

Cimco-GC SYSTEMS

Sound Strategies

Pipe Condition Assessment and Water Loss Prevention Techniques

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Washington State Department of Transportation (WSDOT) announced that both northbound lanes of US 395 will remain closed through the weekend. The goal of this extended closure is to allow time for asphalt to be replaced at the scene once repairs are completed.

Source: KHQ.com





Update: 08/06/2025

Crews worked through the night to repair a water main break near the 8300 block of East Mercer Way. Water service has been restored to approximately 50 affected homes. This break required replacing a section of pipe, which is complex and time consuming to repair. The main has been flushed and the water is safe to drink; there may be some discoloration at first and it should gradually improve. Impacted

Your pipes are worse than you think…

- Information is knowledge. Knowledge is power
- Most metallic pipes in the Pacific Northwest are reaching the end of their service life
- A water main breaks every two minutes in the US
- **How do you know the condition of your pipes?**



Main break leaves residents without water

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Puyallup, Washington



40+ years in water systems



Technical support



Valve maintenance, troubleshooting, startups



Pressure reducing valves and stations

How we support your region



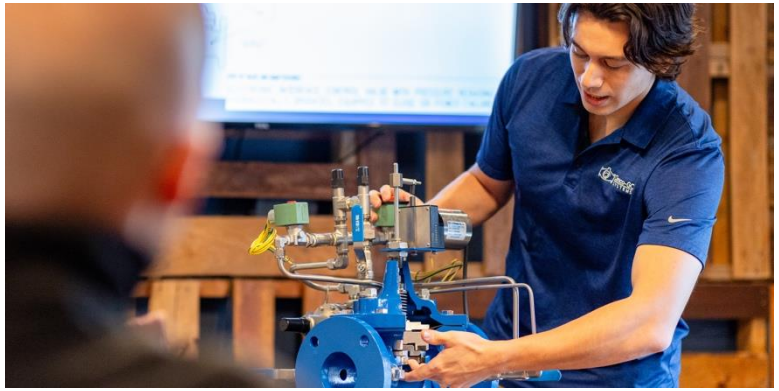
Engineering/Design Support



Troubleshooting



Price and availability



Outside Sales Support



Only factory-authorized Cla-Val Service Team in WA, OR, ID and AK



Inventory: parts, pilot, valve bodies through 8”

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CLA-VAL

Cimco-GC PACKAGED SYSTEMS

Copperhead INDUSTRIES

ECHOLOGICS a MUELLER brand

Thunderline Link-Seal Modular Seals

Garlock RANGER II

GPT an EnPro Industries company

HARCO

HYDRO-GUARD a MUELLER brand

IPEX by aliaxis

MAXADAPTOR ONE&DONE

SAFE-T-COVER

TEMPO COMMUNICATIONS

VAL-MATIC

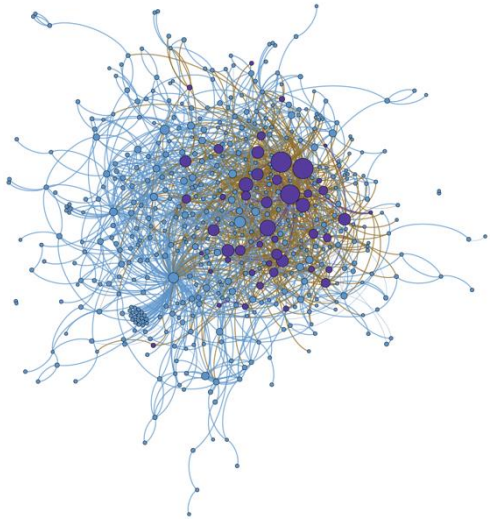
Agenda for Today

1. Intro to Cimco-GC Systems
2. Pipe Condition Assessment
3. Pressure and Flow Monitoring
4. Managed Monitoring with Acoustics
5. Case Studies



Pipe Condition Assessment

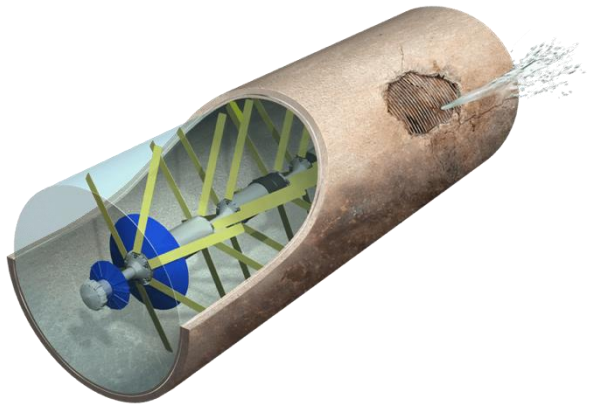
There are many options for condition assessments



AI pipe modeling



Acoustic assessment



Xylem pipe diver

Inspection with robot, diver, pig, CCTV



Potholing / Sampling

Least invasive ⟷ Most invasive

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Pipe Condition Assessment

The Worst Option:

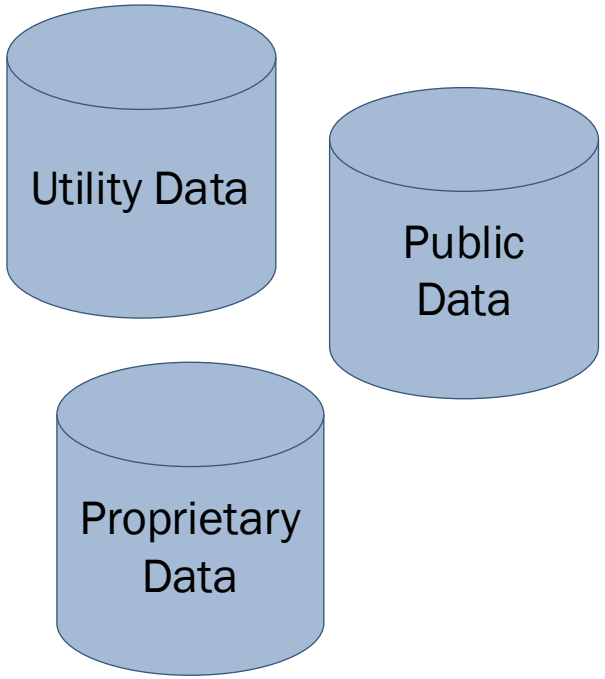
The News

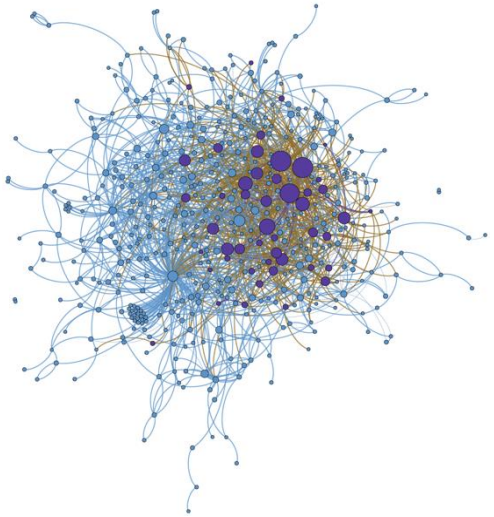


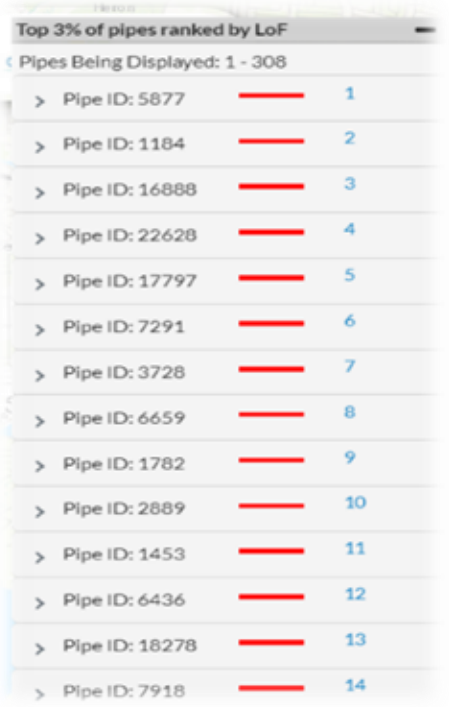
Source KXLY.com

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AI Models







Data collection and clean up

AI finds patterns and relationships

Asset Analysis

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Garbage in, garbage out…

Pipeline 1	Pipeline 2
Installed 1860	Installed 1860
Brown sandy soil	Brown sandy soil
Moderate soil corrosivity	Moderate soil corrosivity
6” Cast Iron Pipe	6” Cast Iron Pipe



31% Thickness Loss

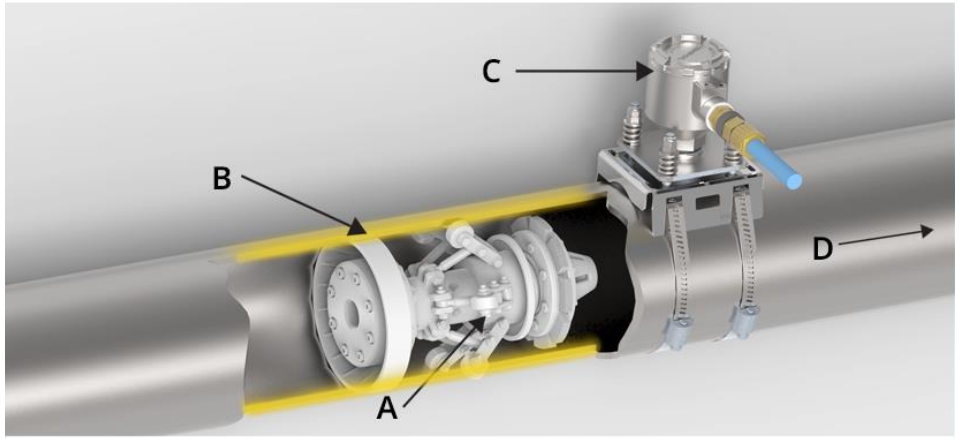


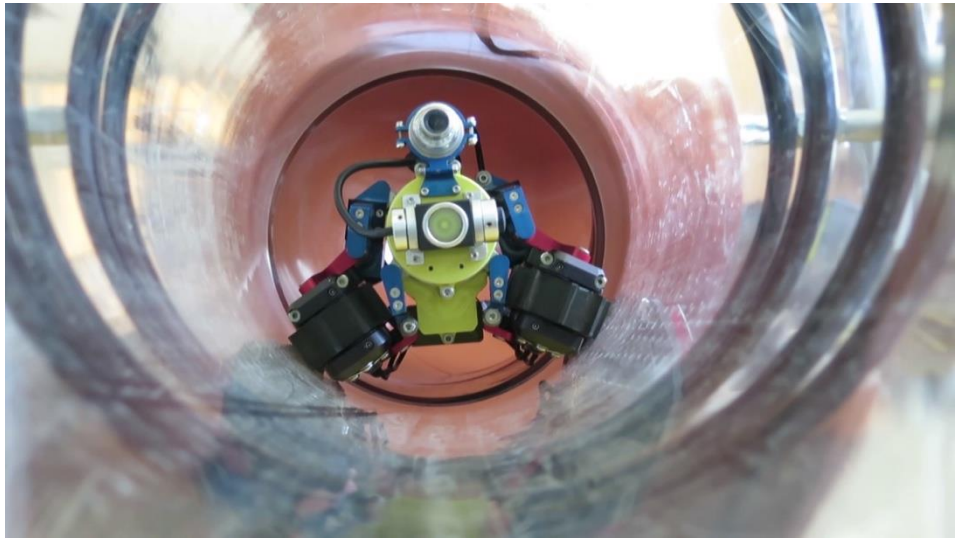
1% Thickness Loss

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Robots and CCTV

- Pipeline inspection guage (PIG), robots, balls, and swimmers
- Allows physical inspection
- May be costly to deploy system wide
- Can be intrusive and specialized





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Physical Inspections

- Destructive and non-destructive methods
- Most accurate (for pipe physically inspected)
- Not feasible to deploy system wide





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Acoustic Pipe Condition Assessment

- Non-intrusive form of pipe condition assessment
- Allows system wide deployment
- Real data from your pipes
- Also Detects Leaks

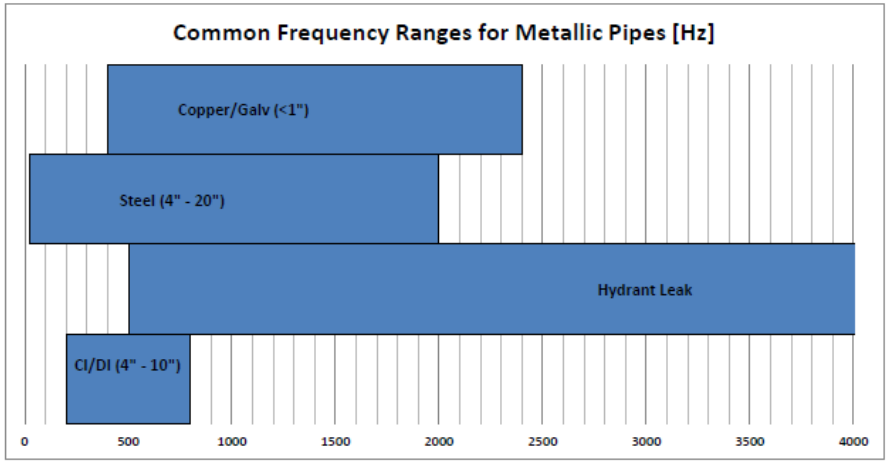


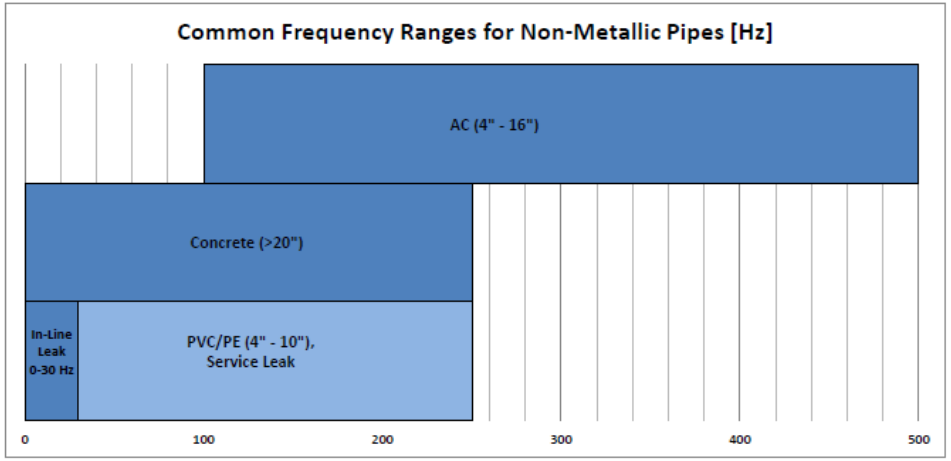
How does Acoustic Pipe Condition Assessment Work?

The velocity and frequency of a leak is affected by

- Pipe material
- Pipe thickness
- Bulk modulus (water)
- **Condition of the pipe**

	Start	End	
PVC/PE (4" - 10")	0	30	220
Concrete (>20")	0	250	
AC (4" - 16")	100	400	
CI/DI (4" - 10")	200	600	
Hydrant Leak	500	5000	
Steel (4" - 20")	25	1975	Or Higher
Copper/Galv (<1")	400	2000	Or Higher

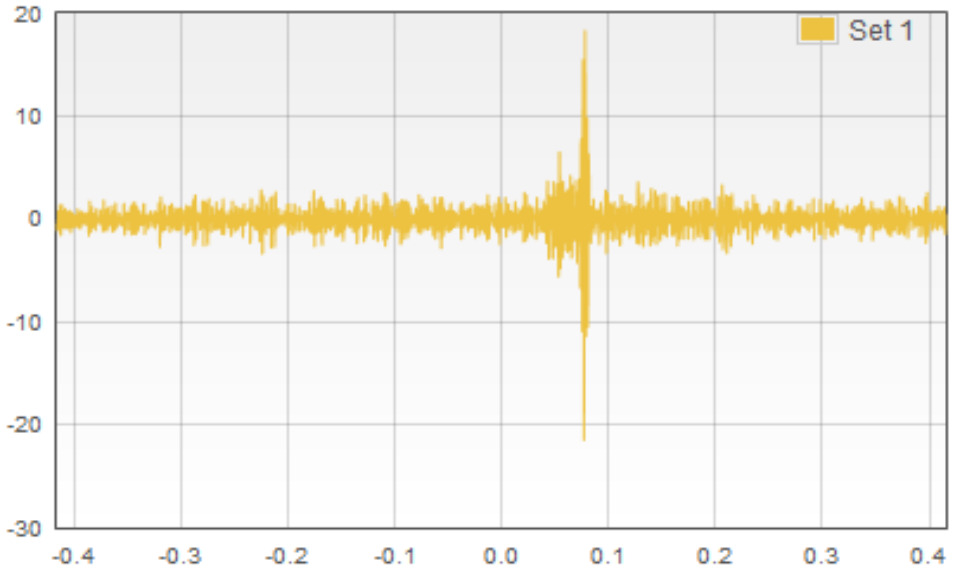




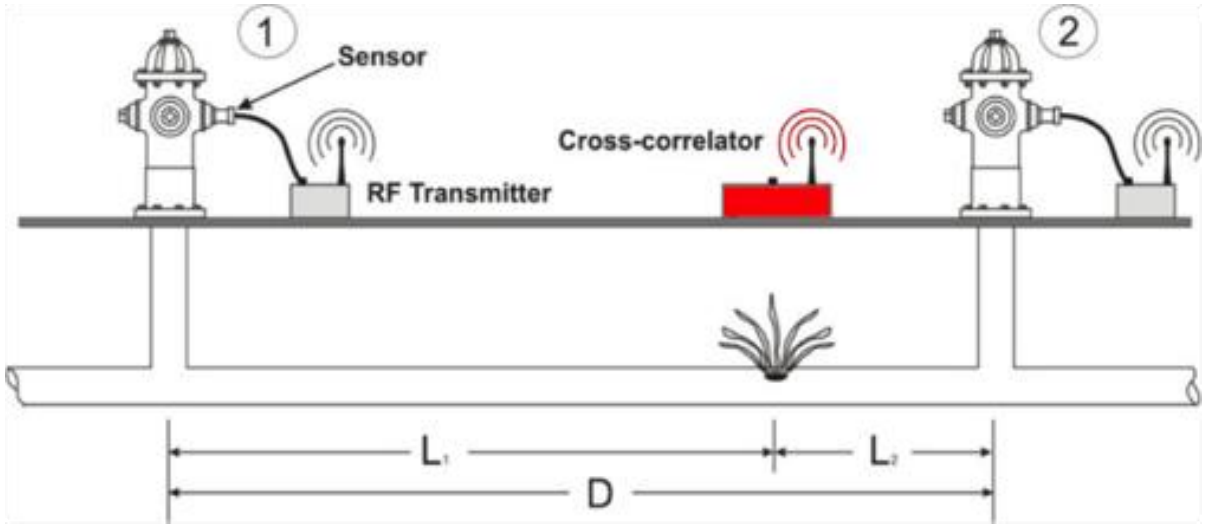
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Acoustic Correlation 101

- **Correlators compare:**
  - Time delay of noise
  - The speed of that noise (Pipe velocity)
  - Distance between the two points







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Acoustic Correlator 101

There is a secret pizza place that is delivery only on a road between you and your friend

You and your friend order pizza delivery on a Hot n Ready pizza to your house at the same time

Assuming the pizza left at the same time, If the pizzas arrive at the same time, it is directly in the middle of your house



Acoustic Correlator 101

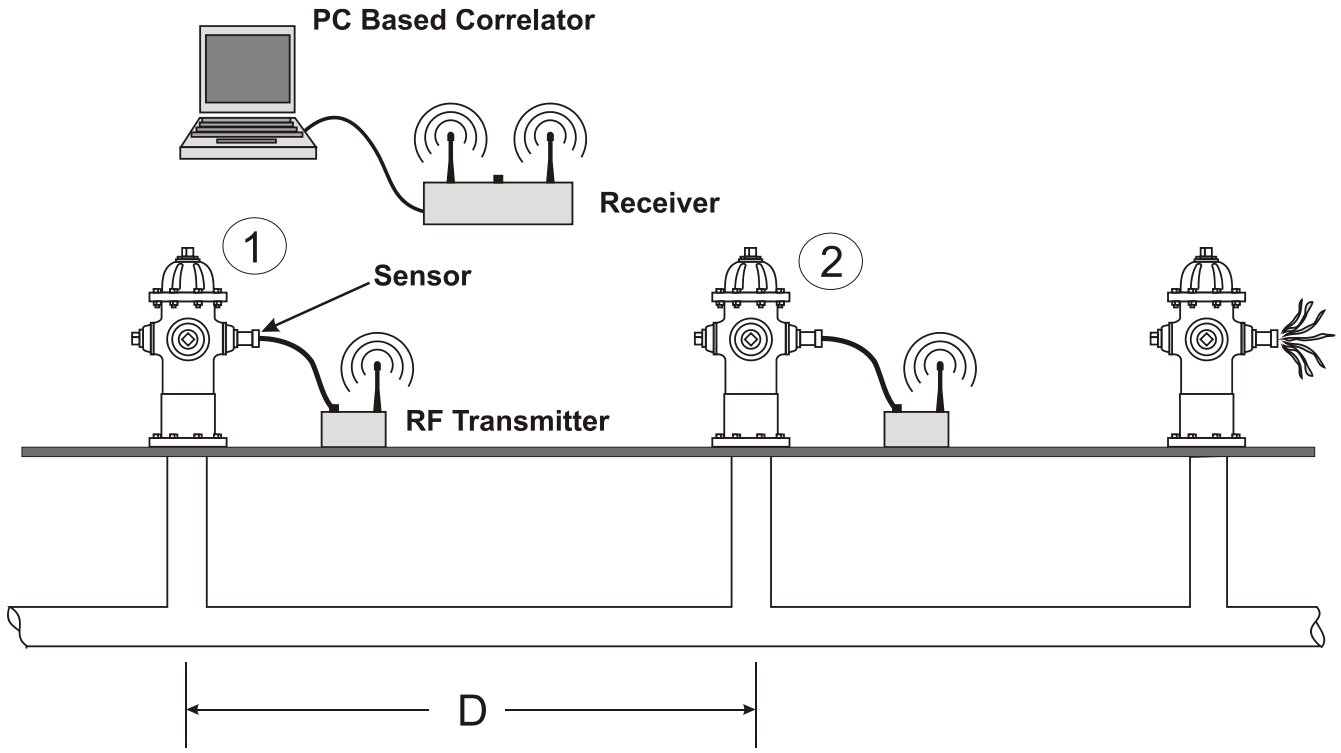
Assuming the pizza left at the same time, If it arrives quicker to your house, you know that its closer to you



The Magic of Acoustics

- If you know pipe material and diameter you have an expected velocity of a pipe
- Using an out of bracket noise to calculate the actual velocity
- Compare the two values to create an estimated remaining service life

Wave propagation velocity (v) = D/ΔT, where ΔT is time delay between signals 1 and 2



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Pipe Condition Affects Speed Sound Travels

Sound through a new pipe is like a highway

A degraded pipe is like potholes on that highway, slowing traffic

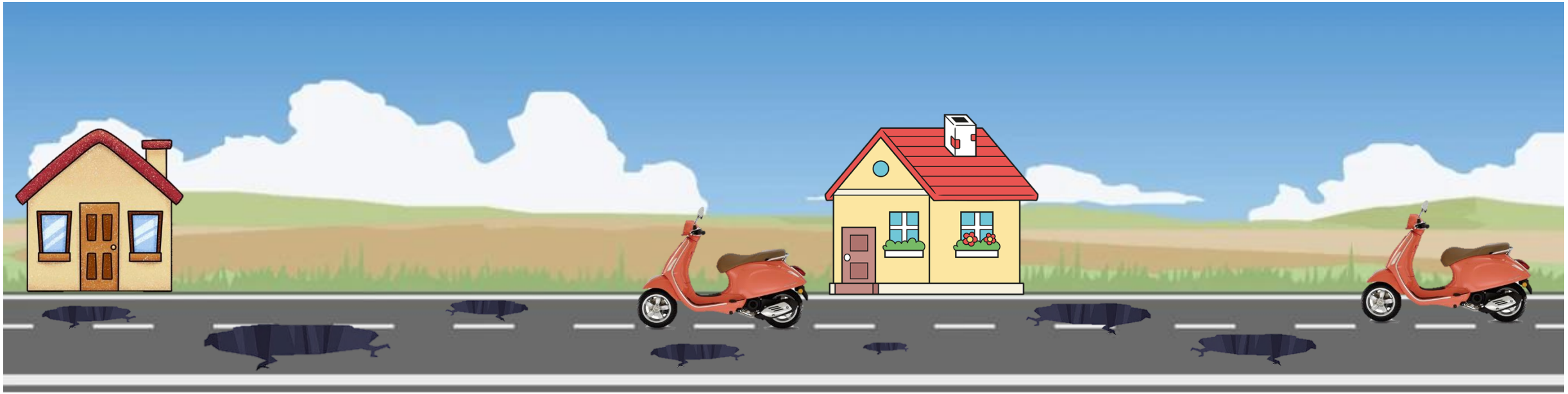






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Pipe Condition Affects Speed Sound travels



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Why ePulse?

- Understand the condition of a specific pipe section
- Gather asset information for capital improvement planning
- Confirm and validate desktop studies
- Validate and confirm need prior to pipe replacement
- Selection of pipe rehabilitation and lining strategy
- Understand pipe condition prior to road resurfacing
- Proactively manage leakage in your network with condition-based replacement



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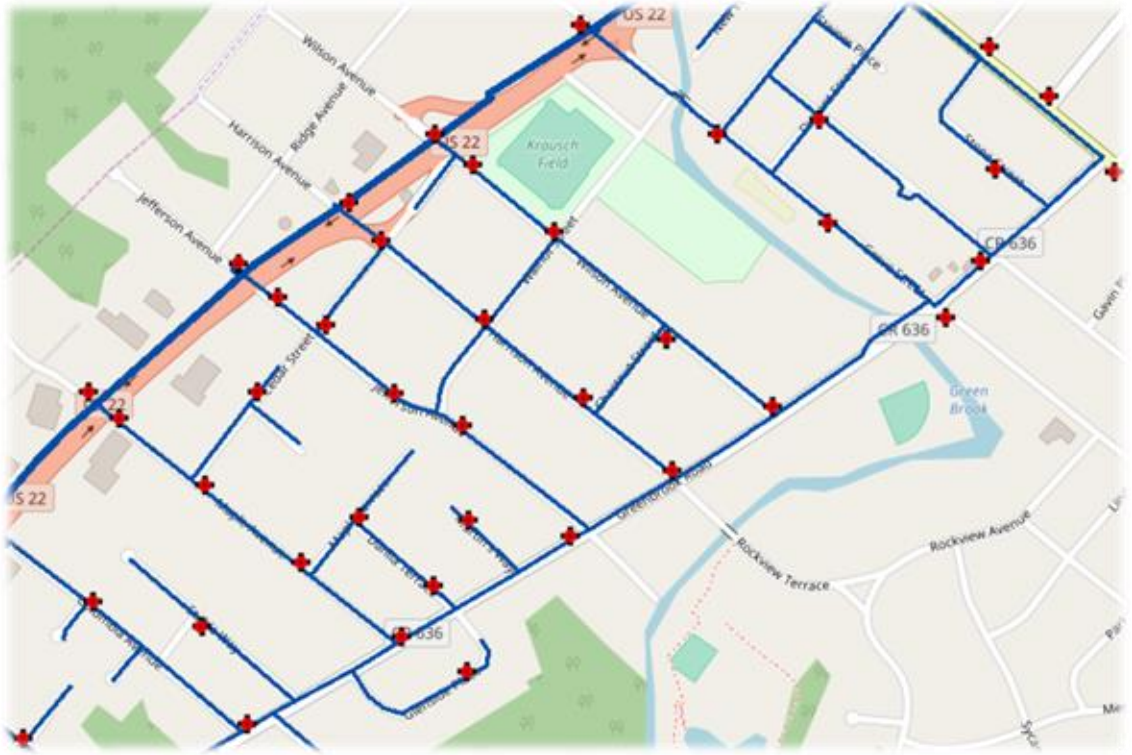
Qualifications

1. Pipe Diameters

- Distribution Main – 4-inches to 16-inches
- Transmission Mains – 16-inches to over 108-inches

2. Pipe Materials

- Asbestos Cement (AC) Pipe
- Cast Iron (CI) Pipe
- Ductile Iron (DI) Pipe
- Steel and Mortar Lined
- Pre-stressed Concrete Cylinder Pipe (PCCP)



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Qualifications

3. Maps

- GIS preferred
- Often GIS Maps is all you need to develop a proposal



4. Access to Pipe

- Can be Fire Hydrants, Valves, or potholing
- Access required every ~700 feet

5. Pressurized Pipe

6. Known Pipe Material and Diameter

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What do you get in an ePulse report?

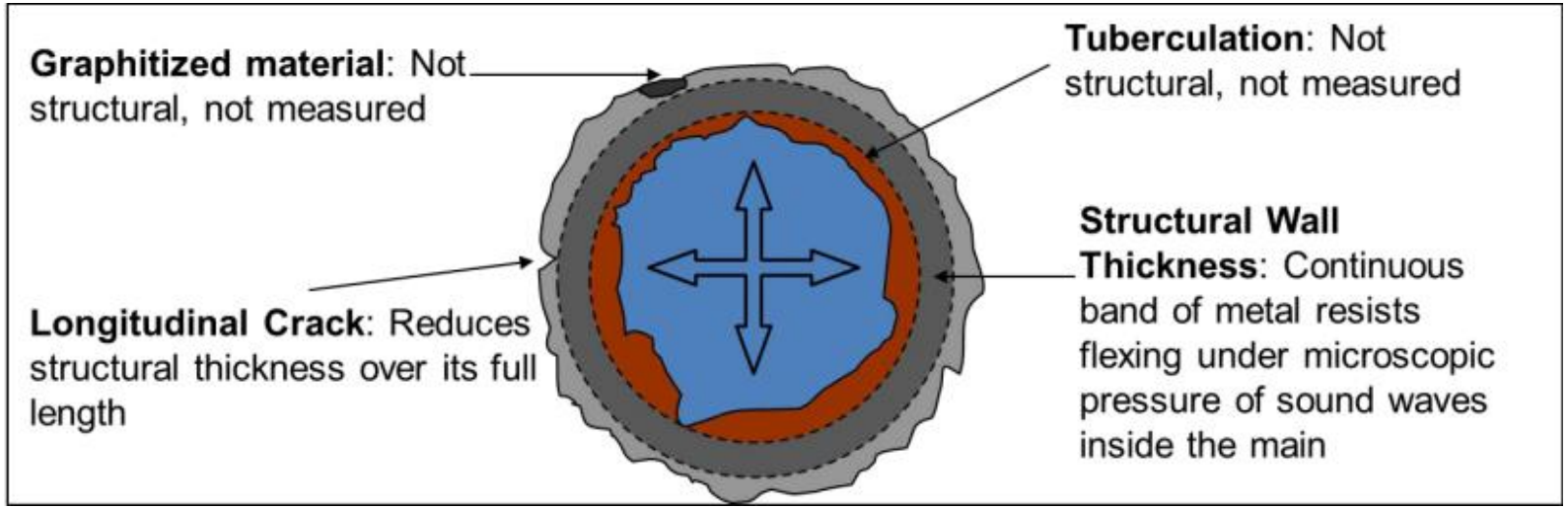
- Actionable information on the condition of your pipes
- Color coded in three categories: green (good), yellow (moderate), red (poor)
- Simultaneous leak detection

Pipe Segment	Site	Length	Pipe Type	Nominal Thickness	ePULSE Measured Thickness	% Change from Nominal
#	#	(ft)		(inch)	(inch)	%
1	1	361	AC	0.76	0.64	-16%
2		444	AC	0.76	0.64	-16%
3		258	AC	0.66	0.42	-36%
4		352	AC	0.66	0.42	-36%
5		329	AC	0.66	0.41	-38%
6		341	AC	0.66	0.47	-29%
7		250	AC	0.76	0.60	-21%
8		253	AC	0.76	0.62	-18%
9		512	AC	0.76	0.62	-18%
10		448	AC	0.76	0.64	-16%
11	2	320	AC	0.76	0.60	-21%
12		362	AC	0.76	0.63	-17%
13		237	AC	0.66	0.43	-35%
14	2	369	AC	0.66	0.42	-36%
15		646	AC	0.76	0.63	-17%
16		374	AC	0.66	0.47	-29%

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Wall Thickness

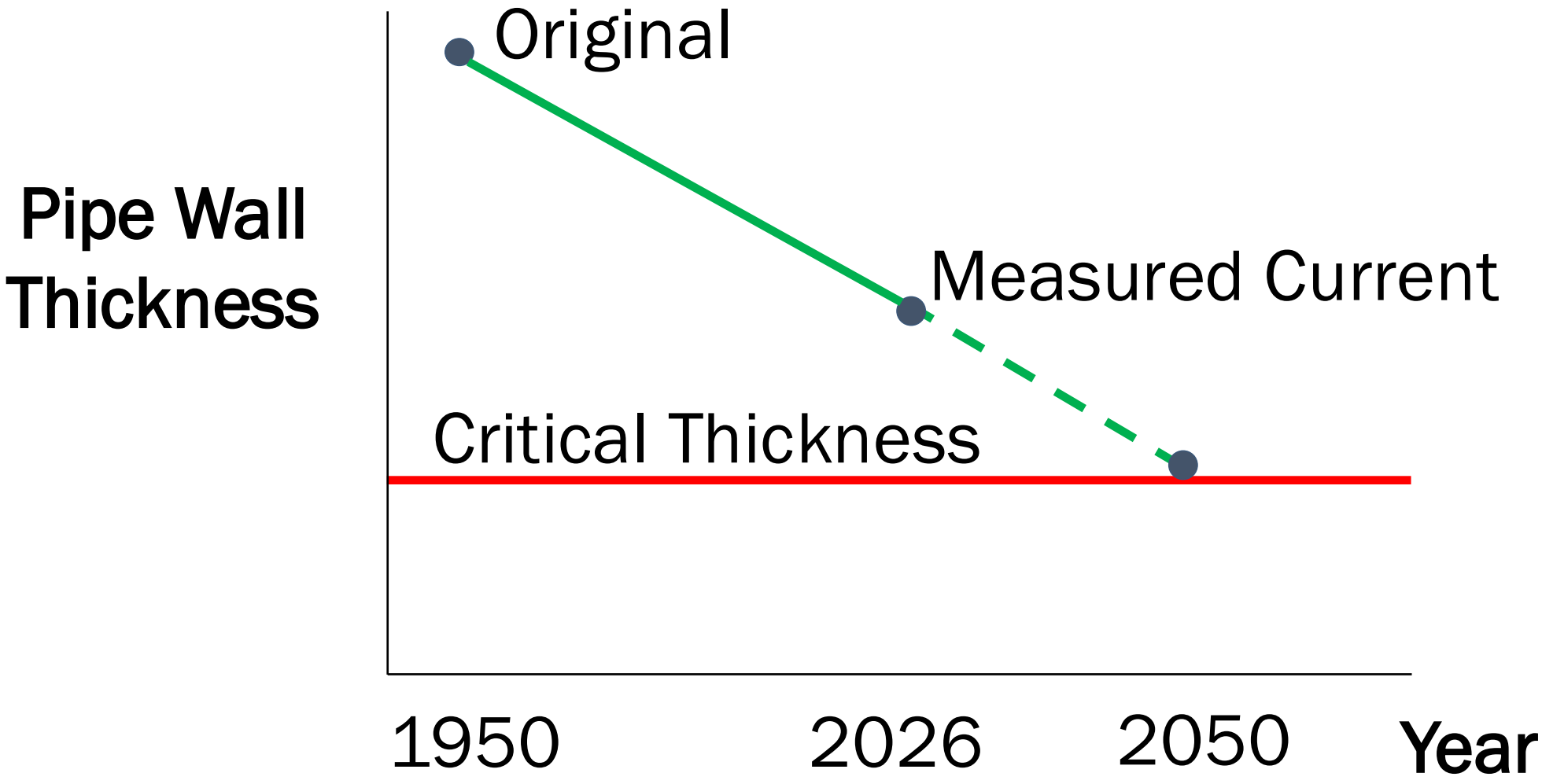
ePulse measures the average minimum remaining pipe wall thickness over a length of pipe between two sensors



Added Value: Detect Leaks while measuring average minimum remaining pipe wall thickness

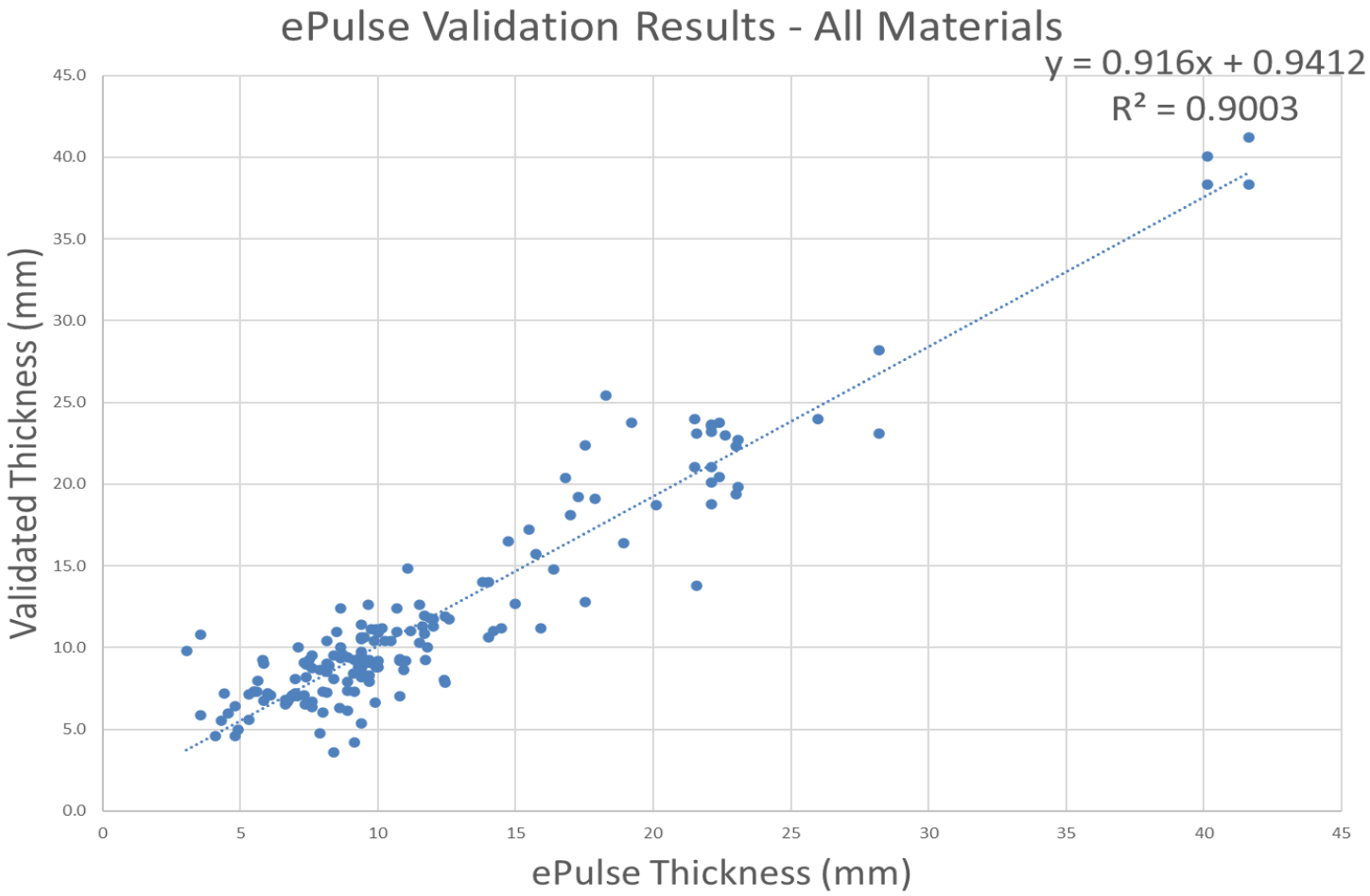
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Remaining Service Life Calculation



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ePulse gives validated data



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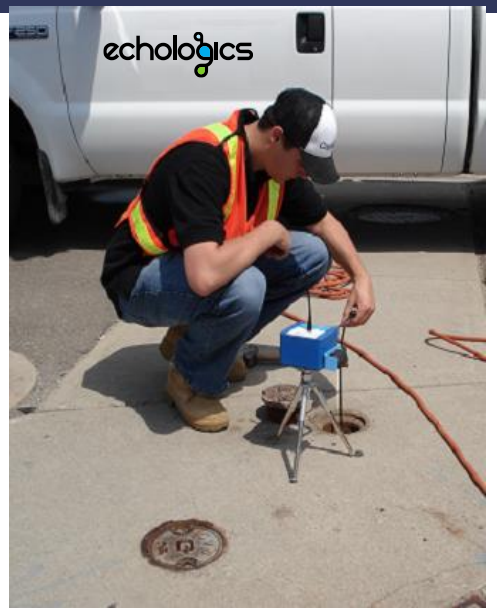
ePulse – Typical Set-up



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ePulse – typical set-up

1-Connect Sensors



2-Measure Distance



3-Create Noise

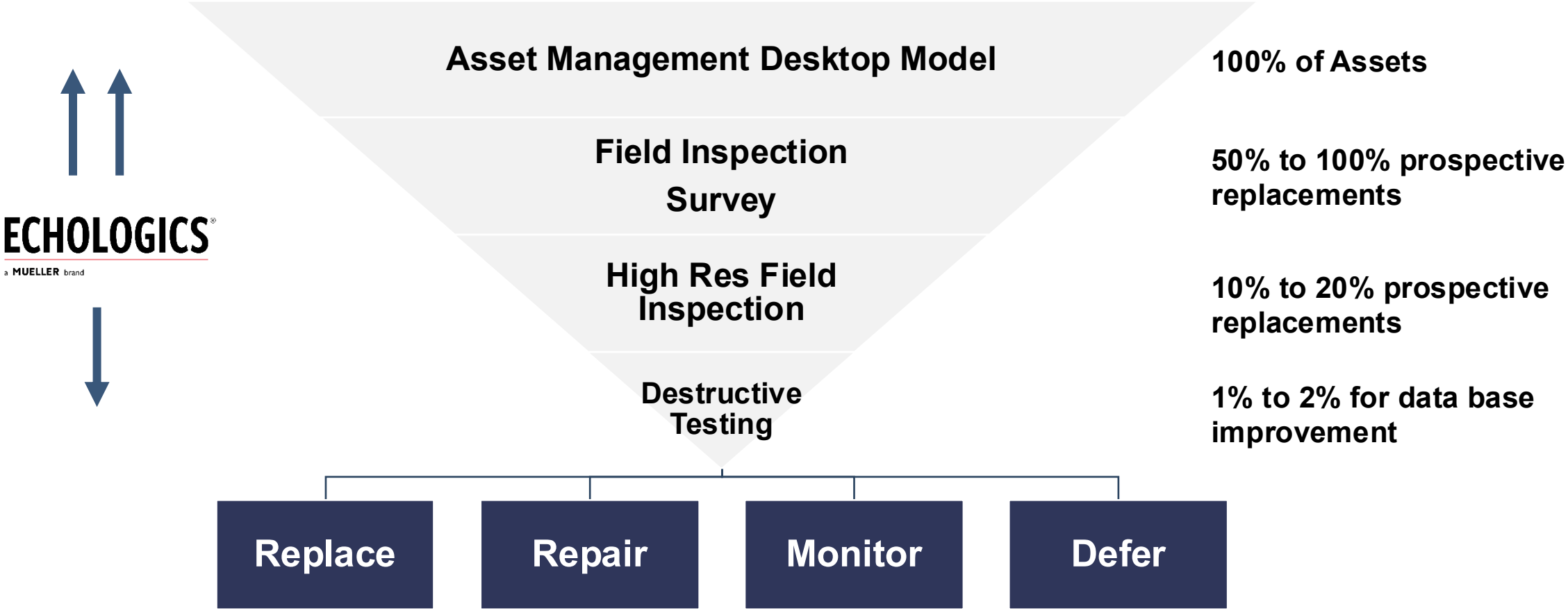


4-Measure Velocity



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Inform Capital Investments

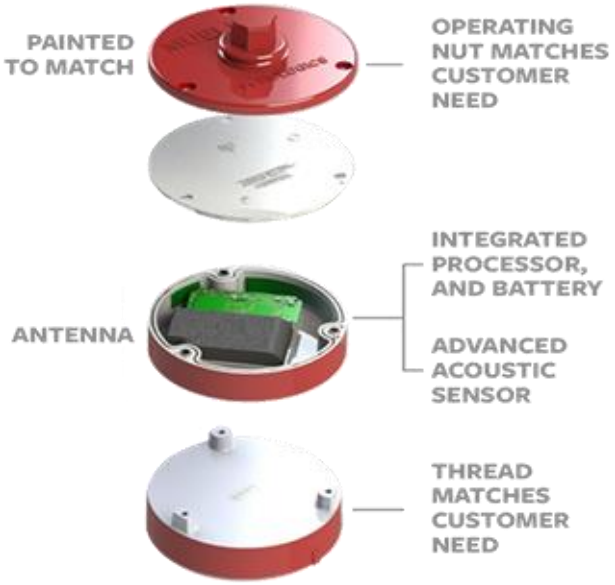


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After ePulse

- Condition assessment informs replacement plan
- Leaks are prioritized and fixed
- Now what?

Monitor your System



EchoShore-DX



EchoShore-TX



XP2F - Data and Flow Acquisition Package

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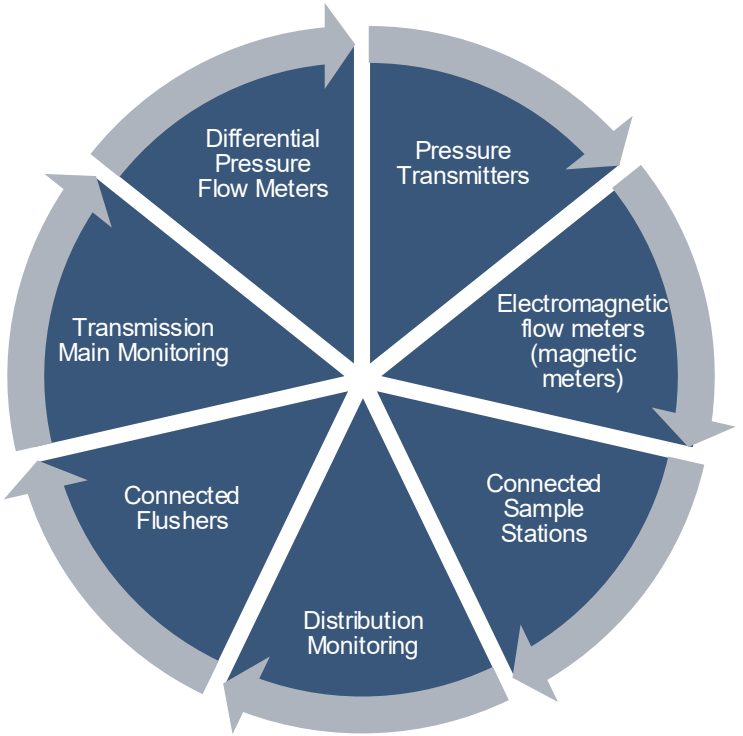
Why monitor?

- **Where do most real losses occur?**
  - Pipe bursts?
  - Unauthorized consumption?
  - Background leakage?
  - Long-running unreported leaks?
  - Leaks that aren’t repaired in a timely manner

Get proactive about your system

Lower non-revenue water-loss

- Pressure monitoring
- Flow monitoring
- Distribution monitoring
- Transmission main monitoring



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Flow and Pressure Monitoring

- Pressure transmitters
- Electromagnetic flow meters (magnetic meters)
- Ultrasonic flow meters
- Turbine flow meters
- Vortex flow meters
- Positive displacement flow meters
- Differential pressure flow meters







Differential Metering: A Key Advantage

More Data Points in One Package

- Upstream Pressure
- Downstream Pressure
- Valve position
- Flow

No Need for Extra Space

- Package retrofits onto existing valves
- Is not limited by bends or joints in pipe around metering package

Cell Connected and Battery Powered

- Does not require power to your vaults
- Set up with cell provider of choice
- Cloud based platform with prebuilt interface



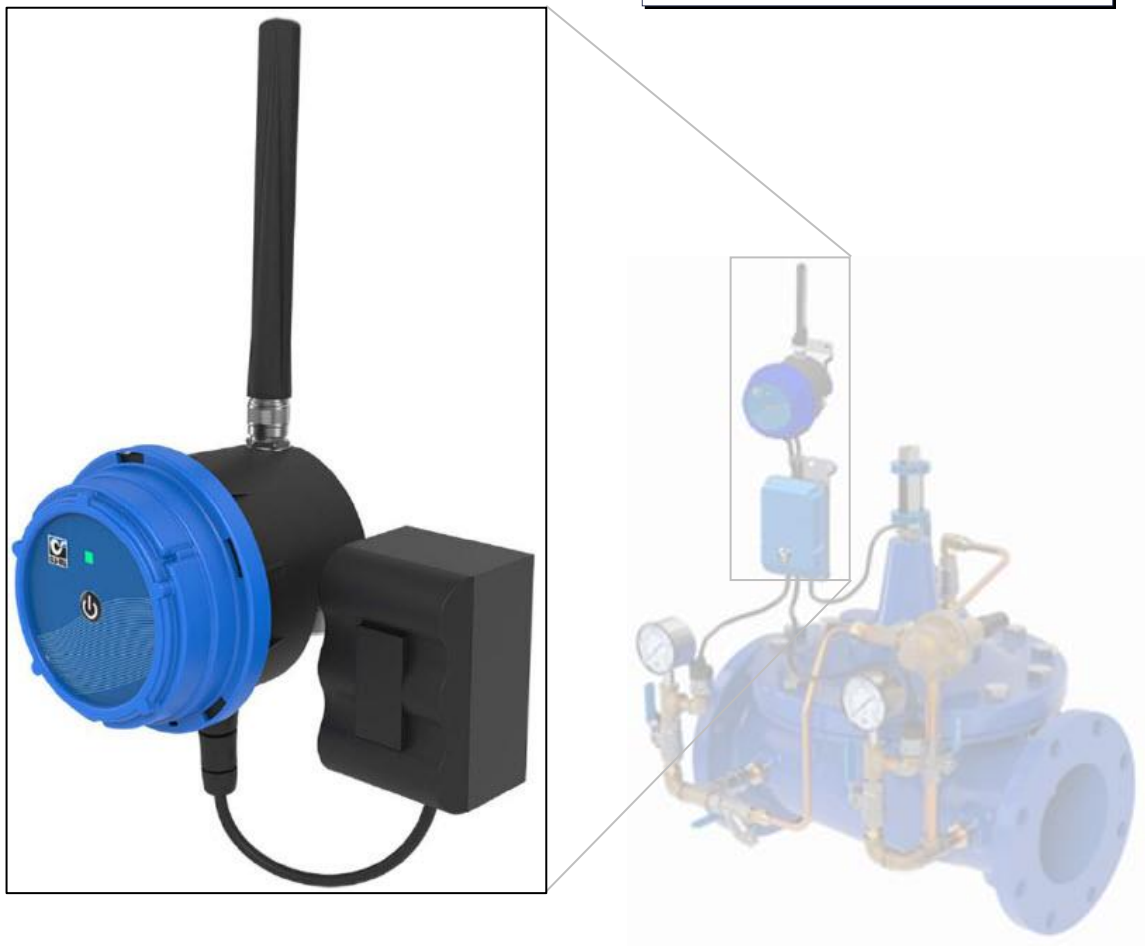
XP2F – Data Acquisition and Flow Meter Package

- Easily retrofitted on existing valves
- Minimal upstream/downstream straight pipe requirements
- Local display with five buttons
- No software needed
- Easy field calibration and commissioning
- Low maintenance/minimal fluid contact
- Forward and reverse metering capabilities



XP2F-CV35

- **Battery powered**
- **Cellular equipped**
  - Integrates with Link2Valves for monitoring
  - WiFi connection for setup and adjustments
- 2 digital input relays
- Components:
  - **CV35 Valve Controller Assembly**
  - E-Lift-35 Position Transmitter
  - X141-PTV Pressure Transmitter Assembly



HydroGuard Connected Flushers

- Temperature and pressure monitoring on your flushing stations
- Connected sample stations
- More points of data build a better picture



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EchoShore-DX

- **EchoShore-DX:** Integrates as a hydrant pumper cap
- **EchoShore-DXe:** Installed on underground appurtenances



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EchoShore-DX - Fire Hydrant Pumper Cap Design



Storz Connection Option

Custom-Made for Each Site

- Painted to match existing hydrants
- Custom thread & operating nut or Storz connections.
- Casting made at Mueller's Albertville foundry





Metallic Casting

Electronic Module

Metallic Casting

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System Advantages

Design Flexibility

- Detects Leaks on cast iron, ductile iron, steel, asbestos cement, and concrete pipe materials.
- Works on Pipe Diameters up to 24” diameter.
- Utilize existing or new fire hydrants of any manufacture

Automatic Acoustic Analysis

- Leaks automatically correlated by multiple nodes
- Leak Location identified within a few feet

Low Maintenance

- Above Ground Installation
- 10-year design life
- System Diagnostic Capabilities



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‘Install-and-forget’

EchoShore-DX sensors require no maintenance for up to 10 years.

- Versatile and rugged design
- Long distance between sensors
- Extra-long (verified) 10-year battery life

Implement EchoShore-DXe on:

- Valves
- Below-ground hydrants
- Release valves





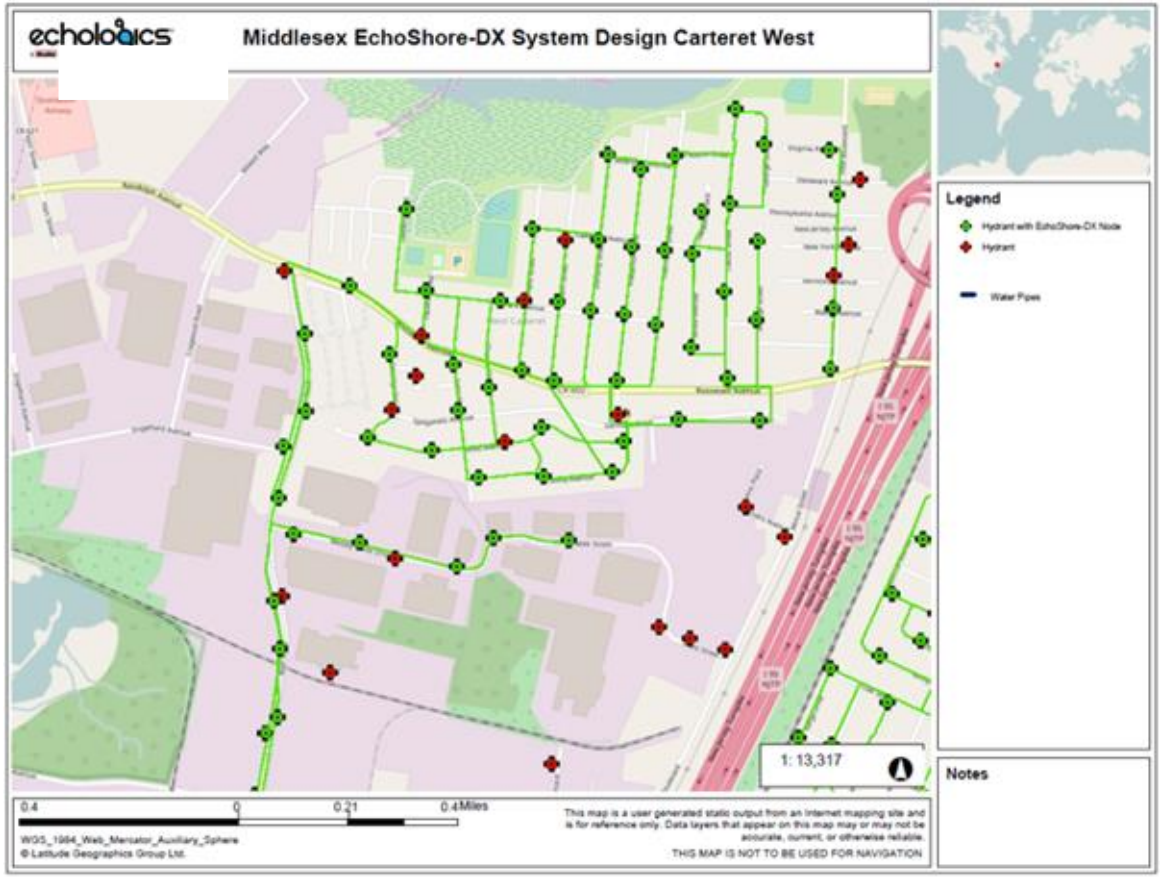


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Sophisticated planning architecture

Our planners work with you to optimize EchoShore-DX by:

- Strategically placing sensors to greatest effect
- Minimizing cost, maximizing impact

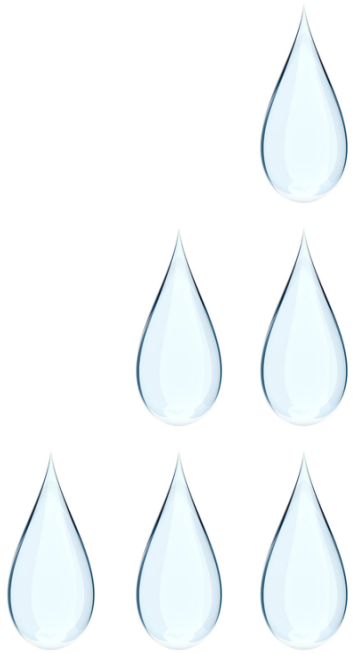


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Leak Sizes – A Predictive Model

Leak Size:

- Predicts the potential size of a reported leak event
- Backed by Machine Learning and model trained and validated on over 1,500 reported leaks
- Provides a prediction of a small, medium or large leak



Small Flow Rate: Less than 5 Gallons Per Minute (GPM)

Medium Flow Rate: Between 5 GPM and 30 GPM

Large Flow Rate: Larger than 30 GPM

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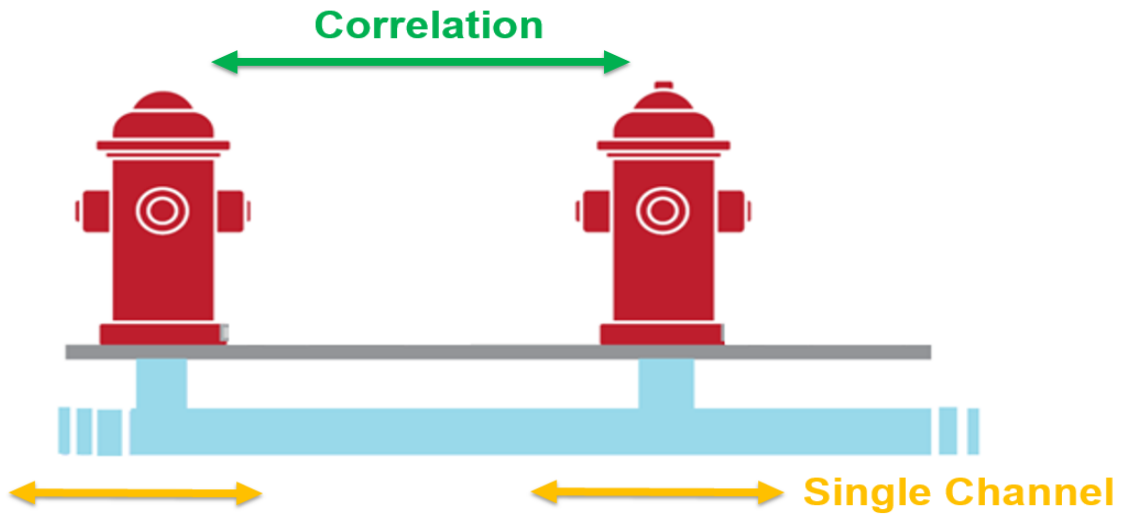
Single Channel Leak Detection

Overview:

- Single Channel leak detection monitors for changes in sound that indicate an emerging leak
- Leak notifications are generated from data from a single sensor and signal leakage at or nearby an EchoShore-DX sensor

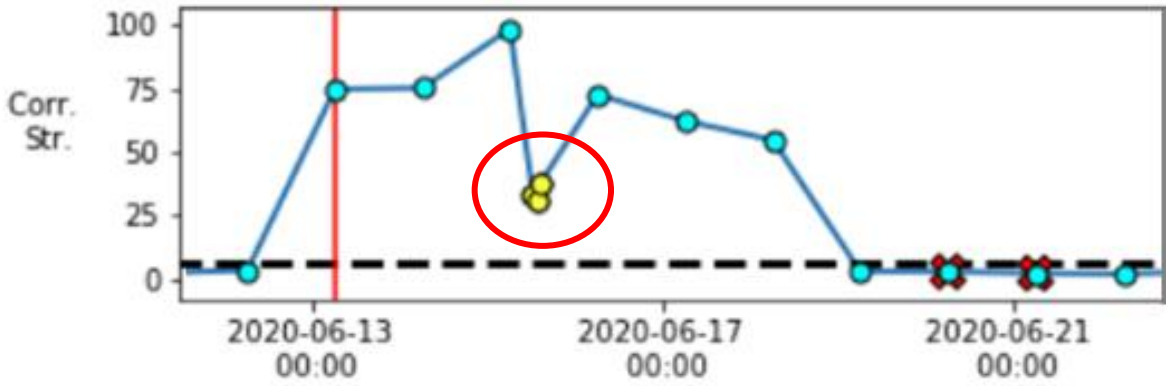
Benefit:

- Detects leaks that are located directly at or nearby EchoShore-DX sensors to improve correlated leak monitoring capabilities

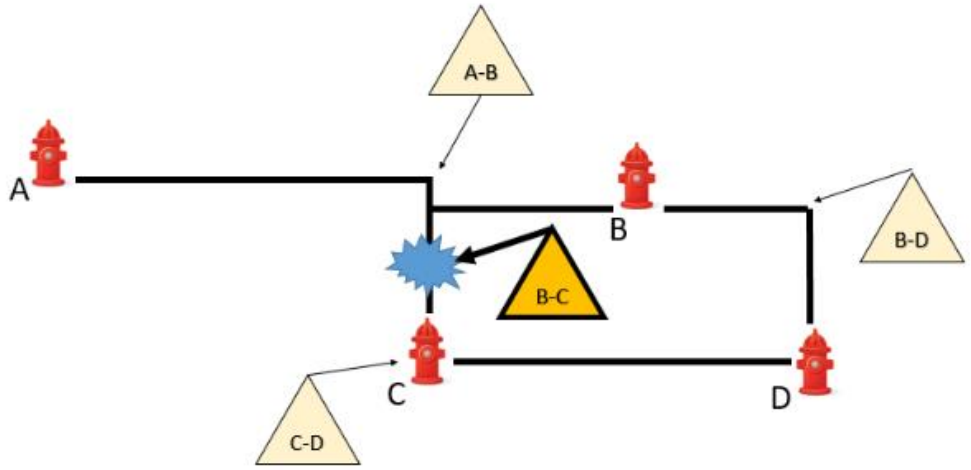


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Machine Learning



Recordings scheduled outside of standard time



Group of signals reporting from same source

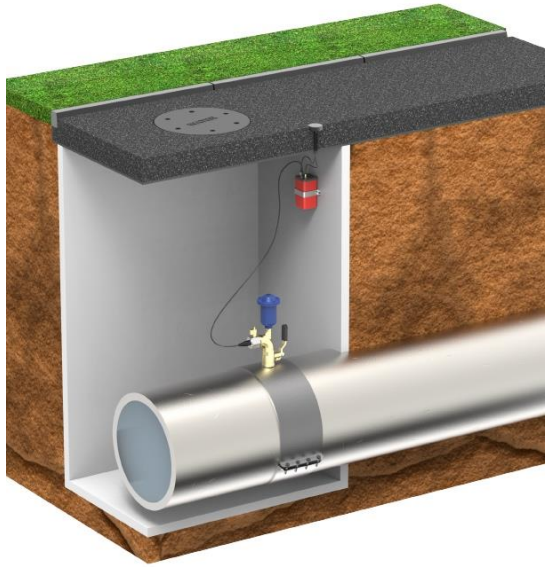
**Both algorithms are automatic and result in a higher likelihood of an alert being a leak*

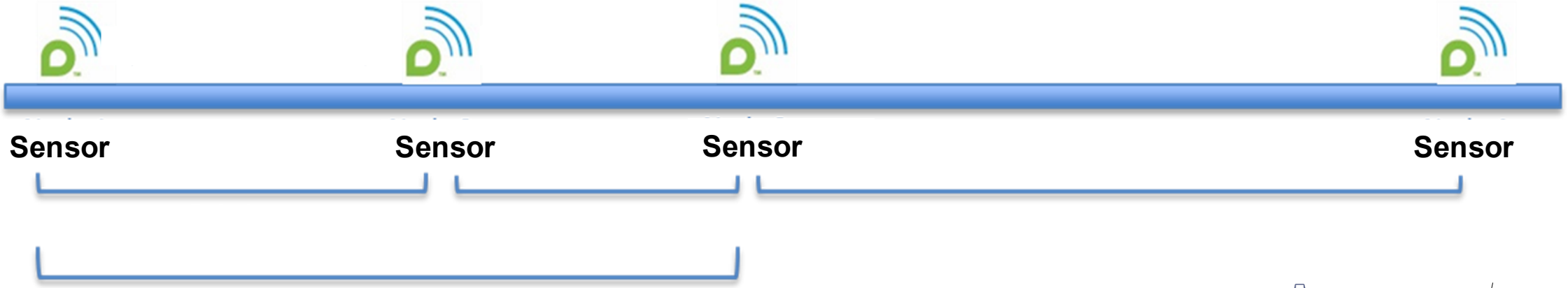
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How do you monitor large diameter pipes?

EchoShore®-TX is a permanent monitoring leak detection solution for transmission water mains

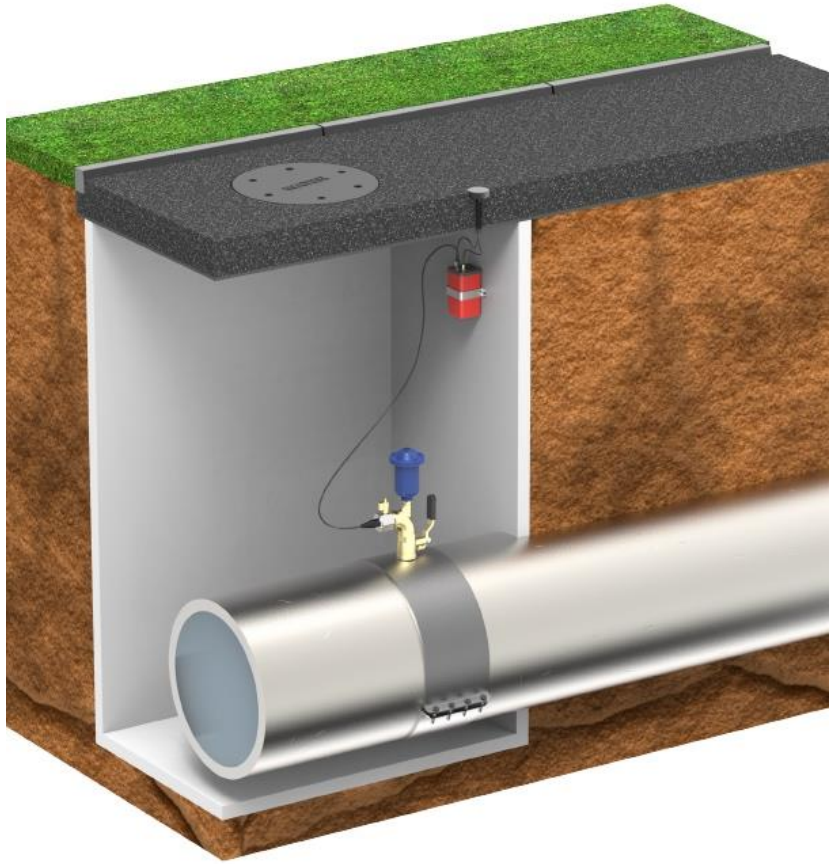
- Captures acoustic data using sensitive acoustic hydrophones sensors installed along a transmission pipe
- Acoustic data from these sensors is reviewed to find leaks





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EchoShore®-TX Hardware Components





Antenna

For cell and GPS connection



Electronic Module

Houses battery and processor



Hydrophone Sensor

Collects acoustic data

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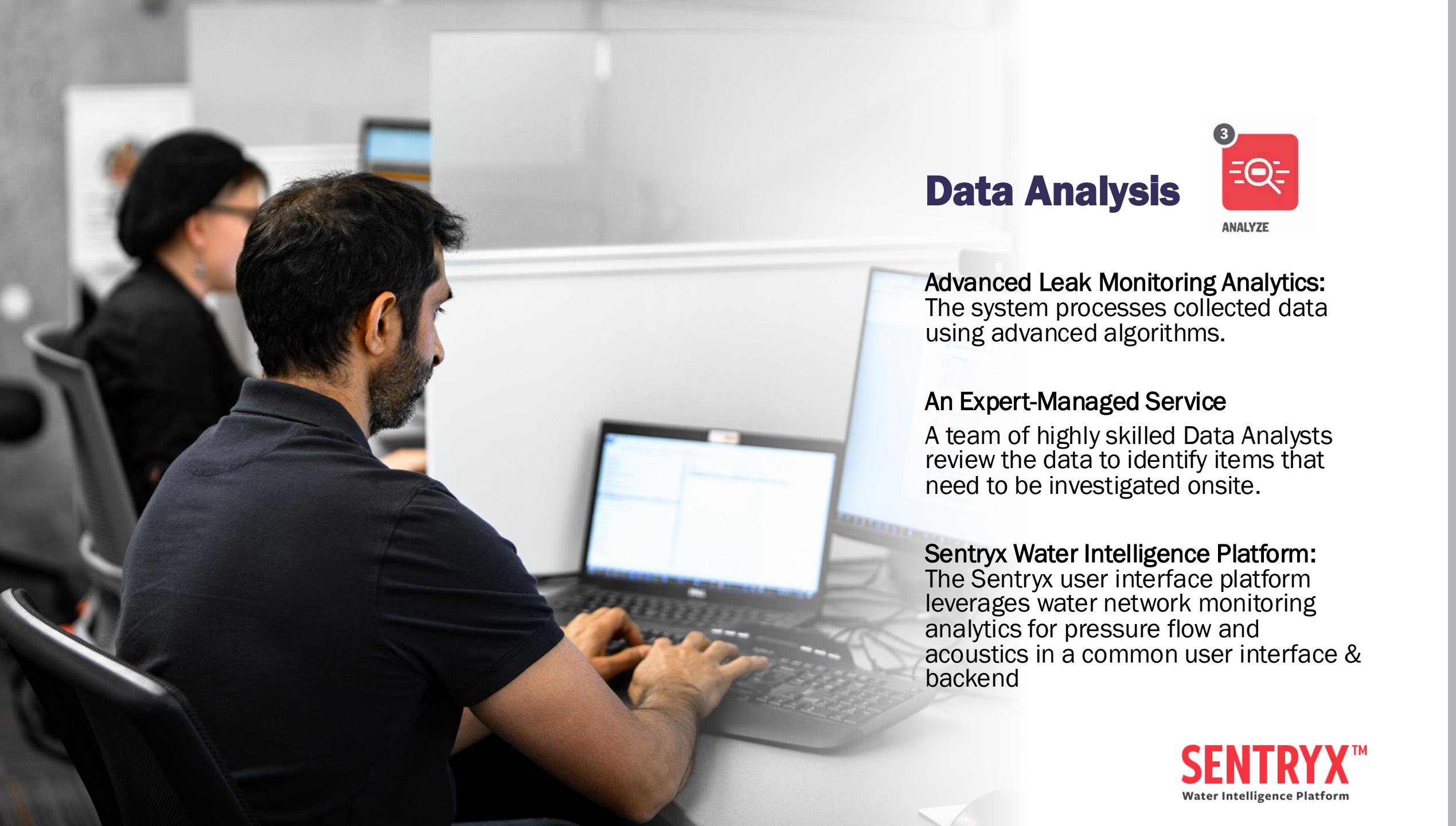
EchoShore®-TX

- Robust and Compact Hardware
- Unified Sentryx Interface
- Updated Collection & Analysis Profile
- Reduced Price Point



EchoShore-TX GEN3

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Data Analysis

3

ANALYZE

Advanced Leak Monitoring Analytics:
The system processes collected data using advanced algorithms.

An Expert-Managed Service

A team of highly skilled Data Analysts review the data to identify items that need to be investigated onsite.

Sentryx Water Intelligence Platform:
The Sentryx user interface platform leverages water network monitoring analytics for pressure flow and acoustics in a common user interface & backend

SENTRYX™
Water Intelligence Platform

Managed Monitoring Service Benefits

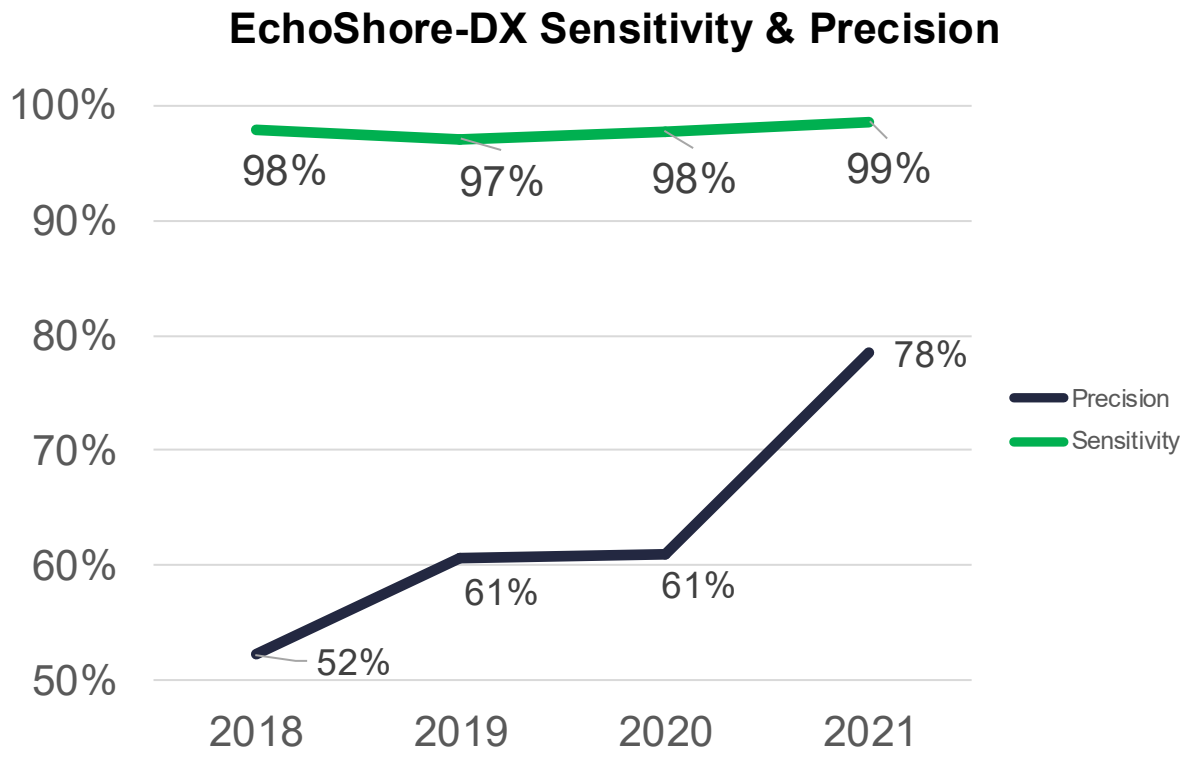
- Dedicated Leak Operations Center (LOC) Analyst assigned to site
- Ongoing customer service
- Constant learning and familiarization with site allows for more accurate PCN reporting

Why has there been a 50% increase in precision of the system?

- Improved understanding of network effects
- Deployed Feedback Tool on Integrated Monitoring Platform
- Standard Process Implementation

What's next?

- Machine Learning to improve efficiency
- Single channel & pressure integration



Precision improvement saved our users from performing ~442 unnecessary field investigations (false alerts) in 2021, saving $100,000+ labor costs.

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Managed Monitoring Alerts

4

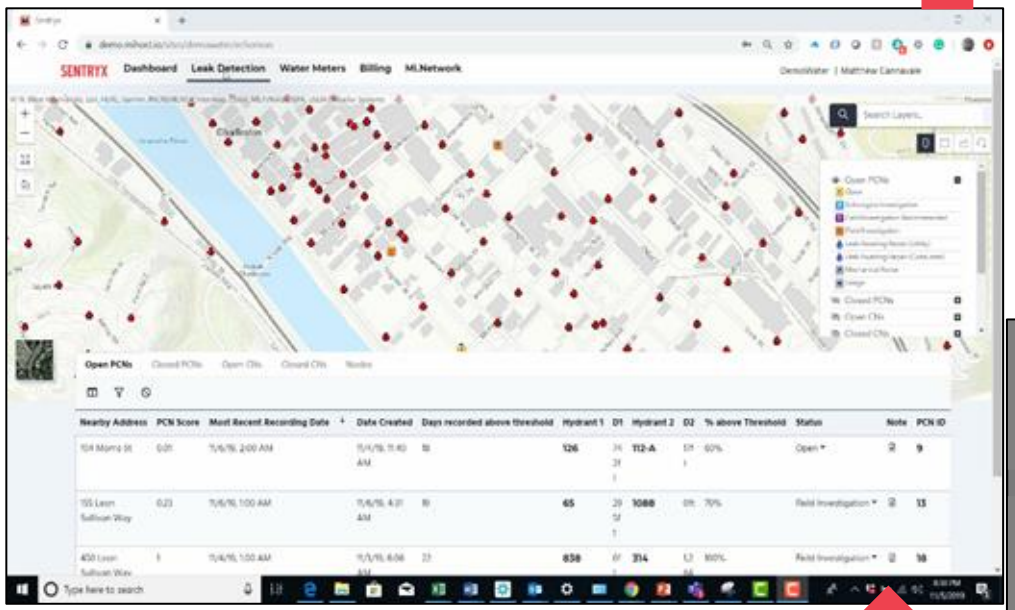
ALERT

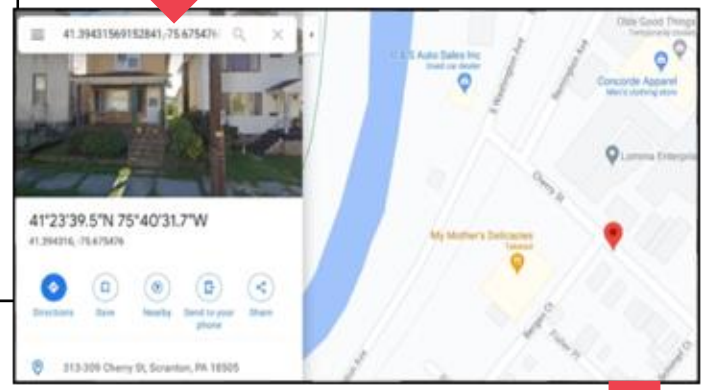
New Message

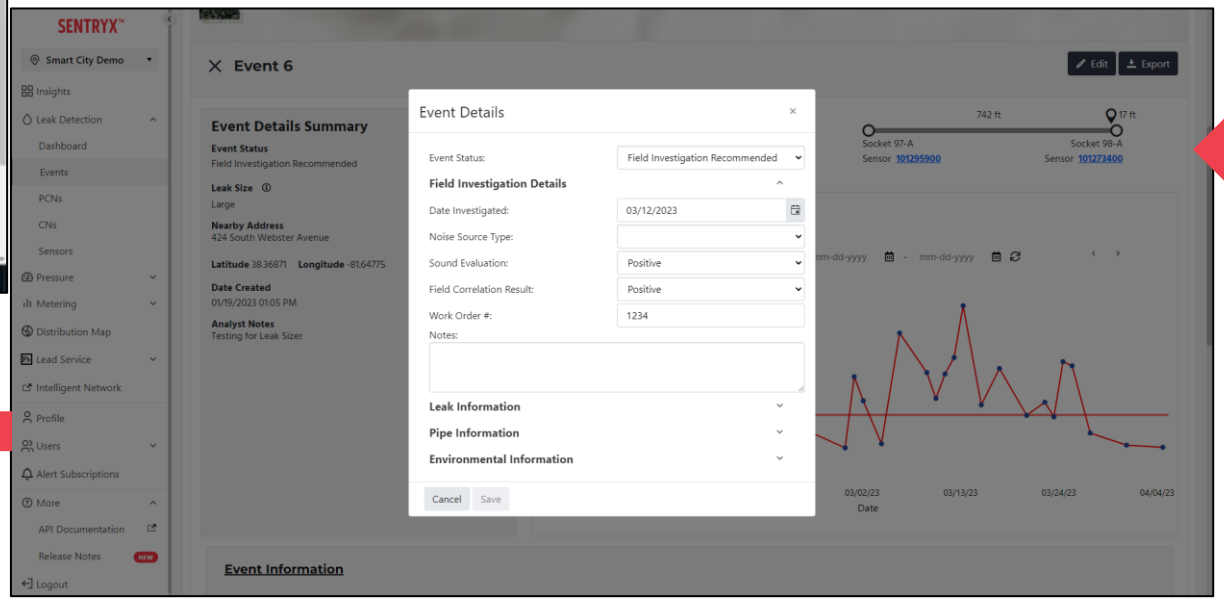
To Water Department

Subject PCN for Investigation Alert

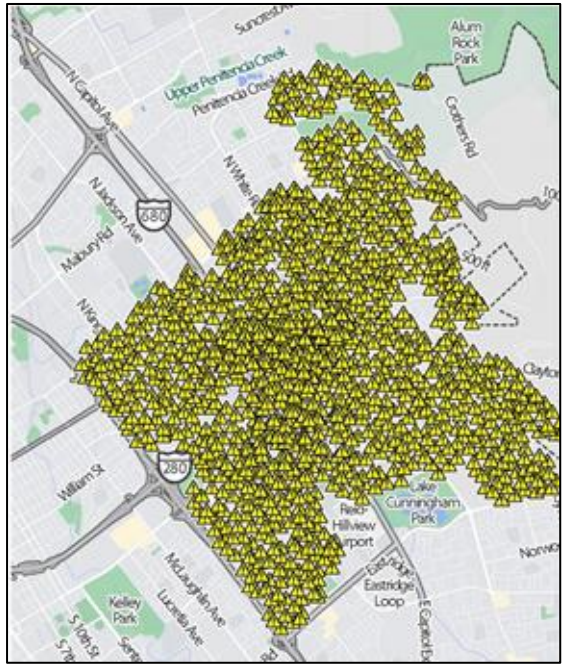
A persistent correlated noise (PCN) has been flagged for investigation.
The signal correlates between hydrant IDs A123 and A124, 186 feet from hydrant A123.
The approximate address is: *123 ABC Street, City Name, New York*
Here's a dropped pin on Google Maps: PCN location **<- this would be a hyperlink to a google map with the PCN location**







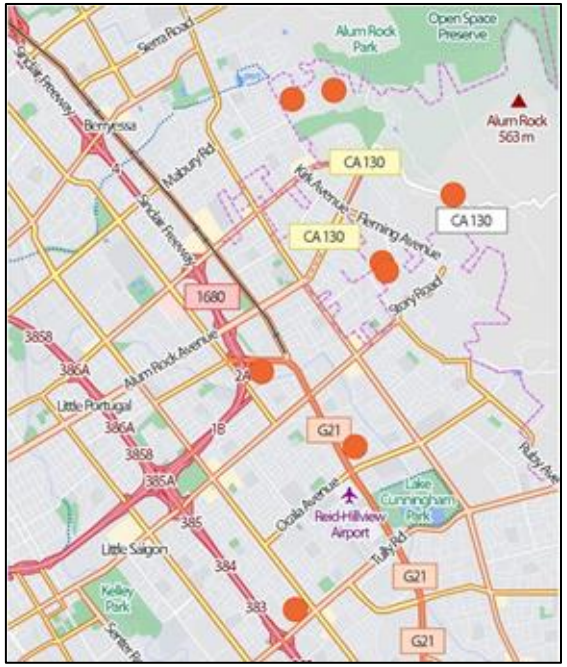
Cut through the noise



Data: 29,297 Network Noises
(correlated noises)



Information: 555 Persistent Noises
(persistent correlated noises)



Insights: 8 Investigations Recommended
(events)

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Who are the analysts?



M.Sc. Physics



B.Sc.
Math & Statistics



Ph.D. Electrical &
Computer Engineering



M.Eng.
Data Analytics



B.A.
Geographic Analysis



M.Sc. Mechanical
Engineering



Ph.D.
Psychology



M.A.Sc. Mechanical
Engineering



M.Sc. Industrial &
Systems Engineering

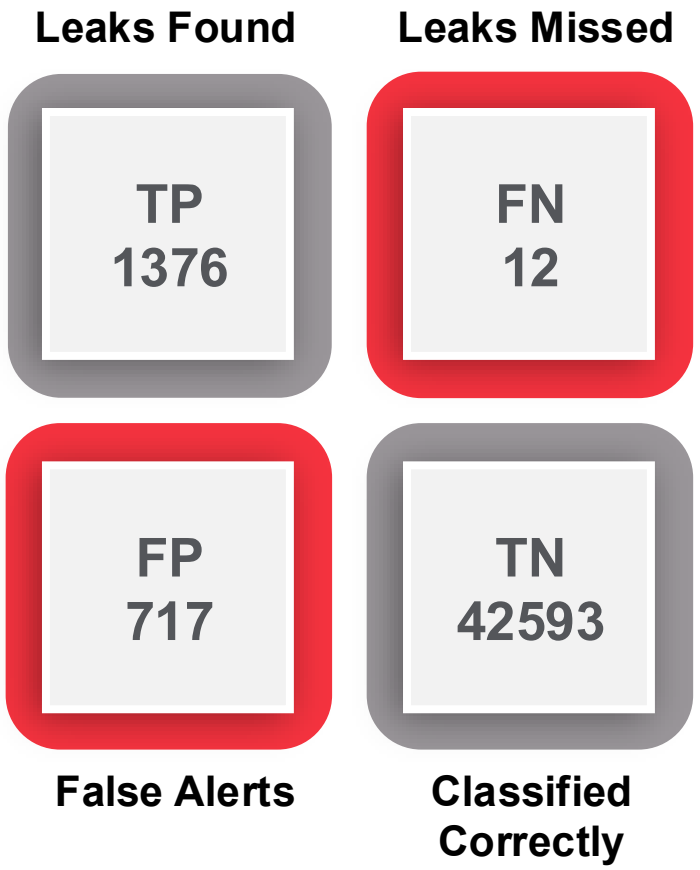


Ph.D.
Astrophysics

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What kind of performance can you expect with managed monitoring?

- We find about 99% of detectable leaks
- Around 60-80% of what we report is leaks
- This can be adjusted to meet client needs



**Sep 2021--Sep 2022 data*

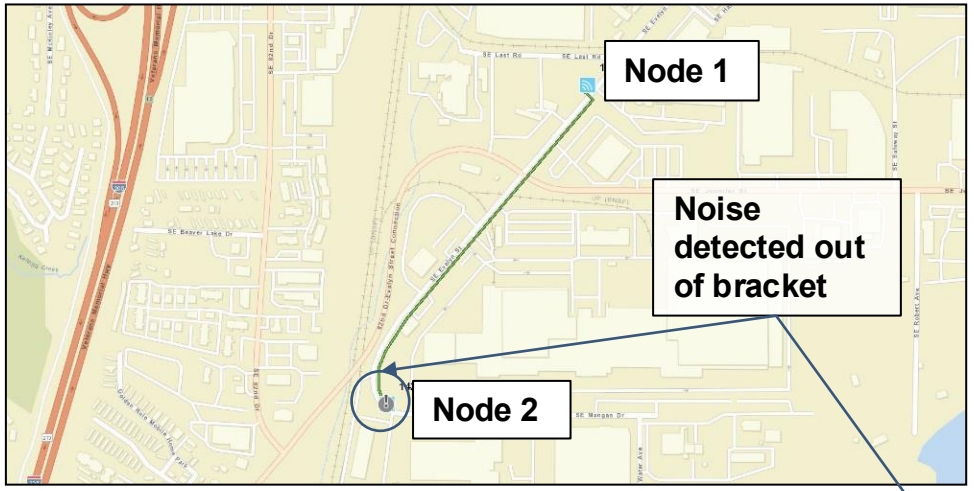
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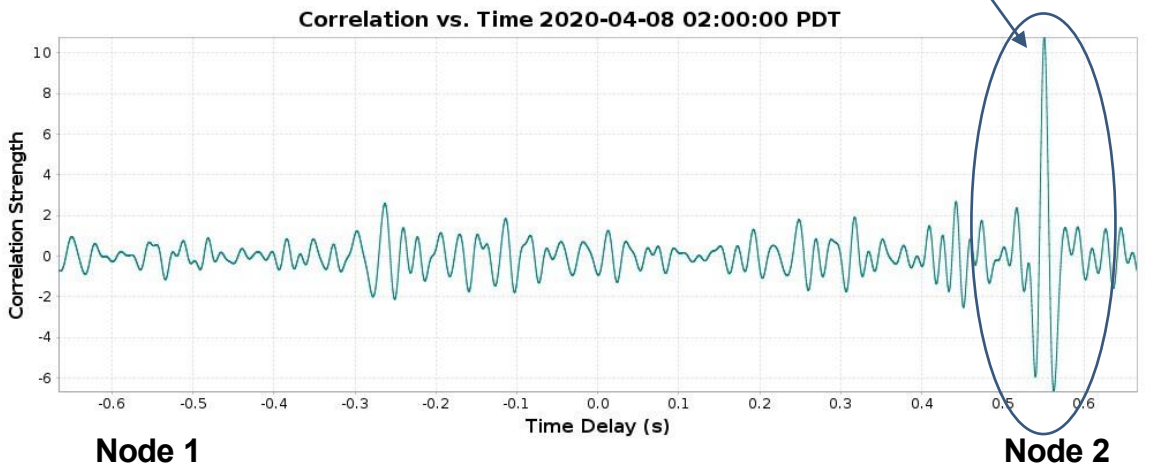


Case Studies

Pump Control Valve Stuck Open

- **Site Overview: West Coast US**
  - ESTX monitored a segment of pipe over 2000ft
- **Results: Out-of-bracket noise detected by ESTX**
  - Field investigations found an open pump control valve stuck open.
  - The noise source was 1,400 feet away from the nearest node.
  - The Utility was unknowingly passing 600 GPM to a neighboring water system as free water





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Sandy DPW – Leak Detection



Deploy Echoshore DX Permanent Leak Detection Sensors

1



Test the sensitivity of the system

2



Identify and repair the leak(s)

3

Water Loss Prevention: Irvington, New Jersey

Problem: Leak surveys not conducted due to safety concerns. High rate of water loss.

Solution: Leak monitoring system installed to plan leak repairs proactively with appropriate staffing.

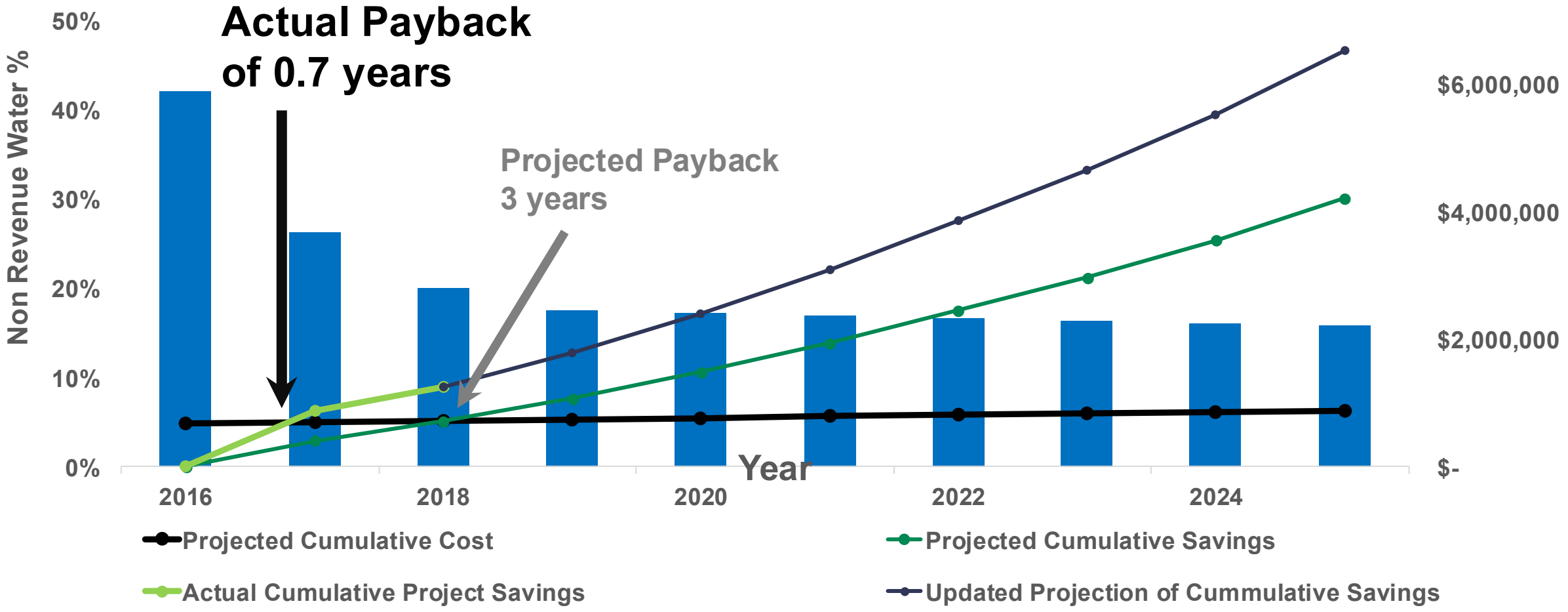
Results: Payback of system within 9 months.
In first year of monitoring:

- 67 leaks repaired
- 880 gallons per minute of water loss prevented
- 90% of leaks not surfacing



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Irvington, NJ: Actual ROI & Project



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XP2F Case Study



City of Walla Walla, WA

- Brought all 25+ Cla-Val valves in distribution system online with XP2F
- Stream valve data into SCADA via advanced metering infrastructure (AMI) system
- Able to track live flow, pressure and valve position
- Equips City to make informed decisions quickly without trips to the field

Cimco-GC Systems can help you determine the best approach in your system

In Conclusion…

Your pipes are worse than you think…

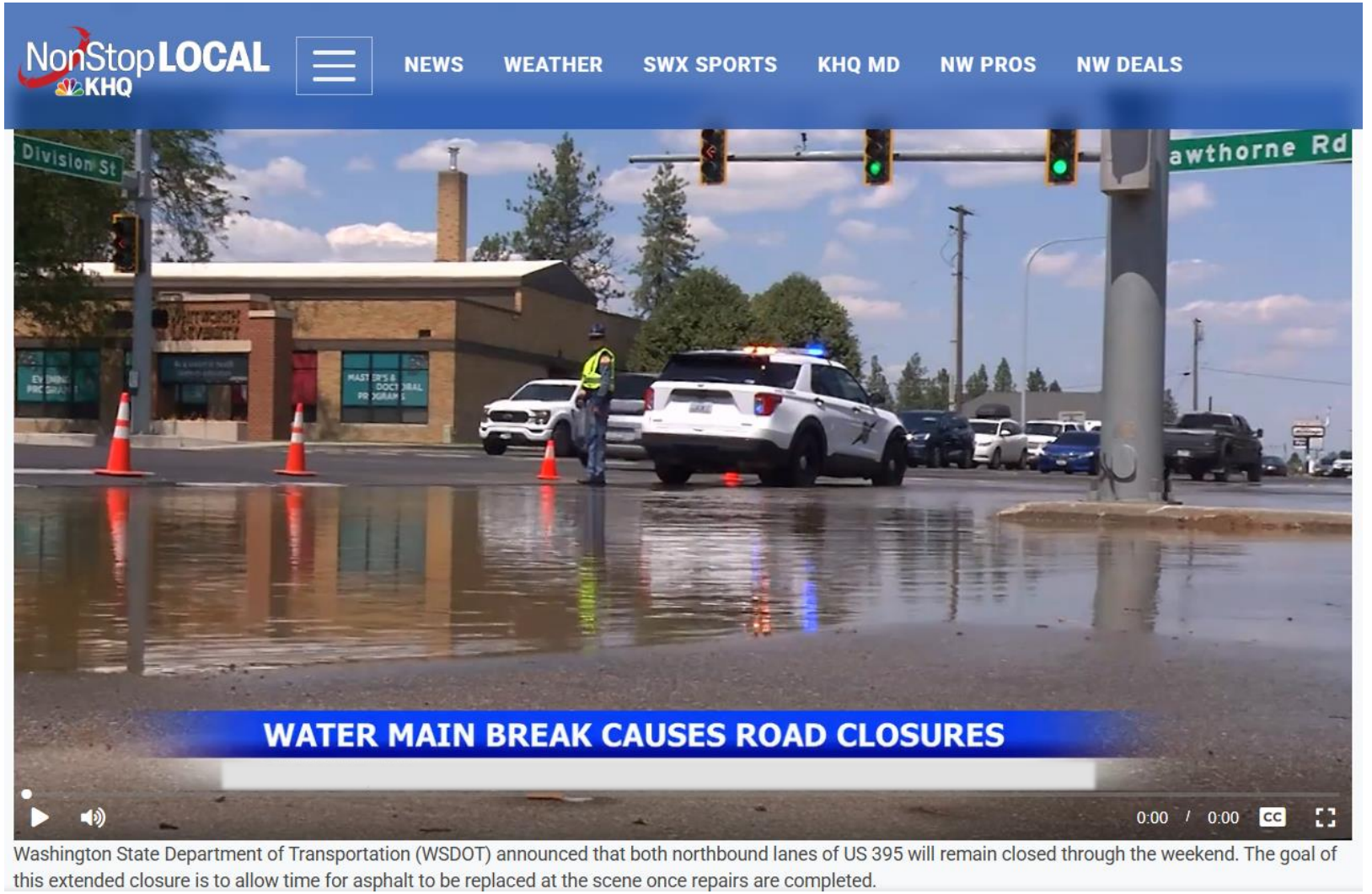
- Information is knowledge. Knowledge is power
- Most metallic pipes in the Pacific Northwest are reaching the end of their service life
- A water main breaks every two minutes in the US
- **How do you know the condition of your pipes?**



Main break leaves residents without water

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Change the news to less of this



Washington State Department of Transportation (WSDOT) announced that both northbound lanes of US 395 will remain closed through the weekend. The goal of this extended closure is to allow time for asphalt to be replaced at the scene once repairs are completed.

Source: KHQ.com

And more of this!





Questions?

Cimco-GC SYSTEMS

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