Hazen

Innovative, Real-Time Data Sharing Methods Create Efficiencies in Sewer Assessments on Nantucket

Presented by:

Daniel Kramer, PE

Deborah Mahoney

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Presentation Overview

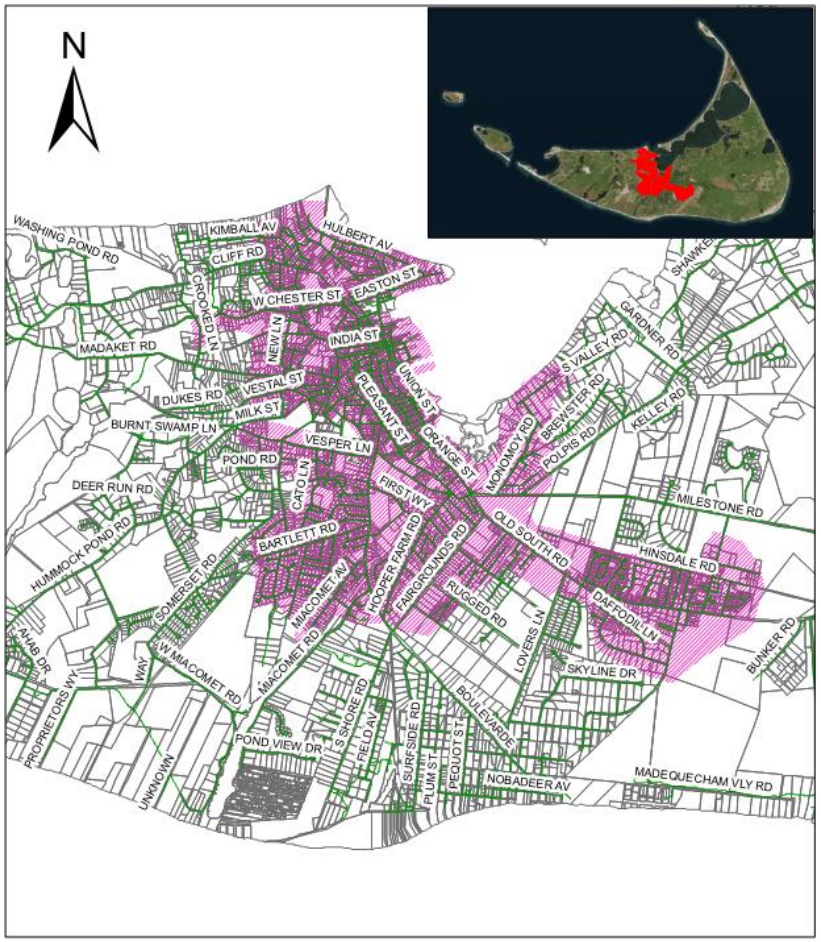
1. Project Background
2. CMOM Program Overview
3. Challenges of Pipe Inspections
4. Innovative Solutions
5. Project Takeaways
6. Q&A

Project Background – Town of Nantucket

- Island Community
- Population Variations
  - Peak Season – ~100,000
  - Year Round – ~ 15,000
- 2 Sewer Districts
  - Town and Siasconset
  - 70+ miles of pipe, 1,300 mhs
  - 16 Pump Stations
  - 8” to 30 “ diameter pipes

Project Background: Town District

- 60 Miles of Gravity Mains
- 12.4 Miles of Forcemains
- 15 Pump Stations
- Surfside WWTF
  - Flows up to 7.7 MGD
  - Average flows vary from 0.01 MGD to 0.40 MGD



Project Background: Siasconset District

- 8 Miles of Gravity Mains
- 0.35 Miles of Forcemains
- 1 privately owned pump station
- Siasconset WWTF
  - Flows up to 0.43 MGD
  - Average flows vary from 0.01 MGD to 0.40 MGD

Project Background

- WWTFs Groundwater Discharge Permit
- SSO resulted in EPA Order of Compliance on Consent to implement CMOM Program

CMOM Program Overview

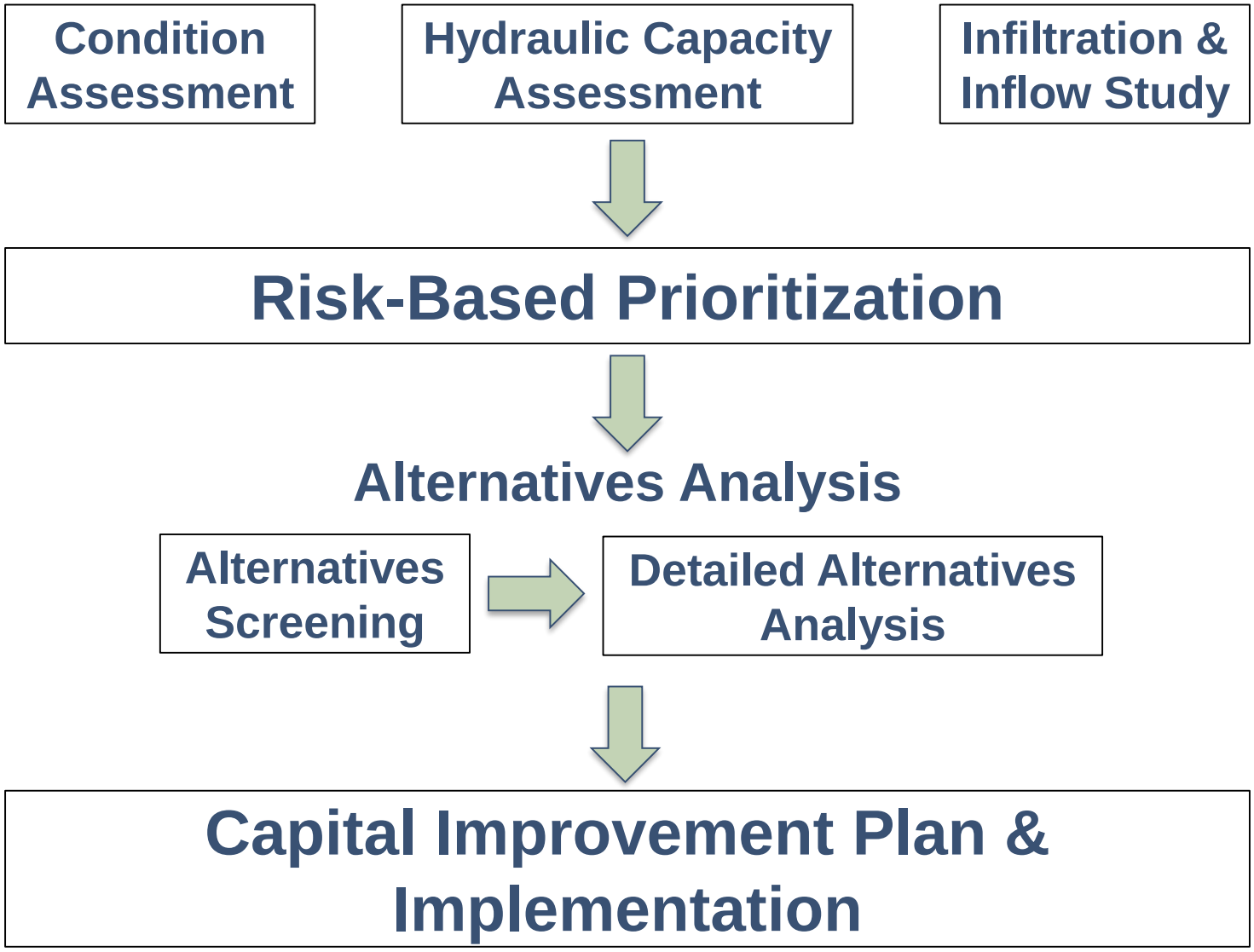
CMOM Program Overview

- Capacity, Management, Operations, and Maintenance (CMOM)
  - Goal is to eliminate Sanitary Sewer Overflows (SSOs) by improving operating efficiency of the system
- Reasons for SSOs
  - Blockages
  - Structural, mechanical, or electrical failures
  - Collapsed or broken sewer pipes
  - Insufficient conveyance capacity
  - Vandalism
  - High Levels of I/I during wet weather events

CMOM Program Overview

- Purpose of CMOM
  - Better manage, operate, and maintain collection systems
  - Investigate capacity constrained areas of the collection system
  - Proactively prevent SSOs
  - Respond to SSO events
- Step 1 Create a CMOM Program Manual
- Step 2 Evaluate and Inspect Collection System
- Step 3 Implement Recommendations
- Step 4 Update Annually – Continuous Program

Collection System Evaluation and Assessment



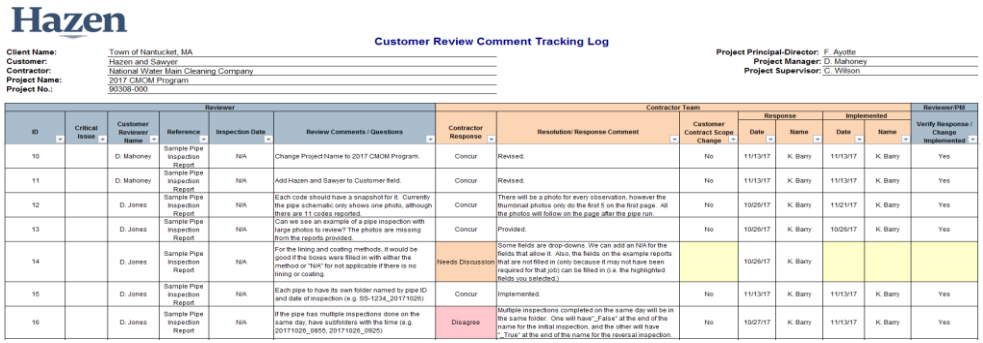
Challenges of Pipe Inspections

Challenges of Pipe Inspections

1. Inherent Challenges of Traditional Pipe Inspection Workflow
2. Island Community
3. Underdeveloped/Outdated GIS
4. Need for Weekly Progress Reporting

First Challenge: Traditional Pipe Inspection Review Workflow

- Hazen watches videos and reviews the inspection report/coding.
- Hazen identifies and documents CCTV miscodings/errors to Comment Tracking Log. Contactor reviews and makes changes.
- Hazen evaluates coding and PACP scores to recommend if, and what type, of rehabilitation is appropriate.
- Recommendations and other pipe inspection data (diameter, length, material, etc.) are recorded in master spreadsheet.
- Hazen presents findings and works with Client to prioritize repairs



Hazen

Customer Review Comment Tracking Log

Client Name: Town of Nantucket, MA
Customer: Hazen and Sawyer
Contractor: National Water Main Cleaning Company
Project Name: 2017 CMOM Program
Project No.: 90308-000

Project Principal-Director: F. Ayotte
Project Manager: D. Mahoney
Project Supervisor: C. Wilson

Reviewer						Contractor Team							Reviewer/PM
									Response		Implemented		
ID	Critical Issue	Customer Reviewer Name	Reference	Inspection Date	Review Comments / Questions	Contractor Response	Resolution/ Response Comment	Customer Contract Scope Change	Date	Name	Date	Name	Verify Response / Change Implemented
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What's the Problem?

- Massive Excel Spreadsheets
- Constant Data Manipulation
- Inaccessible Data
- Large File Size
- Exchange of Storage Devices

Second Challenge: Island Community

- Limited Accessibility
- Groundwater table influenced heavily by tides
- Seasonal Community = Drastic Population Swings and Work Restrictions

Third Challenge: Underdeveloped/Outdated GIS

- Town's GIS was underdeveloped and outdated
- Typical CCTV Process relies on maps created from GIS

Fourth Challenge: Need for Weekly Progress Reporting

- Sewer Director provided regular project updates to Select Board
- Time consuming to develop and deliver project reports:
  - Excel Spreadsheet
  - Technical memoranda
  - PowerPoint presentations

Innovative Solutions

Innovative Solutions

- Real-time data sharing and elimination of bulky files
  - ProjectWise
  - ArcGIS Online (AGO)
- GIS-related Applications
  - Collector, Survey123, Web Apps
- Reporting
  - Microsoft PowerBI

Real Time Data Sharing

ProjectWise

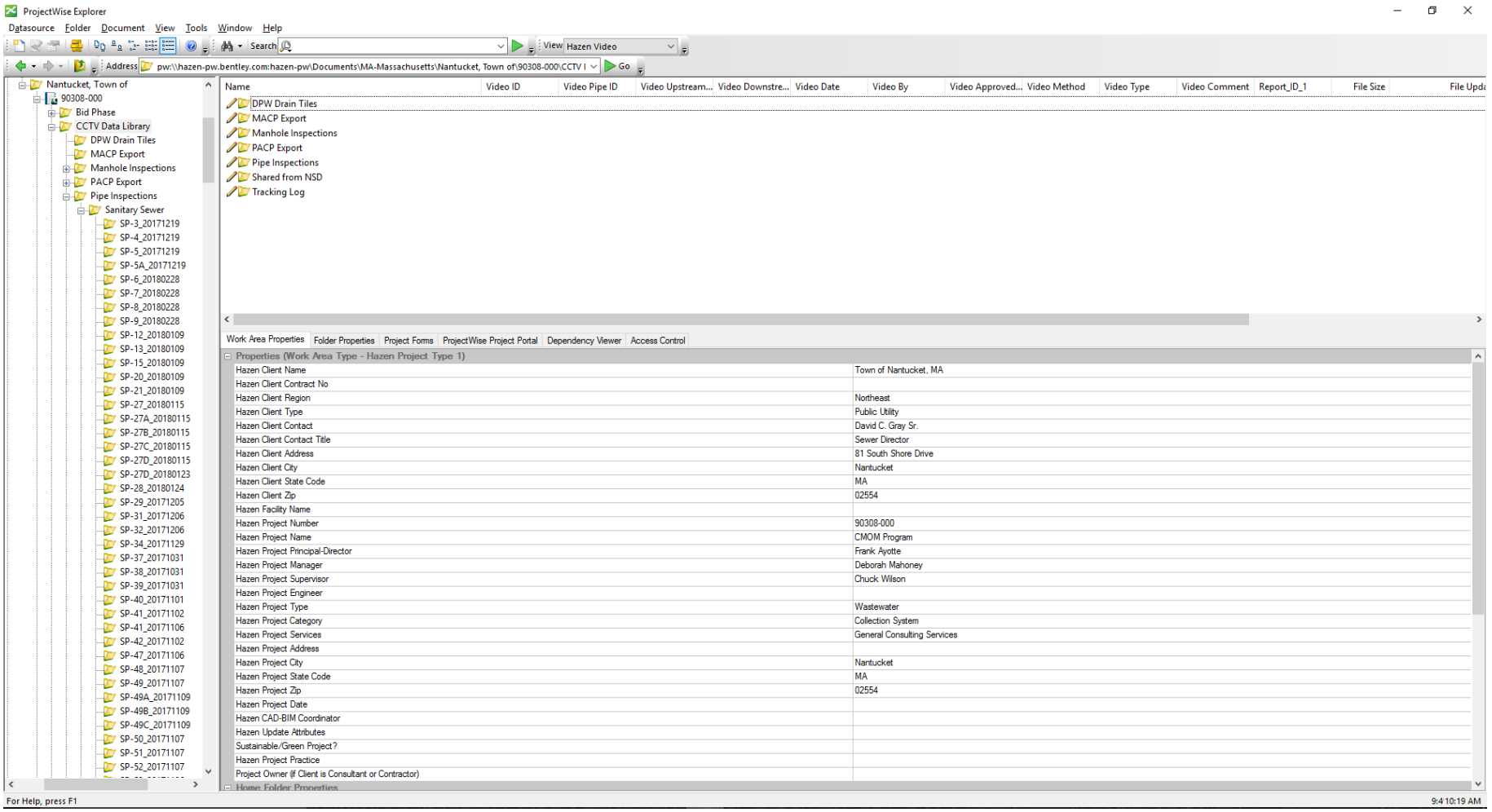
- Acts as a Cloud data storage service
- Contractor & Client were granted accounts to upload, download, & view pipe inspection reports/videos

Benefits

- No more external hard drives!
- Instantly share data between all parties

Real Time Data Sharing

ProjectWise – Sample Screenshot



Real Time Data Sharing

ArcGIS Online

- The use of web and mobile applications to streamline:
  - Data Collection
  - Condition Assessment
  - Data Sharing/Reporting
- User accounts provided to all

Benefits

- Eliminated need for extensive spreadsheets
- Development of a robust GIS for the Sewer Department
- Desktop ArcGIS Pro software provides the full power of GIS, while leveraging other online features

Real Time Data Sharing

AGO Web Applications

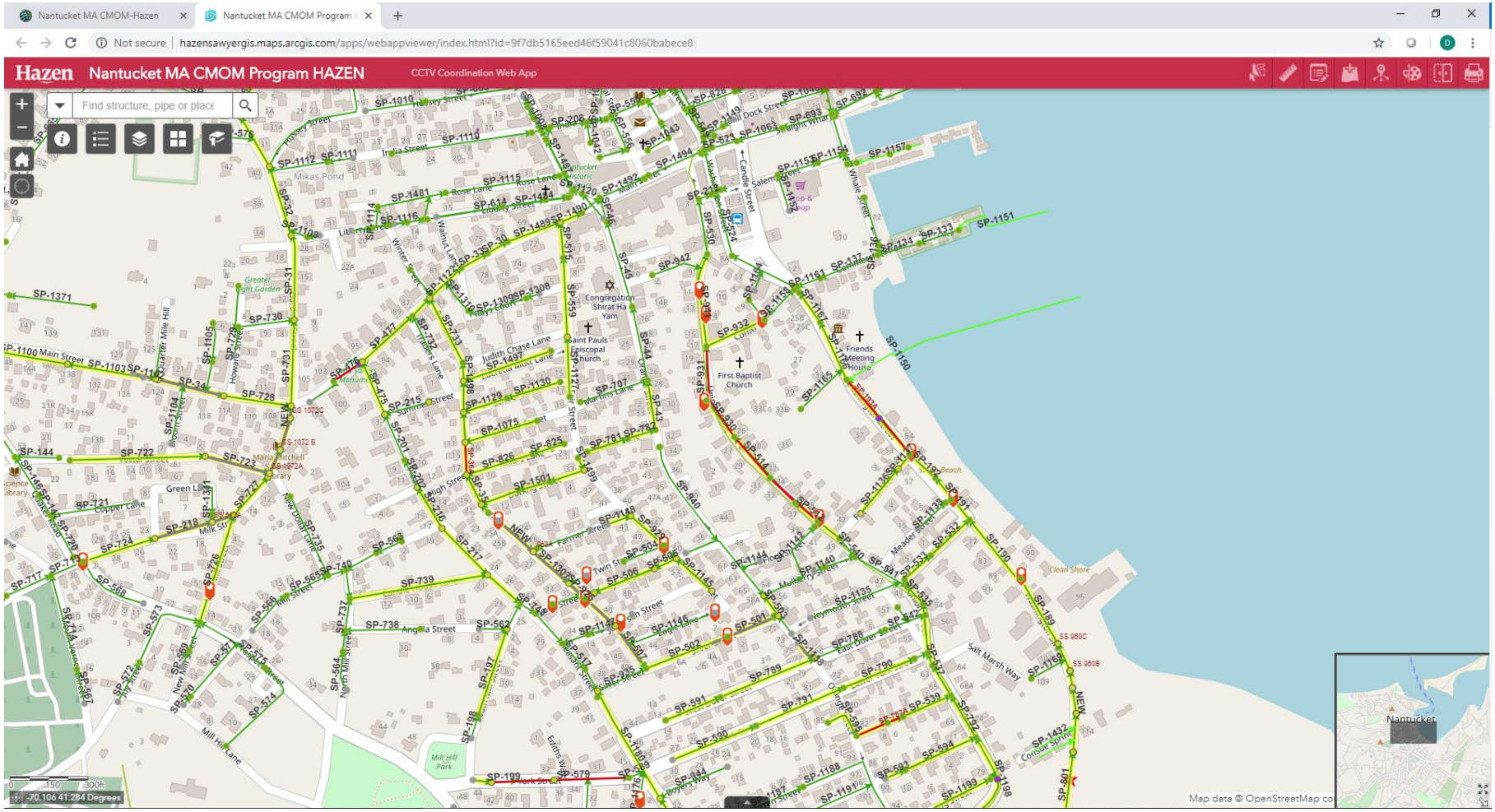
- Enabled the use of Web-Based Applications
  - Web Apps – simplistic, customizable, web-based applications that provide GIS access from any device with a web browser
  - Users can be restricted to maintain data integrity

Benefits

- All parties had access to GIS in real-time for (viewing and editing data)
- Eliminated paper maps and hand written notes
- GIS is widely used in the industry; easy to transfer knowledge between various parties

Real Time Data Sharing

AGO Web Applications – Sample Screenshot



GIS Related Applications

GIS Mobile Applications

- AGO enabled the use of ESRI's Mobile Apps
- Mobile Apps
  - Collector – allows for editing and viewing from a smart phone/tablet
  - Survey123 – allows for custom inspection form creation

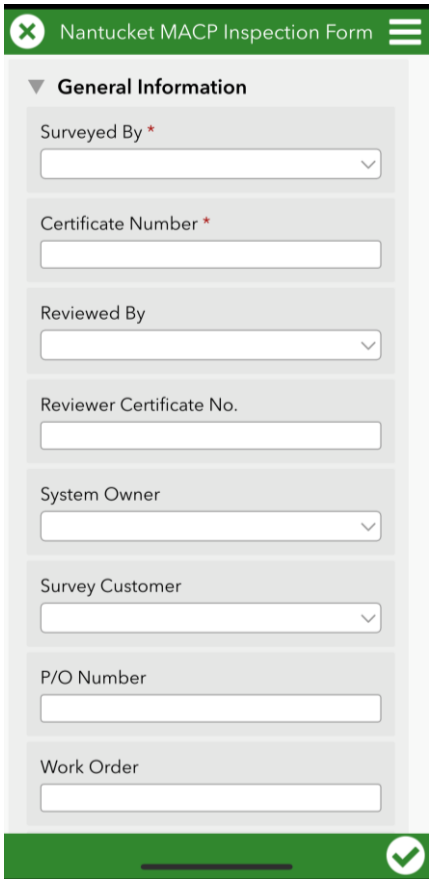
Benefits

- All parties had mobile access to GIS in real-time for viewing and editing data
- Eliminated need for paper maps for CCTV inspections

GIS Related Applications

GIS Mobile Applications – Sample Screenshots

Screenshot of the Collector App



Screenshot of the custom manhole inspection form in Suvery123

Reporting

Microsoft PowerBI

- BI = Business Intelligence
- Used to create reports directly from the AGO data
  - Completely customizable to provide as much detail as the audience desires
  - Reporting in PowerBI is interactive
  - Updates at the click of a button

Benefits

- Eliminates need for time-consuming hardcopy spreadsheet preparation
- Reports and Dashboards can be customized to display the information most important to the audience

Reporting

PowerBI – Progress Report Screenshot

Town of Nantucket CMOM Program

CCTV Progress Report

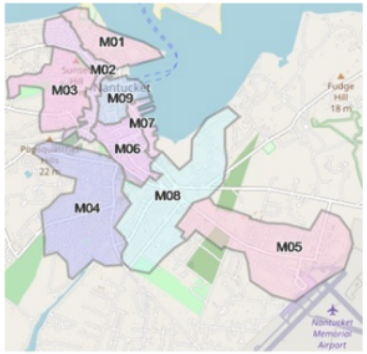
Hazen

Note: The displayed information on these dashboards are only representative of the selected Sub-Area(s).

Sub-Area

- (Blank)
- M01
- M02
- M03
- M04
- M05
- M06
- M07
- M08
- M09
- M10
- M11
- M12

Locus Map: Town District



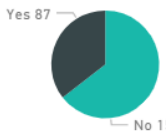
Locus Map: Sconset

CMOM Status

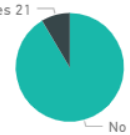
Approved	10
Not Applicable	2
Not Started	119
Review in Progress	3
Review Paused	25
Submitted for QAQC	

Pipe ID	Temp CCTV Pipe ID	Sub-Area	CCTV Date	CCTV Status	Review Status	Revie
SP-54		M10	11/6/2017	CI	Approved	Dan K
SP-912		M10	11/6/2017	CI	Approved	Dan K
NEW	SP-88	M03	11/27/2017	CI	Approved	Ann Sa
SP-726		M02	12/11/2017	CI	Approved	Dan K
SP-648		M03	11/28/2017	CI	Approved	Devon
SP-723		M02	12/11/2017	CI	Approved	Dan K
SP-68		M11	11/13/2017	CI	Approved	Dan K
SP-69		M11	11/13/2017	CI	Approved	Dan K
SP-70		M11	11/15/2017	CI	Approved	Dan K
NEW	SP-27A	M01	1/15/2018	CI	Not Started	
NEW	SP-27B	M01	1/15/2018	CI	Not Started	
NEW	SP-27C	M01	1/15/2018	CI	Not Started	

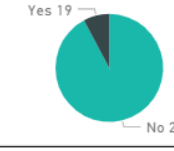
Discrepancy: Pipe Length



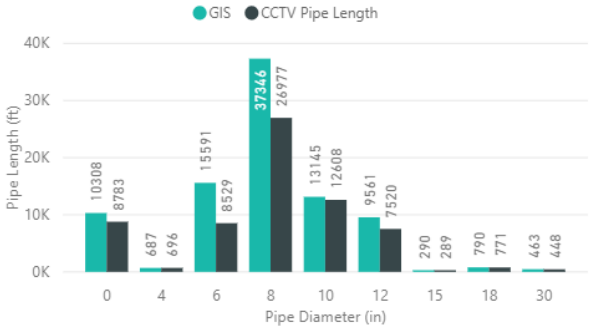
Discrepancy: Pipe Material



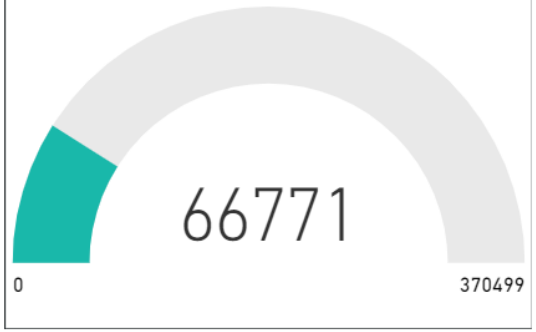
Discrepancy: Pipe Size



Discrepancy Check for Reported Pipe Length

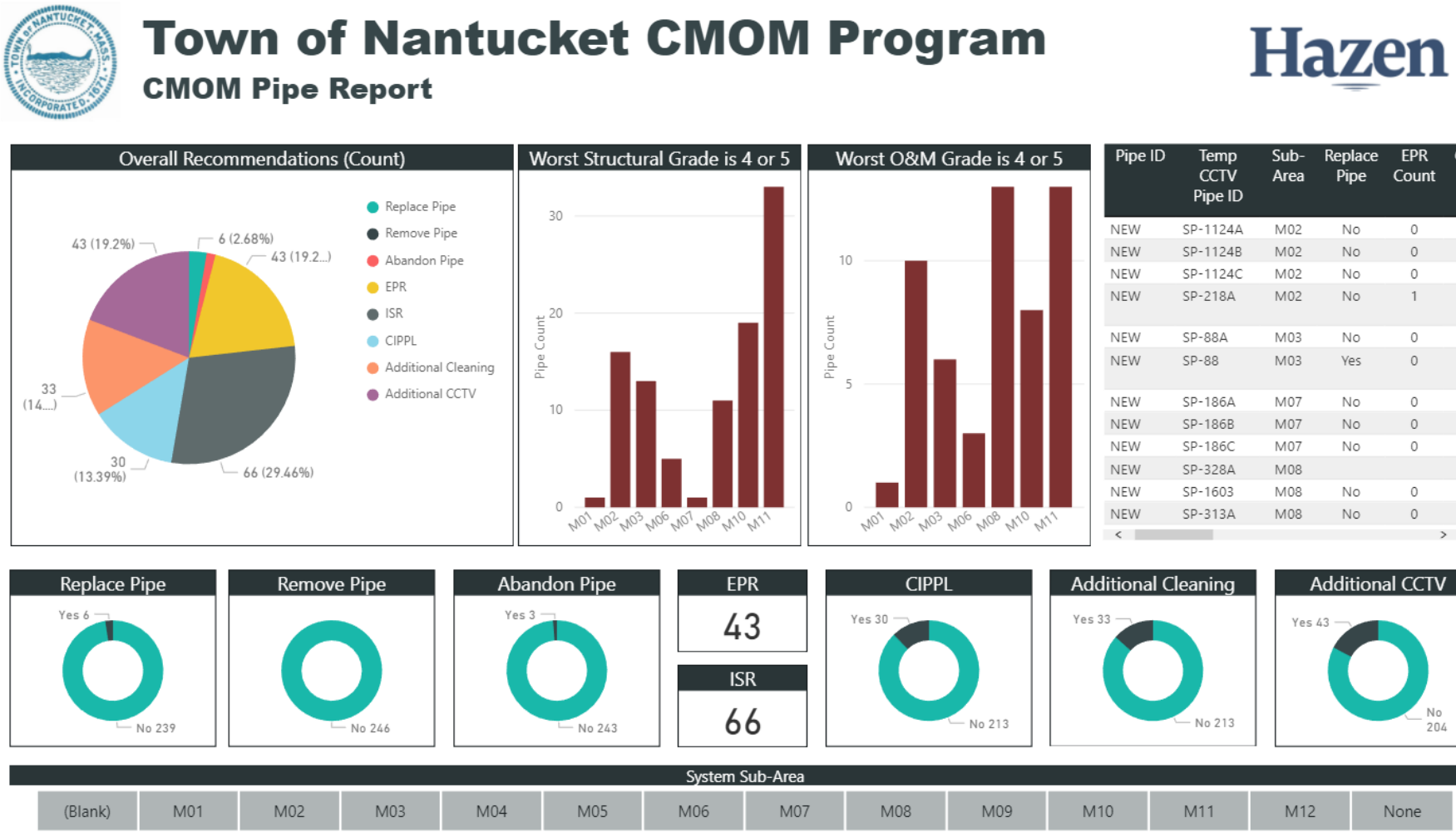


CCTV Progress (LF)



Reporting

PowerBI – Pipe/Rehabilitation Recommendations Report Screenshot



Project Takeaways

Project Takeaways: Hazen

- Frequent Communication is Vital
  - Daily communication between Contractor & NSD staff
  - Weekly calls between Hazen, NSD, & Contractor
  - Monthly progress meetings between NSD & Hazen
- Client and Contractor Flexibility
- Real-time Data Sharing was essential to achieve the best results for the NSD

Project Takeaways: Town of Nantucket

- CCTV and Manhole inspections provided new insight into the system
- By receiving Hazen reviews in real time and having access to inspection videos and reports immediately after upload, NSD crews could address any immediate needs with minimal lag time
- Time and resource investments in this process paid dividends in value via GIS updates, system knowledge, and potential for future use

The Hazen Team Would Like to Extend a Special Thank You to Our Partners on This Project!

Town of Nantucket Sewer Department **National Water Main Cleaning Company**

Hazen

Hazen Team Members:

Chuck Wilson, PE

Sean O'Rourke, PE

Questions?

Hazen

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