API Data Integration Support
RISK MODEL WORK GROUP MEETING
March 7th, 2017  |  Houston, TX
Bruce Dupuis, TransCanada
Outline

- Overview of the applicable API docs
- Review of the roles of each document as it pertains to data integration
- Unbundling API TR 1178 Integrity Data Management and Integration
- Next API data integration initiatives
The collection of API documents supporting Integrity and related to Data Integration

- **API RP 1173**: Safety Management System

- **API RP 1160**: Integrity Management
  - API TR 1178: Integrity Data Management and Integration
  - API RP 1176: Assessment and Management of Pipeline Cracking
  - API RP 1133: Managing Hydro-technical Hazards
API RP 1173: Safety Management System

- Outlines framework of supporting processes
  - Defines the PDCA workflow
  - Management of change
  - Performance metrics
  - Etc.

Previously released
API RP 1160: Integrity Management

- Maps integrity process into the PDCA workflow
- Maps to supporting RP’s and TR’s
- Provides guidance and direction regarding integrity processes
- Applicability targets hazardous liquid pipelines in US jurisdiction
  - Equivalent to ASME B31.8S and CSA Z662
  - Designed to facilitate incorporation by reference into CFR 195

*Scheduled for ballot 2017*
API RP 1160: Integrity Management (in process version)

- delineates threat management vs risk assessment
  - Threat management is process of determining applicability of a threat, appropriate assessment technique and prescribed remediation
  - Risk is broader consideration of POF and consequence, to drive consideration of additional preventative and mitigative measures where practicable

- threat interaction
  - Likely threat interactions and associated considerations

- data sets to be integrated
  - Reiterates the listing proposed in the retracted new hazardous liquid rule

- risk management
  - Broadly discusses role of data in risk process

- response criteria
  - Addresses input uncertainties
Supporting RP’s and TR’s

- Focused on specific aspects of pipe integrity
- A compilation of experience, learnings and practices
- Typically designed to be implemented as applicable - *not everything applicable to every pipeline operator*
- To the extent possible, designed to be applicable to hazardous liquid and gas pipelines in any jurisdiction
Status of Supporting RP’s and TR’s

- API RP 1176: Assessment and Management of Pipeline Cracking  
  previously released

- API RP 1133: Managing Hydro-technical Hazards  
  To be released shortly (all balloting and approvals completed)

- API TR 1178: Data Management and Integration  
  To be released shortly (all balloting and approvals completed)
API RP 1176 Assessment and Management of Pipeline Cracking

- Interpretation of data to determine crack susceptibility
- Guidance on applicability and interpretation of ILI data
- Guidance regarding in ditch processes in terms of fitness for purpose assessments and ILI correlation
API RP 1133 Managing Hydro-technical Hazards

- Inventories data sets that are available to support assessing this threat
- Addresses interpretation of these datasets
API TR 1178 The Data Management and Integration Guideline

- 1178 empowers informed decisions by facilitating a dataset that is
  - accurate, and
  - comprehensive

- Addresses PHMSA’s statement that,
  “the ability to integrate and analyze threat and integrity data from many sources is essential for sustaining performance and a proactive IM program.”

- How that data should be interpreted is largely left to other industry documents such as API 1160, 1176 and 1163
Unbundling API TR 1178
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Annex A (informative) Data Integration and Interpretation Report
Annex B (informative) Representative Data Listing
5 Data Quality

- 5.1 General
- 5.2 Objectives
- 5.3 Strategies and Policies
- 5.4 Data Governance
- 5.5 Data Quality Assessment
5 Data Quality

5.2 Objectives

- Accuracy: The data represents reality.
- Completeness: All needed data is available.
- Consistency: The data is free of internal conflicts.
- Precision: The data is as exact as is needed.
- Granularity: The data is kept and presented at the right level of detail to meet the needs.
- Timeliness: The data is as current as needed and is retained until no longer needed.
- Integrity: The data is structurally sound.
- Usability: The data is accessible, understandable, and navigable.
8  GPS Coordinates

8.2  Coordinate Nomenclature
N 29 50.30 W 95 50.50 vs N 29.5030 W 95.5050

8.3  Datum Selection
100 + datums

8.4  Accuracy
measurement error

8.5  Base Station Elevation
Vertical discontinuities
Alignment for the Purpose of Pipeline Integrity

9.2 Linear Referencing
9.3 Weld Alignment
9.4 Centerline
9.5 Axial Position and Extent
9.6 Circumferential Position
Weld Alignment

- **Multiple ILI Run Integration - ILI to ILI**
  - Automation
  - Leverage welds alignments to position ILI on centerline
- **Excavation to ILI**
- **Hydrostatic Test sections tied to welds**
- **Pipe properties tied to welds**
Multiple ILI Run Integration
Multiple ILI Run Integration

ILI Surveys

Combined ILI Data

Defect

Welds
ILI to ILI Automation

- Assign reference matches
  - Manual
  - Pattern recognition
- Expand out from reference matches
  - Error buffers
  - Distance constraints
ILI to ILI Challenges to Effective Threat Interaction

- **Considerations**
  - Reversed flow
  - Standardizing frames of reference (leading vs center)
  - Normalized terminology across platforms and vendors
  - Multiple versions of same ILI

- **Isolated Utilization**
  - Only supported as ILI pairs
  - Alignment/integration not persisted
  - Weld alignment not used to position ILI features in space or on centerline
Excavation to ILI Integration

ILI Data (active)
Excavation Data As Found (active)
Corrected ILI Data (inactive)

Source (ILI)
Source (NDE)
Excavation to ILI Integration

ILI Data (active)

Excavation Data As Found (active)

Corrected ILI Data (inactive)

ILI and Excavation Data within cut-out (archived)
Hydrostatic Test sections tied to welds

- **Station based references can lead to discontinuities in data**
  - Gaps
  - Overlaps

- **Tie-in weld references**
  - Explicit alignment to welds
  - No gap or overlaps due to linear references
  - Unequivocal resolution against ILI data

- Need projects to provide this mapping
  - Easy at time of construction
Pipe attribution tied to welds

- Certain properties can only transition at a weld
  - Manufacturer
  - Material properties - SMYS
  - Wall thickness

- Avoids inconsistencies between ILI and enterprise data
  - Fitness for purposes assessments
  - Some attributes not typically discerned by ILI

- Supports MOC for weld locations
  - Welds not were anticipated when excavated
  - Using universal station/measure based references makes it difficult to unbundle realignment of different data sets
12 ILI Lifecycle

12.2 General Reporting Requirements
12.3 Data Quality Letter and Preliminary Report
12.4 Immediate Responses
12.5 ILI Final Report Format
12.6 Quality Assurance of Final Report before Acceptance
12.7 Anomaly Assessment
12.8 Excavation Program
12.9 Provide Correlation Results to ILI Vendor
12.10 Program Closeout and Establishment of Reassessment Intervals
14 As-Built Asset Integration

14.1 General Data Requirements
14.2 GPS Survey
14.3 Data Collection
14.4 Virtual Pipeline Creation
14.5 Data Storage
14.6 Continuity of Linear Referencing Schema
14.7 Baseline In-Line Inspection
14.8 Baseline Indirect Assessments
## Annex A Data Integration and Interpretation Report

### A.5 Threat Matrix and Interpretive Methodologies

Table 4 provides a matrix of threats matched with relevant interpretive and QC methodologies.

<table>
<thead>
<tr>
<th>ID</th>
<th>Threat</th>
<th>Description</th>
<th>Data Source</th>
<th>Specific Attributes Used</th>
<th>Sensitivity to Spatial Alignment</th>
<th>Criteria</th>
<th>Interpretive Methodology</th>
<th>QC Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ANY Threat Integration</td>
<td>ILI tool data (Deformation, MFL, CMFL, Ultrasonic ML, and Ultrasonic Crack)</td>
<td>All types of defects from all types of ILI data</td>
<td>N/A</td>
<td>5x5x5</td>
<td>Defects from all types of ILI data</td>
<td>Threats are categorized as internal ML, external ML, cracking, SCC, geometry, other (laminations, inclusions, manufacturing defects, etc.) Where two or more threats overlap spatially, they are carefully analyzed. This analysis may result in plant excavation.</td>
<td>NDE results are reviewed for verification.</td>
</tr>
<tr>
<td>2</td>
<td>ANY Failure Pressure Anomalies</td>
<td>Pipeline Maps, GIS, Operational Data</td>
<td>Pipeline Elevation data</td>
<td>N/A</td>
<td>Line elevation deviates &gt; 100 ft</td>
<td>Elevation data is integrated into the ILI vendor’s report for all anomalies along the pipeline. After receiving the vendor report, a local MOP is calculated using elevation and most conservative product weight for every item on feature list, then ERF is recalculated for all anomalies between 15% and 80%. Vendor does not adjust ERF for elevation.</td>
<td>A review of the vendor’s calculated failure pressures are accomplished prior to imposing elevation data. This step assures the ILI vendor used the proper evaluation pressures and parameters in preparing the submitted vendor report.</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>ANY Appurtenance Reconciliation</td>
<td>Geometry or Metal loss ILI</td>
<td>Features List</td>
<td>N/A</td>
<td>Appurtenance</td>
<td>Appurtenance is a tap, stopple, tee, sleeve, patch, weld plus end, valve, flange, or other pipeline attachment which was unknown or installed with unapproved or unknown installation methods. Compare to GIS data to determine if the appurtenance is known and if it is located within a facility. Evaluate for removal if not needed on the system.</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>ANY A change since the previous assessment</td>
<td>Geometry/ Metal Loss tool</td>
<td>Features list</td>
<td>N/A</td>
<td>An anomaly, predicted to have changed in depth, length, width, orientation, or any injurious manner from the previous assessment</td>
<td>An anomaly, predicted to have changed in depth, length, width, orientation, or any injurious manner from the previous assessment. Supplied to tool vendor to determine if growth since last assessment.</td>
<td>In the event of sensor loss, a data quality certification letter facilitates a clear determination on whether the in-line inspection tool is still able to correctly detect (e.g., minimum anomaly dimensions detectable with given sensor loss), identify, and size all anomalies in accordance with their published detection and sizing accuracy. Included in the letter would be a summary of the number of sensors damaged/inoperative and the impact on overall sensor coverage.</td>
<td>N/A</td>
</tr>
<tr>
<td>5</td>
<td>ANY All ILI Anomalies: Sensor Loss</td>
<td>ILI tool data (Deformation and/or MFL)</td>
<td>Current in-line inspection tool data</td>
<td>N/A</td>
<td>Per vendor spec.</td>
<td>Sensor loss occurs when a sensor is damaged/inoperative and does not function properly through portions of or the entirety of an in-line inspection tool run. The number of sensors on an individual ILI tool varies based upon tool size and ILI vendor. Sensor loss can affect the in-line inspection tool’s ability to correctly identify and size all anomalies per specifications. Variations The vendor must be able to meet the company specified vendor reporting requirements, including meeting detection thresholds. One possible approach is to implement a vendor reporting requirement that references the Pipeline Operators Forum and ensures that the pipeline segment has been assessed.</td>
<td>In the event of sensor loss, a data quality certification letter facilitates a clear determination on whether the in-line inspection tool is still able to correctly detect (e.g., minimum anomaly dimensions detectable with given sensor loss), identify, and size all anomalies in accordance with their published detection and sizing accuracy. Included in the letter would be a summary of the number of sensors damaged/inoperative and the impact on overall sensor coverage.</td>
<td>N/A</td>
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</table>
The Data Management and Integration Guideline (TP)

- will assist the operators in integrating their data such that the analytic and interpretive expectations set by 1160 can be met.
- As a Technical Paper there is no defined review cycle, but
  - Anticipate revisiting as an RP in 3 years
Pending API Data Integration Initiatives

API 1163 Revision
• Addresses ILI tool performance and its validation

On Boarding Construction Data into Operations
• How to facilitate a timely transition/assimilation
• Ensuring usability of the data
• Engagement of Pipe Integrity during construction