

Targeting pipes from a sea of data

Scheduling Inspections, Cleanings and Rehabilitation in
Waterbury, CT



Team Members



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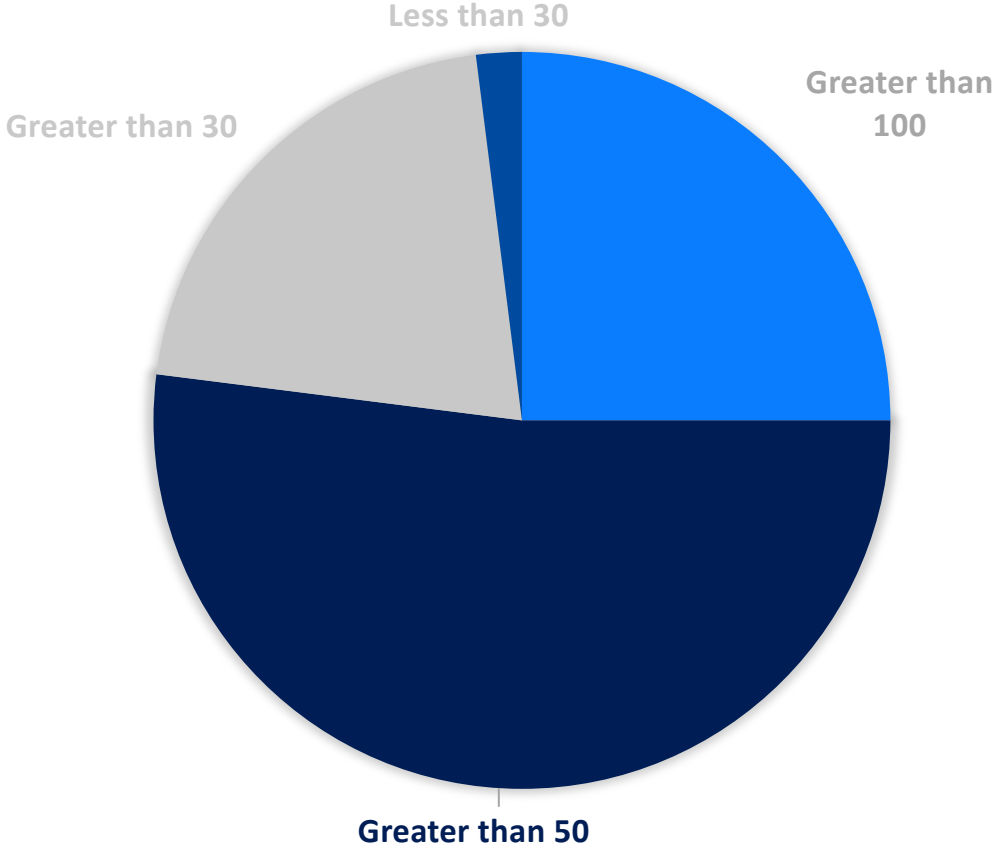
-
- Waterbury's System and History
 - The benefits of continuous asset management
 - Implementing and incorporating Waterbury's data
 - Balancing the results

Collection System Description

- Serves approximately 110,000 people

Service Connections	27,091
Manholes	9,815
Pump Stations	20
Miles of Gravity Sewer	320
Miles of Force Main	6.23
Siphons	1

PIPE AGE (YEARS)



History

- In September of 2018, the City of Waterbury entered into a 10-yr agreement with Jacobs to operate, maintain, and manage the wastewater collection and treatment systems.
- As part of this agreement, Jacobs performs collection system operation and maintenance tasks, including:
 - 20 miles of CCTV a year
 - 30 miles of sewer cleaning a year
 - FOG inspections
 - IPP inspections
 - Building inspections
 - Manhole inspections
 - System repairs



Phase II Investigations

Smoke Testing

- 135,000 LF



CCTV

- 19 miles



Building Inspections

- 417 external inspections
- 142 dye tests



Manhole Inspections

- 1,120 inspections



CMOM Corrective Action Plan (CAP) Focus Areas

- From the Capacity, Management, Operation, and Maintenance Self-Assessment it was determined that Waterbury should be focusing on these four areas...



Geographic Information Systems

- Updating GIS with pipe age, diameter, and material
- Began in 2018



Asset Management/CMMS

- Implement an asset management system with a CMMS system and more preventative maintenance activities.
- Implemented SEDARU and Argon
- Began in 2019



Inflow and Infiltration

- Identify areas of I/I within the collection system
- Decided to conduct a targeted SSES program
- Scheduled for 2019-2024

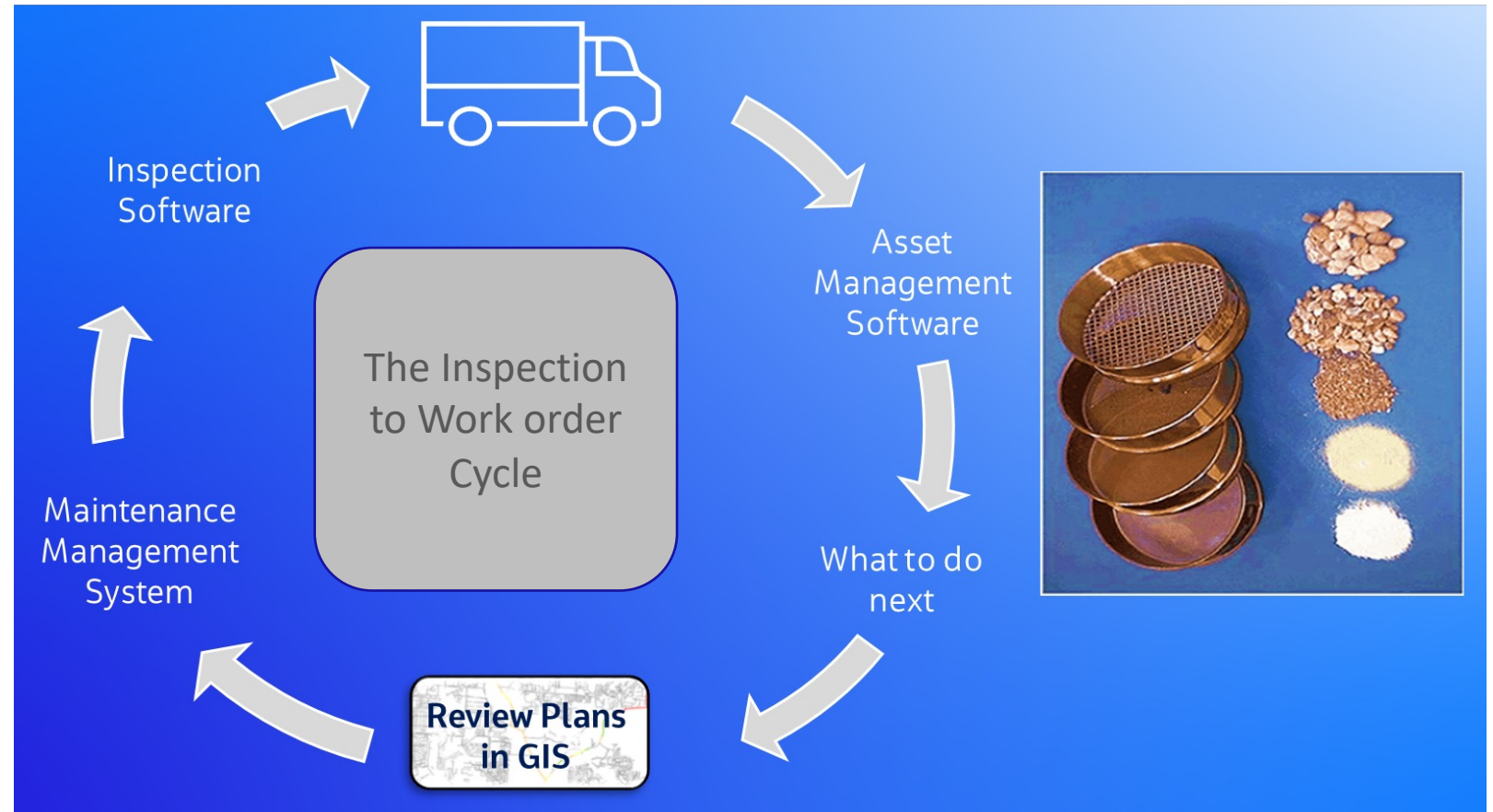


Fat Oils and Grease Program

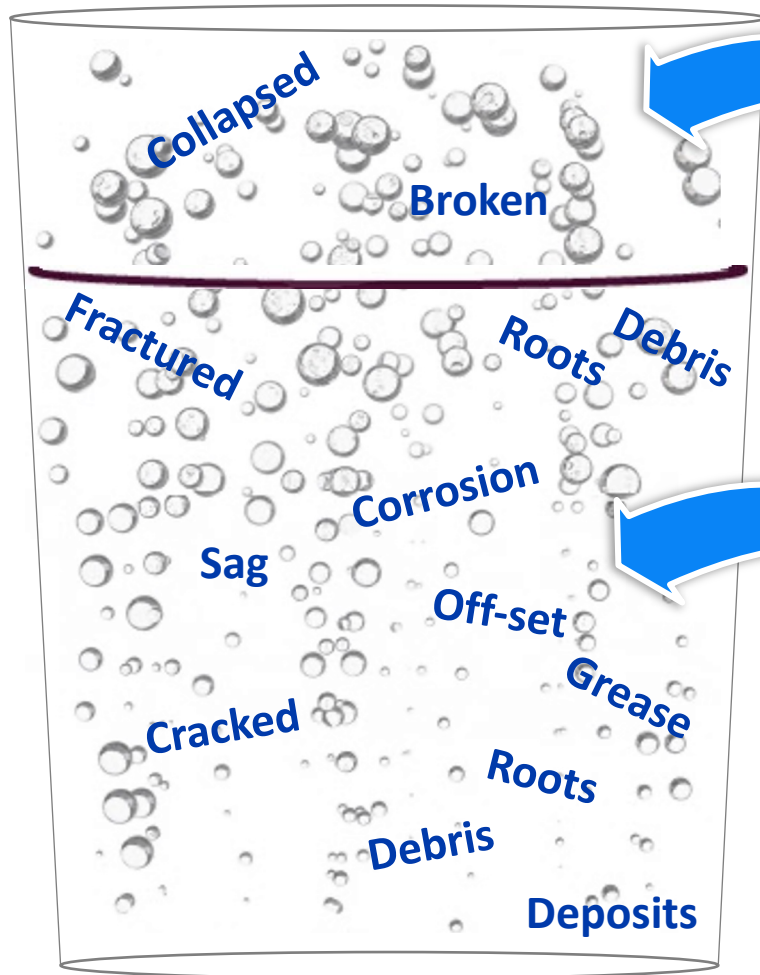
- Conduct additional public and FSE outreach
- Achieved through a FOG program update
- Began in 2018

Good Asset Management Relies on Informed Decisions

- When to reinspect?
- When to clean?
- When to rehab?





Continuous Asset Management tracks assets across their lifecycle.



- Focus on assets needing immediate attention
 - Create Capital Improvement and Maintenance Plans

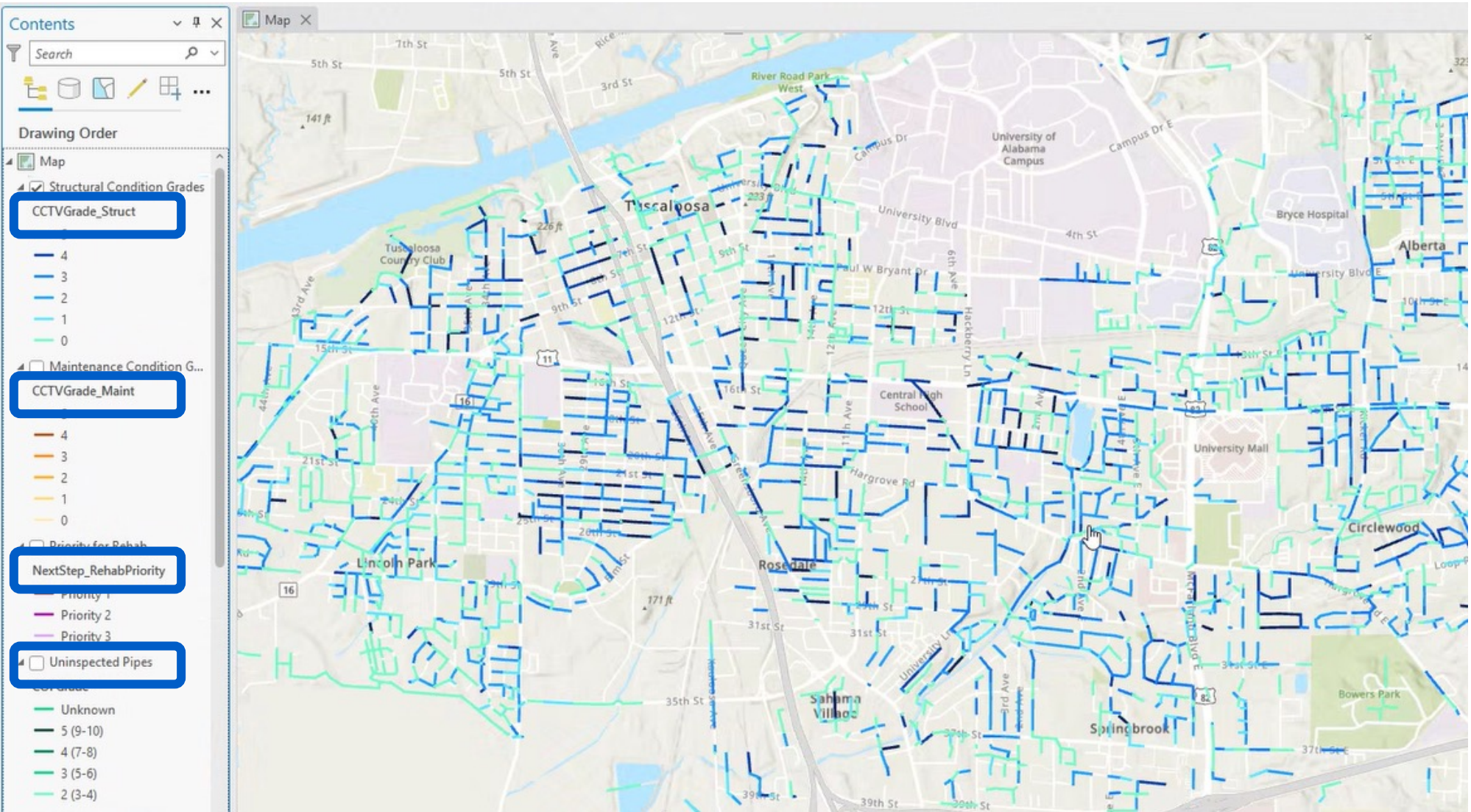
- Track middle-grade assets that may worsen over time
 - Create maintenance and re-inspection cycles

Asset Management Steps

Field Inspections	Score	Risk	Next Step 	Costing 
Asset Inventory / GIS	Calculate condition scores	Calculate risk scores (bottom up)	Create: <ul style="list-style-type: none"> ➤ Re-inspection schedules ➤ Maintenance schedules ➤ Rehab plan (for CIP) 	Estimate: <ul style="list-style-type: none"> ➤ Current rehab costs ➤ RUL & Lifecycle costs ➤ Trench locations ➤ Rehab methods
Work Order History				



Recommendations in GIS

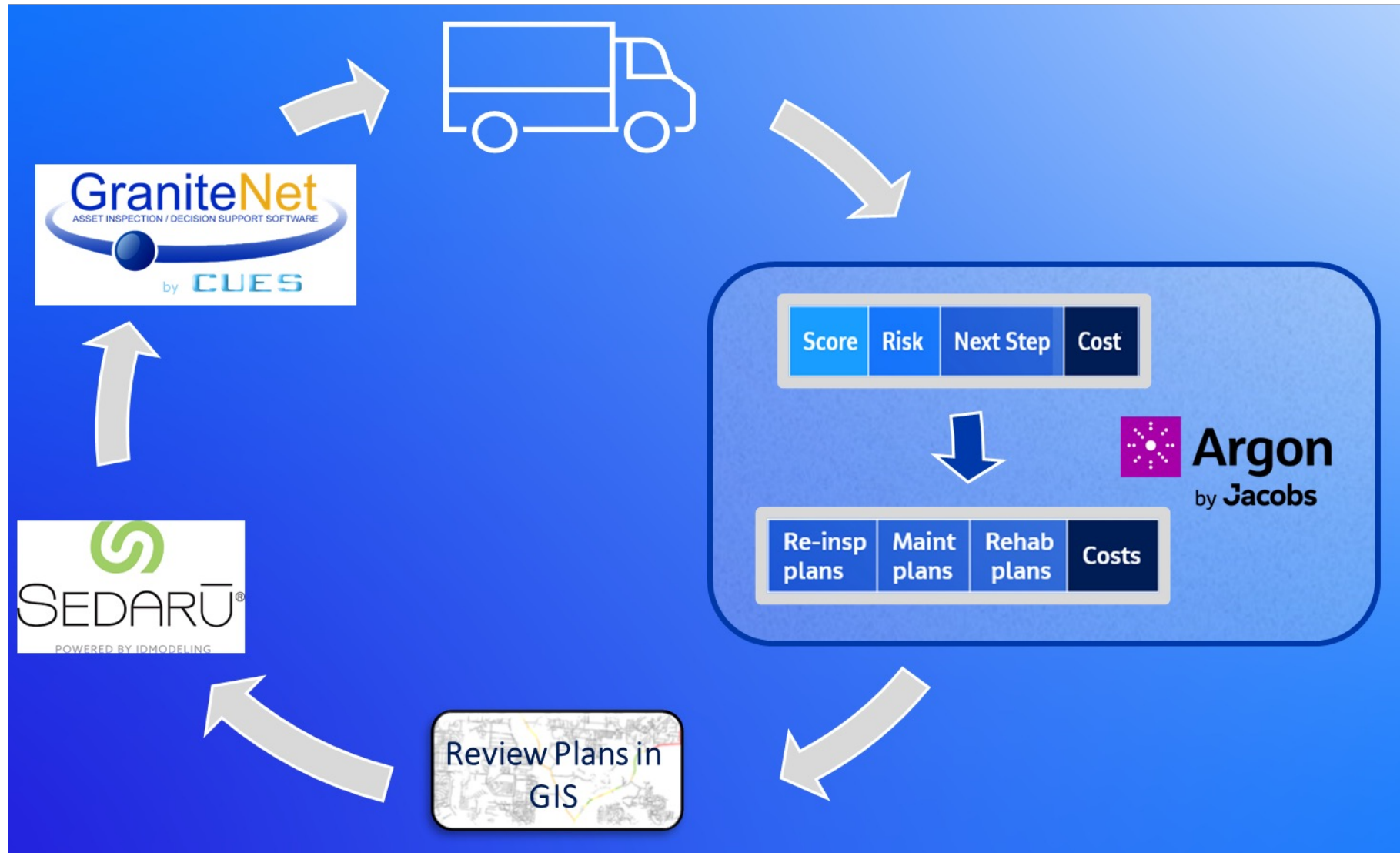


Implementing and incorporating Waterbury's Data


Integrating Data

- Granite Net to collect and organize field inspections
 - CCTV inspections
 - Manhole inspections
- SEDARU to track collection system key performance parameters
 - Work order history
 - Smoke inspections
- Argon for collection system condition assessment and next steps
- GIS to tie all the programs together

Good Asset Management Relies on Informed Decisions

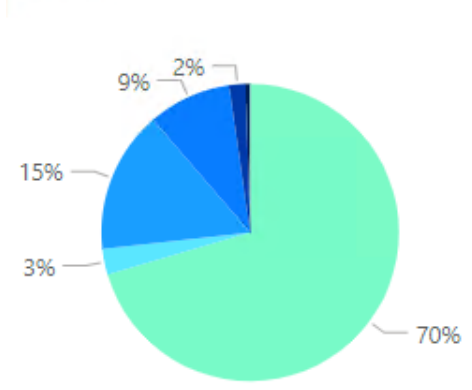


Dashboard of Inspection Results

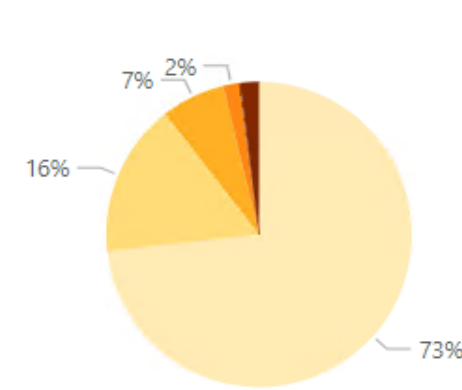

Waterbury CT

12/8/23 **1M** **215.9** **7103**
 Latest CCTV Date Length (ft) Length (mi) # Pipes

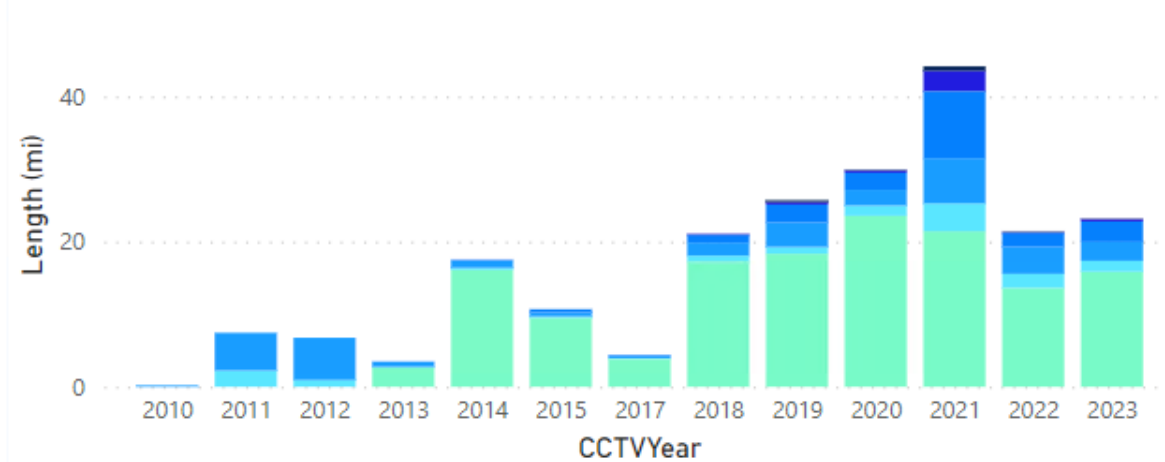
Latest Struct Grade by Length



Latest Maint Grade by Length



Last CCTV Year by Struct/II Grade and Length



Structl ... 0 1 2 3 4 5

Maint Gr... 0 1 2 3 4 5

StructII Grade 0 1 2 3 4 5

PipeID	SewerType	SewerType_Standard	USMAN	DSMAN	USBASIN	Diameter	Material	Length	AvgDepth	COFGrade	InstallYear	LastCCTVDate	LastC
09-127, 09-126	Sewer Main	Sewer	09-127	09-126		8	AC	193		1		5/7/2020	
09-129, 09-126	Sewer Main	Sewer	09-129	09-126		8	AC	322		1		5/7/2020	
09-236, 09-236.1	Sewer Main	Sewer	09-236	09-236.1		8	PVC	117		1		5/7/2020	
09-236.1, 09-235	Sewer Main	Sewer	09-236.1	09-235		8	PVC	100		1		5/7/2020	
09-244, 09-244.1	Sewer Main	Sewer	09-244	09-244.1		8	PVC	185		1		5/7/2020	
09-244.1, 09-235	Sewer Main	Sewer	09-244.1	09-235		8	PVC	107		1		5/7/2020	
09-245.1, 09-244	Sewer Main	Sewer	09-245.1	09-244		8	PVC	165		1		5/7/2020	
10-1/11b-21	Sewer Main	Sewer	10-1	11b-21		8	Vitrified clay pipe	103		1	1	9/11/2014	

Asset Management – Consequence of Failure Matrix

- With any large collection system, it is important to prioritize where updates, maintenance, repairs, etc. are needed.
- In 2020, Waterbury developed a unique Consequence of Failure Matrix tailored to their needs.

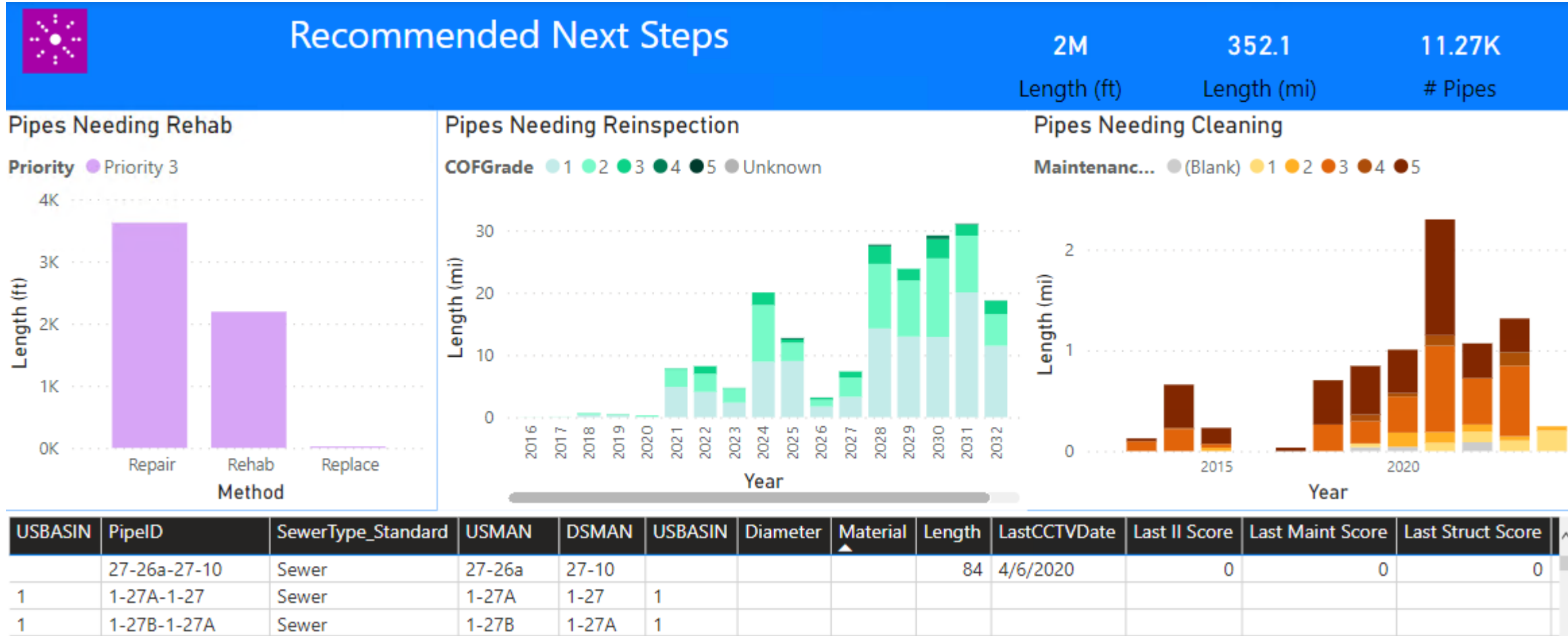
Consequence Category	Critical/High Risk Facilities	Force Main Proximity	Diameter	Pipe Location	SSO Impact	Pipe Material
Weight	20%	10%	30%	15%	15%	10%

Argon uses condition scores, risk COF and hydraulic information

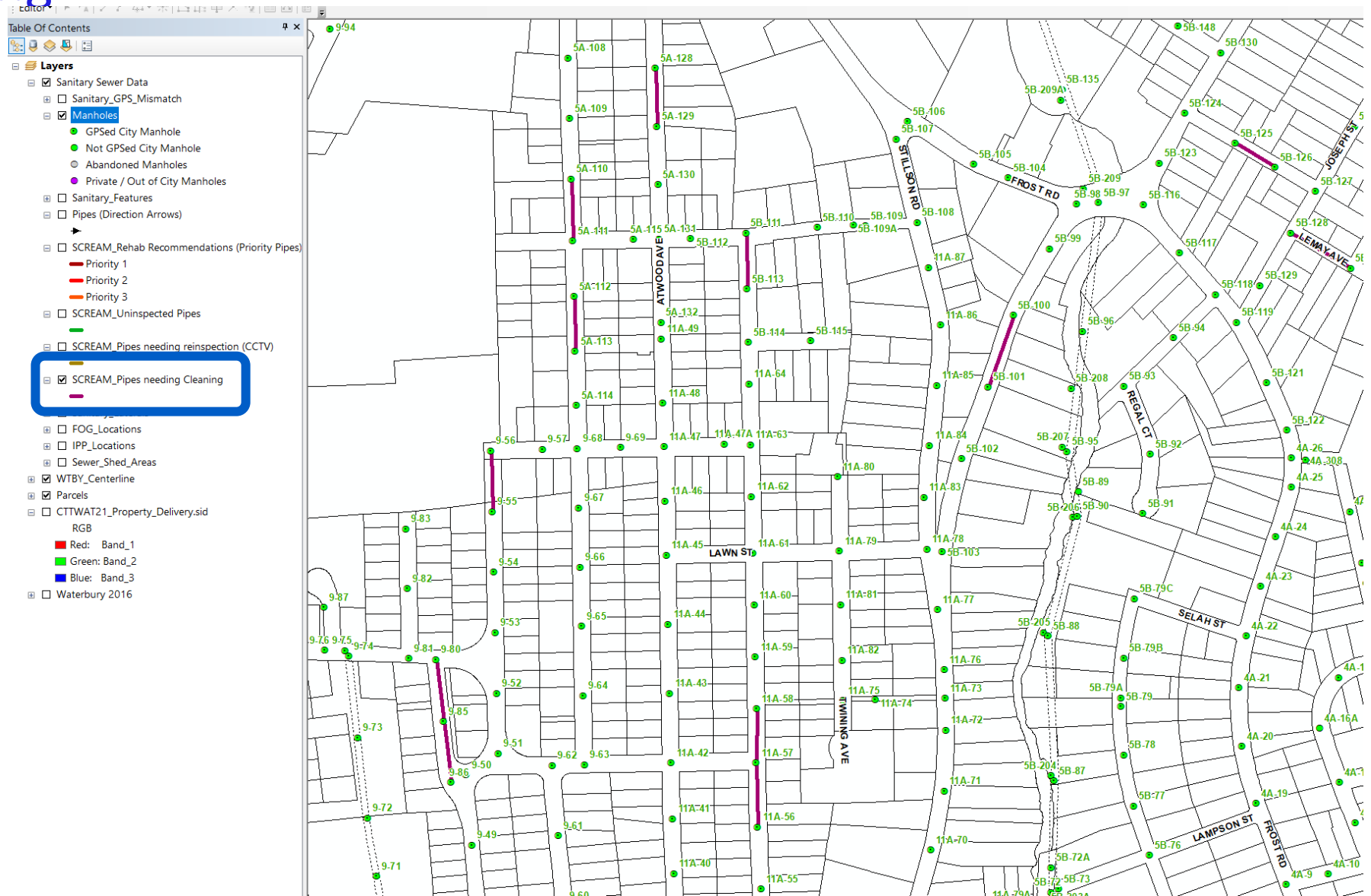
SewerType	Struct_LatestInspType	HighAccel	LatestGrade	0		1		2		3		4		5	
			COFGrade	Length	NextAction	Length	NextAction	Length	NextAction	Length	NextAction	Length	NextAction	Length	NextAction
Sewer	CCTV	No	1	404,196	CCTV 10 years	16,187	CCTV 10 years	19,179	CCTV 10 years	54,296	CCTV 7 years	8,574	CCTV 3 years	2,491	Priority 2
			2	385,287	CCTV 10 years	12,448	CCTV 10 years	42,734	CCTV 10 years	38,717	CCTV 7 years	7,894	CCTV 4 years	2,128	Priority 3
			3	1,111	CCTV 10 years	1,111	CCTV 10 years	1,111	CCTV 10 years	1,111	CCTV 10 years	1,111	CCTV 10 years	1,111	Priority 2
			4	7,884	CCTV 10 years	228	CCTV 10 years	155	CCTV 7 years	161	CCTV 3 years				Priority 1
			5	273	CCTV 10 years		CCTV 10 years		CCTV 7 years		CCTV 3 years				Priority 1
			Unknown	84	CCTV 10 years		CCTV 10 years		CCTV 10 years		CCTV 7 years				Priority 2
		Yes	1	126	CCTV 10 years	118	CCTV 10 years	1,423	CCTV 10 years	8,811	CCTV 4 years	481	CCTV 12 months	434	Priority 2
			2	177	CCTV 10 years		CCTV 10 years	1,172	CCTV 10 years	4,177	CCTV 4 years	812	CCTV 12 months		Priority 2
			3		CCTV 10 years		CCTV 10 years	170	CCTV 7 years	1,127	CCTV 4 years		CCTV 12 months		Priority 2
			4		CCTV 10 years		CCTV 10 years		CCTV 7 years		CCTV 3 years		CCTV 12 months		Priority 1
			5		CCTV 10 years		CCTV 7 years		CCTV 4 years		CCTV 12 months		Priority 2		Priority 1
			Unknown		CCTV 10 years		CCTV 10 years		CCTV 7 years		CCTV 4 years		CCTV 12 months		Priority 2

Note: Only valid inspections are included. For example, pre-cleaned inspections are not valid.

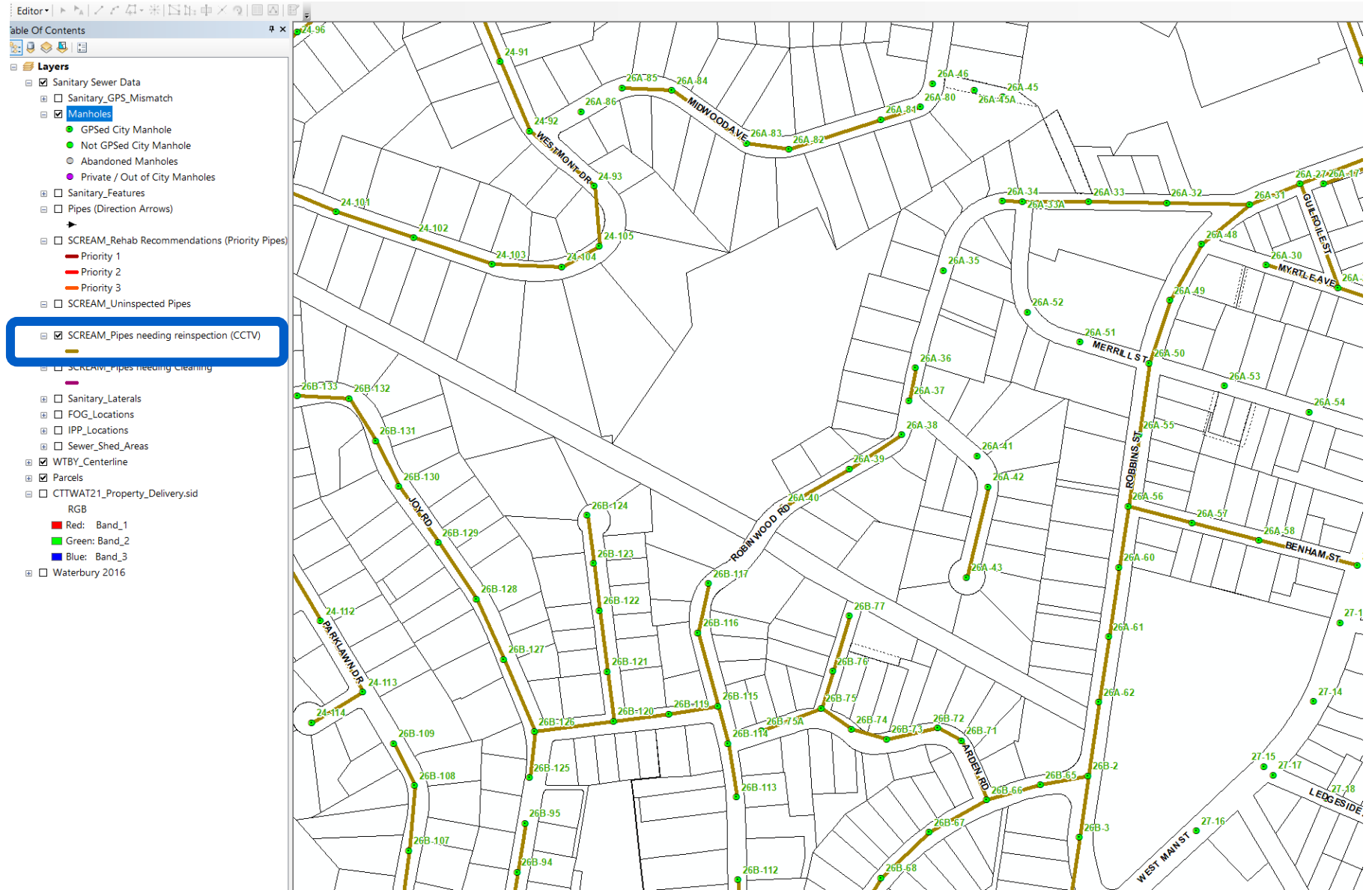
Recommendations included ample CCTV



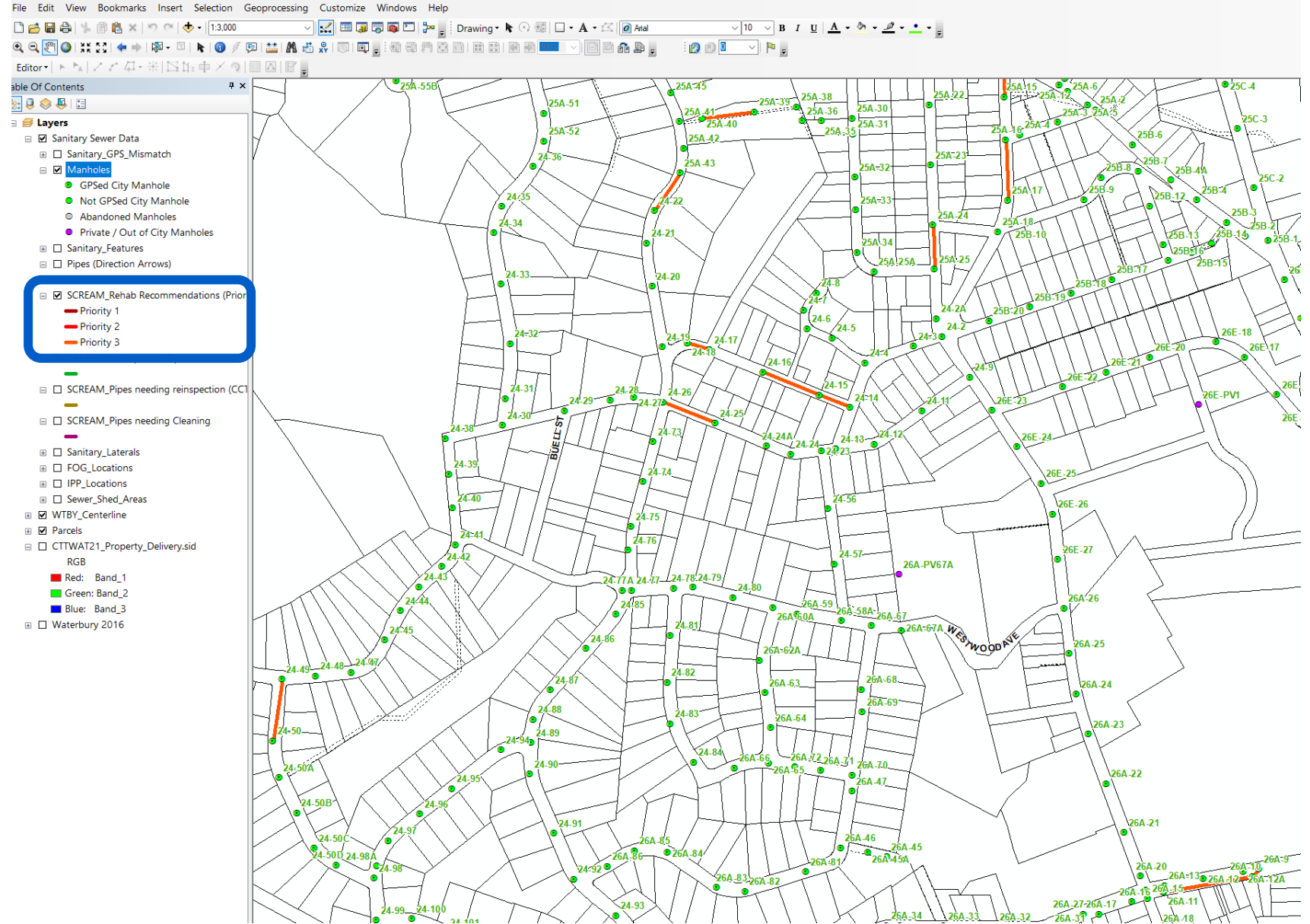
Pipes Needing Cleaning



Pipes Needing Reinspection



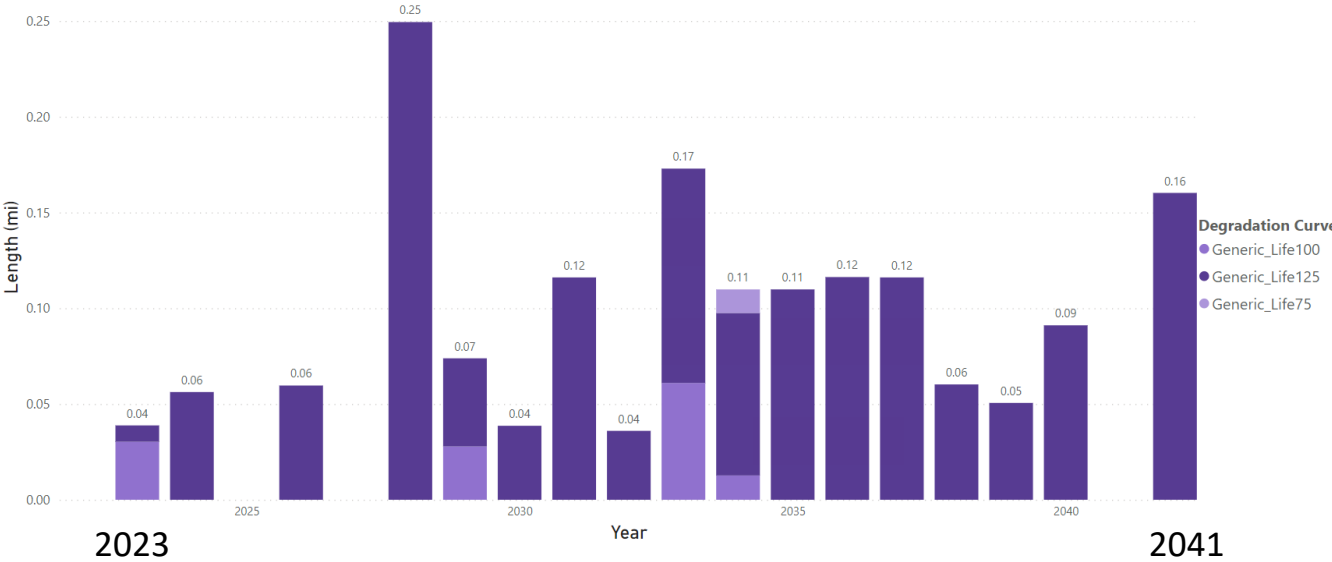
Pipes Recommended for Rehab



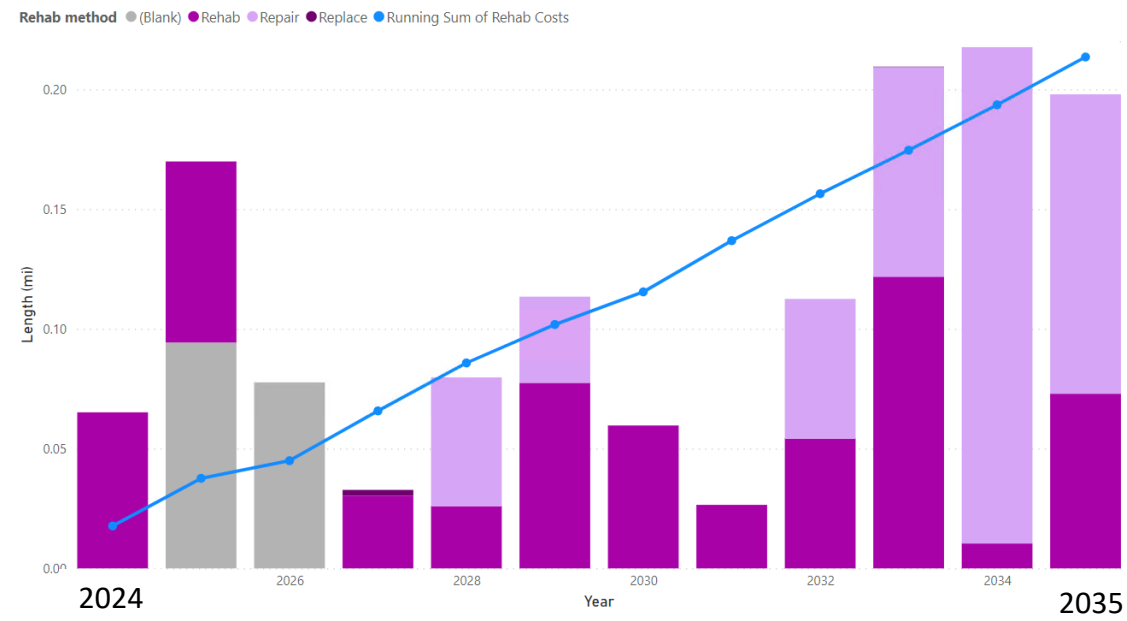
Balancing the Results

The results needed balancing

Un-Balanced by Estimated Remaining Life: Length of Pipe to Rehab per Year



Balancing Priority Pipes: Length of Pipe to Rehab per Year by Methodology





NEWEA
WORKING FOR WATER QUALITY

Questions?

Targeting pipes from a sea of data: scheduling inspections, cleanings and rehabilitation in Waterbury, CT

Please contact Courtney Kennedy with any other questions
610-966-2385 or courtney.kennedy@jacobs.com



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