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**Asia Water Forum 2022**  
8–11 August 2022 • Online

Side Event

## **S4A: Using Technology to Reduce Leakage in Water Distribution Networks**

8<sup>th</sup> August 2022 | 15:30



# Utilising Data and Artificial Intelligence to Make Informed Decisions on Water Distribution Networks

Mark Nicol

**MUELLER**

**ADB**

# ☄ Maintaining Asia's Road Infrastructure



A water operator's worst nightmare



# Mueller's vision for a future state:

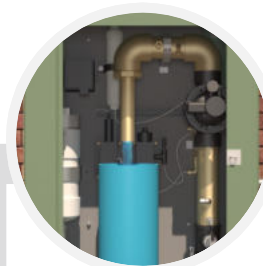
Imagine your  
assets...  
Smarter



- My service pressure is 2.3 bar
- There's a leak inside this home.
- Let's close my valve.



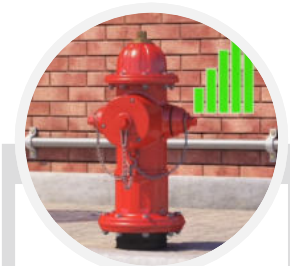
- I am partially open.
- pH levels are OK.
- I've seen 1,200 m<sup>3</sup> of flow in the last hour.



- Chlorine residuals are too low.
- I'm going to flush until chlorine levels are OK.



- My Pressure is too low and might make customers unhappy.
- I'll increase the pressure until after they go to sleep for the night.



- My pressure has dropped 1 bar in the last hour.
- There's a leak 37.5 meters east of me that's been running for at least 6 days.

# Bringing Data Together

A digital services platform for water utilities to monitor, operate and optimise water distribution networks.



## Easy

All your water network data integrated into one secure platform with intuitive dashboards



## Customer Centric

Improve network visibility to prevent and manage issues before customer impact



## Sustainable

Realise a resilient and more sustainable utility through platform insights and efficient operations



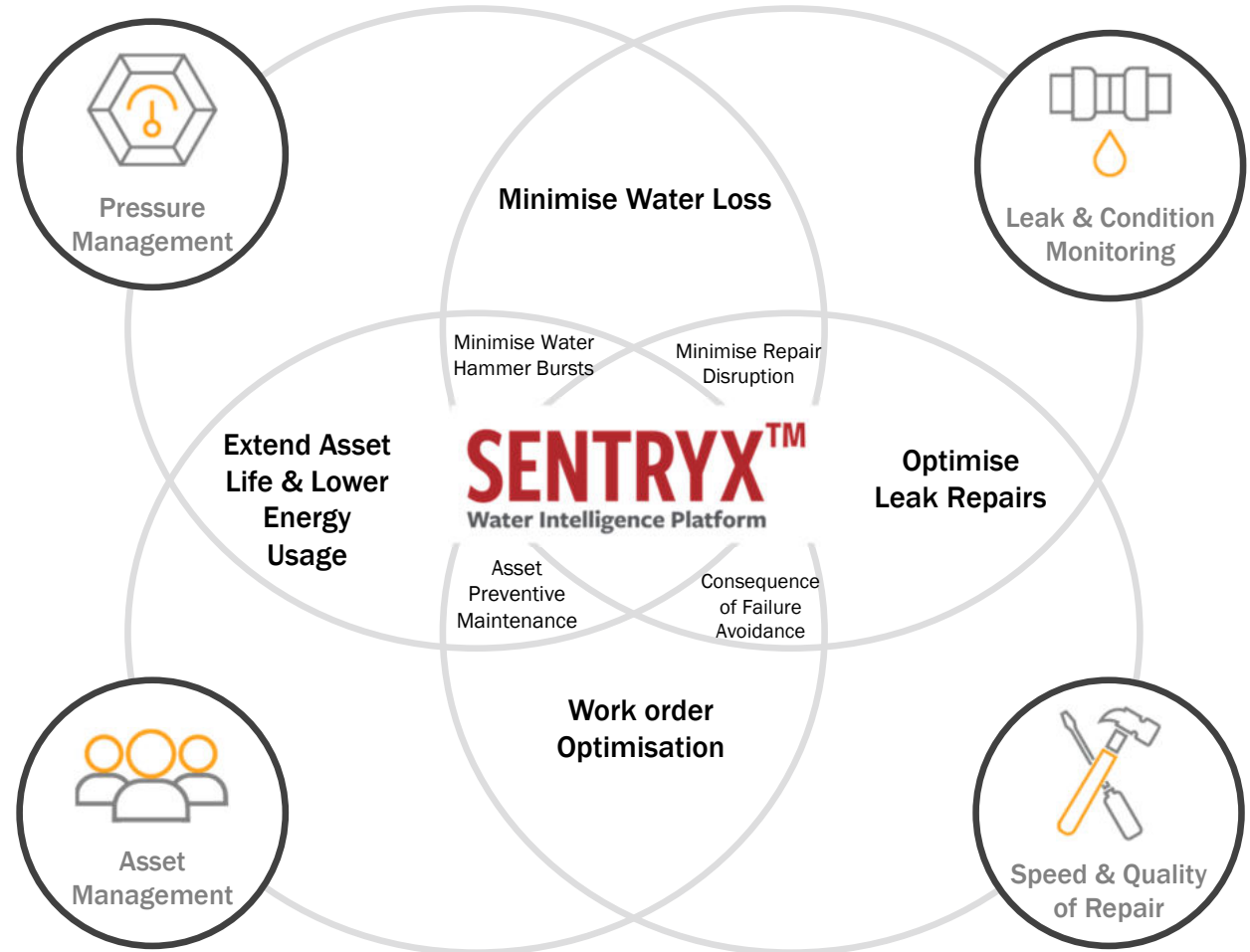
## Dynamic Implementation

Bundle or independent services for metering, pressure monitoring, leak detection, asset planning





# Sentryx provides insights for optimising NRW implementation on Water Supply Networks





# Distribution and Trunk Main Leak Monitoring

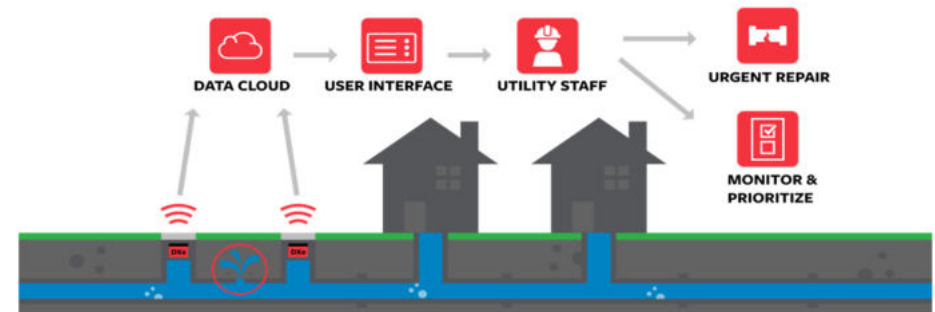
Identify and locate leaks as they form





# Why leak monitoring?

- End-of-life infrastructure requires careful observation, management and intervention
- Surprise leaks impact customer satisfaction and utility reputation
- Reducing run times saves water
- Achieve operational/regulatory targets faster, including Net Zero
- Locating leaks manually costs time, labour and money
- Access to the right insights can immediately improve network operations







# The newest member of the EchoShore<sup>®</sup> family

- Extra long (verified) 10-year battery life
- IP68 rated & designed for multiple climate conditions
- External Accelerometer and Antenna enabling multiple installation options
- Full Daily Network Correlation with supplementary Single Channel analysis
- Longer distances between sensors on metallic/ac pipes
- Communication options available using 4G, NB-IOT and LTE-M cellular networks
- Compatible with EchoShore-DX hydrant cap and Sentinel Smart Fire Hydrant Sensor

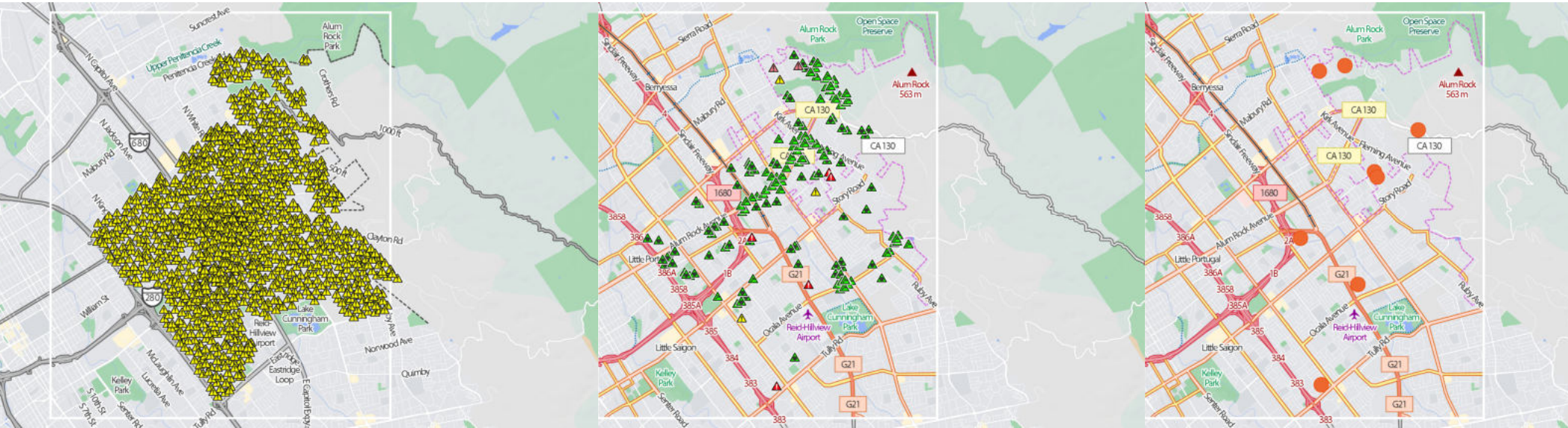
## EchoShore<sup>®</sup>-DXe





# Cut through the noise

10,000 Devices (over 1,500mi / 2,400km of pipe)



**Data:** >25,000 Detected Events/Year

**Information:** 10,000 Qualified Events/Year

**Insights:** 300 Leaks/year



# Noise sources – Ambient Noise

10,000 devices may detect over 250k ambient noise events every year

Leaks are not the only events that create noise.

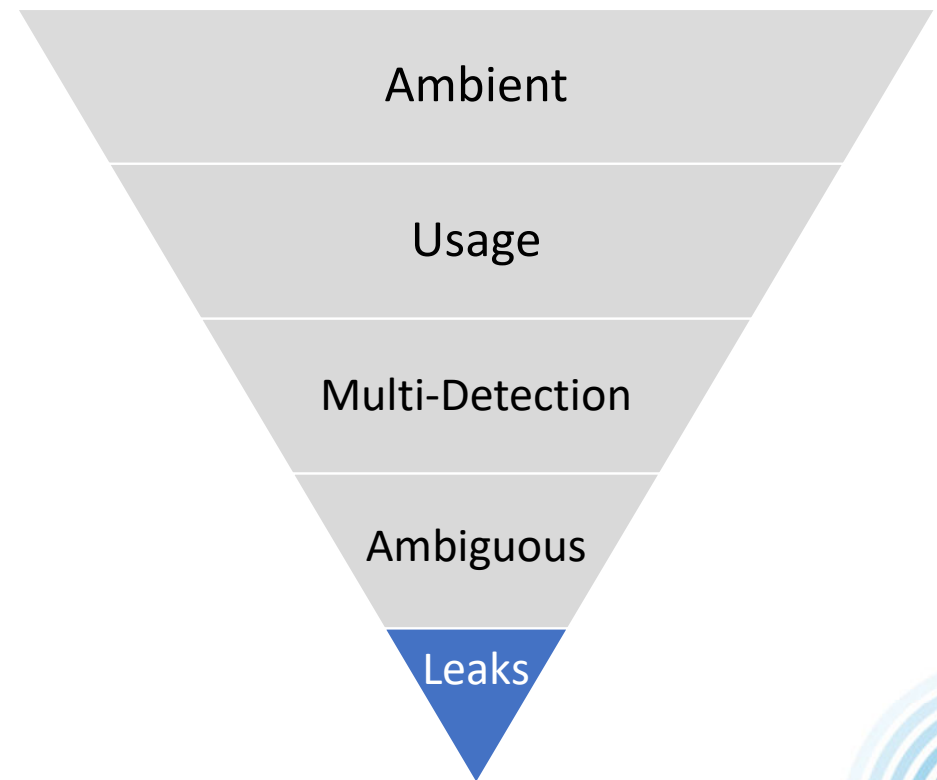
- ✓ Weather: Rain or Wind
- ✓ Traffic
- ✓ Pumps
- ✓ Construction Equipment

Solution:

- ✓ Correlation is immune to ambient noise
- ✓ GBT Classifier significantly reduces false detection caused by weather, traffic and construction equipment

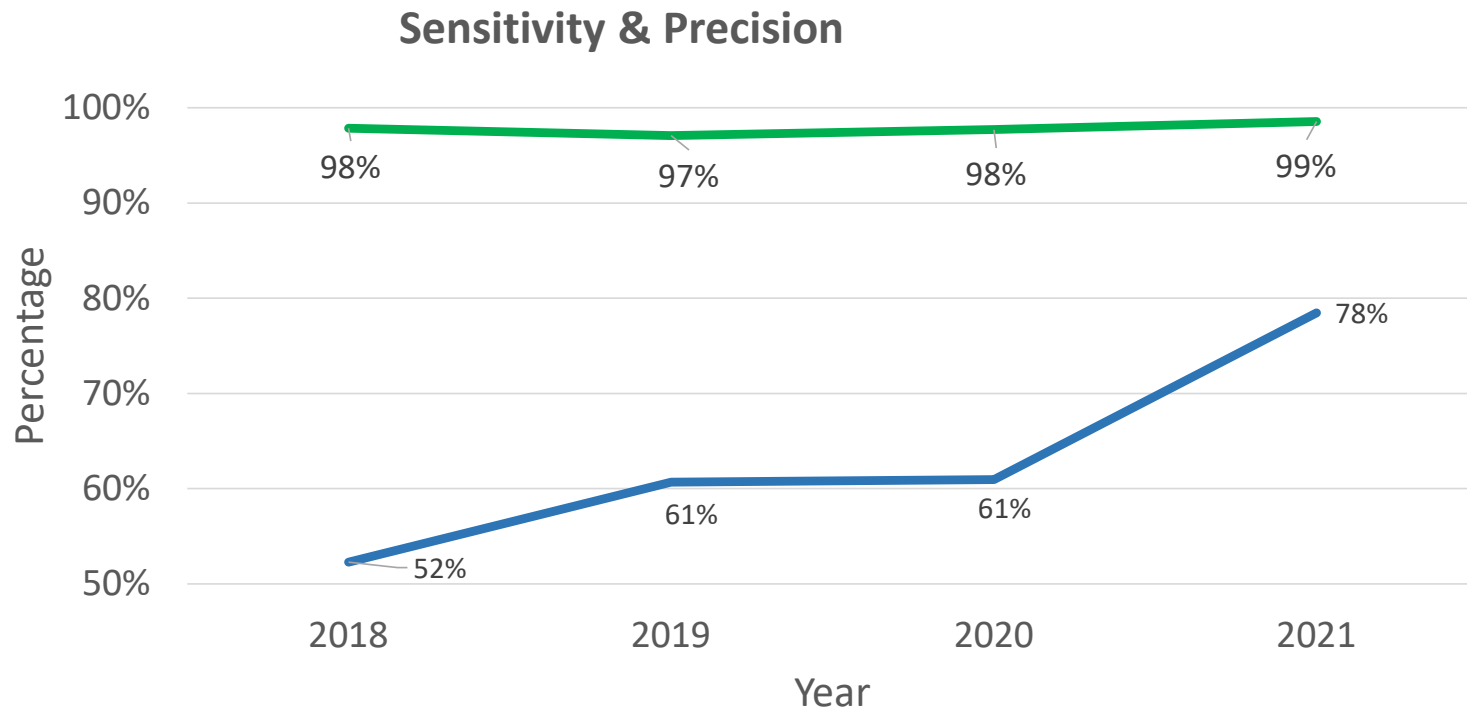


## Event Classification





# EchoShore-DX Performance in North America



**SENSITIVITY = CONFIRMED LEAKS/ACTUAL LEAKS**

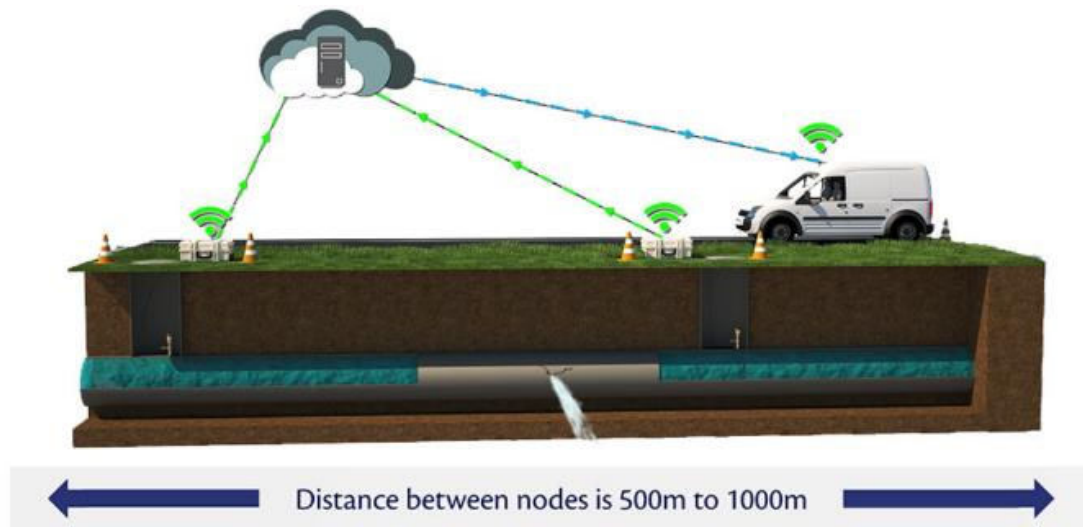
**PRECISION = CONFIRMED LEAKS/(CONFIRMED LEAKS + CONFIRMED NON-LEAKS)**



# Non-invasive trunk main leak detection

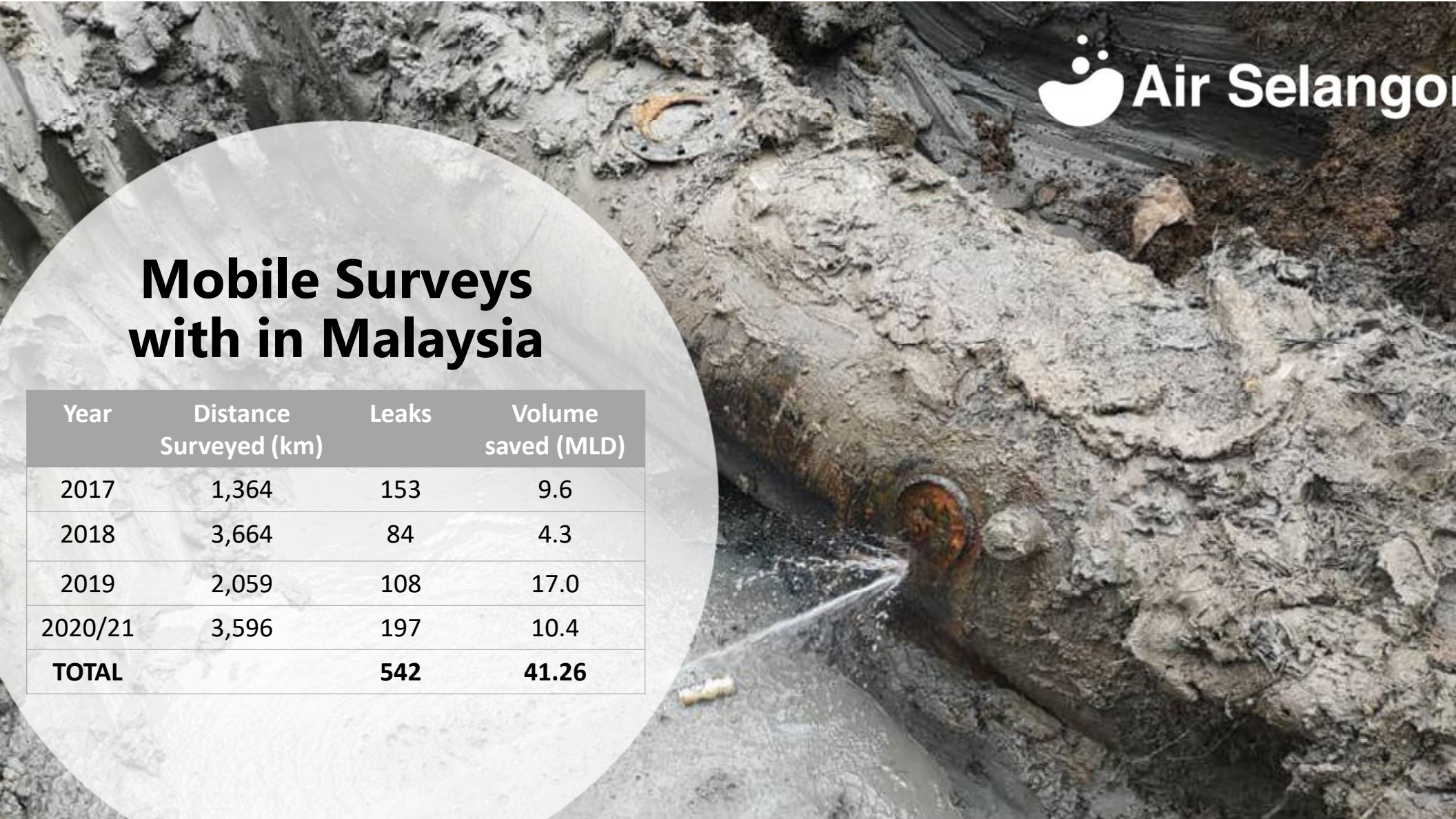
Trunk Mains are often overlooked assets due to perception they do not leak and challenges/costs to perform surveys

A significant portion of leakage occurs on these pipes



## Mobile Surveys with in Malaysia

Year	Distance Surveyed (km)	Leaks	Volume saved (MLD)
2017	1,364	153	9.6
2018	3,664	84	4.3
2019	2,059	108	17.0
2020/21	3,596	197	10.4
<b>TOTAL</b>		<b>542</b>	<b>41.26</b>

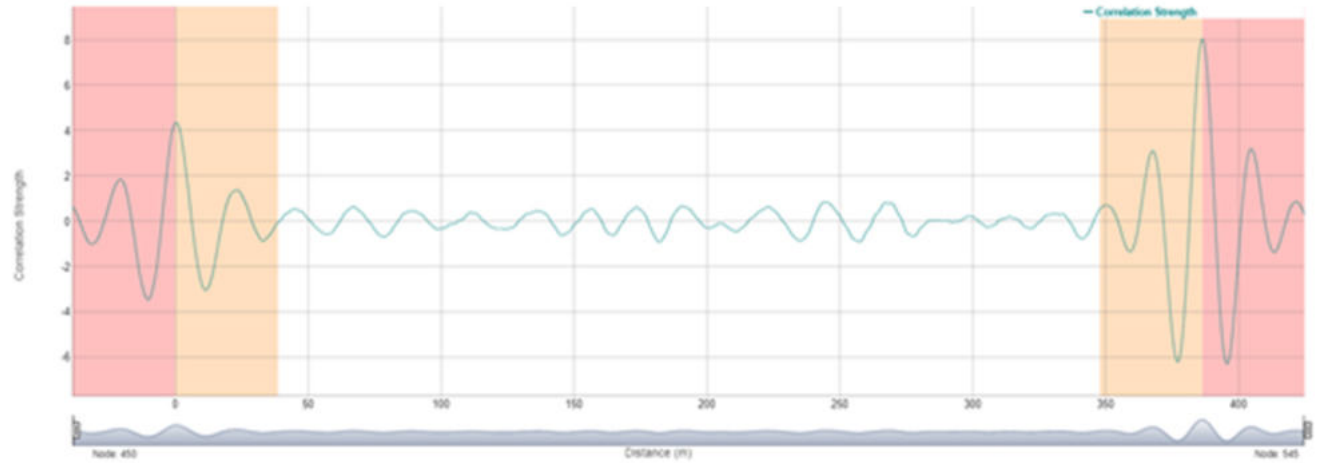


# Permanent Trunk Main Monitoring with Singapore PUB

- Following initial trials and a pilot [6 nodes] Echologics were awarded a 3-year, 100km [120 node] trunk main monitoring project (2017-2020)
- Detected 14 leaks which were not surfacing and were repaired under planned conditions before a catastrophic failure
- In Sept 2020 Echologics were awarded a new 5-year [300 node] contract by PUB, with installation completed by March 2021.

# Significant Acoustic Signal Detected

June 18



June 19







# Pinhole Leak Near Invert of Pipe ~ 20 GPM



No visible signs of leakage



Pinhole leak at point of interest





# Long-term Asset Planning

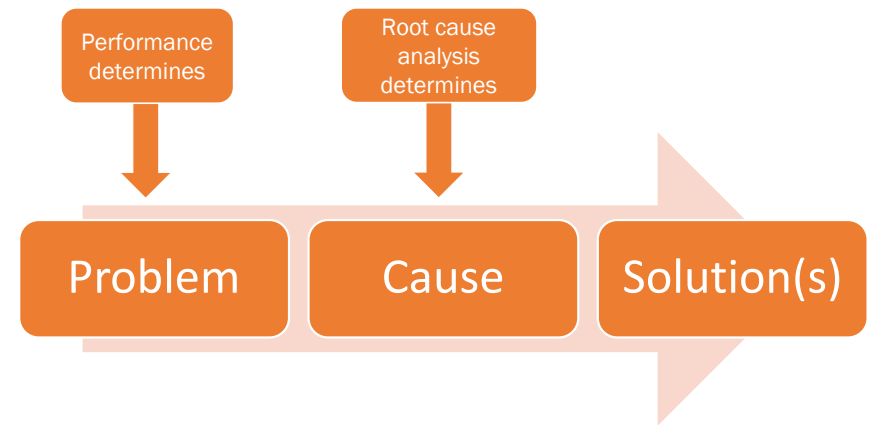
Identify which pipes need to be replaced and when to intervene



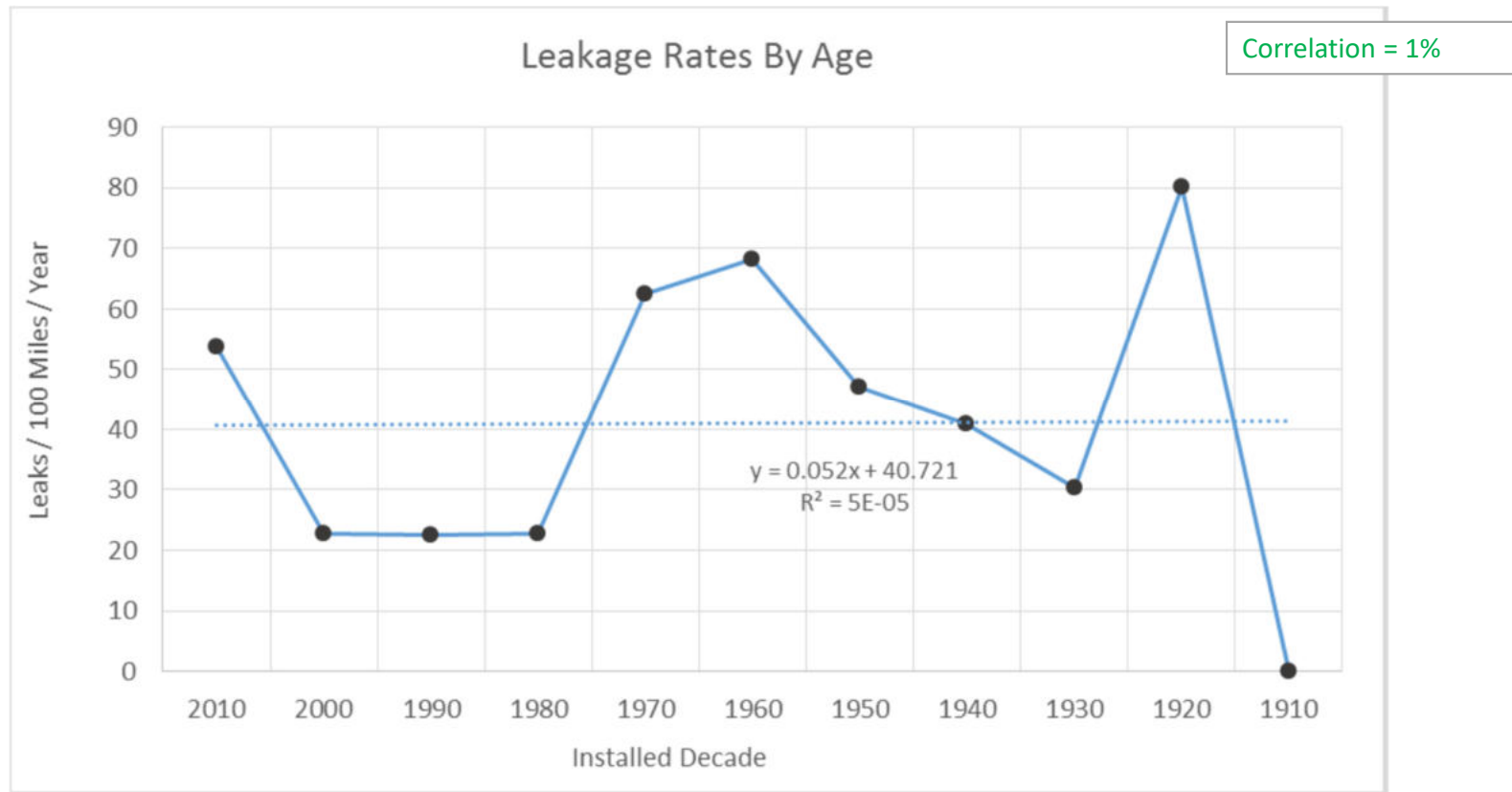


# Pipe failure is a global issue

- Many pipes are reaching or have passed design life
- Insufficient budget available to meet expected replacement needs
- Replacing based on age or prior breaks has been proven ineffective
- As pipes age, they deteriorate at **varying rates** depending on many factors
- Deterioration reduces structural integrity
- Knowing when pipes have reached the end of their life enables targeted replacement, optimising return on investment



# Leakage vs Pipe Age

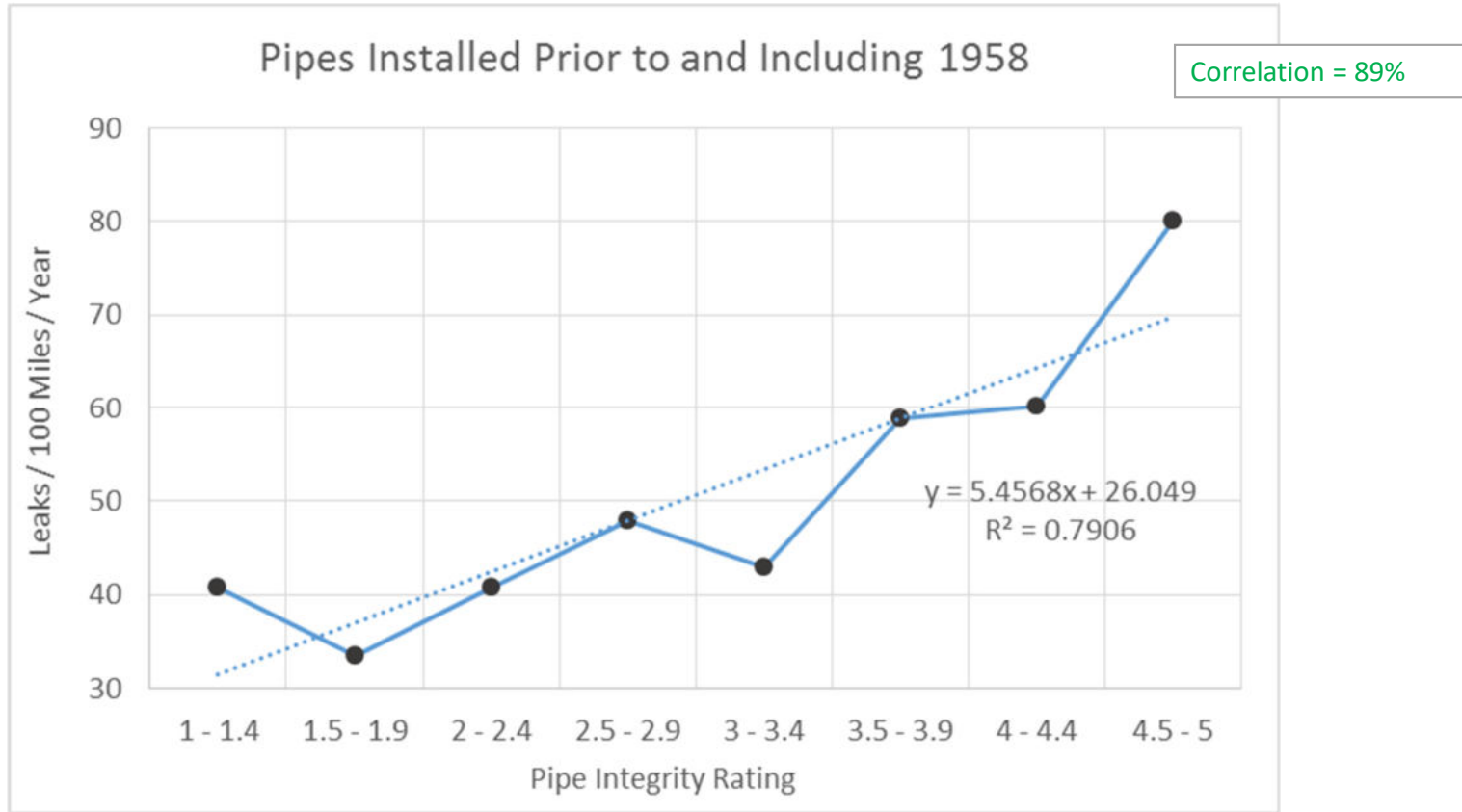


- Data provided by WSSC, water supplier to Washington, US





# Leakage Increases with Pipe Degradation

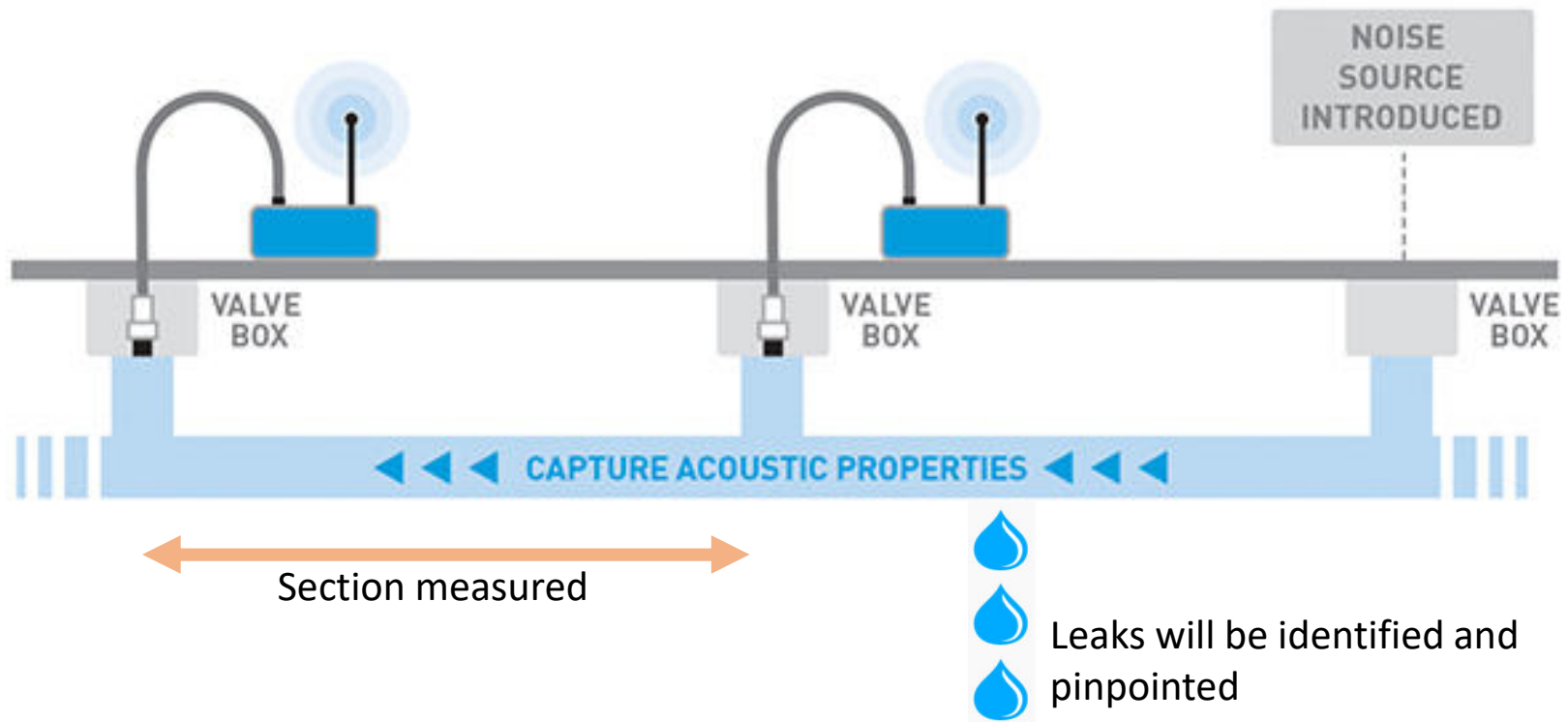


- Data provided by WSSC, water supplier to Washington, US





# Non-invasive Condition Assessment (ePulse<sup>®</sup>)



# ePulse Survey Method



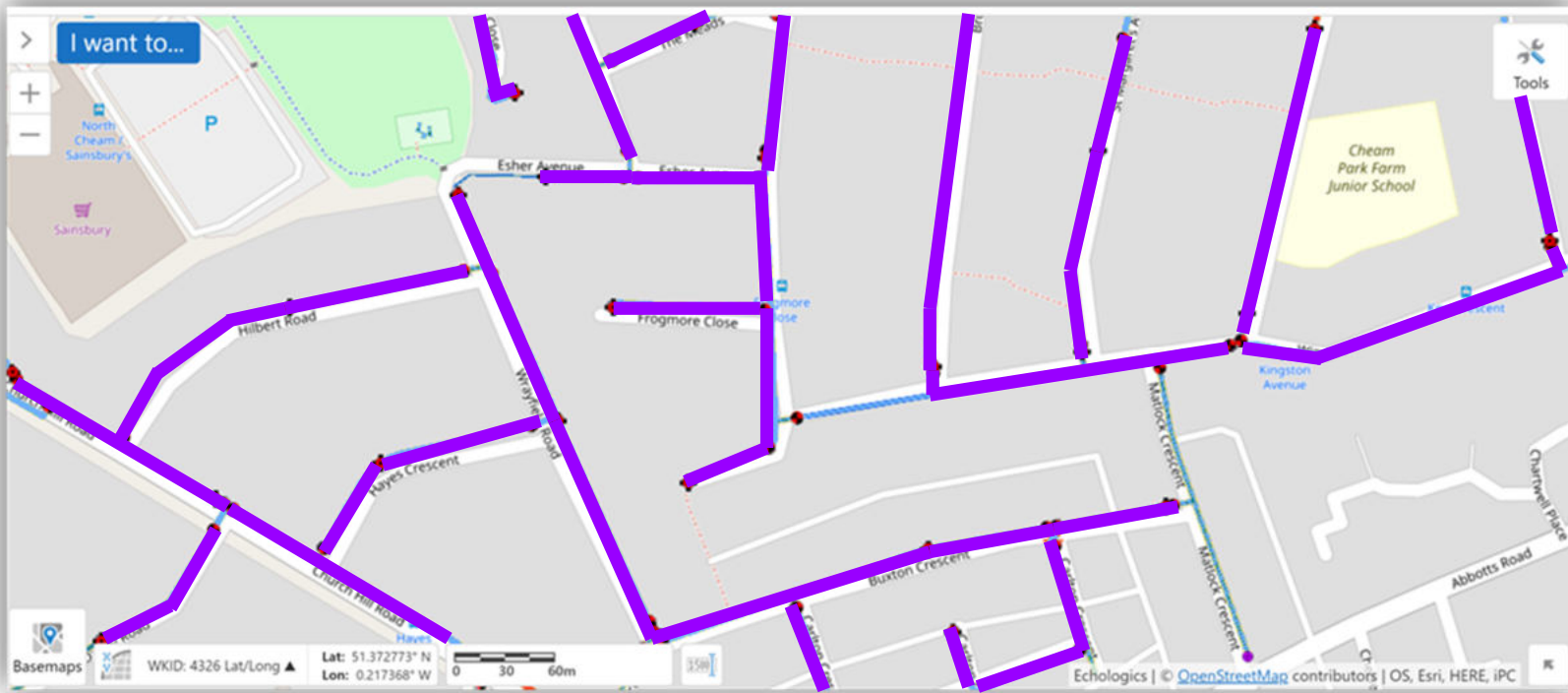
# ePulse Survey Method







# ePulse Survey Method

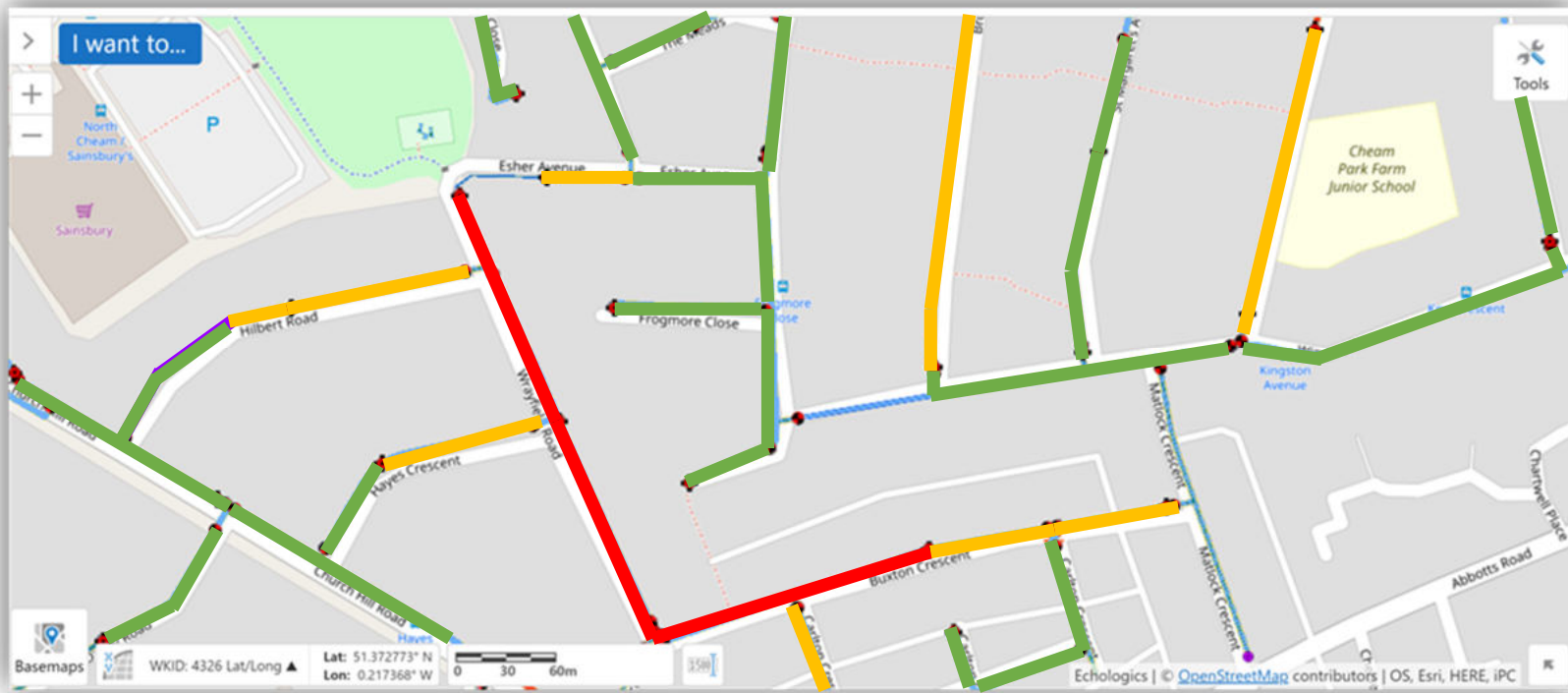


- Data is saved to our online GIS system during surveys and later checked for quality and analysed by our expert Engineers and Analysts in Toronto





# ePulse Survey Method



- Results delivered through Sentryx, as a GIS layer, as a tabular report and where required a full engineering report.



# Case Study: Singapore

- 450km of aging CI mains 400mm and smaller
- PUB engaged Echologics to develop prioritisation plan for replacement of these pipes
- Suez provided AI desktop analysis using Netscan software
- 80km of pipes selected for ePulse condition assessment
- Field data used to calibrate AI model

## Results

- 35% of the network does not need replacing now
- Saving an estimated SGD \$70M (USD 55M).



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# Thank You

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**ADB**