



The Pipeline Robots Joint Laboratory in Water Supplies Department, HKSAR Government

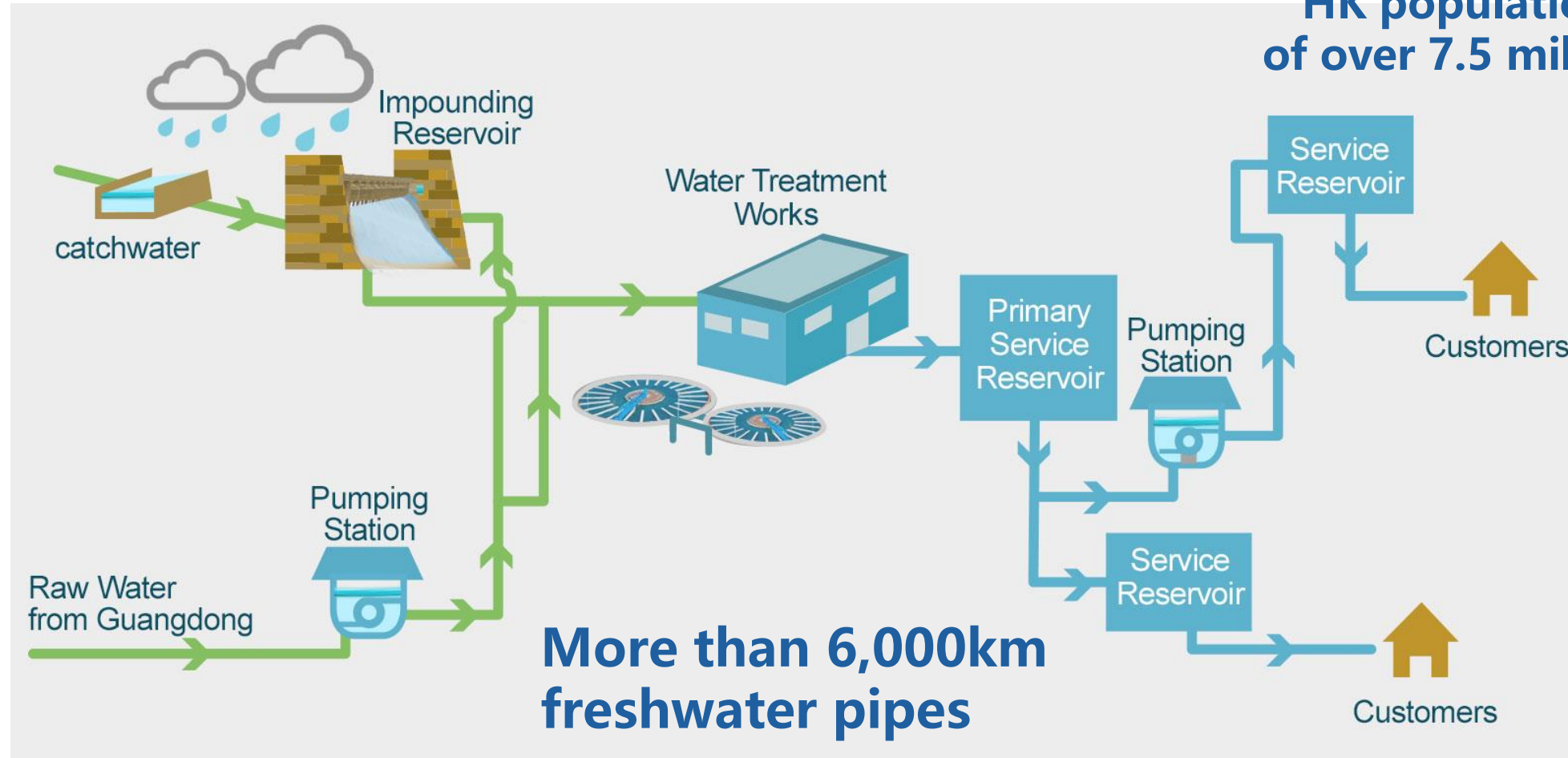
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Engineer / Geographic Information System

3 September 2026

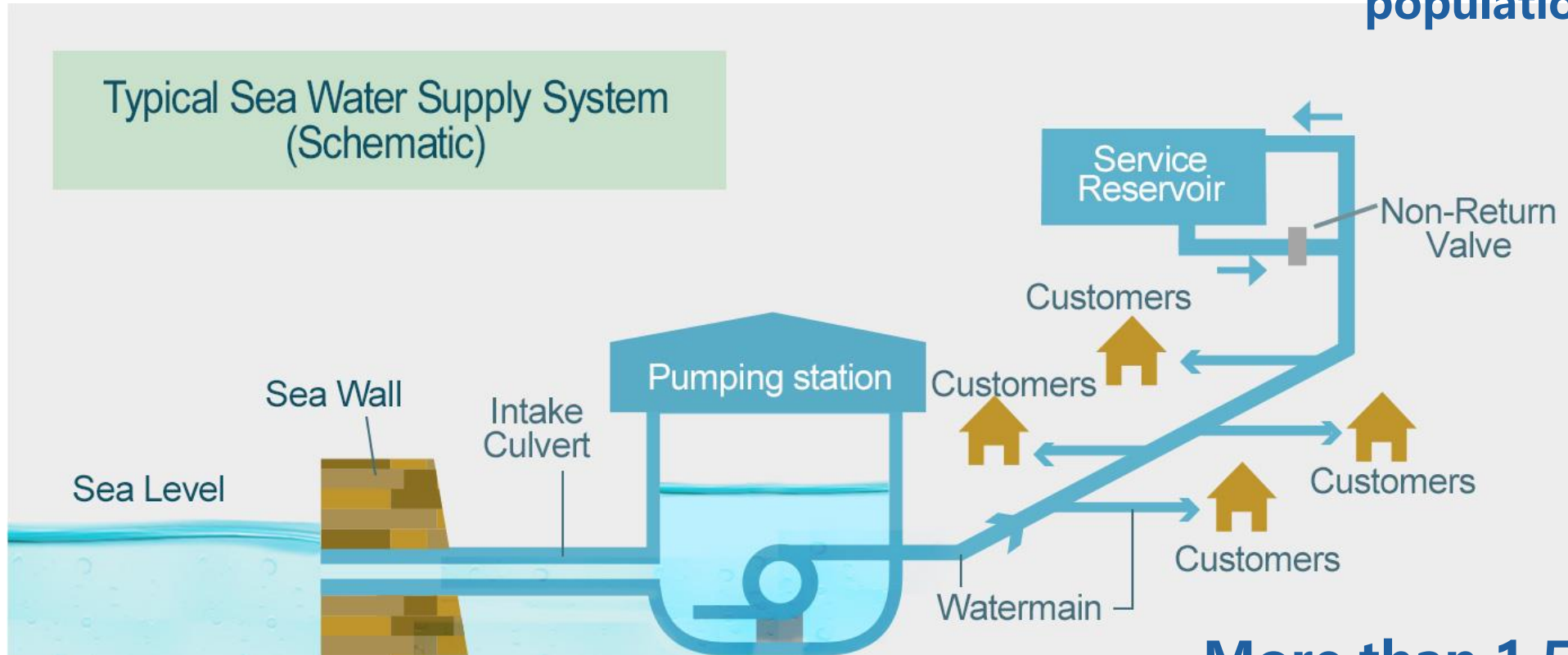
Fresh Water Supply System

Covering 99.99% of
HK population
of over 7.5 million



Sea Water Supply System

Covering 85% of HK population



More than 1,500km salt water pipes



Major Challenges



**High water supply pressure
due to the hilly topography**

**Congested urban setting
and underground
utilities services**



**Aging problem of
water pipes**

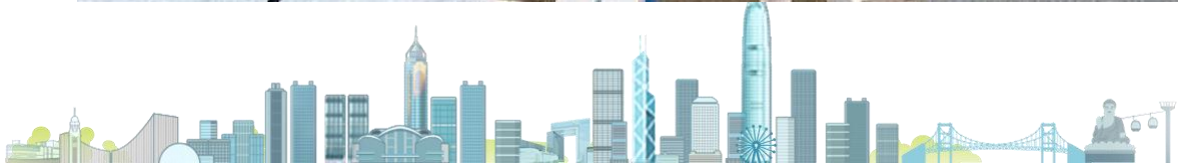


Before the establishment of Pipeline Robots Joint Laboratory



Q-Leak underground water mains leak detection training centre

- Various size (ranging from 50mm to 600mm in diameter) and material (PE, DI, Steel) beneath common types of road surfaces (brick, concrete, bitumen)
- Adjustable pressure and flow controls with as well as simulated leak points



Pipeline Robots Joint Laboratory

- Established in September 2025 with Hong Kong PolyU and Shenzhen Bwell
- Adapting Technologies to Unique Operating Environments and Leveraging Advanced Innovations in Chinese Mainland
- Targeted R&D Vision: Customized inspection robot for live-main operations and high-pressure environments



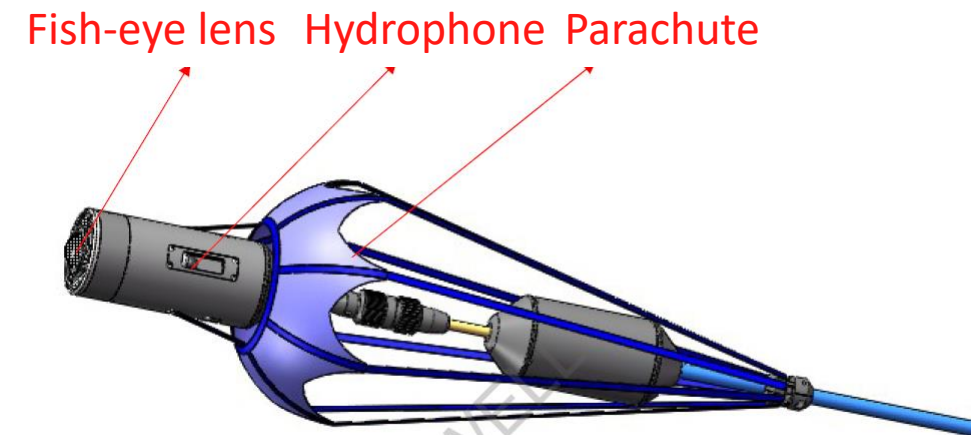
Intelligent Pipescope

- Local technologies of water mains inspection robots, address complex water supply network in Hong Kong
- Conduct internal inspection in pressurized water mains without service suspension
- Collection and analysis of data of image, sound and position for inspection



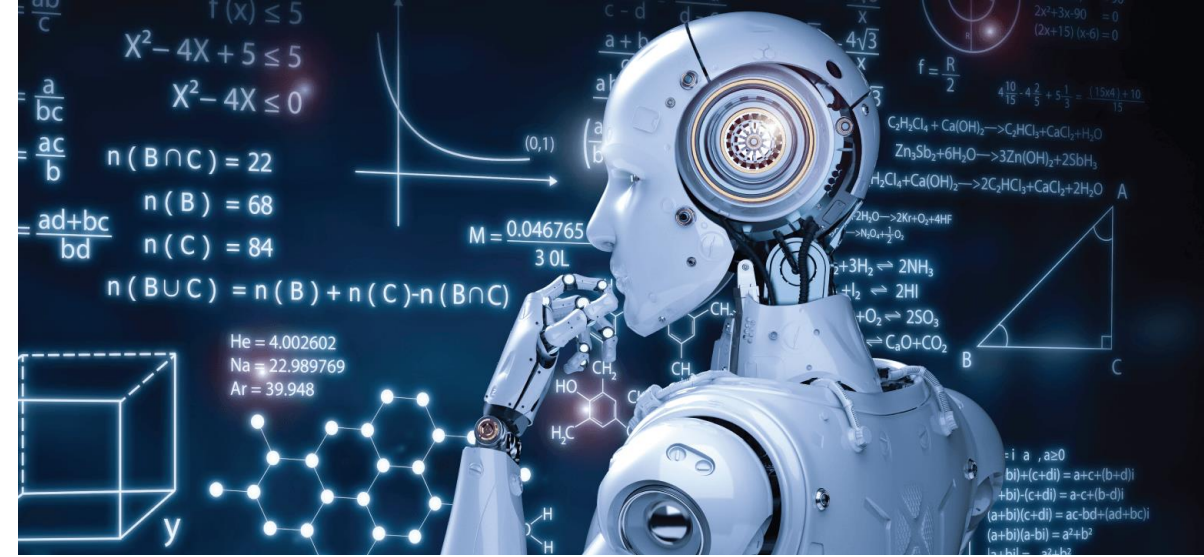
Major Enhancements

- Original Prototype: **Bwell SNAKE**
- Image: HD Fisheye Lens
- Position: Inertial Measurement Unit (IMU)
- Sound: Noise sensor & AI analysis
- Image & sound synchronize
- Durability & reliability



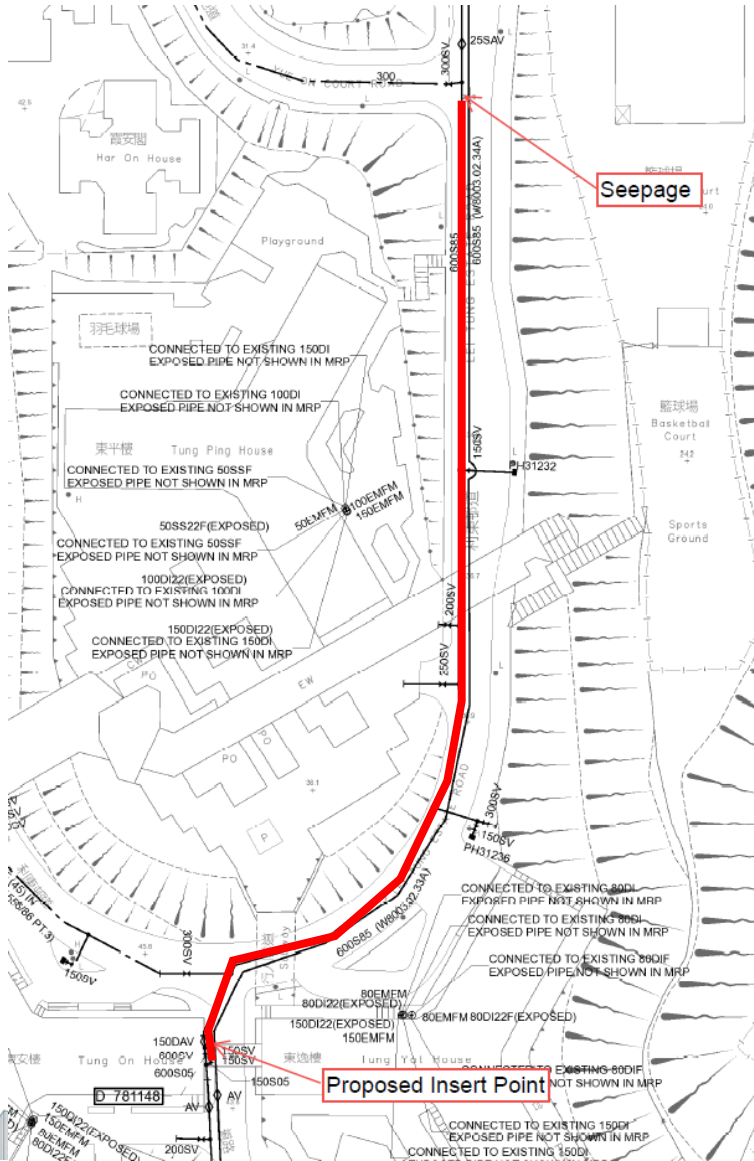
Use of AI and Big Data

- Dual-Modality Recognition
 - Acoustic plus visual recognition
 - Denoising and cross-validation
 - Multi-Source Data Standardized Governance
 - Alignment of multi-source data fusion through unified time-stamps
 - Decision Support and Future Evolution
 - Currently support human identification
 - Ultimate goal: fully automated system featuring autonomous recognition, early warning generation, and multi-modal joint judgment
- 



Successful Case

- SW DN600, Lei Tung Estate Road, Ap Lei Chau (Mar 2026)



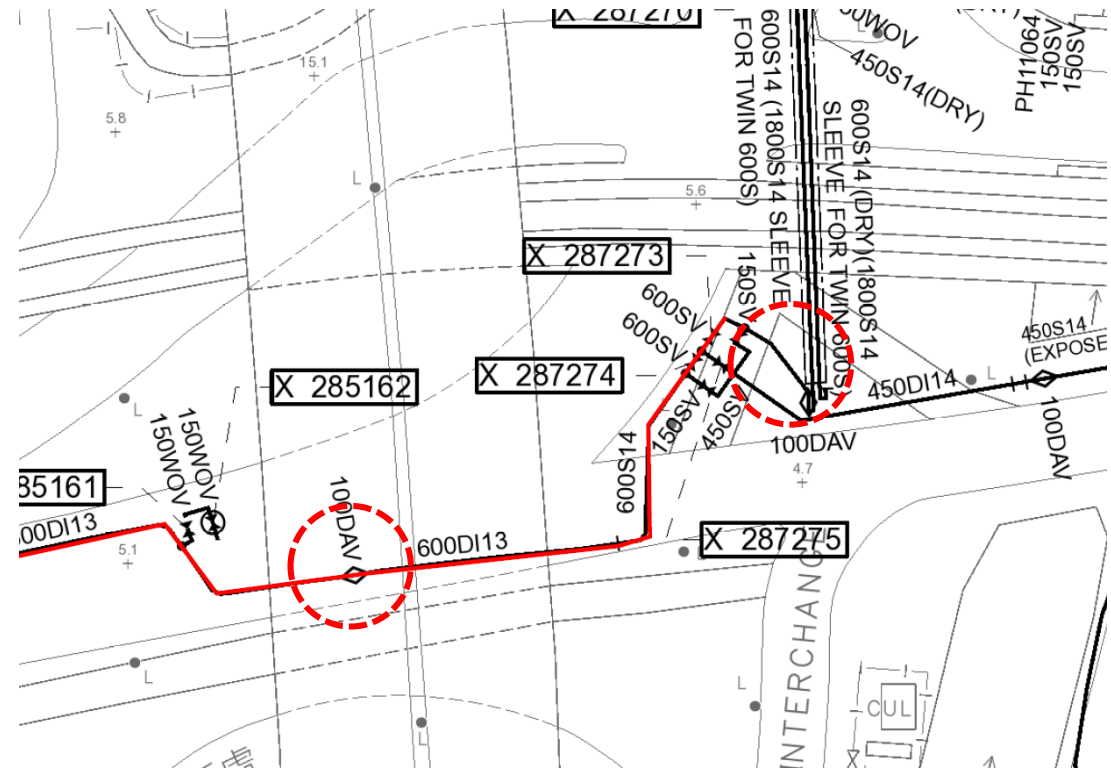
Progress

- **Completed** most of **enhancements** of Intelligent Pipescope and testing in Q-Leak
- Planning at least **20 site trials** in **2026** to collect leak noise
 - Completed 4 site trials
 - 27 locations to check feasibility or arrange chamber modification
- **Q-Leak modification** commenced in May 2026 for completion in Q1 2027
- Target completion of Intelligent Pipescope - **Q1 2027**



Difficulties & Challenges

- Size
 - Insertion point $\geq$ DN100 tee
 - Main pipe $\geq$ DN250
- Length
 - Inspection length $\leq$ 500m
- Bends
 - Single bend $\leq 90^\circ$
 - Cumulative bends $\leq 270^\circ$
(Max . 3 nos. of 90° bends)
 - Vertical bends and horizontal bends

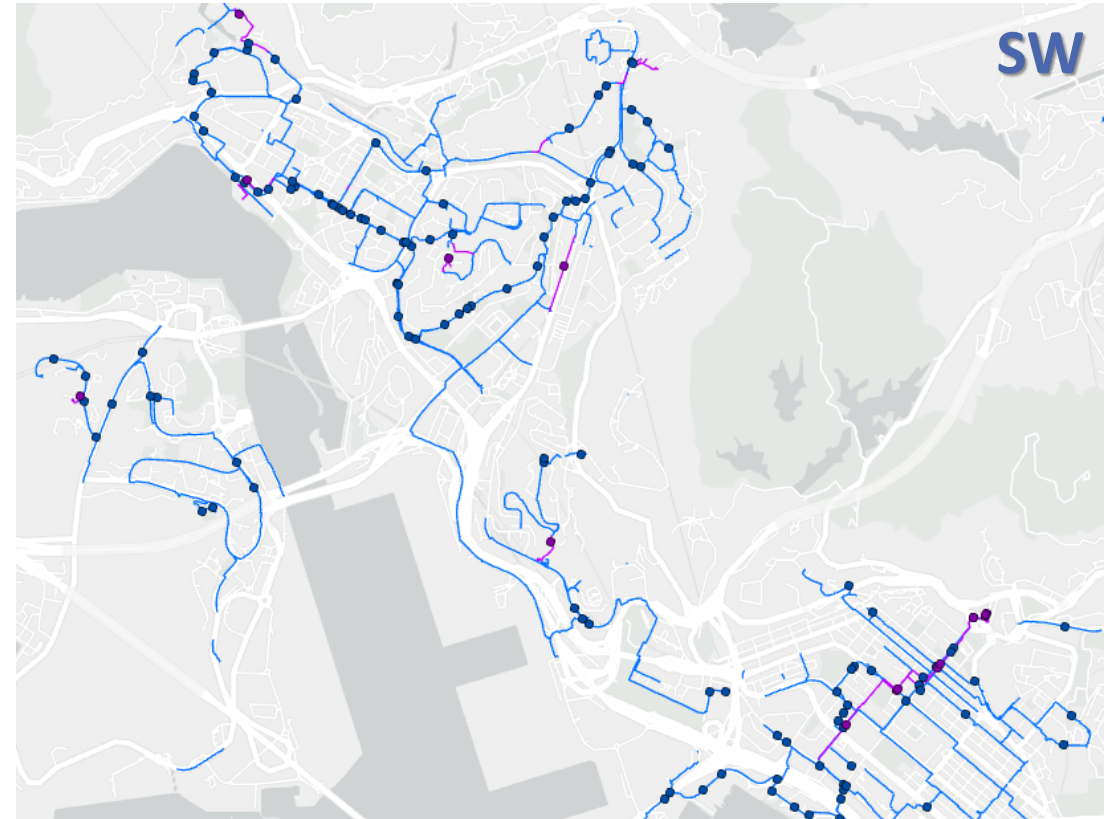
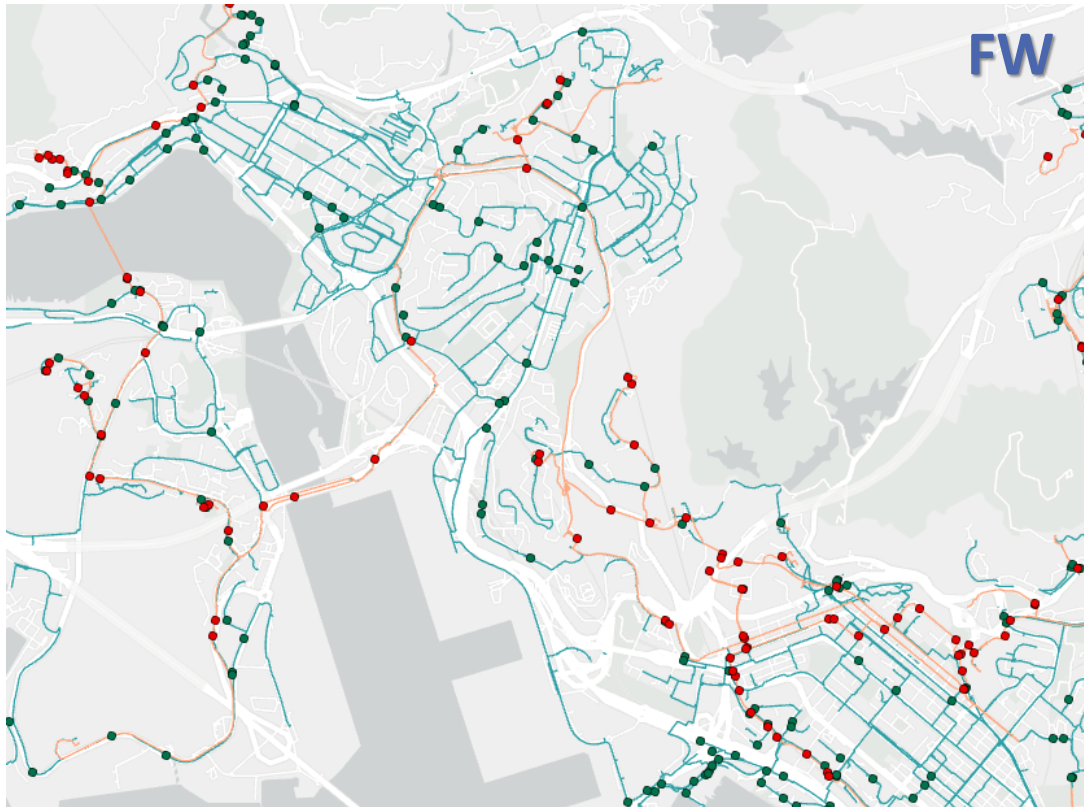


Castle Peak Road, Shui Pin Wai Interchange, Yuen Long



Difficulties & Challenges

- Lack of suitable insertion points

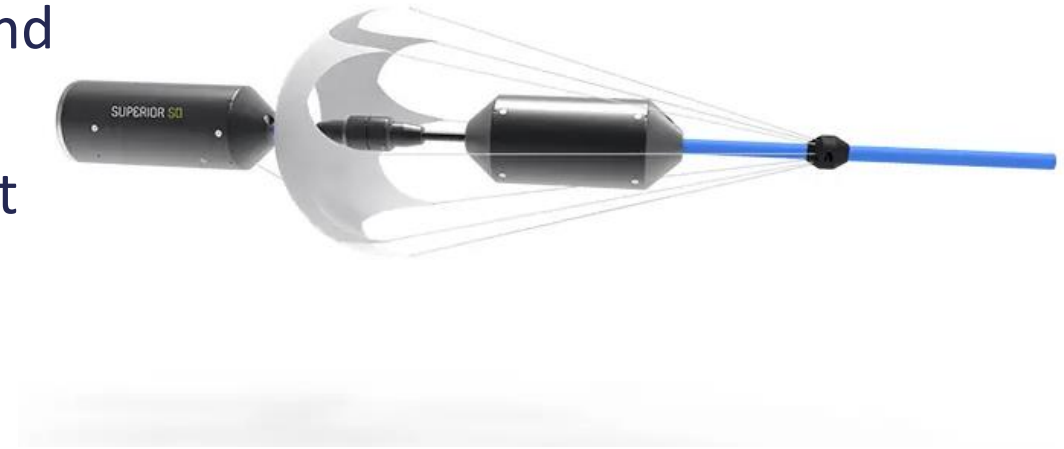


Main pipe ≥ 250 , DAV $\geq \text{DN}100$



Pipeline Robots Joint Laboratory

- Collaboration with local university and Mainland pipeline robotics developer
- Development of robotics technologies that suit Hong Kong's needs
- Long-term training of in-house staff to use the robots as routine leak detection



**Tackle
complex
environment**

**Operation
during
service of
pipeline**

**Application
in various
scenarios**

**Positioning
Instruments**

**Multifunctional
Technologies:
Acoustic sensors,
HD cameras, AI
analysis**

Upcoming...Hong Kong Water Expo (early April 2027)

- Organized by Water Supplies Department and Drainage Services Department, HKSAR Government
- Co-located with IWA Global Utilities Summit
- Intelligent Pressurized Pipeline Robotics Challenge

