Town and County of Nantucket
Select Board • County Commissioners

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Nantucket, Massachusetts 02554

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www.nantucket-ma.gov

C. Elizabeth Gibson
Town & County Manager

AGENDA FOR THE MEETING OF THE
SELECT BOARD
DECEMBER 2, 2024 - 4:00 PM
PSF COMMUNITY ROOM, 4 FAIRGROUNDS ROAD
AND REMOTE PARTICIPATION VIA ZOOM WEBINAR
NANTUCKET, MASSACHUSETTS

YOU TUBE LINK FOR VIEWING ONLY:
https://youtube.com/live/sFAUYuDjuok

ZOOM WEBINAR REGISTRATION LINK TO VIRTUALLY ATTEND MEETING:
https://us06web.zoom.us/webinar/register/WN_5-7liaiWQym0BpqKJ1G0kg

I. CALL TO ORDER

II. JOINT MEETING WITH NANTUCKET PLANNING AND ECONOMIC DEVELOPMENT COMMISSION (NP&EDC)

1. Presentation of Safe Streets and Roads for All (SS4A) Safety Action Plan Key Findings and Possible Safety Solutions.

III. ADJOURNMENT

Safe Streets and Roads for All
Comprehensive Safety Action Plan (CSAP) Update
Key Findings and Possible Safety Solutions

Nantucket Planning & Economic Development Commission
Nantucket Transportation Planning Organization

Agenda

- Opening/Call to Order – 5 mins
- Project Background and a Safe System Approach – 5 mins
- Key Findings from Crash Analysis and Typing - 10 mins
- Summary of What was Heard from the Community – 10 mins
- Review of Key Potential Safety Countermeasures – 10 mins
- Review Locations of Concern and Prior Studies/Recommendations - 25 mins
  - Polling on Specific Locations (Prior Project Concepts)
- Learn about Level of Support
  - Poll Members on Available Countermeasures (General Measures) - 10 mins
  - Revisit and Discuss Projects of Concern (As-Needed) – 12 mins
- Next Steps – 3 mins
  - Schedule/Your Involvement

Project Background and Scope

Nantucket Planning & Economic Development Commission
Nantucket Transportation Planning Organization

Background

S | S
4 | A

Safe Streets and Roads for All (SS4A)

Quarterly Newsletter – March 2024

About SS4A

The Bipartisan Infrastructure Law (BIL) established the Safe Streets and Roads for All (SS4A) discretionary grant program with $5 billion in appropriated funds over five years. The SS4A program funds regional, local, and Tribal initiatives through grants to prevent roadway deaths and serious injuries.

The SS4A program supports the U.S. Department of Transportation's National Roadway Safety Strategy and our goal of zero roadway deaths using a Safe System Approach.

Welcome

As the SS4A Team reflects on the past year, we are excited to share our progress in the first edition of our quarterly newsletter. This publication will share program updates, highlight key developments, and provide a sneak peek into upcoming activities.

The last quarter was filled with planning efforts as the team gathered stakeholders' feedback to inform our training priorities. We translated our takeaways into action by planning and facilitating an initial webinar for FY23 grant recipients and an SS4A Community of Practice kick-off meeting. We also began developing comprehensive trainings that will provide key information that recipients need to take full advantage of the benefits and resources that the SS4A grant program has to offer.

In This Edition

- Grant won in 2023
- Collaboration with Martha's Vineyard and Franklin County
- Focus on rural road typology

Project Team Structure

Kittelson & Associates (Project Manager)
Nelson\Nygaard (Nantucket/Martha's Vineyard)
DREAM Collaborative (Land Use and Community Engagement)

Project Coordination Team: Reviews and collaborates on all work products; facilitates coordination with member towns and local stakeholder groups.

Beth Giannini FRCOG	Mike Burns NP&EDC	Bill Veno MVC
FRCOG Stakeholders	NP&EDC Stakeholders	MVC Stakeholders

Scope and Schedule

2024 2025

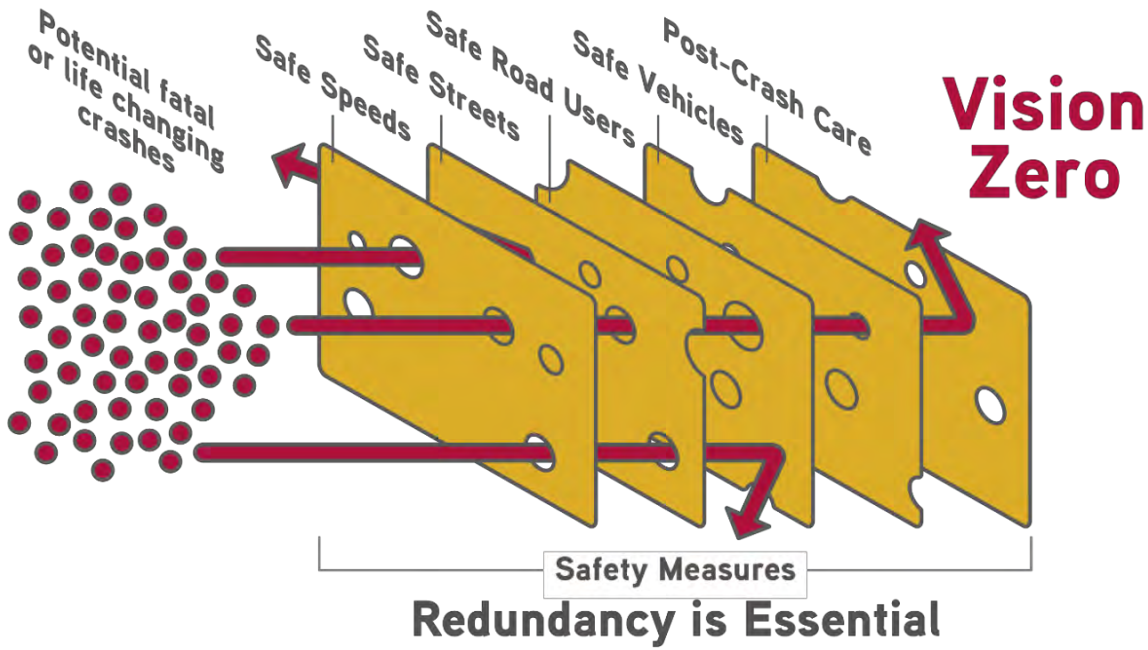
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG

- Kickoff
- Crash Analysis
- Typologies and Treatments
- Joint Meeting
- Practice and Policy Tools
- Develop and Prioritize Projects
- Write Safety Action Plans
- Plan Endorsement
- Stakeholder and Community Engagement

The Safe Systems Approach

Traditional Safety Approach	Prevent Crashes	Improve Human Behavior	Control Speeding	Individuals are Responsible	React Based on Crash History
Safe System Principles	Prevent Death and Serious Injury	Design for Human Mistakes and Limitations	Reduce the Impact of Crashes	Shared Responsibility	Proactively Identify and Address Risks

Redundancy of Measures is Essential



Project Approach

Identify high crash streets/intersections that result in death and injury

Recommend design improvements for high-crash streets/intersections

Recommend changes to policies and traffic laws

Author a community-wide leadership commitment acknowledging safety, health, and equitable transportation are our shared responsibility

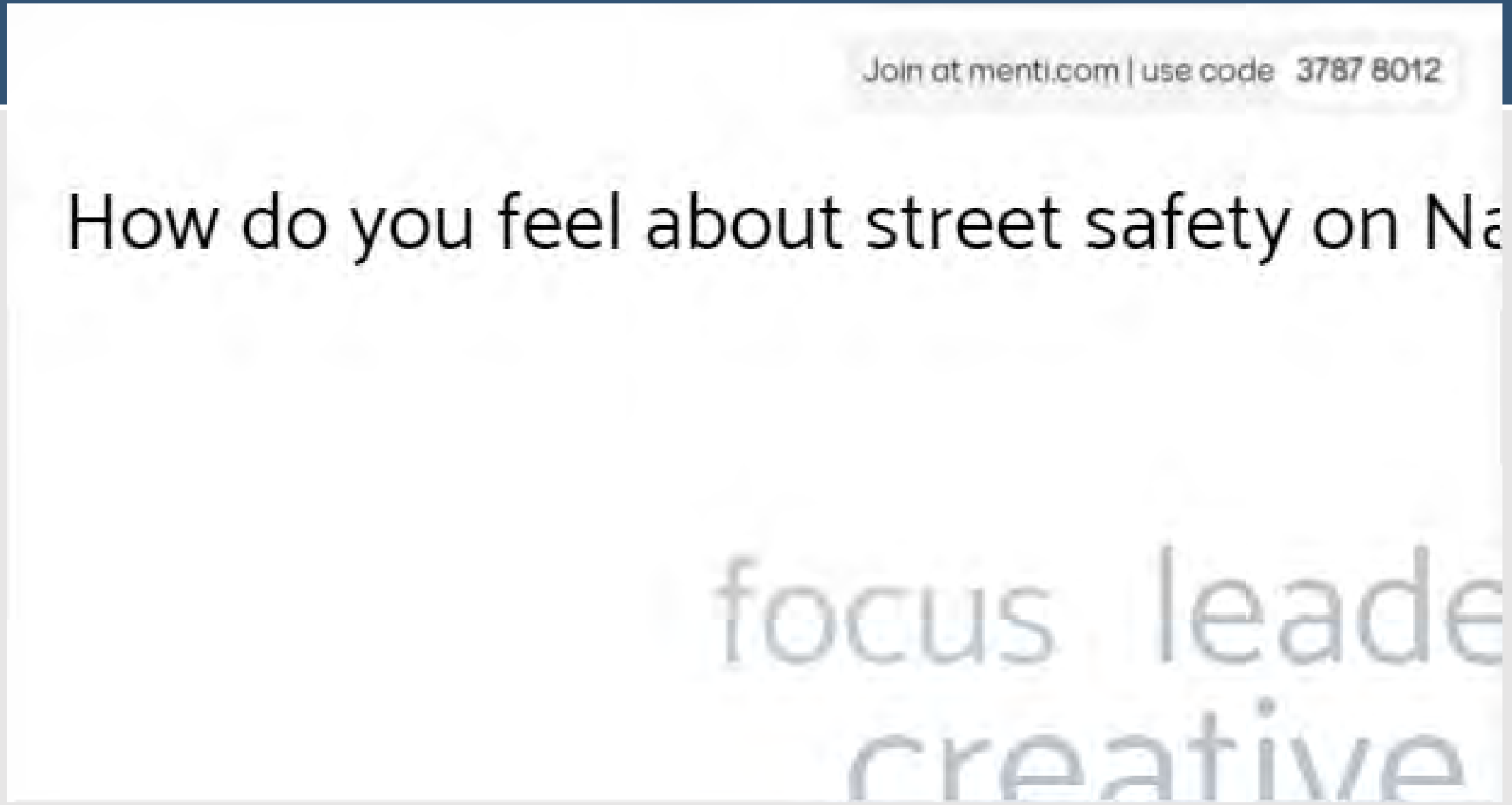
Prioritize safety investments at high crash streets/intersections

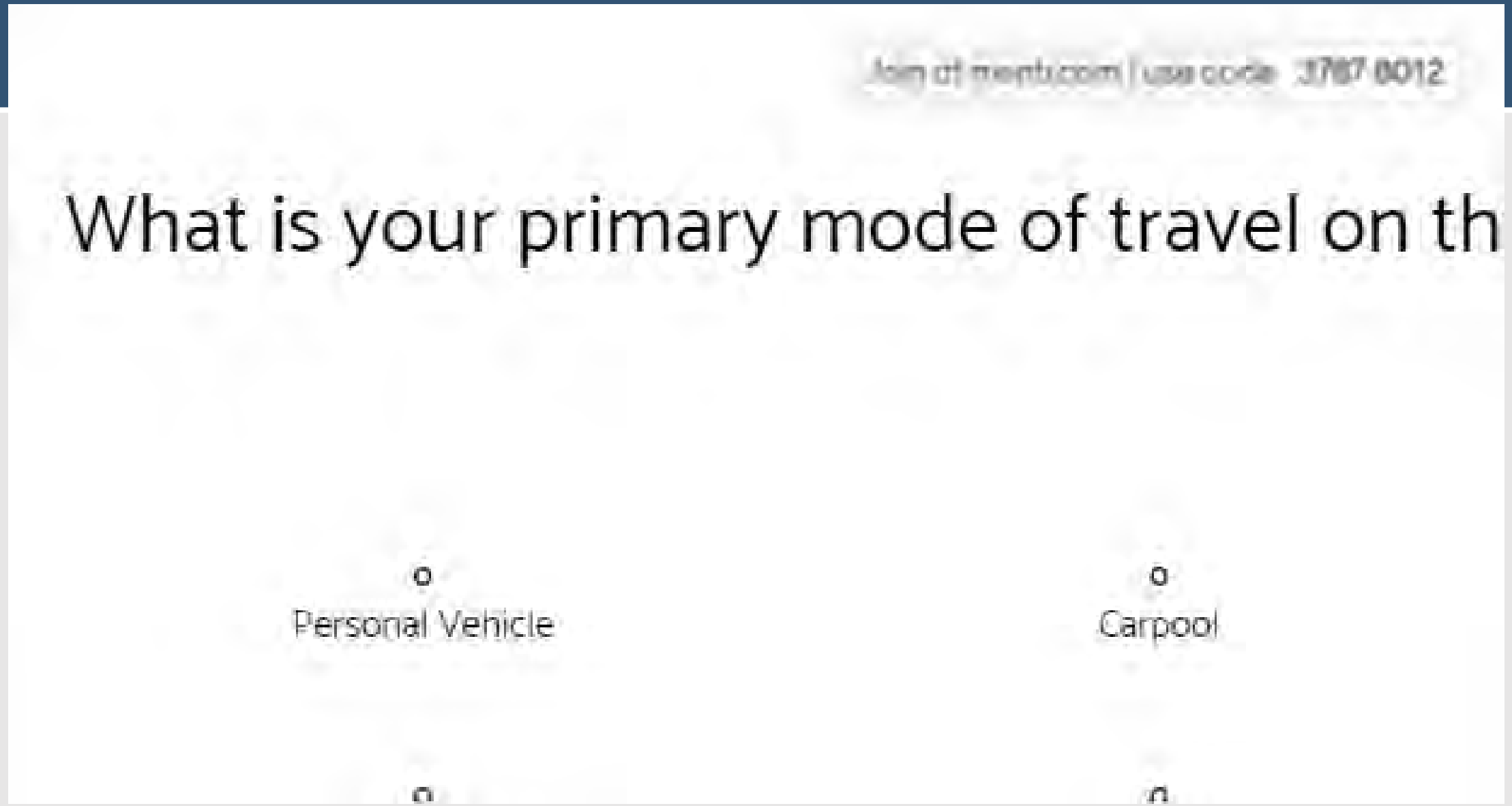
Draft SS4A implementation grants

Formalize and adopt plans

Warm Up Polling

Nantucket Planning & Economic Development Commission
Nantucket Transportation Planning Organization


Join at menti.com | use code 3787 8012
How do you feel about street safety on Na
focus
leade
creative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What is your primary mode of travel on th
Personal Vehicle
Carpool

Join at menti.com | use code 3787 0012

Does anyone in your household have a disabil
wheelchair or mobility device?

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Which of these is of greater concern to yo

Travel Faster vs Travel Safer

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Which of these is of greater concern to yo

More Space for Vehicles vs More Space for Bicyclists and Pedestrians

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Which of these is of greater concern to yo

Better Road Conditions vs More Road Capacity

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Which of these is of greater concern to yo

Reliable Driving Times vs Facilities for Other Modes

Historical Crash Trends and High Injury Network

Nantucket Planning & Economic Development Commission
Nantucket Transportation Planning Organization

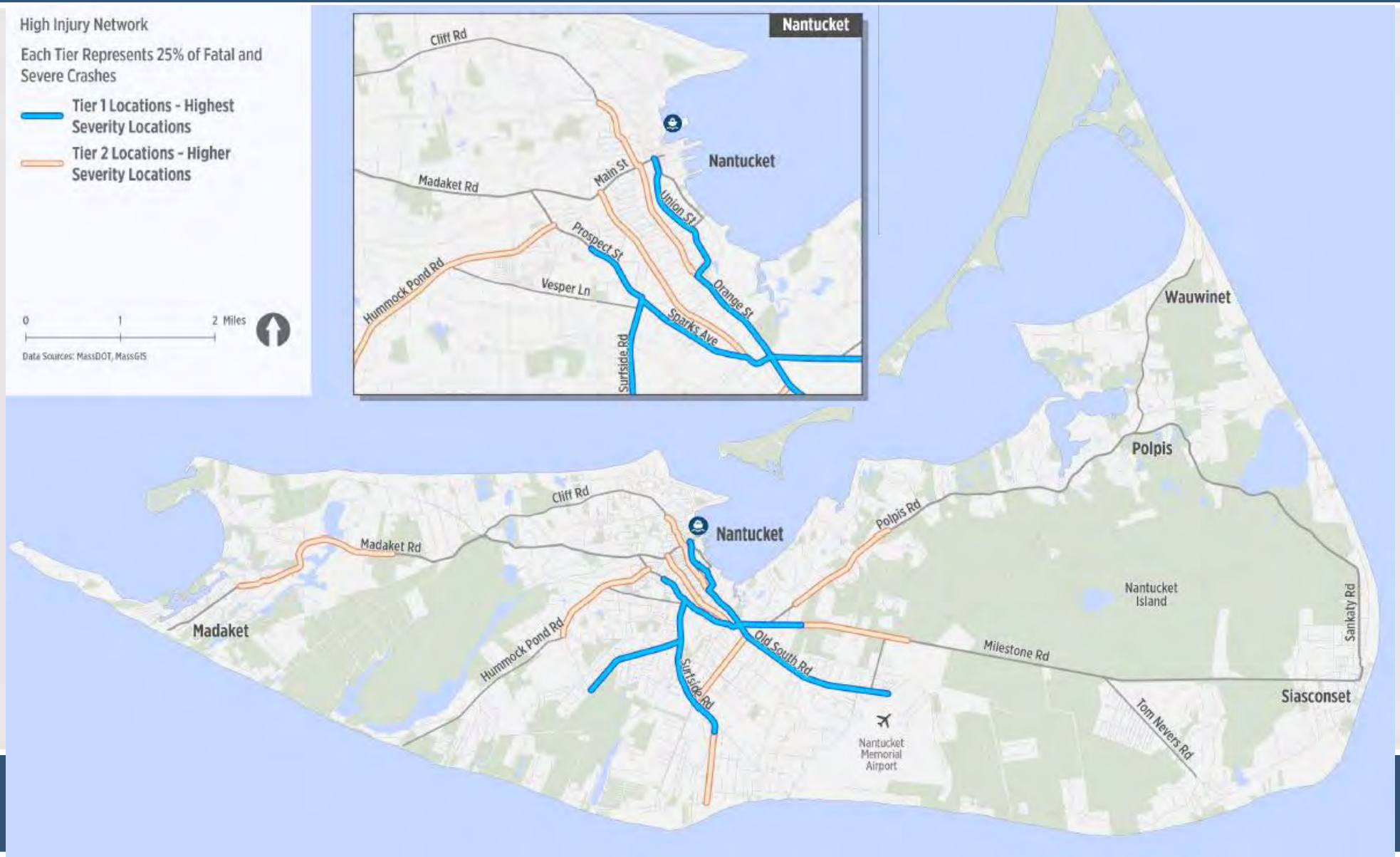
Safety Site Visits with Staff – July 2024

Historical Crash Trends

- General Trends
  - Crashes are substantially higher in summer, mid-day
  - Single vehicle crashes accounted for the most fatal and severe crashes
- Vulnerable Road Users
  - 5% of total crashes but 21% of reported injuries
  - Most likely to occur at intersections and 85% occur in densely settled areas
- Network Screening
  - Crashes are more frequent in and around Town rather than rural areas
  - Rural area crashes are concentrated at density transitions and curves

Highest Crash Locations (2018-2022)

Nantucket High Injury Network



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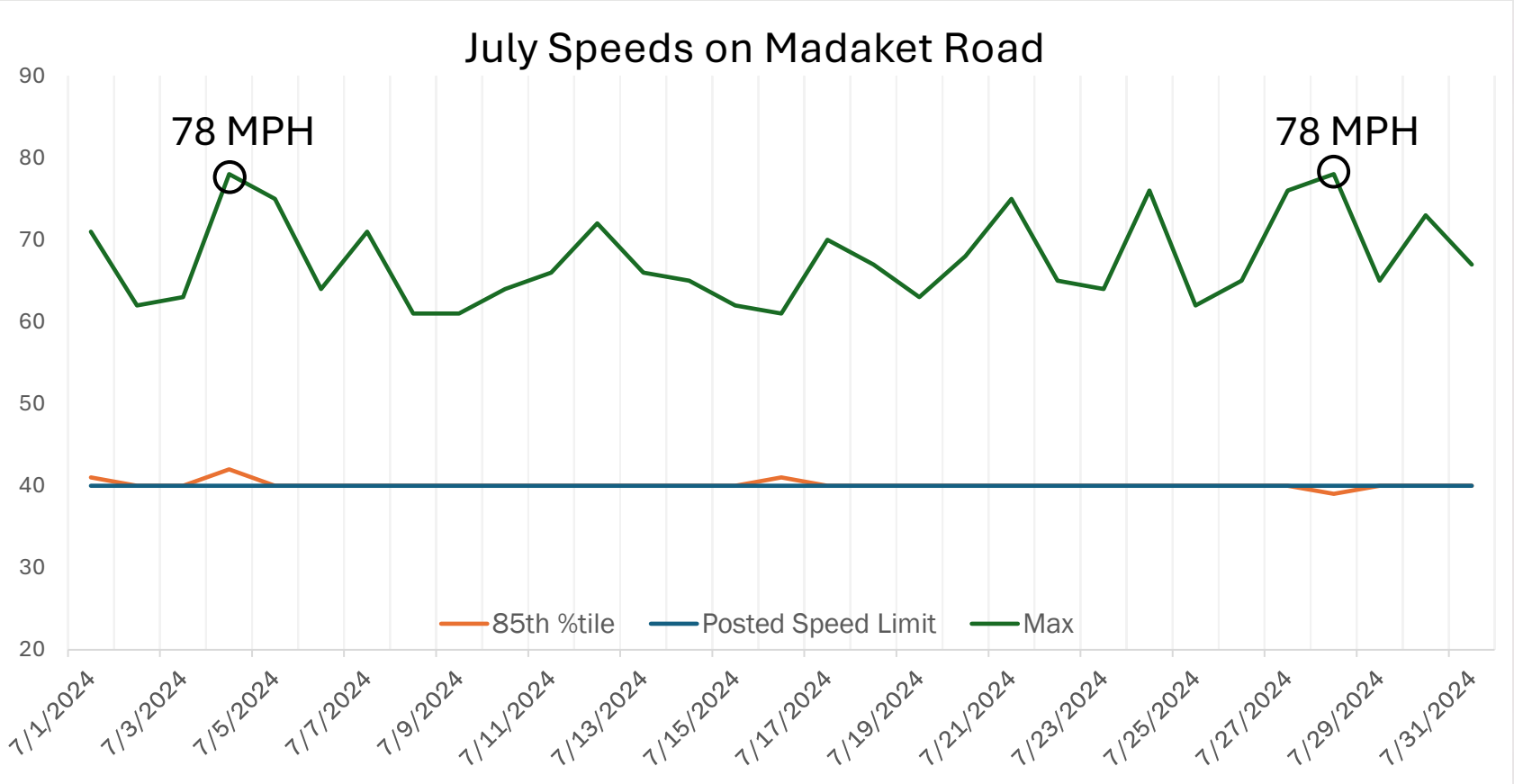
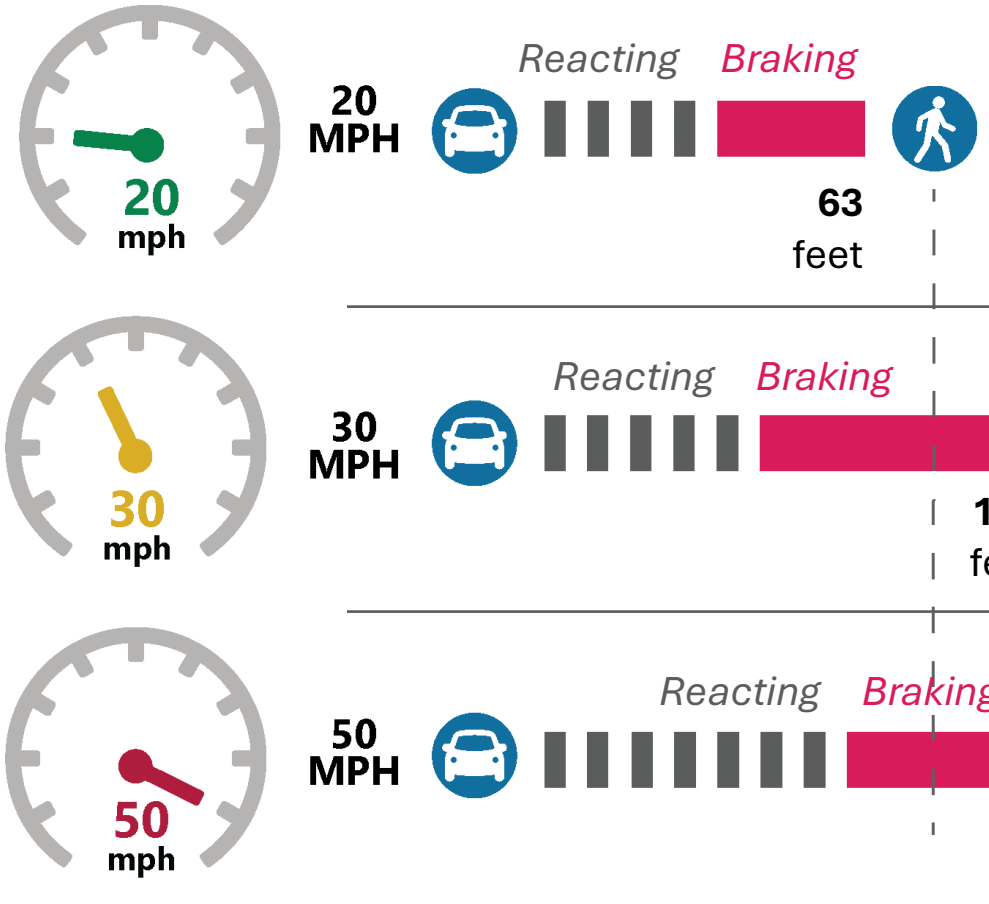
Common Crash Factor: Speed

- 85% percentile speeds align with speed limits
- Excess speeding is rare, but extremely dangerous
- Seasonal speed data monitoring
  - Impact of peak season congestion on speeds compared to off-season



Speeding Contributes to Traffic Deaths, Injuries, and Property & Vehicle Damage



10% chance of pedestrian fatality or severe injury

LOW-SPEED VEHICLE COLLISIONS:

- **Minor vehicle damage** such as scratches, dents.
- **Minor whiplash, bruises or small cuts.** Could be more serious if one vehicle was at a complete stop

50% chance of pedestrian fatality or severe injury

MID-SPEED VEHICLE COLLISIONS:

- **Moderate vehicle damage** or frame damage
- **Moderate whiplash, concussions or fractured bones**

90% chance of pedestrian fatality or severe injury

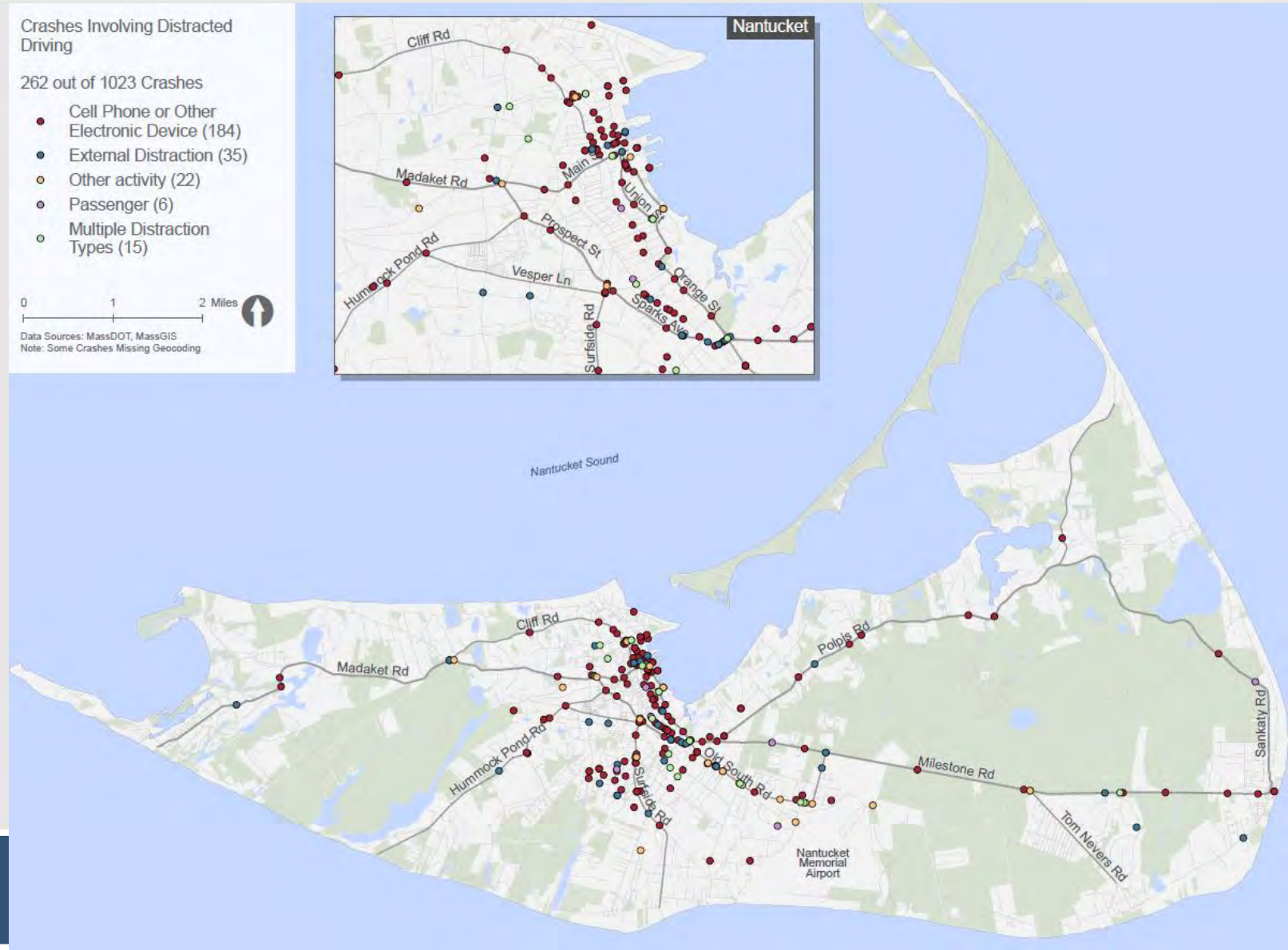
HIGH-SPEED VEHICLE COLLISIONS:

- **Extensive vehicle damage** with structural damage, crumpled frame, often totaled vehicle
- **Serious or fatal injuries**, severe whiplash, traumatic brain injuries, multiple fractures. Internal and life-threatening.

Motorcyclists are **24 times more likely** to die in a crash than passengers in a car *(National Highway Traffic Safety Administration)*

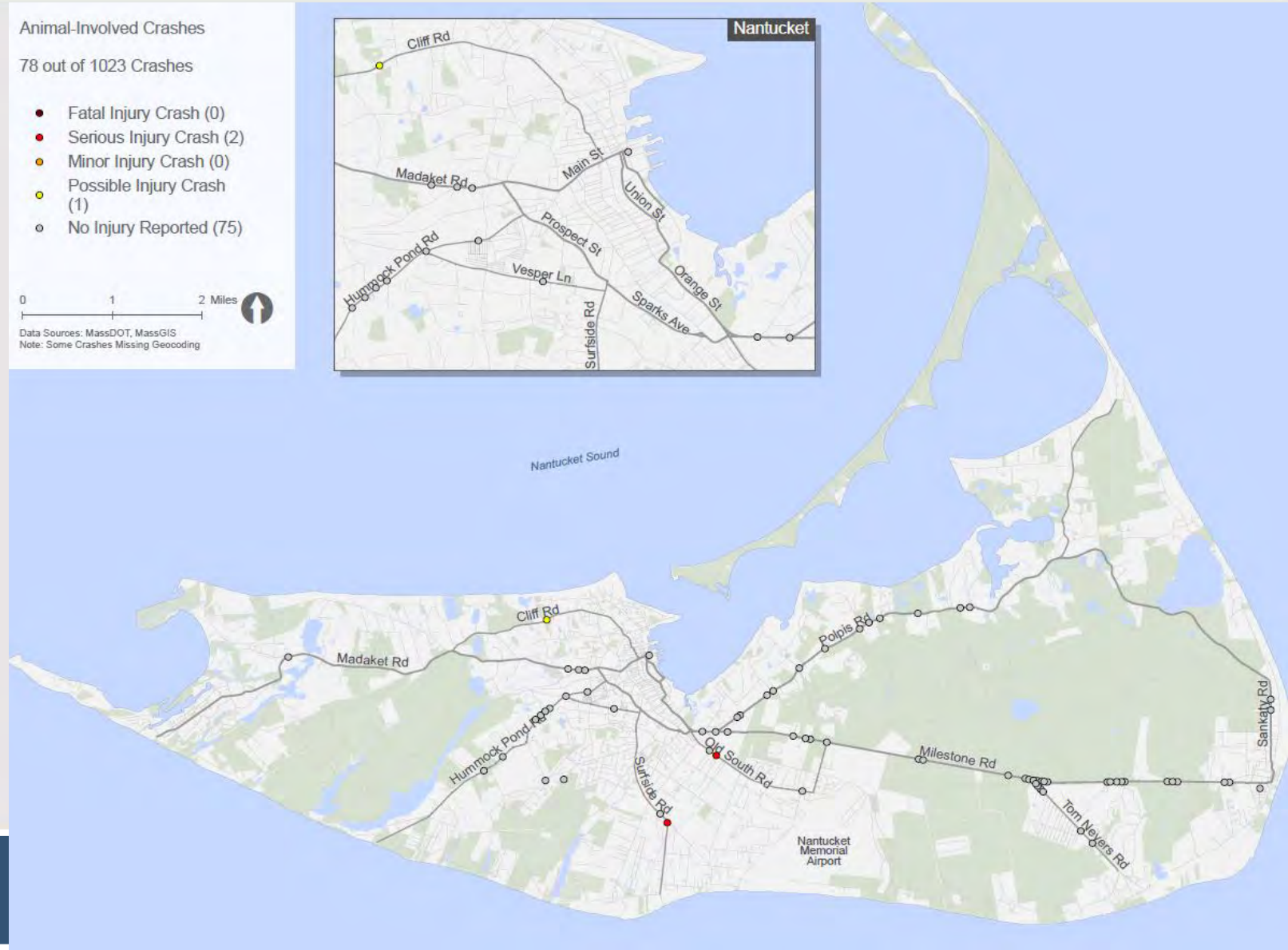
Common Crash Factor: Distracted Driving

- 26% of crashes involve distraction
  - 70% of these crashes involve cell phone use
  - More documented instances than Martha's Vineyard
- 6 fatal and serious injury (FSI) crashes, 39 led to some injury
- Distraction-related FSI crashes concentrated on Madaket, Orange, Monohansett, Sparks



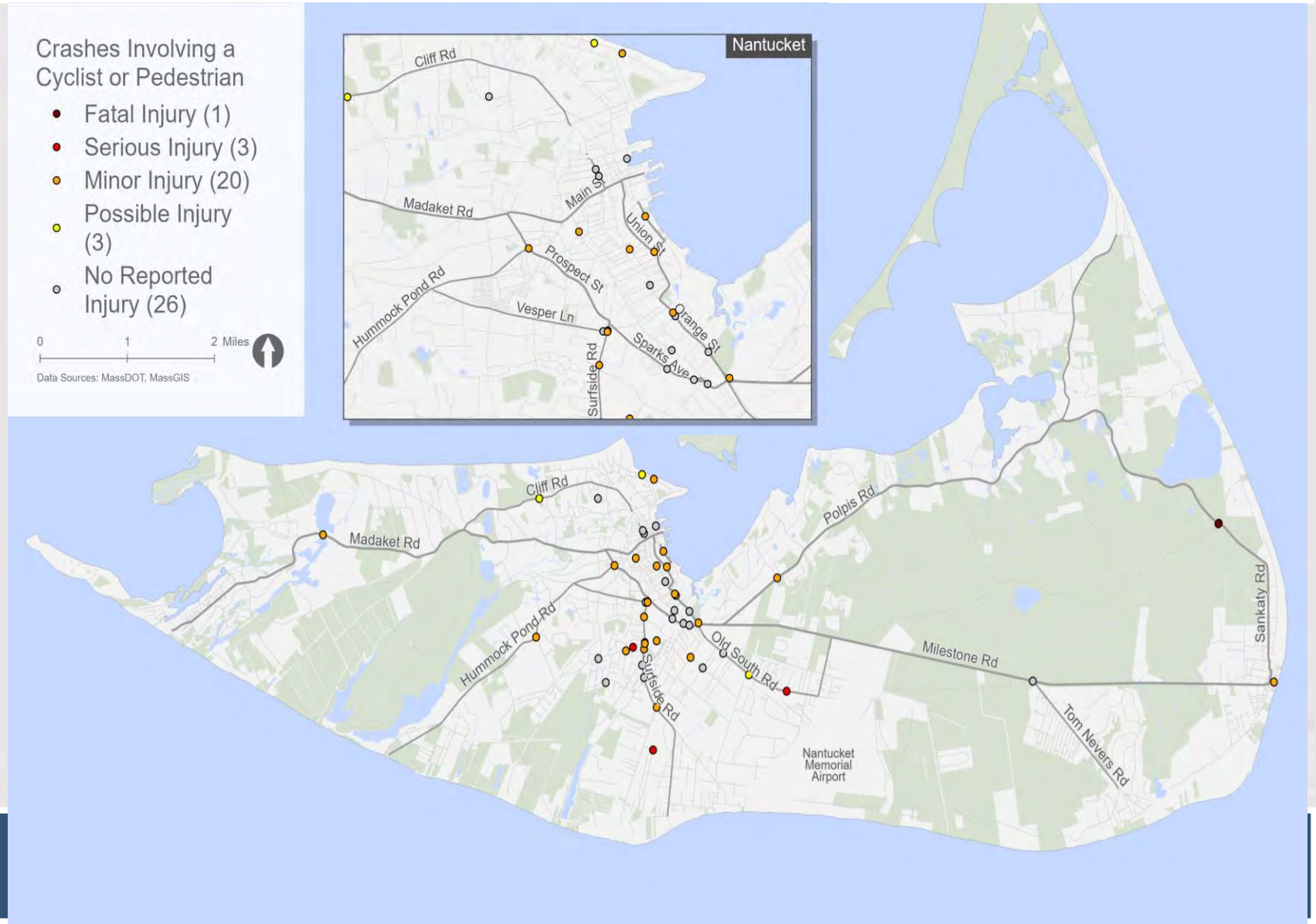
Common Crash Factor: Animals Strikes (Deer)

- 8% of crashes involved animals
  - Almost all of these crashes are with deer
  - Similar volume and pattern to Martha's Vineyard
- 3 led to injuries, all others property damage only
- Concentrated on Milestone, Tom Nevers, Polpis, and Hummock Pond



Crashes Involving Cyclists or Pedestrians

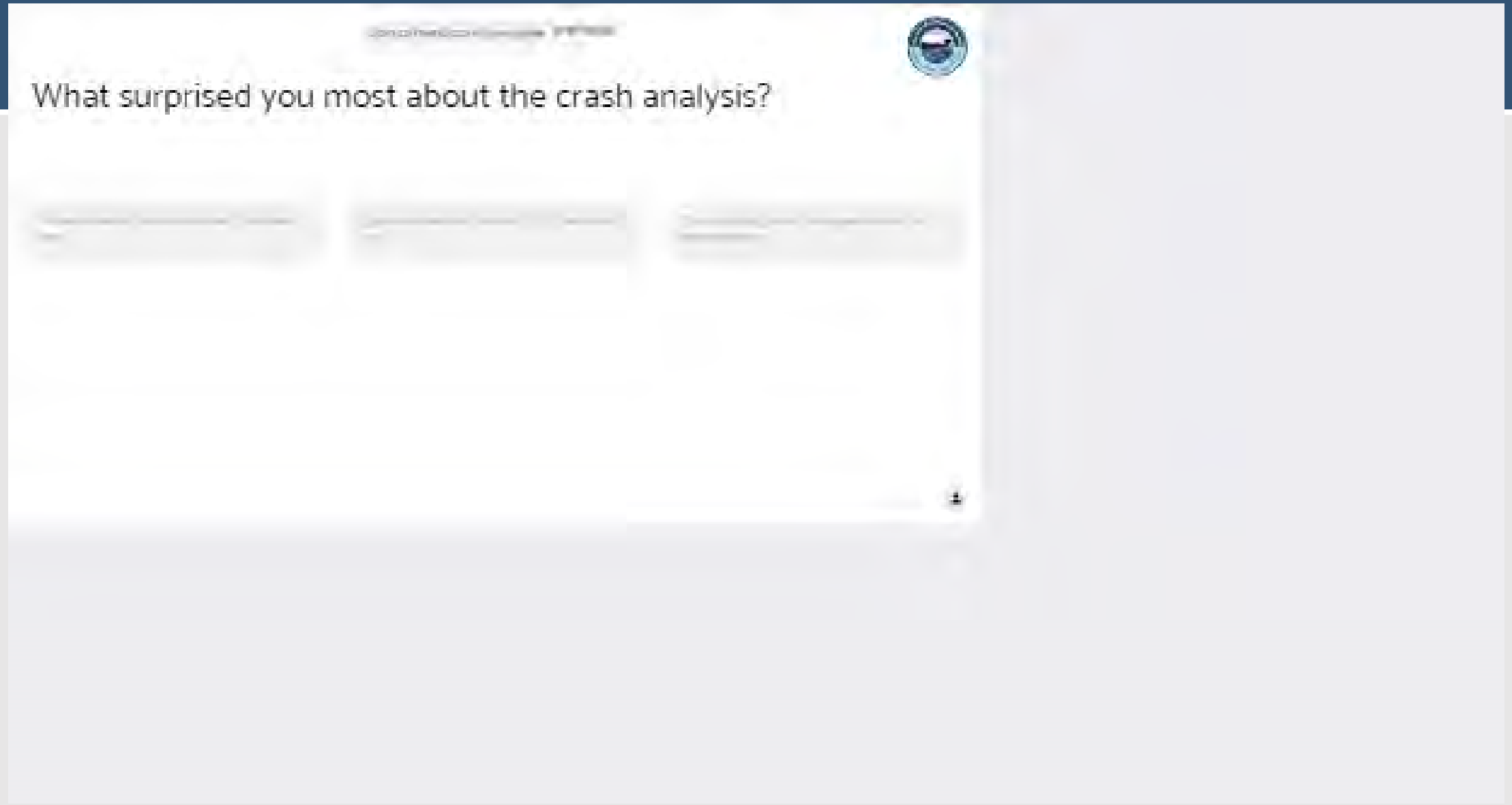
- 5% of total crashes involved a pedestrian or cyclist
  - 21% of reported injurious crashes involved a vulnerable roadway user
- 3 fatal and serious injury crashes, and 27 total injurious crashes
- Spread across the island, most common mid-island



Stop Signs on Shared-Use Paths

MassDOT has a standard and Nantucket has a by-law for application of stop signs on side paths and for how driver must yield to non-motorized users

However, application of the standard is non-consistent


What surprised you most about the crash analysis?

Poll: Stops Signs on Bike Path

What We Heard from the Community

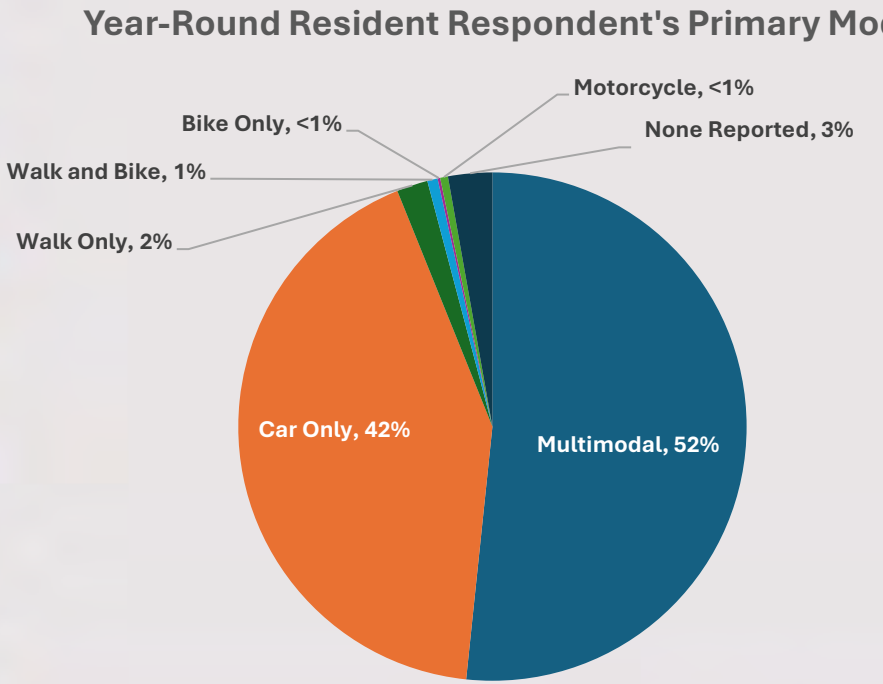
Nantucket Planning & Economic Development Commission
Nantucket Transportation Planning Organization

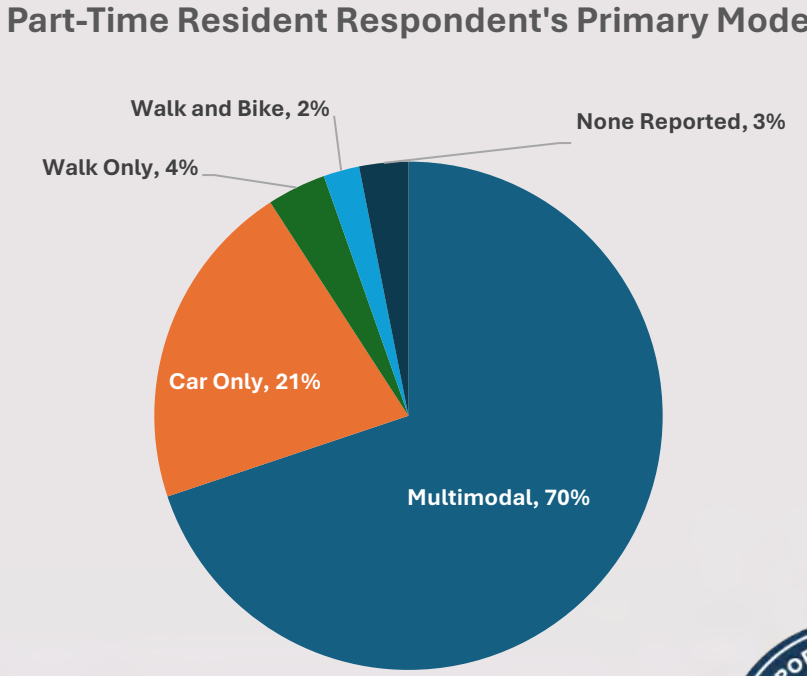
Engagement Summary

- Staff stakeholder tours Summer 2024
- Online survey and map open Fall 2024
- Over 1,100 responses to online survey
- Over 2,200 dots added to online maps

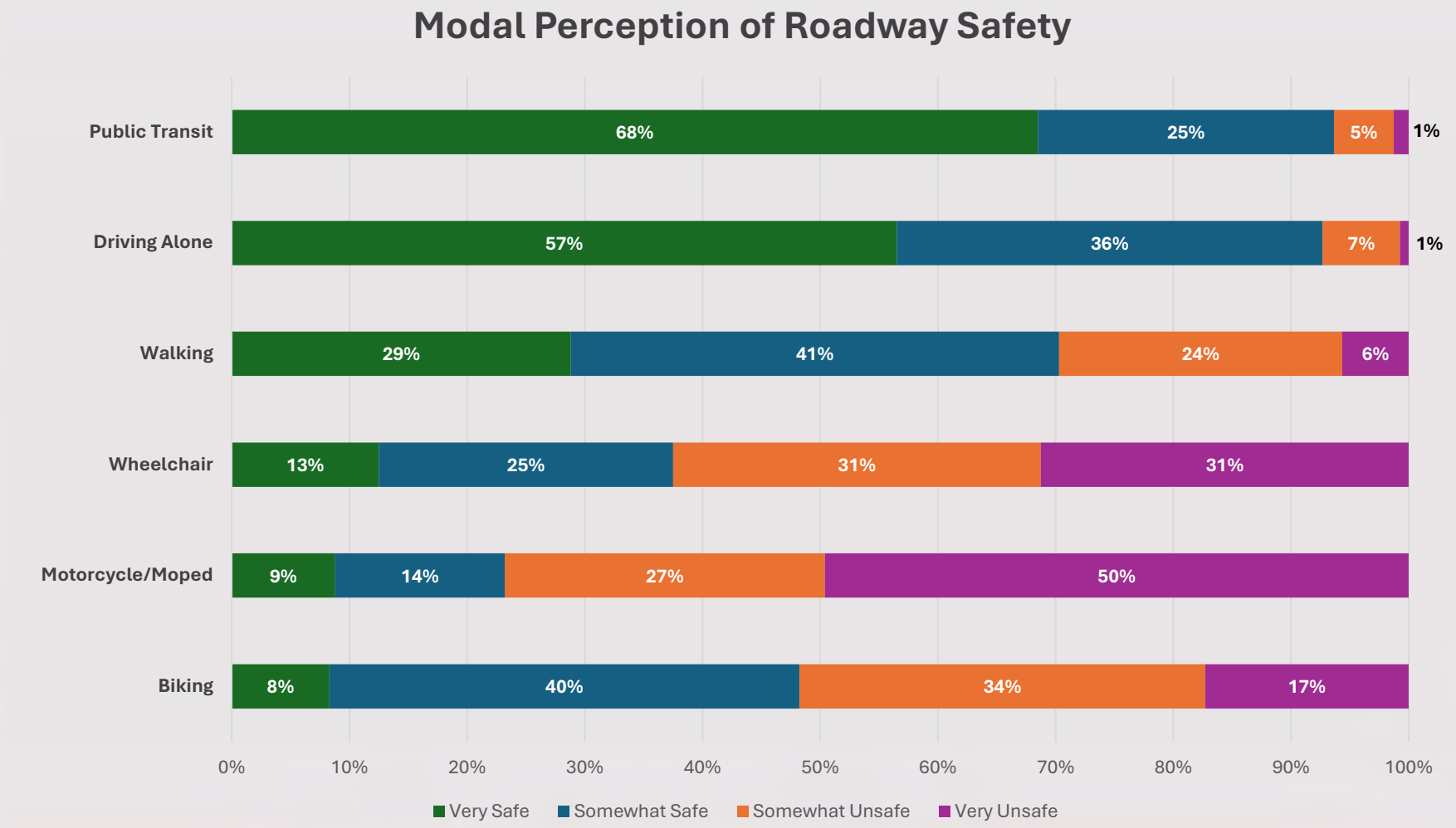
Primary Mode of Respondents

- Over 1,100 responses
  - 53% year-round residents, 42% part-time residents, 5% visitors

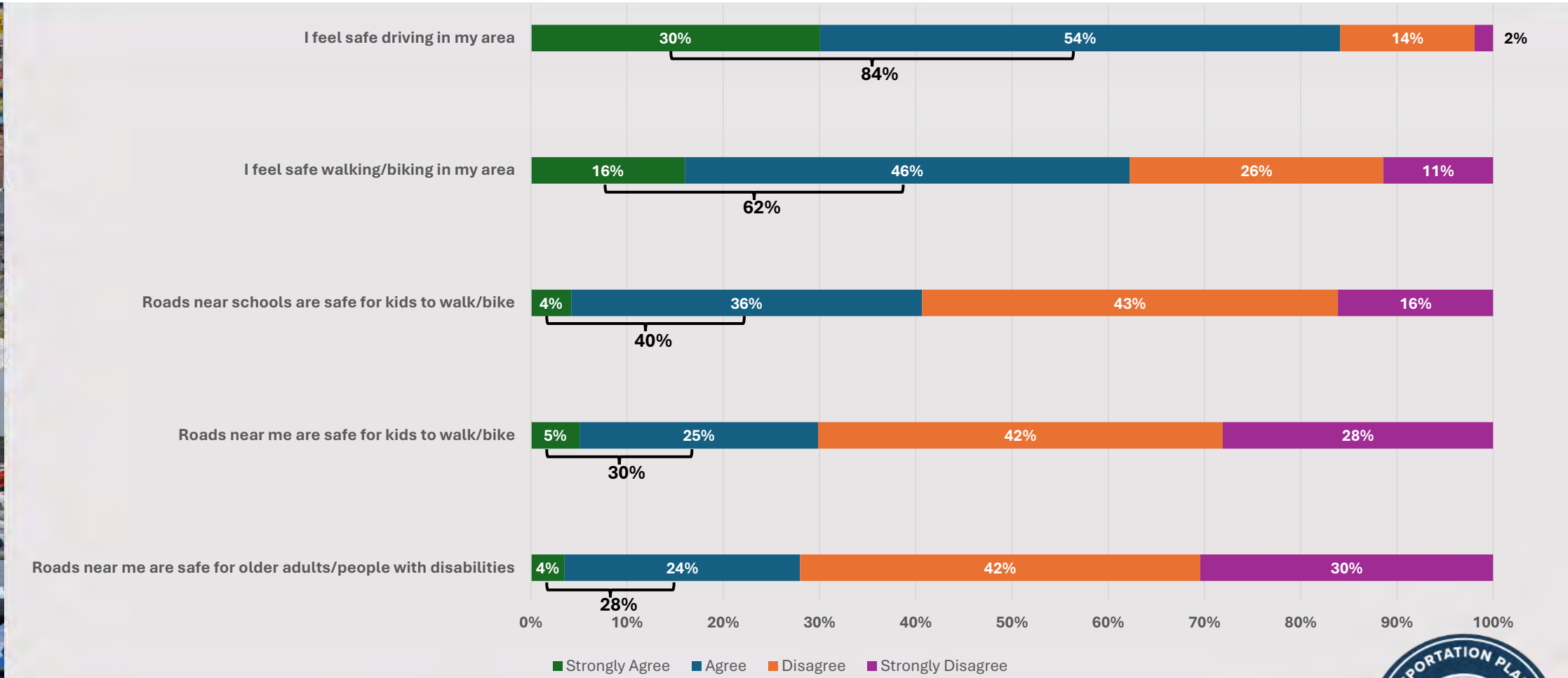




How Respondents Perceive Safety by Mode



Respondents Expressed Relative Road Safety Concerns for Kids, Older Adults, and People with Disabilities



Average Ranking of Roadway Safety Priorities

Poor Operator Behavior — 2.3
1 = Higher Priority — 6 = Lower Priority

Aggressive Operator Behavior — 2.5
1 — 6

Poor Roadway Quality — 3.9
1 — 6

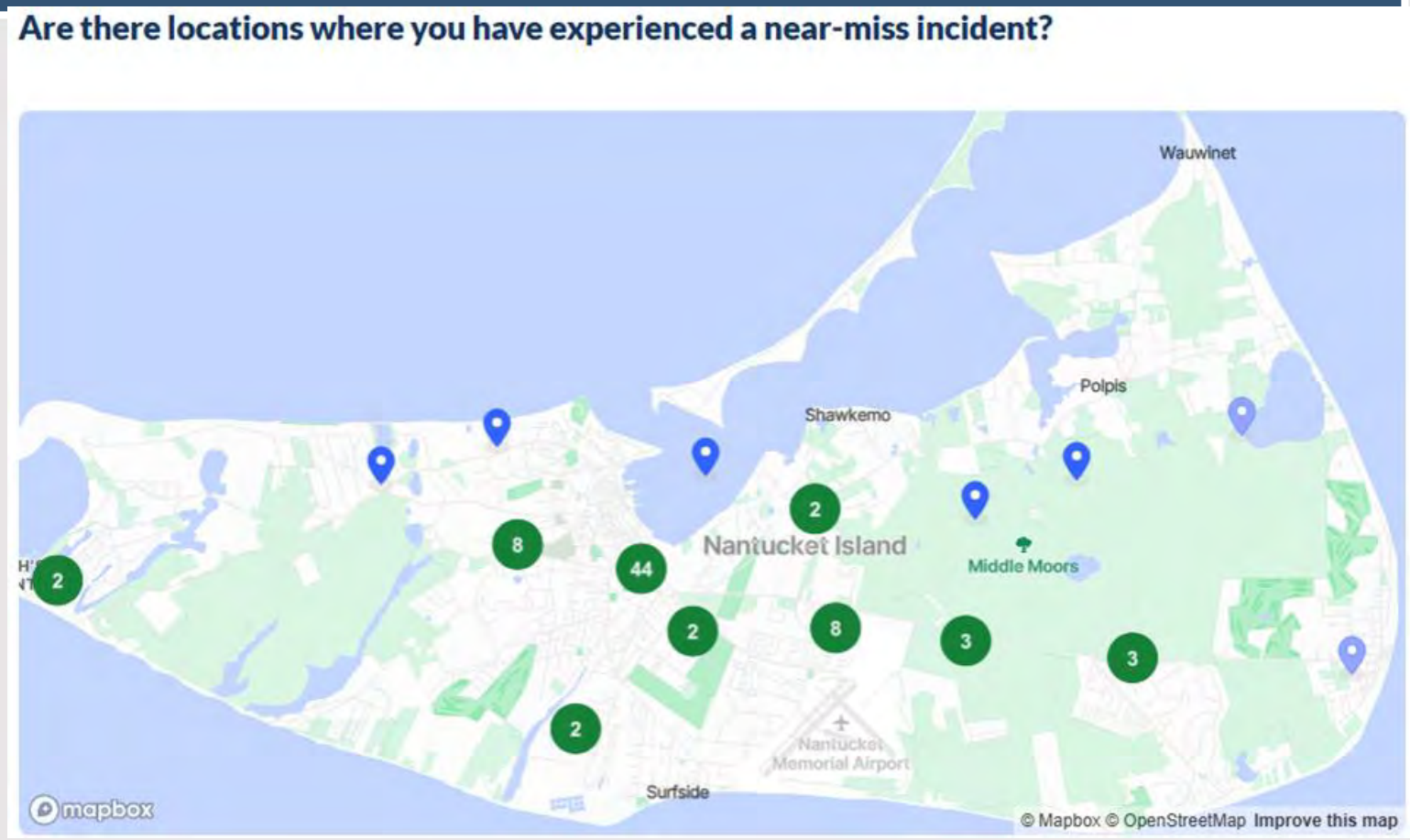
Safety for People Walking — 4.0
1 — 6

Poor Roadway Visibility — 4.1
1 — 6

Safety for People Biking — 4.2
1 — 6

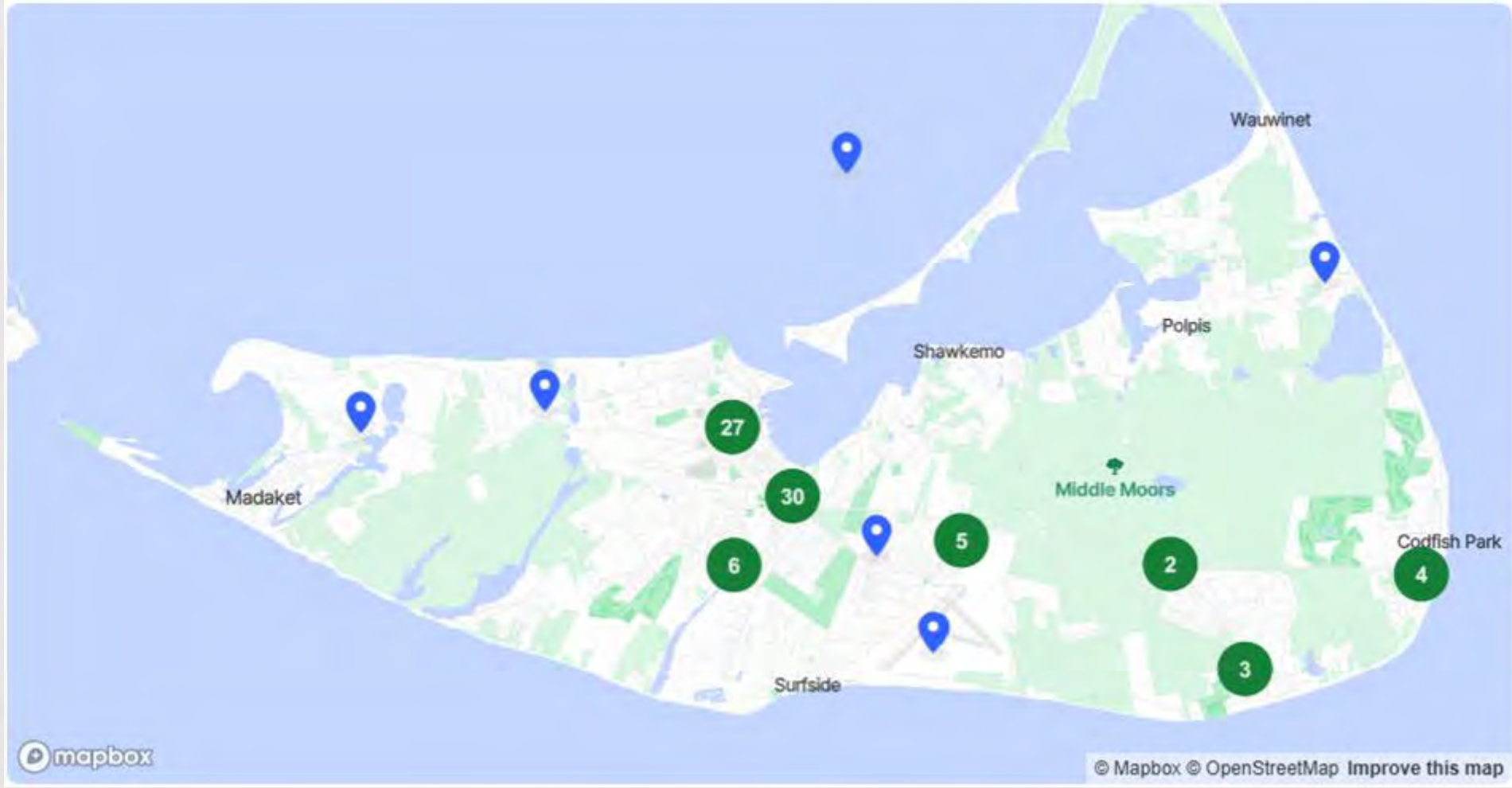
Online Engagement Map

- 2,200 location inputs
- Over 50% of comments related to near-miss events fall within 1/10 mile of a high crash corridor or intersection



Are there locations where you would want to see safety improved through infrastructure/redesign?

Are there any locations in Nantucket where you have challenges with safety due to roadway layout and conditions? (give a comment why with your point)



Proven Safety Countermeasures

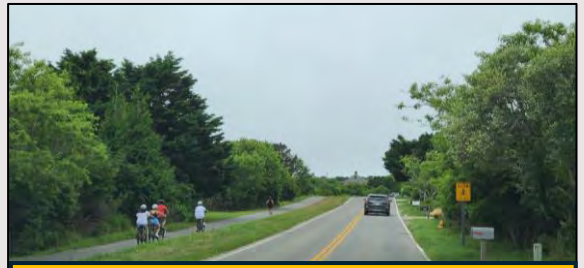
Nantucket Planning & Economic Development Commission
Nantucket Transportation Planning Organization

Crash Types and Factors

- On Village Roads
  - Side-Swipe Crashes
  - Darkness/Unlighted Conditions
- On Town Access/Connector Roads
  - Rear-End and Head-On Crashes
  - Distracted Driving
- On Rural Roads
  - Single-Vehicle and Head-On Crashes
  - Speeding

Broad Street

Pleasant Street



Madaket Road

Safety Countermeasures

This is not an exhaustive list of safety countermeasures that could be recommended but these could have application in project development given trends found in analysis:

- Roundabouts
- Intersection Realignments
- Access Management
- Dedicated Turn Lanes
- Longitudinal Rumble Strips
- Wider Edge Lines
- Transverse Rumble Strips
- Side Paths – Curb/Vertical Separation
- Shared-Use Paths – Buffer
- Median Barriers
- Reduce Speed Limit
- Speed Feedback Signs

Roundabouts

Benefits:

- Significant reductions in fatal and serious injury crashes
- Reduce vehicle speeds
- Decrease vehicle delay
- Improve crossings for cyclists and pedestrians
- Effective transitions from high speed to lower speed locations
- Less maintenance and lower operational costs than signals

Source: FHWA

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Intersection Realignment

Benefits:

- Improved sight lines
- Reduced crossing distances for pedestrians and cyclists
- More uniform traffic flow, making intersection turning movements more predictable
- Reduced turning speeds, which lowers collision speeds in the event of a crash

Source: NearMap

Access Management/Closing Curb Cuts

Benefits:

- Reduce trip delay and congestion caused by turning vehicles
- Safer for walking and biking
- More predictable turning movements at intersections
- Example: Old South Road
  - Medians, Center Turn Lane
- Example: Surfside and Vesper
  - Reduce number of curb cuts

Dedicated Turn Lanes

Benefits:

- Physical separation for traffic slowing or stopping to turn
  - Reduce rear-end crashes
- Additional queuing space for turning vehicles
  - Turning movements more predictable
- Most helpful at two-way stop-controlled intersections
- Consideration: Longer crossing distances for vulnerable road users

Source: Ron Müller & Associates

Longitudinal Rumble Strips/Centerline Hardening

Benefits:

- Reduces lane departure and single vehicle run-off-road crashes
- Enhanced awareness of the travel lane through noise and vibration
- Low implementation cost
- Potential to increase nighttime visibility through combined application of rumble strips and pavement markings (e.g., rumble stripes)

Centerline Rumble Strips in Rural Connecticut
(Source: CTDOT)

Edgeline Rumble Strips in Rural Iowa
(Source: Iowa DOT)

Wider Edge Lines

Benefits:

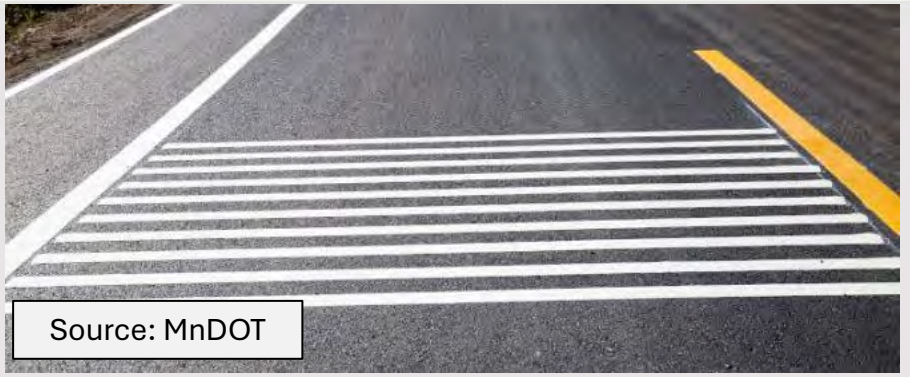
- Increase edge line width to 6 inches
- Enhanced delineation of the edge of the road, reducing run-off-road and single vehicle crashes
- Relatively inexpensive to implement
- Provides stronger guidance for autonomous vehicles


Source: FHWA

Slow Speed Rumbles – Transverse Rumbles

Benefits:

- Alerts drivers to changing conditions ahead
- Particularly useful on higher speed roads
- Alerts drivers to trail crossings, speed limit reductions, or approaching intersections/curves
- Potential Application: Bartlett and Raceway Intersection


Source: MnDOT


Source: MnDOT

Side Paths

Benefits:

- Dedicated, high-comfort facility for bikes and pedestrians of all ages and abilities
- Separates modes to reduced roadway conflict
- Recreation, health, and economic benefits

Shared-Use Path

Benefits:

- Dedicated, high-comfort facility for bikes and pedestrians of all ages and abilities
- Vertical separation to delineate path
- Separates modes to reduced roadway conflict
- Recreation, health, and economic benefits

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Median Barriers

Benefits:

- Reduction in crashes involving vehicles crossing the centerline
- Appropriate in locations with limited access needs
- Systemic application based on volume, median crossover history, roadway alignment, and terrain

Source: NearMap

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Reduce Speed Limit

Benefits:

- Speed reduction is one of the most important ways to reduce fatal and serious injury crashes
- Lower speeds make the roads safer for all roadway users, particularly vulnerable road users
- Low-cost intervention
  - More involved when combined with changes in engineering, education, and enforcement

Source: Siasconset Civic Association

Speed Feedback Signs

Benefits:

- Helps with speed management, particularly in locations where drivers need to slow down
  - Schools, work zones, curves in the road
- Increases driver awareness about their traveling speed versus the posted speed limit
- If crashes do occur, reduced speeds reduce the severity of crashes

Source: Town of Nantucket

Safety – Policy and Program Countermeasures

- Policy and Programs
  - Traffic calming speed hump program
  - Low Speed Vehicles (25MPH)
  - E-bike sticker bylaw
  - Require helmets for all E-bike users
  - Signage on shared-use paths

Traffic Calming Speed Hump Program

Benefits:

- Reduces excessive speeds which improves comfort of all roadway users
- Evaluated by TSWG based on characteristics and conditions of roadway
- Neighborhood support and community funding may be barrier to implementation

Newtown Road, Source: Town of Nantucket

Low Speed Vehicle Fleet

- Number Registered:
  - Statewide: 297
  - Locally: 22
- PLUS purchasing one vehicle
- Maximum Speed: 25MPH
- Legal on roads 30MPH or less

Benefits:

- Lower speeds and compact size can be safer and easier to maneuver and park, particularly on narrow roadways
- Environmentally friendly and quieter than traditional vehicles
- Convenient and cost-effective for short trips

E-Bike Sticker Requirement Bylaw

Class 1 & 2 – Legal on paths

Class 3 – Illegal on Paths

No e-bikes on recreation trails

Benefits:

- Spread awareness about Massachusetts e-bike classification system
- Display class, electric motor capacity, and maximum speed of the bike
  - Class 1 and 2 permitted on side paths
  - Class 3 prohibited from side path and must ride in the street
- Locally-inspired design and commitment to cycling safety

Brain Bucket Stickers

Benefits:

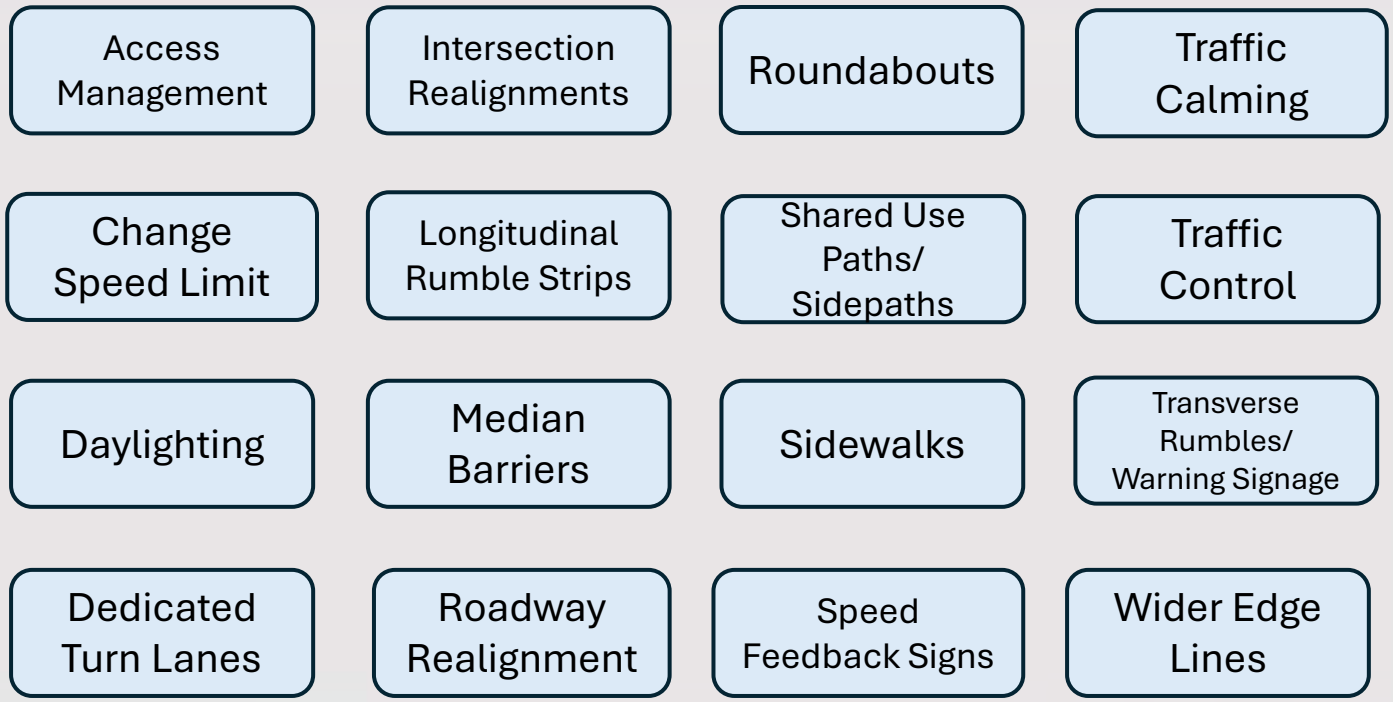
- Spread awareness about safe cycling practices and encourage helmet usage
- Foster a year-round culture of cycling safety
  - Locally-inspired design that aligns in color with the beach permits

Locations of Concern and Prior Recommendations

Nantucket Planning & Economic Development Commission
Nantucket Transportation Planning Organization

Introduction

- Review prior locations of concern (Note: these are not all areas of concern coming from this study)
- Understand crash types at those locations
- Learn about what tools have proven crash reduction results
- Review prior concepts
- Poll your feedback



Four Corners

- 120 comments on online map
- 30 people suggested a roundabout
- 12 near miss crashes reported

“This is the single worst intersection on island but should be the safest.”
– Year-Round Resident

Four Corners: Crash Types, Trends, Tools

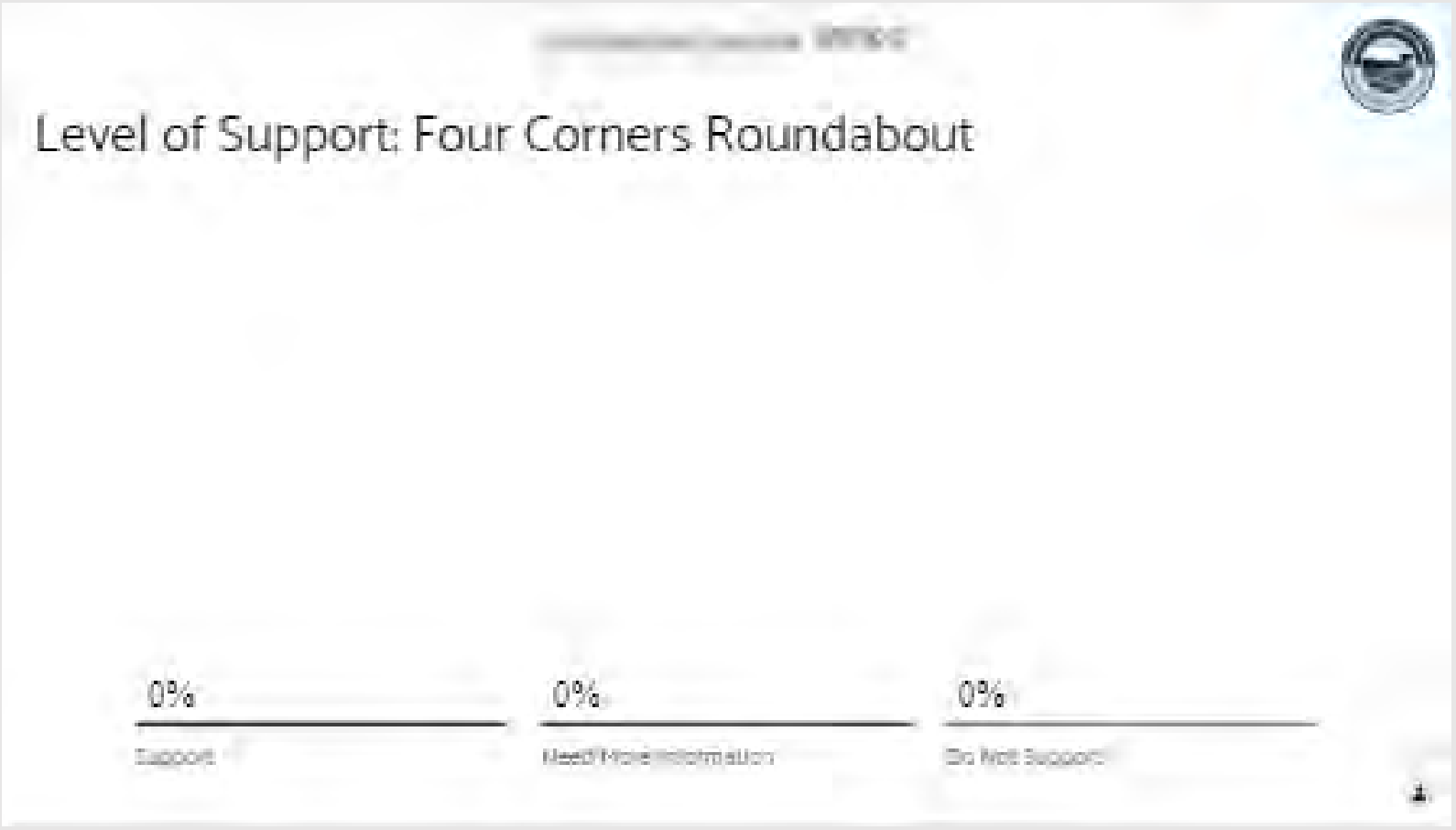
Crash Type	% of Crashes
Failure to Yield/Improper Turn	18%
Rear-End Collision	18%
Single Vehicle Collision w/ Fixed Object Outside Roadway	18%
Collision with Pedestrians and Cyclists	14%

Access Management	**Intersection Realignments**	**Roundabouts**	Traffic Calming
Change Speed Limit	**Longitudinal Rumble Strips**	**Shared Use Paths/ Sidepaths**	Traffic Control
Daylighting	Median Barriers	**Sidewalks / Bikeways**	**Transverse Rumbles/ Warning Signage**
Dedicated Turn Lanes	**Roadway Realignment**	Speed Feedback Signs	**Wider Edge Lines**

Four Corners

Previously Recommended Countermeasure: **Intersection Realignment, Roundabout**

Four Corners Roundabout: POLLING



Surfside and Bartlett

- 32 comments online
- 8 people suggested a roundabout
- 5 near miss incidents

“This intersection is the reason I cut through Essex Rd frequently.”
– Seasonal/Part-Time Resident

Surfside and Bartlett: Crash Types, Trends, Tools

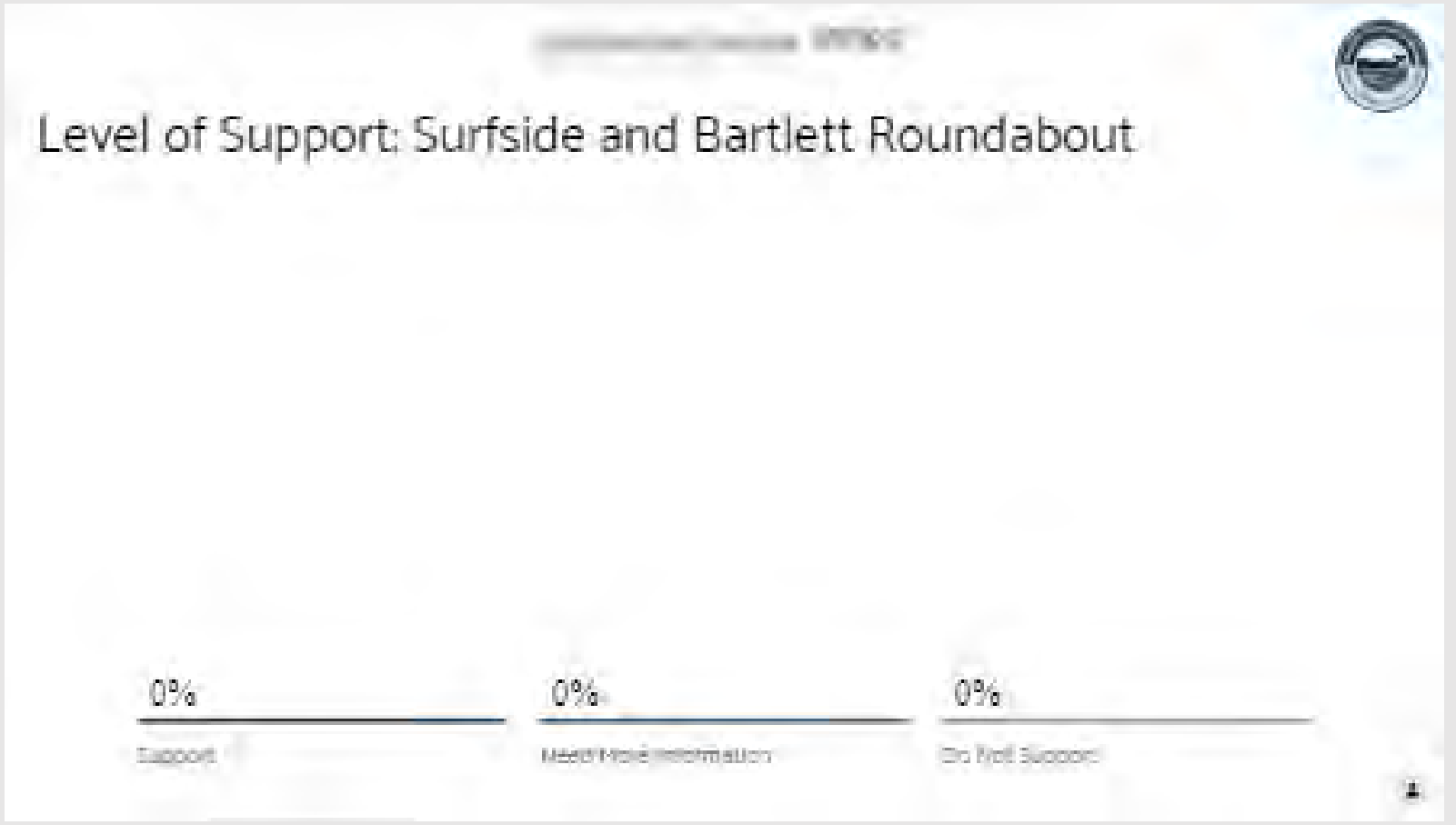
Crash Type	% of Crashes
Rear-End Collision	21%
Angle Collision	21%
Collision with Cyclist	14%
Failure to Yield/ Obey Traffic Signs	14%

Access Management	**Intersection Realignments**	**Roundabouts**	Traffic Calming
Change Speed Limit	Longitudinal Rumble Strips	**Shared Use Paths/ Sidepath Improvement**	**Traffic Control**
Daylighting	Median Barriers	Sidewalks	**Transverse Rumbles/ Warning Signage**
Dedicated Turn Lanes	**Roadway Realignment**	Speed Feedback Signs	Wider Edge Lines

Surfside and Bartlett

Previously Recommended Countermeasure: **Roundabout**

Surfside and Bartlett Roundabout: POLLING



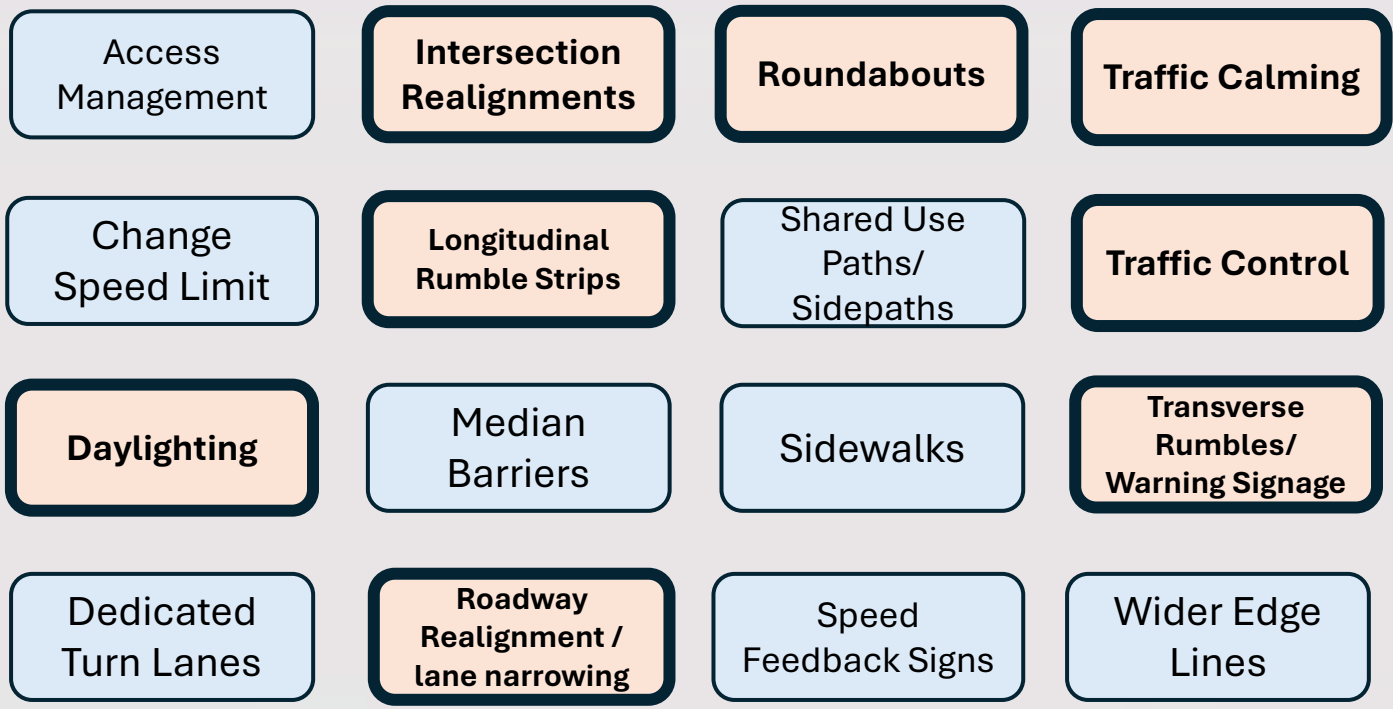
Surfside, Miacomet & Surfside

- 35 comments online
- 8 people suggested a four-way stop
- 12 near miss incidents

“This intersection is always really difficult to navigate.”
– Year-Round Resident

Surfside and Miacomet: Crash Types, Trends, and Tools

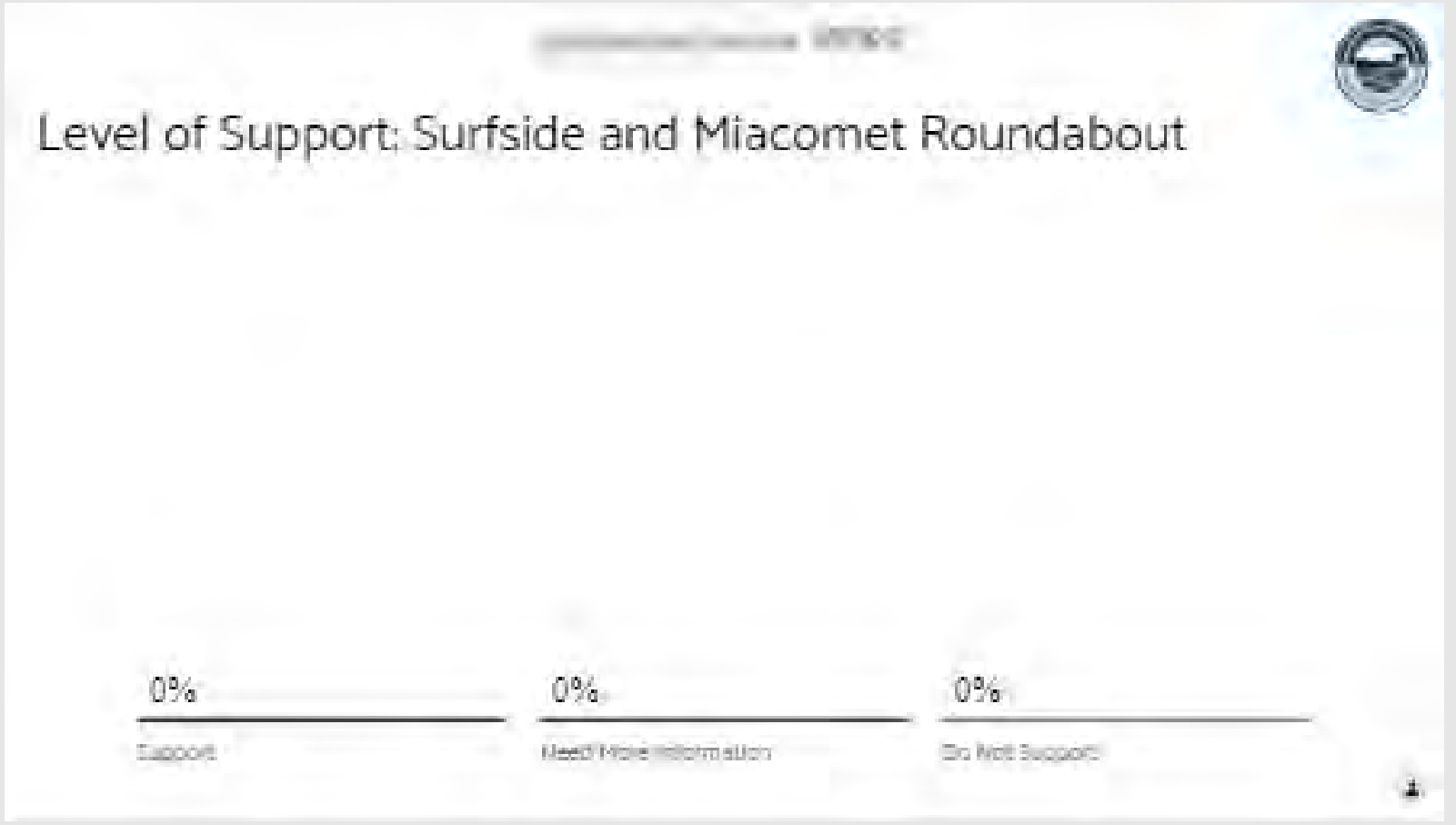
Crash Type	% of Crashes
Angle Collision	58%
Failure to Yield/Obey Traffic Signs	42%
Failure to Keep Lane/Head-On	17%
Speeding	8%



Surfside, Miacomet & Surfside

Previously Recommended Countermeasure: **Mini-Roundabout or Four-Way Stop**

Surfside, Miacomet & Surfside Roundabout: POLLING



Old South & Fairgrounds

- 52 comments online
- 18 people suggested a roundabout
- 6 near miss incidents

“Fairgrounds/OSR is notoriously bad for traffic from June to September.”
– Seasonal/Part-Time Resident

Old South & Fairgrounds: Crash Types, Trends, and Tools

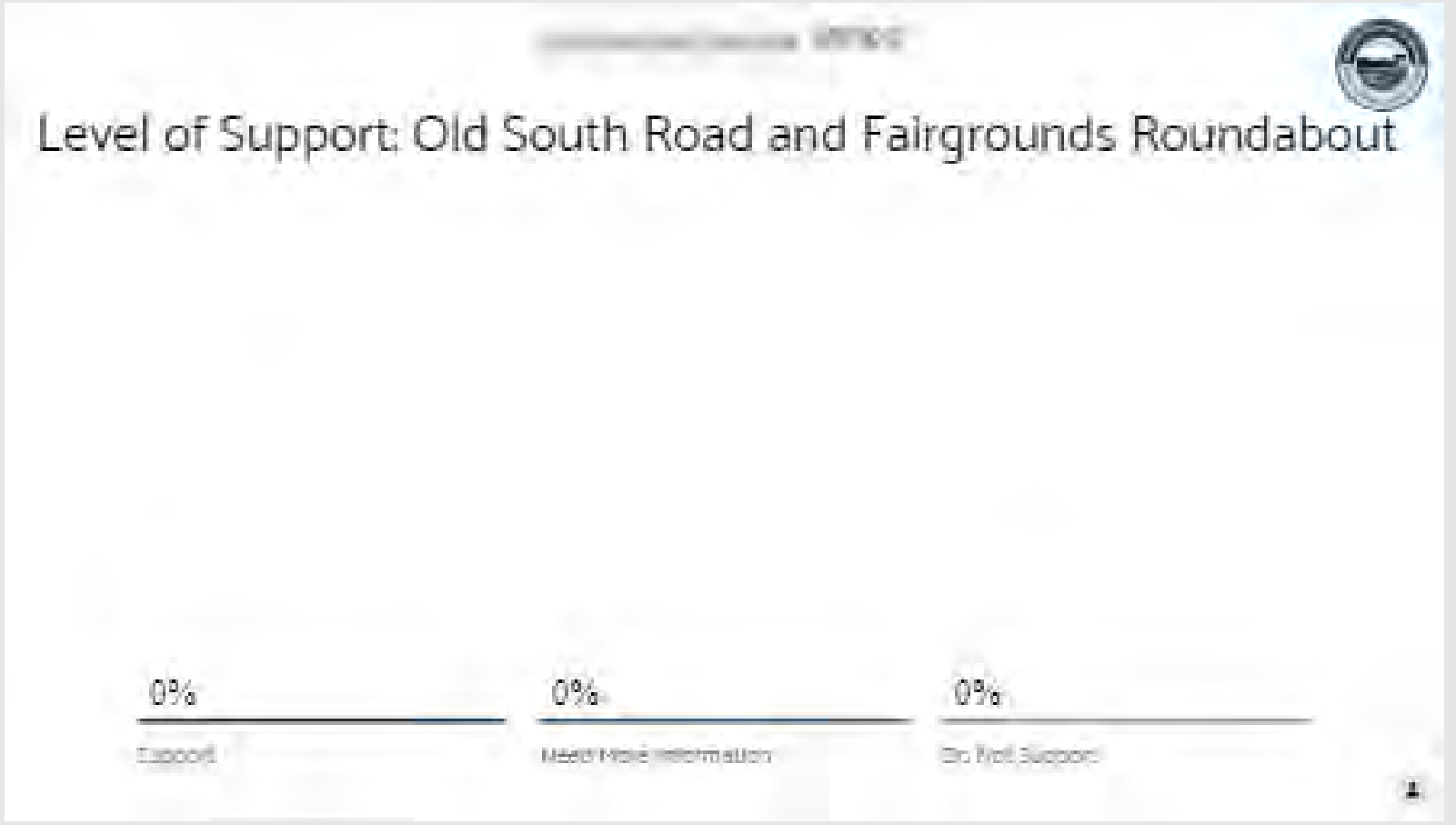
Crash Type	% of Crashes
Angle Collision	31%
Rear-End Collision	31%
Failure to Yield/ Obey Traffic Signs	23%
Lane Departure	15%

Access Management	**Intersection Realignments**	**Roundabouts**	Traffic Calming
Change Speed Limit	**Longitudinal Rumble Strips**	Shared Use Paths/ Sidepaths	**Traffic Control**
Daylighting	**Median Barriers**	Sidewalks	**Transverse Rumbles/ Warning Signage**
Dedicated Turn Lanes	Roadway Realignment	Speed Feedback Signs	**Wider Edge Lines**

Old South & Fairgrounds

Proven Safety Countermeasure:
Roundabout

Old South & Fairgrounds Roundabout: POLLING



Fairgrounds, Surfside, & South Shore

- 17 comments online
- 5 people suggested a four-way stop
- 3 near miss incidents

“At four way stop at end of Fairgrounds Road, many times people just don't stop, but roll right through” – Year-Round Resident

Fairgrounds, Surfside, and South Shore: Crash Types, Trends, and Tools

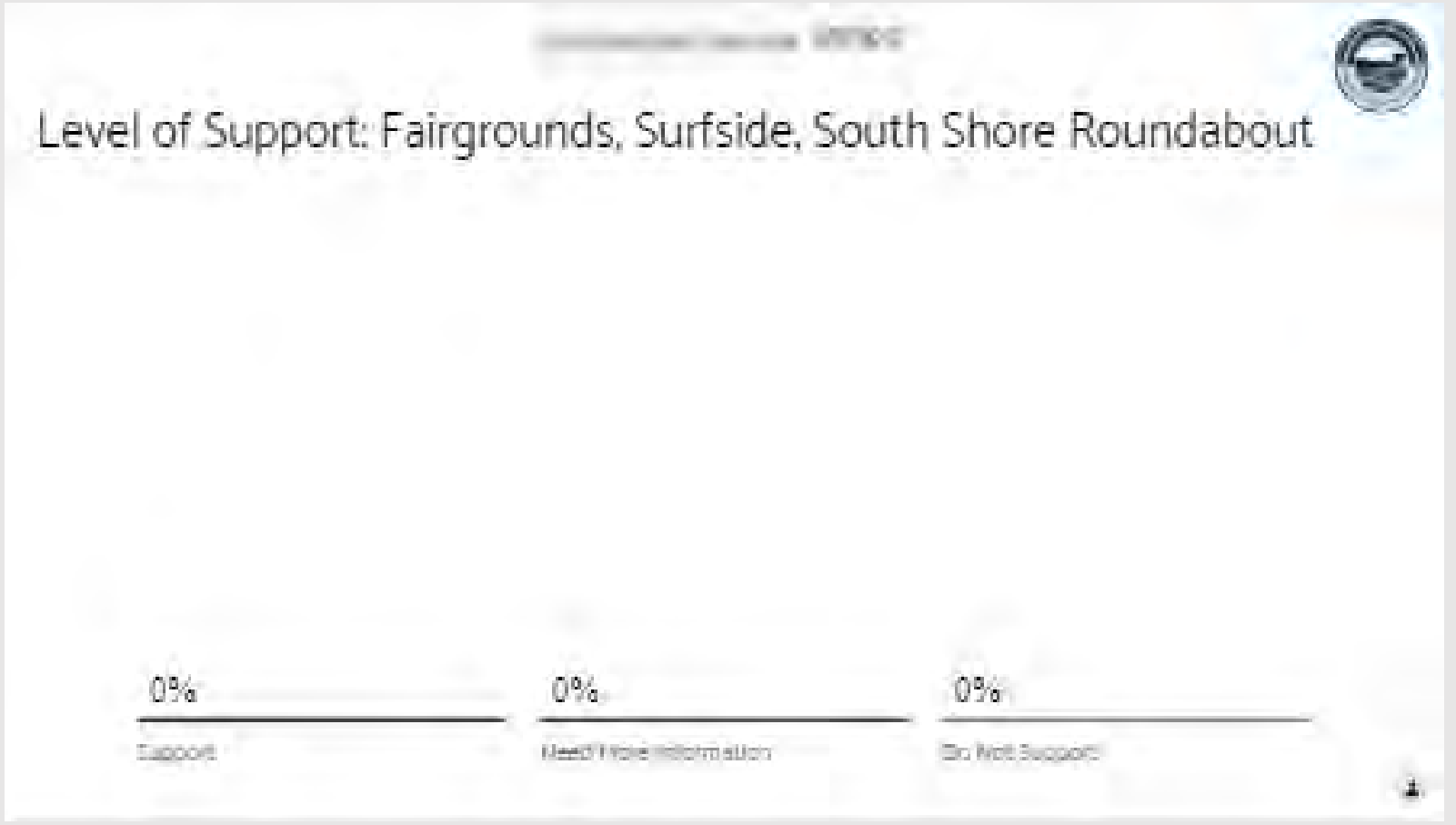
Crash Type	% of Crashes
Collision with Pedestrians and Cyclists	60%
Failure to Yield/ Obey Traffic Signs	60%
Angle Collision	20%
Rear-End Collision	20%

Access Management	**Intersection Realignments / Crossing Improvements**	**Roundabouts**	Traffic Calming
Change Speed Limit	Longitudinal Rumble Strips	Shared Use Paths/ Sidepaths	**Traffic Control**
Daylighting	Median Barriers	**Sidewalks / Bikeways**	**Transverse Rumbles/ Warning Signage**
Dedicated Turn Lanes	Roadway Realignment	Speed Feedback Signs	Wider Edge Lines

Fairgrounds, Surfside, & South Shore

Proven Safety Countermeasure:
Roundabout

Fairgrounds, Surfside, & South Shore Roundabout: POLLING



Old South Road

- 143 comments online
- Support for turning lanes, median, bike path, repaving, new connector to Milestone
- 28 near miss incidents

“Traffic back up is a daily event here, year-round. Cars are stopped from the rotary to Naushop.” – Year-Round Resident

Old South: Crash Types, Trends, and Tools

Crash Type	% of Crashes
Rear-End Collision	39%
Angle Collision	26%
Failure to Yield/ Obey Traffic Signs	16%
Collision with Deer	10%

Access Management	**Intersection Realignments**	**Roundabouts**	Traffic Calming
Change Speed Limit	Longitudinal Rumble Strips	Shared Use Paths/ Sidepaths	**Traffic Control**
Daylighting	Median Barriers	Sidewalks	**Transverse Rumbles/ Warning Signage**
Dedicated Turn Lanes	Roadway Realignment	Speed Feedback Signs	Wider Edge Lines

Old South Road

Proven Safety Countermeasure:
Bus Pulloffs,
Median,
Shared Use Path

Old South Road Corridor: POLLING

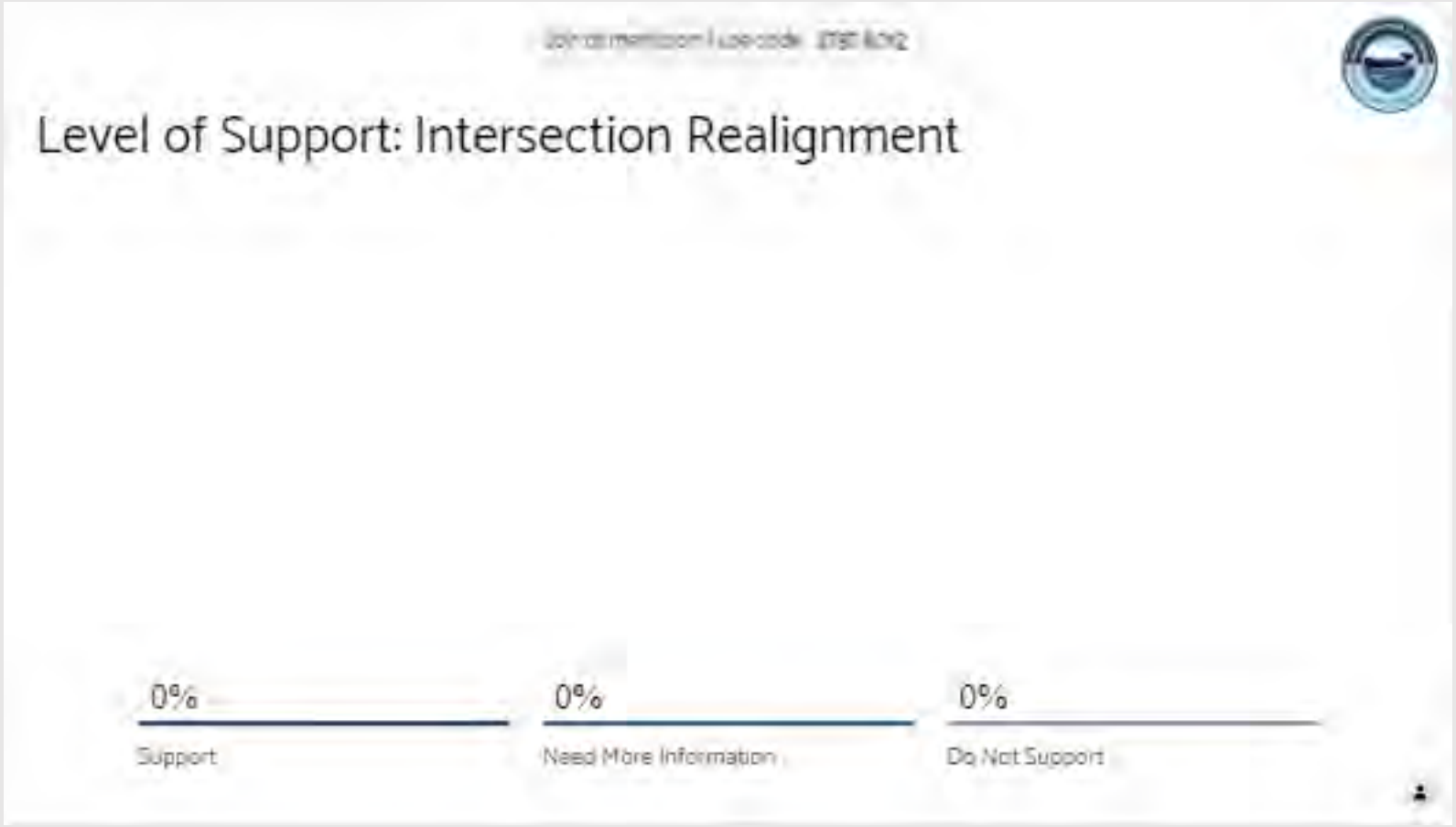
Polling: Countermeasures

Nantucket Planning & Economic Development Commission
Nantucket Transportation Planning Organization

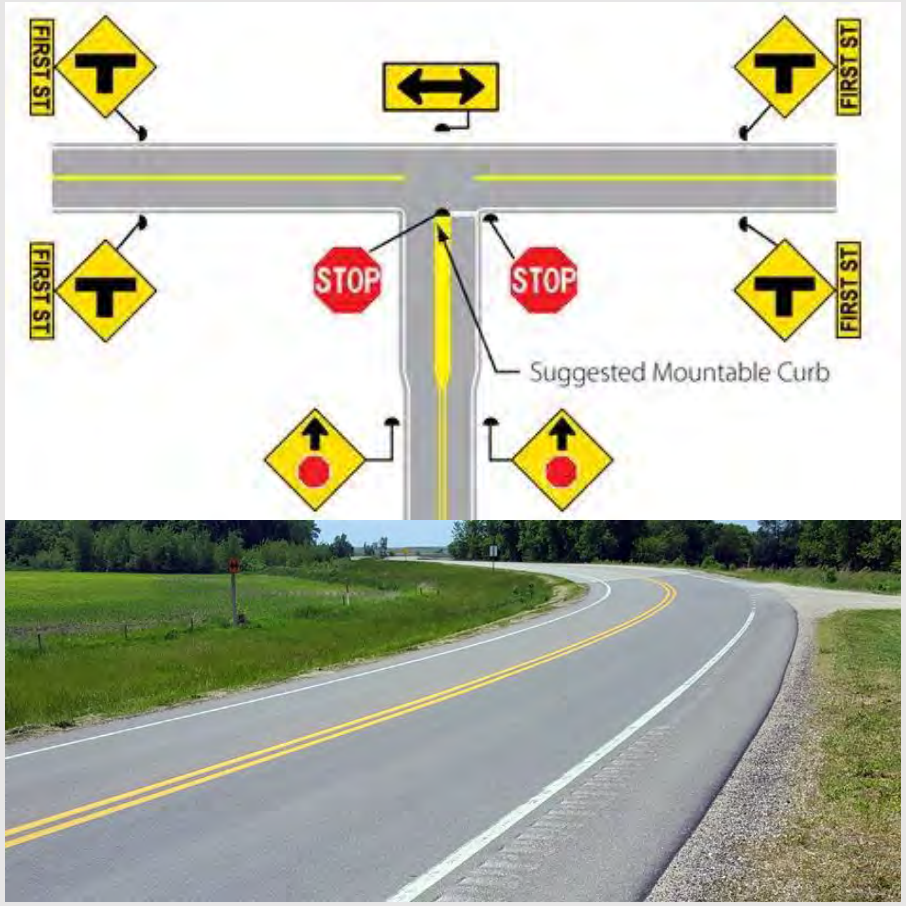
Roundabouts

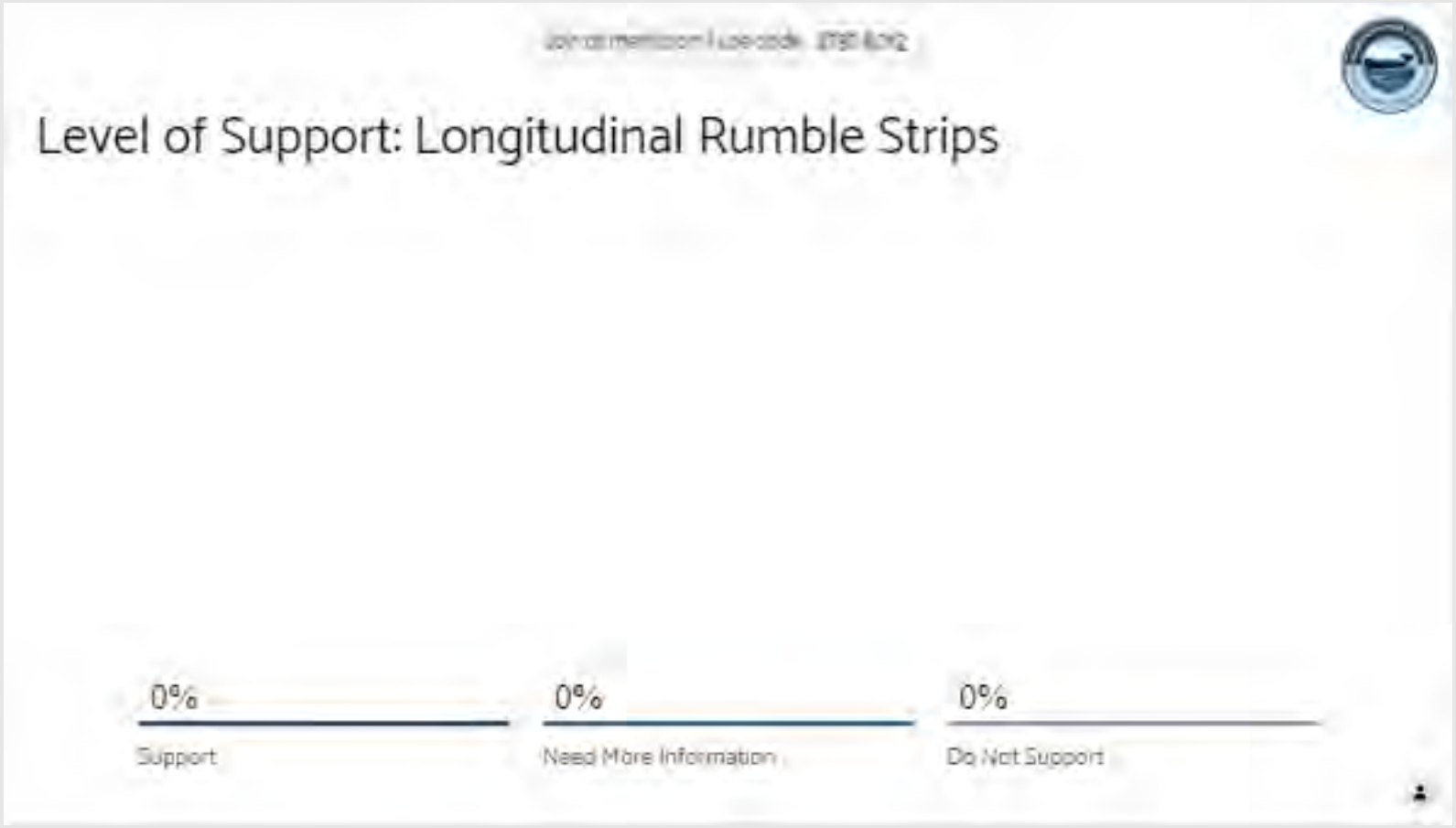
Source: FHWA

Intersection Realignment

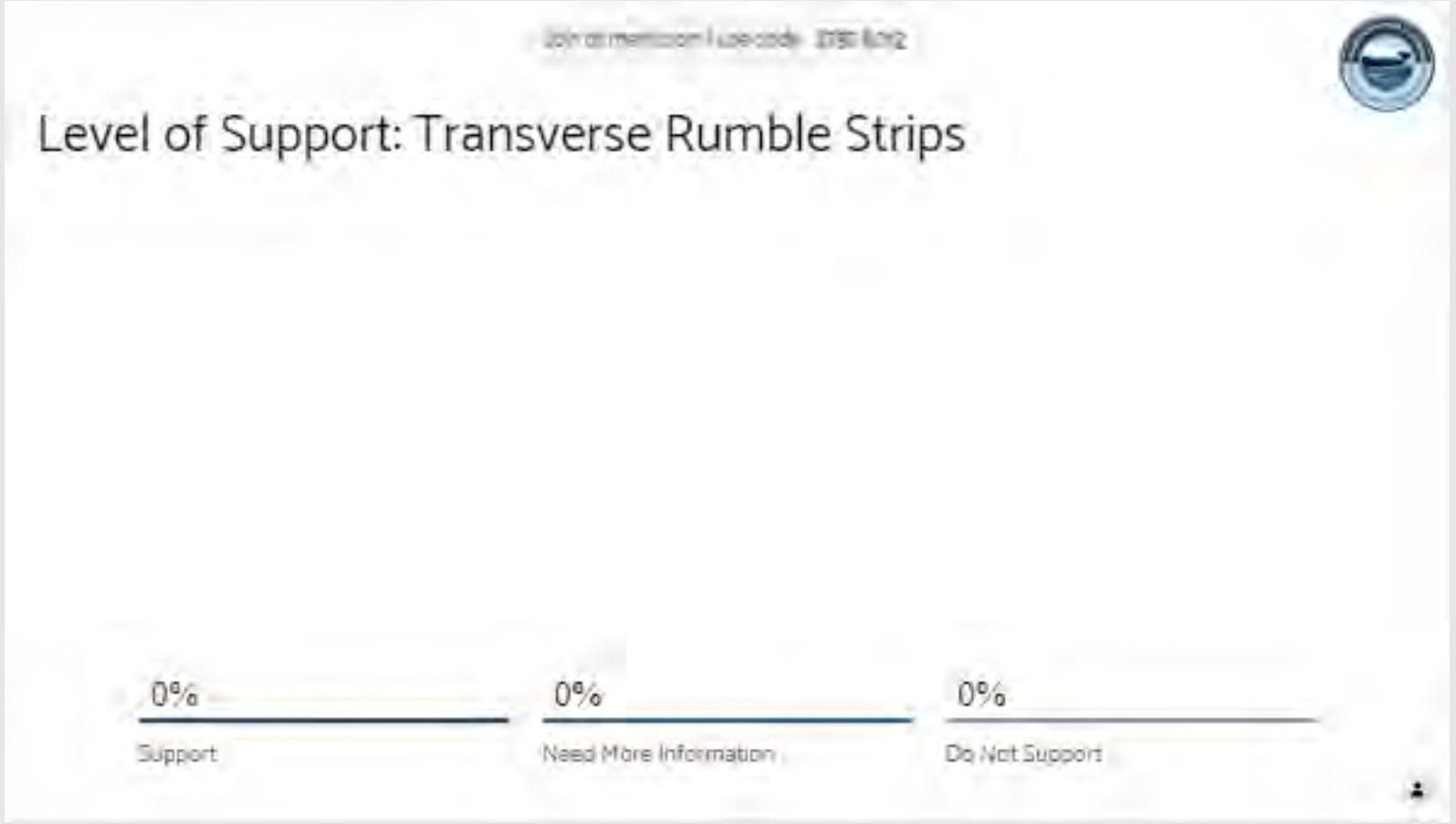


Longitudinal Rumble Strips/Centerline Hardening



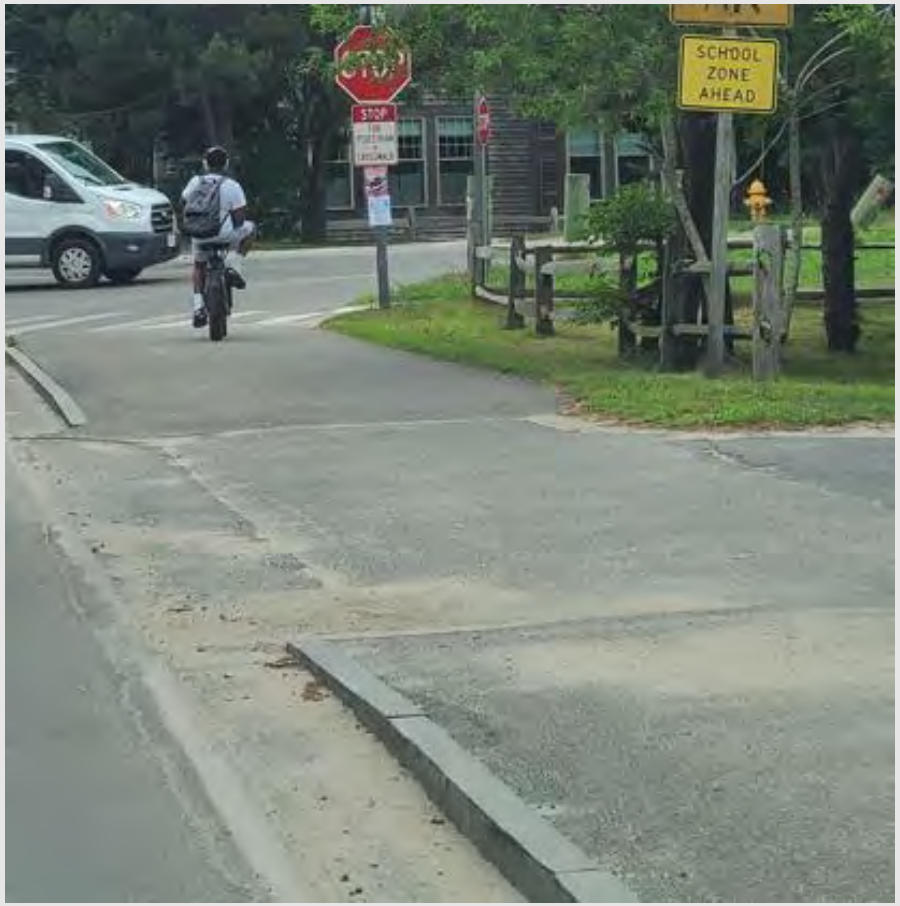


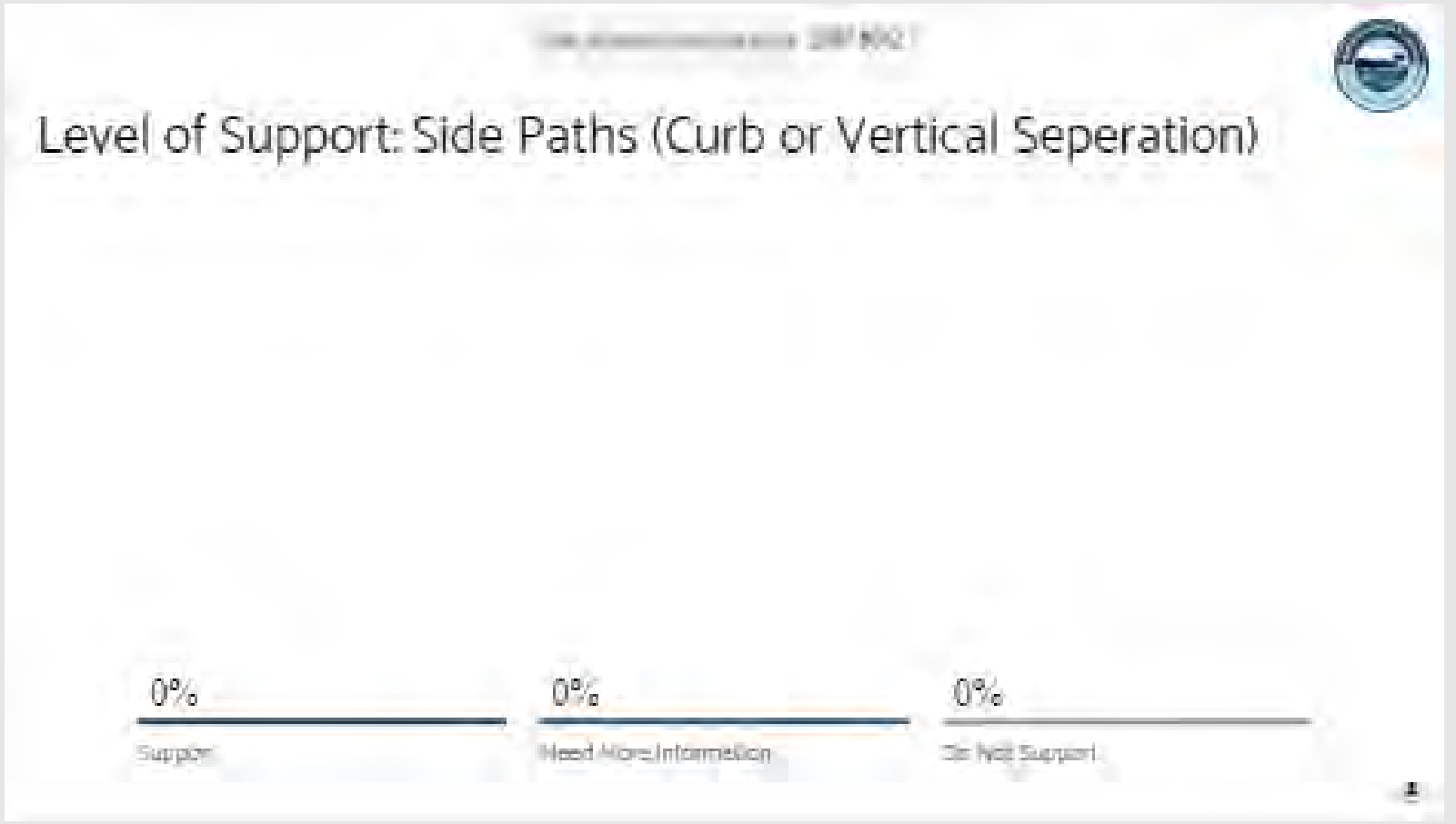
Slow speed rumbles – transverse rumbles



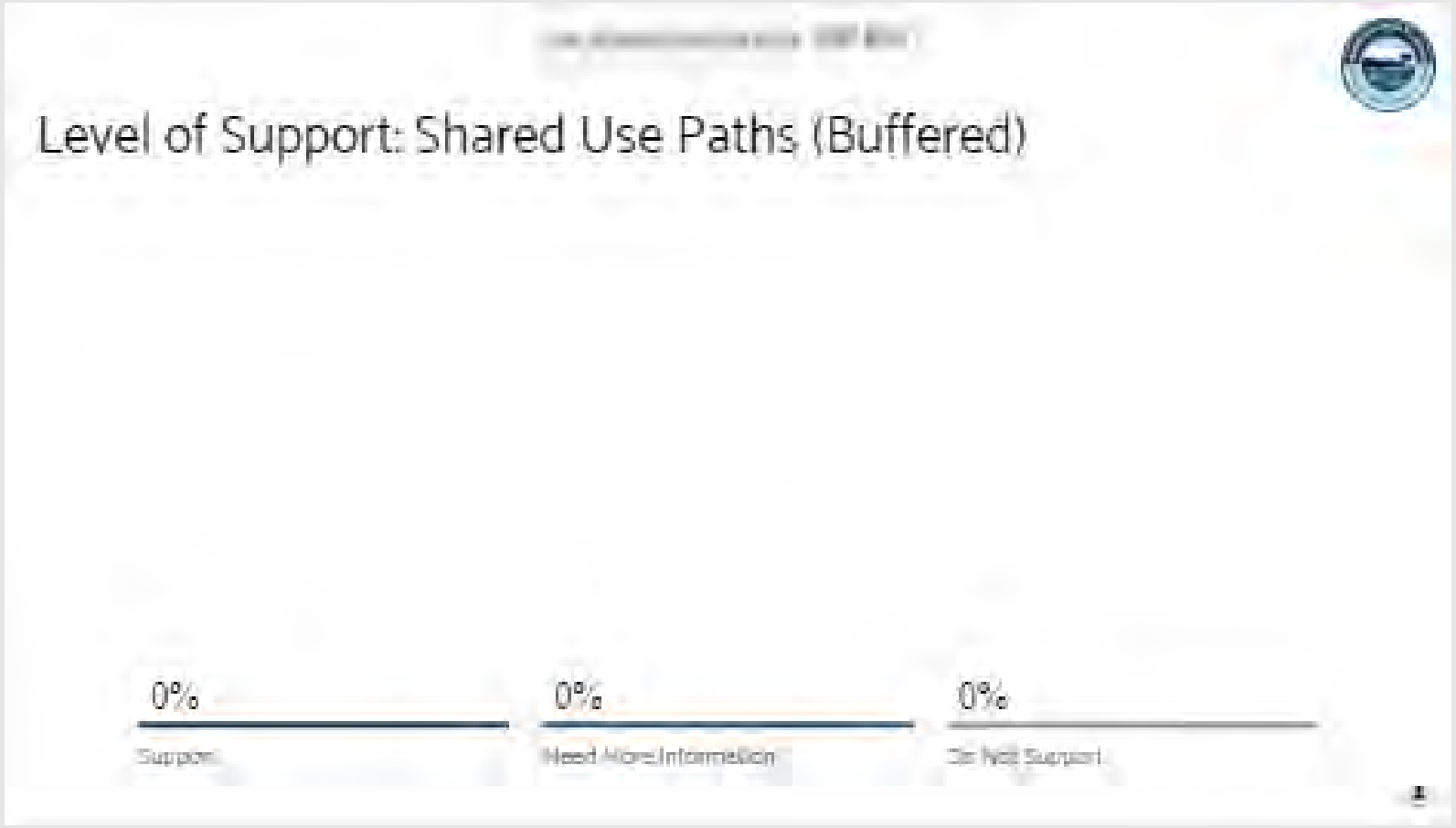
Access Management

Side Paths

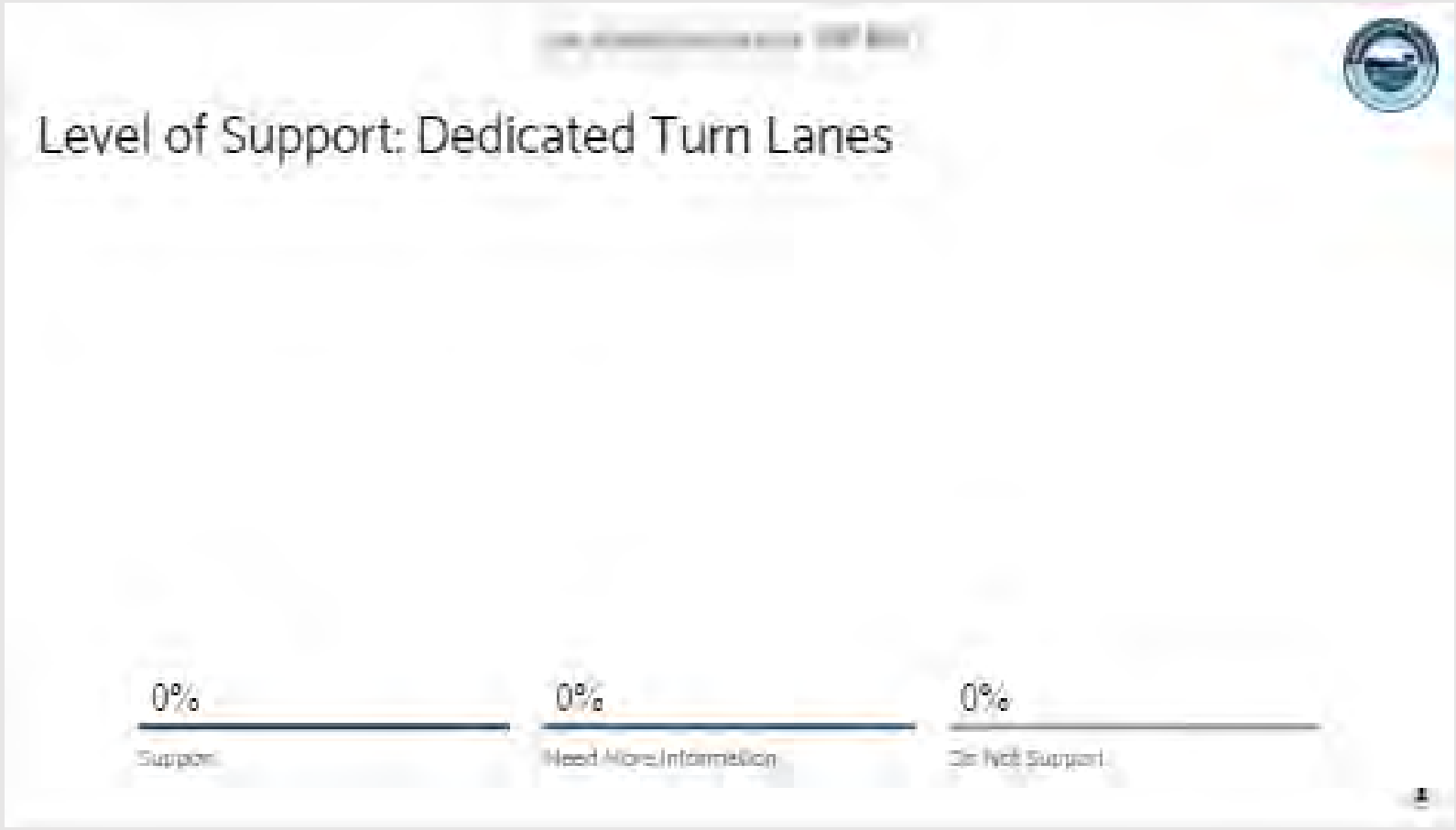

SCHOOL
ZONE
AHEAD
STOP


Level of Support: Side Paths (Curb or Vertical Seperation)
0%
0%
0%

Shared-Use Path

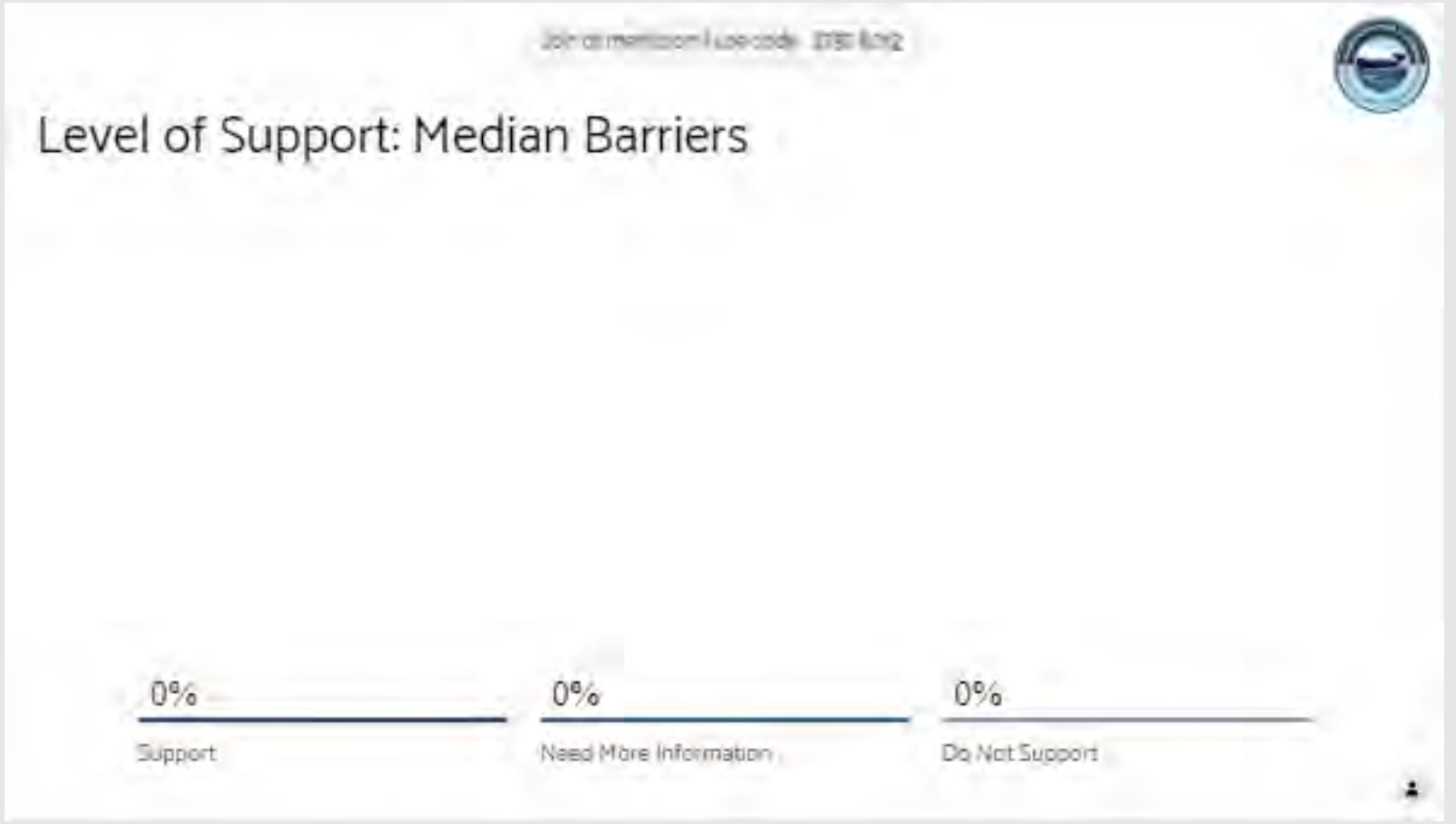


Dedicated Turn Lanes

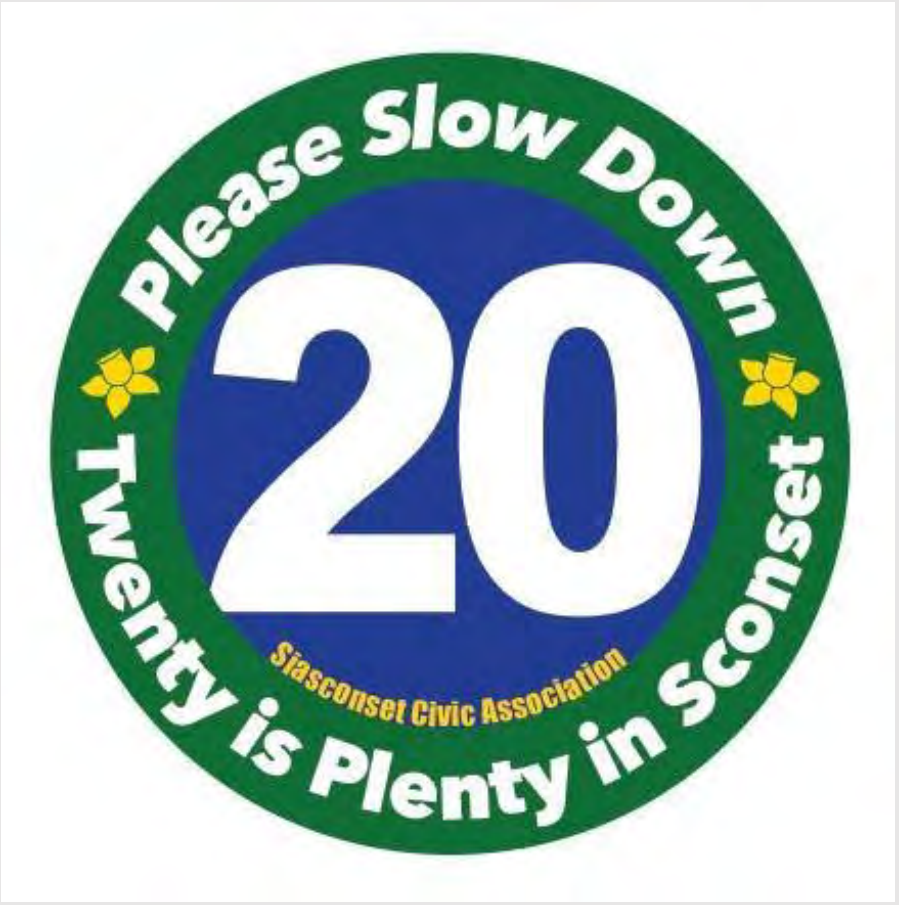


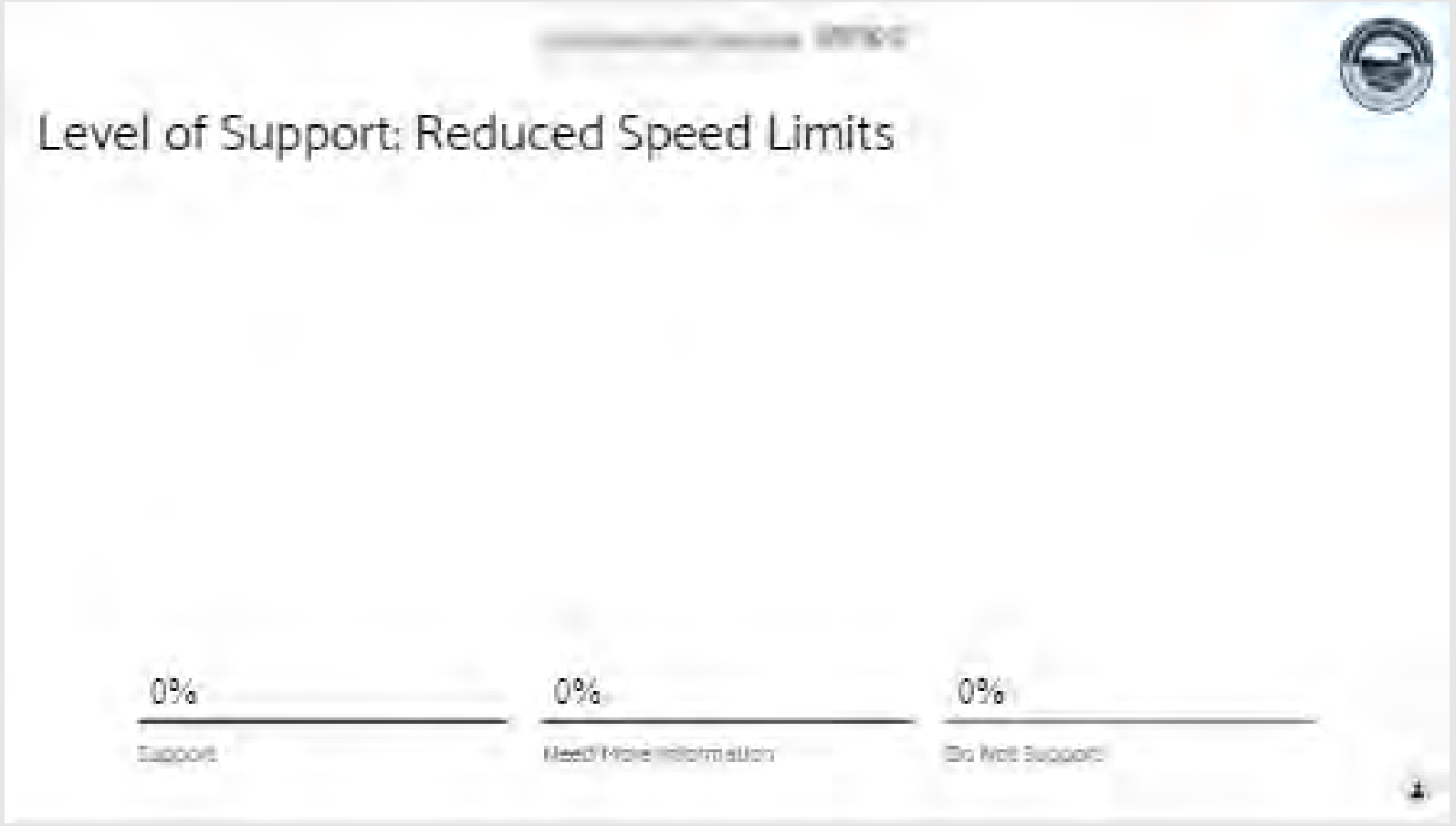
Wider Edge Lines

Median Barriers



Reduce Speed Limit





Speed Feedback Signs

Source: Town of Nantucket

Next Steps

Nantucket Planning & Economic Development Commission
Nantucket Transportation Planning Organization

Project Schedule Outlook

2024 2025

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG

- Kickoff
- Crash Analysis
- Typologies and Treatments
- Joint Meeting
- Practice and Policy Tools
- Plan Endorsement (To Be Scheduled)
- Develop and Prioritize Projects
- Write Safety Action Plans
- Stakeholder and Community Engagement

Safe Streets and Roads for All Project Outlook

Next Steps:

- Follow-up Meetings to be Decided
- Develop Projects and Alternatives Based on Feedback
- Winter 2024/25 Develop project, policy, and strategy recommendations
- Spring 2025: Draft Safety Action Plan
- Summer 2025: Finalize Safety Action Plan

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TECHNICAL MEMORANDUM

August 2, 2024 Project# 29726

To: Mike Burns, Transportation Program Manager
Town and County of Nantucket
16 Broad Street
Nantucket, MA 02554

From: Alex Garbier

RE: Rural MA TPO Join SS4A Action Plan: Task 1 High Injury Network

Introduction

Kittelson is part of a team with Nelson / Nygaard, and DREAM Collaborative (consultant team) working to develop a Comprehensive Safety Plan for the Town of Nantucket (Nantucket) as part of a Safe Streets for All planning grant that was awarded to Nantucket in partnership with the Franklin Regional Council of Governments and Martha's Vineyard Commission. This memorandum will support the completion and adoption of a Safety Action Plan for each region is the Task 1 deliverable. It includes four sections:

- **Historical Trends** – Describes characteristics of crashes for all of Nantucket with a goal of identifying high-risk conditions and priority crash types for reducing crashes resulting in injuries and fatalities.
- **Risk Ratio Analysis** – Presents a system-wide analysis of crashes designed to evaluate differences in crash frequency on roadways and at intersections based on differences in specific factors, such as urban versus rural context.
- **Network Screening** – Identifies where there were more crashes and more severe crashes along roadways and at intersections in Nantucket. Section includes tables identifying the top crash locations.
- **High Injury Development** – Presents the process used to identify the high-injury-network (HIN) for Nantucket, which summarizes the roadways and intersections where crashes are concentrated across the town. The section also describes the relationship of the HIN to disadvantaged communities in Nantucket.

EXECUTIVE SUMMARY

For the five-year period between 2018 and 2022[1], there was an average of over 200 reported crashes per year, 2% of which resulted in a fatal or suspected serious injury[2]. While fatal and suspected serious injuries have remained relatively even across the period, crashes resulting in a less than severe injury increased substantially in 2022.

General Trends

The most common crash types in Nantucket were angle crashes (17%), single vehicle crashes (15%), sideswipe-same direction crashes (16%), and rear-end crashes (12%). Of these, single vehicle crashes accounted for the most fatal and severe crashes (9 crashes). Pedestrian- and bicycle-involved crashes account for 5% of reported crashes but 21% of crashes where an injury was reported. These crashes were more likely than vehicle-only crashes to be at an intersection.

Crashes in Nantucket follow distinct temporal patterns compared to other parts of the state:

- Crashes are substantially higher during the summer months.
- Crashes peak during the middle of the day, mirroring ferry patterns.

Network Screening

Crashes are much more frequent in the more densely built areas on Nantucket near the town center, particularly along collector and arterial roadways. While this may not be surprising given the urban areas and larger roads experience greater roadway volumes, it identifies where efforts may be most impactful.

In more rural areas, the roadway screening identified concentrations of crashes on roadway sections that:

- Transition between a more and less rural character, such as Polpis Road and Milestone Road, where there are more driveways and residences closer to the western section of the roads, and
- Roadways with curves, such as Madaket Road and Tom Nevers Road.

The screening results were used to develop a High Injury Network (HIN) (Figure 13) for Nantucket. The HIN accounts for 9.5% of roadways (12.5 miles), but 50% of fatal and severe crashes.

Equity Considerations

Nantucket is not identified as a disadvantaged community by the USDOT; however, the data used by USDOT is unlikely to account for lower-income seasonal workers when identifying disadvantaged populations. Seasonal workers are likely at greater risk than other residents and visitors as they are more likely to rely on walking or biking as a primary mode of transportation and live on Nantucket during peak periods when crash frequency is higher.

1 Period selected to represent the five most recent years of complete crash data at the start of the project.
2 *Fatal injury* and *suspected serious injury* are defined in the MA Law Enforcement Crash Report E-Manual: https://masscrashreportmanual.com/non-motorist/injury-status/

Data Utilized

The analysis primarily used three data sources.

CRASH DATA

Crash data was downloaded from the MassDOT Open Data Portal as statewide vehicle crashes details and person crash details for the five-year period of 2018 – 2022. The period was selected to represent the five most recent years of complete crash data at the start of the project. Crashes for Nantucket were identified based on the County field ("CNTY_NAME"). The final crash dataset includes 1,024 crashes. Of these crashes, 973 included geospatial information for conducting the network screening analysis.

ROADWAY DATA

The network screening analysis was conducted using roadway and crash data maintained by MassDOT. Roadway data was downloaded from the MassDOT Open Data Portal. The consultant team used the file "Roadway Inventory 2023". The team processed the data by removing grade-separated facilities, and private roadways as identified by MassDOT. Then, the team created a linear reference system feature class for the roadway network by dissolving continuous roadway sections where roads had a shared route ID ("Route_ID") and / or a shared roadway name ("St_Name"). The final roadway file included around 130 miles of public roadways.

INTERSECTION DATA

The team created an intersection file using the processed roadway data. The processed intersection file includes intersections formed by public roads across Nantucket. The consultant team first created a preliminary set of intersections by extracting points where public roadways crossed. Then, the intersections were reviewed to identify offset (points less than 100 ft from one-another) or other intersections represented by multiple points (e.g., at rotaries). At these locations, the consultant team created a single representative point to represent the intersection. The final intersection file included a little under 400 intersections.

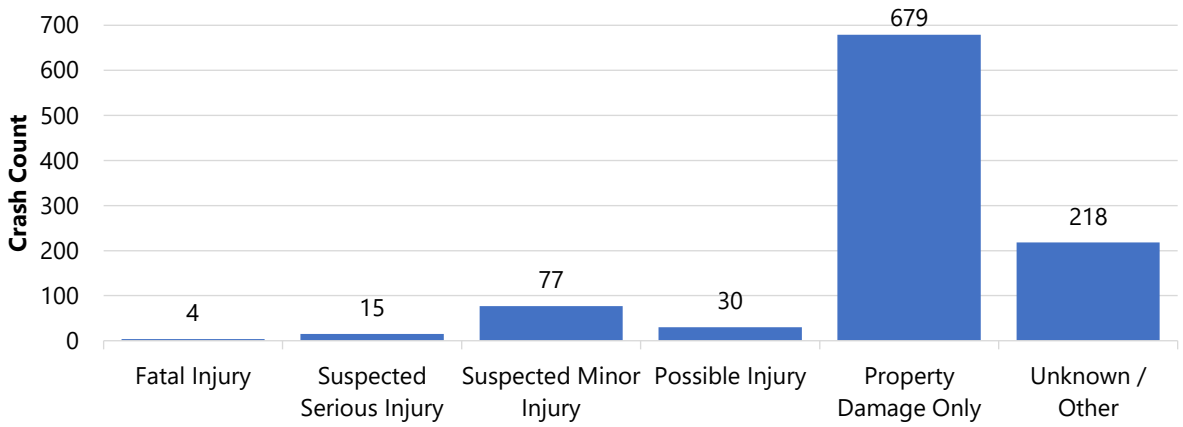
Historical Trends

The consultant team conducted the historical trends analysis to identify characteristics associated with more crashes and more severe outcomes and provide a contextual understanding of roadway safety in Nantucket. Analyzing crashes across the island provides more observations to identify trends and allows for identification of issues that occur frequently across the network in similar locations but may not have occurred repeatedly at the *same* locations.

GENERAL TRENDS

Figure 1 summarizes the reported crashes by severity in Nantucket between January 1st, 2018, and December 31st, 2022. Over the study period, the island averaged 219 crashes annually, 2% of which resulted in a fatal or suspected serious injury.

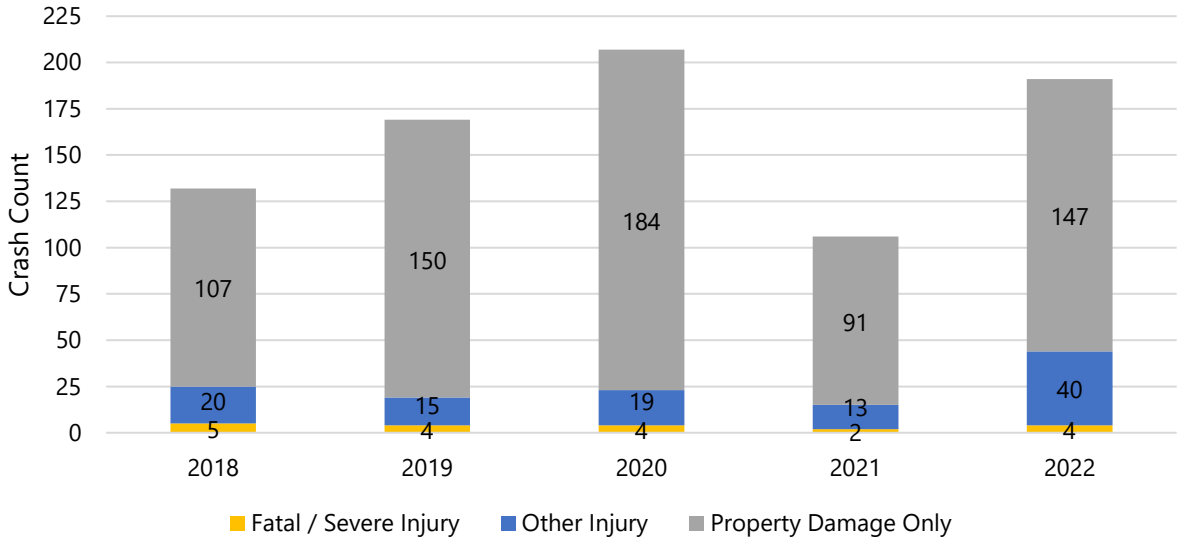
Figure 1: Total Reported Crashes by Severity, 2018 – 2022



Source: MassDOT Crash Report, Nantucket, compiled by Kittelson

Between 2018 and 2022, reported crashes were highest in 2020. As shown in Figure 2, reported crashes declined in 2021 (161 crashes) and before rebounded in 2022 (255 crashes). While fatal and suspected serious injuries have remained relatively consistent across the five-year period, crashes resulting in a less than severe injury increased substantially in 2022. In 2022, there were 44 reported crashes that resulted in an injury. This is 75% higher than the next highest year. Preliminary crash data for 2023 is in line with 2022, indicating the potential of a trend towards more crashes resulting in injuries.

Figure 2: Annual Crashes by Severity, 2018 – 2022



Source: MassDOT Crash Report, Nantucket, compiled by Kittelson

ROADWAY AND INTERSECTION CLASSIFICATION

Approximately half of all reported crashes in Nantucket were reported on roads classified as local; however, crashes were twice as frequent per mile on the arterial and collector roadways (2.5 crashes per centerline mile per year) than on local roads (1.1 crashes per year per centerline mile). Crashes were about equally likely to result in a reported fatal or suspected severe injury for arterial and collector roads as for local roads.

40% of reported crashes in Nantucket were identified in crash reports as occurring at an intersection, with 57% of intersection crashes occurring at three leg intersections. This is not unexpected as three leg intersections are the predominant intersection type in Nantucket. While fewer crashes were reported as four- or five-leg intersections relative to three-leg intersections, the network screening which is reported later in the document has identified several of these intersections as top crash locations, such as Milestone and Old South Road.

CRASHES BY MODE

Table 1 describes the severity of crashes based on the road users involved. 95% involved only motor vehicles. Crashes involving pedestrians accounted for 1% of reported crashes (14 crashes) and crashes involving bicycles accounted for the remaining crashes (39 crashes). Between 2018 and 2022, pedestrian-involved and bicycle-involved crashes accounted for 21% of reported injury crashes. There were no fatal and suspected severe outcome pedestrian-involved crashes and 4 bicycle-involved crashes (21% of reported).

Table 1: Crashes by Severity and Mode, 2018 – 2022

	Fatal Injury	Suspected Serious Injury	Suspected Minor Injury	Possible Injury	Property Damage Only	Unknown / Other	Total
Pedestrian	0	0	6	2	5	1	14
Bicycle	1	3	14	1	15	5	39
Vehicle	3	12	56	27	657	212	967
Unknown / Other	0	0	1	0	2	0	3
Total	**4**	**15**	**77**	**30**	**679**	**218**	**1,023**

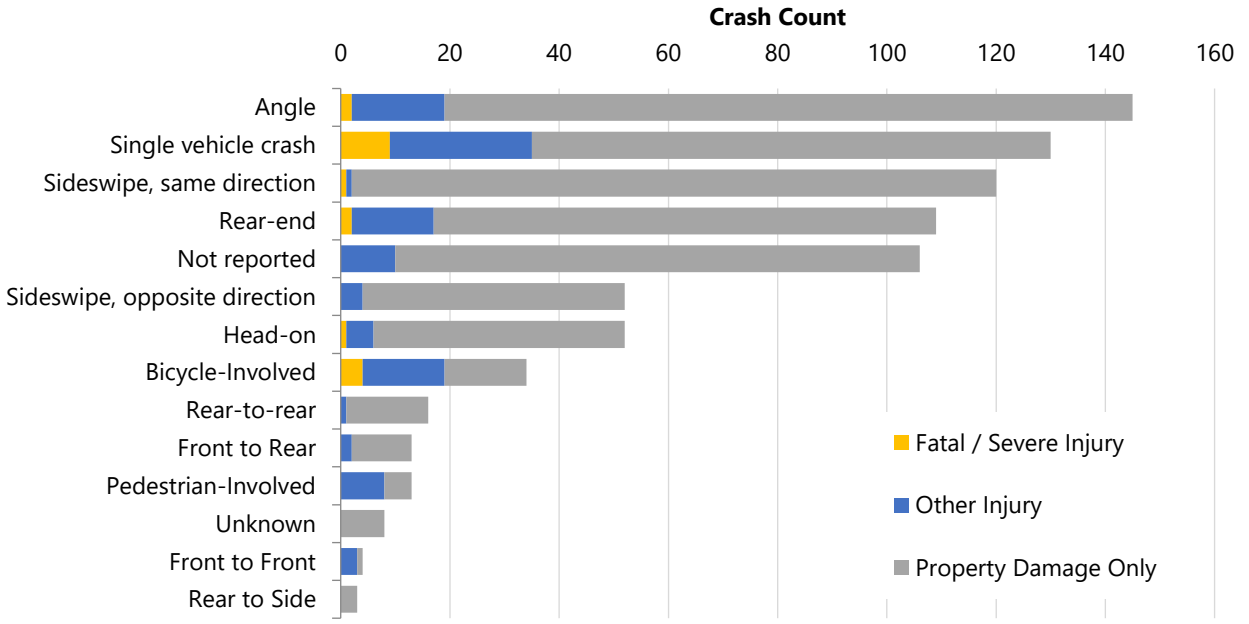
Source: MassDOT Crash Report, Nantucket, compiled by Kittelson

When investigating where these crashes occur, it was found that pedestrian-involved and bicycle-involved crashes were much more likely to be reported at an intersection (62% and 82% of reported crashes respectively) than motor-vehicle-only crashes (38% of crashes). Pedestrian-involved crashes were slightly more likely to be reported on arterial and collector roads (62% of pedestrian-involved crashes) than motor vehicle-only-crashes (48%). Conversely, bicycle-involved crashes were about equally likely to be reported on local roads as on an arterial or collector road. As noted above, there are far fewer miles of arterial and collector roads, such that for each mode type, crashes are more concentrated per mile on arterial and collector roads than local roads.

CRASH TYPE AND CONTEXT

Figure 3 describes reported crashes by type of crash and reported severity for crashes with reported severity. The most common crash types in Nantucket were angle crashes (17%), single vehicle crashes (15%), sideswipe-same direction crashes (16%), and rear-end crashes (12%). Of these, single vehicle crashes were the most likely to report fatal or suspected serious injury and account for almost 50% of fatal and severe injury crashes in Nantucket. Of the single-vehicle crashes, 33% involved a fixed object or tree and 24% involved an animal. Nantucket has a relatively large number of crashes where no crash type was reported or unknown (17%); however, these crashes resulted in few injuries and no higher severity outcomes.

Figure 3: Crashes by Type and Severity



Source: MassDOT Crash Report, Nantucket, compiled by Kittelson

Nantucket contains a mix of land use contexts that range from dense historic town centers to rural tree-lined corridors. To understand how crash patterns are shaped by land use context, transportation mode, and crash type were evaluated separately by reported context[3], rural or urban. Table 2 summarizes crashes by the roadway context. 85% of all reported crashes and 74% of fatal and severe crashes were reported as occurring in an urban context.

Single-vehicle and head-on crashes were the two types of crashes split more evenly between urban and rural context (61% of single-vehicle crashes and 67% of head-on crashes were urban context), with single-vehicle crashes accounting for 4 of the 5 fatal and suspected severe crashes on roads in rural context. Pedestrian- and bicycle-involved crashes primarily occurred on roads with urban contexts.

[3] MassDOT identified roads as "urban" or "rural" based on 2010 Census delineations of urban areas, urban clusters. For roads included on the border of an urban area roads are included in the urban designation. https://www.mass.gov/doc/road-inventory-data-dictionary/download

Table 2: Crashes by Roadway Context (2018 - 2022)

Crash Type	Urban Total	Urban Fatal / Severe	Rural Total	Rural Fatal / Severe
Angle	161 (19%)	2 (14%)	11 (8%)	0 (0%)
Sideswipe, same direction	150 (18%)	1 (7%)	11 (8%)	0 (0%)
Single vehicle crash	93 (11%)	5 (36%)	55 (38%)	4 (80%)
Not reported	114 (13%)	0 (0%)	22 (15%)	0 (0%)
Rear-end	116 (14%)	2 (14%)	9 (6%)	0 (0%)
Sideswipe, opposite direction	65 (8%)	0 (0%)	5 (3%)	0 (0%)
Head-on	44 (5%)	1 (7%)	22 (15%)	0 (0%)
Bicycle-Involved	34 (4%)	3 (21%)	4 (3%)	1 (20%)
Unknown	29 (3%)	0 (0%)	3 (2%)	0 (0%)
Rear to rear	18 (2%)	0 (0%)	0 (0%)	0 (0%)
Front to Rear	14 (2%)	0 (0%)	1 (1%)	0 (0%)
Pedestrian-Involved	13 (2%)	0 (0%)	1 (1%)	0 (0%)
Rear to Side	4 (0%)	0 (0%)	0 (0%)	0 (0%)
Front to Front	2 (0%)	0 (0%)	2 (1%)	0 (0%)
Total	**857**	**14**	**146**	**5**

Source: MassDOT Crash Report for crashes with urban and rural context reported, Nantucket County, compiled by Kittelson

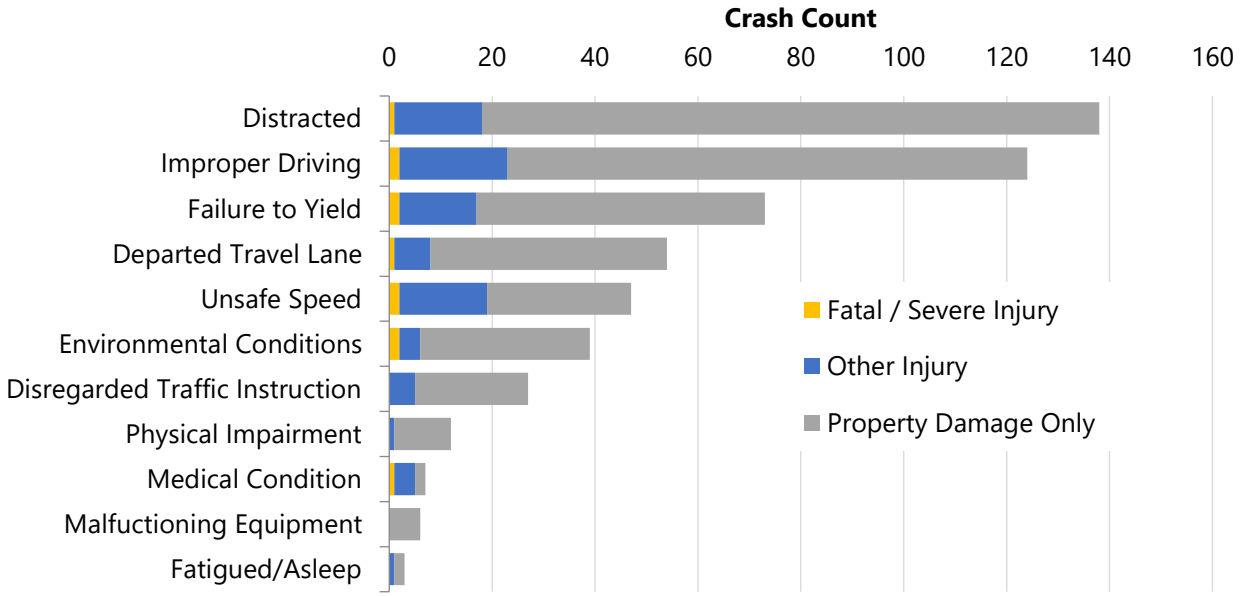
Relative to other jurisdictions, Nantucket has a higher proportion of private roadways. In general, these roads have lower vehicle volumes and lower speeds such that there are fewer and less severe crashes. In 2018-2021, 6.7% of all crashes and two fatal and severe crashes occurred on private roadways.[4]

CONTRIBUTING FACTORS

A contributing factor identifies the activity or event that contributed to the occurrence of a crash. It is important to note that multiple factors may be cited for a single crash. 51% of crashes reported no improper driving or unknown contributing factors. The two most common factors cited were distracted driving (25%) and improper driving (21%). Improper driving aggregates several varieties of improper driving, including following too closely, operating a vehicle in an erratic or reckless manner, and making an improper turn or other action. Failure to yield (8%) can be an indication of drivers having difficulty judging or finding gaps when merging from minor roads. Departed driving lane (6%) can indicate the presence of locations where drivers approach unexpected curves in the roadway or difficulty identifying the edge of the road. Unsafe speeds (6%) reflect a crash where a driver exceeded the posted speed limit or exceeded appropriate speed based for the existing conditions, such as during wet or snowy conditions. Figure 4 displays the crash severity by primary contributing factor.

[4] See Note on Private Roads for more information about private roadways in this analysis.

Figure 4: Crash Severity by Primary Contributing Factor (2018 – 2022)



Source: MassDOT Crash Report, Nantucket, compiled by Kittelson

Drug and alcohol use is also reported for crash records. Table 3 reports the percent of crashes that resulted in an injury or fatality for crashes where alcohol or drug use was cited. The rates for each category are compared to the state averages in Table 3, which shows that alcohol and drug use was reported at roughly the same rate in Nantucket as for the statewide average.

Table 3: Drug and Alcohol Use in Crashes with Injury Reported (2018 – 2022)

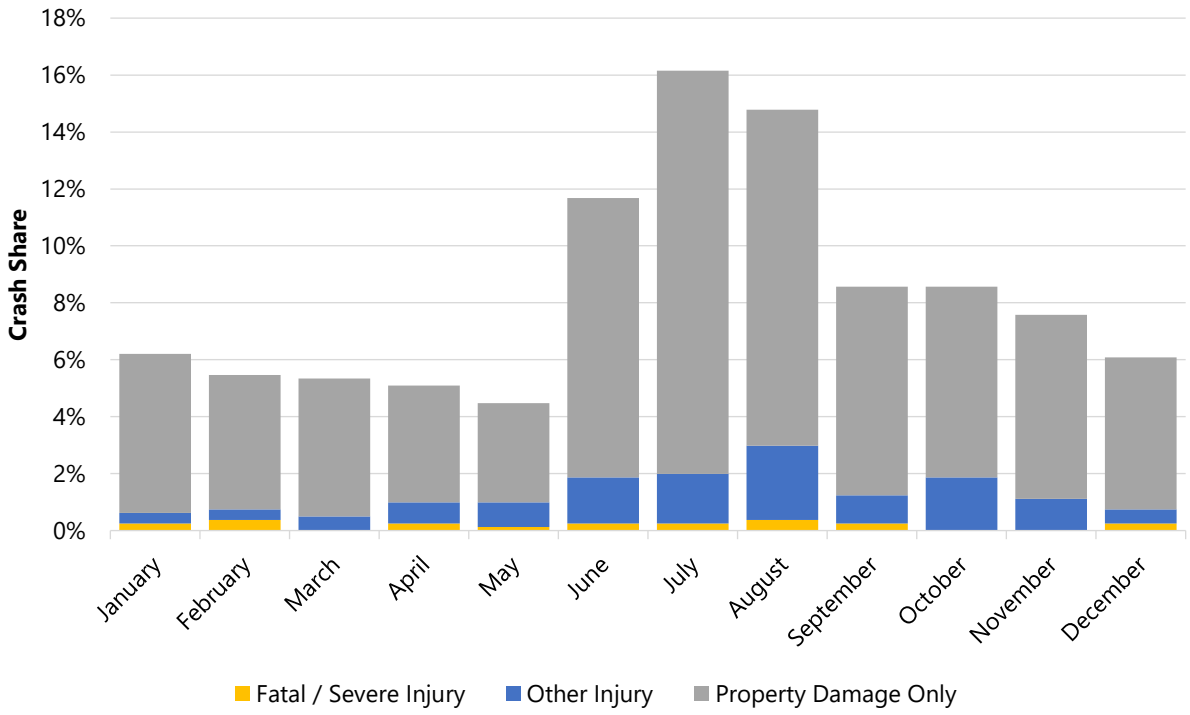
	Statewide	Nantucket
Alcohol Used	4%	4%
Drugs Used	1%	1%
Alcohol or Drugs	5%	4%

Source: MassDOT Crash Report, Nantucket, compiled by Kittelson

TEMPORAL PATTERNS

Figure 5 describes the number of crashes by month and severity. Total reported crashes peak in the summer months, with June, July, and August making up 36% of all reported crashes (approximately 25% of the year). This reflects the busy period when Nantucket sees the greatest number of visitors. Crash frequency is relatively consistent across the week, with slightly fewer crashes occurring on Sundays.

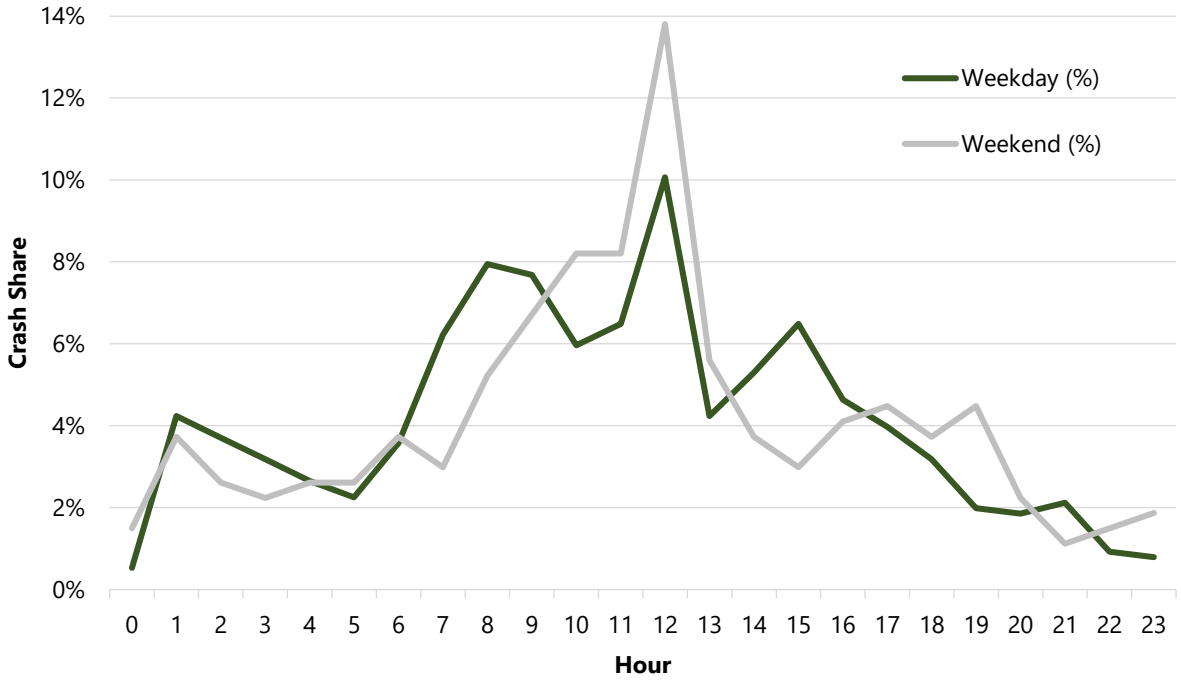
Figure 5: Injury Severity by Month



Source: MassDOT Crash Report, Nantucket, compiled by Kittelson

Figure 6 presents the distribution of crashes by hour for weekdays and weekends. Much as the monthly data presents trends consistent with Nantucket's seasonal travel patterns, the hourly data appears to reflect patterns associated with the ferry schedule which generally has ferries arriving and departing near the middle of the day.

Figure 6: Crashes by Hour of the Day



Source: MassDOT Crash Report, Nantucket, compiled by Kittelson

DRIVER AGE

Table 4 presents drivers' ages in reported crashes statewide compared to Nantucket. Throughout Massachusetts, 21% of reported crashes involve a driver over 64, whereas in Nantucket 26% of crashes involve a driver over 64. This finding may in part reflect a population of drivers that is on average older than the statewide average.

Table 4: Distribution of Driver Age for Crashes with Injury Reported (2018 – 2022)

	Statewide	Nantucket
64 or Younger	79%	73%
65 to 74	12%	13%
75 to 84	6%	7%
Over 84	2%	3%
Unknown	1%	3%

Source: MassDOT Crash Report, Nantucket, compiled by Kittelson

Risk Ratio Analysis

The risk ratio analysis measures relative risk associated with specific roadway and intersection characteristics. The goal of the analysis is to identify characteristics associated with higher risk. For example, if 59% of crashes occurred in roads identified as being in urban areas and 19% of roadway centerline miles occurred in the urban areas, the risk ratio is calculated to be 3.1. This indicates that the frequency of crashes on roads in urban areas is 3.1 times greater than the average roadway mile.

The analysis is possible where near universal data about a characteristic is available for both crashes and roadways, so that crashes history for roadways or intersections where a characteristic is present can be compared to the average crash history for roadways or intersections across Nantucket. The requirement for complete data for all roadways and intersections limited the characteristics that could be evaluated.

The risk ratio analysis was conducted for roadways and intersections. The roadway analysis considered all reported crashes regardless of whether the crash was reported as occurring at an intersection. This approach was used to allow for comparison of roadway segments with more or fewer intersections. The intersection analysis considers crashes that were reported as occurring within 250 feet of an intersection. Table 5 includes the factors evaluated for roadways and intersections.

In this analysis, the roadways included represent over 98% of public roadways and intersections formed by public roads. All crashes where these characteristics were present were included in the analysis.

Table 5: Risk Ratio Categories

Roadways	Intersections
• Average Annual Daily Traffic (AADT) • Functional Classification • Urban / Rural Classification	• Functional Classification • Urban / Rural Classification • Number of Approaches

ROADWAYS

During the analysis, the consultant team found that AADT was strongly associated with increased crash risk. As a result, for the other two characteristics, roadways were grouped into a lower- and higher-AADT category to evaluate if those characteristics were associated with greater risk. Because of the relatively small size of Nantucket, the groupings are limited in number to maintain sufficient sample size for meaningful results.

Table 6 summarizes the risk ratio results. Roadway characteristics with risk ratios exceeding 2.5 are shaded gold and risk ratios between 1.5 and 2.5 are shaded lighter yellow. Results for categories where there were less than five miles of roadway are excluded due to small sample size. In addition, if a cross tabulation resulted in fewer than 5 miles of roadway, the results are not reported to limit reporting on results based on insufficient data. Key findings of the roadway risk ratio analysis include:

- Roadways with AADT greater than 2,000 are associated with greater risk.
- For low-volume roadways, functional class does *not* appear to be associated wither greater risk.
- Roadways with AADT of less than 2,000 vehicles/day in urban context were associated with relatively more risk than roads located in a rural context. Urban and rural context were not associated with meaningfully different risk for higher-volume roads.

Table 6: Risk Ratio for Roadways (2018 - 2022)

AADT Category	Lower AADT (0-2,000 AADT)	Higher AADT (2,000 + AADT)
AADT Alone	0.7	4.5
Cross with Functional Classification		
Arterial / Collector	0.5	4.4
Local	0.7	*Insufficient Sample*
Cross with Urban / Rural Context		
Urban Context	1.1	4.4
Rural Context	0.2	4.6

Source: MassDOT Crash Report, Statewide crashes with injury cited, compiled by Kittelson.

INTERSECTIONS

Entering vehicle volumes are not readily available for intersections.[5] As a result, the consultant team reviewed functional classification[6] against roadway AADT data and determined that because functional classification is highly correlated with AADT an analysis using major and minor approach functional classification would capture risk patterns associated with functional class. Using functional classification also allows for the separate consideration of primary and secondary approach characteristics.

The analysis found greater risk where both the primary and secondary roads are higher functional classes, indicating that risk is generated by the intersection of two roads that serve a greater role in the transportation network. Like roadway AADT, functional class was found to be highly correlated with risk, and so the intersections were divided into three categories based on the primary and secondary roadway functional classifications to control for this relationship when evaluating the other two factors.

Table 7 summarizes the intersection risk ratio results. Roadway characteristics with risk ratios exceeding 2.5 are shaded gold and risk ratios between 1.5 and 2.5 are shaded lighter yellow. Results for categories where there were less than five intersections are excluded due to small sample size. Key findings of the roadway risk ratio analysis include:

- Intersections between roadways with a higher functional class are associated with greater risk.
- Intersections located in an urban context were associated with relatively more risk for the two intersection groups involving at least one arterials or collector road.
- Number of approaches does not appear to be meaningfully associated with additional risk.

Table 7: Risk-Ratio for Intersections (2018 – 2022)

Intersection Category	Local x Local,	Collector x Local, Arterial x Local	Arterial x Arterial, Arterial x Collector Collector x Collector
Alone	0.6	1.5	3.3
Urban / Rural Context			
Urban Context	0.8	1.9	4.0
Rural Context	0.1	0.5	2.2
Number of Approaches			
2-3 Approaches	0.7	2.2	3.6
4 or More Approaches	0.9	1.6	*Insufficient Sample*

Source: MassDOT Crash Report, Statewide crashes with injury cited, compiled by Kittelson.

[5] MassDOT does not produce a statewide intersection layer and therefore does not report information specific to intersections, such as entering vehicle volumes. While entering vehicle volume may be generated from MassDOT roadways, doing so on a large scale poses multiple complications and potential for imprecision.
[6] Functional class is a general classification system used by the Federal Highway Administration to organize roads by significance. This analysis groups sub-categories of arterial and collector classes into single categories.

Network Screening

Whereas the prior two analyses reviewed crash patterns in aggregate across Nantucket, the network screening analysis identifies specific locations with a history of more crashes and more severe crashes.

SCREENING METHODS

The screening analysis is separated into a roadway crash and intersection crash evaluation. The evaluation includes crashes that occurred on public roadways as identified by MassDOT and reviewed by the team (see below note on private roads). Crashes are divided into those occurring in the influence area of intersection and those occurring outside of the area. The consultant team identified the total number of crashes by severity at each intersection by spatially joining crashes within 250 feet of an intersection to that intersection. Where intersections were less than 500 feet from each other, crashes were assigned to the nearest intersection. The team calculated the predicted average crash frequency and a severity weighted crash frequency for each site.

Crashes reported more than 250 feet from an intersection were classified as segment-related crashes. These crashes were located along the nearest roadway feature as long as the reported location was less than 100 feet from the roadway feature. To measure crash history along roadways, the consultant team conducted a sliding window analysis that aggregates crash history along a roadway by creating "window" of a predetermined length that moves along the street network and defined lengths (i.e., the "slide"). Crashes are then spatially joined to each window and crash history is summarized for each window. The analysis used a one-mile window with a half-mile shift.

Figure 7 provides a graphical representation of the sliding window methodology. The figure shows segmentation (in purple) of a two-mile road using an analysis length of one mile, with an analysis interval of a half-mile. The crashes, shown in blue, are then associated with each segment, double-counting crashes where they overlap with more than one segment.

Figure 7: Example of Sliding Window, Count of Crashes for Mile Segments

Source: Kittelson & Associates, Inc.

Note on Private Roads

The screening analysis evaluated crashes occurring along public roads as identified in MassDOT public roadway file.[7] The excluded roadways have a range of characteristics from unpaved roads clearly intended for residential access to fully paved roads that cross neighborhoods and are similar in character to smaller roads on the public road network. As noted in the historical trends section of the memo, about 7% of reported crashes occurred on roads not included in the screening. In general, crashes on these roads are less severe and more dispersed than on the public network; however, a review of the dispersion of the crashes found that there is a concentration of these crashes on the residential streets south of Bartlett Road and Old South Road.

PERFORMANCE MEASURES

For the network screening analysis, the team generated two performance measures for intersections, crash frequency and severity weighted crash frequency. Crash frequency is measured as the number of reported crashes per year. The severity weighted crash frequency assigns weighting factors to crashes based on the maximum reported injury reported for each crash. Greater weights are assigned to crash 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 consultant team employed a three-tier weighting system summarized below:

- 10x for Fatal and Suspected Severe Crash
- 5x for Other Visible injury, Complaint of Pain injury
- 1x for Property Damage Only Crashes

The metric is based on the Equivalent Property Damage Only (EPDO)[8] performance metric. Under the metric, weights are based on the relative costs associated with different crash severities and the metric is reported as crash history in terms of number equivalent to property damage only crashes.

In 2020, MassDOT started calculating EPDO by assigning reported injury crashes a score of 21 (i.e., 21 PDO crashes are equivalent in cost to the average injury crash).[9] In locations with a higher concentration of crashes, the MassDOT is successful in identifying sites where more severe outcomes are more likely to occur; however, because sites in Nantucket tend to have relatively fewer crashes the method struggles to differentiate between sites where crashes are more or less likely to result in more severe injuries.

[7] The analysis used the jurisdiction field to identify roads understood as being under Town of State management. Though MassDOT has another jurisdictional classification for private ways the classification is not well-maintained.
[8] USDOT Improving Safety on Rural Local and Tribal Roads Safety Toolkit
https://safety.fhwa.dot.gov/local_rural/training/fhwasa14072/sec4.cfm
[9] Massachusetts HSIP, Highway Safety Improvement Program 2020 Annual Report
https://safety.fhwa.dot.gov/hsip/reports/pdf/2020/ma.pdf

SCREENING RESULTS

Figure 8 shows the crash frequency for intersections and Figure 9 shows the severity weighted crash frequency for intersections. Figure 10 shows the crash frequency for roadways and Figure 11 shows the severity weighted crash frequency for roadway segments normalized by a segment's length. Following each set of figures, the team identified the top 9 roadway corridors and top 20 intersection by severity weighted crash frequency. The locations are described in Table 8 and Table 9 and shown in Figure 12.

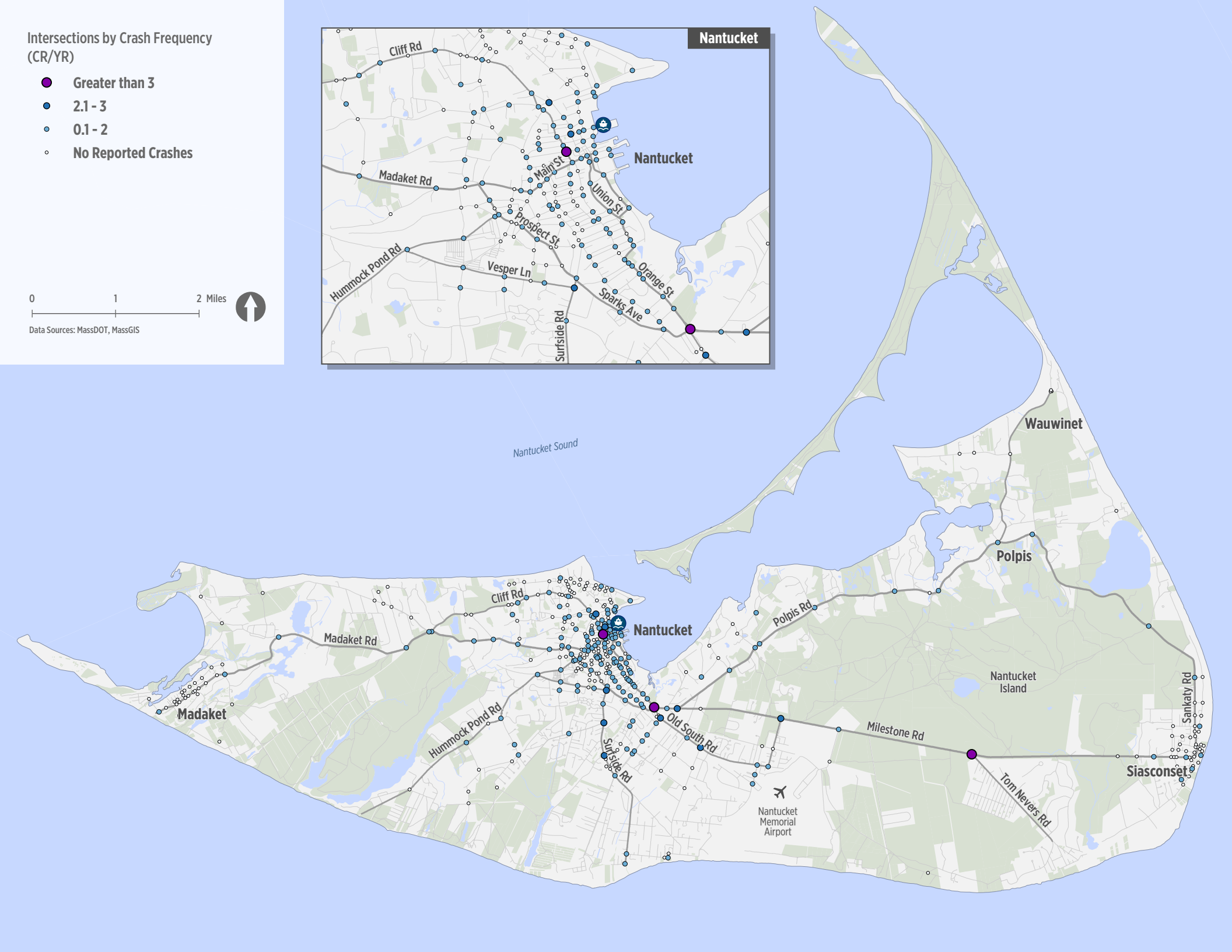
The intersection screening process generally identified the highest severity locations for intersections and roadways at:

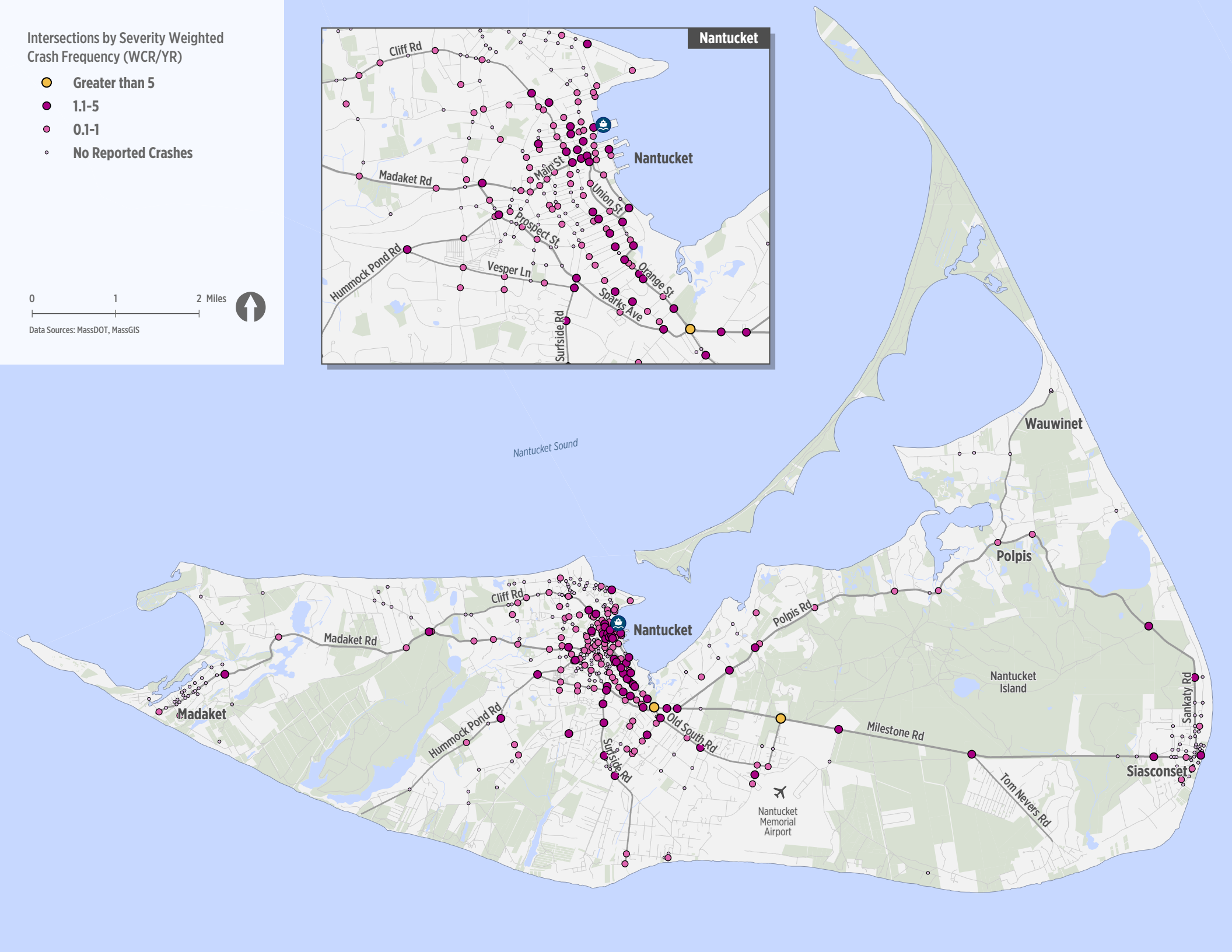
- Corridors adjacent to the historic center of Nantucket, like Orange Street and Sparks Avenue, and
- Intersections formed by these corridors, most notably at the rotary at Milestone Road / Old South Road / Orange Street.

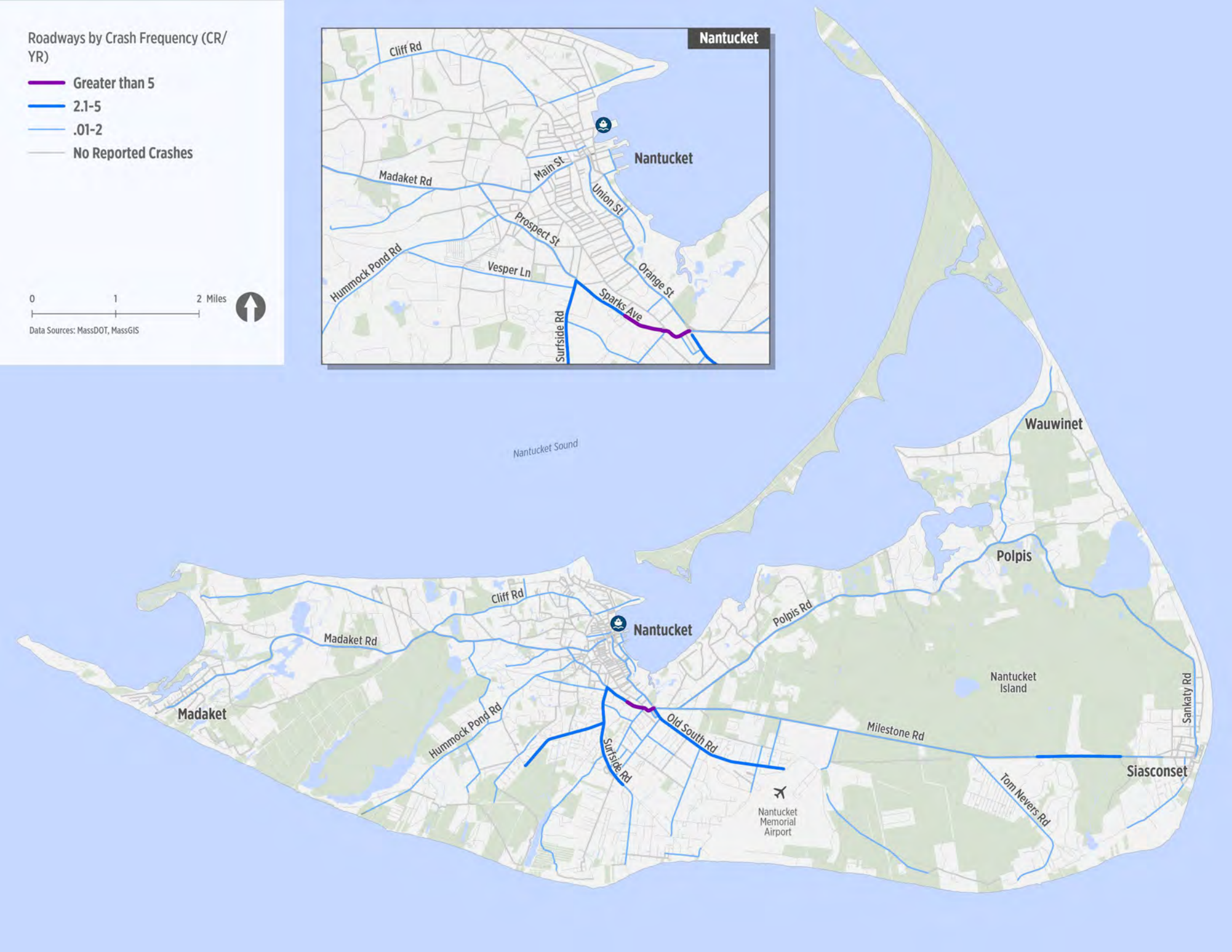
The roadway screening process also identified two types of more rural roadways:

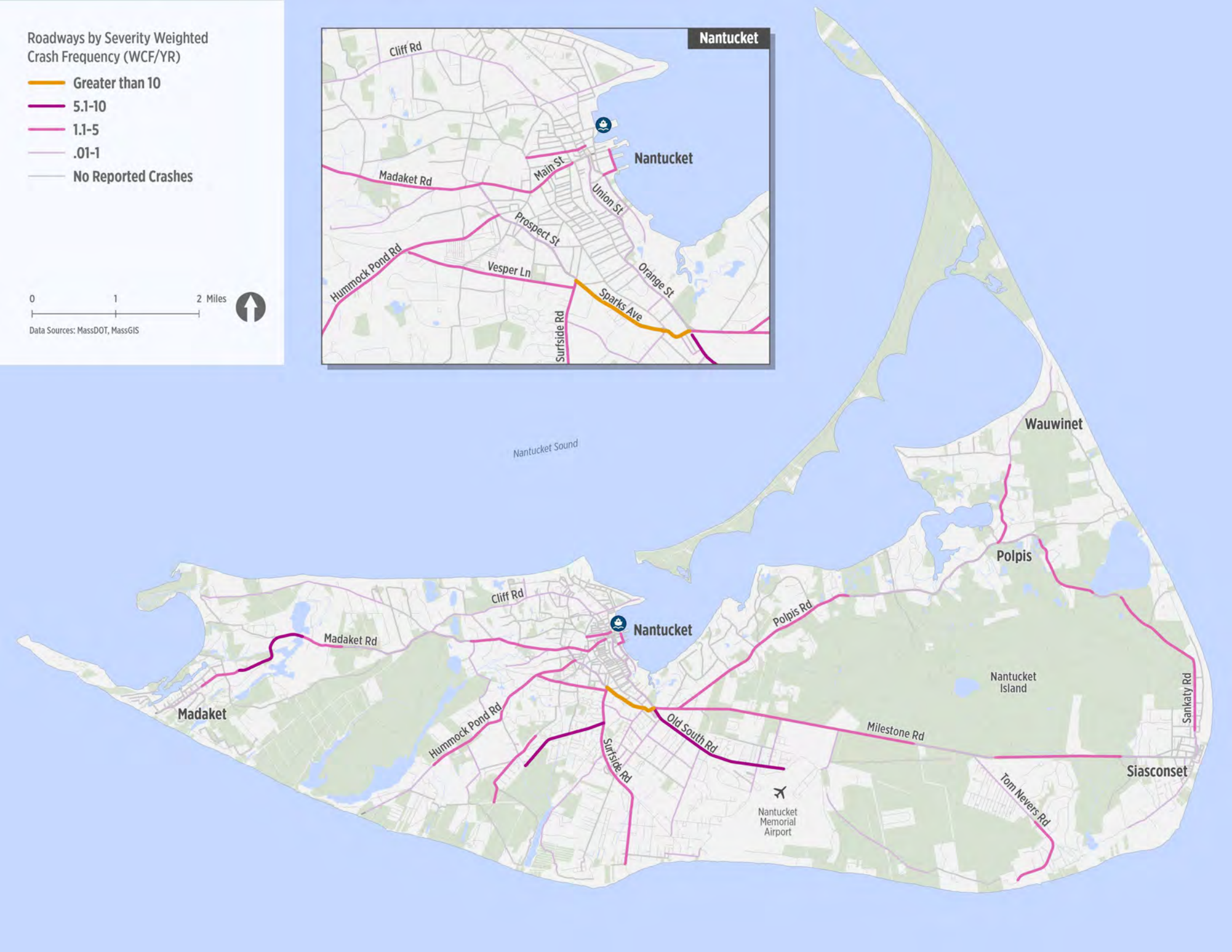
- Corridors that transition between a more and less rural character, such as Polpis Road and Milestone Road, where there are more driveways and residences on the western portion of the corridors.
- Rural roadways with curves where speeds are potentially higher and curves may be unexpected, such as Madaket Road and Tom Nevers Road.

Relative to the rest of Nantucket, corridors and intersections in the heart of the town of Nantucket tend to have more crashes but relatively few crashes resulting in injuries. This is likely due to the slow vehicle speeds on historic streets. Similarly, the neighborhoods of Madaket and Siasconset have relatively few crashes, potentially due to lower roadway volumes and tighter roadway conditions, which could reduce vehicle speeds.


Intersections by Crash Frequency (CR/YR)
Greater than 3
2.1 - 3
0.1 - 2
No Reported Crashes
0
1
2 Miles
Data Sources: MassDOT, MassGIS
Nantucket
Cliff Rd
Madaket Rd
Main St
Union St
Prospect St
Hummock Pond Rd
Vesper Ln
Orange St
Sparks Ave
Surfside Rd
Nantucket
Nantucket Sound
Wauwinet
Polpis
Polpis Rd
Cliff Rd
Madaket Rd
Nantucket
Madaket
Hummock Pond Rd
Surfside Rd
Old South Rd
Nantucket Island
Milestone Rd
Sankaty Rd
Siasconset
Tom Nevers Rd
Nantucket Memorial Airport


Intersections by Severity Weighted Crash Frequency (WCR/YR)
Greater than 5
1.1-5
0.1-1
No Reported Crashes
0
1
2 Miles
Data Sources: MassDOT, MassGIS
Nantucket
Cliff Rd
Madaket Rd
Main St
Union St
Prospect St
Hummock Pond Rd
Vesper Ln
Orange St
Sparks Ave
Surfside Rd
Nantucket Sound
Wauwinet
Polpis
Polpis Rd
Madaket
Old South Rd
Milestone Rd
Nantucket Island
Sankaty Rd
Siasconset
Tom Nevers Rd
Nantucket Memorial Airport


Roadways by Crash Frequency (CR/YR)
Greater than 5
2.1-5
.01-2
No Reported Crashes
0
1
2 Miles
Data Sources: MassDOT, MassGIS
Nantucket
Cliff Rd
Madaket Rd
Main St
Union St
Prospect St
Hummock Pond Rd
Vesper Ln
Orange St
Sparks Ave
Surfside Rd
Nantucket
Nantucket Sound
Wauwinet
Polpis
Polpis Rd
Cliff Rd
Madaket Rd
Nantucket
Madaket
Hummock Pond Rd
Surfside Rd
Old South Rd
Nantucket Island
Milestone Rd
Sankaty Rd
Siasconset
Tom Nevers Rd
Nantucket Memorial Airport


Roadways by Severity Weighted Crash Frequency (WCF/YR)
Greater than 10
5.1-10
1.1-5
.01-1
No Reported Crashes
0
1
2 Miles
Data Sources: MassDOT, MassGIS
Nantucket
Cliff Rd
Madaket Rd
Main St
Union St
Prospect St
Hummock Pond Rd
Vesper Ln
Orange St
Sparks Ave
Surfside Rd
Nantucket
Nantucket Sound
Wauwinet
Polpis
Polpis Rd
Cliff Rd
Madaket Rd
Nantucket
Madaket
Hummock Pond Rd
Surfside Rd
Old South Rd
Milestone Rd
Nantucket Island
Sankaty Rd
Siasconset
Tom Nevers Rd
Nantucket Memorial Airport

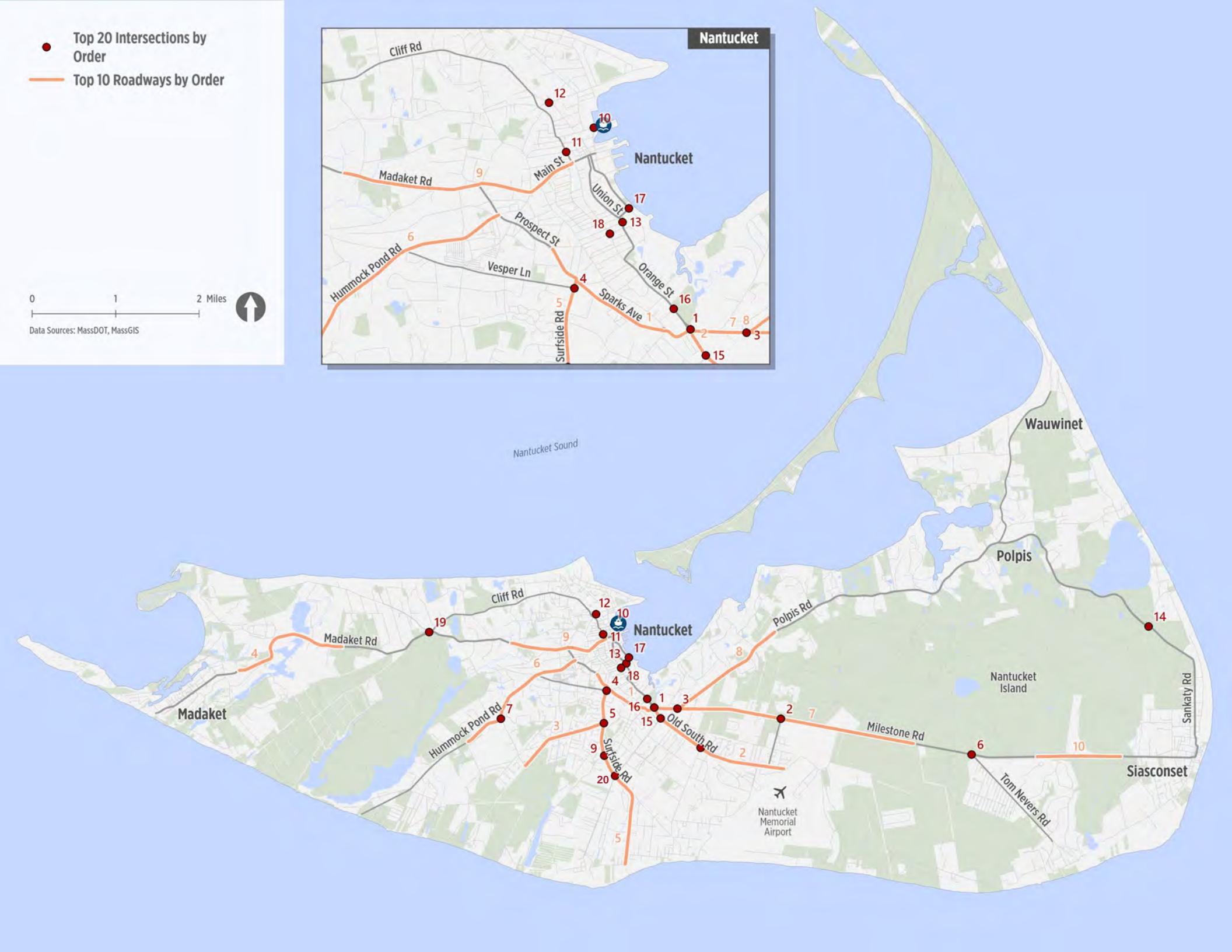

Top 20 Intersections by Order
Top 10 Roadways by Order
0
1
2 Miles
Data Sources: MassDOT, MassGIS
Nantucket
Cliff Rd
Madaket Rd
Main St
Union St
Prospect St
Hummock Pond Rd
Vesper Ln
Orange St
Sparks Ave
Surfside Rd
Nantucket Sound
Wauwinet
Polpis
Polpis Rd
Nantucket Island
Sankaty Rd
Milestone Rd
Siasconset
Tom Nevers Rd
Old South Rd
Madaket
Nantucket Memorial Airport

Table 8: Intersection Locations by Weighted Crash Severity (2018 – 2022)

Order	Location	Fatal or Severe Injury	Other Injury	PDO	Annual Crash Freq.	Annual Weighted Crash Freq.
1	Old South Road / Milestone Road / Orange Street	0	5	24	5.8	9.8
2	Nobadeer Farm Road / Milestone Road	1	2	9	2.4	5.8
3	Milestone Road / Polpis Road	0	3	9	2.4	4.8
4	Surfside Road / Vesper Lane	0	2	13	3	4.6
5	Surfside Road / Bartlett Road	0	2	12	2.8	4.4
6	Milestone Road / Tom Nevers Road	0	1	17	3.6	4.4
7	Hummock Pond Road / Somerset Lane	0	3	5	1.6	4
8	Old South Road / Lovers Lane	0	2	10	2.4	4
9	Surfside Road / Miacomet Road / Surfside Drive	0	2	10	2.4	4
10	Broad Street / Easy Street	1	1	4	1.2	3.8
11	Centre Street / India Street	0	0	19	3.8	3.8
12	Chester Street / Easton Street / North Water Street / Cliff Road	0	1	13	2.8	3.6
13	Union Street / East Dover Street	0	2	8	2	3.6
14	Polpis Road / Barnard Valley Road	1	1	3	1	3.6
15	Old South Road / Fairgrounds Road	0	1	12	2.6	3.4
16	Orange Street / West Creek Road	1	0	7	1.6	3.4
17	Washington Street / Francis Street	0	2	5	1.4	3
18	Orange Street / York Street	1	0	4	1	2.8
19	Madaket Road / Eel Point Road	1	0	3	0.8	2.6
20	Fairgrounds Road / Surfside Road / South Shore Road	0	2	3	1	2.6

Note: Crashes by severity are count of crashes between 2018 – 2022. Crash Frequency and Crash Severity Weighted are annualized.
Source: MassDOT Crash Report, Statewide crashes with injury cited, compiled by Kittelson

Table 9: Roadway Locations by Weighted Crash Severity (2018 – 2022)

Order	Location	Extents	Length (mi)	Fatal or Severe Injury	Other Injury	PDO	Annual Crash Freq.	Annual Weighted Crash Severity Freq.	Annual Max Crash Freq.	Annual Max Weighted Severity Freq.
1	Sparks Avenue	Atlantic Avenue - Orange Street	0.7	1	2	28	4.0	14.8	6.8	10.2
2	Old South Road	Milestone Road - Arrowhead Drive	1.8	2	5	23	3.4	7.7	4.8	9.8
3	Bartlett Road	Raceway Drive - Surfside Road	1.1	1	2	14	3.1	6.1	3.4	6.8
4	Madaket Road	Cambridge Street - Worth Road	1.5	1	3	5	1.2	4.0	1.8	6.0
5	Surfside Road	Western Avenue - Sparks Avenue	2.3	1	3	12	1.4	3.3	2.2	4.6
6	Hummock Pond Road	Bartlett Farm Road - Quaker Road	1.7	1	1	8	1.2	2.7	1.6	3.4
7	Milestone Street	Orange Street - Russell's Way	3.5	0	3	11	0.8	1.5	1.6	2.6
8	Polpis Road	Milestone Road - North Pasture Lane	1.5	0	3	5	1.1	2.7	1.4	3.2
9	Madaket Road / Main Street	Crooked Lane - Center Street	1.2	0	1	6	1.2	1.8	1.4	2.2
10	Milestone Street	Chuck Hallow Road - Driveway Nantucket Golf Club	1	0	0	11	2.2	2.2	2.2	2.2

Note: Crashes by severity are count of crashes between 2018 – 2022. Crash Frequency and Crash Severity Weighted are annualized.
Source: MassDOT Crash Report, Statewide crashes with injury cited, compiled by Kittelson

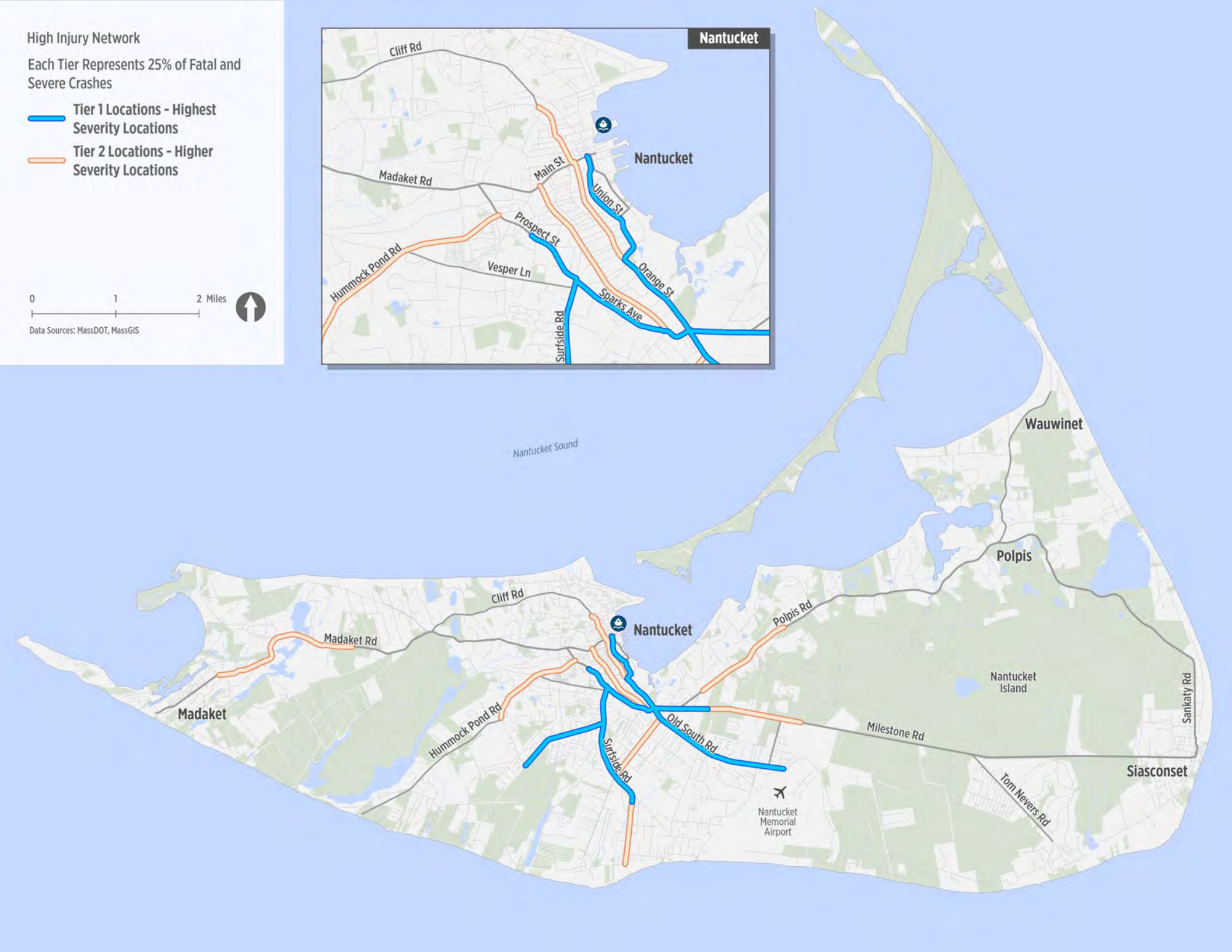
High Injury Network

In general, a high injury network (HIN) consists of a binary or tiered system showing which streets have a history of more frequent and more severe crashes. The primary goal of a HIN is to visually communicate where there is greater crash risk. This contrasts with the screening results presented above, which provide greater detail about individual location and can be more useful for evaluating risk in sub-areas or identifying specific crash patterns.

The HIN presented in Figure 13 uses the same data from the screening results to create a two-tiered HIN for Nantucket. To construct the HIN, the consultant team conducted a screening that included all reported crashes. This approach aggregated both roadway and intersections along corridors. The screening results were then ordered based on the weighted crash severity and grouped into a higher and lower tier that account for 50% of reported fatal and suspected severe crashes between 2018 and 2022.

- Tier I – Roads with the highest severity results. The roads account for 4.8% of Nantucket's centerline roadway miles and 25% of fatal and severe crashes.
- Tier II – Roads with the next highest severity results. The roads account for 4.8% of Nantucket's centerline roadway miles and another 25% of fatal and severe crashes.

The resulting HIN network identifies roadways highlighted in both the intersection and roadway screening and therefore provides a consolidated figure for communicating crash risk.


High Injury Network
Each Tier Represents 25% of Fatal and Severe Crashes
Tier 1 Locations - Highest Severity Locations
Tier 2 Locations - Higher Severity Locations
0
1
2 Miles
Data Sources: MassDOT, MassGIS
Nantucket
Cliff Rd
Madaket Rd
Main St
Union St
Prospect St
Hummock Pond Rd
Vesper Ln
Orange St
Sparks Ave
Surfside Rd
Nantucket
Nantucket Sound
Wauwinet
Polpis
Polpis Rd
Cliff Rd
Madaket Rd
Nantucket
Madaket
Hummock Pond Rd
Surfside Rd
Old South Rd
Nantucket Island
Milestone Rd
Sankaty Rd
Siasconset
Tom Nevers Rd
Nantucket Memorial Airport

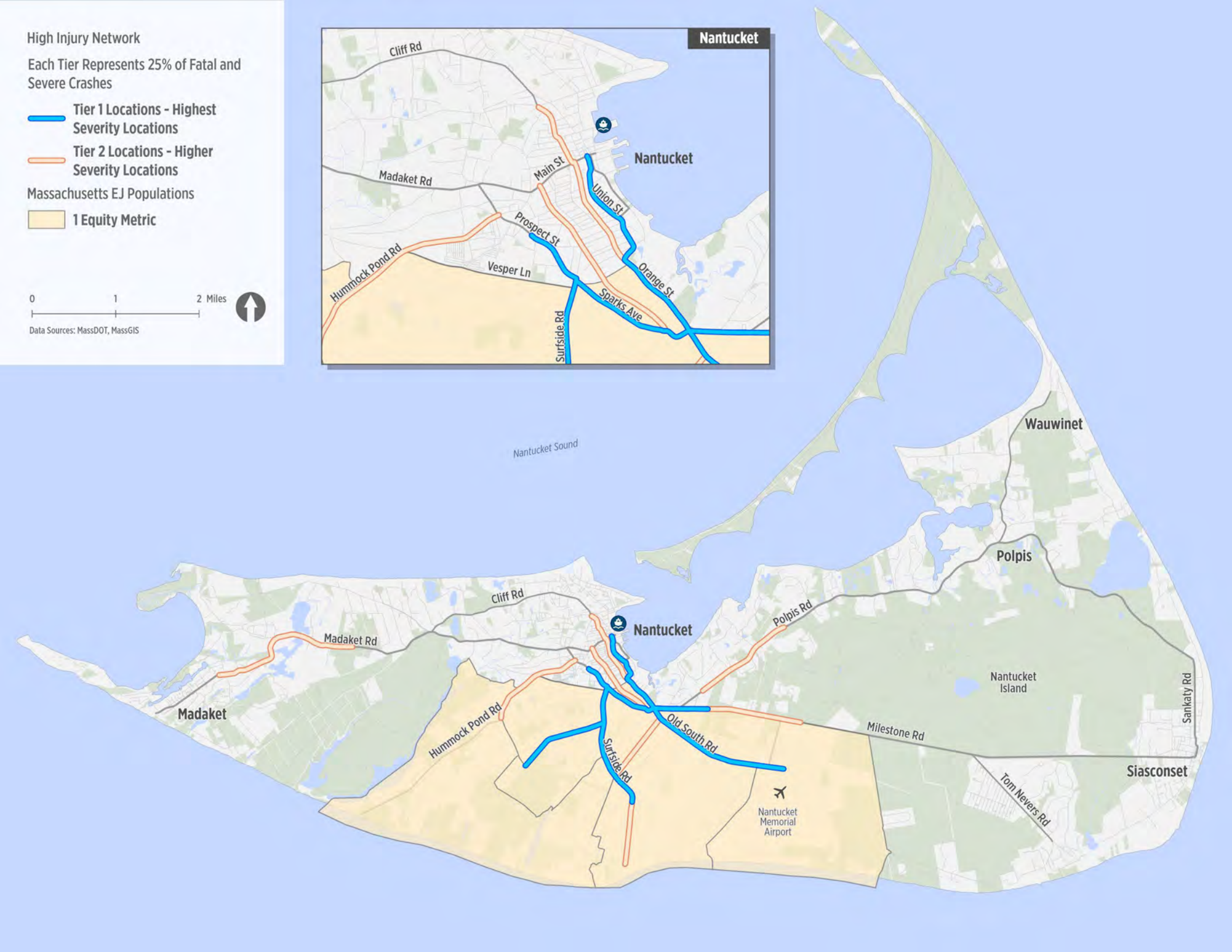
Equity Evaluation

The USDOT recommends using the Climate and Economic Justice Screening Tool[10] (CJEST) as the primary tool to identify disadvantaged communities. The screening tool does not identify any part of Nantucket as disadvantaged. While the Federal equity evaluations will be important for consideration for federal project funding, the CJEST may overlook communities of concerns in Nantucket. The Massachusetts Executive Office of Energy and Environmental Affairs (EEA) conducts its own evaluation which uses more detailed Census geography to identify environmental justice populations in Massachusetts.[11] It identifies several census block groups in the center of the island south of Milestone Road and on the southern half of the island as Vesper Lane as EJ populations due to a higher proportion of minority residents.

In addition, MassDOT is developing a more detailed environmental justice evaluation dataset called Regional Environmental Justice Plus (REJ+)[12]. This dataset identifies census block groups that fall into the highest quartile of each equity metric for each MPO region, effectively normalizing each equity metric within the context of Nantucket. This could be helpful in determining how best to target specific investments and safety strategies across Nantucket. The REJ+ dataset identifies one census tract on the northeast part of the island due to a relatively higher proportion of zero vehicle households. The REJ+ dataset also identifies multiple census tracts in the downtown region due to relatively higher proportions of disabled, nonwhite, or low-income residents.

Neither the CJEST nor the Massachusetts equity data fully accounts for seasonal workers, who come to Nantucket during the summer seasons, because they use residential populations data that tends to reflect full time residents. Season workers tend to be lower-income and less white than full time residents and are likely at increased safety risk relative to permanent residents and wealthier visitors. Season workers are more likely to rely on walking or biking as a primary mode of transportation and live on Nantucket during peak periods when crash frequency is higher. Furthermore, jobs that attract workers are concentrated in Nantucket along many of the same roads included in the HIN. This points to the potential of equity-oriented benefits by improving safety conditions along commercial corridors.

[10] https://screeningtool.geoplatform.gov/
[11] The EEA uses American Community Survey data to identify neighborhoods with EJ populations to support policy makers and state agencies. Results from the analysis are available at https://www.mass.gov/info-details/environmental-justice-populations-in-massachusetts.
[12] https://experience.arcgis.com/experience/8a2b92ad494b4dd59f01360aba165997/page/Page/?draft=true


High Injury Network
Each Tier Represents 25% of Fatal and Severe Crashes
Tier 1 Locations - Highest Severity Locations
Tier 2 Locations - Higher Severity Locations
Massachusetts EJ Populations
1 Equity Metric
0
1
2 Miles
Data Sources: MassDOT, MassGIS
Nantucket
Cliff Rd
Madaket Rd
Main St
Union St
Prospect St
Orange St
Hummock Pond Rd
Vesper Ln
Sparks Ave
Surfside Rd
Nantucket Sound
Wauwinet
Polpis
Polpis Rd
Madaket
Nantucket Island
Milestone Rd
Sankaty Rd
Siasconset
Old South Rd
Tom Nevers Rd
Nantucket Memorial Airport

Next Steps

The development of this memorandum will support the completion and adoption of a Safety Action Plan for each region. The consultant team will use the analysis results to inform future work in the project, including identifying potential strategies to improve safety generally and at specific locations. The next task in this project includes reviewing materials with different stakeholder groups, identifying similar roadway and intersections typologies across Franklin County, Martha's Vineyard, and Nantucket, and selecting engineering and other strategies that would be appropriate based on local context.

Summary of Supplemental Crash Maps: Nantucket

Animal-involved Crashes

- Animal-involved crashes account for approximately 8% of the total crashes on the island in the five-year analysis window.
    - All but two of the animal-involved crashes involved deer.
- Animal-involved crashes are rarely injurious to drivers and passengers on the island; 96% resulted in only property damage.
    - Animal-involved crashes were concentrated on Milestone Road, Polpis Road, and Hummock Pond Road.
    - The intersection of Milestone Road and Tom Nevers Road is a particularly concentrated location for these crashes.

All Driver Distraction Crashes

- There were 262 crashes in the five-year analysis period which involved at least one driver who was distracted. This represents 26% of the total crashes documented during this time period.
    - The most common form of distraction reported was cell phones or other electronic devices. This accounts for 70% of all distraction-related crashes, and 18% of the total crashes in the analysis period.
    - Other common distraction types were distractions external to the vehicle and drivers focused on other activities in the vehicle, like eating or person hygiene. 15 crashes involved drivers subjected to multiple different distractions simultaneously.

  Distraction-related crashes were concentrated on the main roads across the island and throughout the downtown area. There are also numerous crashes on neighborhood streets which involved drivers distracted by cell phones or electronic devices.
- 6 crashes involving driver distraction resulted in a fatal or serious injury (FSI). This accounts for 2% of distraction-related crashes and less than 1% of the total crashes in the analysis period.
    - All six fatal and serious injury crashes involved cell phone or electronic device distraction.
        - 2 of these crashes occurred on Madaket Road
        - 2 others occurred on Orange Street

        - There were also FSI crashes involving distraction on Monohansett Road and Sparks Avenue (1 each)
- 39 crashes involving driver distraction resulted in at least one injury. This accounts for 15% of distraction-related crashes and 4% of the total crashes in the analysis period.
    - 67% of these crashes involved distraction by a cell phone or other electronic device and 21% involved a distraction external to the vehicle.
        - There are concentrations of these crashes spread throughout the island.

<u>Driver Distraction Crashes Involving a Vulnerable Road User</u>

- 15 of the 262 total crashes on the island which involved distracted driving also involved a vulnerable road user. This represents 6% of distraction-related crashes and 1.5% of the total crashes on the island in the five-year analysis period.
    - A VRU is a non-motorist and refers to individuals such as pedestrians, bicyclists, anyone working along a road, individuals on skateboards, scooters, roller skates, wheelchairs, and other micromobility devices.
        - 9 distraction-induced crashes involved a bicyclist
        - 6 distraction-induced crashes involved a pedestrian
    - Each of these fifteen crashes involved either driver distraction caused by a cell phone/electronic device or a distraction external to the vehicle.
    - Nine of the fifteen crashes resulted in some sort of injury, though no fatal or serious injuries were reported among these crashes.
        - Of the nine injurious crashes, six involved drivers distracted by a cell phone or electronic device and three involved drivers distracted by something external to the vehicle.
    - These fifteen crashes were generally geographically dispersed, with some concentrated along Surfside Road and others concentrated near the roundabout at Milestone Road, Old South Road, Sparks Avenue, and Orange Street.

General Disclaimer: Some forms of distraction, such as external distractions or cell phone-related distractions, may rely on driver self-reporting to be included in the analyzed crash data. As a result, these findings may underreport trends in distraction-related crashes across the island.

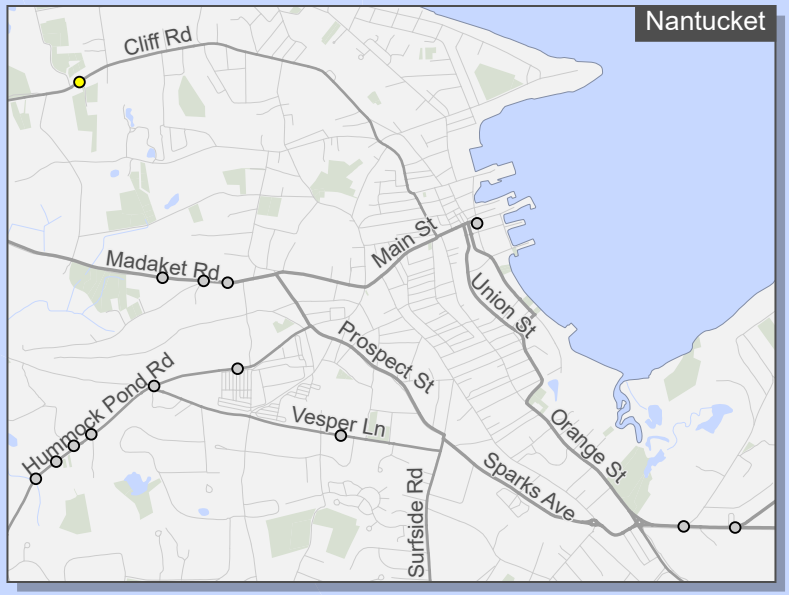
Animal-Involved Crashes

78 out of 1023 Crashes

- Fatal Injury Crash (0)
- Serious Injury Crash (2)
- Minor Injury Crash (0)
- Possible Injury Crash (1)
- No Injury Reported (75)

0 1 2 Miles

Data Sources: MassDOT, MassGIS
Note: Some Crashes Missing Geocoding



Nantucket Sound

Cliff Rd
Madaket Rd
Polpis Rd
Hummock Pond Rd
Surfside Rd
Old South Rd
Milestone Rd
Sankaty Rd
Tom Nevers Rd
Nantucket Memorial Airport

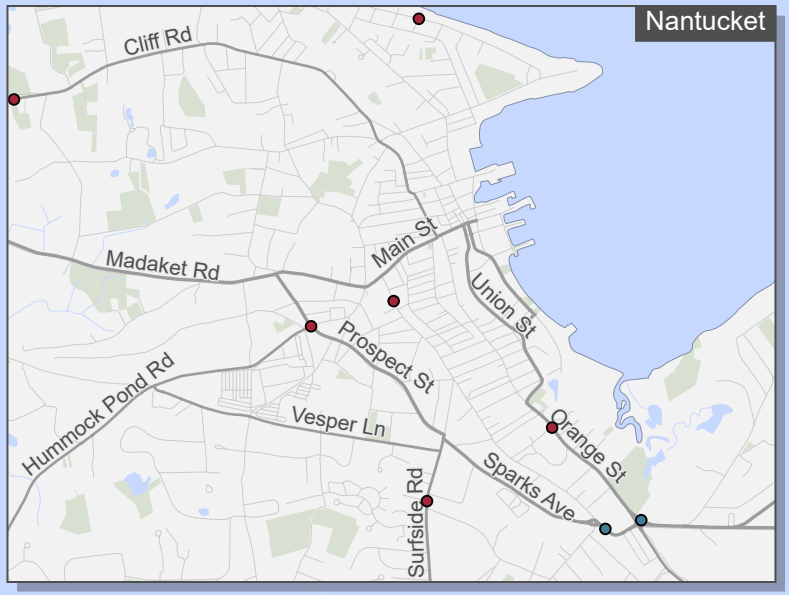
Crashes Involving Driver Distraction and a VRU

15 out of 1023 Crashes

- Cell Phone or Other Electronic Device (10)
- External Distraction (5)
- Other activity (0)
- Passenger (0)
- Multiple Distraction Types (0)

0 1 2 Miles

Data Sources: MassDOT, MassGIS
Note: Some Crashes Missing Geocoding



Nantucket Sound

Cliff Rd
Madaket Rd
Hummock Pond Rd
Surfside Rd
Old South Rd
Polpis Rd
Milestone Rd
Tom Nevers Rd
Sankaty Rd
Nantucket Memorial Airport

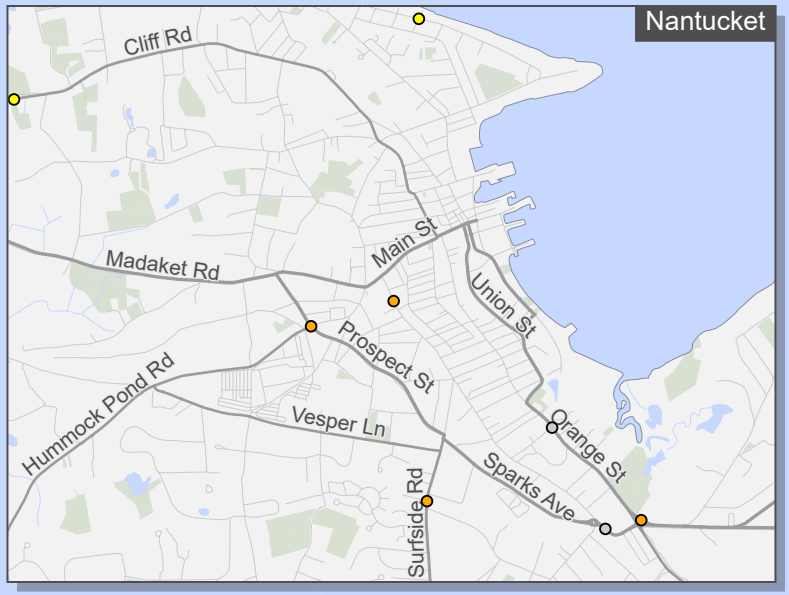
Crashes Involving Driver Distraction and a VRU

15 out of 1023 Crashes

- Fatal Injury Crash (0)
- Serious Injury Crash (0)
- Minor Injury Crash (7)
- Possible Injury Crash (2)
- No Reported Injury (6)

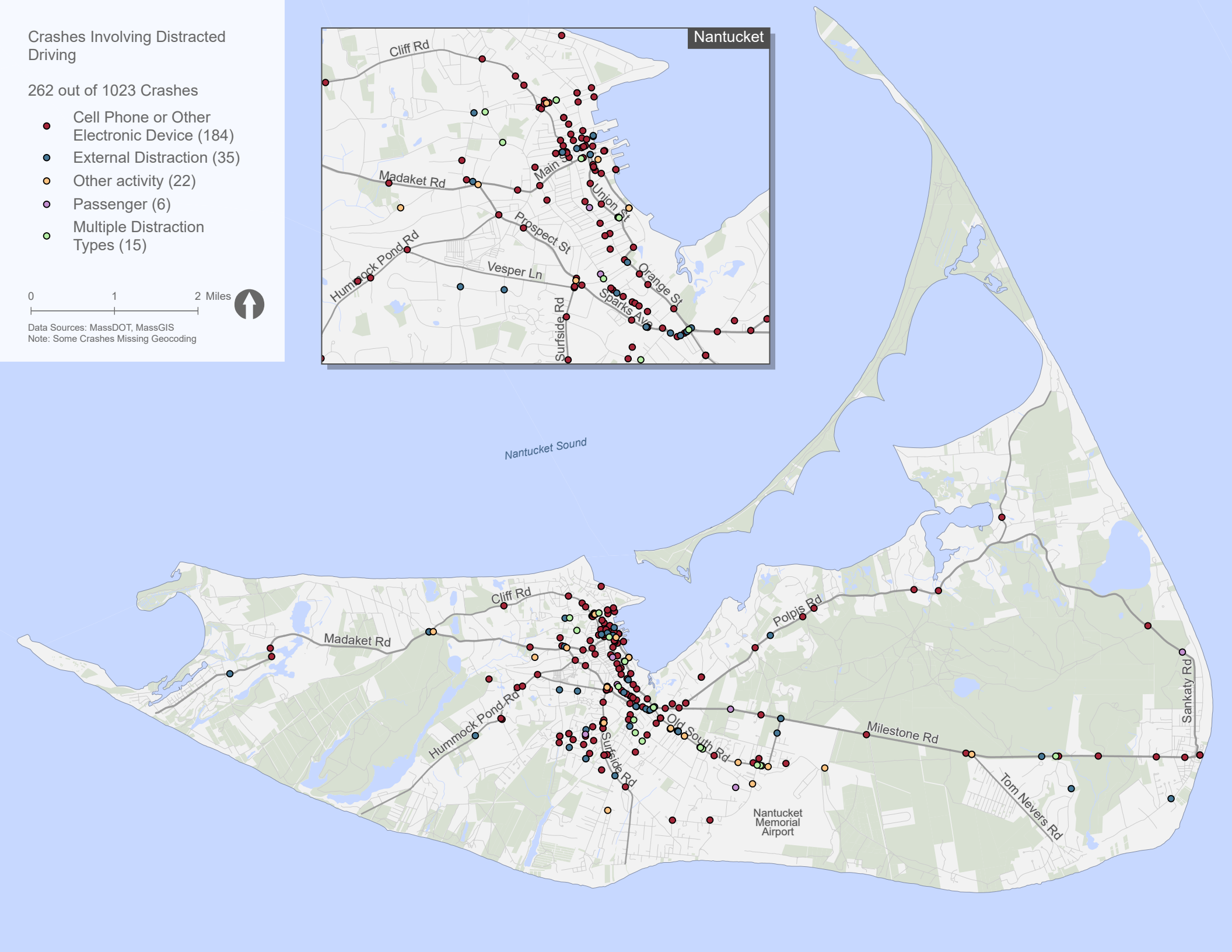
0 1 2 Miles

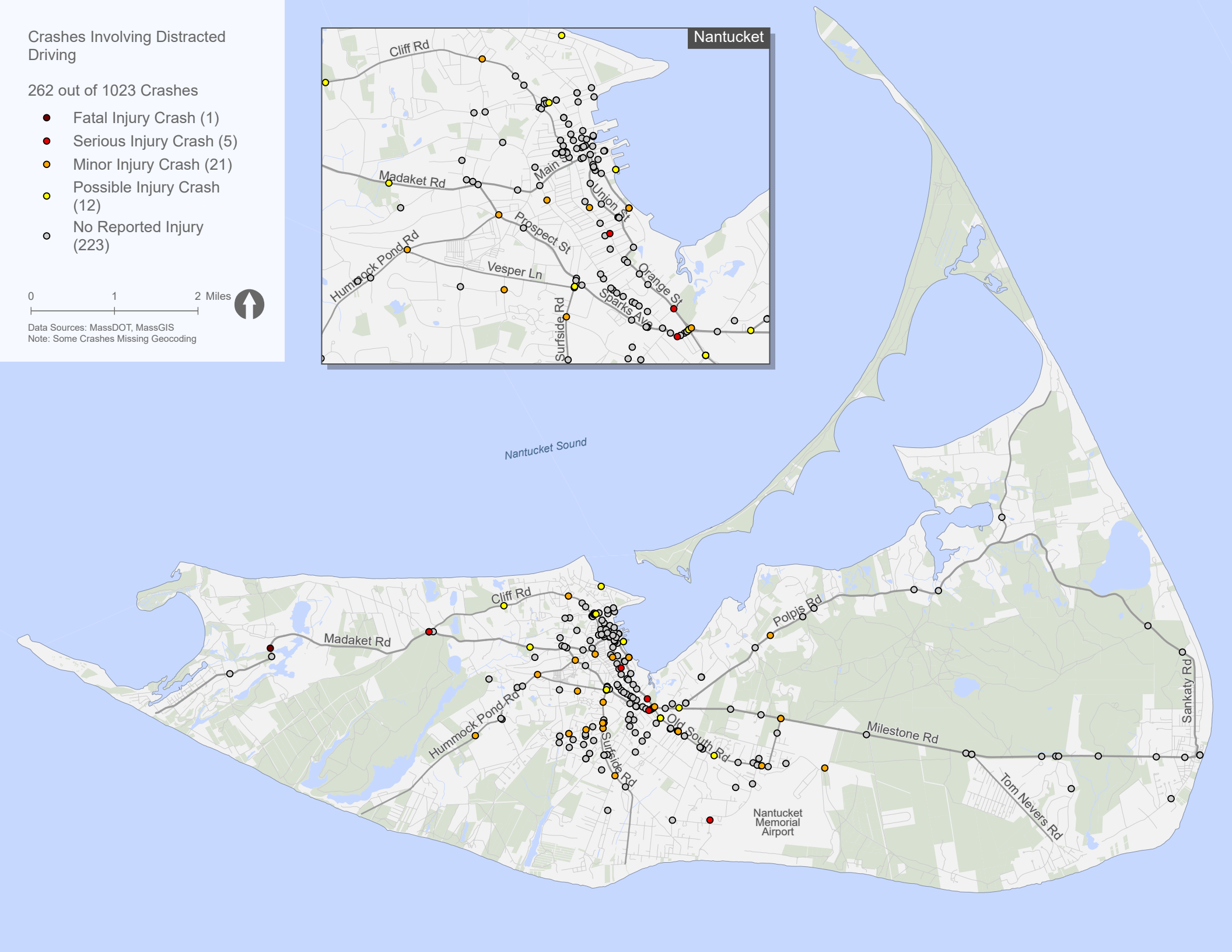
Data Sources: MassDOT, MassGIS
Note: Some Crashes Missing Geocoding



Nantucket Sound

Cliff Rd
Madaket Rd
Polpis Rd
Hummock Pond Rd
Surfside Rd
Old South Rd
Milestone Rd
Sankaty Rd
Tom Nevers Rd
Nantucket Memorial Airport


Crashes Involving Distracted Driving
262 out of 1023 Crashes
Cell Phone or Other Electronic Device (184)
External Distraction (35)
Other activity (22)
Passenger (6)
Multiple Distraction Types (15)
0
1
2 Miles
Data Sources: MassDOT, MassGIS
Note: Some Crashes Missing Geocoding
Nantucket
Cliff Rd
Madaket Rd
Main St
Union St
Prospect St
Hummock Pond Rd
Vesper Ln
Orange St
Sparks Ave
Surfside Rd
Nantucket Sound
Polpis Rd
Milestone Rd
Sankaty Rd
Old South Rd
Tom Nevers Rd
Nantucket Memorial Airport


Crashes Involving Distracted Driving
262 out of 1023 Crashes
Fatal Injury Crash (1)
Serious Injury Crash (5)
Minor Injury Crash (21)
Possible Injury Crash (12)
No Reported Injury (223)
0
1
2 Miles
Data Sources: MassDOT, MassGIS
Note: Some Crashes Missing Geocoding
Nantucket
Cliff Rd
Madaket Rd
Main St
Union St
Prospect St
Hummock Pond Rd
Vesper Ln
Orange St
Sparks Ave
Surfside Rd
Nantucket Sound
Polpis Rd
Old South Rd
Milestone Rd
Sankaty Rd
Tom Nevers Rd
Nantucket Memorial Airport