



## **NORTH CAROLINA**

Department of Transportation



# Materials & Tests Unit

Pavement Design & Data Collection Section

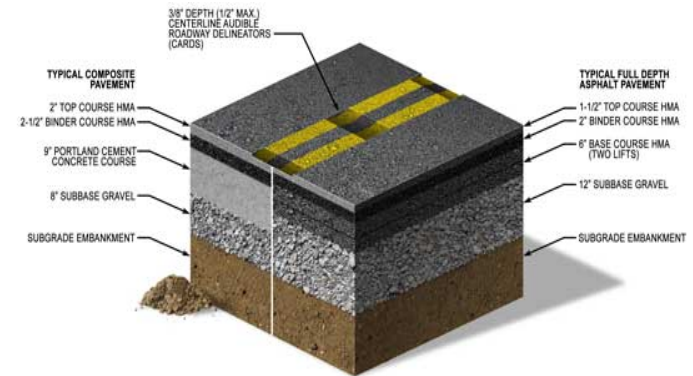
Matt Hilderbran, CPM, PE

2017 Contract Administration Conference

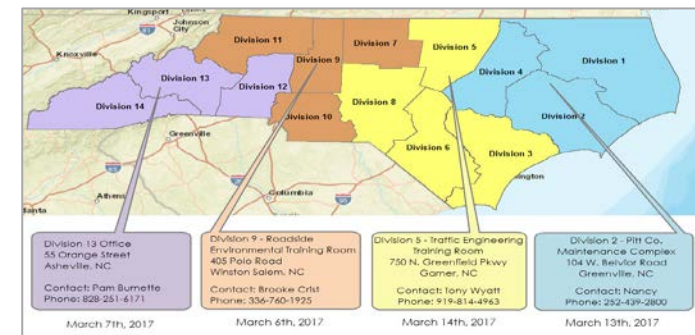
# Pavement Design & Data Collection

## Design

- Design most Flexible and Rigid Pavements for both Central and Division let projects
- Design Build – Write scope and perform review on pavement design alternatives
- Review municipal and town pavement designs on state maintained routes.
- Train Division staff on AASHTO 93' pavement design procedures to: **\*New in 2017\***
  - Expedite the pavement design phase
  - Gives Division the ability to select pavement design alternatives



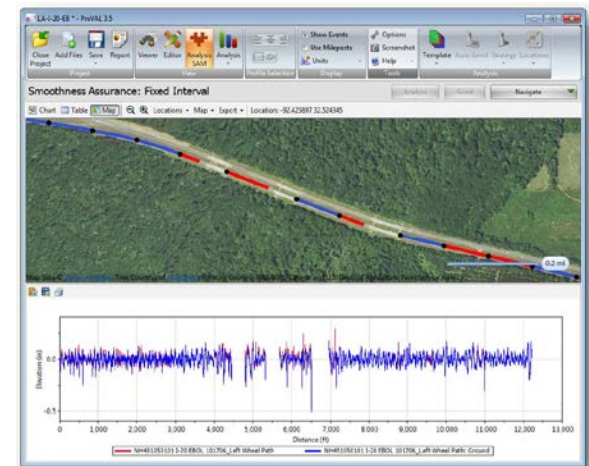
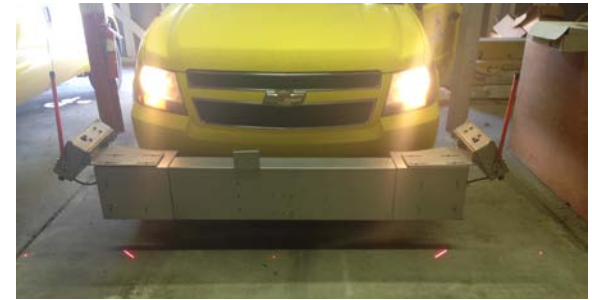
Greensboro Urban Loop and Interchanges



# Pavement Design & Data Collection

## Non-Destructive Testing

- High Speed Inertial Profilometers
  - Federally mandated to collect and report IRI and Rutting values on our NHS and HPMS routes annually.
  - Monitor and report current and historic IRI and Rut conditions of our State maintained routes to all Divisions via NCDOT's Pavement Management System.
  - Evaluate the ride quality of newly constructed or rehabilitated routes.
  - Develop and implement "Smoothness" assurance specifications
  - Diagnose the condition of specific sites to aid in determining appropriate remedies
  - Partner with NC Highway Patrol to operate and maintain North Carolina's Profiler Calibration and Certification Site. **\*New in 2016\***

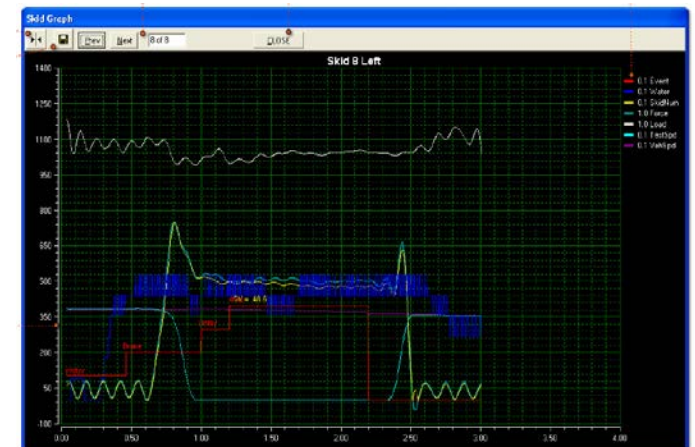
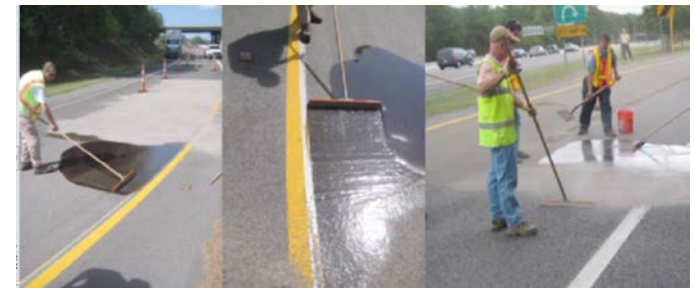




# Pavement Design & Data Collection

## Non-Destructive Testing

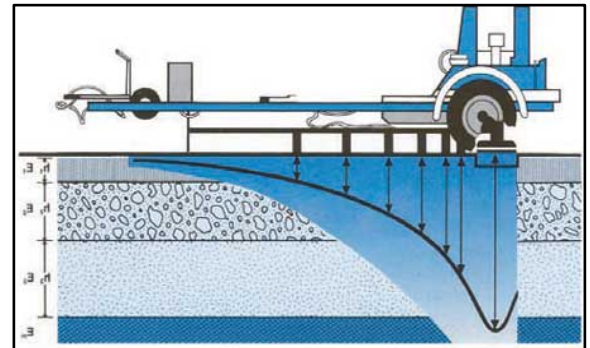
- Locked Wheel Skid Testers
  - Measure friction along state maintained routes to locate areas with inadequate resistance which lead to higher incidences.
  - Evaluate various types of old and new materials and construction practices for friction loss.
  - Coordinate with NCDOT's Traffic Safety Unit to diagnose and analyze skid resistance where a high population of wet crashes are occurring. Recommend appropriate remedies such as High Friction Surface Treatment.
  - Currently partnering with Virginia Tech and NC State University on two separate research projects that involve friction testing.



# *Pavement Design & Data Collection*

## Non-Destructive Testing

- Falling Weight Deflectometer
  - Non-destructive testing device used in pavement engineering to evaluate pavement structural conditions.
  - Crucial role in selecting optimum pavement maintenance and rehabilitation strategies.
  - This technology is used by NCDOT to achieve rapid and repeatable in-situ characterization of pavement layer stiffness.
  - Data is used to determine layer moduli for pavement design and analysis



# *Pavement Design & Data Collection*

## Sub-Surface Testing

- Coring and Dynamic Cone Penetrometer (DCP)
- Coring is used for forensic and routine evaluation to determine the source of problematic pavement layer(s).
- Testing results of the DCP are correlated to the California Bearing Ratios, as well as capture in-situ densities, and resilient modulus, all that aid in determining optimal pavement maintenance and rehabilitation strategies.

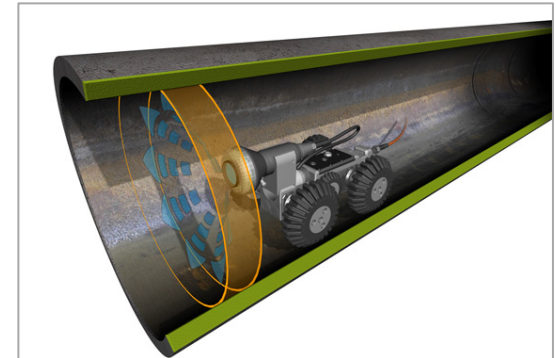




# *Pavement Design & Data Collection*

## Sub-Surface Testing

- CCTV Pipe Rover
  - NCDOT provides quality assurance on placement on new lateral pipe placed on construction of new roadways.
  - NCDOT provides quality assurance that pipes are installed properly according to state and federal standards.
  - NCDOT inspects pipes for all material defects, deformities, obstructions, and soil infiltration on both new and old pipes.
  - Crews respond to emergency calls to investigate pipe failures to help quickly assess damage and recommend necessary repairs.



# *Pavement Design & Data Collection*

## Sub-Surface Testing

- Magnetic Imaging Tomography ( MIT I & II )
  - Used to determine the thickness of freshly placed concrete slabs in lieu of coring which is destructive, time consuming, labor intensive, and costly.
  - NCDOT utilizes a state-of-the-art, nondestructive testing device known as MIT Scan-2 offers a faster, easier, and more accurate means for measuring the three-dimensional position of dowel bars embedded in concrete. Assurance of proper alignment helps reduce faulting and improve the pavement's performance.
  - This data collection scanner may be used for process testing and for acceptance testing during construction of new concrete pavements.

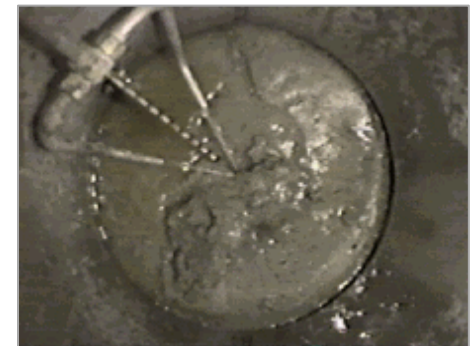




# *Pavement Design & Data Collection*

## Sub-Surface Testing

- Drilled Shaft Inspection Device (SID)
  - NCDOT utilizes SIDs to inspect the bottom cleanliness of drilled shafts so that end bearing could be used reliably in design. SID allows for safe inspection in deep holes with water or slurry, which may be viewed at the same time by the Engineer and the Contractor.
  - SID has special tools which allow sidewall sampling, investigation of the rate and magnitude of slurry buildup, investigation of the rate and magnitude of sidewall softening, investigation of sidewall strength, and profiles of shaft size.
  - SIDs are a valuable inspection tool and a tool to solve difficult drilled shaft construction problems. Use of SID can save valuable time and money for the Owner, Engineer, and Contractor.



## *Pavement Design & Data Collection*

### **Contact Information –**

#### **Pavement Design:**

Clark Morrison, PhD, PE  
[cmorrison@ncdot.gov](mailto:cmorrison@ncdot.gov)  
919-329-4018

#### **Data Collection, Research, & Investigations:**

Matt Hilderbran, CPM, PE  
[mrhilderbran@ncdot.gov](mailto:mrhilderbran@ncdot.gov)  
[randi@ncdot.gov](mailto:randi@ncdot.gov)  
919-329-4015