Striking a Balance in the North: How Edmonton Gets the Most from Its Water Transmission Main Condition Assessment Program

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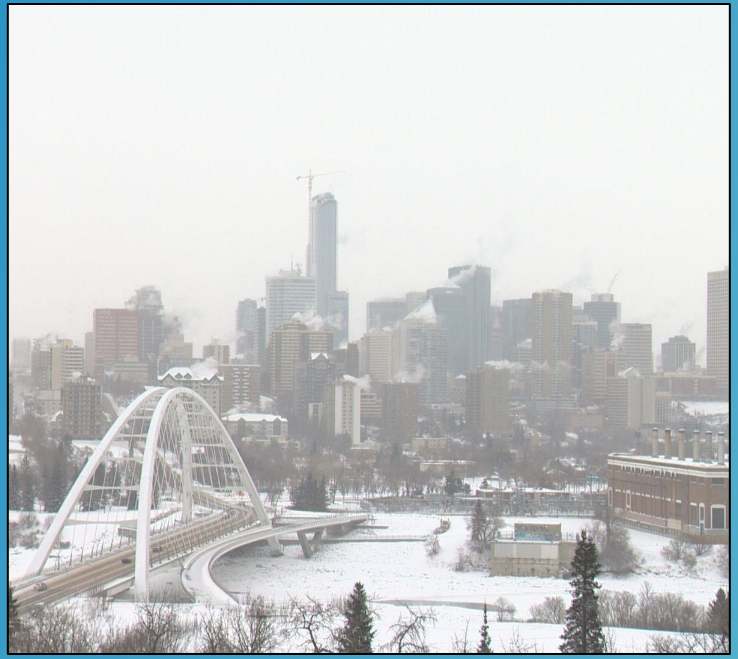
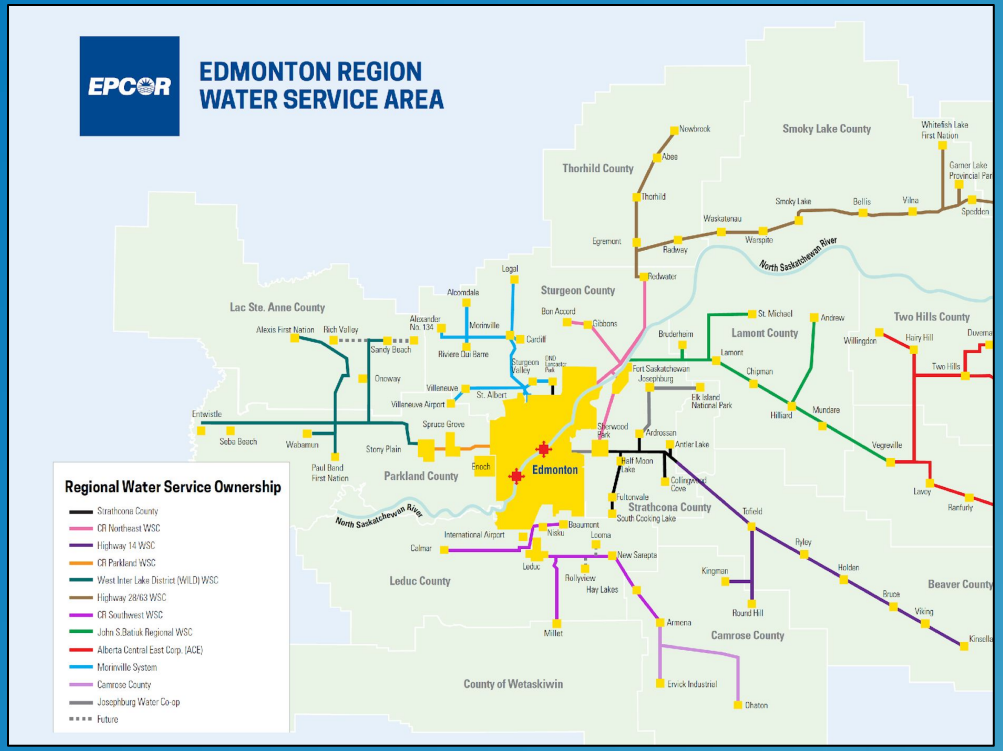
Edmonton, Alberta, Canada

- North America’s northernmost major city
  - 1.4 million ppl
- Below freezing for a third of the year
  - compresses the construction season
  - challenging for utility operation, maintenance and construction
  - coldest day in 2024 was -47°C (-52°F)
  - typical minimum depth of cover for buried pipe is 2.5 m (8.2’) to the crown of the pipe to prevent freezing and damage due to frost.



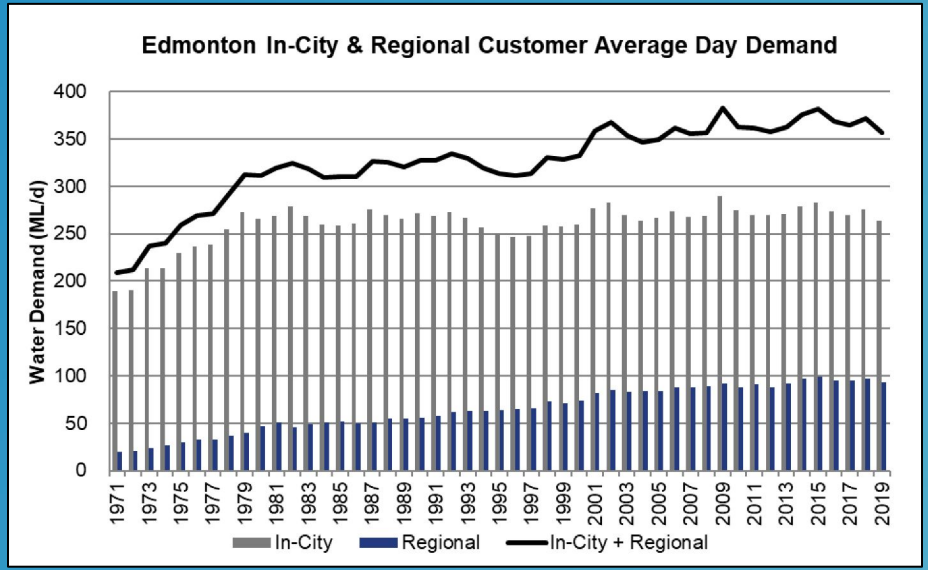
EPCOR Water Services (EWS)



- EWS provides water and wastewater service to over 1 million people in Edmonton area
- The water transmission system consists of ~510 km (320 mi) of water mains
- Range in size from 350 mm (14”) to 1525 mm (60”) in diameter

Edmonton Water Demand

- Regional (outside Edmonton) growth driving increased water demand
  - Population growth and an expanding service area



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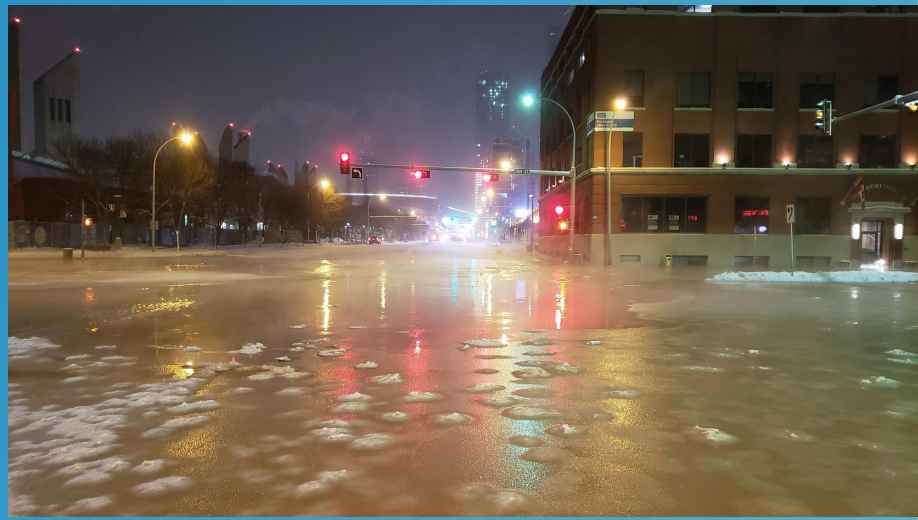
EWS WTM Condition Assessment Program

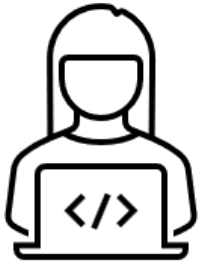
- The severity and consequence of transmission main breaks have been increasing
  - Repair costs alone can easily reach $1 million
  - Breaks with residual chlorine can result in a reportable environmental event
- Breaks have the potential to cause broader and longer impacts for customers
  - Reputational damage/societal costs



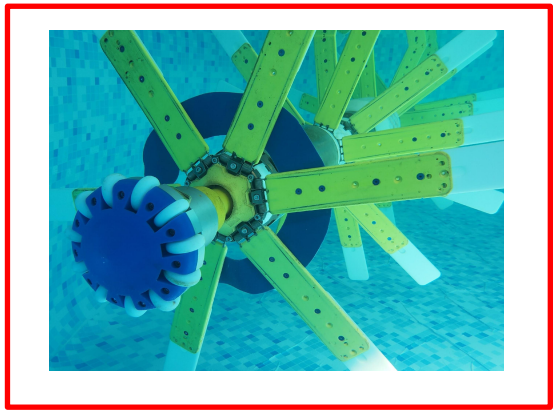
Edmonton Watermain Break (Source: Global News)

EWS WTM Condition Assessment Program

- EWS considered the following options to address the need to determine better likelihood of failure for the mains:



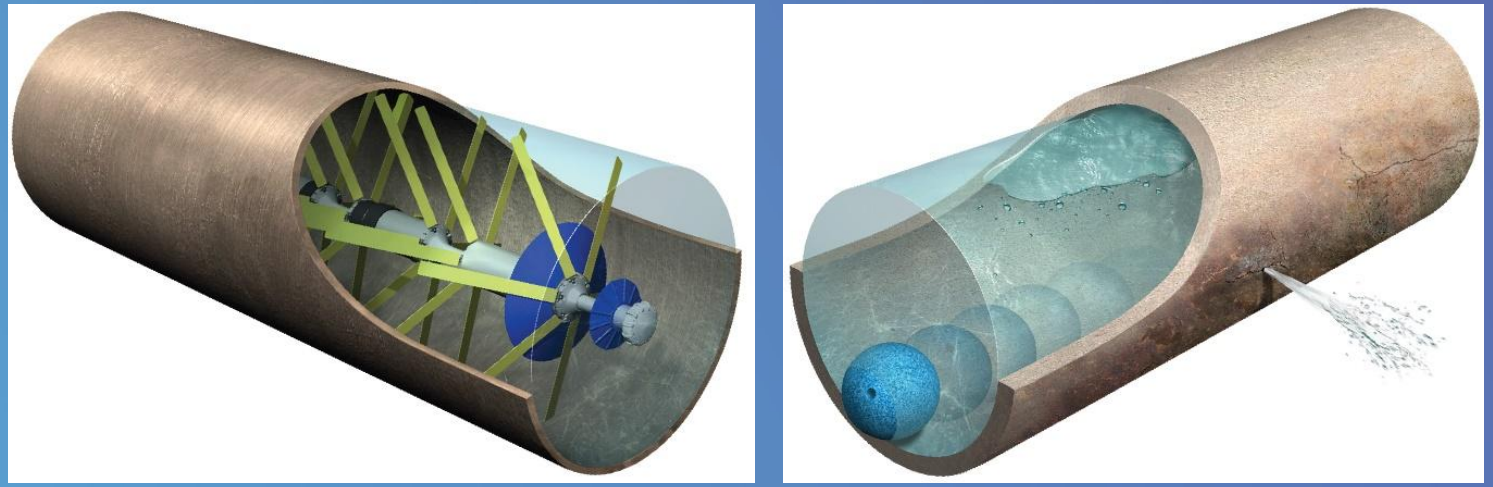
Desktop



Inline Inspections

Run to Failure/
Emergency Repair

Inline Inspection tools



Inline electromagnetic (left) and acoustic (right) free-swimming inspection tools

WTM ILI Risks & Mitigation

Risk	Risk Mitigation
1. **Financial – Inspections not able to be executed due to inoperable valves or flow control.**	- Valve inspections are completed before inspections are executed. Valves will be repaired if needed or other projects will be chosen. - Hydraulic modelling will be completed prior to inspection and flow testing will be completed. - Planning meetings and a site visit with the contractor prior to the inspection will be completed to confirm operating conditions are suitable for inspection.
2. **Financial and Operational Disruption – Tools becoming stuck in mains, leading to shutdowns.**	- Detailed investigation of the main and as-built drawings prior to the tool run will be completed. - Planning meetings and a site visit with the contractor prior to the inspection will be completed to confirm pipeline in-situ conditions are suitable for inline inspection. - EWS will preemptively run a small tool through the main prior to the larger tool runs to identify any issues that could arise.

WTM ILI Planning

- Each year, EWS usually plans two weeks in the Spring and two weeks in the Fall to prepare and inspect its water transmission main network.
- Planning is detailed and preparation typically includes construction of new launch and retrieval points.
- EWS creates access points by wet tapping the main and installing a 400 mm (16”) valve to allow for live tool launch and retrieval – no line shutdowns are required for the preparation or inspection.

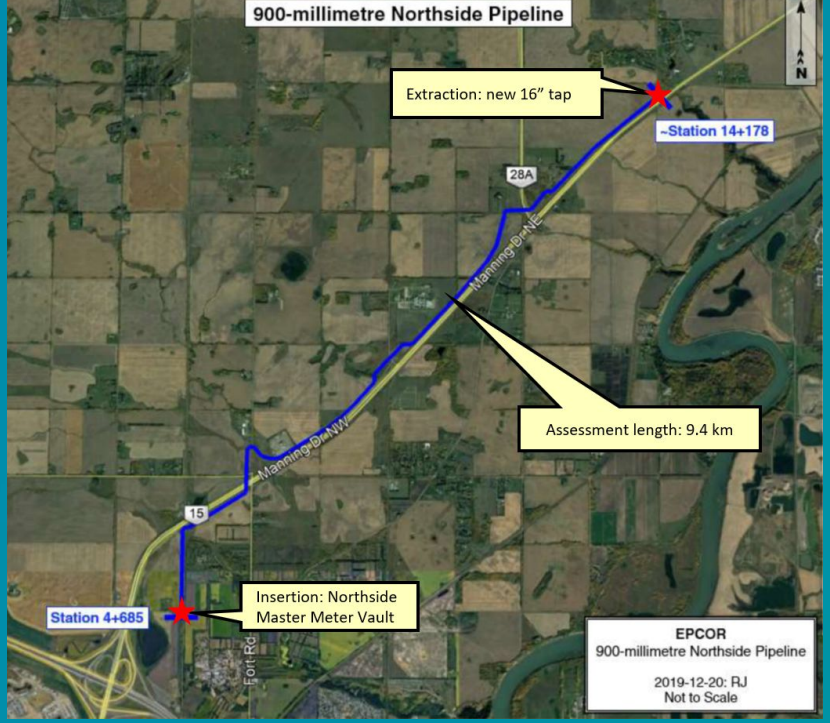
Wet tap with launch tube (left) and insulated retrieval/extraction tube (right)

WTM ILI Challenges

EWS WTM Condition Assessment Program Results

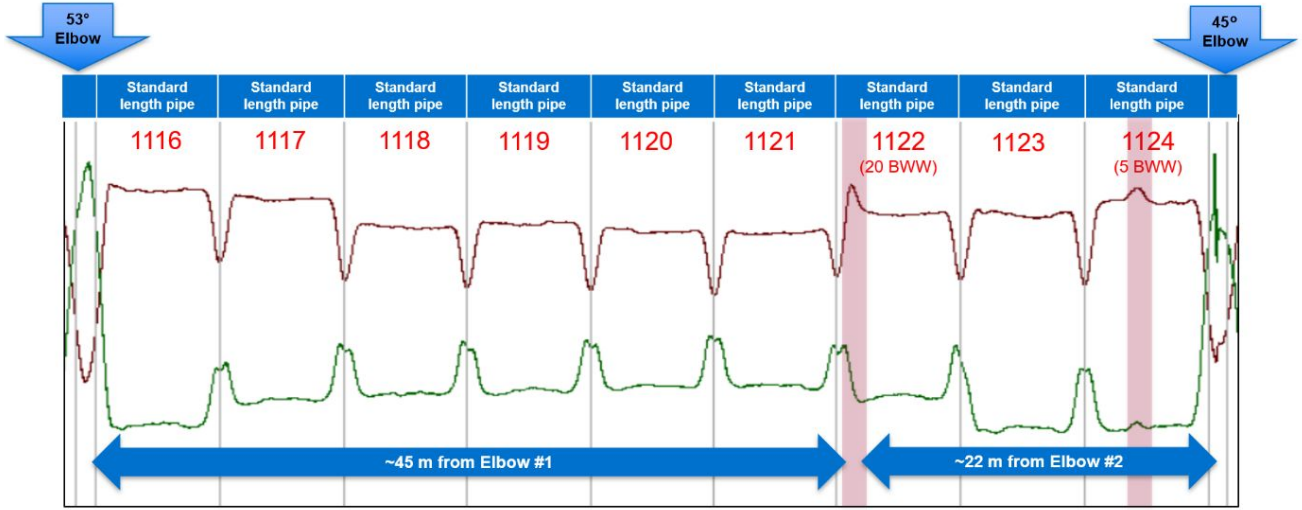
Date	Distance (km)	Diameter (mm)	Material	Inline Inspection Type	Results
2019-Nov	9.42	900	C301 PCCP	Pipe wall defects and leak detection	-10 distressed pipe sticks -3 leaks
2020-Nov	1.13	1050	C303 BWP	Pipe wall defects	-4 distressed pipe sticks
2021-Oct	14.32	1050/750	C301 PCCP C303 BWP	Pipe wall defects and leak detection	-2 distressed pipe stick -4 leaks
2023-Apr	3.63	1050	C303 BWP	Pipe wall defects	-14 distressed pipe sticks
2023-Oct	3.77	1050/750	Steel	Pipe wall defects and leak detection	-1 pipe wall defect -1 pipe wall dent -16 pipes out-of-round >5%
2024-Nov	5.42	750/600	C301 PCCP	Pipe wall defects and leak detection	-0 defects or leaks
2025-Mar	9.42	900	C301 PCCP	Pipe wall defects and leak detection	-7 distressed pipe sticks -3 leaks
2025-Dec	5.3	750	C301 PCCP, C303 BWP, Steel	Pipe wall defects and leak detection	TBD
Total (annual avg.)	**52.4 (8.7)**				

2019 Pilot Project



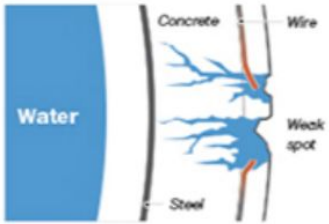
Pipeline	Diameter/ material	Inspection distance (meters)	No. of pipes inspected	Pressure (psi)		Pipes with broken wire wraps (BWW)	Leaks
Northside Pipeline	900mm/ C301-L	9,416	1,361	Min	47.7	10	3 (1 joint, 2 barrel)
				Avg	57.6		
				Max	66.6		

EM Inspection Data



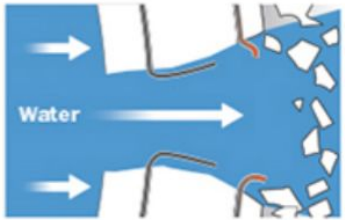
1.

Most commonly, the mortar coating cracks, either through mishandling, accident, poor manufacturing, erosion, or just age.



2.

Water seeps in and corrodes the wires. Wires break, creating a weak spot.



3.

Internal water pressure overwhelms the concrete core. The steel gives way, and the pipe bursts.

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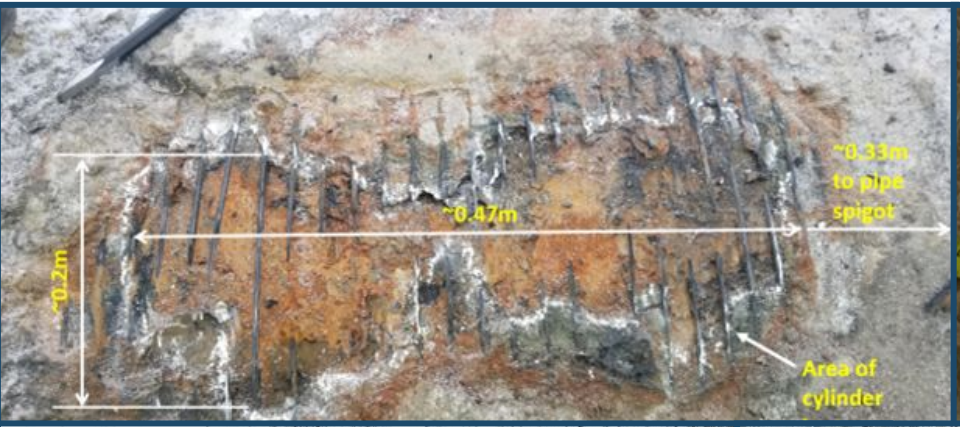

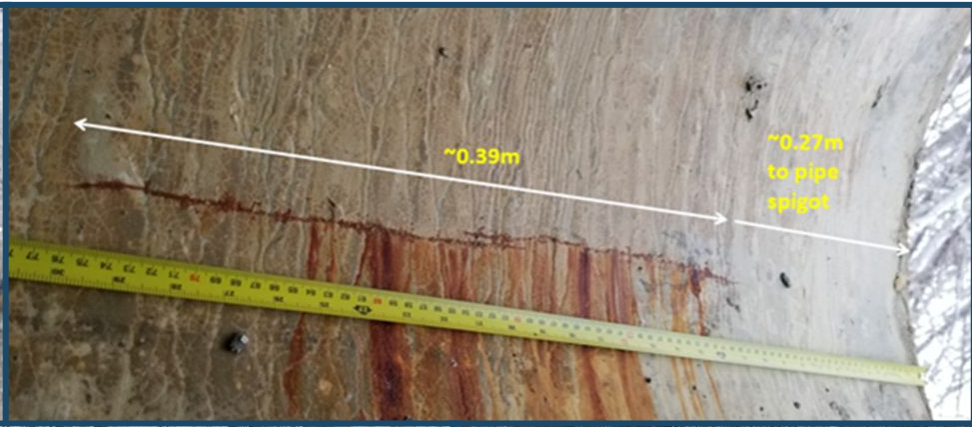

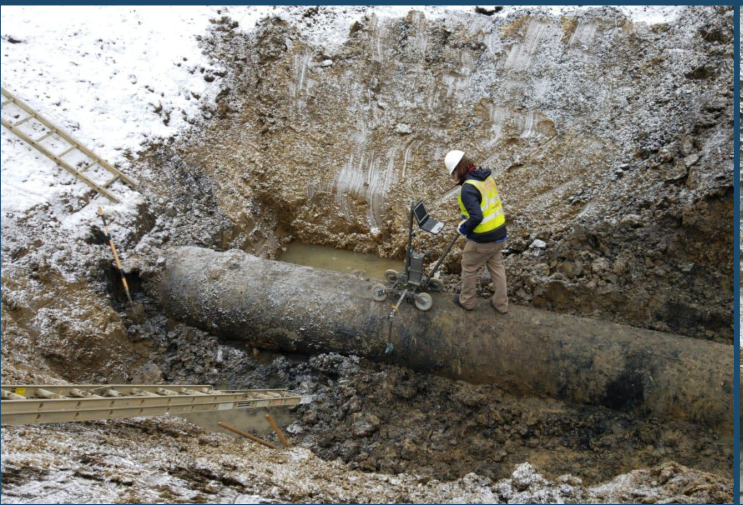

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Conclusion

- EWS' program prioritizes its water transmission mains for inline inspection to evaluate the condition, determine where repairs are required and reduce the number of breaks
- EWS' current plans are to accelerate the inspection program to complete 2 inspections per year until all critical mains have been inspected.
    - Once complete, a re-inspection schedule will be created based on the recommendations from the original inspections, while updating the risk model and adding any new identified mains to the list.
- Utilizing inline inspection technologies provides EWS with high-resolution condition data and helps the program overcome unique challenges present in North America's northernmost major city.

Thank You & Questions

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