NORTH CAROLINA
Turnpike Authority







# Board of Directors
# Operations Committee Meeting

## North Carolina Turnpike Authority

## October 23, 2017

# Autonomous Vehicles Update

Dennis Jernigan, P.E.

# Fixing America's Surface Transportation (FAST) Act - 2016

Section 6025 (GAO Report): Not later than 2 years after the date of enactment of this Act, the Comptroller General of the United States shall submit to Congress a report that:

1. Assesses the status of autonomous transportation technology developed by entities in the United States;
2. Assesses the organizational readiness of the Department to address autonomous vehicle challenges, including consumer privacy protections; and
3. Recommends implementation paths for autonomous transportation technology, applications, and policies that are based on the assessment described in paragraph (2).

# Why Autonomous Vehicles?

## Improved road safety

- *90% of accidents today occur due to human error*
- *Reduction in accidents by 70%[1] feasible if self-driving vehicles represent considerable share of car fleet*

## Reduced public transport spending

- *Reduction in losses from often non-profitable public transport service in lower density areas*

## Decrease in pollution

- *Better fuel efficiency of ~20% can lower overall pollution (absent an increase in mileage)*
- *Even higher decrease of emissions possible with electrification*

## Less waiting time

- *Seamless, multi-modal end-to-end mobility can be offered to consumers*


## Freed up space

- *Need for parking space in the city can be reduced by up to 60%[1]*

## Productivity boost

- *Over 1.2B hours of pure driving time savings over 10 years possible*

## Increased traffic efficiency

- *Traffic congestion can be improved by ~70% [1] due to smoother traffic flow and fewer cars on the road*

## Decreased cost of mobility

- *Cost savings of up to 50% per km for ride shared self-driving taxi service vs. traditional car ownership*

## Equitable access to mobility

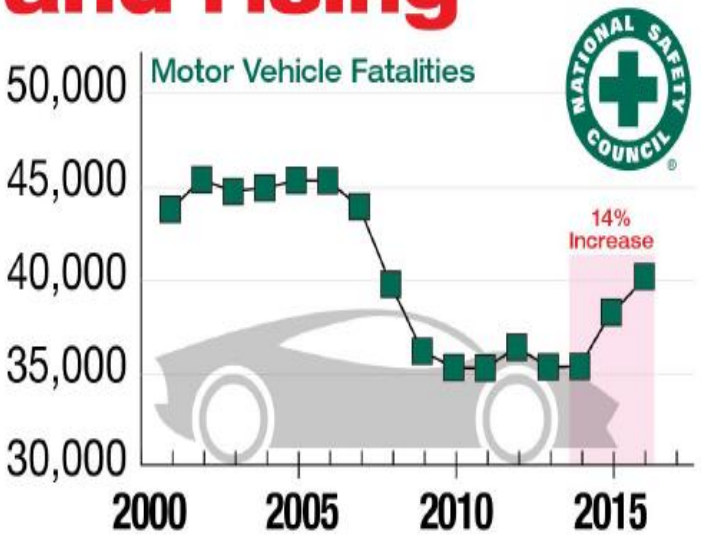
- *Elderly, children and people with disabilities can make use of new end-to-end mobility options*

*Individual benefits*

1. After 10 years; Note: Potential rewards calculated for a model city of ~5M inhabitants; Source: International Organisation for Road Accident Prevention, European Parking Association, UCS, World Economic Forum; BCG analysis

# It's All About Improving Safety

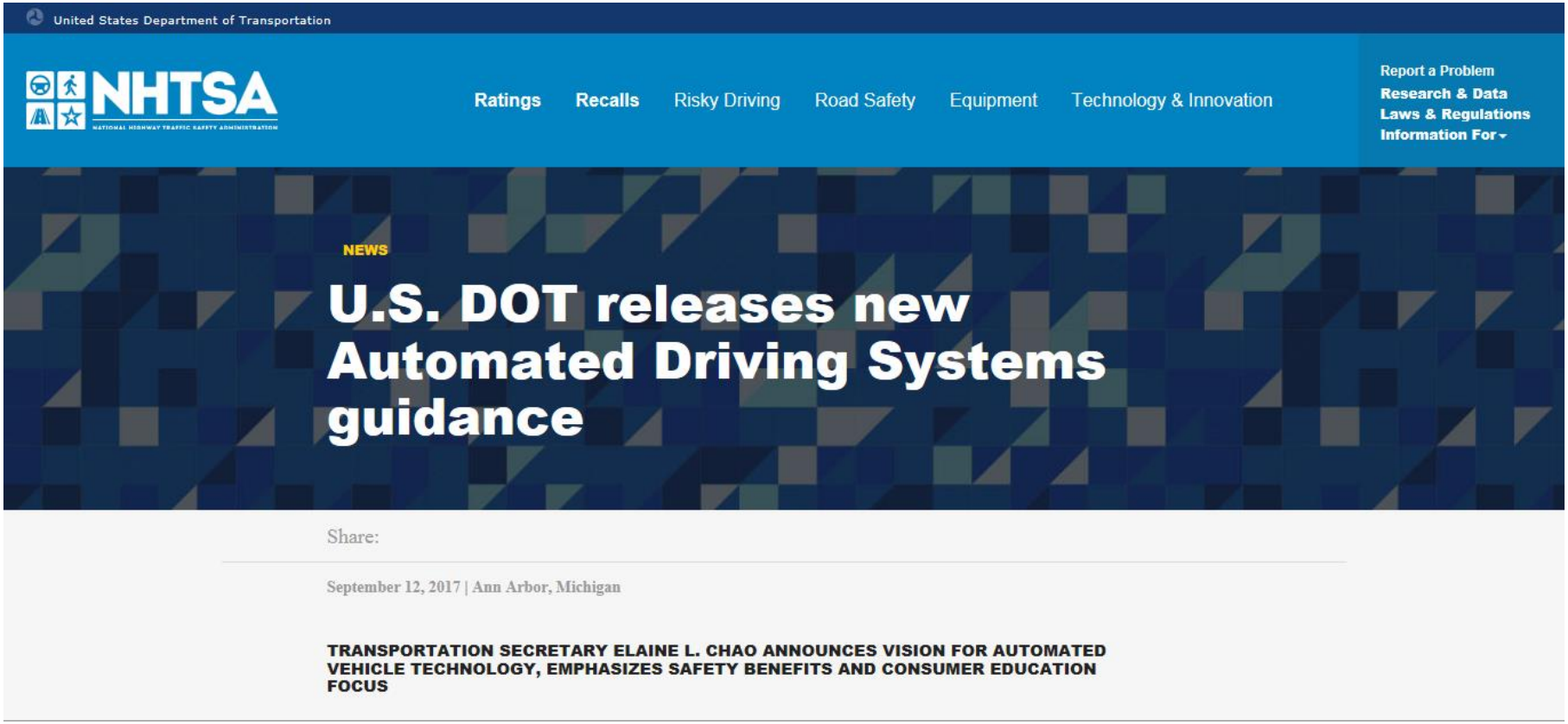
## An estimated 40,000 deaths and rising






Eliminating Preventable Deaths

3



United States Department of Transportation

NHTSA
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

Ratings Recalls Risky Driving Road Safety Equipment Technology & Innovation

Report a Problem
Research & Data
Laws & Regulations
Information For

NEWS

# U.S. DOT releases new Automated Driving Systems guidance

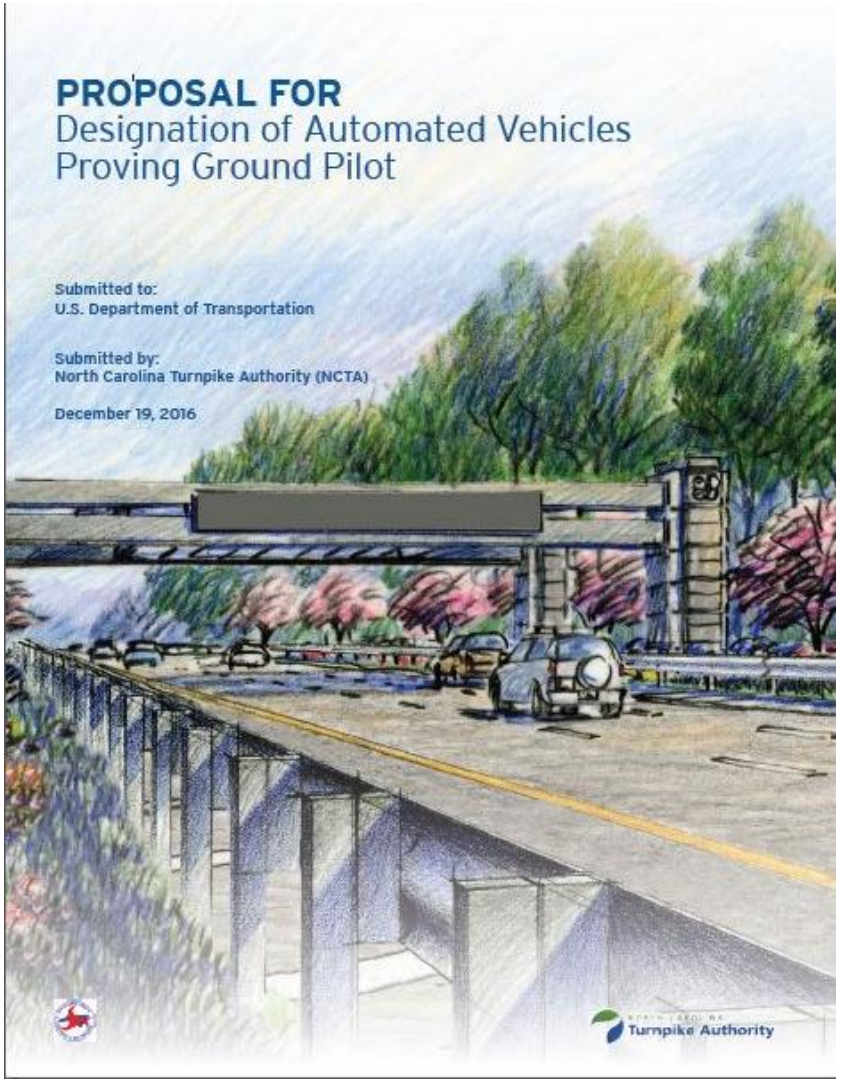
Share:

September 12, 2017 | Ann Arbor, Michigan

**TRANSPORTATION SECRETARY ELAINE L. CHAO ANNOUNCES VISION FOR AUTOMATED VEHICLE TECHNOLOGY, EMPHASIZES SAFETY BENEFITS AND CONSUMER EDUCATION FOCUS**

# Triangle Expressway

- Advertisement 11/22/2016
- Proposal submitted 12/19/2016
- One of ten sites chosen
- 64 proposals received
- Why pursue?
  - Safety of our customers is paramount
  - Support our customer base
  - We have the infrastructure to support this technology



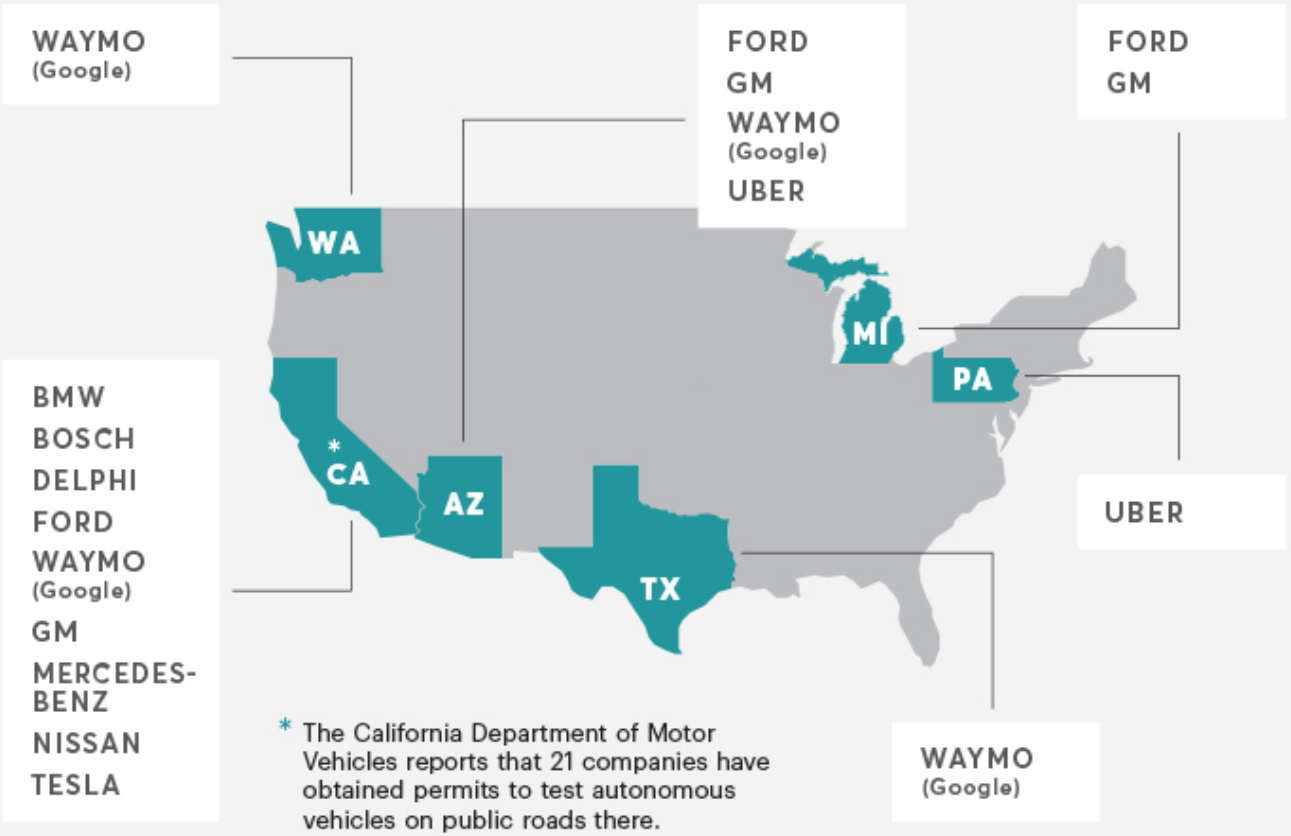
# U.S. DOT'S TEN PROVING GROUND DESIGNEES

# Research and Partnerships

- NCDOT's Research and Development Unit
- Regional Transportation Alliance
- University of North Carolina - Chapel Hill Highway Safety Research Center
- Institute of Transportation Research and Education
- Duke University's Humans and Autonomy Lab
- University of North Carolina - Charlotte Center For Transportation Policy Studies
- North Carolina Agriculture and Technical State University

# Where the Driverless Cars Are

Here are some of the states where automated prototype cars are already being tested on roads, usually with humans at the ready as backup.

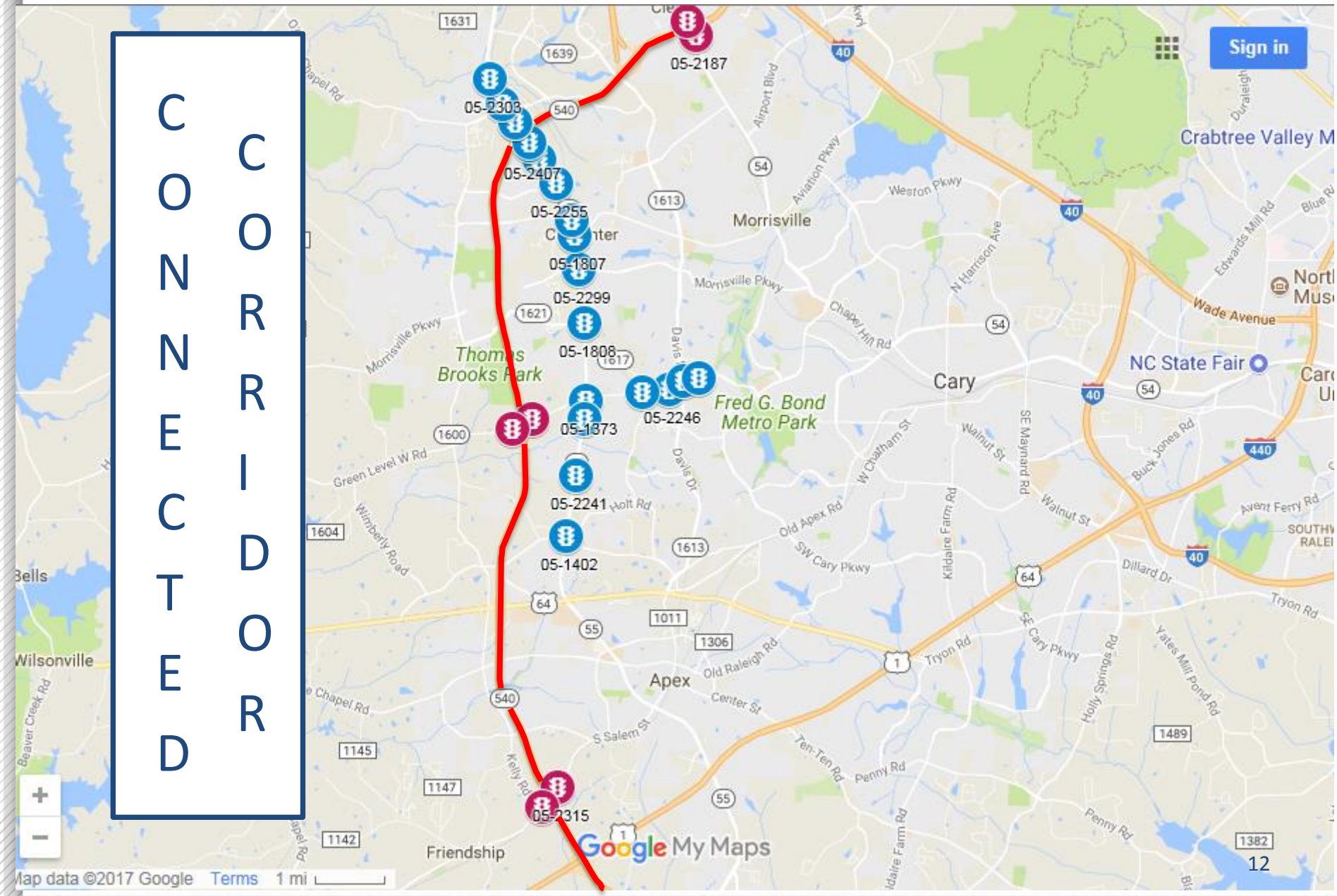



* The California Department of Motor Vehicles reports that 21 companies have obtained permits to test autonomous vehicles on public roads there.

# Legislative Actions

- **HB 469** defined fully autonomous vehicles, made them legal, and formed DOT committee
  - Passed Senate 45-2, House 114-1
  - Signed by Governor July 21
  - Effective December 1
- **HB 716** made truck platooning legal where allowed by DOT ordinance
  - Passed Senate 45-1, House 117-0
  - Signed by Governor July 21
  - Effective August 1

CONNECTED CORRIDOR



# Next Steps

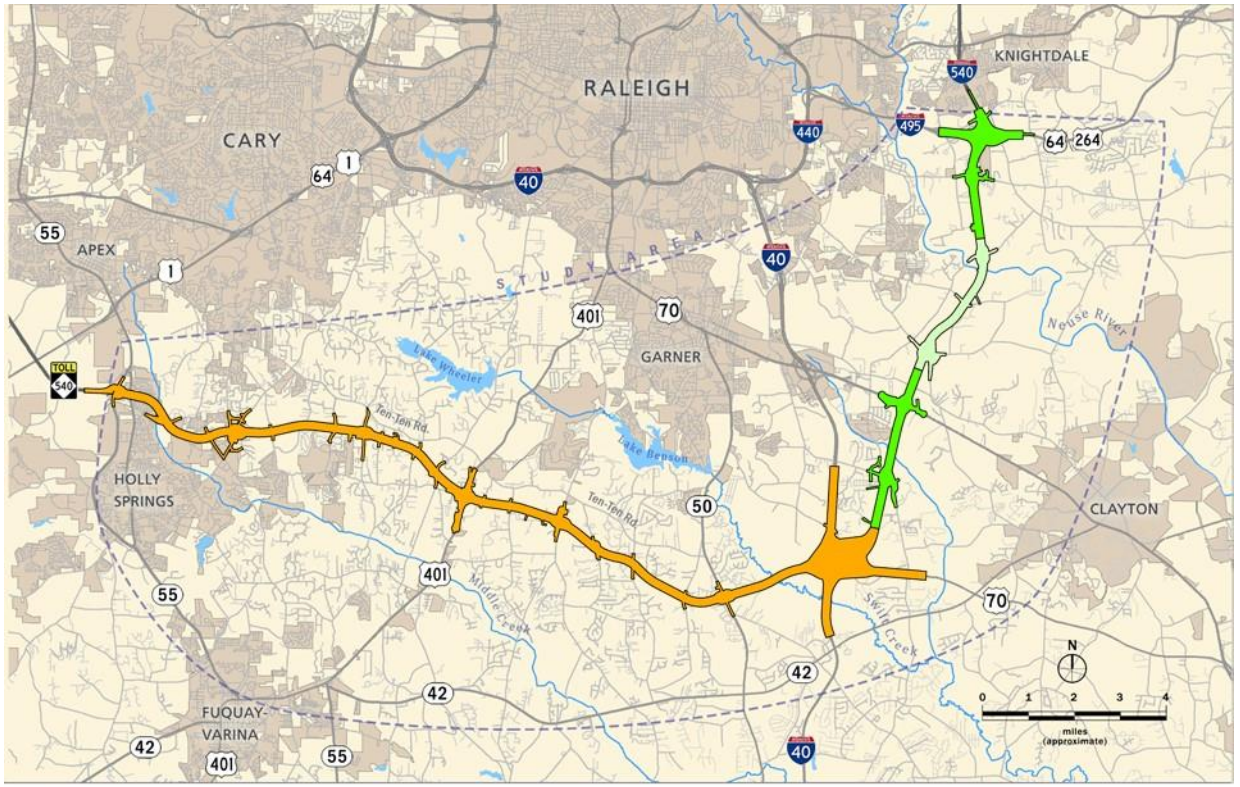
- Memorandum of Agreement with USDOT
- Memorandum of Understanding with trucking industry representatives for a platooning trial
- Develop a proposal to attract auto industry testing in North Carolina
- Developing marketing plan and materials to attract AV testing in NC

# Complete 540 Update

Rodger Rochelle, P.E.

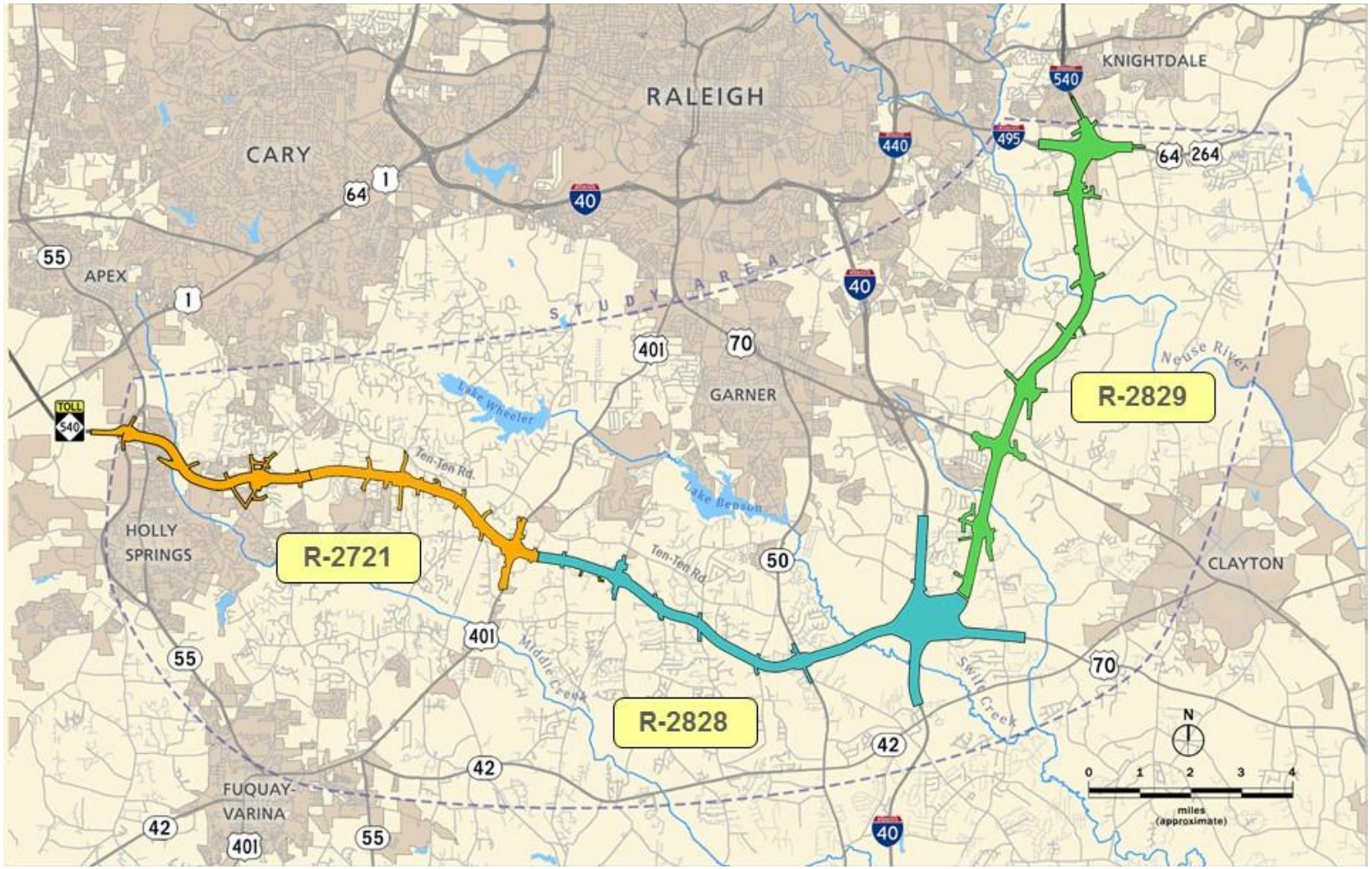
# Complete 540

- Approximately 30 miles
- 70 mph, with interchange access
- All electronic toll collection
- Preferred Alternative
  - DSA 2
  - **orange-green-mint-green**
- Three STIP projects

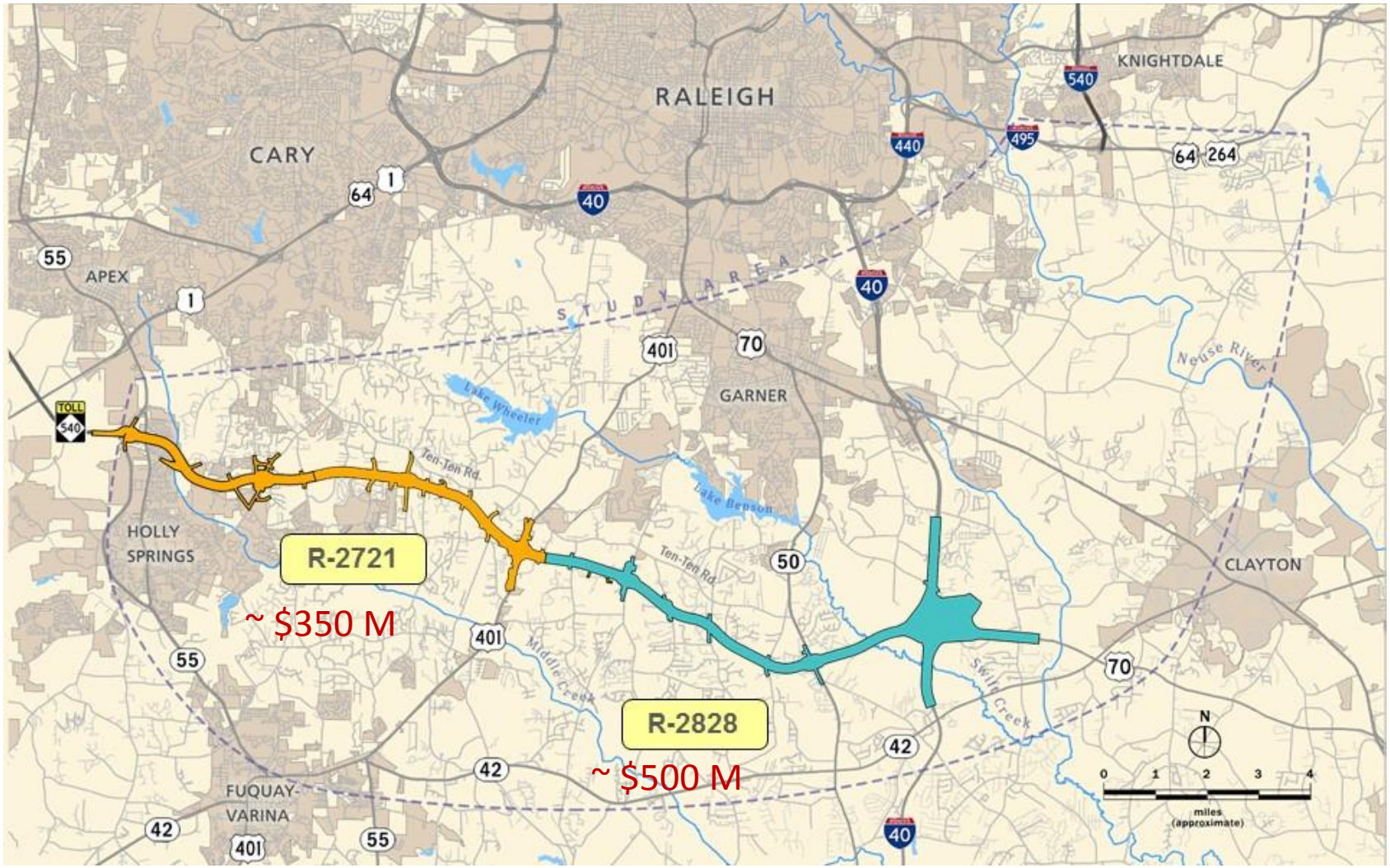



**Preferred Alternative**
(Final EIS)

# Complete 540

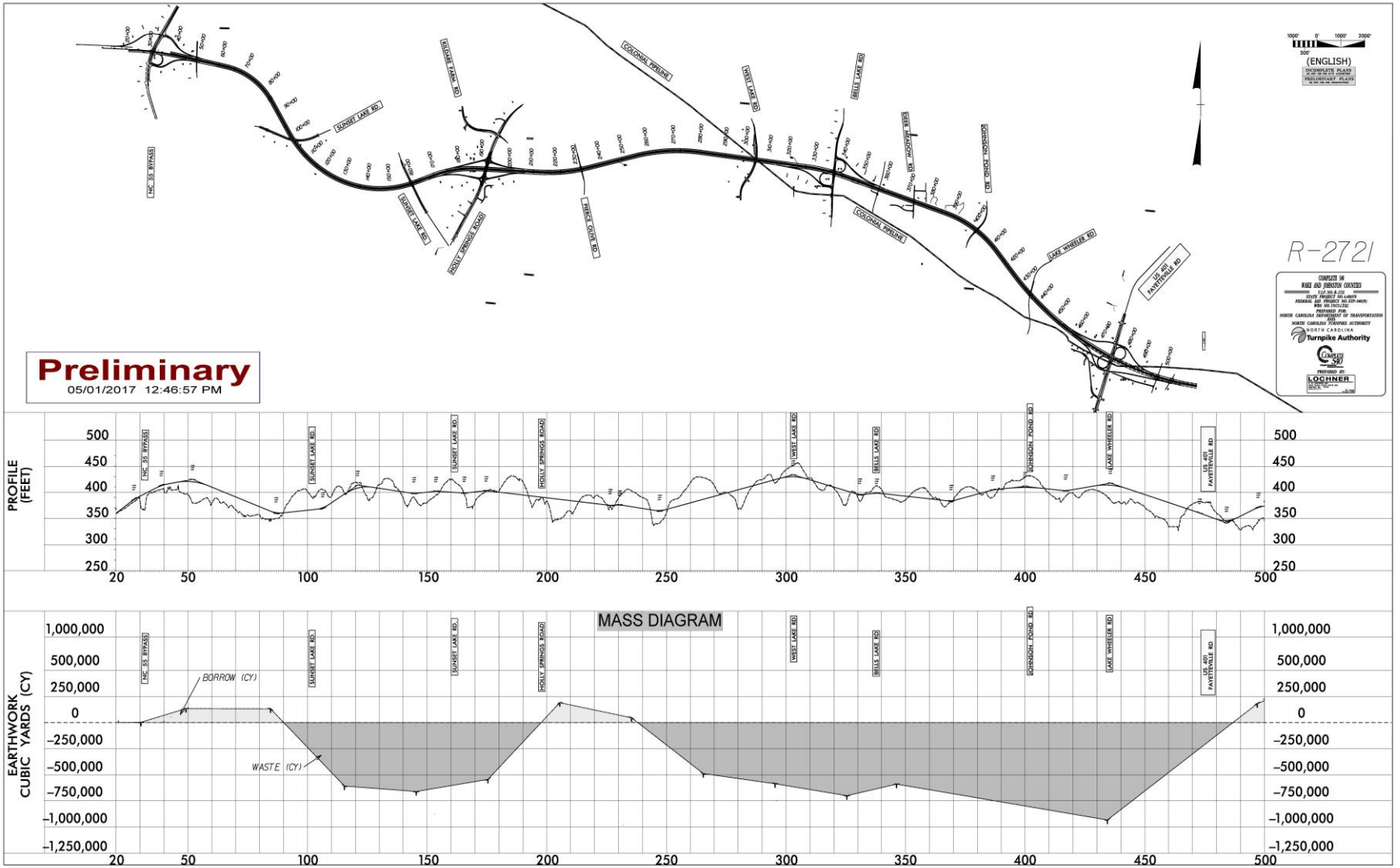


# Complete 540



# Complete 540

# Complete 540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R-2721
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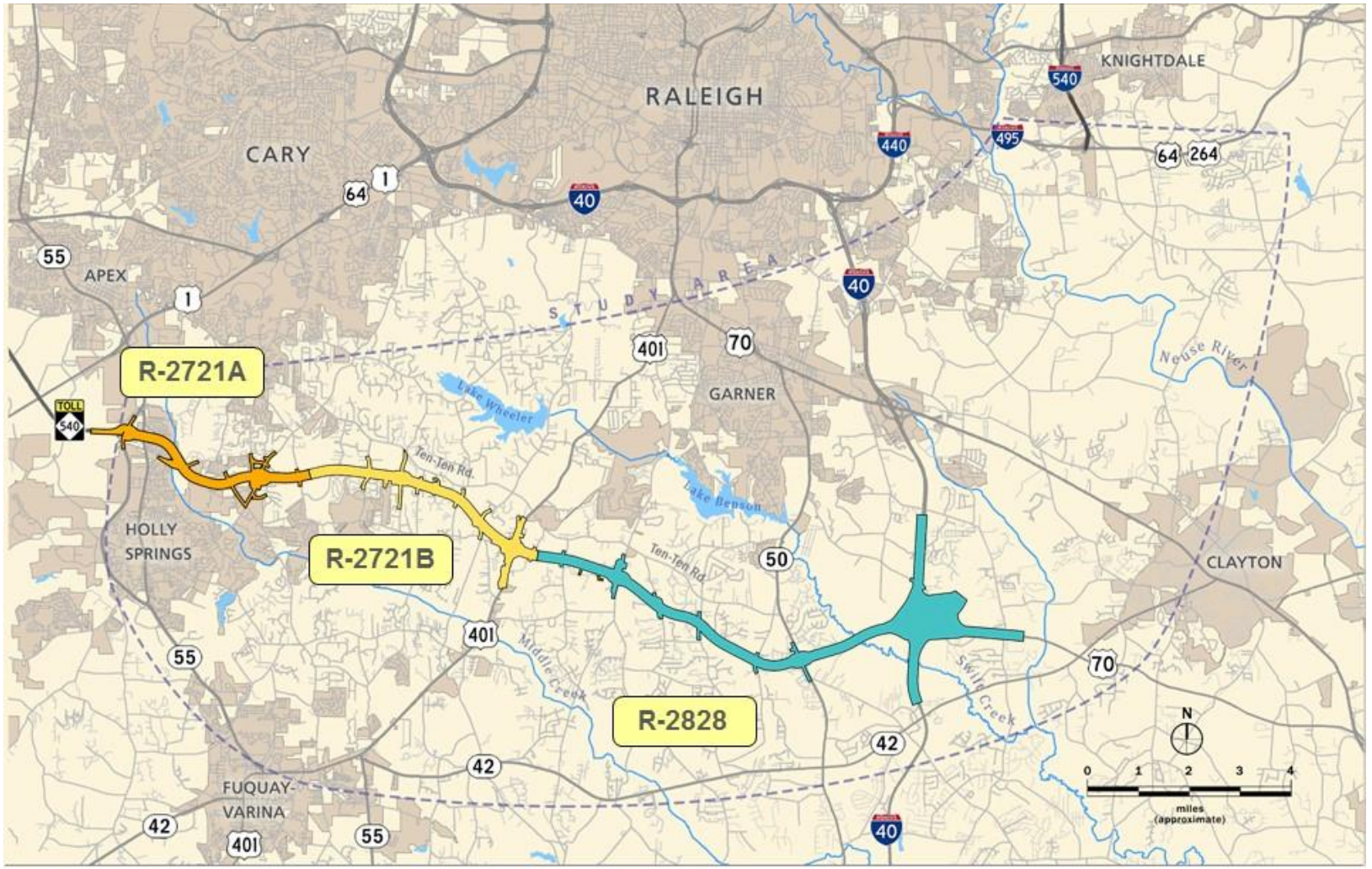
Turnpike Authority
LOCHNER
PROFILE (FEET)
MASS DIAGRAM
EARTHWORK CUBIC YARDS (CY)
BORROW (CY)
WASTE (CY)
NC 55 BYPASS
SUNSET LAKE RD
HOLLY SPRINGS ROAD
COLONIAL PIPELINE
WEST LAKE RD
BELLS LAKE RD
JOHNSON POND RD
LAKE WHEELER RD
US 401 FAYETTEVILLE RD

# Complete 540



# Looking Ahead: Study Process

- Address Public and Agency Comments on the Draft EIS
- Agency coordination for avoiding and minimizing environmental impacts
- Coordination with US Fish and Wildlife Service about protected species
- Updates to traffic noise analysis (determining where noise walls are proposed)

# Looking Ahead: Project Financing

- Updating cost estimates
- Preparing traffic and revenue studies
- Developing detailed Plan of Finance
  - Initiating TIFIA loan pre-approval process

# Looking Ahead: Contracting

- Continued AGC/ACEC Coordination
- Comprehensive advertisement and staggered lets
- Innovative Contracting
- Let East to West, open West to East

# Current Schedule

- Final EIS
  - Submit mid-2018
- Record Of Decision
  - Submit mid-2019
- ROW & Contract Let
  - (R-2721A, R-2721B & R-2828) - FY 2020
  - (R-2829) - FY 2027

# Accelerate 540

- Project ownership shifted to Turnpike Authority
- Experts brought in to review environmental study processes
- Finance, toll operations, contract procurement teams mobilized
- Proactively engaging federal agencies

# Complete 540 Resources

Website

www.ncdot.gov/complete540

Email

complete540@ncdot.gov

Hotline

1-800-554-7849

# Morrisville Parkway Interchange Update

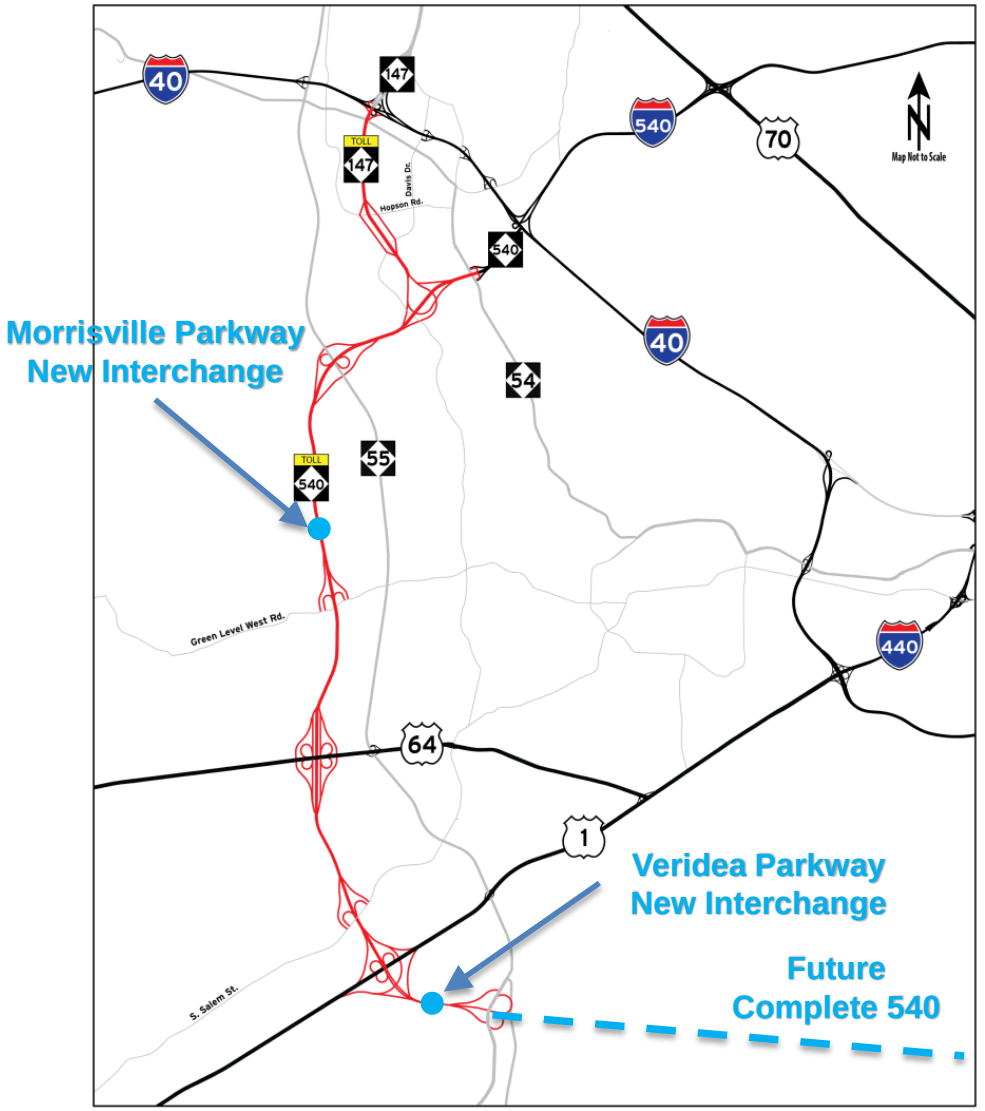
Dennis Jernigan, P.E.

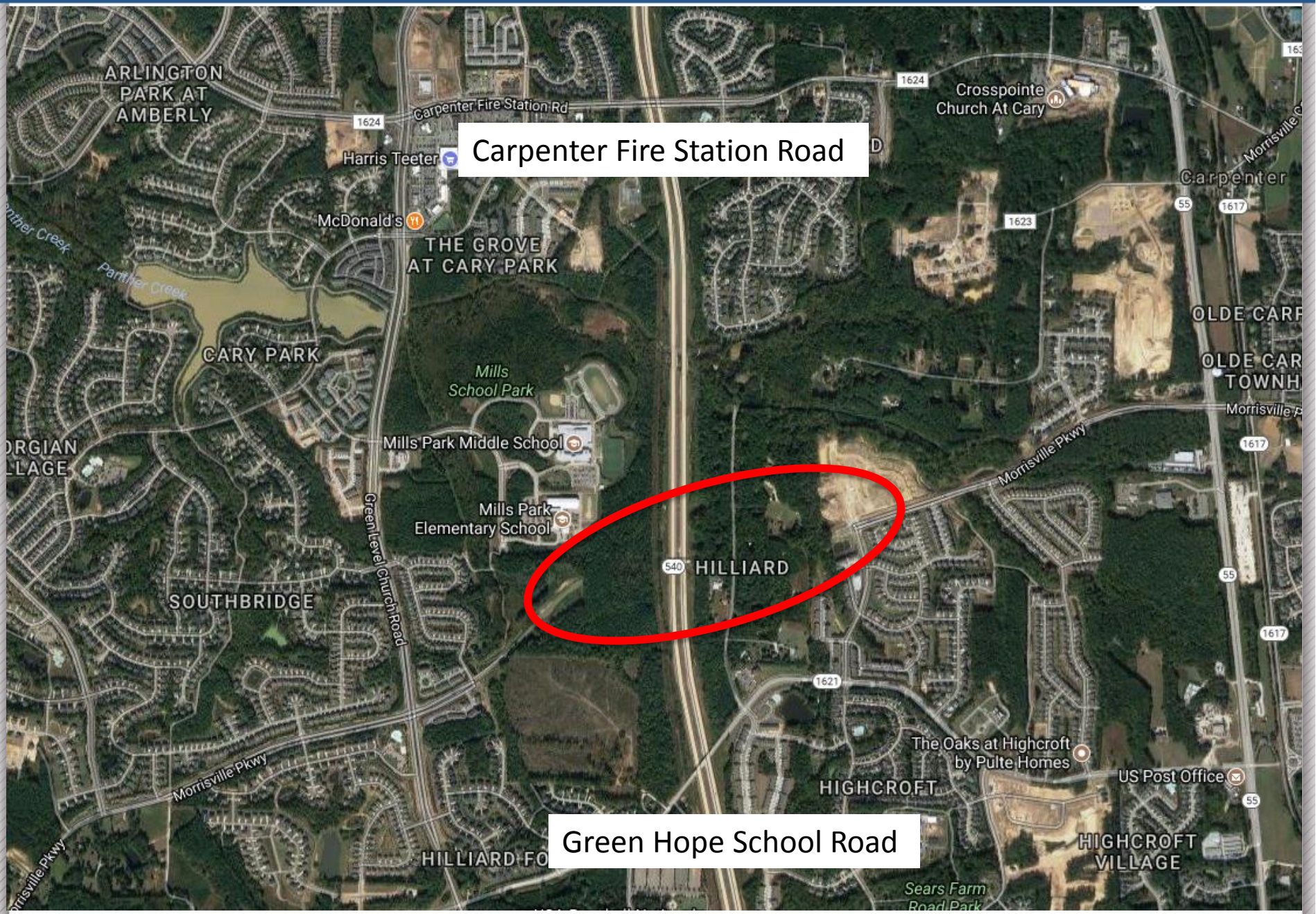
# Triangle Expressway

Veridea Parkway

Morrisville Parkway

Complete 540




Carpenter Fire Station Road
Green Hope School Road
ARLINGTON PARK AT AMBERLY
Carpenter Fire Station Rd
1624
Harris Teeter
McDonald's
THE GROVE AT CARY PARK
Crosspointe Church At Cary
Carpenter
1623
1617
55
CARY PARK
Mills School Park
Mills Park Middle School
Mills Park Elementary School
Morrisville Pkwy
Green Level Church Road
540
HILLIARD
SOUTHBRIDGE
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The Oaks at Highcroft by Pulte Homes
US Post Office
HIGHCROFT
HIGHCROFT VILLAGE
Sears Farm Road Park


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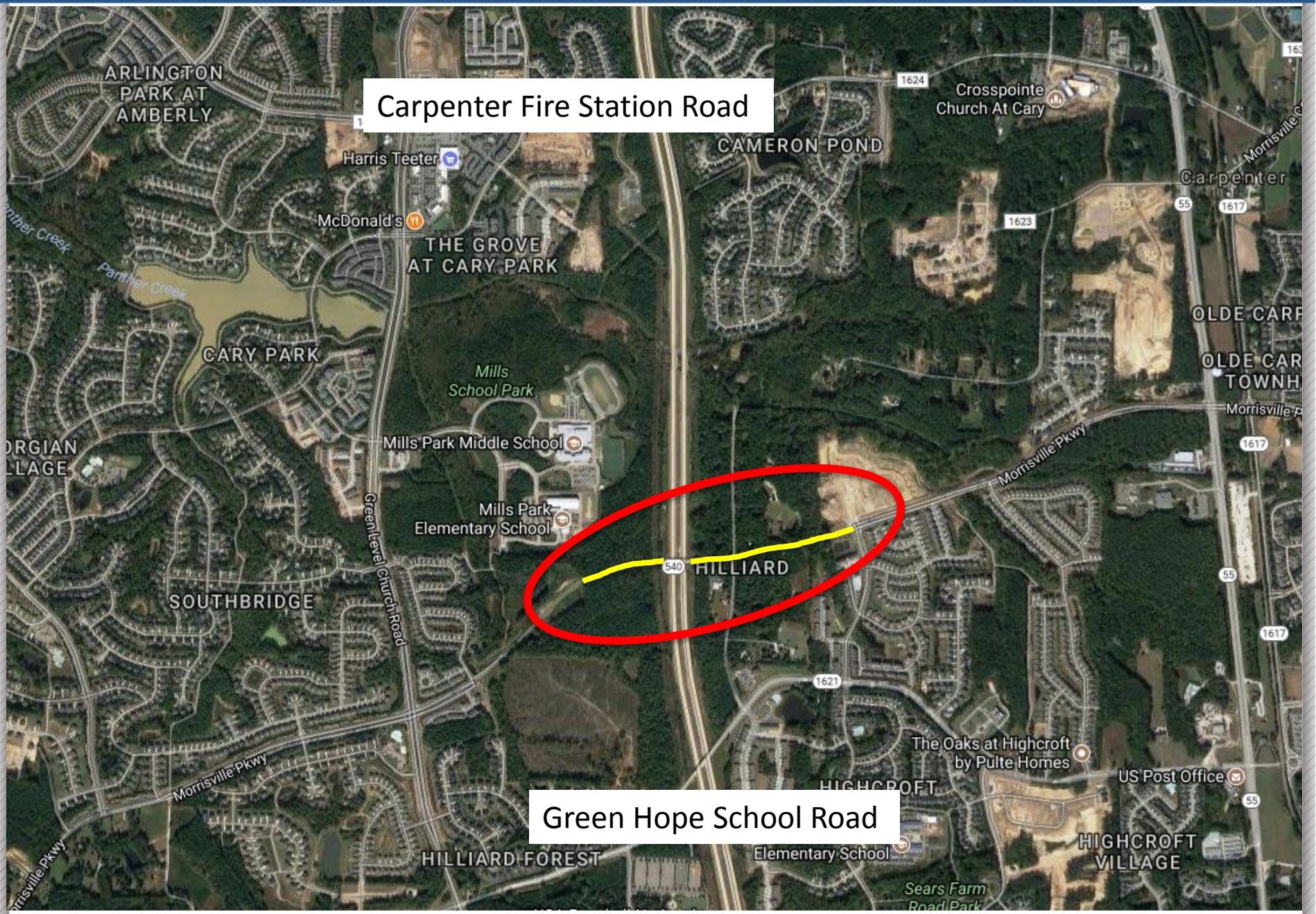
Carpenter Fire Station Road
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ARLINGTON PARK AT AMBERLY
Harris Teeter
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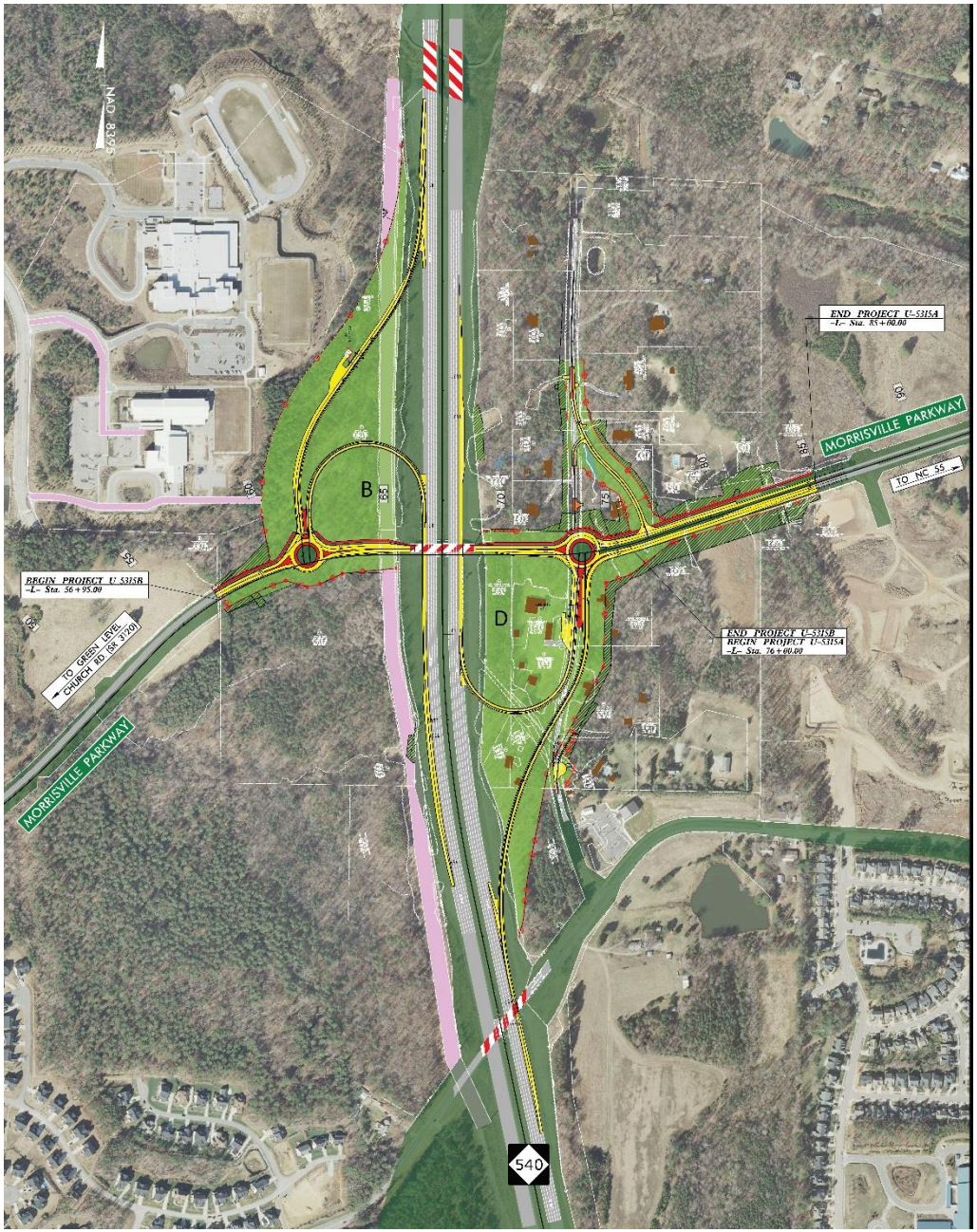
Green Level Church Road
Morrisville Pkwy
HILLIARD
540
SOUTHBRIDGE
1621
The Oaks at Highcroft by Pulte Homes
US Post Office
HIGHCROFT
HILLIARD FOREST
Elementary School
HIGHCROFT VILLAGE
Sears Farm Road Park


NAD 83/96
B
D
END PROJECT U-5315A
-L- Sta. 85+00.00
MORRISVILLE PARKWAY
TO NC 55
BEGIN PROJECT U-5315B
-L- Sta. 56+95.00
TO GREEN LEVEL CHURCH RD (SR 3701)
MORRISVILLE PARKWAY
END PROJECT U-5315B
BEGIN PROJECT U-5315A
-L- Sta. 76+00.00
540

# Morrisville Parkway Interchange

- Cooperative effort between NCTA, NCDOT, and Town of Cary
- Funding sources include contributions from the Town of Cary, and unexpended bond proceeds in the amount of $12.5M
- First NCTA bid-build project
- Maintaining three lanes of traffic on NC 540
- Northbound widening first, then Southbound (120-day ICTs)
- Project comprised of an A and B piece (interchange is A)

# Morrisville Parkway Interchange

- STIP cost estimate is $24.8M
- Estimated average annual increase in toll revenue of 4.0% as compared to the certified 2009 Traffic and Revenue Base Case
- Project timeline:
  - Right of Way Acquisition – Complete (Certification Pending)
  - Utility Relocation – Underway but impacted by Hurricane Irma
  - Construction Contract Letting – December 2017
  - Open to Traffic – Late Summer 2019

# Toll Project Development Policy

Gene Conti

# Briefing Purpose

To brief the Board on findings and recommendations for a comprehensive policy, including selection and implementation of toll-financed highway improvement projects.

# Briefing Topics

1. Study purpose and process
2. Toll Policy need
3. Lessons learned
4. Policy Framework proposal

# Study Purpose

## General Assembly Support

"Establishing policies and guidelines will allow for the Department to make informed decisions when selecting projects as toll candidates and is critical to moving the state forward. Understanding which project characteristics make a project viable for tolling, managed lanes, or a (P3) agreement is necessary in gaining public trust."

*Senators Meredith, Davis, McInnis and Rabon*
*April 6, 2017*

Secretary Trogdon committed to development of a comprehensive policy regarding use of tolling by the department.

# Study Process

- NCTA, TPD, and Planning & Programming guided the study, with internal working group support
- Actively engaged external stakeholders
- Examined lessons learned from other states
- Considered policy implications and implementation strategies
- Will provide legislative briefing and seek Board of Transportation adoption

# Toll Policy Need

**NC is a rapidly growing state with an ever-changing transportation landscape.**

To deliver its transportation program effectively and efficiently, NCDOT faces three converging and overlapping challenges:

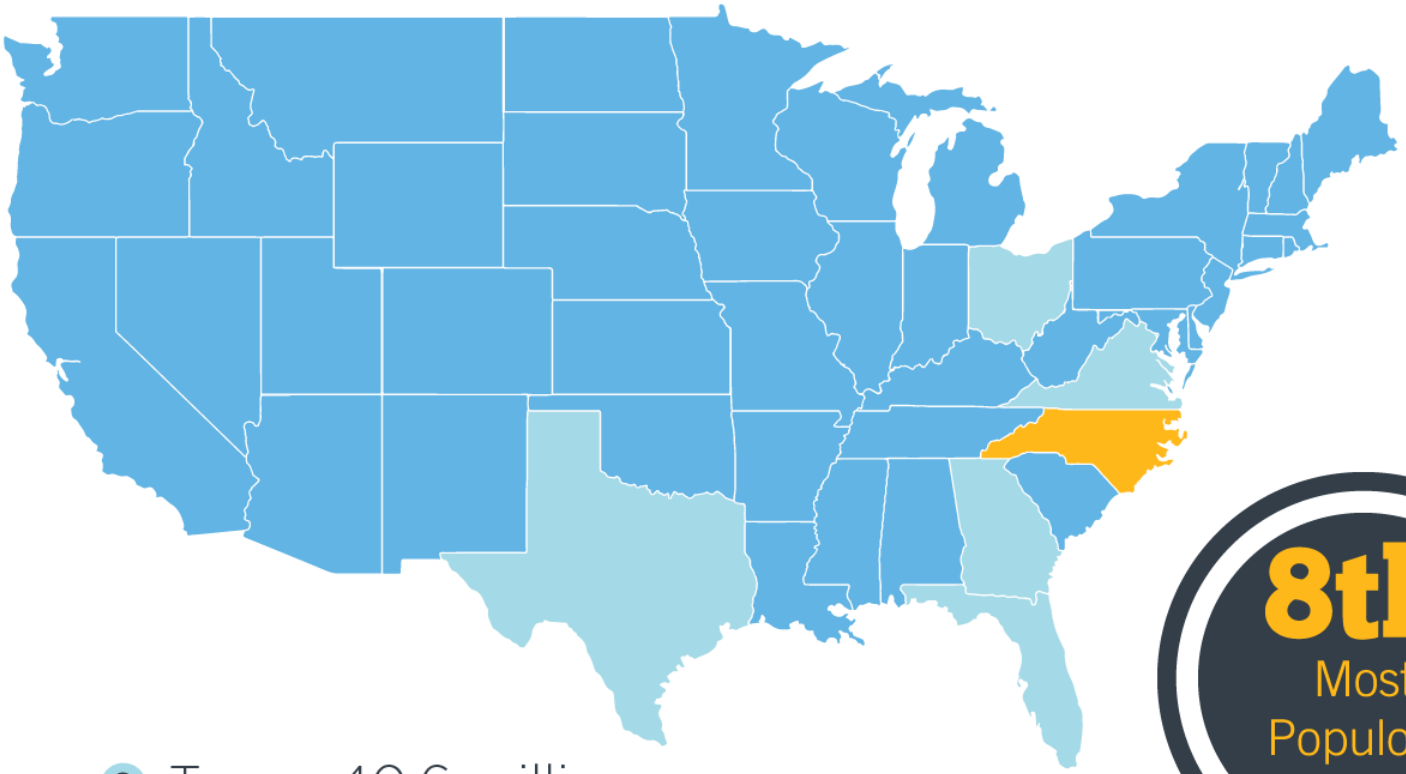
- Increasing traffic and congestion
- Uncertainty over traditional state and federal funding
- A backlog of needed highway capacity and mobility management needs

# Increasing congestion associated with NC's growth is reducing our mobility and adding to the cost of living and of doing business.

- Growing from 9th to 8th most populous by 2040, with a population of 12.5 million
- 90% of new residents forecast to move to five metro areas: Research Triangle, Charlotte, Piedmont Triad, Wilmington and Asheville
- Employment will increase to 5.7 million in 2040 from 4.1 million in 2007
- Truck traffic will increase 43 percent by 2045

**These are challenges that need to be addressed to retain our attractiveness to companies considering locating here.**

# Expected Population Growth by 2040



**8th**
Most Populous State

2040 Population Ranking

2. Texas: 40.6 million
3. Florida: 28.2 million
6. Georgia: 12.8 million
8. **North Carolina: 12.5 million**
9. Ohio: 11.7 million
10. Virginia: 10.2 million

**32%** increase from NC's 2010 population

# Costs to upgrade current & future Interstates may outnumber the available Capital Budget.

- Costs to add need capacity and rehab aging interstates over the next 25 years is **$28 billion**.
- Within that number, the cost to upgrade Interstate 95 is **$5.5 billion**.
- In addition, the cost to upgrade future interstates (I-87, I-587, I-42, and I-73-74) is **$3.4 billion**.
- Over the same 25 years the total Capital Budget is approximately **$32 billion**

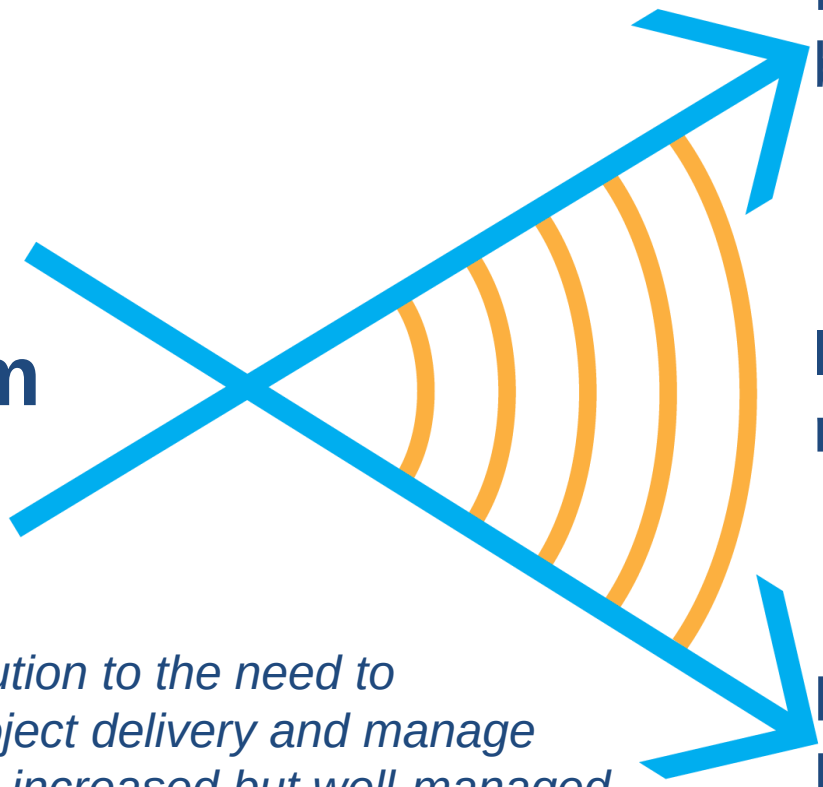
**Bottom Line:**

**You can't get There from Here**

**If funding is depleted by interstate upgrades, this leaves little to no funding for other projects statewide.**

# Growing demand for mobility and added capacity solutions combined with revenue uncertainty is creating an infrastructure needs gap.

Population to increase by over 30 percent



## Problem

**Infrastructure needs gap**

Decreased mobility
Funding uncertainty

*Might one solution to the need to accelerate project delivery and manage congestion be increased but well-managed use of toll revenue?*

# State and Regional Tolling Best Practices

## Many states have concluded that tolling provides multiple benefits.

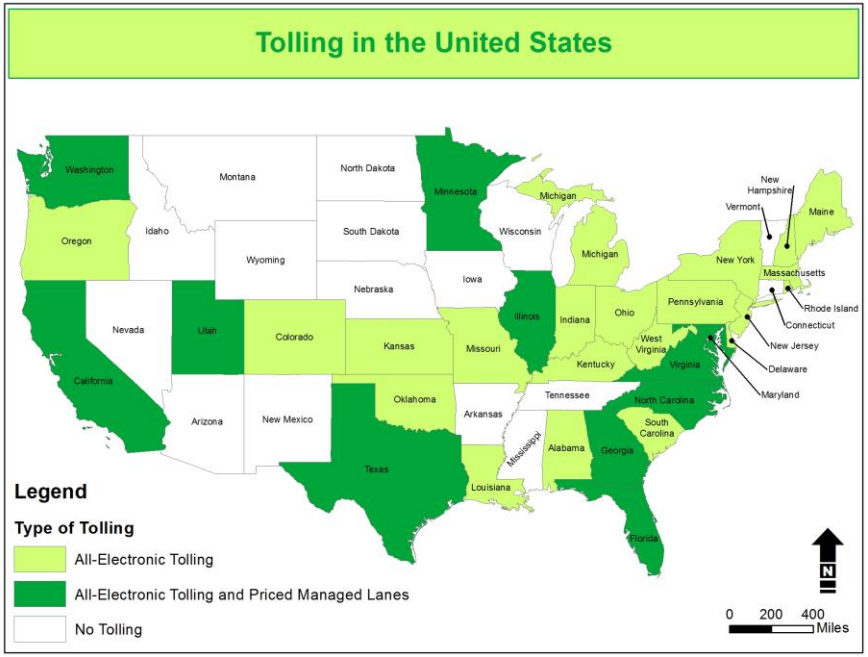
Georgia, Florida, Texas, and others recognize tolling as a useful tool to help manage congestion and generate needed revenues for transportation. Realized benefits include:

- Accelerated project delivery
- Congestion management and relief
- Financial feasibility
- Providing motorists a choice of travel
- Other considerations: safety, economic development

# Today's modern toll roads offer flexibility in project types, objectives, and revenue potential.

Two primary types of toll roads are currently being developed in the U.S., with different objectives and revenue earning potential.

1. **Traditional, greenfield toll roads** –seeking to generate revenue to pay back project debt while providing a mobility option
2. **Priced managed lanes** – striving to improve and maximize person-throughput in congested corridors; also, to generate their own operating revenue



**Current toll road best practices offer NC a wealth of lessons learned to guide future project development.**

**Bottom-line take-aways:**

- Numerous sound approaches are available for selecting and evaluating toll projects
- Successful states have **a programmatic vision** for why they want to use tolling/road pricing
- Goals for tolling managed lanes programs are clearly stated; specific feasibility tests are established
- Local planning agencies and MPOs are engaged

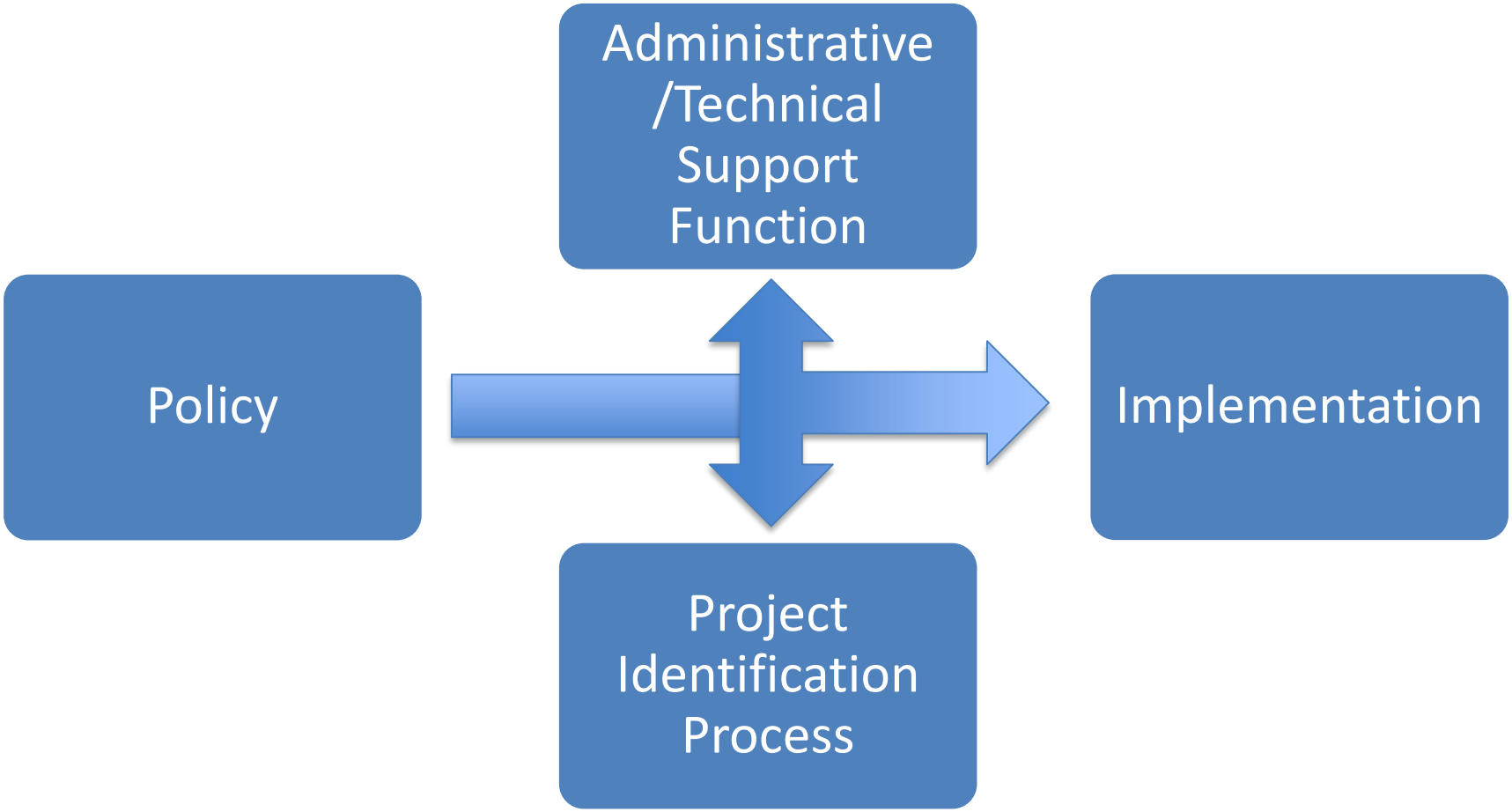
# NC Toll Policy and Feasibility Process

# Toll Policy Framework

In light of findings, staff has developed a draft toll project policy and implementation framework for Board of Transportation consideration.

- Provides policy to define intent and process to evaluate candidate eligible projects
- Proposes 4-step project identification process
- Proposes focused tolled-projects feasibility evaluation function within NCDOT

# Toll Policy Framework



# Toll Policy Statement

- Defines toll policy objective as increasing NCDOT ability to address congestion, leverage limited financial resources, and provide more funding and travel choice
- Provides description of project types eligible to be evaluated for tolling or managed-lanes feasibility with focus on freeway/expressway access control facilities
- Directs development of **Toll Project Feasibility Handbook** to define tolled and priced managed lanes feasibility in cooperation with MPOs and RPOs

Policy

# Administrative/Technical Support Function

- Establishes a cross-functional process (involving NCDOT's NCTA, Transportation Planning Division, Strategic Prioritization Office, and Feasibility Studies Units) to develop and apply financial feasibility criteria and methods
- NCDOT would work closely with Project Sponsors to move viable projects through the screening process.

Administrative /Technical Support Function

## Candidate toll or priced-managed lanes projects will graduate through a four-step screening process.

The process will be structured and methodical. Extensive public participation and engagement would be required.

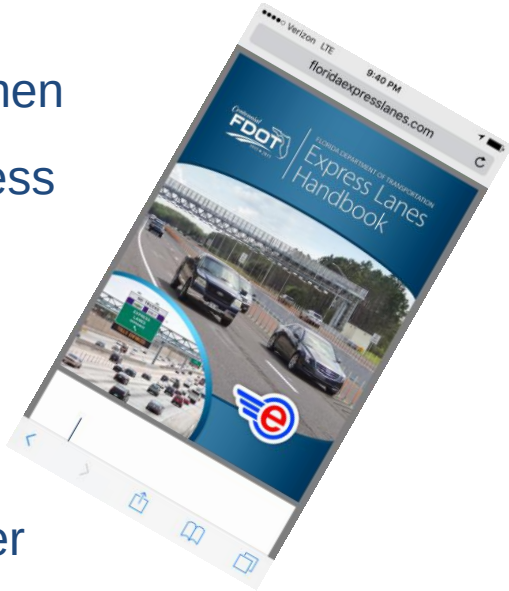
- **Step 1: Initial Project Identification** - MPO or RPO request for review
- **Step 2: Initial NCDOT Toll Feasibility Testing** - NCDOT vetting for operational and financial feasibility
- **Step 3: MPO/RPO Screening** - MPO/RPO evaluation against local standards and statewide factors
- **Step 4: Prioritization and Programming** - NCDOT scoring using established Prioritization criteria before STIP programming

**Screening process details would be defined in Policy-required Toll Project Feasibility Handbook.**

Project Identification Process

## The *Handbook* would evolve to sustain a responsive, modern implementation process.

The framework identifies other longer-term steps to strengthen the viability, adaptation and sustained implementation process described in the *Handbook*.




- **Financing and Delivery Methods** – Conduct continuing research to develop policy recommendations for effective financing mechanisms (public-private, private only, or other finance/operating arrangements)
- **Performance and ROI** – Develop a process to support performance reporting and return on investment accountability of agency resources

Implementation

# Next Steps

1. Finalize Policy Framework
2. NCTA Committee briefings
3. Legislative briefings
4. Request Board of Transportation policy adoption
5. Policy implementation/Handbook development

# Thank You!