WATER LEVEL GAUGES ASSESSMENT AND INSTALLATION

Crystal Moore and Adam Spiller

NCBIWA Fall Conference
October 2026

RISE TO THE **CHALLENGE**
ISO 9001:2015 Certified | Employee-owned Since 1988

Objectives

- Why gauges?

- Gauge Installation
  - The best location for a gauge
  - Installation process
  - Accessing and utilizing the gauge information

Types of Gauges

- Water level gauges
  - Radar or Pressure Transducers

- Not full service USGS gauges



Gauges in Service

- North Carolina – 37,000 miles of streams
  - USGS – 244 Gauges
  - FIMAN – 778 Water Surface Gauges

  - Approximately 320 miles of coastline
    - Barrier Islands – 34 Gauges on FIMAN

Public Safety is Priority #1

- Allows real time decision making during emergencies.
- When to shut down roads.
- Conditions of evacuation routes.





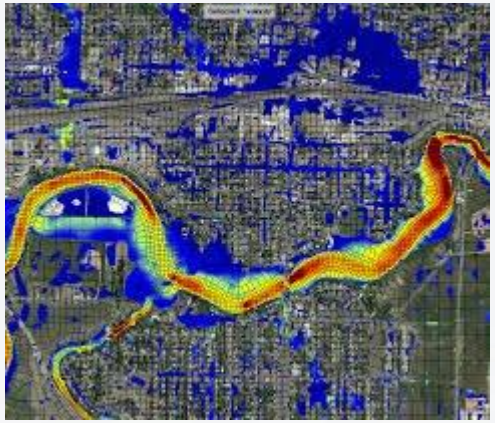
Hurricane Florence 2018

How is gauge data used?

- Roadway Drainage
- Hydrologic & Hydraulic Studies
- Level of Service
- FEMA Flood Mapping
- Watershed Studies
- FEMA CLOMRs / LOMRs
- BMP / Green Stormwater Design
- Culvert / Bridge Analysis
- Dam Breach Analysis
- Scour Analysis
- 2D Modeling
- Erosion & Sediment Control Design
- Stormwater Reviews
- Emergency Assessment





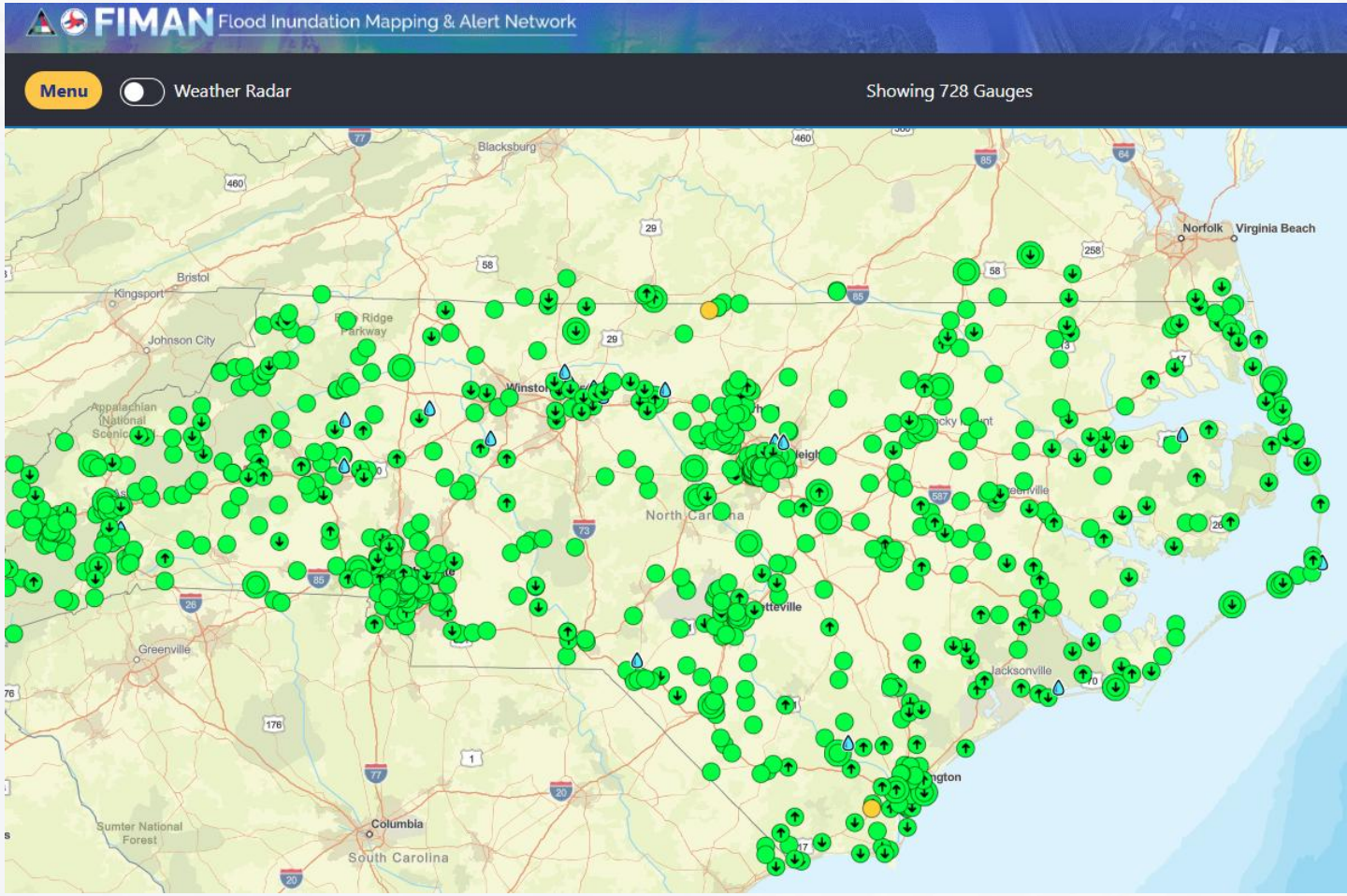




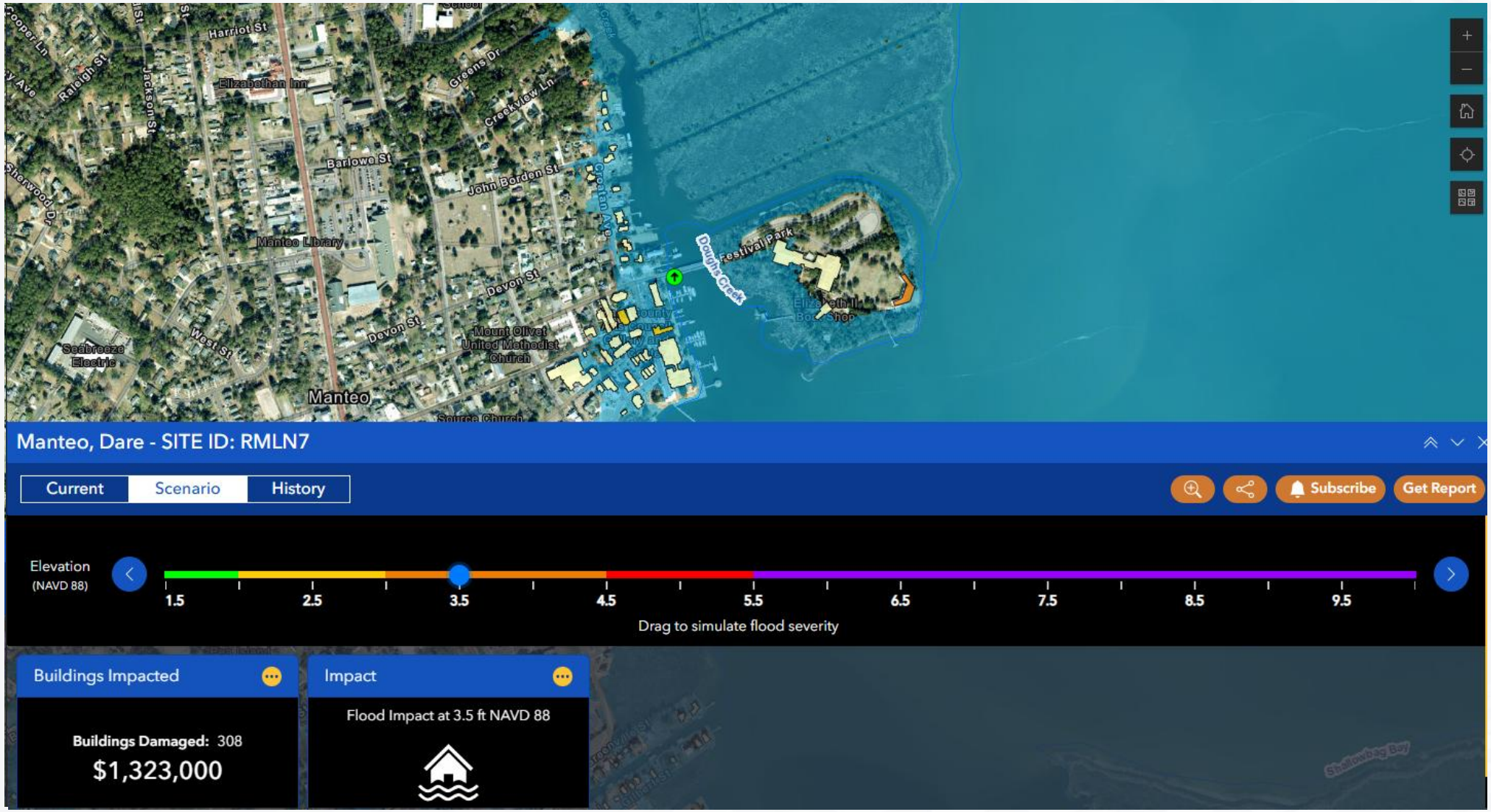
FIMAN (Flood Inundation Mapping & Alert Network)

- Developed in 2016/2018 Matthew and Florence

- Real Time Reporting
  - 15 minute reporting time
  - USGS, NCDOT, and other privately owned gages
    - Hydrogragphs
    - Future forecasting
    - Historical data
  - Emergency response to shut roads down

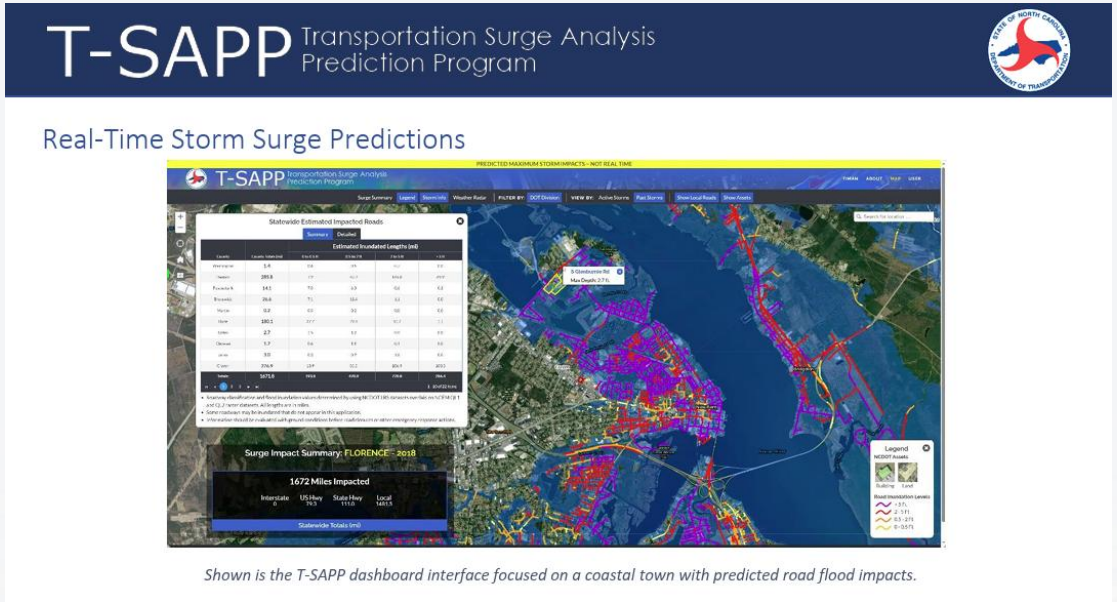


FIMAN (Flood Inundation Mapping & Alert Network)



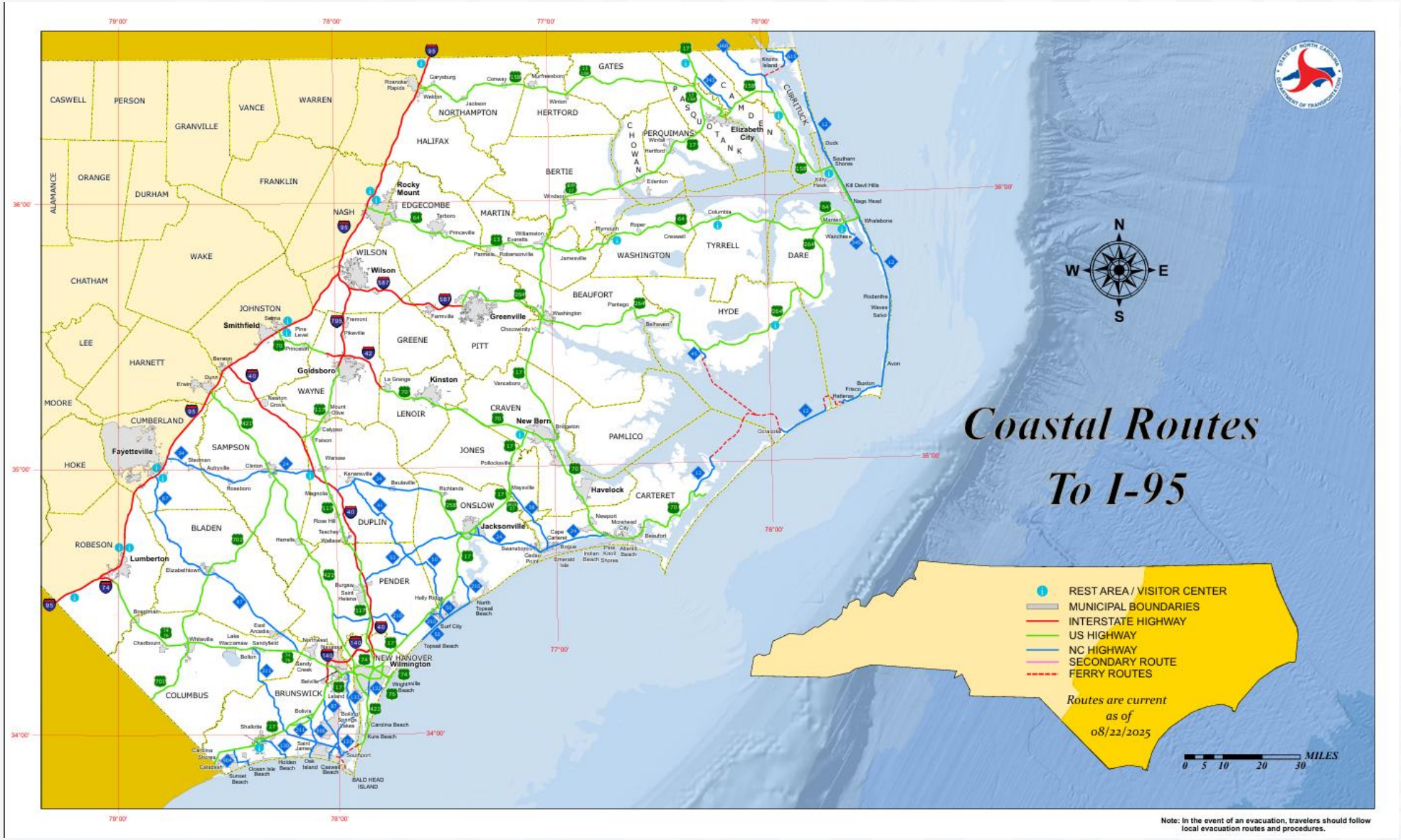
T-SAPP (Transportation Surge Analysis Prediction Program)

- Coastal focus
- Depends on a robust network of coastal gauges.
- More coastal gauges = better prediction models and real time data

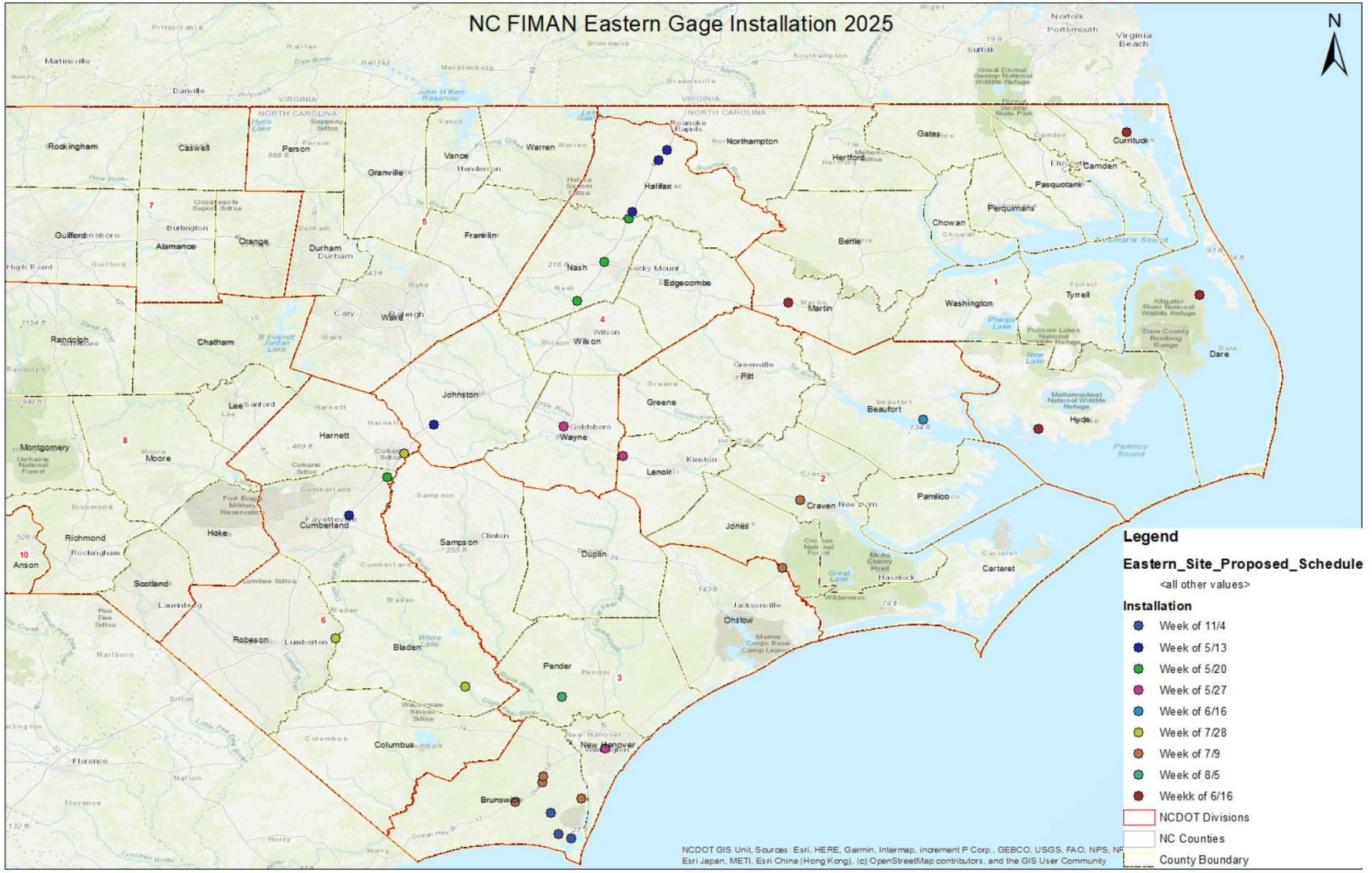


Shown is the T-SAPP dashboard interface focused on a coastal town with predicted road flood impacts.

Coastal Evacuation Routes

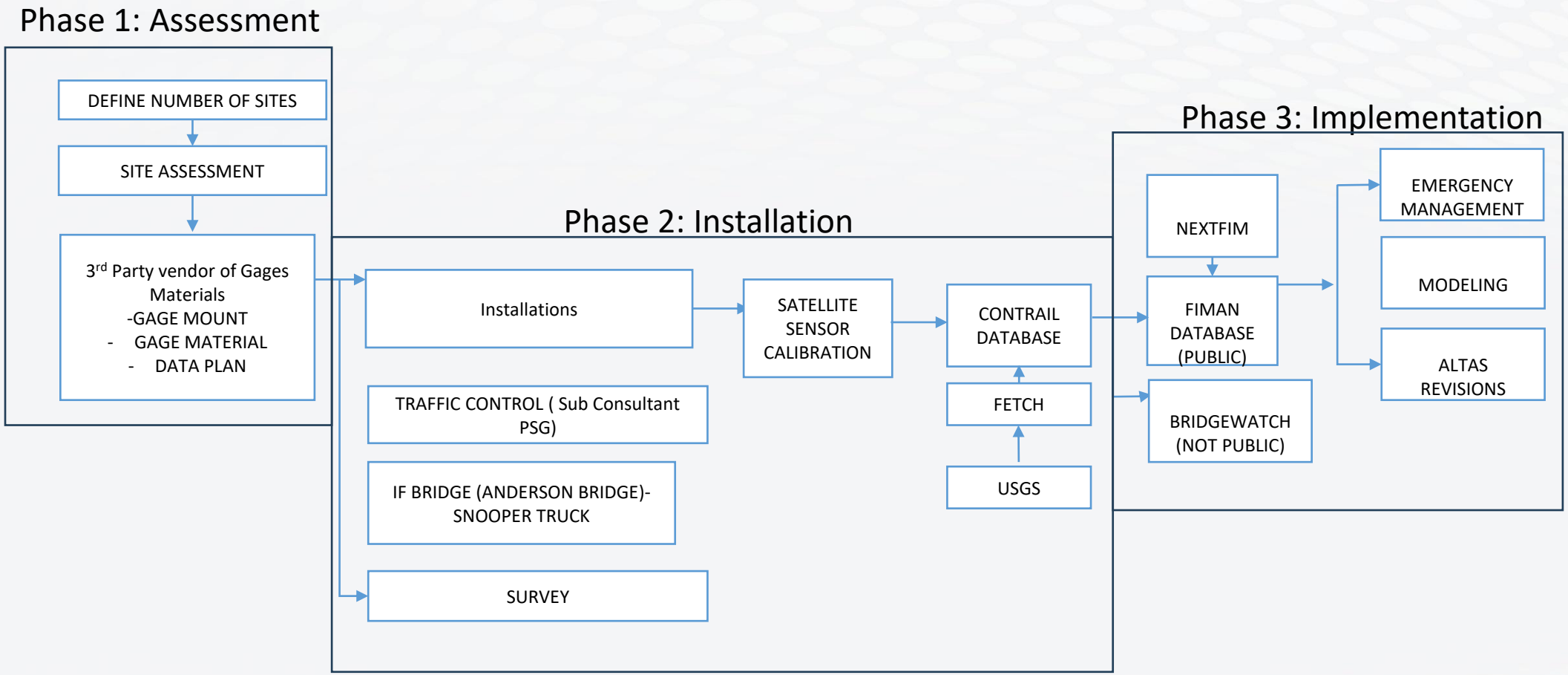


Gauge Overview Map



- Over 100 Gauges installed over the last year
- 2025 Gauge Year
  - - 27 Gauges in East
  - - 27 Gauges in West

Gauge Overview Process



Assessment

- 100 yr +2
- Canopy
- Debris potential
- Water in channel
- Proximity to Traffic
  - Can you close traffic?
- Potential structure life span
- Satellite/cellular

14	Superstructure Type	Ferry electrical platform - Concrete block projects out of pier set on wood piles with wooden railing superstructur
15	Substructure Type	
16	Spans	N/a
17	Gage Mounting Requirements	Add additional 4 x 6 wood to current vertical post and mount fully through 2 x 12 rails
18	Stream Gage Type	Radar & Satellite
19	Mounting Location Elevation (NAVD 88)	
20	Height Above Normal Water	
21	Height Above Max Flood Elevation	13' (500 yr +1))
22	Bank Erosion Evidence (yes/no)	
23	Stream Channel Condition Comment	Electrical platform mounting location Is out far enough to rarely be without water
24	Visible High Water Marks	wind blown MHW 10.5'
25	Vegetation Growth and Bridge Potential Debris Obstr	Location is on Currituck sound
26	Preferred Stream Gage Mount Location	West (landward) side of ferry electrical platform
27	Distance from Gage Location to end of Structure	
28	Type of Gage Mount & Installation Comments	Custom mount on wood rail system
29	Alternate Mounting Locations	Top of concrete on southside of Bridge adjacent to preferred location
30	Preferred Staff Gage Location	Ferry electrical platform
31	Safety-Install Work Area Assessments	
32	Surrounding Utility Descriptions	Electrical line at base of mounting platform for ferry ramp operations
33	Type of Railing	Wooden double railing of 2 x 12 with 4 x 6 posts Height is roughly 3.4'
34	Installation traffice control requirement	
35	Cell phone service Coverage	-119, 21& 3x -118, 23
36	Satellite preferred (yes/no)	yes
37	Solar power vegatative concerns	no
38	Maintenance Operations Concerns (snow, mowing et	no
39	Traffic Operations Equipment Location Comments	
40	**Photos**	
41	-Upstream Photo	
42	-Downstream Photo	
43	-Looking at the bridge face downstream	
44	-High Water Marks	
45	-Structure Failure	
46	-Sag point adjacent to the bridge located on roadway	
47	-Roadway left	
48	-Roadway right	
49	-Upstream Photo	
50	**Sketches**	
51	-Stream gage installation	
52	-Bridge sketch Plan View	
53	**Remarks**	Randy marked survey shot locations with orange paint. Met with Trevor from the ferry office. Met with ferry captai
54		
55		

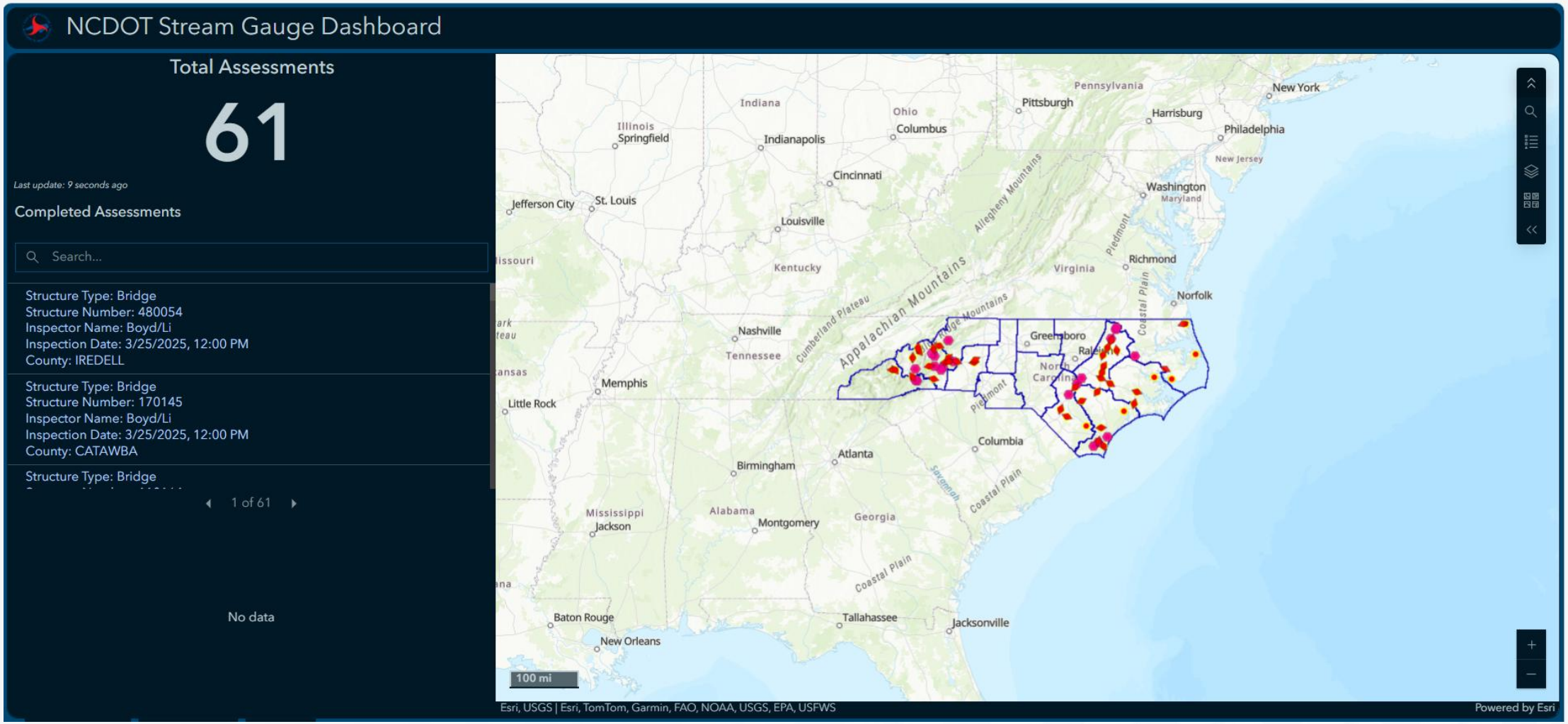
Installation Process



- Key Concerns
  - Traffic Control
  - Bridge Company who will provide/operate the snooper truck
  - Fabricator to manufacture the mount
  - Gauge needs to be up on contrails
  - Survey group established



KCI Tracking Dashboard



KCI Service

- Assessment
- Coordinating with Divisions Traffic Control
- Encroachment Agreements
- Mount and Pole Fabrication
- Contrails set if state has established
- Dashboard
- Survey

Survey Report

- Gage
- Sensor
- Roadway
- Thalweg of stream
- Structure (culvert/bridge)
- Sag in roadway
- Normal Water surface
- Elevation



Stoney Run



Thank you!

Contact Information

- Crystal Moore
  - Email – crystal.moore@kci.com
  - 919-345-1487

- Adam Spiller
  - Email – adam.spiller@kci.com
  - 919-475-3696

KCI

RISE TO THE CHALLENGE