11th National Conference on Transportation Asset Management

Nothing Compares
NORTH CAROLINA

Best Practices of GIS Applications in Asset Management at NCDOT

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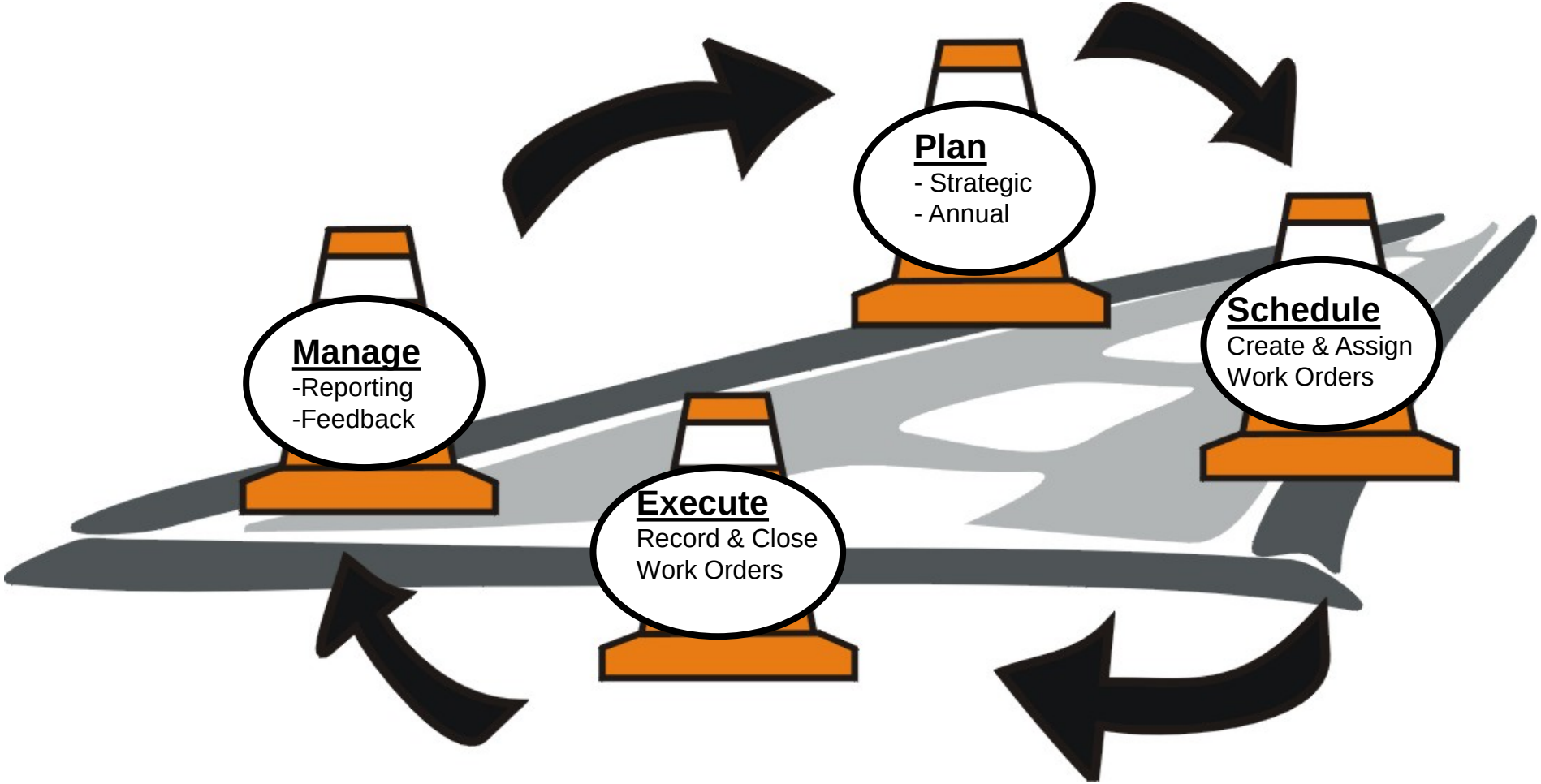
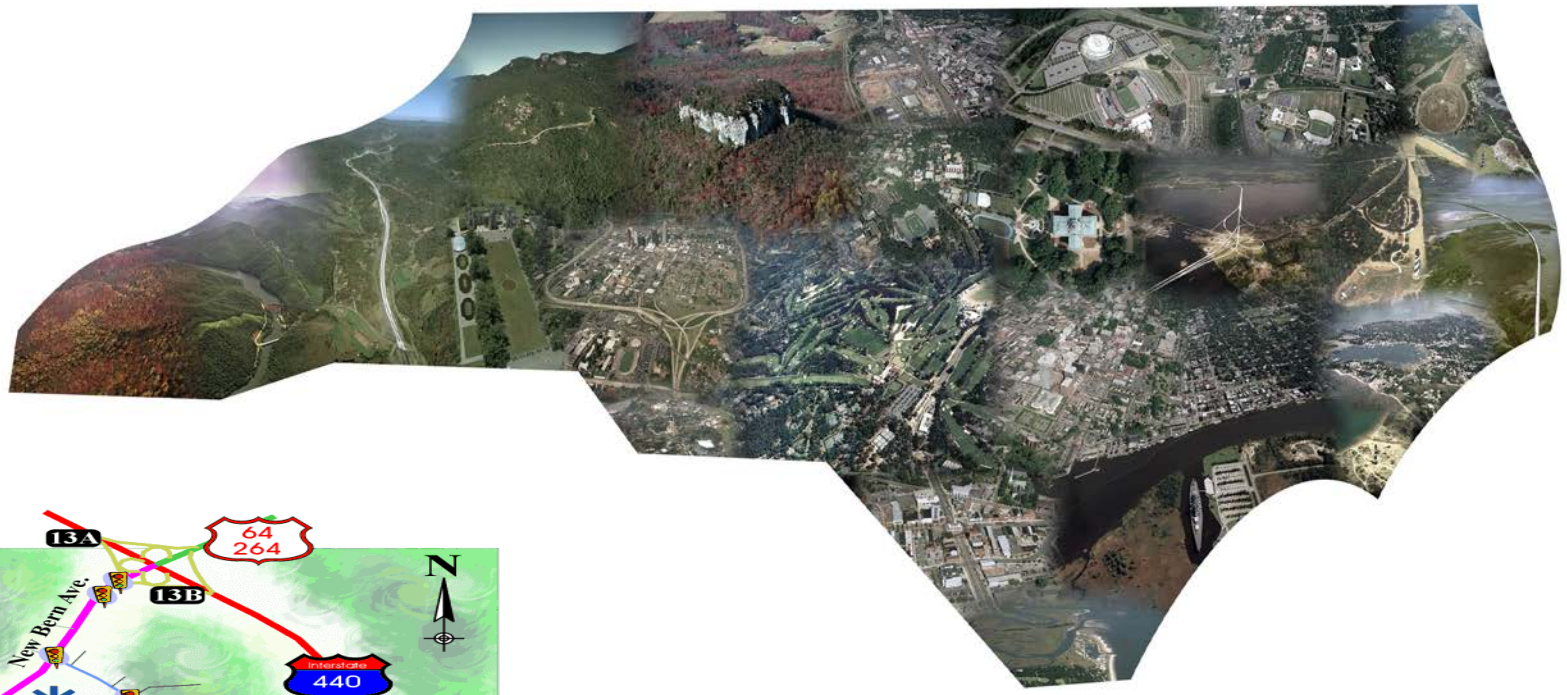
Agenda

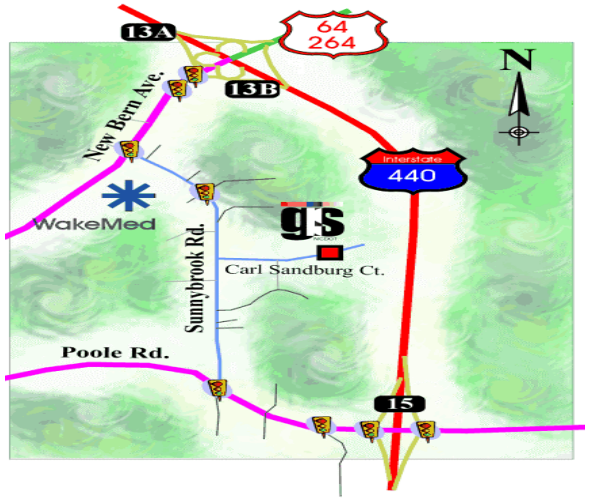
- The use of GIS and the asset management cycle
- Highway network linear referencing system (LRS)
- Field data collection of asset inventory and condition
- Collect and manage roadway network characteristic data
- Managing asset management plans

The use of GIS and the asset management cycle

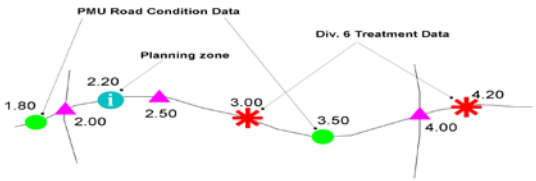


Highway Network Linear Reference System (LRS)





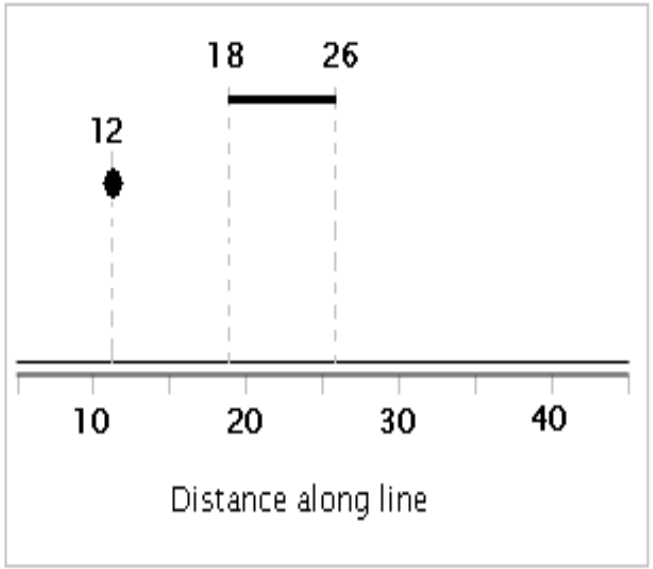
Updated GIS ROADCONDITION Layer



Linear Referencing: The Basics

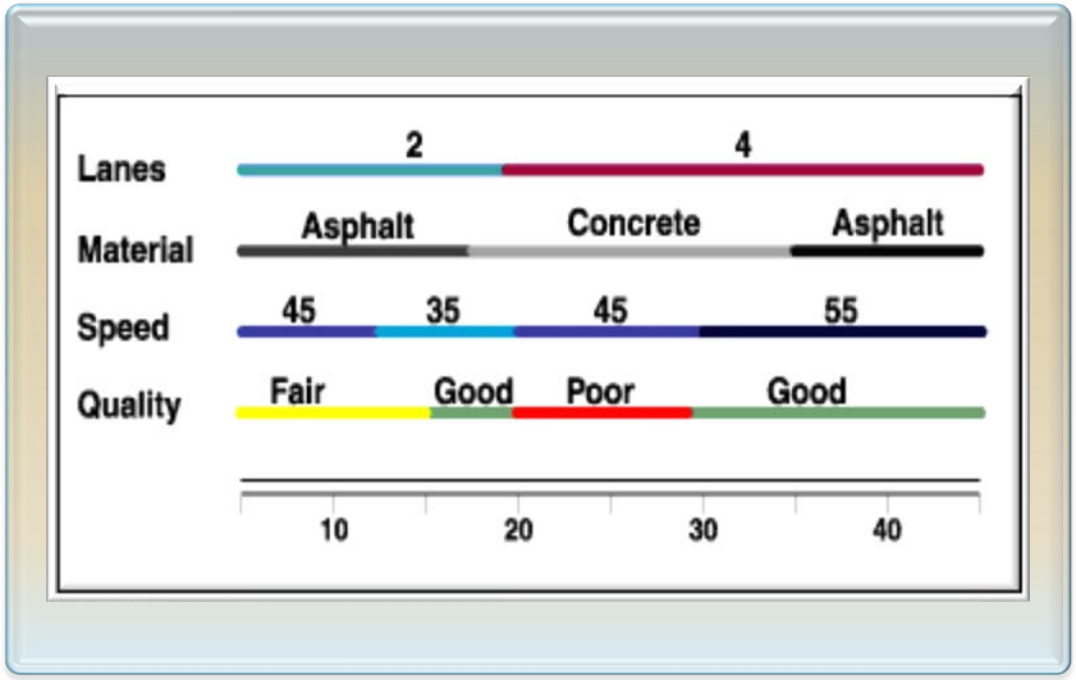
Linear Referencing is a method of spatial **referencing**, in which the locations of features are described in terms of measurements along a **linear** element, from a defined starting point.

- A route ID or reference and a measure value along the line segment.
- One measure creates point events, two measures line events
- NCDOT's Linear Referencing System is County, Route, Milepost based.



Linear Referencing: The Basics

Linear Referencing Systems provide the opportunity to display and analyze data based on common locations along a linear feature such as a roadway.



Advanced Linear Referencing

- Multiple Linear Referencing Methods
- Dynamic Route Representations
- Time Aware LRS
- Rule-based Event Behavior

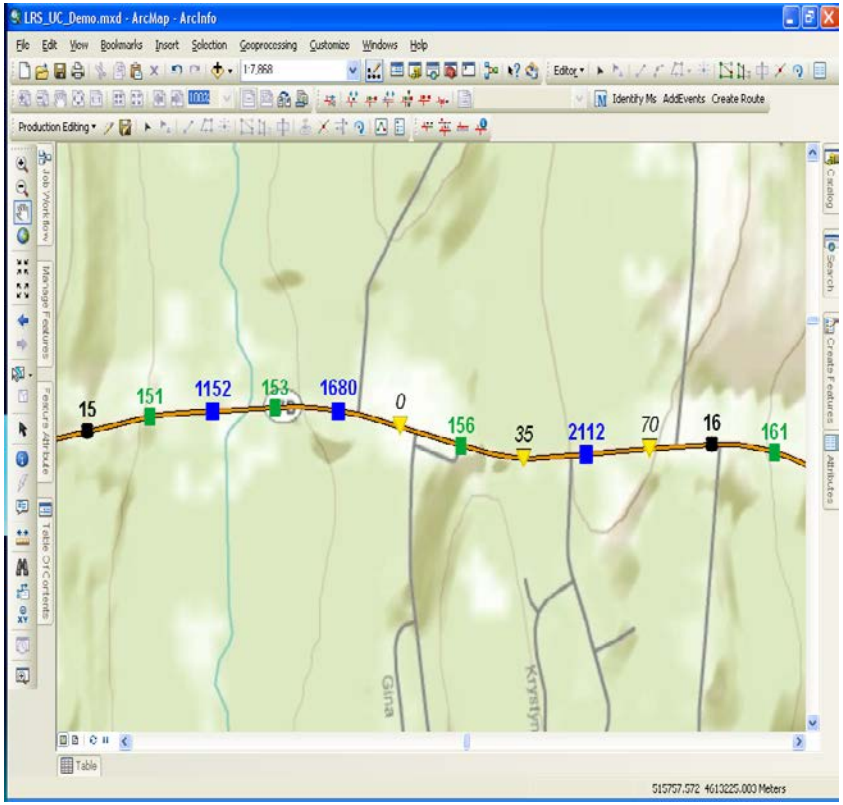
Multiple Linear Referencing Methods

Reference Markers

Project Stationing

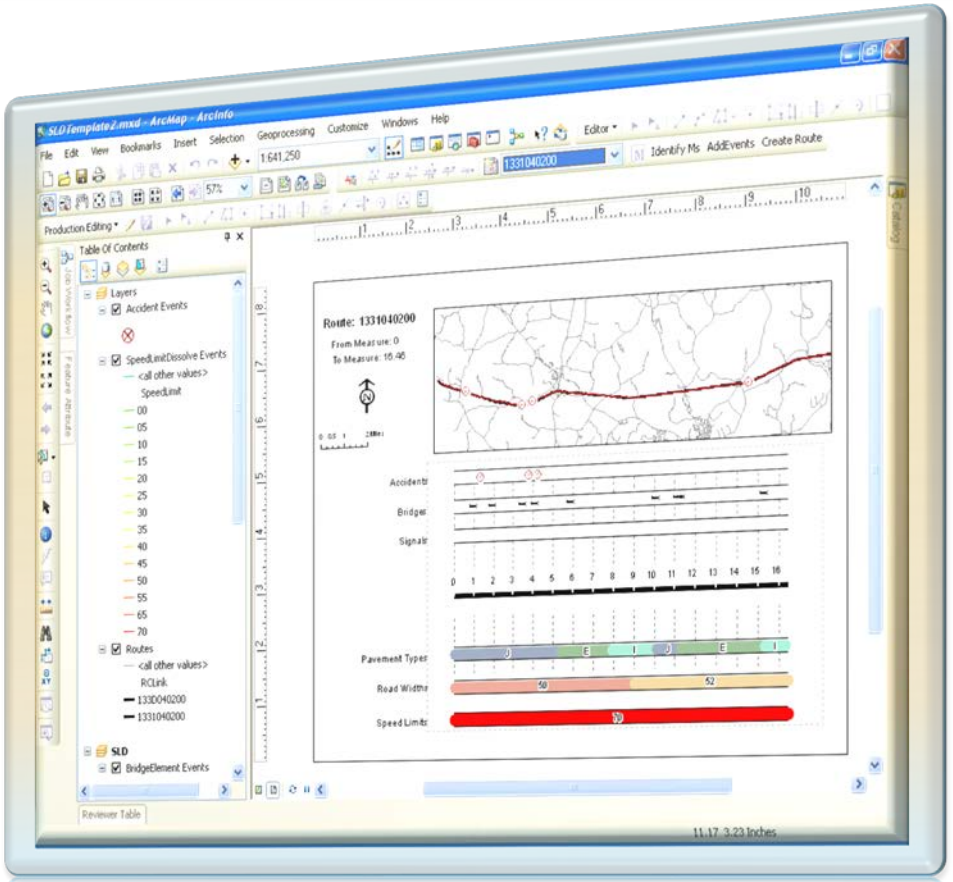
Mile Posts

Road Inventory



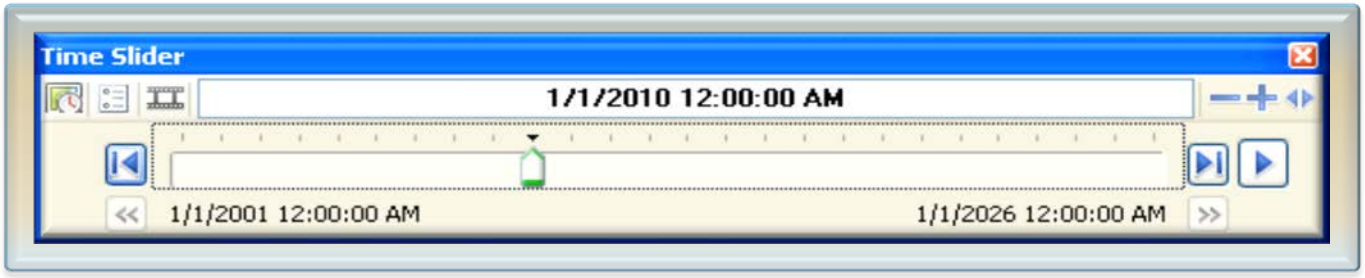
LRMs are like map projections; users need to be able to translate seamlessly from one to another

Dynamic Straight Line Diagram



Time Awareness in Linear Referencing

- Present – We need to see the current state of our highways
- Past – We need to see what our highways looked like when incidents occurred
- Future – We need the ability to add planned highways to our data



LRS Complexities/Consideration:

Rule-Based Event Behavior

There are 4 things that can happen to events when routes change

1. **The event moves**

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Rule-Based Event Behavior

There are 4 things that can happen to events when routes change

1. **The event moves**
2. **The event stays put**
3. **The event goes away**
4. **The event snaps to another route**

LRS: Why is this important in Asset Management?

Asset Management Systems are built on the foundation of an LRS…..

Pavement Management Systems

- **Locating distresses and treatments along the LRS**

Maintenance Management Systems

- **Locations of repairs**
- **Identifying problem areas**

Asset Inventories

- **Location of assets along roadway**

GIS in Asset Management: Field Data Collection

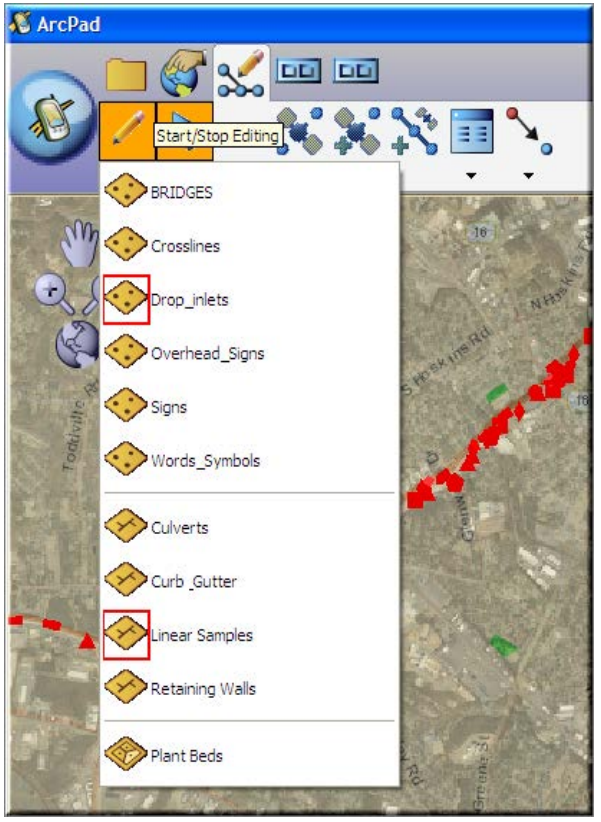
Multiple systems available:

NCDOT has used or is considering:

- **ArcPad**
- **ArcGIS Collector/AGOL**
- **Survey 123**

Allows users to gather data spatially and record attributes on site.

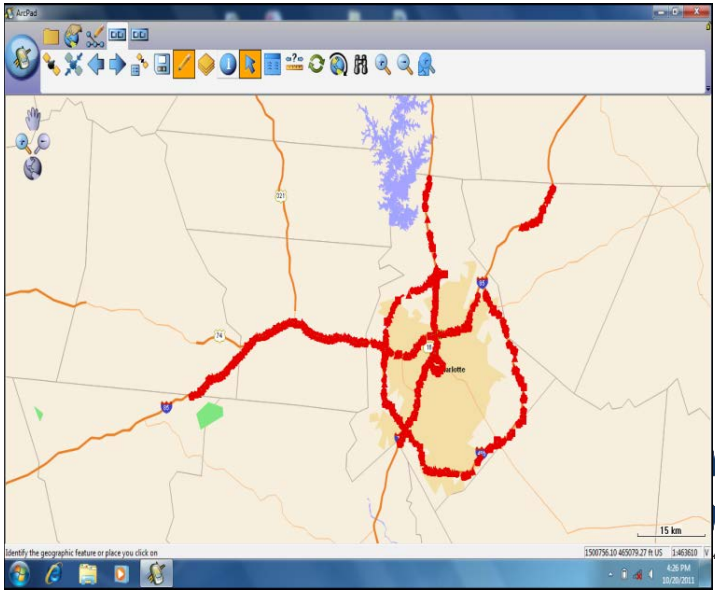
Eliminates need for data entry after returning to office



GIS in Asset Management: Field Data Collection

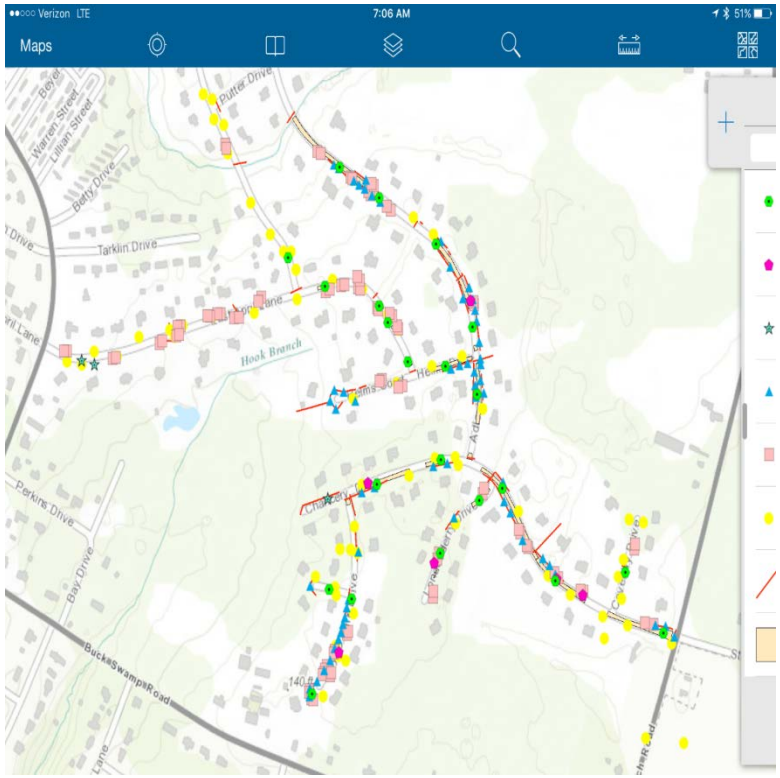
NCDOT uses of ArcPad in Asset Management:

- **Performance Based Maintenance Contract**
- **Maintenance Condition Assessment Program**
- **NC Turnpike Authority Maintenance Rating Program**
- **Pavement Condition Survey of Secondary System**
- **Small Pipe (non-NBIS) inventory**
- **Roadway Reviews**
- **Non-System Inventory Project**

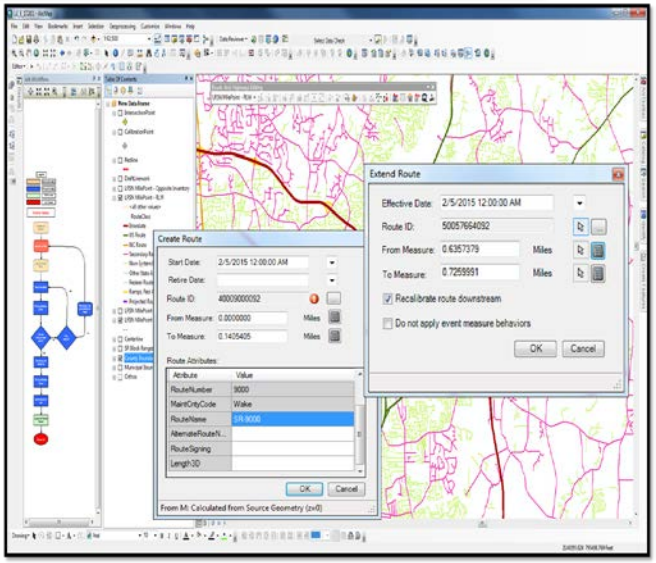


GIS in Asset Management: Field Data Collection

- **Best Practices:**
- **Data Synchronization across devices**
- **Aerial imagery**
- **Quality Control through forms**
  - **Validations**
  - **Conditional**
  - **Automated entry**
- **Quality Assurance reviews**



GIS in Asset Management: Managing Your Network – Business Integration



Best Practices at NCDOT:

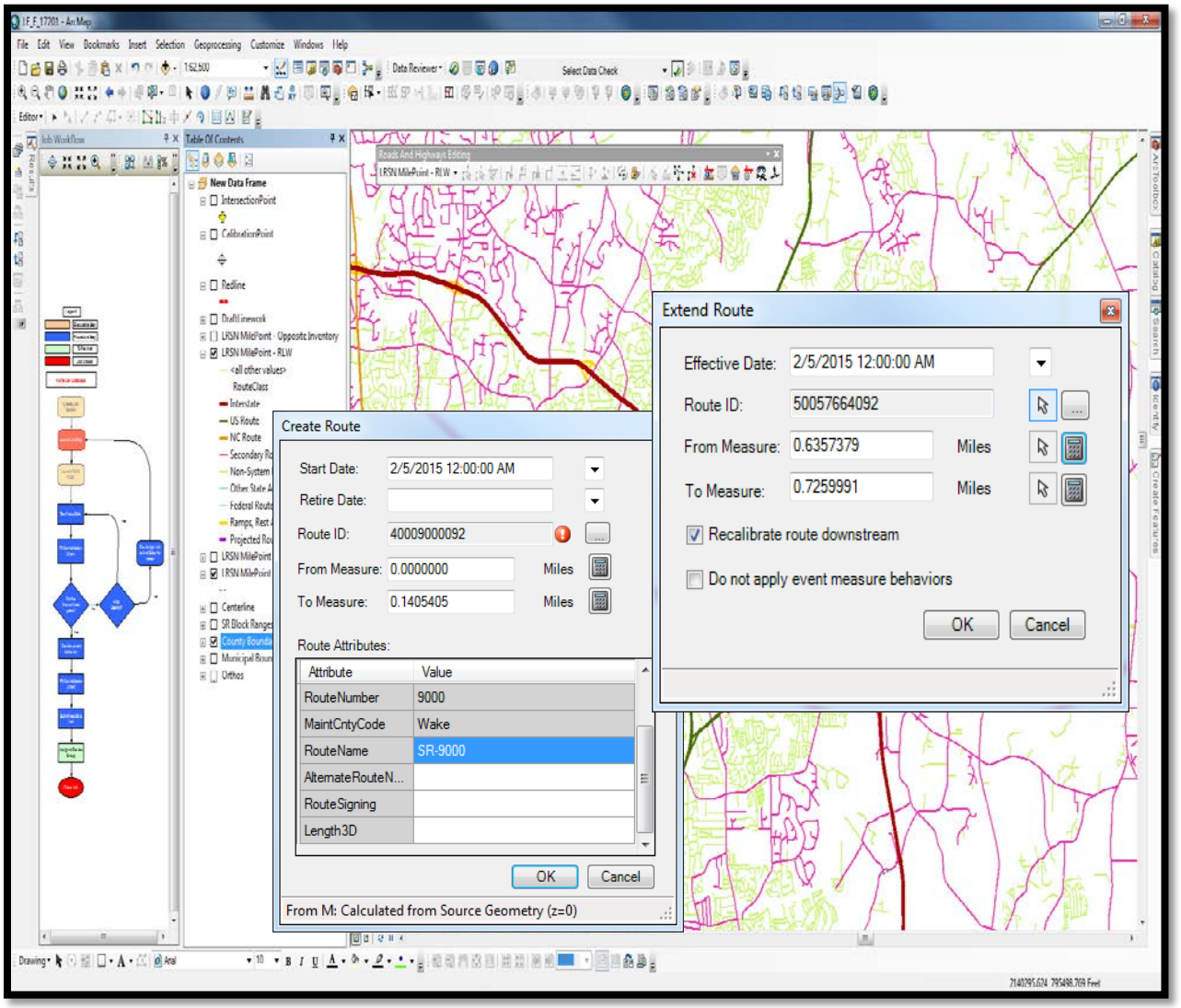
Identify and understand roles

- **Ownership vs stewardship**
- **Owners/stewards include:**
  - **GIS, Asset Management, Traffic Safety, Traffic Survey, Planning, 14 Highway Divisions, etc……..**

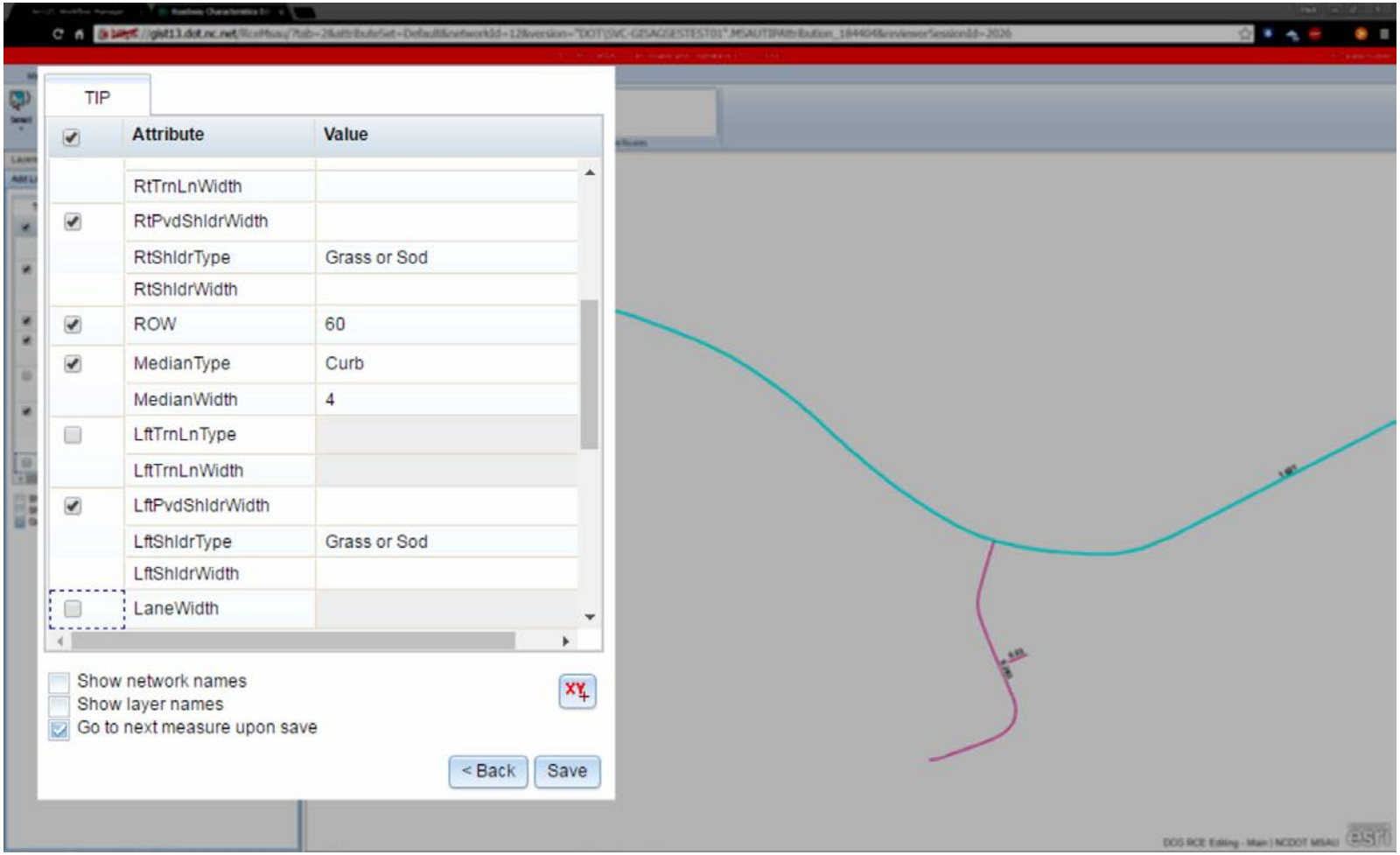
Empower data owners/stewards with appropriate tech

- **Phased rollout of Roads and Highways tools**
- **Eliminate data silos whenever possible by using common LRS**
- **Staff appropriately to maintain data currency and relevance**

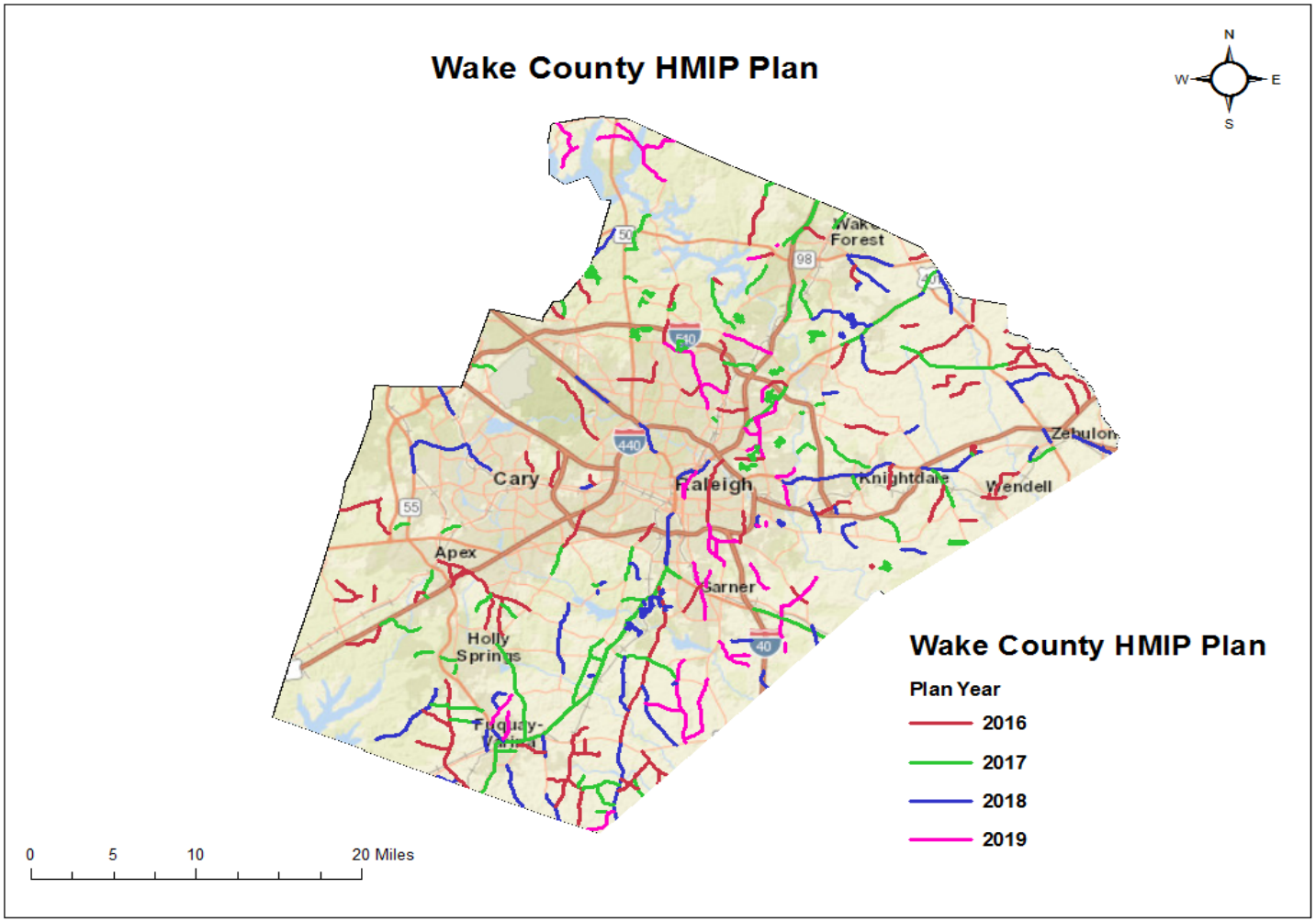
After It's Live – Maintain Our LRS



After It's Live – Maintain Events on the LRS



Managing asset management plans



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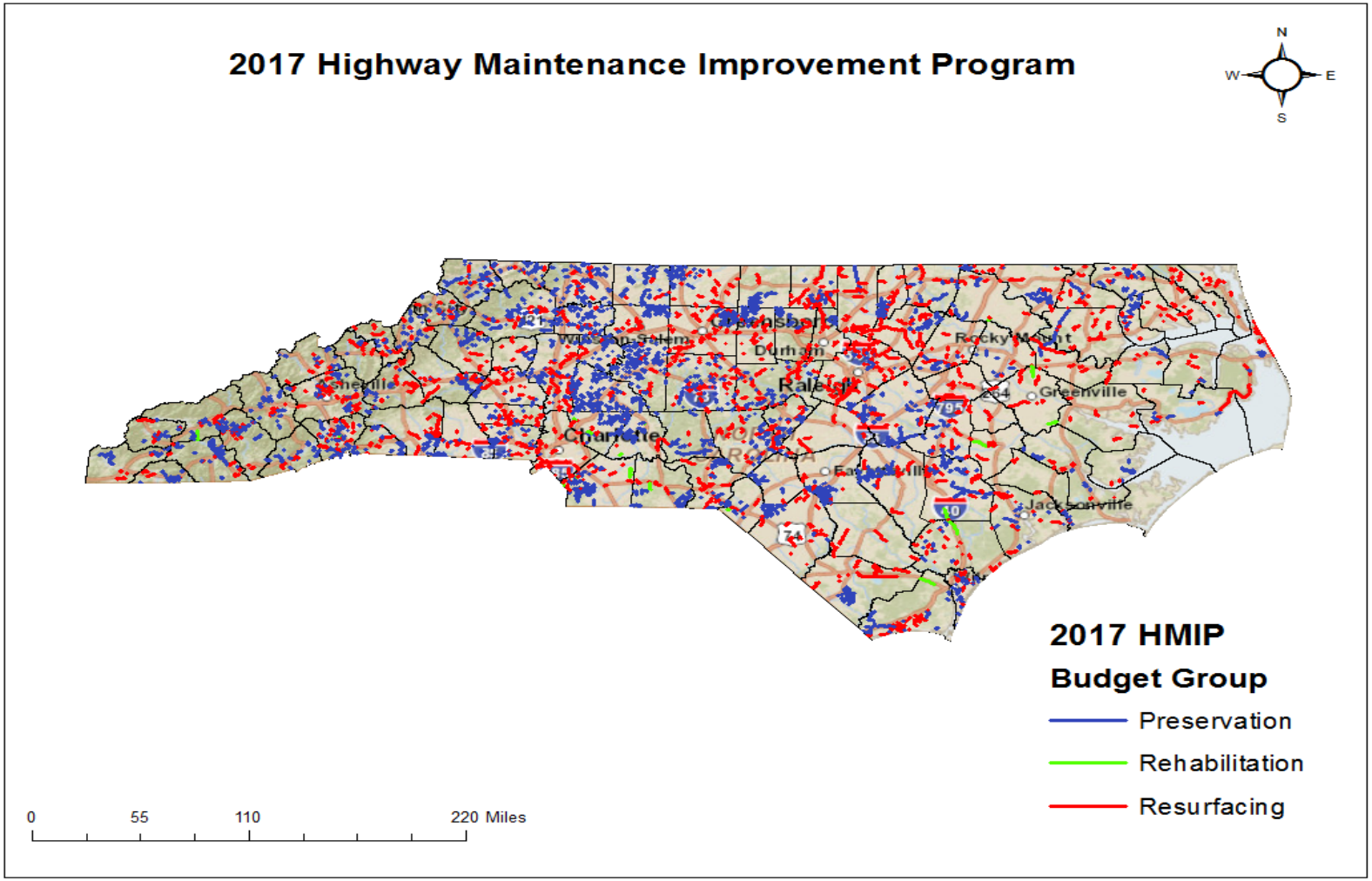

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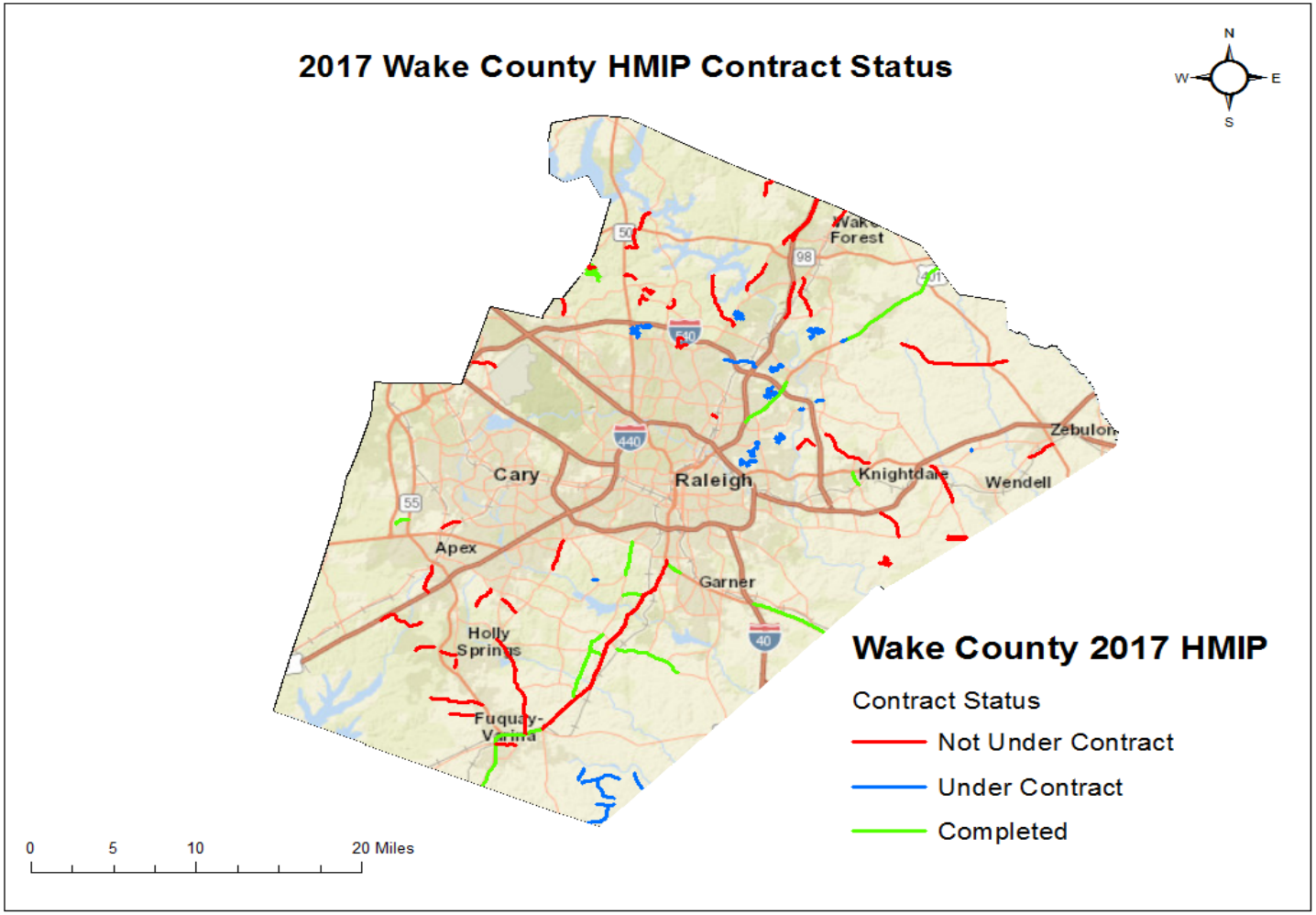

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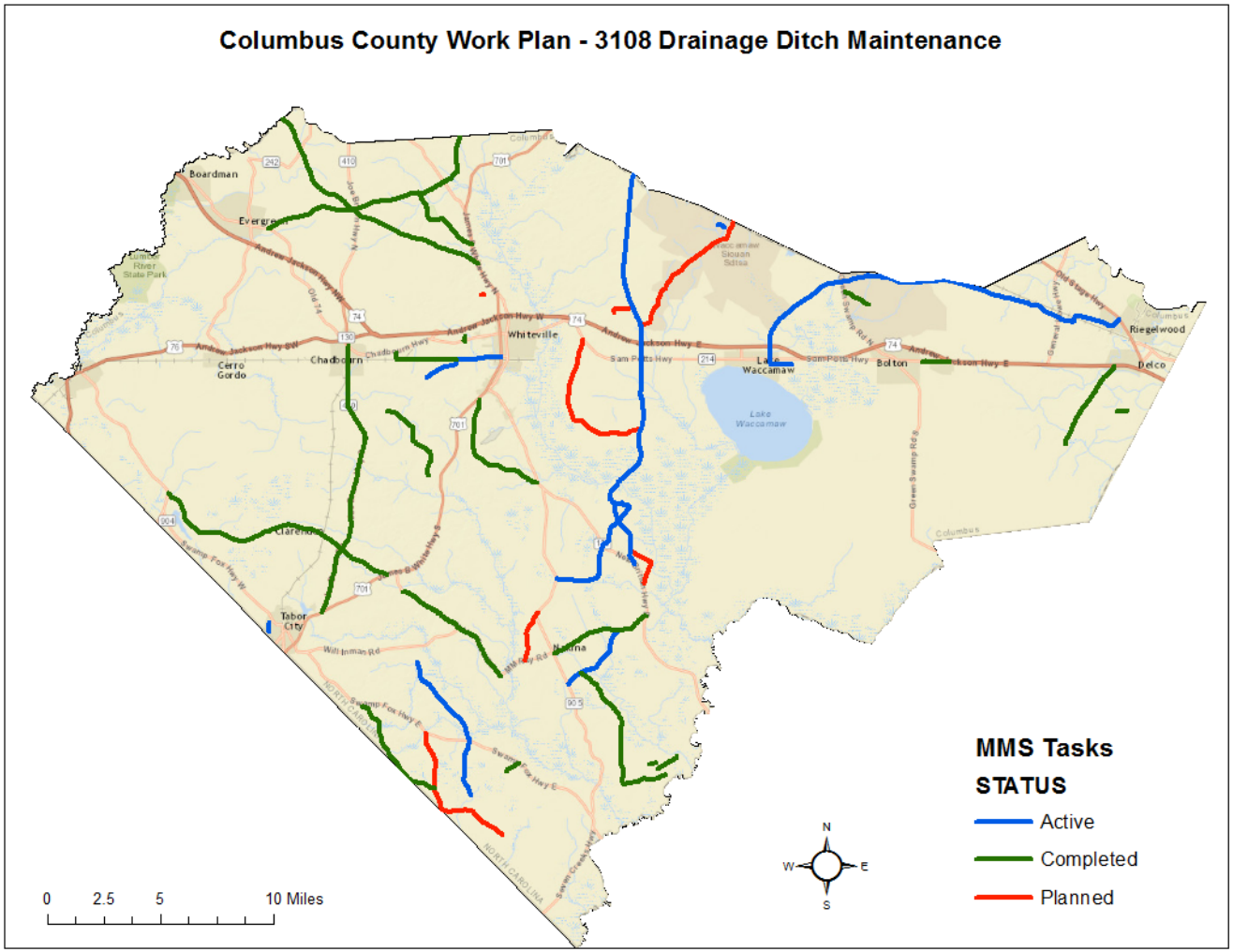

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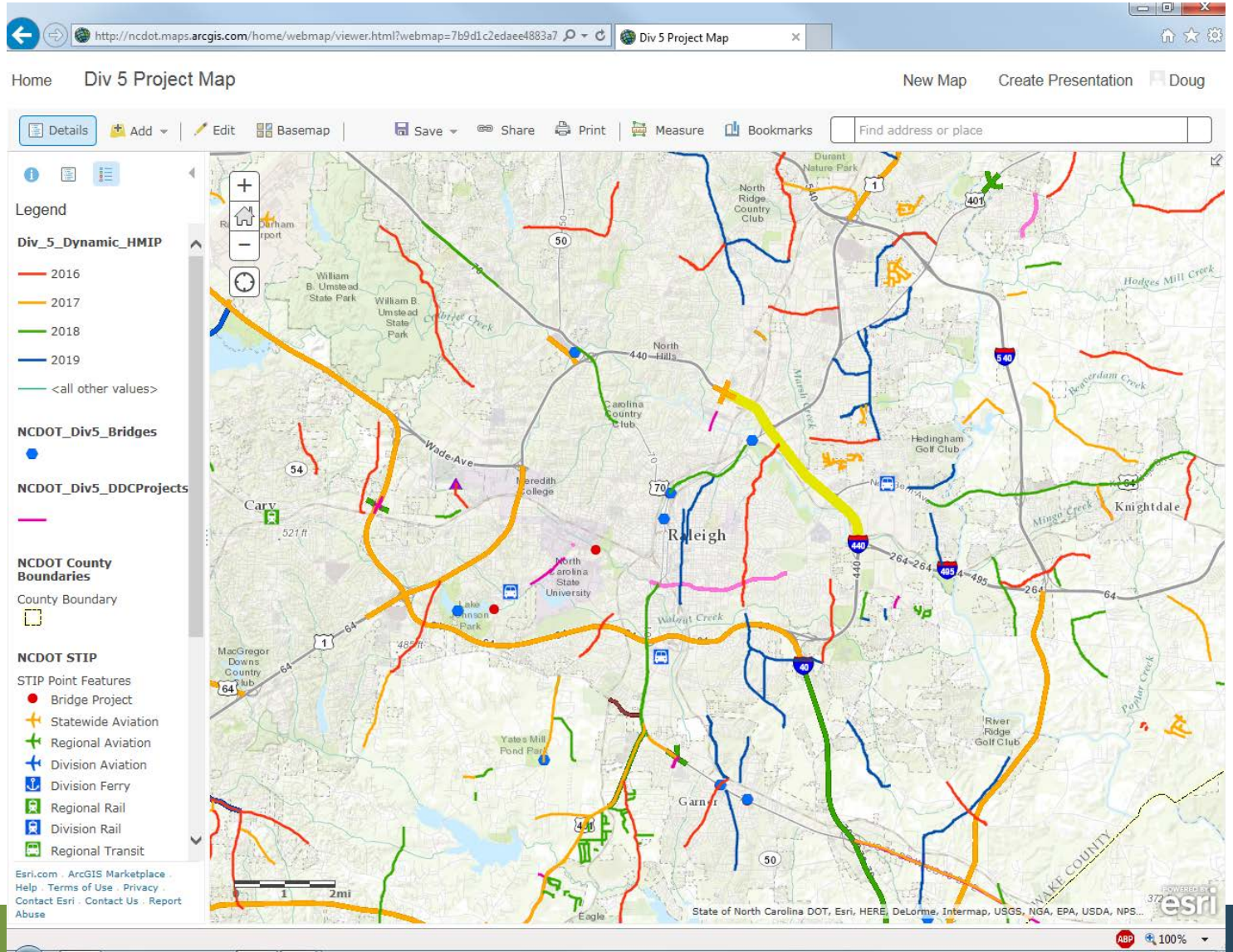

Questions??

Thank You!