NORTH CAROLINA
Department of Transportation

NCDOT IMD – Innovations & Data Branch

Sarah Searcy – Deputy Director for Innovations & Data

June 16th, 2022

Agenda

- NCDOT IMD – Mission, Vision, and Goals
- Division Organization
- Innovations & Data Branch and Sections
  - Overview and Goals
  - Projects, Activities, and Initiatives
- Looking to the Future

Integrated Mobility Division
N.C. DEPARTMENT OF TRANSPORTATION

Mission: Provide leadership for safe, affordable, and **innovative** multimodal transportation throughout North Carolina

Vision

- No remaining transportation barriers or unmet needs.
- Technology and innovation make all modes of transportation quicker, cleaner, cheaper, more convenient, and safer.
- Shared mobility options are better than driving in terms of time, convenience, cost, and safety.
- All transportation users are accommodated safely.
- Residents are happier, healthier, and more likely to participate and succeed in the economy.

Core Goals:

Increase Access

Enhance Quality of Life

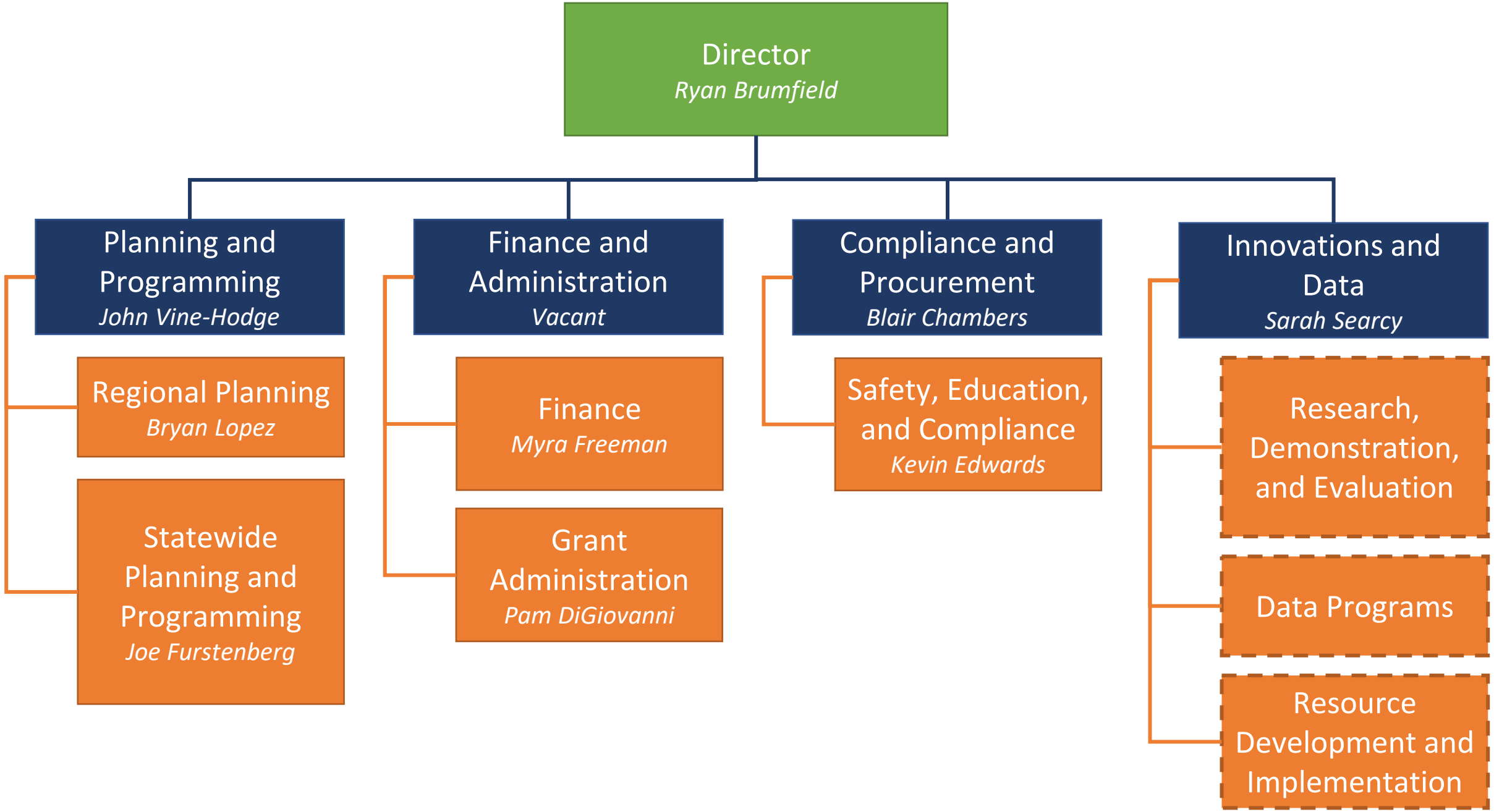
Ensure Safety

Integrated Mobility Division

Mission:
To provide leadership for safe, affordable, and **innovative** multimodal transportation throughout North Carolina.

Innovations and Data Branch

Mission:
Direct and manage research activities, pilot and demonstration projects, and data programs to advance the implementation of best practices in support of safe, affordable, and innovative multimodal transportation throughout North Carolina.


Director
Ryan Brumfield
Planning and Programming
John Vine-Hodge
Regional Planning
Bryan Lopez
Statewide Planning and Programming
Joe Furstenberg
Finance and Administration
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Myra Freeman
Grant Administration
Pam DiGiovanni
Compliance and Procurement
Blair Chambers
Safety, Education, and Compliance
Kevin Edwards
Innovations and Data
Sarah Searcy
Research, Demonstration, and Evaluation
Data Programs
Resource Development and Implementation

Innovations and Data Branch

Research, Demonstration, and Evaluation

- New Mobility
  - Connected Autonomous Vehicles (CAV)
  - Mobility as a Service (MaaS)
  - Microtransit
- Zero Emission Vehicles (ZEV)
  - NC Clean Transportation Plan
  - Fleet Transition Plans

Data Programs

- Bicycle and Pedestrian
  - Crash Data
  - Infrastructure Network Data
  - Volume Data
- Transit
  - Maintenance Data
  - Utilization Data
  - Service Data
  - Financial Data

Resource Development and Implementation

- Policy Analysis
- Concept Development
- Strategic Planning and Outreach

IMD's Innovation Process

- Understand emerging mobility trends and challenges
- Develop ideas
- Secure funding
- Pilot innovations
- Shape new policy, deploy proven concepts broadly, and disseminate best practices

Recent Examples

Mobility for All

NCCARE360

ICPTA

RIDE

Powered by Via

AM ACCELERATING INNOVATIVE MOBILITY

WILSON NORTH CAROLINA

cassi

Connected Autonomous Shuttle Supporting Innovation

cte

CENTER FOR TRANSPORTATION AND THE ENVIRONMENT

AppalCART

NORTH CAROLINA HOKE COUNTY

Innovations and Data Branch

Research, Demonstration, and Evaluation

Connected Autonomous Vehicles (CAV)

cassi

Connected Autonomous Shuttle Supporting Innovation

Why this project?

PILOT: LEARNING ABOUT AV

LEARN ACROSS DOT AGENCY

EVALUATE SAFETY

FIRST MILE/LAST MILE

SOLUTION FOR LIMITED MOBILITY

PED AND VEHICULAR INTERACTIONS WITH AV

INFRASTRUCTURE NEEDS

STUDY VARIOUS TRANSIT USE CASES

PROVIDING OPPORTUNITIES FOR PARTNERS

ADVANCE TECHNOLOGY

INFORM POLICY AND RULEMAKING

Automated vehicles that accurately detect, recognize, anticipate, and respond to the movements of all transportation system users could lead to breakthrough gains in transportation safety.

cassi
Connected Autonomous Shuttle Supporting Innovation

Project Goals

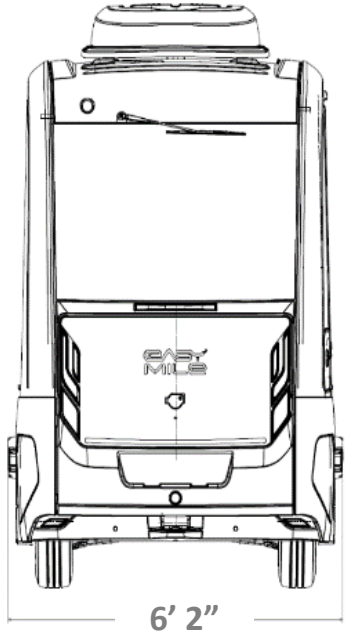
Integrated Mobility Division
N.C. DEPARTMENT OF TRANSPORTATION

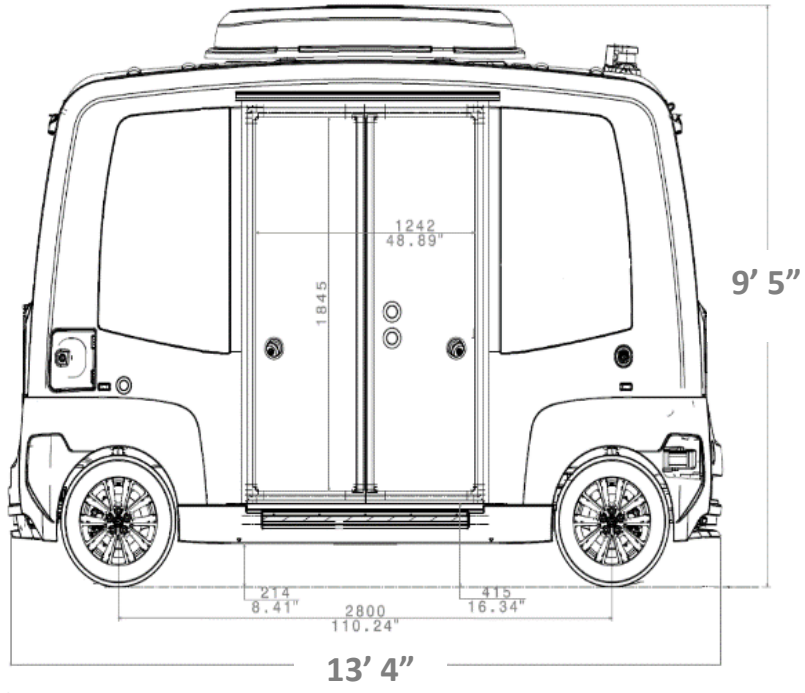
Advanced Tech	Preparing for the future – Deploy leading forward thinking AV technology in NC
Mobility/Safety	Improve mobility and safety for North Carolina residents
Long Term Plan	Develop best practices for long term AV planning
Transit	Launch/deploy AV shuttles for transportation into multiple locations across the state
Progress	Advance the industry with successful deployments

cassi
Connected Autonomous Shuttle Supporting Innovation

The Shuttle

- EasyMile EZ10 Gen3 vehicle
- Low-speed, electric, driverless shuttle
- Level 4 automation
- Transport up to 6 people plus the operator
- 12 mph top speed
- Fixed route – pre-determined, pre-mapped
- Up to 16 hours of operations
- ADA compliant with access ramp





Deployment 1: NCDOT Transportation Summit Convention Center, Raleigh

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Connected Autonomous Shuttle Supporting Innovation

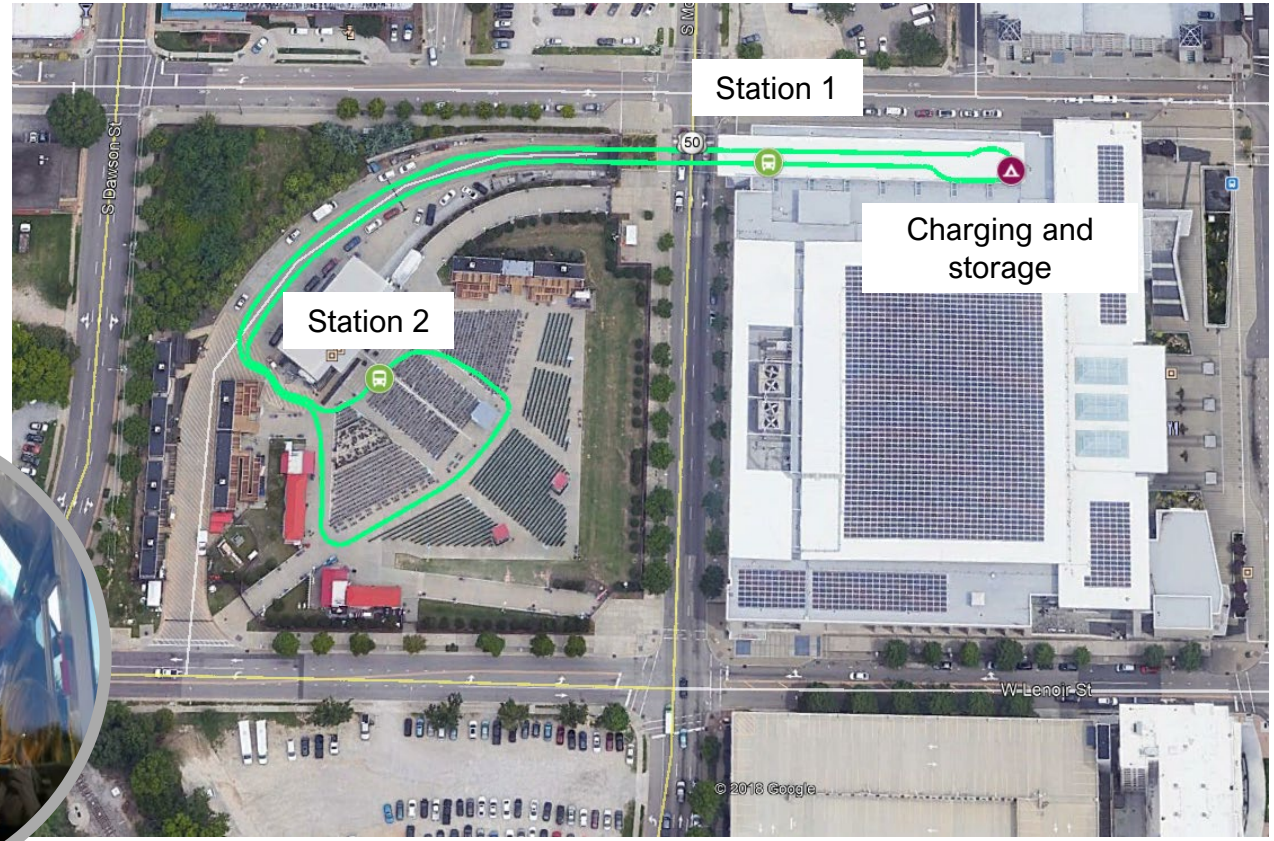
Dates: January 8-9, 2020

Ridership: around 300

Length: 2,000 feet

Speed: 7-8 mph

Available for Transportation Summit attendees



Deployment 2: NCSU Centennial Campus

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Connected Autonomous Shuttle Supporting Innovation

Dates: Jan 21-Feb 25, 2020
(operations for 3 weeks)

Feb 25, 2020
(NHTSA suspension)

March 10, 2020
(Governor's COVID-19 SOE)

Ridership: 260

Length: 0.8 mi

Speed: 10 mph

Open to public

NC STATE UNIVERSITY

Deployment 3: Wright Brothers National Memorial

cassi
Connected Autonomous Shuttle Supporting Innovation

Dates: April 20-July 16, 2021 (operations for 13 weeks)

Ridership: 3,335 (with COVID-19 capacity restrictions)

Length: 1.2 mi

Speed: 10-12 mph

Open to public

First autonomous shuttle deployment at a National Parks site

Survey responses: 364

Evaluation and Lessons Learned

- Technology
- Route Design
- Infrastructure
- Operations
- Regulatory
- Public Perception

First in Flight, First in Automation:
NCDOT and NPS Pilot an Automated Shuttle at the Wright Brothers National Memorial

Joshua Cregger, Kendall Mahavier, Amalia Holub, Elizabeth Machek, Travis Crayton, Rahi Patel, Stephanie Sudano, Amanda Good, Katie Wong, and Steve Suder

FINAL REPORT — May 2022
DOT-VNTSC-NPS-22-02
WRBR 361/180195

Prepared for:
National Park Service
Washington Support Office
Washington, DC

North Carolina Department of Transportation
Integrated Mobility Division
Raleigh, NC

U.S. Department of Transportation
Volpe Center

Link to Report

National Park Service
U.S. Department of the Interior

Park Planning, Facilities and Lands Directorate
Park Facility Management Division
Washington, D.C.

National Park Service

Automation in Our Parks: Automated Shuttle Pilots at Yellowstone National Park and Wright Brothers National Memorial

June 2022

Link to Report

Innovations and Data Branch

Research, Demonstration, and Evaluation

Mobility as a Service (MaaS)

Mobility as a Service (MaaS)

Mobility as a Service (MaaS) is "an **integrated** mobility concept in which travelers can access their **transportation modes** over a single **digital interface**. MaaS primarily focuses on passenger mobility, allowing travelers to seamlessly **plan, book, and pay** for travel on a pay-as-you-go and/or subscription basis."

Source: National Center for Applied Transit Technology's "Mobility as a Service: Now and in the Future" White Paper
Free Download: https://n-catt.org/resources/mobility-as-a-service-now-and-in-the-future/

IMD's Transit Technology Vision

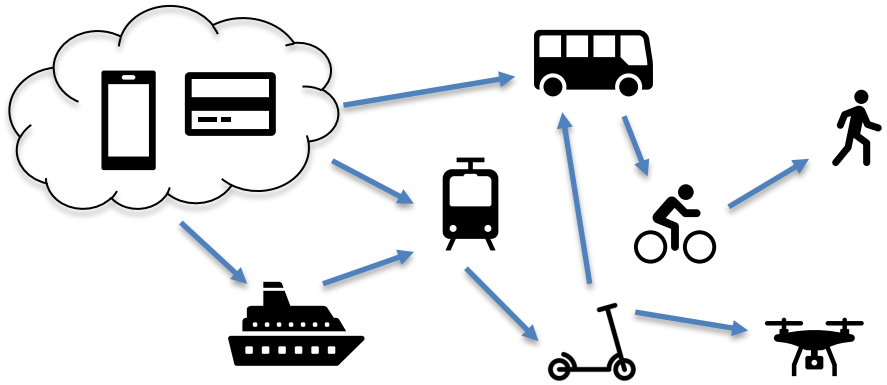
- Anyone can plan, book, and pay for travel across all modes of transportation in one place
- On-demand transit (day-of or hour-of pickup) statewide with seamless cross-jurisdiction trips
- Statewide advanced scheduling software connected by Mobility-as-a-Service (MaaS)

Mobility as a Service (MaaS) Levels

Source: Jana Sochor, Hans Arby, MariAnne Karlsson, and Steven Saranini, "A topological approach to Mobility as a Service: A proposed tool for understanding requirements and effects, and for aiding the integration of societal goals," 1st International Conference on Mobility as a Service, Tampere, Finland, November 28-29, 2017.

IMD's Mobility as a Service (MaaS) Initiatives

- Level 1 MaaS Virtual Training
- Request for Information (RFI)
- Statewide Feasibility Study
- Statewide Transit Software Solution RFP



Innovations and Data Branch

Research, Demonstration, and Evaluation

Microtransit

Microtransit Overview

A technology-enabled transit service that typically uses shuttles or vans to provide pooled on-demand transportation with dynamic routing.

While it uses similar technology such as a mobile app for requesting and scheduling rides, microtransit is different than a rideshare like Uber or Lyft:

- Typically subsidized
- Operates in defined service zones
- Combines trips rather than serving single trips
- Provides lower fares
- Employs professional drivers and dedicated vehicles

Service Models

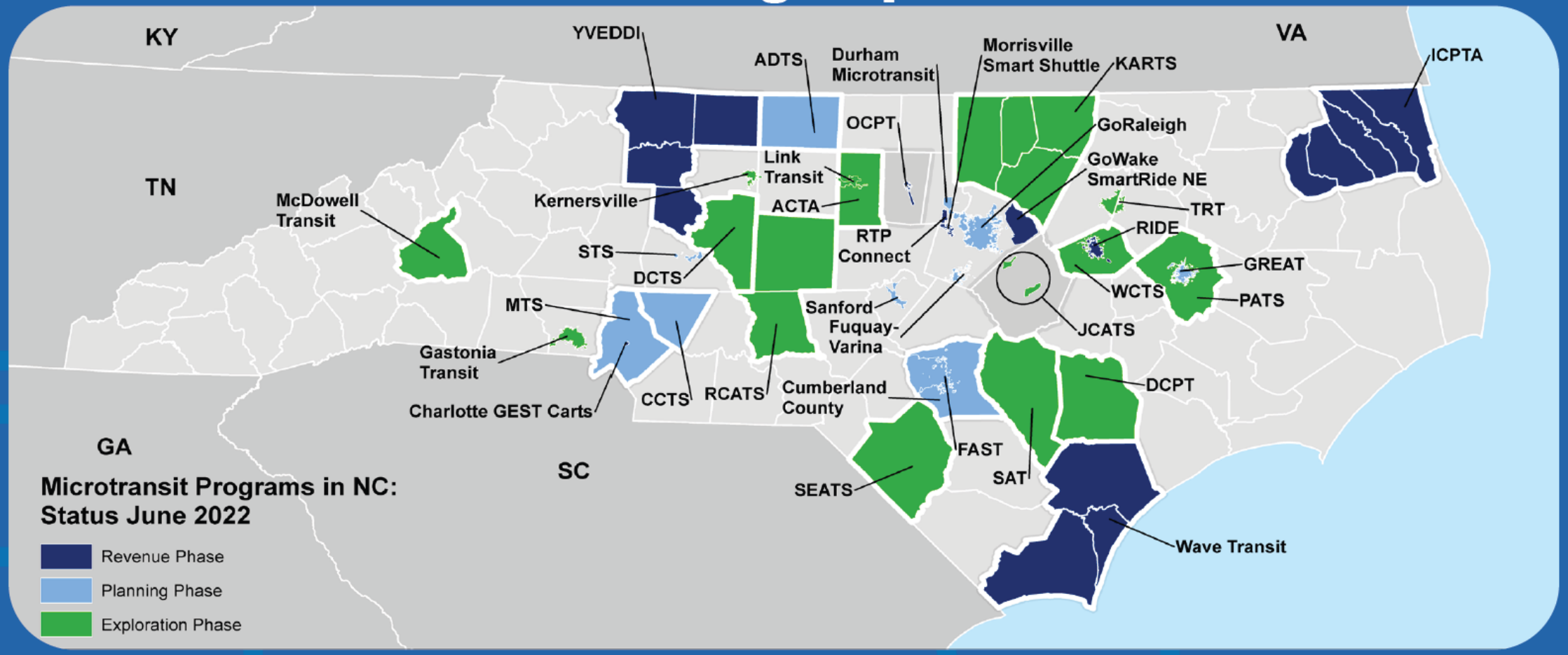
Software as a Service (SaaS)

Provides the software and the transit agency provides the drivers, vehicles, and operations management.

Transportation as a Service (TaaS) / Turnkey

Provides the drivers, vehicles, software, and operations management as a turnkey solution on behalf of the transit agency.

Where is microtransit being implemented?



Subject to change as additional projects are initiated and implemented.

North Carolina Examples

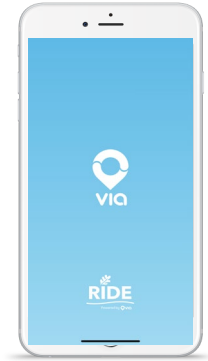
IMD's Key Roles in Wilson Microtransit

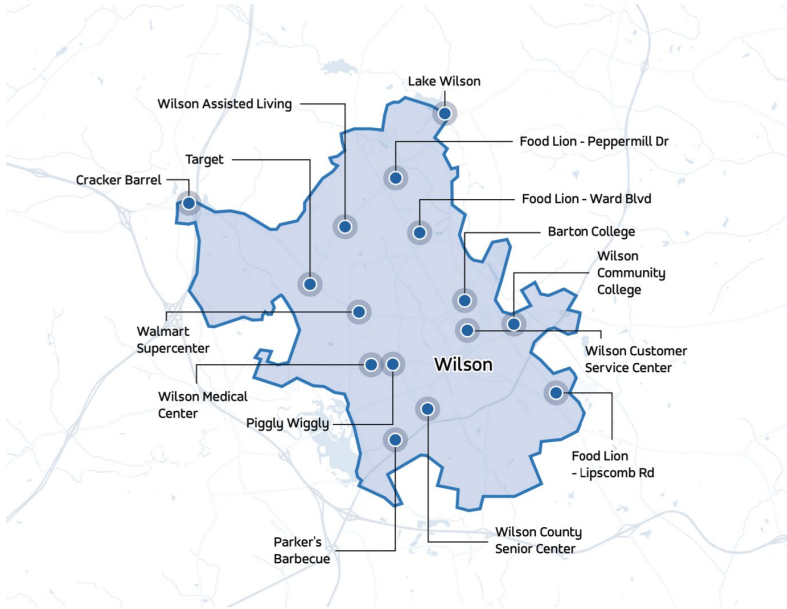
Funding

- State and federal support through NCDOT
- September 2020 – FTA awarded NCDOT and Wilson a competitive grant for $250,000 as part of the Accelerating Innovation Mobility program

Technical Assistance

- Ensuring compliance with federal and state requirements





IMD's Microtransit Initiatives

- Feasibility/Service Planning Studies
- Research Study – *Public Microtransit Pilots in the State of North Carolina: Benefits, Costs and Lessons Learned* (ITRE/NC State University)
- USDOT Rural Surface Transportation Grant Application – Mobility for Everyone, Everywhere in North Carolina (MEE NC)

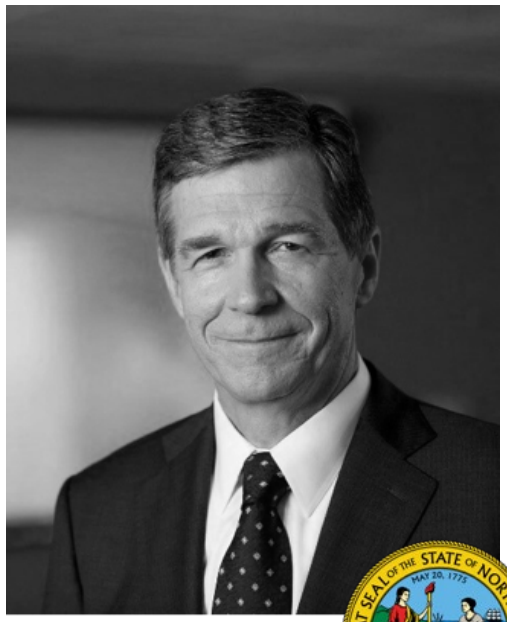
Innovations and Data Branch

Research, Demonstration, and Evaluation

Zero Emission Vehicles (ZEV)

NC Clean Transportation Plan
Fleet Transition Plans

Executive Orders



Gov. Roy Cooper

2018

EO 80

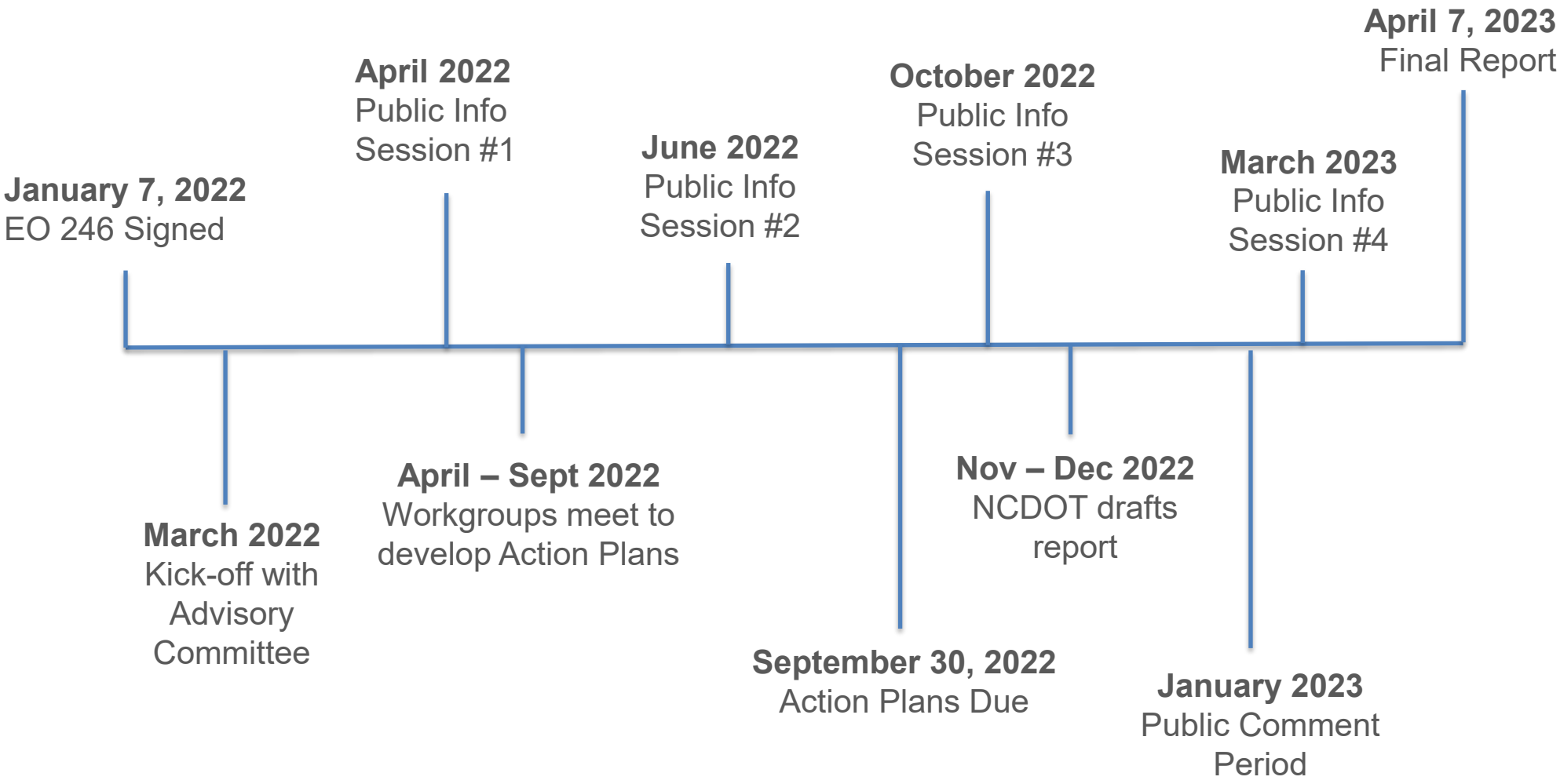
- Reduce economy wide emissions by 40% below 2005 levels by 2025
- Increase total number of registered ZEVs to at least 80,000 by 2025
- Reduce energy consumption in state-owned buildings by 40% below 2002-2003 levels

2022

EO 246

- Reduce economy wide emissions by **50%** below 2005 levels by **2030**
- Increase total number of registered ZEVs to at least **1.25 million by 2030**
- Increase the sale of ZEV so that **50% of in-state sales** are zero emission by 2030

NCCTP Timeline







Working Group Topic Areas

Light Duty ZEV

- Focus on light duty vehicle transition
- Vehicle availability and consumer education
- Incentives and affordable financing options

Medium/HD ZEV

- Builds off the multistate M/HD MOU
- Environmental Justice outreach to impacted communities
- Includes low-carbon fuels

Fleet Transition

- Public entities (state and local fleets)
- Private entities
- School buses

Vehicle Miles Traveled

- Builds off existing VMT Task Force
- Includes transit, bike-ped, passenger rail and other non-vehicle transportation modes

Clean Transportation Infrastructure

- EV Charging Infrastructure
- Alternative fuels infrastructure
- mapping, siting and identification of gaps

Fleet Transition Work Group

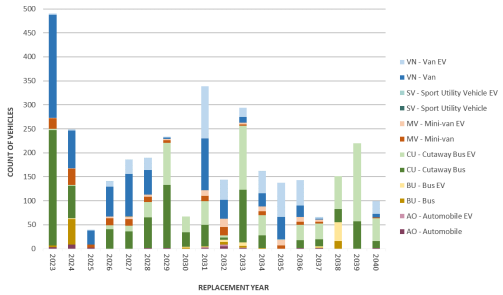
- **Action:** Work with public and private entities to accelerate the transition to zero- and low-emission fleet vehicles – includes public (state and local) and private fleets and school buses
- **Goal:** Develop aspirational targets with corresponding actions that address future purchase and replacement of internal combustion engine (ICE) fleet vehicles with fully electric plug-in or plug-in-hybrid electric vehicles and investment in charging infrastructure
- **Six workgroup meetings** (two hours each) with a co-creation approach to author an Action Plan
  - Working group creates the content
  - Staff and consultant support to wrap the content in narrative using a consistent outline

ZEV Transit Fleet Transition Plans

FTA Requirement under the Bipartisan Infrastructure Law (BIL)

- The BIL requires that any application for projects related to zero-emission vehicles under the FTA's Grants for Buses and Bus Facilities Competitive Program (49 U.S.C. § 5339(b)) and the Low or No Emission Program (49 U.S.C. § 5339(c)) include a Zero-Emission Transition Plan.
  - ITRE assisted to develop a statewide plan that meets the minimum requirements to use for grant submittals that was finalized in May 2022.

2025	5% ZEV
2030	50% ZEV
2040	75% ZEV
2050	100% ZEV



HOPE Grant – "Mountains to Sea: Electrifying North Carolina's Transit Fleets"

CENTER FOR TRANSPORTATION AND THE ENVIRONMENT

AppalCART

NORTH CAROLINA HOKE COUNTY

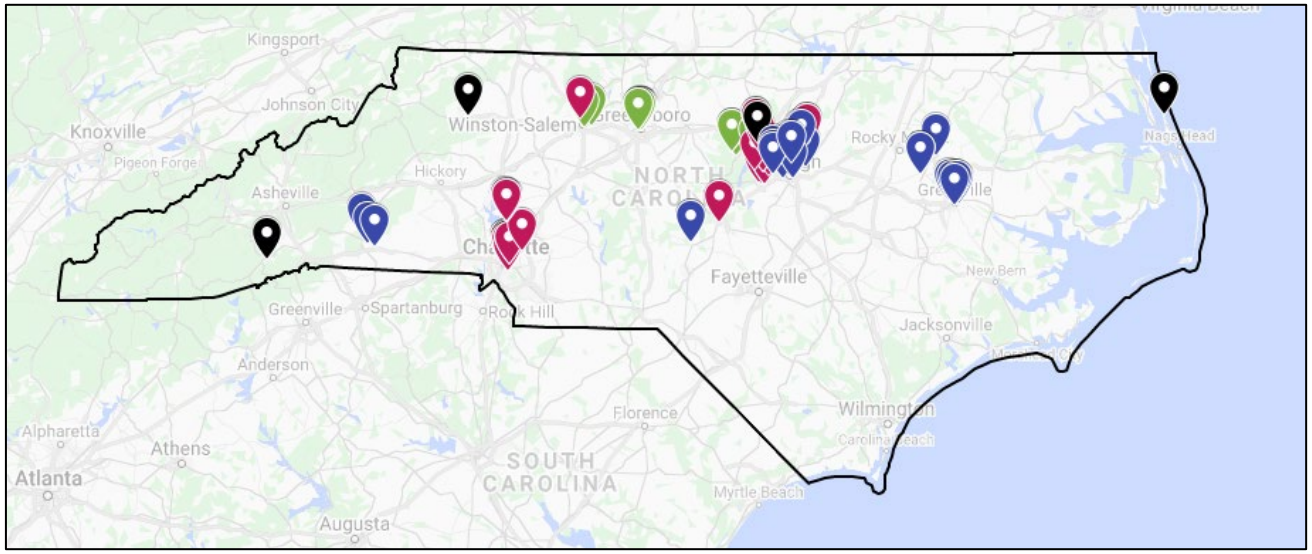
- The Center for Transportation and the Environment (CTE) will assist the Division to develop plans for AppalCART in Watauga County and the Hoke Area Transit Service (HATS) in Hoke County.

Innovations and Data Branch

Data Programs

Bicycle & Pedestrian

North Carolina Non-Motorized Volume Data Program (NC NMVDP)

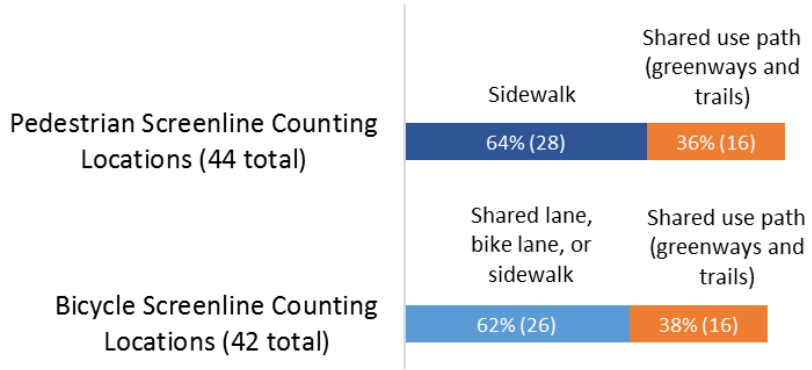


NCDOT-Purchased Counters in the NC NMVDP:

- **Eco-Counter MULTI Systems**
  - Passive infrared pedestrian sensors and inductive loop bicycle sensors
- **48 Counting Locations** (Stations)
- **71 Counting Systems** (Loggers)
- **141 Total Sensors**

20+ additional counting locations were onboarded into the program that were purchased/installed by local agencies in the state.

Screenline Counting Locations by Mode and Facility Type (NC NMVDP Phase 1 & 2)



Phase 1 & 2 Agencies

- Winston-Salem
- Greensboro
- DCHC MPO
- *Durham*
- *Brevard*
- *North Wilkesboro*
- *Duck*
- Charlotte
- Davidson
- Sanford
- CAMPO

Bicycle and Pedestrian Counting Technologies

Technology Type	Common Manufacturers	User Type	Duration	Typical Uses
Infrared (Active and Passive)	• TRAFx • EcoCounter • TrailMaster	*Does not automatically distinguish between peds/bikes.*	Short or long	Sidewalk or shared-use path
Pneumatic Tubes	• EcoCounter • MetroCount • TRAFx • Road Sys		Short	On-road
Inductive Loop	• EcoCounter • Road Sys		Long	On-road or paved shared-use path
Magnetometer	• TRAFx		Long	Shared-use path
Piezoelectric	• MetroCount		Long	On-road
Radar Sensors	• Sensys Networks		Long	On-road
Thermal Imaging	• FLIR		Long	On-road
Video Imaging	• Miovision		Short or long	On-road

Louch, H., David, B., Voros, K., O'Toole, K., & Piper, S. (2016). Innovation in Bicycle and Pedestrian Counts: A Review of Emerging Technology. Alta Planning and Design.

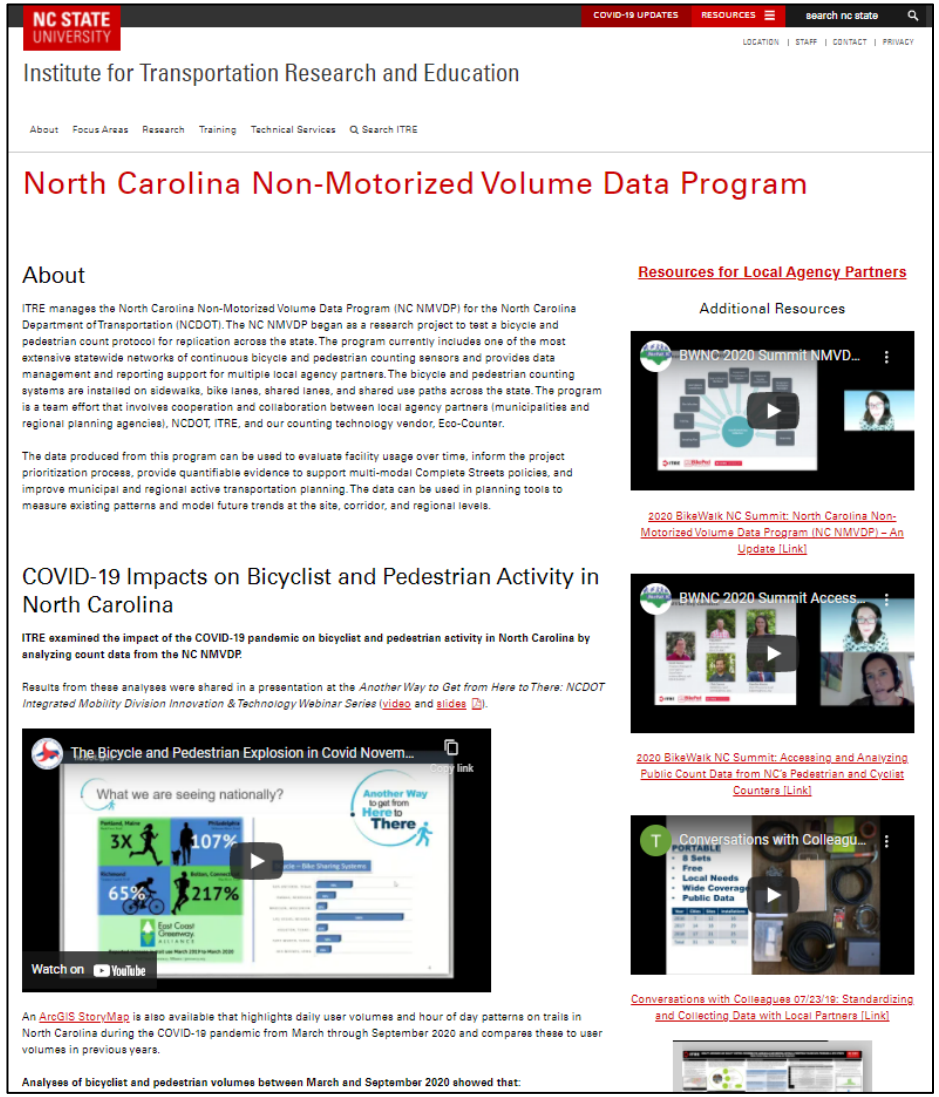
Counters used in the NC NMVDP

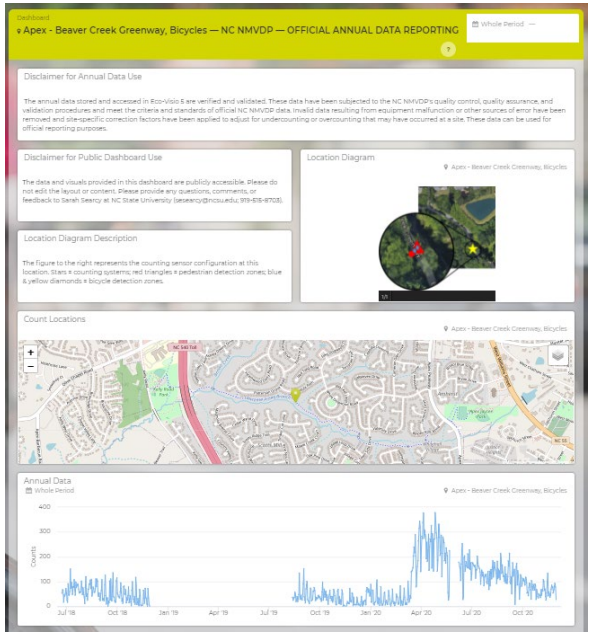
Eco-Counter MULTI Systems

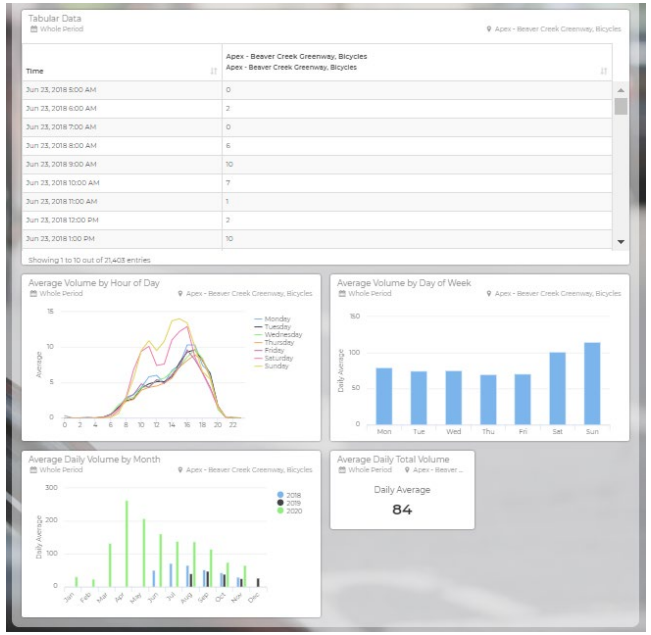
- Passive infrared pedestrian sensors and inductive loop bicycle sensors

Learn more about counting technologies and field test results from North Carolina → **go.ncsu.edu/bikepedcounters**

North Carolina Non-Motorized Volume Data Program (NC NMVDP)



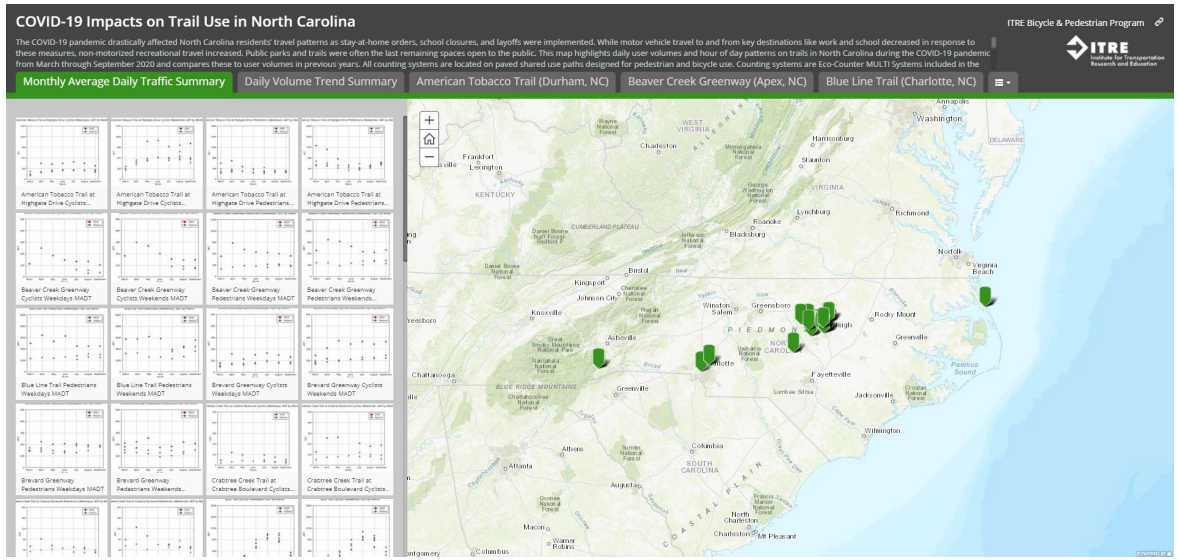


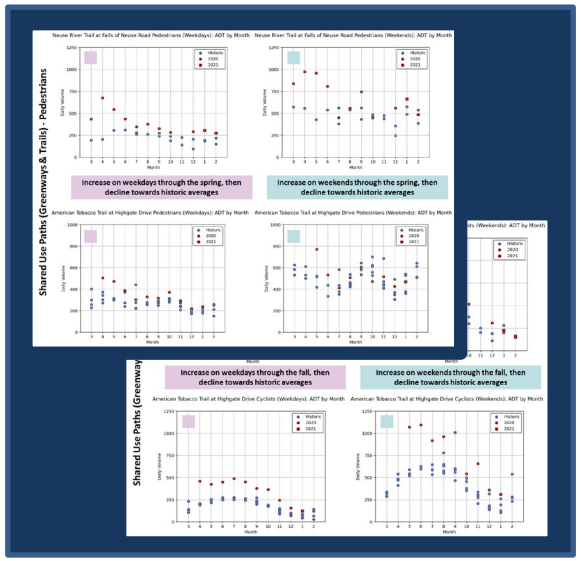


Access the quarterly and annual data reports from the NC NMVDP

go.ncsu.edu/nmvdp

NC NMVDP Count Data Applications





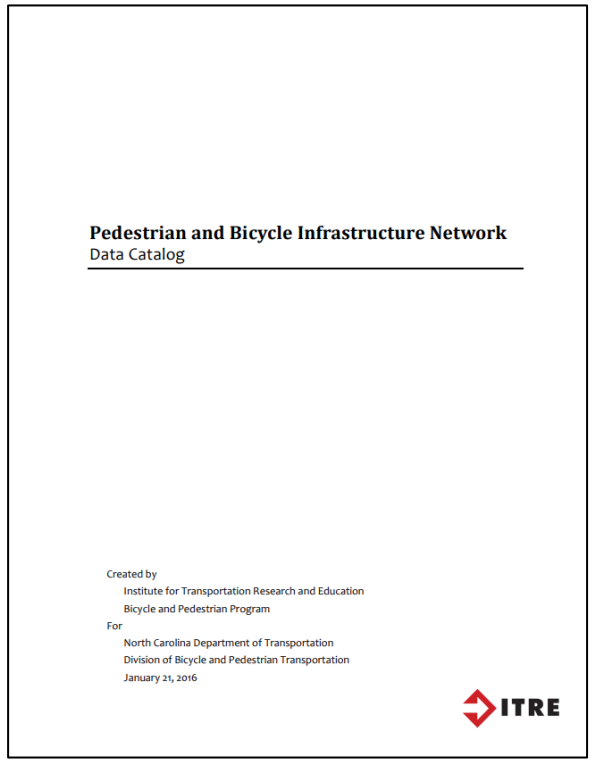
COVID-19 Impacts on Bicyclist and Pedestrian Activity in North Carolina

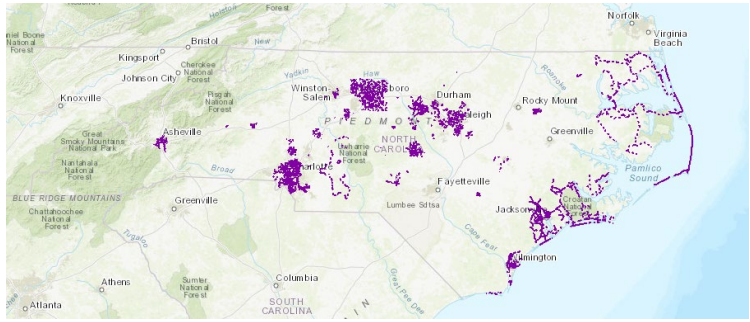
Objective:

Examine the impact of the COVID-19 pandemic on bicyclist and pedestrian activity in North Carolina by analyzing count data from the NC NMVDP

- Preliminary results were shared through presentations to NCDOT Integrated Mobility Division, during the 2021 National Bike Summit, and at the 2021 NC Traffic Safety Conference
- ArcGIS StoryMap also available that highlights daily user volumes and hour of day patterns on trails in NC during the pandemic from March through September 2020 and compares these to user volumes in previous years
- Analyses are currently being updated to reflect results through November 2021

Pedestrian and Bicycle Infrastructure Network (PBIN)

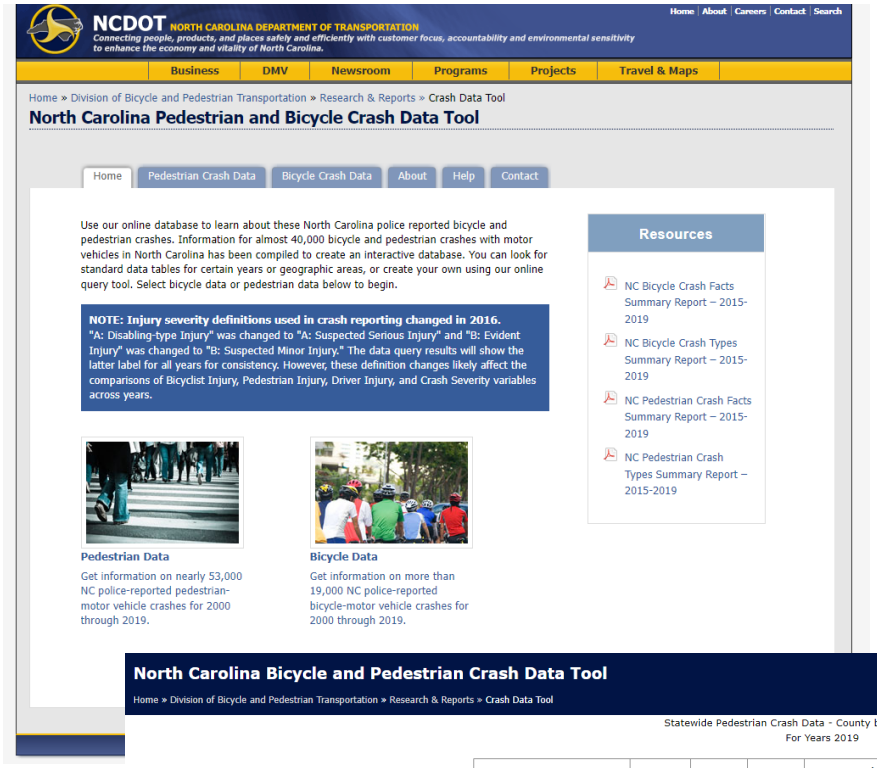


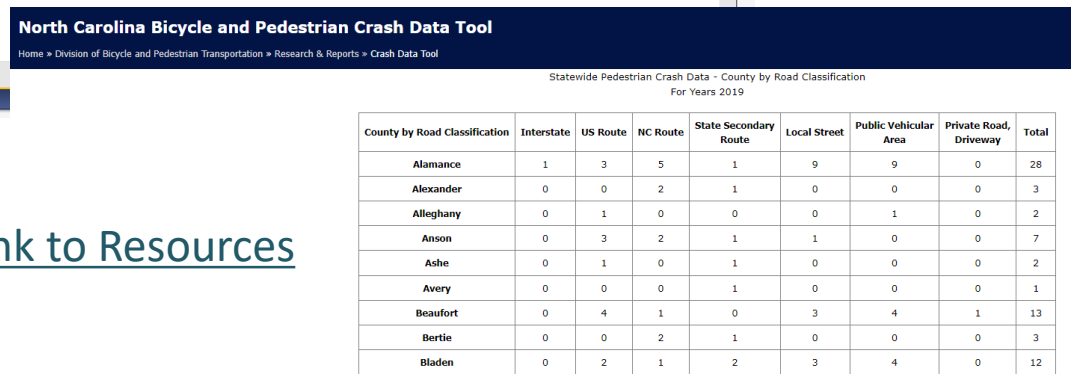


Link to Resources

- Supported by NCDOT DPBT (prior to merger)
- Four-year study (2012-2016) to establish initial geodatabase
- Includes data on existing and proposed bicycle and pedestrian facilities throughout NC
  - Initial data was collected by ITRE during first two phases
  - Not comprehensive – updates to the geodatabase are ongoing based on data submission by municipalities using standardized geodatabase template and terminology
  - Third phase occurred in 2019 with the launching of NCDOT's ATLAS project – involved both data solicitation efforts and extensive digitization of bicycle and pedestrian facilities along roadway corridors throughout the state

North Carolina Pedestrian and Bicycle Crash Data Tool (PBCAT)





County by Road Classification	Interstate	US Route	NC Route	State Secondary Route	Local Street	Public Vehicular Area	Private Road, Driveway	Total
Alamance	1	3	5	1	9	9	0	28
Alexander	0	0	2	1	0	0	0	3
Alleghany	0	1	0	0	0	1	0	2
Anson	0	3	2	1	1	0	0	7
Ashe	0	1	0	1	0	0	0	2
Avery	0	0	0	1	0	0	0	1
Beaufort	0	4	1	0	3	4	1	13
Bertie	0	0	2	1	0	0	0	3
Bladen	0	2	1	2	3	4	0	12

Link to Resources

- Supported by NCDOT DPBT (prior to merger)
- Online, interactive database with information for nearly 40,000 bicycle and pedestrian crashes with motor vehicles in the state

Safety Data Maps and Dashboards

Detailed Crash Maps

Link	Description
Fatal and Serious Injury Crashes	Locations of fatal and serious injury crashes that occurred on public roadways in the past 10 years
Animal Crashes	Locations of crashes involving animals during the past five years
Alcohol Crashes	Locations of crashes involving alcohol with one or more parties during the past five years
Motorcycle Crashes	Locations of crashes involving motorcycles during the most recent five years
Pedestrian and Bicycle Crashes	Locations of crashes involving a pedestrian or bicyclist since 2007
Teen Driver Crashes	Locations of crashes involving teenage drivers (15-19 years old)
Older Driver Crashes	Locations of crashes involving older drivers (65+ years old)

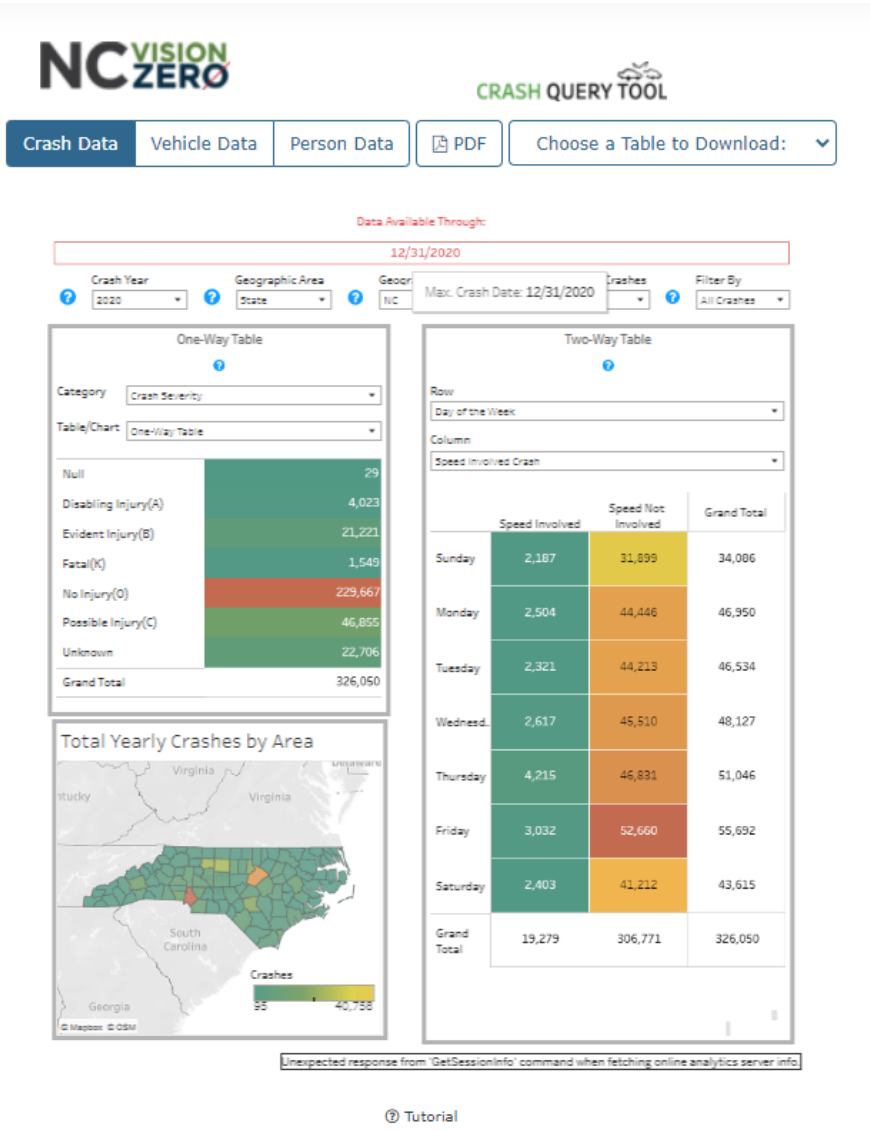
Link to Resources

Dashboards

Link	Description
Statewide Crash Dashboard	Dashboard for the latest 5 years of statewide crashes in North Carolina.
Pedestrian and Bicyclist Crash Dashboard	Dashboard for pedestrian and bicyclist crashes for North Carolina.
MPO Safety Performance Dashboard	Dashboard for MPO (Metropolitan Planning Organization) safety performance on fatal, injury, and pedestrian/bicyclist crashes compared to target values.

- NCDOT's Traffic Safety Unit regularly produces and updates online maps to provide the public with information on crashes and other safety related information
- All maps are updated annually, unless otherwise noted

NC Vision Zero Analytics – Crash Query Tool and Safety Dashboard



Crash Query Tool

- View and export crash data based on a yearly snapshot provided by NC DMV

Safety Dashboard

- View and export crash data based on NCDOT TEAAS data snapshots

Link to Resources

Innovations and Data Branch

Data Programs

Transit

Transit Data Warehouse

ITRE
Institute for Transportation Research and Education

Data Warehouse

ITRE's Public Transportation Group (PTG) is the data warehouse for the transit industry in North Carolina. We collect and maintain a vast array of transportation related information which includes asset utilization, asset management, operating statistics, service areas, urbanized areas, and many more datasets. Our warehouse includes spatial and non-spatial data that is contained in the appropriate database for easy access and retrieval of information. We continuously analyze each dataset and develop reports and other analytical documents based on these datasets.

- Economic Benefits of Transit
- Intercity Bus
- Trip Planner Development (GTFS)
- Enterprise Asset Management
- NTD Reports
- Op Stats
- VUD
- Trip Maker
- Technology Implementation and Support

Looking to the Future

- Build capacity in the Innovations & Data Branch
- Explore the next frontier of CAV technology by evolving the CASSI project
- Advance Mobility as a Service (MaaS) through feasibility studies and pilots
- Support microtransit implementation in the state
- Establish a data inventory and develop a plan to consolidate and streamline data collection, warehousing and analysis
- Engage on state and national committees about emerging mobility trends and innovations

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