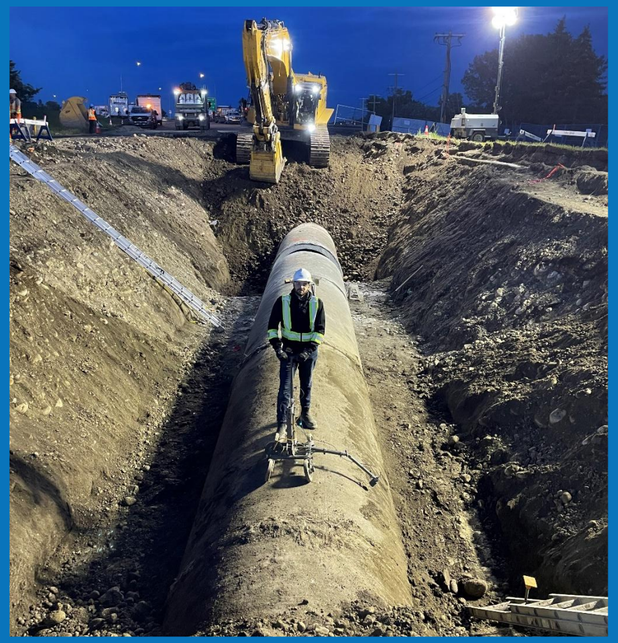


National Water & Wastewater Conference

November 2 – 5, 2025
Victoria Conference Centre, Victoria, BC

Looking back at Calgary's 1950mm (78") PCCP Feeder Main Failure

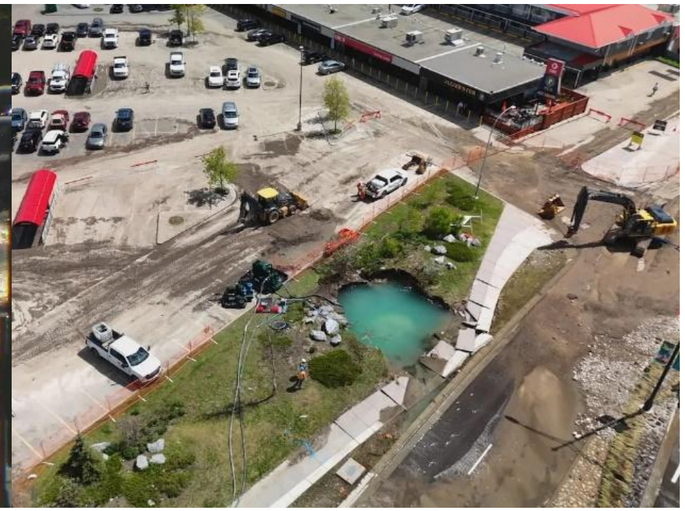
November 3, 2025

Presented by:

Justin Hebner
Pure Technologies Ltd., a Xylem brand

pure TECHNOLOGIES
a xylem brand

Recent PCCP Failures in Canada



AWWA C301 PCCP

- A prestressed wire is wrapped helically around the pipe and gives it the strength to withstand the pressure of the fluid inside.
- PCCP can range in size from 400mm (16”) to 6m (20’) diameter

Overall Performance of PCCP is Excelle

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Large Diameter = High Risk

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Technologies Available for Assessmer

Notable Evolutions to PCCP Over the Years

1942
First PCCP (LCP) is manufactured and installed to save steel for World War II

1952
AWWA C301-52 permanent standard introduced
Initial conservatism from 1949 standard was increased. This more stringent standard led to the manufacturing of stronger pipe.

1953
First installation of embedded cylinder pipe (ECP)

1960s
Competition in PCCP manufacturing increases

1964
AWWA C301 standard changed to allow reduced minimum thickness and higher stress in design; enabled Class II wire.

1970s
Competition results in shortcuts and exploitation of the manufacturing standard

1972
AWWA revised standard C301-72, allowing stronger steel wire; enabled Class III and Class IV wire.

1980s
Failures and loss confidence in product

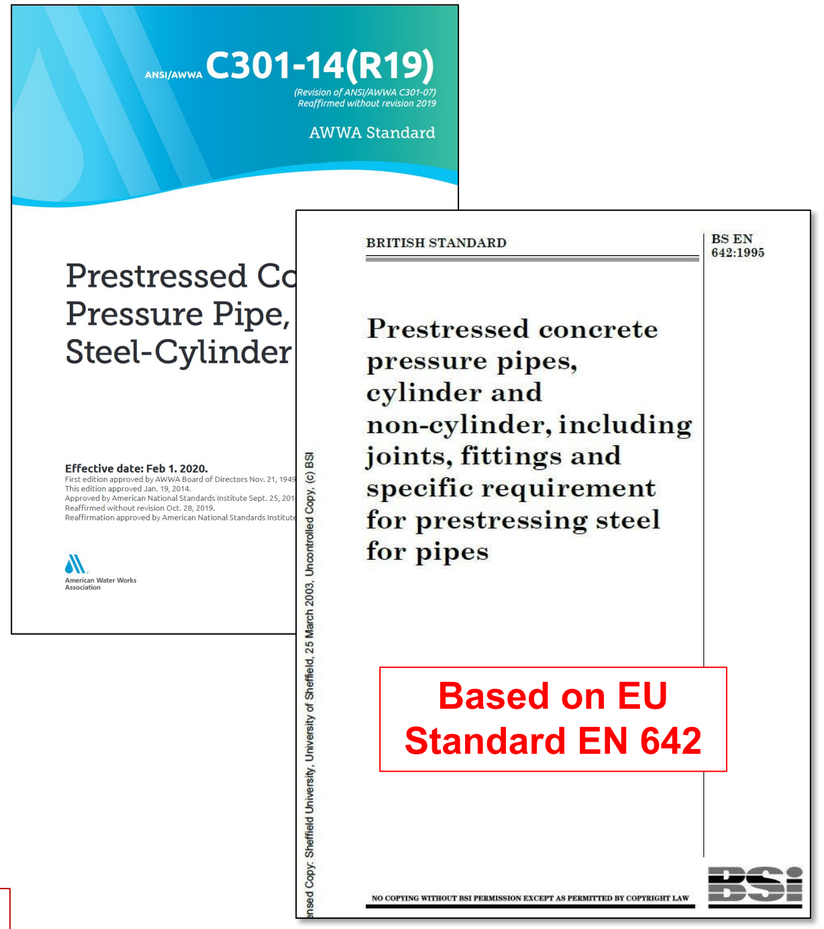
1984
AWWA revised standard C301-84, ending the provision for Class IV wire

1992
AWWA standard C304-92 increased the design basis complexity
Dramatically increased reliability of pipe manufactured from 1992 onward.

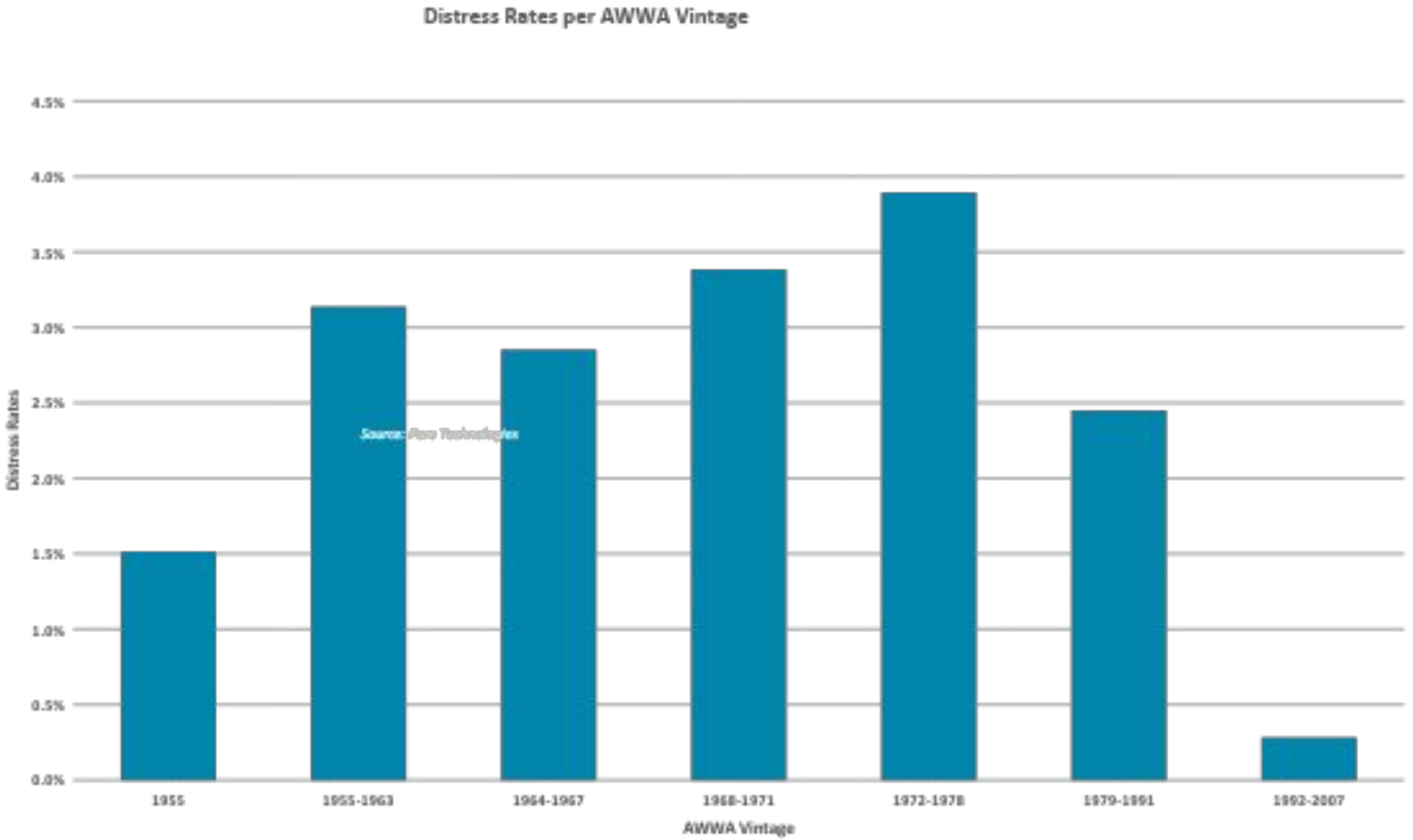
1995
British Standard BS EN 642-1995 introduced for Prestressed concrete pressure pipes, cylinder and non-cylinder

1997
Acoustic Monitoring introduced to “listen” acoustically for wire break events in PCCP

1997
Pressure Pipe Inspection Company (later Pure Technologies) develops electromagnetic inspection tools to detect broken wires in PCCP

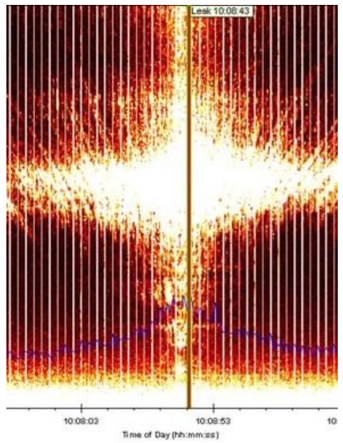


Average PCCP distress rates

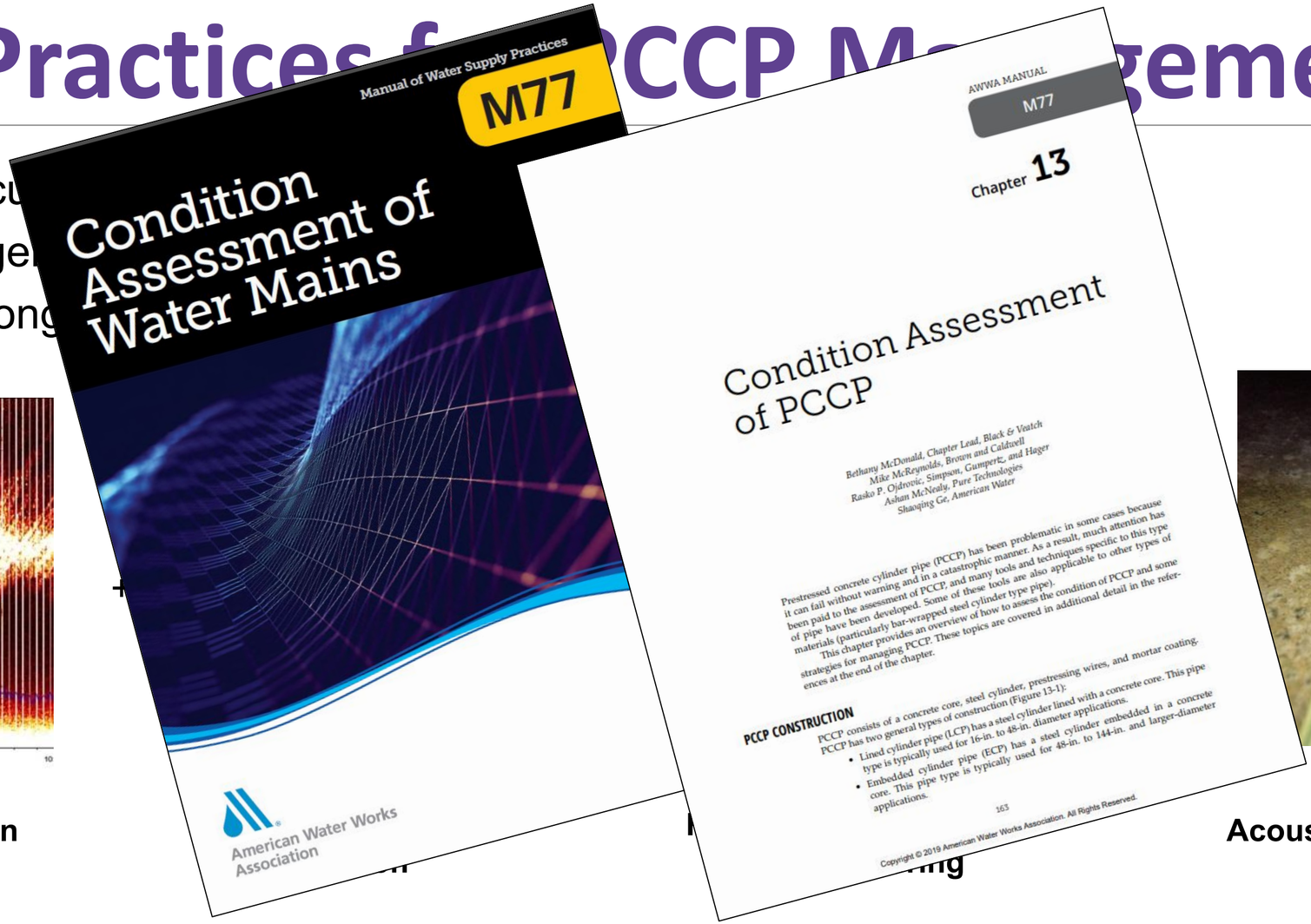


Best Practices f CCP M gement

1. Determine cu
2. Address urge
3. Monitor for ong

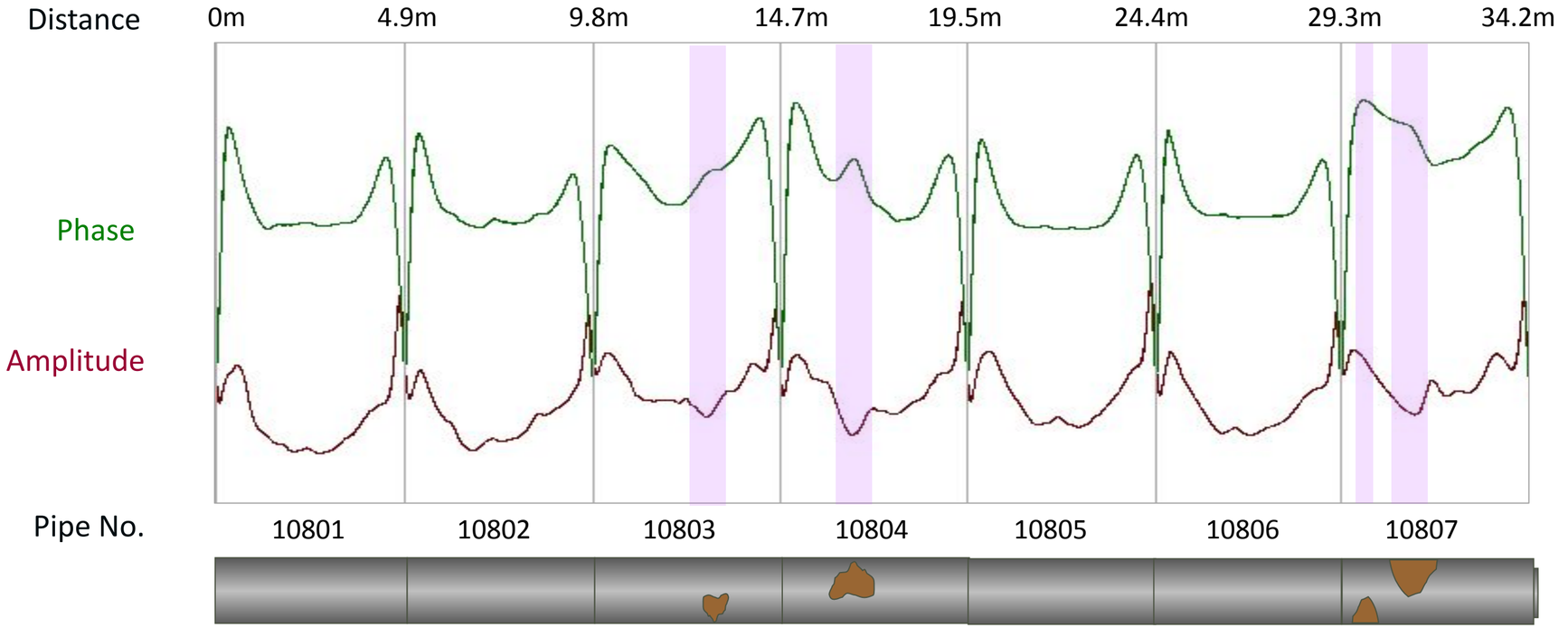


Leak Detection



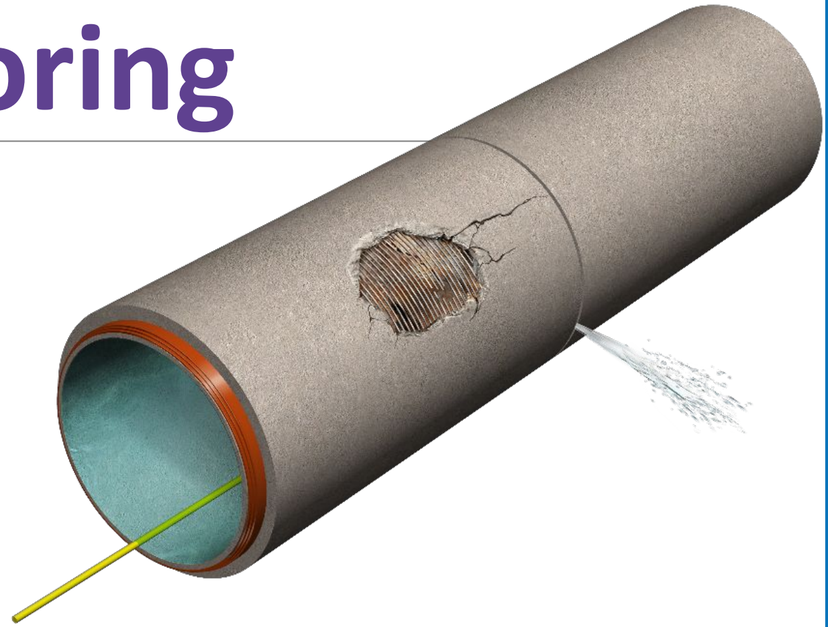
Acoustic Monitoring

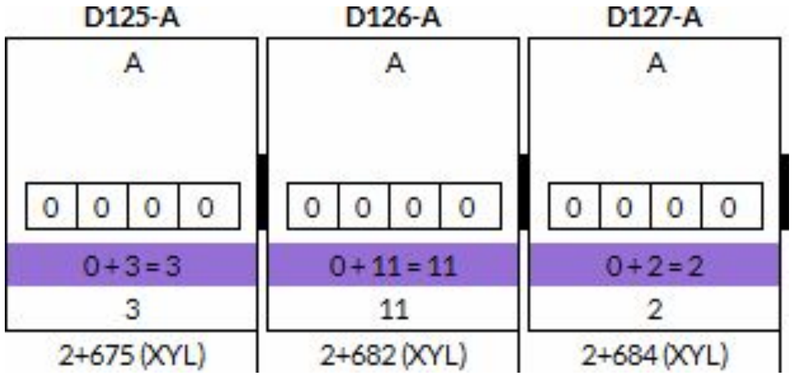
Electromagnetic Data Analysis

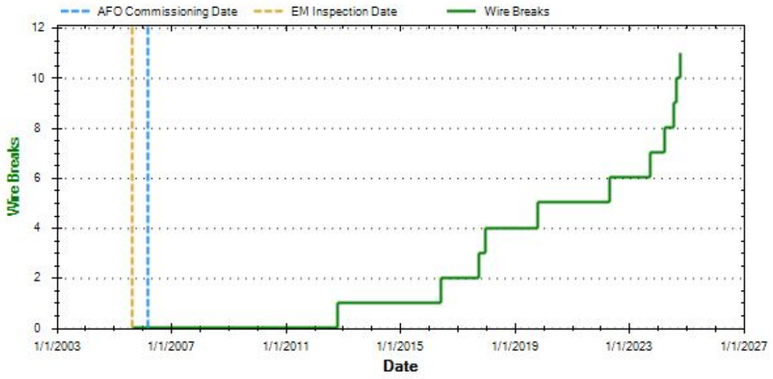


Continuous Acoustic Monitoring

- Electromagnetics provide a snapshot of PCCP distress
- Acoustic Monitoring detects Wire Breaks (WBs) in real time
- Use EM to get a starting point (baseline), then keep watching it with Acoustic Monitoring







Calgary Bearspaw South Feeder Main

Failure and Emergency Response

2024 Failure – Bearspaw South Feeder Main

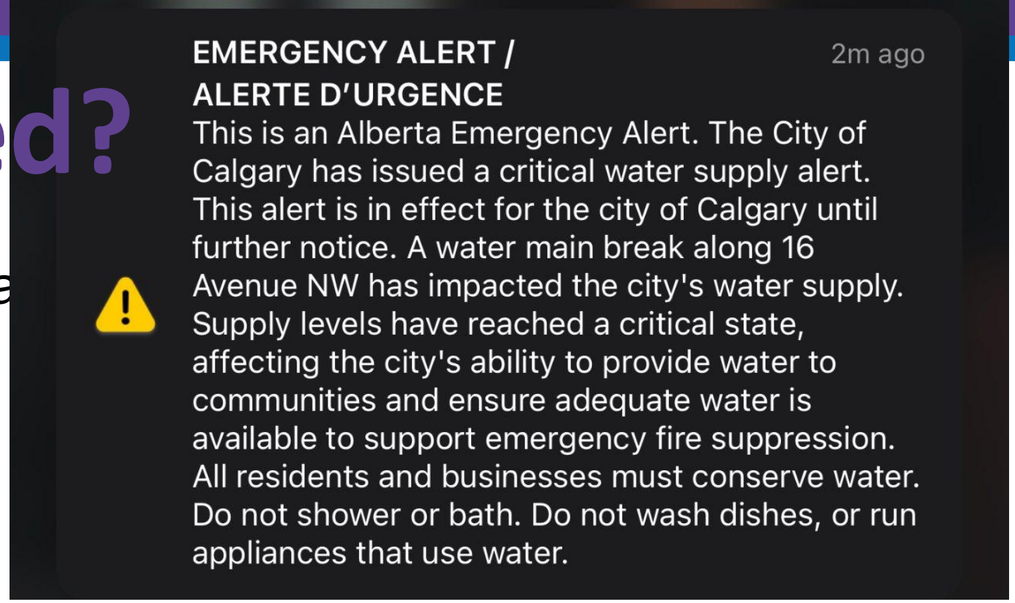
- On June 5, the 1950mm (78”) C301-E PCCP Bearspaw South Feeder Main failed
- Supplies up to 60% of City’s water – prompted Stage 4 Water Restrictions (53 days total)
- Condition assessment was scheduled for Fall 2024

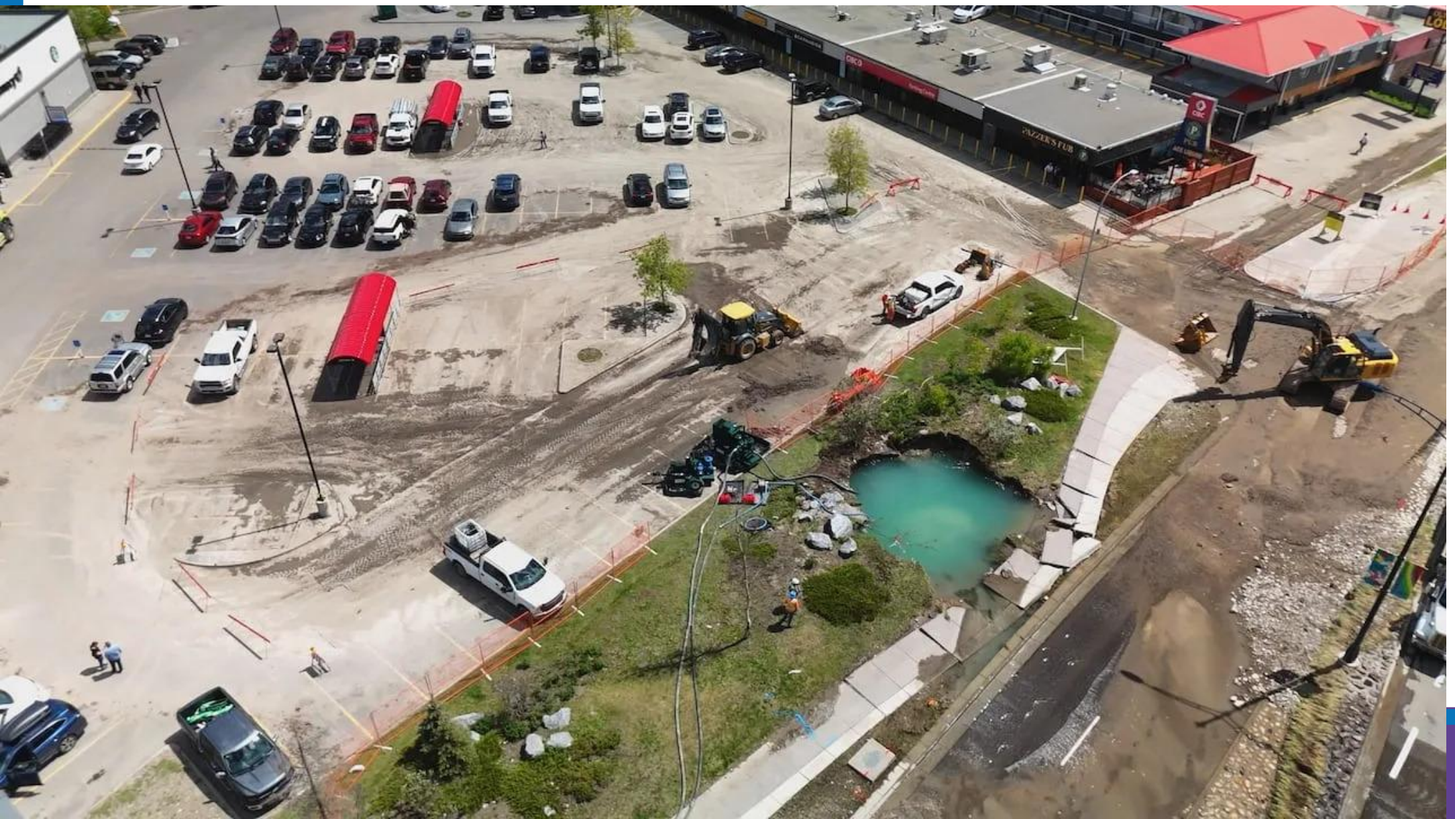
Timeline

Robotic Condition Assessment

What happened?

- June 5, 2024: BPSFM ca





What happened?

- June 5, 2024: BPSFM catastrophic failure.
- Week of June 17: failure repaired; 5 “hot spots” identified/repaired.

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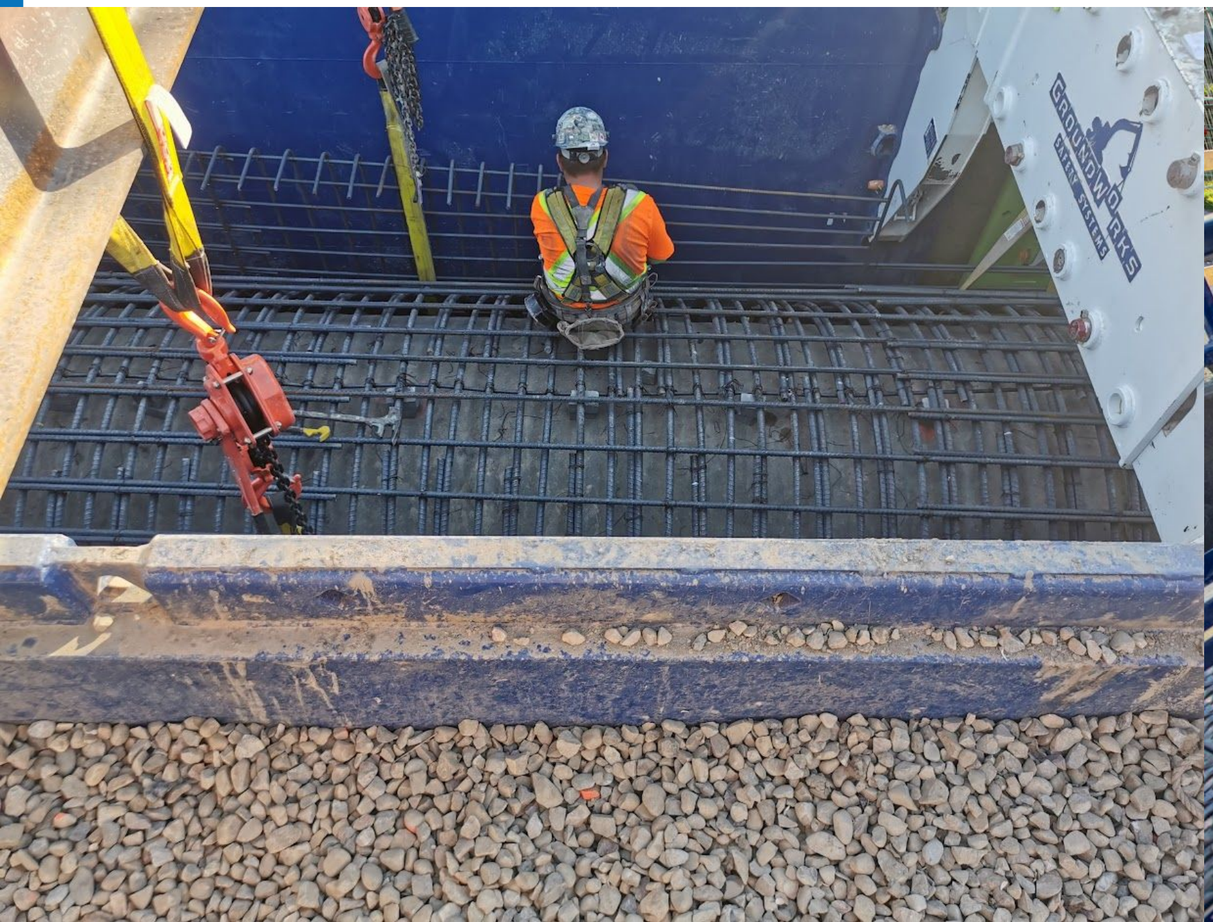


What happened?

- June 5, 2024: BPSFM catastrophic failure.
- Week of June 17: failure repaired; 5 “hot spots” identified/repaired.
- July 5: BPSFM brought back into service; more assessment and monitoring system installed.
- August/September: additional repair work on 21 segments (identified by PipeDiver).
- Mid-October: 2 additional 1500mm segments (identified by PipeDiver) repaired (29 total).

Timeline

Robotic Condition Assessment

PipeDiver Condition Assessment

AFO Monitoring (Stage 1)

AFO Monitoring (Stage 2)

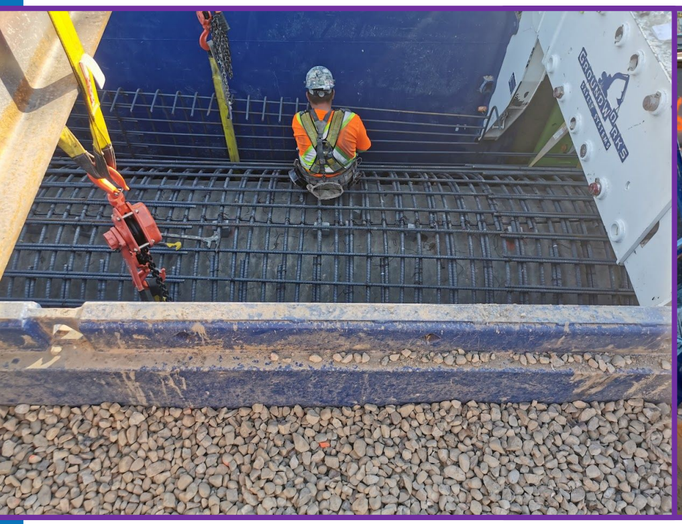
Going forward

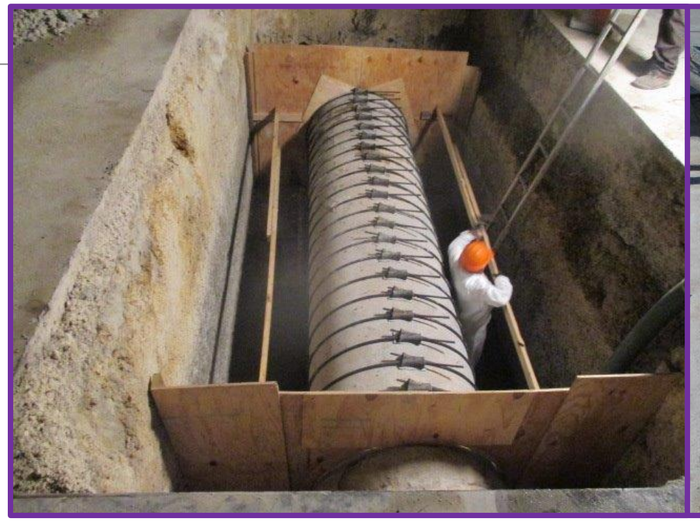
- 2024 failure leads to reconsideration of inspection efforts
  - Do not get complacent
  - Effort is worth it
- Make failures an opportunity (if possible)
  - Assess/Monitor as much as possible
  - Repair as much as possible
  - Review of preparedness for future emergencies
  - Collect as much info as possible (forensics)

How much?

23 locations

PCCP Repair Techniques





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