



# **Condition/Failure Analysis and Rehabilitation Prioritization of Sanitary Collection System**

## **Infrastructure Asset Management Alberta (IAMA) Workshop**

**Presented by:**  
**Nawaz Panhwer, P.Eng**  
**Infrastructure Manager**

# PRESENTATION OUTLINE

- Background/Introduction
- Data Collection
- Structural Assessment
- Prioritization
- Results Summary

# BACKGROUND

- **We see the benefit of using an Asset Management solution in defining the collective infrastructure priorities for our future Capital Budgets.**
- **Currently, each department submits their request independent of other departments. We need to take a holistic, long term view of our future requirements.**
- **We use the GIS to improve our record keeping of completed projects. After reviewing our current work-flow and procedures, we realize that an AM solution will benefit our long-term sustainability.**

# BACKGROUND

## **Why are these activities a priority for your Community?**

- **Currently, the Town has faced expensive failures on the Sanitary Collection Network.**
- **There have been instances where failures have occurred beneath newly paved roads.**
- **We need to manage our Sanitary Collection Network in a proactive manner rather than being reactive, being reactive costs us more in Capital dollars.**
- **We will lead our staff to think pro-actively about all of our assets so that they will be maintained in a responsible, efficient and effective way.**
- **We need to show the public that Asset Management is a foundational pillar of future sustainability.**

# INTRODUCTION

- **On April 27, 2018, the Town of Redwater received funding through Federation of Canadian Municipalities**
- **Condition Analysis, Failure Analysis & Rehabilitation Prioritization of Sanitary Collection System was the first phase of this project.**
- **Cam Trac Inc. was engaged by the Town of Redwater to complete a CCTV inspection of the Town's entire sanitary sewer collection system**
- **CCTV inspection was completed**
- **Town engaged Associated Engineering**

# INTRODUCTION

- **Associated Engineering Prepared the following Tasks**
- **Input the data into a spreadsheet for further analysis,**
- **Analyzed the defects found in the collection system,**
- **Prepared a map of the collection system identifying the defect rating of each pipe segment,**
- **Prepared a 10-year sanitary sewer rehabilitation capital plan.**

# DATA COLLECTION

- Cam Trac completed the data collection, in this process they flushed all the lines and then put the camera to record the data.
- To assess the condition of the sanitary sewers, a CCTV inspection program was implemented based on the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP) rating system.
- CCTV structural inspection data generally includes coding of the defects based on both type and severity. Structural pipe defects, Operations and Maintenance (O&M) issues, and hydraulic restrictions discovered during the inspection need to be ranked by severity based on the potential to impact the system's proper operation, effective maintenance, and hydraulic capacity.

# DATA COLLECTION

- **3<sup>rd</sup> Party Contractor collected CCTV video data to verify the condition of the Town's Sanitary Collection Network.**
- **Verify the location and severity of all found failures.**
- **Prioritize the required rehabilitation and associated costs.**
- **Create a long-term Capital Plan to schedule the rehabilitation work.**
- **This data will also be used in strategy development for our water, storm and road infrastructure networks.**



# INSPECTION REPORT



Cam-Trac Inspection Services Ltd.


TF: 877.460.5440

Ph: 780.460.5440

Email: info@camtrac.ca

<b>Upstream MH</b> 60	<b>Downstream MH</b> 149	<b>Size</b> 200	<b>Material</b> Vitrified Clay Pipe	<b>Total Length</b> 51	<b>City</b> Redwater
<b>Project</b> 2018 Sanitary Sewer Assessment Project		<b>Customer</b> Associated Engineering	<b>Pipe Segment Reference</b> 005-45	<b>Sewer Use</b> Sanitary	
<b>Surveyor's Name</b> KPA	<b>Certificate Number</b> U-0417-07007643	<b>Street Address</b> 54 Street	<b>Location Details</b>		
<b>Direction</b> Downstream	<b>Purpose</b> Capital Improvement Program Assessment	<b>Weather</b> Dry	<b>Date</b> 20180627	<b>Time</b> 13:44	<b>Length Surveyed</b> 51

**Additional Information**

	Ftg.	Code	Description	Pct.	Position	Cont.	Comment
	0.0	AMH	Access Point - Manhole				Starting Manhole: 60
	0.0	MWL	Water Level	0			
	0.0	BSV	Pipe Broken: Soil Visible		3 to 5		
	2.0	CM	Crack Multiple		6 to 8		
	3.1	FM	Fracture Multiple		3 to 9		
	6.6	RFJ	Roots, Fine: Joint		4		
	8.3	RFJ	Roots, Fine: Joint		4		
	9.0	MWL	Water Level	15	10		
	9.7	RFL	Roots, Fine: Lateral		10		
	9.9	MGP	General Photograph		10		
	9.9	TBA	Tap, Break-in / Hammer: Active	5	10		
	11.7	MWL	Water Level				
	19.1	MGP	General Photograph				
	19.1	TBI	Tap, Break-in / Hammer: Intruding		2		
	27.5	MGP	General Photograph				
	27.5	TBI	Tap, Break-in / Hammer: Intruding		10		
	31.0	CC	Crack Circumferential		11 to 2		
	31.0	CC	Crack Circumferential		4 to 6		
	35.9	MGP	General Photograph				
	35.9	TBI	Tap, Break-in / Hammer: Intruding		10		
	36.4	MWL	Water Level	15			
	45.4	MWL	Water Level	25			
	45.4	MCU	Camera Underwater			S01	
	48.3	MCU	Camera Underwater			F01	
	48.6	MMC	Material Change				VCP to PVC
	48.6	MGP	General Photograph				
	48.6	TB	Tap, Break-in / Hammer		3		
	51.0	AMH	Access Point - Manhole				End of survey. Manhole 149

# STRUCTURAL ASSESSMENT

**CCTV inspection reports were reviewed and analyzed.  
Probability scores were assigned based on PACP ratings.**

**Three criteria were determined to correlate with the pipe's condition and likelihood of requiring rehabilitation, namely:**

- **Structural Score (Overall structural score of pipe based on PACP rating)**
- **Mean Score (Structural Score  $\div$  Length of Pipe Inspected)**
- **Peak Score (Worst rating assigned to a pipe length (1-5) - 5 being the worst)**

# STRUCTURAL ASSESSMENT

The severity ranking considers the immediate defect, risk of failure, and rate of deterioration.

- **Severity Grade 5** – Pipe segment has failed or will likely fail within the next five years - requires immediate attention.
- **Severity Grade 4** – Pipe segment has severe defects - risk of failure within the next five to ten years.
- **Severity Grade 3** – Pipe segment has moderate defects - deterioration may continue, at a ten to twenty year timeframe.
- **Severity Grade 2** – Pipe segment has minor defects - pipe unlikely to fail for at least 20 years.
- **Severity Grade 1** – Pipe segment has minor defects - failure unlikely in the foreseeable future

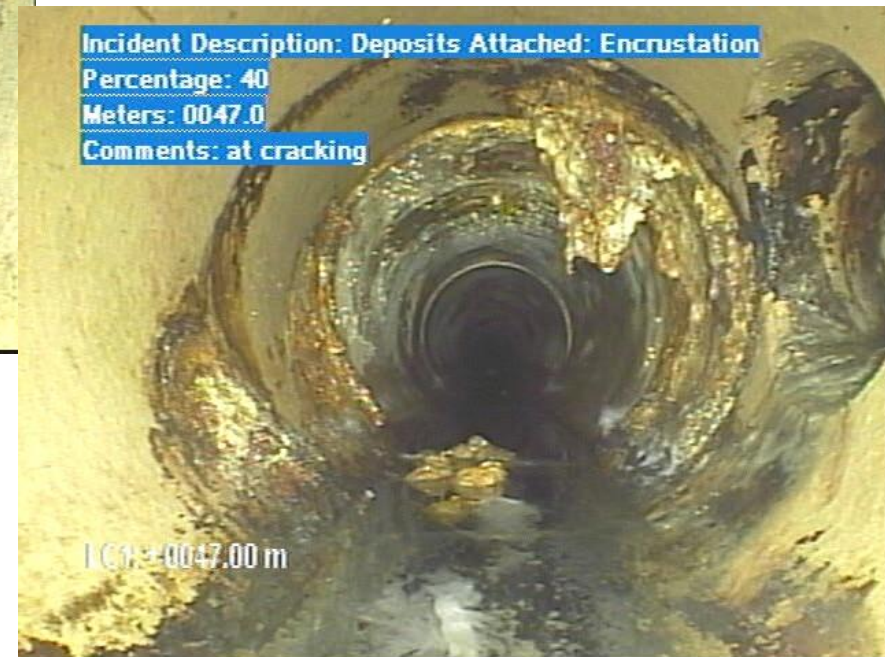
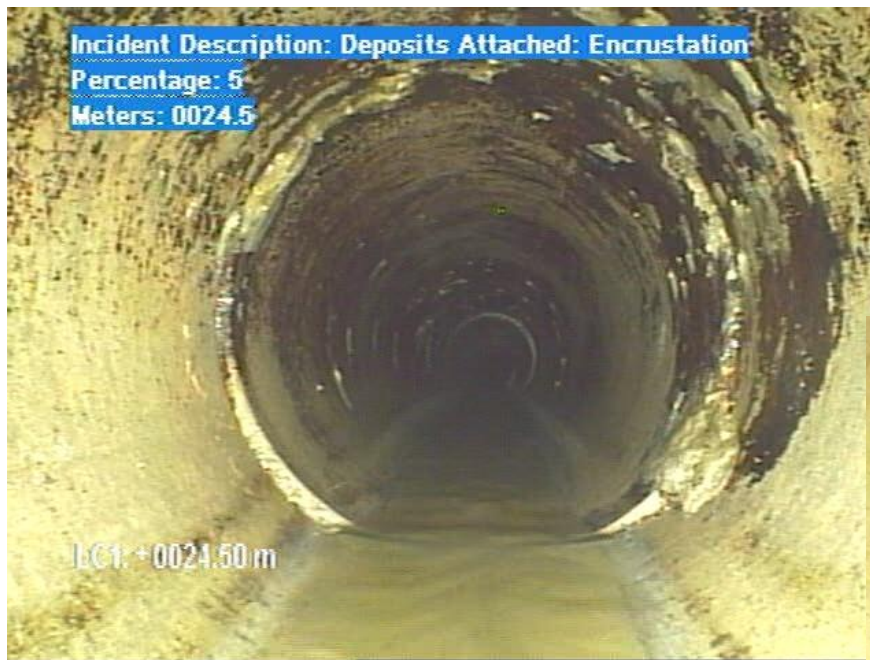
# STRUCTURAL ASSESSMENT

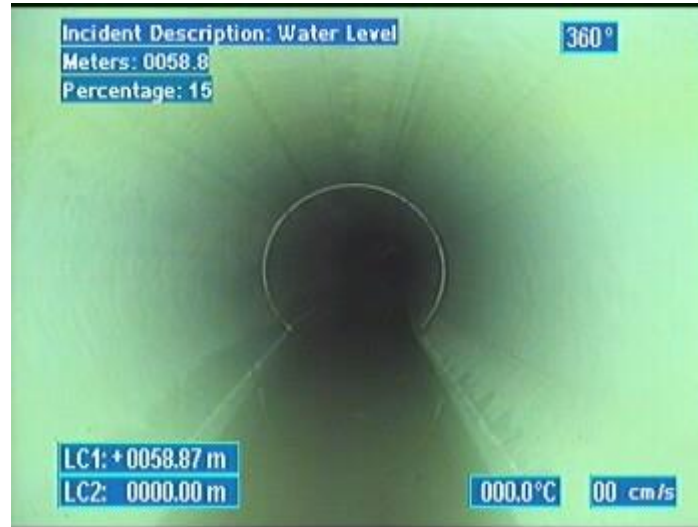
- **A weighted scoring system was adopted to assign probability scores to the inspected sewers.**
- **This system included the three criteria mentioned above.**
- **High probability scores indicate high likelihood of the sewer failing and implies that the sewer requires rehabilitation.**
- **Sewers with assigned probability scores more than 0.5 were included in the 10-year capital plan as they were considered to have relatively high likelihood of requiring rehabilitation.**
- **This threshold was confirmed by reviewing individual CCTV inspections sheets, their PACP ratings, defect's videos, photos, locations, severity and frequency of defects.**

# STRUCTURAL ASSESSMENT



# STRUCTURAL ASSESSMENT





### Sanitary Sewers Identified for Rehabilitation

Inspection ID	Pipe Segment Reference	Street	Upstream MH	Downstream MH	Pipe Size (mm)	Assigned Weighted Probability Score
3	001-45	55 Street	63	62	200	0.52
6	002-38	Easement N. of 49 Ave.	147	44	200	0.68
9	003-38	54 St. & 51 Ave.	44	43	200	0.52
10	003-45	55 Street	61	60	200	0.52
11	004-33	50 Street	30	22	200	0.64
24	005-45	54 Street	60	149	200	0.52
27	006-45	54 Street	149	148	200	0.52
33	008-38	53 St. & 52 Ave.	21	20	200	0.52
36	009-38	53 St. N. 51 Ave.	41	21	200	0.52
42	011-33	50 Street	141	134	200	0.52
44	013-38	53 St. & 51 Ave.	42	41	200	0.52
63	017-38	51 St. & 51 Ave.	29	28	200	0.52
67	018-38	51 St. N. 51 Ave.	28	24	200	0.52
70	019-38	51 St. & 52 Ave.	24	23	200	0.52
73	020-38	51 St. N. 52 Ave.	23	14	200	0.52
111	031-38	51 Street	155A	29	250	0.60
113	032-33	53 Ave.	13	12	250	0.52
124	035-38	48 Street	120	119	200	0.52
152	043-33	47 St.- 52 Ave.	33	32	200	0.52
155	044-33	47 St.- 52 Ave.	32	10	200	0.52
180	054-45	53 Ave.	102X	101X	250	0.36
182	055-45	53 Ave. & 59 St.	101X	174	250	0.56
196	057-45	53 Ave.	103X	102X	250	0.52
271	123-33	52 St. & 49 Ave.	135 A	135	200	0.52



# CCTV WEIGHTED PROBABILITY SCORES



## Sanitary CCTV Weighted Probability Score

- $\geq 0.5$
- 0.41 - 0.49
- 0.21 - 0.40
- No Structural Defects Reported
- Not Inspected
- Sanitary Manhole
- 11 Inspection ID

## Sanitary Sewer CCTV Inspection Results Summary

Insp ID	Pipe Segment Reference	Street	Upstream MH	Down stream MH	Pipe Size (mm)	Material	Total Length (m)	Assigned Weighted Probability Score	Defect Description
3	001-45	55 Street	63	62	200	Vitrified Clay Pipe	58.4	0.52	Broken Pipe - Point repair or Line
6	002-38	Easement N. of 49 Ave	147	44	200	Vitrified Clay Pipe	100	0.68	Light Cracks - Line
9	003-38	54 St. & 51 Ave.	44	43	200	Concrete Pipe (non-reinforced)	101.3	0.52	Broken Pipe, Aggregate Visible - Point repair @ MH 43 and Line, or Replace
10	003-45	55 Street	61	60	200	Vitrified Clay Pipe	115.8	0.52	Broken Pipe - Replace
11	004-33	50 St	30	22	200	Concrete Pipe (non-reinforced)	70	0.64	Light Cracks - Line
24	005-45	54 Street	60	149	200	Vitrified Clay Pipe	51	0.52	Sags and Joint Deflection - Point repair @ MH 149 and Line, or Replace
27	006-45	54 Street	149	148	200	Vitrified Clay Pipe	92.3	0.52	Moderate Cracks, Sags - Replace
33	008-38	53 St. & 52 Ave.	21	20	200	Concrete Pipe (non-reinforced)	70	0.52	Cracks, Aggregate Visible - Replace
36	009-38	53 St. N. 51 Ave.	41	21	200	Concrete Pipe (non-reinforced)	103	0.52	Collapsed Pipe, Aggregate Visible - Point repair @ MH 41 and Line, or Replace

## 10 YEAR CAPITAL PLAN

Based on direction from the Town, it was understood that approximately \$200,000/year is budgeted for sanitary sewer rehabilitation. We have reviewed the 24 segments identified for rehabilitation and provide the following 10-year capital plan based on defect severity and rehabilitation method.

### Sanitary Sewers Identified for Rehabilitation (2020)

Inspection ID	Street	Repair Description	Capital Cost
24	54 Street	Replace Entire Sewer	\$92,000
111	51 Street		\$87,000
63	51 St. & 51 Ave.	Point Repair (Line in 2021)	\$25,000
		Total 2020	\$204,000



*THANK YOU  
FOR YOUR  
ATTENTION*