Riding the Data Highway: GIS Use in Transportation
Meet the presenters

Eric Wilson
Eddy Shipman
Raquel Bensadoun
James Nenaber
Finn Swingley
Participants will learn how NCDOT is utilizing GIS to increase efficiencies for post-incident damage reporting to FEMA, and how communities are leveraging mobile mapping capabilities from HERE to support all phases of a disaster.
Agenda

- 1:00–1:05 Introductions and Welcome (5 mins)
- 1:05 – 1:35 NCDOT (30 min)
- 1:35 – 2:05 HERE (30 min)
- 2:05 – 2:15 Questions/Wrap-up/Closing
GIS Disaster Monitoring & Recovery

NCDOT GIS Unit:
Eric Wilson, GIS Manager
Edward Shipman, Application Development Supervisor
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Grateful Acknowledgements:
Joshua Kellen, PE, Jaimie Nevins
Massiel Perez
GISU Supported Products

TIMS Services

SMO ASSIST Dashboard
SMO deploys Survey123 survey to field workers to collect and report all storm related damages and repair estimates. The dashboard uses that survey data to compile metrics and also create a total monetary estimate for Federal Emergency support.

Damage Assessment Image Viewer
Generated from SMO ASSIST survey to quickly view pictures captured by NCDOT field crews.

Drone SharePoint Viewer Products
Web application created by Aviation for UAS drone images of larger scale damaged areas.
TIMS
Traveler Information Management System

drivenc.gov

TIMS API
TIMS Incidents Dashboard

NCDOT Current DriveNC/TIMS Incidents Dashboard

Filter
Use the buttons, check boxes, and dropdowns to filter the map, charts, and counters.

Divisions:
1 2 3 4 5 6 7
3 9 10 11 12 13

County:
All Counties

Severity:
Low Impact
Medium Impact
High Impact

Route Type:
Interstate
NC Route
Secondary Road
US Route

Route Type

Primary Closures
14

Total
333

108 Closures

Overview Instructions

Event:
All Events
Create Date:
11/08/2023 and forward

Primary Closures
Click on an incident to zoom to it.
Click once again to zoom to the state.
Incident: 681480 - Road Closed
Road: Observation
NC 54 S, Near Fayetteville / Both Directions: Fayetteville, Cumberland County, District 6
The road is closed near Queen City Drive.
11/08/2023, 3:52 AM - 11/09/2023, 3:00 PM

Incident: 660831 - Road Closed with Detour
Construction
AZ: 555, North, Right & Left Lane Shoulder Closure / Northbound:
Construction
Adverse Weather Dashboard
Incorporating Snow/Ice
TIMS Cameras
TIMS Incidents Dashboard

NCDOT Current DriveNC/TIMS Incidents for 2023 Mock Event

Filter
Use the filters and drop down to filter the map and counties.
Use AADT range to filter segments on the map.

Division:
1 2 3 4 5 6 7 8 9 10 11 12 13 14

County
All Counties

AADT Range
1,200 - 100,000

12 Primary Closures 12 Total Closures 12 Total Incidents

Primary Closures
Click on an incident to zoom to it.
Click on it again to zoom to the state.

Incident 58124 - Road Impassable
Weather Event
US-70: New Shalotte / Both Directions
Shalotte, Brunswick County, Division 3

The road is closed near Graham Ave SW.
7/13/2023, 2:15 PM - 7/14/2023, 3:15 PM

Incident 58123 - Road Impassable
Weather Event
NC-132: Near Shalotte / Both Directions
Shalotte, Brunswick County, Division 3

List | Map legend

This dashboard only includes incidents reported due to the 2023 Mock Exercise for Hurricane Season.

This data is updated every 5 minutes.

Overview | Instructions
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

- 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
Deployment: Hurricane Florence (September 2018)

National Weather Service Raleigh, North Carolina
Preliminary Hurricane Florence Rainfall Totals
Data Source: Regional Observations (NWS)

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)
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

Number of Sites
178

Preliminary
$21,510,741

Last update a few seconds ago

FEMA Estimates
$4,173,737

FHWA Estimates
$17,337,004

Last update a few seconds ago

Federal Agency
FEMA: 100
FHWA: 70

Type of Damage
- roadway 141
- bridge 114
- pipe culvert 14

Preliminary Estimates By Damage Type
- roadway $141
- bridge $91
- pipe culvert $14
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.
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)
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
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

Utilities: Yes
Affected Utilities
- fiber
- gas

Preliminary Estimate: 15,000,000
Hydro Report: Yes
Overview of Transfer to SAP

HTTP triggers
Exposed to SAP
<GetAssistData> - checks for surveys that are active and then any records ready in active surveys and transfer initial information
<SetAssistWBS> - Accepts input for SAP processing status and updates record in survey
<GetAssistPDF> - Accepts requests from SAP and returns PDF or TXT files
<BuildPdfFunc> Builds PDF or TXT and stores in Azure Blob storage
<GenerateCountyWideReports>
<SendEmail...> Sends errors to appropriate parties

1) 1 AM check for individual records
   a) if there are retrieve tabular data
   b) 1:30 AM pick up PDF
2) 2 AM check for county-wide
   a) retrieve tabular info
   b) retrieve PDF and TXT
## COMING SOON

[Image of a map with data and a table showing coordinates and road names]
Damage Assessment Viewer

2021 Fred Severe Weather Damage Assessments (ASSIST) Image Viewer

[Image: Map of damage assessments in North Carolina, with highlighted areas and images of affected sites]
Damage Assessment Viewer
UAV Media Ingestion

Drone Image Viewer - Tropical Storm/Hurricane Isaias

Images in Map Area
To ensure good performance, only 10 images are displayed. Pan and zoom in the map to change the list.
Select/wavelet an image to highlight the map polis.

Description:
Image Taken: post-storm
Image Date: 6/4/2020, 3:46 AM

Flight Angle:
Lat/Long: 35.67, -77.03
Questions
Demystifying Digital Twins to Improve GIS for Public Safety

InSPIRE 2023 Presentation

HERE Technologies Public Sector
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Agenda

1. Reframing the Digital Twin
2. Creating a Digital Twin w/Mobile Mapping
3. Applying the Digital Twin to Emergency Management
4. Takeaways & Call to Action
5. Questions & Discussion
Reframing the Digital Twin
Demystifying the Digital Twin
Steps to create an achievable digital twin

What is a digital twin?
• An industry buzzword
• Immersive, photorealistic, interactive
• A virtual representation of a real-world physical asset or system, continuously updated

DON’T build the Death Star!
Creating a Digital Twin
One step at a time

- Think agile within a common operating model
- Focus on roadway infrastructure
- Develop a digital map strategy
- Prioritize use cases to identify data & service layers
- Utilize Mobile Mapping to develop a digital twin and link to available data and services
Creating a Digital Twin using Mobile Mapping
What is Mobile Mapping?

Data Acquisition

Data Processing

Feature Extraction & Conflation

Deployment
Mobile Mapping Use Cases
Digital Twins for Emergency Management
Scenario 1 – Emergency Planning

Planners can identify potential risks, better understand the impact of disasters, and develop more effective mitigation strategies.

Establish roadway clearances to understand if they can accommodate emergency response equipment.
Scenario 2 - Mitigation

Identify at risk infrastructure and effective ways to prevent failure during a natural disaster.

Identify the condition of critical infrastructure and prioritize maintenance.
Scenario 3 – Tactical Response

Identify and prioritize areas of the transportation network that need to be restored quickly to minimize disruption and provide relief to affected areas.

Prioritize critical transportation infrastructure during emergency response

Incorporate real time data within a digital twin
Takeaways & Call To Action
Key Takeaways

Digital Twinning is Agile using software, data, and capture capabilities you can access.

Achieve DTs by integrating immersive basemap, imagery, ground based lidar, and extracted features.

Mobile Mapping is a DT for the road network that enhances public safety, including emergency management.

Mobile Mapping is scalable and interoperable – DOTs and public safety agencies access the same information.

Call To Action – 2024 private sector & public sector can together make a difference!

CALL TO ACTION: In Early 2024, HERE, with support of others, shall gather public sector and private sector together to workshop a digital twin solution strategy and develop POC deliverables.
Q&A / Discussions
Thank you

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THANKS!

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