In-Line Condition Assessment of Small Diameter Pipes While They Remain in Service

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Investigator™ Technology

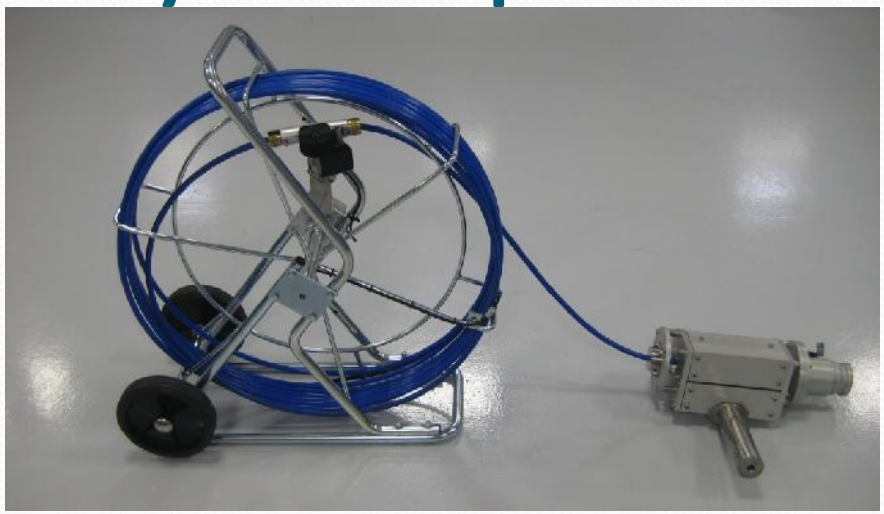
- Simplified pipeline condition assessment technology
- Designed for distribution mains
- Non destructive inspection
- No disruption to service
- Single pass acoustic, CCTV video and sonde mapping
- In-line system increases accuracy

Advantages

- Eliminates needs for excavations
- Eliminates replacement/lining of pipes that are still in good condition
- Allows for comparison of pipeline degradation over time
- Provides understanding of actual pipe condition

Investigator™ Operation

Key Components



- Cable & drum
- Hydrant attachment
- Built in disinfection chamber
- Motorized feed/retrieval drive
- Acoustic/video/tracking head

- Operator control case with acoustic/CCTV video/sonde tracking software

Hydrant Entry

Saint Sauveur

- Remove the stem and base of hydrant
- Insert launch tube
- Put on protective plate
- Adaptor and drive shaft attached
- Hydrant valve opened
- Inspection head inserted through barrel and into distribution main

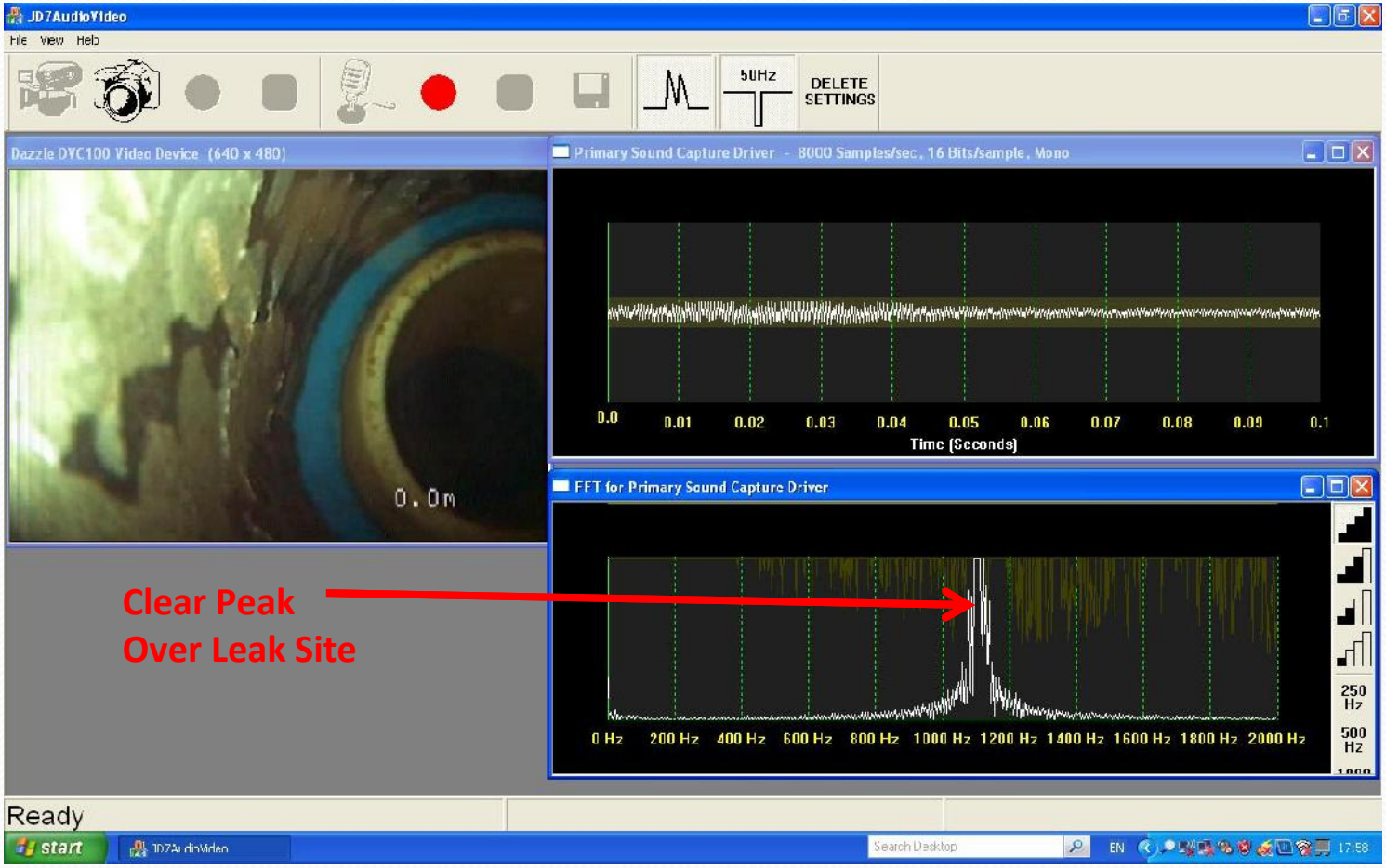
Pipeline Inspection

- Operator is in control at all times
- Operator has “eyes and ears” in the pipe
- Operator has ability to navigate inspection head and stop to look at features
- Inspection typically occurs during pull back

Dollard des Ormeaux

Operator Control

Simultaneous Video and Acoustic



Technical Specifications

	Investigator	Investigator Plus
Pipe Material	Any	Any
Typical Pipe Diameter*	3” – 12”	12” – 24”
Tap Requirement	Hydrant	1.5” internal diameter
Minimum Flow	0 ft/sec	0 ft/sec
Maximum Flow	Not Applicable	Not Applicable
Maximum Pressure	170 PSI	170 PSI
Inspection Distance	330 ft (660 ft bi-directional)	330 ft (660 ft bi-directional)
Degrees of bends	>270	>270

* Base Investigator unit is capable of inspecting large diameter pipelines, however camera view may not display entire circumference of pipeline. Investigator Plus system requires taps.

Ideal Scenarios for Investigator

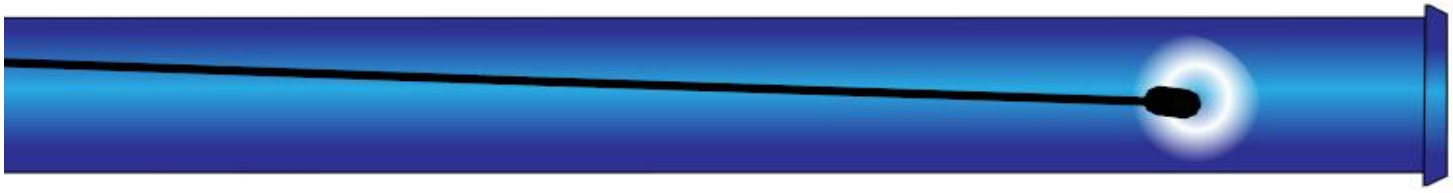
- Visual inspection of lines are vital in determining rehabilitation priority, inspect before:
  - relining
  - warranty lapses
  - repaving road
- Failed hydrostatic pressure test
- Inspection under roadways or under river passing's.

Condition Assessment

Know What's Inside Your Pipe

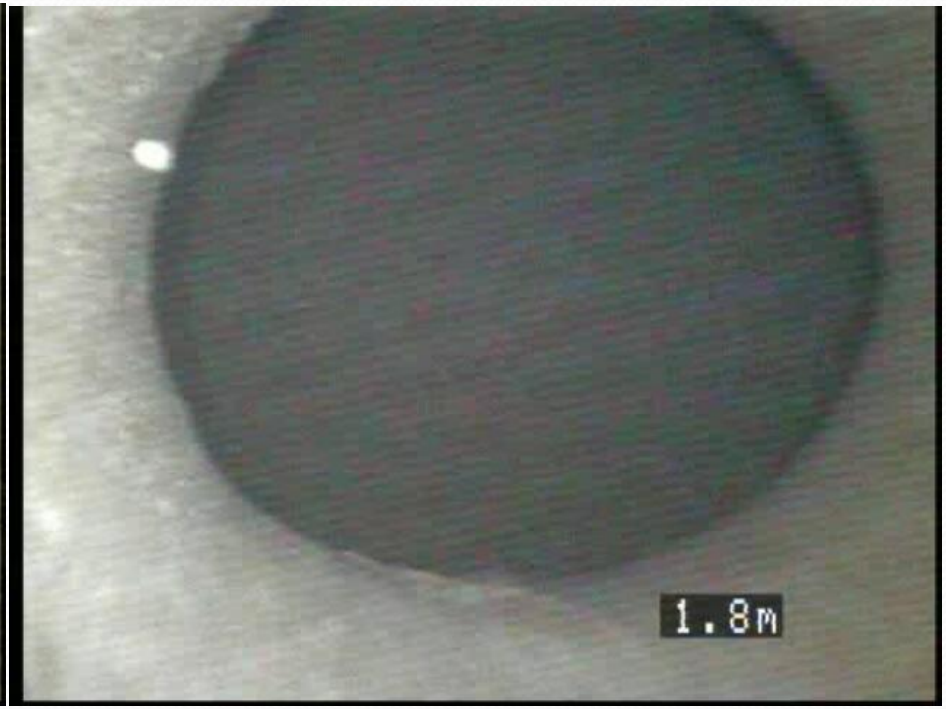
Investigator can identify:

- Closed valves
- Lost valves
- Lost tools
- Undocumented air release valves
- Undocumented drain valves
- Undocumented valves
- Illegal service connections
- Undocumented junctions
- Pipeline direction
- Pipeline material
- Improperly installed liner
- Improperly repaired cracks
- Diameter changes
- Corrosion
- Pipe blockages & flow restrictions
- Improper backfill
- Damaged pipe joints
- Damages service connections
- Leaks
- Damaged pipe walls
- Air pockets
- Screw plugs
- Hardwood dowel repairs
- Operability of valves
- Tuberculation levels
- Debris accumulation



In-Line Asset Locating

Closed gate valve

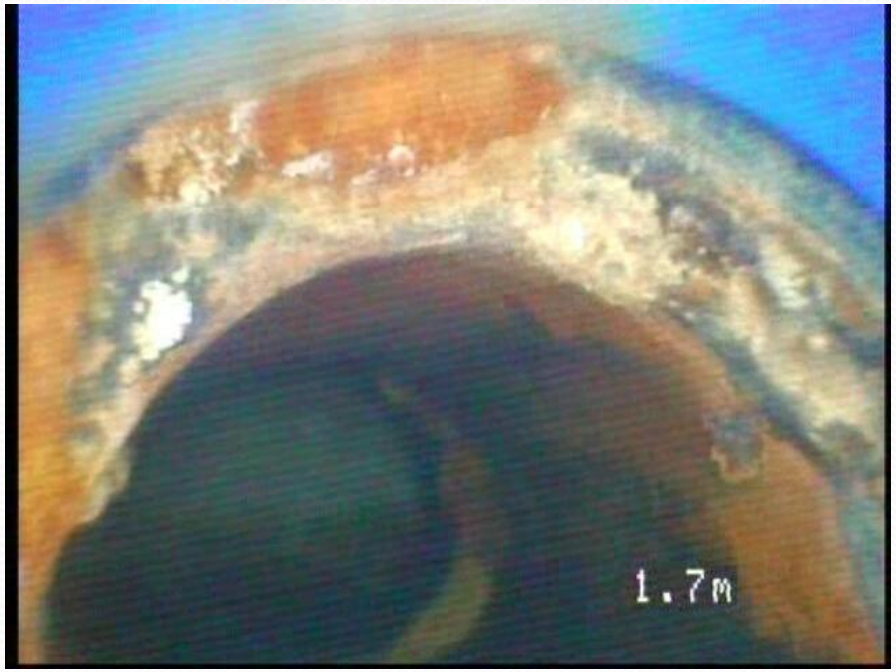


Identification and location (GPS) of undocumented valve

Tuberculation and Flow Restrictions

Severe flow restrictions due to late stages of tuberculation build up.
Leads to pressure loss.

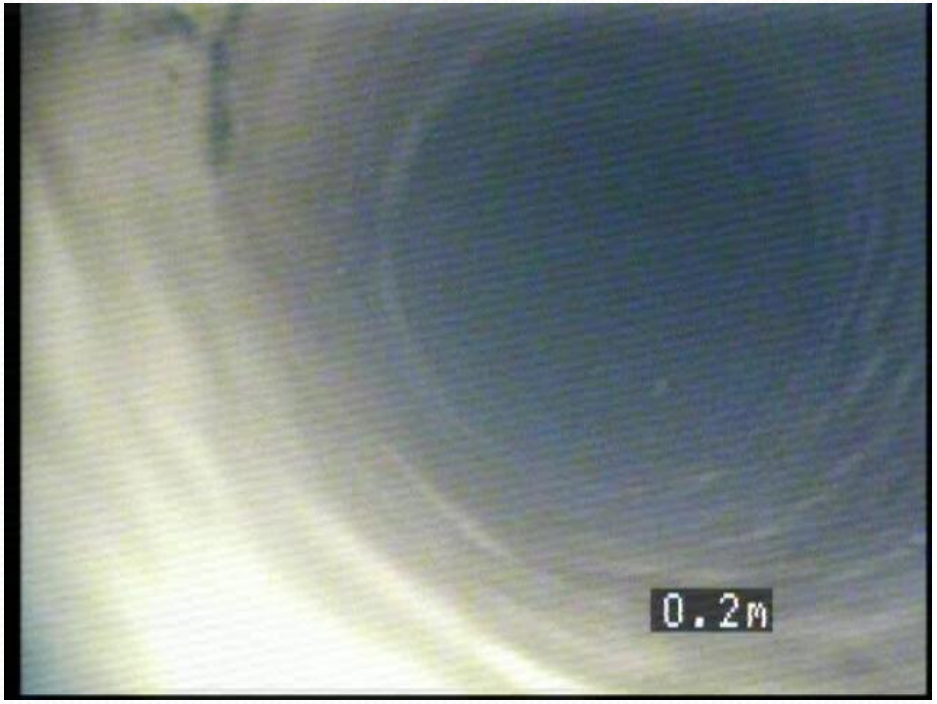
Joint Inspection



Corrosion at cast iron pipe joint

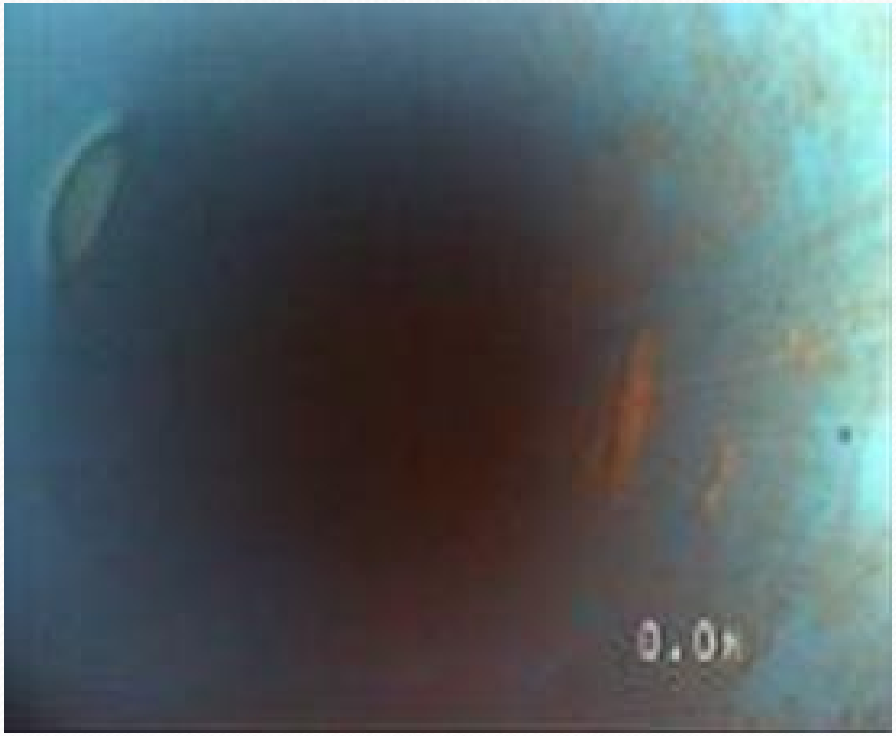
Clean joint verification

Liner Inspection



Post liner quality inspection and verification.
Prioritization of pipelines to rehabilitate.

Validating Leaks with Investigator



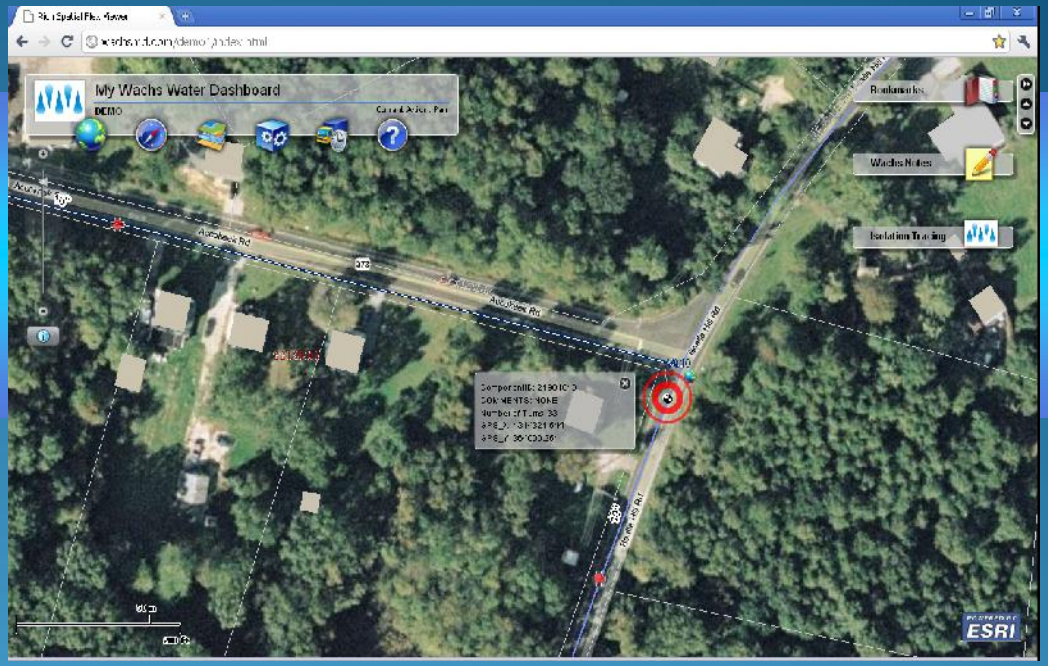
Tap located and confirmed not to be a leak

Change of material confirmed not to be a leak as identified by correlation

System Mapping

- Critical for accurate uni-directional flushing plans and hydraulic modeling
- Confirmation of as-built drawings
- Pre-construction planning
- Emergency shut-down planning
- Asset mapping of PVC pipe can only be done from inside of pipe

Reports & Outputs



Condition Assessment Information

- Full data report on inspection process, location and findings
- Tuberculation accumulation grading
- Video and audio provided on CD/DVD
- **Engineering Report Supplied by Genivar in French**

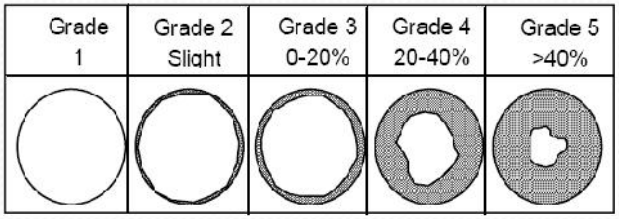
Internal Assessment Report 2 OF 3

Client:	ACBAR	Reference
Scheme:	ICEPIGGING	JD7AG010

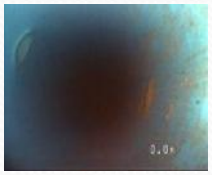
Under Pressure CCTV Inspection DIRECTION 1:

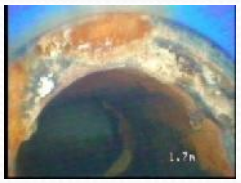
Comment and Recommendations:

Main inspected in one direction.
Heavy debris and moderate build up in entry point (shown above). Main inspected to 23 metres approximately and is in good general condition, but with areas of slight loose debris and moderate to heavy loose sediment in places.



GIS Integration





- Clickable GIS pipeline attributes
- GPS coordinates of insertion points
- Electronic and acoustic MPEG links
- Confirmation of distance inspected from location points

Lessons learnt

- Going through side of hydrant
  - By the time you reach the main you have gone through 270° of bends minimal distance can be travelled (~ 20 – 30 m)
  - Good solution for short distances
  - Less utility preparation
- By inserting through top of hydrant
  - Inspect longer distances
  - Increased productivity

Lessons continued

- Not all pipes can be inspected
  - Tuberculation
  - Design of lead into main
  - Number of bends
  - Distance dependent on internal condition
  - Cloudy Water

To ensure efficient insertions

- Site visit to be perform several weeks in advance
- Launch tubes sent to Utility before start of project
- Need to borrow base of hydrant(s)
- Water Utility must prep and dismantle hydrants
  - Perfect time to clean the stem and operate hydrant
- Should have at least 2 hydrants with insertion tubes ready to go

Completed and Ongoing Projects (in Canada)

- Dollard des Ormeaux
  - Planning on repaving road within 2 years
  - 5 insertions
  - 90m on one insertion
  - Identified significant build up of tuberculation on "T"
  - Validated one line in need of flushing
  - Genivar providing final report

Saint Sauveur

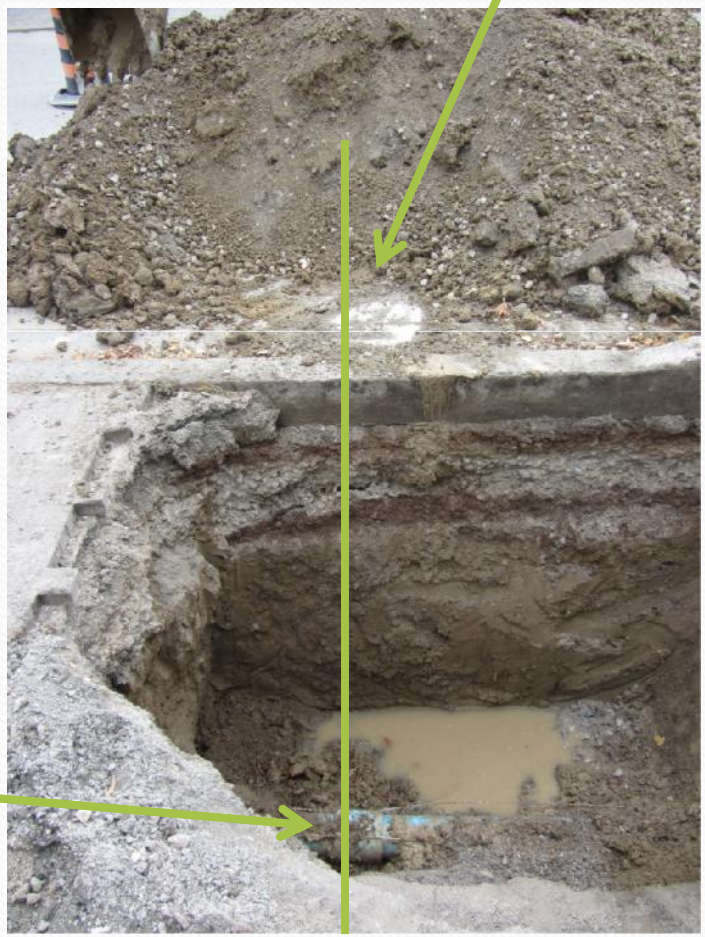
- Concerned about hydraulic model
- Performed 9 insertions
- Found significant tuberculation in area in question
- Main lines were in good shape (little tuberculation)
- Work performed in concert with Genivar

Failed Hydrostatic test in GTA

- 20+ insertions covering 4 km+
- Found 3 leaks within first 2 days (2 – 25' apart)
- PVC pipe
- Contractor spend 5 weeks finding 4 leaks (had to excavate)
- Leaks were 2 – 3m deep and one at a vault in an intersection.
- Found misaligned joint

Leak 1, 2m Depth, 75 PSI, Located Under Driveway, Sonde Location within 4 Inches

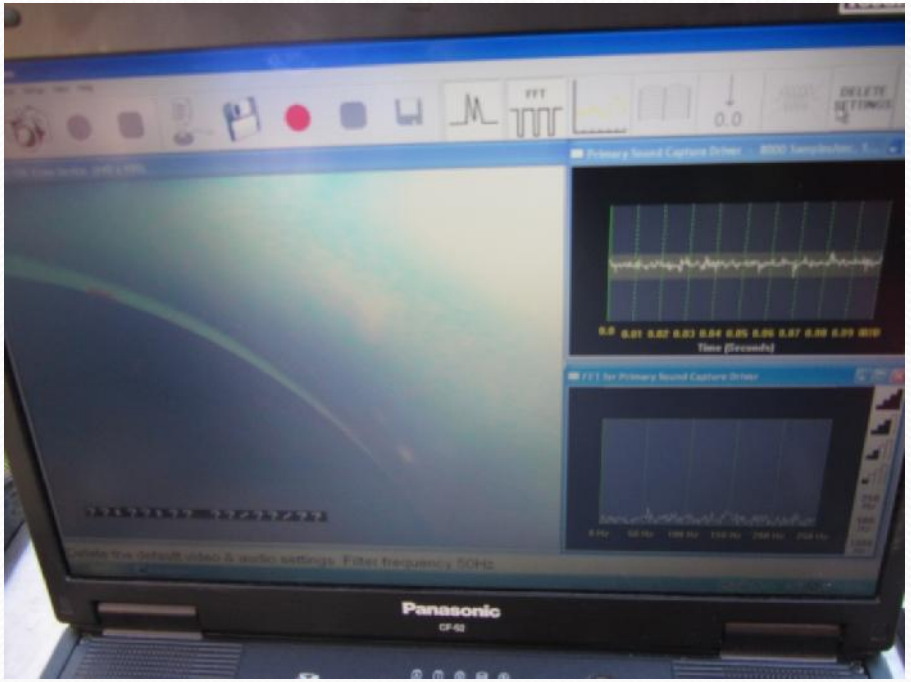
Leak 1 - Continued



Leak 2, 2m Depth, 75 PSI, Approximately 20 ft from Leak 1, Sonde location within 6 inches

Leak 3, 3m Depth, 75 PSI, Middle of Busy Intersection

Sonde accurately identified location of leak on busy intersection near vault.



Leak detected by acoustic sensor (right graphs) and visual confirmation at joint via CCTV (left).

Leak 3 Continued

Crews made immediate repairs once leak locations identified by Wachs Water Services

Future inspections in 2011

- Longueuil, QC
  - 7 insertions looking for tuberculation
- University Campus in Ontario
  - 20+ insertions on chilled water lines
  - Looking for sedimentation
  - Video inspection is key

Regardez avant de creuser!

Questions?

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