of fatalities on both urban and rural roadways has fluctuated over the past six years, with a low of 42 fatalities on urban roadways in 2019 and a high of 69 in 2018. On rural roads, the low was 51 in 2017 and the high was 78 in 2018. On average between 2017 and 2021, 53 percent of fatalities occurred on rural roads and 46 percent occurred on urban roads (1 percent remain non-geolocated). The proportion of fatalities on rural roads is overrepresented, as roughly 40 percent of vehicle miles traveled (VMT) were on rural roads over the same period. Note that 2016 was included in the figure for context, but the primary safety concern is the trend over the most recent five years (2017-2021).

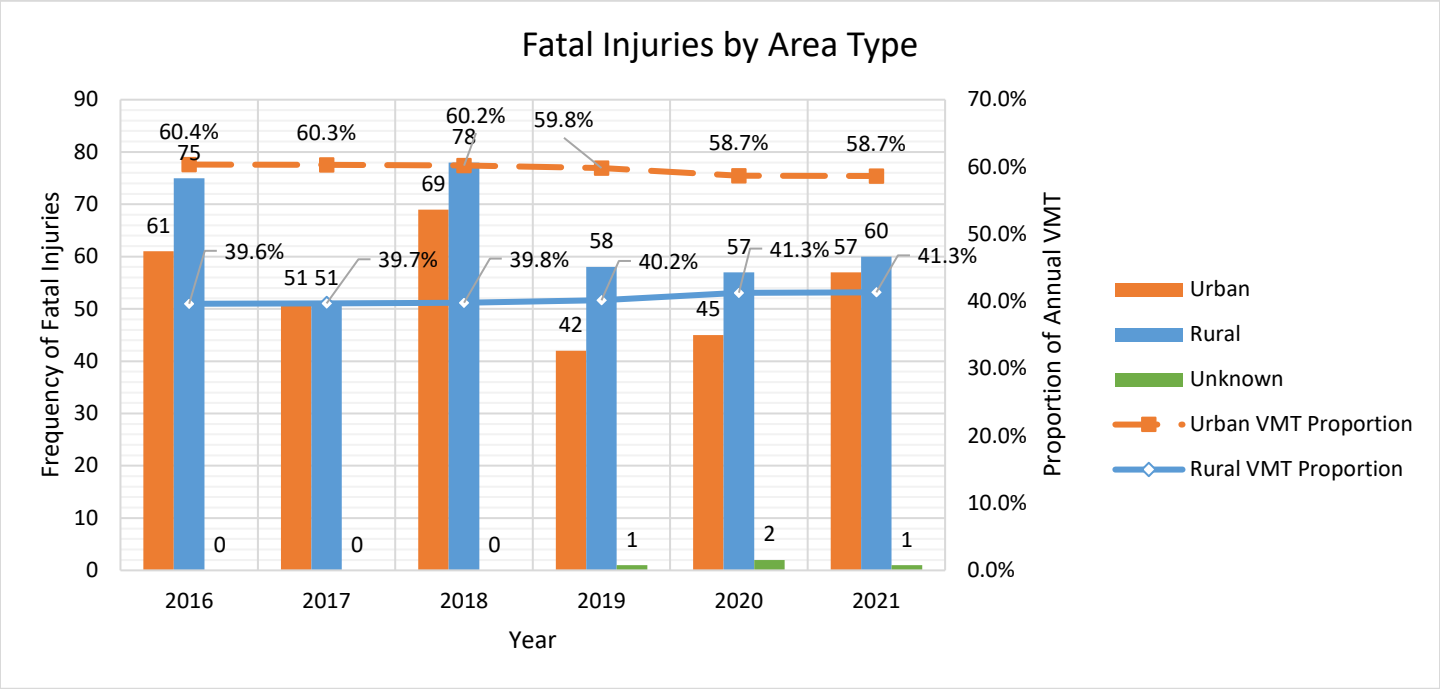

Figure 4. Frequency of Fatalities by area type.

Figure 5 shows that the number of suspected serious injuries by area type has varied in the past six years, with crashes geolocated on rural roads overtaking urban roads in 2018 through 2021. This is likely because rural suspected serious injury crashes were not adequately geolocated in previous years. Note that for 2018 through 2021 (years with sufficient geolocation), 58 percent of fatalities occurred on rural roads, despite those roads only accounting for roughly 41 percent of VMT during that period – another instance of overrepresentation on rural roads.

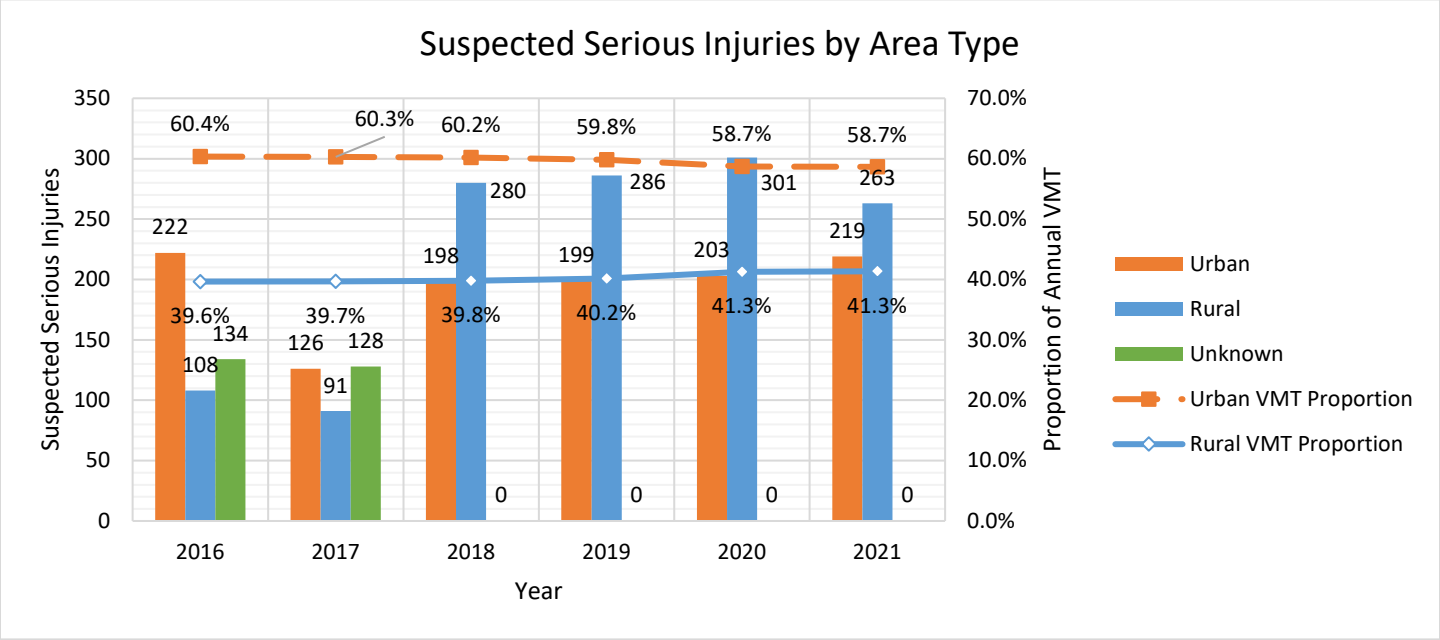

Figure 5. Frequency of suspected serious injuries by area type.

Figure 6 shows the combined trend for the past six years of fatal and suspected serious injuries by area type. Note that the suspected serious injury trend drives the combined trend (because there are roughly four times as many serious injuries as Fatalities), with fewer severe injuries on urban roadways in recent years but a rise in the number of severe injuries for which the area type is rural, apparently due to improved geocoding. Again, rural roads are overrepresented with regard to severe crashes.

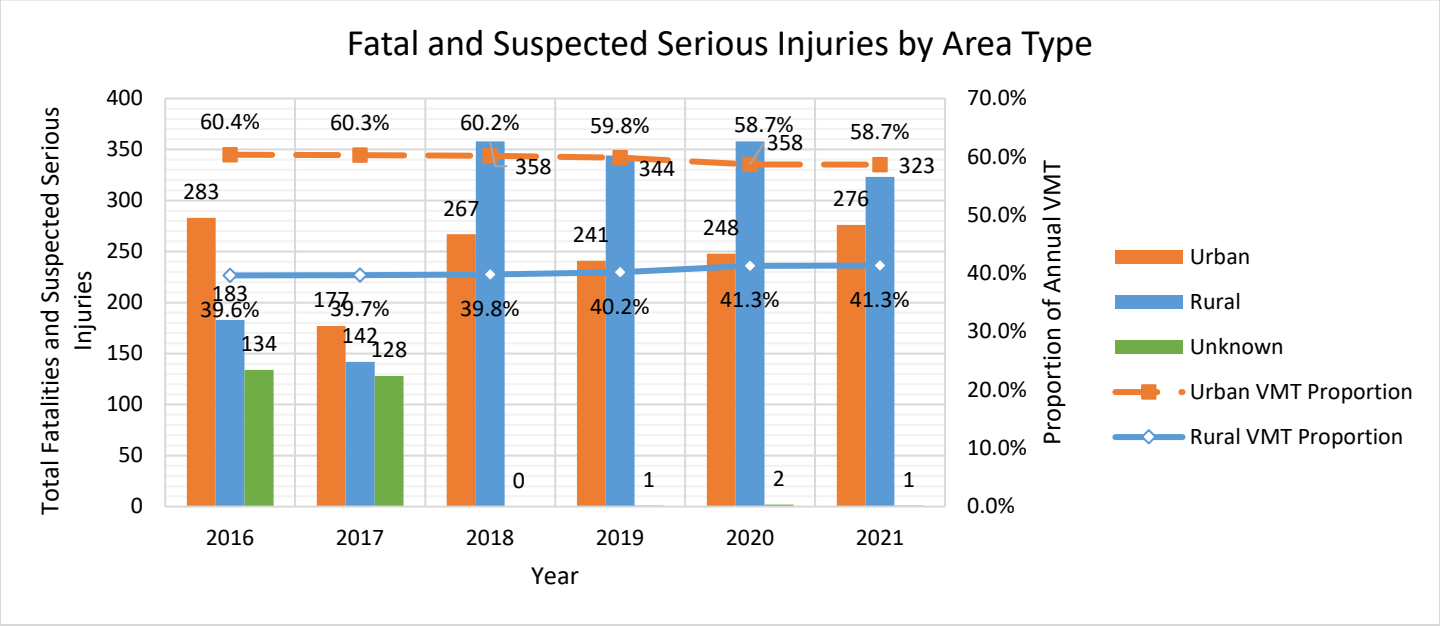

Figure 6. Frequency of fatal and suspected serious injuries by area type

Table 3 shows the combined proportion of fatalities and suspected serious injuries for 2017 through 2021 in New Hampshire broken down by area type. Overall, 42 percent of these injuries occurred on urban roads, 53 percent occurred on rural roads, and 5 percent were not geolocated, so the area type is unknown. For comparison, roughly 41 percent of the VMT was on rural roads and 59 percent was on urban roads. As with the individual summaries, the combined fatalities and serious injuries were overrepresented on rural roads compared to VMT.

Table 3. Proportional Distribution of Fatal and Suspected Serious Injuries by Area Type for 2017 through 2021.

Area Type	Fatalities, 2017 to 2021	Suspected Serious Injuries, 2017 to 2021	Total Fatal and Suspected Serious Injuries, 2017 to 2021	Percentage of Fatal and Suspected Serious Injuries, 2017 to 2021
Urban	264	945	1209	42%
Rural	304	1221	1525	53%
Unknown	4	128	132	5%

Roadway Jurisdiction

NHDOT's HSIP is concerned with traffic safety on all public roads. As such, it is important for NHDOT to consider the number of fatalities and suspected serious injuries not only on State highways but on locally owned and maintained roads as well. There are approximately 4,601 centerline miles of State highways in New Hampshire, and approximately 12,088 centerline miles of local owned and maintained roads[3]. As with area type, NHDOT reviewed the distribution of geolocated severe injuries among State and local roads.

Figure 7 shows the recent trend of Fatalities by roadway jurisdiction. For all years, State-owned roads accounted for the most Fatalities each year. Notably, 2019 was the year with the smallest difference between fatalities on State owned roads compared to city or town owned roads.

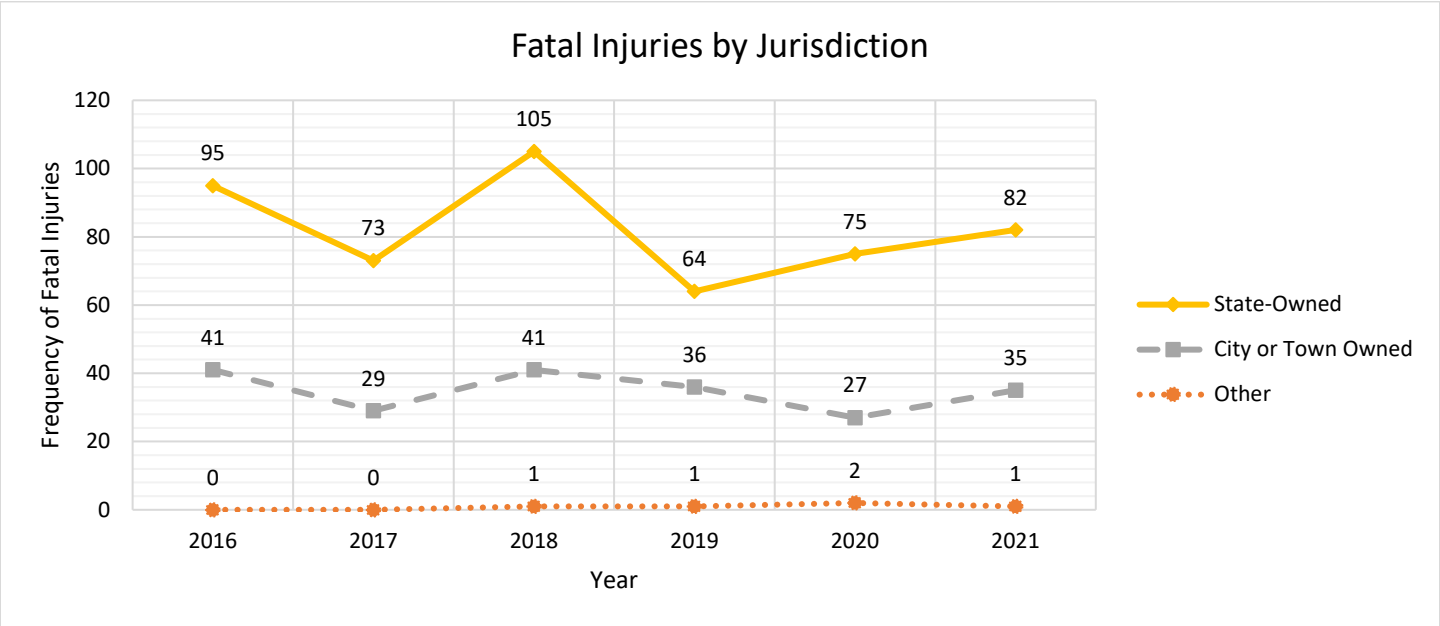

Figure 7. Frequency of Fatalities by roadway ownership.

[3] https://www.nh.gov/dot/org/projectdevelopment/planning/gis-data-catalog/documents/FactsandFigures-2022.pdf

Figure 8 shows the results for suspected serious injuries by ownership type. These data were determined using spatial analysis, which unfortunately means jurisdiction data were only available for geolocated crashes. Of the crashes which were geolocated since 2017, most occurred on State-owned roads. As shown in Figure 9, the combined fatal and suspected serious injury trends are driven by suspected serious injuries, with most injuries occurring on State-owned roads.

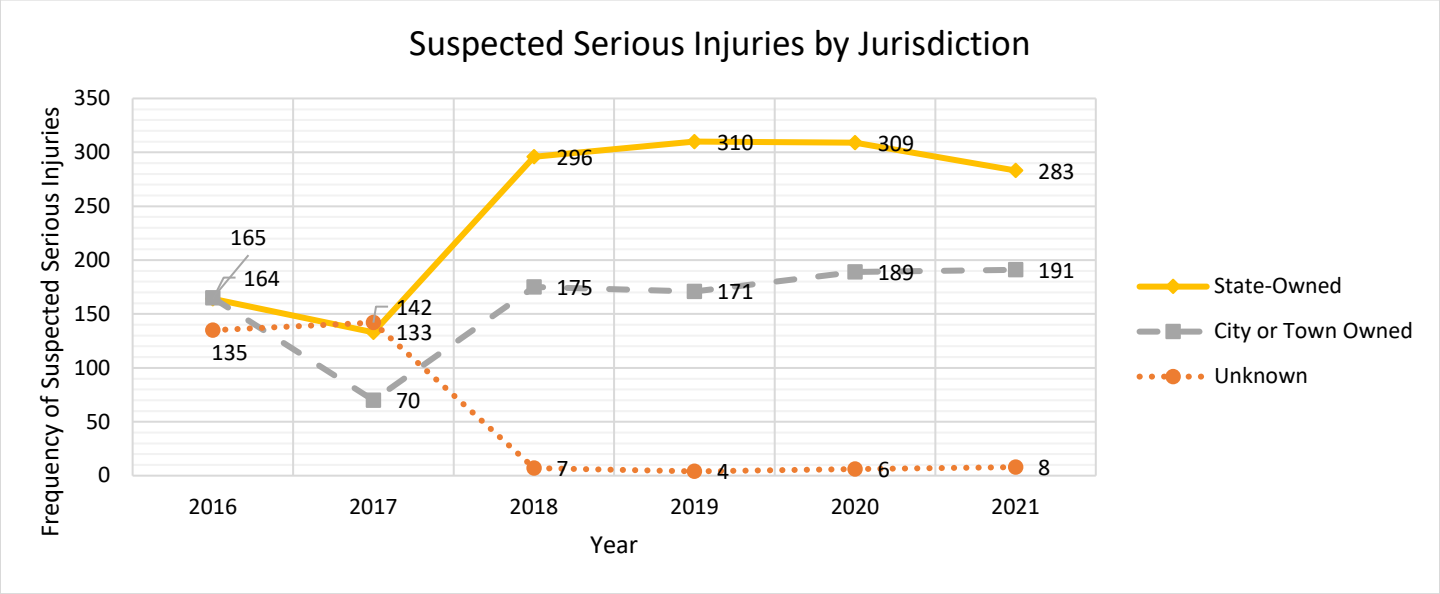

Figure 8. Frequency of suspected serious injuries by roadway ownership.

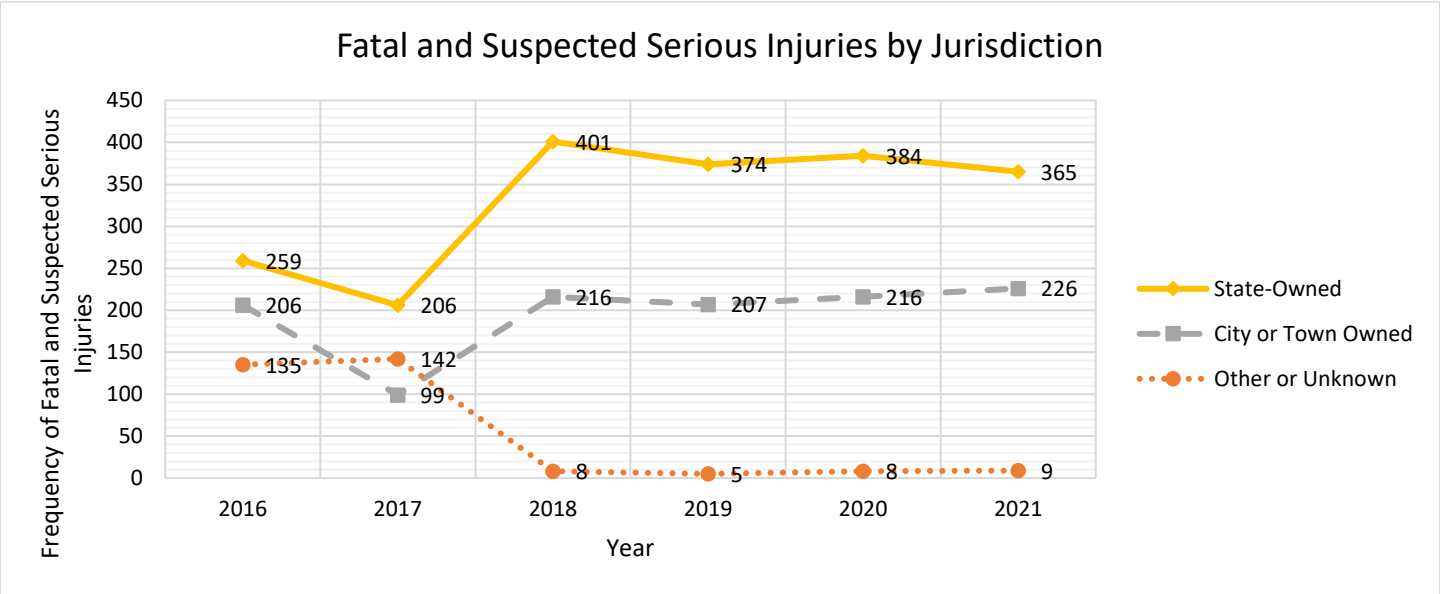

Figure 9. Frequency of fatal and suspected serious injuries by roadway ownership.

Table 4 shows the proportional distribution of roadways by classification for fatal and suspected serious injuries. The majority of crashes (60 percent) were geolocated to State routes, 34 percent on local roads, with 6 percent on other roads or not geolocated. Based on these results, NHDOT should consider distributing $1 in HSIP funds to local roads for every $2 to State roads.

Table 4. Proportional Distribution of Fatal and Suspected Serious Injuries by Roadway Ownership.

Area Type	Fatalities, 2017 to 2021	Suspected Serious Injuries, 2017 to 2021	Total Fatal and Suspected Serious Injuries, 2017 to 2021	Percentage of Fatal and Suspected Serious Injuries, 2017 to 2021
State	399	1331	1730	60%
Local	168	796	964	34%
Other or Unknown	5	167	172	6%

Regions

New Hampshire has nine regional planning commissions (RPCs), shown on the map in Figure 10:

- Central New Hampshire Regional Planning Commission (CNHRPC)
- Lakes Region Planning Commission (LRPC)
- Nashua Regional Planning Commission (NRPC)
- North County Council (NCC)
- Rockingham Planning Commission (RPC)
- Southern New Hampshire Planning Commission (SNHPC)
- Southwest Region Planning Commission (SWRPC)
- Strafford Regional Planning Commission (SRPC)
- Upper Valley Lake Sunapee Regional Planning Commission (UVLSRPC)

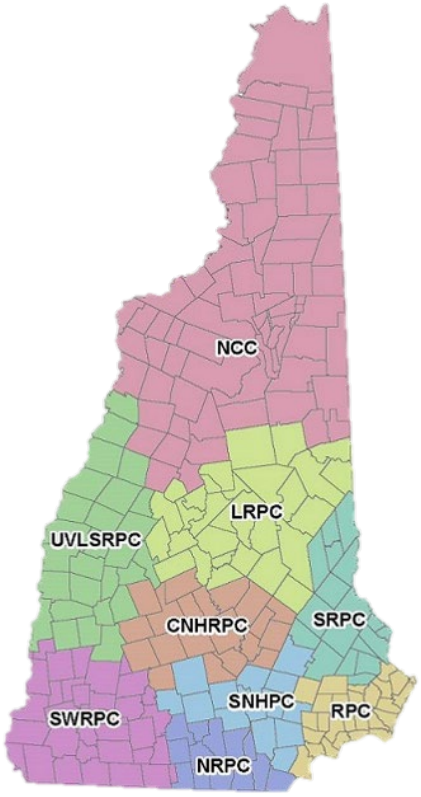

Figure 10. Map of New Hampshire's RPCs[4].

The RPCs play an active role in the generation of HSIP projects in New Hampshire, particularly projects on local roads. To encourage equitable safety outcomes across the State, it is important to consider the distribution of fatalities and serious injuries across the RPCs. Table 5 shows the breakdown of centerline road miles by RPC. Figure 11 shows recent trends in Fatalities by RPC using five-year rolling averages. The SNHPC has the highest five-year average number of Fatalities (likely because SNHPC has relatively high vehicle-miles traveled), though the frequency had decreased slightly from 2018 to 2020 before slightly increasing in 2021. Meanwhile, the UVLSRPC has the lowest five-year average, which has hovered around 6.0 since 2016, but had consistently risen into 2020 before dropping in 2021. Notably, the RPC, SWRPC, and NRPC saw a decline from 2016 through 2021.

[4] https://www.nharpc.org/

Table 5. Centerline Miles by Regional Planning Commission[5]

Regional Planning Commission	Centerline Miles	Percent of Centerline Miles
NCC	2587	14%
LRPC	2491	14%
SNHPC	2232	12%
SWRPC	2077	11%
UVLSRPC	2077	11%
CNHRPC	1883	10%
RPC	1774	10%
NRPC	1603	9%
SRPC	1465	8%
Total	18188	N/A

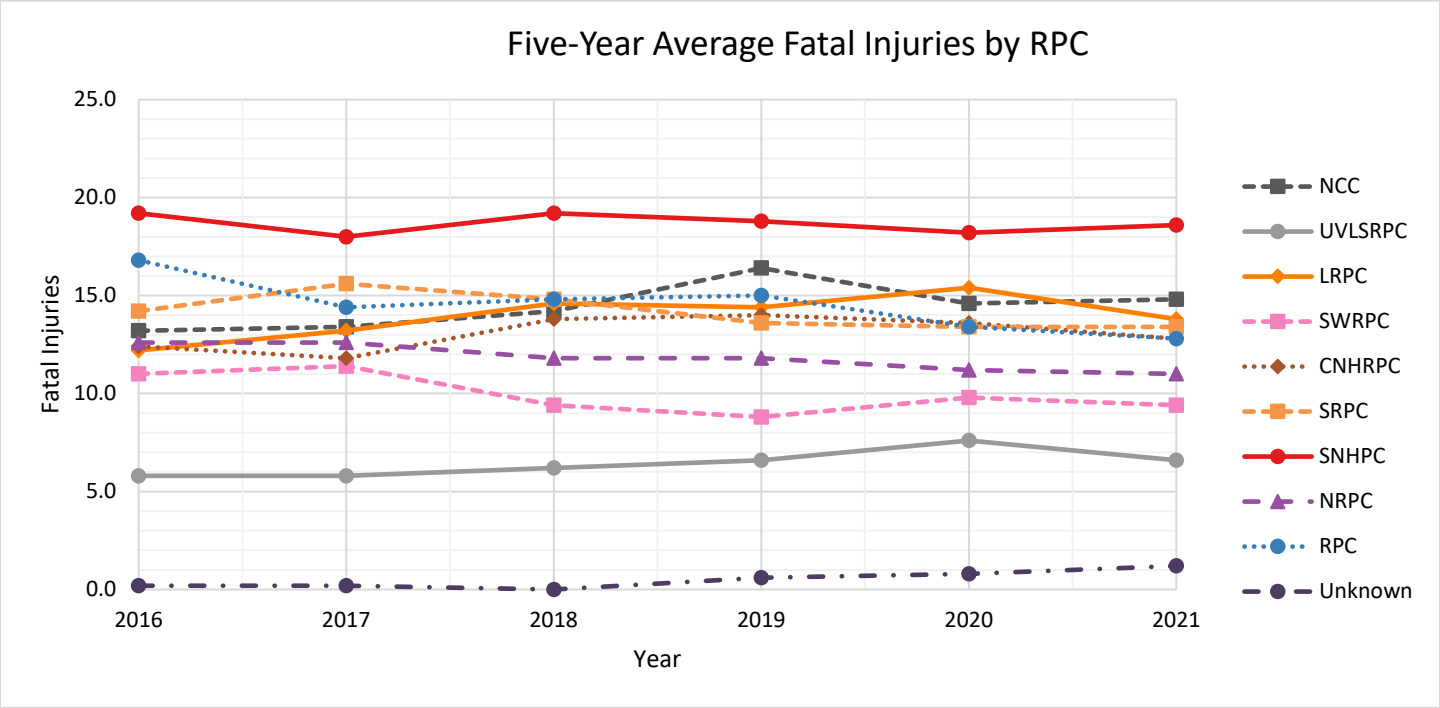

Figure 11. Moving five-year average number of Fatalities by regional planning commission.

[5] Based on town centerline miles from https://www.nh.gov/dot/org/projectdevelopment/planning/gis-data-catalog/documents/town-centerline-miles-legisclass-2019.pdf assigned to relevant regions.

Figure 12 shows the distribution of suspected serious injuries for RPCs from 2016 to 2021 by five-year average. The distribution is similar to fatalities, with SNHPC accounting for the most suspected serious injuries and the UVLSRPC accounting for the least. Additionally, the five-year averages stayed relatively stable from year to year, with gradual increases shown in many regions.

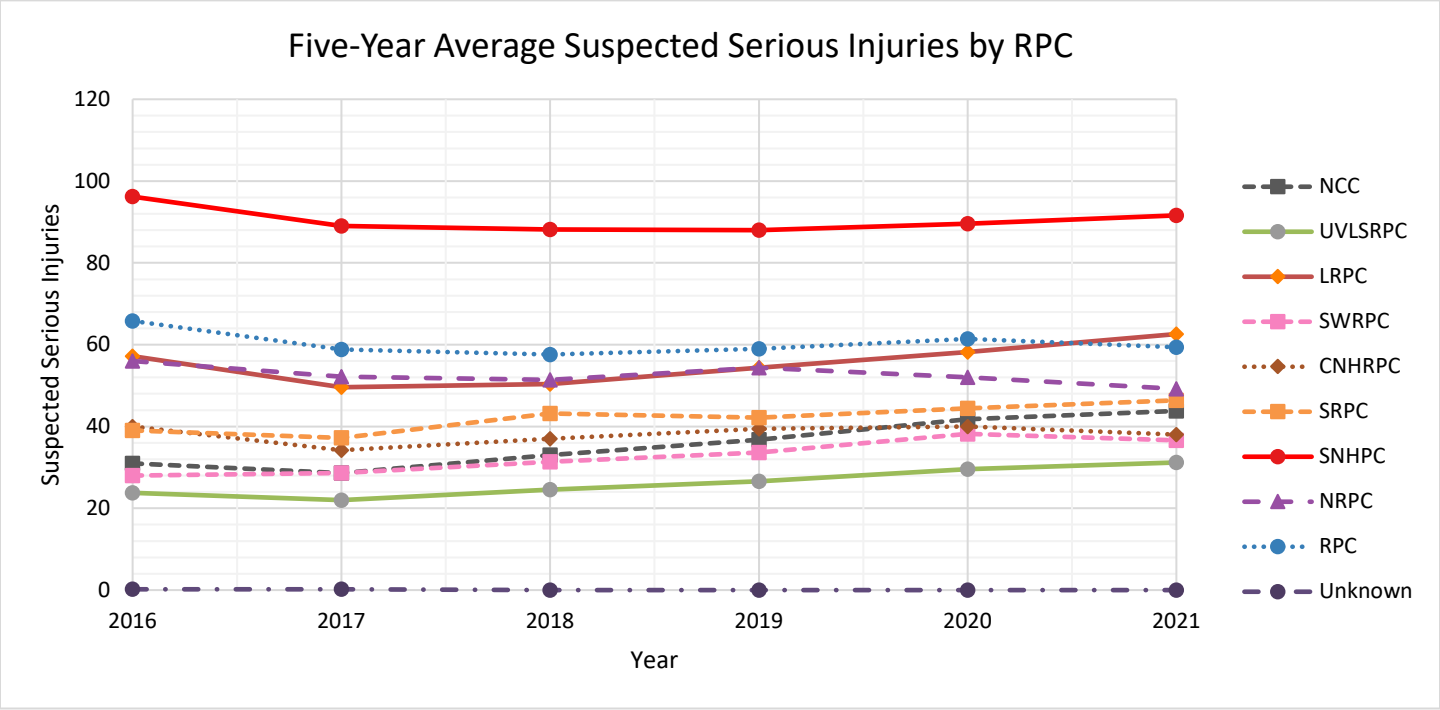

Figure 12. Moving five-year average number of suspected serious injuries by regional planning commission.

When combining fatal and suspected serious injury five-year averages by RPC, a stable picture emerges. As shown in Figure 13, most regions had a steady or at least recent increase in the five-year average of fatal and suspected serious injuries. Again, SNHRPC accounts for the most injuries by far, and UVLSRPC the least.

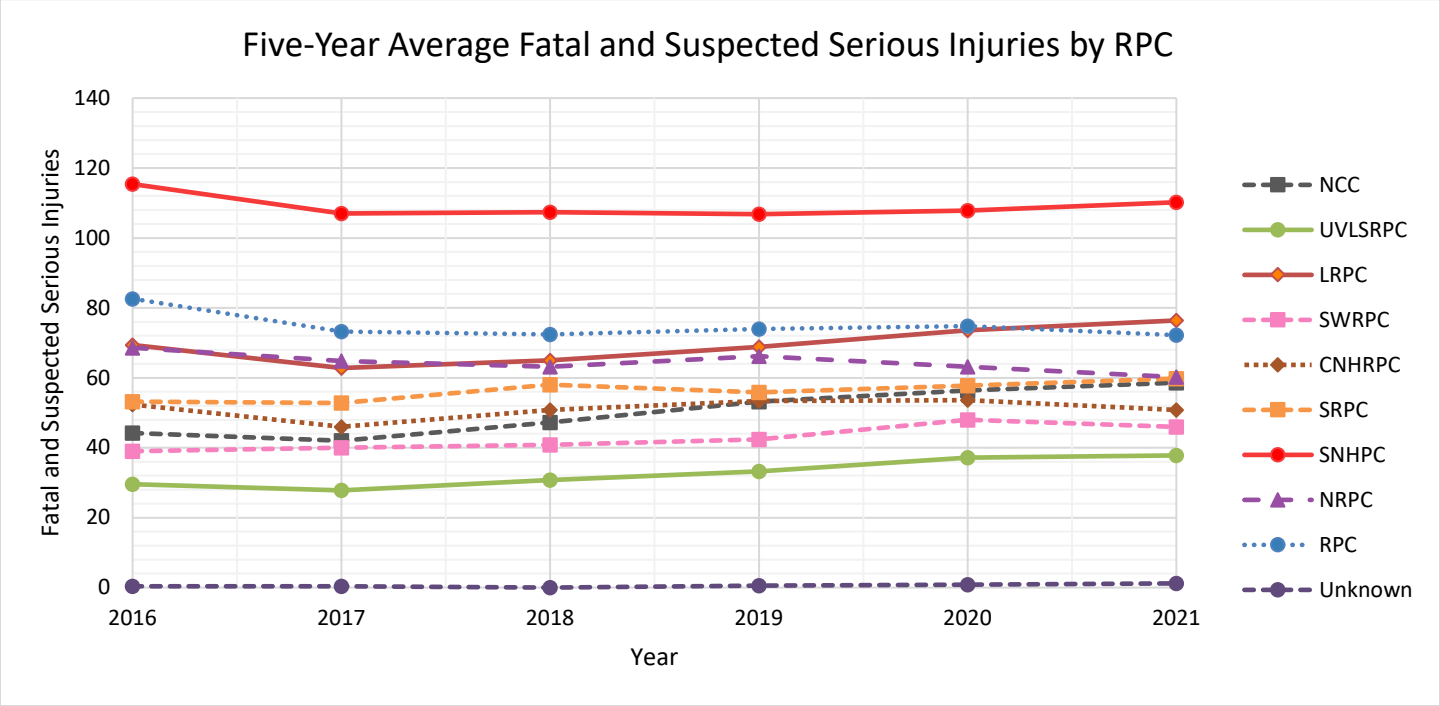

Figure 13. Moving five-year average number of fatal and suspected serious injuries by regional planning commission.

Table 6 summarizes the distribution of fatal and suspected serious injuries among the RPCs in New Hampshire. Note that except for the SNHRPC (19 percent), all planning agencies fall within the 7 to 13 percent range of the State total. These distributions are likely similar to population distributions – the more people present, the more vehicle-miles traveled, the more likely a severe crash occurs. This is especially true for more urban regions. However, NHDOT may still consider the total distribution when distributing funding, regardless of comparison to exposure.

Table 6. Proportional Distribution of Fatal and Suspected Serious Injuries by Regional Planning Agency.

Regional Planning Agency	Fatalities, 2017 to 2021	Suspected Serious Injuries, 2017 to 2021	Total Fatal and Suspected Serious Injuries, 2017 to 2021	Percentage of Fatal and Suspected Serious Injuries, 2017 to 2021
NCC	74	219	293	10%
UVLSRPC	33	156	189	7%
LRPC	69	313	382	13%
SWRPC	47	183	230	8%
CNHRPC	64	190	254	9%
SRPC	67	232	299	10%
SNHPC	93	458	551	19%
NRPC	55	246	301	11%
RPC	64	297	361	13%
Unknown	6	0	6	0%

NHDOT Maintenance Districts

Along with regional distribution, NHDOT reviewed the distribution of fatal and suspected serious injuries by Highway Maintenance District, of which there are six (as shown in Figure 14).

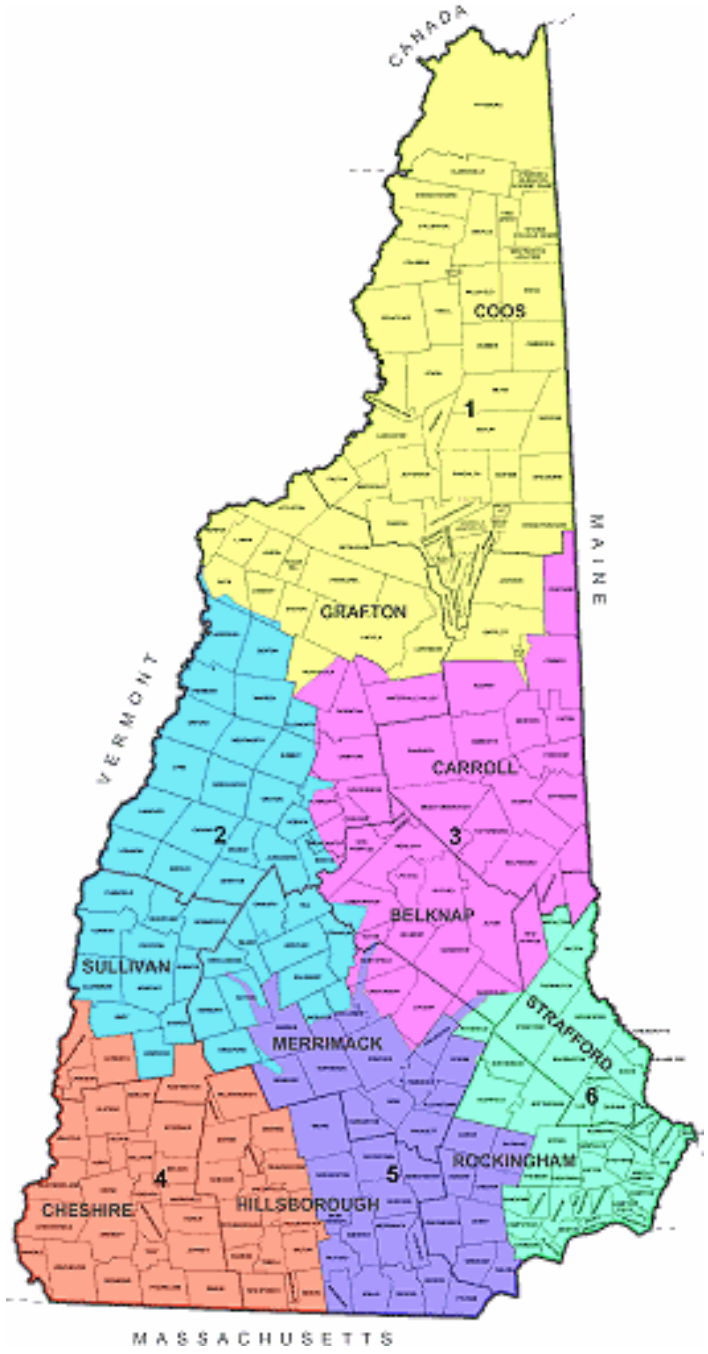

Figure 14. Map of New Hampshire showing NHDOT highway maintenance districts. [SOURCE: NHDOT[6]].

[6] https://www.nh.gov/dot/org/operations/highwaymaintenance/sponsorahighway/contactus.htm

For a baseline level of exposure, Table 7 shows a breakdown of centerline miles by district. Figure 15 shows the frequency and five-year average number of Fatalities in New Hampshire by district. The five-year average trends varied across the districts. District 5 has the highest vehicle-miles traveled and accounts for the most fatalities and has seen fluctuations – notably a decrease from 2019 to 2021. District 1 has also seen a decrease from 2019 to 2021, while District 6 has seen decreases for three straight years. Districts 2 and 3 have seen steady year over year increases in the five-year average number of fatalities (prior to District 3's reduction in 2021), while District 4 has seen fluctuations.

Table 7. Distribution of Centerline Miles by NHDOT District.

District	Centerline Miles	Percentage of Centerline Miles
District 1	1782.38	9.8%
District 2	2893.8	15.9%
District 3	3014.9	16.6%
District 4	2765.21	15.2%
District 5	4856.27	26.7%
District 6	2875.84	15.8%
Total	18188.4	N/A

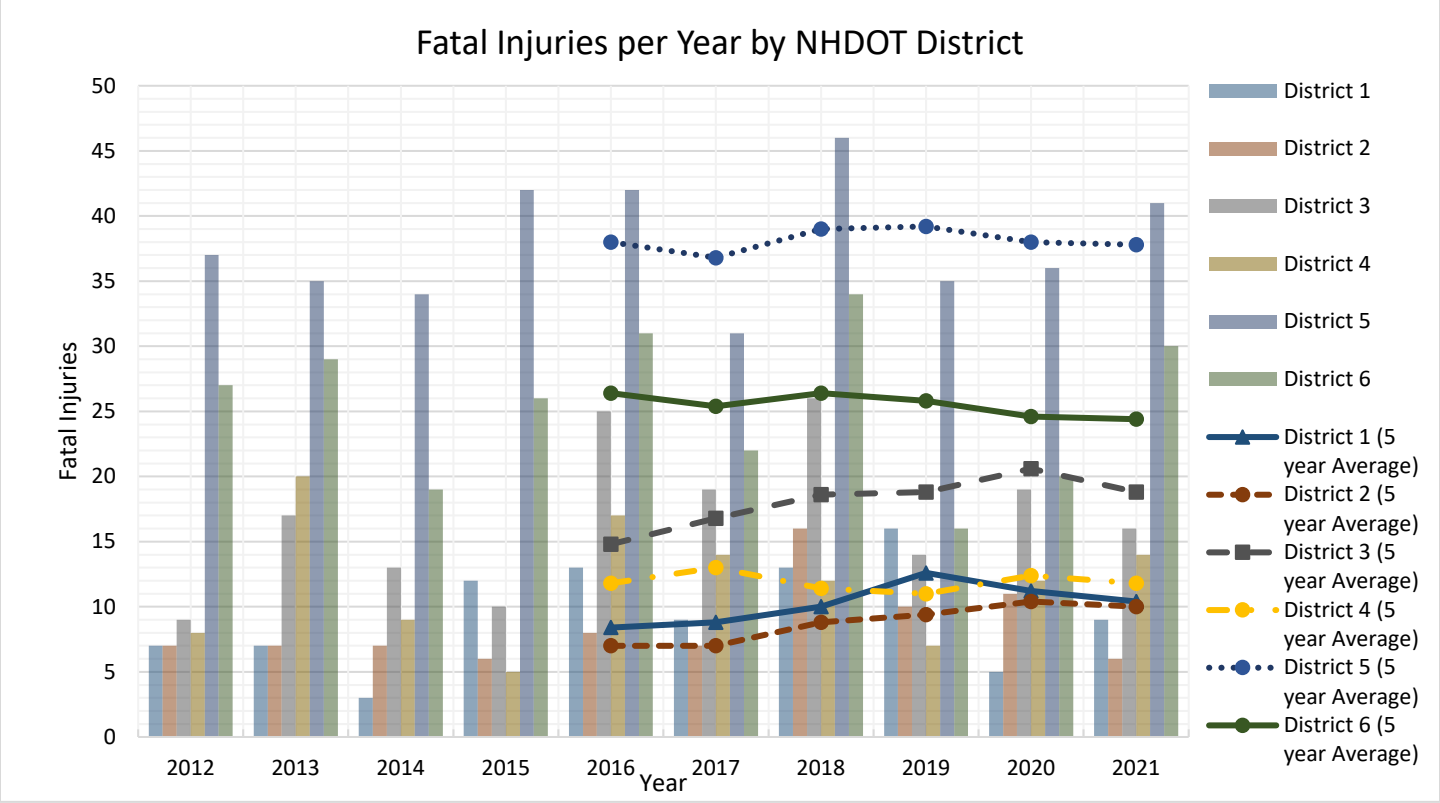

Figure 15. Annual frequency and five-year average number of Fatalities by NHDOT highway maintenance district.

Figure 16 summarizes the frequency and five-year average number of suspected serious injuries per district. District 5 accounts for the highest number of suspected serious injuries by a significant margin, while District 1 accounts for the fewest. District 5 has seen relatively stable five-year averages in recent years, while the other Districts have steadily increased.

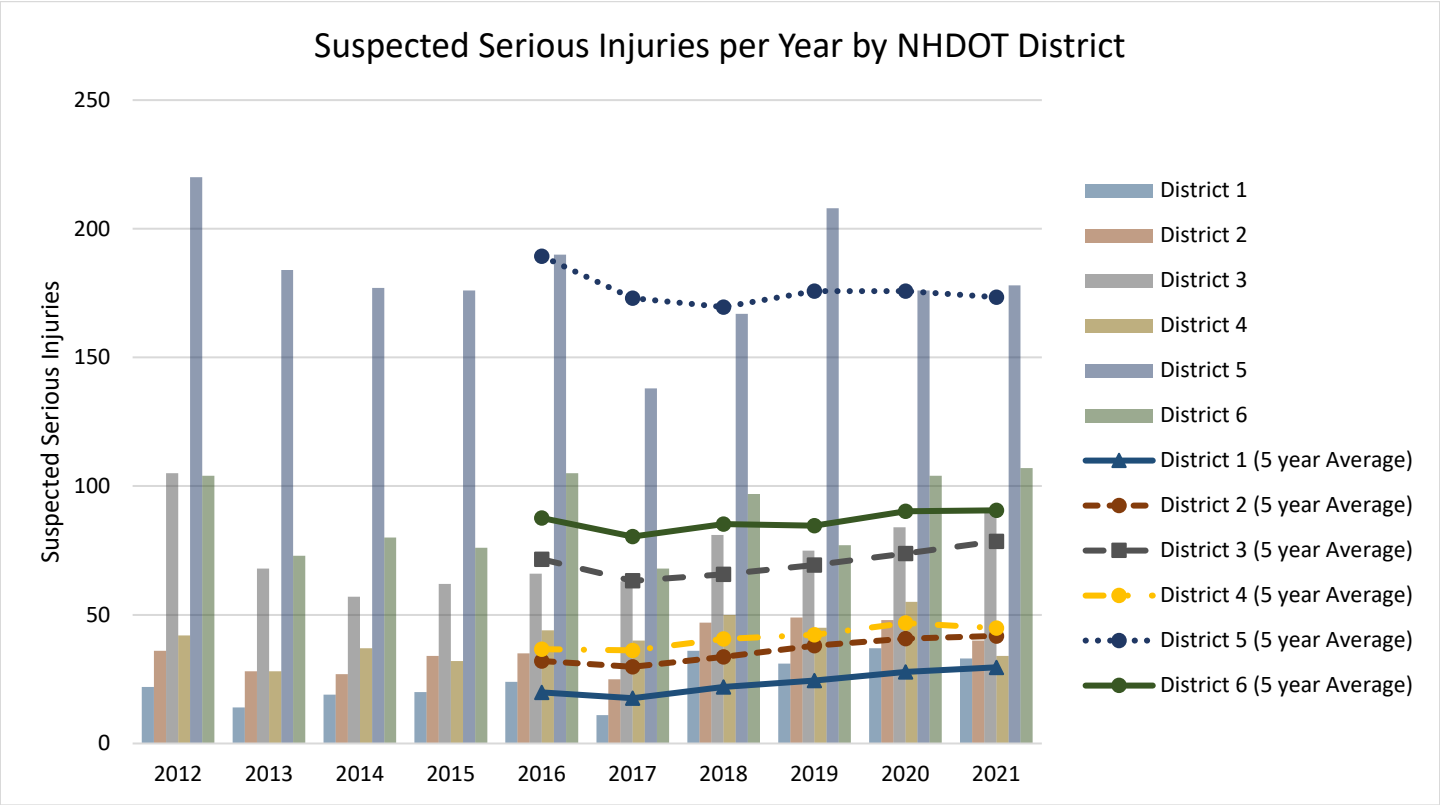

Figure 16. Annual frequency and five-year average number of suspected serious injuries by NHDOT highway maintenance district.

Figure 17 provides a visual summary of the combined frequency and five-year average number of fatal and suspected serious injuries in New Hampshire. The five-year average trends are similar to the suspected serious injury trends, with Districts 5 and 6 accounting for the largest proportion, but slowly trending downward. Meanwhile, the five-year averages for Districts 1, 2, 3, and 4 have stayed relatively consistent from 2016 to 2021, though there has been a small gradual increase in all four Districts.

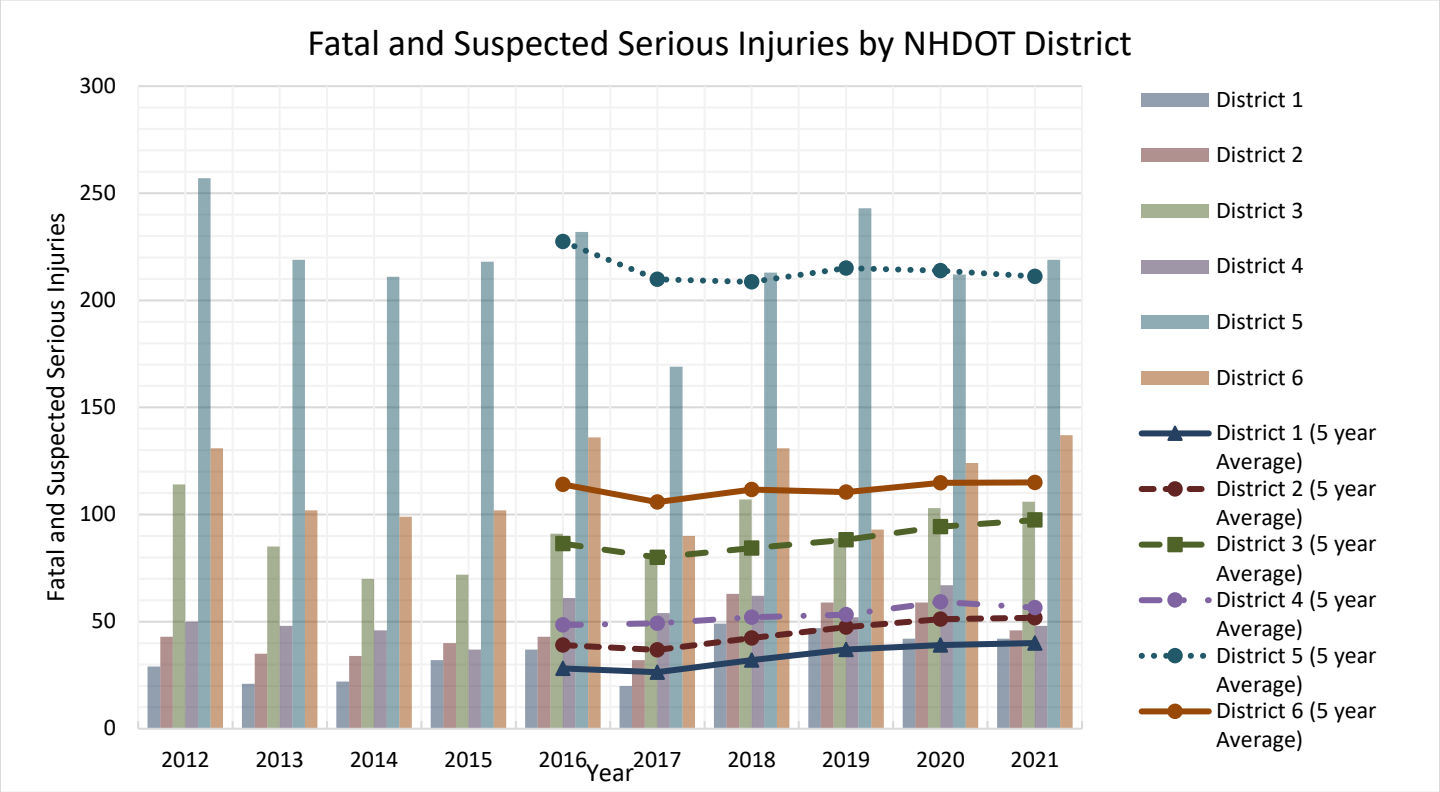

Figure 17. Annual frequency and five-year average number of fatal and suspected serious injuries by NHDOT highway maintenance district.

Table 8 summarizes the proportional distribution of fatal and suspected serious injuries by district. Note that from 2017 to 2021, District 5 accounted for the plurality of fatalities and serious injuries – 37 percent. Districts 6 and 3 accounted for the second and third most, with 20 percent and 17 percent, respectively. District 1 accounted for the fewest severe injuries, with just 7 percent of those that occurred in the State.

Table 8. Proportional Distribution of Fatal and Suspected Serious Injuries by NHDOT Highway Maintenance District.

District	Fatalities, 2017 to 2021	Suspected Serious Injuries, 2017 to 2021	Total Fatal and Suspected Serious Injuries, 2017 to 2021	Percentage of Fatal and Suspected Serious Injuries, 2017 to 2021
District 1	52	149	200	7%
District 2	50	209	259	9%
District 3	94	393	487	17%
District 4	59	224	283	10%
District 5	189	867	1056	37%
District 6	122	453	575	20%

Emphasis Areas

NHDOT reviewed the distribution of fatalities and serious injuries by SHSP emphasis areas[7]. This distribution provides insights into NHDOT HSIP priorities from an infrastructure improvement standpoint. Figure 18 shows the five-year average number of Fatalities by SHSP emphasis area. Of these emphasis areas, lane departure, intersections, and non-motorized (pedestrians and bicyclists) fall within the primary purview of the HSIP because they are susceptible to improvement by infrastructure treatments. Of those, lane departure by far accounts for the most fatalities, followed by intersections and non-motorized. Recent changes to HSIP eligibility in the Infrastructure Investment and Jobs Act (IIJA) means NHDOT can also consider non-infrastructure campaigns for "No Restraint" and other behavioral emphasis areas in the HSIP.

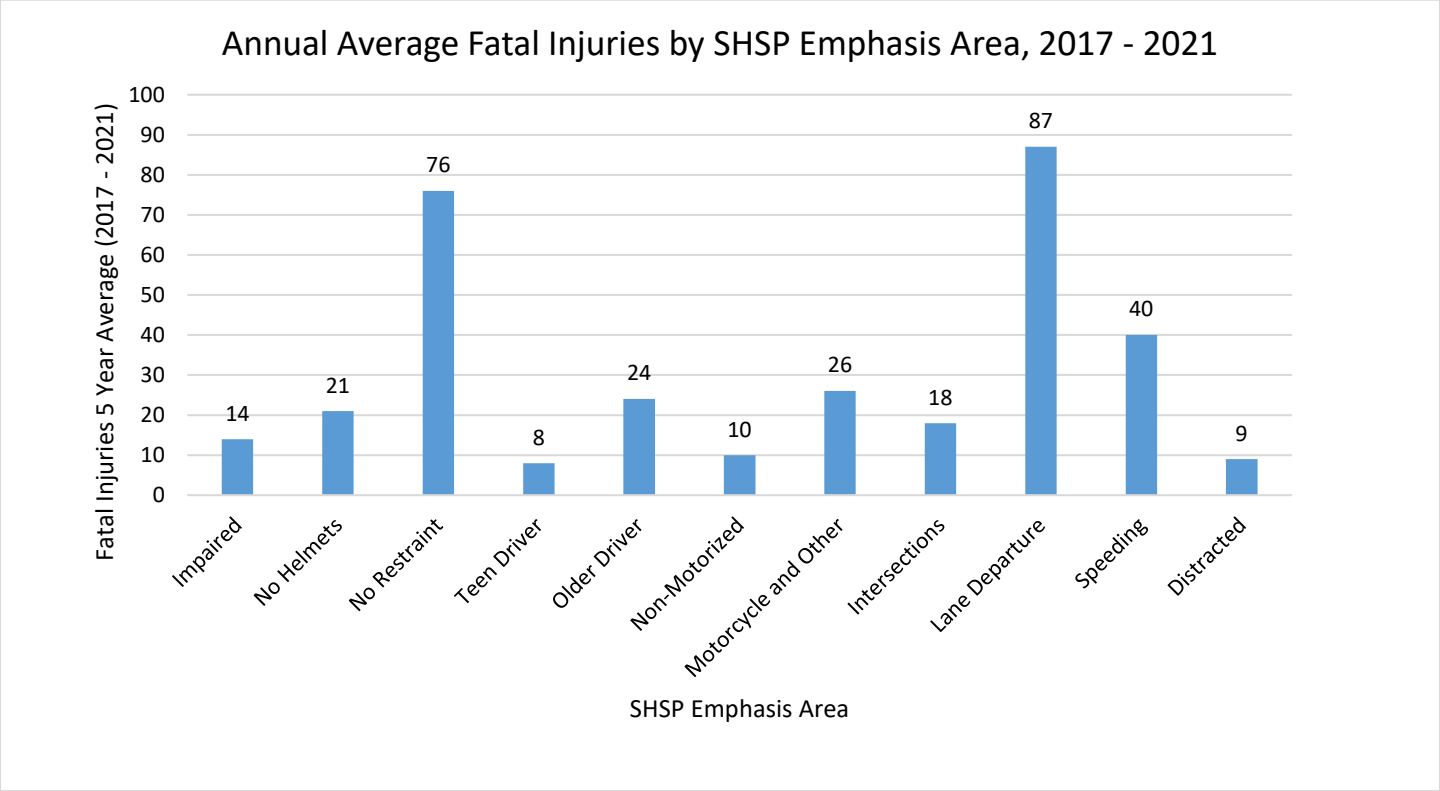

Figure 18. Five-year (2017 to 2021) average number of Fatalities by SHSP emphasis area.

[7] https://www.nh.gov/dot/org/projectdevelopment/highwaydesign/hwysafetyimprovements/documents/43246-nh-hsip-08042022.pdf

Figure 19 shows a different hierarchy for suspected serious injuries, with intersections[8] accounting for the most suspected serious injuries (among HSIP emphasis areas), followed by lane departure and non-motorized.

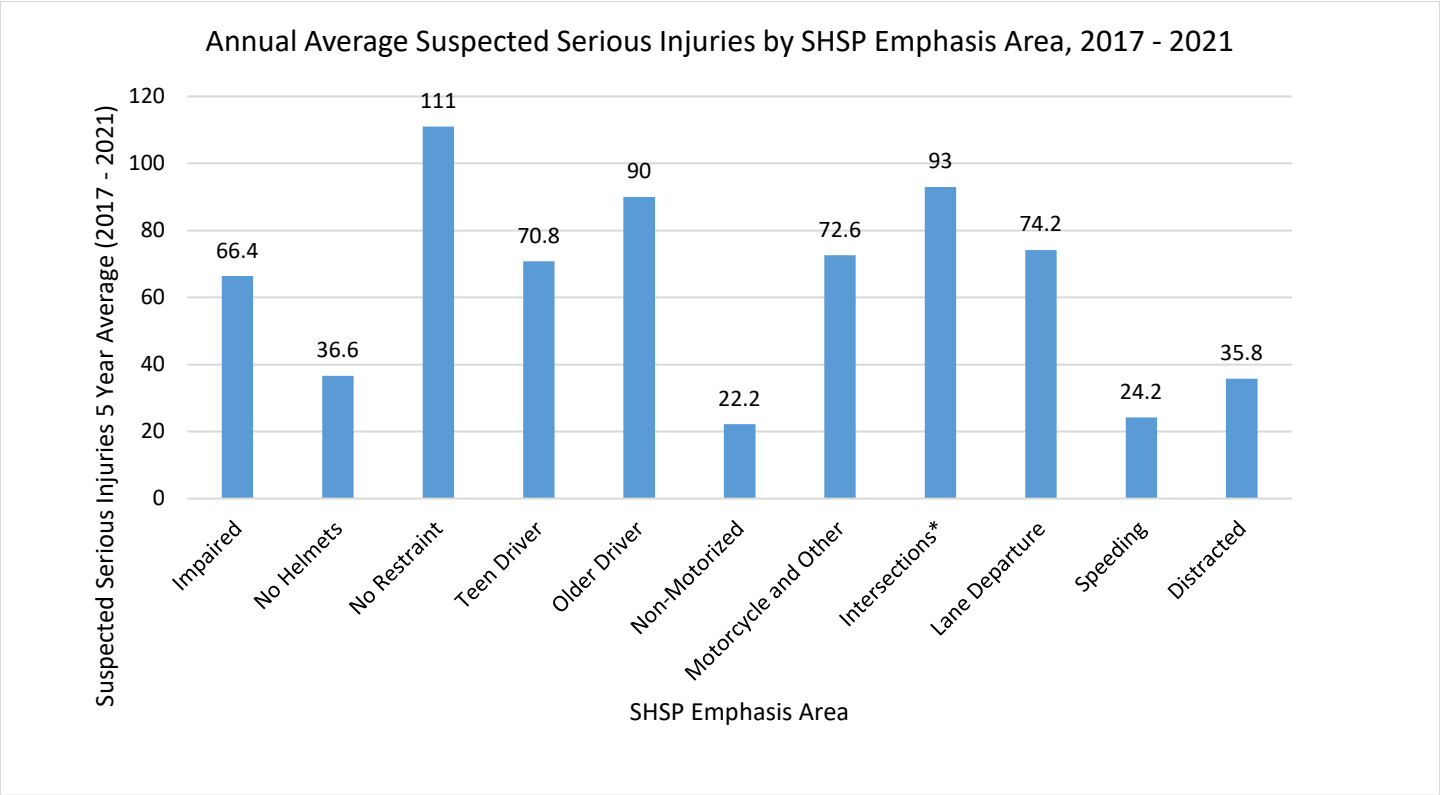

Figure 19. Five-year (2017 to 2021) average number of suspected serious injuries by SHSP emphasis area.

[8] Crash relation to junction data are not readily available after 2018, so this represents the average reported in the SHSP for the years 2015 through 2019.

Figure 20 shows the total five-year average combined for fatal and suspected serious injuries by SHSP emphasis area for the years 2017 to 2021. Again, note that for the HSIP-related areas, lane departure is the dominant area, followed by intersections and non-motorized.

Given expanded HSIP eligibility rules, NHDOT should also consider methods of addressing "No Restraint", "Older Driver", and "Impaired" crashes with HSIP funding.

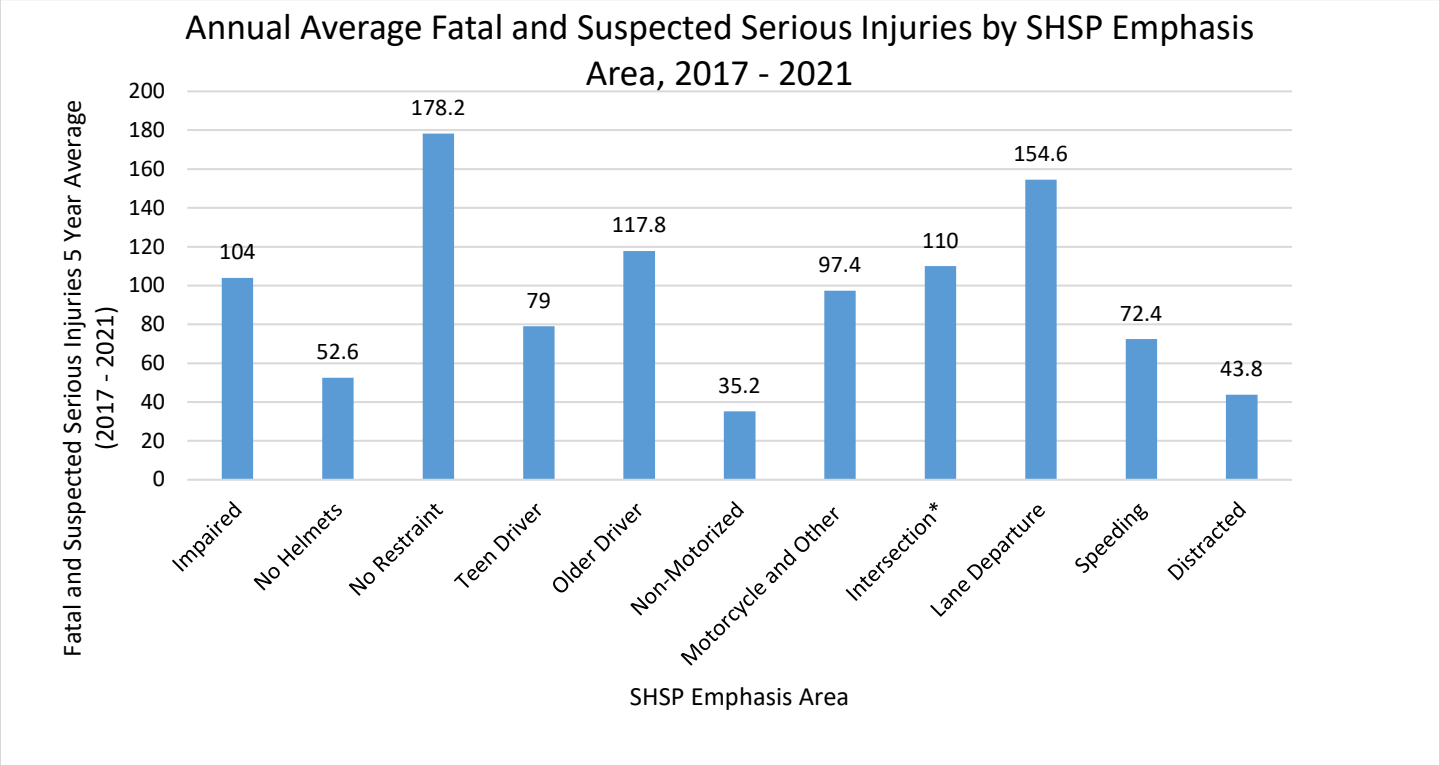

Figure 20. Combined five-year average (2017 to 2021) number of fatal and suspected serious injuries per SHSP emphasis area.

These totals are summarized as percentages in Table 9, which show that lane departures contribute to 27 percent of fatal and suspected serious injuries, intersection crashes contribute to 19 percent and non-motorized crashes contributed to 6 percent. Note the sum of the percentages in Table 9 is greater than 100 percent because more than one emphasis area can be related to a crash. When using these distributions to determine funding, NHDOT can use the relative proportions of these three emphasis areas.

Table 9. Proportional Distribution of Fatal and Suspected Serious Injuries by SHSP Emphasis Area.

SHSP Emphasis Area	Fatalities, 2017 to 2021	Suspected Serious Injuries, 2017 to 2021	Total Fatal and Suspected Serious Injuries, 2017 to 2021	Percentage of Fatal and Suspected Serious Injuries, 2017 to 2021
Impaired	188	332	520	18%
No Helmets	80	183	263	9%
No Restraint	336	555	891	31%
Teen Driver	41	354	395	14%
Older Driver	139	450	589	21%
Non-Motorist	65	111	176	6%
Motorcyclists	124	363	487	17%
Intersection*	85	465	550	19%
Lane Departure	402	371	773	27%
Speeding	241	121	362	13%
Distracted	40	179	219	8%

* Intersection data is shown for 2015-2019

Conclusions

The purpose of this section was to use the data to guide NHDOT's HSIP investment strategies. There was little, if any, change since the previous plan, so there was little change in the conclusions. Based on the findings in this and the last plan, the following potential funding allocation strategies were identified:

- From 2017 to 2021, 42 percent of fatalities and serious injuries were geolocated to urban roadways, 53 percent were geolocated to rural roadways, and 5 percent were not geolocated. Given the similar number of these injuries on urban and rural roadways, NHDOT could consider an even distribution of funding between urban and rural projects.
- In terms of jurisdiction, 60 percent of fatalities and serious injuries were geolocated to State roads, as opposed to 34 percent on local roads. As such, NHDOT might consider allocating approximately one third of safety funds to local roads and the remainder to State roads.
- The distribution of severe injuries by RPC showed some stratification, with SNHPC accounting for significantly more than other RPCs, UVLSRPC accounting for notably fewer, and the rest of the regions hovering around ten percent of severe injuries. NHDOT does not plan on allocating funds by region due to the small apportionment available to the State and the inefficiency that would entail from dividing the safety funds among 9 regions.
- The distribution of HSIP funds by SHSP emphasis area should focus on HSIP-related areas, which are lane departure, intersections, and non-motorists (pedestrians and bicyclists). Based on the distribution of severe injuries, lane departure projects should receive at least half of HSIP funds, intersections roughly a quarter, and the remaining distributed between non-motorists and other projects. Countermeasures focusing on these emphasis areas will also reduce the frequency of behavioral emphasis area crashes. NHDOT intends to continue using emphasis areas to guide HSIP spending, including obligating at least 15 percent of funds for non-motorist projects even when the VRU Special Rule conditions are not invoked.
- Given the limited funds available for the NHDOT HSIP, NHDOT does not plan to use geographic distributions to guide HSIP spending as it would result in an inefficient partitioning of the funds.

Historical Project Performance

NHDOT reports HSIP project evaluation results on an annual basis as part of the HSIP Annual Report. For this plan, NHDOT aggregated the reporting results for 2015 to 2021 to review the safety and economic performance of these projects. This section has been updated to include the 7 projects completed in 2018 for which there are now three years of 'after' crash data available. This section also includes a discussion of project delivery successes and issues that have either furthered or hindered administration of the HSIP. Note that all projects discussed in this section are "spot" projects, i.e., projects in one specific location or roadway segment. NHDOT does not currently have the capacity to evaluate and justify systemic or systematic projects with crash-based and economic-based analysis – the systemic or systematic projects are justified collectively because they implement proven safety countermeasures. Typical systematic projects in New Hampshire include guardrail modernization, curve warning signs, intersection warning signs, flashing yellow arrows, and durable pavement markings. NHDOT has not completed any systemic projects, though plans to do so in future years.

Project Spending

Since 2015, NHDOT has distributed their HSIP projects into three categories[9]:

- Spot – projects at sites with a history of severe crashes.
- Systematic – projects where countermeasures are placed at all locations which meet certain criteria.
- Non-infrastructure – projects that don't include physical improvements, including road safety audits (RSAs), safety culture improvements, and other efforts to improve safety in New Hampshire.

Table 10 summarizes the historical and planned distribution of HSIP spending between the three project types. From 2015-2023, most funds went to spot projects, which accounted for 54.3 percent of project expenditures. The second highest spending category was systematic, which accounted for 40.8 percent of expenditures. Finally, 4.8 percent of funding was spent on non-infrastructure projects. On a per-project basis, spot projects averaged $795,800 per project, systematic projects averaged $698,000 per project, and non-infrastructure projects averaged $108,600 per project. The planned project funding distribution differs for FFY 2024 and 2025. As of writing, NHDOT plans to spend $9.5 million on spot projects (48.1%), $10.0 million for systematic projects (50.2%), and $336,100 for non-infrastructure projects (1.7%).

Table 10. Summary of Actual and Planned HSIP Expenditures by Project Type, 2015-2024

Project Type	Number of Projects, 2015-2023	Total Expenditures, 2015-2023	Percent of Expenditures, 2015-2023	Planned Projects, 2024-2025	Planned Expenditures, 2024-2025	Percent of Planned Expenditures, 2024-2025
Non-Infrastructure	41	$4,454,011	4.8%	1	$336,105	1.7%
Spot	63	$50,133,015	54.3%	10	$9,532,009	48.1%
Systematic	54	$37,693,951	40.8%	8	$9,964,499	50.2%

Safety Performance Results

The evaluation section of the HSIP Annual Report requires the submission of before and after crash data for each evaluated HSIP project. A comparison of the average number of crashes per year in the before period to the average number of crashes per year in the after period provides a simple measure of effectiveness of the project – with the difference describing the number of crashes "prevented" by the improvement (assuming the number of crashes in the

[9] https://safety.fhwa.dot.gov/systemic/fhwasa13019/sspst.pdf

after period is less than the before period). Table 11 shows the number of crashes before and after each project per year. Most projects were reported using 3 years of before and after data, but some with 5 years. The 7 additional projects completed in 2018 all used 3 years of before and after data. The crashes are shown as a total for all severities as well as divided into the following four categories by severity:

- Property Damage Only (PDO) – crashes with no reported injuries.
- Fatality (K) – crashes in which the most severe injury was a fatal injury.
- Serious Injury (A) – crashes in which the most severe injury was a suspected serious injury.
- All Other Injury (BC) – crashes in which the most severe injury was a suspected minor injury or a possible injury. These categories were combined due to potential reporting issues between B and C severity crashes.

As a complement to Table 11, Table 12 summarizes the annual reduction in crashes over the evaluation reporting period for each HSIP project. The 7 projects completed in 2018 were added to the bottom of the table. Based on these results, the Statewide centerline rumble strips project[10] and the NH 11 road narrowing project were both still associated with the largest reduction in severe crashes, with both resulting in an annual reduction of 1.33 fatal and suspected serious injury crashes during the study period. The Concord signal timing improvement project completed in 2018 had the largest reduction in all severity crashes with 6.67 crashes per year. Two projects, the Lee US 4 and NH 125 roundabout project and the Derry NH 102 and NH 28 signal modernization project, stood out for their poor safety performance, though this may be due to evaluation issues as discussed in the next section. Of the newly added projects, only the Belmont auxiliary turn lane project had a negative safety performance, and of a much smaller magnitude than the Derry and Lee projects. It is worth noting that these are simple before-after comparisons, and do not account for regression-to-the-mean (RTM) or other biases which may influence the results. NHDOT should consider calibrating and using crash prediction tools in future evaluations, which will help account for RTM and provide more reliable estimates of project and program effectiveness.

Additional Insight into the Derry and Lee Projects

Since the evaluation reported in 2021, NHDOT has further considered the issues that contributed to the apparent evaluation issues for the Derry and Lee projects. These issues are as follows:

- The Derry project is in the downtown portion of Derry at the intersection of NH Route 28 and NH Route 102. The intent of the project was to align the previously offset Route 28 approaches with each other and to improve the intersection configuration, intended to produce more efficient operations and safety for motorized and non-motorized users. Because of the close spacing of nearby intersections and the traffic congestion that is common during peak travel periods (in both the prior and existing conditions), traffic queues commonly extend a substantial distance from the intersection. As a result, the NHDOT has been unable to reliably quantify the intersection crash performance in either the before or after condition, so an accurate quantification of the change in safety performance has proved elusive.
- The Lee project is located at the intersection of US Route 4 and NH Route 125 and featured the conversion of a 1940s-vintage single lane traffic circle to a modern multi-lane roundabout. In addition to its safety deficiencies, the prior layout also commonly generated substantial peak period queues extending miles on one or more intersection approaches. The completed multi-lane roundabout has virtually eliminated the traffic queues, but has resulted in numerous crashes within the roundabout, although injuries are rare. It is understood that the poor traffic operations of the former intersection layout resulted in many crashes that occurred at a great

[10] This evaluation included only the segment of US 202 in Henniker and Hopkinton. While the evaluation for this segment shows success, it is not representative of the whole project.

distance from the intersection but were truly ‘intersection-related’ crashes. The high speeds on the four intersection approaches would clearly have increased the risk of higher severity outcomes from crashes. NHDOT has been unable to reliably identify the distant intersection-related crashes and thus has not been able to produce a comprehensive and definitive comparison of the before and after safety performance of the roundabout.

Table 11. Annual Number of Before and After Crashes for Evaluated HSIP Projects During the Evaluation Period.

Location	Improvement Type	PDO Before	PDO After	K Before	K After	A Before	A After	BC Before	BC After	Total Before	Total After
Pittsfield 24842	Auxiliary lanes – modify left-turn lane offset	1.00	1.80	0.00	0.00	0.20	0.00	0.60	0.00	1.80	0.00
Statewide 15358[10]	Rumble strips - center	0.00	0.00	1.33	0.00	0.00	0.00	0.00	0.00	1.33	0.00
Derry 13249	Modify traffic signal - modernization/replacement	20.67	38.00	0.00	0.33	0.00	1.33	4.00	11.67	24.67	51.33
New London 14451A	Roadway narrowing (road diet, roadway reconfiguration)	7.67	18.67	0.33	0.00	1.00	0.00	2.00	0.67	11.00	19.33
Boscawen 13957A	Intersection geometry - other	0.67	0.67	0.00	0.00	0.67	0.00	1.33	0.00	2.67	0.67
Holderness 15309	Intersection geometrics - modify skew angle	2.33	0.00	0.00	0.00	0.00	0.00	0.33	0.00	2.67	0.00
Pittsfield 15622	Traffic signal installation	4.33	0.67	0.00	0.00	0.00	0.00	2.33	0.33	6.67	1.00
Brentwood 15619	Modify traffic signal - modernization/replacement	3.00	4.00	0.33	0.00	0.33	0.00	4.67	1.33	8.33	5.33
Greenland 15618	Auxiliary lanes - add left-turn lane	8.67	6.67	0.00	0.00	0.00	0.33	2.33	3.67	11.00	10.67
Boscawen 15621	Modify control - two-way stop to roundabout	4.67	5.33	0.00	0.00	0.00	0.00	2.00	0.33	6.67	5.67
Hampstead-Atkinson 15663	Auxiliary lanes - add right-turn lane	5.00	3.67	0.33	0.00	0.00	0.00	1.00	2.67	6.33	6.33
Lyme 15695	Intersection geometrics - modify skew angle	0.67	0.33	0.00	0.00	0.00	0.00	0.33	0.00	1.00	0.33
Effingham 16041	Intersection signing - add enhanced regulatory sign (double-up and/or oversize)	2.00	0.33	1.00	0.00	0.00	0.00	0.67	0.00	3.67	0.33
Epping 15693	Through lanes - add additional through lane	18.67	16.33	0.00	0.00	0.33	0.33	6.00	3.00	25.00	19.67
Keene 20812	Modify control - two-way stop to roundabout	4.00	0.33	0.00	0.00	0.33	0.00	0.33	1.00	4.67	1.33
Barrington 16201	Auxiliary lanes - add left-turn lane	2.40	0.80	0.00	0.00	0.20	0.00	1.20	0.40	3.80	1.20
Barnstead 16200	Auxiliary lanes - add left-turn lane	3.40	0.20	0.00	0.00	0.40	0.00	0.80	0.20	4.60	0.40
Candia 16413	Intersection geometrics - re-assign existing lane use	0.60	2.40	0.00	0.00	0.20	0.00	0.60	0.60	1.40	3.00
Loudon 24941	Auxiliary lanes - add right-turn lane	2.67	5.33	0.33	0.00	0.33	0.00	1.67	0.33	5.00	5.67
Barrington 16178	Intersection geometry - other	3.00	1.00	0.00	0.00	0.00	0.00	0.67	0.33	3.67	1.33

Location	Improvement Type	PDO Before	PDO After	K Before	K After	A Before	A After	BC Before	BC After	Total Before	Total After
Lee 15692[11]	Modify control - modifications to roundabout	36.00	75.00	0.00	0.00	0.33	1.00	7.33	10.67	43.67	86.67
Lebanon 29362	Pedestrian beacons	0.00	2.00	0.33	0.00	0.00	0.00	0.00	0.33	0.33	2.33
Rochester 27873	Intersection geometry - other	1.67	0.67	0.00	0.00	0.00	0.00	0.67	0.33	2.33	1.00
Swanzey 15697	Modify control - two-way stop to roundabout	4.33	1.67	0.00	0.00	0.00	0.00	0.33	0.33	4.67	2.00
Keene 26765	Modify control - two-way stop to roundabout	2.33	5.00	0.00	0.00	0.00	0.00	2.00	0.33	4.33	5.33
Derry 15690	Roadway widening - travel lanes	2.00	2.67	0.00	0.00	0.33	0.00	3.00	1.00	5.33	3.67
Belmont 16203	Auxiliary turn lanes	1.00	0.67	0.00	0.00	0.00	0.33	0.00	0.33	1.00	1.34
Brookline 40092	Auxiliary turn lanes	0.67	0.67	0.00	0.00	0.00	0.00	0.67	0.00	1.33	0.67
Northfield-Canterbury 41057	Realign ramp; convert from yield to stop	4.33	1.67	0.00	0.00	0.00	0.00	0.00	0.00	4.33	1.67
Farmington 16212	Two-way left turn lane	3.00	0.67	0.00	0.00	0.00	0.00	0.67	0.00	3.67	0.67
Fitzwilliam 16211	Traffic calming (signs and median island)	2.00	1.33	0.00	0.00	0.00	0.00	0.67	0.33	2.67	1.67
Meredith 16470	Offset right turn lane	0.67	0.33	0.00	0.00	0.00	0.00	0.33	0.00	1.00	0.33
Concord 24921	Signal phasing and timing improvements	4.33	0.00	0.00	0.00	0.67	0.00	1.67	0.00	6.67	0.00

[11] There are issues with the analysis of this project as it did not accurately capture the entire potential impact of this project.

Table 12. Annual Crash Reductions by HSIP Projects for the Evaluation Period.

Location	Improvement Type	PDO	K	A	K+A	B+C	Total
Pittsfield 24842	Auxiliary lanes – modify left-turn lane offset	-0.80	0.00	0.20	0.20	0.60	1.80
Statewide 15358	Rumble strips - center	0.00	1.33	0.00	1.33	0.00	1.33
Derry 13249	Modify traffic signal - modernization/replacement	-17.33	-0.33	-1.33	-1.67	-7.67	-26.67
New London 14451A	Roadway narrowing (road diet, roadway reconfiguration)	-11.00	0.33	1.00	1.33	1.33	-8.33
Boscawen 13957A	Intersection geometry - other	0.00	0.00	0.67	0.67	1.33	2.00
Holderness 15309	Intersection geometrics - modify skew angle	2.33	0.00	0.00	0.00	0.33	2.67
Pittsfield 15622	Modify traffic signal - modernization/replacement	3.67	0.00	0.00	0.00	2.00	5.67
Brentwood 15619	Modify traffic signal - modernization/replacement	-1.00	0.33	0.33	0.67	3.33	3.00
Greenland 15618	Auxiliary lanes - add left-turn lane	2.00	0.00	-0.33	-0.33	-1.33	0.33
Boscawen 15621	Modify control - two-way stop to roundabout	-0.67	0.00	0.00	0.00	1.67	1.00
Hampstead-Atkinson 15663	Auxiliary lanes - add right-turn lane	1.33	0.33	0.00	0.33	-1.67	0.00
Lyme 15695	Intersection geometrics - modify skew angle	0.33	0.00	0.00	0.00	0.33	0.67
Effingham 16041	Intersection signing - add enhanced regulatory sign (double-up and/or oversize)	1.67	1.00	0.00	1.00	0.67	3.33
Epping 15693	Through lanes - add additional through lane	2.33	0.00	0.00	0.00	3.00	5.33
Keene 20812	Modify control - two-way stop to roundabout	3.67	0.00	0.33	0.33	-0.67	3.33
Barrington 16201	Auxiliary lanes - add left-turn lane	1.60	0.00	0.20	0.20	0.80	2.60
Barnstead 16200	Auxiliary lanes - add left-turn lane	3.20	0.00	0.40	0.40	0.60	4.20
Candia 16413	Intersection geometrics - re-assign existing lane use	-1.80	0.00	0.20	0.20	0.00	-1.60
Loudon 24941	Auxiliary lanes - add right-turn lane	-2.67	0.33	0.33	0.67	1.33	-0.67
Barrington 16178	Intersection geometry - other	2.00	0.00	0.00	0.00	0.33	2.33
Lee 15692	Modify control - modifications to roundabout	-39.00	0.00	-0.67	-0.67	-3.33	-43.00
Lebanon 29362	Pedestrian beacons	-2.00	0.33	0.00	0.33	-0.33	-2.00
Rochester 27873	Intersection geometry - other	1.00	0.00	0.00	0.00	0.33	1.33
Swanzey 15697	Modify control - two-way stop to roundabout	2.67	0.00	0.00	0.00	0.00	2.67
Keene 26765	Modify control - two-way stop to roundabout	-2.67	0.00	0.00	0.00	1.67	-1.00
Derry 15690	Roadway widening - travel lanes	-0.67	0.00	0.33	0.33	2.00	1.67
Belmont 16203	Auxiliary turn lanes	0.33	0.00	0.33	0.33	-0.33	-0.34
Brookline 40092	Auxiliary turn lanes	0.00	0.00	0.00	0.00	0.67	0.67
Northfield-Canterbury 41057	Realign ramp; convert from yield to stop	2.66	0.00	0.00	0.00	0.00	2.66
Concord 24921	Signal timing improvements	4.33	0.00	0.00	0.00	1.67	6.67
Farmington 16212	Two-way left turn lane	2.33	0.00	0.00	0.00	0.67	3.00
Fitzwilliam 16211	Traffic calming (signs and median island)	0.67	0.00	0.00	0.00	0.34	1.00
Meredith 16470	Offset right turn lane	0.34	0.00	0.00	0.00	0.33	0.67

While the individual project results provide some indication of HSIP effectiveness, a more useful measure of safety effectiveness is reviewing the results at an aggregated, per-project level. Table 13 shows the annual crash reduction results aggregated at the HSIP Improvement Category level from the HSIP Annual Report, now including the 7 projects from 2018. The roadway projects produced the largest reduction in fatal and suspected serious injury crashes per project, a total of 0.60 per project per year. This is lower than the reduction of 1.00 fatal and suspected serious injury crashes reported previously, likely because the two additional roadway projects completed in 2018 had no fatal or suspected serious crashes before or after the projects were completed. Intersection geometry projects also consistently reduced fatal and suspected serious injury crashes, though only 0.11 per project per year instead of the 0.16 reported previously. This is because the three additional intersection geometry projects completed in 2018 either had no reduction in fatal or suspected serious crashes or a slight increase. When looking at total crashes, intersection geometry projects reduced 0.87 crashes per project per year, the largest of the three categories with more than one project. This is lower than the previous 1.28, because two of the additional intersection geometry projects from 2018 increased total crashes and the third added intersection geometry project did not reduce total crashes enough to compensate.

While the intersection traffic control results look troubling, removing two projects with exceptionally poor safety performance shows that the remaining 9 projects reduced 0.30 fatal and suspected serious injury crashes per project per year and 2.73 total crashes per project per year. This is improved from the previous report, with one of the two added 2018 projects, the Concord signal timing project, reducing 6.67 total crashes per year, 0.67 of which were fatal or suspected serious injury.

Table 13. Summary of Annual Crash Reductions per Project by HSIP Improvement Category

Improvement Category	Number of Projects	PDO	K	A	K+A	B+C	Total
Intersection Geometry	16	0.33	0.04	0.07	0.11	0.32	0.87
Intersection Traffic Control	11	-3.82	0.09	-0.06	0.03	-0.06	-3.85
Roadway	5	-1.73	0.33	0.27	0.60	0.87	-0.26
Pedestrians and Bicyclists	1	-2.00	0.33	0.00	0.33	-0.33	-2.00

Economic Results

While the simple safety evaluation results show that most HSIP projects have resulted in annual crash reductions, NHDOT also considered the economic benefits of these reductions. In order to keep all calculations current, everything has been calculated with 2021 crash costs instead of 2017, meaning the benefits from the previous report have been recalculated. Given the simple nature of the results and the inability to account for RTM, NHDOT used average costs for crashes generated for 2021 based on the average severity distribution of crashes in New Hampshire:

- Fatal and injury (KABC) average crash cost = $582,125.
- PDO average crash cost = $8,623.

NHDOT calculated the average annual benefit for each project by converting the annual reduced KABC and PDO crashes to annual costs. NHDOT then converted this to a present value service life benefit assuming a service life (t) of 20 years and an annual discount of 2.8 percent (i), resulting in a uniform series present worth conversion factor of 15.16, which is calculated in Equation 1 and converts annual returns to a total present worth value.

Equation 1. Uniform Series Present Worth Factor

$$Uniform\ Series\ Present\ Worth = \frac{(1+i)^t - 1}{i(1+i)^t} = \frac{(1+0.028)^{20} - 1}{0.028 * (1+0.028)^{20}} = 15.16$$

Table 14 summarizes the annual benefits, service life benefits, and benefit-cost ratio for the evaluated HSIP projects in 2021 dollars. Overall, the evaluated HSIP projects provided an annual benefit of $7.7 million per year, with a service life benefit of $116.7 million. This is a significant increase from the previously reported benefits, likely due to the change in crash costs and improved relative safety performance of the 2018 projects. The Brentwood traffic signal modernization project is still expected to produce the largest annual safety benefits in terms of societal costs, returning nearly $2.3 million per year. The increase in crashes at the Derry intersection and the Lee intersection significantly skewed the overall economic success of the HSIP projects. For example, excluding the two noted projects from the computations would increase the annual benefits to $15.9 million per year for a service life benefit of $241.7 million. Note that the NHDOT HSIP only programmed projects which were estimated to have a benefit-cost ratio of 2.0 or greater.

Table 14. Annual Benefits, Service Life Benefits, and Benefit-Cost Ratio for Evaluated HSIP Projects in 2021 Dollars.

Location	Improvement Type	Annual Benefit	Service Life Benefit	Cost	Benefit-Cost
Pittsfield 24842	Auxiliary lanes – modify left-turn lane offset	$458,802	$6,953,754	$311,879	22.30
Statewide 15358	Rumble strips - center	$774,226	$11,734,438	$147,721	79.44
Derry 13249	Modify traffic signal - modernization/replacement	$(5,582,632)	$(84,612,279)	$2,156,715	-39.23
New London 14451A	Roadway narrowing (road diet, roadway reconfiguration)	$1,457,480	$22,090,070	$1,139,751	19.38
Boscawen 13957A	Intersection geometry - other	$1,164,250	$17,645,771	$76,829	229.68
Holderness 15309	Intersection geometrics - modify skew angle	$214,162	$3,245,912	$194,001	16.73
Pittsfield 15622	Modify traffic signal - modernization/replacement	$1,195,868	$18,124,979	$696,050	26.04
Brentwood 15619	Modify traffic signal - modernization/replacement	$2,319,877	$35,160,849	$499,015	70.46
Greenland 15618	Auxiliary lanes - add left-turn lane	$(952,962)	$(14,443,423)	$574,232	-25.15
Boscawen 15621	Modify control - two-way stop to roundabout	$964,460	$14,617,680	$1,531,952	9.54
Hampstead-Atkinson 15663	Auxiliary lanes - add right-turn lane	$(764,669)	$(11,589,590)	$696,770	-16.63
Lyme 15695	Intersection geometrics - modify skew angle	$196,916	$2,984,526	$220,421	13.54

Location	Improvement Type	Annual Benefit	Service Life Benefit	Cost	Benefit-Cost
Effingham 16041	Intersection signing - add enhanced regulatory sign (double-up and/or oversize)	$984,580	$14,922,631	$76,615	194.77
Epping 15693	Through lanes - add additional through lane	$1,766,495	$26,773,607	$1,398,521	19.14
Keene 20812	Modify control - two-way stop to roundabout	$(162,424)	$(2,461,754)	$575,568	-4.28
Barrington 16201	Auxiliary lanes - add left-turn lane	$(107,802)	$(1,633,884)	$614,209	-2.66
Barnstead 16200	Auxiliary lanes - add left-turn lane	$368,246	$5,581,256	$894,997	6.24
Candia 16413	Intersection geometrics - re-assign existing lane use	$(24,144)	$(365,941)	$80,387	-4.55
Loudon 24941	Modify control – two-way stop to signal	$1,141,255	$17,297,256	$1,197,041	14.45
Barrington 16178	Intersection geometry - other	$211,288	$3,202,348	$556,656	5.75
Lee 15692	Modify control - modifications to roundabout	$(2,664,797)	$(40,388,574)	$3,502,285	-11.53
Lebanon 29362	Pedestrian beacons	$(17,246)	$(261,386)	$226,754	-1.15
Rochester 27873	Intersection geometry - other	$202,665	$3,071,655	$98,748	31.11
Swanzey 15697	Modify control - two-way stop to roundabout	$22,995	$348,515	$1,798,397	0.19
Keene 26765	Modify control - two-way stop to roundabout	$947,214	$14,356,294	$1,691,297	8.49
Derry 15690	Roadway widening - travel lanes	$1,352,543	$20,499,604	$1,403,116	14.61
Belmont 16203	Auxiliary turn lanes	$(385,238)	$(5,838,795)	$358,656	-16.28
Brookline 40092	Auxiliary turn lanes	$390,024	$5,911,333	$548,256	10.78
Northfield-Canterbury 41057	Realign ramp; convert from yield to stop	$22,966	$348,079	$1,027,089	0.34
Concord 24921	Signal timing improvements	$1,399,510	$21,211,453	$303,953	69.79
Farmington 16212	Two-way left turn lane	$410,144	$6,216,284	$1,095,629	5.67
Fitzwilliam 16211	Traffic calming (signs and median island)	$201,731	$3,057,500	$1,004,372	3.04
Meredith 16470	Offset right turn lane	$195,004	$2,955,552	$1,101,711	2.68

NHDOT computed benefit-cost ratios to normalize the safety benefits against the money invested to gain them. Originally, the evaluated HSIP projects had a benefit-cost ratio of 2.96, indicating a return of $2.96 for every $1.00 invested. Considering the updated crash costs and the additional projects completed in 2018, the total benefit cost ratio is now 4.20, indicating a return of $4.20 for every $1.00 spent. The increase in the benefit cost ratio is partially due to the overall success of the added 2018 projects but is primarily due to the 2021 crash costs being higher than the 2017 crash costs, increasing the calculated benefits of all the projects while costs remain the same. The Boscawen intersection geometry project still returned the highest benefit-cost ratio of all projects – a ratio of 229.68. Again, excluding the Derry and Lee intersection projects from the computations would significantly increase the overall benefit-cost ratio from 4.18 to 10.92.

The costs shown in Table 14 and subsequent tables reflect the total cost of the projects, including preliminary engineering, right-of-way acquisitions, and construction, as well as all sources of funding. HSIP is the primary funding source for most projects, but almost all include funding from other sources. The benefit-cost reflects the effectiveness of the entire project, not just what was addressed with HSIP funds, as it is not feasible to isolate the HSIP-related safety improvements from the rest of the projects' improvements.

As with safety performance, it is also worth looking at economic results at an aggregated level, as summarized in Table 15[12]. Roadway projects provided the most annual benefits – a total of $4.2 million per year. Previously, intersection geometry projects had the highest annual benefit. This likely changed because the Belmont auxiliary turn lanes project, added as part of the 2018 projects, had a negative safety performance. Overall, there are multiple intersection geometry projects with a moderately negative safety performance, whereas none of the completed roadway projects have had a negative safety performance. When normalized against the number of projects, roadway projects provide the most benefit at about $0.8 million per year. From a benefit-cost perspective, roadway projects provide the most benefit for each dollar spent – returning $13.28 per dollar spent. Intersection geometry projects also provide an overall positive benefit-cost ratio – returning $6.92 per dollar spent. Again, removal of the Derry and Lee projects changes the intersection traffic control benefit-cost ratio from -0.60 to 14.22. It should also be noted that the two intersection control projects completed in 2018 both reduced crashes, which has improved the overall benefit-cost ratio for intersection control projects. In general, the three main categories of improvement have been shown to provide favorable economic returns as part of NHDOT's HSIP.

Table 15. Summary of Annual Benefits, Service Life Benefits, and Benefit-Cost Ratio by Improvement Category.

Improvement Category	Number of Projects	Annual Benefit	Service Life Benefit	Cost	Benefit-Cost
Intersection Geometry	16	$4,074,290.47	$61,751,339.18	$8,923,314	6.92
Intersection Traffic Control	11	$(552,384.32)	$(8,372,125.60)	$13,858,936	-0.60
Roadway	5	$4,196,124.42	$63,597,896.18	$4,790,589	13.28

Another method to measure the economic effectiveness of NHDOT's HSIP projects is by the amount of money spent to prevent one fatal or suspected serious injury crash. Table 16 summarizes those data at the aggregate improvement category level on a per year basis. The value for serious injury crashes was not reported for intersection traffic control projects (due to the increase in crashes) and for pedestrian and bicyclist projects (due to no reduction). For aggregated projects, intersection geometry, intersection traffic control, and roadway all appear to be cost-effective, especially considering the average cost of a fatal crash in New Hampshire is $13.6 million. Unfortunately, the HSIP projects were apparently not cost-effective for preventing suspected serious injury crashes, as a typical suspected serious injury crash costs $737,900, but the aggregate cost per suspected serious injury crash prevented in the HSIP projects was $15.4 million. However, this is skewed by the Derry and Lee projects – removal of those projects shows the remaining intersection traffic control projects prevented 1.34 suspected serious injury crashes per year at $6.1 million per suspected serious injury crash prevented. This is still much higher than the typical suspected serious injury crash costs, but it is significantly lower than the previously calculated $8.2 million per suspected serious injury crash. Based on these

[12] This table does not include the single non-motorist project, which is in its own category.

results, NHDOT should still consider funding fewer intersection traffic control projects (other than roundabouts) through the HSIP.

Table 16. Dollars Spent for Fatal and Suspected Serious Injury Crash Prevented per Year.

Improvement Category	Cost	Fatal Crashes Prevented per Year	Dollars per Fatal Crash Prevented	Suspected Serious Injury Crashes Prevented	Dollars per Suspected Serious Injury Crash Prevented
Intersection Geometry	$8,923,314	0.67	$13,384,971.00	1.13	$7,873,512.35
Intersection Traffic Control	$13,858,936	1.00	$13,858,936.00	-0.66	N/A
Roadway	$4,792,589	1.66	$2,880,113.63	1.33	$3,592,941.75
Pedestrians and Bicyclists	$226,754	0.33	$680,262.00	0.00	N/A
Total	$27,799,593	3.66	$7,588,605.91	1.80	$15,415,670.79

Project Delivery

It is important to consider NHDOT's history with delivering HSIP projects. Currently, NHDOT administers nearly all HSIP projects, except for Local Public Agency (LPA) projects which may be supported by HSIP funds. HSIP participation in LPA projects is usually small, with examples including retroreflective signal backplates added to signal coordination projects and rectangular rapid flashing beacons (RRFBs) as part of a larger improvement. Traditional HSIP project delivery is done through a design, bid, build process that NHDOT has not encountered issues with. There has been some localized opposition to horizontal curve warning sign projects on local roads which were administered by NHDOT. In the future, to address the potential for local concerns rooted in the NHDOT performing work on local jurisdiction roads, NHDOT anticipates developing a materials procurement project to provide signs and other safety devices for willing local agencies. There have been no further issues identified in the past year.

Conclusions

The purpose of this section was to review the performance of NHDOT's HSIP projects to determine what projects are effective at reducing crashes, what projects are most cost-effective at reducing crashes, and what delivery methods have and have not been successful. Based on the findings in this section, NHDOT should consider the following for their HSIP:

- Implement Highway Safety Manual (HSM) Part B methods to perform more statistically rigorous before-after evaluations. The current use of simple before-after evaluations can bias estimates of project and program effectiveness.
- Develop a tracking system for systemic project installations. Include the ability to incorporate crash data and other data needed for evaluations. The tracking system can simply be a GIS map which marks location, countermeasure, and installation date.
- Intersection geometry and roadway projects have proven to reliably reduce crashes. While this review did not consider the effectiveness of systemic improvements, it does appear that continuing to allocate a portion of HSIP funds to spot improvements will support long-term safety targets.
- Intersection geometry and roadway projects produced positive benefit-cost ratios that indicate significant return-on-investment with regards to reductions in crash frequency and severity.

- Roadway, intersection geometry, and intersection traffic control projects are also cost-effective when used to target severe crashes, including fatal and suspected serious injury crashes.
- Consider using material procurement contracts to support projects on local roads. This could involve the procurement of devices such as warning signs, RRFBs, pedestrian hybrid beacons, etc. Both Maine DOT and MassDOT have effective and well-received material procurement programs that provide warning signs and devices to participating municipalities who then own, install, and maintain them.

Program Evaluation and Improvements

NHDOT approached the previous HSIP Implementation Plan as an opportunity to thoroughly review their HSIP to identify areas for improvement, while also recognizing current noteworthy practices. As part of that effort, NHDOT solicited input from members of the HSIP Committee to provide a diverse perspective. The following sections describe specific gaps and deficiencies along with opportunities (strategies) to overcome the stated challenges identified in the previous plan. Following the gaps and deficiencies is a section on current noteworthy practices that should continue. This section was updated to include a brief discussion of changes since the previous plan, including how the BIL may impact the HSIP.

BIL and the NHDOT HSIP

The passing of the BIL has a notable impact on the NHDOT HSIP[13]. Most importantly, the following should influence decision making in the program:

- Increased funding levels for safety, both within the HSIP as well as grant opportunities, which presents opportunities to fund additional HSIP projects as well as encourage safety-related projects within NHDOT and through local agencies.
- New Hampshire can use up to 10 percent of HSIP funding for "specified safety projects", which includes projects that:
    - Promote public awareness and inform the public regarding highway safety matters.
    - Facilitate enforcement of traffic safety laws.
    - Provide infrastructure and infrastructure-related equipment to support emergency services.
    - Conduct safety-related research to evaluate experimental safety countermeasures or equipment.
    - Support safe routes to school non-infrastructure-related activities.
- States can now apply HSIP dollars to automated traffic enforcement systems, although automated enforcement (e.g., speed cameras, red light cameras) is currently prohibited by State law.
- NHDOT must take several steps to consider vulnerable road users:
    - NHDOT is in the process of developing their Vulnerable Road User (VRU) safety assessment, a recent requirement as part of BIL which is a documented assessment of VRU safety and development of strategies to improve the safety of non-motorists.
    - In years where the VRU penalty is assessed (where non-motorist fatalities account for at least 15 percent of annual fatalities), obligate at least 15 percent of HSIP funding on non-motorist safety projects. If the VRU penalty is not assessed, NHDOT should still consider obligating at least 15 percent of HSIP funds for non-motorist safety projects.
- While not directly impacting the HSIP, the Safe Streets and Roads for All (SS4A) grant program is an opportunity for local agencies in New Hampshire to receive Federal dollars for safety projects.
- States should incorporate socioeconomic, demographic, and equity data into safety decision making (i.e., planning and project prioritization) to ensure that the transportation needs of underserved communities are being accounted for in the HSIP.

Gaps and Deficiencies

NHDOT identified the following gaps and deficiencies within the HSIP. Accompanying each issue is a list of strategies which NHDOT can use to address them. Additionally, as part of the 2023 update to this plan, NHDOT provided updates two years removed from the initial identification of the strategies. In some cases, NHDOT removed recommendations

[13] https://www.fhwa.dot.gov/bipartisan-infrastructure-law/hsip.cfm

which are no longer relevant to the program and added strikethroughs to updates which indicated the progress was complete as of the previous update. Finally, NHDOT developed a tracking matrix used to monitor implementation of the proposed strategies. This matrix includes recommended performance measures as well as 3-month, 6-month, and 12-month goals. The HSIP Committee will regularly review the matrix to check on NHDOT's progress.

Local Road Safety

NHDOT has issues delivering safety projects on local roads. This is problematic because NHDOT owns only 28 percent of the State's road mileage[14] while the HSIP is intended to address safety on all public roads. One example of a challenging project on local roads was a Statewide effort to ensure horizontal curve signage complies with the Manual on Uniform Traffic Control Devices (MUTCD). Local agencies and residents resisted efforts by NHDOT to administer the installation of these low-cost safety countermeasures, leading to state routes and only selected towns receiving these sign improvements. NHDOT believes it may be more efficient to deliver safety projects on the local system via the Local Public Agency program or material procurements with HSIP funds.

Local projects are typically lower cost but consequently have proportionally higher administrative costs, thus it can be more efficient to pursue higher cost projects, bundle smaller projects, or utilize indefinite delivery/indefinite quantity (IDIQ) contract mechanisms to gain efficiencies of scale during project delivery. This helps to ensure that most of the HSIP budget is spent on implementing countermeasures as opposed to project management.

Strategies

Strategies for NHDOT to improve local road project delivery include:

- Local Road Safety Plans (LRSPs) (Ongoing – Intermediate-Term) – NHDOT can work with the Local Technical Assistance Program (LTAP) to help local agencies develop LRSPs. LRSPs are data-driven safety plans that help local agencies identify safety issues on their roads. The plans will improve local buy-in for safety efforts and make it easier for NHDOT to develop and deliver local road safety projects. FHWA considers LRSPs a Proven Safety Countermeasure[15] and provides a do-it-yourself webpage which guides local agencies through the LRSP process[16]. Committing an annual allocation of HSIP funds to LPA projects identified through LRSPs will further encourage local agencies to develop these plans. LRSPs are an HSIP-eligible activity.
- Material Procurement Contracts (Intermediate-Term) – Local projects might also be delivered via material procurement contracts where NHDOT would purchase and provide traffic control devices to willing communities who would then install, own, and maintain the devices. Examples of such a program include Ohio's Township Safety Sign Grant Program[17] and the Maine DOT materials procurement process. Eligible devices could include static warning signs or energized devices such as RRFBs or speed feedback signs.
- Highlight Local Road Safety Success Stories (Intermediate-Term) – Work with the LTAP and local agencies to highlight successful local road safety projects. One example is the Town of Lincoln's installation of RRFBs at all

[14] https://www.nh.gov/dot/org/projectdevelopment/planning/gis-data-catalog/documents/FactsandFigures-2022.pdf
[15] https://safety.fhwa.dot.gov/provencountermeasures/local_road/
[16] https://safety.fhwa.dot.gov/LRSPDIY/
[17] https://www.transportation.ohio.gov/wps/portal/gov/odot/programs/local-funding-opportunities/resources/township-safety-sign-grant-program#:~:text=Township%20Safety%20Sign%20Grant%20Program%20October%2016%2C%202019,install%20new%20safety%20signage%20on%20Ohio%E2%80%99s%20township%20roads

marked crosswalks. These can be distributed through a webinar, email blast, or other medium as NHDOT and the LTAP see fit.

Two-Year Check-In

- NHDOT will reach out to FHWA, Maine, and other agencies for advice on implementing a materials procurement contract to support local road safety efforts. The primary purpose is for speed feedback signs and pedestrian safety elements (e.g., RRFBs).
- The BIL included the SS4A Grant Program[18], an opportunity for local governments to receive Federal funding for local road safety projects. Three communities (Town of Haverhill, City of Franklin, and City of Keene) as well as the Rockingham Planning Commission (on behalf of the 4 MPOs in New Hampshire) received SS4A grants and NHDOT is prepared to support the grant implementation as needed.

Data Quality

NHDOT is aware of issues with crash data quality, including geolocation accuracy. It is important for New Hampshire to have quality, complete, and accurately located crash data as this allows for more informed decision making. Addressing data quality issues will necessitate the coordination of many stakeholders, including DMV. As such, any data quality improvement efforts will need the support of executive leadership.

Strategy

The strategy for NHDOT to improve data quality is:

- Crash Data Improvement Program (CDIP) (Long-Term) – NHDOT can encourage the DMV to request a CDIP from NHTSA. A CDIP is a NHTSA effort to measure the quality of New Hampshire's crash data and identify methods to address data issues, including establishing performance measures such as timeliness, accuracy, completeness, uniformity, integration, and accessibility to assess crash data quality[19]. New Hampshire's Office of Highway Safety can submit a request to NHTSA for a GO Team[20] to conduct a CDIP, work through the technical assistance provided, and work towards implementing the proposed improvements to the crash data system. Though the technical assistance request can take place in the near-term, the associated data quality improvements will be a multi-year effort. This effort would be done in concert with the New Hampshire DMV, the owners of the crash data.

Two-Year Check-In

- New Hampshire Department of Safety (NHDOS) will be releasing an RFP for a crash data solution that will include data quality improvements. However, NHDOT should still consider working with DMV to request a CDIP.

Network Screening

Prior to the previous version of this plan, NHDOT had not performed network screening since 2015 due to data challenges and a lack of resources. In the past, the "Top 5 Percent" report, listing "Hot Spots", has been helpful to identify urban and rural safety project candidates. NHDOT intends to resume network screening using a rigorous, data-driven approach.

[18] https://www.transportation.gov/grants/SS4A
[19] https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812419
[20] A GO Team is a small group of subject matter experts selected to help States address traffic records issues.

Strategies

- Develop or Calibrate Network Screening SPFs for Simple Ranking Network Screening (Intermediate-Term) – In the intermediate-term, NHDOT can calibrate or develop network screening SPFs to predict crashes on segments and at intersections. Predicted crashes from SPFs, when used in conjunction with computations of expected crashes developed using Empirical Bayes (EB) methods, can account for RTM in network screening, producing a more statistically robust and reliable list of "Hot Spots" on the network. A simple ranking network screening with SPFs and EB can be done with GIS; however, reliable results depend upon accurately located crash data.
- Select and Implement a Network Screening Product (Long-Term) - In the long-term, NHDOT can review potential network screening products on the market. NHDOT should thoroughly review available products to ensure the purchased software suite will address all of NHDOT's needs, including SPF maintenance and calibration, and provide a variety of network screening methods. The product should be intuitive and come with robust product support. NHDOT should have multiple team members familiar with the software so there are redundancies if personnel leave the Department. This is not currently possible due to resource limitations. Finally, the product should include the ability to identify correlations between network screening results and equity issues.

Two-Year Check-In

- NHDOT has begun investigating network screening products which would include the calibration or development of relevant SPFs. It would also be prudent to investigate whether the product being considered under the crash data RFP (see page 38) includes a network screening tool.

Project Prioritization

NHDOT currently struggles with project prioritization. After identifying project candidates, NHDOT confirms whether basic requirements, such as having a sufficient initial estimated benefit-cost ratio, are satisfied. If the project meets requirements, NHDOT places the project into the HSIP based on available funding and anticipated duration of preliminary engineering. Historically, NHDOT has avoided expending HSIP funds on the early engineering of projects that might not ultimately be selected for action as these expenditures would be subject to reimbursement to FHWA.

Strategies

- Increase the Number of Candidate Sites (Near-Term) – Currently, NHDOT identifies candidate sites using a naïve network screening list and RSAs. NHDOT should use a data-driven approach to screen the network for candidate sites. The top-ranking sites from the network screening results can be used to build a larger collection of candidate sites. These can be spot locations or systemic projects. For systemic projects, there is an opportunity to identify common characteristics of sites on the list of top sites or follow the more general systemic approach that starts by identifying focus crash and facility types.
- Tie Project Selection to Targets (Near-Term) – Each project funded by the HSIP should advance NHDOT towards the goal of reducing fatalities and serious injuries. As such, part of the project prioritization and selection process should include an estimation of the number of fatalities and suspected serious injuries which will be reduced by each project. NHDOT can use these metrics to assess how the selected HSIP projects will help New Hampshire meet their safety performance targets.
- Develop Tools to Assist with Prioritization (Intermediate-Term) – NHDOT can develop data-driven safety analysis tools to assist with prioritization. The tool could integrate existing crash and other data for selected candidate sites and estimate potential benefits based on a crash modification factor (CMF) selected by NHDOT. The tool can then estimate benefits and calculate a benefit-cost ratio. Additionally, the tool could track risks, such as probability of selection into a program, which NHDOT can use to count against the likelihood of a project being

prioritized. Such a tool can be a simple tracking spreadsheet, or a robust application and analysis tool like Virginia's SMART SCALE program[21]. The tools should include the ability to incorporate equity considerations into the project prioritization process.

Two-Year Check-In

- ~~With the new network screening maps, NHDOT was able to expand the list of candidate sites for safety improvements.~~
- ~~NHDOT requested and received technical assistance from FHWA to develop updated crash costs for assistance in project prioritization. NHDOT now uses these crash costs for safety analysis.~~
- NHDOT is developing a VRU Safety Assessment. Use the outcome of the VRU Safety Assessment to identify potential pedestrian and bicycle safety projects and programs, increasing the number of candidate projects.
- NHDOT receives as many as 20 RSA requests per year, which serve as a method of identifying and initiating safety projects. NHDOT is working to develop a score-based approach to prioritizing RSAs, which will help improve project prioritization.
- NHDOT began investigating safety management tools which can help with network screening and project prioritization.

Non-Motorized Safety

NHDOT's HSIP does not have an extensive history of funding non-motorist safety projects. Per the crash data analysis, pedestrians accounted for 8 percent of fatalities and suspected serious injuries while bicyclists accounted for 2 percent. NHDOT hosted Safe Transportation for Every Pedestrian (STEP) workshops in 2020 with the purpose of educating NHDOT, planning commissions, and municipalities on proven pedestrian safety countermeasures. Based on the findings of this workshop, NHDOT plans to have an annual allocation of HSIP funds for safety improvements at uncontrolled pedestrian crossings.

Strategies

Strategies for NHDOT to improve safety for non-motorists include:

- Dedicate Stable Funding for Non-Motorized Safety (Near-Term) – Based on the data analysis, NHDOT is dedicating 15 percent of HSIP funding towards non-motorized safety projects. Given the small amount of allocation that is available, non-motorized safety projects should be primarily systemic or systematic in nature, such as applying RRFBs at uncontrolled crossings and warning signs at trail crossings, or leading pedestrian intervals (LPIs) at signalized intersection pedestrian crossings.
- Develop Program for Uncontrolled Pedestrian Crossings (Intermediate-Term) – NHDOT has interest in developing a program to address safety at uncontrolled pedestrian crossings. As stated in the previous bullet, the limited amount of available funds for non-motorist improvements suggests the need for a systemic program to improve safety at these locations. NHDOT can perform a systemic analysis to identify risk factors that are correlated with increased probability of a fatal or suspected serious injury crash at a crossing. NHDOT can then prioritize the crossings for improvements based on the risk factors present. Finally, NHDOT can develop countermeasure packages that should be considered at each crossing.

[21] https://safety.fhwa.dot.gov/tsp/fhwasa19013/

Two-Year Check-In

- ~~With the new network screening maps, NHDOT was able to expand the list of candidate sites for safety improvements.~~
- NHDOT is nearing publication of a Pedestrian Safety Action Plan and published a Pedestrian and Bicycle Transportation Plan in August 2023, which will guide pedestrian safety policy and produce a list of projects for vulnerable users. NHDOT will also be able to identify projects as an outcome of the VRU Safety Assessment.
- The VRU special rule requires NHDOT to obligate at least 15 percent of its HSIP funding to non-motorized safety improvements within the fiscal year in which the rule applies. While the special rule has not been triggered for FY24, NHDOT will maintain a pipeline of such projects to avoid being caught unprepared if the rule applies in the future.

Systemic Safety Projects

NHDOT intends to expand the use of systemic safety projects as part of the HSIP as data and analysis capabilities improve. However, there is no established proportion of HSIP funds for systemic projects (versus "Hot Spot" projects). When installing low-cost safety countermeasures at many sites, agencies can realize significant returns on investment due to the cost efficiencies gained by bundling projects. The projects are also proactive, in that they try to prevent severe crashes before they happen, prioritizing sites based on the risk of such a crash, rather than addressing sites after a severe crash has occurred.

Strategies

Strategies for NHDOT to increase systemic safety projects include:

- Develop a Funding Formula (Near-Term) – NHDOT can develop a formula to determine what proportion of HSIP funds should be dedicated to systemic projects on an annual basis. Recent discussions at FHWA roundtables showed a wide range of distributions, with some States funding almost no systemic projects (zero percent to twenty percent) and others allocating as much as eighty percent of HSIP dollars to systemic projects. Given the modest HSIP funding available, NHDOT could establish flexible funding goals or consider the formula as a guide for investments over multiple years, rather than a single year. Another option is to prioritize all projects based on expected return on investment (benefit-cost ratio); systemic projects tend to compete relatively well under this approach.
- Calculate benefit-cost ratio for systemic projects (Intermediate-Term) – NHDOT should develop a method to estimate benefit-cost for systemic projects. One solution is to use GIS to plot all proposed installations then identify the average existing crash frequency within a selected buffer of the improvement. NHDOT can then apply a CMF to each site for the proposed improvement, estimate the crash reduction, then convert the estimated change in crashes to a monetary benefit using average crash costs. Comparing those benefits to the proposed cost of the projects will produce a benefit-cost ratio. Another option is to move toward a more predictive approach, rather than relying solely on observed crashes, for estimating benefits for both spot and systemic projects.
- Identify Focus Crash Types, Facility Types, and Risk Factors (Intermediate-Term) – NHDOT's systemic program should be guided by focus crash types, facility types, and risk factors related to fatalities and serious injuries. FHWA's *Systemic Safety Project Selection Tool* describes how NHDOT can achieve this strategy[22]. Based on the

[22] https://safety.fhwa.dot.gov/systemic/fhwasa13019/sspst.pdf

SHSP emphasis areas, focus crash types for New Hampshire should include lane departures, intersection-related crashes, and non-motorized crashes. Focus facility types are those where the focus crashes are most prevalent.

- Education (Intermediate-Term) – NHDOT can request technical assistance from FHWA to educate agency staff on systemic safety, and to develop material to promote the systemic approach to highway safety to the public.
- Develop LRSPs (Ongoing – Intermediate Term) – As stated previously, LRSPs identify safety issues on locally-owned roads. NHDOT can develop systemic projects specifically for local roads, using sites or risk factors identified in the LRSPs. This would act as encouragement for local agencies to complete LRSPs, as they will see the potential for systemic funding as an incentive for completing a plan.

Two-Year Check-In

- NHDOT is committing to the project funding split described in the previous plan. Additionally, NHDOT is exploring methods to calculate benefit-cost ratios of systemic projects for their inclusions in project prioritization.
- The New Hampshire LTAP has performed training throughout the State, educating local agencies on the benefits of LRSPs. Several MPOs are applying for funding through SS4A to develop regional safety plans.
- NHDOT will commit to $500,000 annually for systemic projects, which will encourage the safety team to develop at least one systemic project per year. This will include an educational component, either marketing the countermeasure itself or advising against behaviors which contribute to the focus crash.

Roundabouts

NHDOT intends to expand the use of roundabouts in New Hampshire. One challenge is the maintenance of the adjacent sidewalks, including snow removal, which, by NHDOT policy, is the responsibility of the local community. FHWA considers roundabouts a proven safety countermeasure that can reduce severe crashes by 82 percent at stop-controlled intersections and by 78 percent at signalized intersections[23].

Strategies

Strategies for NHDOT to expand the use of roundabouts in New Hampshire include:

- Develop Education Campaigns for Local Agencies when proposing Roundabouts (Intermediate-Term) – FHWA has an extensive collection of resources for education and outreach for roundabouts. NHDOT can use these resources to develop a standard approach to communicating with the public and local agencies when installing a roundabout. The campaigns should focus on educating users, both motorists and non-motorists, as well as educating local agencies on maintenance and snow-clearing practices. NHDOT can collect and distribute stories from engineers, planners, politicians, and others from New Hampshire who were initially skeptical of roundabouts but have now become advocates.
- Compact Roundabouts (Intermediate-Term) – Compact roundabouts, called mini roundabouts by FHWA, are roundabouts with reduced diameters and traversable islands that are used for low-speed intersections with limited right-of-way[24]. To increase the use of compact roundabouts in the State, NHDOT can identify candidate sites with a high potential for success to use as pilot sites. If the pilot installations work successfully, NHDOT will be able to market them to encourage more installations in New Hampshire.

[23] https://safety.fhwa.dot.gov/provencountermeasures/roundabouts/
[24] https://nacto.org/wp-content/uploads/2015/04/fhwasa10007_MiniRoundabouts.pdf

- Review Roundabout Design Practices in New Hampshire (Intermediate-Term) – In some cases, a roundabout may have higher initial cost compared to signalizing an intersection, primarily due to the additional right-of-way requirements at the intersection. While the additional safety benefits of a roundabout over the life of the project will often outweigh its additional initial cost over signalizing an intersection, New Hampshire would benefit from developing design standards that maximize the potential safety and operational benefits of a roundabout while minimizing costs.

Two-Year Check-In

- NHDOT now considers roundabouts a viable alternative for all intersection projects, with several being advanced to construction throughout the State. NHDOT is still advocating for the construction of a compact or mini-roundabout in the appropriate context.

Project Delivery

NHDOT recognizes that there are potential improvements to the current delivery methods of HSIP projects. Modifications to the typical design-bid-build delivery process of HSIP projects can help NHDOT save money and deliver projects quicker and more efficiently.

Strategies

Strategies for NHDOT to streamline project delivery include:

- Material Procurement Contracts (Intermediate-Term) – As discussed previously, material acquisition contracts are useful for NHDOT to assist local agencies with the acquisition and installation of low-cost safety countermeasures. Example countermeasures which could be applicable to this strategy include horizontal curve signage and RRFBs.
- Leadership Support (Intermediate-Term) – In order to make significant and innovative changes to HSIP project delivery, NHDOT will need the support of executive leadership from multiple bureaus in the Department. NHDOT can work with FHWA to identify resources which can be used to garner this support from leadership. The resources should justify the changes and highlight why the changes will be beneficial to both NHDOT's HSIP and NHDOT as a whole. Part of this could include the integration of proven safety countermeasures in design and operations manuals and policies, which would allow the HSIP to focus on specific locations or risk factors of concern.

Two-Year Check-In

- The highway safety program now reports directly to the Assistant Commissioner, increasing the leadership support for highway safety, especially for newer initiatives such as material procurement.
- NHDOT will be reaching out to FHWA and the Maine, Massachusetts, and Ohio DOTs to learn more about best practices for materials procurement.

Project Evaluations

Agencies should perform evaluations at the project, countermeasure, and program level. Additionally, evaluations should focus on both changes in safety performance (reductions in crash frequency and severity) and the economic performance of projects (benefit-cost ratios, documentation of cost overruns, and the project delivery process). FHWA notes that evaluation is important because it allows NHDOT to understand the potential return on investments, identify and address potential safety opportunities, inform future safety programming decisions, improve HSIP processes, demonstrate accountability to stakeholders and the public, and to meet Federal reporting requirements.

NHDOT only performs evaluations as part of the annual HSIP report. Current challenges to performing more regular evaluations include the limited staff resources and widely varying number of crashes on a year-to-year basis. When crashes fluctuate widely from year-to-year at a given site, it is difficult to complete meaningful evaluations without using more rigorous methods (e.g., EB or comparison group before-after studies), which are more time and resource intensive.

Strategies

Strategies for NHDOT to improve project evaluations include:

- Add or Balance Resources (Intermediate-Term) – FHWA's *HSIP Evaluation Guide*[25] describes best practices for project, countermeasure, and program evaluations. NHDOT can review this guide and determine what staff and data resources are lacking which inhibit the agency's ability to improve their evaluations. NHDOT can then work with FHWA to identify trainings, request workshops, and request technical assistance to fill the gaps and improve the resources available for evaluation. If the challenge is related to staff time, there is an opportunity to shift some of the workload from diagnosis and project development to evaluation (i.e., review slightly fewer locations each year and devote that time to evaluating the effectiveness of past projects).
- Develop Evaluation Tools (Intermediate-Term) – Given the need for annual evaluation, it is helpful for NHDOT to develop tools which can automate some aspects of evaluation. FHWA's *HSIP Evaluation Guide* recommends a tracking tool, such as a spreadsheet, which can be used to document location, countermeasure, crash, and financial data for each project. It also includes spreadsheet templates for performing the different levels of evaluation. For more rigorous statistical evaluations, NHDOT can calibrate crash prediction models from the HSM or other sources, or develop State-specific SPFs, to be used for EB before-after evaluations. These models can be incorporated into tracking tools for automated calculations. This could also be incorporated into a safety management software.

Two-Year Check-In

- NHDOT began investigating safety management software tools which can help with safety project evaluations. They have now released an RFP for a crash data product and safety management tool.
- NHDOT worked with FHWA to update crash costs by severity to improve economic evaluations.
- NHDOT posted a "Data Analyst" position who will perform evaluations as part of their responsibilities.

Noteworthy Practices

NHDOT identified the following practices as noteworthy in their HSIP that they will continue, and even use as inspiration for other issues.

HSIP Committee

NHDOT has an HSIP Committee which provides guidance for the State's HSIP. The membership consists of representatives of NHDOT as well as regional and local agencies. Committee meetings are typically held monthly to review projects for selection into the program and get status reports from project managers. The variety of affiliations in the HSIP committee helps NHDOT ensure the HSIP is meeting the safety needs of Statewide, regional, and local transportation agencies in the State.

Two-Year Check-In

- NHDOT continues to use the HSIP Committee to guide the HSIP.

[25] https://safety.fhwa.dot.gov/hsip/docs/fhwasa17039.pdf

Road Safety Audits

NHDOT has an RSA program which specifically targets local agencies. Local agencies submit applications for RSAs on an annual basis. Typically, these audits investigate problematic intersections and lead to intersection safety improvement projects. New Hampshire RSAs include multidisciplinary stakeholders such as:

- NHDOT engineering staff.
- FHWA.
- Consultant facilitator.
- Municipal administration and emergency responders.
- Business and landowners adjacent to the site.

The RSAs result in a report that identifies a prioritized list of crash contributing factors, targeted strategies, the parties responsible for implementation, and the anticipated timeframe for implementation. In addition, NHDOT and the local agency typically identify a shortlist of intermediate- to long-term alternatives for a more in-depth safety analysis. This includes a detailed benefit-cost analysis using the crash history and CMFs to estimate expected project benefits.

FHWA considers RSAs a proven safety countermeasure[26] with a documented history of producing 10- to 60-percent reductions in crashes from the countermeasure strategies installed as a result[27]. NHDOT will continue to perform RSAs while looking for opportunities to improve and expand the RSA process.

Two-Year Check-In

- NHDOT continues to use RSAs to inform safety and other projects. There has been an increase in RSA application frequency, so NHDOT is reviewing potential prioritization methods. NHDOT is also establishing annual RSA completions as a performance measure for the HSIP.

Rumble Strips

Rumble strips are an FHWA proven safety countermeasure[28] shown to achieve significant reductions in target crashes. NCHRP Report 641 showed that centerline rumble strips can reduce fatal and injury head-on and sideswipe-opposite direction crashes by 44- to 64-percent and shoulder rumble strips can reduce fatal and injury single-vehicle roadway departure crashes by 13 to 51 percent[29]. NHDOT's rumble strip program was on hiatus during recent years due to noise concerns by the public. To address concerns, NHDOT developed a new sinusoidal rumble strip design aimed at reducing exterior noise while preserving the safety benefit. NHDOT has resumed installing rumble strips according to its updated design standard, primarily in conjunction with resurfacing projects. Rumble strip guidance for NHDOT is available at https://www.dot.nh.gov/about-nh-dot/divisions-bureaus-districts/materials-research/research-projects/research-program-0. Table 17 summarizes the conditions under which rumble strips are installed in New Hampshire.

[26] https://safety.fhwa.dot.gov/provencountermeasures/road_safety_audit/
[27] https://safety.fhwa.dot.gov/rsa/case_studies/fhwasa12037/fhwasa12037.pdf
[28] https://safety.fhwa.dot.gov/provencountermeasures/long_rumble_strip/
[29] http://www.cmfclearinghouse.org/studydocs/nchrp_rpt_641-GuidanceRumbleStrips.pdf

Table 17. Summary of Conditions for Rumble Strip Installation

Rumble Strip Type	Divided Highways	Undivided Highways
Centerline Rumble Strips	• N/A	• Posted speed limit at least 40 mph. • Pavement width of 28 feet or wider. • Pavement surface is in good condition. • Sufficient pavement depth and condition.
Shoulder Rumble Strips	• All limited access highways.	• Posted speed limit at least 40 mph. • Paved shoulder width of 6 feet or wider. • Pavement surface is in good condition. • Sufficient pavement depth and condition.

Two-Year Check-In

- NHDOT continues to support the systematic implementation of centerline and edge rumble strips, with several systematic projects planned for FY 2024.

Systematic Safety

With the challenges described in identifying "Hot Spot" project candidates, NHDOT has implemented annual systematic safety projects. Countermeasures installed under these projects include:

- Guardrail and end terminal modernization.
- Traffic signal equipment upgrades.
- Durable pavement marking application.
- Horizontal curve signage improvements.
- Centerline and shoulder rumble strip installation.
- Retroreflective backplate installation.
- Pedestrian signal upgrades.

Unfortunately, NHDOT does not have the capacity to evaluate systematic safety projects due to the dispersed nature of the improvements and the rigorous data analysis that would be needed, so there is a lack of knowledge about the effectiveness of such efforts in New Hampshire. However, all the identified treatments are proven safety countermeasures. New Hampshire will continue to develop systematic projects in efforts to install low-cost safety countermeasures across wide geographic areas.

Two-Year Check-In

- NHDOT continues to use systematic safety projects, including rumble strip projects and barrier and end treatment improvements.
- NHDOT is investigating tracking tools which will allow for evaluations of systematic projects in the future.
- NHDOT is reviewing the potential for systematic projects on local roads.

Intersection Conflict Warning Systems (ICWS)

NHDOT is conducting a pilot study of three Intersection Conflict Warning Systems (ICWS) that were installed in 2021, including systems in Peterborough, Chesterfield, and Pelham. The effectiveness of these pilot study installations will inform potential revisions to NHDOT's Concept of Operations for ICWS document as well as potential revisions to plan and specification documents. The general objectives of the overall effort are to document the following:

- The change in frequency of crashes and near misses before, shortly after, and in the years after ICWS deployment.
- Changes in motorist behaviors in the intersection, including, but not limited to, speed of vehicles on the major street approaches.
- The reliability of the systems.

There are 15 CMFs in FHWA's CMF Clearinghouse for the impact of ICWS on injury crashes. Of those 15, the average crash reduction is 21.4 percent, the largest reduction is 55 percent, and 12 of the 15 show an estimated reduction in crashes[30]. NHDOT hopes these pilot efforts prove just as successful and ICWS will help reduce injury crashes at high-speed intersections in the State.

Two-Year Check-In

- NHDOT continues to collect data for an observational evaluation of the pilot efforts.

Target Setting

New Hampshire coordinates with several stakeholders to set targets. Participants include representatives of NHDOT and the Commissioner's Office, the HSIP Committee, regional planning commissions, the NHDOS, FHWA, and NHTSA. The target setting process used for 2024, which is representative of the standard approach, consists of three steps:

1. Compute initial 2024 target value based on the trend line of the five most recent five-year rolling average values (e.g., compute trend line of five-year averages from 2018 to 2022 and project the trend line to 2024).
2. Evaluate the computed 2024 target value from step 1 for reasonableness.
    a. Case 1: Is the trend rising? If so, adopt the current year's five-year average as the 2024 target. NHDOT and NHDOS have historically been unwilling to adopt a rising trend as a target as it would be contrary to the core objective of the state's Driving Toward Zero initiative, which is to halve motor vehicular fatalities by 2035 and achieve 0 fatalities by 2050.
    b. Case 2: Is the trend falling, but at a rate that is considered unsustainable? Compute a revised safety target based on the five-year average of 2018 through 2022, assuming the 2022 annual performance is equaled in 2023 and 2024.
    c. Case 3: Is the trend falling, but at a modest rate that could reasonably be improved upon? Adopt a 2024 safety target equal to the 2022 five-year average.
3. Adjust the 2024 safety target from step 2 up or down to account for environmental and societal trends that might affect safety performance either positively or negatively.

NHDOT will continue to refine its target setting process to better understand the factors that impact safety performance in New Hampshire.

Two-Year Check-In

- NHDOT continues to employ this approach to setting targets.
- NHDOT should consider including the DMV in these discussions. Increasing DMV's awareness of the need and use of quality crash data should encourage their commitment to improving the data.

[30] http://www.cmfclearinghouse.org/study_detail.cfm?stid=468

Previous Recommendations

NHDOT developed this HSIP Implementation Plan to identify methods to improve the HSIP with the goal of helping New Hampshire achieve its safety performance targets. NHDOT followed the template provided by FHWA, which includes a decision support framework, to guide this plan. NHDOT began with an overview of severe crash data to set the scene for safety performance in New Hampshire. NHDOT then summarized the historical performance of HSIP projects, providing insight into the effectiveness of safety projects and programs as well as NHDOT's current evaluation capabilities. Finally, NHDOT evaluated their program to identify strengths as well as opportunities for improvement. Based on the results of the decision support framework, NHDOT is considering the following recommendations for their program:

Program Spending

Program spending should be guided by the infrastructure-based SHSP emphasis areas (lane departure, intersection, non-motorist). NHDOT previously established a soft goal of 50 percent of HSIP funds spent on lane departure projects, 30 percent on intersection projects, 15 percent on non-motorist projects, and 5 percent on miscellaneous other projects. To support this spending distribution, NHDOT will:

- Develop a systemic safety program.
- Develop a general hot-spot program.
- Support data and analysis improvements (including evaluations).

Two-Year Assessment

NHDOT is still targeting this distribution for the HSIP Program. One aspect to monitor relates to the non-motorist distribution. If New Hampshire triggers the Vulnerable Road User Special Rule (as happened most recently in FY 2023), NHDOT will be required to spend at least 15 percent of HSIP funds on non-motorist safety projects. NHDOT should have a backlog of non-motorist safety projects to help meet this funding requirement in the event the Rule is triggered.

Fortunately, NHDOT is prepared to develop such a backlog. The pending publication of the *Pedestrian Safety Action Plan* will guide pedestrian safety policy, while the *Pedestrian and Bicycle Transportation Plan* will identify potential projects across the State. The ongoing vulnerable road user safety assessment will also guide non-motorist safety investments. Further, NHDOT should consider working with cities to prioritize pedestrian safety improvements in urban networks. Such a program could emulate the Pedestrian Safety Improvement Plan administered by the Ohio Department of Transportation.

Project Prioritization

Continue to select and prioritize projects relying on benefit-cost analysis whenever possible. This will help to improve the cost-effectiveness of the HSIP. To inform the benefit-cost analyses, identify methods to estimate benefit-cost for systemic and systematic projects so they can be ranked and prioritized along with spot projects.

Two-Year Assessment

NHDOT received technical assistance from FHWA to update their average crash costs. NHDOT now uses these costs to inform the estimation of safety benefits. One example application is the NH 101 Corridor Safety Study, in which the updated crash costs were used to generate a benefit-cost analysis for proposed countermeasures.

NHDOT identified difficulties estimating benefit-cost ratios for systemic safety projects. This ratio will help to prioritize systemic projects alongside spot projects. A naïve approach NHDOT should consider is to use the average crash rate on the focus facility type as the predicted crash rate. A CMF could then be applied to calculate the expected reduction in crashes, which can be converted to benefits.

NHDOT also lacks sufficient roadway data for estimating the benefit-cost ratio of some sites. For instance, while NHDOT would like to develop curve-specific systemic projects, the DOT does not have a GIS curve inventory for planning purposes. NHDOT should work with FHWA to identify a cost-efficient manner of generating a curve inventory map.

Project Identification
Use the new Top 1 Percent lists to identify spot projects for the coming HSIP program years. The naïve approach used to generate this list should only be used until NHDOT develops a more rigorous network screening approach, such as an EB-based approach.

Two-Year Assessment
NHDOT developed segment-based and intersection-based naïve network screening maps. NHDOT is using these maps to identify RSA and safety project sites.

Project Type
Continue to develop a mix of spot and systematic safety projects. Additionally, perform a systemic safety analysis for lane departure, intersection, and non-motorist crashes. The analysis should identify focus crashes, facility types, and risk factors for these emphasis areas. NHDOT can use these results to prioritize sites for low-cost safety countermeasure installation. Finally, capitalize on the increased HSIP flexibility provided in recent changes to FHWA regulations to develop targeted education and public outreach.

Two-Year Assessment
NHDOT plans to develop more systemic safety projects. As described earlier, NHDOT identified roadblocks and solutions to overcome those roadblocks and move towards more systemic improvements.

Crash Data Improvements
NHDOT should encourage the DMV to pursue a CDIP to improve crash data. This HSIP Implementation Plan showed how quality crash data can enhance a safety management program, and how difficult it can be to understand a program without quality crash data. Additionally, as NHDOT invests in network screening, evaluation, and other data analysis tools, the analysis results are only as good as the data used. As such, it is important for New Hampshire to continue to improve crash data to allow for a more informed safety program.

Additionally, a review of injury reporting in the crash data showed a higher reported frequency of Suspected Minor Injuries than Possible Injuries. This is unexpected, as traditionally there are more Possible Injuries. Given this anomaly, NHDOT should also consider working with the NH Department of Safety on training for first responders to improve the accuracy of injury reporting and ensure it follows the best practices of the NHTSA Model Minimum Uniform Crash Criteria guideline.

Two-Year Assessment
NHDOT is evaluating the State's crash data to determine the proportion of crashes which can be reliably geolocated. This will inform NHDOT's pending CDIP discussion with the New Hampshire Department of Safety. Additionally, NHDOT is considering combining suspected minor injuries (B) and possible injuries (C) for analysis, reducing concerns about reporting consistency between the two injury categories.

Safety Analysis
In concert with crash data improvements, NHDOT should identify opportunities to improve analysis capabilities. Suggested improvements to analysis capabilities include:

- Identify a safety management software that will support statistically rigorous network screening capabilities, such as EB-based performance measures, as well as project prioritization and before-after evaluations.
- Identify resources to support safety analysis, whether this is in-house or through contract support. FHWA offers training courses in data-driven safety analysis, including HSM methodologies and systemic methodologies, which can help with knowledge building.
- Identify or develop tools, either standalone or as part of the safety management software, to support safety analysis throughout the project planning and development process – specifically for alternatives analysis, project prioritization, and evaluation.
- Alternatives analysis and project prioritization should include the ability to estimate the potential effect a project would have on the State's safety performance measures (e.g., Project A is expected to prevent 0.1 fatalities and 0.5 suspected serious injuries per year). This will help NHDOT quantify how the HSIP will specifically support safety targets. This should be part of the safety management software.
- Develop an HSIP project tracking tool to assist with monitoring safety performance, funding, construction progress, and evaluation. This should be part of the safety management software.

Two-Year Assessment

NHDOT has begun investigating safety management software solutions for network screening and project prioritization, including developing an RFP. NHDOT can also develop a simplistic tracking tool using GIS.

Materials Acquisitions

Develop an HSIP materials acquisitions process or contract mechanism to support local agencies with the installation of low-cost safety countermeasures on their roads. This process could include such safety devices as static warning signs for vehicles or pedestrians, or energized devices such as RRFBs or speed feedback signs.

Two-Year Assessment

NHDOT plans to research the Maine DOT, MassDOT, and/or Ohio DOT materials procurement processes for local road safety. On top of Maine's requirements (local agencies must be trained and implement the countermeasure in a timely manner), NHDOT is also considering the requirement for documentation of the countermeasure need in a safety plan for eligibility.

Local Road Safety Plans

Encourage local agencies to develop LRSPs. NHDOT can encourage LRSP development by allocating HSIP funds to local safety projects identified by LRSPs. FHWA can provide support to local agencies interested in developing LRSPs. NHDOT can also work with the Local Technical Assistance Program in the State to facilitate LRSP development. For further encouragement, NHDOT can support local agencies with project development and installation, including through material procurement contracts, systematic improvements to local roads, and allocating a portion of HSIP funds to local roads.

Two-Year Assessment

The LTAP delivered training throughout the State highlighting the benefits of LRSPs to local agencies. Additionally, 3 communities and the four MPOs were awarded SS4A grants from the USDOT to develop safety action plans for their jurisdictions.

Innovative Intersections

Encourage the installation of roundabouts and other innovative intersections (in the appropriate context) as part of the HSIP intersection program and other general transportation programs within the State (e.g., the Statewide

Transportation Improvement Program—STIP). Safety alternatives analysis will highlight the potential safety benefits of various designs, including roundabouts, restricted crossing U-turns, and others.

Two-Year Assessment

NHDOT now regularly considers roundabouts for intersection improvements projects, with several under development. NHDOT is also considering a Restricted Crossing U-Turn (RCUT) intersection design as an alternative in one project; there is also a Diverging Diamond Interchange (DDI) under design.

Noteworthy Practices

Continue to look for opportunities to improve NHDOT's HSIP noteworthy practices. Potential improvements include:

- HSIP Committee – continue to solicit and include volunteers to join the Committee, to involve representatives of municipalities and planning commissions, while maintaining geographic diversity. A variety of voices will improve the already successful operations of the Committee. Consider including a representative from the DMV to show how the current quality of crash data hinders the safety planning activities of the committee.
- RSAs – review previous RSAs to identify potential improvements to the process. Potential improvements include incorporating data-driven safety analysis and identifying additional stakeholders for inclusion.
- Rumble strips – continue the systemic installation of rumble strips on undivided highways, with selection and prioritization of locations based on appropriate risk factors. Update and finalize the draft guidelines published in 2019.
- Systematic safety – NHDOT has installed many countermeasures as part of systematic projects. There is a potential to develop additional systematic safety projects as part of the HSIP. For example, the uncontrolled pedestrian crossing safety project could be a systematic project providing signing and pavement markings to uncontrolled locations which meet certain criteria.
- Target setting – continue to evaluate New Hampshire's target setting approach to identify potential improvements. This could include the incorporation of other data, such as VMT, population, etc. which may correlate with safety performance measures.

Obligation

Obligate the total apportioned funds for FFY 2024 - $12,029,350.

Two-Year Assessment

NHDOT plans to obligate funds which matched the apportionment in FY 2024.

Project Backlog

In this year and future years, develop a project list that matches or exceeds the funding distribution. Having a project list that exceeds the funding distribution is useful in the event additional funds become available, allowing NHDOT to implement these shovel ready projects. Increasing this backlog is especially important given NHDOT expects a larger and earlier redistribution, which a bigger backlog can help absorb.

Two-Year Assessment

The new network screening maps provided NHDOT with a large list of sites for potential safety projects to inform the backlog. The *Pedestrian and Bicycle Transportation Plan* and the VRU Safety Assessment will provide an extensive backlog of non-motorist safety projects and programs. Additionally, NHDOT has seen an increase in the number of RSA requests, which will also lead to more projects. As a result, NHDOT will need additional resources to support the RSA requests and projects.

Program Implementation
Implement and develop the programs described in this HSIP Implementation Plan.

Two-Year Assessment
NHDOT continues to commit to the apportioned programs described in the next section. Additionally, NHDOT will develop a tracking matrix which includes the strategies described in this plan along with recommended performance measures and goals for monitoring progress. NHDOT will regularly review progress for these strategies in their HSIP Committee meetings.

Additional Recommendations
As part of this year's update to the NHDOT HSIP Implementation Plan, NHDOT is considering the following additional recommendations which were not present in the previous plan:

Safety for Vulnerable Users
As described previously, the 2019 BIL included two provisions related to vulnerable road users: a safety assessment and a special rule. NHDOT is working to complete the required safety assessment for vulnerable users by the end of 2023. This is accompanied by the *Pedestrian and Bicycle Transportation Plan*, also published in 2023. Non-motorist fatalities and serious injuries commonly account for 10 percent or more of all fatalities and serious injuries and thus should be taken seriously. NHDOT should consider this assessment an opportunity to evaluate and understand non-motorist risk factors in the State and incorporate a Safe System approach into non-motorist safety practices.

Additionally, the assessment will help NHDOT build a non-motorist project backlog in the event the State triggers the special rule requiring 15 percent of the apportioned funds to be obligated towards non-motorist safety projects.

Safe System Approach
In 2022, the United States Department of Transportation (USDOT) published the National Roadway Safety Strategy (NRSS)[31], which describes approaching highway safety from the perspective of a Safe System and emphasizes safer people, safer roads, safer vehicles, safer speeds, and post-crash care. NHDOT is taking the initial steps to understand and implement Safe System practices on New Hampshire's roadways. Several initiatives are supporting this implementation, including discussions to amend the SHSP to include the Safe System Approach and develop a speed management policy, similar to that developed by Washington State Department of Transportation.

Funding Allocation Goals
NHDOT's initial soft funding allocation goals are based on the distribution of fatalities and serious injuries identified in the Crash Data Analysis. The distribution goal for NHDOT is shown in Figure 21, where lane departure projects will account for approximately $6.0 million (50 percent), intersection projects will account for approximately $3.6 million (30 percent), non-motorist projects will account for approximately $1.8 million (15 percent), and miscellaneous projects, including data improvements, RSAs, material procurements, local allocations, and potentially additional lane departure, intersection, and non-motorist projects, will account for approximately $0.6 million (5 percent). These allocations are slightly different from the severity distribution due to anticipated preliminary engineering cost differences.

[31] https://www.transportation.gov/sites/dot.gov/files/2022-02/USDOT-National-Roadway-Safety-Strategy.pdf

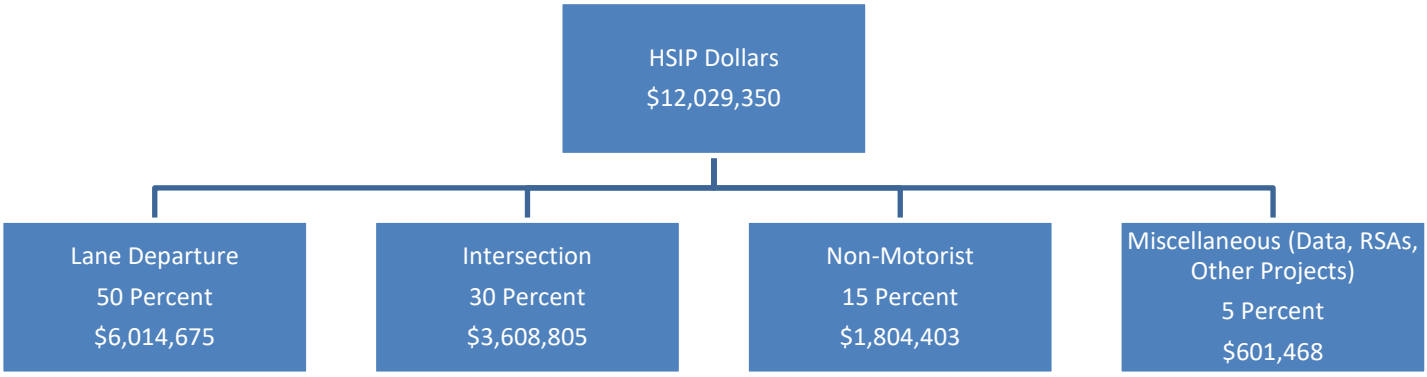

Figure 21. Soft goals for funding distribution for the NHDOT HSIP based on fatalities and serious injuries.

HSIP Programs, Strategies, and Activities

Table 18 summarizes the proposed programs, strategies, and activities for the NHDOT HSIP. NHDOT proposes six individual categories:

- Lane Departure.
- Intersection.
- Non-Motorist.
- Data Improvements.
- RSAs.
- Other Projects.

For each program, Table 18 describes the purpose, allocation goal, proposed methodology and implementation plan, and how the benefits will be measured. The allocation goals are based on the funding distribution in Figure 21. These were not changed in this year's update.

Table 18. HSIP Programs, Strategies, and Activities.

Program, Activity, or Strategy Name	Purpose	Allocation Goal for FY 2024	Methodology and Implementation Plan	Benefits
Lane Departure	The purpose of this program is to reduce severe lane and roadway departure crashes on all public roads in New Hampshire.	$6.0 Million	Within current capabilities, this will be a mix of spot and systematic projects. The systematic projects will be based on installing rumble strips where applicable, and extending curve warning sign improvements to local roads. The spot projects will be based on diagnosis of the Top 1 Percent lists.	Benefits will be measured using a naïve approach – applying the CMF for the appropriate treatment to the treated sites.
Intersection	The purpose of this program is to reduce severe crashes at intersections in New Hampshire	$3.6 Million	Within current capabilities, this will be primarily spot projects based on the Top 1 Percent list; however, there will be at least 1 systematic project.	Benefits will be measured using a naïve approach – applying the CMF for the appropriate treatment to the treated sites.

Program, Activity, or Strategy Name	Purpose	Allocation Goal for FY 2024	Methodology and Implementation Plan	Benefits
Non-Motorist	The purpose of this program is to reduce severe pedestrian and bicyclist crashes in New Hampshire	$1.8 Million	Within current capabilities, this will be a mix of spot and systematic projects. The spot projects will be based on diagnosis of the Top 1 Percent lists. The systematic efforts can include improvements at controlled or uncontrolled crossings.	Benefits will be measured using a naïve approach – applying the CMF for the appropriate treatment to the treated sites.
Data Improvements	The purpose of this program is to improve data and analysis capabilities to support the NHDOT HSIP. This also involves the procurement and maintenance of a safety management system.	Up to $601,000	Encourage NH Dept of Safety – Division of Motor Vehicles to undergo a Crash Data Improvement Program. Invest in safety management software to implement best practices of the Highway Safety Manual.	N/A
RSAs	The purpose of this program is to support and expand the use of RSAs in New Hampshire.	Up to $601,000	Seek to simplify and streamline the RSA process to expand the number of audits that can be conducted.	N/A
Other Projects	The purpose of this program is to address projects for other SHSP Emphasis Areas that do not fall within the Lane Departure, Intersection, or Non-Motorist programs. Examples include intelligent transportation system (ITS) improvements, local road safety projects, and material procurements.	Up to $601,000	Examples of investments might include Intelligent Transportation Systems devices, autonomous vehicle infrastructure, etc. One specific example is the pilot effort for intersection conflict warning systems.	Benefits will be measured using a naïve approach – applying the CMF for the appropriate treatment to the treated sites.

Project List

NHDOT developed a project list for the FY 2024 HSIP. The specifics for the project list are provided in Table 19. For each project, NHDOT provides identifying features (project names and numbers), defines location using roadway ownership, provides an estimated project cost, and links each project to an HSIP program and an SHSP Emphasis Area.

Table 19. NHDOT FY 2023 HSIP Project List

Project Name	Project Number	Project Cost for FY 2024	Program, Strategy or Activity	SHSP Emphasis Area	Roadway Ownership
Annual Durable Pavement Marking Project	44205	$1,650,000	Lane Departure	Roadway Departure	NHDOT
Annual Guardrail Improvements	44206	$1,650,000	Lane Departure	Roadway Departure	NHDOT
Road Safety Audits	44207	$165,000	Safety Planning	N/A	NHDOT
Brookline - Intersection Safety Improvements	43768	$143,000	Intersection	Intersection	NHDOT
Chester – NH 102/NH 121 Intersection Safety Improvements	41848	$247,500	Intersection	Intersection	NHDOT
Conway – Implement Intersection Safety Improvements	42522	$2,200,000	Intersection	Intersection	NHDOT
Durham – Implement Intersection Safety Improvements	42523	$231,000	Intersection	Intersection	NHDOT
Farmington – NH 11/Central Street Intersection Safety Improvements	43410	$1,405,800	Intersection	Intersection	NHDOT
Hinsdale, Winchester, & Fitzwilliam – Guardrail upgrades in Hinsdale, Winchester, and Fitzwilliam, Routes 10, 12, and 119.	44187	$2,004,200	Lane Departure	Roadway Departure	NHDOT
Lancaster – Shelburne RS Installation of Rumble Strips along US Route 2	40844	$528,000	Lane Departure	Roadway Departure	NHDOT
Manchester – Sheffield Road Intersection Safety Improvements	43960	$221,540	Intersection	Intersection	NHDOT
Rochester – Tebbetts Road Intersection Safety Improvements at Old Dover Road	43491	$65,000	Intersection	Intersection	NHDOT
Rochester – US 202/Estes Road Intersection Safety Improvements	43964	$275,000	Intersection	Intersection	NHDOT

Project Name	Project Number	Project Cost for FY 2024	Program, Strategy or Activity	SHSP Emphasis Area	Roadway Ownership
Salem – Improve Signal Operations at 28 Intersections to Identify Hardware and Software Upgrades Needed	42884	$90,000	Intersection	Intersection	NHDOT
Salem – NH 111/Ermer Road Intersection Safety Improvements	43790	$43,000	Intersection	Intersection	NHDOT

Project Summary

Finally, NHDOT summarized the projects for FY 2024 in Table 20. Note that the estimated funding amounts by program are similar to the allocation goals previously provided in Figure 21. Note that almost all HSIP funds for FY 2024 are allocated to Lane Departure and Intersection projects. As mentioned earlier, these allocation goals are soft and meant to be arrived at over several years.

Table 20. Summary of FY 2024 NHDOT HSIP Projects.

Program, Strategy or Activity	Estimated # of Projects	Estimated Funding	Allocation Goal
Lane Departure	4	$5,832,200	$6,014,675
Intersection	10	$4,921,840	$3,608,805
Non-Motorist	0	$0	$1,804,403
RSAs	1	$165,000	Up to $608,968
Data Improvements	0	$0	Up to $608,968
Other Projects	0	$0	Up to $608,968

Summary of Critical Path Actions

The purpose of this HSIP Implementation Plan was to evaluate the NHDOT HSIP and determine how effectively it can reduce fatalities and serious injuries and meet the State's safety performance targets. Based on the evaluation, NHDOT will take short-term, intermediate-term, and long-term actions to implement the strategies and recommendations described previously in the HSIP Implementation Plan. The primary short-term actions for NHDOT include:

- Distribute RFP and solicit proposals for crash data and safety management solution, including crash data quality improvements.
- Use the new network screening results to identify spot, systemic, and systematic projects for 2024 and beyond.
- Work with the LTAP to support the development of LRSPs by the communities and planning agencies who received SS4A grants.

These actions are on the critical path to improving the NHDOT HSIP, thus their status as short-term priority actions. NHDOT will treat this HSIP Implementation Plan as a living document. In future years, NHDOT will revisit these critical path actions, assess their completion, and replace actions as needed.