



## NORTH CAROLINA

Department of Transportation



# Automated Vehicle Proving Ground

North Carolina Turnpike Authority

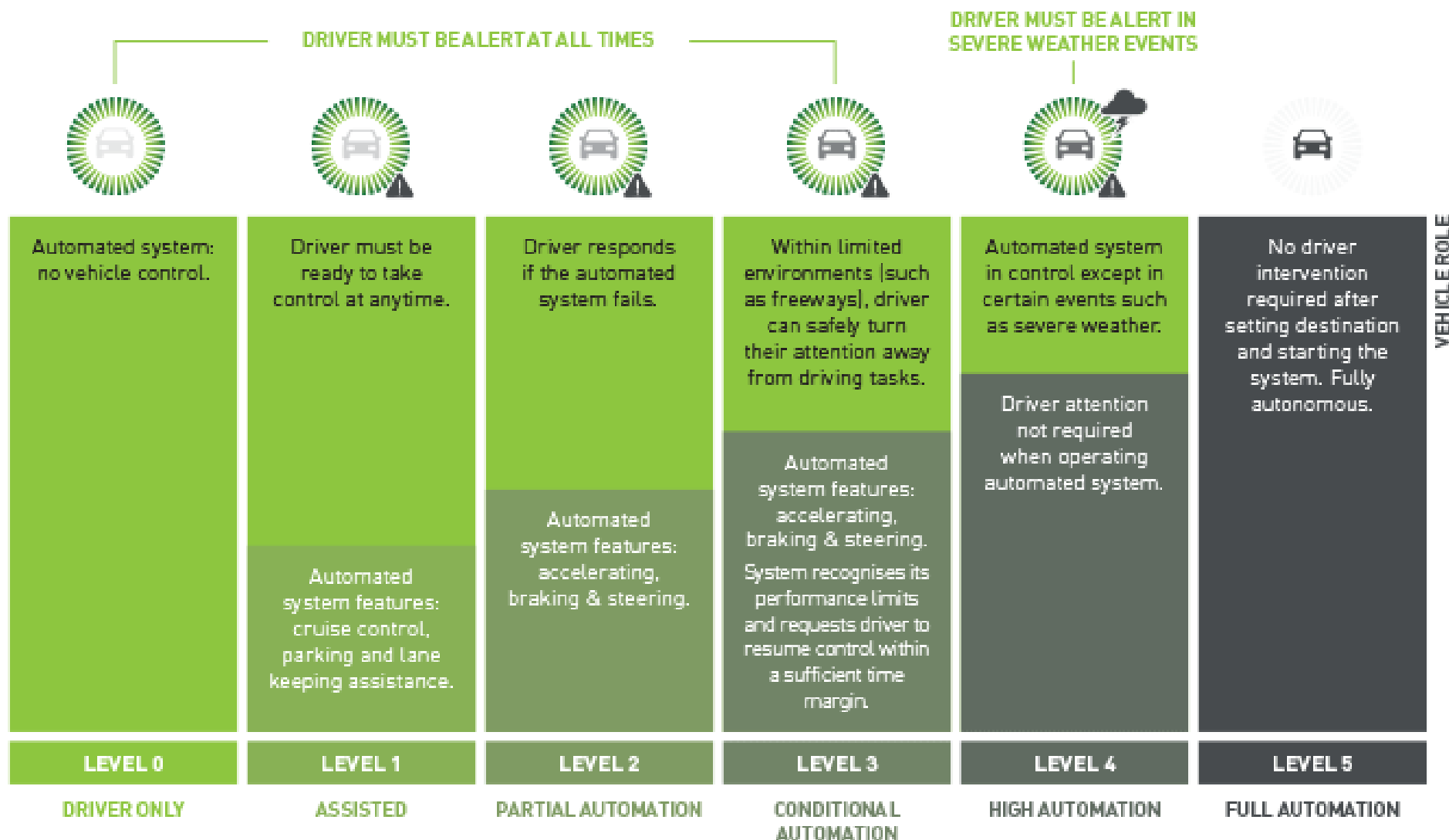
Dennis Jernigan, PE | **April 26, 2017**











# 33 Corporations Working on Autonomous Vehicle Technology Development



# Manufacturer Goals

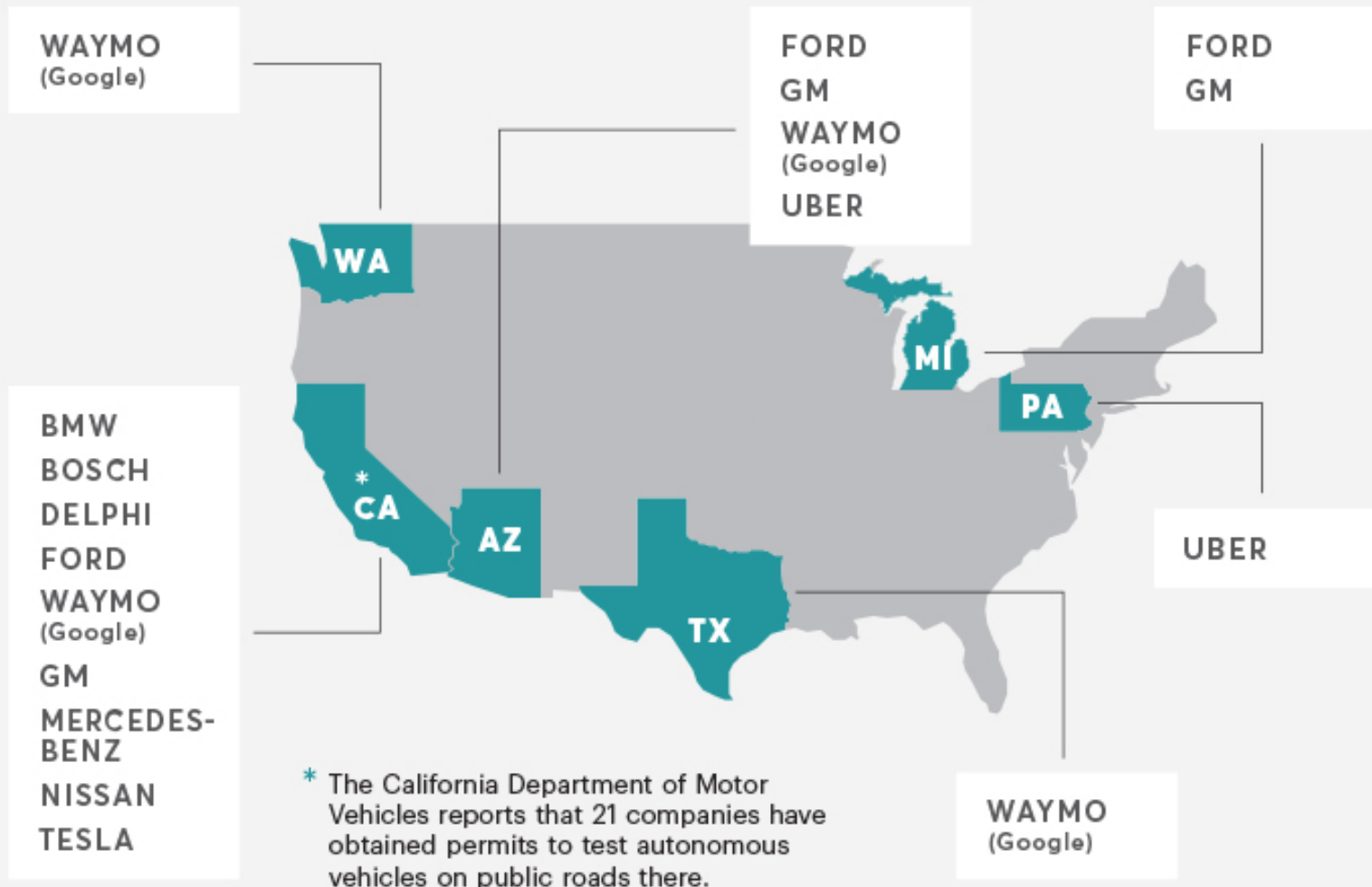
*Consumer Reports, April 2017*

- BMW: deliver autonomous vehicles by 2021
- Ford: deliver robotic taxis by 2021
- Google/Waymo: deliver fully autonomous ride sharing cars in 2017
- GM: semi-autonomous technology on some Cadillacs this year
- Mercedes: produce autonomous vehicles for Uber - next few years
- Nissan: 10 models with some autonomous technology by 2020
- Tesla: fully self-driving models possible in 2 to 3 years
- Toyota: some autonomous features by 2021
- Volvo: self-driving car by 2021; eliminate fatalities related to its cars by 2020



# Where the Driverless Cars Are

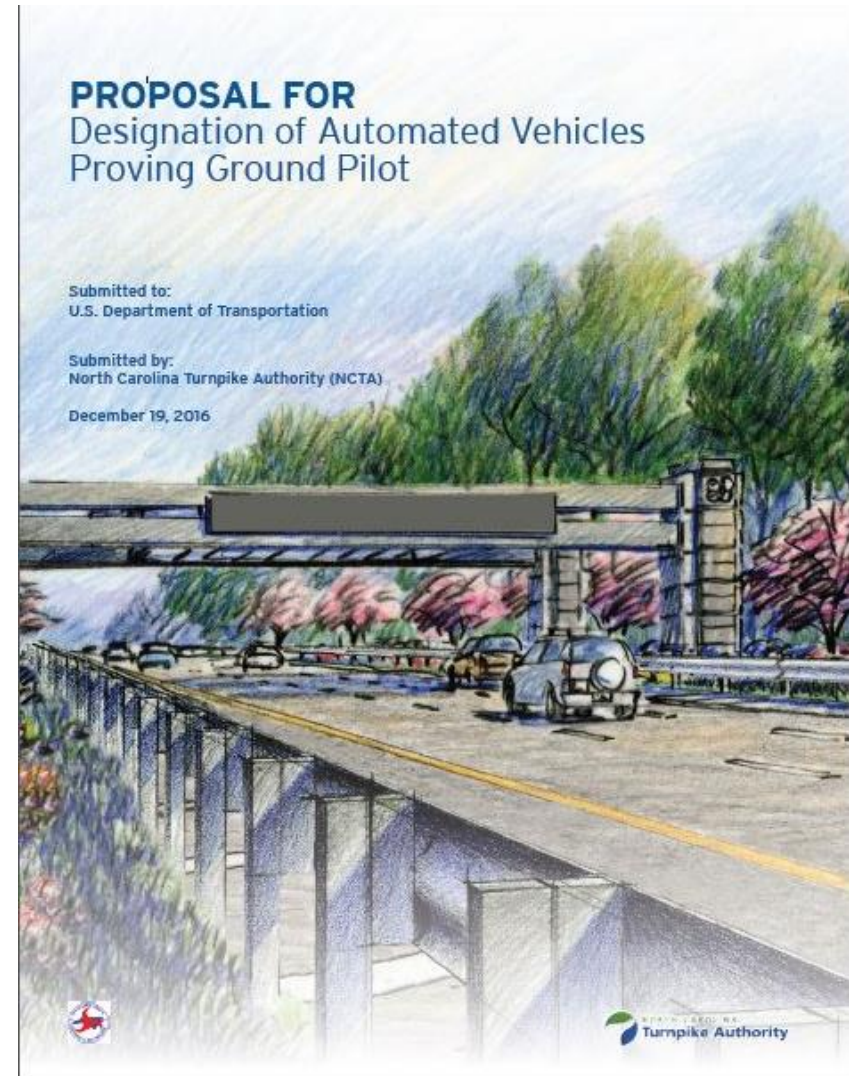
Here are some of the states where automated prototype cars are already being tested on roads, usually with humans at the ready as backup.





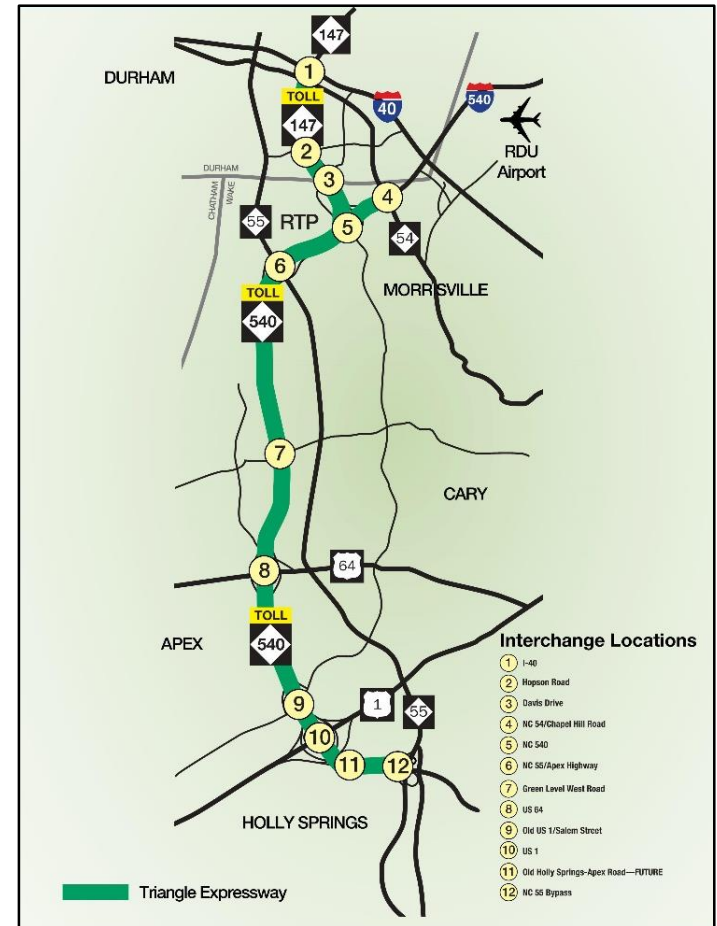
# Triangle Expressway

- 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



# Triangle Expressway

- Second All-Electronic Toll (AET) facility in US
- First new toll road designed as an AET facility from inception
- 18.8 mi between I-40 (near Durham) and NC 55 Bypass (near Holly Springs)
- Six-lane, 70 mph, full access controlled facility
- 10 interchanges and 18 AET tolling points
- Weekday Traffic Growth ~ 21% YOY



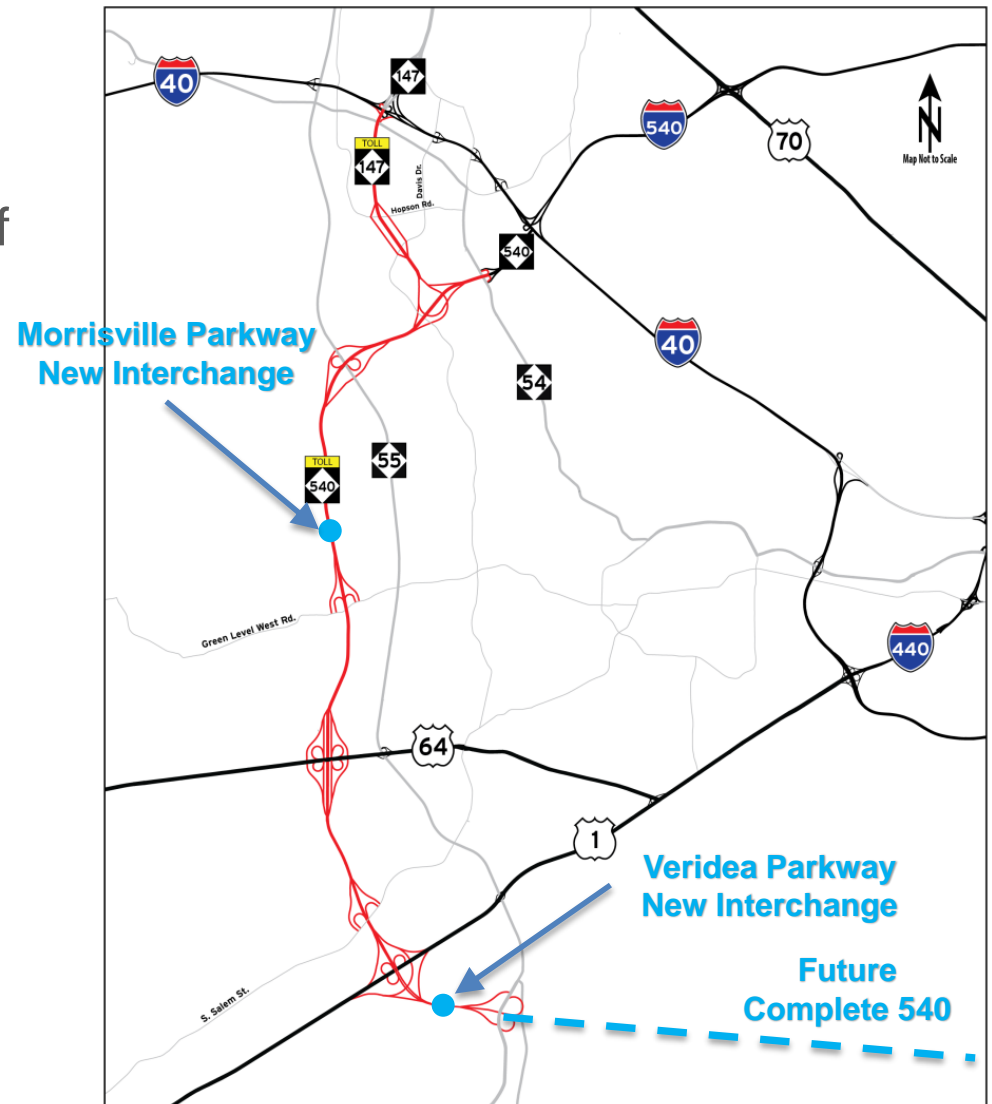
# Triangle Expressway

## Morrisville Parkway

- Cooperative effort between NCTA, NCDOT, and Town of Cary
- Open to traffic in late 2018

## Veridea Parkway

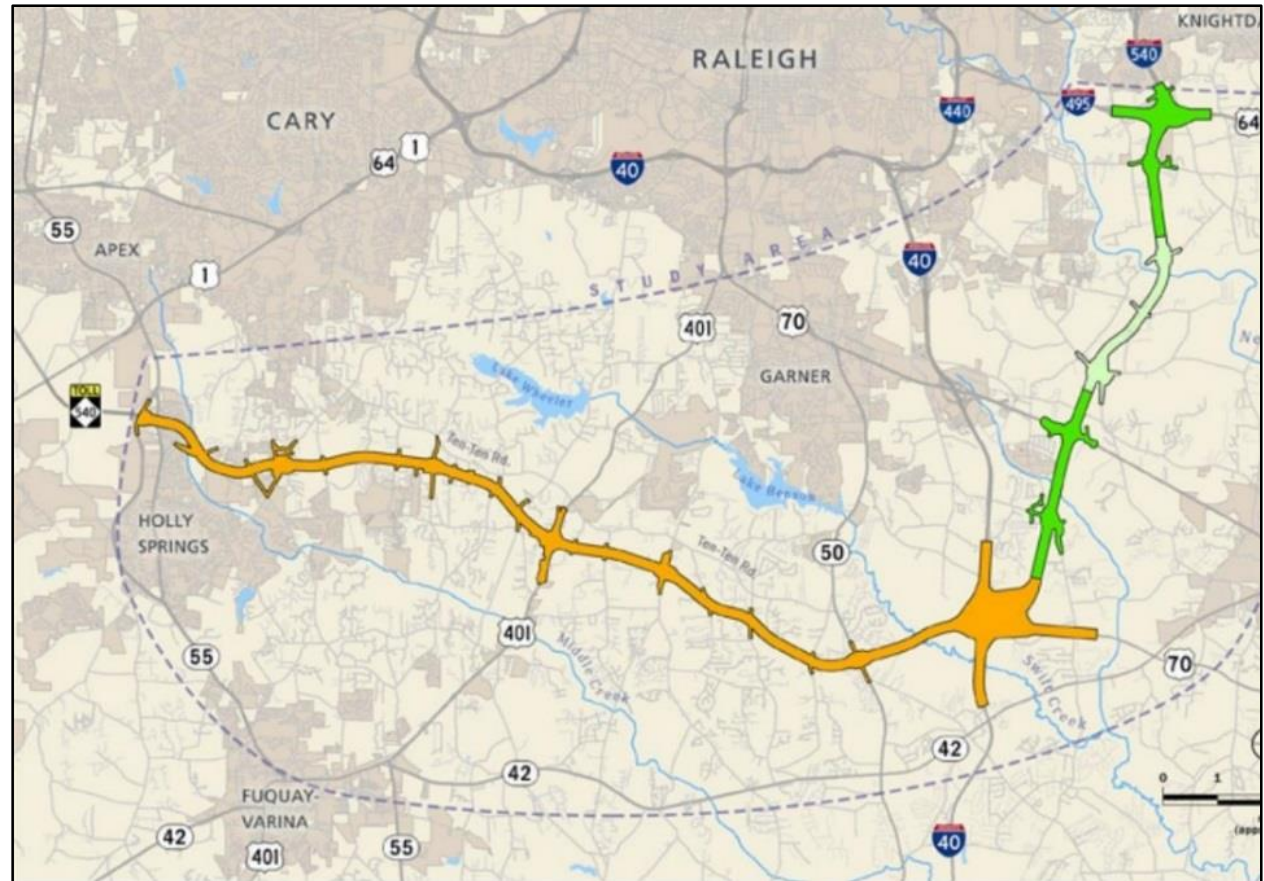
- Design-Build contract was awarded in June 2015
- Open to traffic April 2017





# Complete 540

- Approximately 30 miles
- 70 mph, full access controlled AET facility
- 3 phases
- Phases 1 & 2 scheduled for construction contract award in 2020



Complete 540 Preferred Alternative Corridor



# 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



RESEARCH & DEVELOPMENT



NORTH CAROLINA AGRICULTURAL  
AND TECHNICAL STATE UNIVERSITY



**Transportation.gov**  
U.S. Department of Transportation

## U.S. Department of Transportation Designates 10 Automated Vehicle Proving Grounds to Encourage Testing of New Technologies

The Proving Ground designees are:

1. City of Pittsburgh and the Thomas D. Larson Pennsylvania Transportation Institute
2. Texas AV Proving Grounds Partnership
3. U.S. Army Aberdeen Test Center
4. American Center for Mobility (ACM) at Willow Run
5. Contra Costa Transportation Authority (CCTA) & GoMentum Station
6. San Diego Association of Governments
7. Iowa City Area Development Group
8. University of Wisconsin-Madison
9. Central Florida Automated Vehicle Partners
10. North Carolina Turnpike Authority

# Commitment to Safety

## Designated Safety Officer (DSO) – Dennis Jernigan, PE

- 25-Year Veteran of NCDOT
- Background in Contract Engineering and Inspection (CEI) and project controls
- Recently managed the I-40 Reconstruction Project in Raleigh, NC

## Safety Monitoring and Data Systems

- NC Strategic Highway Safety Plan (SHSP)
- NCDOT Safety Manuals and Guidelines
- Traffic Engineering Accident Analysis System (TEAAS)
- Maintenance Rating Program (MRP) Reports
- Dedicated TMC and Safety Patrol Program

# Proposed Contributions

## Digital Mapping

- Study and test AVs on newly opened roadways and interchanges
  - Veridea Pkwy interchange in 2017
  - Morrisville Pkwy interchange in 2019
  - NC 540 phased in future years



High-Definition Digital Mapping Example

## Work Zone Traffic Control (WZTC)

- Study and test AVs in real-world Work Zone conditions
  - TriEx Maintenance of Traffic (MOT) Evaluation Plan
  - New WZTC guidelines and best practices to accommodate AVs



# Proposed Contributions

## Incident Management

- Study and monitor effectiveness incident management strategies and policies for AVs
- Utilize NCTA's TMC and TIMS



## All-Electronic Tolling (AET)

- Study interactions between AVs and tolling systems

## Big Data Analysis

- Comprehensive ITS infrastructure for research data collection
- University and business partners to analyze data



# NCTA Readiness

## Ability to Test

- Triangle Expressway is fully operational for immediate testing with newly available facilities opening in coming years



## Ability to Share Data

- Open data sharing through NCDOT's R&D Unit and NCTA's partners

## Designated Safety Officer and Safety Systems In Place

- DSO is committed to ensuring the program is an active, integral contributor to the advancement of AV technology.

## Community Engagement

- Ready to engage nearby communities and promote public involvement in advancement of AV technology

# 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



# Automated Vehicles Roadmap for NC

The NC General Assembly and NCDOT developed the Automated Vehicles Roadmap for North Carolina program.



[ncav.org](http://ncav.org)

## Program Goals

- Assess NC's current AV conditions and recommend changes
- Benchmark against industry and current initiatives of other agencies
- Provide near-term actions for NCDOT and key State agencies