Evaluation of a High Resolution GEOPIG to detect and size Slab Erosion

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Agenda

- Pipeline System
- Identification of Potential Problem
- Standard ILI Techniques
- Calipier Inspection
- PullTests
- Conclusion

Pipeline Details

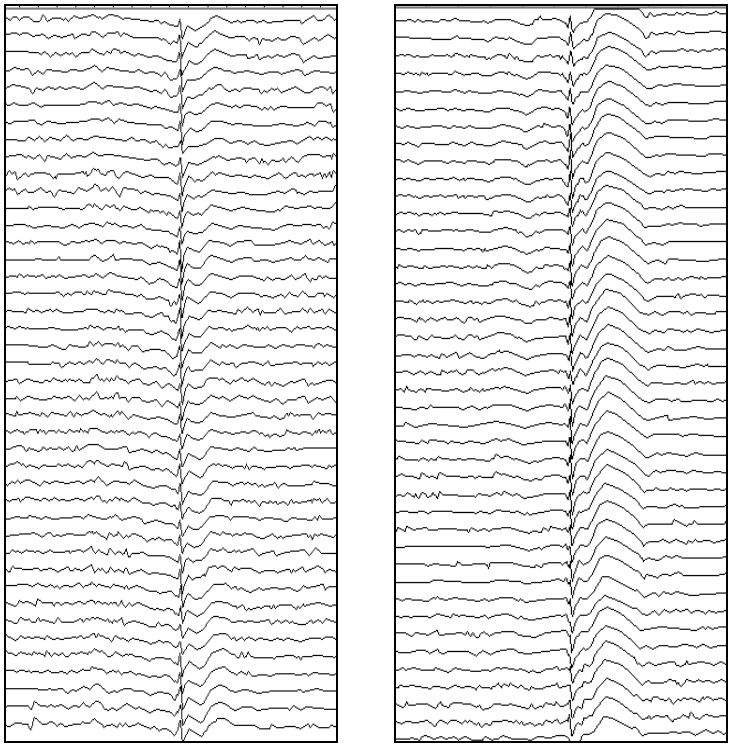
- 14” Pipe, Wall Thickness 0.875”
- Installed 2003, Service 2003
- 30000 bbl per day of Oil, 58000 bbl per day Water, 40MMSCF of Gas
- Corrosion Inhibitor
- Regular MFL Inspection

Identification of Potential Problem

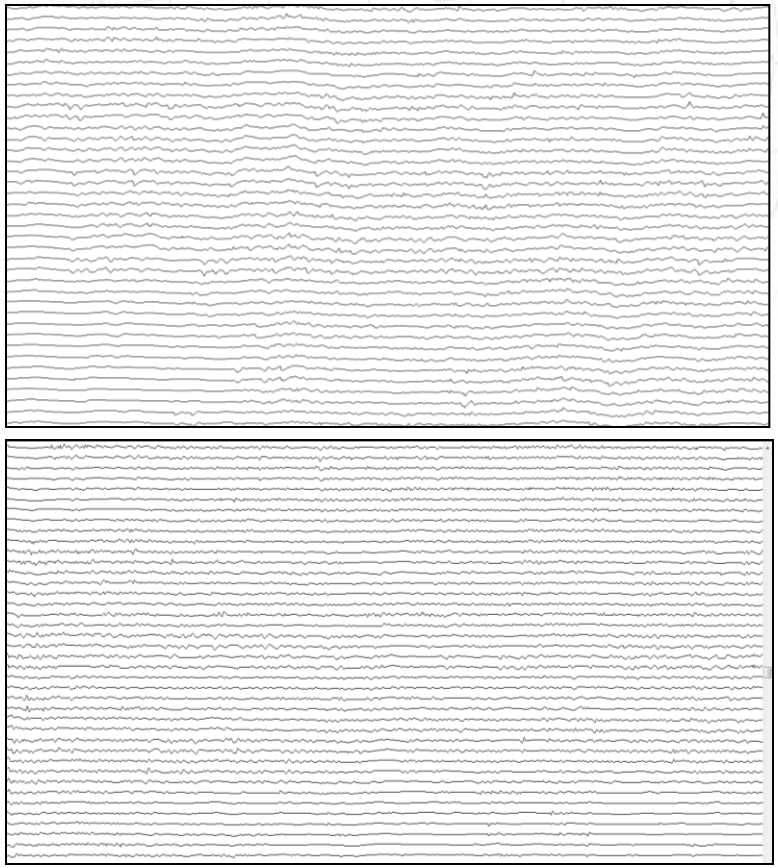
- Company Policy to use a Third Party Expert to Review MFL Data
  - At the Signal Level
- Identified Potential Slab Erosion
- Production Records High Flow Velocities

Signal Visibility

At the start and end of the inspection data the girth weld signals and also the signals associated with the seamless pipe type are clearly visible



Weld signals at start and end of the pipeline

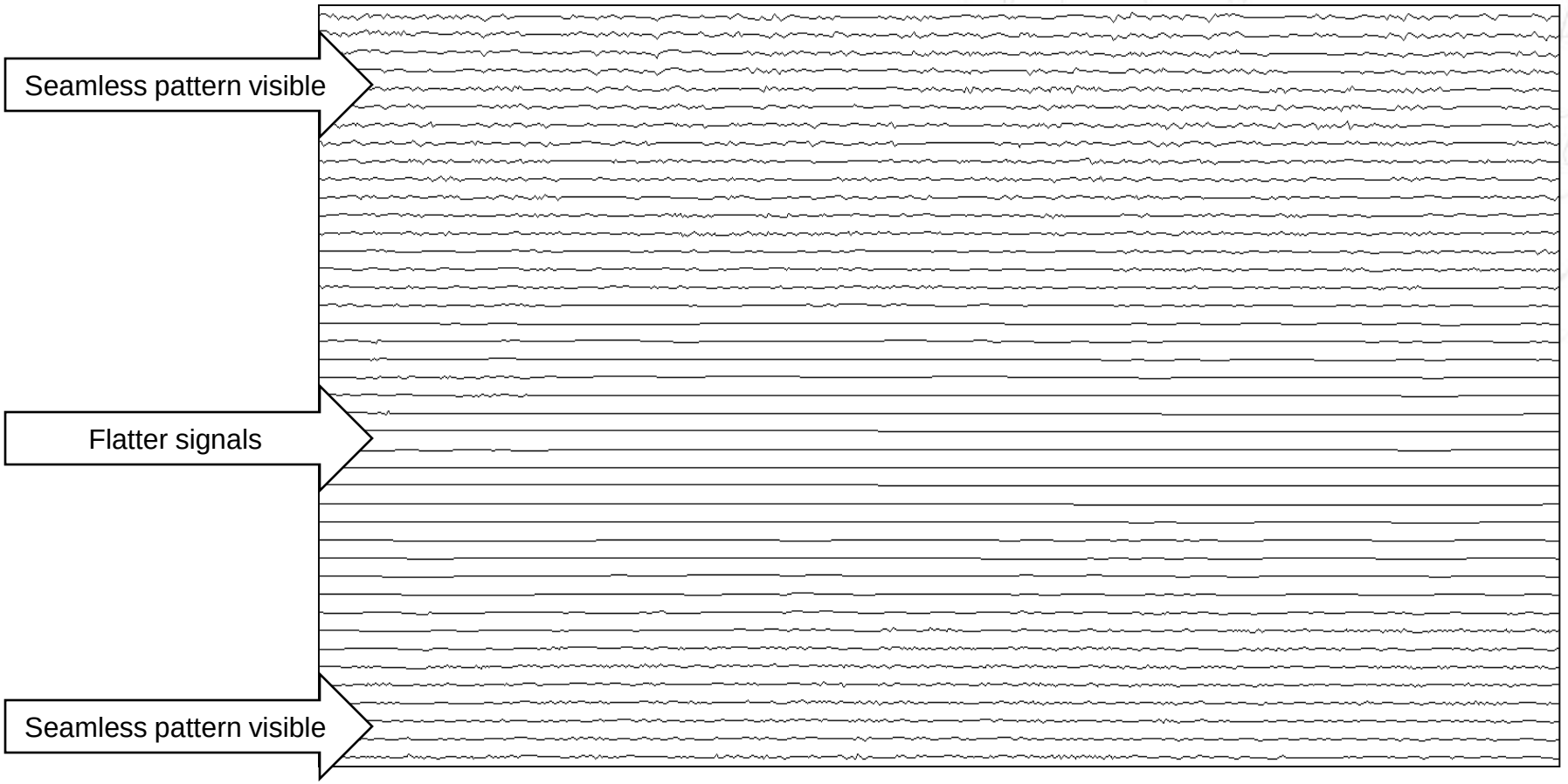


Seamless pipe signals clearly visible

Signal Visibility

- Seamless pattern is visible throughout the data; however the signals reduce in size from approximately 150m into the inspection
- Seamless pattern is always discernible at the “sides” of the pipeline – centred around the 3 o’clock and 9 o’clock orientations
- Towards the 6 o’clock and 12 o’clock orientations of the pipeline the signals within many pipe spools appear to be fairly flat, which would indicate that the pipe is much smoother as virtually nothing is being recorded by the sensors
- The extent of the “flatter” signals varies around the pipe circumference and throughout the inspection data

Signal Visibility



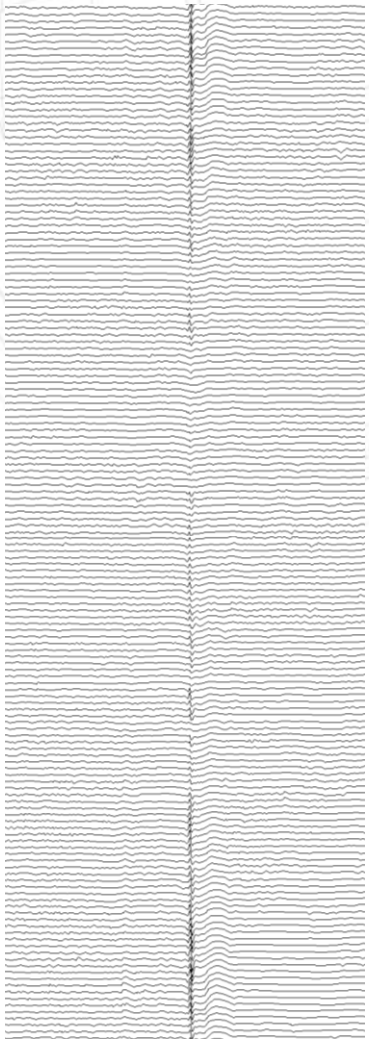
Signal Visibility

Smaller signal recorded for many of the girth welds and on some welds the signals virtually disappear completely at various orientations

Weld signal between 5:15 and 6:45 barely visible

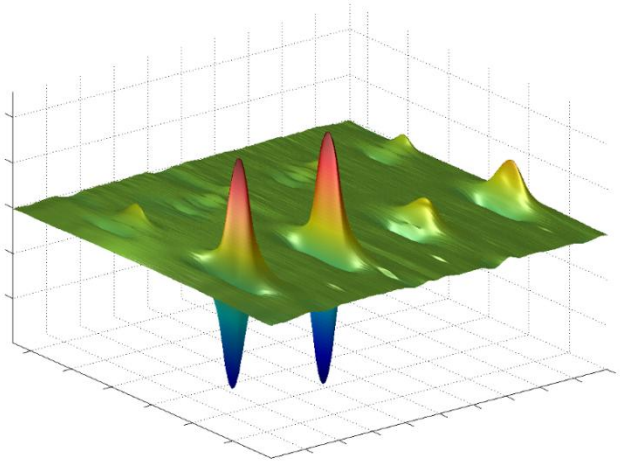
Weld signal at 12:00 “normal” signal

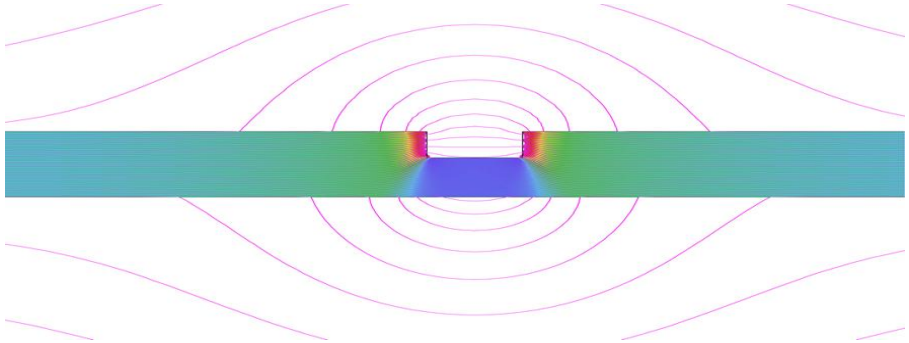
Seamless pattern clearly visible on the data



Standard ILI Techniques

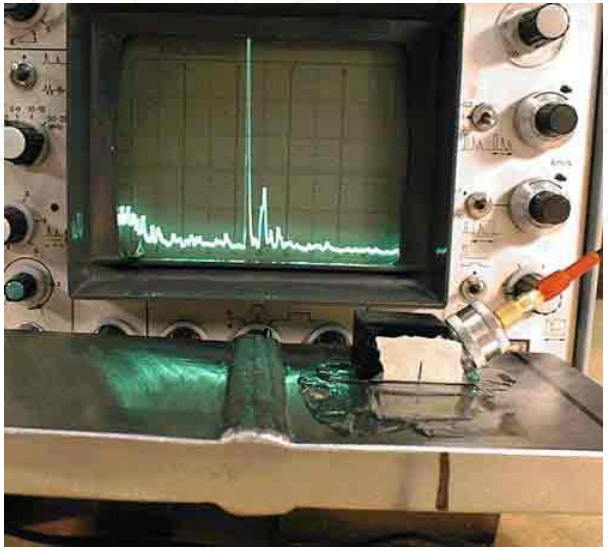
- Magnetic Flux Leakage
  - Relies on Flux leakage
  - Indirect technique
  - Pull Tests
  - Unlikely to work on Slab Erosion





Standard ILI Techniques

- Ultrasonics
  - Direct Method
  - Would Work
  - Requires a Couplant
  - Expensive and Disruptive to Production



Potential Calipier Inspection

42 Caliper Arms

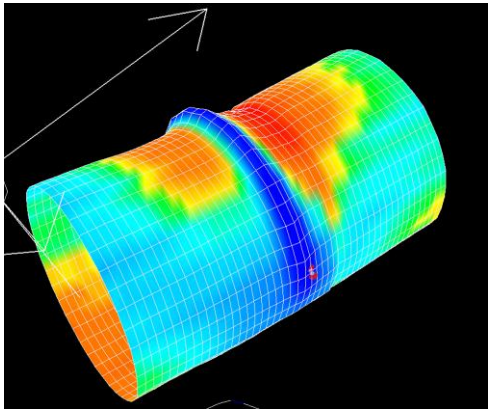
Odometers

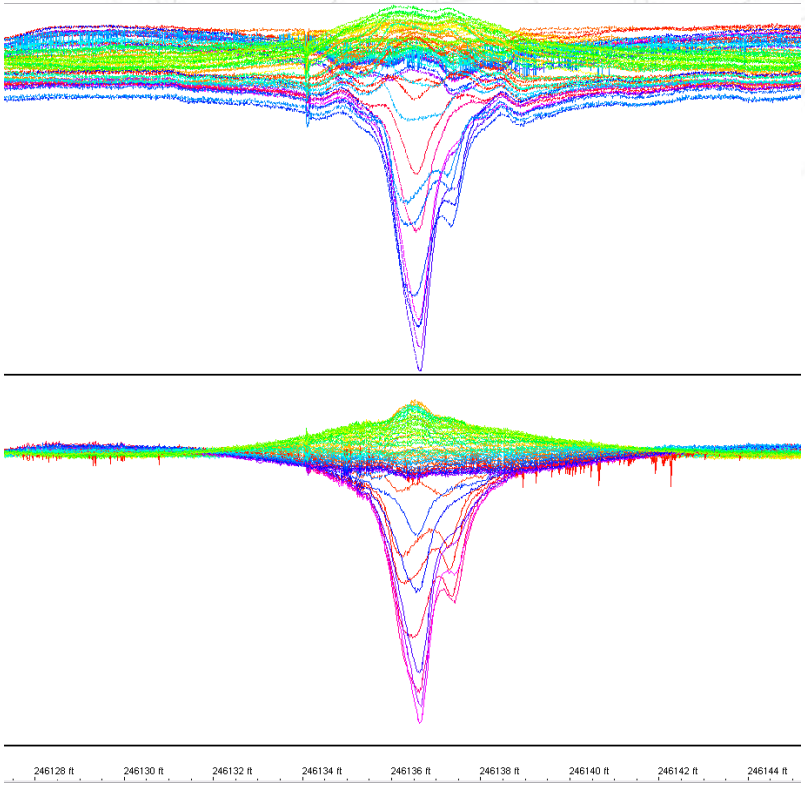
Battery Can

LN 200 Inertial Measurement Unit

Calipier Measurements

- Tool measures Multiple Radius Measurements
- From that we determine Multiple Diameter Measurements
- From those Diameter Measurements
  - Minimum
  - Maximum
  - Average

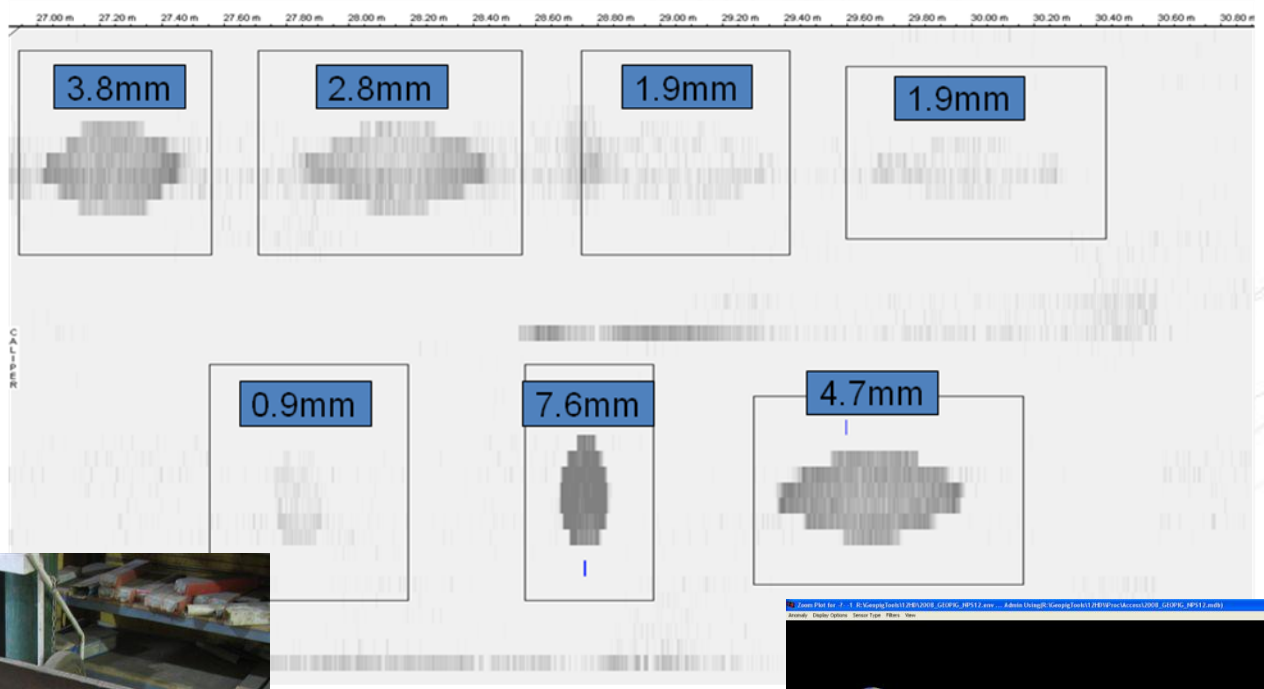


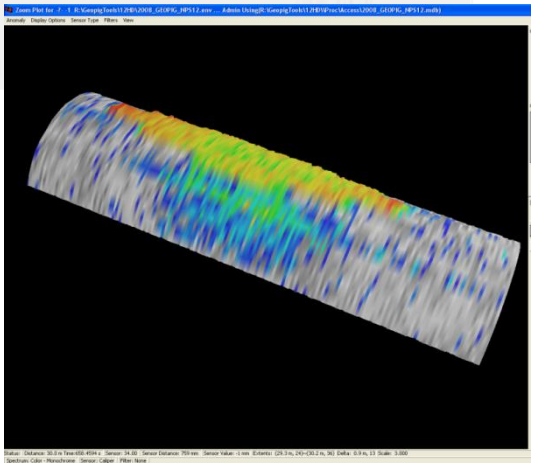


PullTests

- First Series mimic Large Internal Defects
- Second Series mimic Slab Erosion

Large Internal Defects

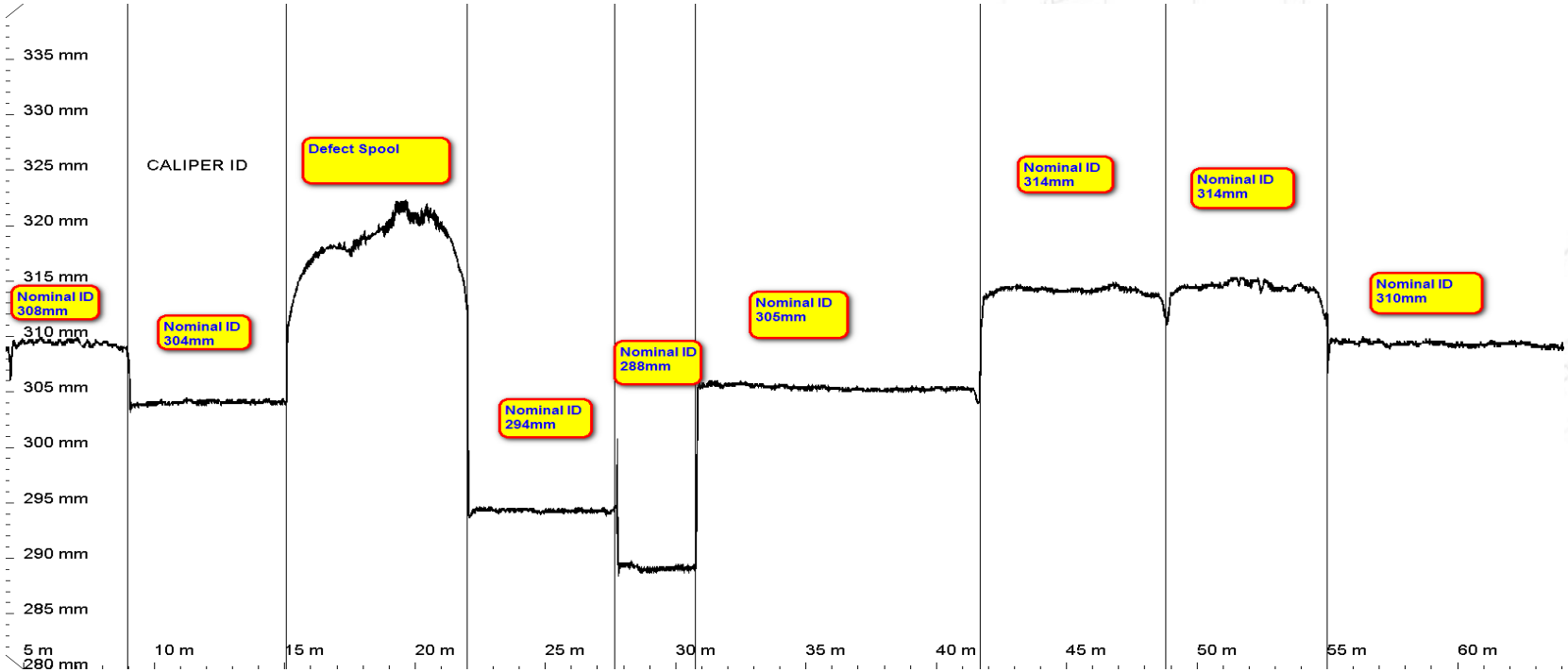




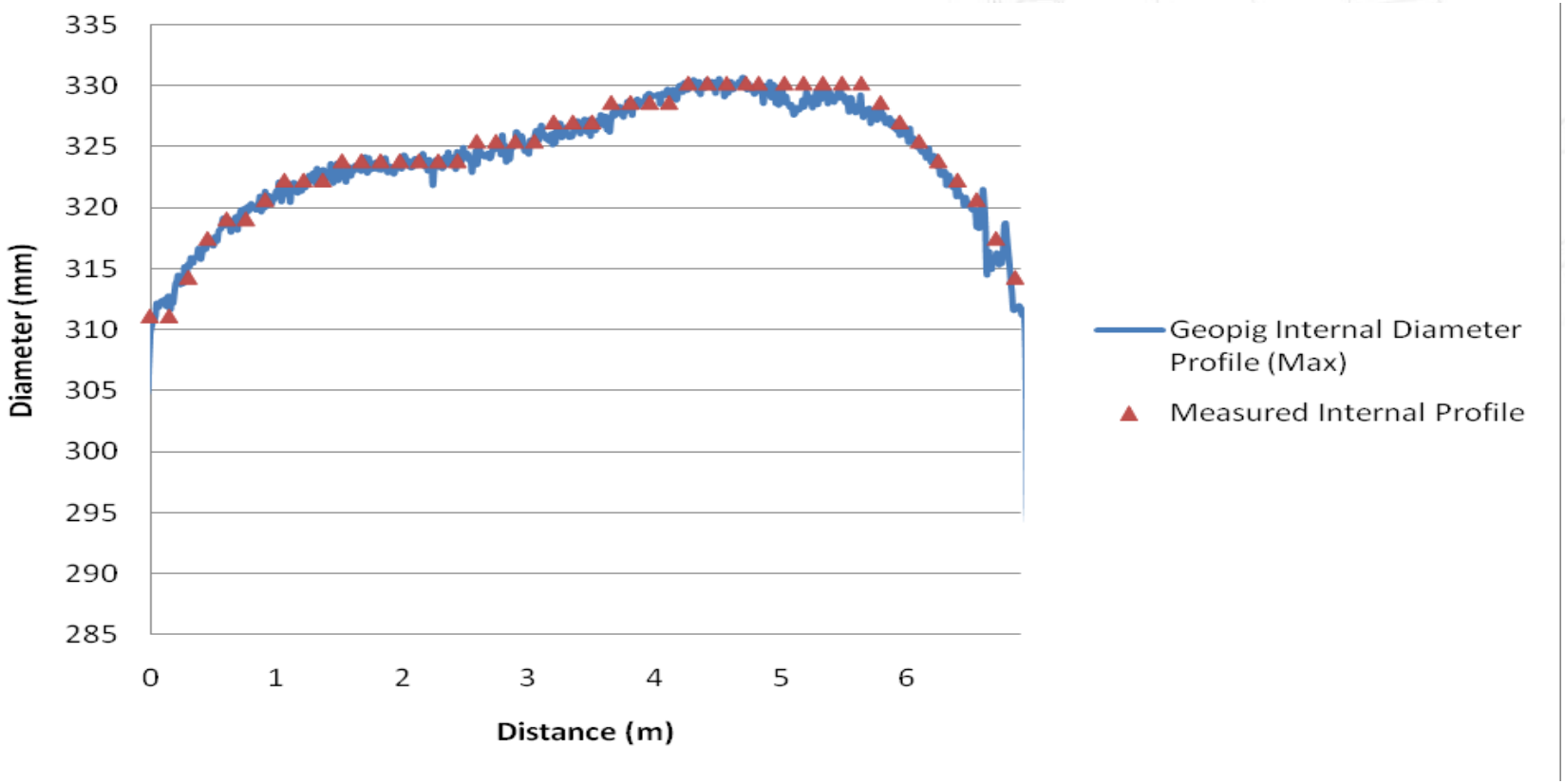
Slab Erosion PullTest

- Special Defect Spool Made
- ¼ Section cut from Pipe
- Welded Back in as Two Tapers

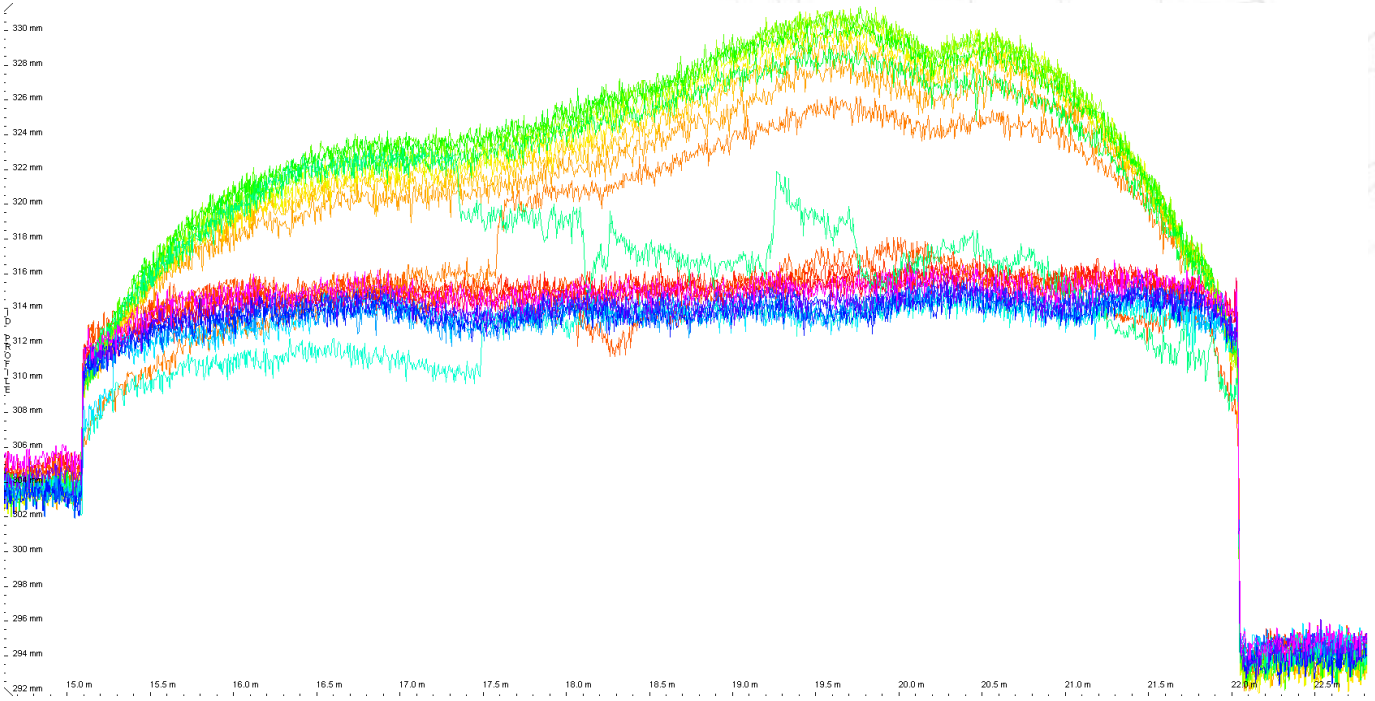
Diameter Measurement



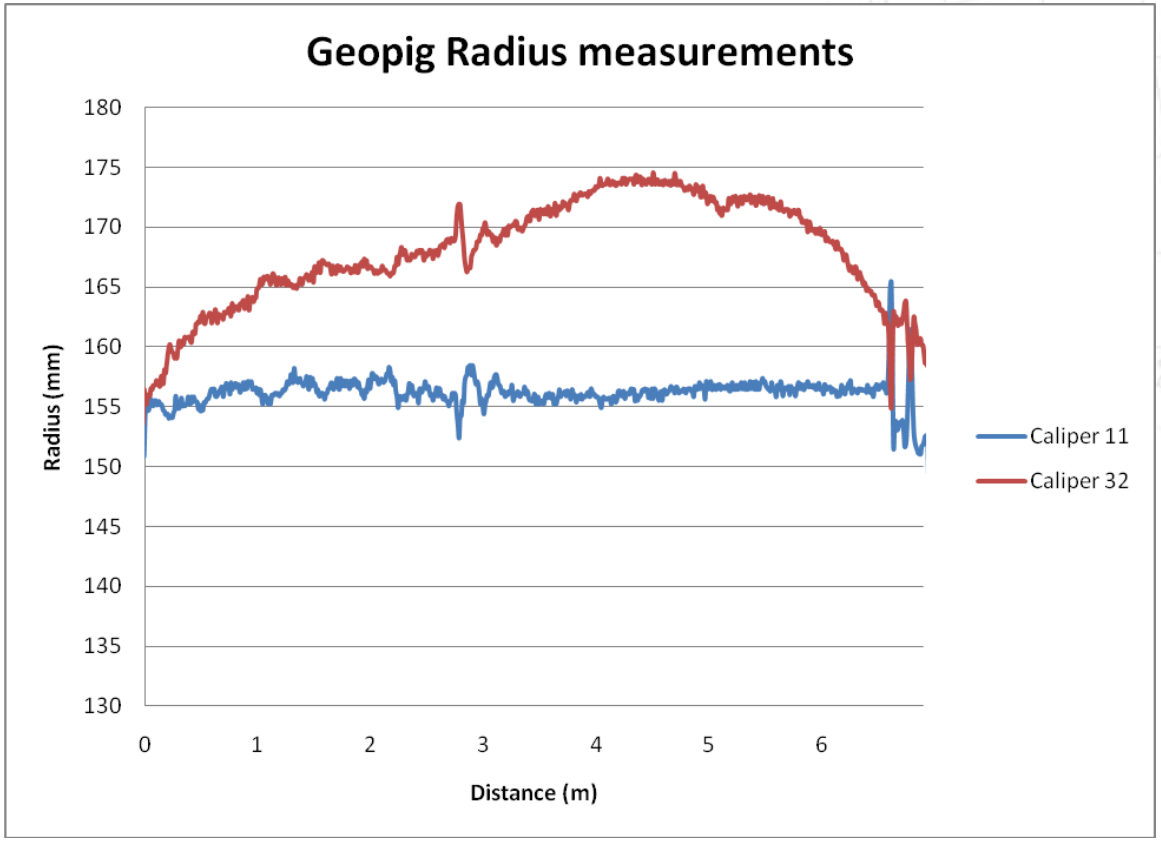
Slab Erosion Spool



Individual Diameter Measurements



Individual Radius Measurements



Conclusion

- Problem Identified through 3rd Party Expert Analysis of MFL Data
- Demonstrated Potential for High Resolution Geopig to detect Slab Erosion
- Run Planned for 2009. Pigging Gods willing

Questions