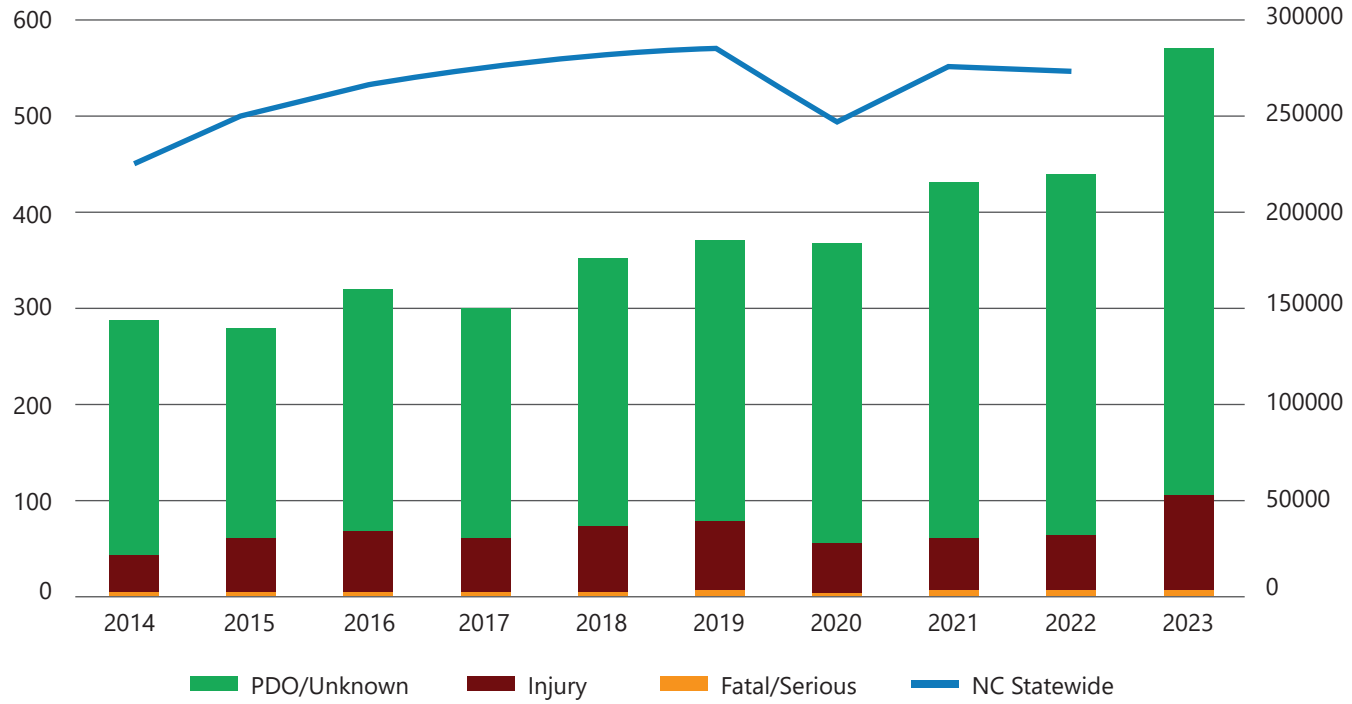
SS4A Safety Action Plan

Taking action on traffic safety: Why Leland? Why now?

Each year in Leland, crashes kill or seriously injure five people on average. Seven people died on roads within Leland in 2024. Crashes have nearly doubled since 2014 and Leland's crash frequency is growing faster than North Carolina as a whole.

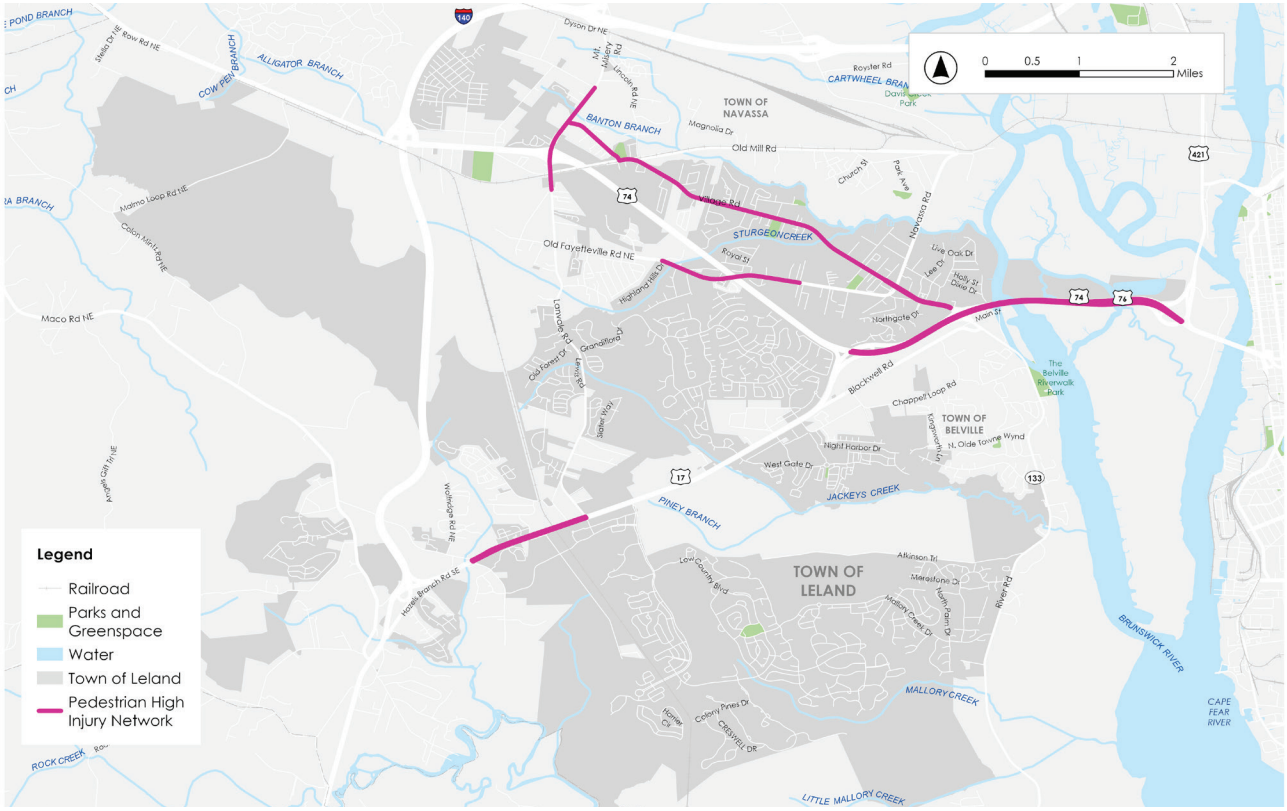


It's time to take action! Leland was awarded a Safe Streets and Roads for All (SS4A) Planning Grant from the U.S. Department of Transportation to study safety and develop near-term actions to reduce crash risk. The Leland Safety Action Plan is the result. Informed by community feedback, the plan provides a vision for transportation safety, safety risk analysis within an equity framework, and projects and strategies to address roadway safety issues.

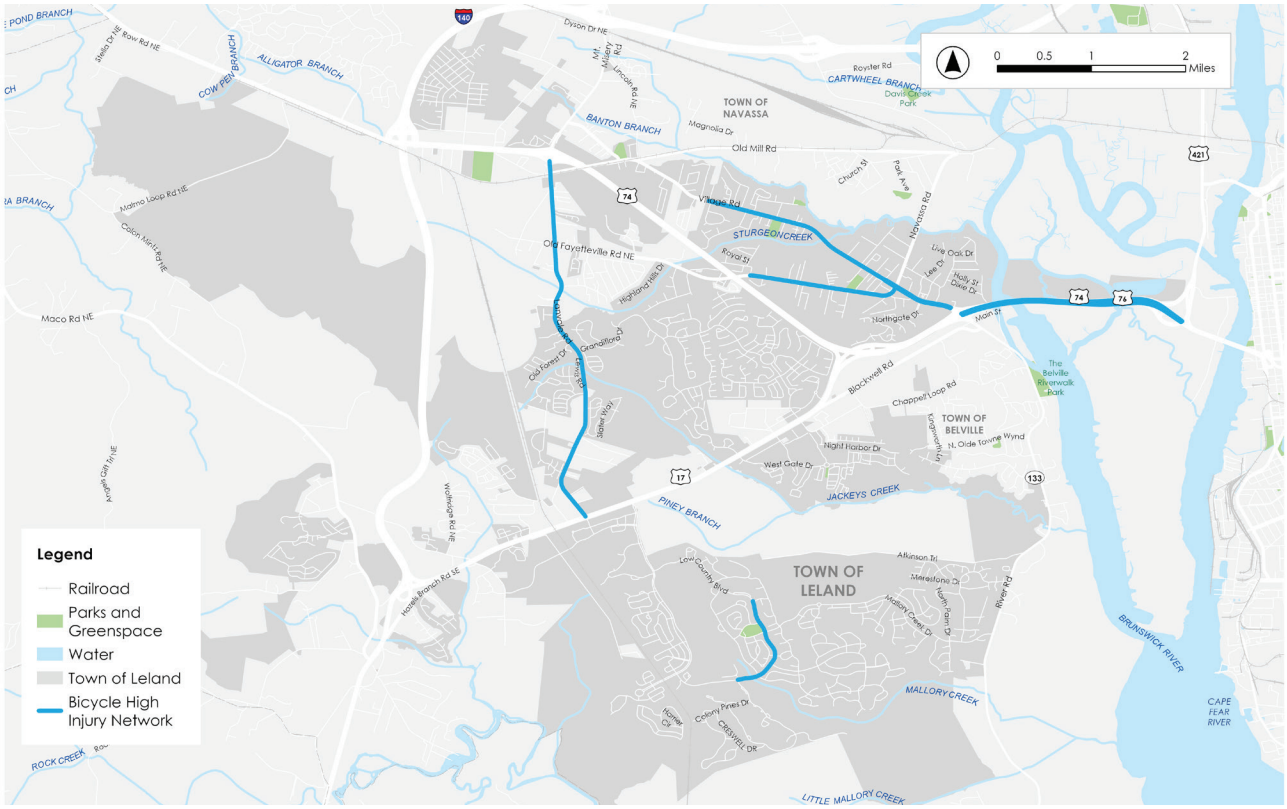
The High Injury Network

Leland's high injury network is made up of locations with a history of serious crashes or a high risk of future crashes based on roadway characteristics. The high injury network allows the Town of Leland to focus crash countermeasures where they are likely to do the most good.

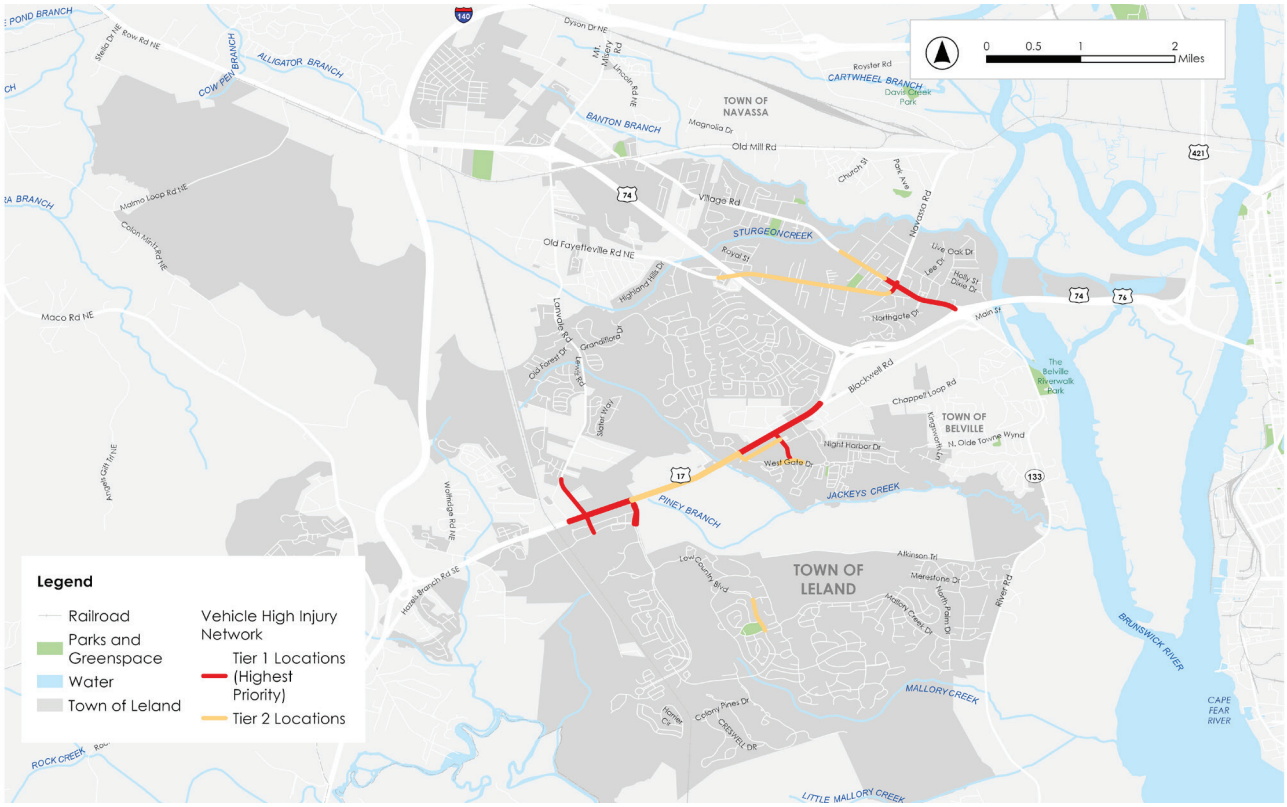
Pedestrian High Injury Network



Bicycle High Injury Network



Vehicle High Injury Network

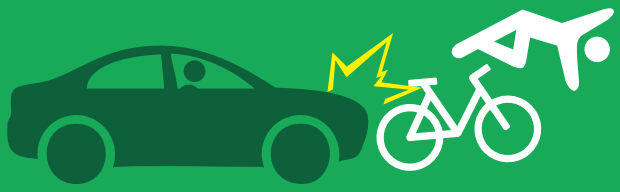


Fatality Risk by Mode

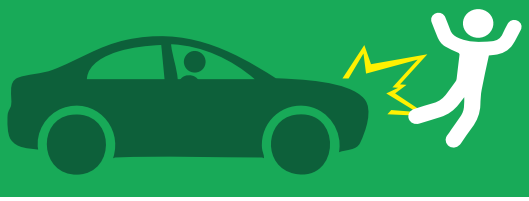
People walking, riding bikes and riding motorcycles are more likely than car drivers or passengers to die or be severely injured in a crash.

1 IN 430
Vehicle Crashes Resulted in Death

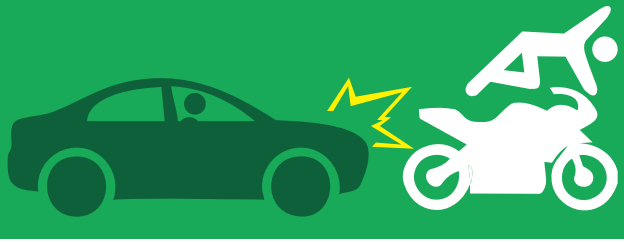
1 IN 15
Bicycle Crashes Resulted in Death



1 IN 20
Pedestrian Crashes Resulted in Death



1 IN 30
Motorcycle Crashes Resulted in Death



SAP Vision Statement

The Town envisions a future where everyone can walk, bike, roll, and drive in Leland without transportation-related fatalities or serious injuries.

SAP goals

- Develop a SS4A Safety Action Plan for Town of Leland municipal limits
- Develop a data-driven framework to identify systemic safety challenges
- Increase collaboration and partnerships across safety stakeholders
- Ensure equitable investment in safety needs
- Recommend innovative, low-cost, high-impact solutions to safety
- Educate and promote a community-wide culture of roadway safety
- Create a continual commitment to fostering safe, equitable, and sustainable mobility for all

Data analysis

Town-wide historical crash trends were analyzed to identify roadway characteristics, conditions, and human factors associated with fatal and severe crashes in Leland.

Focus Intersections by Contributing Factor and Crash Type

Focus Intersection	Contributing Factors				Prominent Crash Types		
	Speeding	Failure to yield	Disregard traffic signals	Improper turns	Angle	Rear End	Side-swipe
US 17 at Ploof Rd/ Olde Waterford Way	X	X	X	X	X	X	X
US 17 at Lanvale Rd/ Provision Pkwy	X	X	X		X	X	X
US 17 at Grandiflora/ West Gate Dr	X			X	X	X	X
US 17 at Ocean Gate Plaza/ Gregory Rd	X		X		X	X	X
US 17 at Brunswick Forest Pkwy	X	X	X		X	X	
Village Rd at Fairview Rd/ Baldwin Dr	X	X		X	X	X	X
Village Rd at Old Fayetteville Rd/Navassa Rd	X				X	X	X
Ocean Gate Plaza at New Pointe Blvd		X			X		
Lanvale Rd at Village Rd/Fletcher Rd	X				X	X	
US 17 at Old Regent Way	X					X	

Public engagement

Community members informed this plan every step of the way. The Safety Action Plan's project team engaged people through interactive activities in person and online.

Public outreach activities

Focus group

A focus group made up of community safety experts, community members of all ages and abilities, and key decision-makers helped guide the plan's development. The focus group participated in four meetings with the project team in between May and December 2024, providing input on Leland's safety issues; helping define the plan's vision, goals, and strategies; guiding public outreach efforts, and reviewing recommendations and priorities.

What we heard from the community

- A significant majority of respondents endorse the goal of achieving zero deaths or serious injuries on roadways.
- An overwhelming 98% of participants are willing to accept longer travel times in exchange for enhanced safety.
- Safety issues are quite prevalent, with 71% of respondents expressing a lack of safety when riding e-scooters and e-bikes. Similar issues are voiced by motorcyclists, bicyclists, and pedestrians, with 64%, 62%, and 45% of respondents, respectively, feeling not safe at all.
- There is a consensus that the town should prioritize the safety of bicyclists and pedestrians, with notable frustration regarding the inadequacy of current bike and pedestrian infrastructure.

What happens now

The project team, collaborating with the public, developed and prioritized infrastructure, policy, and program strategies to help the Town of Leland and its member agencies fulfill the community's vision of a future where no one in Leland dies or is seriously injured in a crash.

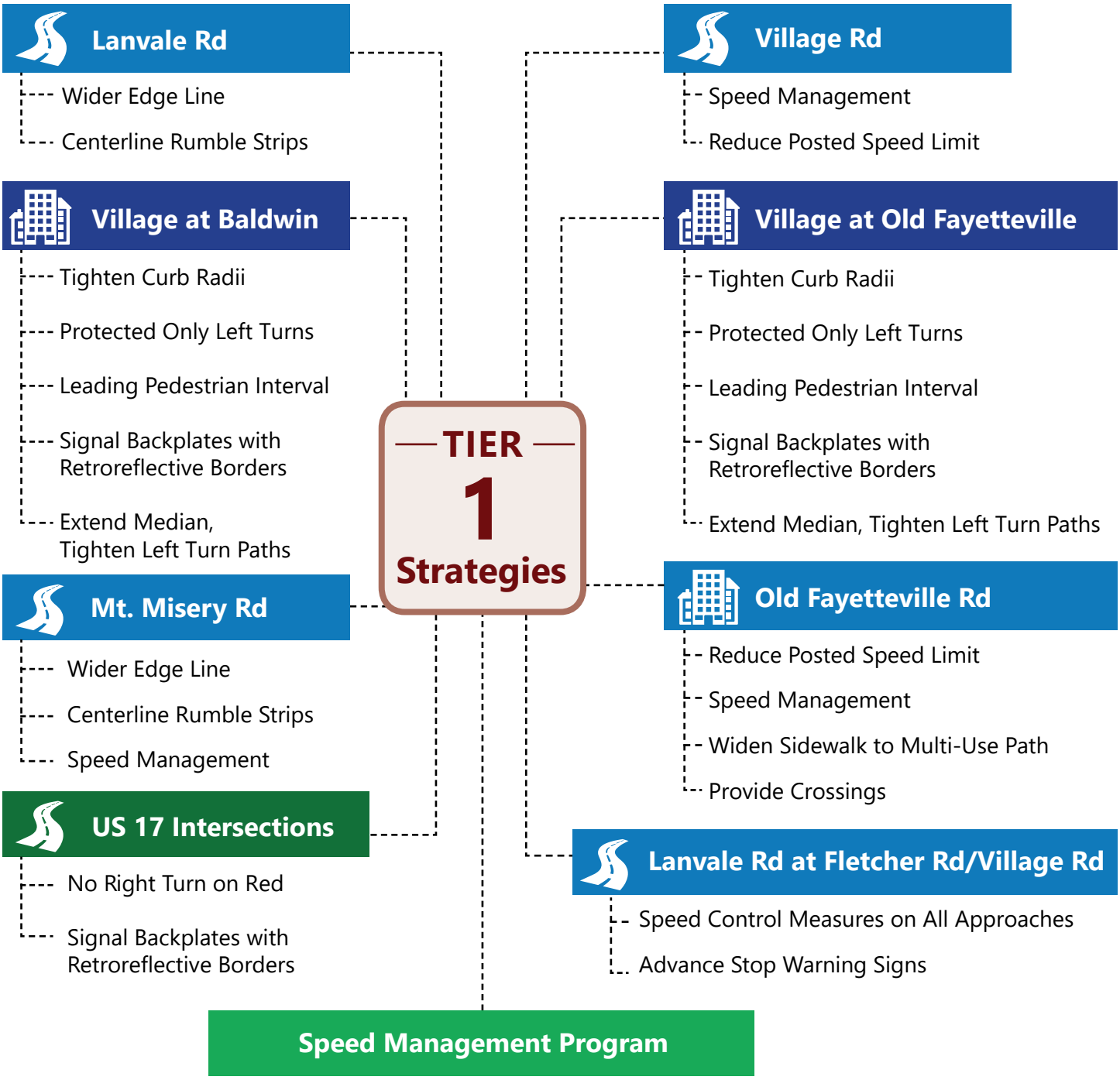
Infrastructure projects

Out of the array of potential projects, the project team identified the most urgent based on the following metrics with a emphasis on near-term implementation:

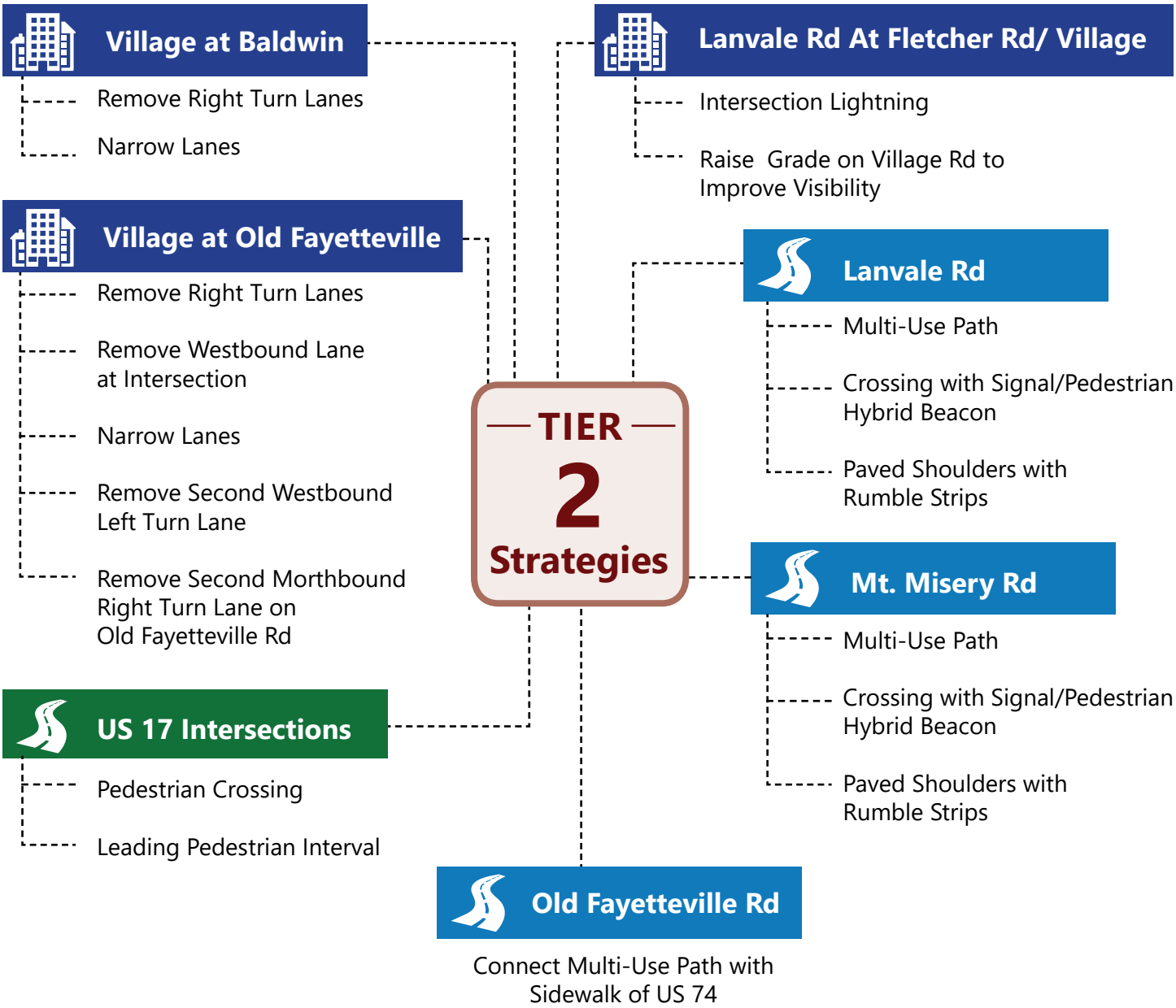
Quick Build Nature	Cost of materials, installation effort, and timeline
Design and Construction	Level of design and degree of construction needed
Cost	Overall expected cost of the project
Public Input	Public perception of priority areas

The project team further developed tier 1 and tier 2 priority projects for the Action Plan. Each priority project implements location-specific strategies to reduce fatal and serious injury crashes. Priority projects serve as a starting point for further development for grant funding and can also be used as examples of how countermeasures could be used for similar locations.

Tier 1 High Priority Recommended Projects



Tier 2 Secondary Priority Recommended Projects



Policy, program and other strategies

This section presents implementation considerations for high-priority, non-infrastructure strategies, such as policies and plans or recommendations related to agency coordination or operations. Many of these recommendations require partnerships with WMPO, NCDOT, and adjacent municipalities for effective implementation. Recommended strategies include the following:

Non-Infrastructure Strategies

- Continue safety focus group
- Identify grant funding opportunities
- Establish Dedicated Funding for Safety Projects
- Regularly Assess Implementation Successes and Challenges
- Lower posted speed limits
- Encourage and incentivize speed management training
- Develop and advertise a traffic calming toolbox
- Apply targeted enforcement
- Project development
- Updating roadway cross sections
- Education campaign for all road users
- Public sense of responsibility
- Communicate with EMS for speed management projects

Learn more!

- Details on all the information in this summary can be found in the full Safety Action Plan.
- For more information on what's happening now, visit https://www.townofleland.com/planning-inspections/planning-zoning/transportation-planning/safe-streets-and-roads-all.

Leland SS4A Safety Action Plan

TABLE OF CONTENTS

Executive Summary 1
Vision and Goals 10
Existing Conditions 11
Action Plan 36
Implementation Plan 52

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Wilmington, NC 28401
P 910.475.1789

TECHNICAL MEMORANDUM

February 3, 2025 Project# 29848

To: Ben Andrea
Town of Leland
102 Town Hall Drive
Leland, NC 28451

From: Andrew Ooms, PE

CC: Zach Bugg PhD, PE, Andrew Ooms

RE: Leland SS4A Comprehensive Safety Action Plan - Vision and Goals

Vision and Goals

This section presents the draft vision statement after initial discussion with the Focus Group in Meeting #1, the proposed interim target to meet that vision, and goals to help the region achieve its vision.

Vision

The SS4A program requires a safety action plan with a goal of zero fatalities and serious injuries to be eligible for Implementation Grants. Applying agencies also need to set a specific date for achieving this goal or for achieving a significant reduction in fatalities and serious injuries.

The vision statement for the Leland Comprehensive SS4A Safety Action Plan is:

> **Vision Statement:** *A future where everyone can walk, bike, roll, and drive in Leland without transportation-related fatalities or serious injuries.*

Goals

To achieve this vision, the Town is adopting the following goals:

- Develop a SS4A Safety Action Plan for Town of Leland municipal limits
- Develop a data-driven framework to identify systemic safety challenges
- Increase collaboration and partnerships across safety stakeholders
- Ensure equitable investment in safety needs
- Recommend innovative, low-cost, high-impact solutions to safety
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RE: Leland SS4A Comprehensive Safety Action Plan

Introduction

Kittelson is working to develop a Comprehensive Safety Plan for the Town of Leland as part of a Safe Streets for All (SS4A) planning grant. This memorandum will support the completion and adoption of a Safety Action Plan and summarizes work completed under Task 5 of the contract. It includes six sections:

- **Best Practices** – Summarizes best practices from the Federal Highway Administration (FHWA) and other international practices.
- **Literature Review** – Reviews existing plans, practices and findings from other plans implemented in the Town of Leland and North Carolina.
- **Public Engagement** – Summarizes outreach and engagement with agencies and the public as well as summary findings from public comment.
- **Town-Wide Trends** – Describes historical trends for the Town of Leland by crash characteristics and participant characteristics with a goal of identifying high-risk conditions and priority crash types for reducing crashes resulting in injuries and fatalities.
- **High-Injury Networks Development** – Presents the process used to identify the high-injury network (HIN) for the Town of Leland, which summarizes the roadway segments where crashes are concentrated across the town.
- **Systemic Analysis and Emphasis Areas –** Describes the town-wide systemic analysis to identify focus areas to be addressed by policy actions and widespread treatments.

Crash Data

The North Carolina Department of Transportation (NCDOT) maintains the Traffic Engineering Accident Analysis System (TEAAS)[1], a comprehensive crash database. TEAAS has recorded all reportable traffic crashes in North Carolina since 1990, including details such as location, date, crash type, and involved parties. Law enforcement officers complete crash report forms that are then sent to a statewide database

[1] Traffic Engineering Accident Analysis System (TEAAS) (ncdot.gov)

managed by the N.C. Division of Motor Vehicles and then recorded in TEAAS. This data serves various purposes including analysis and planning.

For the period spanning 1/1/2014 - 12/31/2023, detailed crash information for the entire town was obtained through collaboration with NCDOT. This data was processed to determine the individual vehicles involved and individuals involved, including both drivers and passengers. Data from the most recent five years (2019-2023) was used for motor vehicle crash analysis, while data from the past decade (2014-2023) was used for analyzing bicycle and pedestrian crashes.

This crash data includes information on the crash location, however this information is not always complete. In this crash data set, 74% of Town crashes were geocoded, that is, assigned to a roadway and milepoint and able to be included in GIS mapping and analysis. The other 26% of crashes generally include street information, but not enough supplemental detail to make a precise determination of location, such as placing the crash at a particular intersection. These unmapped crashes were predominately low severity and on local streets. While the mapped crashes were later including in GIS-based analysis and mapping, the following approaches were implemented to overcome this and other data challenges:

- Utilizing additional NCDOT mapping resources with complete geocoding from the NCDOT GO!NC Portal[2], including all fatal and serious injury crashes and all pedestrian and bicycle crashes
    - Pedestrian and Bicycle crash data extends through 2022, so the data presented in Figure 11 is the most recent available.
    - Fatal and severe injury crashes are mapped through 2023 as shown in Figure 10.
- The crash data provided by NCDOT is all crashes within the Town of Leland boundaries. However, these boundaries are irregular and often run parallel to but excluding major roads like US 17. The crash mapping data available from the GO!NC Portal extends beyond this boundary and is considered in the GIS and systemic analysis.
- The crashes without mapping information were analyzed via spreadsheet based on the location data available (typically street name) to identify crash patterns and hotspots. These locations are considered in the development of the high injury networks.

Best Practices

The project team reviewed FHWA guidance, international best practices, and plans from various other agencies. Key findings from these reviews include:

- The Safe System Approach (SSA) has been adopted as a core strategy by the United States Department of Transportation in its National Roadway Safety Strategy. The SSA is a mindset shift from crash prevention to injury/fatality prevention - putting emphasis on designing for mistakes that people make so those mistakes do not result in a fatal or serious injury crash. FHWA has published two documents that that should be used to help develop strategies for this plan: the *Safe System Roadway Design Hierarchy* and *Safe System-Based Framework and Analytical Methodology for Intersections*. The SSA is being implemented by leading agencies around the country.
- Successful regional transportation safety plans include the following approaches:

[2] https://ncdot.maps.arcgis.com/home/index.html

  - Conduct a robust and targeted stakeholder outreach effort, with a steering committee to guide the plan implementation and evolution. Continued engagement after the plan encourages SS4A communities to implement projects and facilitate subsequent updates.
  - Data analysis should identify systemic trends and develop a HIN that focuses on fatal and serious injury crashes.
  - To address systemic trends, many regional plans provide a toolbox of potential solutions that allow member agencies to develop projects to address identified trends. Using the toolbox as a guide, some agencies have successfully identified projects as part of their safety plans.
- Successful elements of regional safety plans include:
  - Agency-specific strategies related to education, engagement, coordination, and technical support.
  - Strong political support and a commitment from elected officials and staff to prioritize their safety goals.
  - Implementation strategies that include:
    - Identifying quick-build and low-cost projects for quick-wins.
    - Making incremental progress to build toward the ultimate goal.
    - Providing funding and other support to agencies to simplify the project development process.
    - Coordinating across agencies to share resources and prepare joint project applications.
    - Adapting strategies to changing data and sharing success stories.

Lessons Learned from Federal and International Practices

Safe System Approach (SSA)

The Safe System Approach (SSA) has been in use in countries around the world for decades to help them move towards a goal of zero roadway deaths and serious injuries. It has proven to be effective, as countries who have adopted the approach saw decreases of 33% to nearly 70% in roadway fatalities between 2000 to 2019[3]. In January 2022, the United States Department of Transportation released its *National Roadway Safety Strategy*[4] that adopted the SSA as its core strategy for achieving the goal of zero traffic-related fatalities and serious injuries, often referred to as "Vision Zero." The SSA is a mindset shift from crash prevention to injury/fatality prevention. It puts less emphasis on improving behavior and more emphasis on designing for mistakes that people make so that those mistakes don't result in fatal or severe injury crashes.

[3] SSA Presentation Oct 2022 update 508_Jan04.2023.pptx
[4] National Roadway Safety Strategy (transportation.gov)

Figure 1: Safe System Approach Principles and Objectives (Source: FHWA)

Figure 1 illustrates the six principles and five objectives of the SSA. The six SSA principles, shown on the outside ring of the graphic, encompass the fundamental beliefs that the approach is built on. A successful Safe System Approach weaves together all six principles. The six principles are shown around the outside ring of the graphic.

The five SSA objectives, presented in the middle ring of the graphic, are conduits through which the approach is implemented. These promote a holistic approach to safety across the entire roadway system and employ the six principles. **Figure 2** contrasts the Safe System Approach with how transportation safety has been more historically addressed.

Figure 2: Historical Approach Compared to SSA (Adapted from FHWA[4])

Safe System Roadway Design Hierarchy

To help agencies put the SSA into practice, FHWA recently published the *Safe System Roadway Design Hierarchy*[5]. This guide is intended to help practitioners make project-specific decisions for treatments. It places strategies into four tiers with respect to their alignment with the SSA, as shown in **Figure 3.** It prioritizes the need to remove the severe conflicts that are mostly likely to result in fatal or serious injuries (e.g., separating vulnerable road users from motor vehicles, removing roadside fixed objects). This is followed by managing motor vehicle speeds (reducing kinetic energy), using traffic control devices to manage conflicts in time, and, finally, making road users more aware of potential conflicts (e.g., signing, striping. etc.). Practitioners are encouraged to start at the top of the hierarchy when identifying potential treatments. The guide includes several countermeasures in each tier to be considered when evaluating a site and developing projects.

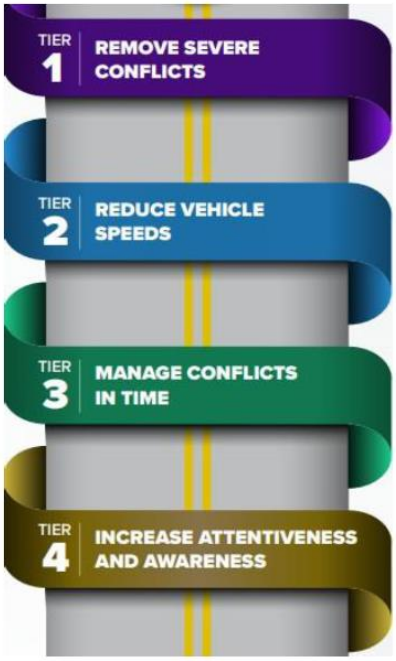


Figure 3: Safe System Roadway Design Hierarchy[4]

International Examples

The Safe System Approach, as well as the goal of zero fatalities and serious injuries, has been adopted by multiple countries over the last few decades. **Figure 4** shows the success that these countries have had in

[5] https://highways.dot.gov/sites/fhwa.dot.gov/files/2024-01/Safe_System_Roadway_Design_Hierarchy.pdf

reducing fatalities through this commitment. Between 2000-2019, the countries that have been leaders in adopting the Safe System Approach saw fatalities drop from 70% to nearly 33% compared to the fatality rate in the United Stated decreasing by less than 6% during the same time[2].

These countries have incorporated the SSA into many facets of their transportation system, including planning, design, and operations in addition to changes in traffic laws and enforcement practices. Examples of common tactics employed in these countries to achieve this level of success include:

- **Prioritizing speed management** – By recognizing that speed plays a significant role in the severity of a crash when it occurs, these countries prioritize speed management. It is often based on the types of crashes that are expected to occur (e.g., a maximum speed of 20 miles-per-hour (mph) when people walking and biking are expected to be present[6]. Roundabouts, raised crossings, and other forms of horizontal or vertical deflection are some of the treatments used to promote safe speeds.
- **Reducing conflict points and separating modes** – These strategies aim to reduce the likelihood of a crash occurring between multiple users. They include treatments such as separated infrastructure and signal phasing for different modes, roundabouts, and frequent passing lanes on rural high-speed roads.
- **Incorporating the SSA into analysis and design practices** – Many countries have begun incorporating the mindset for injury and fatality prevention into their analysis and design practices. For example, Australia conducts Safe System Assessments to evaluate how well project designs align with Safe System principles. These assessments focus on major crash types and consider crash severity potential, road user exposure, and crash likelihood[7].

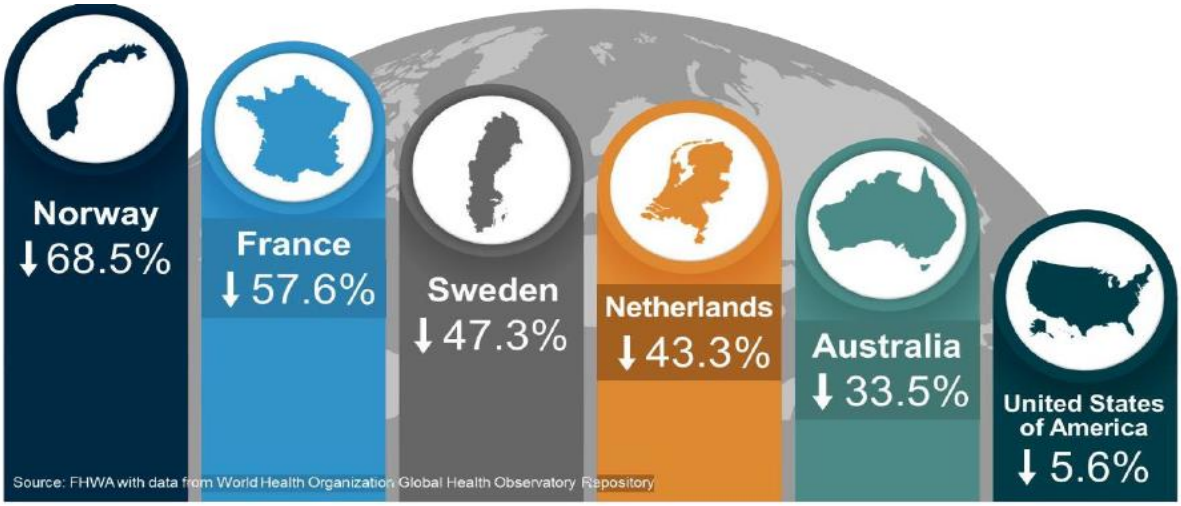


Figure 4: Change in Fatalities from 2000 to 2019 (Source: FHWA[2])

FHWA Intersection Safety Analysis Methodology

FHWA recently published a *Safe System-Based Framework and Analytical Methodology for Intersections*. This report introduces a method for analyzing intersection design and operations in accordance with the

[6] https://highways.dot.gov/public-roads/winter-2022
[7] https://austroads.com.au/__data/assets/pdf_file/0026/171728/AGRS06-19-Guide_to_Road_Safety_Part_6_Managing_Road_Safety_Audits.pdf

Safe System Approach, referred to as the Safe System for Intersections (SSI) method. The SSI method emphasizes strategies that include the following:

- Minimizing and modifying conflict points
- Reducing speed of vehicles
- Improving visibility at intersections
- Providing space and protection for pedestrians and bicyclists

Local Plan Review

The project team investigated other plans implemented in the Town of Leland.

The Leland 2045 Comprehensive Land Use Plan

The purpose of *The Leland 2045 Comprehensive Land Use Plan*[8] is to enable Leland officials and citizens to anticipate and constructively respond to growth and change and to encourage the development of safe and healthy, built and natural environments that create opportunities for all. The main vision of the plan is to develop a healthy, safe, equitable, and accessible community built upon their strong values for the natural environment; inclusivity; walking and biking; social, economic, and physical connectivity; the quality of our neighborhoods; access to services, facilities, and places to gather; and the unique image and sense of place they have nurtured together as a community.

Safety is a key element of the following vision statements that were identified as part of this plan:

i. Livable, diverse, and connected neighborhoods that accommodate growth

The plan values walkable and bikeable connections between neighborhoods to promote a sense of community and belonging. It aims to promote development patterns that support safe, effective, and multi-modal transportation options, including auto, pedestrian, bicycle, and transit. This will minimize vehicle traffic by providing for a mix of land uses, walkability, and compact community form. Proposed actions in the plan include:

- Plan for Transit Ready Nodes along US 17, US 74, Village Rd, Lanvale Rd, and Old Fayetteville Rd.
- Plan for Trail Ready Nodes along the Green Network.

ii. Infrastructure that supports community life

Leland aims to provide efficient, cost-effective, and environmentally-friendly infrastructure service, including safe and complete streets as well as opportunities for potential future transit connectivity. As Leland grows and expands, its identity can include biking and walking as a major component of day to day living, mobility, and recreation. The existing and proposed trail system will provide bicyclists and pedestrians numerous ways of moving through and around Leland safely, for both active transportation

8 https://www.townofleland.com/sites/default/files/uploads/Planning%20and%20Inspections/leland2045_final_draft.pdf

and recreation, to create a truly connected town - one that is connected to the Cape Fear River, regional trails and the proposed Gullah Geechee Heritage Trail. Proposed actions in the plan are:

- Create and adopt a "Complete Streets" policy.
- Create access management plans for all major roadways and roadways supporting commercial land uses.
- Create neighborhoods that are walkable with pedestrian-scaled streets and blocks.
- Create roadway and trail connectivity in a connected street pattern adapted to the natural environment and land use type.
- Establish access management designs on major roadways that avoid multiple curb cuts and lengthy turning lanes, establish back street connectivity, and promote parking lot connectivity.

North Carolina Strategic Highway Safety Plan (SHSP) (NCDOT)

The North Carolina Strategic Highway Safety Plan[9] established NCDOT's goal to reduce fatalities and serious injuries by half by 2035, moving towards zero by 2050. The main emphasis areas of this plan, along with their planned actions are summarized below:

- Lane departure crashes
  - Implement roadway departure countermeasures.
  - Continue research to better understand the contributing factors in lane departure crashes and to identify opportunities to mitigate the problem by applying countermeasures.
  - Conduct outreach to educate the public, agencies, and officials on critical issues related to lane departure crashes.
- Intersection safety
  - Increase implementation of all-way stop intersections at appropriate locations.
  - Increase implementation of quick-build intersection safety countermeasures.
  - Consider the exposure of pedestrians, bicyclists, and users of personal mobility when designing intersections and manage speeds at conflict points.
  - Fund ongoing and new campaigns for public acceptance of intersection safety treatments and designs.
  - Educate roadway designers, planners, and officials/decision-makers on intersection design principles proven to reduce fatalities and serious injuries.
  - Research and implement effective ways to better ensure compliance with traffic control devices.
- Pedestrians, bicyclists, and personal mobility
  - Develop and adopt formal policies, practices, and guidance documents supporting the implementation of pedestrian- and bicyclist-focused design, operations, and maintenance.
  - Improve pedestrian, bicyclist, and personal mobility data collection practices to enable improved analysis and decision-making and support increased adoption of these modes.
  - Develop and implement funding and project development strategies that support effective multimodal project development and education for all road users.

[9] https://connect.ncdot.gov/groups/echs/Documents/2024/2024%20NC%20SHSP%20Update%20(2-16-24).pdf

    - Explore, demonstrate, and implement innovative and emerging tools to support improving safety for pedestrians, bicyclists, and users of personal mobility devices.
    - Develop and promote public education programs that support education for all road users on safety for pedestrians, bicyclists, and personal mobility users.
- Seat belts and car seats
    - Increase seat belt use and car seat use statewide
    - Strengthen state-wide Child Passenger Safety Program.
    - Improve Child Passenger Safety outreach to at-risk and underserved communities.
    - Develop sample language for public agencies and private business with fleet vehicles to implement a workplace seat belt policy.
- Safer speeds
    - Improve speed-related data collection, completeness/coverage, accessibility, and applications.
    - Use the results of data analysis to identify speed-related issues.
    - Support municipalities by increasing their involvement and partnership in speed-related issues (e.g., speed limits) for NCDOT-maintained streets.
    - Expand automated enforcement options for roadway safety in North Carolina, specifically the use of speed safety cameras in school zones and work zones.
    - Analyze speed-related two-lane rural road crashes.
- Motorcyclists
    - Build a foundation to strengthen motorcycle endorsement/training practices, legislation, and policy.
    - Develop training and education for law enforcement on understanding issues and complexities of motorcycle crashes.
    - Improve data on protective gear to better understand the different needs and safety issues by rider type.
    - Recognize the unique vulnerabilities and characteristics of motorcyclists during the construction and maintenance of transportation infrastructure.
    - Conduct data improvement efforts related to motorcyclist training, exposure measures (traffic volumes/locations), and safety outcomes in crashes.
- Younger drivers
    - Continue research to better understand the contributing factors in young driver crashes and to identify opportunities to mitigate the problem.
    - Reinforce the driver education curriculum and licensing procedures to promote safe driving habits.
    - Educate the public and agency stakeholders on younger driver issues and safe driving habits.
- Older drivers
    - Design a roadway system that better accommodates the needs of older drivers.
    - Monitor research to identify opportunities and implementation strategies to mitigate contributing factors in older driver crashes and improve the efficacy of medical review process.
    - Implement programs that assess cognitive abilities of older drivers and identify adequate alternatives to driving.
    - Educate the public and agency stakeholders on older driver issues.
- Substance impaired driving

- Work with the Governors Highway Safety Program to educate the public on the risks of impairment.
- Research lowering BAC levels and establishing maximum THC levels for driving in North Carolina.
- Increase training for prosecutors and law enforcement officers on different forms of impairment.
- Strengthen intervention policies to reduce recidivism.
- Increase the number of drug recognition experts (DRE) across the State.

WMPO Metropolitan Transportation Plan

The Wilmington Urban Area Metropolitan Planning Organization (WMPO) is the designated Metropolitan Planning Organization (MPO) recognized by the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) for the Wilmington Urban Area. Covering approximately 494 square miles, WMPO's planning jurisdiction includes New Hanover County and parts of Brunswick and Pender counties. *Cape Fear Moving Forward 2045*[10] is the WMPO's Metropolitan Transportation Plan (MTP). It outlines the region's transportation needs and sets a roadmap for development over the next 25 years.

The primary vision of the 2045 MTP is to establish a safe, efficient, and reliable multimodal transportation network that embraces innovation while upholding environmental and social responsibility. Among the ten key planning factors outlined in the MTP, one of them is to enhance the safety of the transportation system for both motorized and non-motorized users. One of the major visions of the plan is to "promote transportation projects that increase the safety of all users by decreasing injury and increasing user awareness."

As part of this plan's development, WMPO received a robust response from the community. The top investment priorities identified from this outreach include:

1. Improving the safety of existing roads
2. Enhancing the quality of existing roads
3. Implementing initiatives to enhance bicycle and pedestrian safety

In terms of travel priorities, safety also emerged as the paramount issue among respondents.

To address these priorities, the plan emphasizes leveraging technology to empower users with better information. This approach aims to facilitate safer, more coordinated, and smarter utilization of the transportation network.

Public Engagement

Public engagement is a critical element for the development of any Safety Action Plan. The project team engaged local community members in a variety of ways to gain their input on existing conditions, identify transportation safety issues, and discuss potential improvement strategies. Prior to beginning any detailed

[10] https://www.wmpo.org/wp-content/uploads/2020/11/Cape-Fear-Moving-Forward-2045_ADOPTED-November-2020_Reduced-File-Size.pdf

public engagement, the team created a Community Engagement Plan (Appendix A) to document the engagement strategy, key community groups, and general goals for public engagement. Public engagement for the project included a range of methods, including in-person events (with a virtual option), online surveys, and both digital and printed materials.

ENGAGEMENT GOALS AND OUTREACH STRATEGIES

Acknowledging the key goal for developing a holistic, well-defined strategy to prevent roadway fatalities and serious injuries in Leland, the project team developed a broad strategy for engaging with members of the town with a goal to not only inform but also to encourage interactive activities over a mix of in-person and online media. The following public engagement activities and tools were utilized to help achieve the goals of the project:

- Two rounds of Focus Group meetings
- Public outreach consisting of:
    - In-person open house event with physical mapping activities
    - Online survey
    - Interactive map

The public engagement plan successfully identified community perceptions of safety, potential problem areas, and proposed solutions. As documented in the following sections, the project team was successful in receiving hundreds of comments and survey responses, as well as individual conversations at in-person events.

Focus Group Meetings

A Focus Group is a large group that represents community safety experts, community members of all ages and abilities, and key decision makers that understand the importance of the Plan and can help guide the development of the Plan.

MEETING #1

This meeting was held in May 2024 to kick off the project and prepare for the first round of public engagement. This meeting focused on:

- Introducing the concept of a Safety Action Plan to the Focus Group members
- Gathering input from the members on safety issues and the vision of achieving zero-fatalities
- Discussing the roles and responsibilities of the members in the development of the plan

MEETING #2

This meeting was held in June 2024 after the initial crash data analysis was complete. This meeting focused on:

- Reviewing and discussing the results of the crash analysis
- Defining emphasis areas, goals, and strategies for the Safety Action Plan
- Exploring potential strategies to expand the reach and effectiveness of public outreach efforts

Public Outreach

The Town of Leland launched a public engagement period to hear from the public about their transportation and roadway safety issues. A total of 302 responses were obtained from the survey. Various methods were utilized to reach out to the public such as:

- Open House with physical mapping activity (conducted on July 2024)
- Public Survey and Online Interactive Map[11] publicized via:
    - Town of Leland's webpage
    - Social Media platforms (Facebook, Instagram, X, and LinkedIn)
    - Notification boards and paper surveys in Town Hall, Senior Center, Leland Library, and Cultural Arts Center

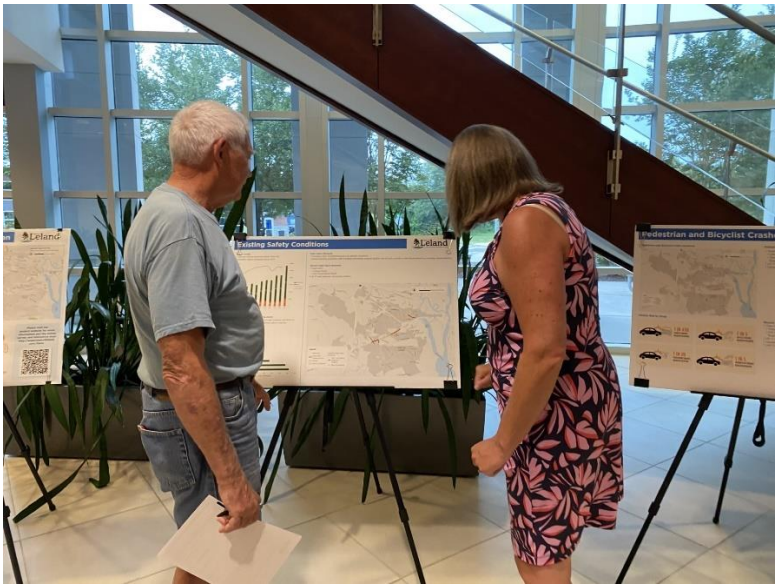


Figure 5: Photos from the Open House

PUBLIC ENGAGEMENT SUMMARY

Based on the responses, the following key takeaways can be obtained:

SURVEY RESPONSES

- A significant majority of respondents endorse the goal of achieving zero deaths or serious injuries on roadways.
- An overwhelming 98% of participants are willing to accept longer travel times in exchange for enhanced safety.
- Safety issues are quite prevalent, with 71% of respondents expressing a lack of safety when riding e-scooters and e-bikes. Similar issues are voiced by motorcyclists, bicyclists, and pedestrians, with 64%, 62%, and 45% of respondents, respectively, feeling not safe at all.

[11] https://maps.kittelson.com/LelandSS4A

- There is a consensus that the town should prioritize the safety of bicyclists and pedestrians, with notable frustration regarding the inadequacy of current bike and pedestrian infrastructure.

LOCATION-SPECIFIC RESPONSES

- Lighting in many areas is identified as a significant issue affecting safety.
- Consideration should be given to reducing speed limits in certain areas and implementing traffic calming measures such as speed bumps or rumble strips. Enhanced enforcement of traffic laws may also be necessary to address aggressive driving, speeding, and distracted driving.
- Many issues have been raised about the intersections at Lanvale Road/Fletcher Road and Brunswick Forest Parkway/Low Country Boulevard.
- Considering recent developments, the addition of pedestrian crossings on Highway 17 is deemed essential for improving accessibility and safety.
- Lanvale Road experiences significant bicyclist and pedestrian activity; however, the corridor faces issues with vehicles speeding and a lack of bike and pedestrian infrastructure.
- There is a need for additional crossings on US 17 to facilitate safe access to commercial establishments.
- Desire for pedestrian crossings at the intersection of Low Country Boulevard and Brunswick Forest Parkway.
- There is a significant safety concern on US 17 related to speeding vehicles, U-turns on red lights, and red-light violations.
- U-turns on Village Road at Baldwin Drive have adversely impacted safety at this intersection.
- Access management is deemed crucial on Ocean Gate Plaza at New Pointe Boulevard and US 17 at Brunswick Forest Parkway for enhanced safety at these intersections.

Town-Wide Trends

Town-wide historical crash trends analysis were used to identify characteristics associated with fatal and severe crashes and to provide a contextual understanding of roadway safety in the Town of Leland.

General Trends

Figure 6 summarizes the reported crashes by severity in the Town of Leland between January 1st, 2019, and December 31st, 2023. The crashes are categorized on the basis of severity as follows:

- Class K – Fatal Injury Crash
- Class A – Serious Injury Crash
- Class B – Minor Injury Crash
- Class C – Possible Injury Crash
- Property Damage Only Crash (PDO)
- Unknown Severity

During this time, there were 2,169 reported crashes, 1.06% of which resulted in a fatality or serious injury. Note that this time period includes the COVID-19 pandemic, which per NCDOT, both reduced statewide roadway volumes and crash frequency, but increased fatal crashes compared to prior years.

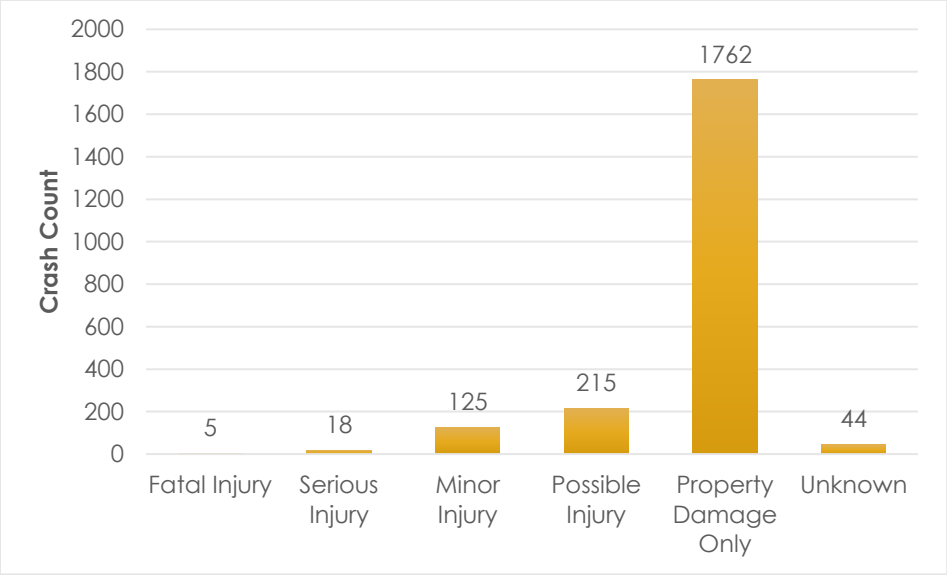


Figure 6: Total Reported Crashes by Severity (2019-2023)

Figure 7 illustrates the annual trends of crashes in Leland by severity and compared to statewide crash trends. This data indicates an overall upward trend in the number of crashes and highlights that the rate of growth of crashes in Leland exceeds that of crashes statewide in North Carolina.

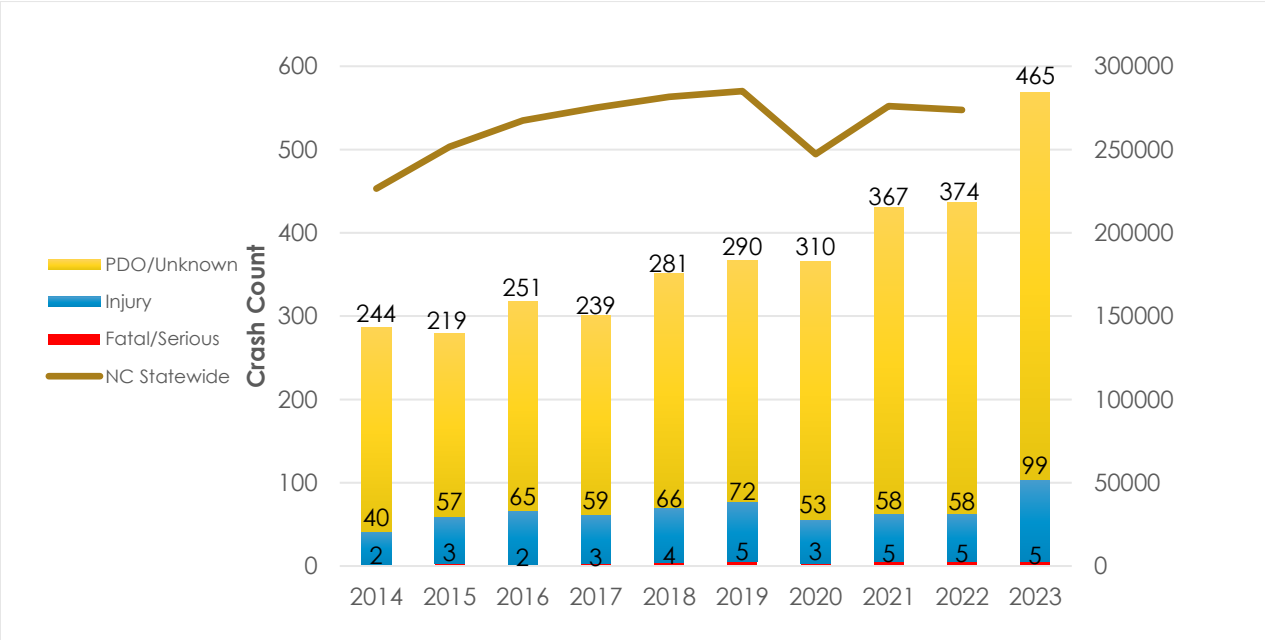


Figure 7: Annual Crashes by Severity (2014 - 2023)[12]**Figure 8** presents a comparison between the population growth rate and the crash growth rate in the town of Leland. The data shows that the rate of crash growth exhibits considerable fluctuations over time, with some years showing a significant increase compared to the overall population growth. However, the total growth in annual crashes over this time period (7.5% per year) is comparable to the total populate growth (8.5% per year).

[12] The chart displays two different datasets with separate axes. The bar diagrams represent the number of crashes in the town of Leland, with the right axis ranging from 0 to 600. The line graph indicates the number of crashes statewide in North Carolina, with its right axis ranging from 0 to 300,000.

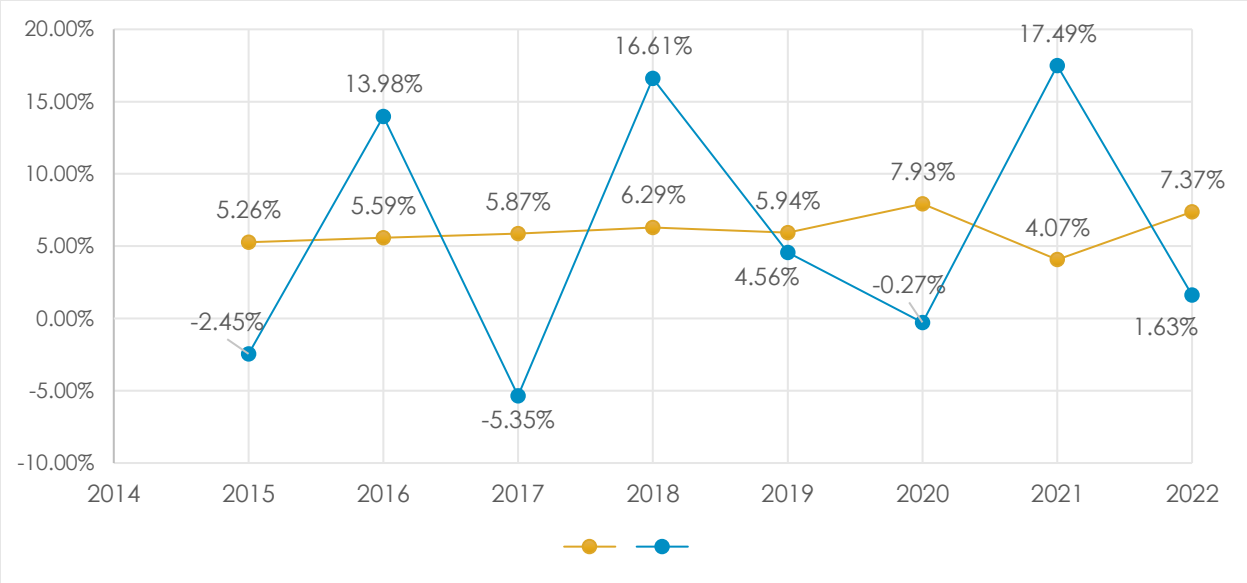


Figure 8: Population Growth and Crash Growth: A Comparison

Crashes by Mode

Figure 9 represents the severity of crashes by mode. As shown, there is the highest risk associated with bicycle crashes, followed by pedestrians and then motorcyclists,

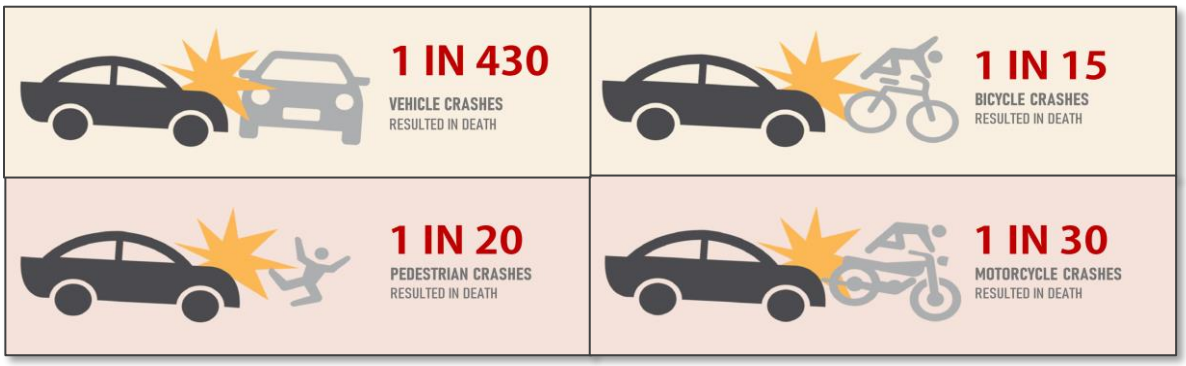


Figure 9: Crash Severity by Mode[13]

Table 1 describes the severity of crashes based on the road users involved between 2019-2023. It can be observed that 98% of the crashes involved motor vehicles only. Crashes involving people walking, or on a bicycle, moped or motorcycle accounted for only 2% of all reported crashes; however, these crashes accounted for 35% of all reported fatal and serious crashes.

[13] Vehicle and motorcycle crashes from the past five years (2019-2023) were analyzed, whereas bicycle and pedestrian crashes from the past 10 years (2014-2023) were analyzed.

Table 1: Total Reported Crashes by Severity and Mode (2019 - 2023)

Mode	Fatal/Serious Injury Crashes	Injury Crashes	PDO/Unknown	Total Crashes
Pedestrian	1	8	1	10
Bicycle	0	7	2	9
Motorcycle	7	14	10	30
Vehicle	15	311	1793	2120
Total	**23**	**340**	**1806**	**2169**

Crash Type and Context

Table 2 describes reported crashes by type of crash and reported severity. The most common crash types reported for the Town of Leland are rear-end crashes (33%), lane departure crashes[14] (31%), and angle crashes (21%). Angle crashes account for 43% and lane departure crashes account for 39% of all fatal and serious injury crashes.

Table 2: Crashes by Type and Severity (2019 – 2023)

Crash Type	Fatal/Serious Injury Crashes	Injury Crashes	PDO/Unknown	Total Crashes
Rear end	2	126	591	719
Lane departure	9	79	580	668
Angle	10	97	349	456
Animal	0	1	79	80
Other	1	7	59	67
Backing up	0	0	60	60
Left turn	0	10	48	58
Right turn	0	5	37	42
Pedestrian	1	8	1	10
Bicycle	0	7	2	9

Crash Location

Figure 10 displays the spatial distribution of fatal and serious motor vehicle injury crashes, indicating a concentration along high-speed and high-volume roads adjacent to the town boundaries.

Figure 11 presents a visual representation of where bicycle and pedestrian crashes have occurred. It was observed that the crashes generally occur on high-speed and high-volume roads without adequate bike and pedestrian infrastructure within the town boundaries, such as Village Road and Old Fayetteville Road, and highways adjacent to town boundaries, such as US 17.

[14] https://connect.ncdot.gov/resources/safety/Documents/Crash%20Type%20Descriptions.pdf

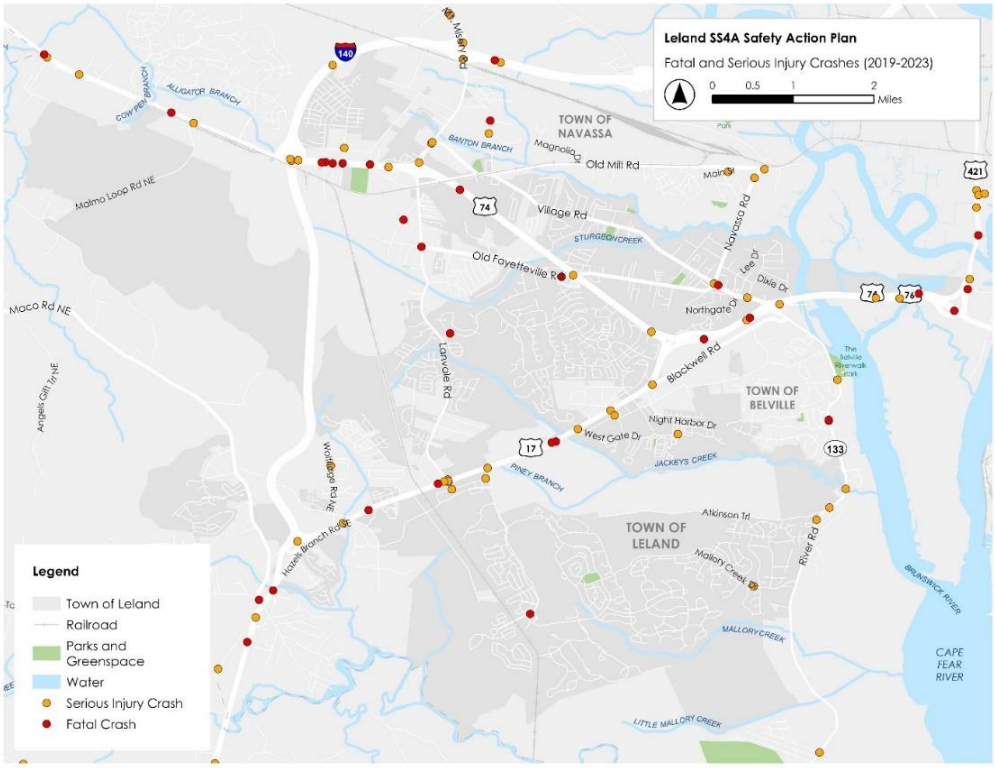


Figure 10: Spatial Distribution of Fatal and Serious Motor Vehicle Crashes

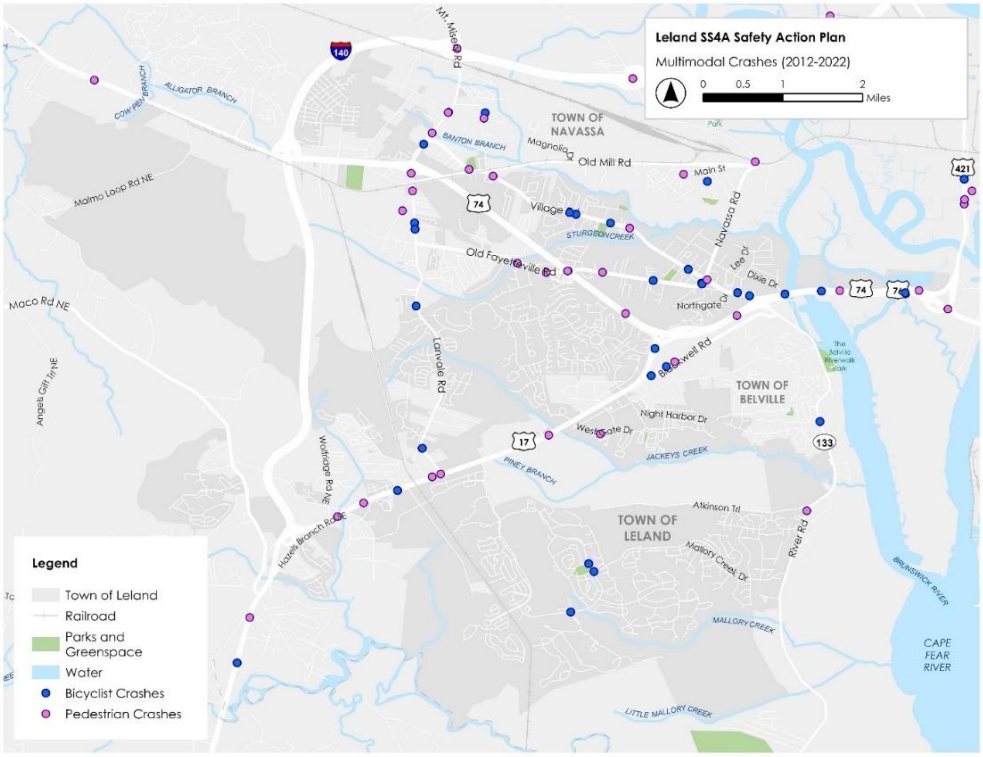


Figure 11: Spatial Distribution of Bicycle and Pedestrian Crashes

Contributing Factors

A contributing factor identifies the action or condition that led to a crash occurring. Out of the 2,169 total crashes reported in the past five years, 4,051 units were involved.

Table 3 outlines the causes of these crashes by the units involved. No contributing circumstances were identified or the cause could not be determined during the filing of the crash report for 53% of the units involved. Speeding was the prevalent contributing factor as it was identified in 18% of the crashes.

Table 3: Contributing Factors to Crashes and Severity

Contributing Factor	Fatal/Serious Crashes	Injury Crashes	PDO/Unknown	Total
Speeding	2	142	602	**746**
Improper lane change/passing/ backing/turning/parking	1	21	264	**286**
Inattention/Distraction/ Aggression	6	55	220	**281**
Failure to yield right of way	6	45	213	**264**
Other reasons	2	40	155	**197**
Disregarding traffic signals/signs/road markings	0	15	42	**57**
Alcohol/Drug use	1	12	29	**42**
No contributing circumstances/ unable to determine	23	345	1810	**2178**

Ten focus intersections were identified from map and spreadsheet analysis and public comments. These intersections will be the starting point for location-specific countermeasure selection based on the contributing factors and crash types shown in **Table 4.**

Table 4: Focus Intersections by Contributing Factor and Crash Type

Focus Intersections	Contributing Factors				Prominent Crash Types		
	Speeding	Failure to yield	Disregard traffic signals	Improper turns	Angle	Rear end	Side-swipe
US 17 at Ploof Rd/Olde Waterford Way	✘	✘	✘	✘	✘	✘	✘
US 17 at Lanvale Rd/Provision Pkwy	✘	✘	✘		✘	✘	✘
US 17 at Grandiflora/West Gate Dr	✘			✘	✘	✘	✘
US 17 at Ocean Gate Plaza/Gregory Rd	✘		✘		✘	✘	✘
US 17 at Brunswick Forest Pkwy	✘	✘	✘		✘	✘	
Village Rd at Fairview Rd/Baldwin Dr	✘	✘		✘	✘	✘	✘
Village Rd at Old Fayetteville Rd/Navassa Rd	✘				✘	✘	✘
Ocean Gate Plaza at New Pointe Blvd		✘			✘		
Lanvale Rd at Village Rd/Fletcher Rd	✘				✘	✘	
US 17 at Old Regent Way	✘					✘	

Demographics

Table 5 provides data on crashes involving drivers of different age groups. 8% of all drivers involved in crashes were young drivers below the age of 19 and 18% of all drivers involved were above the age of 65.

Table 5: Age Groups of Drivers Involved in Crashes

Age Group	K	A	B	C	O	U	Total
<19		1	18	33	245	1	298
20-64	5	27	161	330	2303	10	2836
65+	2	5	36	69	564	5	681

NCDOT developed a Transportation Disadvantage Index (TDI) map and interactive dashboard to help understand and visualize transportation disadvantage and the disproportionate impact of transportation barriers. Higher scores represent higher areas of potential disadvantage. TDI creates a composite score for the following demographics:

- Black, Indigenous, and People of Color
- Low-income
- Zero-car households
- Youth under 15
- Older adults over 65
- Disability

TDI scores help inform policies, planning, and project development decision making and assess the equity of the current and proposed transportation system. **Figure 12** overlays the fatal and severe crashes from **Figure 10** with the NCDOT TDI score. Overall, there is low variation in TDI score within the Town of Leland's boundaries at the census tract level at which TDI is calculated.

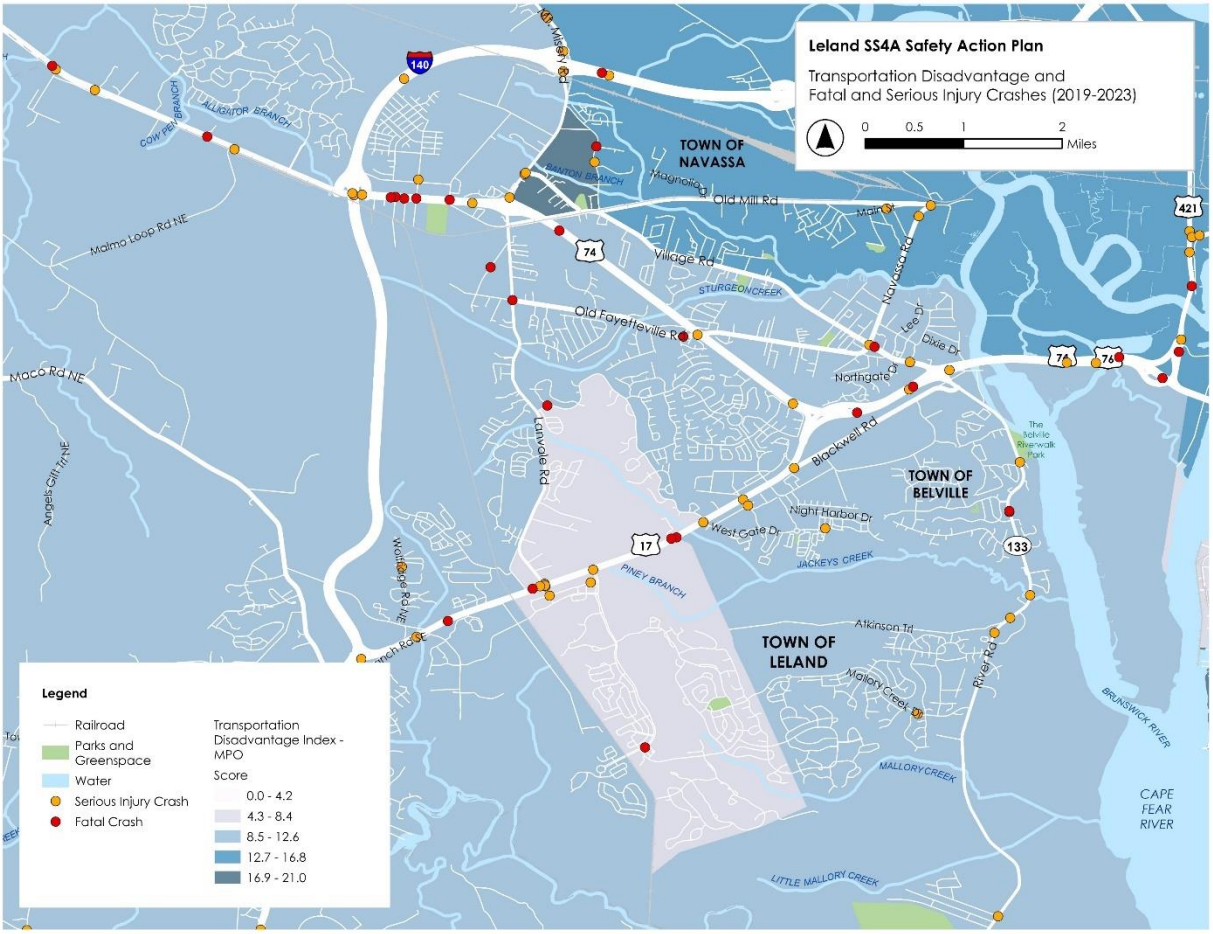


Figure 12: Fatal and Serious Motor Vehicle Crashes over TDI Score

High Injury Networks

In general, a high injury network (HIN) consists of a binary or tiered system showing which streets have a history of more or more severe crashes separated by vehicle, pedestrian, and bicycle modes. The primary goal of a HIN is to visually communicate where there is greater crash risk in a jurisdiction's roadway network.

To construct the HIN, a screening was conducted that included all reported crashes that could be geocoded. This process captures crash history along the corridors including those at the intersections. The screening results were then ordered based on the severity weighted crash frequency.

The severity weighted crash frequency assigns weighting factors to crashes based on the maximum reported injury of each crash. Greater weights are assigned to crashes where more severe outcomes are reported. The metric is used to differentiate locations with relatively similar number of crashes that have on average more severe or less severe outcomes. Each site received a score calculated by multiplying the count of crashes by category by the associated weighting factor and then dividing by number of years. For the analysis, the team decided to employ a three-tier weighting system summarized below:

- 76.8x for Fatal and Serious Injury Crashes
- 8.4x for Other Visible injury, Complaint of Pain injury
- 1x for Property Damage Only Crashes

This evaluation is based on the Equivalent Property Damage Only (EPDO) performance metric consistent with NCDOT guidelines15 in which weights are based on the relative costs associated with different crash severities. This process allows for the results to be reported as crash history in terms of number equivalent to property damage only crashes. The results of this EPDO screening are displayed in **Figure 13**.

A manual spreadsheet review was conducted to consider crashes that were not geocoded and thus not included in the EPDO GIS analysis. This evaluation included Excel-based EPDO calculations for roadways with a high preponderance of unmapped crashes. The results of this analysis were included in the development of the two-tiered vehicle HIN presented in **Figure 14.** Tier 1 captures the highest crash locations while Tier 2 locations are the next highest locations and still candidates for effective countermeasures.

Separate HINs were developed for bicycle crashes and pedestrian crashes and are presented in **Figure 15** and **Figure 16** respectively. These HINs were developed using documented crash histories as well as public comment and systemic analysis extrapolating the risk locations identified from crash patterns. Special care was taken to account for recent growth and road construction to identify new roadways and locations with recent increased demand that has not yet been captured in the crash data.

[15] https://connect.ncdot.gov/resources/safety/Crash%20Data%20and%20TEAAS%20System/TEAAS/Chapter%2014%20Severity.pdf

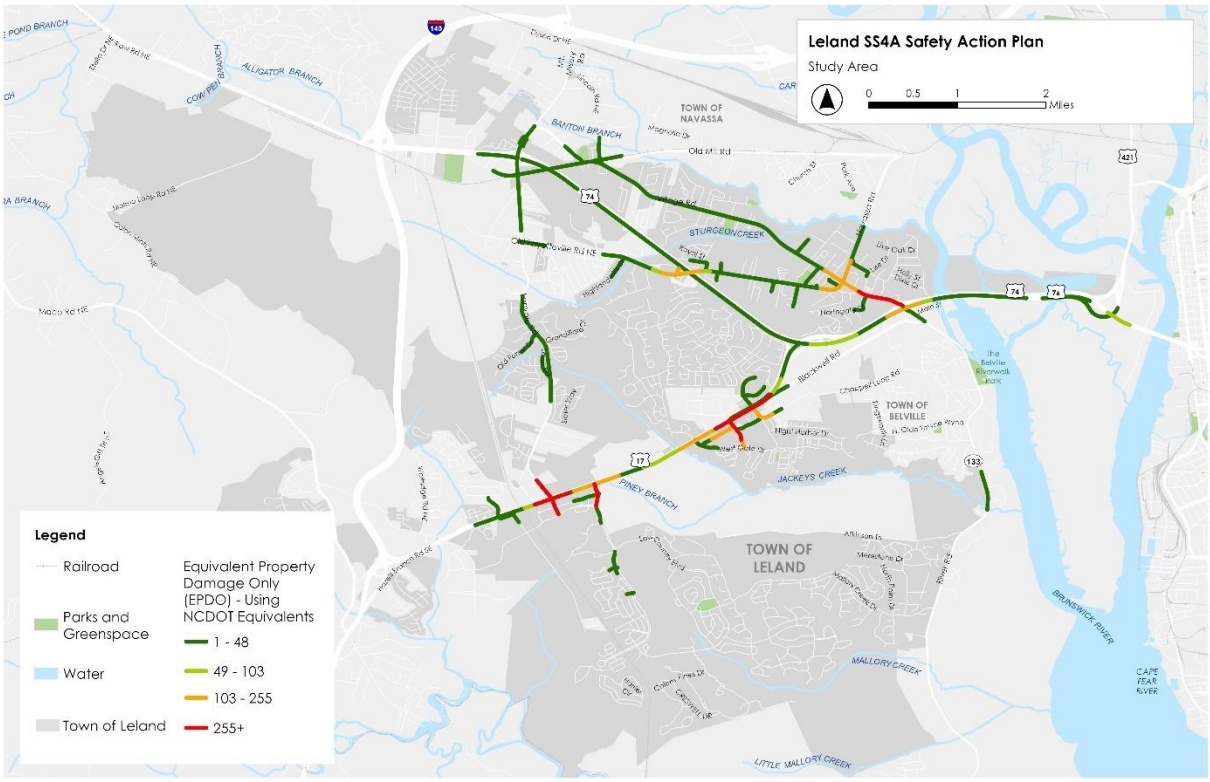


Figure 13: Leland EPDO Screening Results

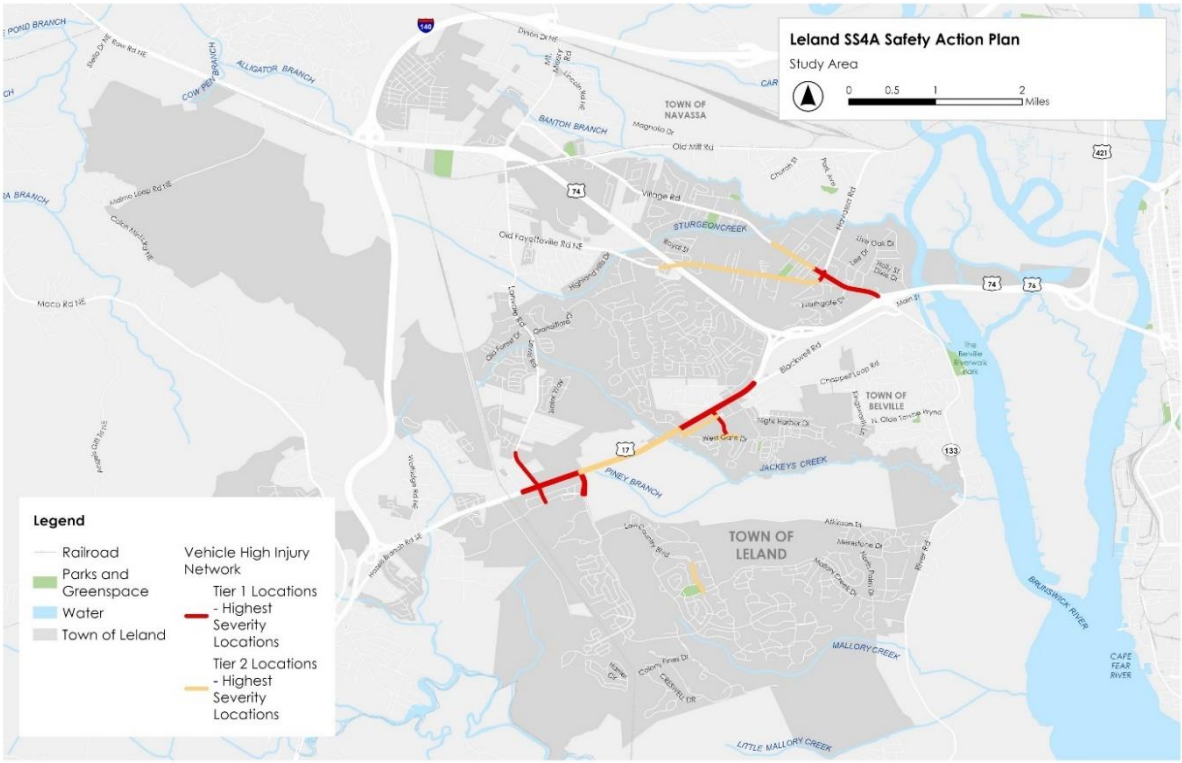


Figure 14: Motor Vehicle Tiered High Injury Network

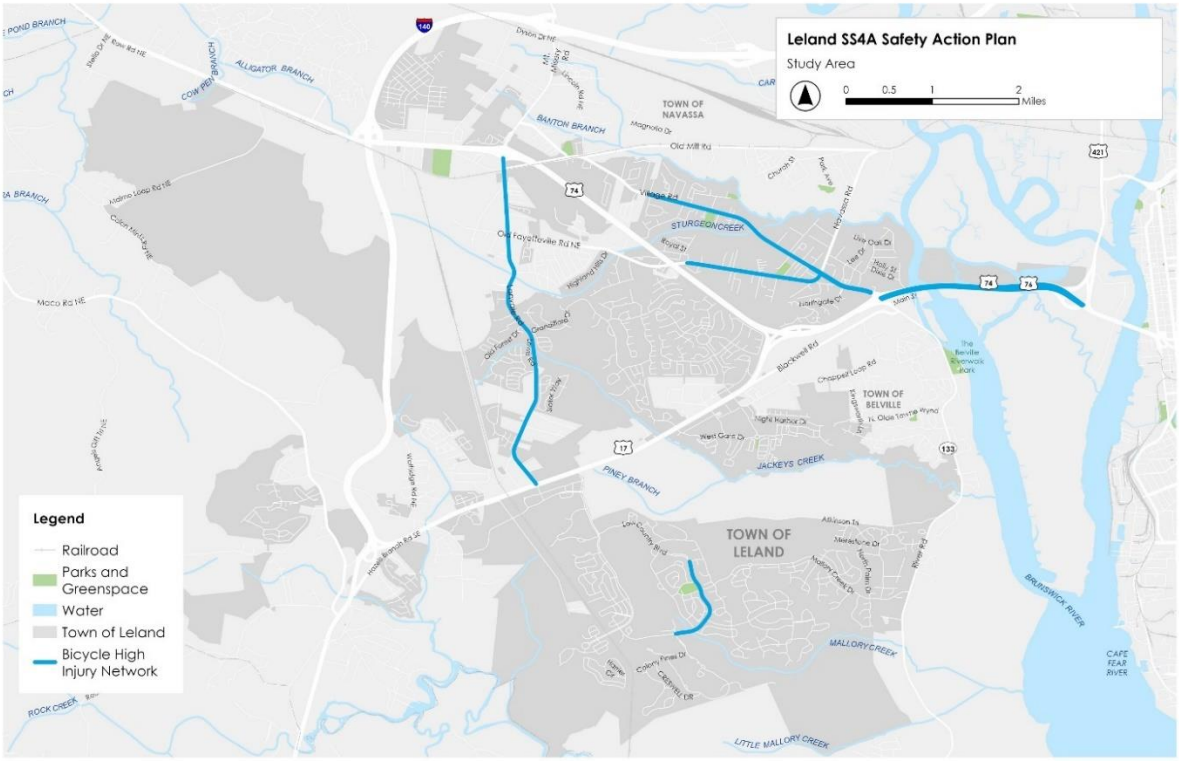


Figure 15: Bicycle High Injury Network

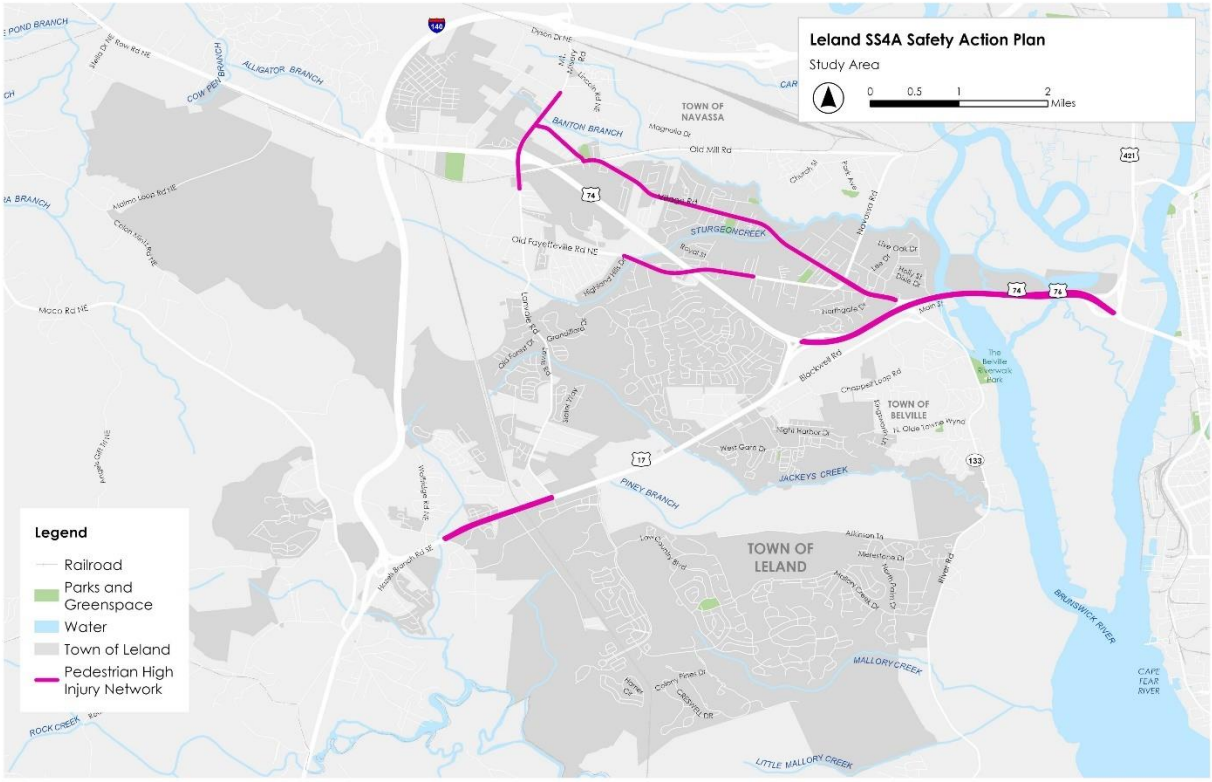


Figure 16: Pedestrian High Injury Network

Systemic Analysis and Emphasis Areas

Crashes were analyzed at the town level to identify systemic trends in crash location, participants, crash types, and context within the framework of the SHSP and the Safe Systems Approach. Based on the crash patterns, Leland corresponds with five of the SHSP's Emphasis Areas:

- Pedestrians, bicyclists, and personal mobility
  - Pedestrians account for only 0.5% of all crashes, but 8.1% of all fatal and serious crashes.
  - Bicyclists account for only 0.4% of all crashes, but 2.7% of fatal and seriously injury crashes.
  - Recent increase in pedestrian and bicycle crashes.
- Motorcyclists
  - Motorcycles, Mopeds, and Scooter crashes account 30% of all fatal and serious injury crashes.
- Safer speeds
  - Speeding was identified the primary contributing factor in 18% of crashes.
- Lane departure crashes
  - Lane departure crashes make up 31% of all crashes and 39% of fatal and serious injury crashes.
- Intersection safety
  - Angle crashes represent 21% of all crashes and 43% of fatal and severe injury crashes.
- Rear end crashes are the most common crash type with 33% of total crashes.

Furthermore, each of these five emphasis areas are magnified when combined with high-speed/high-volume roads and at commercial areas. As demonstrated on the HIN maps, 50% of all fatal and injury crashes occur on US 17 and Village Road makes up another 20%. Additionally, 87% of all injury crashes occur on 11 roads, which concentrations at intersections and commercial driveways:

- US 17
- Village Rd
- Old Fayetteville Rd
- Lanvale Rd
- US 74
- Brunswick Forest Pkwy
- New Pointe Blvd
- Low Country Blvd
- West Gate Dr
- Ocean Gate Plaza
- Navassa Rd

These systemic crash risks are summarized in the safety action plan emphasis areas shown in **Table 6**.

Table 6: Leland Safety Action Plan Emphasis Areas

Name	Safe System Approach	Applicability
Vulnerable Road Users	Safer People + Safer Roads + Safer Speeds	Pedestrians, Cyclists, Motorcycle
Intersection Crashes	Safer Roads	Engineering
Lane Departure Crashes	Safer Roads	Engineering
Commercial Areas	Safer Roads	Engineering
High Speed Roadways	Safer Road + Safer Speeds	Engineering

Next Steps

The development of this memorandum will support the completion and adoption of a Safety Action Plan for the town of Leland. The information in this document will be used to identify proven strategies, as identified by the FHWA and NHTSA, to address specific locations within the HIN and to enhance overall safety in the Town. Additionally, the consultant team will help the Town develop methods to integrate safety management into existing practices. Equity impact assessments of the proposed strategies will also be conducted, evaluating their effects on various populations and identifying opportunities to better serve historically underserved communities.

KITTELSON & ASSOCIATES
272 North Front Street, Suite 410
Wilmington, NC 28401
P 910.475.1789

TECHNICAL MEMORANDUM

February 3, 2025 Project# 29848

To: Ben Andrea
Town of Leland
102 Town Hall Drive
Leland, NC 28451

From: Andrew Ooms, PE

CC: Zach Bugg PhD, PE, Aishwarya Sharma

RE: Leland SS4A Comprehensive Safety Action Plan

The purpose of this memorandum is to identify relevant local strategies that address the emphasis areas identified from the High-Injury Network (HIN), the challenges faced by the Town of Leland, and transportation safety issues identified through community input. This memo contains the following:

- Introduction and Guiding Principles
- Countermeasure Strategies
- Location Specific Strategies

This memorandum identifies strategies for reducing the number of crashes resulting in injuries or fatalities on Leland's roadways.

INTRODUCTION AND GUIDING PRINCIPLES

This introduction describes the guiding principles used to identify strategies and key findings from previous work in the Leland SS4A Comprehensive Safety Action Plan development process.

Safe System Approach & Design Hierarchy

The strategies identified in this memo apply the principles of the Safe System Approach (SSA). The SSA is a mindset shift from crash prevention to injury/fatality prevention – putting less emphasis on improving behavior and more emphasis on designing for the mistakes that people make so that those mistakes don't result in fatal or severe injury crashes. The Safe System Approach (SSA) has been in use in countries around the world for decades to help them move towards a goal of zero roadway deaths and serious injuries. It has proven to be effective, with countries adopting the approach in a variety of contexts. In January 2022, the United States Department of

Figure 1: Safe System Approach Principles and Objectives (Source: FHWA)

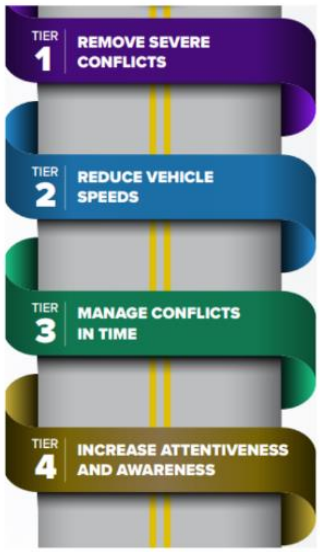


Figure 2: Safe System Roadway Design Hierarchy[2] (Source: FHWA)

Transportation released its *National Roadway Safety Strategy*[1] that adopted the SSA as its core strategy for achieving its goal.

Figure 1 illustrates the six principles and five objectives of the SSA. The six SSA principles (shown in black text around the circle) encompass the fundamental beliefs the approach is built on. The five SSA objectives are conduits through which the approach is implemented. The strategies presented in this memo represent the facets of the SSA that are actionable by COMPASS and its member agencies. This memo presents strategies that address all SSA objectives.

To help agencies put the SSA into practice, the Federal Highway Administration (FHWA) recently published the *Safe System Roadway Design Hierarchy*[2]. This guide is intended to help practitioners make project-specific decisions on treatments. It places strategies into four tiers with respect to their alignment with the SSA. **Figure 2** illustrates this hierarchy. This hierarchy of strategy tiers was used to gauge the priority of strategies that are presented in this memo.

Key Findings from Previous Work

This section describes key findings from previous Leland SS4A Comprehensive Safety Action Plan activities earlier in this project's process.

EMPHASIS AREAS

Crashes were analyzed at the town level to identify systemic trends in crash location, participants, crash types, and context within the framework of the *North Carolina Strategic Highway Safety Plan (SSHP)*[3] and the Safe Systems Approach. Based on the crash patterns, Leland corresponds with five of the SHSP's Emphasis Areas:

- Pedestrians, bicyclists, and personal mobility
  - Pedestrians account for only 0.5% of all crashes, but 8.1% of all fatal and serious crashes.
  - Bicyclists account for only 0.4% of all crashes, but 2.7% of fatal and seriously injury crashes.
  - Recent increase in pedestrian and bicycle crashes.
- Motorcyclists
  - Motorcycles, Mopeds, and Scooter crashes account 30% of all fatal and serious injury crashes.
- Safer speeds
  - Speeding was identified the primary contributing factor in 18% of crashes.
- Lane departure crashes

[1] National Roadway Safety Strategy (transportation.gov)
[2] https://highways.dot.gov/sites/fhwa.dot.gov/files/2024-01/Safe_System_Roadway_Design_Hierarchy.pdf
[3] https://connect.ncdot.gov/groups/echs/Documents/2024/2024%20NC%20SHSP%20Update%20(2-16-24).pdf

    - Lane departure crashes make up 31% of all crashes and 39% of fatal and serious injury crashes.
- Intersection safety
    - Angle crashes represent 21% of all crashes and 43% of fatal and severe injury crashes.

The systemic crash risks are summarized in the Leland SS4A Comprehensive Safety Action Plan emphasis areas shown in **Table 1**. The emphasis areas were then used to identify the countermeasures. Additional details on the results of the crash analysis and the High-Injury Network can be found in the previous technical memorandum.

Table 1: Leland Safety Action Plan Emphasis Areas

Name	Safe System Approach	Applicability
Intersection Crashes	Safer Roads	Engineering
Lane Departure Crashes	Safer Roads	Engineering
Vulnerable Road Users	Safer People + Safer Roads + Safer Speeds	Pedestrians, Bicyclists, Motorcycle, Personal Mobility Device Users
Commercial Areas	Safer Roads	Engineering
High-Speed Roadways	Safer Road + Safer Speeds	Engineering

COUNTERMEASURE STRATEGIES

The project team collected various countermeasure strategies to address Leland's emphasis areas. Strategies were collected from various sources such as:

- Federal Highway Administration's *Proven Safety Countermeasures*[4]
- Federal Highway Administration's *Safe System Roadway Design Hierarchy*[2]
- National Highway Traffic Safety Administration's *Countermeasures that Work*[5]
- Institute of Transportation Engineers' *Unsignalized Intersection Improvement Guide*[6]

This section presents an overview of high priority strategies that align with the emphasis areas.

Strategies for Intersection Crashes

This section discusses strategies for reducing fatal and serious injury crashes at intersections. Strategies for intersections can generally be categorized into two types - strategies for signalized intersections or unsignalized intersections.

SIGNALIZED INTERSECTION STRATEGIES

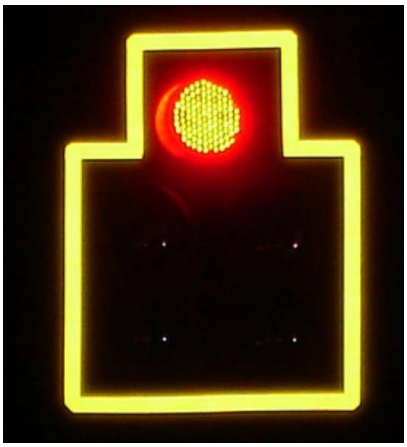
Treatments at signalized intersections seek to improve the visibility of the intersection for approaching drivers, improve the visibility of other conflicting movements, reduce or eliminate conflicting movements, and/or reduce vehicle speeds for users navigating the intersection. Treatments can generally be

[4] Proven Safety Countermeasures | FHWA
[5] Countermeasures that work | NHTSA
[6] UIIG | ITE

categorized as signal timing adjustments, signal operations or phasing modifications, or physical changes to the intersection's configuration. A list of high priority treatments in these categories is as follows:

- Traffic Signal Timing, Operations, or Phasing Modifications
    - Flashing Yellow Arrow with Time-of-Day and Pedestrian Call Restrictions
    - Left-Turn Restrictions or Reduced Left-Turn Conflict Intersection Form (i.e., median U-turn or displaced left-turn)
    - Protected Left-Turn Phasing
    - Prohibit Right-Turn on Red
    - Coordinated Signal Timing (Lower Speeds)
- Traffic Signal Equipment
    - Signal Backplates with Retroreflective Borders
    - Blank-out Signage or Turn-Lane Pedestrian Indicator: Crash modification factors are unavailable for these treatments due to lack of data-availability, but these are both treatments that seek to reinforce desired driver behavior.
- Removal of Vegetation, Parking, and Other Sight Distance Obstructions
- Conversion of the intersection to a Roundabout or a Reduced Conflict Intersection

Protected Left-Turn Phasing (Source: Flickr - Benny Mazur)



Signal Backplates with Retroreflective Borders (Source: FDOT)

Roundabout (Source: Kittelson)

Prohibited Right-Turn on Red (Source: Wikimedia Commons - Caltrans)

UNSIGNALIZED INTERSECTIONS

Unsignalized intersections often have lower traffic volumes, lack of turn lanes and lighting, and higher vehicle speeds in suburban and rural settings. Fatal and serious injury crashes often involve high-speed turning, angle, or rear-end related crashes. There are lower-cost improvements that improve the sight distance, driver awareness, and traffic control device visibility. High priority treatments for unsignalized intersections in rural settings include:

- Advanced Warning Signage
- Enhanced Approach Pavement Markings
- Retroreflective and/or Over-Sized Stop or Advanced Warning Signs
- Removal of Vegetation, Parking, and Other Sight Distance Obstructions
- Properly Painted Stop Bar
- Conversion from Two-Way Stop Control to All-Way Stop Control
- Conversion from Two-Way Stop Control to Roundabout
- Dedicated Left and Right-Turn Lanes (Most applicable on uncontrolled approach on high-speed roadways)
- Left-Turn Restrictions or Reduced Left-Turn Conflict Intersections (i.e., median U-turn or displaced left-turn)

Advanced Warning Signage
(Source: Wikimedia Commons - The Navigators)

All-Way Stop Control
(Source: Kittelson)

In urban settings, strategies listed above such as removal of sight distance obstructions, conversion from two-way stop to all-way stop controlled or roundabout, and properly painted stop bars can be effective at addressing fatal and serious injury crashes at unsignalized intersections. Access management or speed management treatments can also reduce crashes at unsignalized intersections on a corridor-level. Additional treatments for non-motorized users at unsignalized intersections are listed in the Strategies for Vulnerable Users section of the memorandum.

Strategies for Lane Departure Crashes

Lane departure crashes occur when a vehicle leaves their travel lane and collides with another vehicle or object or overturns. Strategies for lane departures seek to improve the visibility of the roadway, provide

physical barriers, and alert drivers of horizontal curves or other changes in the roadway. High-priority strategies that reduce serious injury and fatal crashes related to lane departures include:

- Wider Edge Lines, Wider Shoulders, Enhanced Pavement Markings
- Median Buffer Area or Raised Median
- Enhanced Delineation at Horizontal Curves
- Rumble Strips (not applicable in urban areas)

Rumble Strips (Source: Wikimedia Commons - SriMesh, SayCheeeeeese)

In rural areas on roadways with higher speeds, a large proportion of lane departure crashes occur at horizontal curves. Potential strategies to mitigate these crash types seek to enhance the delineation within and ahead of the horizontal curve. These strategies may include enhanced pavement marking, in-lane curve warning pavement markings, retroreflective strips, and chevron signs. These strategies may be applied separately or in combination with each other.

Strategies for Vulnerable Road Users

Vulnerable road users include pedestrians, bicyclists, motorcyclists and personal mobility device users. Strategies for such users seek to provide dedicated space for people walking and biking, reduce or eliminate conflict points between people walking/biking and vehicles, or raise awareness of drivers nearing potential conflict points with people walking and biking. Generally, these treatments can be categorized as walkways, bikeways, crossings, or intersection treatments.

WALKWAYS & BIKEWAYS

A walkway includes any type of shared-use path, sidewalk, or other defined space for people walking or traveling by mobility device. Bikeways include any dedicated space for people biking and allow bicyclists to ride at a preferred speed with less interference from traffic conditions. Bike lanes or shared-use paths can also be utilized by people riding scooters. High-priority treatments in this category include:

- Sidewalks (Attached or Detached)
- Bike Lanes (Protected or Buffered)
- Raised Bike Lanes
- Multi-Use Paths

Implementation of these facilities should be prioritized in areas with a history of non-motorized crashes, on higher-speed, multi-lane roadways, in locations with attractors for people walking and biking (i.e.,

schools, community centers, or transit stops), and in areas with higher-proportions of transportation-disadvantaged populations.

UNSIGNALIZED INTERSECTIONS AND MID-BLOCK CROSSINGS

Crossing-related treatments seek to improve the visibility of people walking, biking or using a personal mobility device across a roadway or at an unsignalized intersection, reduce the conflict zone between drivers and people using the crossing, and increase the awareness of drivers approaching a crossing location. High priority crossing treatments include:

- Actuated Crossings
    - Rectangular Rapid Flashing Beacon (RRFB)
    - Pedestrian Hybrid Beacon (PHB)
- Pedestrian Refuge Islands
- Crosswalk Visibility Enhancements
    - High-Visibility Crosswalks
    - Improved Lighting
    - Enhanced Signing and Pavement Markings
    - Curb Extensions/Bulb-Outs
- Raised Crosswalk

These treatments may be used individually or in conjunction to improve visibility and awareness at crossing locations. Implementation should be prioritized at the crossing of major roadways on dedicated bicycle routes, near attractions for people walking and biking, and high-speed, multi-lane roadways. Agencies should also consider developing policies to identify and prioritize locations for the implementation of these treatments.

Crossing with PHB (Source: Kittelson)

Pedestrian Refuge Island (Source: Kittelson)

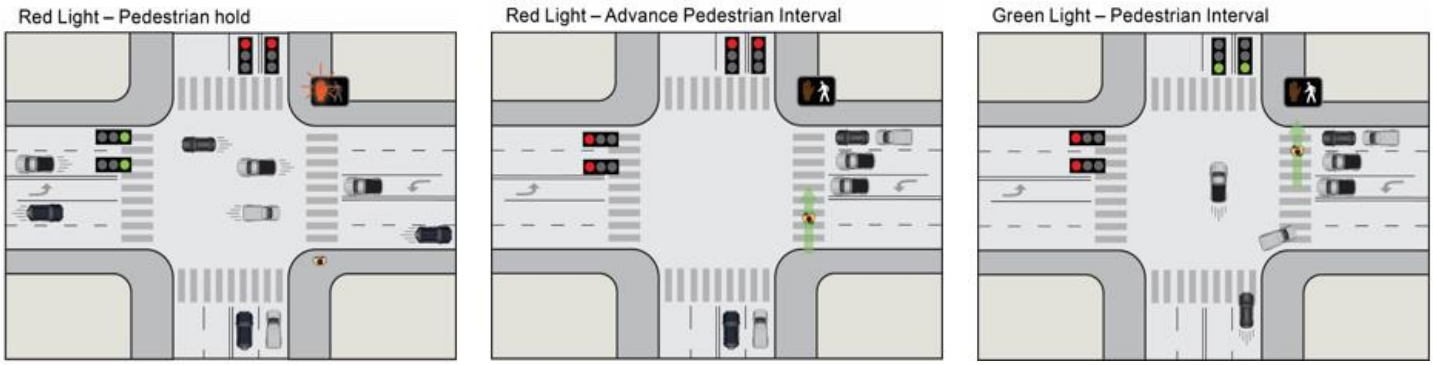
SIGNALIZED INTERSECTION TREATMENTS

Signalized intersection treatments are focused on increasing visibility for people walking and biking through an intersection, reducing vehicle speeds traveling through intersections, and increasing the likelihood of drivers yielding to people walking, biking, and using a personal mobility device. Treatments may include:

- Protected Intersections: Intersection configuration that provides physical barriers and separation between vehicles, bicycles, and pedestrian movements. Typically include elements to shorten crossing distances, decrease vehicle speeds, and improve visibility of other intersection users. Generally provided on roadways with protected or buffered bike lanes.
- Bike Boxes
- Leading Pedestrian Interval (LPI)

Further intersection treatments related to signal timing and operations that provide benefit to vulnerable road users are summarized below and described in detail in later sections:

- Flashing Yellow Arrow with Time-of-Day and Pedestrian Call Restrictions
- Limiting Permissive Left-Turn Phasing
- Prohibit Right-Turn on Red

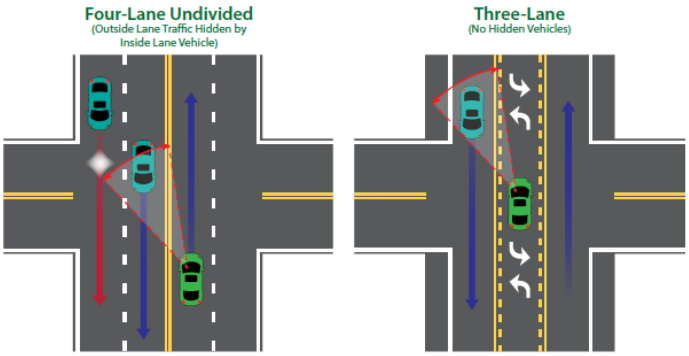


Leading Pedestrian Interval (Source: Kittelson)

Strategies for Commercial Areas

Commercial areas include highways and streets that are responsible for serving regional traffic passing through the community as well as providing direct access for community members to businesses, schools, parks, and other activity generators for people walking and biking. Roads in commercial areas need to balance competing needs and objectives. Treatments for such areas should focus on improving multimodal access to community members and speed management for vehicles traveling through the corridor. Potential strategies include:

- Sidewalks or Shared-Use Paths
- Bike Lanes (Protected or Buffered)
- Crossing Improvements
    - Marked crosswalks and pedestrian signal heads
    - RRFB or PHB
    - Pedestrian Refuge Islands
    - Visibility Enhancements
    - Improved Lighting
- Road Diet (Four-Lanes to Three-Lanes)
- Access Management



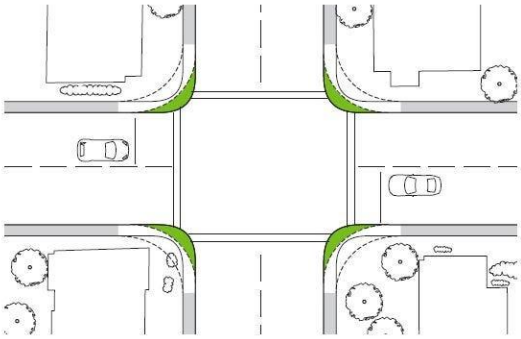
Road Diet (Source: FHWA)

Strategies for High-Speed Roadways

Speed management on high-speed roadways can reduce crash severity for most crash types and should be implemented through a combination of engineering, enforcement, and education techniques. This section primarily focuses on engineering solutions. Engineering solutions that change the built environment (i.e., installation of protected bike facilities or roundabouts) are typically more effective at reducing fatal and serious injury crashes than solutions that require individuals to make behavioral changes (i.e., enforcement or education efforts).

Setting appropriate speed limits is the first step for effective speed management. However, roads also must be designed in a way that reinforces drivers to travel the desired speed limit. For example, it may not feel natural for drivers to drive less than 30 mph on a straight, 5-lane roadway with limited intersection control. However, drivers may feel more inclined to drive less than 30 mph if the roadway has traffic calming elements like narrow lane widths, on street parking, chicanes, roundabouts at intersections, curb extensions, and/or mid-block crossings. High-priority strategies for speed management include:

- Road Design to Reinforce Desired Speed
- Setting Appropriate Lower Speed Limits
- Traffic Calming Elements
    - Horizontal Deflection Elements: Chicanes, Roundabouts, or Traffic Circles
    - Vertical Deflection Elements: Speed Humps, Raised Crossings
    - Narrowing Elements: Curb Extensions, Presence of On-Street Parking or Protected Bike Facilities
- Dynamic Speed Feedback Signs



Tightening of Curb Radii to Lower Turning Speeds
(Source: Traffic Calming Guide for Toronto)

Policies, Processes, and Other Strategies

There are several strategies focused on education, enforcement, and agency coordination that Leland and its partner agencies, including NCDOT and the Wilmington Urban Area Metropolitan Planning Organization (WMPO), should implement. This section highlights the various recommended policies, processes, and other strategies.

LOWER POSTED SPEED LIMITS

High vehicle speeds has been found to be one of the major causes behind crashes in Leland. Setting appropriate speed limits is the first step for effective speed management. Lowering posted speeds is most effective when combined with engineering strategies to create roadways that "self-enforce" speed limits.

ENCOURAGE AND INCENTIVIZE SPEED MANAGEMENT TRAINING

The National Highway Institute[7] offers a free 10-hour web-based training course on Designing and Operating Roadways for Safe Speeds[8]. The training course is designed for agency personnel at all levels (DOTs, MPOs, and local and Tribal governments). The training covers a breadth of approaches to attaining safer speeds on the roadway network, including a review of the Safe Systems Approach and the role of speed in crash severity.

DEVELOP AND ADVERTISE A TRAFFIC CALMING TOOLBOX

A traffic calming dictionary acts as a menu for speed management strategies. It can organize strategies by their approach to speed management (e.g., horizontal versus vertical deflection), detail when various strategies are appropriate, and highlight the cost and timeline for implementing countermeasures. NHTSA's Traffic Calming ePrimer[9] could be used as a starting point to develop a traffic calming dictionary.

COMMUNICATE WITH EMS FOR SPEED MANAGEMENT PROJECTS

Speed management countermeasures on emergency responder routes can impact response time. Coordinating with EMS during safety planning is an effective way to implement speed management treatments that improve safety and minimize disbenefits. This coordinated approach can also positively influence traffic incident management.

APPLY TARGETED ENFORCEMENT

Targeted enforcement is a strategy that involves placing enforcement officers on patrol in areas with high operating speeds to detect and warn and/or cite speeding drivers. These enforcement efforts may be complemented by High Visibility Enforcement (HVE)[10], which involves using visibility elements to educate the public and promote voluntary speed compliance. NHTSA has developed a HVE Toolkit[11] with guidance

[7] NHI | FHWA
[8] Designing and Operating Roadways for Safe Speeds Training
[9] NHTSA's Traffic Calming ePrimer
[10] HVE | NHTSA
[11] HVE Toolkit

on enforcement elements (placement, training, measure effectiveness, etc.), publicity strategies, visibility elements, and implementation.

PROJECT DEVELOPMENT

The Town of Leland can make the roads safer by thinking to the project development process in terms of:

- Evaluating historic crashes and known crash risk factors during the project planning phase, and then applying countermeasures identified in the Safety Action Plan and other best practices to address them.
- Using safety related performance measures to evaluate the effectiveness of projects. This could include:
    - Before-after studies of crashes or near-misses
    - Evaluating the reduction in conflict points and/or severity of different design alternatives, etc.

To ensure the inclusion of best practices in project development, Leland staff and consultant support should stay abreast of best practices from FHWA, NCDOT, and other sources and attend continuing education opportunities. When developing lists of priority projects, Leland can also emphasize a safety criterion to give safety-oriented projects on the High Injury Network higher priority.

UPDATING ROADWAY CROSS SECTIONS

Leland can update typical roadway cross sections in the Street Technical Standards to include best practices for addressing the needs of all roadway users. Updated typical sections can systemically align roadway design for retrofit and new roads with the Safer Roads strategies.

EDUCATION CAMPAIGN FOR ALL ROAD USERS

Leland should partner with area agencies to expand upon education campaigns aimed at increasing the public awareness of key safety concerns and patterns in Leland. Considering the Existing Conditions Analysis and feedback gathered in the first phase of community engagement, key themes of education campaigns should include:

- Drivers should not speed.
- Road users should take special care at intersections, where most crashes in Leland occur.
- Drivers should be aware of pedestrians and bicyclists.
- Pedestrians and bicyclists should engage in safe practices.
- Road users should not be distracted.

Education campaigns should be responsive to the variety of people in Leland. Campaigns should be delivered through various approaches. For example, campaign messages should be distributed through social media as well as printed brochures and posters. Education campaigns should build upon existing community frameworks, such as engaging schools in the dissemination of education campaigns focused

on children. Programs conducted by NCDOT's Integrated Mobility Division[12] and WMPO[13] may be used as a starting point for the campaigns.

PUBLIC SENSE OF RESPONSIBILITY

Leland can build a culture around safety and a sense of public responsibility by developing programs to respond to community feedback on safety concerns and notifying the public when treatments are implemented. In addition to engaging with individuals, Leland can specifically engage with community organizations and collaborate to disseminate information through the community groups.

LOCATION SPECIFIC STRATEGIES

The project team conducted an initial screening of the High-Injury Network to identify segments and intersections with the highest number of fatal and serious injury crashes within the study area. The HINs were developed using documented crash histories as well as public comment and systemic analysis extrapolating the risk locations identified from crash patterns.

After the initial screening of the high-crash locations, 13 priority locations were identified. Among them, 9 of those locations are intersections as illustrated in **Figure 3**. The recommended countermeasures for the priority intersections are identified in **Table 2**. The remaining 4 priority locations are roadway segments as illustrated in **Figure 4**. Additionally, 4 reduced speed zones were also identified which are also shown in **Figure 4**. The recommended countermeasures for the priority roadway segments and reduced speed zones are identified in **Table 3**.

[12] NCDOT: Integrated Mobility Division - Safety
[13] Be A Looker | Go Coast

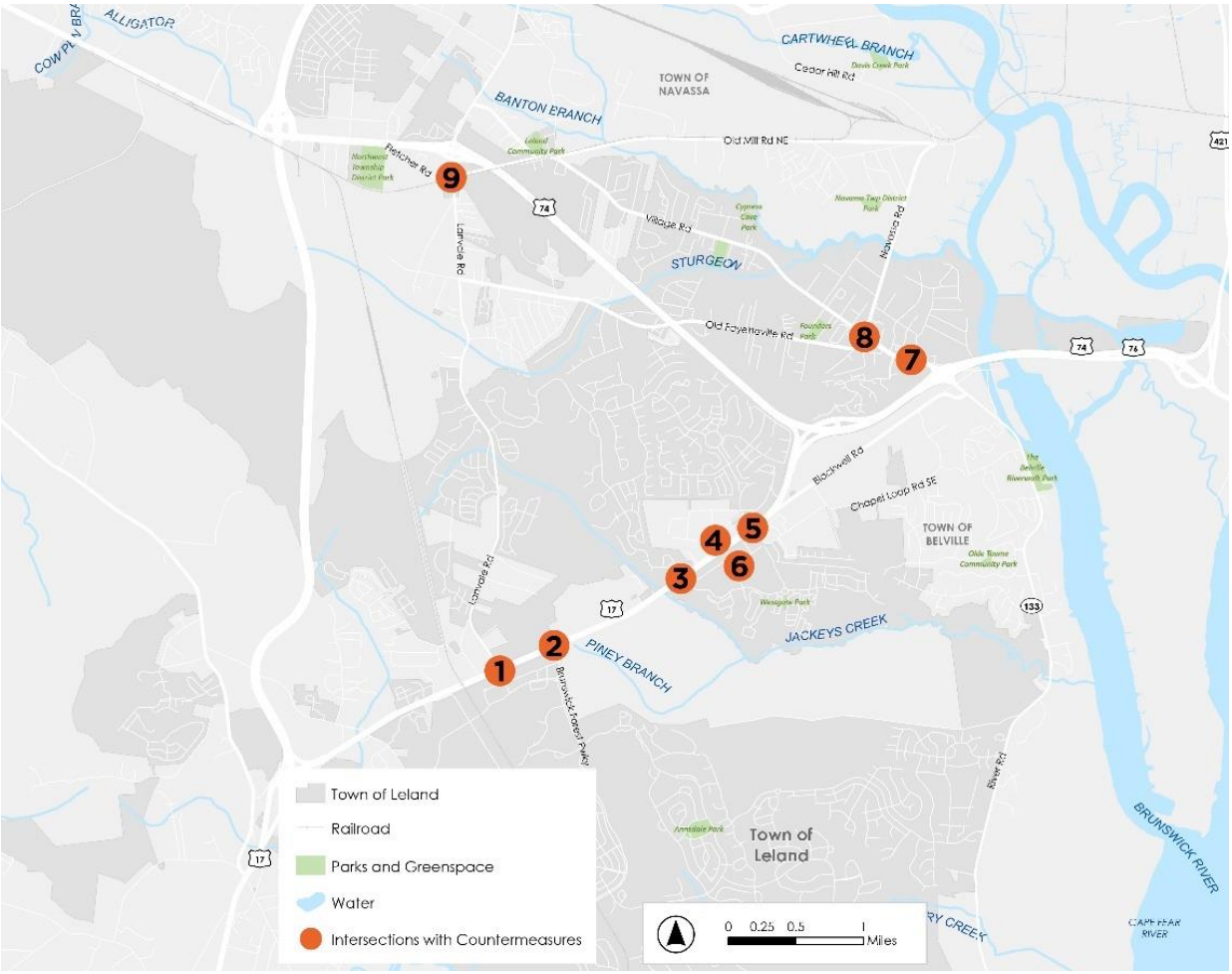


Figure 3: Priority Intersections

Table 2: Recommended Countermeasures for Priority Intersections

SN	Location	Safety Issues	Recommended Countermeasures
1	US 17 at Lanvale Rd	▪ No Pedestrian Facilities ▪ Speeding ▪ Failure to Yield ▪ Disregard of Traffic Signals	▪ Install Pedestrian Crossings ▪ No Right Turn on Red ▪ Leading Pedestrian Interval ▪ Signal Backplates with Retroreflective Borders
2	US 17 at Brunswick Forest Pkwy	▪ Speeding ▪ Failure to Yield ▪ Disregard of Traffic Signals	▪ No Right Turn on Red ▪ Signal Backplates with Retroreflective Borders
3	US 17 at Grandiflora Dr/W Gate Dr	▪ No Pedestrian Facilities ▪ Speeding ▪ Right Turn on Red	▪ Install Pedestrian Crossings ▪ No Right Turn on Red ▪ Leading Pedestrian Interval ▪ Signal Backplates with Retroreflective Borders
4	US 17 at Gregory Rd NE/Ocean Gate Plaza	▪ No Pedestrian Facilities ▪ Speeding ▪ Disregard Of Traffic Signals ▪ Driver Inattention	▪ Install Pedestrian Crossings ▪ No Right Turn on Red ▪ Leading Pedestrian Interval ▪ Signal Backplates with Retroreflective Borders
5	US 17 at Ploof Rd/Olde Waterford Way	▪ Speeding ▪ Failure to Yield ▪ Disregard of Traffic Signals ▪ Improper Turns ▪ Right Turn on Red	▪ Install Pedestrian Crossings (In Design) ▪ No Right Turn on Red on Ploof Rd ▪ Leading Pedestrian Interval ▪ Signal Backplates with Retroreflective Borders
6	Ocean Gate Plaza at New Pointe Blvd	▪ No Pedestrian Facilities ▪ Difficult New Pointe Blvd Left Turn ▪ Failure to Yield	▪ Partial Roundabout in Design Including Pedestrian Crossings
7	Village Rd at Baldwin Dr	▪ Speeding ▪ Failure to Yield ▪ Improper Turns ▪ Long Pedestrian Crossings	▪ Tighten Curb Radii to Lower Turning Speeds ▪ Protected Only Left Turns ▪ Leading Pedestrian Interval ▪ Signal Backplates with Retroreflective Borders ▪ Village Rd Road Diet: Remove Right Turn Lanes, Narrow Lanes ▪ Extend Median to Provide Crossing Refuge and Tighten Left Turn Paths
8	Village Rd at Navassa Rd/Old Fayetteville Rd	▪ Speeding ▪ Failure to Yield ▪ Improper Turns ▪ Long Pedestrian Crossings	▪ Tighten Curb Radii to Lower Turning Speeds ▪ Protected Only Left Turns on Old Fayetteville Rd ▪ Leading Pedestrian Interval ▪ Signal Backplates with Retroreflective Borders ▪ Village Rd Road Diet: Remove Right Turn Lanes, Remove Westbound Lane at Intersection, Narrow Lanes ▪ Remove Second Westbound Left Turn Lane ▪ Remove Second Northbound Right Turn Lane on Old Fayetteville Rd ▪ Extend Median to Provide Crossing Refuge and Tighten Left Turn Paths
9	Lanvale Rd at Fletcher Rd/Village Rd	▪ Speeding ▪ Lighting ▪ Failure to Yield ▪ Railroad Crossing	▪ Speed Control Measures on All Approaches ▪ Advance Stop Warning Signs on Village Rd ▪ Intersection Lighting ▪ Raise Grade on Village Rd to Improve Visibility

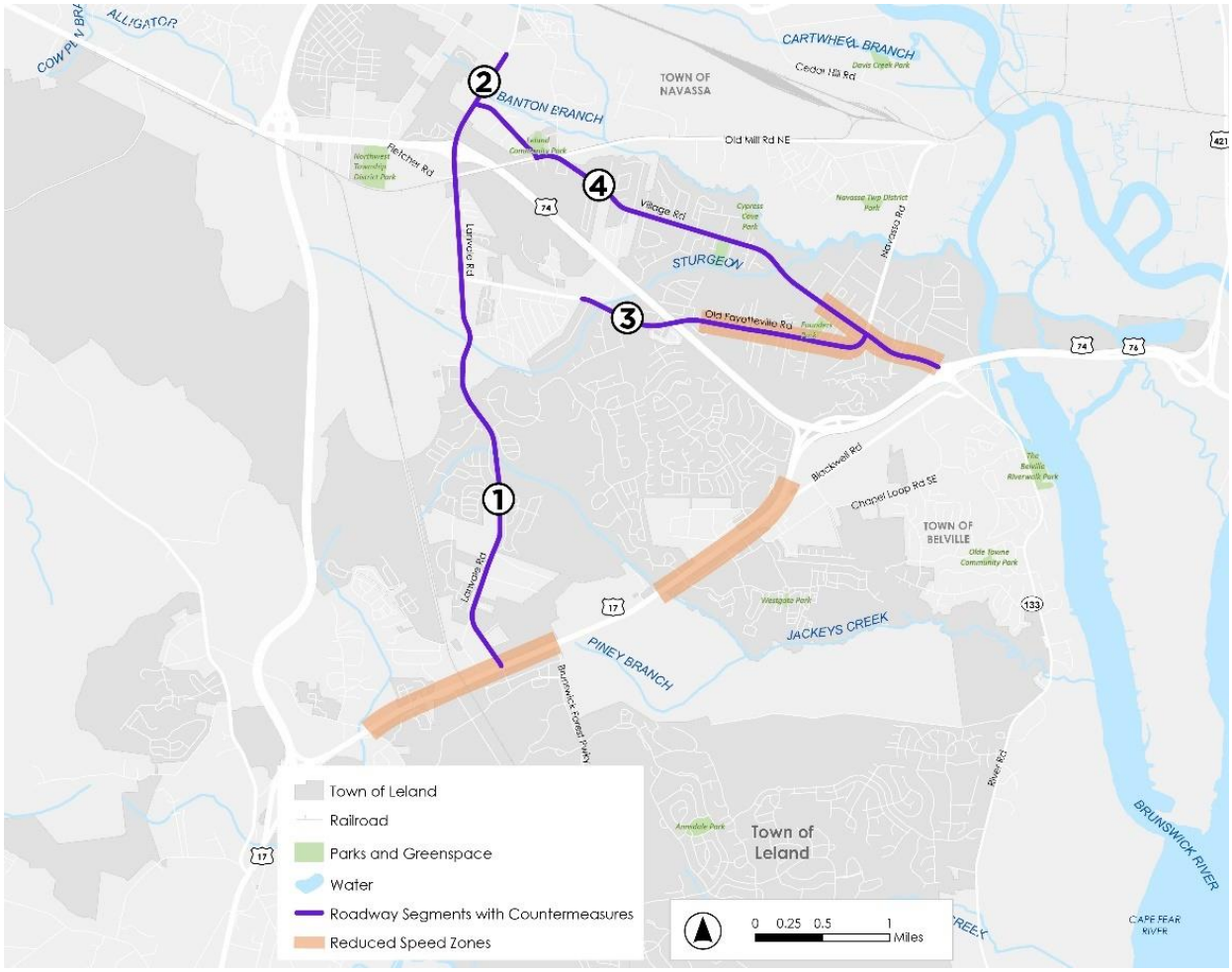


Figure 4: Priority Roadway Segments and Reduced Speed Zones

Table 3: Recommended Countermeasures for Priority Roadway Segments and Reduced Speed Zones

SN	Location	Safety Issues	Recommended Countermeasures
1	Lanvale Rd	▪ No Pedestrian and Bicycle Infrastructure ▪ Bicycle Crashes ▪ Speeding ▪ Failure to Yield	▪ Multi-Use Path ▪ Crossings with Signal/Pedestrian Hybrid Beacon ▪ Wider Edge Lines ▪ Paved Shoulders with Rumble Strips ▪ Centerline Rumble Strips
2	Mt. Misery Rd	▪ No Pedestrian and Bicycle Infrastructure ▪ Pedestrian Crashes ▪ Speeding ▪ Failure to Yield	▪ Multi-Use Path ▪ Crossings with Signal/Pedestrian Hybrid Beacon ▪ Wider Edge Lines ▪ Paved Shoulders with Rumble Strips ▪ Centerline Rumble Strips ▪ Speed Management
3	Old Fayetteville Rd	▪ Incomplete Pedestrian and Bicycle Infrastructure ▪ Pedestrian and Bicycle Crashes ▪ Speeding	▪ Reduce Posted Speed Limit and Speed Management ▪ Connect Multi-Use Path with Sidewalk West of US 74 ▪ Widen Sidewalk to Multi-Use Path East of Founder's Park ▪ Provide Crossings
4	Village Rd	▪ Incomplete Pedestrian and Bicycle Infrastructure ▪ Speeding ▪ Failure to Yield ▪ Improper Turns and Lane Changes ▪ Inattention	▪ Speed Management ▪ Reduce Posted Speed Limit ▪ Reduce Lanes to 11 Foot Width
Reduced Speed Zones			▪ Speed Management, Including Speed Limit Reduction

NEXT STEPS

This memorandum will support the completion and adoption of a Safety Action Plan for the town of Leland. The proven strategies and candidate projects presented in this document will be screened by Town staff, the project Focus Group, and the public to inform project development, filtering, and prioritization.

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TECHNICAL MEMORANDUM

February 3, 2025 Project# 29848

To: Ben Andrea
Town of Leland
102 Town Hall Drive
Leland, NC 28451

From: Andrew Ooms, PE

CC: Zach Bugg PhD, PE, Aishwarya Sharma

RE: Leland SS4A Comprehensive Safety Action Plan - Implementation Plan

IMPLEMENTATION PLAN

The purpose of this memorandum is to provide implementation guidance for high-priority strategies for the Town of Leland and its member agencies. Strategies covered in this memorandum include infrastructure projects, as well as non-infrastructure (e.g., policy, program) actions. It also provides high-level guidance on, and resources for, implementing safety treatments through quick-build treatments and funding considerations. It is organized as follows:

- Priority Projects
- Quick-Build Guidance
- Funding Considerations
- Non-Infrastructure Strategies
- Performance Measures

Outlined below is how the various components of this memo can be utilized by Leland and its member agencies to support the goal of this Plan: achieving zero fatalities and serious injury crashes.

What Projects Should Leland Prioritize?

The **Priority Project** section presents high-priority projects that Leland can implement to improve safety in their jurisdiction. The section includes information on:

- Determining project locations
- Identifying countermeasures
- Prioritization of strategies

What Tools Are Available to Leland to Implement Strategies and Projects Identified in this Plan?

The **Quick-Build Guidance** section provides information on best practices, resources, and implementation considerations for quick-build projects. Quick-build projects and processes can be useful

tools for agencies to implement safety projects with limited budgets and on a compressed timeframe. Quick-build projects can also be helpful tools for trying new or experimental countermeasures as pilot programs prior to permanent installation.

The **Funding Considerations** section provides information on federal, state, and regional funding sources that may be used to implement the projects and strategies presented in this plan.

What Planning and Policy Strategies Should Leland Prioritize?

The **Non-Infrastructure Strategies** section presents implementation considerations for high-priority, non-infrastructure strategies, such as policies and plans or recommendations. This section includes guidance on the following considerations:

- **Safe System Approach Objective:** Which SSA objective does the strategy target?
- **Near-Term Action**: What next step should be taken to achieve the strategy?
- **Performance Metric**: How can Leland measure the implementation progress of each strategy?

How do Agencies Evaluate the Effectiveness of the Strategies in This Plan on Improving Safety?

The **Performance Measures** section describes measures that can be used to help evaluate and understand the changes that implementing this plan has affected in transportation safety in Leland. This section includes:

- **Program Outcome Measures**: What quantitative metrics can be used to evaluate the success of the program in achieving its goals of eliminating fatalities and serious injuries?
- **Accountability**: What actions should be taken to encourage accountability and continued implementation of the strategies in this Plan?

PRIORITY PROJECTS

The project team further developed priority projects for Leland described in the Action Plan. Each priority project implements location-specific strategies to reduce fatal and serious injury crashes. Priority projects serve as a starting point for further development for grant funding and can also be used as examples of how countermeasures could be used for similar locations.

General guidance includes understanding the financial capabilities, and when and how to consider quick build alternatives. The guidance is also intended to prepare a jurisdiction to apply for Safe Streets and Roads for All (SS4A) grant or other sources of funding.

Once a project location has been identified, the task becomes to determine what treatments are appropriate and will be effective in reducing fatal and serious injury crashes given the roadway context. To help aid agencies across the US in implementing the Safe System Approach, FHWA has published the *Safe*

System Roadway Design Hierarchy[1]. This hierarchy can be used to assess how well aligned a treatment is with the Safe System Approach and its goal of reducing fatal and serious injury crashes. Countermeasure strategies were collected from various sources such as:

- Federal Highway Administration's *Proven Safety Countermeasures*[2]
- Federal Highway Administration's *Safe System Roadway Design Hierarchy*[1]
- National Highway Traffic Safety Administration's *Countermeasures that Work*[3]
- Institute of Transportation Engineers' *Unsignalized Intersection Improvement Guide*[4]

In addition to location-specific strategies, systemic strategies were also developed. Instead of starting with a location, area-wide trends were identified to address. Systemic projects proactively treat locations to reduce the likelihood of future fatal and serious injury crashes. Selected locations may or may not have a history of fatal and serious injury crashes, but share similar characteristics (e.g., number of lanes, posted speed, surrounding land-use context, intersection control-type) with locations that do have fatal and serious injury crashes.

Prioritization of Projects

The identified countermeasures were analyzed using the following metrics to assess their level of priority.

Quick Build Nature	• Cost of materials, installation effort, and timeline
Design and Construction	• Level of design and degree of construction needed
Cost	• Overall expected cost of the project
Public Input	• Public perception of priority areas

Based on those metrics, all the proposed countermeasures have been divided into two tiers.

- Tier I : Projects which are quick-build and provide high benefit for relatively lower costs and in the near term. These projects may be able to be implemented by maintenance staff and budgets, as part of systemic programs, or through grants.
- Tier II : High impact projects with higher complexity and higher costs. These capital projects are expected to require the design and construction process and dedicated funding, with a longer time horizon.

Figures 2 and 3 list recommended projects by the two tiers.

[1] https://highways.dot.gov/sites/fhwa.dot.gov/files/2024-01/Safe_System_Roadway_Design_Hierarchy.pdf
[2] Proven Safety Countermeasures | FHWA
[3] Countermeasures that work | NHTSA
[4] UIIG | ITE

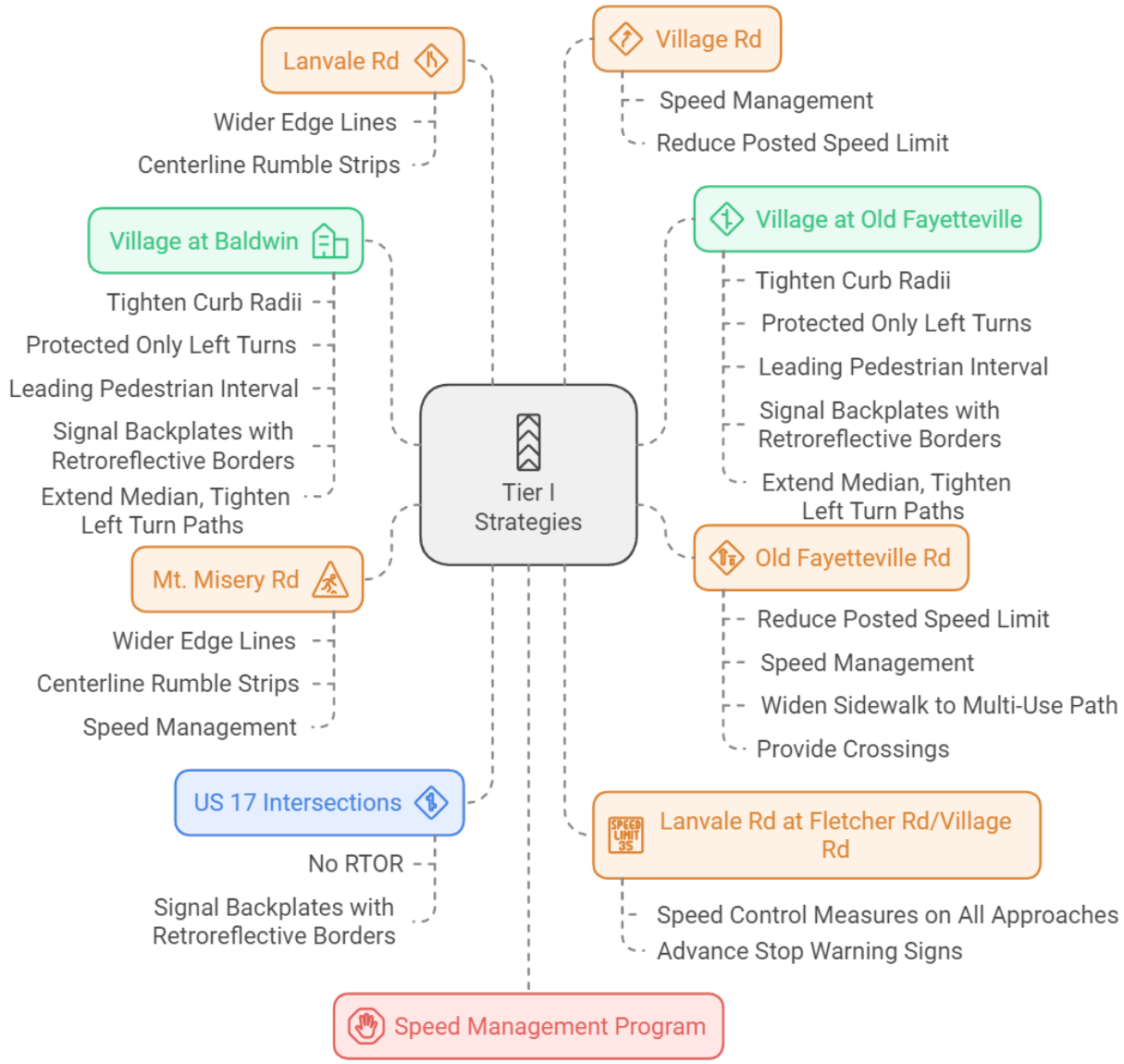


Figure 2: Tier 1 High Priority Recommended Projects

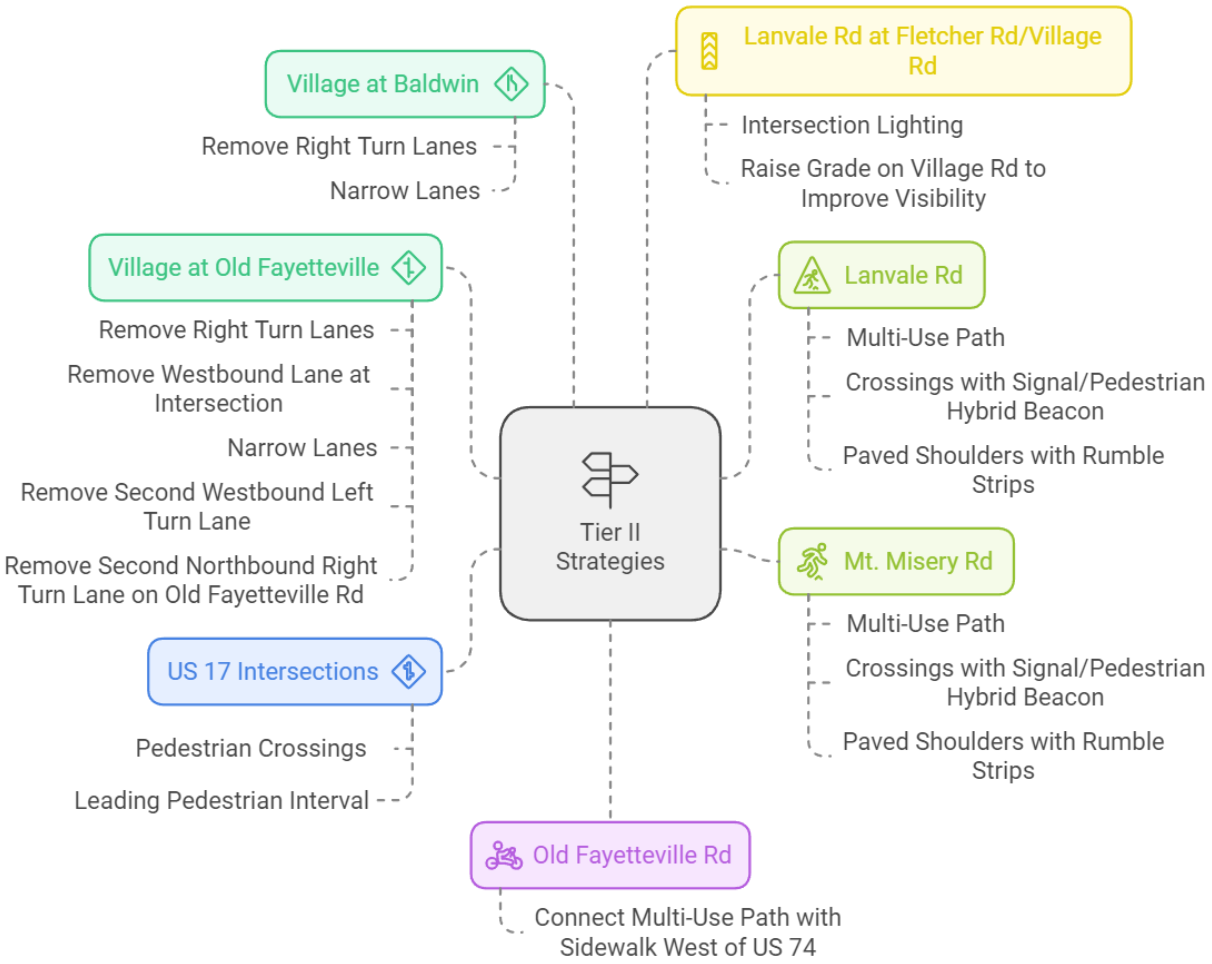


Figure 3: Tier 2 Secondary Priority Recommended Projects

QUICK-BUILD GUIDANCE

This section discusses national best practices, resources, and implementation considerations for quick-build projects.

What Are Quick-Build Projects?

Quick-build projects generally have the following characteristics:

- Low-cost materials.
- Materials can be installed quickly.
- Materials can be easily changed, adapted, or replaced with more durable materials as needed.

Why Is Quick-Build Useful?

Quick-build projects and processes can be useful tools for agencies to implement safety projects with limited budgets and on a compressed timeframe, compared to traditional, capital projects. Quick-build projects can also be helpful tools trying new or experimental countermeasures or pilot programs prior to permanent installation.

This section presents the best practices related to quick-build projects, a summary of current practices around Leland, and recommended next steps for how agencies can best utilize quick-build projects to improve safety.

Best Practices and Process

Effective quick-build implementation should generally follow the process shown in **Figure 4**. The following references, including guidebooks for quick-build projects or example quick-build guides used by agencies across the nation. They may be used by Leland to guide and inform quick-build project implementation.

- *Quick-Build Guide: How to Build Safer Streets Quickly and Affordably*[5]
  - Created by the California Bicycle Coalition in 2020.
  - Provides information for agencies and practitioners on how to plan-for, design, maintain, and implement quick-build projects. Focus is on active transportation infrastructure.
- *Quick Builds for Better Streets*[6]
  - Created by PeopleForBikes in 2016.
  - Provides a list of resources, considerations, and factors that can contribute to successful quick-build implementation.
- *City of Orlando Quick Build Guide*[7]
  - Created by the City of Orlando in 2023.
  - Provides a framework and process for quick-build implementation.
  - Provides a toolbox with list of quick-build project types with information on material options, design considerations, and additional resources.

[5] Quick-Build-Guide-White-Paper-2020.pdf
[6] 2016PeoplefoBikes_Quick-Builds-for-Better-Streets.pdf
[7] orlandoquickbuildguide06-28-2023.pdf

- *Tactical Urbanism: A Guide for Street Activations and Demonstration Projects*[8]
    - Created by the Nashville Department of Transportation.
    - Provide a toolbox with suggestions on tool, materials, and methods for consideration in quick-build project implementation.
    - Provides an example of an agency's process for the identification, design, approval, and installation of quick-build projects.

Current Regional Quick Build Practices

Several Quick Build projects are in place in the Cape Fear Region:

- Curb Extensions: NCDOT Integrated Mobility Division installed "interim design safety pilot projects" across the state. Flex posts were installed on the corners of 3rd Street/Market Street and 17th Street/Castle Street in Wilmington to extend the curbs and tighten the turning radii. This gives pedestrians more buffer space, shortens crossing distances, and slows turning vehicles. The posts were deemed beneficial and left installed after the trial period.
- The City of Wilmington implemented Leading Pedestrian Interval at signalized crosswalks throughout the city. This implementation was able to be completed quickly with in-house personnel.

Next Steps

Based on the best practices review and the current quick-build practices around Leland, the following items should be taken into consideration by Leland for implementing quick-build projects:

- **Continue Implementing Quick-Build Projects:** Especially at locations with an immediate need (e.g., locations on the High-Injury Network, areas with higher crash activity) where improvements via capital projects are not anticipated in the near-term due to lack of funding or other constraints. Quick-build projects can also be used to demonstrate new treatments.
- **Develop Internal Agency Processes that Enable Effective and Efficient Quick-Build Implementation:** These may include dedicating town staff to coordinating quick-build projects, developing a formal process (such as the City of Orlando's), inventorying available resources, and identifying key partners for implementation (e.g., maintenance staff, emergency service providers, and neighborhood advocacy groups).
- **Constant and On-Going Communication:** Involve town staff, community members, and other partners in conversations in all stages of the process. This can build buy-in before installation, set expectations for roadway users and members of the public, and allow agencies to learn lessons from project implementation.
    - **Maintenance Matters:** Maintenance needs should be a focus in the planning, design, and implementation stages. This includes monitoring of annual maintenance costs post-implementation.

[8] TUGuide_Interactive.pdf

Figure 4 Quick-Build Implementation Process

1 PLANNING STAGE

Structure

Agencies should have an administrative framework in place for quick-build projects.

Includes: identification of key staff coordinators, an inventory of available resources, and a checklist of stakeholders that should be engaged with during the planning stage of the process.

Reference

Leverage existing planning efforts (e.g., this plan or other safety plans, active transportation plans) to identify locations for quick-build implementation.

Brainstorm

Include agency staff, community members, and other key stakeholders in initial conversations to understand the needs of the location, set expectations, and obtain initial buy-in for the project concept.

These conversations should make sure that future maintenance needs and emergency vehicle access are considered in the quick-build concept. Consider community pop-up meetings to communicate project ideas and obtain feedback.

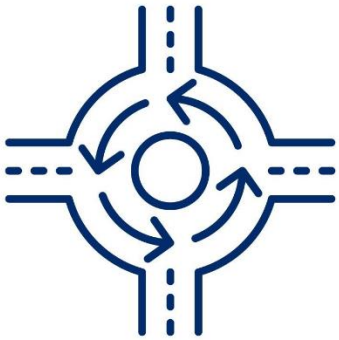
Identify

Develop a data collection and evaluation plan (e.g., crash data, near-miss, speeds, or multimodal traffic counts) if a before-after evaluation is desired or needed.

2 INSTALLATION STAGE

Communicate

Continue pro-active communication with community members so that the installation date and project concept and purpose are advertised. Consider a project-opening event to raise awareness for the effort.



3 MONITORING & MODIFICATION

Engage

Continue engagement with community members and solicit feedback on the project.

Analyze

Collect and evaluate data to determine the project's effectiveness (especially if part of a demonstration activity).

Discover

Continue conversations with maintenance staff, emergency service providers, and other stakeholders to learn about successes and challenges associated with the project.

Adjust

Modify the project, as needed based on the feedback and data evaluation. Since quick-build projects are not built with permanent materials, there is the opportunity to modify and improve the design at a relatively low cost.

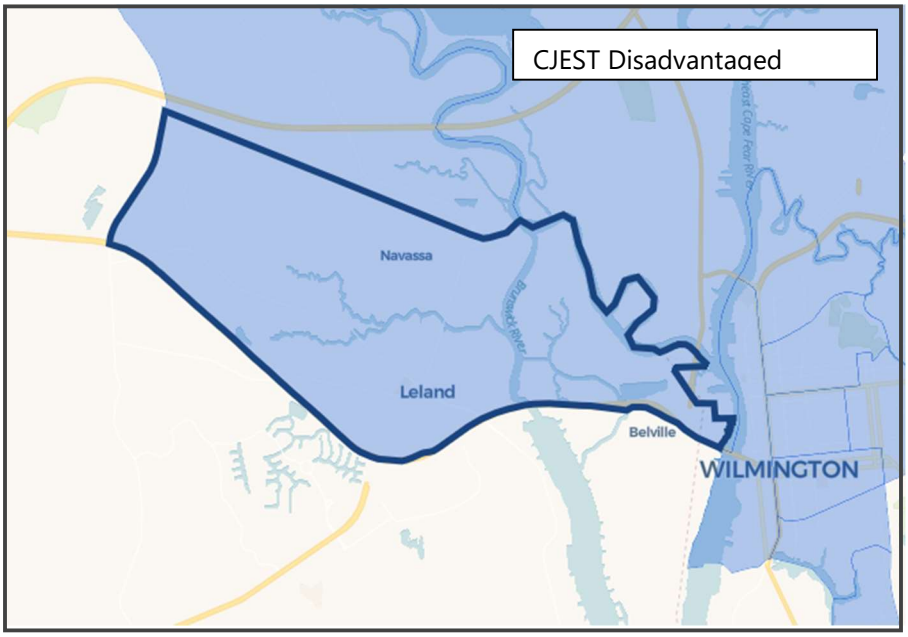
Evaluate

Determine if the project will continue with the same materials or if they will be replaced with more durable materials (e.g., replacing a curb bulb-out built with flext posts with a concrete bulb-out).

TOWN OF LELAND SS4A FUNDING STRATEGIES

The Town of Leland can consider federal, state, and local funding opportunities to implement the strategies identified in this document. A common question/analysis found in both federal and state grant applications refers to disadvantaged community designations. There are several tools that provide insight on the national level regarding a disadvantaged community.

Climate and Economic Justice Screening Tool (CEJST) – this is the tool used to identify Justice40 Census tracts. The Federal government has made it a goal that 40 percent of the overall benefits of certain Federal climate, clean energy, affordable and sustainable housing, and other investments flow to disadvantaged communities that are marginalized by underinvestment and overburdened by pollution. President Biden made this commitment when he signed Executive Order 14008. As described below, the portion of Leland that is north of US74/76 is in a Justice40 Census tract. This designation will create more competitive grant applications, particularly for federal grant programs.



Areas of Persistent Poverty (APP) – APP is defined by the Bipartisan Infrastructure Law. It can be a county or Census tract. Similar to CEJST, the Census tract in Leland north of US74/76 is designated an APP.

Historically Disadvantaged Community (HDC) – HDC is defined by the Office of Management and Budget's Interim Guidance for the Justice40 Initiative. Therefore, if a Census tract is designated a Justice40 disadvantaged tract, then CEJST defines it as disadvantaged, and it is also an HDC. The Census tract in Leland north of US74/76 is designated a HDC.

Other disadvantaged community designations/data tools include USDOT's Equitable Transportation Community (ETC) Explorer. There are not any Census tracts in Leland (as of 2025) that are designated disadvantaged according to the ETC. A list of potential funding sources are shown on the next page.

Federal Funding

- **Safe Streets and Roads for All (SS4A) Grant Program**: Funds initiatives through grants to prevent roadway deaths and serious injuries. Provides two types of grants (described below). Requires a local match of 20%.
    - **Planning and Demonstration Grants**: May be used to develop, complete, or supplement a Safety Action Plan (such as this plan). May also be used for supplementary planning activities (such as road safety audits, safety planning for a corridor or subarea, or community engagement) and demonstration activities (such as pilot programs or feasibility studies). Examples of demonstration grants include implementing low-cost/quick-build materials that can inform potential permanent projects (e.g., protected bike lanes), new technology pilot programs (e.g., use of GIS/GPS technology for signal preemption for emergency vehicles), or pilot training for law enforcement. It should be noted that most demonstration activities require the collection and analysis of before-and-after crash data related to the safety problems being addressed.
    - **Implementation Grants**: May be used to implement projects and strategies identified in a Safety Action Plan. Includes infrastructural, behavioral, and operational activities. May also include supplemental planning and demonstration activities. In FY24, eligible entities could submit their Safety Action Plan for pre-application review so USDOT could affirm or provide details regarding whether the Action Plan met the eligibility requirements. In 2024, those were due in April.
    - **Additional Considerations:** In 2024, approximately 20% of applications were awarded Implementation Grant funds. Nearly all eligible Planning and Demonstration grant applications received grant funds. The Implementation Grant program is much more competitive than the Planning and Demonstration Grant Program.
- **Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grant**: Provides funds up to $25 million that can be used for a variety of transportation projects that have a significant local or regional impact, including impacts to safety. May include funds for planning, design, and/or construction of projects. Requires a local match of 20% for projects in urban areas.
    - **Additional Considerations**: A Benefit Cost Analysis (BCA) is required to submit a capital improvement project (not a planning project). This is a very technical process that requires extensive traffic engineering analysis. The success rate of RAISE grant applications is approximately 13%.
- **Active Transportation Infrastructure Investment Program (ATIIP):** Provides funds for projects that help communities plan, design, and construct safe active transportation systems that connect to destinations or between communities. Priority is given to projects with significant public input. Requires a local match of 20% unless located in a community with a poverty rate over 40%.
    - **Additional Considerations:** Planning and Design projects must have a cost of at least $100,000; Construction projects must have a cost of at least $15 million. In 2024, applications were due in June.
- **Reconnecting Communities Pilot (RCP) Program:** Provides funds for projects focused on improving disadvantage communities adversely-impacted by past infrastructure choices. Competitive projects are those that reconnect communities by removing, retrofitting, or mitigating highways or other transportation facilities that create barriers to community connectivity, including to mobility, access, or economic development. Includes Capital Construction and Community

Planning grant types. Planning grants require a 20% local match; Construction grants require a 50% local match.

  - **Additional Considerations:** A BCA is required for Construction applications.

- **Local Highway Safety Improvement Program (LHSIP)**: Federally-funded program distributed by the Local Highway Technical Assistance Council (LHTAC) aimed at eliminating fatal and serious injury crashes on the roadway system. Local Highway Jurisdictions (LHJs) with a Fatal and/or Serious Injury (Type A) crash in a rolling five (5) year window are eligible for the program. LHJs that have experienced at least one (1) Fatal or Serious Injury (Type A) crash over the last five years are eligible to apply. A 7.34% local match is required.
- **Surface Transportation Block Grant (STBG):** Federal formula program that may be applied to many types of roadway projects, including pedestrian and bicycle projects, transit capital projects, and maintenance. The Wilmington Metropolitan Planning Organization administers these funds for the Cape Fear Region. The Call for Projects is typically in the summer. A 20% local match is required for all STBG program grants.
  - **Direct Attributable**: Set-aside from the STBG; provides flexible funding that may be used for projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge and tunnel projects on any public road; pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminals.
  - **Transportation Alternatives Program**: Set-Aside from the STBG program that generally provides funding for smaller-scale projects, such as pedestrian and bicycle facilities; construction of turnouts, overlooks and viewing areas; community improvements such as historic preservation and vegetation management; environmental mitigation related to storm water and habitat connectivity; recreational trails; safe routes to school projects; and vulnerable road user safety assessments..
  - **Carbon Reduction Plan:** Set-aside from the STBG program that can be used for projects that reduce transportation carbon dioxide emissions, including public transportation and pedestrian facility projects.
- **Promoting Resilient Operations for Transformatvie, Efficient, and Cost Saving Transportation (PROTECT) Grant Program:** PROTECT provides funding to ensure surface transportation resilience to natural hazards including climate change, sea level rise, flooding, extreme weather events, and other natural disasters through support of planning activities, resilience improvements, community resilience and evacuation routes, and at-risk coastal infrastructure. A 20% local match is required.
  - **Additional Considerations:** A BCA is required to submit a Construction application.
- **Strengthening Mobility and Revolutionizing Transportation (SMART) Grant**: The SMART Program provides funding to eligible public-sector agencies to conduct demonstration projects focused on advanced smart community technologies and systems in order to improve transportation efficiency and safety, among the other USDOT Innovation Principles. SMART is a two-stage program. Stage 1(up to $2,000,000 dollars and 18 months) grants are open for any eligible entity to apply. Recipients of Stage 1 grants will be eligible to expand their projects through Stage 2 grants (up to $15,000,000 and 36 months).

State Funding

- **Governors' Highway Safety Program:** This program helps fund the efforts of law enforcement agencies, local governments, community organizations, schools and nonprofits to reduce traffic crashes in North Carolina. GHSP funds projects/programs that address the following areas of

highway safety: drunken driving, seat belt safety, police traffic services, young drivers, motorcycle safety, and traffic record-keeping. GHSP also provides funds to address distracted driving and to make roads safer for older drivers, pedestrians, bicyclists, commercial motor vehicles and school buses.

- **NC's Safe Routes to School (SRTS) Non-Infrastructure Program:** provide an opportunity for communities to improve conditions for bicycling and walking to school. Projects can range up to three years. Grant amounts range from $50,000 - $500,000 per project. Funding may be requested to support activities for community-wide, regional or statewide programs. Proposed projects need to be education, encouragement, or evaluation-based.
- **NCDOT High Impact/Low Cost Funds:** High Impact / Low-Cost funds are for statewide rural or small urban highway improvements and related transportation enhancements to public roads/public facilities, industrial access roads, and spot safety projects. Funds are used to complete low-cost projects with high impacts to the transportation system including intersection improvement projects, minor widening projects, and operational improvement projects. Applications are submitted to NCDOT Division Engineers for a field inspection, review, and recommendation to be approved by the NCDOT Board. The maximum award amount is $1.5 million.
- **NC Department of Natural and Cultural Resources (DNCR) Division of Parks and Recreation's Recreational Trails Program (RTP):** The Recreational Trails Program provides funding for construction of new trails, maintenance and repair of existing trails, land acquisition, purchase of trail tools and planning, legal, environmental and permitting costs. It is a federal grant reviewed by the NC Trails Committee and recommendations are made to the Secretary of the NC Department of Natural and Cultural Resources who makes the final determination. In 2024, applications were due early September. A 25% local match is required. The minimum award is $10,000; the maximum award is $100,000.
- **DNCR Division of Parks and Recreation's Parks and Recreation Trust Fund Grant (PARTF):** PARTF provides matching grants to local governments to assist with public park and recreation projects, including greenways. In 2024, applications were due in early May. The project must be on a single site. A 50% local match is required. The maximum award is $500,000.
- **Land and Water Conservation fund (LWCF):** LWCF is split into the 'federal side' with money allocated to the National Parks Service and the 'state side' which allocates 40% of the funds as matching grants to states and local governments. In NC, LWCF can fund riparian greenway projects. These projects can include land and easements along streams, and often feature paved or natural surface trails for recreational, educational, and environmental uses. Greenway corridors funded by the NCLWF can connect schools, neighborhoods, and community parks in urban areas. The project must be on a single site. A 50% local match is required. The maximum award is $500,000.
- **Powell Bill Program:** The Powell Bill program, also known as the State Street Aid program, is administered by the North Carolina Department of Transportation (NCDOT) to provide state funding to eligible municipalities for street maintenance and improvements. The funds are derived from a percentage of the state's gasoline tax revenue. Municipalities can use the funds to maintain, repair, reconstruct, or improve streets, sidewalks, bikeways, greenways, and public thoroughfares; build or widen streets, bridges, and drainage areas; and plan, build, and maintain bicycle paths. Each municipality manages Powell Bill funds differently as they own/maintain different roads.
- **NCDOT Small Construction Funds:** Established 1985 to fund small projects in and around cities and towns which could not be funded in the Statewide Transportation Improvement Program (STIP). Budget Bill provisions currently allow for use on variety of transportation projects for municipalities, counties, businesses, schools and industries throughout the State. An equal amount of funds are

allocated to each NCDOT Division. Division engineer performs field inspection, forwards information to Chief Engineer, who sends along to the Project Review Committee that will approve or deny. The maximum award is $250,000 per project per year.

- **NCDOT Statewide Contingency Funds:** These funds were created for statewide rural or small urban highway improvements and related transportation enhancements to public roads/public facilities, industrial access roads, and spot safety projects. Same review/approval process as above.

NON-INFRASTRUCTURE STRATEGIES

This section presents implementation considerations for high-priority, non-infrastructure strategies, such as policies and plans or recommendations related to agency coordination or operations. Implementation considerations include the following:

- **Safe System Approach Objective:** Which SSA objective does the strategy target?
- **Near-Term Action**: What next step should be taken to achieve the strategy? These actions should generally be started 1-2 years after this plan is adopted.
- **Performance Metric**: How can Leland measure the implementation progress of each strategy?

Table 1 summarizes the implementation considerations for the various non-infrastructure strategies.

Table 1: Non-Infrastructure Strategies

Strategy	SSA Objective	Near-Term Action	Performance Metric(s)
Continue safety focus group	Multiple Objectives	Schedule and hold at least two meetings per year with FG	Number of meetings per year
Identify grant funding opportunities	Multiple Objectives	Continue to identify potential projects and relevant federal, state and local grants for funding	Demonstrated progress beyond current activities
Establish Dedicated Funding for Safety Projects	Multiple Objectives	Leland to consider opportunities to dedicate funds for safety-focused projects	Demonstrated progress beyond current activities
Regularly Assess Implementation Successes and Challenges	Multiple Objectives	Leland to obtain successes/challenges information from stakeholders, create summary documents, and present to stakeholders annually at FG meeting or similar forum	Assessment completed. Topic presented/discussed at FG meeting or similar forum
Lower posted speed limits	Safer Speeds	Evaluate agency-wide speed limits on an annual basis. Identify locations where speed limits are not appropriate based on recent land use or other changes	Evaluations and changes completed
Encourage and incentivize speed management training	Safer Speeds	Encourage town staff to take speed management training such as *Designing and Operating Roadways for Safe Speeds*[9]	Number of training sessions and trainees per year
Develop and advertise a traffic calming toolbox	Safer Speeds	Develop a menu of speed management strategies with relevant costs and their implementation timeline	Number of strategies on the toolbox.

[9] Designing and Operating Roadways for Safe Speeds Training

Apply targeted enforcement	Safer Speeds	Place enforcement officers on patrol in areas with high operating speeds to detect and warn and/or cite speeding drivers	Demonstrated progress beyond current activities
Project development	Safer Roads	Evaluate historic crashes and known crash risk factors during the project planning phase, and apply countermeasures identified in the Safety Action Plan and other best practices to address them	Evaluations and policy updates
Updating roadway cross sections	Safer Roads	Update typical roadway cross sections to include best practices	Evaluations and policy updates
Education campaign for all road users	Safer People	Identify and implement education campaigns	Campaign launched. Effectiveness evaluated annually.
Public sense of responsibility	Safer People	Conduct public engagement events to respond to community feedback on safety concerns and notifying the public when treatments are implemented.	Number of events conducted per year
Communicate with EMS for speed management projects	Post Crash Care	Implement speed management countermeasures on emergency responder routes, conduct trainings to teach responders about critical roadway safety and traffic incident management	Number of trainings conducted per year

PERFORMANCE MEASURES

This section describes performance measures and program outcomes that can be used to help evaluate and understand the changes that implementing this plan has on roadway safety in Leland. The performance measures are generally used to evaluate progress made in implementing the strategies recommended in this plan. The program outcomes measure the success of the plan in achieving its goals (e.g., reducing fatalities and serious injuries).

Listed below are the performance measures that should be used to measure the level of implementation of the strategies in this plan:

- Number of safety projects completed
- Progress of Non-Infrastructure Strategies
- Level of funding allocated to safety projects
- Frequency and quality of engagement with stakeholders

Program Outcome Measures

Program outcome measures provide quantitative metrics to evaluate the success of the program in achieving its goals of eliminating fatalities and serious injuries. The change in crashes should be measured over 5 year rolling averages and broken out by emphasis areas. Breaking out crashes based on different

categories can help indicate which strategies are most effective and which areas might require a greater focus in the future.

Table 2 provides an example template for measuring program outcomes in future years. The total number of fatal and serious injury crashes should be summarized on an annual basis to see if the number of crashes is trending towards the goal identified in this plan. Alternatively, program outcomes can be measured by the number of crash fatalities and serious injuries per total population instead of crash frequency.

Table 2: Performance Measure Tracking Template

Emphasis Area	Total Fatal and Serious Injury Crashes			
	2019 – 2023 (Baseline)		5 Year Rolling Average (e.g., 2020-2024)	Goal for Year 2035
	#	%[1]		
Total	23	100%	*To be evaluated in in future and compared to year 2035 goal.*	0
Vulnerable Road Users: Pedestrian	1	4.3%		0
Vulnerable Road Users: Bicycle	0	0%		0
Intersection Crashes: Angle	10	44%		0
Lane Departure Crashes	9	39%		0
Motorcyclists	7	30%		0
Safer Speeds	2	9%		0

[1]Values in this column represent percent of total fatal and serious injury crashes within study area.

Accountability

To encourage member agencies to continue implementation of the strategies presented in this plan, it is recommended that Leland present the performance measures and program outcomes to the stakeholders on an annual basis. This can inform stakeholders of progress towards reaching the plan's goals, provide an opportunity to share regional safety practices, and hold the town staff accountable in implementing high-priority strategies.