RiverCOG

Comprehensive Safety Action Plan

Safe Streets and Roads for All

Base Mapping & Safety Analysis

December 2024

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INTRODUCTION

The *RiverCOG Safe Streets and Roads for All (SS4A) Comprehensive Safety Action Plan* aims to enhance road safety and reduce traffic-related injuries and fatalities across the Lower Connecticut River Valley (LCRV) region. The Action Plan will identify safety issues through a comprehensive evaluation of current infrastructure, crash data, and feedback from the community and stakeholders. Guided by this extensive data and community engagement effort, the plan will establish recommendations centering projects that will improve the design and functionality of streets to accommodate all users, implement best practices from similar regions, and foster safer, more accessible transportation networks. The plan will ultimately culminate with a framework and strategy to establish a safer and more connected transportation network for the residents and visitors of the Lower Connecticut River Valley.

About Safe Streets and Roads for All (SS4A)

The 2021 Infrastructure Investment and Jobs Act established the Safe Streets and Roads for All (SS4A) Program to prevent roadway deaths and serious injuries. The program enables county, city, and town governments; transit agencies; metropolitan planning organizations (MPOs); and Tribal governments to enact safety in their communities using the U.S. Department of Transportation's (U.S. DOT) National Roadway Safety Strategy and the embedded Safe System Approach.

Figure 1 Safe System Approach (Source: USDOT)

The fundamental principle underlying the Safe System Approach is the acknowledgement of human behaviors that require holistic and multipronged approaches to eliminate roadway deaths and serious injuries in a human-focused transportation system. The Safe System Approach believes that establishing safety must be proactive and be addressed by layering safety measures to reduce harm and circumvent human behavior.

In keeping with this approach and the guidance provided by the USDOT, RiverCOG's Comprehensive Safety Action Plan will consider a range of infrastructure and policy recommendations to address the region's most pressing safety concerns.

This Report

As an initial step in addressing the safety concerns, RiverCOG's project team has completed a base mapping exercise and safety analysis to identify existing conditions. This report outlines the key takeaways and helps establish a baseline understanding of this region, its transportation needs, the current transportation system, and the people it serves.

In the first section, the region's governance, demographics, transportation, and environmental factors are discussed. The following section provides a review of relevant planning studies. This report concludes with a comprehensive analysis of the region's fatal and serious crashes.

EXISTING CONDITIONS & BASE MAPPING

This study serves the 443-square mile Lower Connecticut River Valley region, which includes seventeen municipalities:

- Chester
- Clinton
- Cromwell
- Deep River
- Durham
- East Haddam
- East Hampton
- Essex
- Haddam
- Killingworth
- Lyme
- Middlefield
- Middletown
- Old Lyme
- Old Saybrook
- Portland
- Westbrook

The rich cultural composition of this region is highlighted by the economic hub and anchor institutions in Middletown, the vibrant tourism industries along the shoreline, and the recreational and environmental diversity along the Connecticut River. The 176,215 people of the Lower Connecticut River Valley region primarily commute by car but have a diversity of transportation options, including the River Valley Transit (RVT) bus network, and the three Shoreline East commuter rail stations. Walking and biking are also common in the densest areas of the region, as well as on recreational trails. These and other characteristics of the region are discussed below.

Population

Density

Population and employment density in this region is concentrated in Middletown, the region's largest city. Home to 48,152 residents in 2022, Middletown is a vital employment hub with vibrant retail and entertainment districts and key anchor institutions, attracting a large population to work and live in its city. Factors like the proximity of amenities and concentration of housing contribute to heightened transportation activity and the presence of walkable areas. Other areas of population and employment density include communities along the shoreline, such as Clinton and Old Saybrook, and historic village centers, like East Hampton, which historically were the centers of civic and industrial life for the region, outside of Middletown. These trends influence local transportation options, such as RVT whose bus services mirror the density patterns of the region, and Shoreline East, whose three stations connect the region to outside employment centers (see Transit section below).

Maps of population and employment density can be found in the following pages.

Figure 2. Population Density in the RiverCOG Region

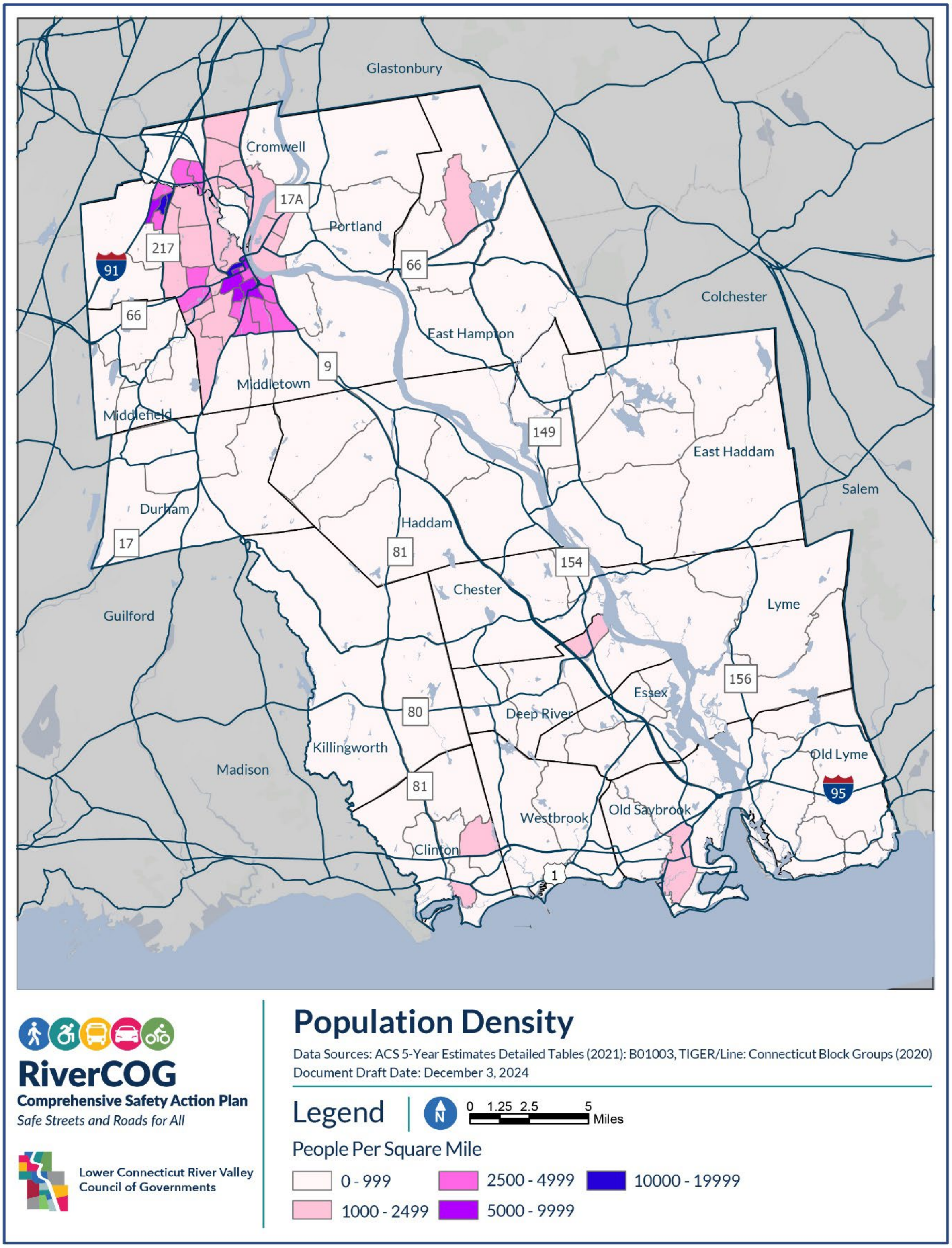
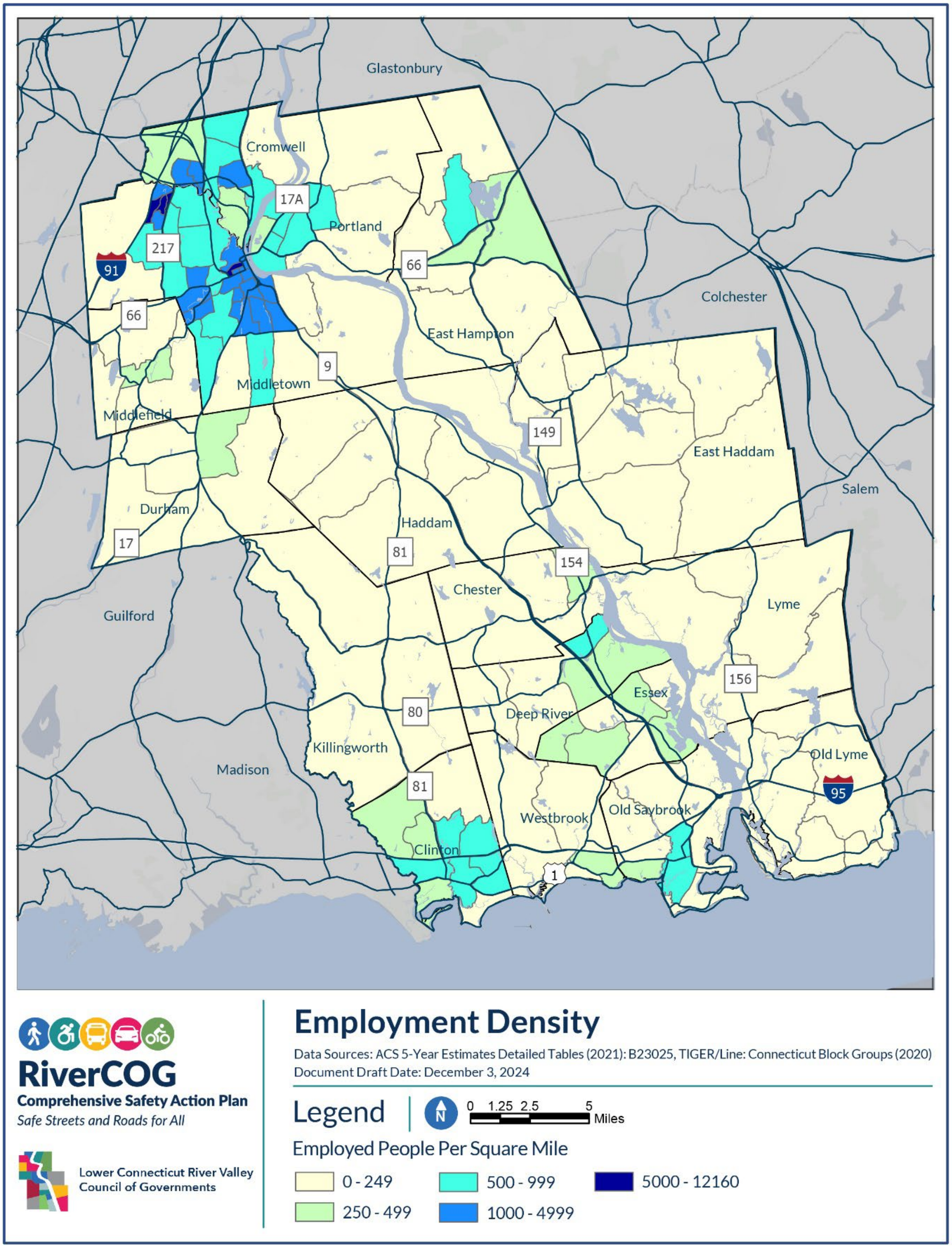


Figure 2. Employment Density in the RiverCOG Region



Equity

Equity assessments are necessary to identify populations that are more likely to use transit, bike, or walk and are thus more susceptible to roadway deaths or serious injuries. Nationwide, people with lower incomes, minorities, and older adults are overrepresented in pedestrian fatalities.[1] This study recognizes this concerning trend, and RiverCOG has integrated equity into the project approach. This equity assessment identifies equity priority areas that will be a factor in project prioritization later in the study. Additionally, this equity assessment will help guide the engagement strategy. Pop-ups, public meetings, and other outreach will emphasize participation from historically underrepresented groups and populations disproportionately impacted by roadway fatalities.

A multi-pronged approach was used to identify equity priority areas. This equity assessment overlaid equity scores calculated from Census Bureau American Community Survey 5-Year Estimates (2021), Justice40 criteria, and Connecticut Department of Energy and Environmental Protection Environmental Justice criteria (CTDEEP) to identify areas in the study area with the highest need. As shown in Figure 4,, the highest equity locations include areas of Middletown, Westbrook, Old Lyme, East Haddam, Haddam, Killingworth, Essex, Old Saybrook, and Clinton due to (1) being placed at or above the 90th percentile of calculated equity scores in the region, (2) defined by either Justice40 or CTDEEP criteria, or (3) a combination of the former two criteria.[2]

Middletown scored the highest in the equity assessment due to high populations of people with disabilities, minorities, limited English proficiencies, poverty, and no car ownership. These same locations were defined as environmental justice areas according to Justice40 and CTDEEP criteria. Westbrook also scored high in the equity assessment due to its high populations of people with disabilities, minorities, seniors, limited English proficiencies, and no car ownership. Additionally, Old Lyme had a high equity score due to poverty, limited English proficiency, minorities, seniors, and youth. Parts of East Haddam, Haddam, Killingworth, Essex, Old Saybrook, and Clinton were deemed as environmental justice communities by CT DEEP and its indicators of income, poverty, population rate, employment, income, housing stock, and education.[3] These areas were not determined as equity priority areas by internal equity analysis as these indicators focused on vulnerabilities related to transit-reliance (i.e., age, race, car ownership) rather than socioeconomic vulnerabilities at large.

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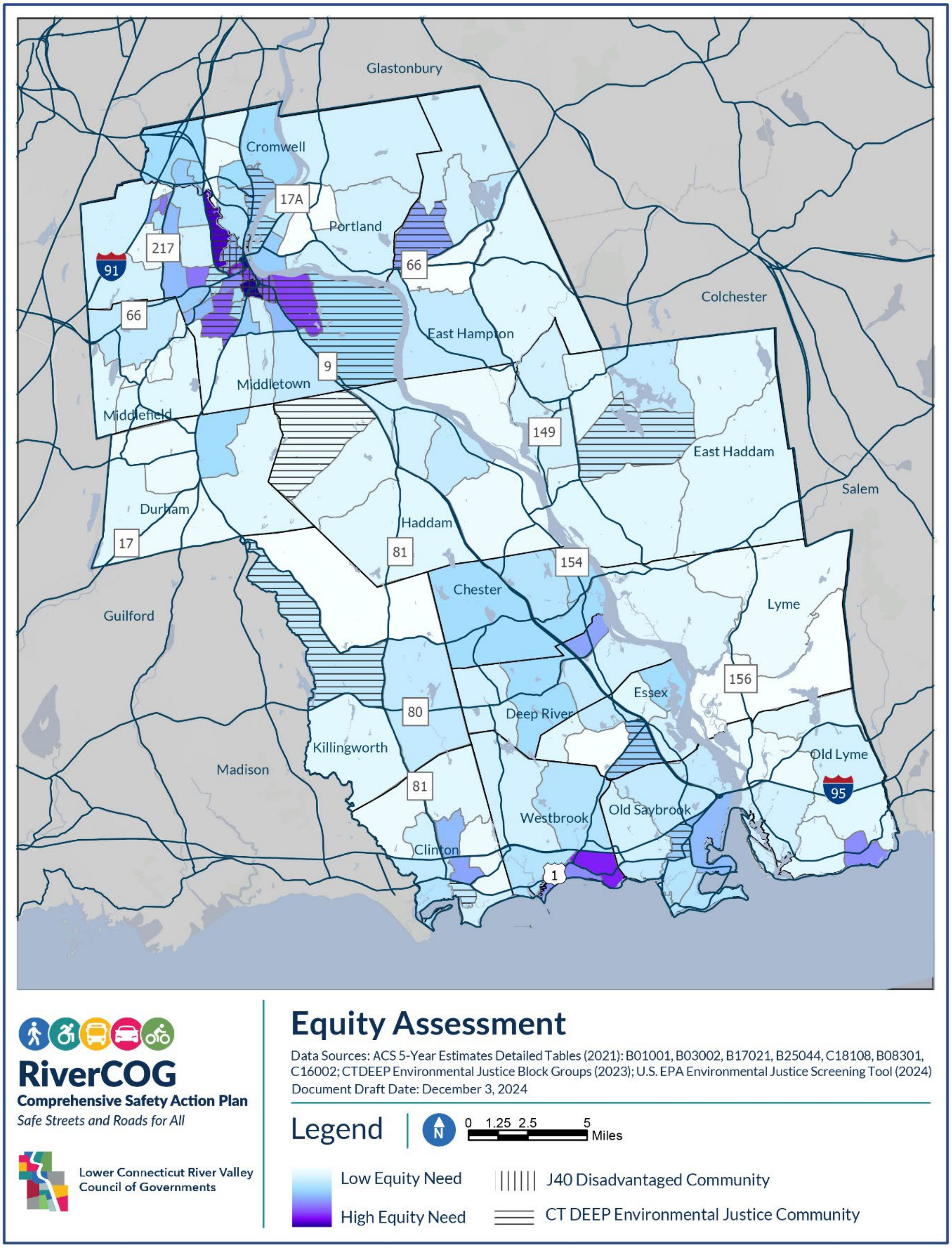
[1] Smart Growth America. Dangerous by Design 2024. https://smartgrowthamerica.org/dangerous-by-design/#custom-tab-0-3b878279a04dc47d60932cb294d96259
[2] The equity assessment methodology can be found in Appendix A.
[3] Additional information on CT DEEP's methodology can be found on their website: https://portal.ct.gov/deep/environmental-justice/05-learn-more-about-environmental-justice-communities

Figure 3. Equity Assessment



Transportation Network

This section provides a brief overview of the roadway, transit, and trail network.

Roadways

The Lower Connecticut River Valley Region is served by a multitude of major roadways providing vital connections within and throughout the region. Three of the most heavily trafficked roadways are I-95 (running along the shoreline), Route 9 (crosses the region north to south), and I-91 (located in the northwest corner of the region).[4] Other significant State routes include:

- Route 66, connecting Middletown to Meriden and Waterbury in the west and Portland and East Hampton to the east
- Route 17, running southwest from Middletown through Durham
- Route 3, running north-south in Cromwell and Middletown
- Route 81, running north-south in Haddam, Killingworth, and Clinton
- Route 151, running north-south in East Hampton, Haddam, and East Haddam
- Route 156, running north-south in Lyme and Old Lyme
- Route 148, running primarily east-west in Killingworth, Chester, and Lyme
- Route 145, running primarily north-south in Haddam, Chester, and Deep River

Due to the presence of the Connecticut River, the roadway network's development is primarily oriented north-south. There are, however, three major river crossings: the Arrigoni Bridge in Middletown, the East Haddam Swing Bridge (Route 82), connecting Haddam and East Haddam, and the Baldwin Bridge (I-95) between Old Saybrook and Old Lyme.

Transit

Transit options in the region include River Valley Transit's fifteen bus routes, Amtrak's Northeast Regional and Acela routes, CTtransit's buses, CTrail's Shoreline East route, and the CT Department of Transportation (CTDOT) Chester–Hadlyme Ferry. Buses and trains provide diversity in the mobility options of this region by serving as viable alternatives to single-occupancy vehicle use and by enhancing safety for pedestrian access along the routes they serve. Transit typically provides access to major destinations such as employment centers, commercial plazas, and densely populated neighborhoods, and often serve riders who are also pedestrians. The vulnerable road users that take transit highlight the critical need for safe mobility access because they frequently

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[4] Although interstates (I-95 and I-91), Route 9, and private roadways are not included in this study, State routes, U.S. Route 1, and local roadways are included.

walk as part of their trips (e.g., to train stations), have exposed unprotected proximity to vehicles and are more susceptible to roadway related serious injuries and deaths.

RVT services are primarily concentrated in Middletown as there is robust bus service within the city itself and the regional routes originate or end in Middletown. However, it also provides service along the shoreline from Madison westward to New London. North-south connections outside of Middletown into the southern Lower Connecticut River Valley region are provided by the 642, 644, or 645 routes where riders can transfer to the 641, 643, or 645 routes for east-west service along the shoreline.

The RiverCOG region is also served by Amtrak's Northeast Regional and Acela routes and CTrail's Shoreline East route along the shoreline. Amtrak provides broader regional connectivity along the east coast ranging from Boston to Washington D.C. and Norfolk. CTrail provides service along the shoreline from New London to New Haven. The Department of Transportation's Chester – Hadlyme Ferry is the oldest operational ferry in the country and provides seasonal service across the Connecticut River between April 1 through November 30 each year.

Active Transportation & Trails

In 2019, the Connecticut Department of Transportation (CTDOT) published the Connecticut Active Transportation Plan, which outlined significant bicycle corridors.[5] The plan identifies corridors that most need bicycle infrastructure improvements, either as stand-alone projects or as components of other roadway projects. The following are significant bicycle corridors within RiverCOG's region, the following bicycle corridors:

- Route 1 in Clinton, Westbrook, Old Saybrook, and Old Lyme
- Route 154 in Old Saybrook and from Essex to Middletown
- Route 156 through Lyme into Old Lyme
- Route 99 in Cromwell
- Route 66 in Middletown
- Route 3 in Middletown
- Route 17 in Middletown and Durham
- Route 149 in East Haddam (including the Haddam-East Haddam Swing Bridge)
- Route 17 A in Portland to Middletown (including the Arrigoni Bridge

Bike networks on local roads are limited and frequently unmarked. A notable exception is the Air Line State Park Trail in Portland and East Hampton. Potential trails, such as the Central Connecticut Loop and Lower CT River Valley Heritage Trail Plan, are currently being explored.

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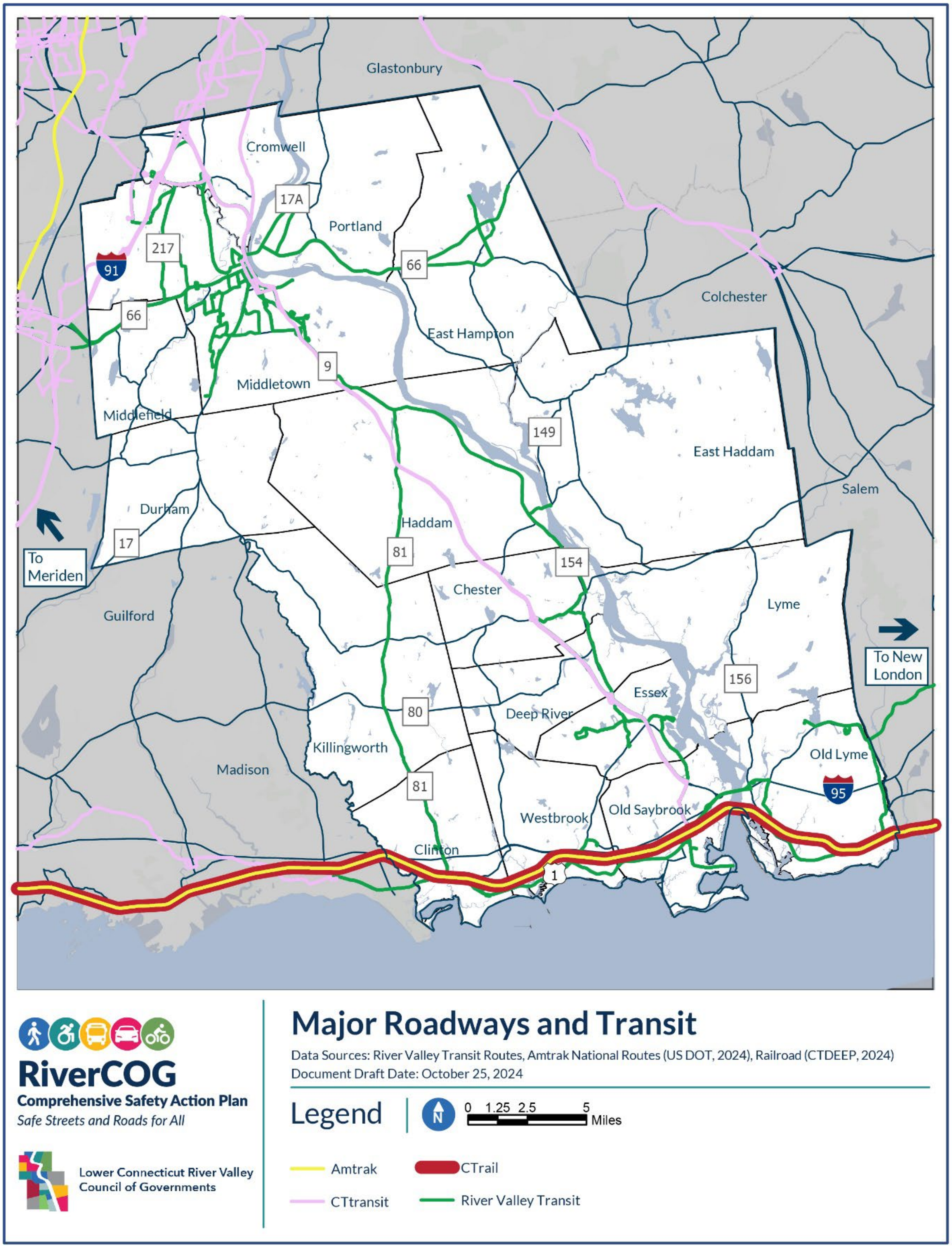
[5] The state's Active Transportation Plan update has recently begun, and is expected to complete in 2026.

The Lower Connecticut River Valley region is known for its ecological diversity, and the variety of natural preserves along the Connecticut River. The networks of notable trails in this region include those found in the Cockaponset State Forest and Devil's Hopyard State Park, as well as segments of the New England Trail. Generally, off-road trails are outside the scope SS4A Action Plans but are recognized as important destinations that may have sightline issues at roadway crossings.

Figure 4. Regional Roadway & Transit Map



Environment & Land Use

Environmental and land use factors can influence transportation choice, travel habits, and safety. The Lower Connecticut River Valley leverages its natural resources to provide an abundance of recreational opportunities, but in some cases topography and water resources create sightline, congestion, or infrastructure-related barriers. Moreover, the density and types of land use play a prominent role in reliance on private automobile use, congestion, and speeds. This section highlights major themes, and more detail is documented in the 2021-2031 Lower Connecticut River Valley Plan of Conservation and Development. As concepts for roadway segments are developed later in the study, a more nuanced look at environment and land use will be explored further.

Environment

The Lower Connecticut River Valley borders the Long Island Sound to the south and is split diagonally by the Connecticut River. Throughout both sides of the Connecticut River, there are multiple state parks and wildlife refuges such as Nehantic State Forest and Cockaponset State Forest. The Gateway Conservation Zone is a thirty-mile zone with special viewshed protections along the hillsides of the lower Connecticut River.

Land Use

Land use trends range from dynamic urban centers to open space. Middletown is represented by a diverse variety of land uses, and most notably, holds the greatest concentration of institutions (e.g., Wesleyan University, CT State Community College, and Middlesex Hospital). This speaks to the strengths in creating a walkable area and the diverse availability of amenities in higher density areas. Shoreline communities also offer a diversity of commercial uses, leveraging on their position as popular tourist destinations. Outside of major urban, town, and village centers, open space is the focal land use due to the region's multiple State Parks and Reserves.

Planning Context

A thorough plan review was conducted for regionally significant plans. Key themes of the plans include the need for traffic calming measures in high-crash and high-speed locations, improved pedestrian and bike infrastructure, improved visibility and wayfinding, and campaigns and infrastructure to improve driver behavior.

The key themes and relevant planning documents are outlined in Table 1. A plan review summary can be found in Appendix B.

Table 1 Key Themes from Plan Review

	Traffic calming measures	Improved pedestrian or bike infrastructure	Improved wayfinding and visibility	More sustainable transportation choices	Safety Improvements	Improve driver behavior
Lower Connecticut River Valley Regional Transportation Safety Plan (2022)	✓	✓	✓	✓	✓	✓
Lower Connecticut River Valley Bicycle and Pedestrian Master Plan (2022)	✓	✓	✓	✓	✓	
Lower Connecticut River Valley Plan of Conservation and Development 2021-2031	✓	✓		✓		
Lower Connecticut River Valley 2023-2050 Regional Metropolitan Transportation Plan (2023)	✓	✓	✓	✓	✓	✓
Boston Post Road (Route 1) Corridor Plan Connecticut River to Clinton Western Town Boundary (2015)	✓		✓	✓	✓	
Route 81 Corridor Study - Clinton (2019)	✓	✓	✓		✓	
Route 66 Transportation Study Portland and East Hampton, CT (2020)	✓	✓	✓	✓	✓	
CT SHSP Strategic Highway Safety Plan for 2022-2026 (2022)	✓	✓	✓	✓		✓
VRU Assessment CTDOT Approach (2023)		✓	✓	✓		

SAFETY ANALYSIS

Methodology Overview

The safety analysis data collection includes the collection of crash data from January 1, 2019, to December 31, 2023, from the Connecticut Crash Data Repository (CTCDR). The crash data was filtered to review crash data to include fatal (K) and serious injury (A) crashes only to align with the Safe Streets and Roads for All (SS4A) program goals of preventing serious injury and fatal crashes. The data set includes all reported crashes on non-interstate and non-freeway CTDOT roadways as well as local roadways throughout the RiverCOG region. Private property, private roadways, and limited access roadways including I-91, I-95, and Route 9 are excluded from the analysis. Crashes that occurred at freeway ramp junctions at state or local roadways were included in the analysis.

Crash Trends

There were approximately 225 reported KA crashes on state and locally owned and maintained roadways across the region over the period analyzed. Approximately 74% of all KA crashes occurred on state roads, with the remaining 26% occurring on local roadways. The fatal and serious injury crash locations are illustrated in Figure 6.

Vulnerable Road Users

Vulnerable road users (VRUs) are defined as roadway users who are unprotected by a vehicle making them more prone to injury. VRUs are non-motorized road users and may include pedestrians, bicyclists, wheelchair users, and scooter users; motorcyclists are not considered VRUs for the purposes of the VRU analysis. A review of crashes involving VRUs shows approximately 33 crashes involved pedestrians, bicyclists, or other non-motorists during the analysis period. Approximately 15% were fatal, and 85% resulted in serious injury. The VRU action or circumstance prior to the crash was reviewed to determine any contributing factors that may have led to a crash. Approximately 70% of KA crashes involving pedestrians occurred when crossing a roadway, indicating potential opportunity for new or improved crossings and/or improved or additional facilities for vulnerable road users. Almost half (45%) of all drivers involved in crashes were cited with an infraction or given a verbal or written warning, indicating a potential need for increased driver education. Table 2 summarizes all crashes involving vulnerable road users by severity, light condition, pre-crash action, and driver infraction. Figure 7 illustrates the locations of all VRU crashes that occurred during the five-year analysis period.

Table 2 Vulnerable Road User Summary

Type	Town	Roadway	Severity	Light Condition	Pre-Crash Action	Infraction
Pedestrian	Clinton	Route 1	A	Dark-Lighted	Crossing Roadway	Infraction
Pedestrian	Middlefield	Lake Rd	A	Dark-Lighted	Adjacent to or In Travel Lane	None taken
Pedestrian	Middletown	Westlake Dr	A	Daylight	Walking/Cycling on Sidewalk	None taken
Pedestrian	Middletown	Route 17	A	Dark-Lighted	Adjacent to or In Travel Lane	Written Warning
Bicyclist	Middletown	East Main St	A	Daylight	Other	Verbal Warning
Bicyclist	Cromwell	Route 372	A	Daylight	Crossing Roadway	Verbal Warning
Pedestrian	East Hampton	North Main St	A	Dark-Lighted	Crossing Roadway	Verbal Warning
Pedestrian	Middletown	Westfield St	A	Daylight	Crossing Roadway	Verbal Warning
Pedestrian	Middletown	Route 3	K	Dark-Lighted	Crossing Roadway	None taken
Pedestrian	Middletown	Route 66	K	Dark-Lighted	Crossing Roadway	None taken
Pedestrian	Middletown	Country Club Rd	A	Daylight	Crossing Roadway	None taken
Bicyclist	Westbrook	Route 166	K	Dusk	Adjacent to Roadway	None taken
Pedestrian	Old Saybrook	Route 154	A	Dark-Not Lighted	Adjacent to or In Travel Lane	Verbal Warning
Bicyclist	Middletown	Route 155	K	Daylight	Adjacent to Travel Lane	None taken
Pedestrian	Middletown	Route 66	A	Dark-Lighted	Crossing Roadway	Verbal Warning
Pedestrian	Old Lyme	Route 156	A	Daylight	Crossing Roadway	None taken
Pedestrian	Old Lyme	Route 156	A	Daylight	Crossing Roadway	None taken

Vulnerable Road User Summary (Continued)

Type	Town	Roadway	Severity	Light Condition	Pre-Crash Action	Infraction
Bicyclist	Middletown	Route 66	A	Daylight	Crossing Roadway	None taken
Bicyclist	Clinton	Route 1	A	Daylight	In Shoulder or Median	Verbal Warning
Bicyclist	Haddam	Route 81	K	Dark-Not Lighted	Adjacent to or In Travel Lane	None taken
Pedestrian	Middletown	Saybrook Rd	A	Daylight	Crossing Roadway	Verbal Warning
Pedestrian	Middletown	Route 66	A	Dark-Lighted	Crossing Roadway	Verbal Warning
Pedestrian	Middletown	Warwick St	A	Daylight	In Roadway - Other	None taken
Pedestrian	Middletown	Main St	A	Daylight	Crossing Roadway	None taken
Pedestrian	Middletown	Route 66	A	Dark-Lighted	Crossing Roadway	Verbal Warning
Bicyclist	Middlefield	Route 66	A	Dark-Lighted	Adjacent to Roadway	None taken
Pedestrian	Westbrook	Route 1	A	Dark-Lighted	Crossing Roadway	Verbal Warning
Pedestrian	Middletown	East Main St	A	Dark-Lighted	Crossing Roadway	Verbal Warning
Pedestrian	Cromwell	Route 99	A	Dark-Lighted	Other	None taken
Other VRU	Chester	Wig Hill Rd	A	Daylight	Adjacent to or In Travel Lane	Infraction
Bicyclist	Middletown	Old Farms W	A	Daylight	In Roadway - Other	None taken
Pedestrian	Middletown	Washington St	A	Daylight	Crossing Roadway	None taken
Pedestrian	Middletown	Walnut St	A	Daylight	Walking/Cycling on Sidewalk	None taken
Pedestrian	East Hampton	Route 66	A	Daylight	Crossing Roadway	None taken

Figure 5 KA Crashes

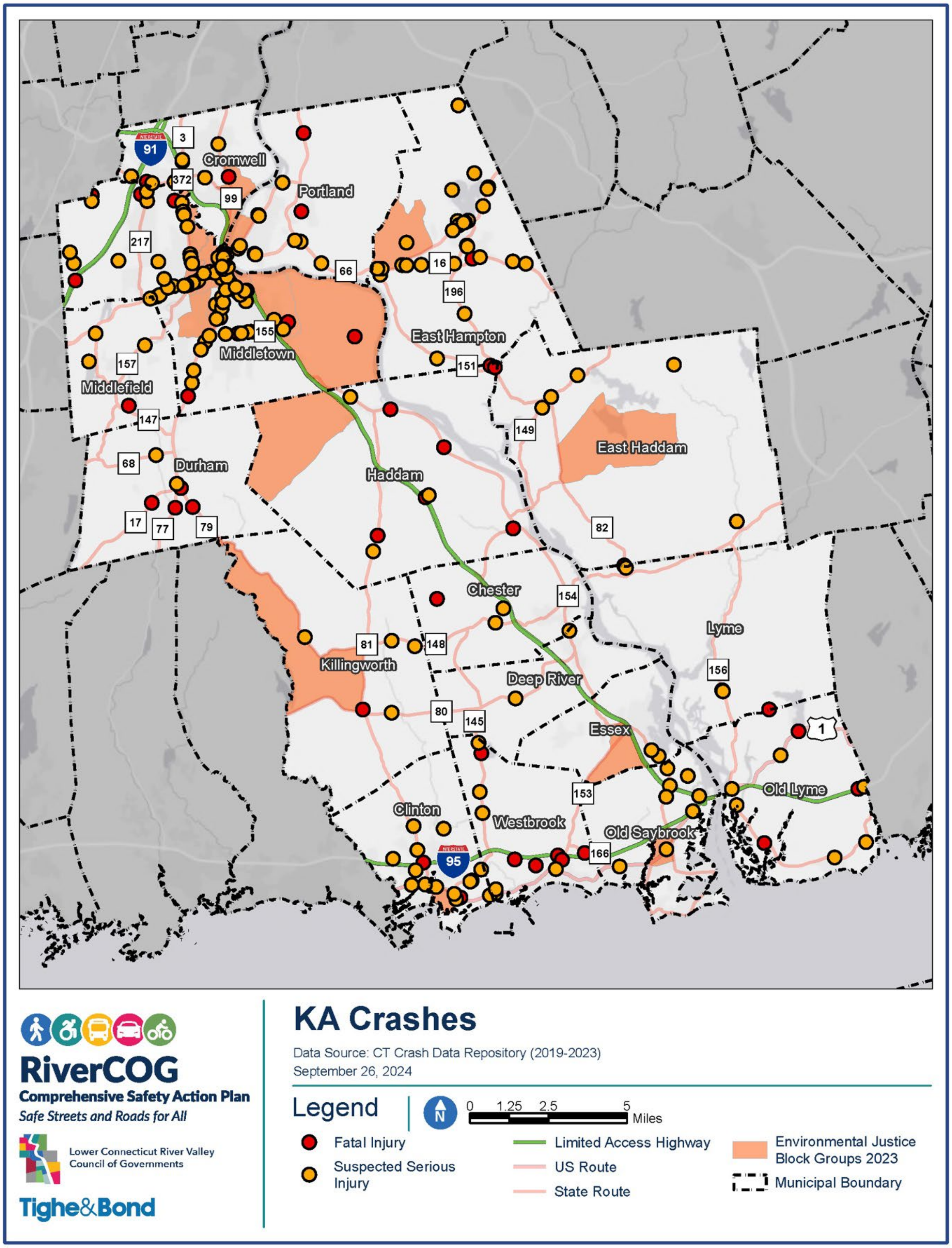
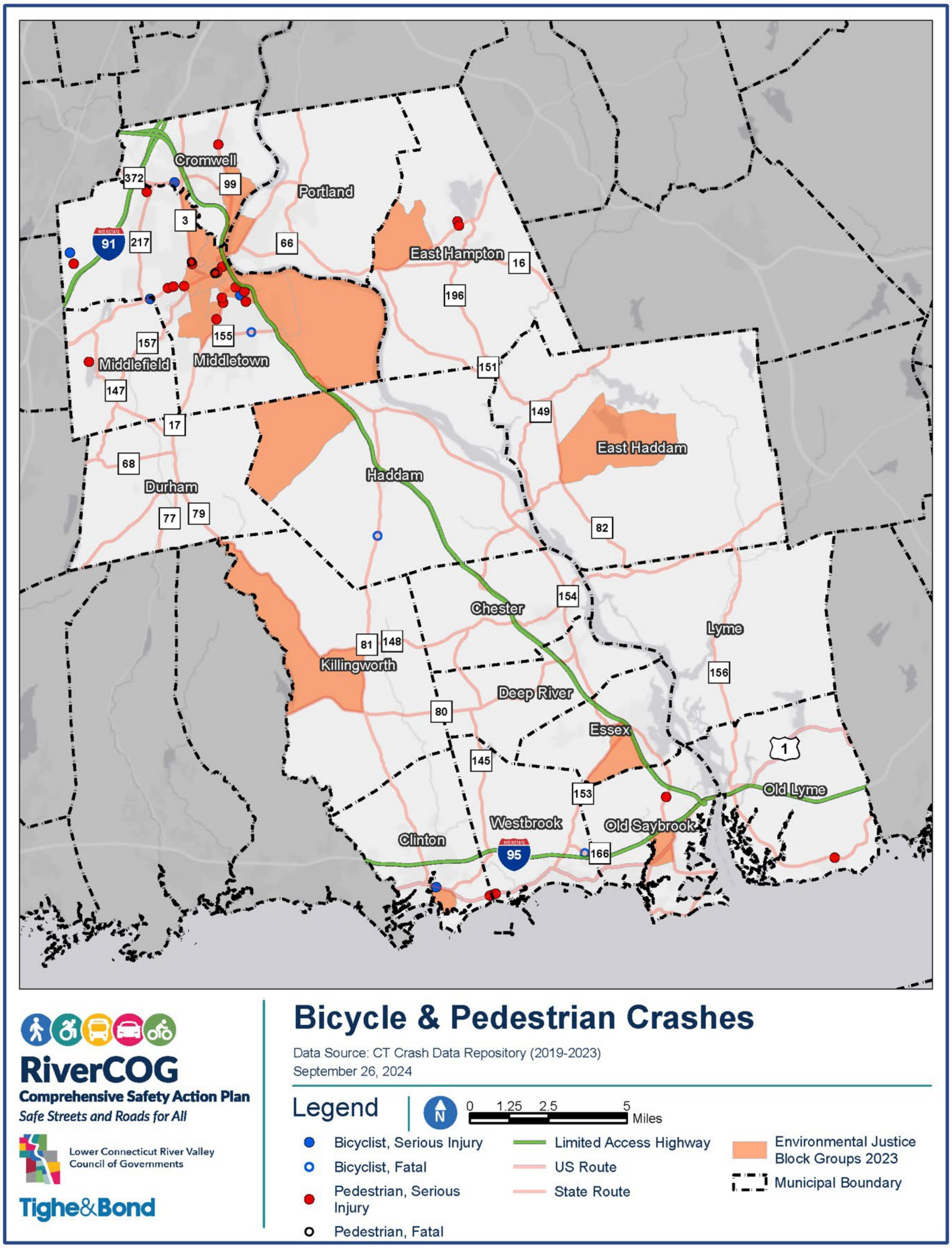


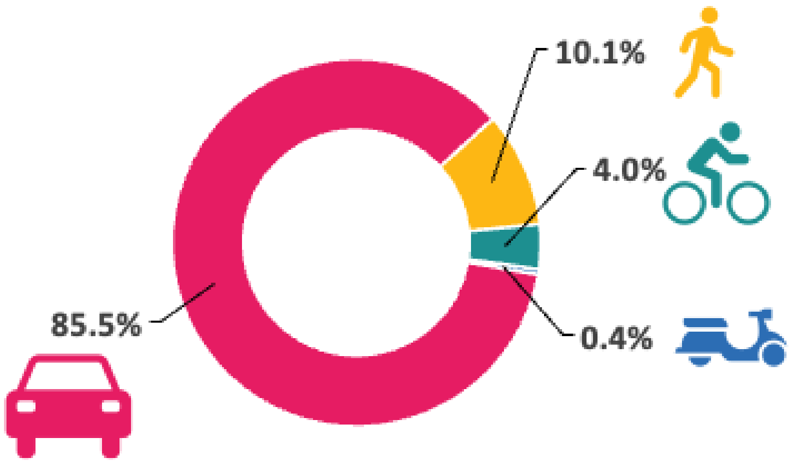
Figure 6 Bicycle and Pedestrian Crashes



Crash Mode

As shown in Figure 8 below, approximately 86% of reported crashes involved a motor vehicle, 10% involved a pedestrian, 4% involved a bicyclist, and 0.4% involved other non-motorized users.

Figure 7 Distribution of KA Crashes Based on the Collision Event



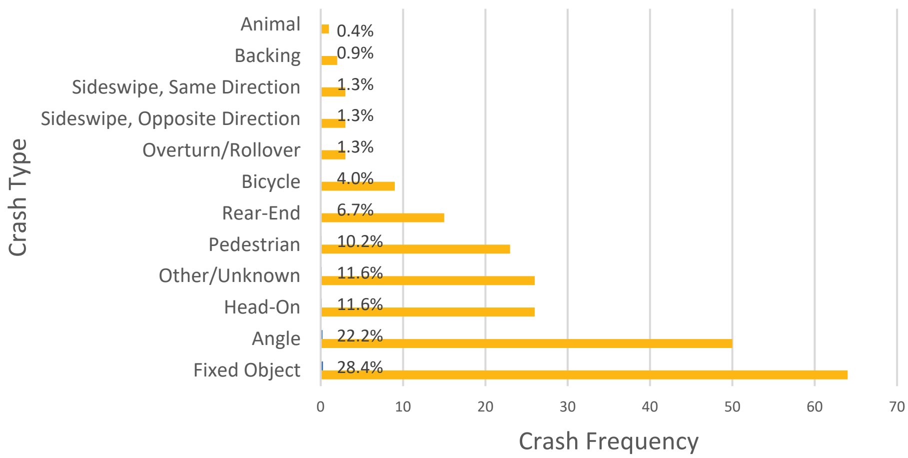
Crash Severity

As previously stated, only serious injury and fatal crashes were analyzed as part of the safety analysis. Approximately 21% of the 225 total reported crashes (48 crashes) were fatal while the remaining 79% (177 crashes) resulted in serious injuries.

Crash Type

Crash types were reviewed to determine any notable trends in KA crashes. Angle (22% of total crashes) and fixed object (28% of total crashes) represent approximately half of all reported crashes. Other key trends include bicycle and pedestrian crashes accounting for approximately 14% of total crashes. Opportunities to reduce fixed object crashes may include the review of potential strategies to decrease roadway departures that may include signs, pavement markings, lighting, guiderail, and/or removal of fixed objects within the roadway clear zone. Angle crashes are typically most prevalent at roadway or driveway intersections. Angle crashes may provide opportunities to reduce potential conflicts with turning vehicles through review of sight distance, traffic signal clearance interval changes, turn lane improvements, and/ or access management review. The frequency of each crash type during the analysis period is shown in Figure 9.

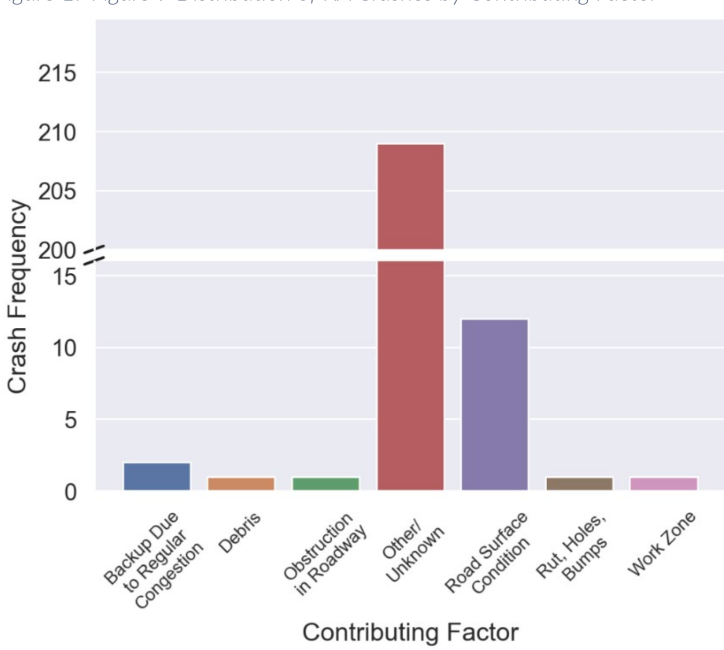
Figure 8 Distribution of KA Crashes Based on the Crash Type



Contributing Factor

Contributing factors for all KA crashes were reviewed to identify potential circumstances that may be attributable to crashes. A majority of reported crashes did not identify a definitive contributing factor. However, approximately 5% of KA crashes reported road surface condition as being a contributing factor in the crash. The data shows there is an opportunity to improve crash reporting to include contributing factors in order to better understand the root causes of crashes. It is important to note, however, that environmental and behavioral factors discussed in subsequent sections may contribute to crashes. The contributing factors for all KA crashes are presented in Figure 10.

Figure 1. Figure 9 Distribution of KA Crashes by Contributing Factor



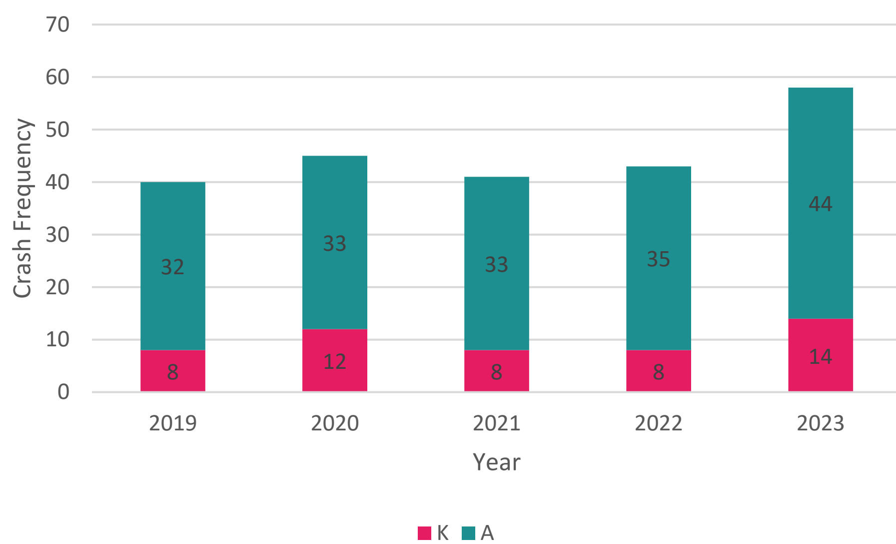
Time-Based Trends

Reviewing data on a time-basis can help to identify certain hours during the day, days during the week, and/or months during year for targeted enforcement, public awareness campaigns, and other targeted strategies. Annual crash trends are useful in measuring year over year trends in crashes.

Yearly Distribution

Crashes were reviewed on an annual basis to determine if there are any trends over the five-year analysis period. Total KA crashes were shown to remain steady at between 40 and 45 crashes per year between 2019 and 2022. A moderate uptick in KA crashes was seen in 2023 with 58 total KA crashes, up from 43 crashes in 2022. This trend is consistent with statewide crash trends that show a spike in fatal, serious injury, and vulnerable user crashes beginning in 2022 as traffic volumes generally returned to pre-COVID-19 pandemic levels. The yearly distribution of KA crashes is presented in Figure 11.

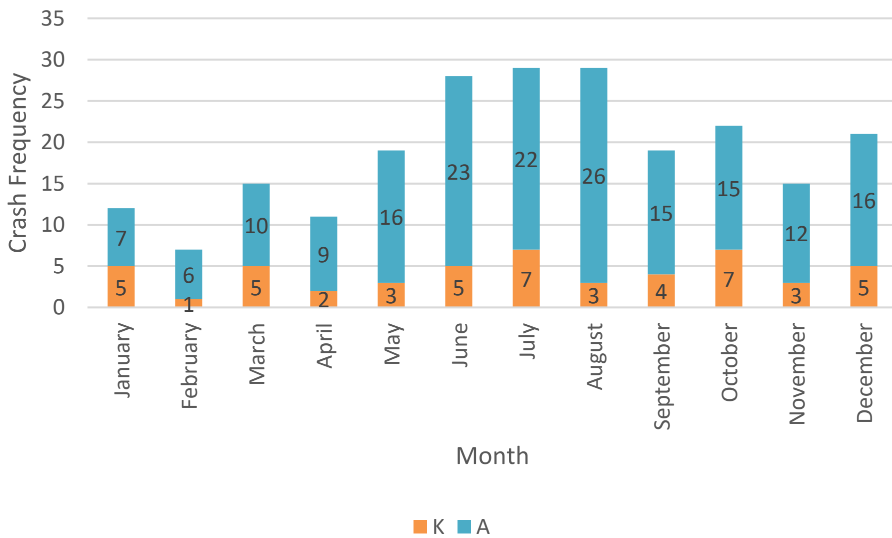
Figure 10 Yearly Distribution of KA Crashes



Monthly Distribution of Crashes

KA crashes were reviewed on a month-by-month basis over the analysis period. Factors such as vacations, weather, and school schedules may influence the number or severity of crashes over the course of a year. The analysis indicates the summer months from June through August experience the highest total number of KA crashes. January through April saw the lowest number of KA crashes over the 12-month period. The monthly distribution of crashes is shown in Figure 12.

Figure 11 Monthly Distribution of KA Crashes (2019-2023)



Daily Crash Distribution of Crashes

The distribution of KA crashes over the course of a week was reviewed. The data indicates the highest number of crashes on Saturday (23%) and Sunday (17%). Tuesday to Friday experienced between 13% and 16% of total crashes, while Monday experienced a significantly lower percentage of the crashes at 4%. Several factors including commuter travel patterns and social factors may impact the distribution of crashes over the course of a week.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
17%	4%	16%	14%	13%	13%	23%

Time of Day Crash Distribution

The distribution of crashes on an hourly basis on both weekdays and weekends were reviewed to determine if there are crash patterns based on the time of day. The weekday hourly KA crash distribution shows the highest percentages of crashes occurred between 4:00 to 5:00 PM (10%), 6:00 to 7:00 PM (9%), and 7:00 to 8:00 PM (8%), as shown in Figure 13. The weekend time periods between 7:00 to 8:00 AM, 5:00 to 6:00 PM, 8:00 to 9:00 PM, and 9:00 to 10:00 PM experienced the highest hourly rate of crashes, each experiencing 9% of the total daily weekend crashes, as shown in Figure 14.

Figure 12 Weekday Hourly Distribution of KA Crashes

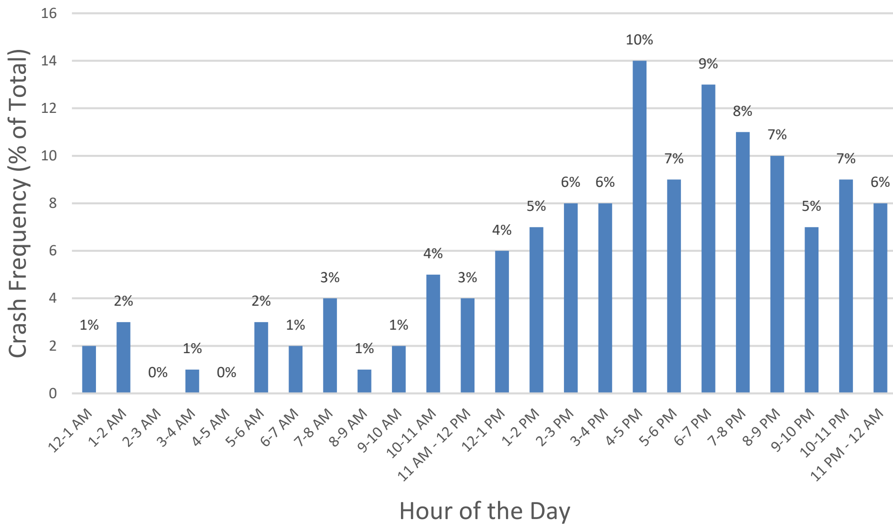
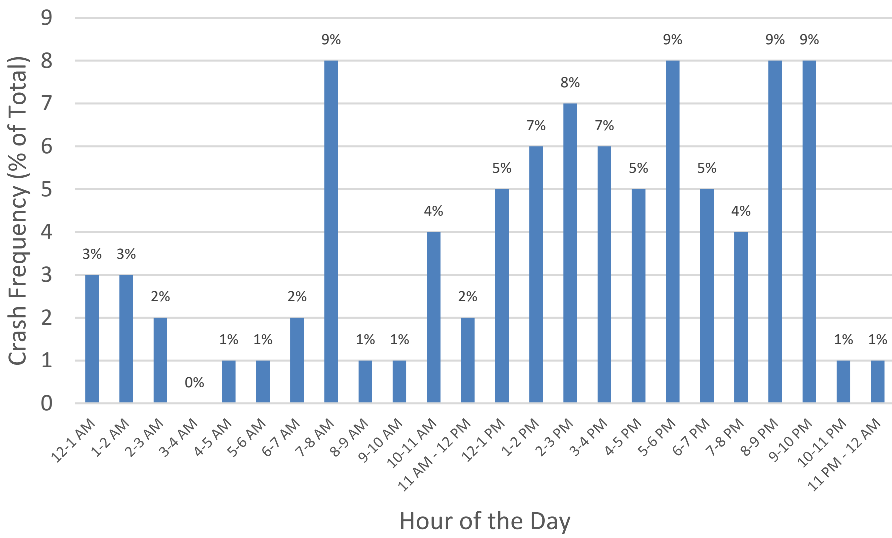


Figure 13 Weekend Hourly Distribution of KA Crashes

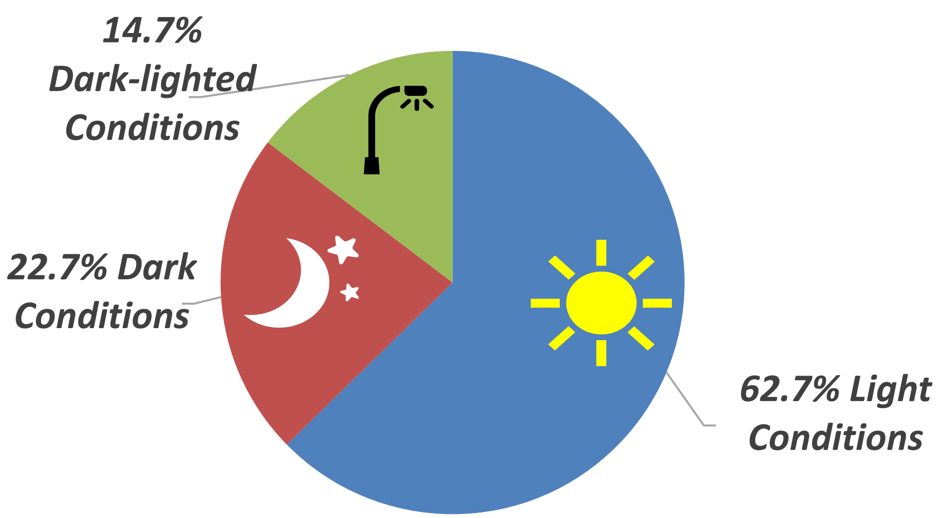


Environmental Factors

Light Conditions

Light conditions at the time of the crash were reviewed to understand any patterns related to roadway lighting. The majority of crashes (63%) occurred in light conditions, 23% occurred in dark conditions, and 15% occurred in dark-lighted conditions. Crashes occurring in light conditions occurred during daytime hours, dark conditions occurred during overnight hours, while dark-lighted conditions occur during overnight hours with street lighting providing improved visibility. With almost a quarter of the crashes occurring in dark conditions with no lighting, there may be an opportunity to review roadway illumination to determine if new and/ or enhanced street lighting may improve safety for road users. The distribution of KA crashes based on lighting condition is shown in Figure 15.

Figure 14 Distribution of KA Crashes Based on the Lighting Condition



Weather Condition

The weather conditions at the time of the crash were reviewed. Ninety-one percent of the KA crashes occurred under clear conditions, indicating that weather is generally not a factor in KA crashes. The following trends were noted:

- 91% of serious injury and fatal crashes occurred in clear conditions

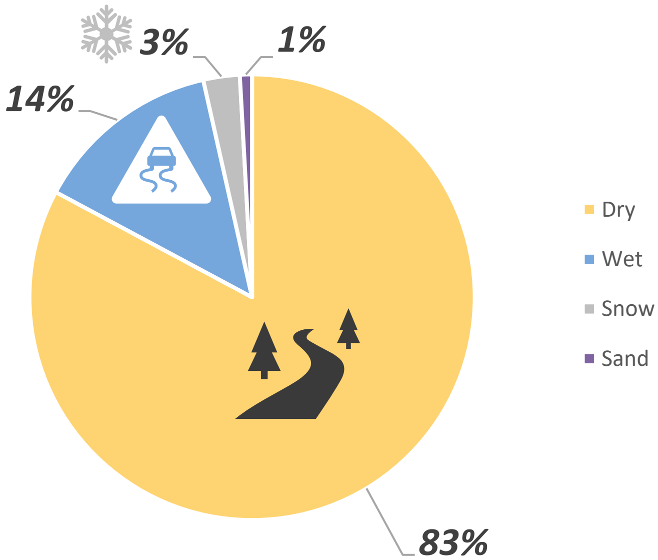
- 8% of serious injury and fatal crashes in rainy conditions

- 3% of serious injury and fatal crashes in icy conditions

Road Surface Condition

Figure 16 presents the distribution of KA crashes by road surface condition during the analysis period. A majority of crashes (83%) occurred under dry road conditions. Approximately 14% occurred under wet roadway conditions, 3% occurred on snow or ice-covered roadways, and the remaining 1% on sand-covered roadway. Based on the data, road surface conditions do not appear to be a large contributing factor in KA crashes.

Figure 15 Distribution of KA Crashes by Road Surface Condition



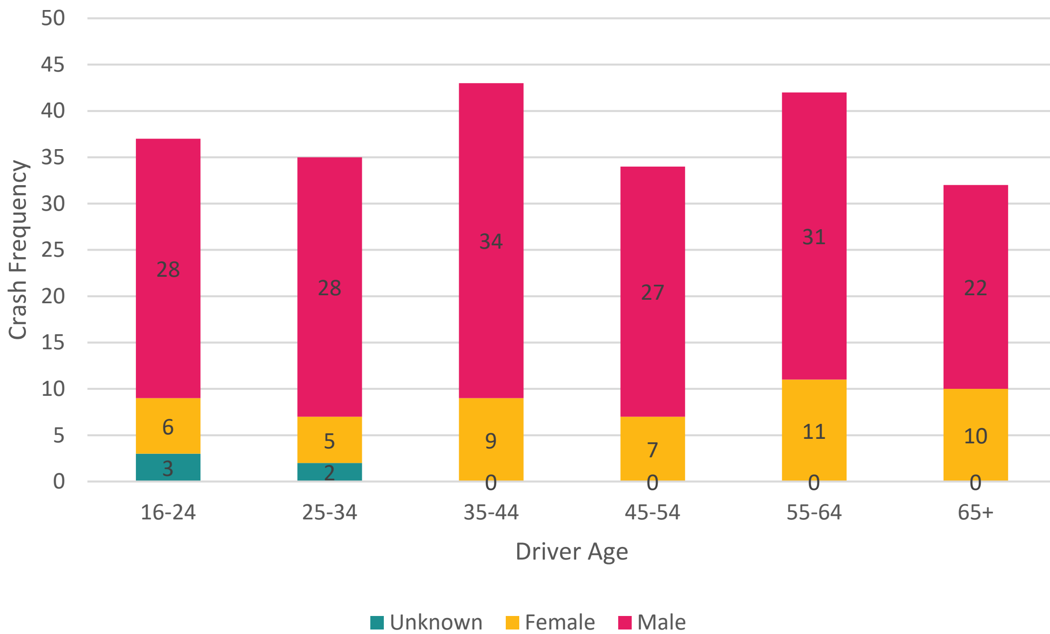
Driver Demographics

Road user demographics were reviewed to determine if any trends exist related to driver age and gender.

Driver Age & Gender

Driver age and gender were reviewed in incremental age groups to review if certain age groups were overrepresented in the crash data. While there are no clear outliers in the data, age groups between 16-24 years old, 45-44 years old, and 55-64 years old represent the top three highest crashes by age group. Male drivers consistently accounted for 70-80% of all KA crashes across all age groups. While not the highest proportion of crashes, younger drivers between 16 and 24 may provide an opportunity for increased early driver education to reinforce safe driving behaviors. The spread of crashes over multiple age groups may indicate the need for increased driver education in the years following initial licensure, while the male dominance across all age groups indicates an opportunity to target the demographic for driver safety education. The data is presented in Figure 17.

Figure 16 Distribution of KA Crashes based on Driver Age and Gender



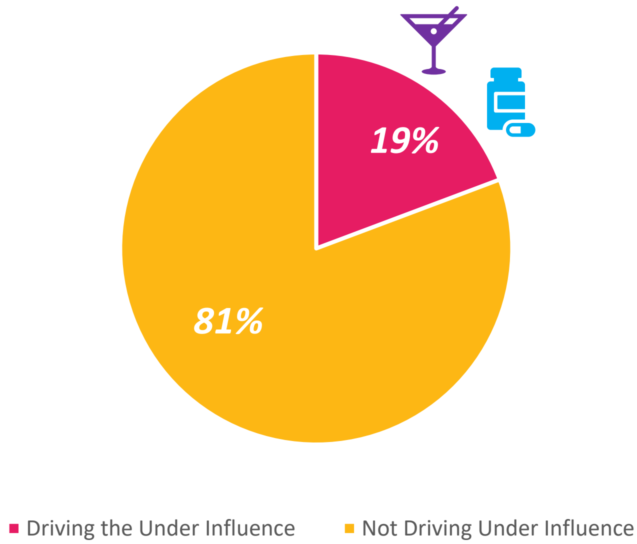
Behavioral Trends

The crash analysis reviewed behavioral trends of both drivers and passengers. Seat belt usage, the influence of alcohol or drugs, and behaviors in work zones were reviewed to determine if any current trends exist.

Driving Under the Influence

A review of the crash data indicates 19% of drivers involved in KA crashes were reported to be under the influence of medication, drugs, or alcohol at the time of the crash as shown in Figure 18. This number suggests there may be opportunities for increased enforcement, public awareness campaigns, increased driver education, and/or changes in laws or policies to reduce the number of crashes involving drivers under the influence.

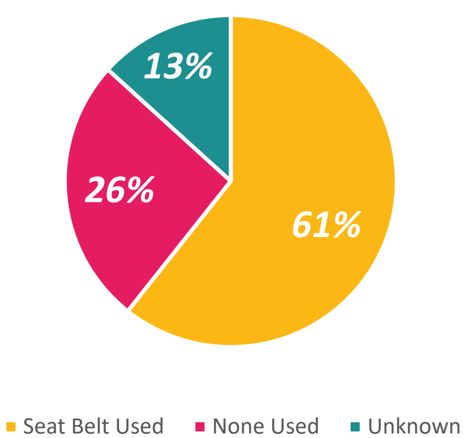
Figure 17 Driving Under the Influence KA Crashes



Vehicle Restraint System Usage

Seat belt usage for both drivers and passengers were reviewed. The analysis indicates approximately one quarter of occupants involved in KA crashes were not using a seat restraint. Utilizing a seat belt has proven to be an effective tool to prevent ejection from a vehicle. Occupants that are ejected from a vehicle typically have a greater chance of experiencing a serious injury or fatality. Of the 55 total occupants that were reported to not use a seatbelt at the time of the crash, eight (15%) were ejected from their vehicle. The gap in seat belt usage presents an opportunity to increase driver education efforts on the importance of seat belts to minimize the most severe crashes. Figure 19 presents motor vehicle seat belt usage among drivers involved in KA crashes.

Figure 18 Motor Vehicle Seat Belt Usage in Crashes



Work Zones

A review of work zone-related crashes indicates three KA crashes occurred within a work zone during the analysis period. While this only represents slightly over 1% of reported KA crashes, public awareness campaigns to bring attention to work zone safety should continue and potentially be expanded.

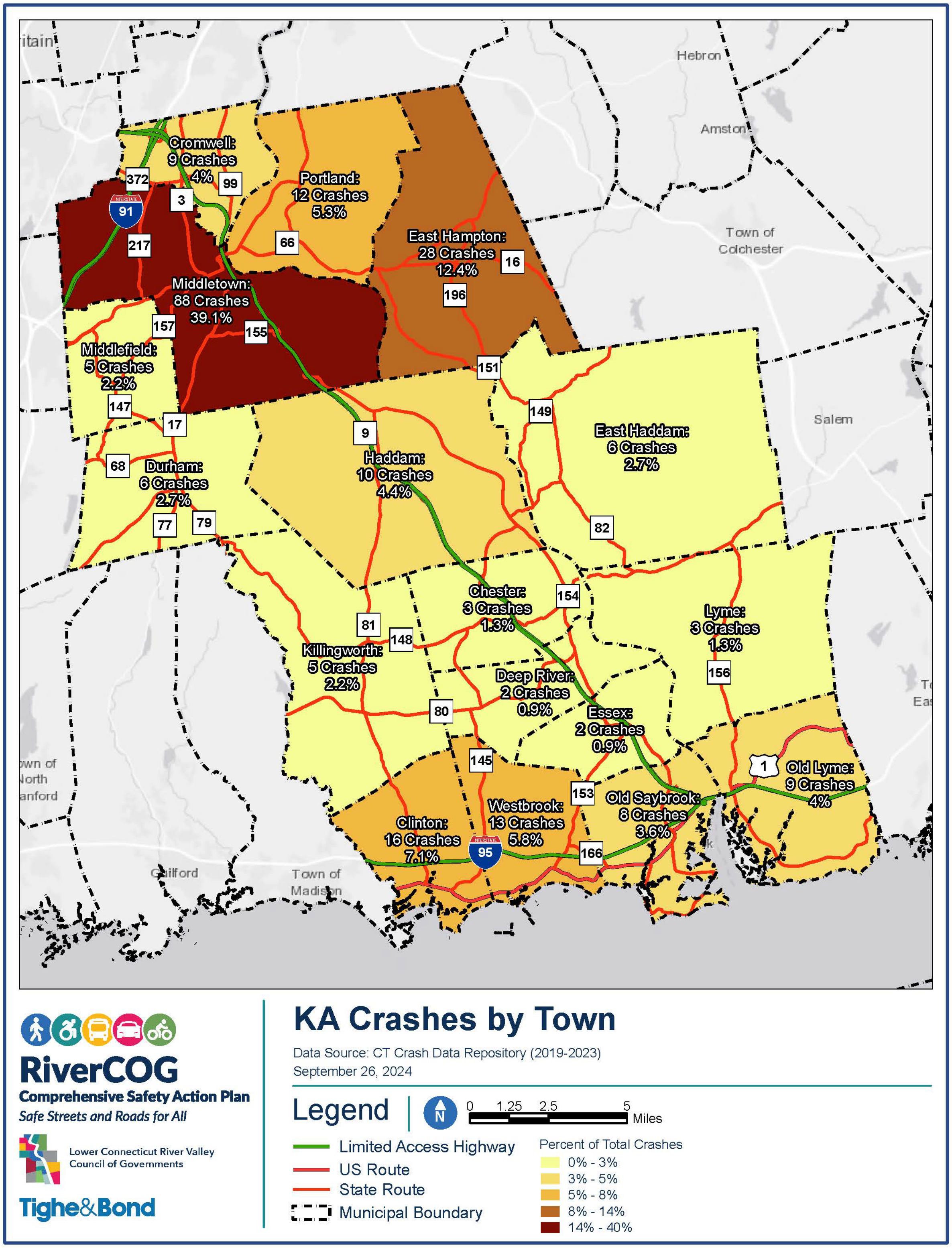
Town-by-Town Analysis

Crash data was reviewed on a town-by-town basis for the 17 member towns in the RiverCOG region. Middletown experienced the highest percentage of total KA crashes within the region at 39%. This is expected given that the city is a dense urban area with the highest population in the region. East Hampton represented 12% of total reported crashes, followed by Clinton, Cromwell, Haddam, Old Lyme, Old Saybrook, Portland, and Westbrook, with each experiencing between approximately 4-7% of the total KA crashes. Chester, Deep River, Durham, East Haddam, Essex, Killingworth, Lyme, and Middlefield each experienced 3% or less of the total KA crashes. Table 3 presents the town-by-town KA crashes ranked as a percentage of all KA crashes in the RiverCOG region. Figure 20 presents the percentages of KA crashes by town graphically on a gradient scale.

Table 3 Town-by-Town Percentage of KA Crashes

Town	Total KA Crashes	Percent of KA Crashes
Middletown	88	39.1%
East Hampton	28	12.4%
Clinton	16	7.1%
Westbrook	13	5.8%
Portland	12	5.3%
Haddam	10	4.4%
Cromwell	9	4.0%
Old Lyme	9	4.0%
Old Saybrook	8	3.6%
Durham	6	2.7%
East Haddam	6	2.7%
Killingworth	5	2.2%
Middlefield	5	2.2%
Chester	3	1.3%
Lyme	3	1.3%
Deep River	2	0.9%
Essex	2	0.9%

Figure 19 KA Crashes by Town



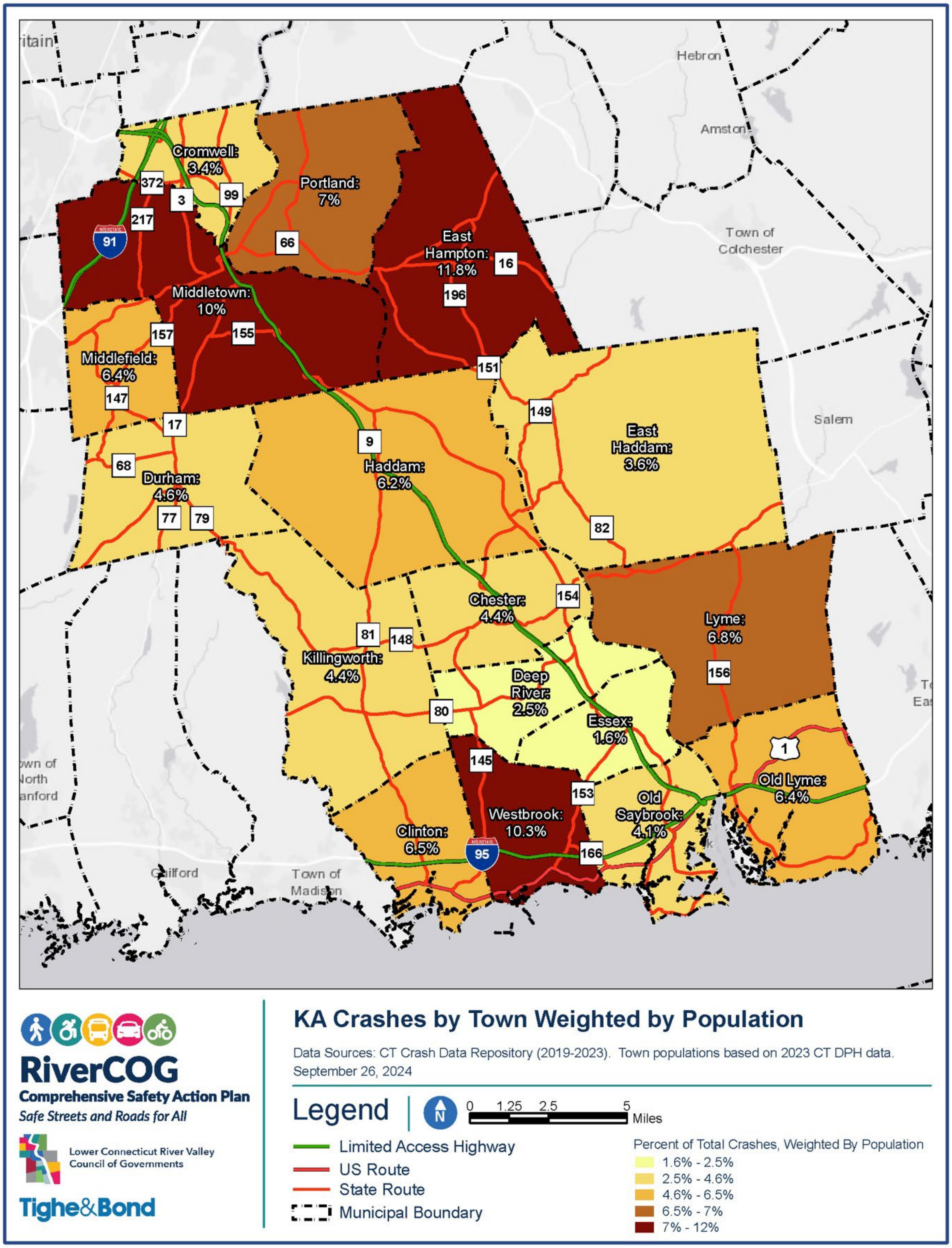
To account for the variable population among the member towns, the crashes were reviewed based on the population of each municipality. After adjusting for population, East Hampton, Westbrook, and Middletown each experienced between 10-12% of the total percentage of crashes. Portland, Lyme, Clinton, Middlefield, Old Lyme, and Haddam each account for between 6-7% of total crashes based on population. This weighted analysis can help to identify towns with lower populations that may exhibit a proportionally higher crash rate as compared to towns with larger populations. East Hampton and Portland may see a higher proportion of crashes despite lower populations based on the number of roadways within each town that provide regional connectivity: Route 66 in Portland and East Hampton provide the primary east to west connection between Route 9 to the west and Route 2 to the east. East Hampton also includes key routes such as Route 16, which extends between Route 66 and the Route 2/ Route 11 interchange to the east and Route 151 which runs from Route 66 to the south into East Haddam. Shoreline towns including Westbrook, Clinton, and Old Lyme may trend higher due to higher traffic volumes and more commercial activity along U.S. Route 1 as compared to other roadways in the region. The full town-by-town KA crashes weighted to account for population are shown in Table 4. The percentage of weighted KA crashes by town are shown graphically on a gradient scale in Figure 21.

Table 4 Town-by-Town Percentage of KA Crashes Weighted for Population

Town	Total KA Crashes	Population[1]	Percent of Total KA Crashes	KA Crashes per Person	Weighted Percentage
East Hampton	28	12,989	12.4%	0.0022	11.8%
Westbrook	13	6,881	5.8%	0.0019	10.3%
Middletown	88	47,984	39.1%	0.0018	10.0%
Portland	12	9,428	5.3%	0.0013	7.0%
Lyme	3	2,409	1.3%	0.0012	6.8%
Clinton	16	13,402	7.1%	0.0012	6.5%
Middlefield	5	4,257	2.2%	0.0012	6.4%
Old Lyme	9	7,696	4.0%	0.0012	6.4%
Haddam	10	8,773	4.4%	0.0011	6.2%
Durham	6	7,204	2.7%	0.0008	4.6%
Killingworth	5	6,254	2.2%	0.0008	4.4%
Chester	3	3,761	1.3%	0.0008	4.4%
Old Saybrook	8	10,571	3.6%	0.0008	4.1%
East Haddam	6	8,987	2.7%	0.0007	3.6%
Cromwell	9	14,363	4.0%	0.0006	3.4%
Deep River	2	4,454	0.9%	0.0004	2.5%
Essex	2	6,802	0.9%	0.0003	1.6%
TOTAL	225	176,215	100.0%	0.0183	100%

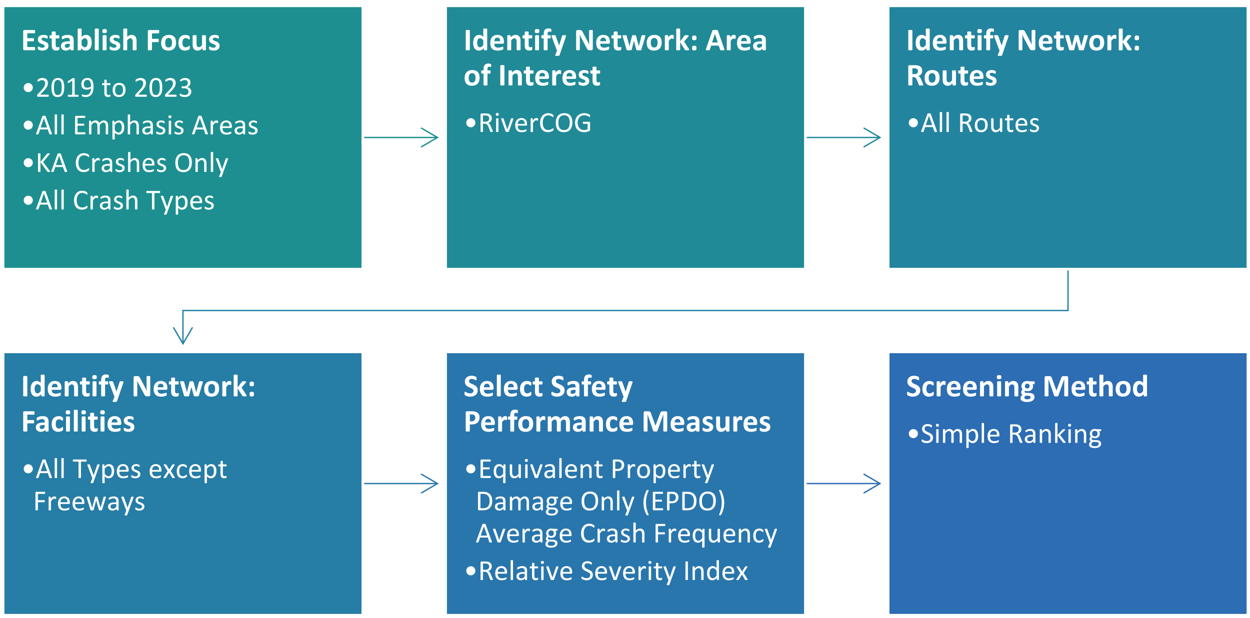
[1]Population based on 2023 Connecticut Department of Public Health (DPH) data

Figure 20 KA Crashes by Town, Weighted



CRSMS Analysis

The Connecticut Roadway Safety Management System (CRSMS) was utilized as part of the safety assessment to identify intersections or segments within the region that may show specific safety concerns. The Network Screening tool was utilized to identify and rank a set of sites. The following inputs were assumed:



The sites were ranked and reviewed both in terms of Equivalent Property Damage Only (EPDO) Average Crash Frequency and Relative Severity Index.

Screening Methodology

Within the site analysis tool, there are eight performance measures that may be used to review the sites. The Equivalent Property Damage Only (EPDO) Average Crash Frequency and Relative Severity Index locations were reviewed and screened to develop a list of the top 10 sites across the region that will ultimately form the High Injury Network.

Equivalent Property Damage Only (EPDO) Average Crash Frequency

The sites were first ranked by EPDO Average Crash Frequency. Because the study primarily focuses on addressing KA crashes, this performance method was determined to be appropriate as it considers crash severity. The EPDO method assigns a weighting factor to each crash based on crash severity as outlined on the KABCO scale, the scale utilized to assign injury severity in crash reporting. A mean comprehensive cost per crash is then assigned to each type of crash. The mean comprehensive cost per crash for each crash type was developed by the Federal Highway Administration (FHWA) in 2001 dollars. The CRSMS adjusts these costs annually to correct for inflation based on the Consumer Price Index (CPI) and Employment Cost Index (ECI) on an annual basis to reflect current economic conditions. The current mean comprehensive cost per crash and weighting factors by crash severity utilized in the CRSMS are summarized in Table 5.

Table 5 EPDO Weighting Factors

Severity	Mean Comprehensive Cost (per crash)	Weight Factor
K – Fatal Injury	$6,415,389	574
A – Suspected Serious Injury	$338,576	30
B – Suspected Minor Injury	$123,646	11
C – Possible Injury	$69,541	6
O – No Apparent Injury	$11,186	1

Relative Severity Index

The sites were also ranked using the Relative Severity Index (RSI) for comparison to the EPDO ranking. The RSI is similar to the EPDO as they both consider crash severity. However, the RSI also accounts for crash severity *and* crash type and applies a cost to each crash type per site for both segments and intersections. Like the EPDO ranking, the CRSMS adjusts crash costs based on the CPI and ECI to reflect current economic conditions. The most recent data for segment mean comprehensive cost per crash and weighting factors by crash type utilized in the CRSMS are summarized in Table 6. The current intersection mean comprehensive cost per crash and weighting factors by crash type utilized in the CRSMS are summarized in Table 7.

Table 6 RSI Segment Crash Costs

Crash Type	Mean Comprehensive Cost per Crash (RSI Costs)
Front to Front/Head-on	$596,355.00
Pedestrian/Bike	$457,787.00
Overturn/Rollover	$380,945.00
Fixed Objects	$149,919.00
Total Single-Vehicle Crashes	$143,179.92
Angle and Multi-Other	$88,213.00
All Other Categories	$86,929.00
Total Multi-Vehicle Crashes	$70,667.75
Sideswipe (Both Same and Opposite Directions)	$53,282.40
Front to Rear	$46,945.00

Table 7 RSI Intersection Crash Costs

Crash Type RSI	RSI for Signalized Intersections	RSI for Unsignalized intersections
Front to Front	$37,269	$74,519
Front to Rear	$41,383	$20,036
Sideswipe (Same and opposite directions)	$53,284	$53,284
Angle	$74,157	$96,063
Multi-Other	$87,011	$87,011
Total Multi-vehicle Crashes	$54,086	$47,764
Fixed Objects	$149,919	$149,919
Non-Fixed Object	$87,011	$87,011
Overturn/Rollover	$87,011	$87,011
Jackknife	$87,011	$87,011
Non-collision Other	$87,011	$87,011
Single-Other	$87,011	$87,011
Total Single-vehicle Crashes	$123,627	$136,291

High Injury Network

Following the ranking of sites based on EPDO and RSI, the sites were screened based on the following criteria (in order of weighting) to generate a list of the top 10 sites that have been denoted as the High Injury Network (HIN):

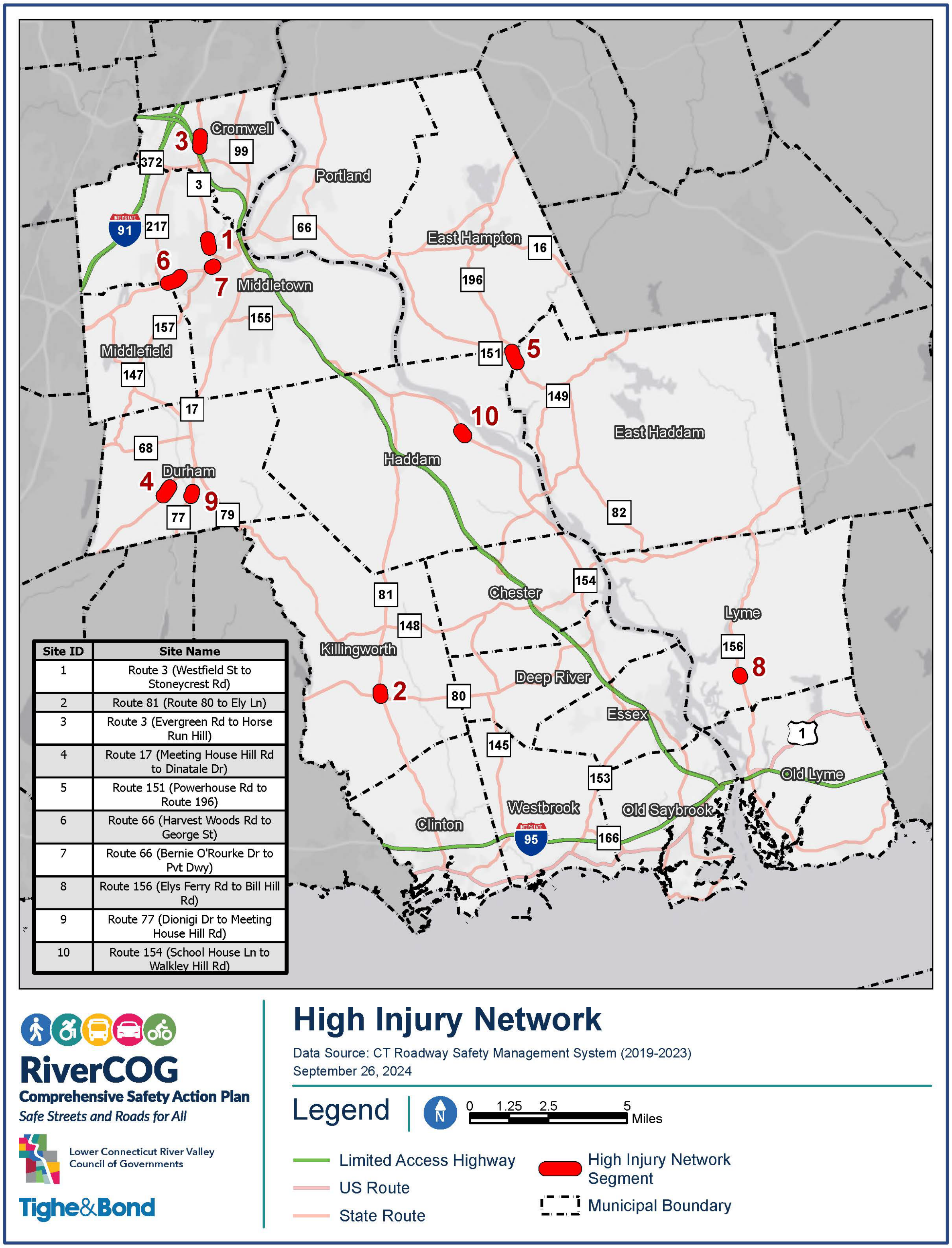
- Sites with overrepresented KA crashes
- Overlapping sites ranked high for both EPDO and RSI
- High EPDO ranking
- Exclusion of sites with known ongoing or planned projects

A desktop review of each site was then conducted to identify key characteristics or factors that may be contributing to crashes at these sites. The High Injury Network locations resulting from the CRSMS analysis are identified in Table 8 and shown graphically in Figure 22.

Table 8 High Injury Network Site Locations

Site ID	Site Name	Town(s)	EPDO Rank	RSI Rank	K	A	Site Characteristics
1	Route 3 (Westfield St to Stoneycrest Rd)	Middletown	5	3	1	0	Mid-block Crossing Transit Stops Older Traffic Signal
2	Route 81 (Route 80 to Ely Ln)	Killingworth	10	11	1	0	Wide driveway curb cuts Horizontal Curves Narrow Shoulders
3	Route 3 (Evergreen Rd to Horse Run Hill)	Cromwell	19	3	1	0	Straight Roadway Segment Older Traffic Signal
4	Route 17 (Meeting House Hill Rd to Dinatale Dr)	Durham	19	3	1	1	Centerline Rumblestrips Horizontal Curve Passing Zone
5	Route 151 (Powerhouse Rd to Route 196)	East Haddam & Haddam	23	11	1	3	Horizontal Curves Skewed Intersecting Road Vertical Rock Face No Centerline Rumblestrips
6	Route 66 (Harvest Woods Rd to George St)	Middlefield & Middletown	24	16	1	0	Wide Cross Section Transit Stop Commercial Driveways High Speeds
7	Route 66 (Bernie O'Rourke Dr to Pvt Dwy)	Middletown	2	--	1	2	Railroad Overpass Steep Downgrade Wide Curb Cuts
8	Route 156 (Elys Ferry Rd to Bill Hill Rd)	Lyme	4	--	1	1	Horizontal Curve Skewed Intersecting Road
9	Route 77 (Dionigi Dr to Meeting House Hill Rd)	Durham	11	--	1	1	Horizontal Curve Centerline Rumblestrips
10	Route 154 (School House Ln to Walkley Hill Rd)	Haddam	15	--	1	1	Mid-block Crossing Centerline Rumblestrips Library & Senior Center Transit Stop

Figure 21 High Injury Network



Site ID	Site Name
1	Route 3 (Westfield St to Stoneycrest Rd)
2	Route 81 (Route 80 to Ely Ln)
3	Route 3 (Evergreen Rd to Horse Run Hill)
4	Route 17 (Meeting House Hill Rd to Dinatale Dr)
5	Route 151 (Powerhouse Rd to Route 196)
6	Route 66 (Harvest Woods Rd to George St)
7	Route 66 (Bernie O'Rourke Dr to Pvt Dwy)
8	Route 156 (Elys Ferry Rd to Bill Hill Rd)
9	Route 77 (Dionigi Dr to Meeting House Hill Rd)
10	Route 154 (School House Ln to Walkley Hill Rd)

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Critical Crash Rate – Top 25 Locations

The Critical Crash Rate was also considered when identifying locations for the High Injury Network. The CRSMS does not isolate KA crashes under this analysis; rather, the Critical Crash Rate must consider all crash severities. This analysis may be useful in identifying locations with high crash rates on higher traffic volume roadways that may not appear in the high severity locations shown in the High Injury Network. The benefits of the Critical Crash Rate methodology include the following:

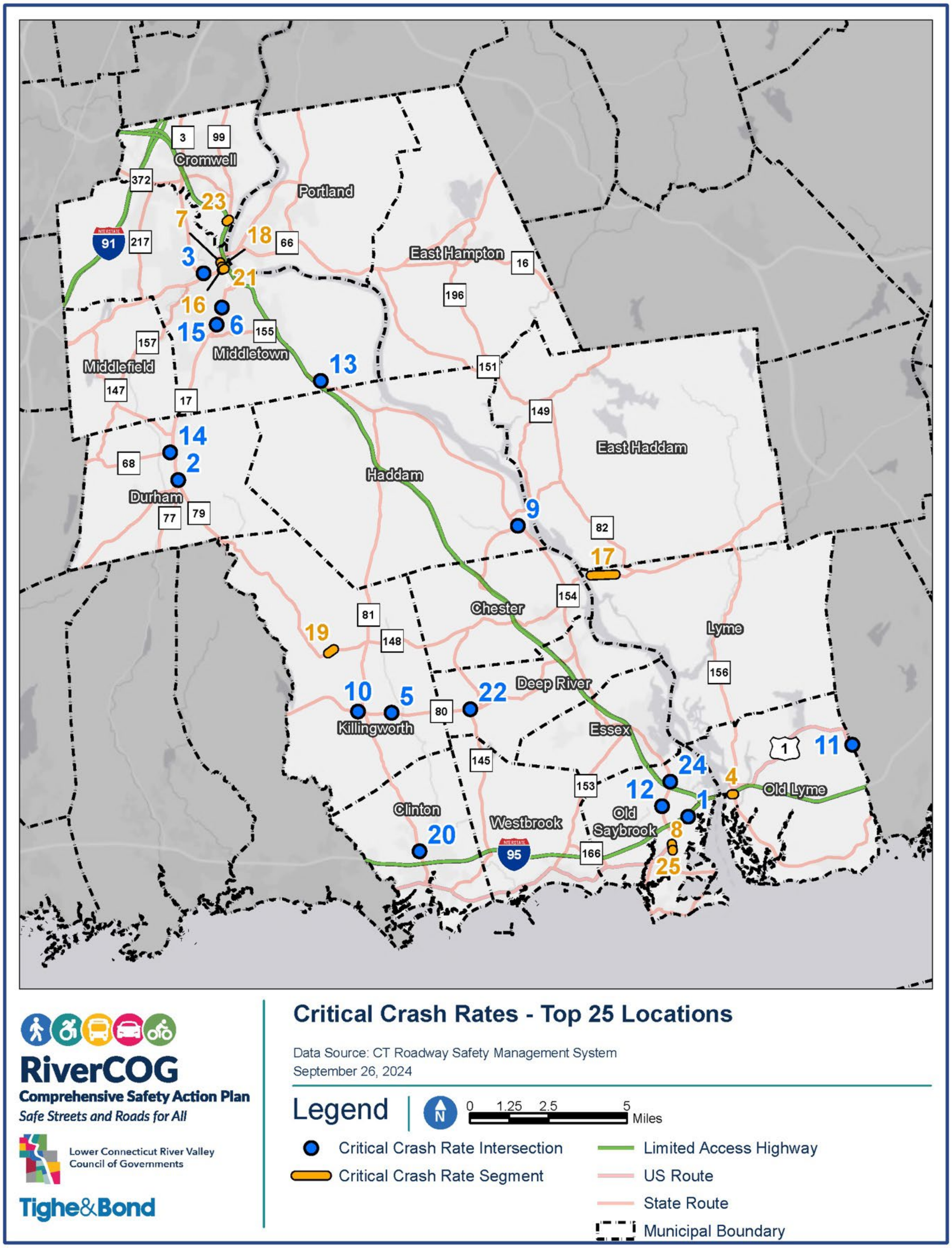
- Reduces exaggerated effect of sites with low volumes
- Considers variance in crash data
- Establishes a threshold for comparison

The top 25 Critical Crash Rate locations are intended to provide additional locations for consideration during project selection. The top 25 list includes several sites along the shoreline towns that are not as well represented in the EPDO and RSI analysis due to the higher traffic volumes in this area and due to the impact of reviewing all crash severities. The top 25 sites are tabulated in Table 9 and shown graphically on Figure 23.

Table 9 Critical Crash Rate – Top 25 Site Locations

Rank	Site Name	Town	Type	Total Crashes
1	US-1 and SR-628	Old Saybrook	Intersection	33
2	CT-79 and Higganum Rd	Durham	Intersection	35
3	CT-3 and Liberty St No 2	Middletown	Intersection	31
4	US-1 and I-95 NB Exit 70 Off-ramp	Old Lyme	Segment	14
5	CT-80 and Roast Meat Hill Rd	Killingworth	Intersection	22
6	CT-17 and Farm Hill Rd	Middletown	Intersection	27
7	CT-66 (Rappallo Ave to Kings Ave	Middletown	Segment	14
8	CT-154 (Elm St to US-1)	Old Saybrook	Segment	28
9	CT-154 and CT-82	Haddam	Intersection	20
10	CT-80 and Old Deep River Tpk No 2	Killingworth	Intersection	8
11	US-1 and Four Mile River Rd	East Lyme	Intersection	11
12	CT-154 and Bokum Rd	Old Saybrook	Intersection	16
13	CT-154 and Freeman Rd	Middletown	Intersection	10
14	CT-68 and Maple Av	Durham	Intersection	27
15	CT-17 and Highland Av	Middletown	Intersection	34
16	CT-66 (Wells Fargo Exit to Main St)	Middletown	Segment	23
17	CT-148 (Great Hill Rd to Day Hill Rd)	Lyme	Segment	4
18	CT-66 (Washington St to Ferry St)	Middletown	Segment	31
19	CT-148 (Beckwith Rd to Birch Mill Rd)	Killingworth	Segment	6
20	CT-81 and Walnut Hill Rd	Clinton	Intersection	12
21	SR-545 (Main St to Melilli Plaza)	Middletown	Segment	13
22	CT-80 and CT-145	Deep River	Intersection	9
23	SR-901 (Main St to CT-9 Overpass)	Cromwell	Segment	2
24	CT-154 and Essex Rd	Old Saybrook	Intersection	9
25	CT-154 (Elmwood St to Dudley Ave)	Old Saybrook	Segment	8

Figure 22 Critical Crash Rate - Top 25



Conclusion & Next Steps

The crash data collection and safety analysis identified crash patterns based on crash type, severity, environmental conditions, temporal trends, driver demographics, driver behavior as well as a review of crashes on a town-by-town basis, all with an overarching focus on KA crashes and crashes involving VRU. The key themes and patterns identified will aim to address existing safety deficiencies. The safety analysis also included the utilization of the CRSMS to develop a High Injury Network and high crash rate locations. The High Injury Network and trend data identified in the safety analysis will serve as the basis for identifying potential projects during the project selection phase of the project.

APPENDIX A: EQUITY ASSESSMENT METHODOLOGY

Calculated equity scores were determined by aggregating scores that corresponded to each of the seven indicators (minority, poverty, LEP, disability, elderly, youth, and zero car). Scores for each indicator ranged from zero to four, where zero would indicate a Block Group had a value lower than the regional average.

Table 10 Equity Analysis Indicators

Indicator	Regional Average
Minority	17.4%
Below Poverty Level	6.3%
Limited English Proficiency	2.4%
People with a Disability	10.8%
Seniors	20.7%
Youth	17.6%
Zero Vehicle Ownership	4.8%

Each indicator score value above zero would be defined based on the distribution of values each Block Group in the region had. Indicators were weighed equally. The highest overall equity score a Block Group could be assigned was 28. Tables used from 2017-2021 American Community Survey 5-Year Estimates were: B01001, B03002, B25044, B17021, B08301, C18108, and C16002.

Justice40 and CTDEEP were included in the equity assessment to understand which communities were deemed as disadvantaged according to federal and state guidelines. Census Tracts are deemed as disadvantaged by Justice40 criteria if they were at or above the threshold for environmental and socioeconomic burdens, completely surrounded by disadvantaged communities and were at or above the 50th percentile for low income, or Federally Recognized Tribes.

Block Groups for CTDEEP were categorized as disadvantaged if 30% or more of the population was below 200% of the federal poverty level, per CT State statute 22a-20a which defines "environmental justice community" as *"(A) a United States census block group, as determined in accordance with the most recent United States census, for which thirty per cent or more of the population consists of low income persons who are not institutionalized and have an income below two* *hundred per cent of the federal poverty level, or (B) a distressed municipality, as defined in subsection (b) of section 32-9p."*

APPENDIX B: PLAN REVIEW

Introduction

This document summarizes the key findings from the plan review. The list of plans includes the following:

- Lower Connecticut River Valley Regional Transportation Safety Plan (2022)
- Lower Connecticut River Valley Bicycle and Pedestrian Master Plan (2022)
- Lower Connecticut River Valley Plan of Conservation and Development 2021-2031
- Lower Connecticut River Valley 2023-2050 Regional Metropolitan Transportation Plan (2023)
- Boston Post Road Corridor Plan Connecticut River to Clinton Western Town Boundary (2015)
- Route 81 Corridor Study (2019)
- Route 66 Transportation Study Portland and East Hampton, CT (2020)
- Connecticut Strategic Highway Safety Plan for 2022-2026 (2022)
- Vulnerable Road User (VRU) Assessment CTDOT Approach (2023)

Review of Plans

Lower Connecticut River Valley Regional Transportation Safety Plan (2022)

The Lower Connecticut River Valley Regional Transportation Safety Plan (2022) aims to reduce crashes by defining and outlining countermeasures to the leading emphasis areas of these crashes. Locations were identified to guide the prioritization of projects with the greatest impact on crash reduction and identify funding opportunities to implement these measures. Locations with their key issues that have the highest frequency and most severe crashes during 2015-2019 are:

- CT-3 between Rose Circle and Westfield Street (Middletown): additional signage with more visibility to address front-to-rear crashes
- CT-81 between Hurd Bridge Road and Oakwood Lane (Clinton): treatments to increase friction and decrease sharpness of curves to counter curve crashes
- CT-17/CT-66 between CT-17A and Perry Avenue (Portland): additional signage with more visibility to curb front-to-rear crashes and speed feedback signage to hinder speeding

- CT-147 between Lakeview Place and Powder Hill Road (Middlefield): treatments to increase friction to decrease curve crashes and speed feedback signage to discourage speeding
- CT-17 between Pinewood Terrace and Ward Street (Middletown): turning lanes and limit driveways to decrease crashes at driveways and increase signage to aid wayfinding at the Highland Ave intersection

Lower Connecticut River Valley Bicycle and Pedestrian Master Plan (2022)

The Lower Connecticut River Valley Bicycle and Pedestrian Master Plan (2022) identifies opportunities to establish safe and connective pedestrian and cyclist access in the region. Key location-based recommendations of the plan include:

- Village Centers: Expanding pedestrian facilities to connect to residential neighborhoods, creating new connections to improve connectivity and can activate open space and trail resources for tourism
- Beach Community: Designing roads to allow for safe multimodal use, with acknowledgement of the high volumes of non-motorized users in beach neighborhoods
- Regional Connections: Expanding and closing gaps in regional greenway networks to enhance multimodal connections and boost recreation and tourism
- State Route Commercial Node: Improving bicycle and pedestrian facilities to make commercial hubs safer and encourage more trips to be made

These recommendations can address the high crash locations resulting from high volumes of traffic and population densities in urban areas in Middletown and Cromwell and the shoreline communities in Old Saybrook, Westbrook, and Clinton. Between 2017 and injury 2019, there was one fatal crash involving a bicycle and three fatal crashes involving a pedestrian in Clinton, Westbrook, Old Saybrook, and Old Lyme.

Lower Connecticut River Valley Plan of Conservation and Development 2021-2031

The Lower Connecticut River Valley Plan of Conservation and Development 2021-2031 develops a vision for the region that creates vibrancy for all who live, work, and play in these communities, as well as recommendations to advance to this vision. Key recommendations of the plan include:

- Addressing safety and traffic congestion on Route 9 through partnership with CTDOT and the City of Middletown

- Creating a local and regional bike network that provides safe connections with convenient amenities
- Developing safe active transportation routes for children to go to school

Lower Connecticut River Valley 2023-2050 Regional Metropolitan Transportation Plan (2023)

The Lower Connecticut River Valley 2023-2050 Regional Metropolitan Transportation Plan (2023) develops the region's long-term transportation goals and priorities to ensure it meets current and future regional needs. This plan takes into account changing demographic, economic, development, and environmental trends. Key recommendations of the plan include:

- Improve safety for road users by reducing roadway related fatalities and serious injuries
- Advance multi-modal plans for enhanced pedestrian and bicycle access through extension of sidewalks, implementation of multi-use trails, and safer connections throughout communities
- Promote a safer and efficient roadway system by implementing improvements for lower congestion, better sightlines, and clear navigation for wayfinding

Boston Post Road Corridor Plan Connecticut River to Clinton Western Town Boundary (2015)

Boston Post Road Corridor Plan: Connecticut River to Clinton Western Town Boundary (2015) seeks to enhance travel access and economic growth along the corridor in the towns of Clinton, Westbrook, and Old Saybrook. Key recommendations of the plan include improving traffic flow, safety, and multimodal travel in locations on Route 1 by:

- Converting the 5-way intersection to 4-way by closing Stevens Road to facilitate safe navigation (Clinton)
- Decreasing the flow of traffic by narrowing the access points at Essex Street (Westbrook)
- Changing the 4-lane road to 3 lanes from Stage Road to Staples intersection to allow for space for other modes and de-center vehicles on the road (Old Saybrook)
- Improving intersections on Elm, Main, and Stage to support traffic flows and mitigate congestion (Old Saybrook)

These measures will ultimately address issues that arise from the following locations with the highest crash rates during 2009-2011 at:

- Grove Street to Liberty Park Center and Liberty Park Center to Beach Park Road (Clinton) influenced by high turning vehicle movement and higher speed limits

- Ledge Road to Mill Rock Road (Old Saybrook) due in part by proximity to Old Saybrook High School, pedestrian traffic from the train station, and multi-lane roads and limited gaps to change lanes or turn
- Eckford Avenue to Westbrook Heights (Westbrook) likely from limited visibility on roadways

Route 81 Corridor Study (2019)

The Route 81 Corridor Study (2019) identifies opportunities to create greater inclusion of the corridor in Clinton with a complete street that meets existing needs and enhances and supports sustainable growth of transportation, quality of life, and economic development. Based on crash data during 2013 to 2017, the highest crash rate activity occurred at the following intersections on Route 81 and interventions are recommended to improve the transportation environments at:

- North High Steet: The I-95 interchange had the highest crash rates in the study area (mostly rear-end collisions) due to the prevalence of many signalized intersections. To allow for pedestrian use, recommendations include enhancing sidewalk connections, implementing signage, and establishing facilities
- I-95 Southbound Interchange: This is a heavily utilized and congested intersection that should install more pedestrian facilities and infrastructure for safe pedestrian access
- CTDOT Commuter Parking Lot Driveway: This lot is adjacent to I-95 and neighbors the outlet mall and commercial corridor. Pedestrian access is limited and safe connections should be made with infrastructure and pedestrian facilities.
- Hurd Bridge Road and Rocky Ledge Drive: Crashes have been reported here likely due to the high traffic volumes and the sharp curvature that impacts visibility. To counter this, roadway shoulders should be extended to at least five feet and the lanes should be reduced to 11 feet to allow for more space for pedestrians, cyclists, and service vehicles.

Route 66 Transportation Study Portland and East Hampton, CT (2020)

The Route 66 Corridor Planning Study (2020) aims to create “complete streets” that support inclusion of the corridor with the broader community in Portland and East Hampton and alleviates congestion, enhances safety and accessibility, and promotes multimodal use. Key recommendations of the plan include: developing a traffic management plan to mitigate the high volumes of traffic and speeding along Route 66. Interventions are recommended for the following along Route 66:

- Intersection at Route 17A (Main Street) which had the most collisions during 2015-2017 likely due to high volumes of traffic and high speeds.

- High Street/ Maple Street and Route 196/ East Hampton/Marlborough Town Line which had a high number of collisions due to the long spacing of traffic signals and steep roadways
- East Hampton Shopping Center driveway and Route 196 which had a high number of collisions due to the large number of access points impacting navigation

Connecticut Strategic Highway Safety Plan for 2022-2026 (2022)

The Connecticut Strategic Highway Safety Plan (2022) aims to reduce 15% of roadway related fatalities and serious injuries by 2026. Key recommendations addressing the major emphasis areas for roadway safety include:

- Improving infrastructure through measures for better roadway navigation, conditions, and visibility to reduce collisions and crashes at intersections.
- Curtailing driver behavior through increased viability of other modal options, use of traffic calming measures, and driver safety campaigns.
- Protecting pedestrians through robust sidewalk networks, improved visibility for drivers, and safe buffers from cars.

Vulnerable Road User (VRU) Assessment CTDOT Approach (2023)

The CTDOT VRU Safety Assessment (2023) determines the safety performance of vulnerable road users, such as pedestrians and cyclists, and recommends strategies to target and improve roadway dangers. These include:

- Enhancing pedestrian safety through measures to improve visibility, protective buffers from cars, and speed reductions.
- Improve bicycle safety through research and implementation for policies, infrastructure investments, and partnerships with local, state, and federal organizations.

These measures emerged from identifying the causes of state-wide VRU fatalities and serious injuries and aim to address and reduce these roadway dangers.