



# **NORTH CAROLINA**

## Department of Transportation



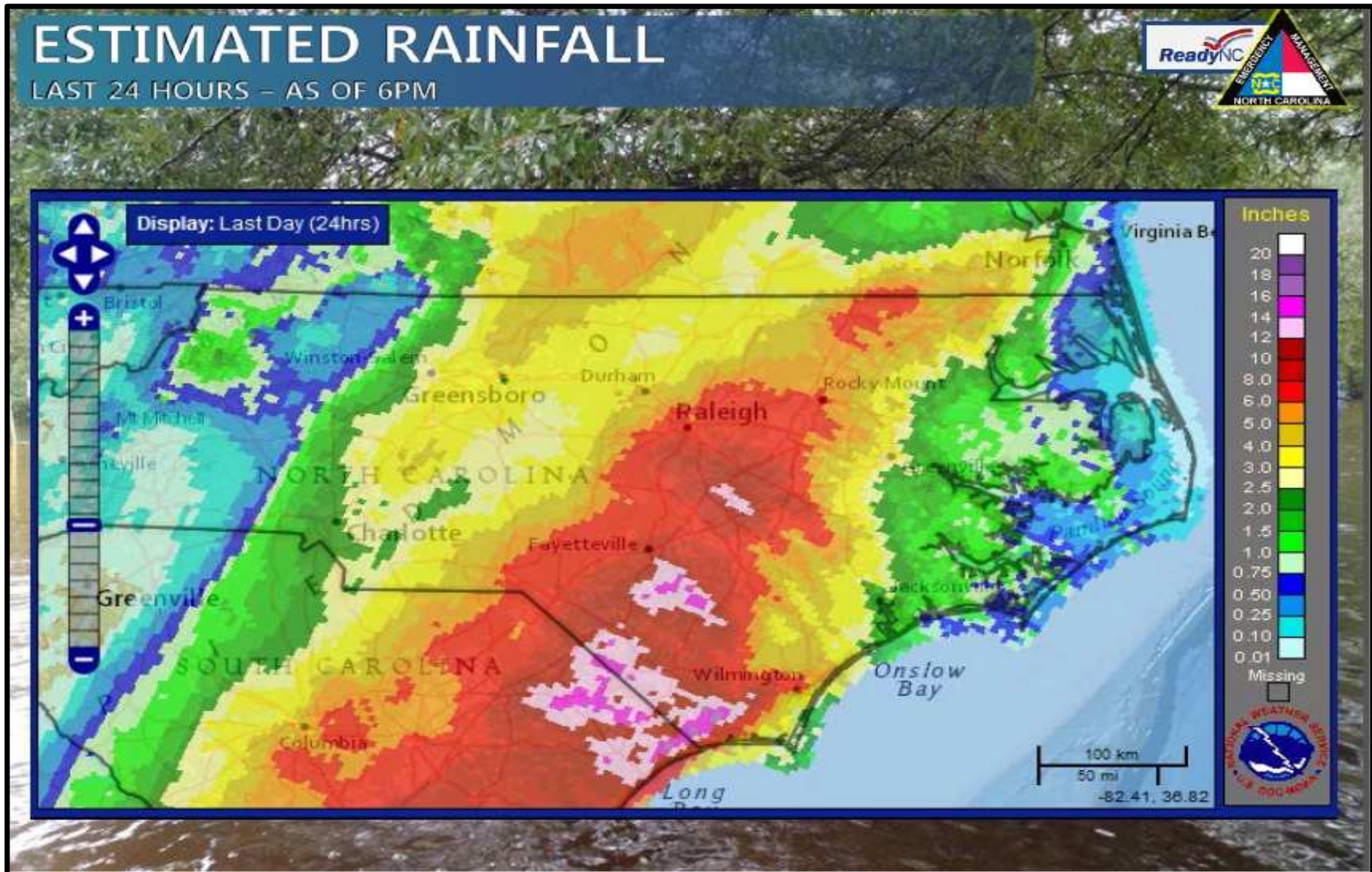
# Transportation Resiliency – Prepare, Respond, and Recover

Joshua Kellen, PE

Training & Development Engineer

February 7, 2023

*The Precursor: Hurricane Matthew (October 2016)*



## *The Precursor: Hurricane Matthew*

- Over 1,760 Incidents
- Over 2000 Identified FEMA Sites
- Over 700 Identified FHWA Sites
- Price tag of ~\$200 million



*Starting with the end in mind: Financial Recovery*



FEMA



- Damage Description:  
Including Dimensions
- Scope of Work
- Pictures
- Engineer's Estimate
- Environmental Permits
- Hydraulic Recommendations
- GPS Coordinates
- Location Map
- Timesheets
- Equipment Logs
- Material Receipts/Purchase Orders
- Contracts
- Etc.



# Starting with the end in mind: Financial Recovery

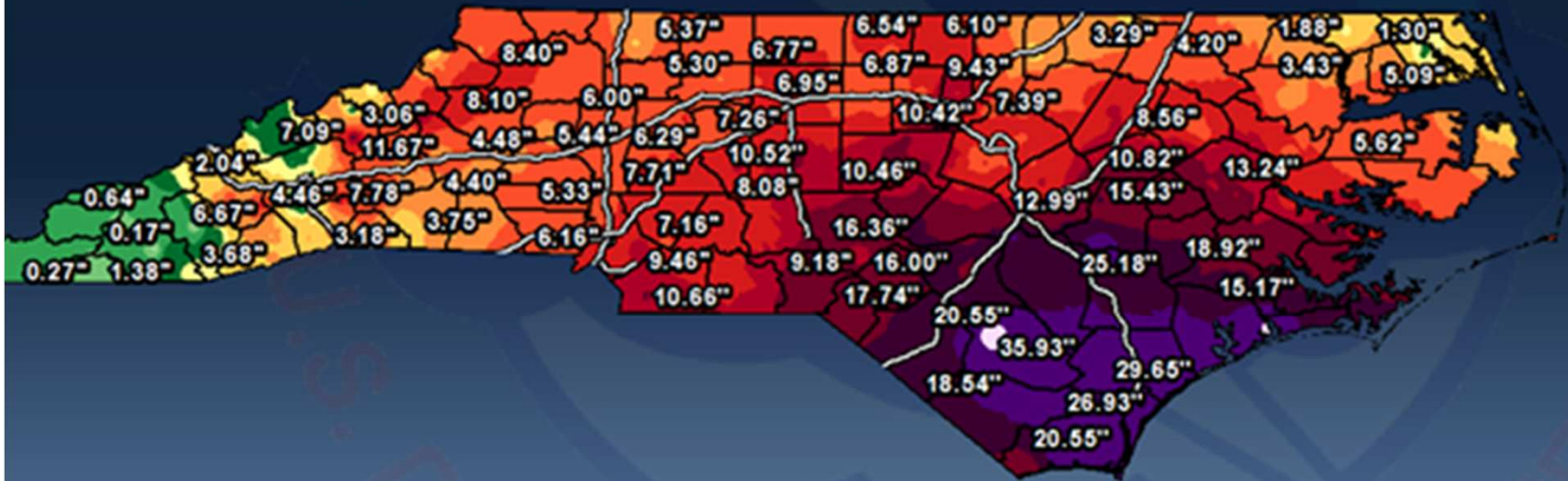
The image shows a screenshot of the ASSIST application interface, which is an application for Site Specific Information Storage and Tracking. The interface is displayed as a series of overlapping windows, each with a blue header containing the word "ASSIST" and a close button (X). The main window shows a form with the following fields and options:

- Date of Inspection:** Enter the date that the inspection was conducted. Example: Monday, March 1, 2015.
- Route Number \*:** What is the Route Number?
- Name of Damage:** Provide your first and last name.
- Phone Number of Damaged Party:** Provide your phone number.
- Site Number:** Provide a site number for this damage.
- Division \*:** What Division is the site in?
- County \*:**
- Type of Site Damaged \*:** Select what best describes the damage.
  - roadway
  - bridge
  - box culvert
  - pipe culvert
  - building or structure
- Diameter of Pipe \*:** (measured in inches)
- Length of Pipe \*:** (measured in feet)
- Number of barrels:** How many barrels are affected?
- Headwalls \*:** Does the culvert have headwalls?
  - Yes
  - No
- Type of Pipe Damage \*:**
  - RCP\_reinforced concrete
  - CMP\_corrugated metal
  - HDPE\_high density polyethylene
- Pavement Damage:** Is there any pavement damage?
  - Yes
  - No
- Roadbed Damage:** (Soil directly below the roadbed)
  - Yes
  - No
- Shoulder/Embankment Damage:** (Soil other than roadbed)
  - Yes
  - No
- Signs and Guardrail \*:** Are there any signs or guardrail damaged at this site?
  - Yes
  - No
- Utilities \*:** Are there any utilities that are damaged or affected at this site?
  - Yes
  - No
- Damage Photo 1 \*:** Provide an image of the overall damage to the site. (Includes camera and gallery icons)
- Damage Photo 2 \*:** Provide a second image of the overall damage to the site. (Includes camera and gallery icons)
- Optional Photos \*:** Do you have more photos to upload?
  - Yes
  - No
- Notes:** Provide any important information.
- Preliminary Estimate \*:** Provide a windshield estimate of the amount needed to repair the damages.

## Deployment: Hurricane Florence (September 2018)

### National Weather Service Raleigh, North Carolina Preliminary Hurricane Florence Rainfall Totals

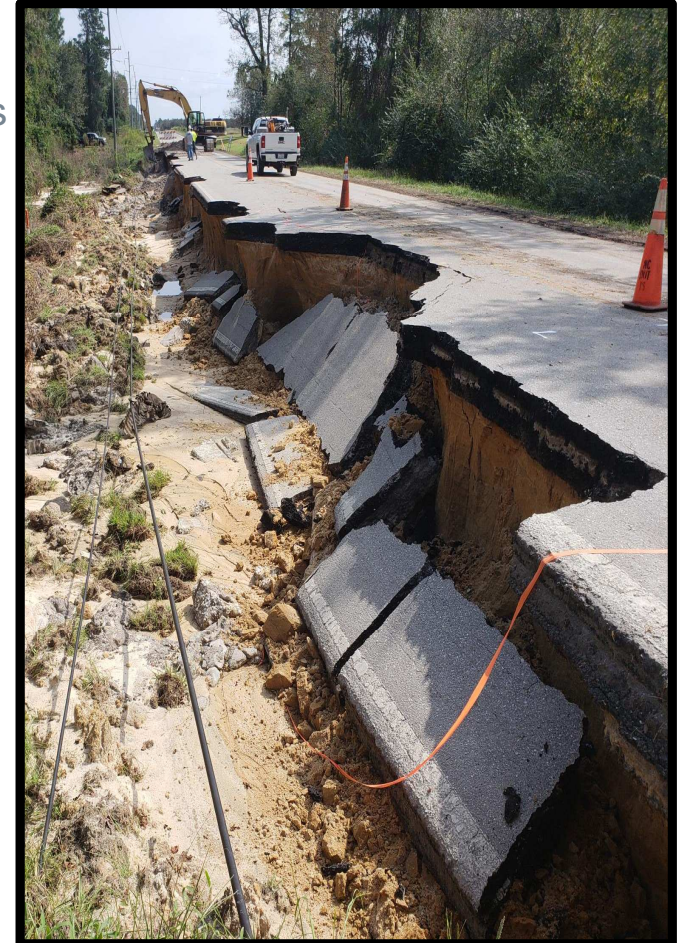
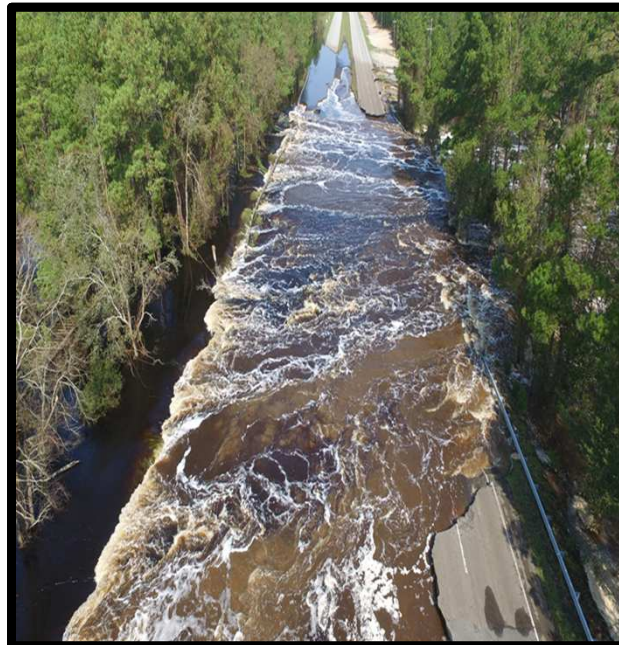
Data Source: Regional Observations(PNS)



This is an experimental product. Care should be taken in using the data. Unofficial observations are plotted. Values at interpolated locations may not represent actual precipitation totals at that location.

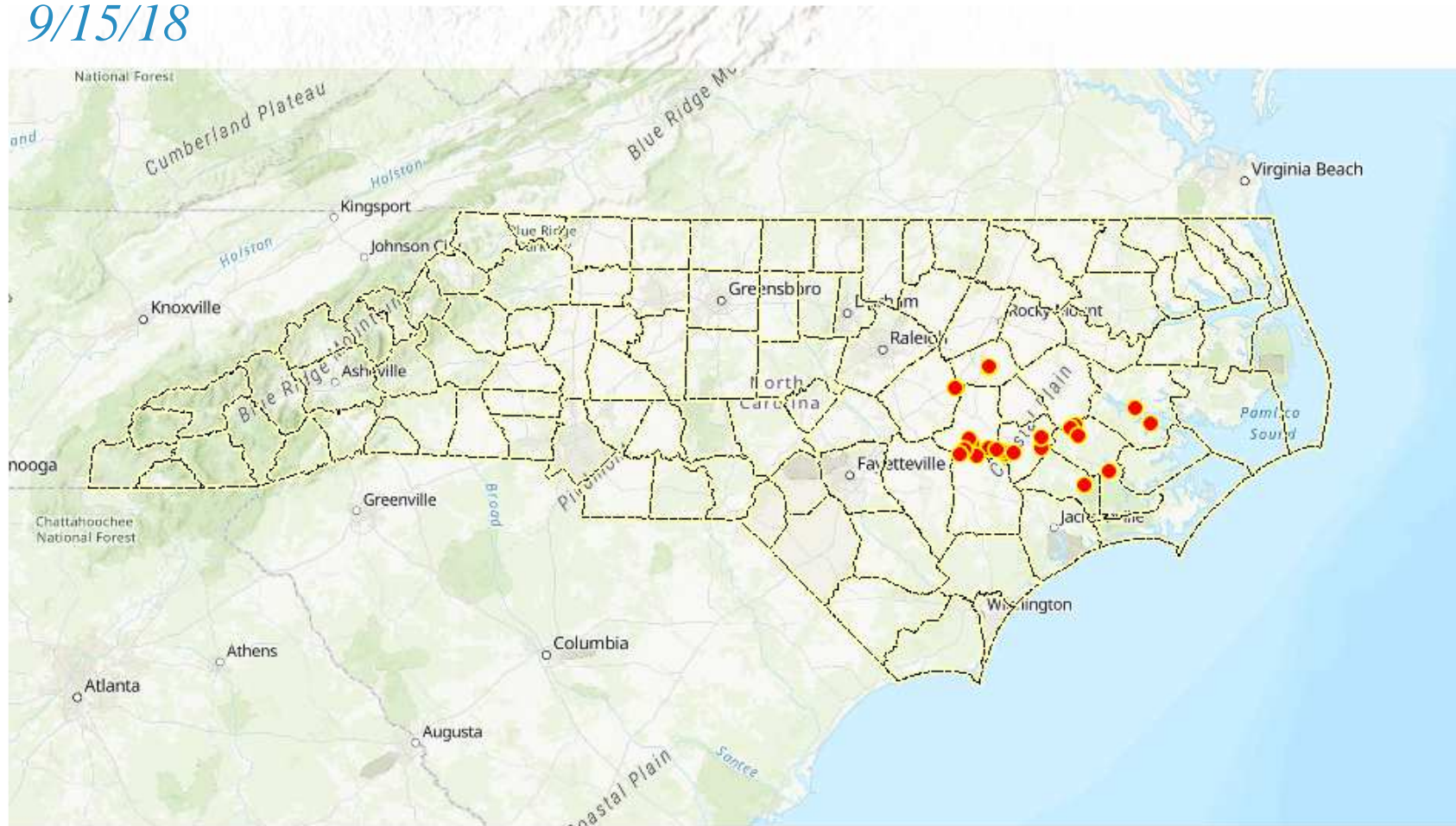
*Deployment: Hurricane Florence (September 2018)*

- Over 2,500 Incidents
- 2,642 Identified FEMA Route Sites
- 853 Identified FHWA Route Sites
- Price tag of ~\$250 million



## Deployment: Hurricane Florence (September 2018)

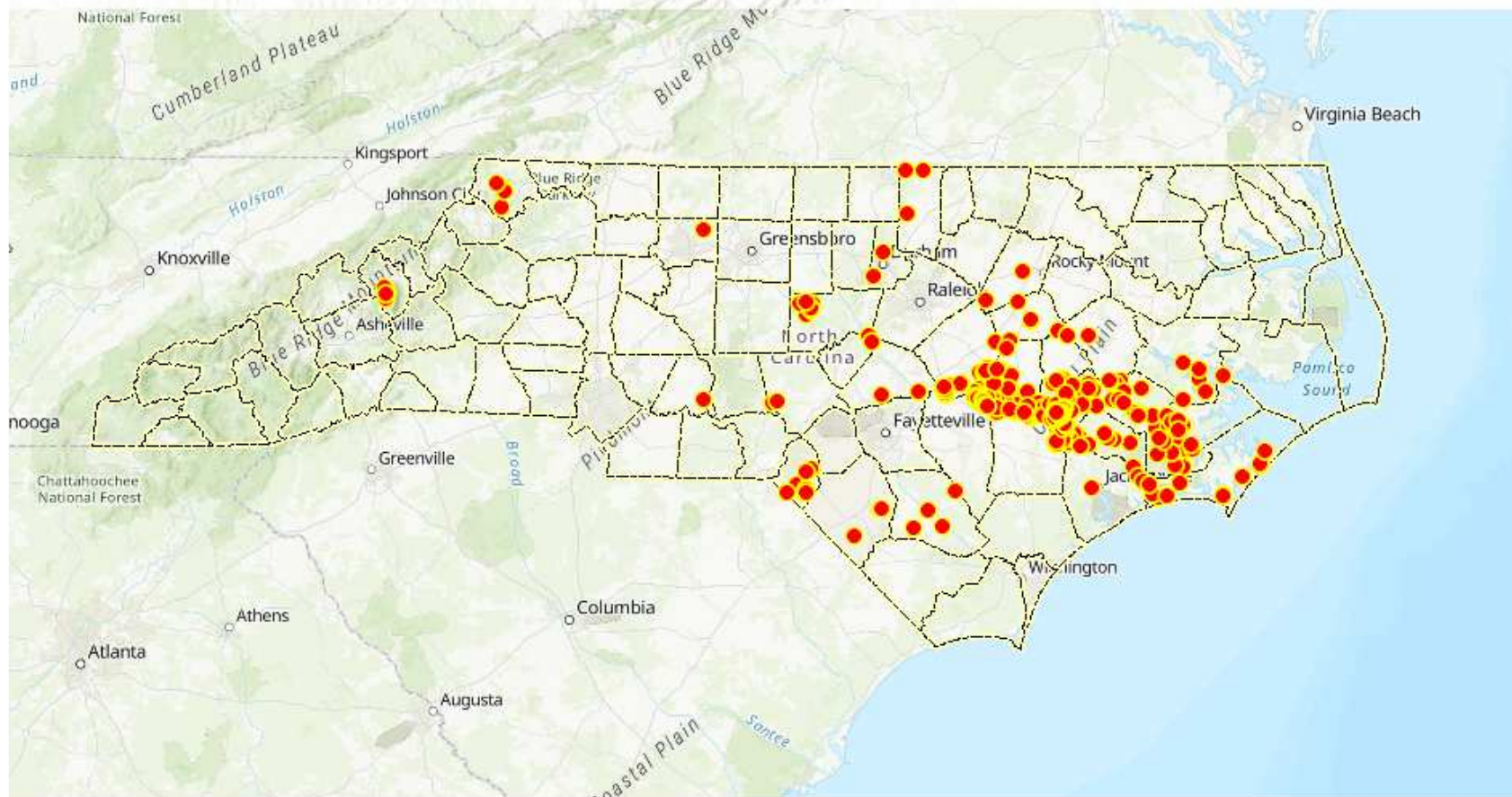
9/15/18





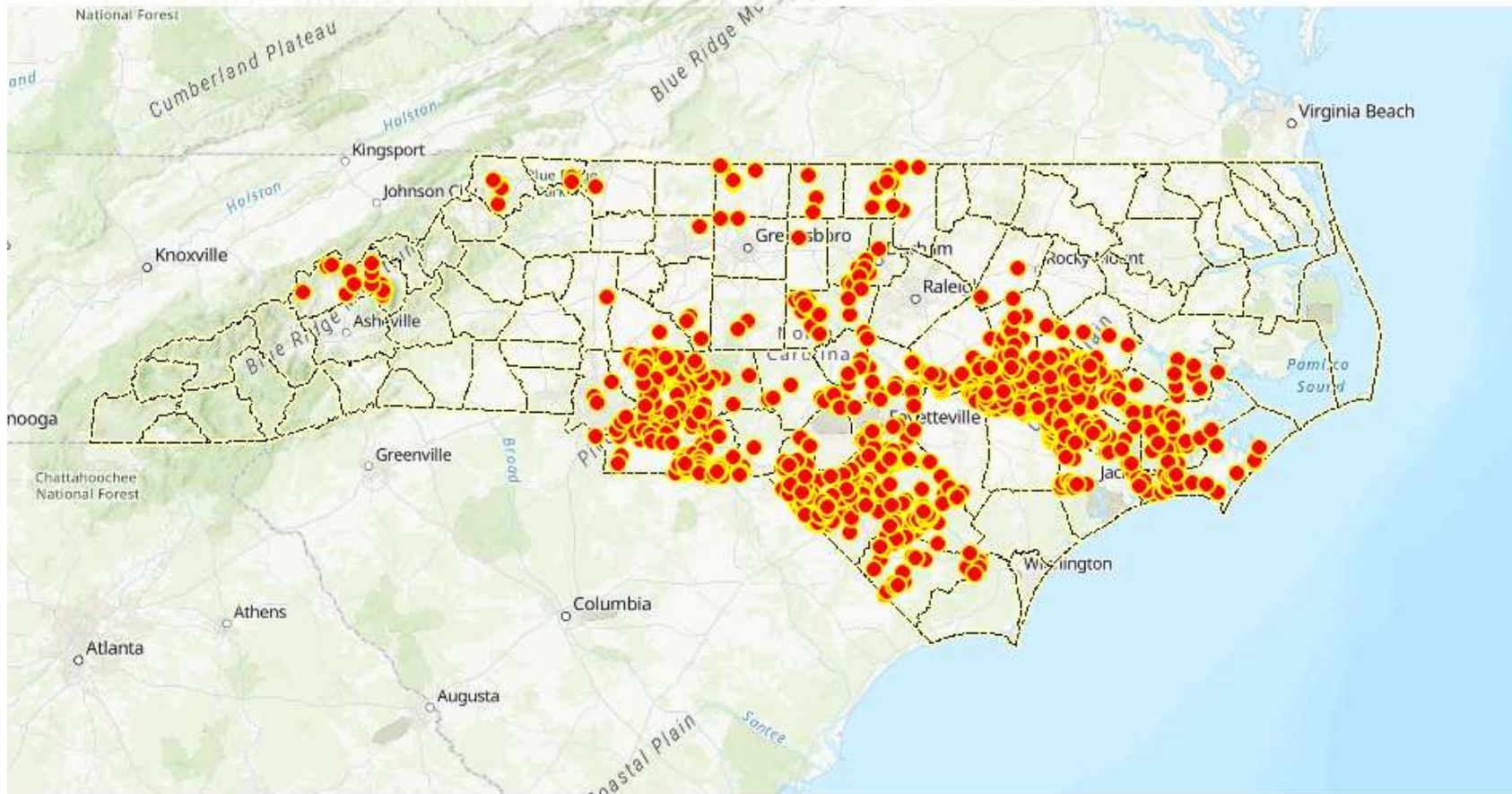
# Deployment: Hurricane Florence (September 2018)

9/17/18



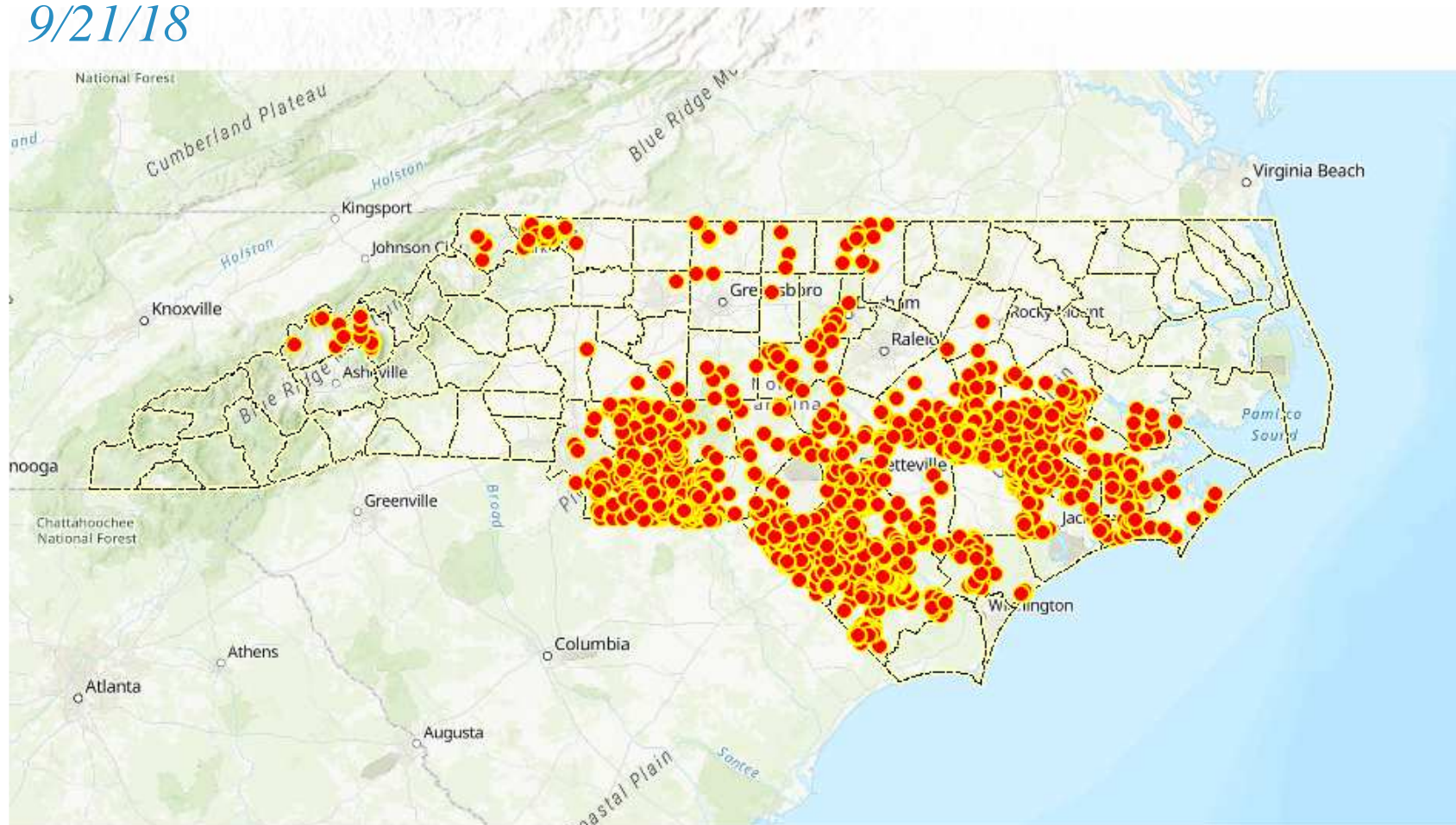
# Deployment: Hurricane Florence (September 2018)

9/19/18



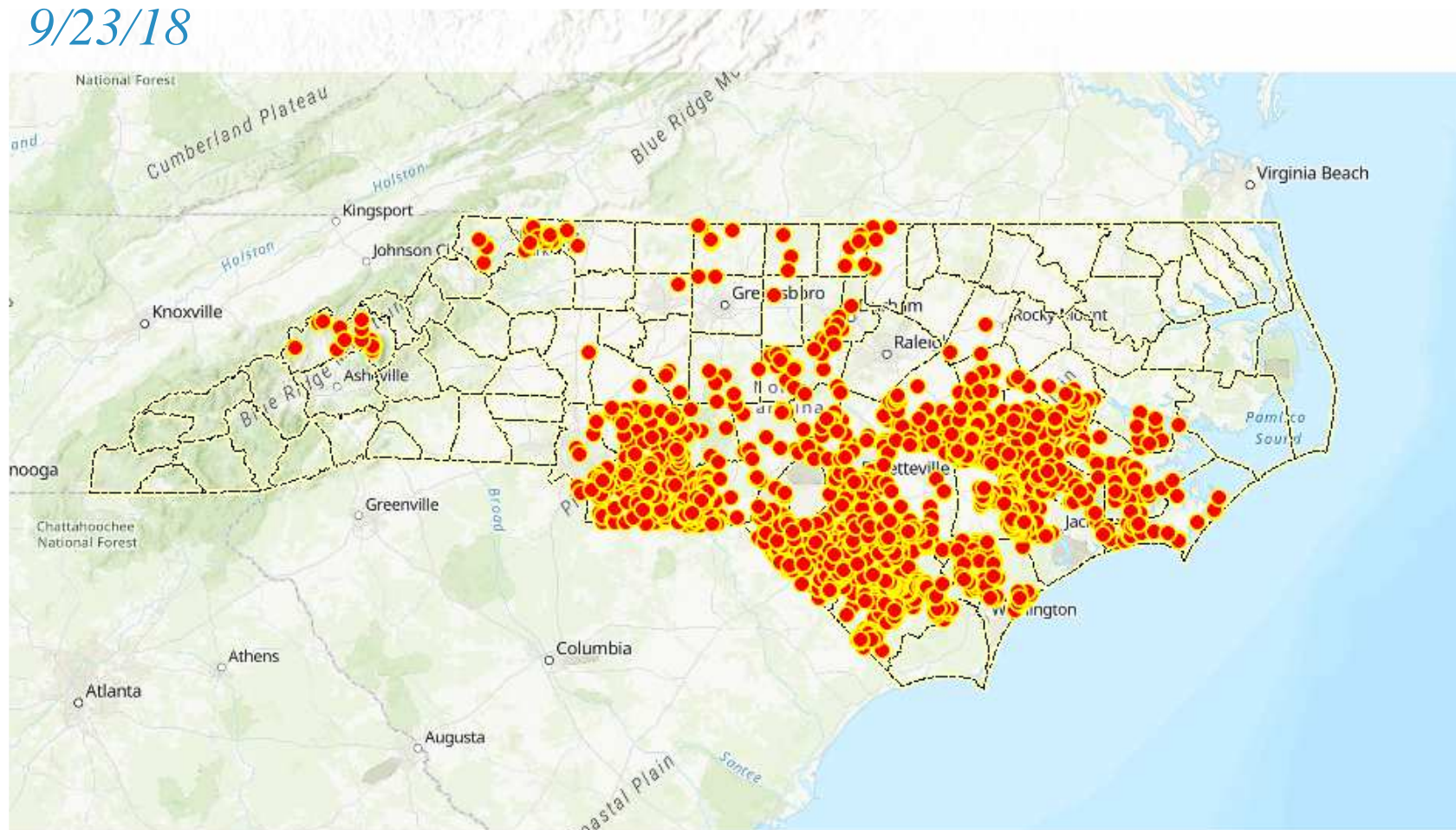
## Deployment: Hurricane Florence (September 2018)

9/21/18



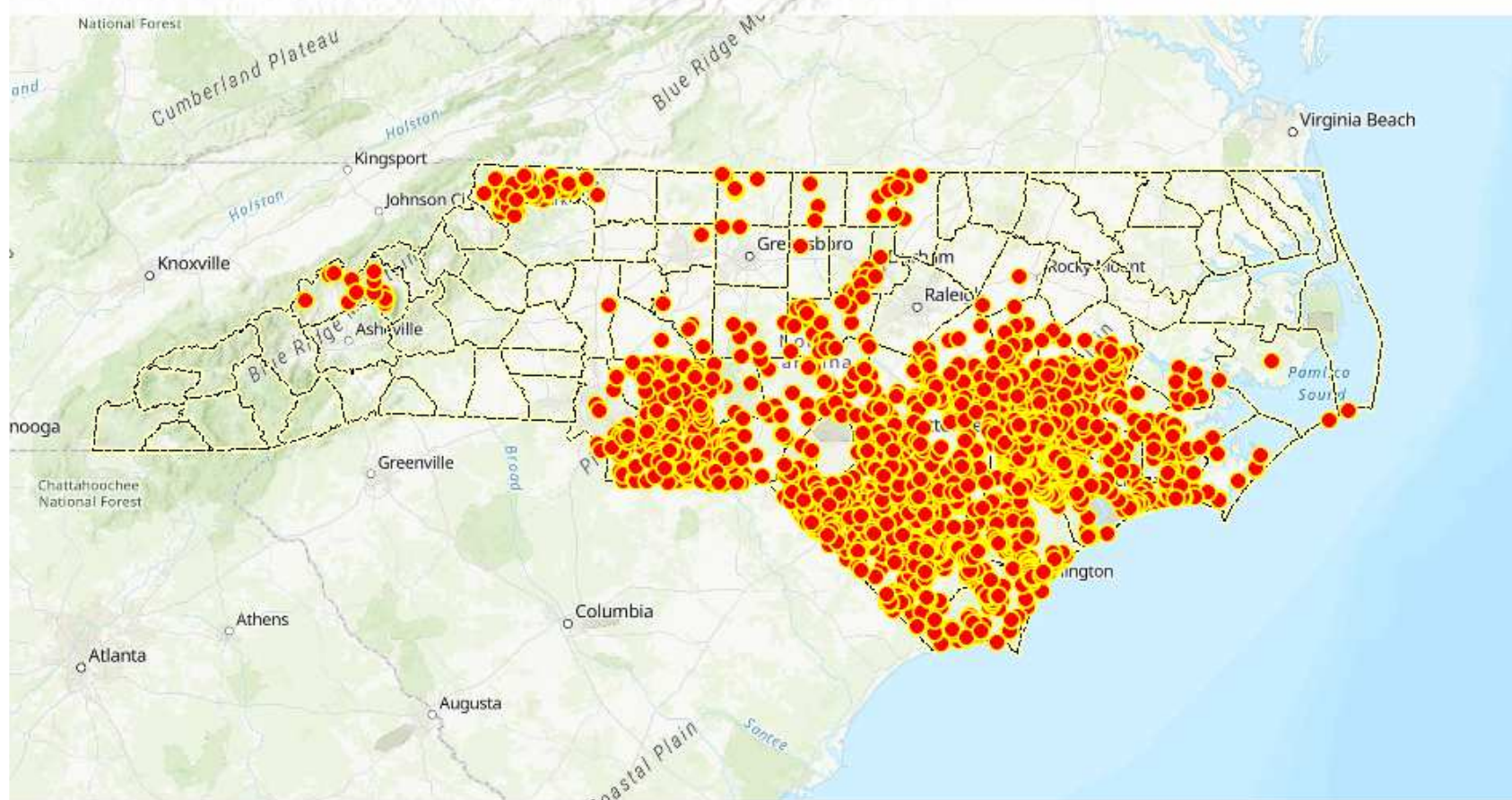
## Deployment: Hurricane Florence (September 2018)

9/23/18



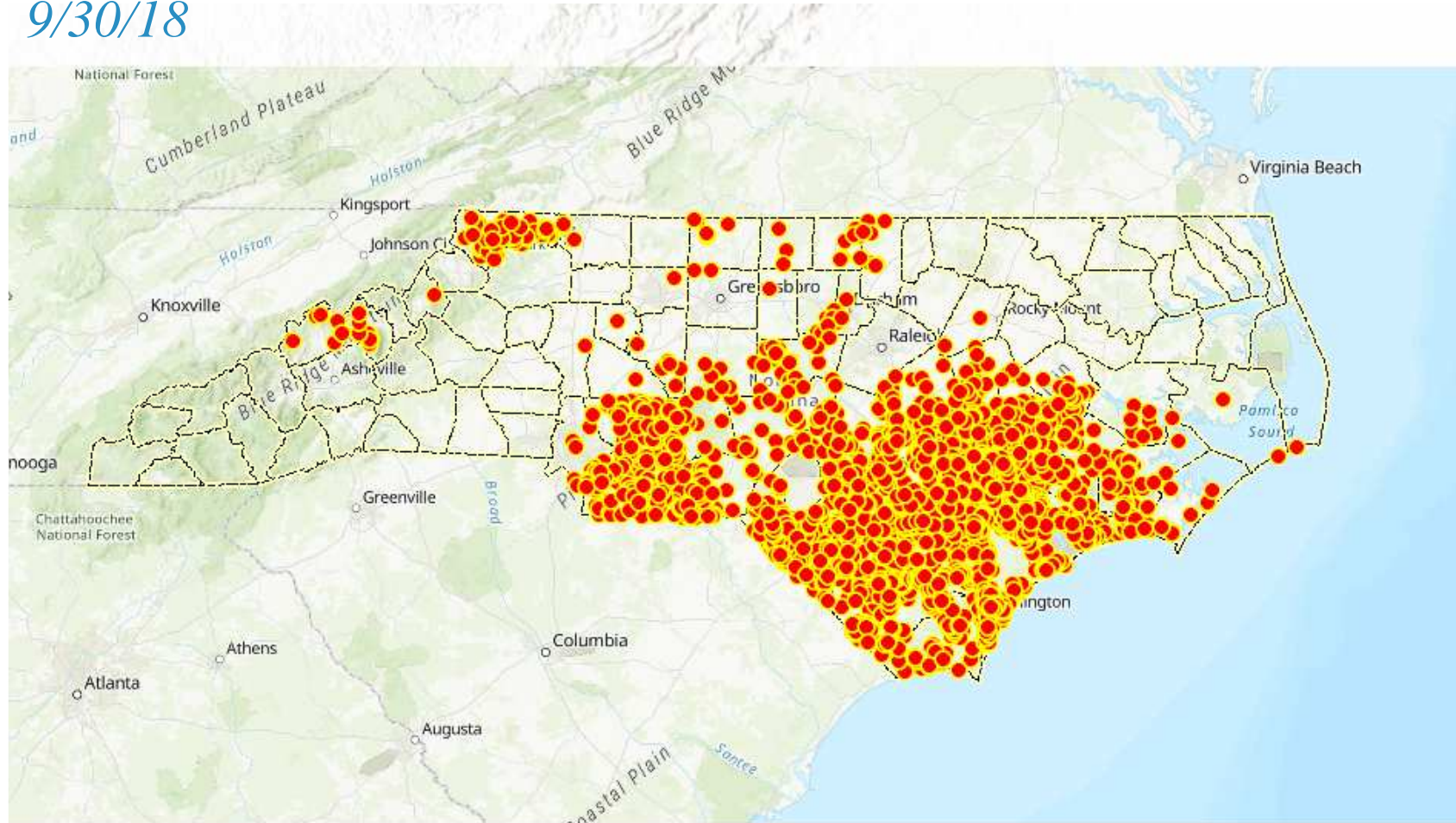
## Deployment: Hurricane Florence (September 2018)

9/25/18

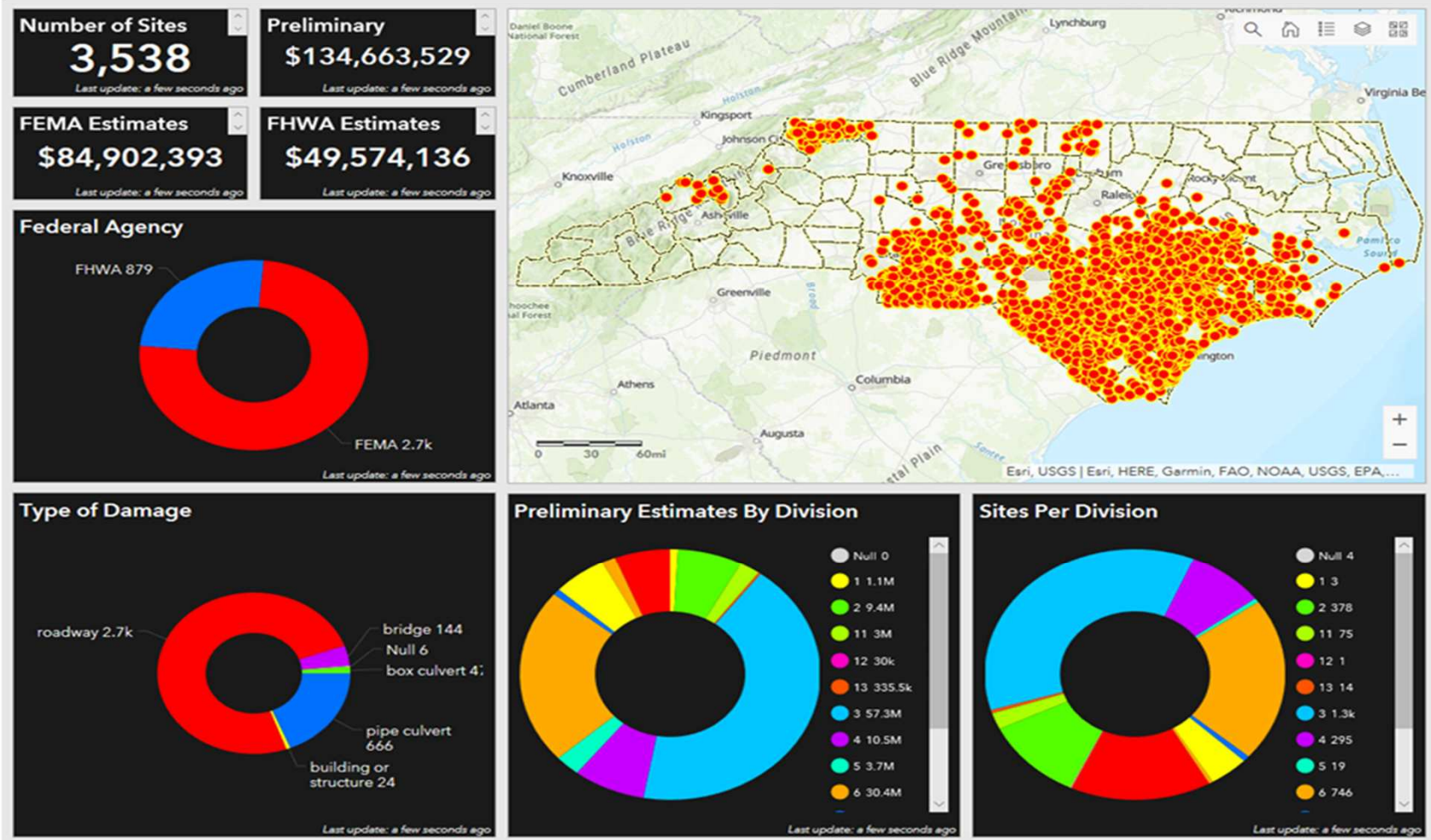


# Deployment: Hurricane Florence (September 2018)

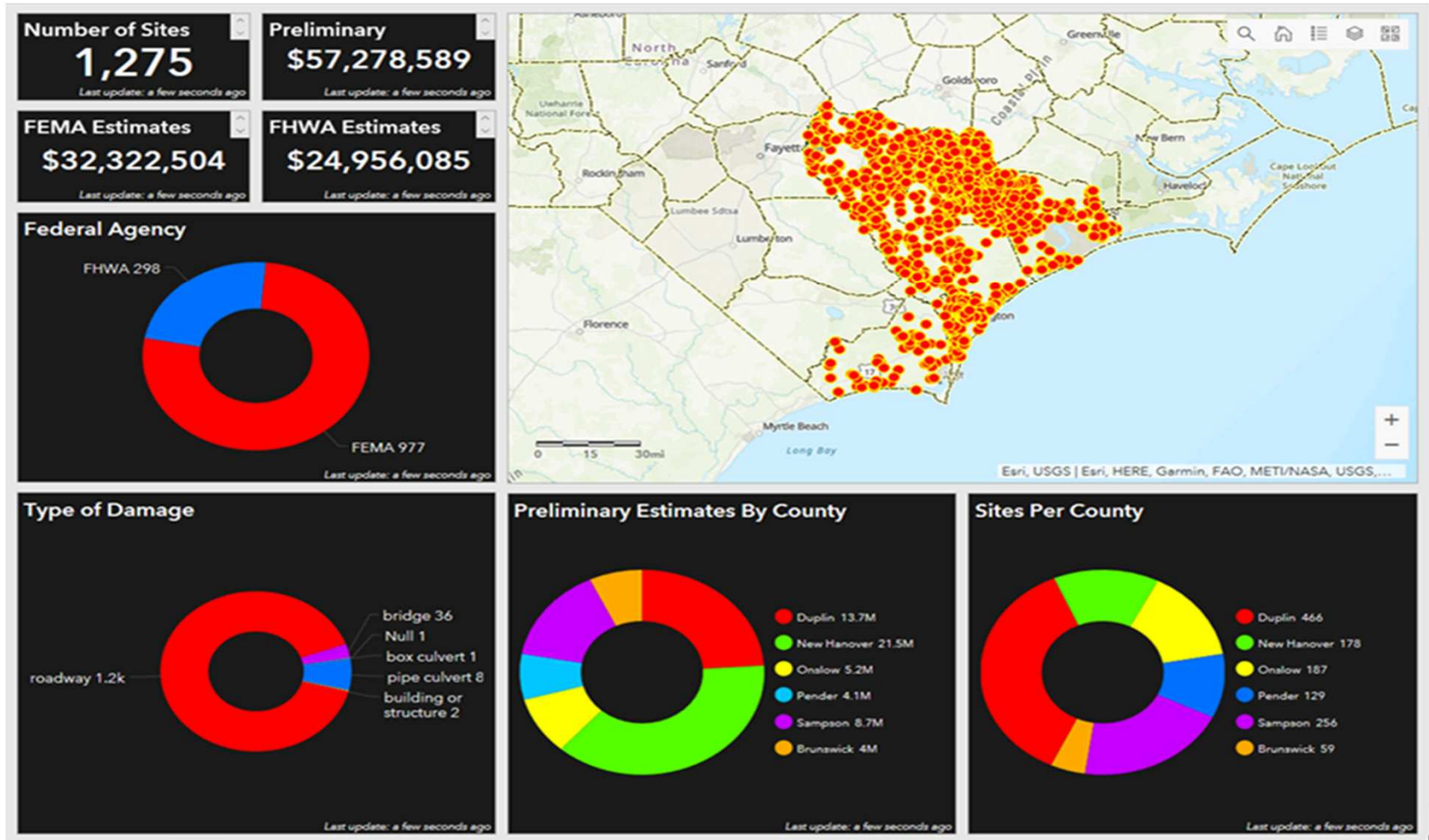
9/30/18



# Outcomes

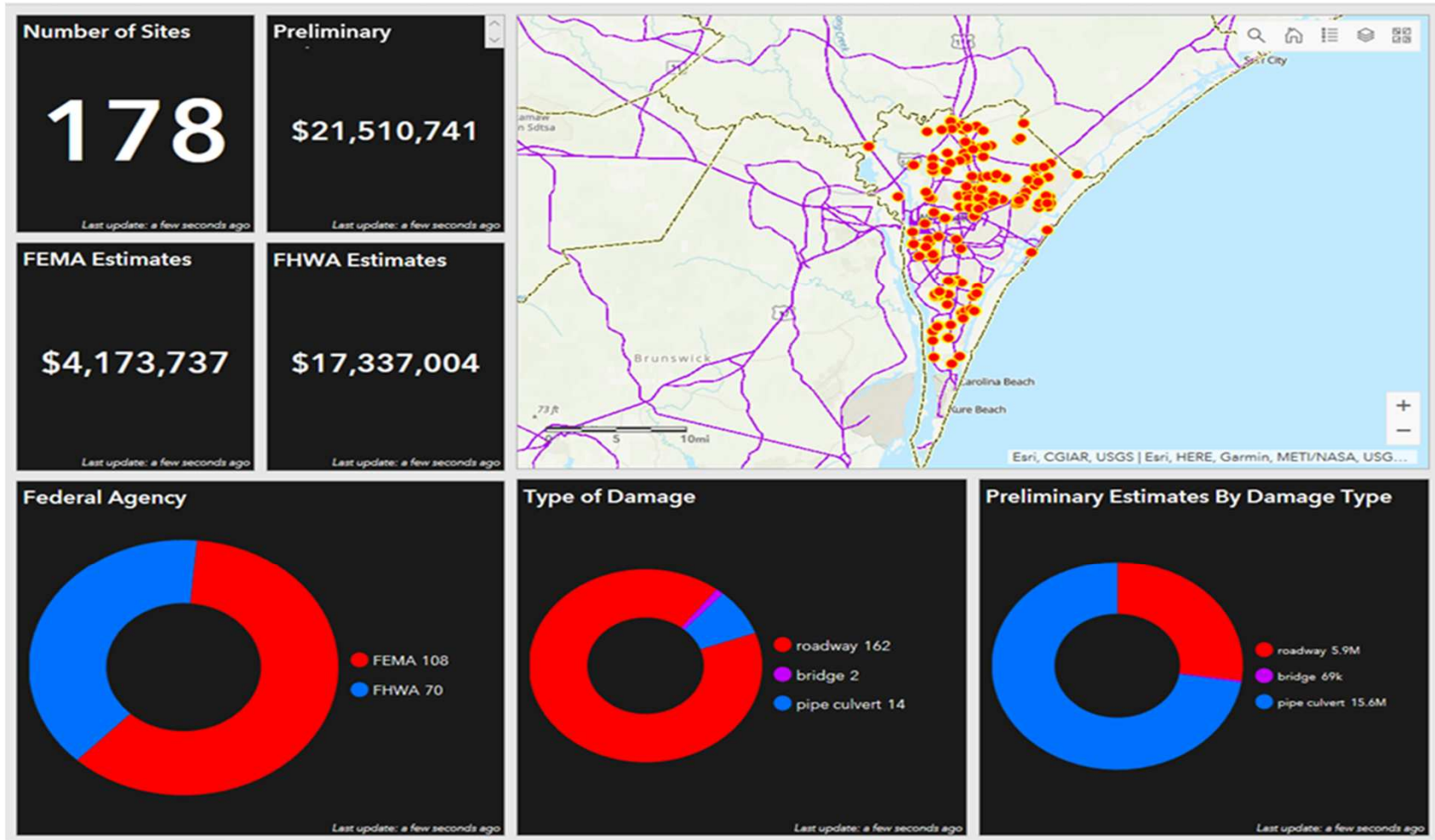


# Outcomes





# Outcomes

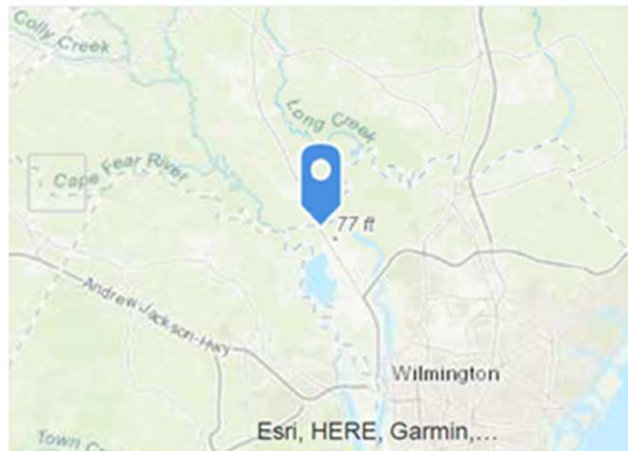


## Outcomes

### Hurricane Florence Site Specific

Submitted By: gmtaylor1  
 Submitted Time: Sep 25, 2018, 4:03:51 PM  
 Date of Inspection: Sep 20, 2018  
 Name of Damage Inspector: D Monro  
 Phone Number of Damage Inspector: [REDACTED]

Site Number: 15403.1065027  
 Division: 3  
 County: New Hanover  
 Type of Route: US  
 Route Number: 421  
 Road Name: Hwy 421  
 Site Configuration: FHWA  
 Site Location: Lat: 34.33086 Lon: -77.99958



Type of Site Damaged: pipe culvert  
 Diameter of Pipe: 78  
 Length of Pipe: 210  
 Number of barrels: 1  
 Headwalls: No  
 Type of Pipe Damaged: CMP\_corrugated metal pipe

Pavement Damage: Yes  
 Length of Pavement damaged: 600  
 Width of Pavement damaged: 56  
 Thickness of Pavement damaged: 12

Roadbed Damage: Yes  
 Length of Roadbed damaged: 700  
 Width of Roadbed damaged: 700  
 Depth of Roadbed damaged: 5

Shoulder/Embankment Damage: Yes  
 Length of Shoulder/Embankment damaged: 1,500  
 Width of Shoulder/Embankment damaged: 20  
 Depth of Shoulder/Embankment damaged: 20

Notes: Site 065-00-19 still has flow cannot fully assess at base, washed out. Pipe to be determined.

Signs and Guardrail: Yes  
 Length of Guardrail Damaged: 1,500  
 Number of Signs Damaged: 0

Utilites: Yes  
 Affected Utilities

- fiber
- gas

Damage Photo 1



Damage Photo 2



Preliminary Estimate: 15,000,000

Hydro Report: Yes

## Outcomes



# FEMA



- Damage Description:  
Including Dimensions
- Scope of Work
- Pictures
- Engineer's Estimate
- Environmental Permits
- Hydraulic Recommendations
- GPS Coordinates
- Location Map
- Timesheets
- Equipment Logs
- Material Receipts/Purchase Orders
- Contracts
- Etc.

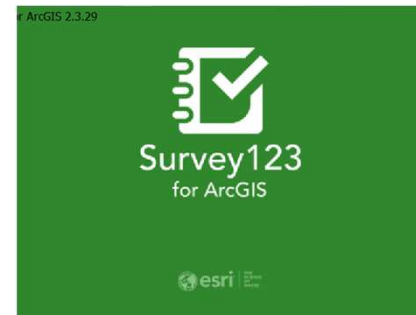


U.S. Department of Transportation  
**Federal Highway  
Administration**

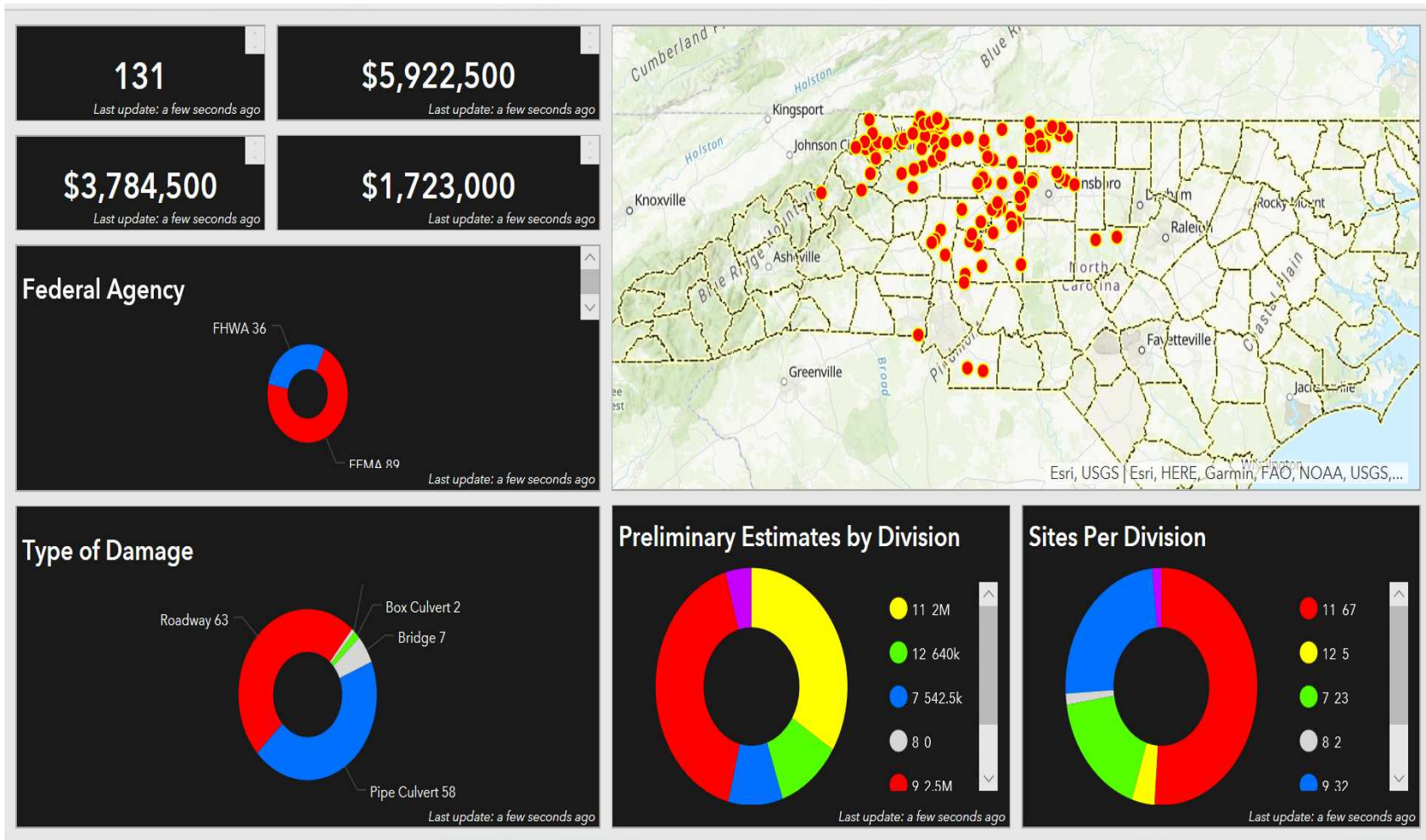


## Outcomes

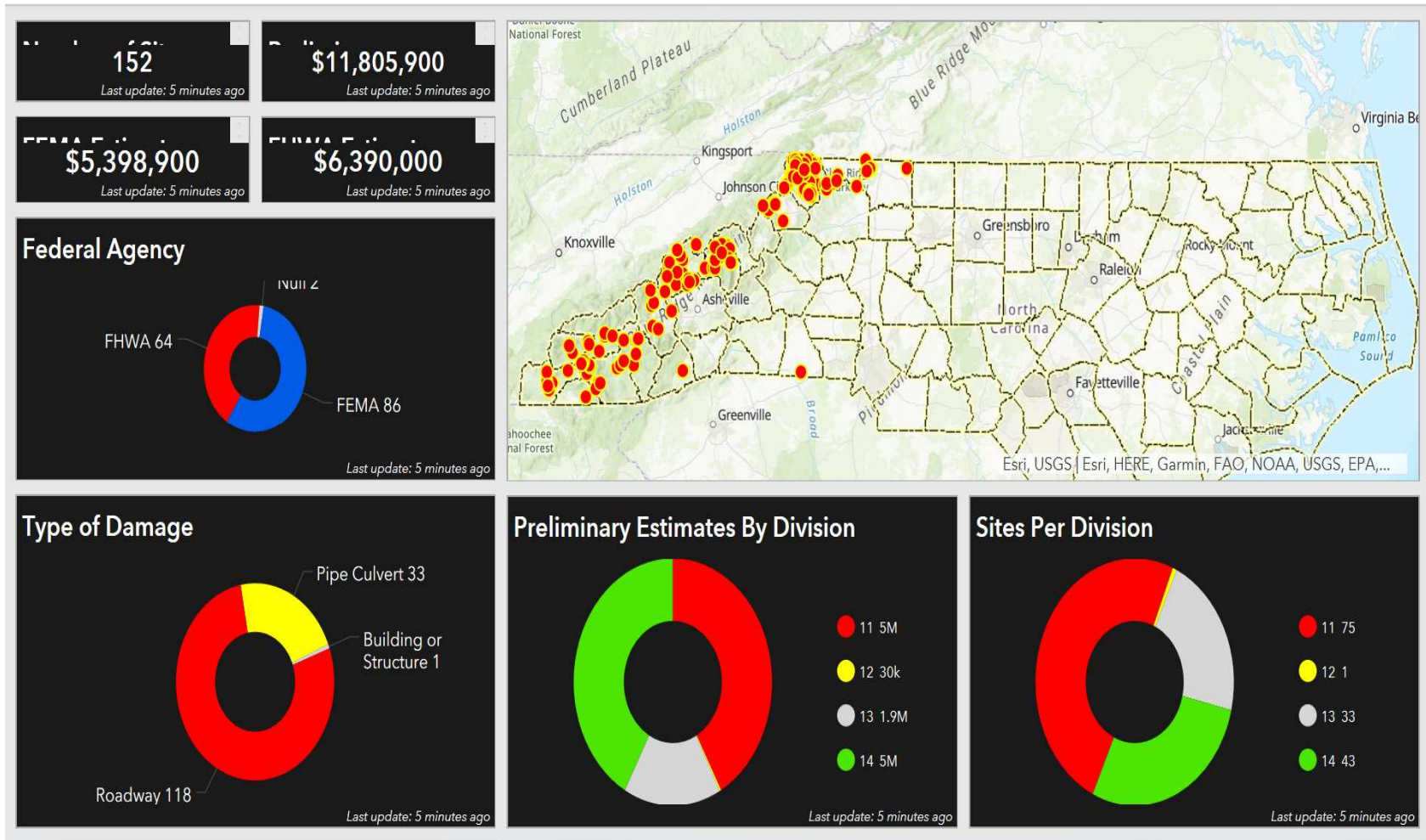
- ✓ • Damage Description:  
Including Dimensions
- ✓ • Scope of Work
- ✓ • Pictures
- ✓ • Engineer's Estimate
- ✓ • Environmental Permits
- ✓ • Hydraulic Recommendations
- ✓ • GPS Coordinates
- ✓ • Location Map
- Timesheets
- Equipment Logs
- Material Receipts/Purchase Orders
- Contracts
- Etc.



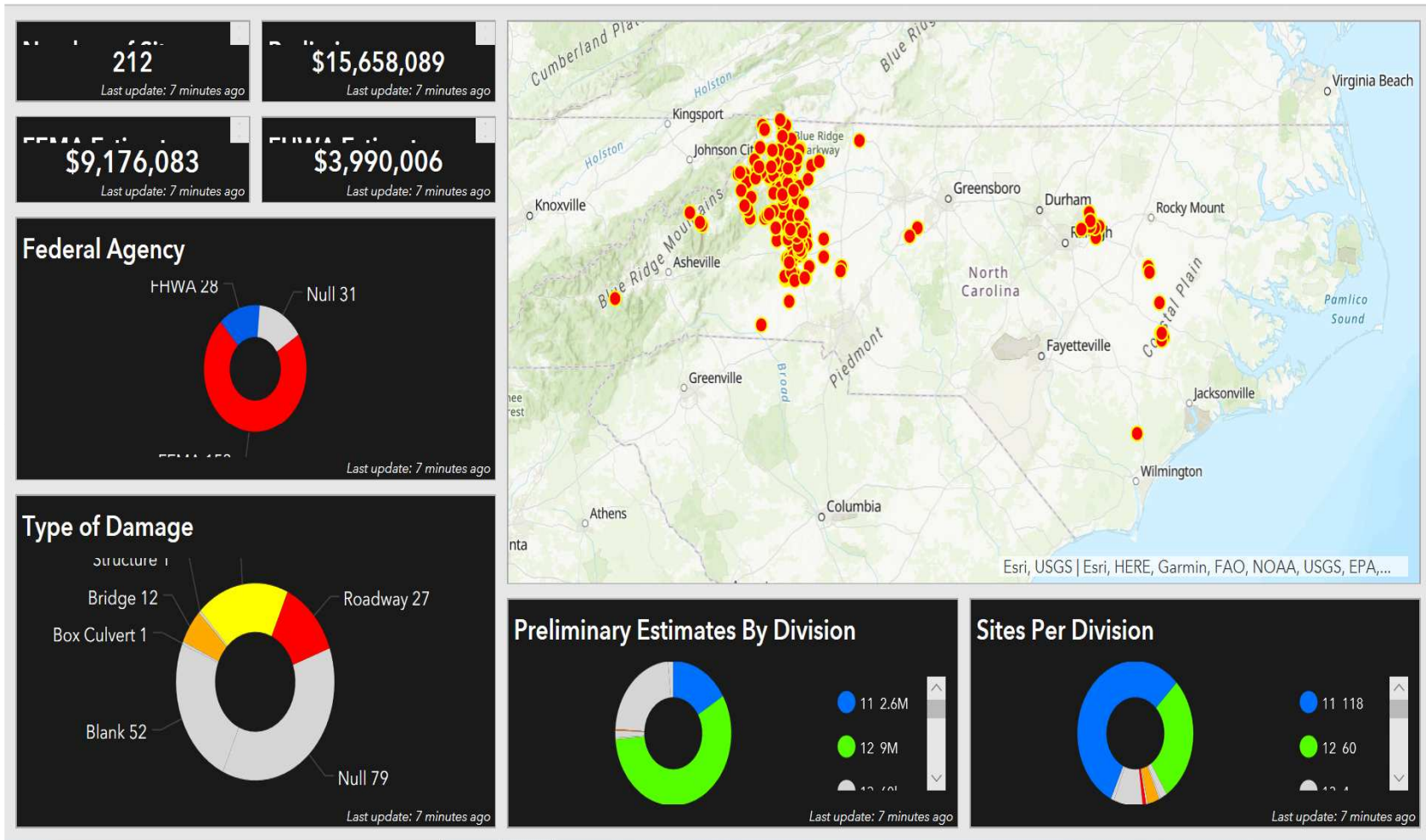
## Usage (Hurricane Michael)



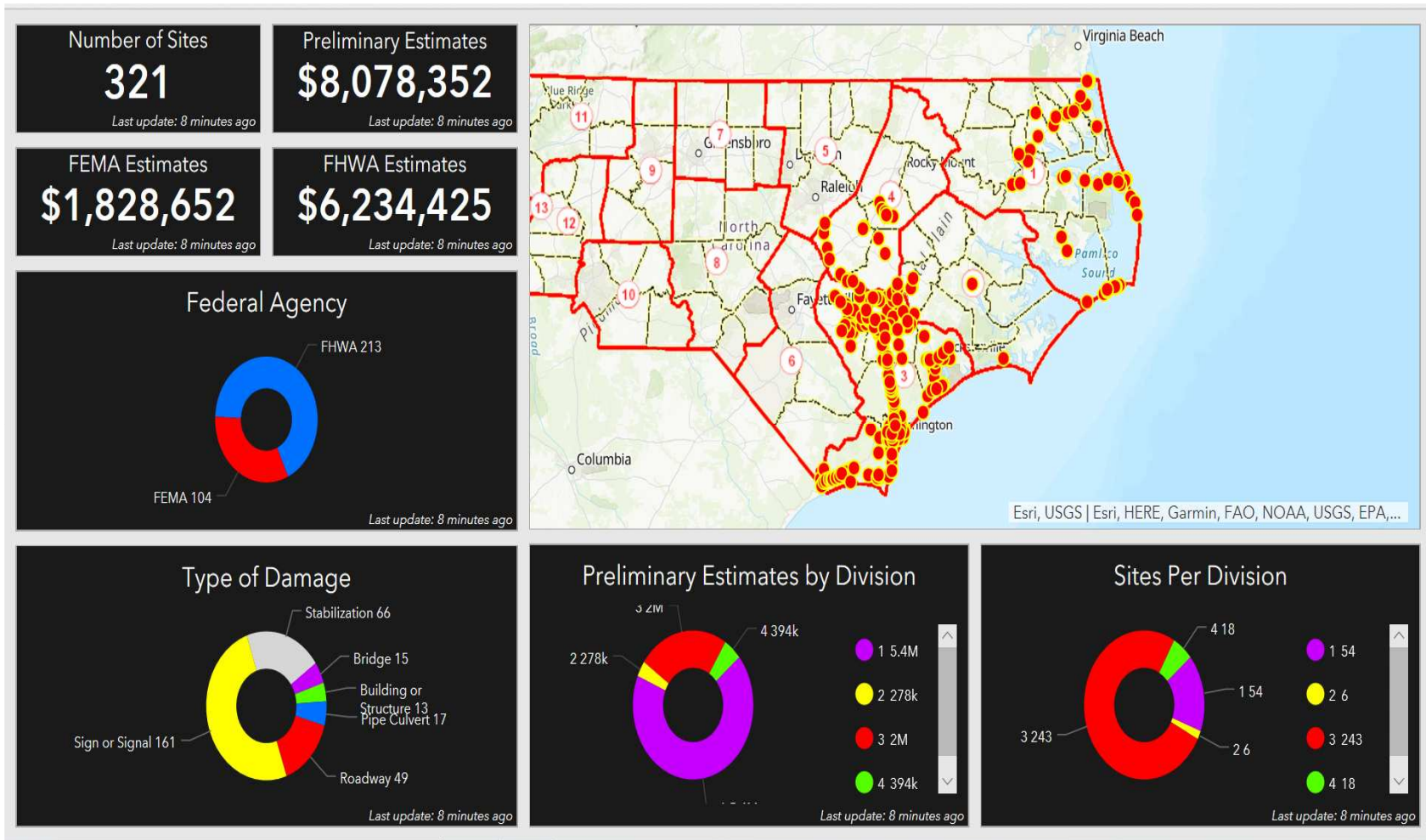
## Usage (2019 February Rains)



# Usage (2019 June Rains)

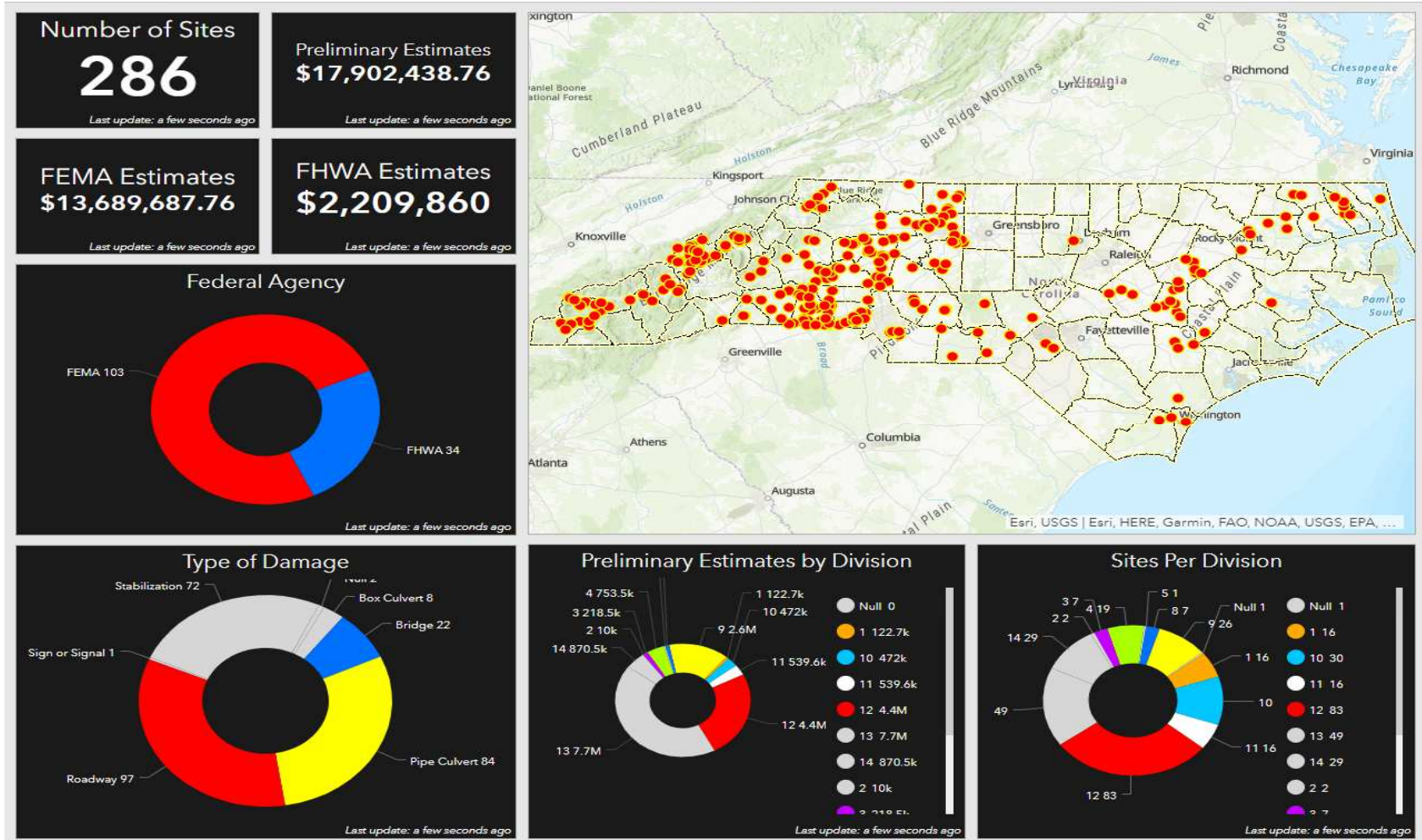


## Usage (Hurricane Dorian)

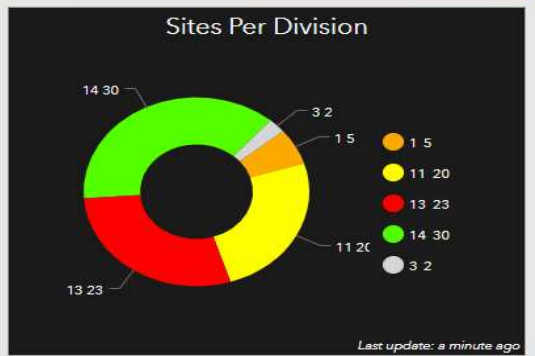
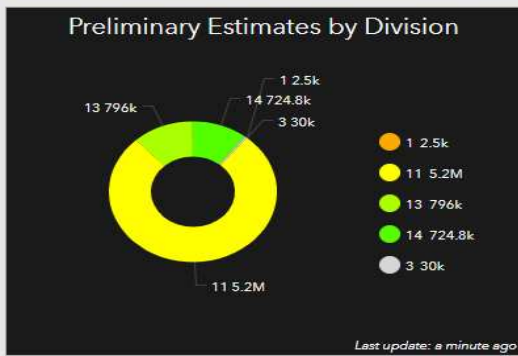
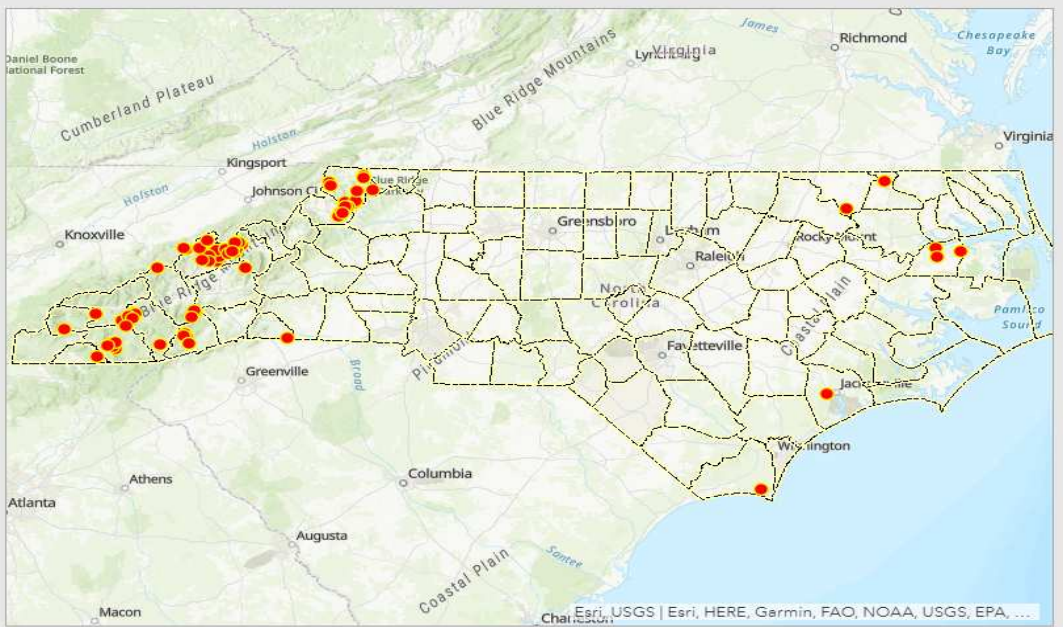
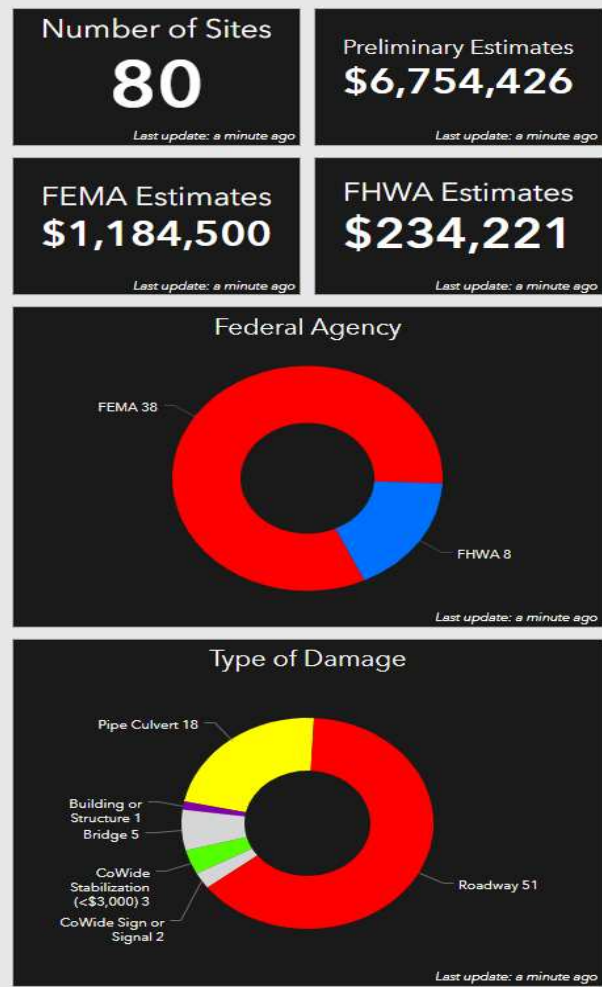




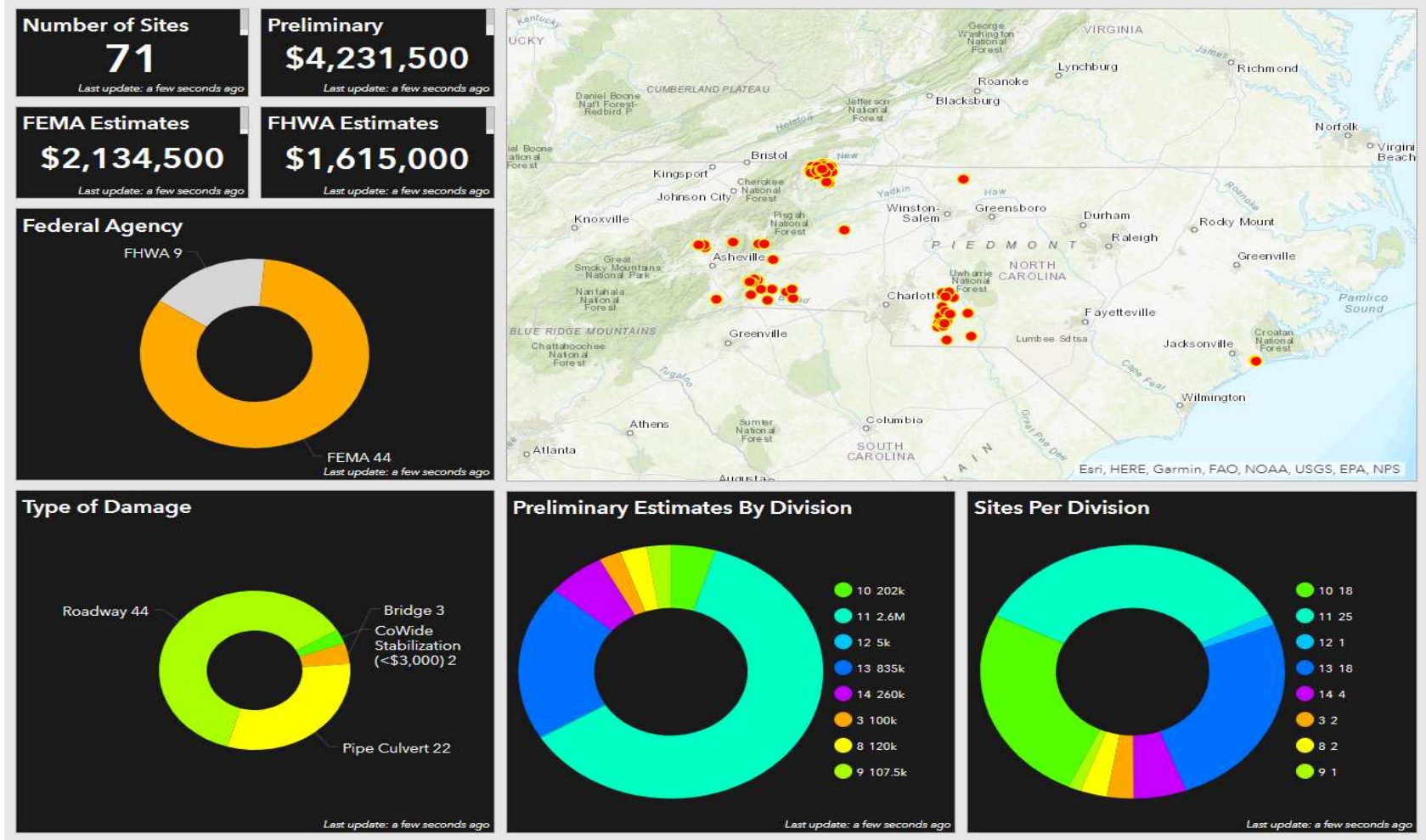
# Usage (2020 February 6 Rains)



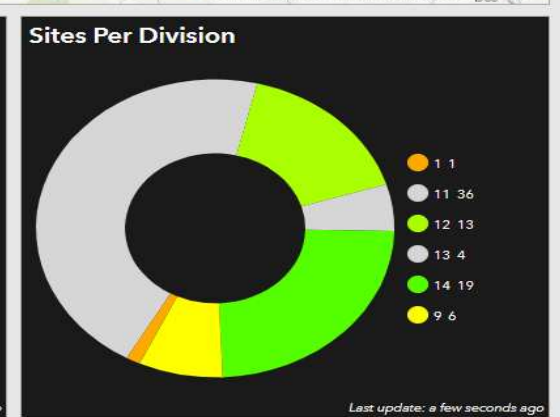
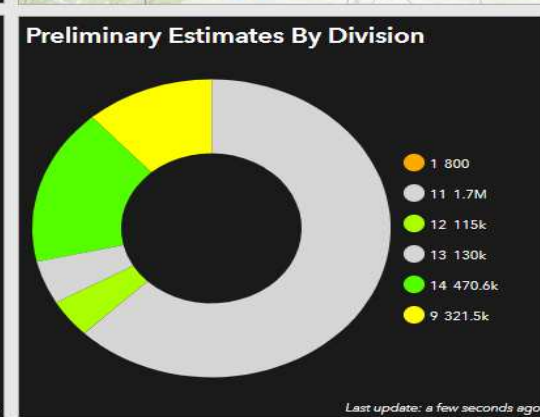
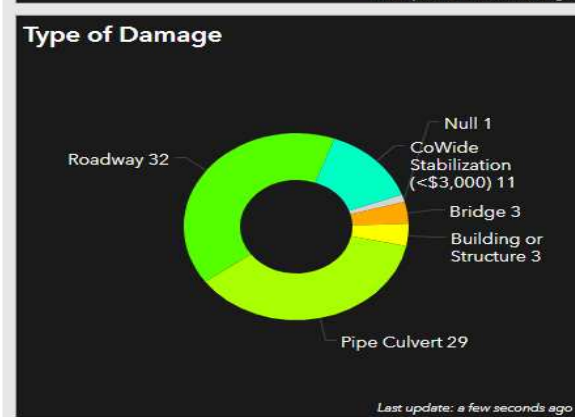
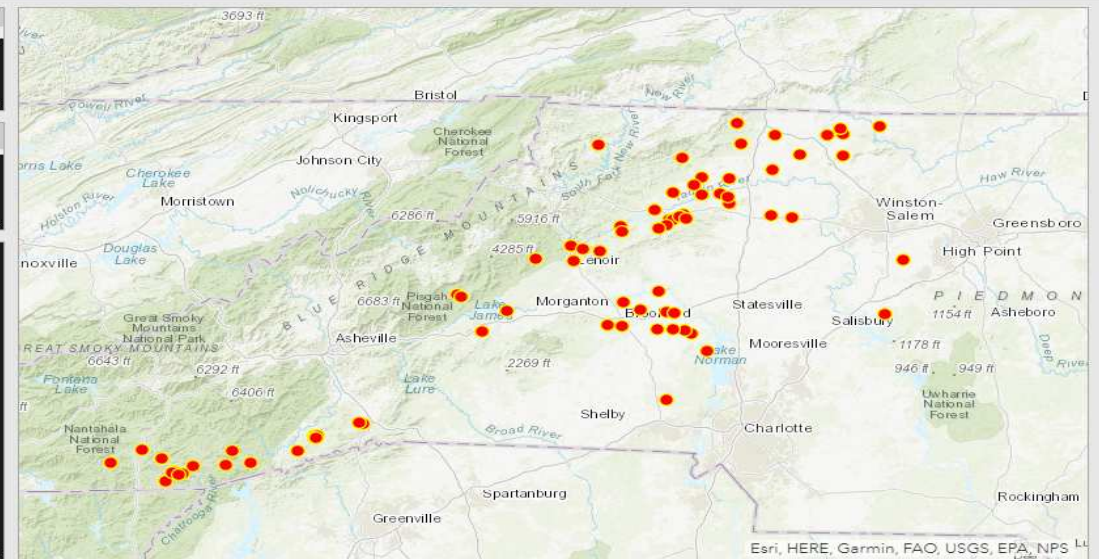
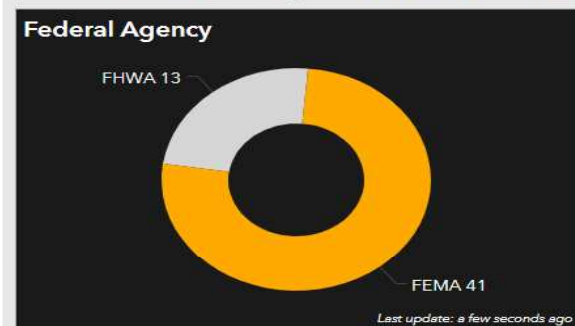
# Usage (2020 April Severe Weather)



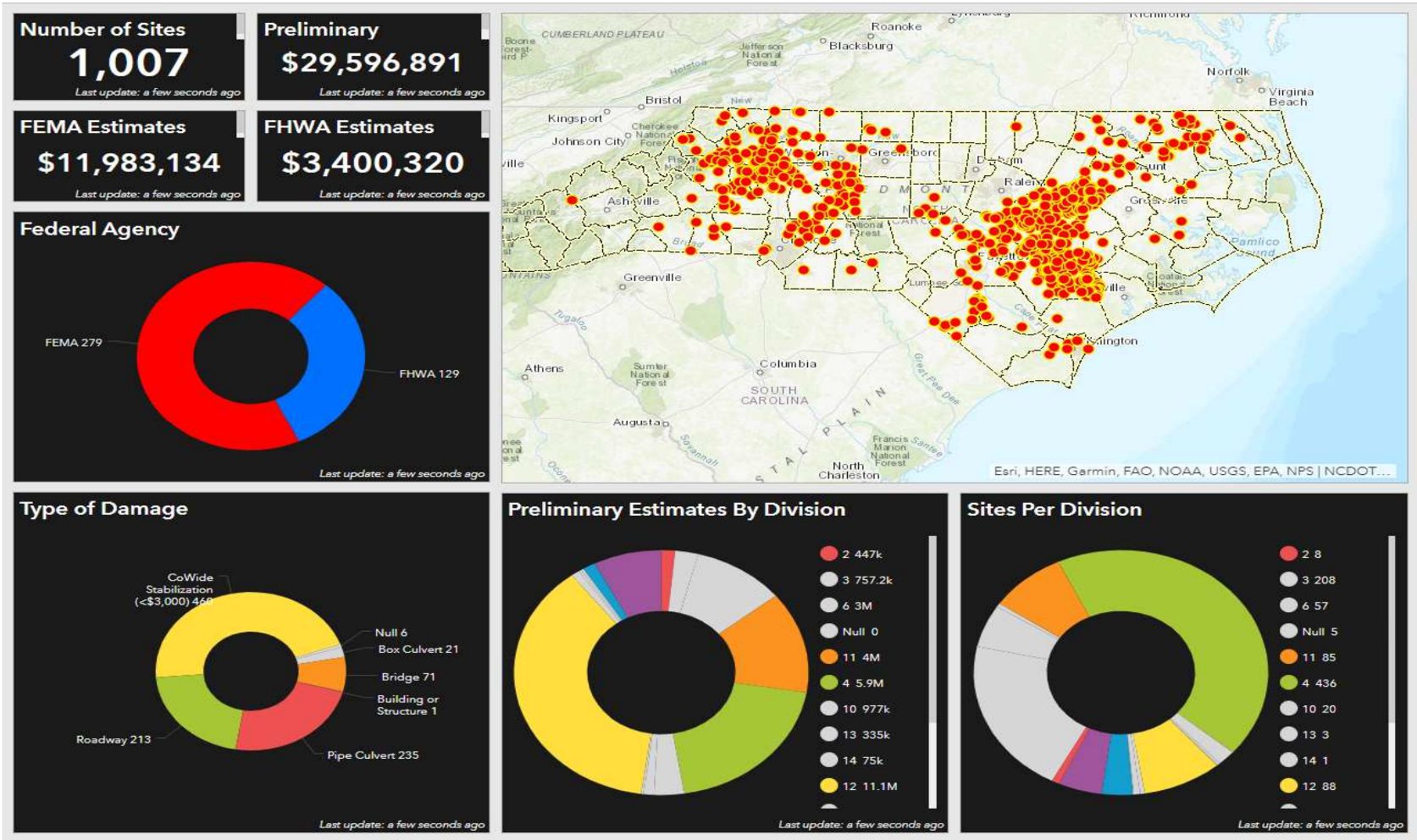
# Usage (2020 May 19 Rains)



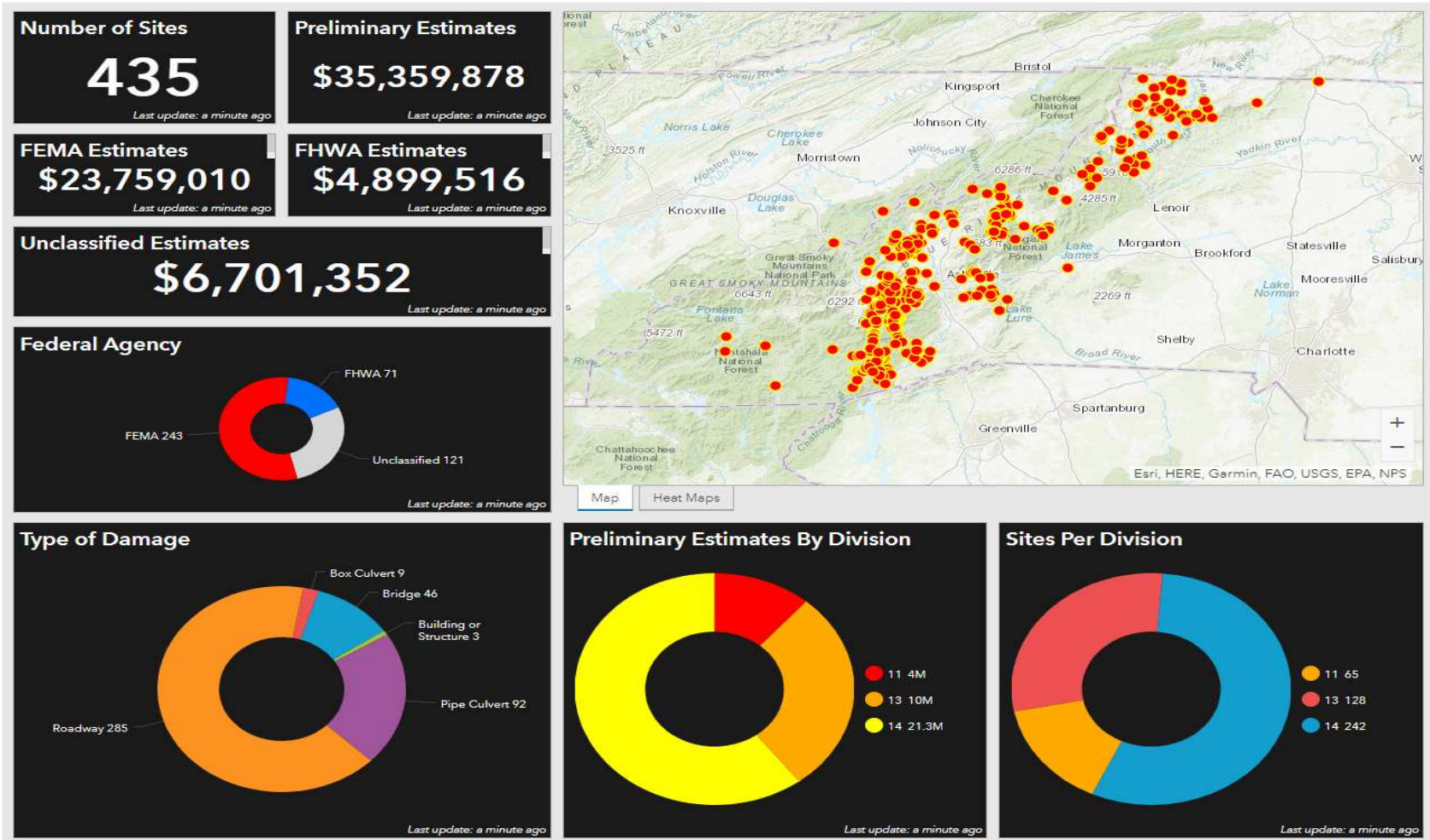
# Usage (2020 TS Zeta)



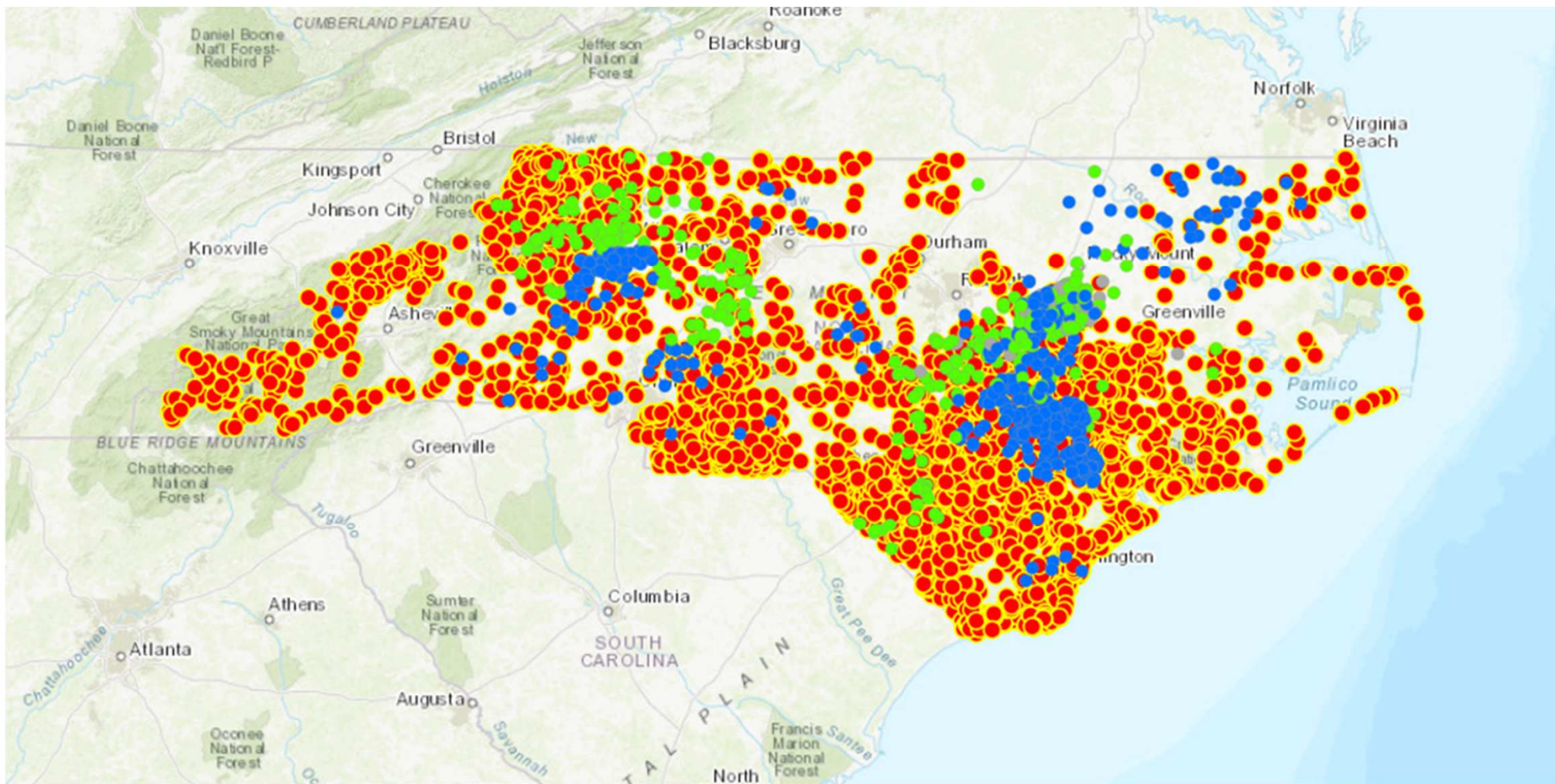
# Usage (2020 November 11 Rains)



# Usage (2021 Fred)



# Usage



## Technology: User Interface

### Field Personnel

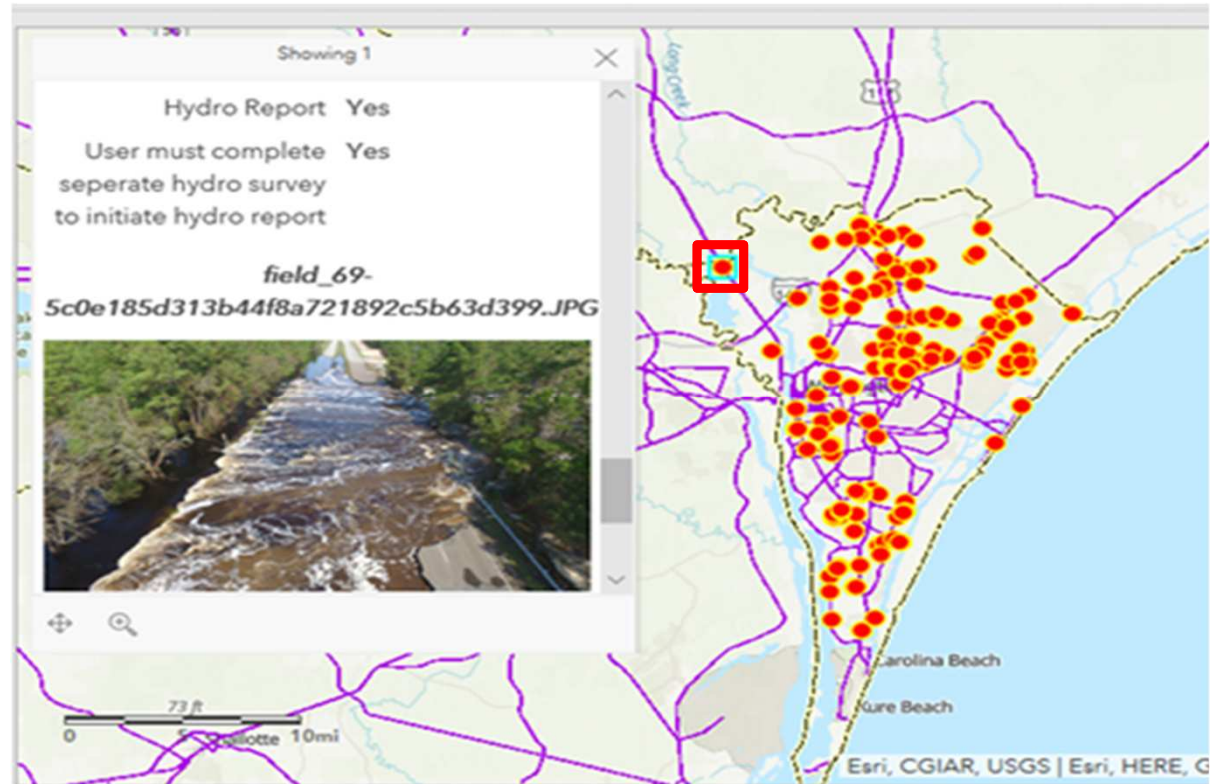
- Single trip to sites for data
- Map/Type of Damage led to work plans
- Standardization of data collection (CEI and State Forces)
- Automation of data management

### Management

- Real time analysis
- Reporting capability
- Eyes in the field

### FEMA/FHWA

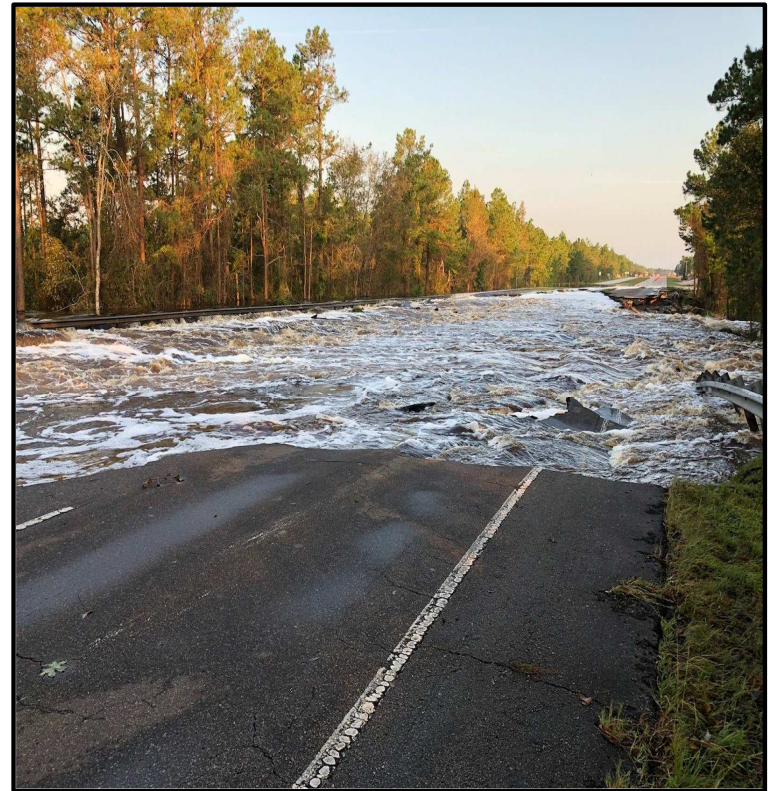
- Declarations made based on data
- Automatically creates the “List of Identified Damages”
- Consolidates collected data and simplifies submissions
- Reduces RFI’s



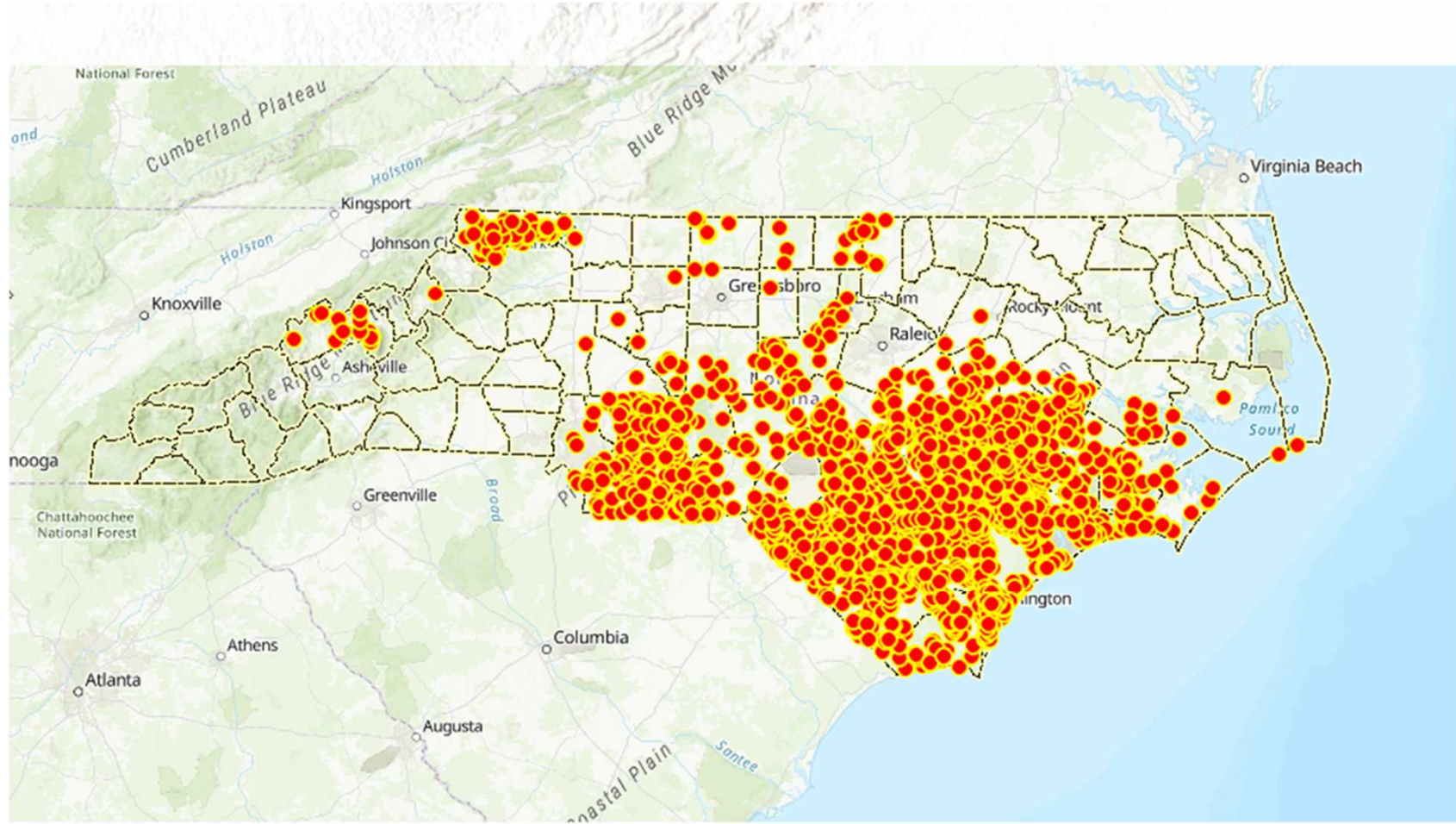


## *Additional Outcomes*

- Tied to Financial System – SAP
  - Automated WBS creation
  - Automated WBS data transfer
  - Automated site report creation
- Automate required documentation creation
  - Preliminary Estimates extrapolation
  - Engineer's Estimates
  - Fulfilled need for DD & SOW
  - Future edits captured (actual repair documentation)
  - Part 667 of the TAMP
  - Automated Hydraulic Report request
  - Repair status reporting
- Acceptance by field personnel beyond disasters



# Questions





**NORTH CAROLINA**  
Department of Transportation



# NCDOT BridgeWatch

**Charles Smith, PE**  
NCDOT Hydraulics Unit

February 7, 2023

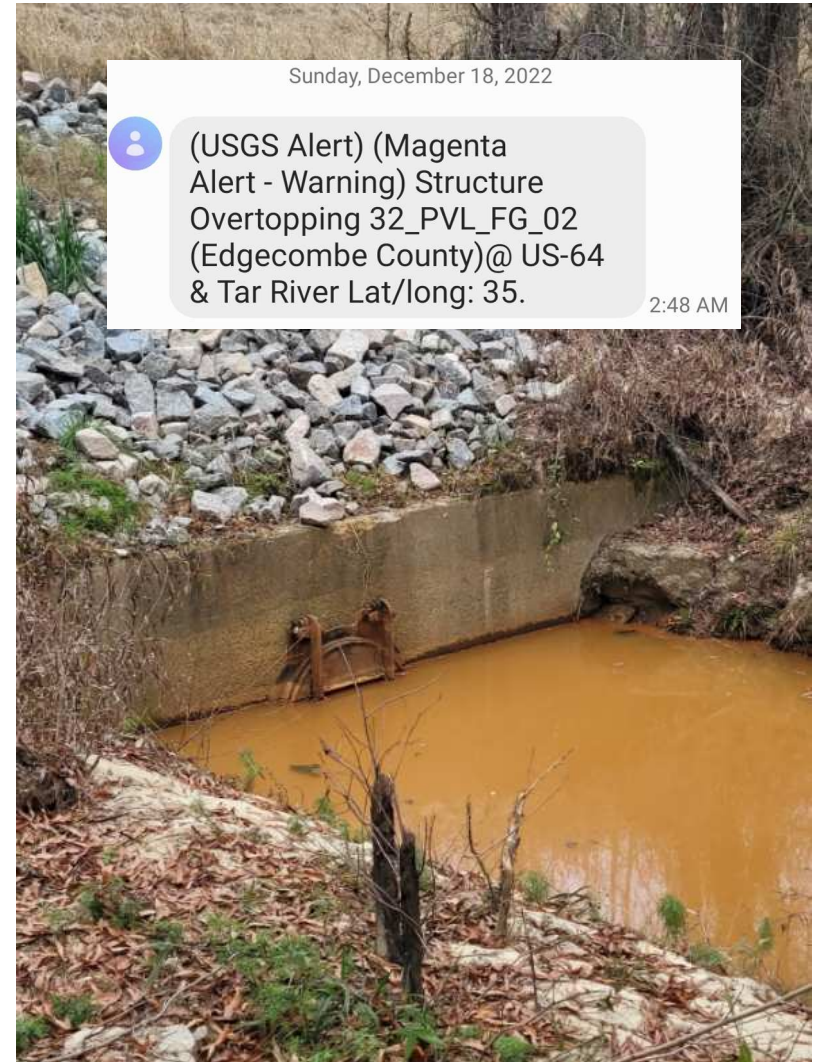
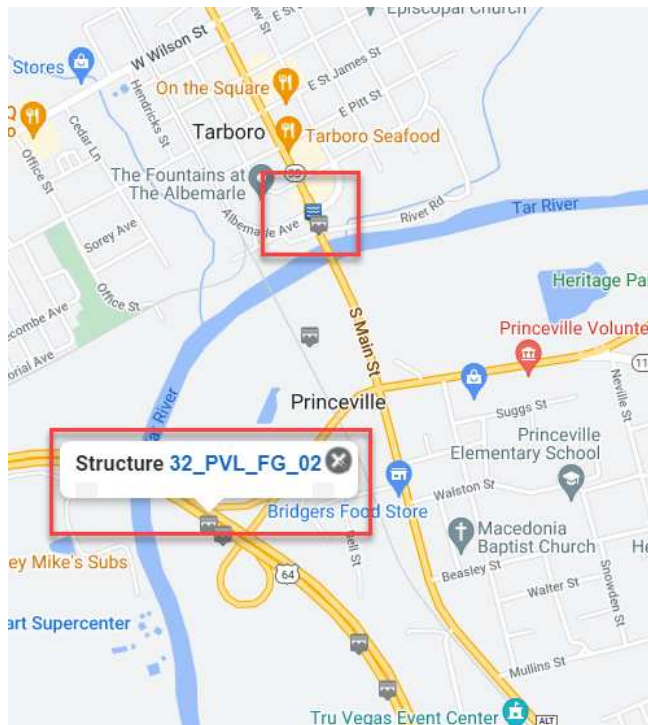


 **BridgeWatch**



Agenda:

- What is BridgeWatch?
- Alerts: Gauge-Based
- Alerts: Radar-Based Rainfall
- Alerts: SLOSH Storm Surge
- Reporting:
- Field Actions:



Sunday, December 18, 2022

(USGS Alert) (Magenta Alert - Warning) Structure Overtopping 32\_PVL\_FG\_02 (Edgecombe County)@ US-64 & Tar River Lat/long: 35.

2:48 AM

# What is BridgeWatch?

## Environmental Monitoring

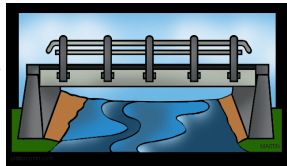


Stream Gauges

Weather Radar

NWS Alerts

### Monitoring Location



Bridges, Approaches & Culverts = 15709

Counties = 100

Ferry Ramps = 13

Landslides = 21

Total Active in BW = 7441  
Total in BW, Active & Inactive = 15843

### Levels/Thresholds Monitored



Water Elevation > Bridge Deck

Inches of Rainfall > 50yr Storm Over Watershed

Storm Surge 10% Chance of Exceeding Bridge Low Chord

### Alert



Texts

Emails

GIS Map

Web Application

Excel Report

### Measured Response



Post-Storm Inspection

Road Closure

## Alerts: Gauge-Based

580 Gauged Structures  
297 USGS Gauges  
255 NC and NOAA Gauges

Gauge Alert 2ft  
Freeboard  
(Watch-Orange)

GAUGE ALERT, 2FT FREEBOARD, (WATCH - ORANGE) IS ISSUED WHEN ON-SITE WATER SURFACE ELEVATION GAUGE INDICATES WATER IS 2 FEET FROM BRIDGE LOW CHORD OR 2 FEET FROM EDGE OF PAVEMENT AT A CULVERT

Gauge Alert  
Low Chord  
(Warning-Red)

GAUGE ALERT, LOW CHORD, (WARNING - RED), IS ISSUED WHEN ON-SITE WATER SURFACE ELEVATION GAUGE INDICATES WATER IS TOUCHING THE BRIDGE LOW CHORD. LOW CHORD ALERTS ARE NOT ISSUED FOR CULVERTS



Gauge Alert  
Overtopping  
(Warning-Magenta)

GAUGE ALERT, OVERTOPPING, (WARNING - MAGENTA), IS ISSUED WHEN ON-SITE WATER SURFACE ELEVATION GAUGE INDICATES WATER IS OVERTOPPING THE BRIDGE OR THE ROADWAY OVER A CULVERT

# Alerts: Gauge-Based (Bridge)

4152 Mobeys Bridge Rd  
Grimesland, North Carolina  
View on Google Maps

Linked Gage

USGS

Site Number	Name	Year Peak	Year Peak Height (ft)	Current Height (ft)	Last Time Measured	Monitoring Status
02084160 (3)	CHICOD CR AT SR1760 NEAR SIMPS...	Freeboard	11	8.65	02/08/2021 2:45:00 PM EST	Active
	CHICOD CR AT SR1760 NEAR SIMPS...	Low Chord	12	8.65	02/08/2021 2:45:00 PM EST	Active
	CHICOD CR AT SR1760 NEAR SIMPS...	Overtopping	12.3	8.65	02/08/2021 2:45:00 PM EST	Active

Thresholds

Measurement

Measurement Time

# Alerts: Gauge-Based (Culvert)

Structure 770464

94 Tartan Rd  
Lumberton, North Carolina

Linked Gage

Measurement Time

Thresholds


Measurement

Station Name	Name	Type	Status	Action Level	Last Time Measured	Monitoring Status	Critical Stage (ft)	Current Stage (ft)
30619 (2)	Five Mile Branch @ SR 1792 (Kahn Dr, Lumberton)	NCEM Gage	Active	Freeboard	07/12/2022 1:00:04 PM EDT	Active	9.43	1.85
	Five Mile Branch @ SR 1792 (Kahn Dr, Lumberton)	NCEM Gage	Active	Overtopping	07/12/2022 1:00:04 PM EDT	Active	11.43	1.85
30620 (2)	Meadow Branch @ SR 1792 (Kahn Dr, Lumberton)	NCEM Gage	Active	Freeboard	07/12/2022 1:00:04 PM EDT	Active	8.43	1.47
	Meadow Branch @ SR 1792 (Kahn Dr, Lumberton)	NCEM Gage	Active	Overtopping	07/12/2022 1:00:04 PM EDT	Active	10.43	1.47




# Alerts: Gauge-Based

## Example of Gauge Alert Email and Text


 (Device Alert) (Orange Alert - Watch) Freeboard Br 730431 (Pitt County)@ SR1591 & PARKER CREEK Lat/long: 35.644,-77.346 Time: 11:35 PM






Thursday, January 26, 2023

 (Device Alert) (Red Alert - Warning) Low Chord Br 730431 (Pitt County)@ SR1591 & PARKER CREEK Lat/long: 35.644,-77.346 Time: 2:10 AM


[External] BridgeWatch - Device Alert



NCBridgeWatch@ncdot.bridgewatch.us  
To:  Smith, Charles R

 Reply  Reply All  Forward  

Thu 1/26/2023 2:11 AM

 If there are problems with how this message is displayed, click here to view it in a web browser.

**CAUTION:** External email. Do not click links or open attachments unless you verify. Send all suspicious email as an attachment to [Report Spam](#).

Gauge malfunctions and the possibility of system miscalibration are sources of error that make field verification of BridgeWatch alerts a necessary part of using the system. Do not rely solely on alerts for critical decision making.  
Low Chord bridges: 730431 (In Pitt County)

\_Red\_Alert - Warning  
[NCEM Low Chord](#)  
Structure: [730431](#)  
County: Pitt County  
Road: SR1591  
Stream: PARKER CREEK  
Lat/Long: 35.644,-77.346  
Gage: 30119  
Time: 2023-01-26 02:55:00 EST  
Event Value: 11.02  
Threshold Exceeded: 11.01  
Scour Critical (Item 113): 8  
Drift: G  
Substructure Condition (60): 8  
Channel Condition (61): 8

[Watchlist](#)

Other NCDOT and NCEM flood warning tools such as FIMAN-T, BridgeWatch AGOL and Excel Dashboards can be viewed or linked to on the Hydraulics Flood Warning Tools SharePoint (link below):

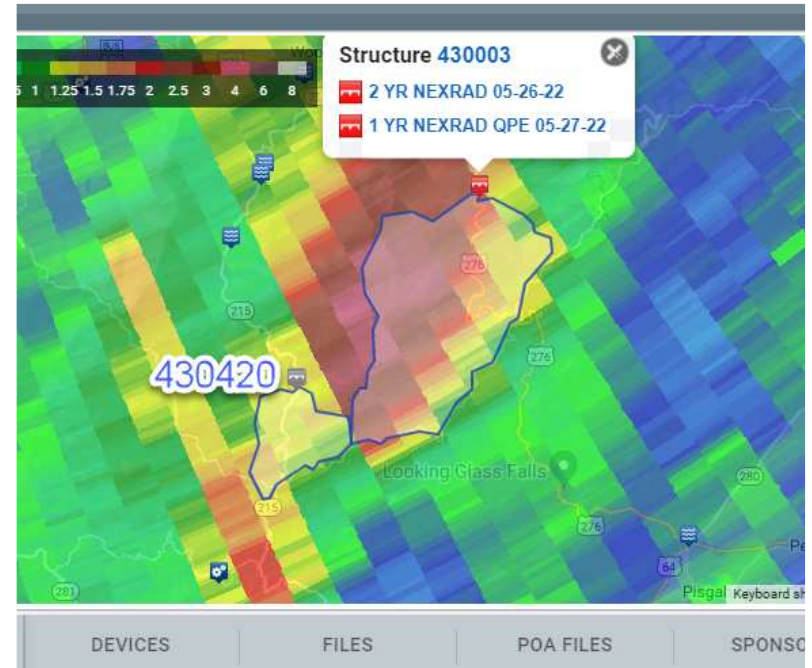
[NCDOT - Hydraulics & EM Flood Warning Tools - Home \(sharepoint.com\)](#)

# Alerts: Radar-Based Rainfall

## 7405 Active Structures with Rainfall Thresholds

Rainfall Alert Based on NEXRAD or QPF (Watch-Yellow)

RAINFALL ALERT IS ISSUED WHEN WEATHER RADAR INDICATES INCHES OF RAINFALL EXCEEDING A 50-YEAR STORM (FOR BRIDGES AND CULVERTS) OR 200-YEAR STORM (FOR COUNTY GEOGRAPHIC AREAS) ARE PREDICTED. ALERTS INDICATE FAVORABLE CONDITIONS FOR FLOODING - NOT THAT FLOODING IS IMMINENT OR OCCURING. A WEATHER RADAR SNAPSHOT OF THE RAIN EVENT IS AVAILABLE ON THE BRIDGEWATCH APP.



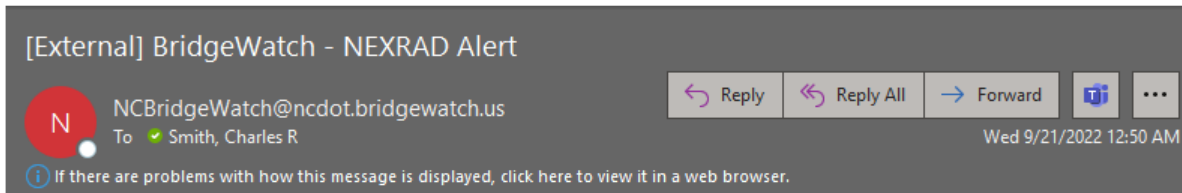
### Alert Triggers:

33% of Structure Drainage Area Receives Inches of Rainfall Greater Than 50-year Threshold

10sq mi of County Geographic Area Receives Inches of Rainfall Greater than 200-year Threshold 8

# Alerts: Radar-Based Rainfall

## Example of NEXRAD Alert Email and Texts



**CAUTION:** External email. Do not click links or open attachments unless you verify. Send all suspicious email as an attachment to [Report Spam](#).

BridgeWatch rainfall alerts are provisional and indicate a potential for flooding at structure. Field verification of BridgeWatch alerts are a necessary part of using the system. Do not rely solely on alerts for critical decision making.  
50 yr bridges: 370035 (In Graham County)

Yellow Alert - Watch  
[NEXRAD 50 yr 3-hr \(KMRX\)](#)  
Structure: [370035](#)  
County: Graham County  
Road: SR1259  
Stream: SAWYER CREEK  
Lat/Long: 35.393,-83.721  
Time: 2022-09-21 04:38:00 EDT  
Event Value: 4.05 inches (3 hours)  
Threshold Exceeded: 3.85 inches (3 hours)  
Scour Critical (Item 113): U  
Drift: G  
Substructure Condition (60): 6  
Channel Condition (61): 7

Wednesday, September 21, 2022

(NEXRAD Alert) (Yellow Alert - Watch) Rainfall 200 yr NEXRAD 2-hr (KMRX) Co 860000 (Swain County)@ & Lat/long: 35.487,-83.493 12:28 AM

(NEXRAD Alert) (Yellow Alert - Watch) Rainfall 50 yr NEXRAD 3-hr (KMRX) Br 370091 (Graham County)@ SR1236 & SAWYER CREEK Lat/

(NEXRAD Alert) (Yellow Alert - Watch) Rainfall 50 yr NEXRAD 3-hr (KMRX) Br 370035 (Graham County)@ SR1259 & SAWYER CREEK Lat/

(NEXRAD Alert) (Yellow Alert - Watch) Rainfall 50 yr NEXRAD 3-hr (KMRX) Br 370037 (Graham County)@ SR1236 & SOUTH FORK SAWYER 12:50 AM

(NEXRAD Alert) (Yellow Alert - Watch) Rainfall 50 yr NEXRAD 3-hr (KMRX) Br 370089 (Graham County)@ SR1241 & TUSKEEGEE CREEK L 1:01 AM

## Alerts: SLOSH Storm Surge (and future ADCIRC)

~200 Structures with SLOSH Thresholds

270 Structures with future ADCIRC Thresholds



Forecast Coastal  
Storm Surge SLOSH  
(Watch-Blue)

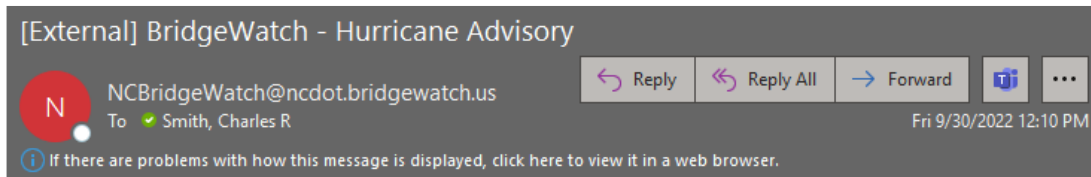
SLOSH ALERT IS ISSUED WHEN HURRICANE STORM SURGE HAS A 10% CHANCE OF EXCEEDING BRIDGE LOW CHORD ELEVATIONS. SLOSH ALERTS INDICATE FAVORABLE CONDITIONS FOR FLOODING - NOT THAT FLOODING IS IMMINENT OR OCCURING.

### Alert Trigger:

National Hurricane Center issues an Advisory with a Storm Surge Elevation that has a 10% Chance of Exceedance. This advertised Storm Surge Elevation is greater than the Low Chord Threshold set for the Bridge.

# Alerts: SLOSH Storm Surge (and future ADCIRC)

## Example of SLOSH Alert Email and Text



**CAUTION:** External email. Do not click links or open attachments unless you verify. Send all suspicious email as an attachment to [Report Spam](#).

BridgeWatch SLOSH alerts are provisional and indicate a potential for flooding at structure. Field verification of BridgeWatch alerts are a necessary part of using the system. Do not rely solely on alerts for critical decision making.

[Blue Alert - Watch](#)

[Ian Advisory 32](#)

Storm Surge elevation without wave height has 10% chance of reaching structure low chord for 090056

Visit BridgeWatch website, SLOSH data source for details.

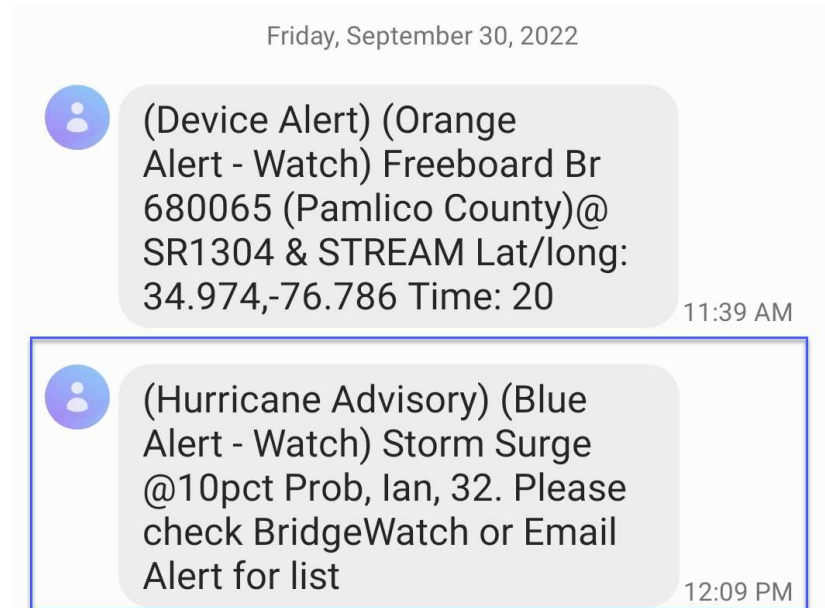
[Blue Alert - Watch](#)

[Ian Advisory 31A](#)

[Storm Surge elevation without wave height has 10% chance of reaching structure low chord for 090056](#)

[Visit BridgeWatch website, SLOSH data source for details.](#)

[<a href='https://ncdot.bridgewatch.us/main/main-app.html#/hurricane-advisory />](https://ncdot.bridgewatch.us/main/main-app.html#/hurricane-advisory/)



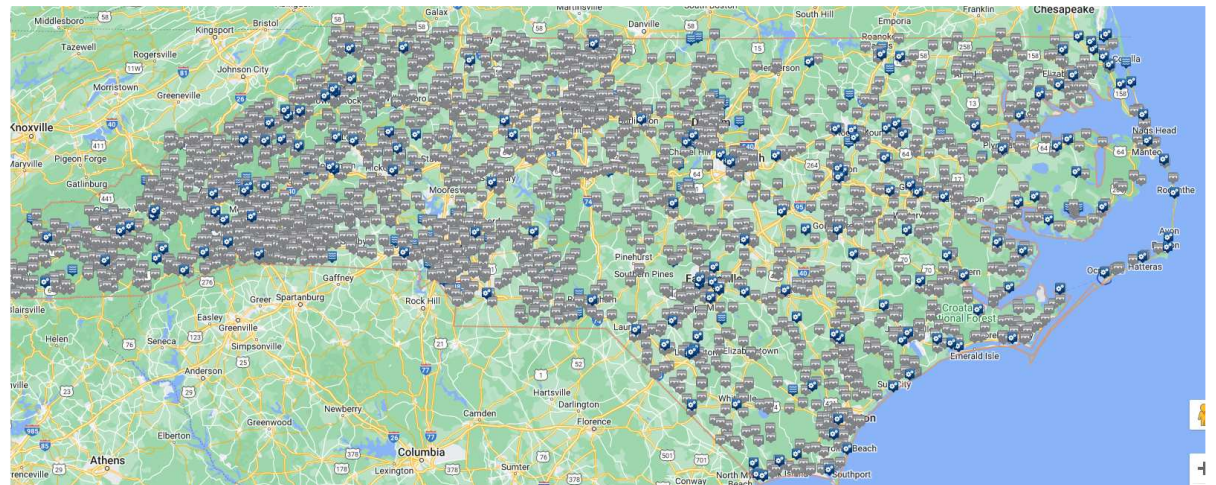
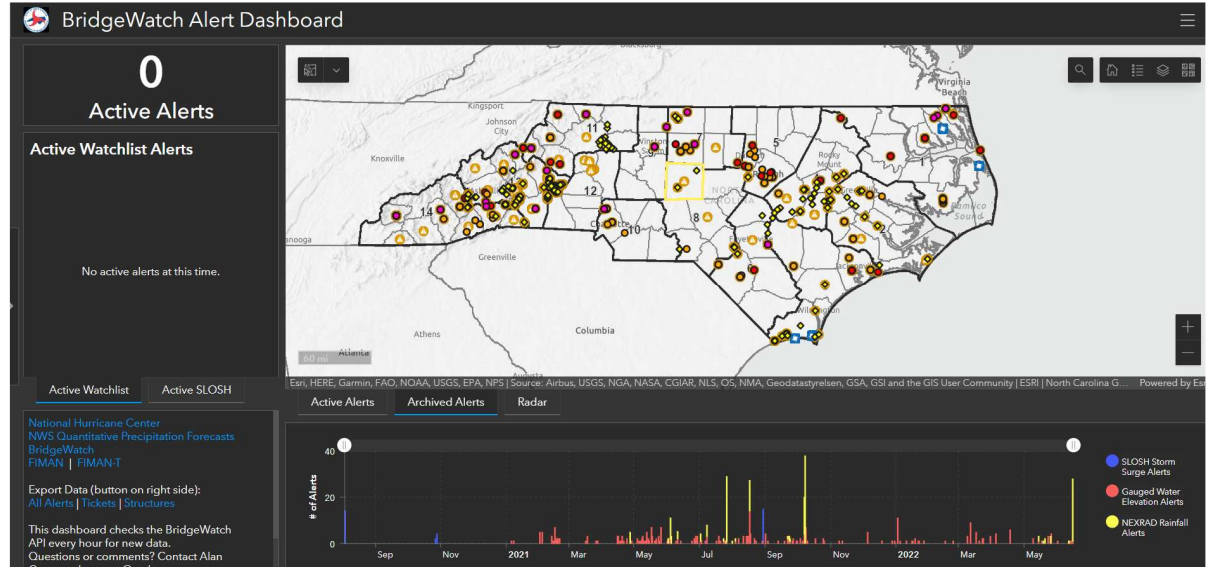
# Reporting: View Alerts and Alert History

BridgeWatch Web Application:

Texts & Emails:

BridgeWatch AGOL Dashboard:

BridgeWatch Brief ( Spreadsheet )



# Field Actions and TIMS / DriveNC Integration: Inspections and Road Closures

Storm event Alert List is Emailed to NCDOT Bridge Inspection Chief, who compiles a prioritized list of inspections based on alert level and scour potential.

State Highway Patrol, Local Authorities, or NCDOT may close roadways based on verified alerts.

Official Road Closure Status is found on DriveNC.gov

**Traveler Information Management System** CRSMITHI   DRIVENC   LOG OFF

Administration ▾ Add Incident Live Feeds Search Incidents Alerts ▾ Notifications ▾ TIMS Manuals ▾ What's New?

### Live Feeds

SHP   IMAP   Waycare   **BridgeWatch**

Last Updated: 1/26/2023 2:11:49 PM   Division: All ▾   County: All ▾   Road Type: All ▾

Show 10 ▾ entries   Search:

Id	Division	County	Road Name	River	Water Level	Time Caused
872284975	2	Pitt County	SR1591	PARKER CREEK	Low Chord	1/25/2023 9:55:00 PM
Devices Gage Id:		773001744				
Structure Id:		730431				
Gage Agency:		NCEM Gage				
Latitude:		35.644336				
Longitude:		-77.345623				

Showing 1 to 1 of 1 records   Previous **1** Next







# NORTH CAROLINA

## Department of Transportation



# Traffic Systems Operations: Traffic Operations for Hurricanes

Kelly Wells, PE

Traveler Information Engineer

February 7, 2023



## *Statewide Transportation Operations Center (STOC)*

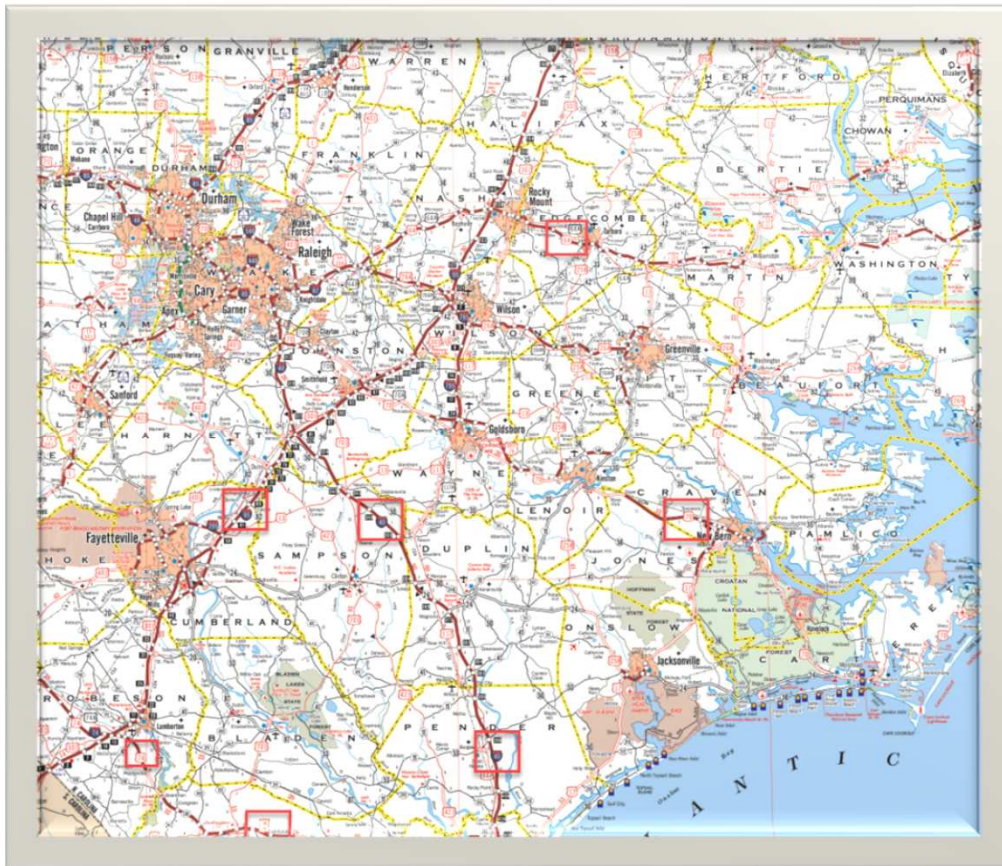


Dynamic Message Sign

- 24x7x365
- Detect, verify, clear, inform of incidents
- Incoming data from
  - Law Enforcement
  - Traffic Cameras
  - Google + Other Traffic Maps
- Coordination with Divisions, LE, Towing, Fire, etc. to clear
- Inform
  - Dynamic Message Signs
  - Traffic Cameras
  - DriveNC.gov and 511
  - Google, Apple, Waze, ...
  - DOT, EM and SHP Management

## *Pre-Storm: Evacuation*

Traffic Operations Focus on Key Routes: I-40, US 70, US 64, US 74 & I-95



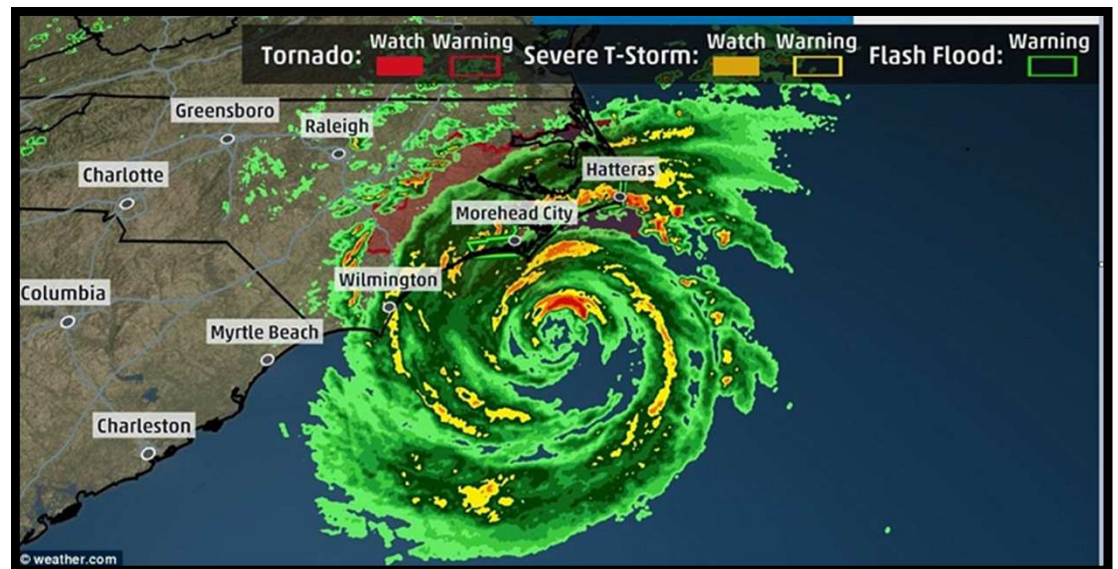
- Immediate Tow
- Incident Management Assistance Patrol (IMAP)
- Signal Timing



## *Pre-Storm: Evacuation*



- Possible I-40 Evacuation Strategies
  - Hard Shoulder Running
  - Closing Interchanges
  - Lengthen Merges
  
- I-40 Reversal: almost never



## *Pre-Storm: Evacuation*

- Current speeds visible on Drive NC.gov
- Watching key routes and reporting congestion to management

The screenshot displays the DriveNC.gov traffic map interface. At the top, there is a search bar containing 'Wake County, North Carol...' and navigation icons for Legend and Settings. Below the search bar, there are tabs for 'Traffic Map', 'Incidents', and 'Snow & Ice'. The main map area shows a network of roads in Wake County, North Carolina, with green lines representing traffic flow. A red banner across the top of the map area reads 'NORTH CAROLINA REMAINS UNDER A SAFER AT HOME ORDER'. The sidebar on the left contains several sections: 'Choose Map Pins' with options for 'All Types', 'Planned Road Work', 'Other Incidents', 'All Roads', and 'Future Events Hidden'; 'Ongoing Events' with '#Biz/10NC' and '2020-08-01 Hurricane Isaias'; and 'View Data Layers' with options for 'Cameras', 'Congestion', 'Rest Areas', and 'Snow & Ice'. The bottom of the map shows a scale bar for 10 miles and 25 km, and a copyright notice for 2020 TomTom and HERE.

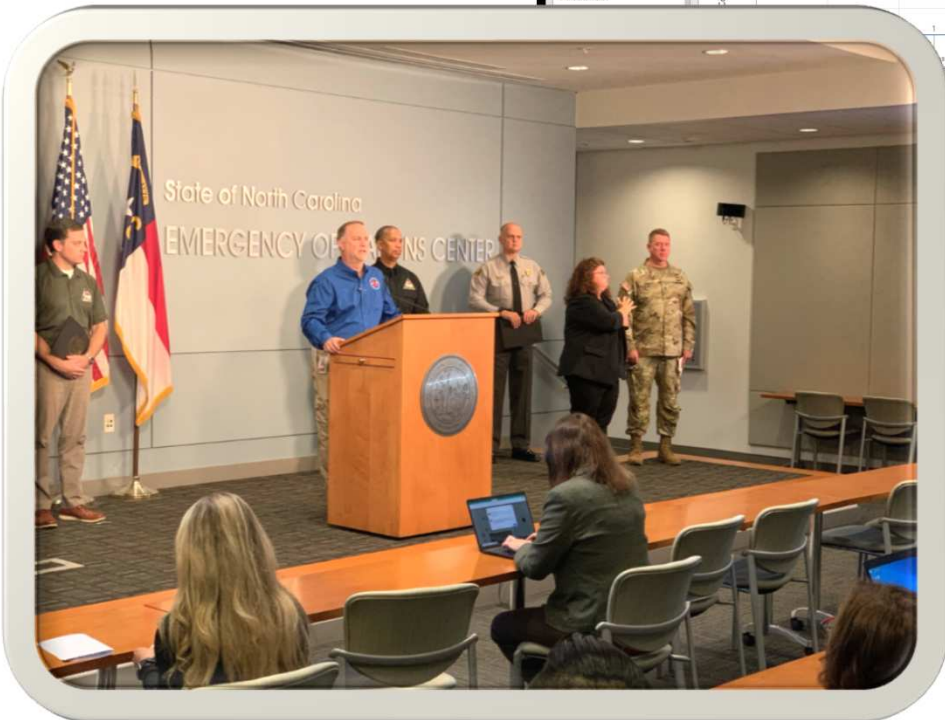
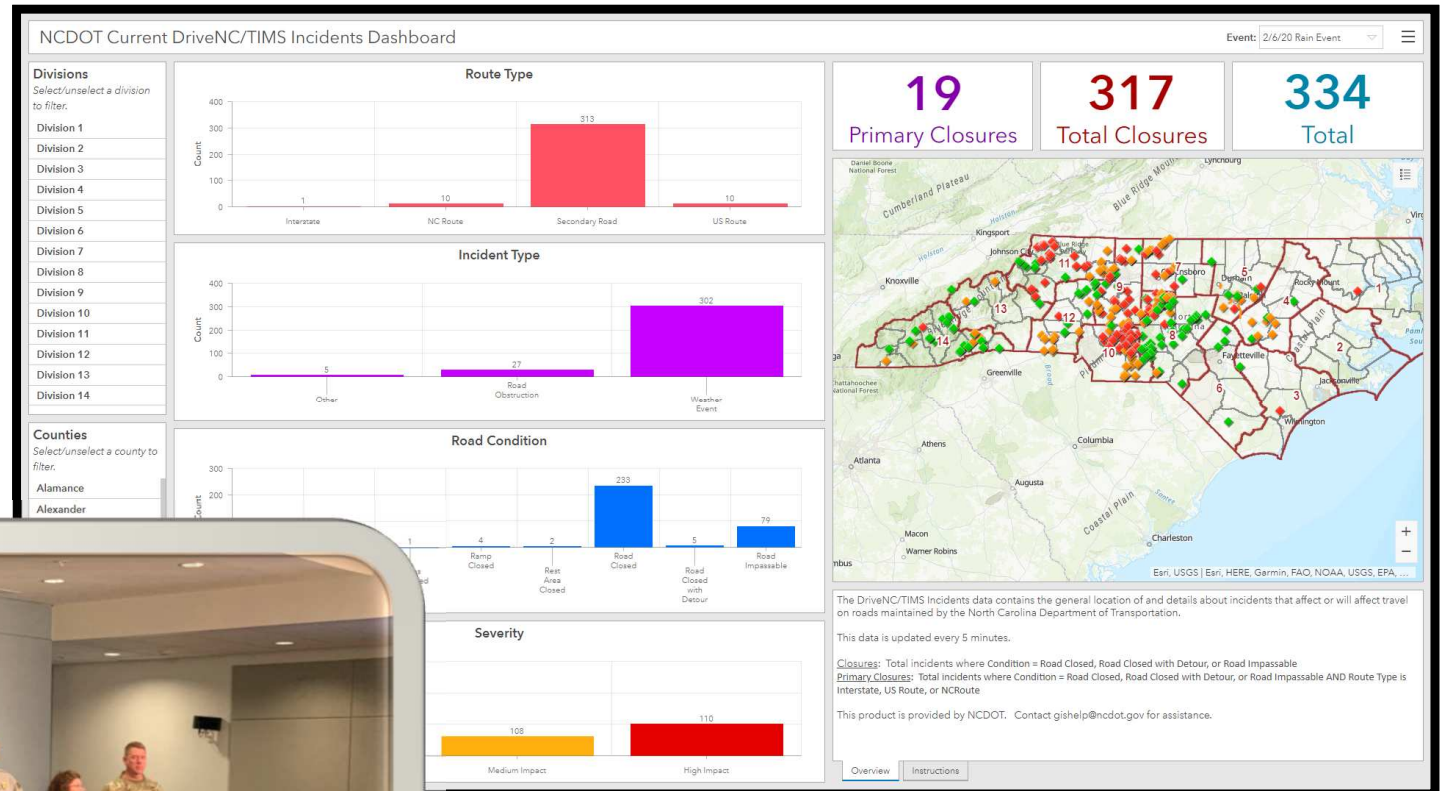
*Pre-Storm >>> Post Storm*



# Post Storm: DriveNC Event Toggle

The screenshot displays the DriveNC.gov website interface. At the top, there is a search bar for "City, county, zip..." and navigation links for "Traffic Map", "Incidents", and "Share". A "Map Filters" sidebar on the left contains a red-bordered toggle for "2021 Fred Severe Weather", which is currently turned on. Below the sidebar, a dark red banner provides information about Tropical Depression Fred's impact on roads in western North Carolina, including a warning to slow down and links for the latest Fred info from NC Emergency Management and the National Weather Service. The main map area shows a map of North Carolina with numerous yellow "Weather Event" markers scattered across the western and central regions, indicating affected roads. The map includes labels for various cities and counties, as well as major highways.

# Post Storm: TIMS Dashboard for Management Reporting





## From Bridgwatch >> Traveling Public

- New source of flooding info in 2021
- STOC verifies info from Bridgwatch
- STOC creates TIMS incident > DriveNC
- TIMS feeds info to other sources...



### Live Feeds

SHP IMAP Waycare **BridgeWatch**

Last Updated: 9/30/2022 3:04:32 PM

Division: All County: All Road Type: All

Show 10 entries

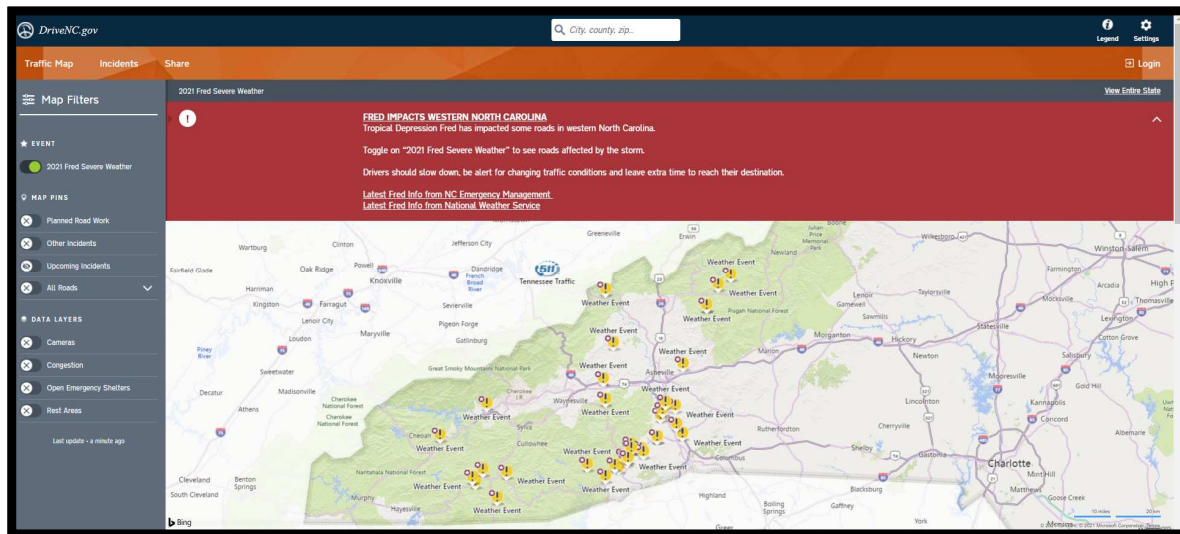
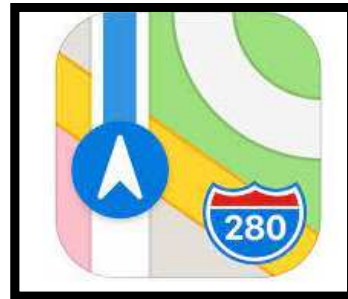
Search:

	Id	Division	County	Road Name	River	Water Level	Time Caused
	815233537	3	Brunswick County			Structure Overtopping	9/30/2022 1:25:00 PM
	815233538	3	Brunswick County	NC179 BUS	CALABASH RIVER	Low Chord	9/30/2022 1:15:09 PM

Showing 1 to 2 of 2 records

Previous **1** Next

## Public Traveler Info Tools



### Used For

- Hurricanes
- Snowstorms
- Rockslides
- Crashes
- Work Zones
- Special Events
- ....

## *Post Storm: Routing Room @ JFHQ / STOC*



- Stood up for only major events
- Provides routing for emergency responders into affected area: National Guard, grocery and ATM re-suppliers, etc.



# NORTH CAROLINA

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# Traffic Systems Operations: Traffic Operations for Hurricanes

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