



Using Asset Management to Maintain a Resilient Stormwater System

Presented by:
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Purpose

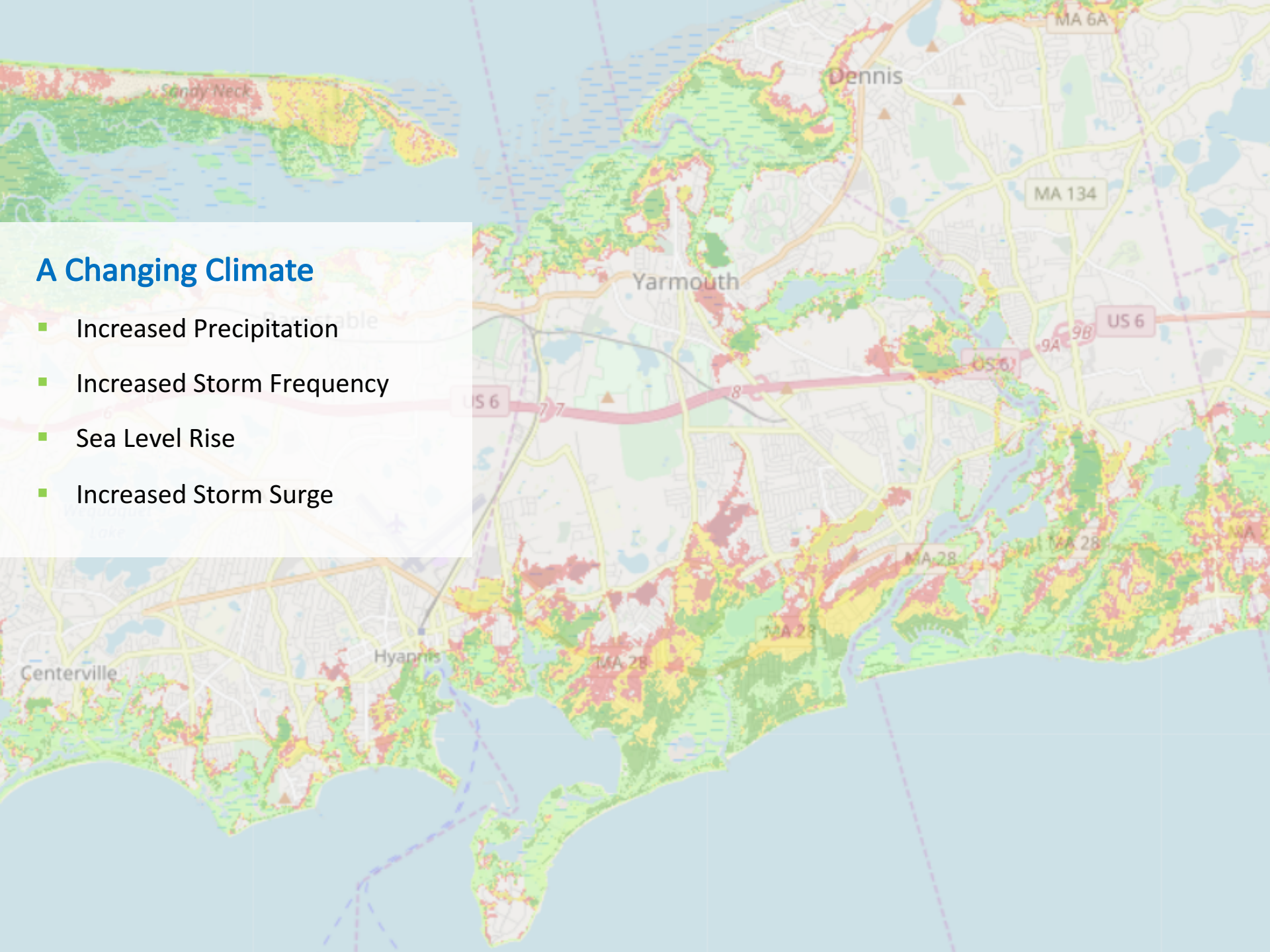
Highlight the benefits of centralized stormwater asset management to minimize damage by intense storms and initiate rapid response when disaster strikes

Agenda

- Importance of well-managed drainage systems
- SAM IS: Centralized asset management
- Case Study: Responding to disasters
- Wrap up and questions

A Changing Climate

- Increased Precipitation
- Increased Storm Frequency
- Sea Level Rise
- Increased Storm Surge



Storms in New England

- Recent New England storms
- Damage from storms
- Cost of Damage
- Irene:
 - 11 inches of rain



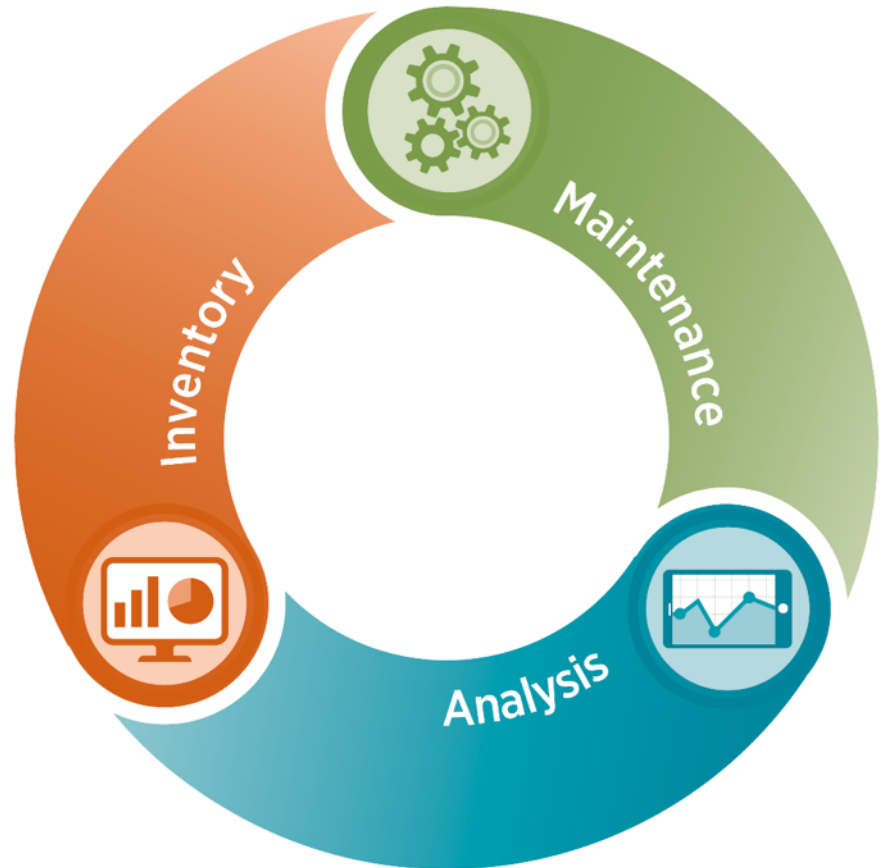


Asset Management Planning

Goal

Preserve and extend service life of infrastructure assets by making data-driven decisions

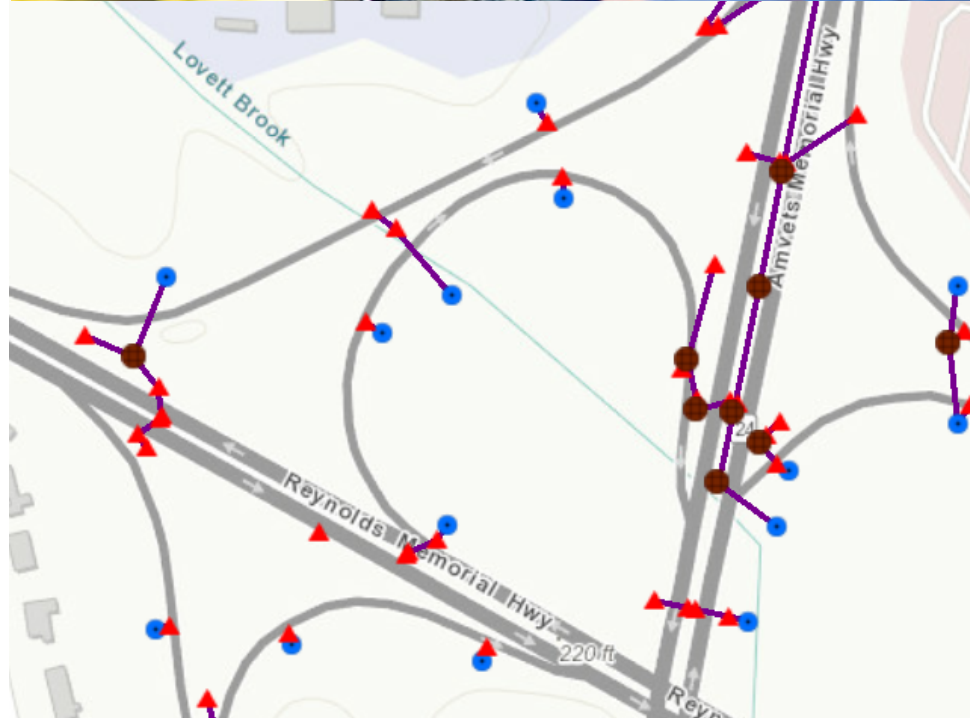
- System Inventory
- Performance Criteria
- Prioritization
- Budget & Scheduling
- Communication & Reporting
- Repeat

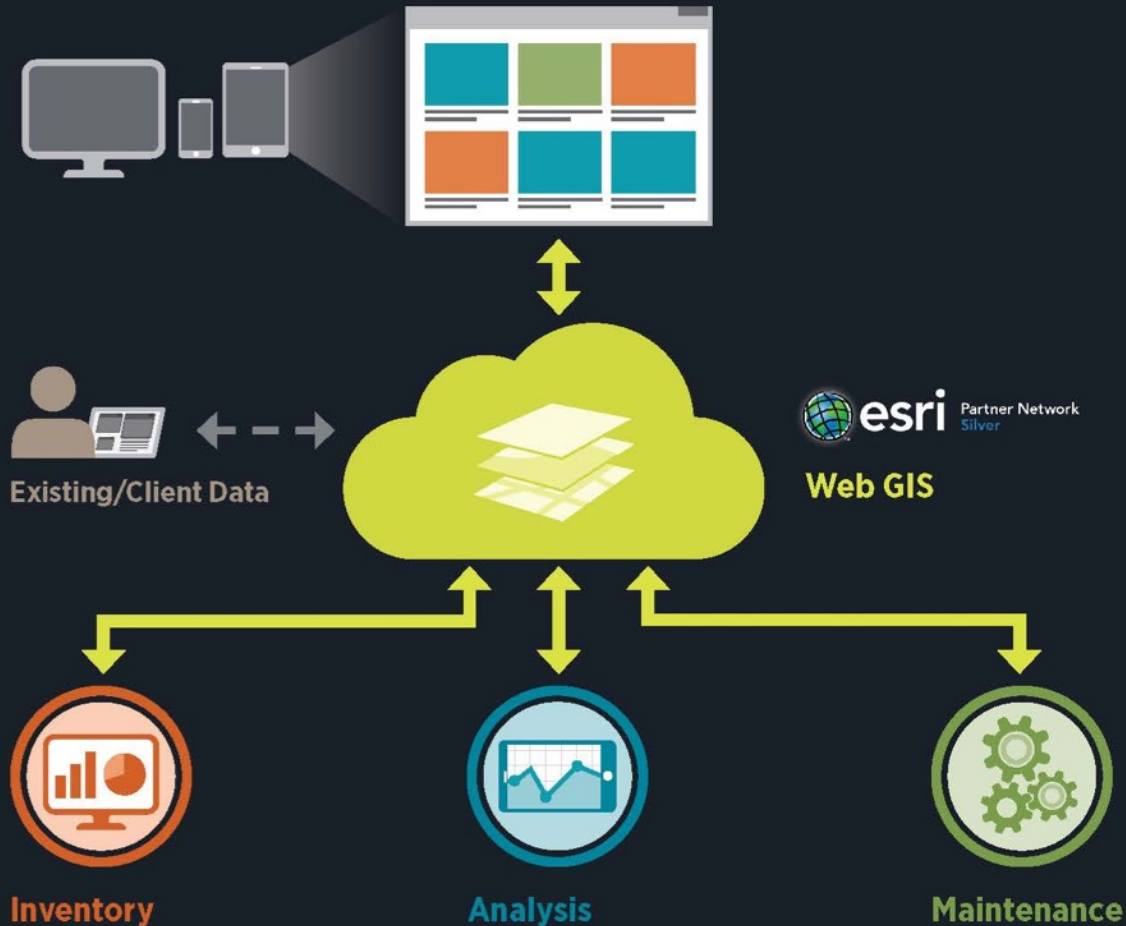


System Inventory

Framework of asset management system

- Data organization
- Efficient data collection
- Simple communication through reports and dashboards
- Overlay with existing data
- Basis for decision making





- Data Collection and Mapping
- Summary Characteristics
- Historical Knowledge
- Emergency Response (flooding, spill prevention)

- Budgeting
- Planning
- MS4 Annual Reporting
- Querying
- Water Quality Control

- Work Orders
- CB/MH/Pipe Cleaning
- Street Sweeping
- IDDE Inspections
- BMP Inspections
- IDDE Investigations



Log In to the secure web-based portal from any computer or tablet.



Understands your asset **inventory** through data collection capabilities, a user-friendly GIS based mapping interface, dashboard summary of asset condition, and customizable reports.

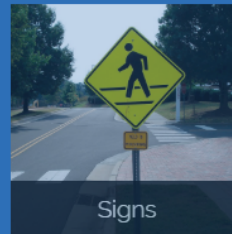
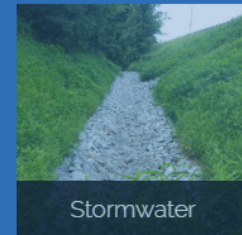
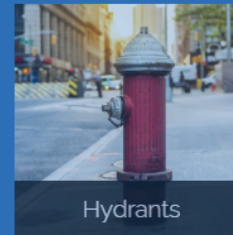
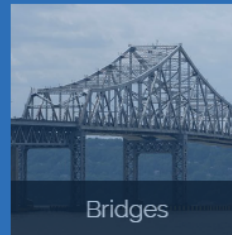
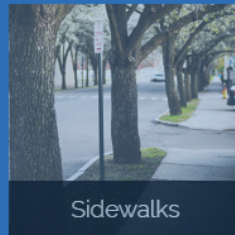


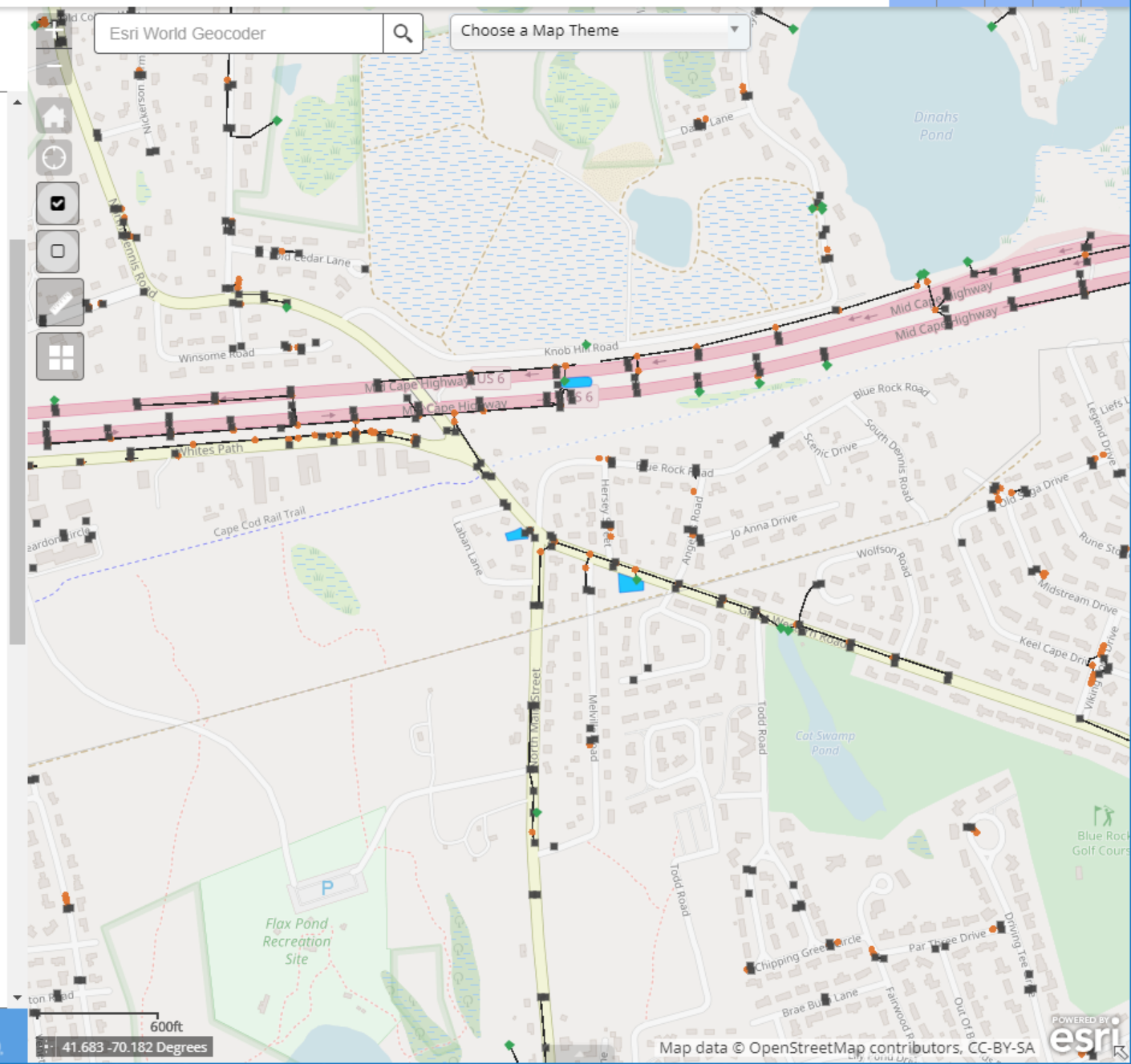
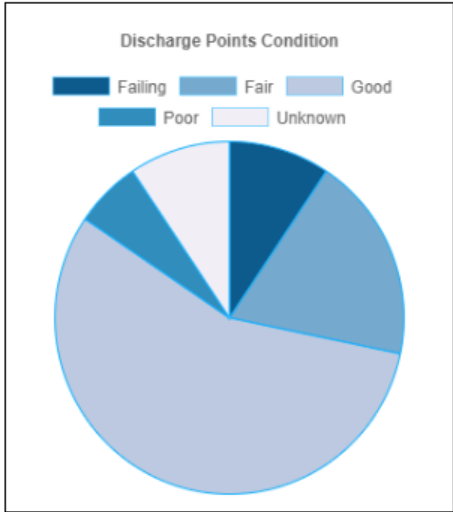
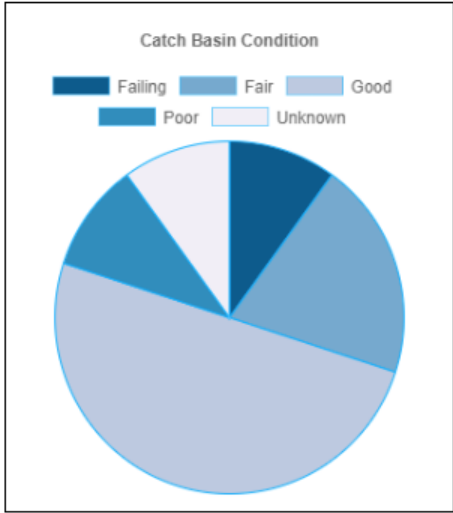
Performs **analysis** of assets to determine the future condition and plan for future needs.



Schedules and manages the **maintenance** of the improvements identified in the analysis or by the user.

Assets





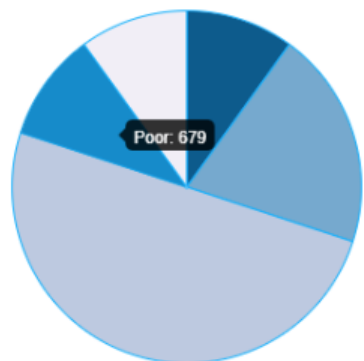
Esri World Geocoder



Choose a Map Theme

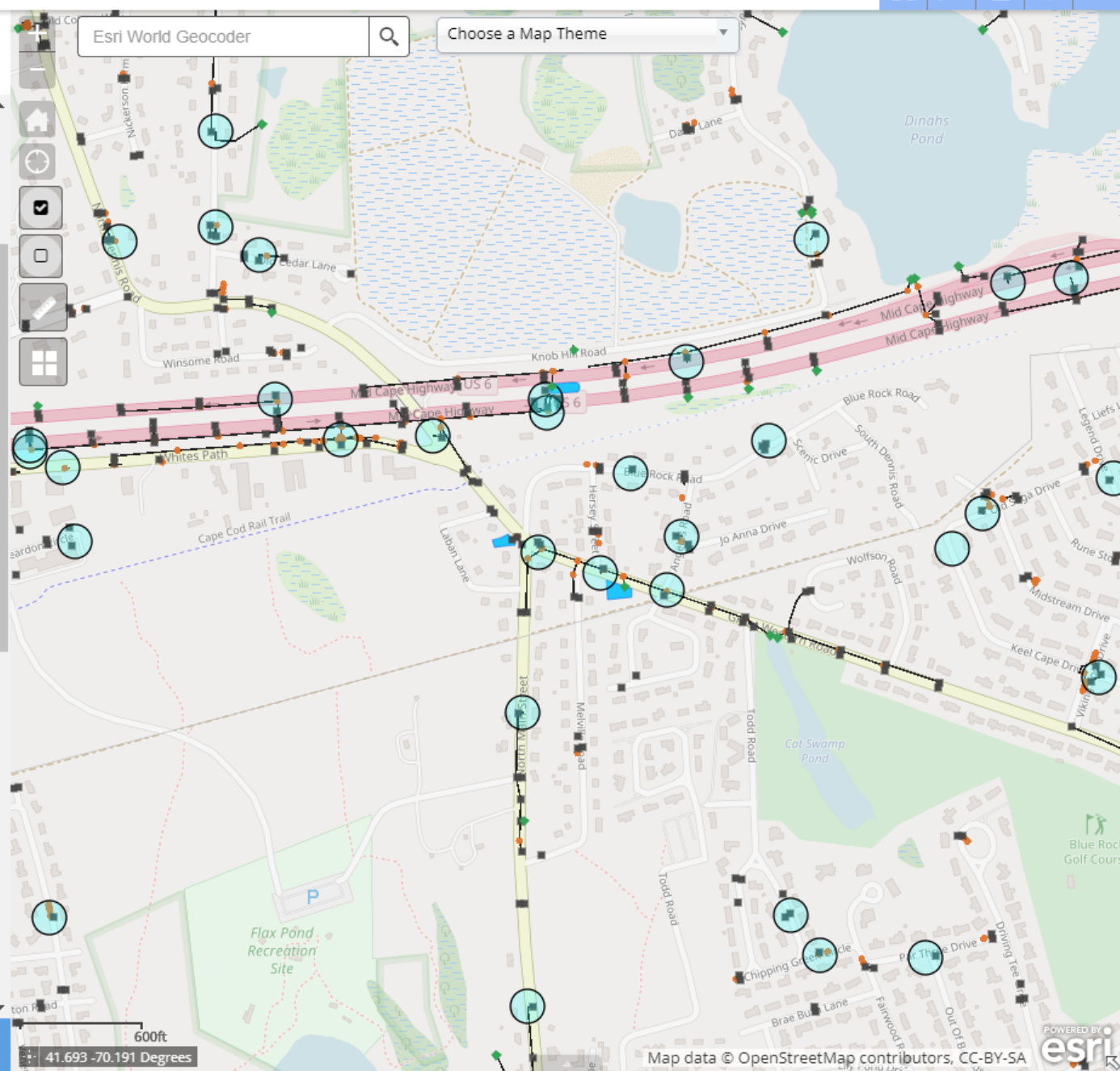
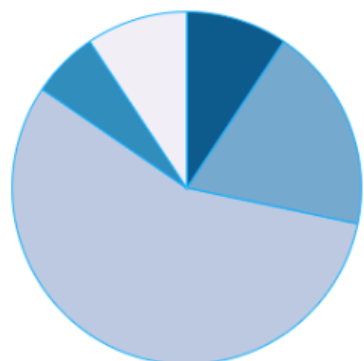
Catch Basin Condition




■ Failing ■ Fair ■ Good
■ Poor ■ Unknown




Discharge Points Condition

■ Failing ■ Fair ■ Good
■ Poor ■ Unknown



 Dashboard
  Collect
  Query



SELECT ASSETS

Query Builder 

Available Asset Queries:

679

Current Map Selection

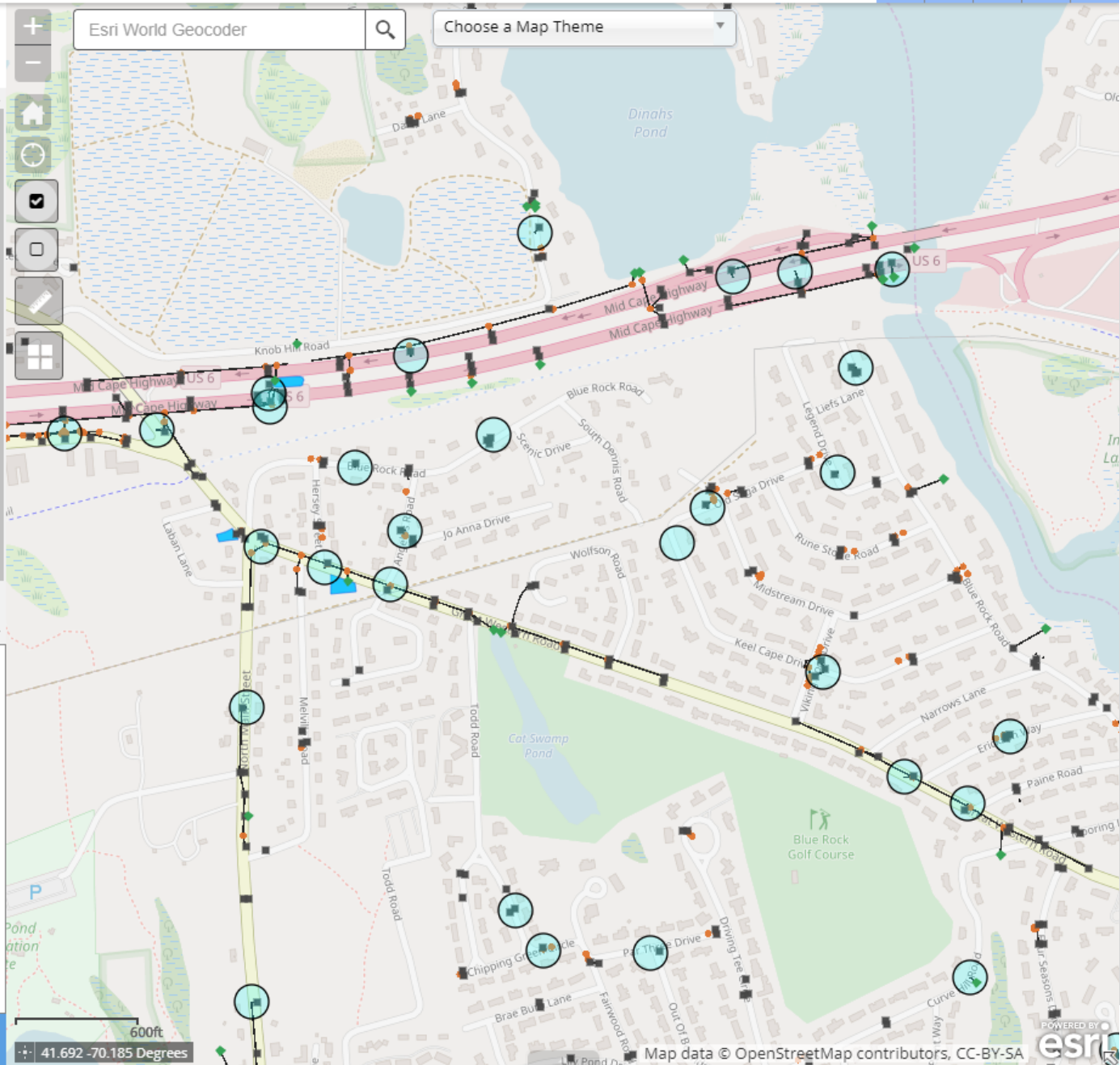



- Inlets in 100 yr. Flood Zone
- Inlets Inundated by Cat 1 Storm
- Inlets Inundated by Cat 2 Storm
- Inlets Inundated by Cat 3 Storm
- Inlets Inundated by Cat 4 Storm
- Inlets in Failing Condition
- Discharge Points in Failing Condition
- Discharge Points in 100 yr. Flood Zone

INLET INVENTORY

CURRENT CB CONDITION

HISTORICAL BMP INSPECTIONS





Dashboard



Collect



Query

SELECT Open the Query Builder Panel

Query Builder

Available Asset Queries:

679 Current Map Selection



Inlets in 100 yr. Flood Zone

Inlets Inundated by Cat 1
StormInlets Inundated by Cat 2
StormInlets Inundated by Cat 3
StormInlets Inundated by Cat 4
Storm

Inlets in Failing Condition

Discharge Points in Failing
ConditionDischarge Points in 100 yr.
Flood Zone

INLET INVENTORY

CURRENT CB CONDITION

HISTORICAL BMP INSPECTIONS

CURRENT MAP SELECTION



CSV

PDF

Search:

Inlet Type	Owned By	Condition	Evacuation Zone	Flood Zone	Waterbody ID
Other	State	Poor	3		
Other	State	Poor	4		
CBCI	School	Poor			
CBCI	School	Poor			
CBCI	School	Poor			
Gutter Inlet	School	Poor			
Leaching Basin	School	Poor			
Leaching Basin	School	Poor			
Leaching Basin	School	Poor	2	AE: 1% Annual Chance of Flooding, with BFE	
Leaching Basin	School	Poor	1	AE: 1% Annual Chance of Flooding, with BFE	

Showing 351 to 360 of 679 entries

< Previous

1

...

35

36

37

...

68

Next >

OK



Dashboard



Collect



Query

SELECT ASSETS

Query Builder

Available Asset Queries:

Current Map Selection

Inlets in 100 yr. Flood Zone

Inlets Inundated by Cat 1 Storm

Inlets Inundated by Cat 2 Storm

Inlets Inundated by Cat 3 Storm

Inlets Inundated by Cat 4 Storm

Inlets in Failing Condition

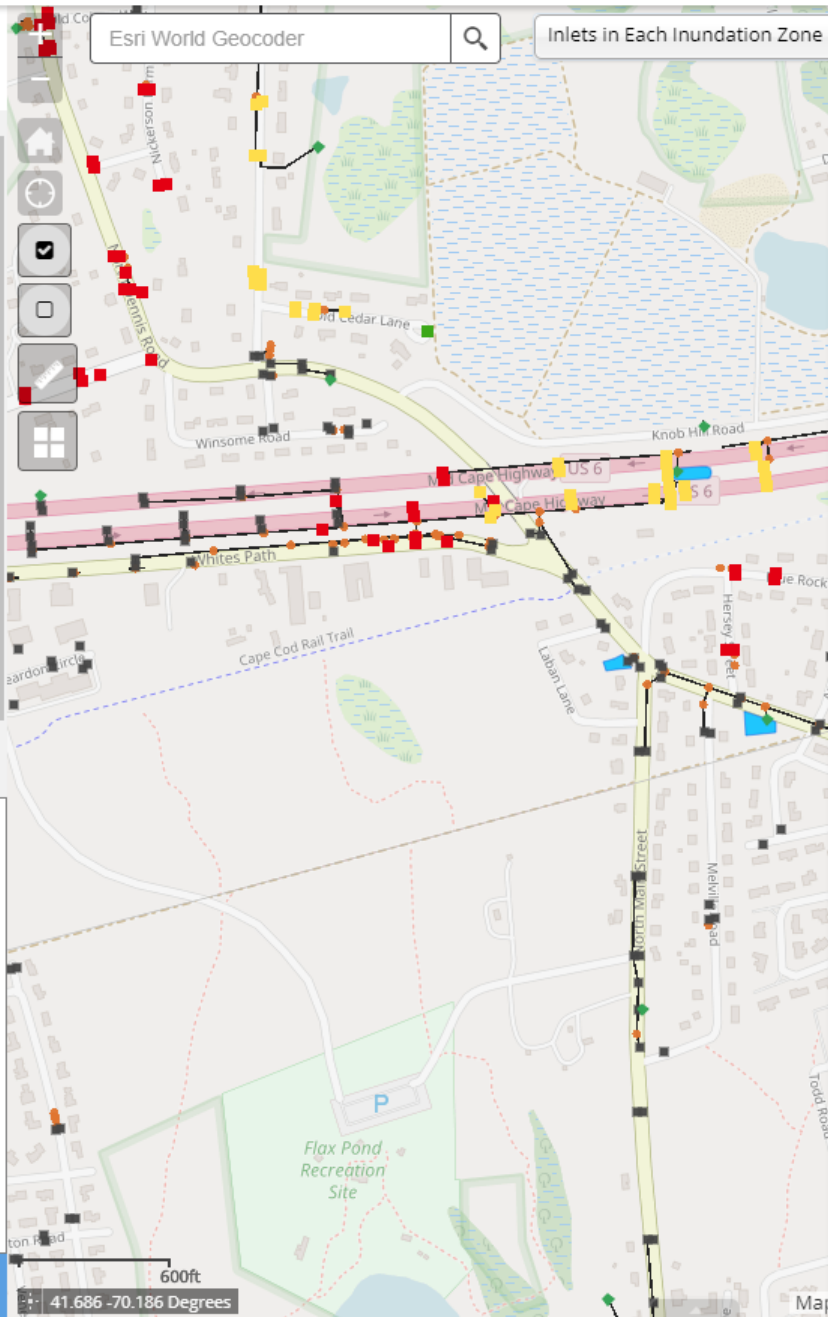
Discharge Points in Failing Condition

Discharge Points in 100 yr. Flood Zone

INLET INVENTORY

CURRENT CB CONDITION

HISTORICAL BMP INSPECTIONS



Inlets in Each Inundation Zone

Legend

THEMEMAP - Inlets in Each Inundation Zone

- Category 1
- Category 2
- Category 3
- Category 4

Collect - Discharge Points



Collect - Storm Inlets



Collect - Storm Detention Areas



Reference Layers


Storm Manholes



Drainage Pipes



SELECT ASSETS

Query Builder 

Available Asset Queries:

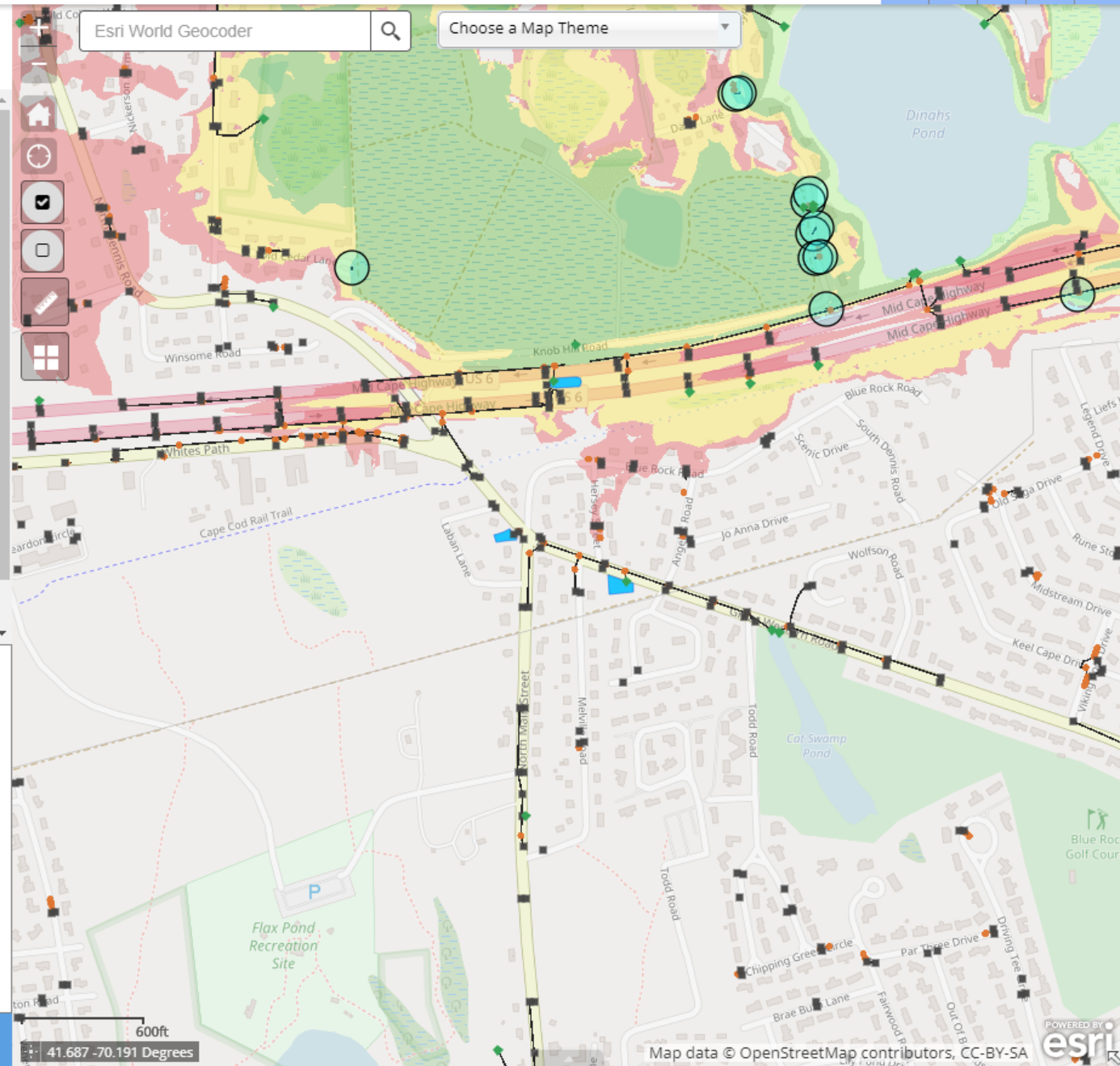
- 1030** Current Map Selection
- Inlets in 100 yr. Flood Zone
- Inlets Inundated by Cat 1 Storm
- 1030** Inlets Inundated by Cat 2 Storm
- Inlets Inundated by Cat 3 Storm
- Inlets Inundated by Cat 4 Storm
- Inlets in Failing Condition
- Discharge Points in Failing Condition
- Discharge Points in 100 yr. Flood Zone



 INLET INVENTORY

 CURRENT CB CONDITION

 HISTORICAL BMP INSPECTIONS





Dashboard



Collect



Query

SELECT ASSETS

Query Builder

Available Asset Queries:

- Current Map Selection
- Inlets in 100 yr. Flood Zone
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- Discharge Points in Failing Condition
- Discharge Points in 100 yr. Flood Zone

INLET INVENTORY

CURRENT CB CONDITION

HISTORICAL BMP INSPECTIONS

Esri World Geocoder



Choose a Map Theme

(1 of 2)

Discharge Points: CRANBERRY LN

Discharge Type	PO
Street Name	CRANBERRY LN
Location	UNNAMED WETLAND
Owned By	TDEC
Waterbody	UNNAMED WETLAND
Condition	Good- inspect within 2 years
FLOODZONE	X: 0.2% Annual Chance of Flooding

Attachments:

No attachments found

[Zoom to](#)



Dashboard



Collect



Query



New Maintenance



New Inspections

1 SELECTED RECORD

Storm Detention Areas:

Details



Install Date:

Location Description: NORTH MAIN AT GREAT
WESTERN

BMP Type:

BMP Water Quality Volume (cuft):

Facility Name: NORTH MAIN STREET IMPOUND

BMP Owner: TOWN

BMP Condition:



Inspections



Maintenance



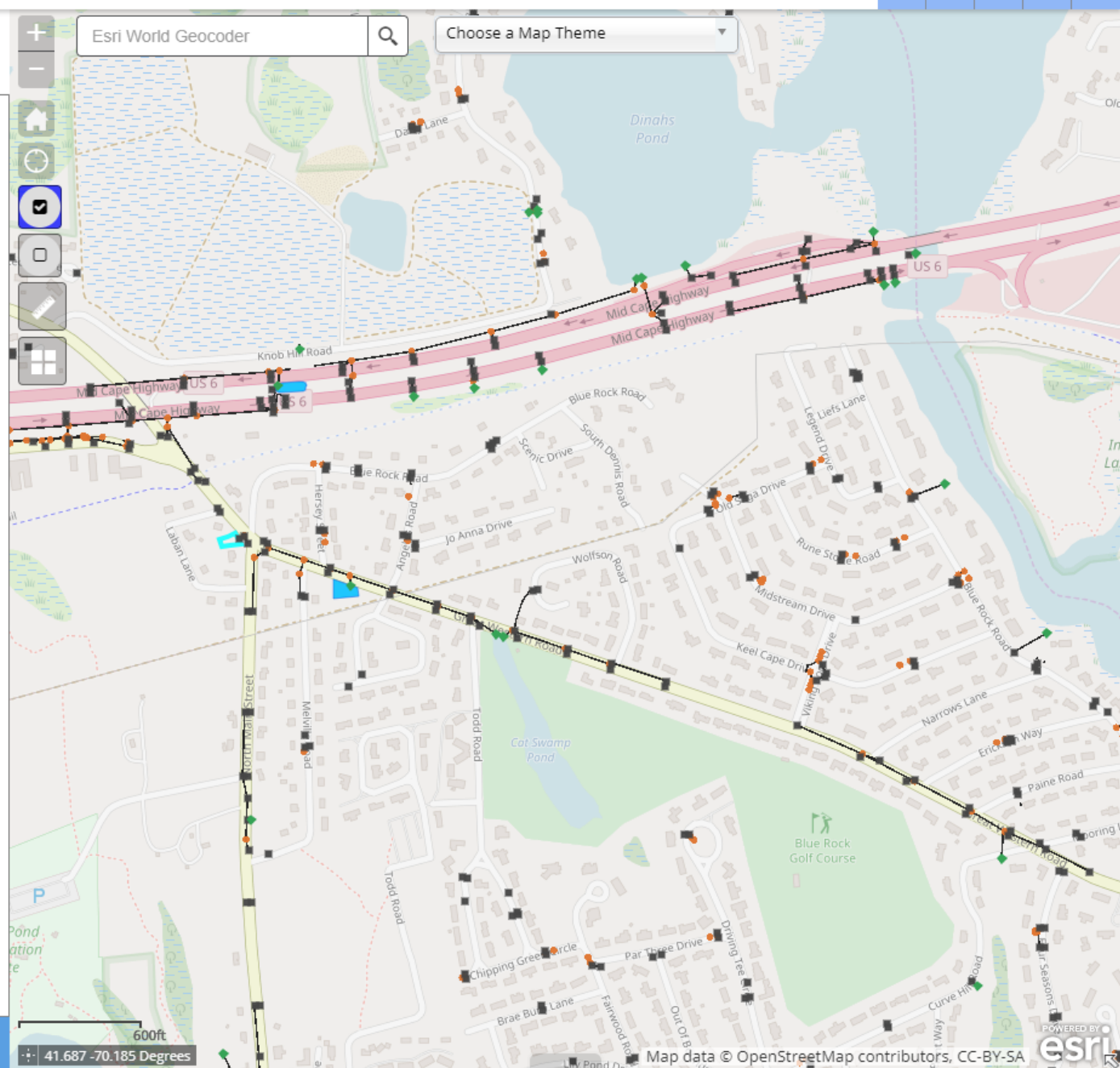
Files



Esri World Geocoder



Choose a Map Theme





Control Center

Upcoming Tasks

- 5/6 - Town Meeting
- 5/20 - Budgets Due
- 5/25 - CB Cleaning Scheduled
- 7/1 - Annual Report Due

Notifications

- Your IDDE Plan is due in 2 months....
- You have 5 problem outfalls...
- You have 15 catch basins that need maintenance...
- You have 22 dry weather screening that need to be...



IDDE Map



Construction Map



O&M Map



Water Quality Map



Document Library



Budgets



Calendar



Reporting

When the Storm Hits...



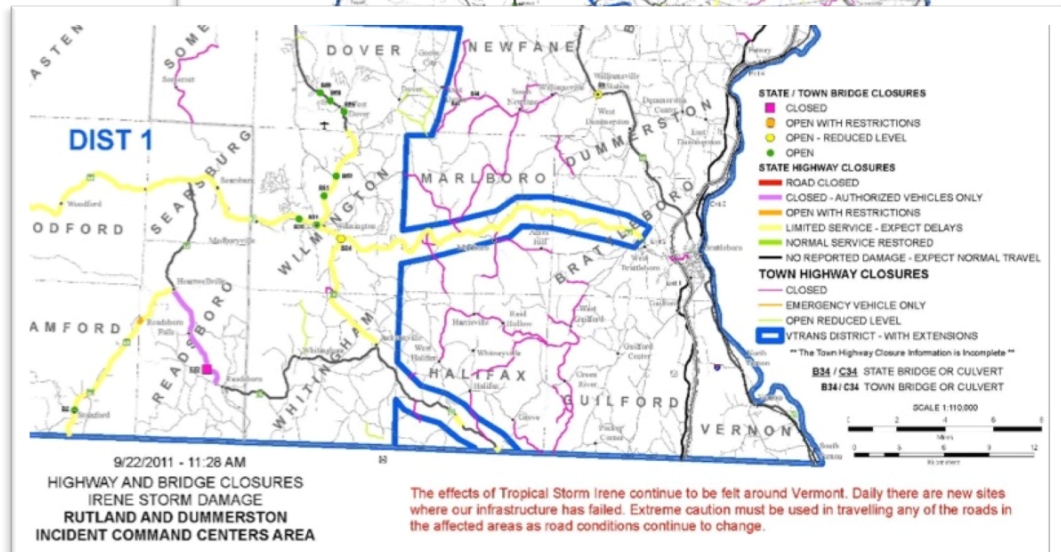
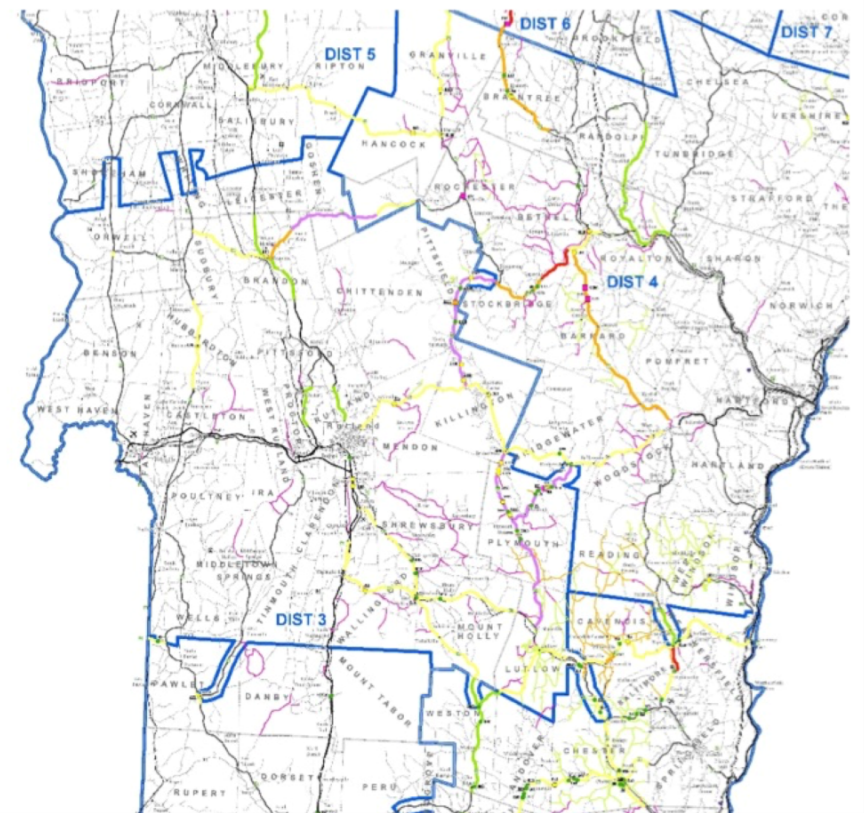
Emergency Response

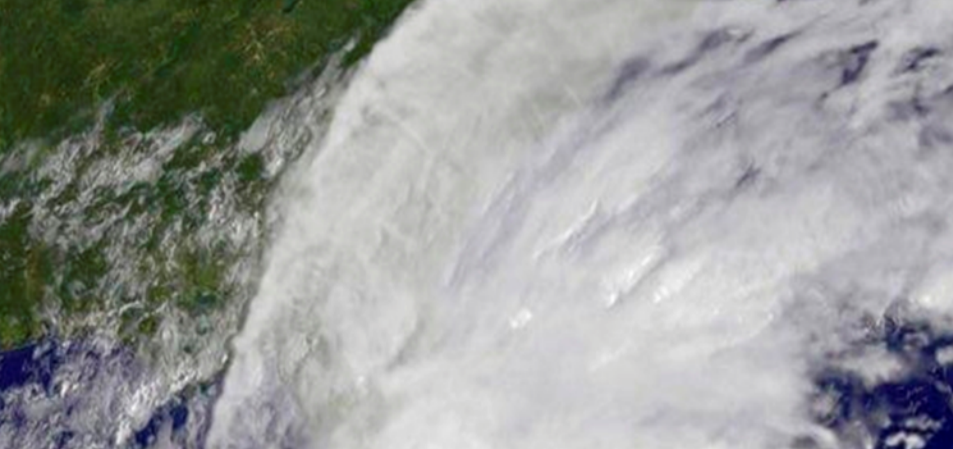
- Focus on transportation
 - Evacuation
 - Access to critical facilities
 - Delivery of supplies
 - Public safety
- Damaged traffic signals
- Debris
- Damaged roads and bridges



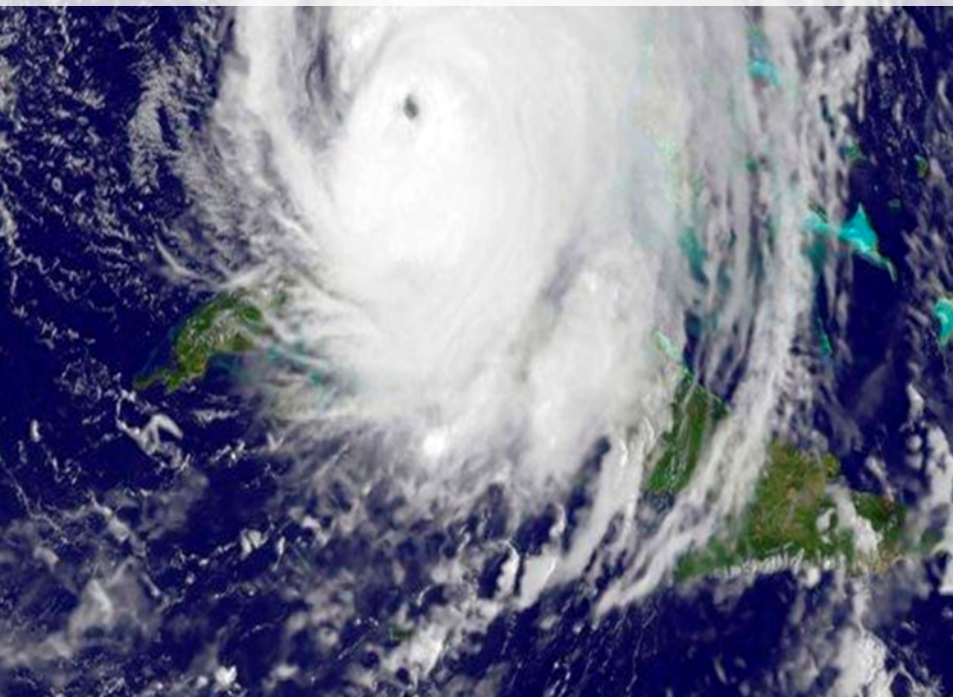
Irene Response

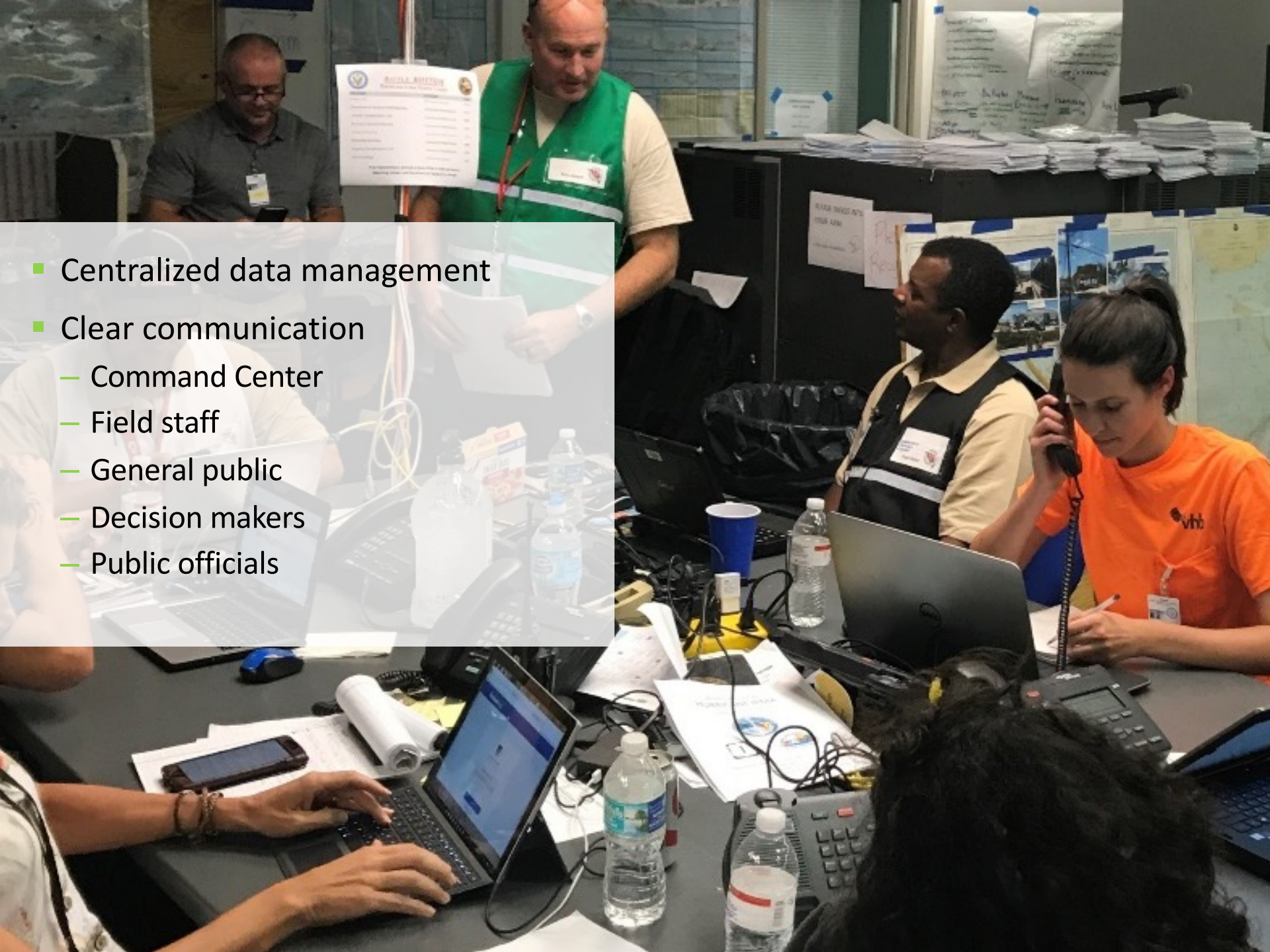
- Extreme storm
- Major damage
- Major public impact
- Infrequent occurrence
- Massive response required
- Required new communication plan





Hurricane Irma Response with Florida DOT



- 
- The background image shows a busy emergency operations center. In the foreground, a woman in an orange shirt is talking on a phone while looking at a laptop. To her left, a man in a yellow shirt and black vest is also working. In the background, a man in a green vest is holding a large document. The room is filled with computer monitors, papers, and water bottles, indicating a high-pressure environment.
- Centralized data management
 - Clear communication
 - Command Center
 - Field staff
 - General public
 - Decision makers
 - Public officials

DMS Sign Location – ArcGIS Collector

- Portable dynamic message signs
- Ensure public safety
- Mapped location of all signs using ArcGIS Collector
- Field inspections of DMS
 - Take pictures
 - Verify messages
 - Ensure functionality
- Instantaneous communication with Command Center



Emergency Signal Repair- Survey123

- Traffic signals were left damaged, without power, and offline
- Field staff inspected intersections and deployed generators
- Used Survey123 for ArcGIS on tablets
- Track location and fueling needs
- Retrieve generators following repair

The screenshot shows a mobile application interface for reporting emergency signal damage. The title bar is green with a white 'X' icon and the text 'Hurricane IRMA Emergency Signal Report'. The form contains several input fields: 'Major Road' with the value 'SRA1A', 'Minor Road' with 'Sheppard Dr.', 'County' with a dropdown menu showing 'Brevard', 'Date/Time' with '9/19/17' and '5:42 PM', 'Installed By (TCD)' with 'TCD', and 'Inspected By (VHB)' with 'Devon B'. Each input field has a small 'X' icon to clear the text. At the bottom right, there is a green bar with a white checkmark icon, indicating the form is ready to be submitted.

Hurricane IRMA Emergency Signal Report

Major Road:
SRA1A

Minor Road:
Sheppard Dr.

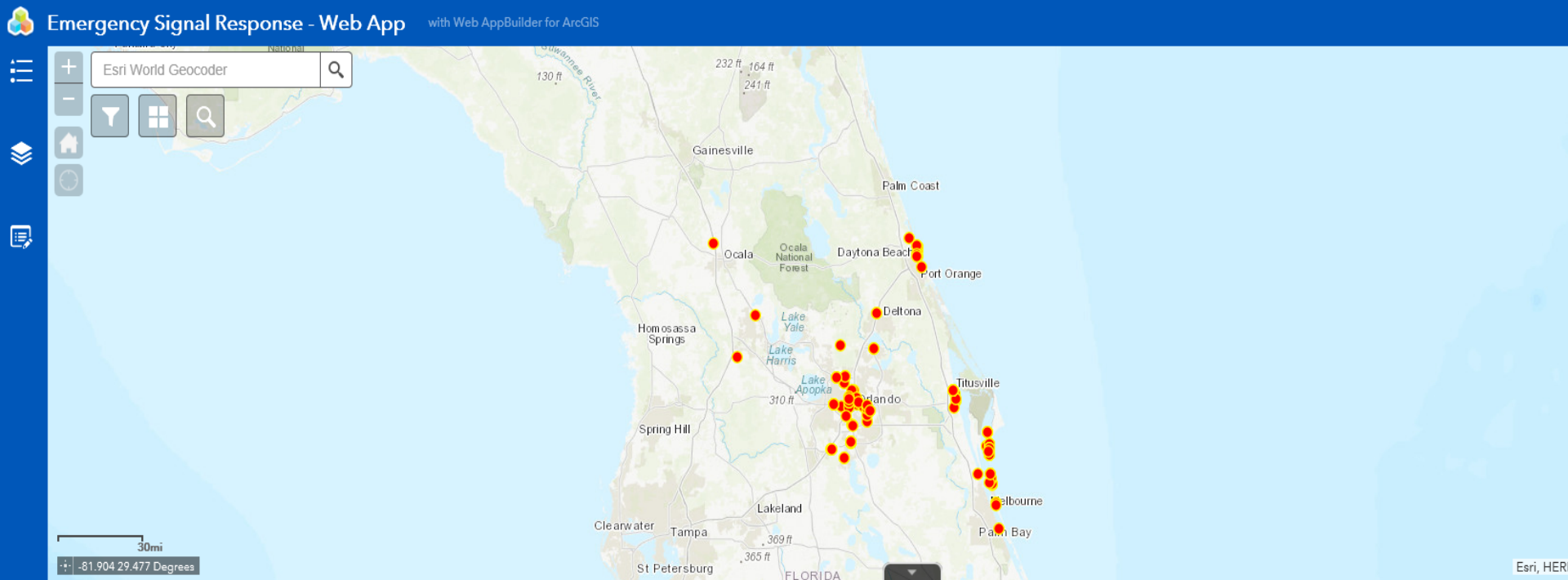
County:
Brevard

Date/Time:
9/19/17 5:42 PM

Installed By (TCD):
TCD

Inspected By (VHB):
Devon B

Emergency Signal Repair



Emergency Signal Repair Extended

Options Filter by map extent Zoom to Clear selection Refresh																
Major Road:	Minor Road:	County:	Date/Time:	Installed By (TCD):	Inspected By (VHB):	Intersection was on-line at arrival	Intersection was off-line at arrival	Model #:	Serial #:	Observed intersection operations for 5 cycles	Notes	Notes continued	Notes continued	Notes Photo1	Notes Photo2	Notes
SR 472	I-4 WB Ramps	Volusia	9/18/2017, 10:36 AM		Devon Brazeal	powernogen				opsnormal						
SR 423 (Lee Rd)	I-4 WB Ramps	Orange	9/18/2017, 11:03 AM		Devon Brazeal	powernogen				opsnormal						
US-92	Palmetto Ave	Volusia	9/18/2017, 9:39 AM	Dave Anderson	Rory highstone	powernogen		N/a	N/a	opsnormal	Electrician Dave arrived at approximately 8:30am to continue programming the flashing yellow for main line properly as	Another two man crew had come by earlier and sealed the bottom of the cabinet with caulk to prevent water entry as well as bolt misc.	1 electrician and cargo van. Weather was clear, then cloudy and had rain throughout the day that stopped work due to electrical	Caulking and sealing of bottom of new cabinet installed	Eastbound example US-92 flashing yellow during main, one green operating properly	Part of d

Debris Removal

- Three teams of field staff
 1. Demo
 2. Data
 3. Removal
- Streamlined effort
- Clear communication
- Simple reporting



Debris Removal- Data Management



DebrisRemoval - DebrisRemoval table (Features: 145, Selected: 1)

Date	Name	Street	From or Begin MM	To or End MM	Crew	Debris Removed in CY	Truck Number	Truck Other	Truck Percent Loaded
9/28/2017, 10:21 AM	Charles Woods	White St.	Atlantic Ave.	Case Marina Ct.	M10, FC5, 861	131.90	Other	31955 (Loads: 5) 31568 (Loads: 4) 32449 (Loads: 4)	100%
9/28/2017, 9:38 AM		White St.	Truman Ave	Olivia ST.	Brannon Chatwood		26952 - 717752 - 10 yards	28799 (1/2 Load = 11.5 yards)	
9/28/2017, 9:56 AM		White St.	Olivia St.	Pine St.	Brannon Chatwood			28799 (1/2) 26952 (1)	
9/28/2017, 10:29 AM		White St.	Pine St.	Newton St.	Brannon Chatwood			26952 (2) 28799 (2)	

Emergency Response Planning

- Plan ahead
- Develop tools
- Assign responsibility
- Specify operation centers
- Identify critical infrastructure
- Identify vulnerable infrastructure
- Coordinate with partners



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Kelly Siry | ksiry@vhb.com | 617.607.6238

www.vhb.com



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Instagram

[**www.instagram.com/vhbnow**](http://www.instagram.com/vhbnow)

Benefits of Centralized Asset Management

- All drainage asset data stored in one place
 - Relate inspection and maintenance records to the asset
- Analyze asset conditions
 - Prioritize work based on condition assessments
 - Recognize areas that require maintenance more regularly for improvements or investigations
- Identify high risk areas
 - Flood zones
 - Areas that receive public complaints

Responding to Disasters

- Inventory of facilities
 - Vulnerable pollutant storage
 - Designate facilities for emergency response and supply distribution centers, debris collection locations
- Flood prone areas
 - GeoForms collect public flood reports
 - Schedule road closures and optimize emergency routes