

### Innovations in In-Service Robotic Inspection of Unpiggable Natural Gas Pipelines at River Crossings for Which There are No Existing Launching and Receiving Capabilities



PPSA Seminar 20 November 2024



Ever-evolving solutions •

## **River-Crossings are Critical**

With the critical role natural gas plays in our energy infrastructure, ensuring the integrity of transmission and distribution pipelines is paramount as these river crossing pipelines ensure infrastructure connectivity and energy availability to a vast array of communities and businesses worldwide.



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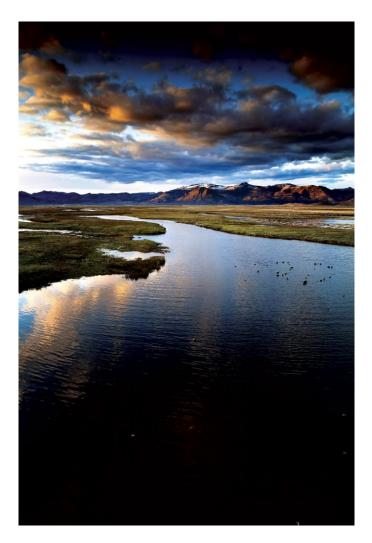
## **River-Crossing Pipeline Failures**

#### Impact to the Community

- Contamination of local ecosystem
- Supply disruptions to households or businesses
- Build-up of combustible gas / Explosion

#### Impact to the Operator

- Legal / Regulatory repercussions
- Damage to public image / valuation
- Closure of the business





## **Alternative Inspection Techniques**

#### **External Corrosion Direct Assessment (ECDA) via Diver**

- Visibility Challenges
- Limited access to the line (buried)
- Time constraints from equipment
- Dangerous (current/flow)

#### Sonar Survey via Boat

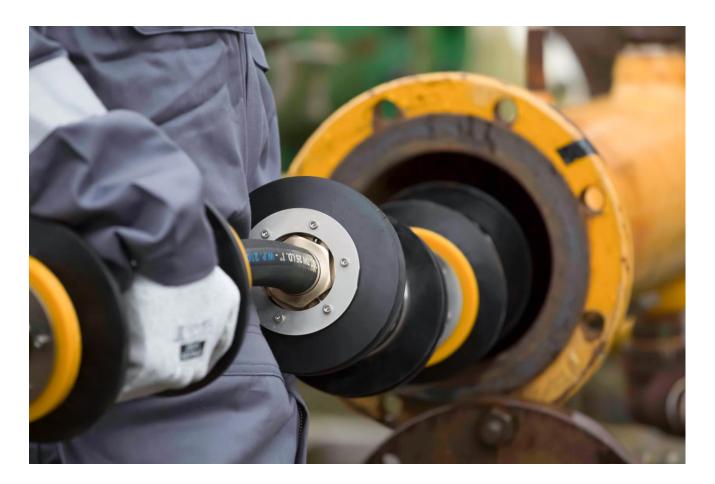
- Low-resolution / poor detection of anomalies
- Only general features
- Debris/rock/coverage can distort signal



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## **Alternative Inspection Techniques**



#### Free-swimming Inline Inspection (ILI)

- Piggable vs unpiggable
  - Lack of Launcher/Receiver
  - Inability to shut down the line
  - Unknown pipeline conditions
  - Difficult to track tool underwater
  - Potentially costly retrieval





## **Pipe Explorer Robotic ILI Summary**

Non-tethered

Self-propelled

100% controlled

Constant 300 m/hr, no speed excursion

**Bi-directional** 

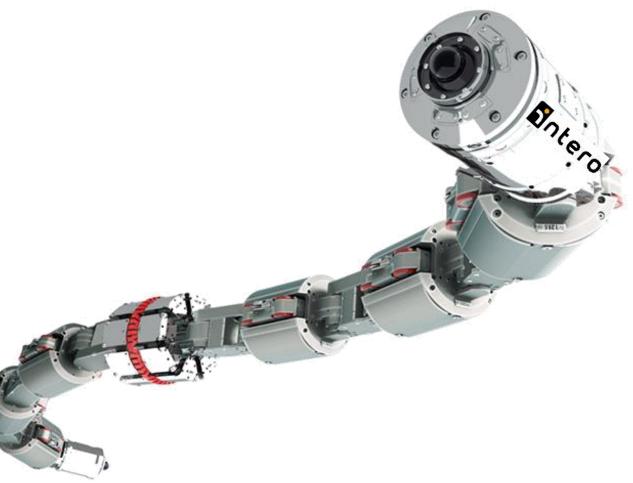
Up to 50bar in-service inspection

Mitered elbow (no radius)

Barred/Unbarred tee navigation

20% bore reduction

Camera, MFL, and Laser sensors







## **Pipe Explorer Robotic Fleet**



Pipe Explorers available in sizes from 6" (DN150) to 36" (DN900):

Pipe Explorer 6

Pipe Explorer 8

Pipe Explorer 10/14

Pipe Explorer 16/18

Pipe Explorer 20/26

Pipe Explorer 30/36



## **Track Record**

- Successfully deployed since 2010
- More than 1,600 inspections completed
- 99% success rate
- Shortest inspection 20 meter
- Longest continuous project: 6.1km
  - Live gas conditions
  - Inline charging technology



Brooklyn (NYC), NY - 20", 24", 30" pipeline inspection

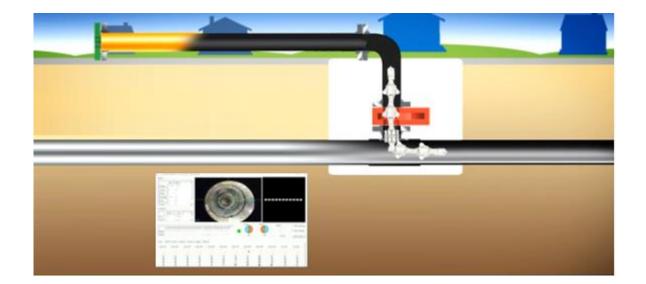
INSPECTION

SERVICES



## **Live Gas Launching**

Pipe Explorer entry and exit through hot tap fitting









### **Datatel Software Package**

| eo   | 8 ×  | 8 × Axial MFL Signal  |  |   |  |   |  |  |   |  |   |  |
|--|--|---|--|---|--|---|--|--|---|--|---|--|
| 000  | - 00:80 - 00:0 |   |  |   | <u>x</u>   |   |  | 6)   | 1   |  |   | 1  |
|  |  |   |  |   |  |   |  |  |   |  |   |  |
|  | 06:00 -  | 90.5(   | 0  | 1<br>91.00  | 91.5   | 50<br>Axia  | 92.00<br>Distance(m)   | 92.50<br>)   | )   | 93.00  | 93.50<br>> 10   | € 90 €   |
| Path: C;/Data Analysis/SampleData2<br>Name: log-video-20220825-090230.mp4  |  |   | 0<br>Name Q  |   | O'Clock<br>(hh:mm)   | 50<br>Axial<br>Depth<br>(%wt)                         | 92.00<br>Distance(m)   |  | )<br>Width<br>(mm)  | 93.00<br>WT<br>(mm)  |   |  |
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### **Case Study – 24" River Crossings**







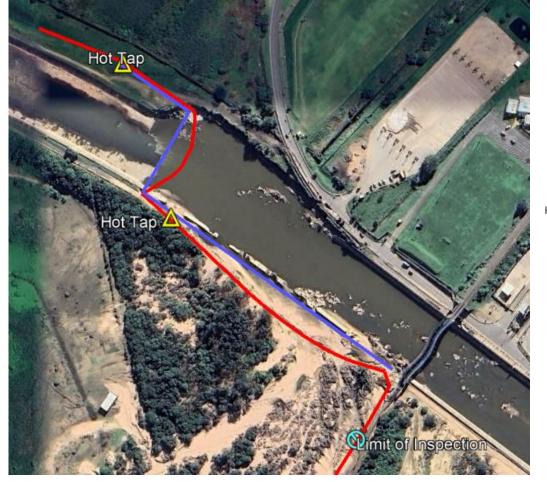
## Case Study 1 – 24" River Crossing Results

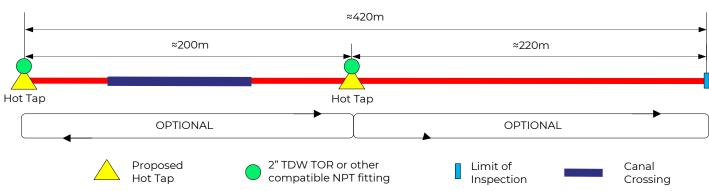
- Installed in the 1950's, but never inspected
- Took approximately 6 hours (each)
- Zero downtime
- Pipeline remained in service (50% bypass)
- 40bar operating pressure
- Redundant data scan



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### Case Study 2 – Concept







# Thank you.

#### **David Gian**

Business Development Manager – Eastern Hemisphere

**MFL** Robotics

E David.Gian@intero-integrity.com

**M** +48 881 948 844

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