UCTC

ULSTER COUNTY TRANSPORTATION COUNCIL

ULSTER COUNTY
ROAD SAFETY PLAN

JUNE 2021

REVISED JUNE 2023

All photos sourced to Gerald Berliner unless otherwise noted.

ACKNOWLEDGEMENTS

City of Kingston

NYSDOT

New York State Police

SUNY Ulster

Trucking Association of New York

Town of Denning

Town of Esopus

Town of Gardiner

Town of Hardenburgh

Town of Hurley

Town of Kingston

Town of Lloyd

Town of Marbletown

Town of Marlboro

Town of Marlborough

Town of New Paltz

Town of Olive

Town of Plattekill

Town of Rochester

Town of Rosendale

Town of Saugerties

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Village of Ellenville

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Village of Saugerties

UCTC
ULSTER COUNTY TRANSPORTATION COUNCIL

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The Ulster County Transportation Council (UCTC) believes that improving transportation safety is a shared responsibility of the owners and operators of transportation facilities and services, travelers, law enforcement, and emergency responders. As established in the Ulster County Long Range Transportation Plan (LRTP), the major safety goals of the metropolitan planning organization (MPO) are to reduce fatalities and serious injuries in the UCTC planning area.

Strategies to address safety, security, public health, and other risks are key to achieving this goal, among others. Improving safety in transportation systems can increase efficiency and reliability of the system, encourage use across alternative transportation modes and improve quality of life for the public. UCTC developed the Road Safety Plan to utilize quantitative and qualitative data to drive the identification and prioritization of safety strategies and investments tailored to the needs of the region.

The analysis within this plan identifies trends in fatalities and serious injuries, specific locations on the local network with the highest potential for safety improvement, and the most cost-effective solutions. This analysis informed stakeholders throughout the plan development process and will aid decision making in the implementation of safety improvements in the UCTC planning area moving forward.

Stakeholder engagement was another key aspect of the plan development and tailoring the plan to the local transportation network. Engagement efforts included outreach to transportation professionals, such as law enforcement, transportation planners, engineers, emergency response providers, and others impacted by safety investments and decisions. This process also employed a Technical Advisory Committee (TAC) with insight into MPO and State safety-related expertise to review goals, analyses, and recommendations delivered throughout the plan.

A combination of analysis and stakeholder input led to a series of recommended strategies and implementable actions, each developed with a focus on reducing crashes and eliminating fatalities and serious injuries. These strategies range across infrastructure and behavioral considerations, including:

- Developing systemic analysis and treatments for emphasis areas such as roadway departure crashes;
- Implementing cost-effective safety countermeasures at priority locations;
- Continuing education and promotion of campaigns to address driver behavior; and
- Expanding collaboration with a comprehensive group of transportation safety stakeholders.

This plan serves as a blueprint for transportation professionals and decision makers in the MPO planning area to implement safety improvements efficiently to address safety priorities. UCTC's Road Safety Plan is a working document and it will be reviewed and updated every five years in line with the Long Range Transportation Plan as priorities and safety data trends change.

1 INTRODUCTION

OVERVIEW

PURPOSE

Transportation and safety partners across the Ulster County Transportation Council (UCTC) planning area have implemented safety policies, programs, and projects over the past few years to address crashes through infrastructure improvements. However, even one death on the transportation network is unacceptable, and when more agencies take a safety leadership role, more can be accomplished to reduce severe crashes. The Ulster County Road Safety Plan (RSP) provides an opportunity for the metropolitan planning organization (MPO) and local member jurisdictions to inform a proactive framework for lowering fatalities and serious injuries in the region.

This RSP provides the MPO and decision makers with sufficient information to understand and prioritize the transportation safety needs throughout the Ulster County Transportation Council (UCTC) planning area. This plan also identifies opportunities to educate and collaborate with other transportation safety stakeholders. Development of the RSP uses a data-driven process that ends in clear guidance and investment choices aimed at reducing the number and severity of all crashes that occur on the transportation system.

FHWA Proven Safety Countermeasure

While local roads are less traveled than State highways, they experience around three times the fatality rate[1] of the Interstate Highway System. The Federal Highway Administration (FHWA) promotes local road safety plan (LRSP) development as a proven safety countermeasure for identifying, analyzing, and prioritizing roadway safety improvements on local roads. FHWA provides guidance, tools, and best practices for developing these plans as a framework tailored to local safety issues and needs, while also suporting the overal goals of the State's SHSP. The process results in a prioritized list of issues, risks, actions, and improvements that can reduce fatalities and serious injuries on the local and surrounding road network.

[1] FHWA, "Local Road Safety Plans", *Proven Countermeasures.* safety.fhwa.dot.gov/provencountermeasures/local_road/

PROCESS TO DEVELOP PLAN

Figure 1. FHWA Local Road Safety Plan Development Process

UCTC utilized aspects of the FHWA six-step process for developing a Local Road Safety Plan[2]. The process is meant to be cyclical, allowing for continuous review and updates. This approach and framework were tailored to the unique needs and circumstances of the UCTC planning area. Each of these elements is discussed in detail throughout the plan.

The first step of developing the RSP requires leadership and coordination around safety in the region. UCTC started by convening a Technical Advisory Committee (TAC) to help oversee the process and confirm priorities at the State and MPO level. Stakeholders from the planning area were also brought together for input on goals, analysis, emphasis areas, priority locations, and key elements of the plan. Each of these groups provided expertise to supplement the analysis throughout the development process.

The safety data analysis was developed to help drive decision making on potential emphasis areas and priority projects for the plan. Safety data analysis included a review and collection of existing safety-related data and documentation, trends and contributing factors analysis, and a network screening. This analysis and the methods used are discussed throughout the plan, including qualitative data provided from stakeholder feedback.

TECHNICAL ADVISORY COMMITTEE

- NYSDOT
- NYSP
- SUNY Ulster Health and Safety
- Ulster County DPW
- Ulster County Traffic Safety Board

Combining the quantitative and qualitative data findings, UCTC identified key emphasis areas and developed strategies to address them. Strategies were also developed for priority locations from the network screening and further refined by TAC and stakeholder feedback. These strategies include specific safety infrastructure improvements, systemic considerations for the entire network, and strategies outside of engineering and infrastructure.

Finally, the last step before repeating the process is to monitor progress on implementation of the strategies and evaluate the existing plan. This is designed to be a living document where priorities and actions are data-driven, and actions and strategies are updated as the safety data trends change and reveal new priority safety

[2] FHWA, "Developing Safety Plans: A Manual for Local Rural Road Owners", *Local and Rural Roads*. https://safety.fhwa.dot.gov/local_rural/training/fhwasa12017/

concerns. The cycle will follow a five year schedule to coincide with the UCTC Long Range Transportation Plan update.

2 SAFETY ANALYSIS

REGIONAL ANALYSIS AND NETWORK SCREENING

In alignment with the State Strategic Highway Safety Plan and the UCTC LRTP, UCTC and its stakeholders seek to reduce fatalities and serious injuries from the region. Analyzing crash trends for the region and network priorities provides a clear understanding of the largest contributing factors, overrepresented crash types, and common roadway risk characteristics. The project team presented this analysis to stakeholders and used their feedback to develop recommended strategies and safety improvements tailored to the UCTC planning area.

REGIONAL ANALYSIS

The project team examined crash data for long-term trends and averages to avoid short-term statistical anomalies and outlier datapoints that can lead to improper conclusions. Regional trend analysis reviews fatality and serious injury totals, rates, contributing factors, and collision types, including potential emphasis areas.

Program and Document Review

Transportation and safety related documents in New York State, the UCTC planning area, and local jurisdictions were collected and reviewed to better understand the types of safety policies, programs, and projects already in place that could inform and enhance this Safety Plan. The project team succinctly summarized each document and its applicability to the Safety Plan. Based on feedback from the TAC, the following documents were reviewed:

- New York State Strategic Highway Safety Plan
- New York State Highway Safety Improvement Program
- New York State Pedestrian Safety Action Plan
- New York State Complete Streets Report
- UCTC Long Range Transportation Plan
- UCTC Transportation Improvement Program
- UCTC Road Safety Assessment
- City of Kingston Comprehensive Plan
- Town of New Paltz Comprehensive Plan

A summary of the findings from the review of each of these is available in **Appendix B – Document Review**.

Data Collection

In New York, police agencies submit a standard report after all crashes to the Department of Motor Vehicles (DMV); the DMV in turn makes the coded data available to New York State Department of Transportation (NYSDOT), which uses a Geographical Information System (GIS)-based application called the Accident Location Information System (ALIS) as its database to store the geolocated crash data reports. MPOs and other agencies may query ALIS for crash information by location, type, and other factors.

Crash Data

The project team collected crash data for the UCTC planning area for all years between 2010 and 2018, then downloaded the data in Excel format and included report fields, including but not limited to injuries, collision type, driver behaviors, roadway conditions, weather, lighting, and user/vehicle types. Geographic locations for each crash were used to analyze crash concentrations, join roadway and traffic data, and complete network screenings. Each crash is identified by a unique case number, as well as occupant and vehicle information.

Roadway Data, Traffic Volumes, and Population

Comprehensive roadway data for the region, including functional class, roadway ownership, speed limits, and annual average daily traffic (AADT), was also used in this analysis. The project team joined roadway data through GIS to the individual crashes for analysis purposes. Comprehensive vehicle miles travelled (VMT) data for each year between 2010 and 2018, summarized by functional class, municipality, and ownership, were also collected.

The project team obtained population data through the American Community Survey (ACS) five-year estimates of population for each municipality in Ulster County.

Data Analysis Results

Figure 2. Fatalities and Serious Injuries by Year (2010-2018) shows fatalities and serious injuries from 2010 to 2018. Serious injuries and fatalities both declined between 2010 and 2016. However, the highest number of fatalities (24) occurred in 2017, and serious injuries increased by 25 percent between 2017 and 2018, hitting their highest total since 2010. Spikes in recent years highlight the importance of not only reviewing long-term data and addressing trends reactively, but also proactively addressing causal factors to maintain decreasing trends.

Figure 2. Fatalities and Serious Injuries by Year (2010-2018)

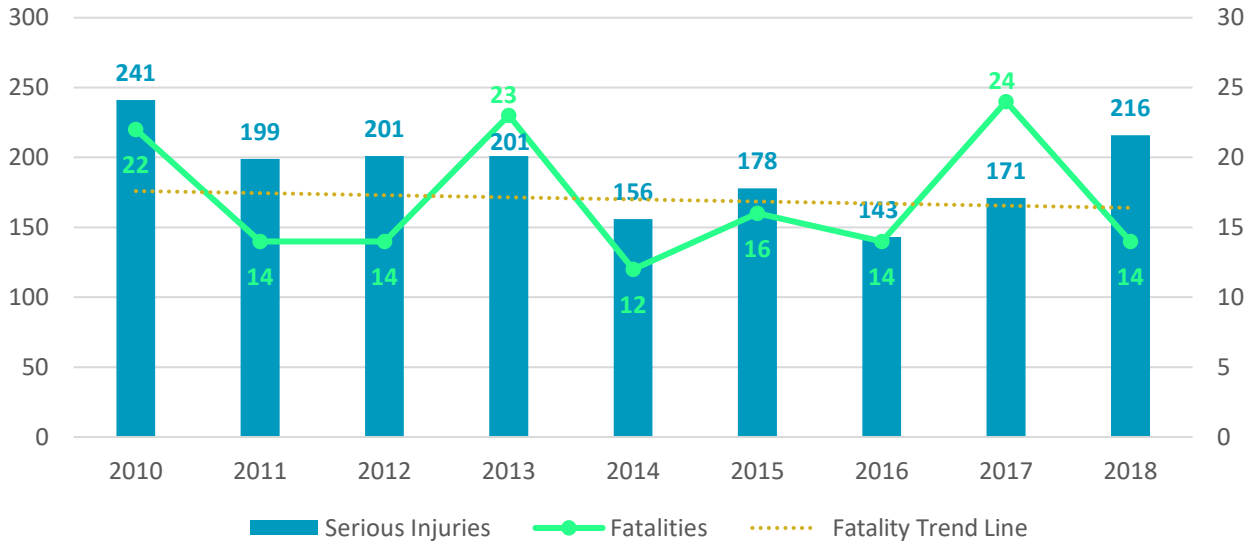
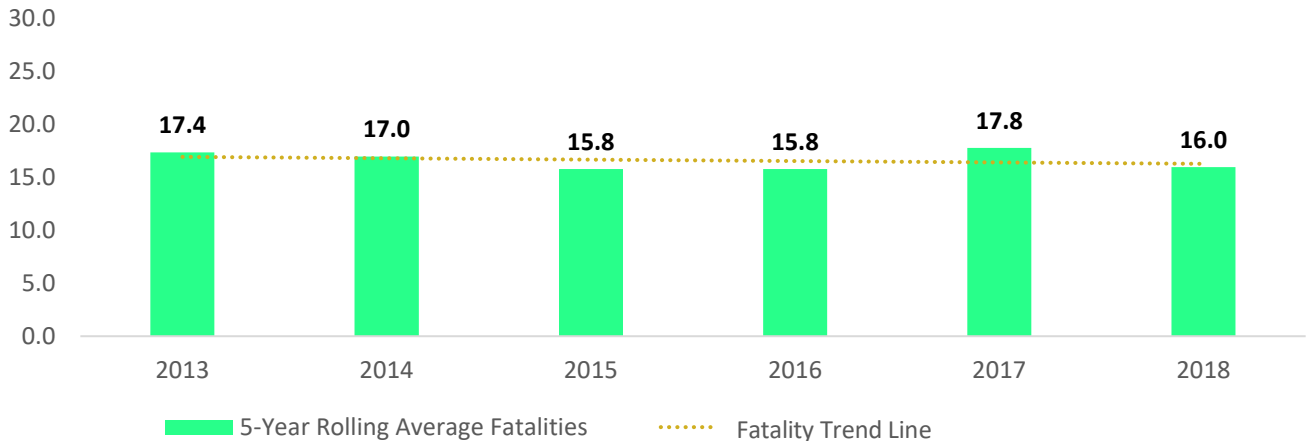
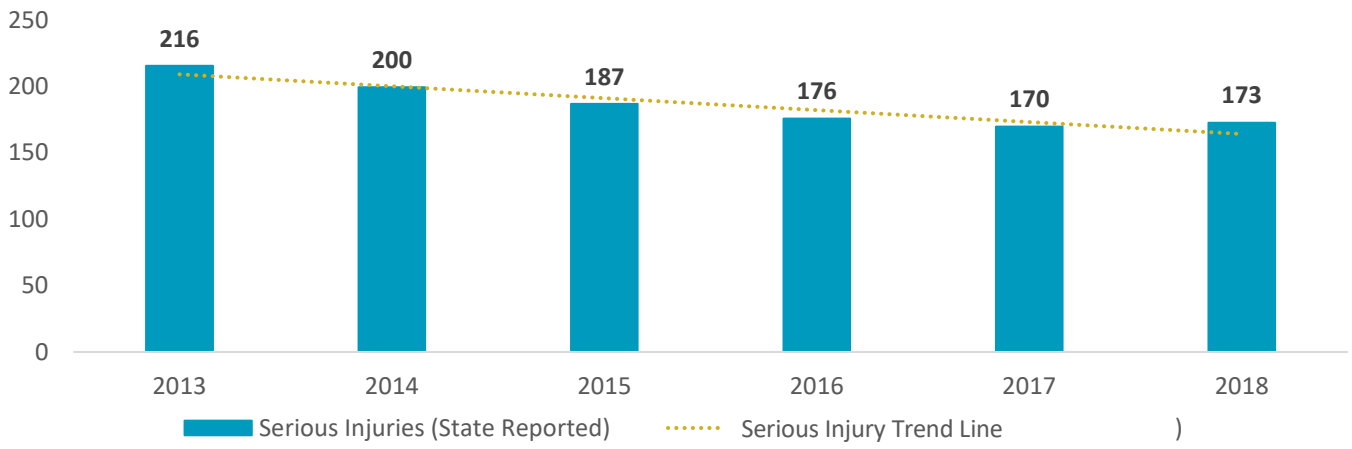


Figure 3. Fatalities by Five-Year Rolling Average



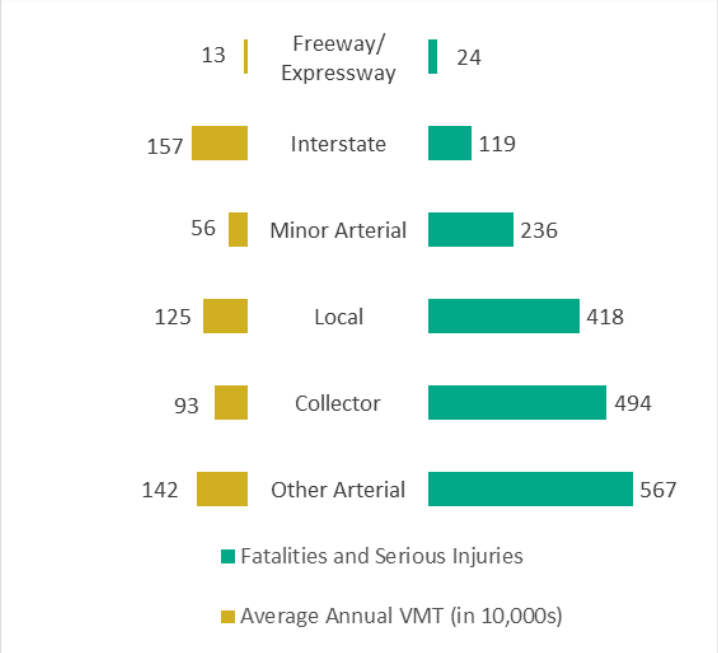
The total number of fatalities has stayed relatively consistent, with a five-year rolling average (**Figure 3. Fatalities by Five-Year Rolling Average**) ranging around 16 or 17 average fatalities between the 2009-2013 average and 2014-2018 averages, while serious injuries have mostly decreased in the same period, with the five-year rolling average (**Figure 4. Serious Injuries by Five-Year Rolling Average**) falling from 216 in 2009-2013 average to 170 in 2014-2017 average. There was an uptick in the five-year rolling average for the 2014-2018 average due to the annual number of serious injuries returning to 216 in 2018 (**Figure 2. Fatalities and Serious Injuries by Year (2010-2018)**). For reference, the highest annual number of fatalities (22) occurred in 2017, while 2010 saw the highest number of serious injuries (241).

Figure 4. Serious Injuries by Five-Year Rolling Average



In 2018, the UCTC had a fatality rate of 7.3 per 100,000 residents, which was higher than the New York State rate of 4.8 per 100,000 residents, but lower than the nationwide rate of 11.2. The analysis also filtered fatalities and serious injuries by municipality to identify areas of the county that might be overrepresented. These results were normalized by vehicle miles traveled (VMT) in each municipality, shown in **Appendix C – Additional Crash Analysis**. Denning (29.2), Hardenburgh (28), and Kingston (22.3), had the three highest rates of serious injuries per 100 million VMT, while Gardiner (1.9), Olive (1.7), and Lloyd (1.7) had the highest rates of traffic fatalities. Also, when normalized for population, a disproportionate number of fatalities and serious injuries occurred in Lloyd and Denning, respectively.

Figure 5. Fatalities and Serious Injuries Compared to VMT by Functional Class



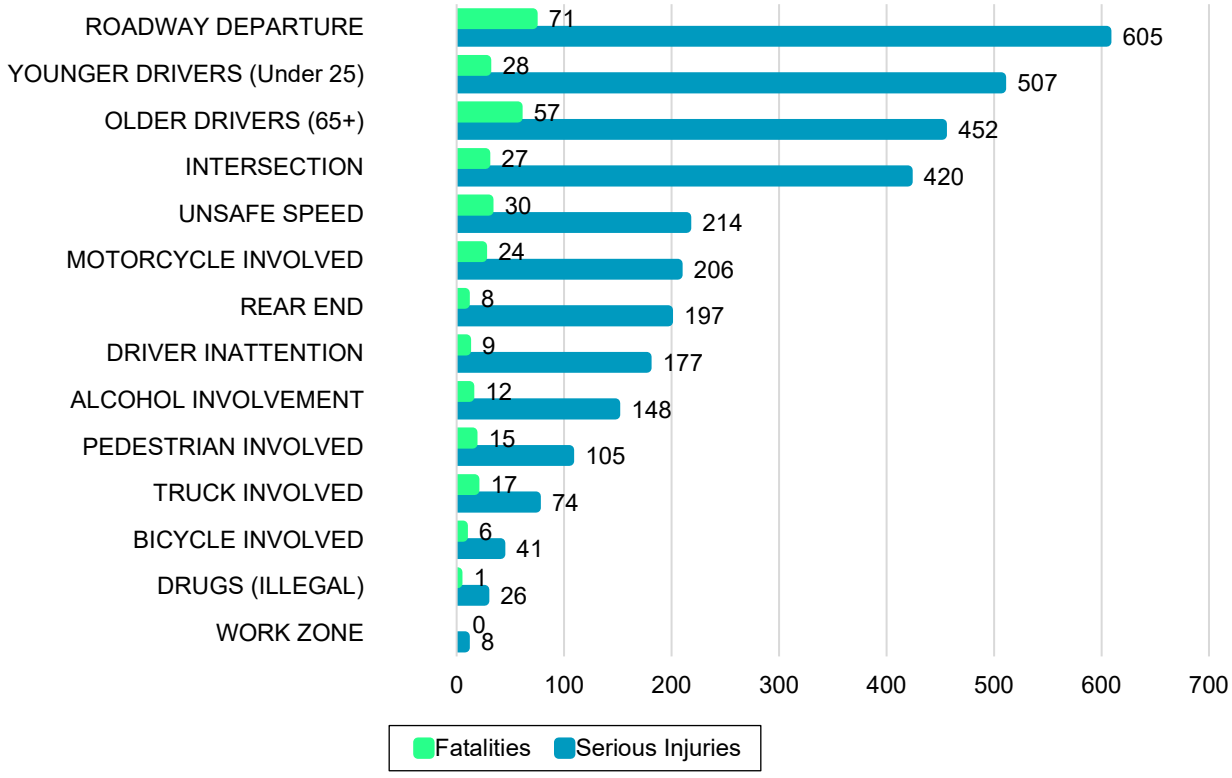
In a review of crash data by functional class and roadway location, fatality and serious injury rates are greatest on collector roads, in both rural and urban contexts, while interstate highways have the lowest rate of fatalities and serious injuries when normalized by VMT (**Figure 5.Fatalities and Serious Injuries Compared to VMT by Functional Class**). Arterial roadways also see relatively high rates of fatalities and serious injuries in both urban and rural contexts.

Collision Types and Contributing Factors

Collision types refer specifically to the manner in which the crash took place, such as a rear-end crash or a turning crash. Contributing factors focus on aspects of the crash report that discuss potential overlapping aspects, such as driver age, impairment, and distraction, that help determine effective strategies. Some of these are highlighted as potential emphasis areas identified at the State level.

One of the key goals of this analysis was to understand the types of collisions and factors that lead to serious injuries and fatalities. Some of the highest contributors to fatalities and serious injuries in Ulster County include younger drivers (under 25 years of age), older drivers (65+), and crashes that occur at intersections. This is shown in **Figure 6**.

Figure 6. Fatalities and Serious Injuries by Emphasis Area

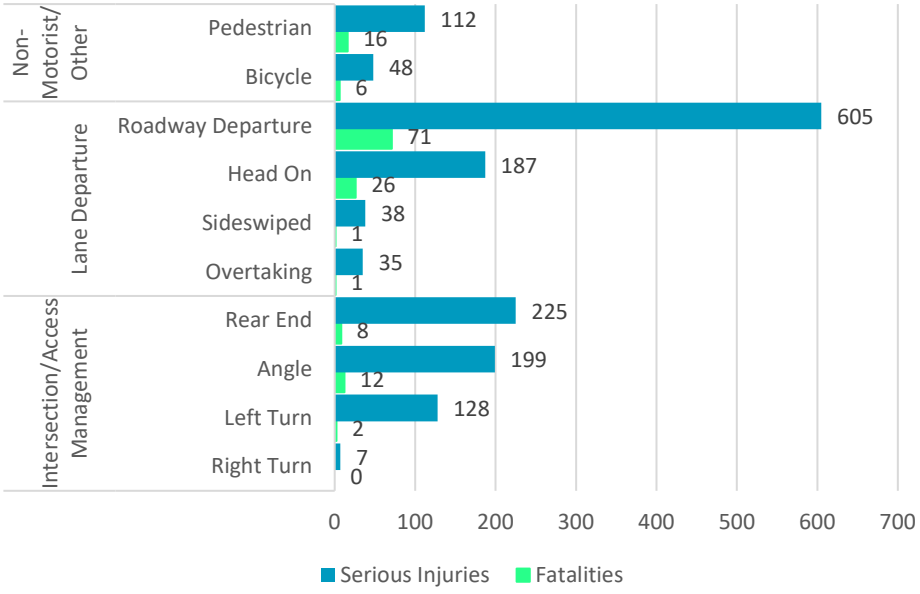


Roadway departure emerged as the highest contributor to fatalities and serious injuries, accounting for almost 50 percent of fatalities where a crash type could be identified. The TAC and stakeholders also deemed it a key emphasis area, resulting in additional investigation regarding crash trends. Roadway departure crashes can be defined as any crash that is the result of a vehicle leaving a roadway. Trees, utility poles, and guide rails were the most common objects that vehicles collided with during roadway departure incidents that resulted in serious injuries or fatalities. Roadway departure crashes resulting in fatalities or serious injuries are most common on local and collector roadways.

There is also significant overlap between roadway departure crashes resulting in fatalities or serious injuries and those involving younger drivers, as 28 percent of roadway departure fatalities or serious injuries involved a younger driver. The project team analyzed both weather and roadway conditions to understand their relationship with roadway departure crashes. While only 34 percent of all crashes occur in non-clear weather conditions, 42 percent of roadway departure crashes occur when conditions are reported as something other than clear, suggesting a small relationship between non-clear weather conditions and roadway departure crashes. Similarly, 18 percent of all crashes are reported as taking place on roadways that are not dry, while 27 percent of roadway departure crashes are reported on roadways that are not dry, indicating that wet roadways do contribute to roadway departure crashes.

Serious injuries and fatalities among cyclists and pedestrians were a key emphasis area for the region as well. Looking at recent trends, both serious injuries and fatalities have increased since 2010 for non-motorists. While the overall totals of fatalities and serious injuries to pedestrians and bicyclists struck by vehicles remain low, the last two years of available data show an increase, with 2017 seeing a high of 5 fatalities and 22 serious injuries. These fatalities and serious injuries are heavily concentrated in the county's largest jurisdictions, with 24 percent occurring in Kingston and 11 percent each in New Paltz, Saugerties, and Ulster. Additionally, collectors and arterial roadways remain the predominant functional classes for pedestrian and bicyclist fatalities and serious injuries.

Figure 7. Fatalities and Serious Injuries by Crash Type



NETWORK SCREENING

A network screening is a method for identifying specific roadway locations with the highest potential for safety improvement and prioritizing where to invest in safety improvements. This analysis segments and divides the transportation network into comparable sites using crash history and specific factors, such as AADT, crash costs by severity, and even particular crash types or emphasis areas as desired. Locations can be ranked around a set of clearly defined criteria to assist in decision making on resource allocation based on the purpose of the methodology and priority list.

Methodology

The network screening considered both intersections and segments separately to provide two priority lists. Methods and criteria were similar for each list and are summarized in the following sections.

Intersections

Intersection points were created where two or more line segments crossed or intersected within the 2018 NYSDOT Roadway Inventory System. At the generated point, the following data required for ranking were attributed through GIS.

Crashes (2014-2018) within a 150-feet radius of an intersection point were flagged as "at intersection" and attributed or tied to that intersection. Crash criteria collected through the network screening process included the average number of crashes that occur at the intersection per year, crash costs based on crash severity, manner of collision or crash type that appears the most times within the attributed crashes, and manner of collision or crash type that appears the most times within the attributed fatal and serious injury crashes.

Roadway data and site types are also useful to analyze and compare the intersections, as well as provide context in the evaluation process to determine potential improvements. Other data collected and assigned to each intersection included AADT, the number of lanes, and speed limit.

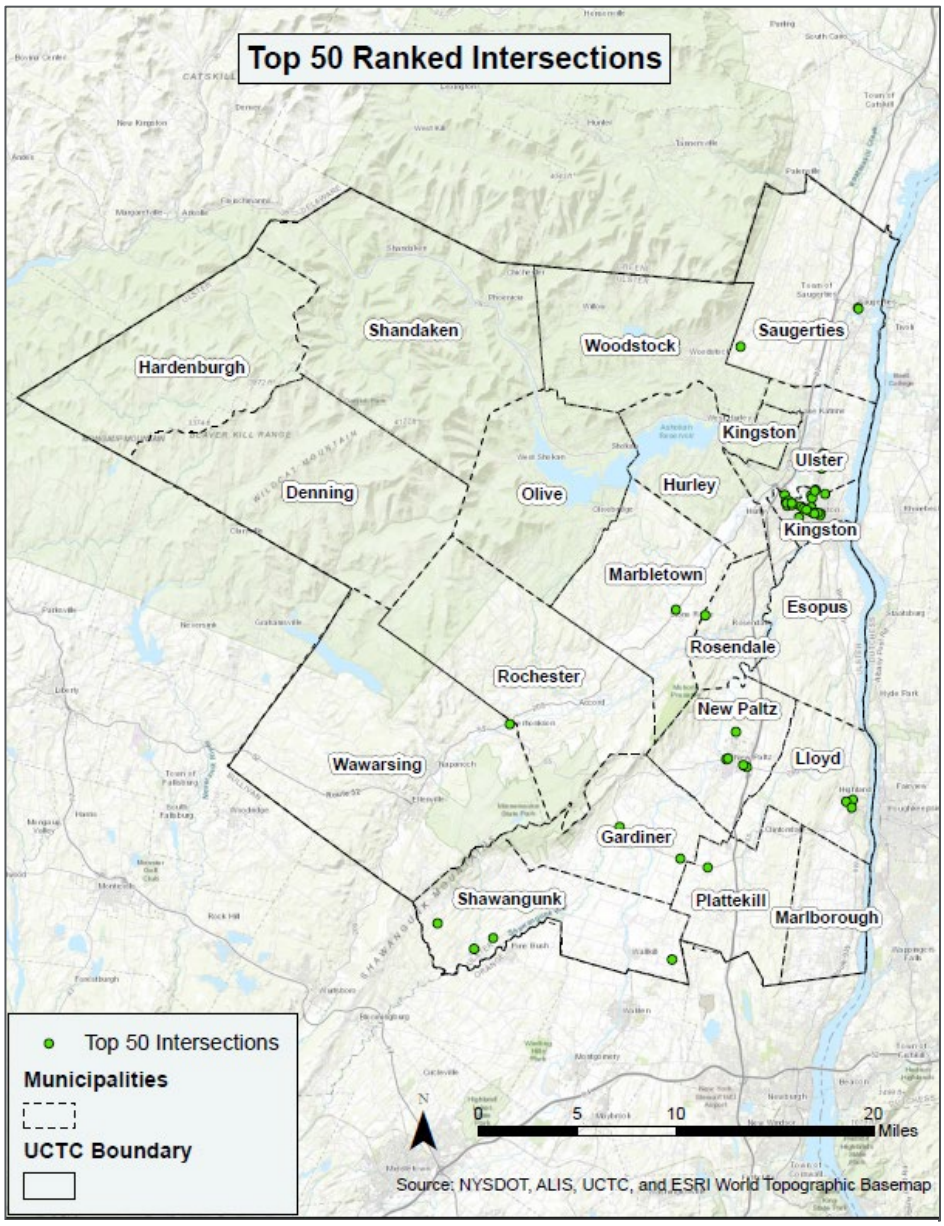


Figure 8. Top 50 Priority Intersections

Segments

A sliding window of 600 feet or 0.11 miles was used to group crashes along the roadway network into individual segments for evaluation, sliding every 150 feet or 0.03 miles. A buffer of 50 feet was also used on either side of the roadway line to adjust for misalignment of crash data locations with the roadway.

Crash data (2014-2018) attributed to intersections was not considered in the segment analysis. Remaining crashes were attributed to the segments identified through the network screening process based on the crash location. Criteria developed for each segment included the average number of crashes per mile per year, crash costs based on crash severity per mile, manner of collision or crash type that appears the most times within the attributed crashes, and manner of collision or crash type that appears the most times within the attributed fatal and serious injury crashes.

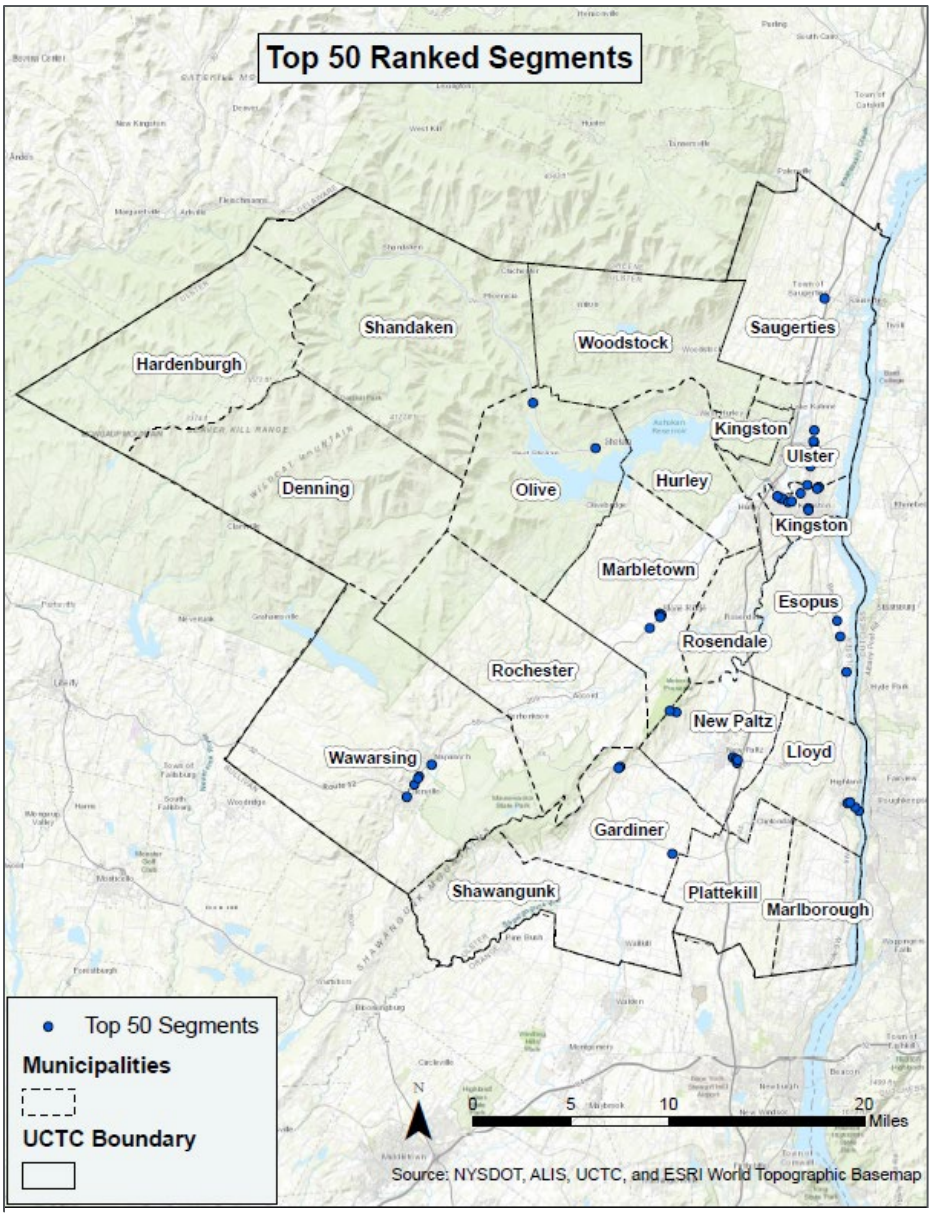


Figure 9. Top 50 Priority Segments

Roadway data and site types are also useful to analyze and compare the segments, as well as provide context in the evaluation process to determine potential improvements. Other data collected and assigned to each segment included AADT, the number of lanes, and speed limit.

Ranking

The project team used the extracted data to develop rankings for the crashes per year (and per mile for segments), normalized by AADT, and the overall crash severity weighted in terms of crash costs. These two rankings were combined for the overall intersection and segment priority lists.

The team also implemented thresholds prior to developing the top-50 lists using the NYSDOT's Priority Investigation Location (PIL) and Priority Investigation Intersection (PII) criteria. These provide a minimum crash totals based on roadway context and minimum crash rate (upper control limit) for a given location to stay on the list, helping to eliminate those locations that may have a couple outlier high severity crashes or a crash rate overrepresented based on the AADT.

3 TAC AND STAKEHOLDER ENGAGEMENT

OUTREACH

Comprehensive stakeholder engagement drove the majority of the decisions and strategies related to the RSP. UCTC provided outreach to a diverse number of stakeholders and the TAC through virtual workshops and recording, analysis results and graphics, and surveying through tools like online feedback mapping.

TECHNICAL ADVISORY COMMITTEE

The TAC was composed of safety experts from the MPO and the State with an understanding of priorities and resources for safety programming in future years. Members of TAC represented various agencies that could assist UCTC in generating an actionable and informed plan.

Meetings between the UCTC and the TAC were held leading up to each step of the process, including the analysis, stakeholder workshops, priority location selection, and recommendation development. TAC feedback and support were solicited for all of the materials and decisions to be shared with stakeholders, as well as every element of the final plan.

STAKEHOLDER WORKSHOPS

UCTC also reached out to transportation and safety stakeholders throughout the region, including elected officials and Highway Superintendents from every jurisdiction within the MPO, members of the Ulster County Traffic Safety Board, education representatives, and groups representing specific modes such as transit, trucking, and non-motorists.

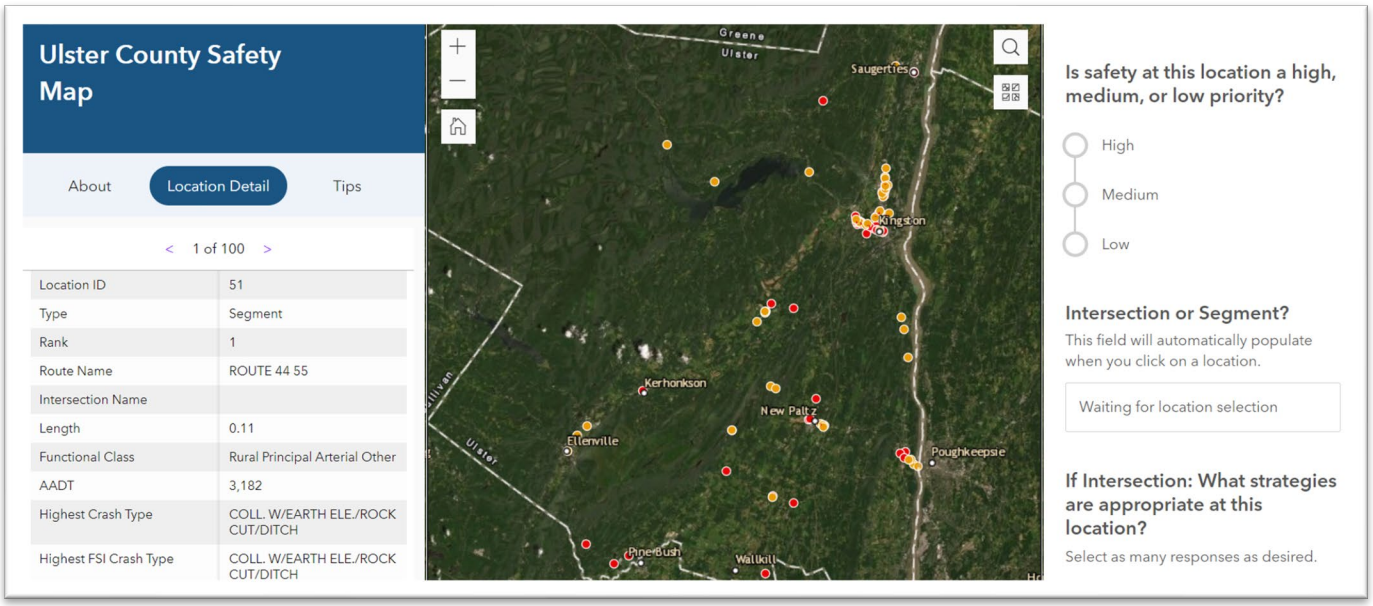
Stakeholder workshops were conducted to provide updates on important steps within the plan development process, as well as key future steps. These workshops included presentations and findings from the document and program review, general trends and regional analyses, and priority locations resulting from the network screening. This background helped stakeholders understand the purpose of the UCTC RSP, as well as the concerns it could address.

Following background on the purpose of the plan, the process, and the available data and documentation, stakeholders were solicited for input on selecting emphasis areas for additional analysis and considerations for recommended improvements as a result of the plan, as well as safety strategies unrelated to engineering that would be beneficial to consider or prioritize in the future.

The major action items requested of the stakeholders in regard to priority locations were 1) to help identify the top priority locations from the top-50 lists and 2) to select preferred countermeasures to be considered at the locations. Priority locations were shared through an online mapping tool (**Figure 10. Online Priority Location Feedback Map**) through which the user could select individual priority locations and review information about the location, including roadway characteristics, speed, AADT, and highest crash types.

Stakeholder input was then collected via a survey within a mapping tool that asked the user for the location's priority level and preferred improvement types based on the type of location.

Figure 10. Online Priority Location Feedback Map



STAKEHOLDER AND TAC INPUT

Stakeholders and the TAC agreed that reducing the highest severity and most costly crashes should be a priority of the plan. They also confirmed, based on the regional trends and analysis presented, that roadway departure crashes and non-motorist crashes should be emphasis areas within the plan, including the roadway characteristics and contributing circumstances most likely to lead to those crash types.

They also provided a number of strategies related to education, enforcement, and emergency medical services based on the results and findings of the regional trend analysis on fatalities and serious injuries, as well as their experience working in transportation.

TAC and stakeholder input were also significant factors in the selection of the top-10 priority locations and recommended countermeasures. As explained in **Priority Lists**, their input helped prioritize the final top locations and elevate the considerations for certain treatment types.

4 PRIORITY SAFETY ISSUES AND LOCATIONS

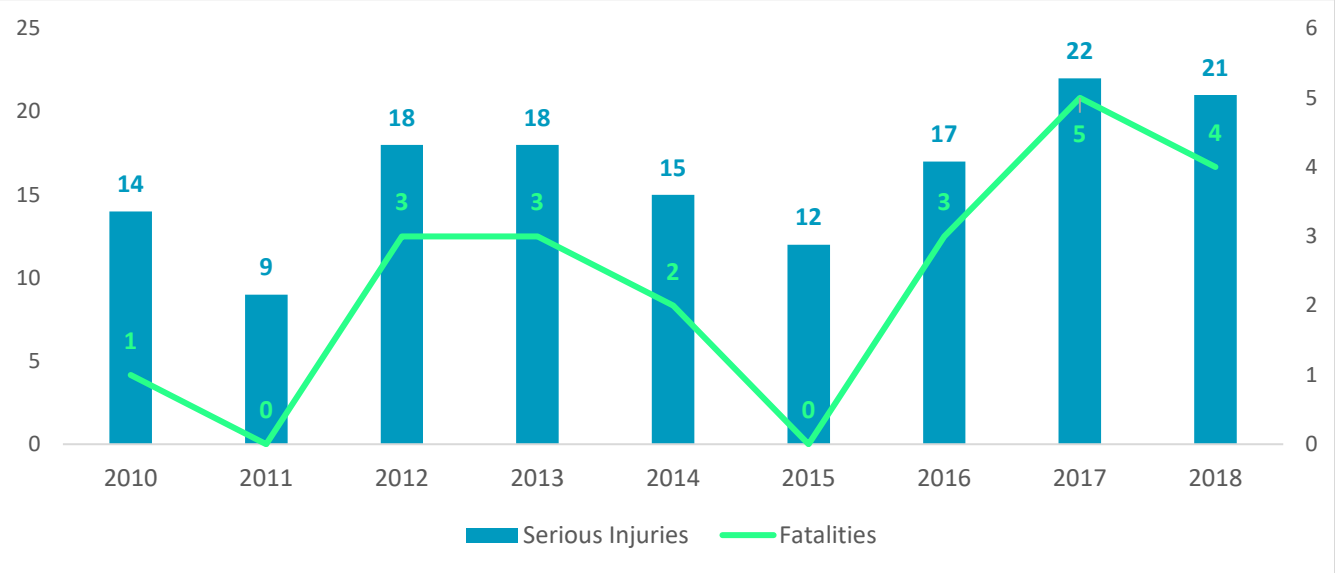
EMPHASIS AREAS

The emphasis areas that emerged from the preliminary analysis for the county include pedestrian/bicyclist and roadway departure. These are both priorities for the MPO, the State, and stakeholders. Each has very different causal factors and very different potential solutions.

PEDESTRIANS AND BICYCLISTS

Non-motorists make up a relatively small percentage of the total fatalities and serious injuries for the region, but, as highlighted by stakeholders, this is a growing area of concern. Following the plan's mission, there is interest in increasing the availability and use of these modes and keeping them safe. While the overall numbers of fatalities and serious injuries to people walking and biking remain low, the last two years of available data show an increase. Pedestrians and bicyclists are some of the most vulnerable user types and have a much higher percentage chance of being injured or killed in a collision with a motor vehicle compared to the other modes of travel or even other collision types.

Figure 11. Pedestrian and Bicyclist Fatalities and Serious Injuries by Year

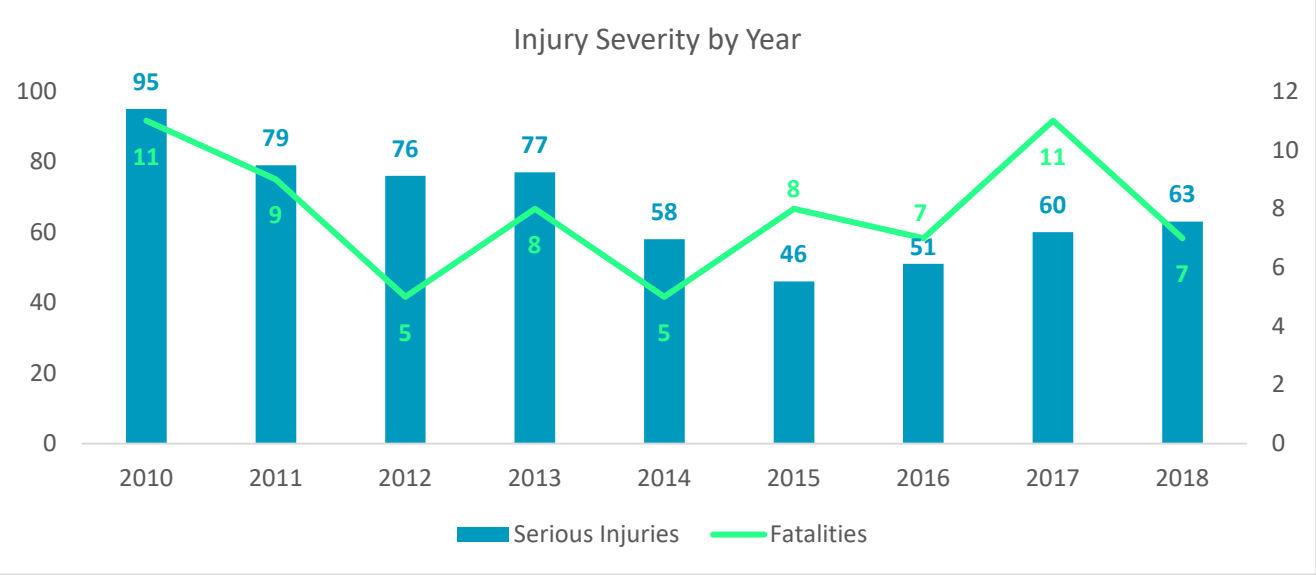


Naturally, fatalities and serious injuries among people walking and biking are heavily concentrated in the county's most populated jurisdictions. The deeper analysis of this emphasis area showed the county's collectors and arterials are the predominant functional classes for pedestrian and bicyclist fatalities and serious injuries, and non-motorist serious injuries and fatalities are more likely to occur during clear conditions (69 percent of crashes) than vehicle occupant injuries or fatalities (63 percent), which is likely due to the increase in cyclists and pedestrians in clear conditions.

ROADWAY DEPARTURE

Roadway departure crashes contributed the highest percentage of total fatalities and serious injuries (nearly 50 percent) among all crash types and contributing circumstances. Stakeholders identified this as a regional emphasis area and a key concern for many of the segments and priority locations from the network screening results.

Figure 12. Pedestrian and Bicyclist Fatalities and Serious Injuries by Year



The emphasis area analysis showed roadway departure crashes resulting in fatalities or serious injuries are most common on local and collector roadways, and trees, utilities, and guide rails are the most frequent objects struck in roadway departure collisions. Weather and roadway conditions seem to play only a minor role in roadway departure crashes, as 58 percent of roadway departure crashes took place during clear weather conditions compared to 66 percent for other crash types, while 73 percent of roadway departure crashes took place on dry roadways compared to 82 percent of all other crashes.

PRIORITY LISTS

The network screening methodology (see **Network Screening Methodology Section**) resulted in two priority lists, one for intersections and one for segments. UCTC and the TAC reviewed the priority lists to narrow the field to the top-50 intersection and top-50 segment lists (**Appendix A – Network Screening Results**) for stakeholder input, considering location aspects such as crash history, functional class, roadway ownership, and roadway characteristics.

TOP-10 PRIORITY LOCATIONS

The project team used additional analysis, review, and stakeholder input to pare down the top-50 lists to shortlist locations to be analyzed and addressed with recommended safety treatments. UCTC and the TAC finalized the top-10 locations to receive recommendations for potential safety improvements. The list includes five intersection locations and five segment locations. As part of the analysis and project identification, the team completed an inventory of roadway characteristics and safety data at each location, including any information required to complete Highway Safety Manual Predictive Analysis.

Table 1. Top-5 Intersection Locations

ID	Location Type	Route Name	Int. Route	AADT	Posted Speed (Max)	Highest Crash Type (FSI)	Roadway Owner	Jurisdiction (Rural/ Urban)	Crash Info
1	Int.	Route 44	County Route 7	2,342	55	Right Angle (Right Angle)	NYSDOT & County	Gardiner (Rural)	25 crashes 52% Inj; 3 FSI
2	Int.	Lucas Turnpike	Cottekill Rd	3,624	35	Right Angle (Right Angle)	County & County	Rosendale (Rural)	18 crashes 39% Inj; 1 FSI
3	Int.	County Route 7	Ulsterville	2,104	35	Right Angle (None)	County & Town	Shawangunk (Rural)	17 Crashes 47% Inj
4	Int.	Route 44	State HWY 208	6,958	55	Rear End (Left Turn)	NYSDOT	Gardiner (Rural)	27 crashes 26% Inj; 1 SI
5	Int.	Route 208	Wallkill & Central	8,574	35	Rear End (Head On)	NYSDOT & County & Town	Wallkill (Urban)	27 crashes; 26% Inj; 1 SI

Table 2. Top-5 Segment Locations

ID	Location Type	Route Name	AADT	Posted Speed	Highest Crash Type (FSI)	Roadway Owner	Jurisdiction (Rural/Urban)	Crash Info
6	Segment	Route 44	3,182	55	Fixed Object (Fixed Object)	NYSDOT	Gardiner (Rural)	23 Crashes 39% Inj; 3 SI
7	Segment	N Front St	6,584	30	Right Angle (Bicycle)	City	Kingston (Urban)	44 crashes 13% Inj; 2 SI
8	Segment	Route 28	5,858	55	Rear End (Head On)	NYSDOT	Olive (Rural)	13 Crashes 23% Inj; 1 SI
9	Segment	Morton Blvd	8,255	30	Right Angle (Pedestrian)	Town	Ulster (Urban)	18 Crashes 17% Inj; 2 SI
10	Segment	Mohonk Rd	3,247	35	Rear End (None)	County	Marbletown (Rural)	12 crashes 17% Inj

5 RECOMMENDATIONS AND IMPLEMENTATION PRIORITIES

STRATEGIES AND RECOMMENDED ACTIONS

The most important outcome of the analysis and stakeholder engagement during the plan development process are the specific actionable recommendations and steps to be taken to implement the plan. This section summarizes the implementation strategies the UCTC will consider to reach their safety goals. This plan is a working document and should be reviewed annually and revised every five years.

EDUCATION, ENFORCEMENT, AND EMERGENCY MEDICAL SERVICES

The plan development process and outreach provided insight into the safety strategies outside of engineering that remain equally important for meeting the safety goals of the UCTC and addressing changes in the planning area. Throughout stakeholder and TAC engagement, the following strategies were highlighted for inclusion in the plan and prioritization for further investment and resource allocation in future years:

- Increase coordination and collaboration with EMS providers and enforcement;
- Continue utilizing education campaigns focused on driver behaviors such as impairment and distraction; and
- Expand coordination and outreach to education, non-motorist, and other non-engineering fields.

EMPHASIS AREA AND SYSTEMIC IMPROVEMENTS

Pedestrians and Bicyclists

The project team developed the non-motorist crash rankings for the network's segments and intersections that can be used to prioritize recommended pedestrian and bicycle infrastructure improvements, including those stakeholder priorities by the stakeholders.

Roadway Departure

For future systemic analysis related to roadway departure, roadway attributes in the NYSDOT roadway inventory have been associated to the segments generated in the network screening by spatially matching the center points of the 600-ft segments to the roadways. The attributes are consistent with NYSDOT's methods and criteria for analyzing the network systemically for roadway departure candidates. This includes the aggregation of crash types used by NYDOT's criteria.

TIMELINE

As projects are identified and prioritized, an implementation timeframe should be established for each action. For roadway treatments, low-cost (below $30,000) countermeasures should be implemented in the near term, 1-3 years, while larger scale improvements should be considered for mid-range, 4-10 years, or as funding becomes available.

New and existing TIP projects should be evaluated against the priority network. For projects at locations identified on the priority network, the Countermeasure Selection Toolkit should be used to identify treatments given the crash types seen. These treatments should be considered, evaluated, and implemented to address safety issues.

PRIORITY LOCATIONS

The following provides a summary of the analysis and recommendations for each of the top-10 priority locations. Each summary includes potential safety countermeasures, such as roadway, signal, and signage improvements designed to reduce crashes. The Crash Modification Factor (CMF) for each improvement represents the relative amount the crash frequency will be impacted by this improvement. This is done by multiplying the CMF by the crash frequency. For example, a CMF of 0.90 at a location with a predicted crash frequency of 10 crashes per year would result nine remaining predicted crashes per year, a reduction of 10 percent or one crash per year. The Benefit/Cost (B/C) Ratio shows the expected benefits of the project quantified by the costs avoided by expected crash and injury reductions over the life of the improvement divided by the cost. This ratio allows for comparison between potential improvements by their economic benefit of crash reductions and their general cost. A legend for each of the provided crash diagrams is available in **Appendix D – Crash Diagrams**

Intersections

Location 1: US-44 & CR-7

This intersection is in rural Gardiner at the junction of a rural major collector and a rural minor collector. The intersection is stop controlled for the minor road only. This location is the top-ranked intersection from the network screening process based on crash rates and severity. Stakeholders and members of the TAC ranked this location as a "high" priority. The treatments recommended combine feedback and benefit-cost comparison using the expected crash rate.

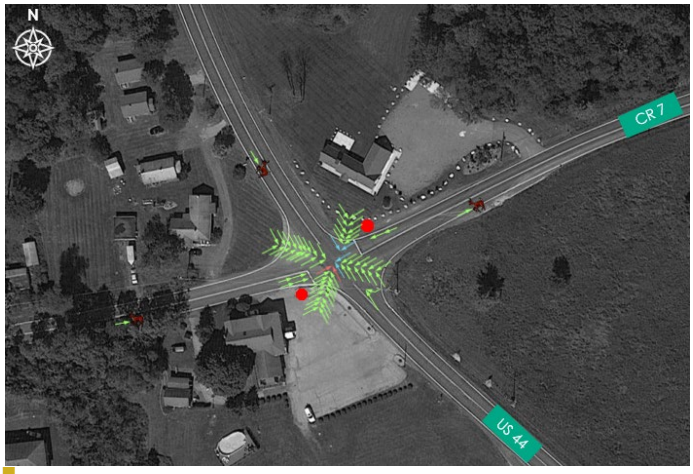


Figure 13. US-44 & CR-7 Crash Diagram

This location had 25 total crashes from 2014-2018, 52 percent resulting in injury. Most crashes at this intersection were right angle crashes (20), which led to two serious injuries and a fatality. Many occurred due to a vehicle on CR 7 either not seeing an approaching vehicle on US 44 or misjudging the gap to complete their maneuver. A limited number of vehicles on CR 7 stopped at the stop sign and got rear-ended by vehicles following too closely, and there were also three collisions with animals in this area.

While the most severe crashes could be addressed using a roundabout or signal installation, the costs and right-of-way considerations may impact the effectiveness of these treatments, especially in the short-term. This plan also recommends a combination of low-cost countermeasures for this location. LED stop signs and intersection conflict warning signs will help raise driver awareness of the respective intersecting route and vehicles. These treatments should be implemented first and monitored.

Table 3. US-44 & CR-7 Countermeasure Summary

Treatment	Cost	Crash Modification Factor	Benefit/Cost Ratio	Notes
Install Traffic Signal	$500,000	0.56	3.2	Remove gap judgment
Roundabout	$1,500,000	0.18 (FSI)	1.9	Remove severe conflict points
LED-Enhanced Stop Signs	$15,000	0.87	31.1	
Intersection Conflict Warning Signs	$100,000	0.70	10.8	Assist with any sight distance limitations and slow US-44

Location 2: Lucas Turnpike & Cottekill Road

This intersection in rural Rosendale is the junction of a rural major collector and a rural minor collector. The intersection is stop controlled for all approaches. Members of the TAC ranked this location as a "high" priority. The treatments recommended combine feedback received at similar locations and benefit-cost comparison using the expected crash rate.

Figure 14. Lucas Turnpike & Cottekill Road Crash Diagram

This location had 18 total crashes from 2014-2018, 39 percent resulting in injury. Most crashes at this intersection were right angle crashes (11), which led to one fatality. The crashes occurred at the intersection when one vehicle either did not properly yield or missed the stop sign completely. Several crashes also occurred at the access point to the Post Office.

While the most severe crashes could be addressed using a roundabout, the costs and right-of-way considerations may impact the effectiveness or feasibility of the treatment, especially in the short-term. This plan recommends a combination of low-cost countermeasures for this location. Stop ahead pavement markings and LED stop signs will help raise driver awareness of the respective intersecting route, while improved street lighting will help drivers identify other vehicles earlier. These treatments are recommended to be implemented first and monitored.

Table 4. Lucas Turnpike & Cottekill Road Crash Diagram Countermeasure Summary

Treatment	Cost	Crash Modification Factor	Benefit/Cost Ratio	Notes
LED-Enhanced Stop Signs	$15,000	0.87	35.1	
Roundabout	$1,500,000	0.18 (FSI)	2.1	
Improve Lighting	$10,000	0.88	46.3	Fatality occurred in dark conditions
Stop Ahead Pavement Marking	$10,000	0.34	267.7	Sign and/or pavement markings

Location 3: CR-7 & Ulsterville Road

This intersection is located in rural Shawangunk at the junction of a rural minor collector and rural local road. The intersection is stop controlled for the minor route approaches. Members of the TAC ranked this location as a "high" priority. The treatments recommended are a combination of feedback received at similar locations and benefit-cost comparison using the expected crash rate.

Figure 15. CR-7 & Ulsterville Road Crash Diagram

This location had 17 total crashes from 2014-2018, 47 percent resulting in injury. The majority of crashes were right angle (11) crashes, many of which occurred when a vehicle either did not have proper sight distance and pulled out from Ulsterville Road at the stop sign or missed the stop sign entirely. A limited number of crashes also occurred where cars attempted to exit/enter the parking lot on the west side of the intersection.

While the most severe crashes could be addressed using a roundabout or signal installation, the costs and right-of-way considerations may impact the effectiveness of these treatments, especially in the short-term. This plan recommends a combination of low-cost countermeasures for this location. LED stop signs and intersection conflict warning signs will help raise driver awareness of the respective intersecting route and vehicles. These treatments are recommended to be implemented first and monitored.

Table 5. CR-7 & Ulsterville Road Countermeasure Summary

Treatment	Cost	Crash Modification Factor	Benefit/Cost Ratio	Notes
Install Traffic Signal	$500,000	0.56	1.6	
Roundabout	$1,500,000	0.18 (FSI)	0.9	Remove severe conflict points
LED-Enhanced Stop Signs	$15,000	0.87	15.3	
Intersection Conflict Warning Signs	$100,000	0.70	5.3	Assist with any sight distance limitations and slow CR-7

Location 4: US-44 & SR-208

This intersection is located in rural Gardiner at the junction of a rural minor arterial and rural major collector. The intersection is signalized and has no turn lanes. Stakeholders and members of the TAC ranked this location as a "high" priority. The treatments recommended are a combination of feedback received at similar locations and benefit-cost comparison using the expected crash rate.

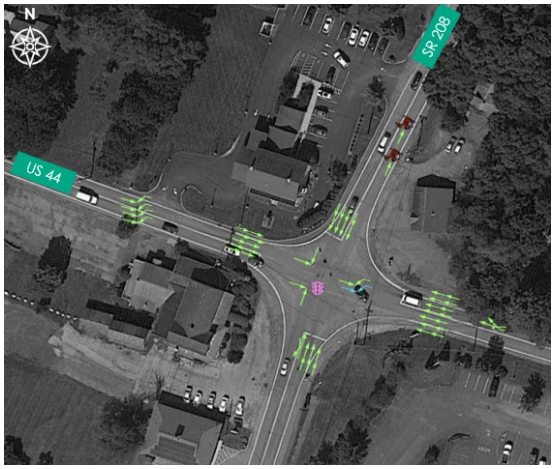


Figure 16. US-44 & SR-208 Crash Diagram

This location had 27 total crashes from 2014-2018, 26 percent resulting in injury. The majority of crashes were rear end collisions (18), where a car stopped at the traffic signal and the car behind them was following too closely or not paying attention. There were also a limited number of crashes that occurred in the intersection at right angles (3) or when a vehicle is trying to turn left (2) and the opposing vehicle hits them. One of the left turn collisions resulted in a serious injury. A limited number of crashes also occurred when cars attempted to exit/enter the parking lot to the west of the intersection on US 44.

While the most severe crashes could be addressed using a roundabout, the costs and right-of-way considerations may impact the effectiveness of this treatments, especially in the short-term for a location that is performing as expected. This plan recommends a combination of low-cost countermeasures for this location. Adjusting signal operation or adding a protected left turn phase could help reduce the severe left turn crashes, and backplates or intersection signage could help raise awareness for drivers approaching the signal and alleviate rear end crashes. However, backplates may require mast arms to support them. These treatments are recommended to be implemented first and monitored.

Table 6. US-44 & SR-208 Countermeasure Summary

Treatment	Cost	Crash Modification Factor	Benefit/Cost Ratio	Notes
Install Mast Arms	$500,000	0.85	2.1	
Roundabout	$1,500,000	0.22 (FSI)	3.3	
Backplates	$10,000	0.85	103.1	May need mast arms
Protected Left	$10,000	0.84 (left turn)	102.1	Seven percent of crashes were left turns

Location 5: SR-208 & Wallkill Avenue

This intersection is located in urban Wallkill at the junction of a urban minor arterial and urban major collector. The intersection is stop controlled including channelized right turns to and from the south leg. Members of the TAC ranked this location as a "high" priority. The treatments recommended are a combination of feedback received at similar locations and benefit-cost comparison using the expected crash rate.

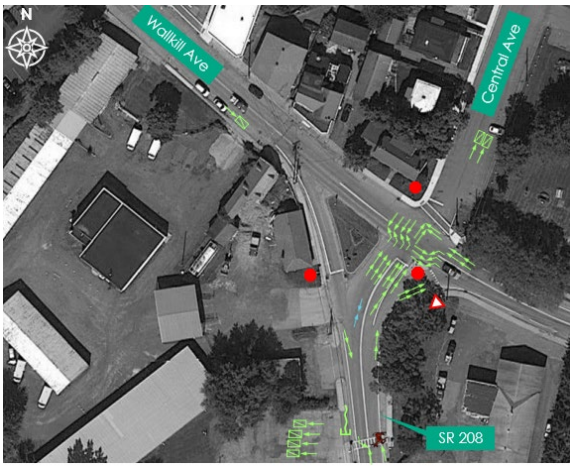


Figure 17. SR-208 & Wallkill Avenue Crash Diagram

This location had 27 total crashes from 2014-2018, 26 percent resulting in injury. The most prevalent crash types at this intersection were right angle (3) and left turn (6) crashes where a vehicle failed to yield at the stop sign between Wallkill Avenue and SR 208, as well as rear end crashes (9) that occurred when a vehicle stopped at the stop sign or slowed down to make a left turn from westbound Wallkill Ave to southbound SR 208. The only serious injury was a result of the single head-on crash. There were also several crashes with parked cars or cars entering/exiting spots on Central Avenue with perpendicular street parking and Wallkill Avenue with parallel parking.

While most crashes could be addressed by removing the skew at this intersection or constructing a roundabout or signal installation, the costs and right-of-way considerations may impact the effectiveness of these treatments, especially in the short-term. This plan recommends a combination of low-cost countermeasures for this location. LED stop signs and intersection conflict warning signs will help raise driver awareness of the respective intersecting route and vehicles. These treatments are recommended to be implemented first and monitored. Traffic calming through this area would also be beneficial.

Table 7. SR-208 & Wallkill Avenue Countermeasure Summary

Treatment	Cost	Crash Modification Factor	Benefit/Cost Ratio	Notes
Install Traffic Signal	$500,000	0.56	6.0	
Roundabout	$1,500,000	0.18 (FSI)	3.5	
LED-Enhanced Stop Signs	$15,000	0.87	59.5	
Intersection Conflict Warning Signs	$100,000	0.70	20.6	Assist with any sight distance limitations and slow SR-208

Segments

Location 6: US-44 (Main Street)

This 0.22-mile segment is a hairpin curve along US-44, located in rural Gardiner. This location is a combination of the first and second ranked segment locations from the network screening process based on crash rates and severity. Stakeholders and members of the TAC ranked these locations "high" priorities. The treatments recommended were selected from a combination of their feedback and benefit-cost comparison using the expected crash rates.

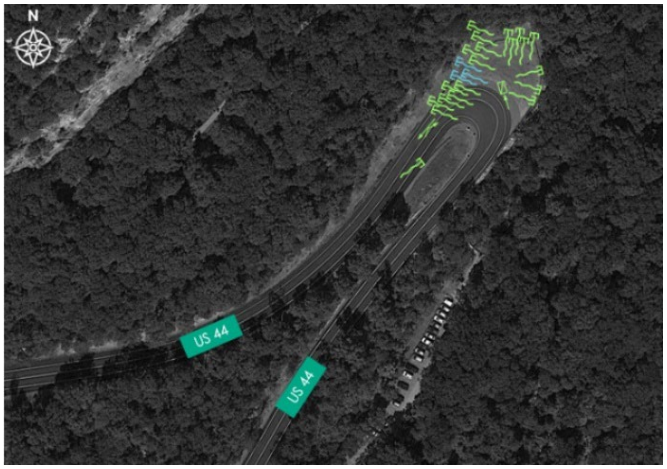


Figure 18. US-44 Crash Diagram

This location had 23 total crashes from 2014-2018, 39 percent resulting in injury. The overwhelming majority (21) of crashes at this location were fixed object crashes, where vehicles lost control while navigating the tight turn on US 44, running off the road, and colliding with the rock wall or guardrail on the curve. These fixed object crashes also contributed three serious injuries. The only side-swipe crash occurred when a large truck taking the tight turn side-swiped a smaller vehicle on the north side of the curve.

This plan recommends a combination of low-cost countermeasures for this location. Edge line rumble, chevron signs, and safety edge all have relatively high benefit-cost ratios. These treatments are recommended to be implemented first and monitored. High friction surface treatment may be considered if these crash trends persist.

Table 8. US-44 Countermeasure Summary

Treatment	Cost	Crash Modification Factor	Benefit/Cost Ratio	Notes
Edge line Rumble	$1,320	0.83	681.8	Highlighted by Stakeholders
High Friction Surface Treatment	$50,000	0.76	25.4	35% crashes occurred on wet/snow/ice road conditions
Chevron Signs	$1,000	0.75 (nighttime)	878.1	
Safety Edge	$500	0.89 (FSI)	1064.2	Proven Countermeasure

Location 7: Front Street

This 0.22-mile segment is a city-maintained urban arterial located in downtown Kingston. This location is a combination of the eighth and twelfth-ranked segment locations from the network screening process based on crash rates and severity. Members of the TAC ranked these locations "high" priorities. The treatments recommended are a combination of feedback received on similar locations with non-motorist and urban considerations, as well as benefit-cost comparison using the expected crash rate.

Figure 19. Front Street Crash Diagram

This location had 44 total crashes from 2014-2018, 13 percent resulting in injury. Most of the crashes at this location were a result of vehicles entering and exiting various access points and parking along Front Street. The highest crash frequency conflict points of this type include the parking lot entrances/exits on the north and south side between Crown and Green Street and those on the north and south side of the street west of Frog Alley and Greet Street. Cars turning into these parking lots were involved in side-swipe crashes when other vehicles tried to pass them or rear-end crashes if vehicles were following too closely. There were two serious injuries at this location, one of which was a bicyclist struck by a motor vehicle.

This plan recommends a combination of low-cost countermeasures for this location. Traffic Calming through street design, narrowing, or speed humps could help slow travel speeds through this area and reduce the angle and rear-end crashes at access points, as well as severity. The eastern portion of the segment makes use of these treatments. Reducing the number and size of access points to the parking lots identified could also reduce a high percentage of the crashes in this segment for a low cost. Bicycle infrastructure is also recommended based on the multiple bicycle crashes and access to a State Bike Route in this corridor.

Table 9. Front Street Countermeasure Summary

Treatment	Cost	Crash Modification Factor	Benefit/Cost Ratio	Notes
Traffic Calming (Speed Humps)	$1,000	0.60	861.4	Other items to match the feel of east end
Buffered Bike Lanes	$10,000	0.40 (bike crashes)	149.2	State bike route within segment
Access Management	$10,000	0.93	376.8	High driveway density (consolidate)

Location 8: Route 28

This 0.11-mile segment is located on a state-maintained rural principal arterial in Boiceville adjacent to several schools and businesses. This location ranked nineteenth among segment locations from the network screening process based on crash rates and severity. Members of the TAC ranked this location as a "high" priority. The treatments recommended are a combination of feedback received on similar locations with high volume driveways and higher speeds, as well as benefit-cost comparison using the expected crash rate.

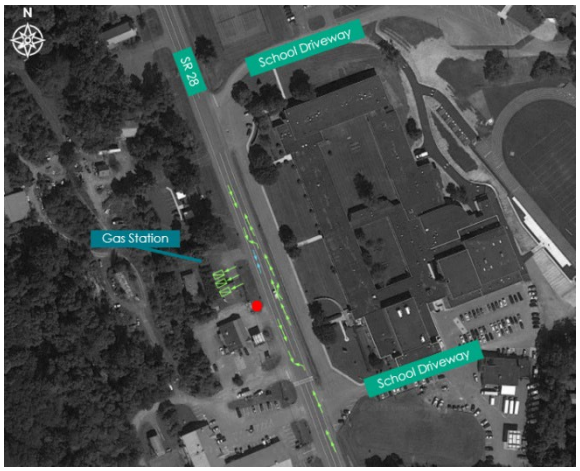


Figure 20. Route 28 Crash Diagram

This location had 13 total crashes from 2014-2018, 23 percent resulting in injury. Most crashes at this location were related to vehicles entering and exiting parking lots on the west wide of SR 28, resulting in rear-ends (6) and left turn crashes (2). There was also a serious injury from the single head-on crash at this location.

This plan recommends a combination of low-cost countermeasures for this location. Reducing the number and size of access points to the parking lots identified could also reduce a high percentage of the crashes in this segment for a low cost. Pedestrian infrastructure was also recommended based on the pedestrian crash and adjacent school in this corridor and is already in the Transportation Improvement Program (TIP).

Table 10. Route 28 Countermeasure Summary

Treatment	Cost	Crash Modification Factor	Benefit/Cost Ratio	Notes
Sidewalk	$10,000	0.45 (pedestrian)	5.8	Sidewalk project added to the TIP with construction anticipated in 2023
Access Management	$10,000	0.93	9.2	Crashes at driveways
TWLTL	$200,000	0.92	0.5	Crashes at driveways
Centerline Rumble	$2,000	0.66	223.0	Potential for additional head on crashes

Location 9: Mohonk Road

This 0.11-mile segment is located on a county-maintained rural minor collector west of New Paltz. The segment spans the entrance to the Mohonk Mountain House, including a pedestrian crossing, a narrow tunnel under a golf cart path bridge, and hidden driveways and parking lots. Members of the TAC ranked this location as a "high" priority. The treatments recommended are a combination of feedback received on similar locations with right-of-way constraints and sight distance concerns, as well as- benefit-cost comparison using the expected crash rate.

Figure 21. Mohonk Road Crash Diagram

This location had 12 total crashes from 2014-2018, 17 percent resulting in injury. Most crashes at this site were due to a one-way underpass of the golf cart path bridge, including vehicles that were too tall hitting the underside of the bridge and vehicles stopping suddenly to yield to vehicles on the other side of the bridge and getting rear-ended. There were several other rear end crashes at the Garden Road and Mohonk Road intersection and the pedestrian crossing east of that location.

The cost to widen the underpass for the bridge would likely exceed most other improvements that could be implemented and monitored. This plan recommends a combination of low-cost countermeasures for this location. Warning signage and speed advisory signage would both help address crashes caused by the bridge tunnel and the vertical curve on the western portion of the segment. Transverse rumble strips could also be helpful to alert drivers of potential slowing in traffic at the bridge, pedestrian crossing, or entrance to Mohonk Mountain House.

Table 11. Mohonk Road Countermeasure Summary

Treatment	Cost	Crash Modification Factor	Benefit/Cost Ratio	Notes
Advanced Warning Signage	$1,000	0.84	143.6	Bridge tunnel has minimal reflective warnings
Transverse Rumble Strips	$5,000	0.75	44.9	Prior to bridge and curve
Speed Advisory Sign	$1,000	0.87 (Injury)	106.6	No downhill speed advisory sign
Left Turn Lane	$100,000	0.73	2.4	At entrance of Mohonk Mountain House

Location 10: Morton Boulevard

This 0.11-mile segment is located on a town-maintained urban major collector in the Town of Ulster. The segment spans the entrance of multiple businesses and driveways. Members of the TAC ranked this location as a "high" priority. The treatments recommended are a combination of feedback received on similar locations with high traffic volume and large open driveway, as well as benefit-cost comparison using the expected crash rate.

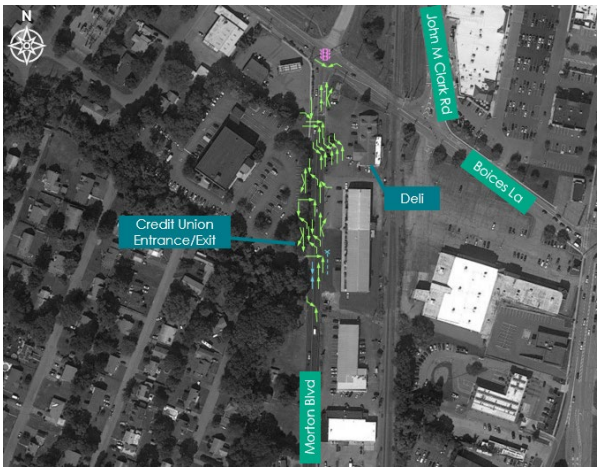


Figure 22. Morton Boulevard Crash Diagram

This location had 18 total crashes from 2014-2018, 17 percent resulting in injury. Most crashes along this segment were from vehicles entering or exiting parking lots along Morton Boulevard, including the Credit Union or the Deli. The highest crash types at these access points were right angle (7) and left turn (5) crashes. There were also two serious injuries from both a pedestrian crash and a head-on collision.

This plan recommends a combination of low-cost countermeasures for this location. Restriping and signage could alert drivers and raise awareness of the additional lane traveling north. Reducing the number and size of access points to the parking lots identified could also reduce a high percentage of the crashes in this segment for a low cost. Transverse rumble strips could also be helpful to alert drivers of potential slowing in traffic at the access points, lane shifting, and the intersection to the north.

Table 12. Morton Boulevard Countermeasure Summary

Treatment	Cost	Crash Modification Factor	Benefit/Cost Ratio	Notes
Restriping	$500	0.78	795.7	Transition to two lanes NB
Access Management	$10,000	0.93	12.7	Narrow driveway entrances
Transverse Rumble Strips	$5,000	0.75	90.4	Wide, open lanes lead to higher than posted speeds

APPENDIX

APPENDIX A – NETWORK SCREENING RESULTS

Table 13. Top-50 Priority Intersections

Route Name	Int. Route	AADT	Posted Speed (Max)	Highest Crash Type (FSI)	Roadway Owner	Jurisdiction
ROUTE 44	CR 7 BRUYNSWICK AVE	2,342	55	RIGHT ANGLE (RIGHT ANGLE)	01 NYSDOT & 02 County	Gardiner
US HIGHWAY 9W	ROUTE 44	3,210	30	REAR END (LEFT TURN)	01 NYSDOT	Lloyd
JOYS LN	WASHINGTON AVE	1,539	30	REAR END (COLLISION WITH BICYCLIST)	04 City or village	Kingston
PINE GROVE AVE	BROADWAY	4,735	30	REAR END (RIGHT ANGLE)	04 City or village	Kingston
FLATBUSH AVE	EAST CHESTER ST	12,134	30	REAR END (RIGHT ANGLE)	04 City or village & 01 NYSDOT	Kingston
E CHESTER ST	HASBROUCK AVE	6,376	30	REAR END (RIGHT ANGLE)	04 City or village	Kingston
BROADWAY	CHANDLER DR	16,914	40	REAR END (REAR END)	04 City or village & 01 NYSDOT	Kingston
HIGHWAY 9W	PARTITION ST	12,454	30	OVERTAKING (COLLISION WITH MOTOR VEHICLE)	01 NYSDOT & 04 City or village	Saugerties
FOXHALL AVE	ALBANY AVE	13,231	30	REAR END (HEAD ON)	04 City or village & 01 NYSDOT	Kingston
COTTEKILL RD	LUCAS TPKE	3,624	35	RIGHT ANGLE (RIGHT ANGLE)	02 County	Rosendale
S PUTT CORNERS RD	MAIN ST	19,148	45	REAR END (NA)	02 County & 01 NYSDOT	New Paltz
CEDAR ST	BROADWAY	17,231	40	REAR END (REAR END)	04 City or village	Kingston

TILLSON AVE	VINEYARD AVE	3,210	30	REAR END (NA)	03 Town & 01 NYSDOT	Lloyd
FOXHALL AVE	FLATBUSH AVE	9,650	30	REAR END (COLL. W/LIGHT SUPPORT/UTILITY POLE)	04 City or village	Kingston
W CHESTER ST	BROADWAY	10,284	40	RIGHT ANGLE (LEFT TURN (AGAINST OTHER CAR))	04 City or village	Kingston
STATE ROUTE 300	PLAINS RD	5,666	55	RIGHT ANGLE (RIGHT ANGLE)	01 NYSDOT & 02 County	Shawangunk
MORTON BLVD	BOICES LN	10,950	40	RIGHT ANGLE (NA)	03 Town & 02 County	Ulster
BURLINGHAM RD	ULSTERVILLE RD	2,104	35	RIGHT ANGLE (NA)	02 County & 03 Town	Shawangunk
STATE HWY 32	ROUTE 44	6,958	45	LEFT TURN (COLLISION WITH MOTOR VEHICLE)	01 NYSDOT	Plattekill
ULSTER AVE	FRANK SOTTILE	26,305	35	REAR END (NA)	01 NYSDOT & 02 County	Ulster
BOULEVARD	GREENKILL AVE	7,944	30	RIGHT ANGLE (RIGHT ANGLE)	04 City or village	Kingston
ROUTE 212	GLASCO TPKE	4,921	45	RIGHT ANGLE (NA)	01 NYSDOT & 02 County	Saugerties
STATE ROUTE 52	PIROG RD	2,807	55	REAR END (NA)	01 NYSDOT & 03 Town & 02 County	Shawangunk
ALBANY AVE	ULSTER AVE	13,231	30	REAR END (COLLISION WITH PEDESTRIAN)	01 NYSDOT & 03 Town	Kingston
STATE ROUTE 32 N	SHIVERTOWN RD	7,632	55	RIGHT ANGLE (RIGHT ANGLE)	01 NYSDOT & 03 Town	New Paltz
WASHINGTON AVE	LUCAS AVE	7,228	30	REAR END (RIGHT ANGLE)	04 City or village	Kingston

WEED RD	STATE ROUTE 52	2,684	45	RIGHT ANGLE (RIGHT ANGLE)	03 Town & 01 NYSDOT	Shawangunk
HASBROUCK AVE	FOXHALL AVE	6,376	30	RIGHT ANGLE (RIGHT ANGLE)	04 City or village	Kingston
ALBANY AVE	WRENTHAM ST	13,231	30	OVERTAKING (REAR END)	01 NYSDOT & 04 City or village	Kingston
FAIR ST	WALL ST	6,584	30	COLLISION WITH PEDESTRIAN (COLLISION WITH PEDESTRIAN)	04 City or village	Kingston
US HIGHWAY 9W	N ROBERTS RD	30,444	40	REAR END (LEFT TURN)	01 NYSDOT & 03 Town	Lloyd
CHERRY HILL RD	MAIN ST	19,148	35	REAR END (NA)	03 Town & 01 NYSDOT	New Paltz
WASHINGTON AVE	SAWKILL RD	8,597	45	REAR END (COLLISION WITH TREE)	01 NYSDOT & 02 County	Ulster
CORNELL ST	SMITH AVE	5,867	30	OVERTAKING (NA)	04 City or village	Kingston
E CHESTER ST	MIRON LANE	24,426	55	REAR END (COLLISION WITH MOTOR VEHICLE)	01 NYSDOT & 02 County	Ulster
BROADWAY	ELMENDORF ST	15,515	30	REAR END (COLLISION WITH MOTOR VEHICLE)	04 City or village	Kingston
US HWY 209	42ND ST	9,556	30	REAR END (LEFT TURN (AGAINST OTHER CAR))	02 County & 01 NYSDOT & 03 Town	Wawarsing
HURLEY AVE	SCHWENK DR	21,293	30	REAR END (RIGHT ANGLE)	04 City or village & 01 NYSDOT	Kingston
COTTEKILL RD	MILL DAM RD	11,962	40	REAR END (LEFT TURN)	02 County & 01 NYSDOT & 03 Town	Marbletown
FROG ALY	SCHWENK DR	11,976	30	RIGHT ANGLE (RIGHT ANGLE)	04 City or village	Kingston

STATE HWY 208	ROUTE 44 55	6,958	55	REAR END (LEFT TURN)	01 NYSDOT	Gardiner
PARTITION ST	JANE ST	12,454	30	OVERTAKING (NA)	01 NYSDOT & 04 City or village	Saugerties
WASHINGTON AVE	JOYS LANE	14,932	30	REAR END (COLLISION WITH MOTOR VEHICLE)	04 City or village	Kingston
WALL ST	JOHN ST	3,528	30	REAR END (NA)	04 City or village	Kingston
PINE GROVE AVE	BROADWAY	17,231	40	REAR END (RIGHT ANGLE)	04 City or village	Kingston
WALL ST	FAIR ST	6,584	30	COLLISION WITH MOTOR VEHICLE (NA)	04 City or village	Kingston
W OREILLY ST	BROADWAY	17,231	40	REAR END (NA)	04 City or village	Kingston
S CHESTNUT ST	MAIN ST	15,825	30	OVERTAKING (NA)	01 NYSDOT & 04 City or village	New Paltz
PLATTEKILL AVE	MAIN ST	15,825	30	REAR END (NA)	04 City or village & 01 NYSDOT	New Paltz
BROADWAY	HENRY ST	15,515	30	REAR END (LEFT TURN)	04 City or village	Kingston

Table 14. Top-50 Priority Segments

Route Name	Length (Miles)	AADT	Posted Speed (Max)	Highest Crash Type (FSI)	Roadway Owner	Jurisdiction
ROUTE 44	0.11	3,182	55	COLL. W/EARTH ELE./ROCK CUT/DITCH (COLL. W/EARTH ELE./ROCK CUT/DITCH)	01 NYSDOT	Gardiner
ROUTE 44	0.11	3,182	55	COLL. W/EARTH ELE./ROCK CUT/DITCH	01 NYSDOT	Gardiner

				(COLL. W/EARTH ELE./ROCK CUT/DITCH)		
FRANK SOTTILE BLVD	0.12	5,156	30	REAR END (OVERTAKING)	02 County	Ulster
US HWY 9W	0.08	1,851	55	REAR END (NA)	01 NYSDOT	Ulster
HASBROUCK AVE	0.11	1,539	30	OVERTAKING (NA)	04 City or village	Kingston
MOUNTAIN REST RD	0.12	3,247	36	COLLISION WITH GUIDE RAIL (COLLISION WITH GUIDE RAIL)	02 County	New Paltz
MAIN ST	0.11	816	40	REAR END (NA)	02 County	Marbletown
N FRONT ST	0.11	6,584	30	COLLISION WITH BICYCLIST (COLLISION WITH BICYCLIST)	04 City or village	Kingston
S MAIN ST	0.11	14,917	30	REAR END (NA)	01 NYSDOT	Ellenville
S PUTT CORNERS RD	0.11	6,907	45	REAR END (COLL. W/EARTH ELE./ROCK CUT/DITCH)	02 County	New Paltz
ROUTE 212	0.11	8,099	40	COLLISION WITH BICYCLIST (RIGHT ANGLE)	01 NYSDOT	Saugerties
N FRONT ST	0.11	6,584	30	OVERTAKING (COLL. W/LIGHT SUPPORT/UTILITY POLE)	04 City or village	Kingston
US HIGHWAY 209	0.11	11,976	45	REAR END (NA)	01 NYSDOT	Marbletown
US HIGHWAY 209	0.11	14,917	35	REAR END (NA)	01 NYSDOT	Wawarsing
US HWY 9W	0.11	26,305	35	RIGHT ANGLE (RIGHT ANGLE)	01 NYSDOT	Ulster
US HWY 9W	0.12	22,639	35	REAR END (REAR END)	01 NYSDOT	Ulster

US HWY 9W	0.11	16,602	45	REAR END (COLLISION WITH MOTOR VEHICLE)	01 NYSDOT	Ulster
US ROUTE 209	0.11	10,156	45	REAR END (NA)	01 NYSDOT	Wawarsing
STATE ROUTE 28	0.11	5,858	55	REAR END (HEAD ON)	01 NYSDOT	Olive
ULSTER AVE	0.12	26,305	35	RIGHT ANGLE (REAR END)	01 NYSDOT	Ulster
MOUNTAIN REST RD	0.11	3,247	35	REAR END (NA)	02 County	Marbletown
MORTON BLVD	0.12	8,255	30	RIGHT ANGLE (COLLISION WITH MOTOR VEHICLE)	03 Town	Ulster
MAIN ST	0.11	11,976	30	REAR END (HEAD ON)	01 NYSDOT	Marbletown
MAIN ST	0.11	19,148	35	COLLISION WITH MOTOR VEHICLE (NA)	01 NYSDOT	New Paltz
FLATBUSH AVE	0.12	11,262	45	RIGHT ANGLE (NA)	01 NYSDOT	Ulster
ULSTER AVE	0.11	26,305	35	REAR END (NA)	01 NYSDOT	Ulster
WASHINGTON AVE	0.12	21,293	30	REAR END (NA)	01 NYSDOT	Kingston
MAIN ST	0.11	19,148	35	REAR END (NA)	01 NYSDOT	New Paltz
BROADWAY	0.11	10,499	40	OVERTAKING (NA)	04 City or village	Kingston
US HIGHWAY 209	0.11	14,917	30	REAR END (NA)	01 NYSDOT	Wawarsing
US HWY 9W	0.11	11,662	45	RIGHT ANGLE (NA)	01 NYSDOT	Ulster
ALBANY AVE	0.11	15,946	30	REAR END (NA)	04 City or village	Kingston
ROUTE 44	0.11	37,852	25	REAR END (NA)	32 Other Toll Authority	Lloyd
MAIN ST	0.11	11,976	30	REAR END (NA)	01 NYSDOT	Marbletown

STATE HWY 208	0.11	5,650	45	SIDESWIPE (NA)	01 NYSDOT	Gardiner
I 587	0.12	14,634	55	REAR END (REAR END)	01 NYSDOT	Kingston
STATE ROUTE 28	0.11	8,185	45	LEFT TURN (COLLISION WITH PEDESTRIAN)	01 NYSDOT	Olive
ALBANY AVE	0.11	13,231	30	REAR END (NA)	01 NYSDOT	Kingston
E CHESTER S	0.08	12,134	45	LEFT TURN (NA)	01 NYSDOT	Kingston
STATE ROUTE 28	0.11	14,934	45	REAR END (NA)	01 NYSDOT	Kingston
US HWY 44	0.11	37,852	25	REAR END (NA)	01 NYSDOT	Lloyd
BROADWAY	0.11	11,114	55	COLLISION WITH TREE (LEFT TURN)	01 NYSDOT	Esopus
MAIN ST	0.11	19,148	45	REAR END (LEFT TURN)	01 NYSDOT	New Paltz
ULSTER AVE	0.12	23,294	30	REAR END (NA)	01 NYSDOT	Ulster
US HIGHWAY 209	0.12	14,917	35	REAR END (LEFT TURN)	01 NYSDOT	Wawarsing
US HWY 9W	0.12	11,114	55	COLL. W/EARTH ELE./ROCK CUT/DITCH (HEAD ON)	01 NYSDOT	Esopus
US HWY 44	0.12	37,852	25	REAR END (NA)	01 NYSDOT	Lloyd
ULSTER AVE	0.11	23,294	35	REAR END (NA)	01 NYSDOT	Ulster
US HIGHWAY 9W	0.11	11,114	55	COLL. W/EARTH ELE./ROCK CUT/DITCH (COLLISION WITH TREE)	01 NYSDOT	Esopus
US HWY 44	0.11	37,852	25	OVERTAKING (COLLISION WITH OTHER BARRIER)	01 NYSDOT	Lloyd

APPENDIX B – DOCUMENT REVIEW

Table 15. Document Review Summary

Name of Plan (Year Published)	Description	Key Safety Components	Relevance to Ulster County Road Safety Plan
NY Strategic Highway Safety Plan (2017)	▸ Five-year plan to frame statewide priority safety areas (emphasis areas) and proven strategies and actions to be taken to reduce fatality and serious injury crashes, by emphasis area, on NY public roads. Programs and projects identified that address a SHSP emphasis area are eligible for Highway Safety Improvement Program (HSIP) funding.	▸ Set five-year objectives for reductions of fatal, injury, and non-motorized crashes. ▸ Establishes six emphasis areas and three cross-cutting and emerging needs. ▸ Provides an example of a data-driven approach to identify emphasis areas. ▸ Outlines proven strategies and actions to address emphasis areas. ▸ Identifies safety partners.	▸ Statewide objectives and approach for setting those can be considered. ▸ Understand statewide emerging needs that apply to UCTC. ▸ Relevant emphasis areas and supporting strategies and actions can be adopted or customized. ▸ Understand State safety partners and engage in planning process (or implementation process) as needed.
NY Highway Safety Improvement Program (2018)	▸ Shows safety infrastructure-related projects, and reports performance and program funding for HSIP funding.	▸ Establishes annual targets that support SHSP objectives. ▸ Describes project identification and scoring criteria used to program funds. ▸ Shows infrastructure projects programmed throughout the state. ▸ NYSDOT Post Implementation Evaluation System provides crash modification factors (CMF) for NYS-specific projects.	▸ Statewide targets and approach for setting those can be considered. ▸ Scoring criteria will be considered during project identification process. ▸ Understand eligible CMFs.
New York Pedestrian Safety Action Plan (2016)	▸ Identifies current safety conditions and recommends a distinct set of engineering, education, and enforcement countermeasures that can be accomplished over the next five years to improve pedestrian safety.	▸ Focus on strategies and projects that improve pedestrian safety outside of New York City, which has a separate safety initiative. ▸ Includes recommended engineering countermeasures and performance measures for pedestrian safety solutions.	▸ Ulster County is a focus county for pedestrian crashes (15th highest pedestrian crashes 2009-2013, outside NYC) so could be identified as an emphasis area. ▸ Strategies could be applicable to identified pedestrian challenges. ▸ Findings and systemic countermeasure packages should be reviewed for possible recommendations at identified UCTC locations during data analysis.

Name of Plan (Year Published)	Description	Key Safety Components	Relevance to Ulster County Road Safety Plan
New York Complete Streets Report (2014)	▸ Highlights NYSDOT's Complete Streets policies and programs, best practices, and next steps for furthering Complete Streets in New York.	▸ Requires NYSDOT to incorporate its design features in planning, project scoping, design, and implementation.	▸ Best practices can be reviewed for applicability in Ulster County. ▸ Ulster County Complete Streets policy passed in 2009 and it would be beneficial to understand how policies have been implemented or known challenges. ▸ Kingston and New Paltz have individual Complete Streets policies and it would be beneficial to understand how policies have been implemented or known challenges.
Ulster County Transportation Council Long Range Transportation Plan (2015)	▸ Twenty-year long-range plan and investment program for transportation programs and projects in the UCTC area.	▸ Safety for all users of the transportation system is an explicit goal of the LRTP (Goal 3). ▸ Safety objectives and targets are identified and align with statewide safety goals and meet federal requirements. Additional objectives are also identified for transit safety and special user groups. ▸ Includes crash data from 2011-2015 for the region and for each municipality. ▸ List short and mid-range recommended safety projects for the planning area by local priorities and NYSDOT priorities. ▸ Lists long range recommendations for safety projects.	▸ Safety goal can be aligned with Safety Plan goal. ▸ Safety objectives and targets can be incorporated, and projects selected based on how well they meet these. ▸ Based on the results of the network screening, short and mid-term projects in the LRTP will be reviewed to ensure project recommendations are not duplicated and/or certain projects receive more attention. ▸ Consider how the longer-range recommendations could be incorporated into Safety Plan as strategies.
Ulster County Transportation Council Transportation Improvement Program (TIP)	▸ Five-year capital funding program for federal funded transportation projects. Must be aligned with goals and strategies identified in the Long-Range Transportation Plan.	▸ Lists safety as a major goal for the plan. ▸ Recognizes support for and alignment with state safety targets, meaning programs and projects in the TIP should work to achieve these safety reductions. ▸ Criteria to evaluate all transportation projects includes safety considerations. ▸ Lists programmed safety projects.	▸ Consider projects in Safety Plan that will achieve progress toward safety targets. ▸ Based on the results of the network screening, safety projects in the TIP will be reviewed to ensure project recommendations are not duplicated.

Name of Plan (Year Published)	Description	Key Safety Components	Relevance to Ulster County Road Safety Plan
Ulster County Transportation Council Road Safety Assessment (2018)	▸ Detailed examination of conditions and potential solutions on segments of roadway with elevated congestion and crash frequency in Ulster County.	▸ Identifies existing conditions (safety, traffic, and crash) at three study areas (NYS Route 212, NYS Route 32/NYS Route 212, NYS Route 299). ▸ Identifies issues and suggests improvements for each study area. ▸ Recommendations cover roadway pavement/markings, signage, user behavior, and traffic/roadway/roadside characteristics.	▸ Details a process for field investigations that can be utilized at the ten priority locations identified through the crash analysis for this Safety Plan. ▸ Provides potential solutions to safety issues at three locations, which could inform solutions at other, similar locations, in the region. ▸ Identified concerns such as poor lane markings and sign reflectivity, which may be systemic issues in the UCTC planning area.
City of Kingston Comprehensive Plan (2015)	▸ Land use and transportation plan for the City of Kingston.	▸ Improving safety for all road users is one of 11 goals identified in the document. ▸ Indicates safety-related projects and potential design approaches that are desired in the City of Kingston.	▸ Safety goal could be aligned with Safety Plan goal. ▸ Kingston projects will be reviewed so recommendations are not duplicated. ▸ Emphasis on and desire for "complete streets" design.
Town of New Paltz Comprehensive Plan (2015)	▸ Land use and transportation plan for Town of New Paltz.	▸ Objective 5 of the Transportation Network Goals is to increase safety throughout the transportation system. ▸ Identifies safety-related action steps. ▸ Identifies bicycle and pedestrian infrastructure is a key concern.	▸ Safety goal could be aligned with Safety Plan goal. ▸ Action steps can be reviewed and included in Safety Plan, as relevant. ▸ Bicycle and pedestrian safety needs can be considered during the data analysis.

APPENDIX C – ADDITIONAL CRASH ANALYSIS

Figure 23. Fatality Rate (Fatalities per 100 Million Vehicle Miles Traveled)

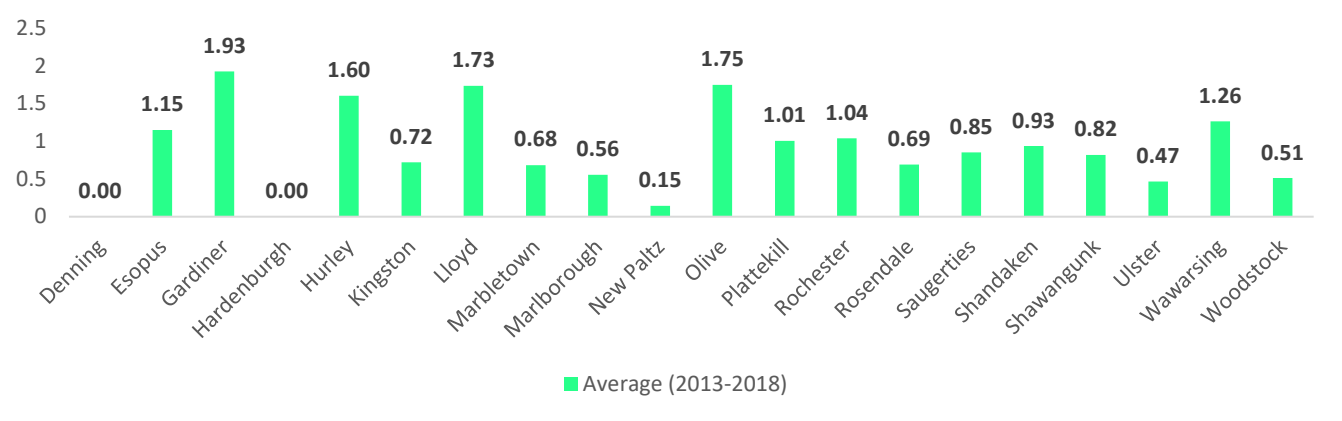
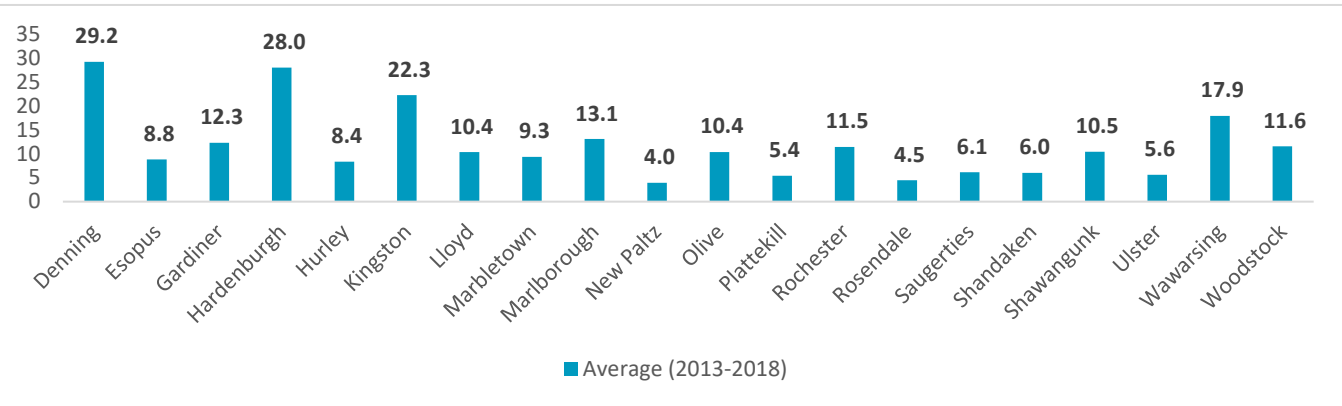


Figure 24. Serious Injury Rate (Serious Injuries per 100 Million Vehicle Miles Traveled)



APPENDIX D – CRASH DIAGRAMS

Figure 25. Crash Diagram Legend