



JUNE 16, 2022

Using GIS and Dashboards to Support Intelligent Traffic Engineering Decisions

PRESENTED TO: VASITE 2022 Annual Meeting and Technical Conference

A waterfront scene with a wooden pier, a lifebuoy, and industrial structures in the background. The image is overlaid with a dark blue gradient and a white rectangular frame containing the title text.

JMT INTRODUCTION AND OVERVIEW



Who is JMT?

- Full-Service A&E firm
- 100% Employee-owned
- 1800+ Employees, primarily in offices throughout the east coast
- Three offices in Virginia (Virginia Beach, Richmond, Herndon)
- One stop shop – full-service firm



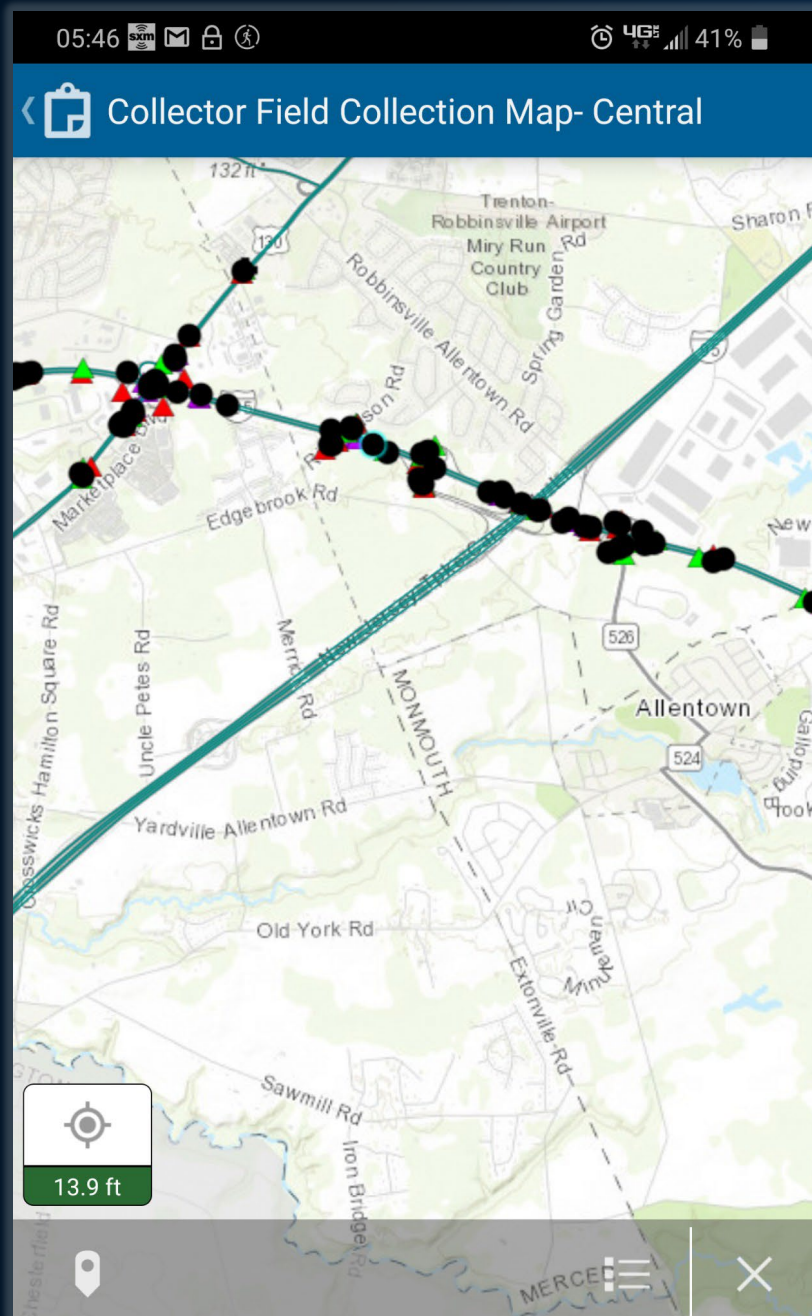
JMT Technology Group

- Division of Johnson, Mirmiran, & Thompson
- Nearly 100 technology employees supporting our engineering, planning, design, and survey staff
- Primary focused on GIS and software development with other services provided
- Focus on developing technology solutions for engineering needs

WHY SHOULD I CARE ABOUT TECHNOLOGY?

- Technology is becoming far more prevalent in design and engineering contracts
- Many RFPs released now include language specifically dedicated to technology, including GIS, survey technologies, and efficiencies provided through technology
- **This trend will continue, it's time to embrace how technology can support and enhance your engineering workflows**





How can technology improve engineering services?

- Improved and more informed data-driven decision making
- Prioritization of projects and funding
- Provide efficiencies in the field
- Improved reporting for supervisors and management staff
- Improved project documentation and data for project closeout



How can technology provide safety and operational improvements?

Pedestrian and bicycle **Risk Assessment**

Technology assessment for **TSMO Deployments**

Work Zone Safety evaluation application

Speed limit and **passing zone** application

Bus stop **Pedestrian Safety** analysis

Intersection, highway, and lighting risk analysis and **Prioritization**

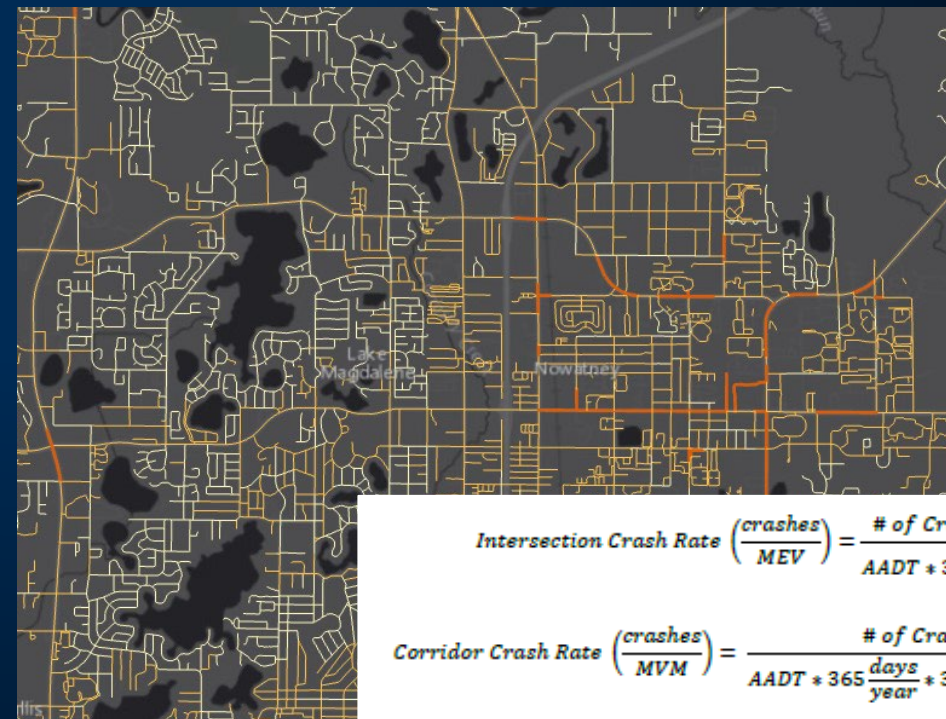
UAV (Drones) for “near-survey” information for engineering projects

Technology Solutions Prioritization

USING DATA FOR PRIORITIZATION

- JMT's traffic engineers develop countermeasures and crash reduction factors for multiple organizations
- Our Technology Group uses Python scripting and other tools within GIS to make data driven decisions to solve traffic and safety issues
- We develop prioritization techniques using traffic algorithms from engineering staff, then use GIS to execute the results
- **We focus on the engineering and GIS teams working together to resolve and accelerate the resolution of issues, saving time and money for our clients**

Countermeasure	CRF
New signal at channelized intersection	12
New signal at non-channelized intersection	15
Add signal and channelization	19
Modify signal at channelized intersection	11
Modify signal at non-channelized intersection	-99
Modify both signal and channelization	24
Modify signal and add channelization	28
Remove signal	
Add flashing warning signal (signalization)	-2
Interconnect traffic signals	
New LT channelization w/ LT phase (signalized)	17

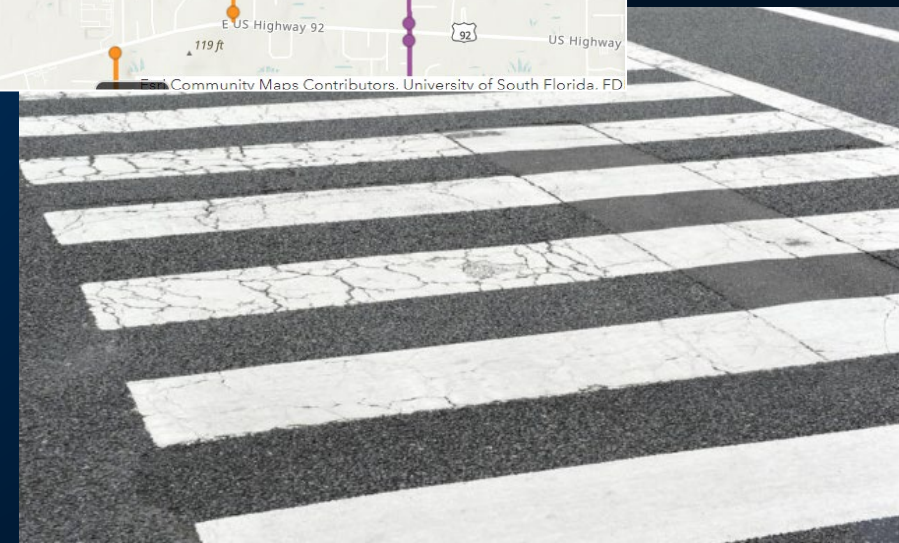
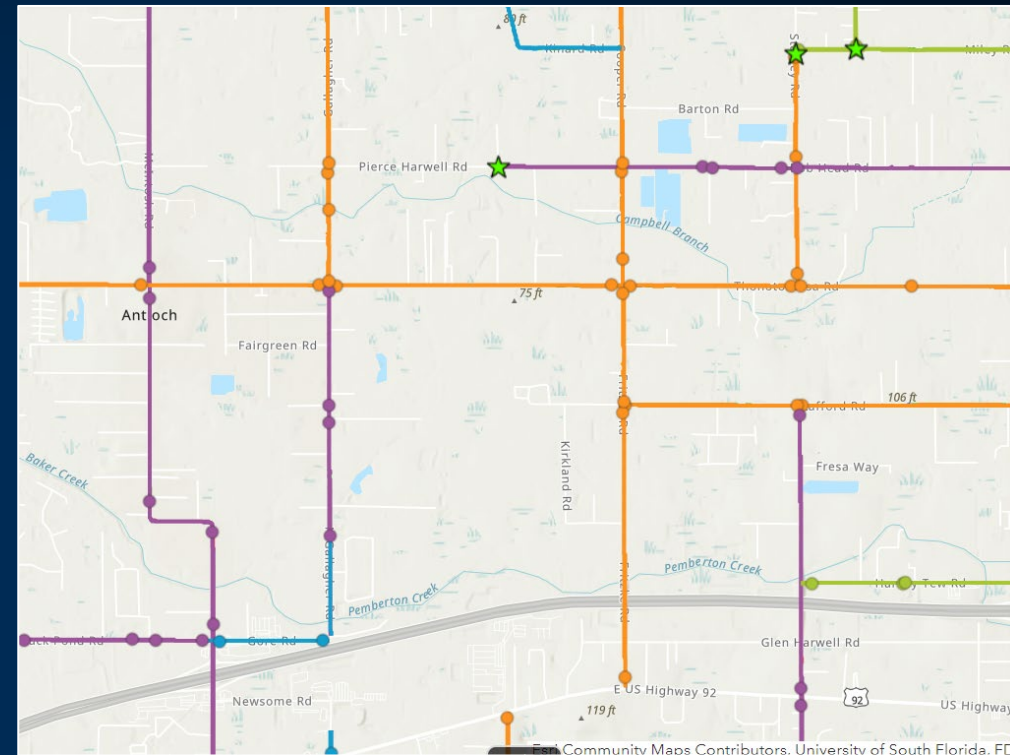


$$\text{Intersection Crash Rate} \left(\frac{\text{crashes}}{\text{MEV}} \right) = \frac{\# \text{ of Crashes} * 1,000,000}{\text{AADT} * 365 \frac{\text{days}}{\text{year}} * 3 \text{ years}}$$

$$\text{Corridor Crash Rate} \left(\frac{\text{crashes}}{\text{MVM}} \right) = \frac{\# \text{ of Crashes} * 1,000,000}{\text{AADT} * 365 \frac{\text{days}}{\text{year}} * 3 \text{ years} * \text{length of corridor}}$$

Walking and Bus Stop Hazard Field Evaluation

- Evaluate GIS Right-of-Way Data
- Evaluate existing sidewalk and crosswalk information
- Field reviews are conducted at each location to determine constructability/feasibility for pedestrian safety improvements
- Provide planning cost estimates for construction based on field reviews



Pavement Prioritization

- Automated pavement data collection
- Prioritization and programming for new paving and rehabilitation projects
- Prioritization of paving projects in conjunction with utility projects and pavement cuts
- Development of future paving budgets based on material costs

GPIS - City of Philadelphia Department of Streets
 User: utilityuser@gpis.gpis | Manage Contacts | Logout

16th Street Conduit Project

Create New Location

Street: Select a Street...
 Location Type: Street | Intersection
 Search By: Cross Street | Hundred Block
 From Street: Select a From Street...
 To Street: Select a To Street...
 Connect Selected | Select Streets
 Work Type: Select an Option

Selected Pavement Segments

- PG.GARRISRDA_A004
 GARRISON RD
 To: WEST LANHAM DR
 From: ANNAPOLIS RD
 Zoom
- PG.FREDERRD_B001
 FREDERICK RD
 To: FREDERICK RD SPUR
 From: 77TH AV
 Zoom

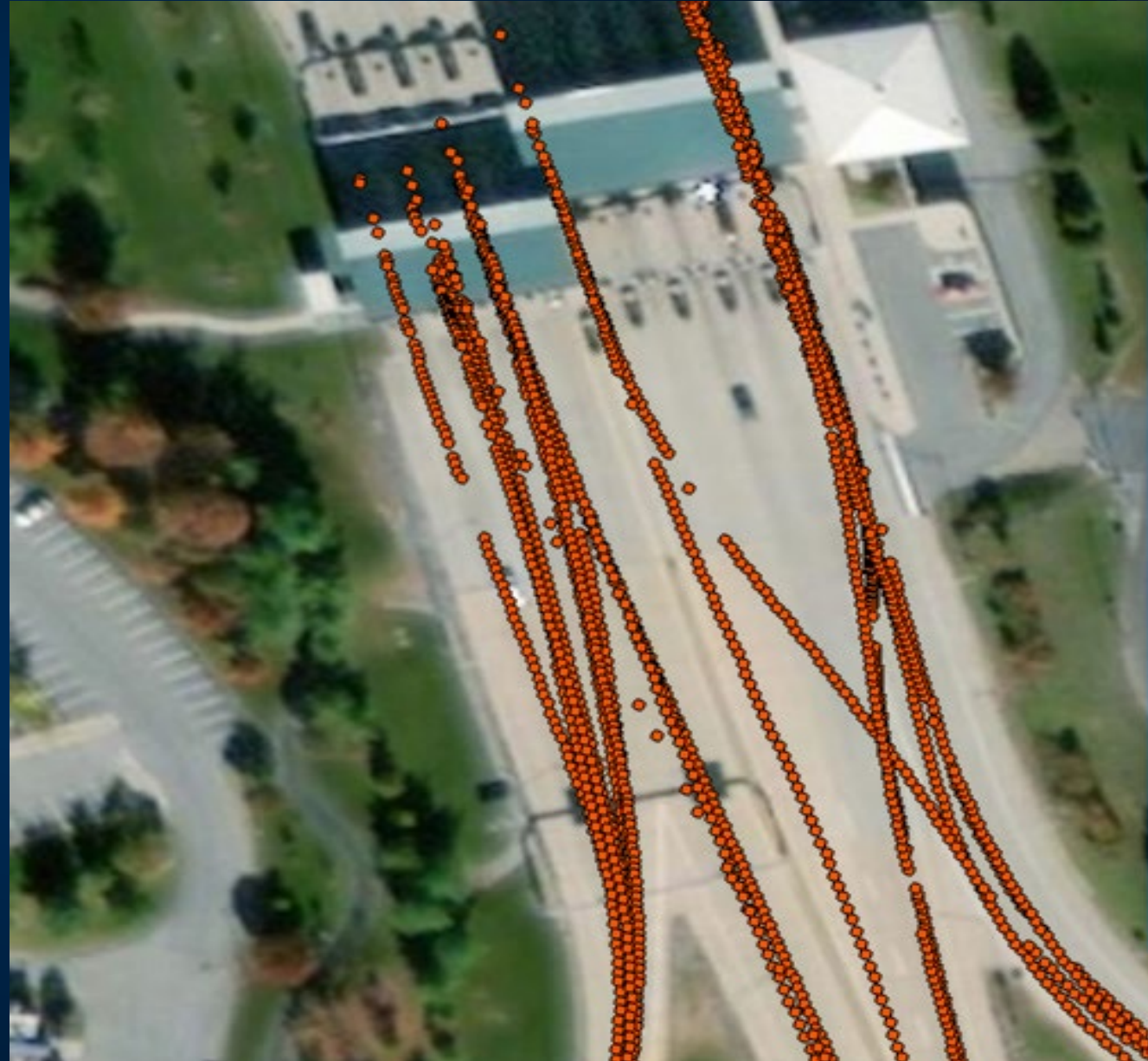
Active Pavement Segment Information

Branch Name	Open/Closed	Full curb	Length	Calc	Municipality
GARRISON RD			1,643.1		WEST
Pvmt. ID	PG.GARRISRDA_004	From Street	ANNAPOLIS RD	Width	26
Network ID	PG	To Street	WEST LANHAM DR	Const. Date	7/28/1993
Branch ID	GARRISRDA	Urbs/Rur	Urban	Last Insp.	6/12/2013
Section ID	004	Last Cont.		Pvmt. Use	ROADWAY
Managed	County	Last PCI	43.91	DPWT District	District 2
Class	Secondary Residential	Surface	AC	Council District	District 3
St. Seg. ID					Comments

Pavement Attributes | Associated Projects (0) | PCI Scores (10) | Distresses (2) | Complaints/Needs List (0) | Completed Work (0) | Edit Log (0)

Real Time Analytics

- Acquire data from multiple sources, data feeds
- Determine traffic and transportation trends
- Use the data to improve safety measures
- Make informed decisions about future design and construction based on data captured in real time

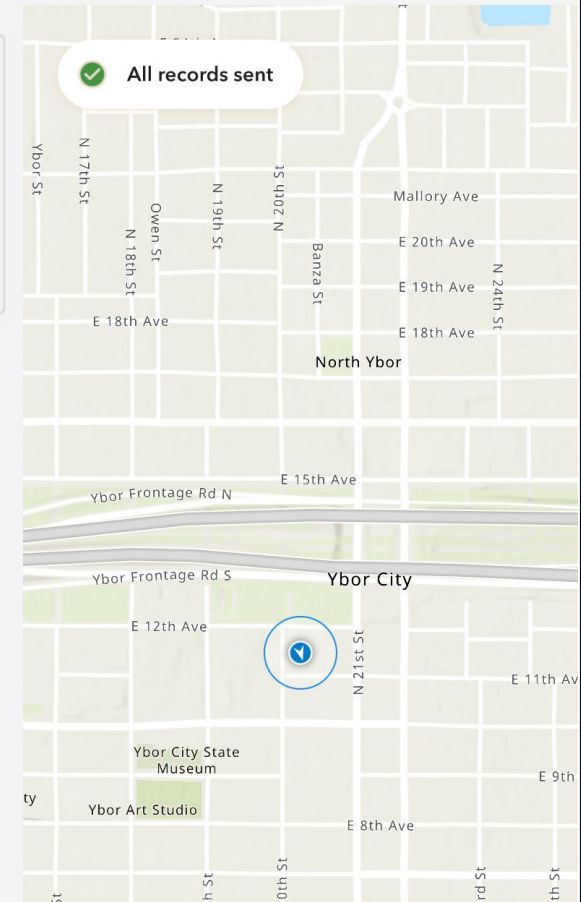
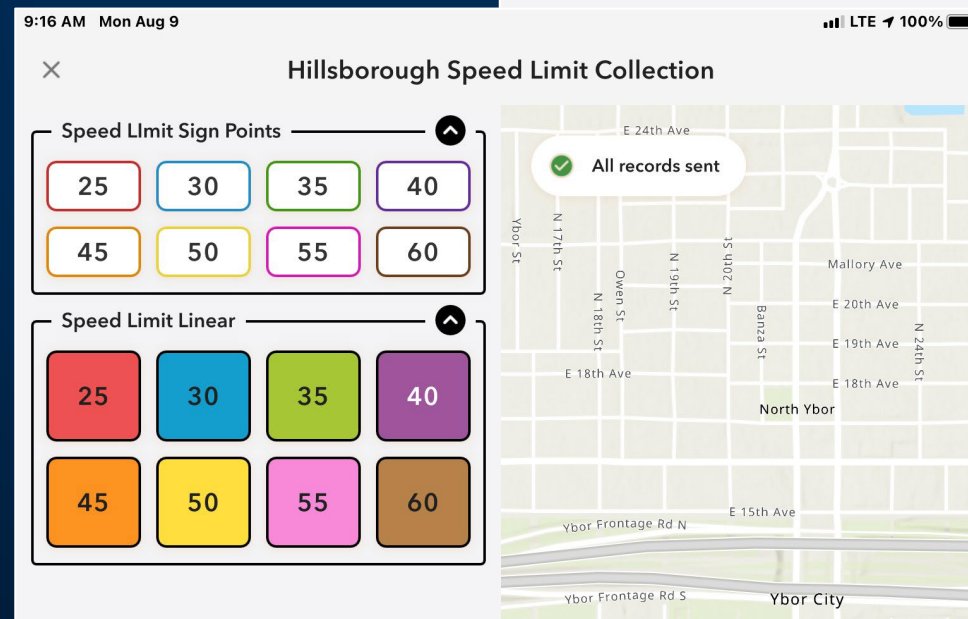
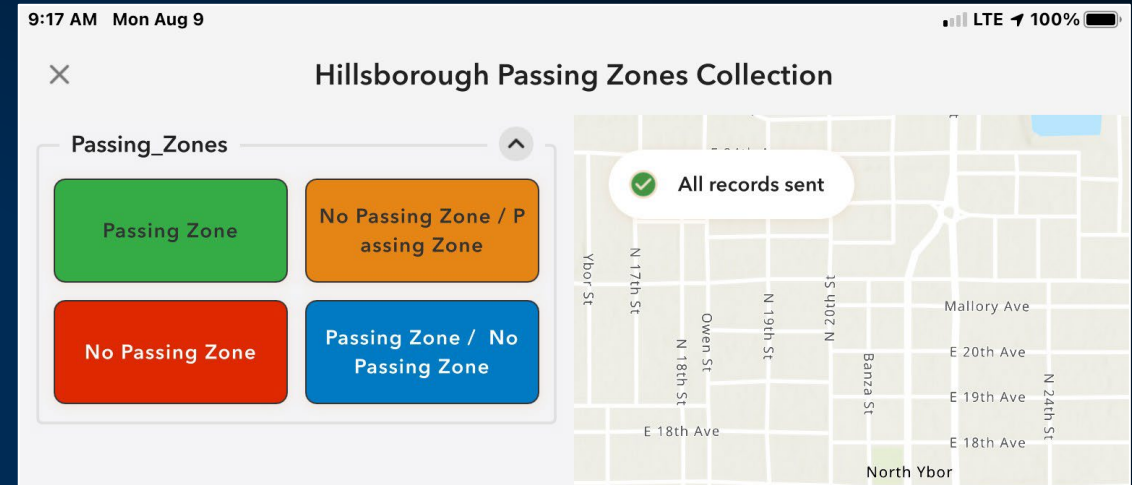




Technology Solutions Field Applications

Passing Zone and Speed Limit Inventory

- Field data collection including a two-person crew in a vehicle
- iPad usage while traveling as a vehicular passenger
- Use Esri ArcGIS QuickCapture for rapid data collection
- Cross reference data with crash data to determine if changes need to be made in any given area



ADA Pedestrian Inventories

- Assess ADA Pedestrian Facilities
- Collect data using iPads and GPS receivers
- Use information such as horizontal gaps, vertical elevation differences, obstructions, and pedestrian signals to help determine ADA compliance
- Data collected in the field is used to prioritize future projects



WORK ZONE FIELD APPLICATION FOR SAFETY

- Provides VDOT Personnel with access to spatial data in the field through iPads and Android tables
- Delivers a consistent data model of Work Zone traffic control device installation
- Provides improved field reviews and improves reporting capabilities
- **Uploads data in real time to VDOT's ArcGIS Online, allowing office staff immediate access to inspection data from the field**



▼ B. SIGNS:

CHOOSE WHICH APPLIES ▾

ADEQUATE INADEQUATE

CHOOSE ALL THAT APPLY

NEED TO BE (REMOVED/REPOSITIONED/COVERED)

NEED (CLEANING/REPLACEMENT)

NEED ADDITIONAL SIGNS

CONFLICTING (PERMANENT/TEMPORARY SIGNING)

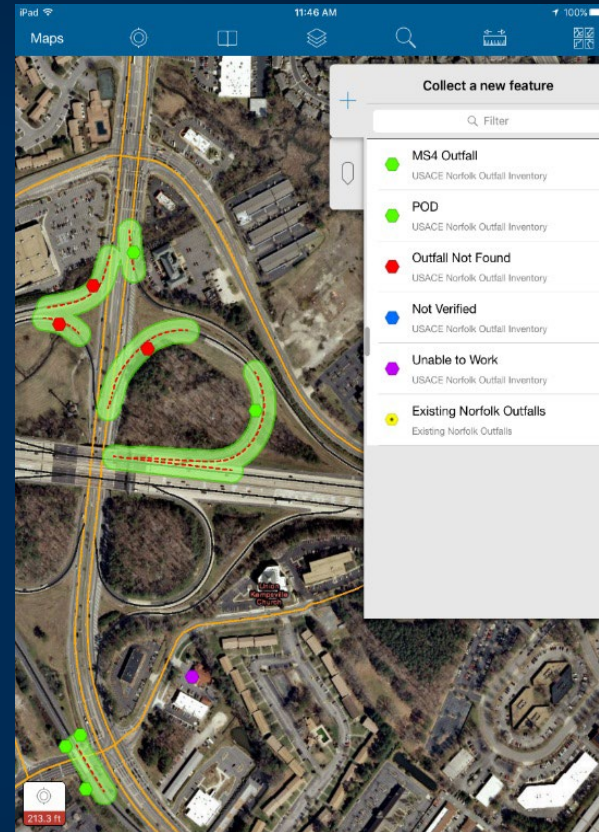
NON-APPROVED SIGN SUPPORT

BLOCKED BY VEGETATION

COMMENTS: ▾

Roadside Stormwater **Inventory** and **Inspection**

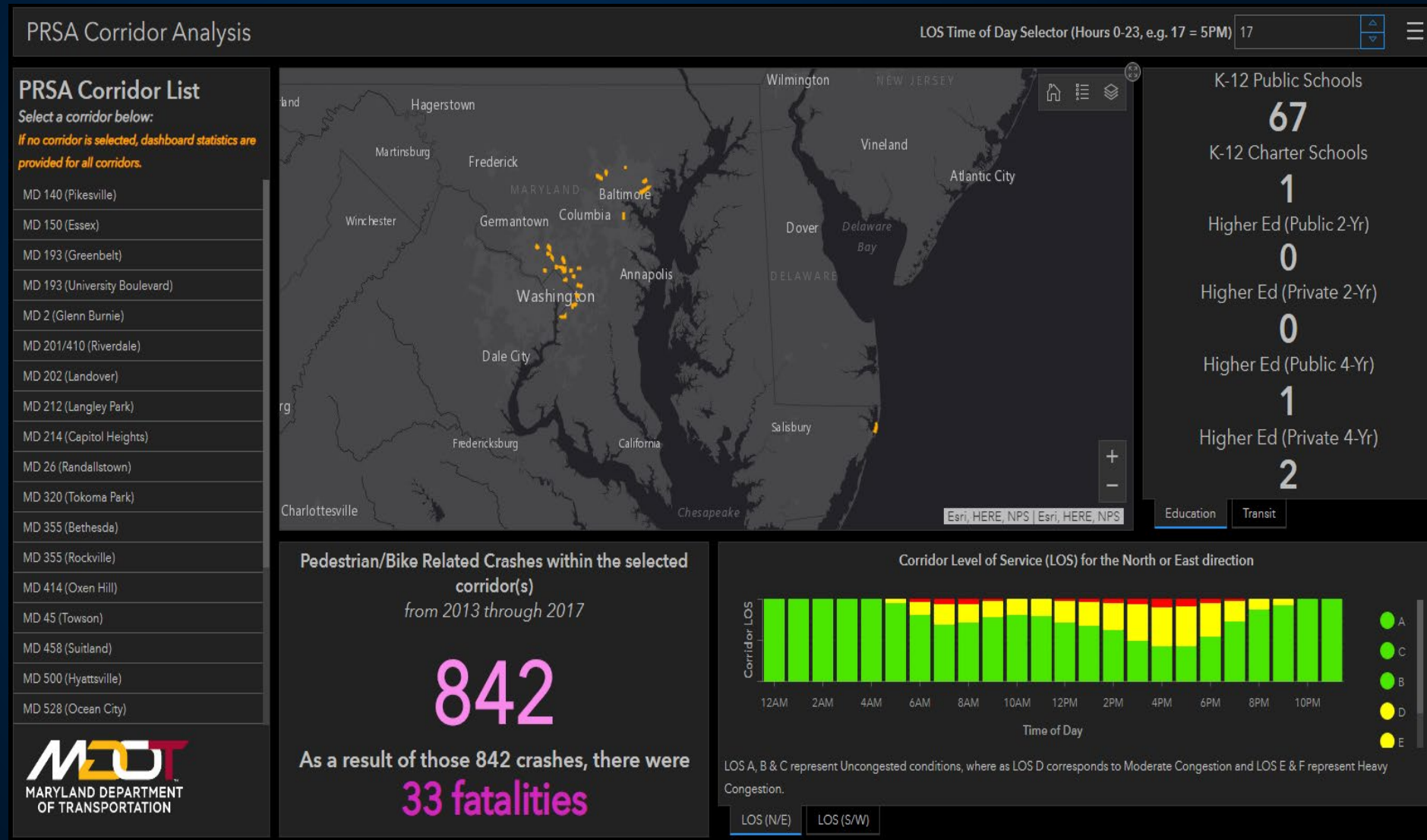
- Inspect facilities in the field using iPads or Android devices
- Upload data in real time to your organization's GIS database
- Prepare new schedules based on information gathered in the field and resulting GIS analysis
- **Eliminate paper, embrace the move to digital inspections and inventories**

A screenshot of a web-based BMP inspection form. The form is titled 'BMP Inspection' and is part of a 'Survey123 for ArcGIS' application. It contains several input fields and dropdown menus. The fields are: 'BMP GlobalID *' (text input), 'General BMP Type *' (dropdown menu with 'Filtration' selected), 'Inspector Name *' (text input with a refresh icon), 'Inspection Date *' (date and time dropdowns showing '7/17/2017' and '12:37 PM'), 'Next inspection date' (date and time dropdowns showing '7/17/2018' and '12:37 PM'), and 'Inspection Type *' (dropdown menu with 'Annual Inspection' selected). Below these fields is a 'BMP Overview Photo' section with a camera icon and a folder icon. At the bottom, there is a list of inspection categories with expandable arrows: 'Accessibility', 'Debris', 'Vegetation', 'Structural Components', 'Outlet/Overflow Structures', 'Inlet, Outlet, & Overflow Spillway', 'Plants', and 'Overall Function of Facility'. A blue checkmark icon is visible in the bottom right corner.

Using Dashboards

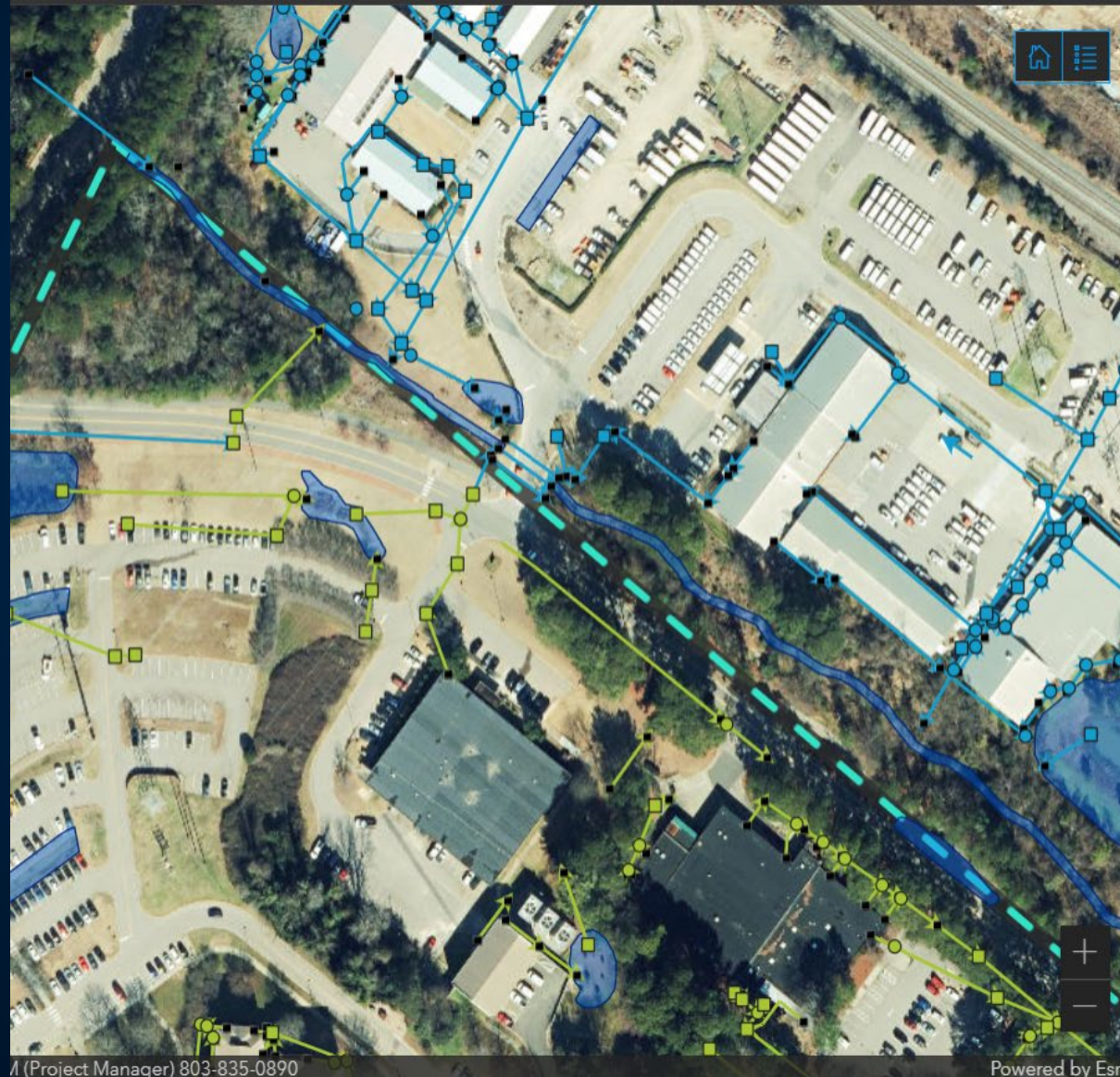
Safety Audit Dashboards

- Provide situational awareness for your audience
- Does not require GIS expertise, only a web browser
- Allows management and operational staff to access data as frequently as desired

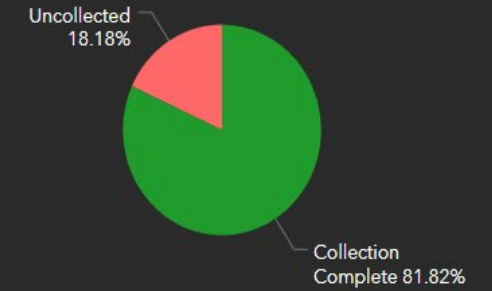


Project Tracking Dashboards

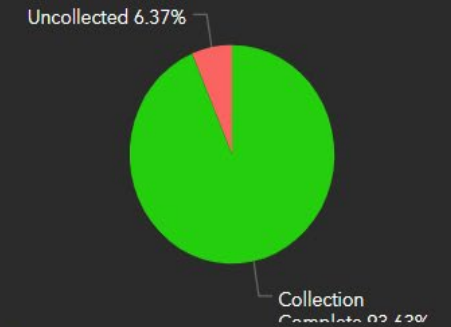
- Track progress of your field crews
- Evaluate how quickly data is being collected in real time
- Adjust project schedules and budgets based on information gathered



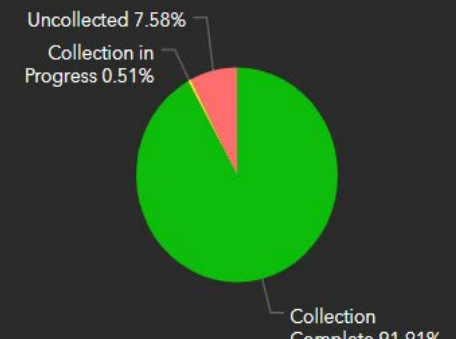
Inlet Collection Status



Junction Collection Status



Pipe Collection Status



Questions?

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