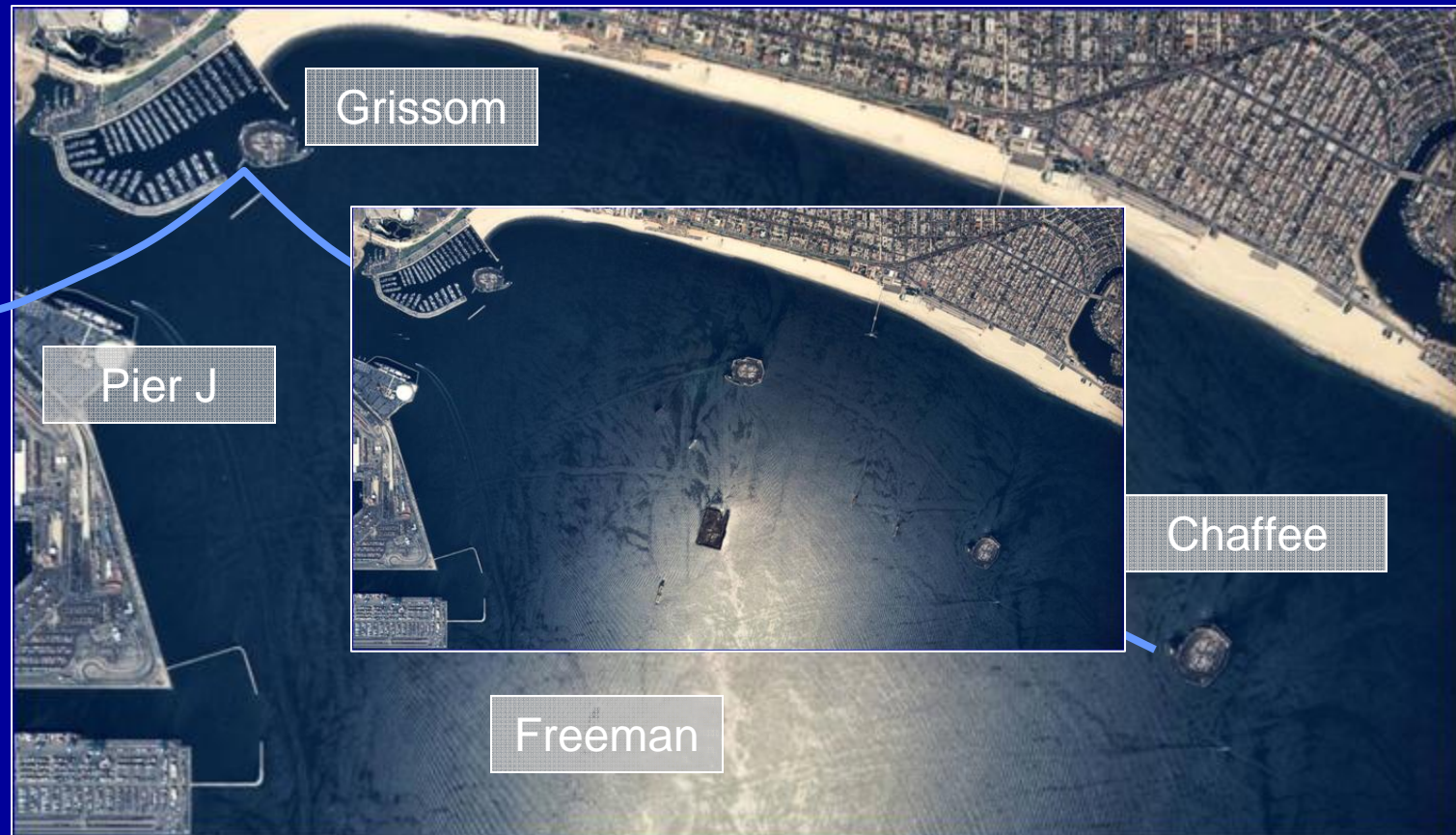


Integrity Management of Thums Cement Lined Pipelines



Thums Subsea Pipelines

Original Pipelines installed in 1966
Oil , Gas and Water (J-lines) Pipelines



Thums Subsea Pipelines

- **8 Subsea Pipelines Transport Oil and Gas to Pier J**
 - Steel Lines
 - 6", 8", 12" and 14" lines
 - Water cut in Oil Pipeline ranges from 5% to 70%
- **4 "J-lines" Transport Water from Pier J to the Islands for Re-injection**
 - Internally cement Coated Lines
 - 12", 14" and 18" lines
 - Produced water (5ppm oil)



Oil & Gas Pipeline Mechanical Integrity

- DOT Regulated
- Monitoring Program (Inspection Surveys)
- Cathodic Protection
- Chemical Inhibition
- Pipeline Cleaning Program (Pigging)



J-Line Mechanical Integrity Program

- Cathodic Protection Surveys
- Corrosion Inhibition
- Pressure Testing
- Internal Inspection Survey

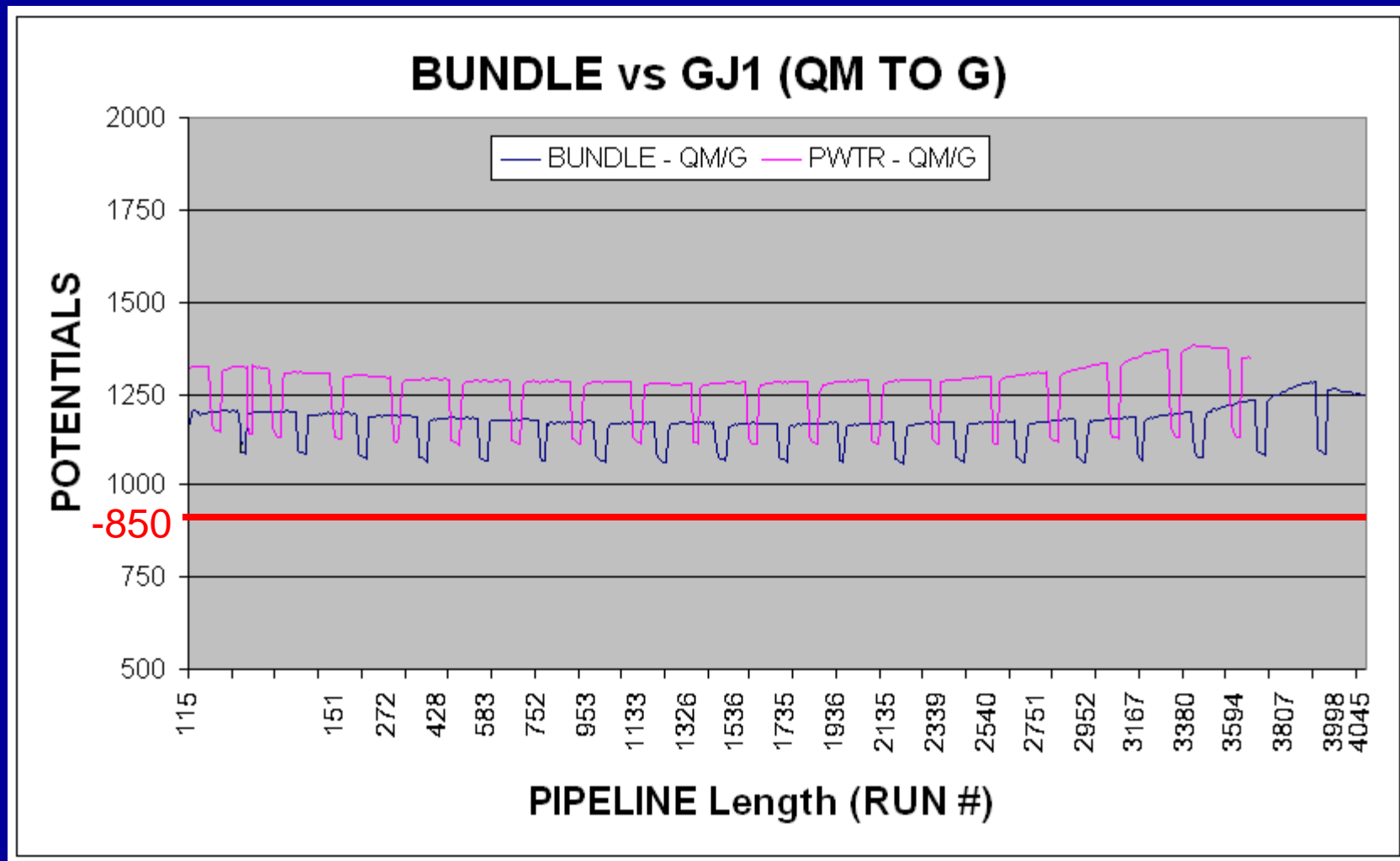


J-Line: CP Over-the-line Survey

- **Generate a potential profile along the entire Pipeline Length**
 - Test connection to the pipeline is onshore
 - A silver/silver chloride reference electrode is towed above the pipeline
 - Test connection is Maintained to the pipe by spooling out a light gauge insulated wire
- **The pipe-to-electrolyte potential is measured**
 - The polarized potential of the pipeline is measured by cycling rectifiers "ON" and "OFF"



J-Line : CP Over-the-line Survey



J-Line : Chemical Corrosion Inhibition

- Heavy residual inhibitor concentrations from Islands
- Pipelines also Treated Continuously with small dosage of Corrosion Inhibitor
- Corrosion coupons analyzed to track deposit build-up that may affect Water Quality



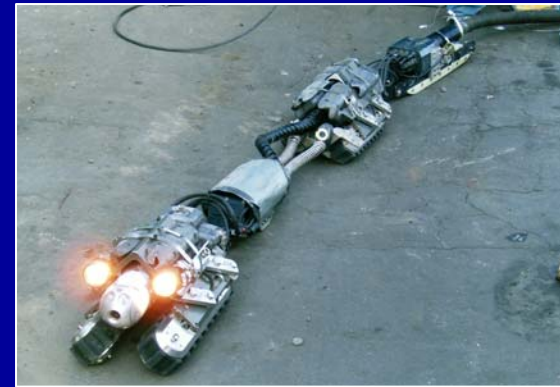
J-Line: Video Inspection Survey

- Pipeline is Internally Cement Coated
- Pipelines not able to use UT Smart Pig or MFL Technology
- Video Camera Technology will allow documented visual internal inspections



J-Line: Pipeline Video Survey

- Determined that Tethered Crawler Video Camera would be used (Fiber optics, zoom lens)
- Ability to Move Camera back/forward
- Able to pull equipment out if stuck
- Camera allows for magnification of Corrosion areas or other anomalies



J-Line: Pipeline Video Survey

- Use of Crawler required installation of Pig Launchers / Receivers
- 2007/2008 Installed Launchers / Receivers
 - Allow for Cleaning of the Pipelines
 - Access for the Inspection Tool
- Project Cost was approx \$2.1MM



J-Line: Pipeline Video Survey



J-Line: Pipeline Video Survey



J-Line: Pipeline Video Survey



J-Line: Pipeline Video Survey



J-Line: Pipeline Video Survey



J-Line: Pipeline Video Survey

- Lines were Pigged to remove solids
- 5 & 8 lb Foam pigs were used



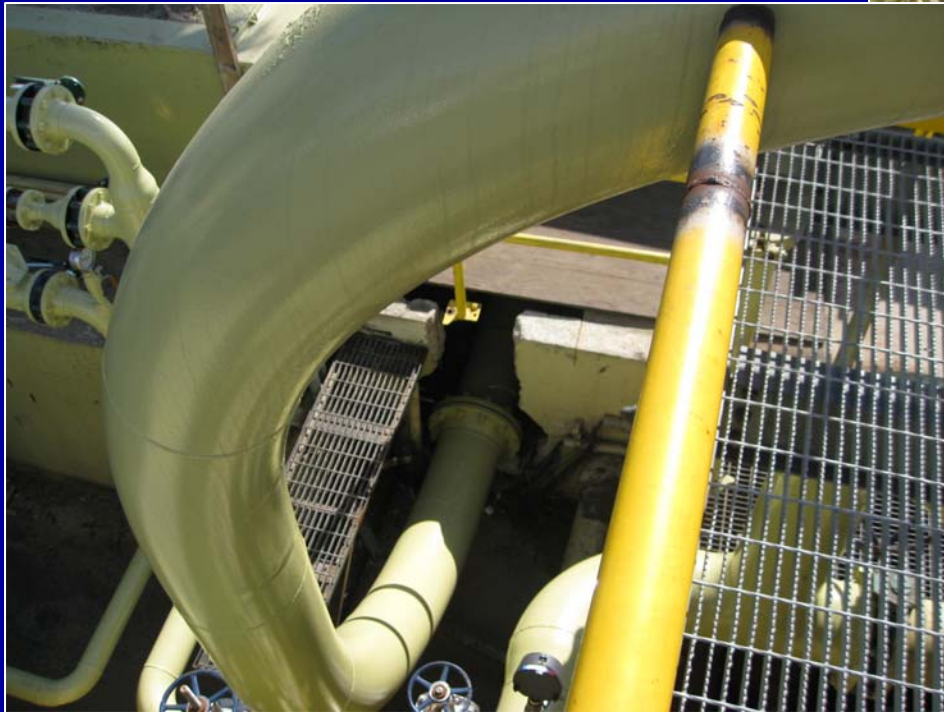
J-Line : Pipeline Video Survey

- **Initial Survey was in Water**
- **Lines then pigged to Nitrogen for Better Clarity**
- **Crawler Survey distance inhibited by**
 - Condensation in Pipelines
 - Friction from the Tether line
- **Problems with Crawler Orientation due to Piping Bends**

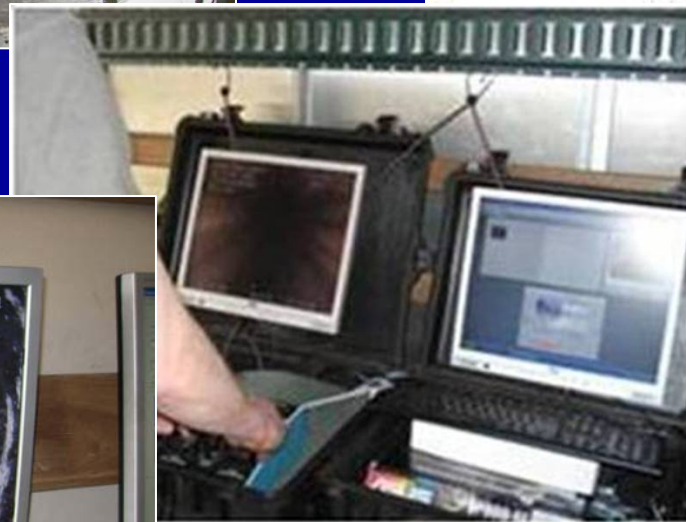


J-Line : Video Survey

Launcher / Receiver Piping Bends



Thums JL-1 Pipeline Video Survey



J-Line : Video Survey

Surveyed 70% of the J-lines



J-Line : Video Survey Summary

- **Good Visual of the Pipeline Condition**
- **Internal Cement coating appears to be in good condition**
- **Good Weld Integrity**
- **Successful Hydrotest**



Thums JL-1 Pipeline Video Survey

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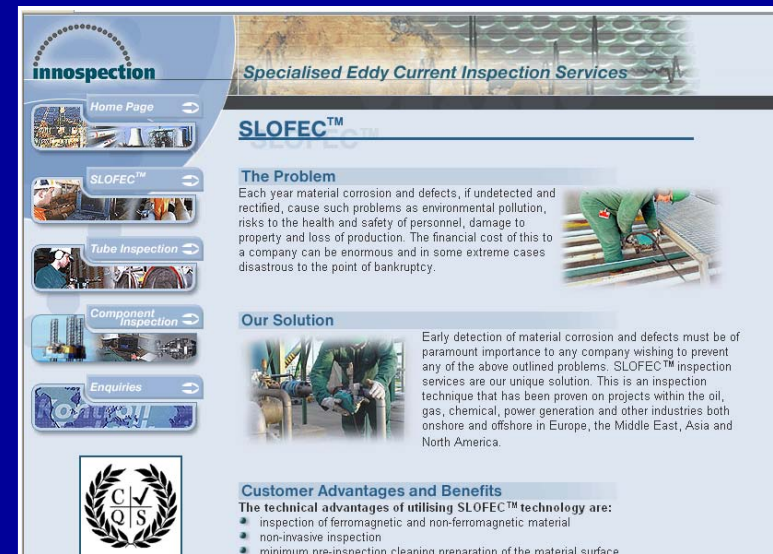
[Jlinempeg1.mpg](#)

[Jlinempeg2.mpg](#)



J-Line Integrity Plan Forward

- Improve the Quality of Inspections for the Internally Cement Lined Pipelines
 - Investigate use of a “Modified” MFL tool
 - Investigate use of a Tethered Eddy Current Inspection (SLOFEC)
- Continue to investigate other Inspection Technologies



Questions?

