

Improving Project Delivery Using Online GIS & BI

NEWEA Spring Conference 2022

Presented by Devon Jones and Kenneth Camacho

CMOM Past Practices

Why go digital?

CMOM Data Collection



Hard drives for CCTV data transfer

MACP Inspection Form

Header Section

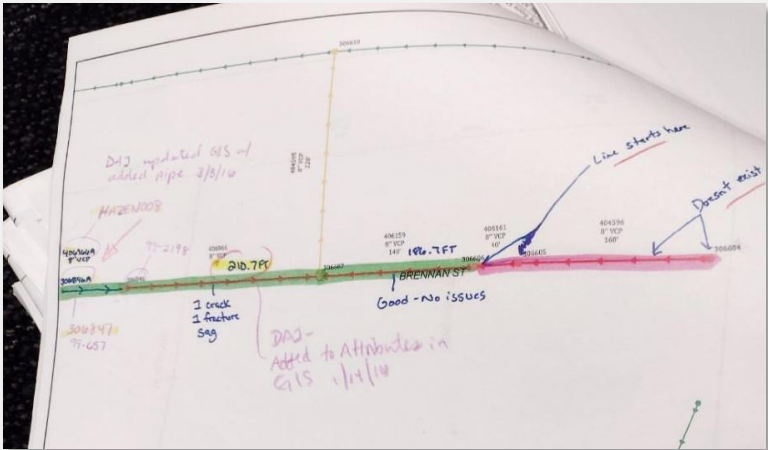
General Information		4. Reviewer Certificate No.	
1. Surveyed By (1,2)	2. Certificate Number (1,2)	3. Reviewed By	
5. Owner	6. Customer	7. PID Number	8. Work Order
9. Media Label	10. Project	11. Date (1,2)	12. Time
13. Sheet Number (1,2)	14. Weather	15. Pre-Cleaning (2)	16. Date Cleaned
17. Purpose of Survey (1,2)	18. Inspection Level (1,2)	19. Inspection Status (1,2)	20. Consequence of Failure
Location			
21. Drainage Area	22. MVI/Access Point No. (1,2)	23. Sheet (1,2)	24. City (1,2)
25. Location Code (2)	26. Surface Type (2)	27. Inflow Potential from Runoff	
28. Location Details			
Manhole			
29. MH Use (2)	30. Access Type (1,2)	31. Year Constructed	
32. Year Renewed	33. Evidence of Surcharge (2)		
Measurements			
34. Rim to Invert (2)	35. Rim to Grade (2)	36. Grade to Invert (2)	37. Rim to Grade Exposed
38. Northing*	39. Easting*	40. Elevation**	41. Coordinate System*
42. Vertical Datum**	43. GPS Accuracy		
44. Additional Information			

* Information required if Northing, Easting or Coordinate System data is recorded
** Information required if Elevation or Vertical Datum data is recorded
Red Font Fields = Mandatory, Black Font Fields = Optional

Pipeline Assessment Certification Program
Version 7.0.3 January 2018

Copyright © 2016, NASSCO

Paper forms for structure inspections

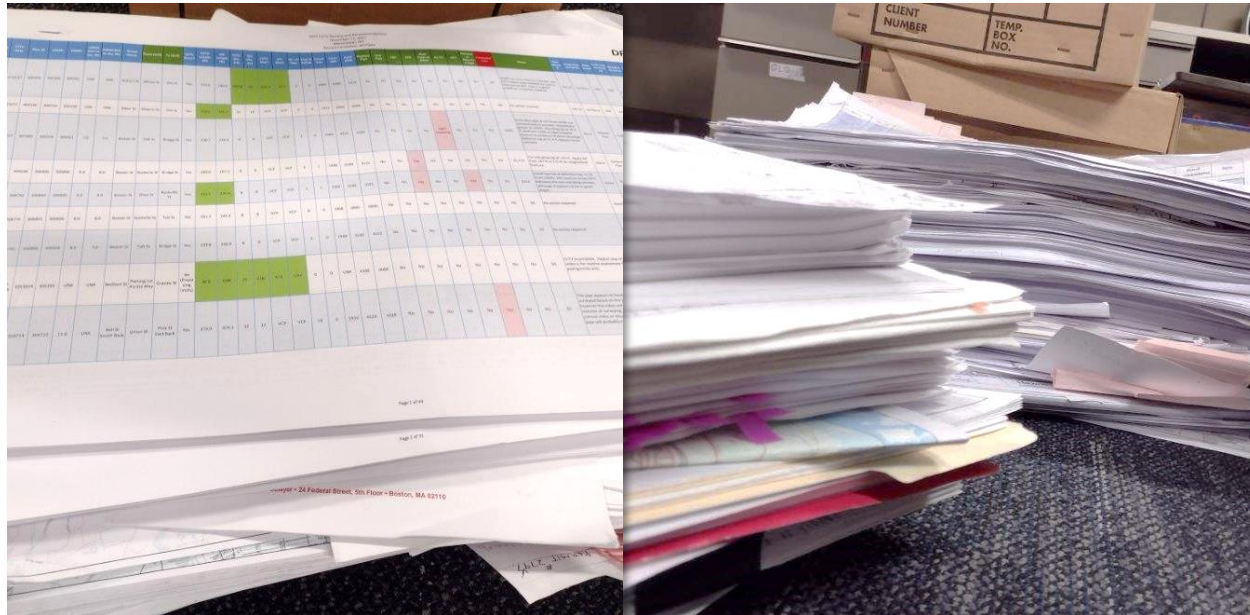


Paper maps for field crew assignment and hand-written markups

CMOM Project Delivery

Monthly recommendation tables

- Lengthy
- Heavy
- Disposable
- Repetitive
- Not spatial
- Not sortable or searchable



Final deliverable (Hard Drive and Hard Copy)

- Revised geodatabase
- Final recommendation table
- Summary report
- CCTV Data & Structure Inspection Reports



Digital Project Setup

Nashua CMOM Architecture

Digital Data Management

Components of a Successful Digital Solution

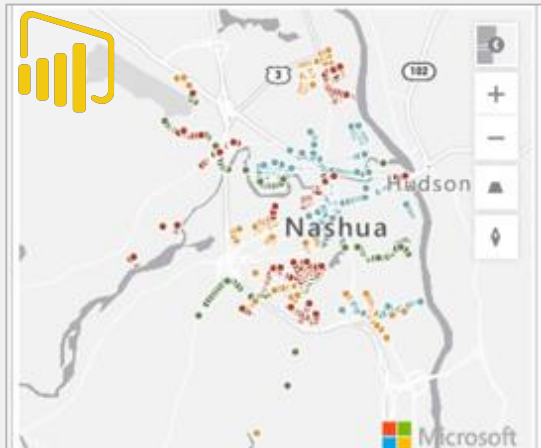
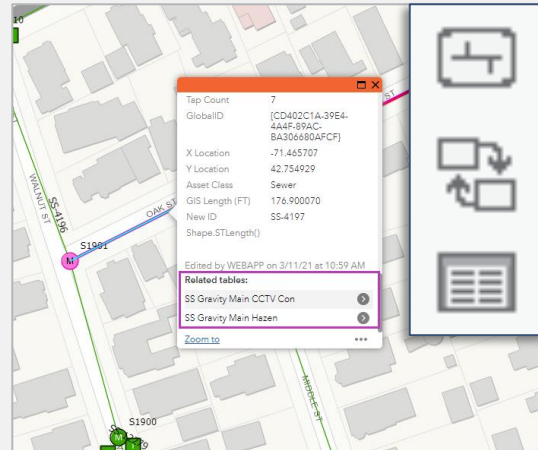
	Collection	Storage	Sharing
Digital	<ul style="list-style-type: none">• Esri Mobile applications• CCTV software	<ul style="list-style-type: none">• SDE geodatabase• ProjectWise	<ul style="list-style-type: none">• Esri web applications• Power BI
Previous Practices	<ul style="list-style-type: none">• Paper forms and maps• CCTV software	<ul style="list-style-type: none">• Local file geodatabase• Excel• External hard drive	<ul style="list-style-type: none">• Hard drives• Paper deliverables

Digital Data Setup

Current Layer

NH_Nashua.GIS.swgGravityMain

<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Visible	<input checked="" type="checkbox"/> Read Only	Field Name	Alias	Location Description	Data Type	<input checked="" type="checkbox"/> Allow NULL	<input checked="" type="checkbox"/> Highlight	N
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<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	last_edited_user		last_edited_user	Text	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
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- Unique Asset IDs
 - **Best practices**
 - **Requirement for relationship classes**
- Finalize schema
 - **Add fields/domains**
 - *Inspection progress tracking*
 - *Revision layer schema for targeted markups*
 - *Related tables*
 - *NASSCO PACP/MACP Compliance*
 - *X,Y Locations for Power BI*
 - *Editor Tracking*
 - **Updates require stopping services**



Challenges

Digital Solution Challenges

Learning curve for CCTV Contractors to use Esri Mobile Apps

Learning curve for Client to use ArcGIS Enterprise Web Apps

Extra responsibility for Contractors

Microsoft 365 restrictions for Power BI

GIS Portal downtime

Duplicate Asset IDs throughout system



Digital Workflows

In Practice

Digital Field Data Collection

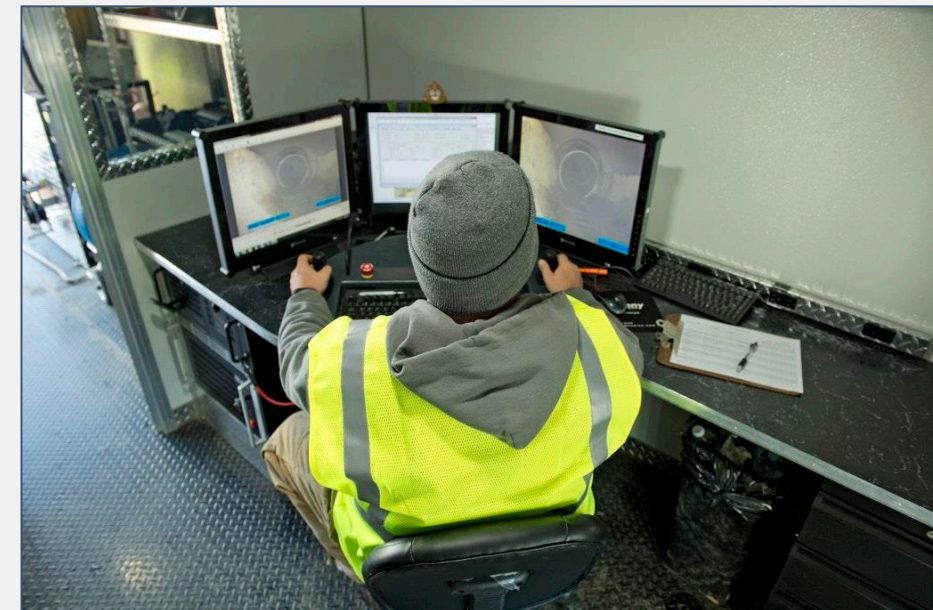
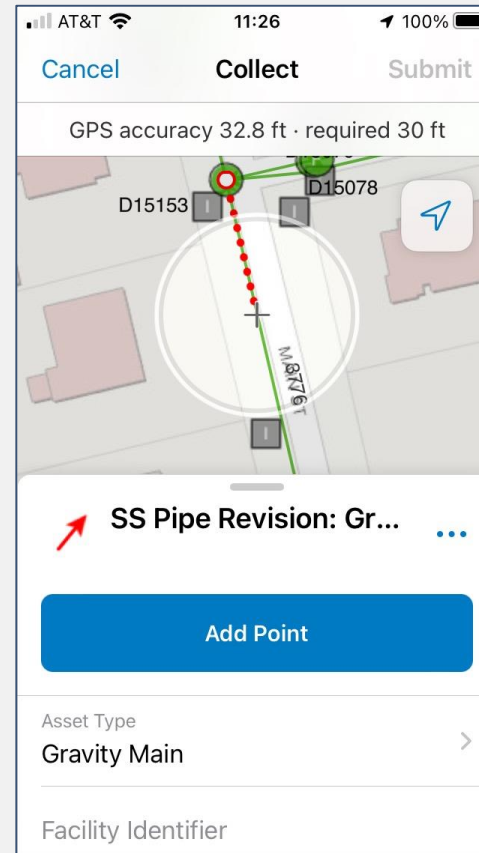
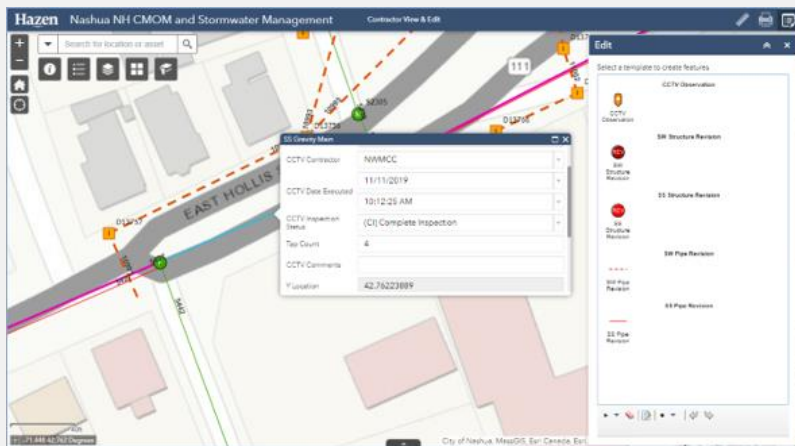
Pipes

Technology

- CCTV truck, camera, PACP compliant software
- Collector application on mobile device
- Web App: office support or desktop use in truck

Process

- Markups
- Live updates



Digital Field Data Collection

Manholes

Technology

- Survey123
- Collector
- Web App

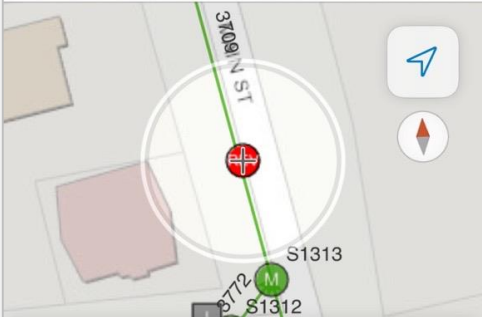
Process

- MACP data collection
- Markups
- Updates

AT&T 09:56 69%

Cancel Collect Submit

GPS accuracy 32.8 ft · required 30 ft



SS Structure Revisio...
42.749220°N 71.460320°W

Update Point

Asset Type
Manhole

Facility Identifier

Nashua MACP Inspection Form L1+

General Information

Surveying Company
National Water Main Cleaning Co.

Surveyed By
[Dropdown]

Certificate Number
[Text]

Project
CMOM and Stormwater Management

Date
Tuesday, May 17, 2022

Time
[Time]

Weather
[Dropdown]

Purpose of Survey
[Dropdown]

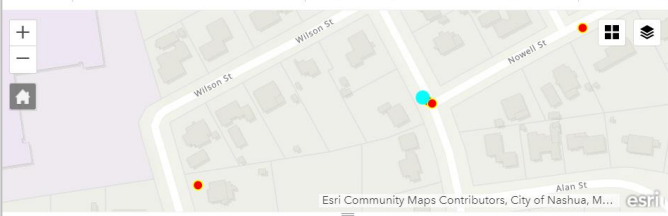
Inspection Level
Level 1+




ArcGIS Survey123 My surveys Organization Help

Nashua MACP Form L1 Overview Design Collaborate Analyze Data Settings

9/17/19 - 5/19/22 Filter Report Export Open in Map Viewer Form view 836/836



Attachments:

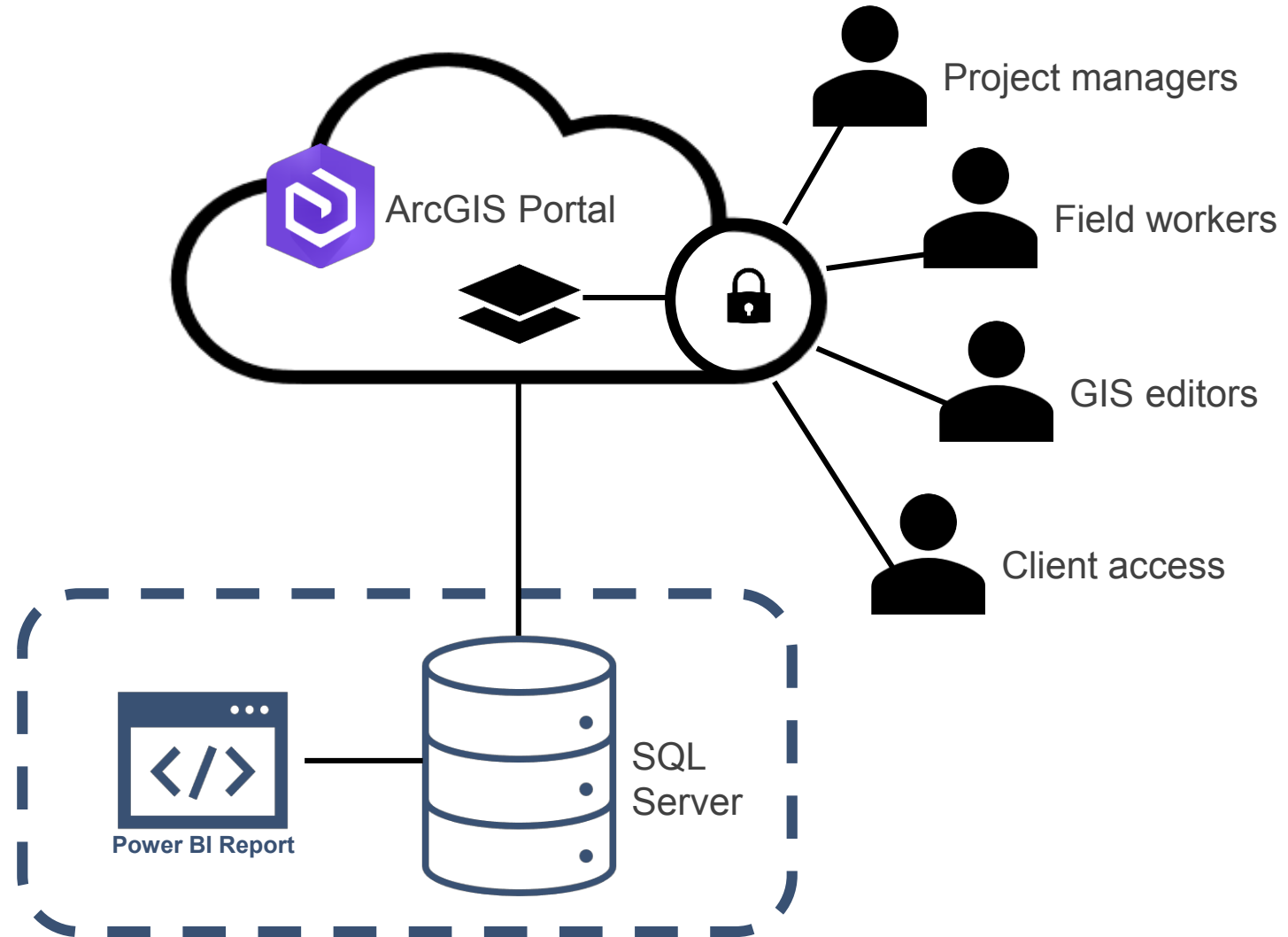


Manhole ID	Street Name	City/Town	Location
S8171B	nowell st	Nashua, NH	Local Rural Streets - Light traffic, town and city back streets, estate streets and curbside parking areas
S2418	Hoyts Ln	Nashua, NH	Local Rural Streets - Light traffic, town and city back streets

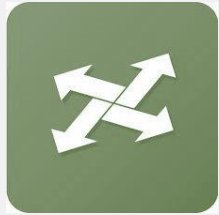
1 of 836 selected

Data Storage and Access

- Data stored on SQL server
- Secure access via Esri apps and Power BI
- Data backed up regularly

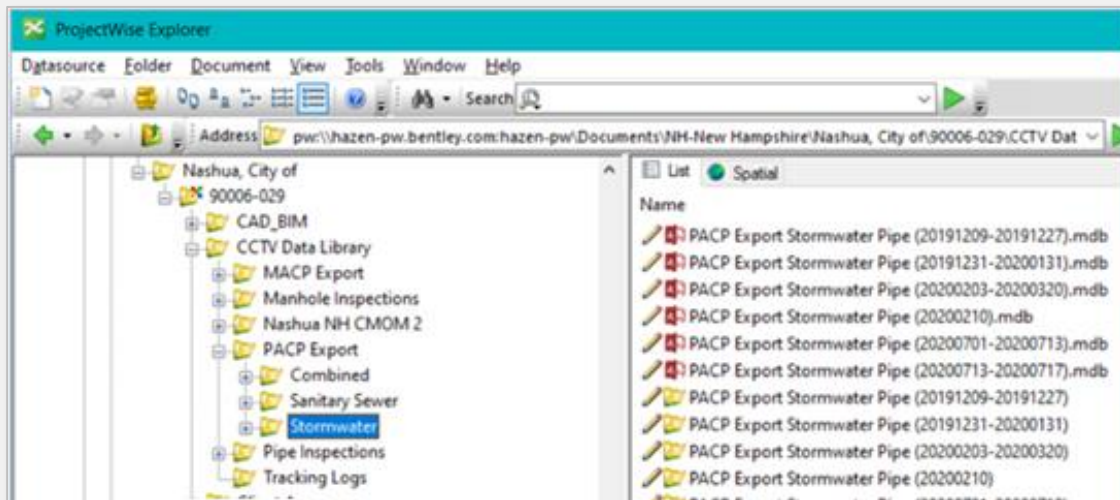


CCTV Review



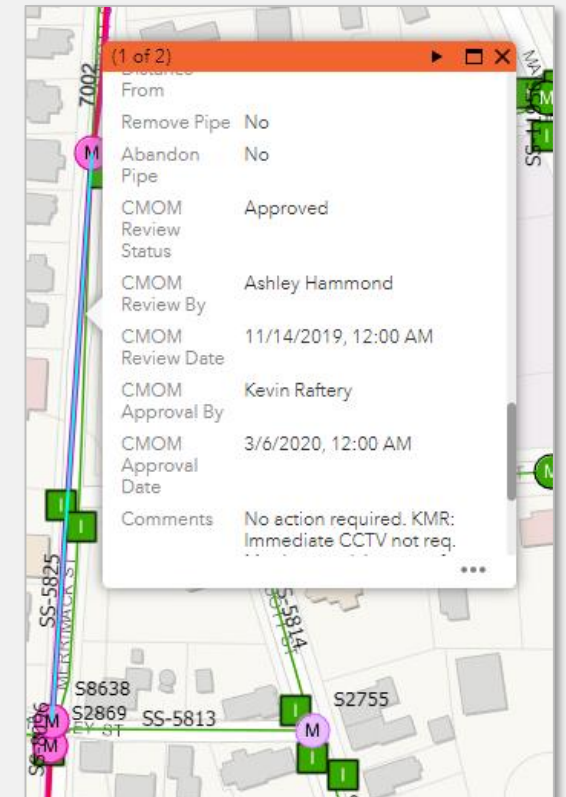
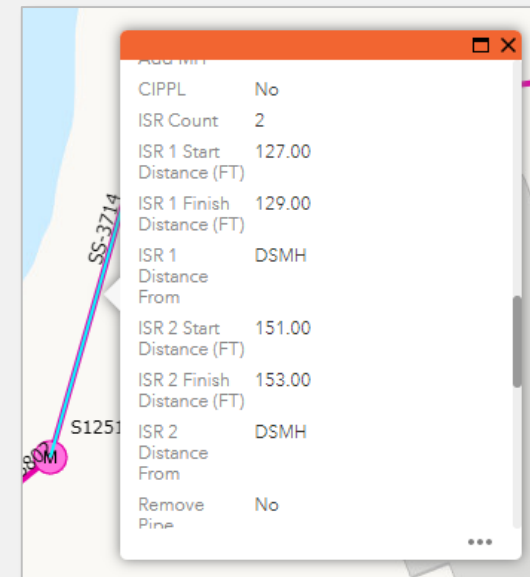
ProjectWise

- Home for CCTV data
- Reviewed by engineers



GIS Portal

- Tracked CMOM recommendations in GIS database related tables
- QC CMOM recommendations
- Tracked errors in collected data




GIS Review



ArcGIS Pro Desktop

- Review live revision layers
- Update GIS layers
- QAQC GIS updates
- Data enhancements
 - Taps plotter
- Reviewed/approved recommendations
 - Done in ArcGIS Pro or Web App




71.4726322°W 42.7667833°N

Selected Features: 1

description	Water Type	Comments 1	Comments 2	Hazen Integration	GlobalID *
ON ST	<Null>	Fitting S275 not found	<Null>	Approved - CCTV for...	{AC27B308-B...
	Combined Sewer	Fitting S9711 does no...	<Null>	Approved	{0186E17A-0...
	Combined Sewer	Add-on manhole	S2129	Approved	{95F0D37E-A...
ON ST	Combined Sewer	Is on Vernon St comb...	<Null>	Approved	{4C702D45-8...
ST	Combined Sewer	Add-on	Not on maps	Approved	{09F14102-CC...
ON ST	Combined Sewer	Add-in manhole	<Null>	Approved	{331AC257-B...
d or near	Combined Sewer	Line seg. 5925 ends at...	Not fitting	On Hold - Switched fi...	{34E8959C-C...
T @ FAIR...	Combined Sewer	Fitting not found	<Null>	Approved - swapped...	{CF79DFFD-2...
CK ST Dri...	Combined Sewer	Add-on Manhole	<Null>	Approved	{F0370375-CE...

SS Structure Revision - SS Structure Revision: Fitting

OBJECTID	4002
Asset Type	Fitting
Facility Identifier	S2990
Original Identifier	S2990
New	No
CCTV Contractor	NWMCC
Inspection Date Executed	10/15/2019, 5:51 PM
MH Access	(NF) Not Found (Incomplete)
Location Description	AMHERST ST @ FAIRMOUNT ST
Water Type	Combined Sewer
Comments 1	Fitting not found
Comments 2	<Null>
Hazen Integration	Approved - swapped fitting for abandoned manhole
GlobalID	{CF79DFFD-209F-40E3-BEE3-C99AFA1D72A2}
created_user	nwmccleixeira
created_date	10/15/2019, 5:55 PM
last_edited_user	GISEDITOR
last_edited_date	11/11/2020, 6:10 AM



Project Delivery

Monthly and Final Deliverables

Sharing

Web Applications configured for different audiences



Hazen

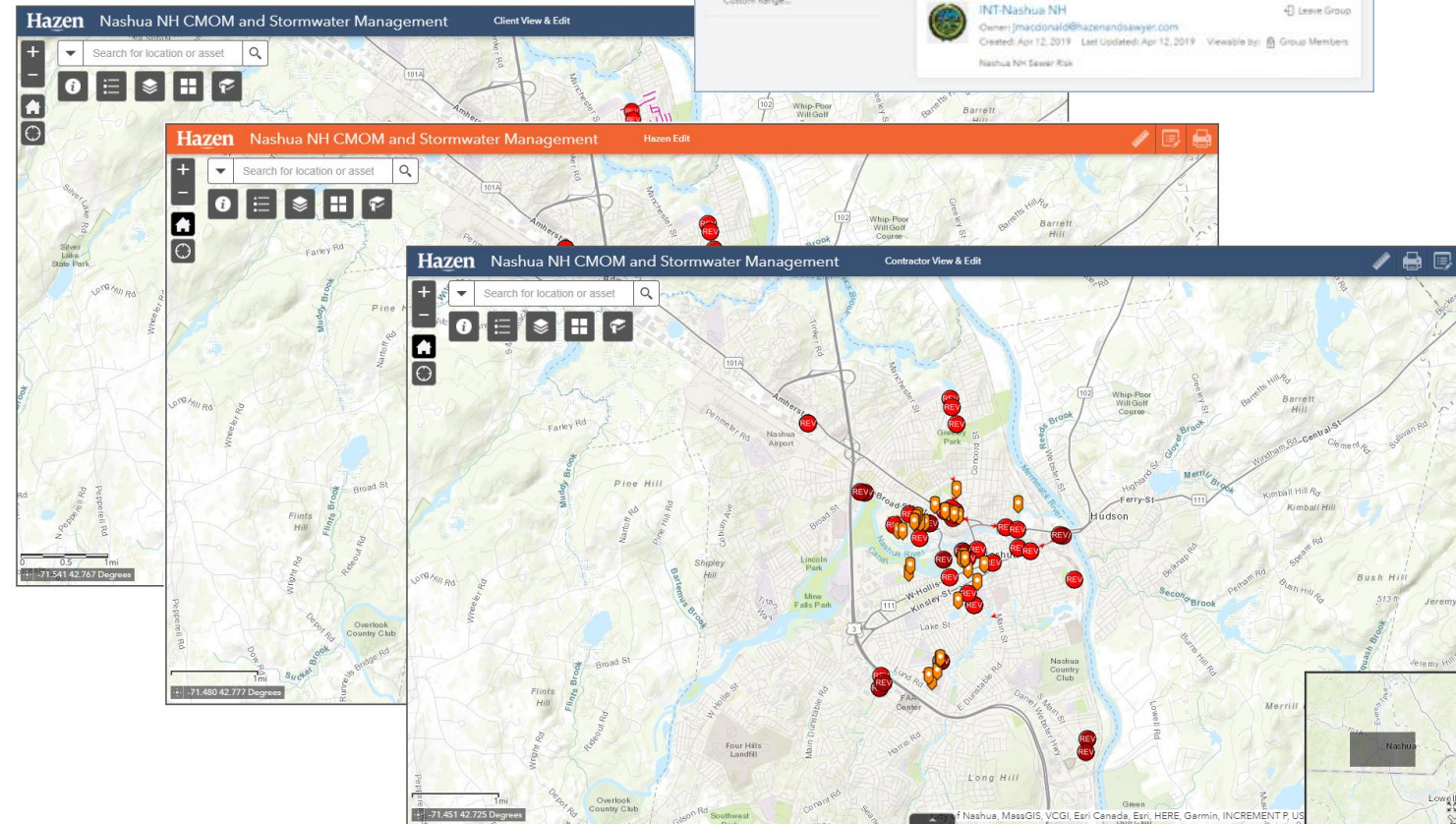
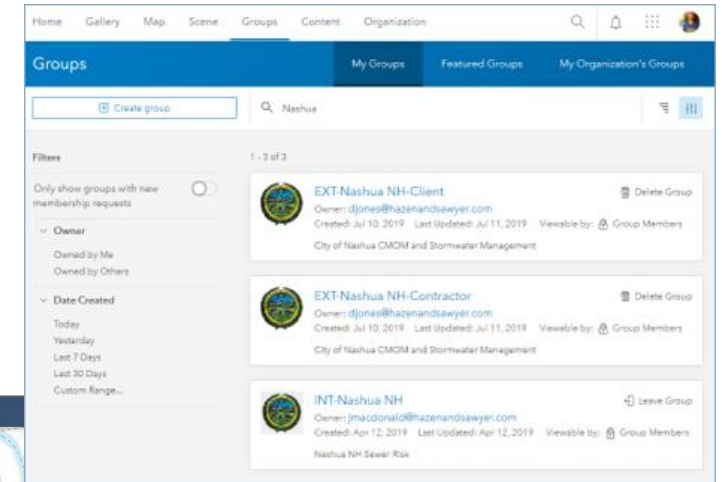
- Home for CCTV reviews/recommendations
- Spatial investigation
- Used during meetings for progress update and review

Contractor

- Spatial edits
- Note-taking
- Progress tracking
- Remote support and QAQC

Client

- Map-based, paperless deliverable
- Available for review



Sharing

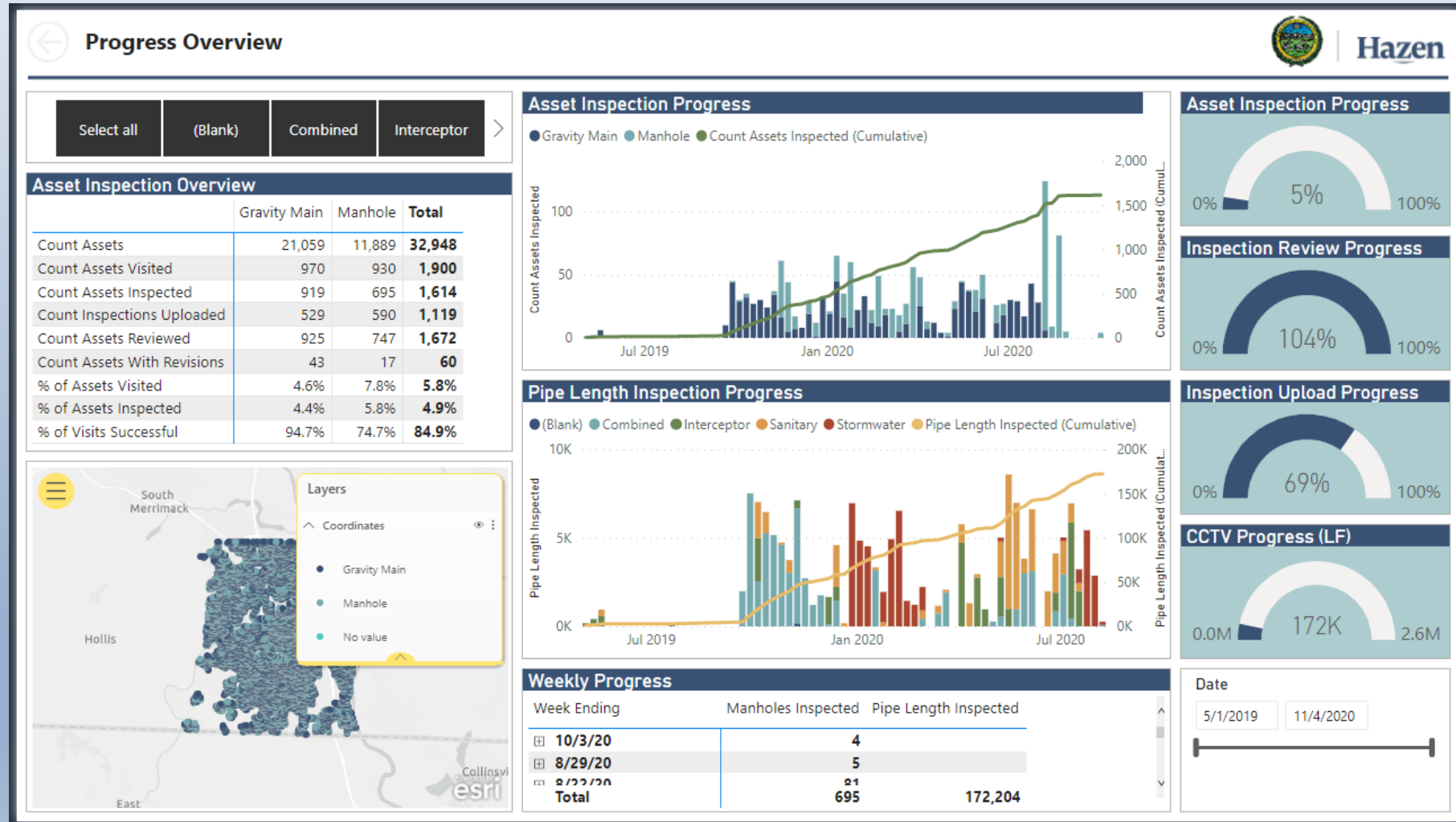
Power BI

- Paperless deliverable to Client
- Project Management tool
- QAQC tool for Hazen
- Shows CCTV progress
- Shows data implementation progress
- Review and Recommendation progress
- Map components and visuals to see trends
- Updates on scheduled interval

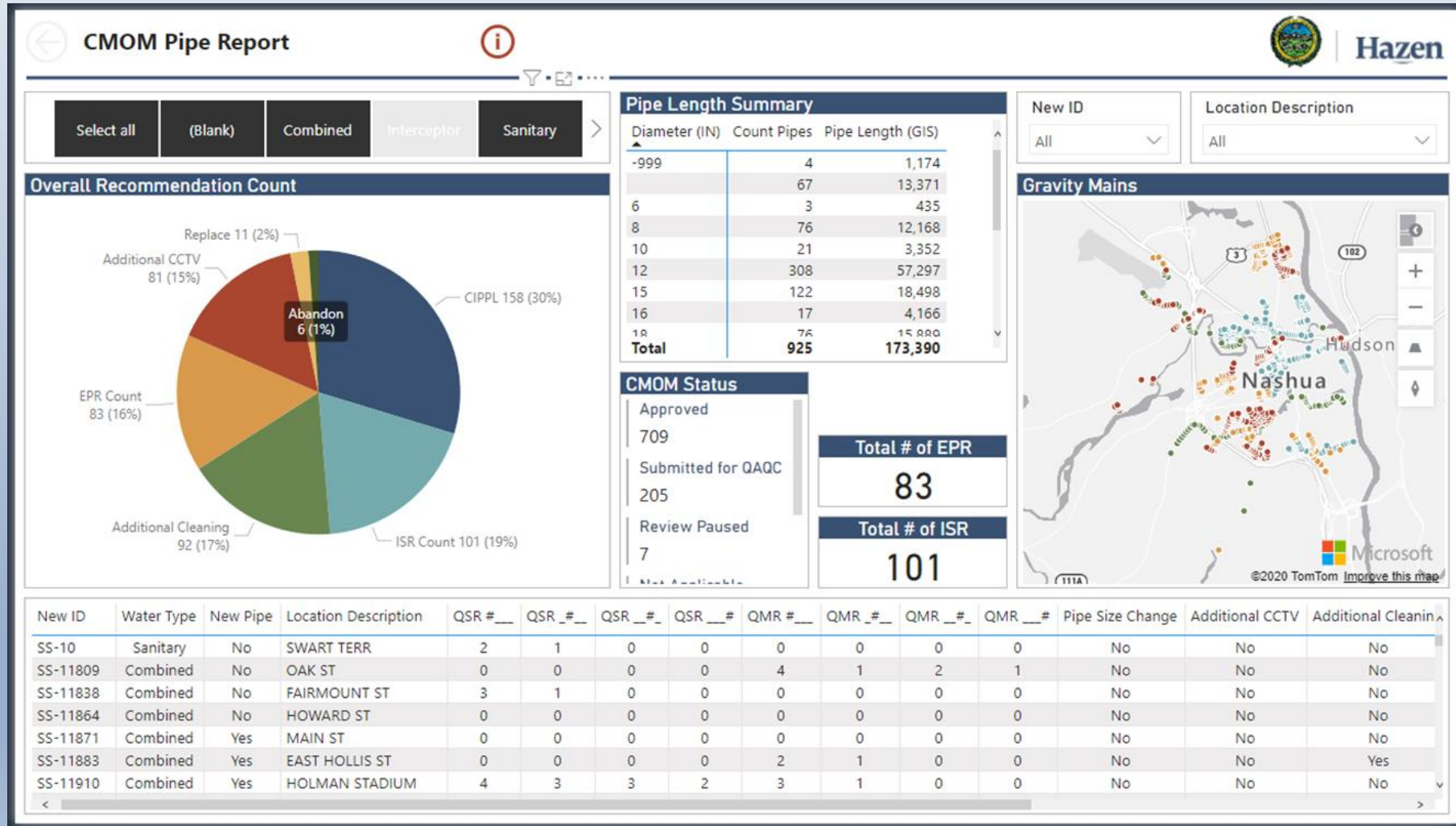


Sharing

Power BI



Power BI



Sharing

Power BI

←

Pipe Videos

Select all

Combined

Interceptor

Sanitary

New ID

All

FacilityID

All

Location Description

All

Inspections

Water Type	NewID	FacilityID	Location Description	InspDate	Count of AssetID
Combined	SS-12426	5734A		10/8/19	
Combined	SS-12427	5764A		10/8/19	
Combined	SS-12428	5764B		10/8/19	
Interceptor	SS-8137	8137		10/1/19	
Combined	SS-6838	6838	ABBOTT ST	10/10/19	
Combined	SS-7002	7002	ABBOTT ST	10/11/19	
Combined	SS-5718	5718	AMHERST ST	10/15/19	
Combined	SS-5750	5750	AMHERST ST	10/15/19	
Combined	SS-5751	5751	AMHERST ST	10/15/19	
Combined	SS-5752	5752	AMHERST ST	10/16/19	
Combined	SS-5755	5755	AMHERST ST	10/16/19	
Combined	SS-5756	5756	AMHERST ST	10/16/19	
Combined	SS-5888	5888	AMHERST ST	10/15/19	
Combined	SS-5891	5891	AMHERST ST	10/15/19	
Combined	SS-5893	5893	AMHERST ST	10/15/19	
Combined	SS-7829	7829	BALDWIN ST	9/20/19	
Total					71

Gravity Mains

Start date/time: 20191022

Pipe segment ref.: Sewer Main '5342'

Project name: HAZ003-3

Surveyed by: Luis Teixeira

City: Nashua

Street: MAIN ST

Upstream MH No: AMH 'S2445'

Downstream MH No: AMH 'S2446'

Direction: D

Location code: A

Height: 36 in.

Width: 30 in.

Shape: O

Material: BR

Weather: 1

BRICK PIPE 32IN X 40IN

0:00 / 12:20

Gravity Mains

Hollis

Nashua

©2020 TomTom

Start date/time: 20191023

Pipe segment ref.: Sewer Main '5408'

Project name: HAZ003-3

Surveyed by: Luis Teixeira

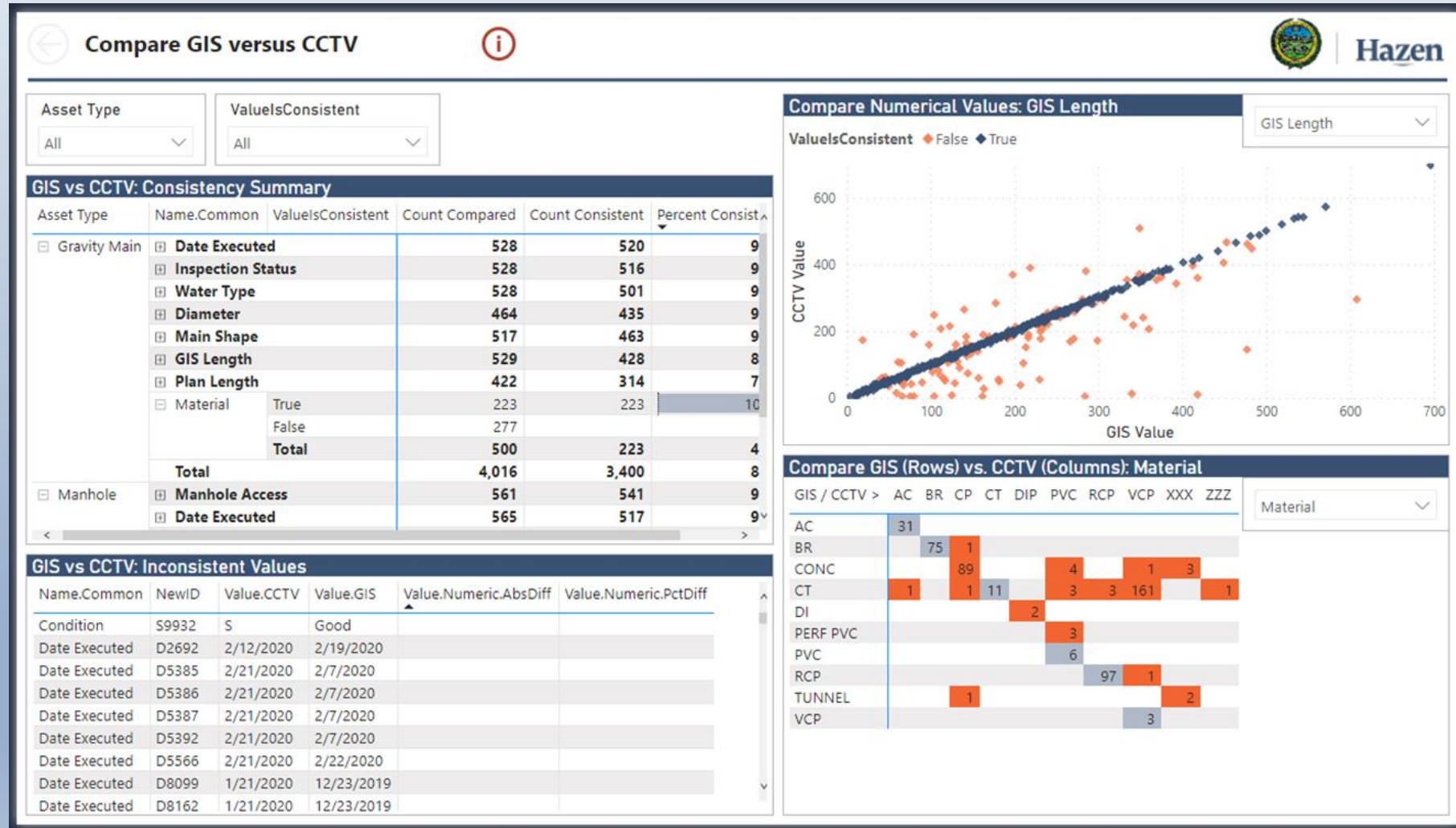
City: Nashua

Street: MAIN ST

Upstream MH No: AMH 'S2450'

Sharing

Power BI



Sharing

Final Deliverables

Hard drive

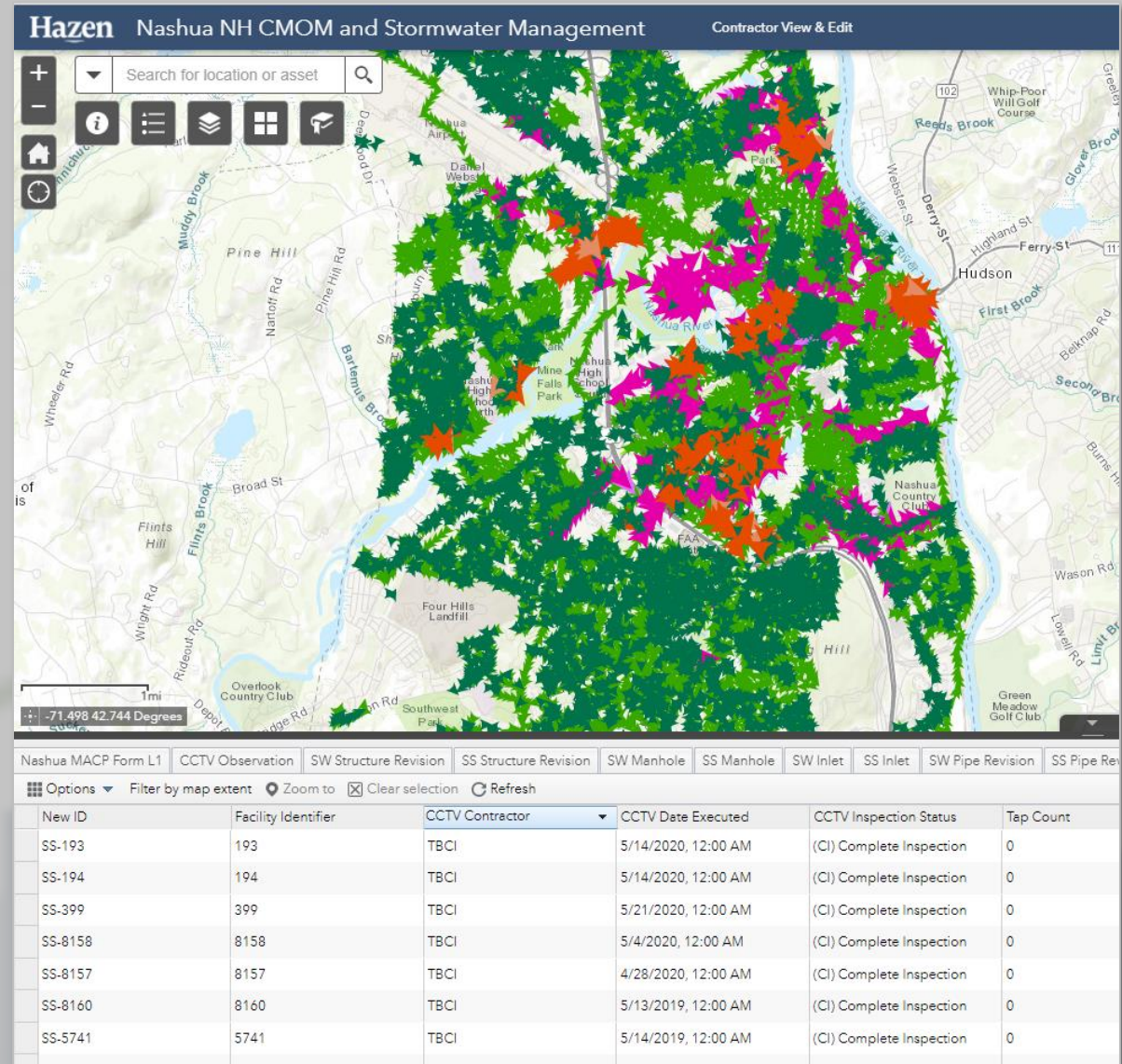
- Excel tables
- Updated GIS data
 - Feature classes
 - Related tables
- CCTV data
 - Videos
 - Images
 - Pdf reports
 - Access database

Paper reports



Benefits of Live Data Sharing

- Track project progress
- Live deliverables rather than snapshots
- Respond to data more quickly
 - Repairs
 - Inform capital improvement planning
- Simplified progress meetings
 - **No printed copies required**



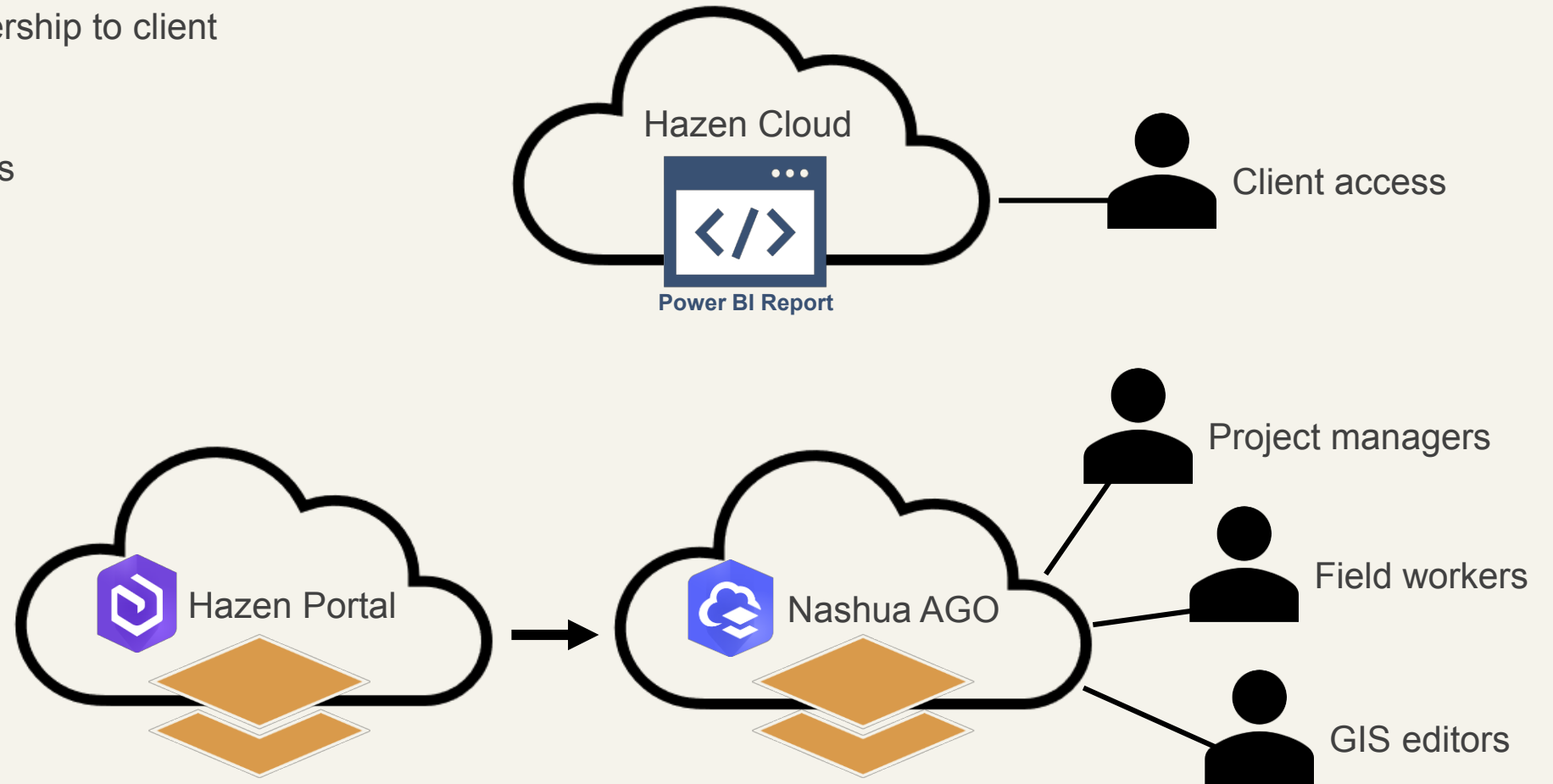
Considerations

- Training with contractors
- New responsibilities for field workers
- Make data collection as simple and efficient as possible
- GIS data preparation
- GIS data improvements
- Client expectations and access



Looking Ahead

- Transitioning GIS ownership to client
- Access to Power BI
- Workflow improvements
 - Field Maps
 - Custom pop-ups
 - Auto-populate asset IDs



Questions?

Thank you!



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Senior GIS Analyst
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