National Energy Board

Office national de l'énergie

International Regulatory Perspective
Risk Evaluation Approaches

PHMSA pipeline risk modeling methodologies public workshop

2015-09-09

Canada

Presentation outline

- NEB expectations
- Prescriptive vs. performance-based regulation
- Non-QRA example
- CSA Z662-15 Annex O – RBDA
- QRA case study 1
- QRA case study 2
- Conclusion

Note

The views, judgments, opinions and recommendations expressed in this session do not necessarily reflect those of the National Energy Board, its Chairman or members, nor is the Board obligated to adopt any of them.

Where the NEB regulates

NEB expectations OPR 6.5

- (*c*) establish and implement a process for identifying and analyzing all hazards
- and potential hazards;
- (*d*) establish and maintain an inventory of the identified hazards and potential
- hazards;
- (*e*) establish and implement a process for evaluating and managing the risks
- associated with the identified hazards, including the risks related to normal and
- abnormal operating conditions;
- (*f*) establish and implement a process for developing and implementing controls
- to prevent, manage and mitigate the identified hazards and the risks and for
- communicating those controls to anyone who is exposed to the risks;

(Underline added for emphasis)

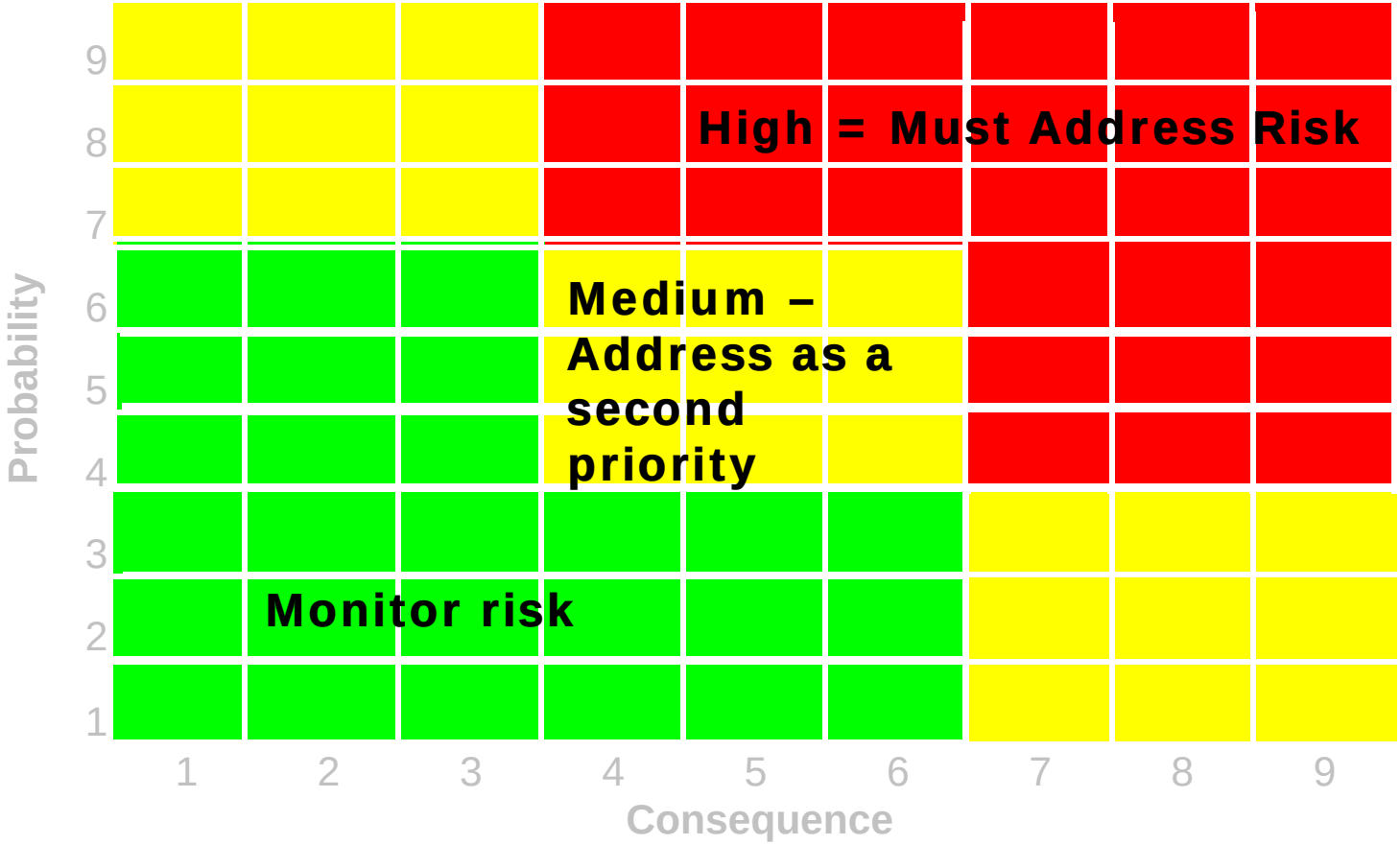
Risk model for regulatory actions (index based)

- Risk = Probability x Consequence
- Probability = f (Adequacy, Implementation & Effectiveness) of management system
  - Adequacy assessed through audits and compliance screening meetings – Leading Indicator
  - Implementation assessed through inspections, incident reviews, manual reviews, and meetings – Leading Indicator
  - Effectiveness assessed through incident history – Lagging Indicator

Consequence receptors

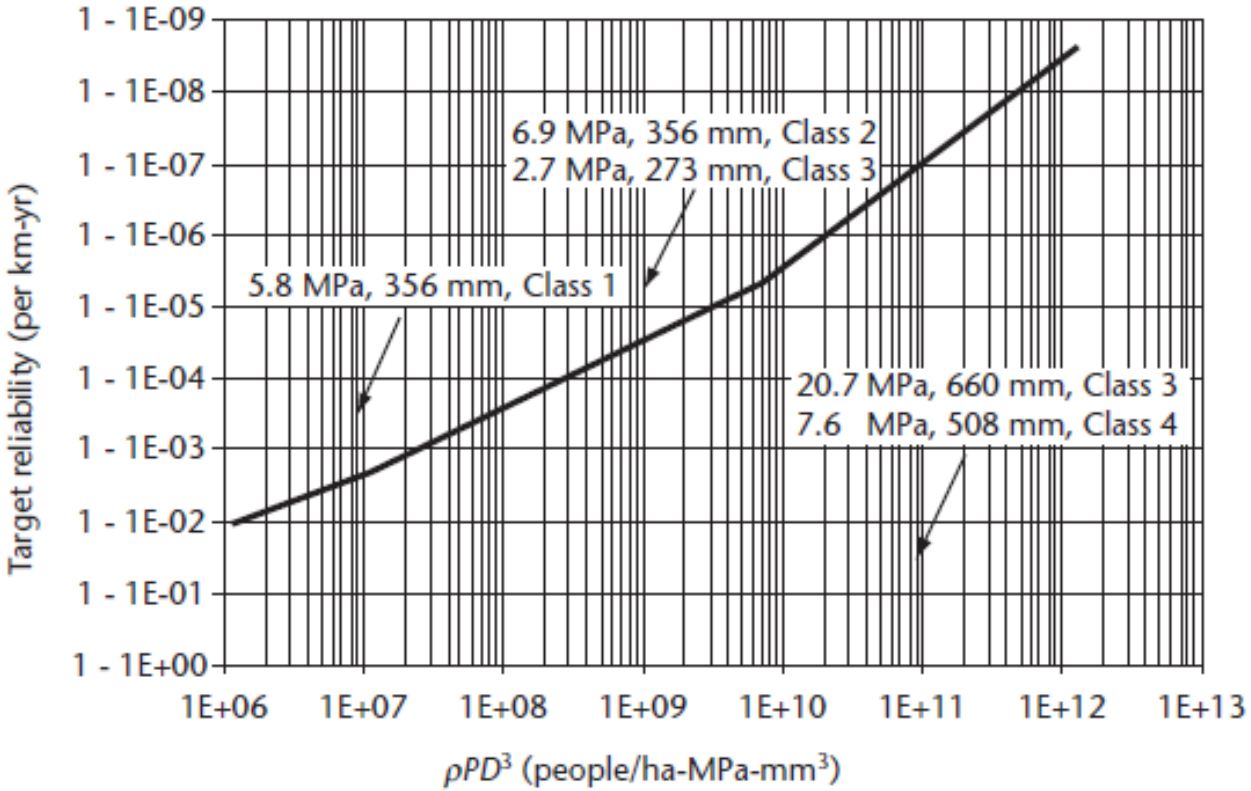
- Safety
  - Product
  - Proximity of workers
  - Proximity of public
- Security
  - Impact of supply disruption
  - Collateral damage
- Environment
  - Processing Plants
    - Facility Type (F)
    - Size of Facility (S)
    - Proximity to Water (W)
  - Pipelines
    - Land use (LU)
    - # Watercourse Crossings (WC)
    - Pipe Diameter (OD)
    - Length (LP)
    - Product (P)

Basic risk assessment risk evaluation matrix



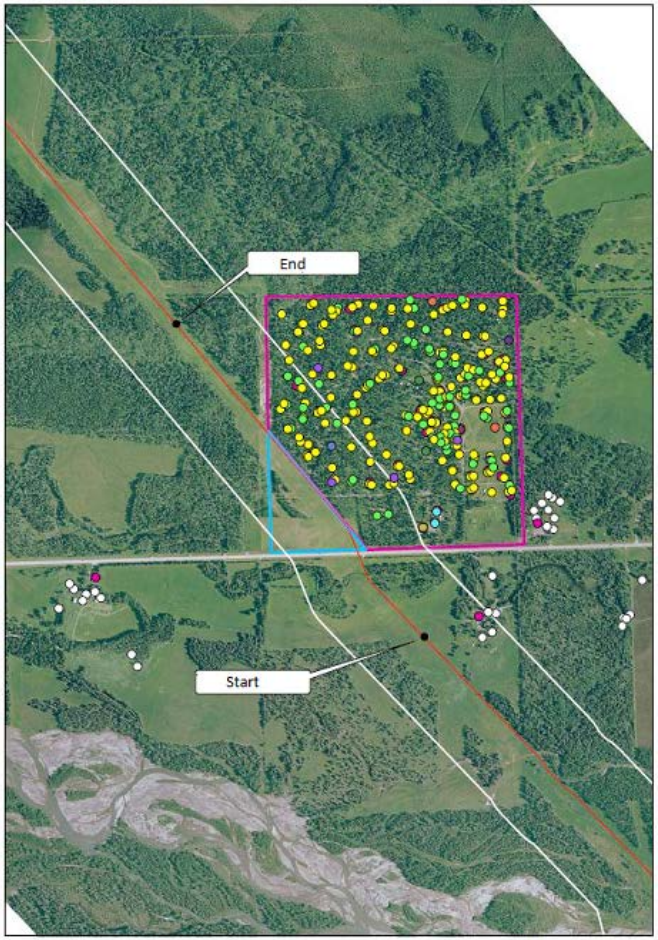
CSA Z662-15 - Annex O

Reliability-based design and assessment (RBDA) of onshore non-sour service natural gas transmission pipelines



Case Study 1 – class location change from Class 1 to Class 2

- Natural Gas Pipeline:
  - High Pressure (6450 kPa)
  - Large Diameter (NPS 42)
  - Length (1280 m)
  - In Proximity of a Campground (41 Campsites)
- NEB Requirements in case of a change in class location:
  - Pipe replacement; or
  - Pressure reduction; or
  - **Engineering Assessment**



Three analysis levels

Level 1 – Code check

		ARE REQUIREMENTS FOR HIGHER CLASS LOCATION MET?						
Site	Line	Stress Level	Material	Depth of Cover	Pressure Testing	Joining	Coating	Valve Spacing
1	2000	No	Yes	Yes	Yes	Yes	Yes	Yes
2	2000	No	Yes	Yes	Yes	Yes	Yes	Yes
3	2000	No	Yes	Yes	Yes	Yes	Yes	Yes
5	3000	No	Yes	Yes	Yes	Yes	Yes	Yes

Level 2 – Identify hazards (threats) – external corrosion and mechanical damage

Level 3 – QRA for identified hazards (threats)

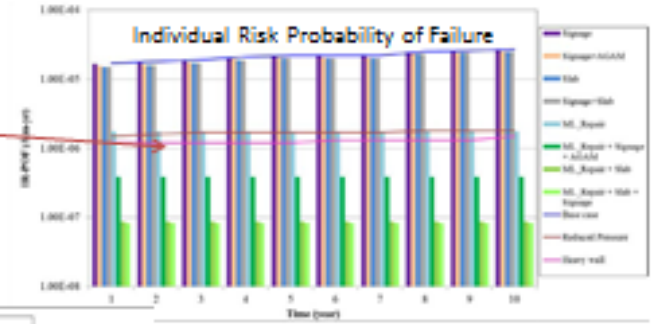
Case study 1 (continued)

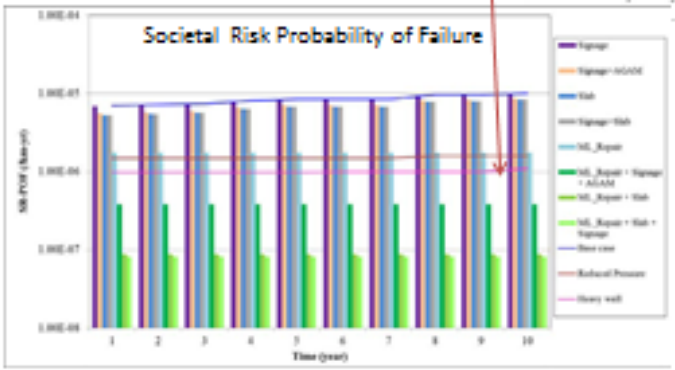
Case Study 1 (Continued)

Reliability-Based Engineering Assessment

Reliability Target:

Probability of failure of the heavy wall pipe that meets the requirements of CSA Z662 for a Class 2 location for both individual and societal risk probabilities of failure

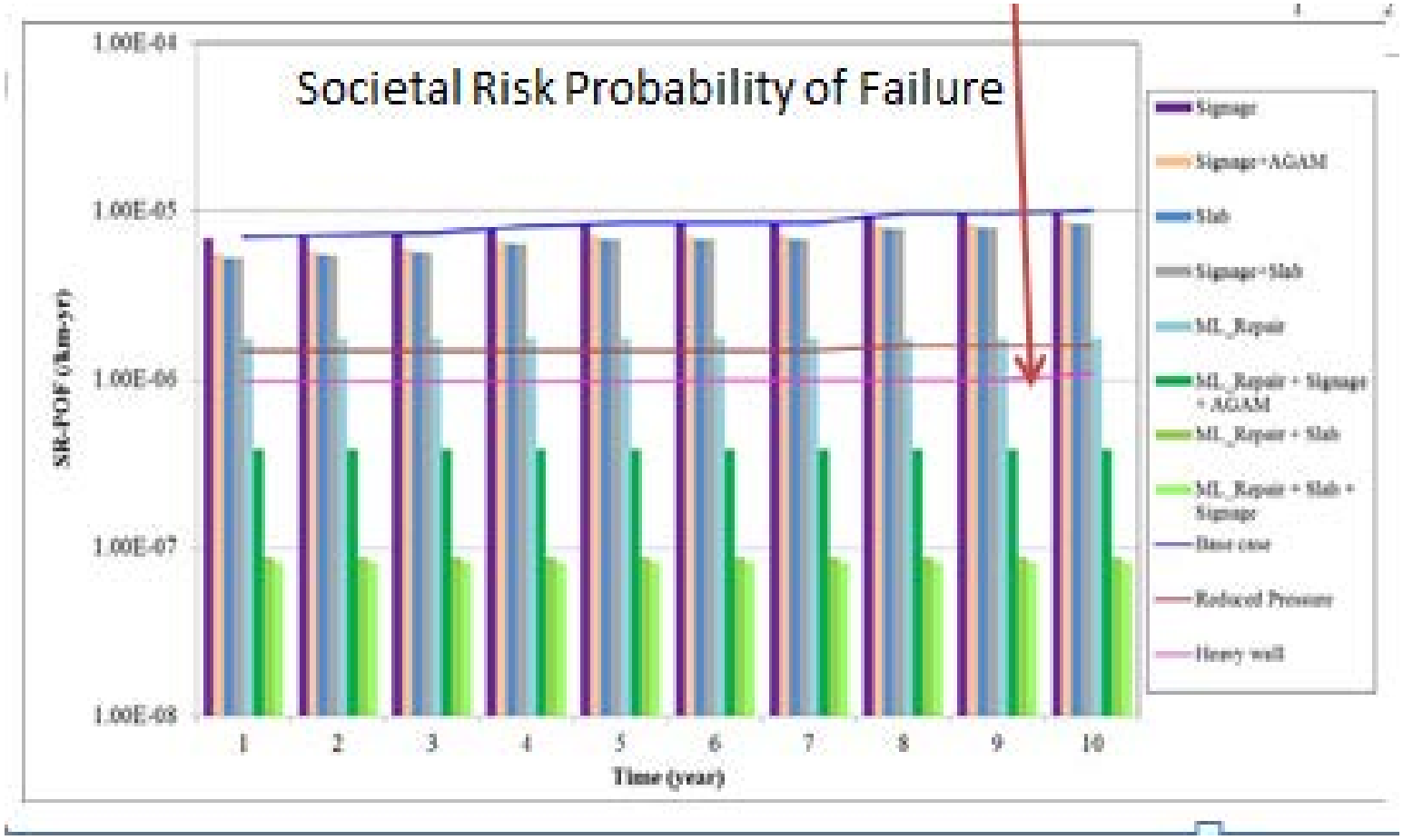




Initial Mitigation Actions Proposed by the Operator:

- Excavation and repair of the ILI-reported metal loss anomaly
- Installation of AGAMs and increasing signage
- Re-inspection and reassessment interval of 10 years

Case study 1 - POF scenarios

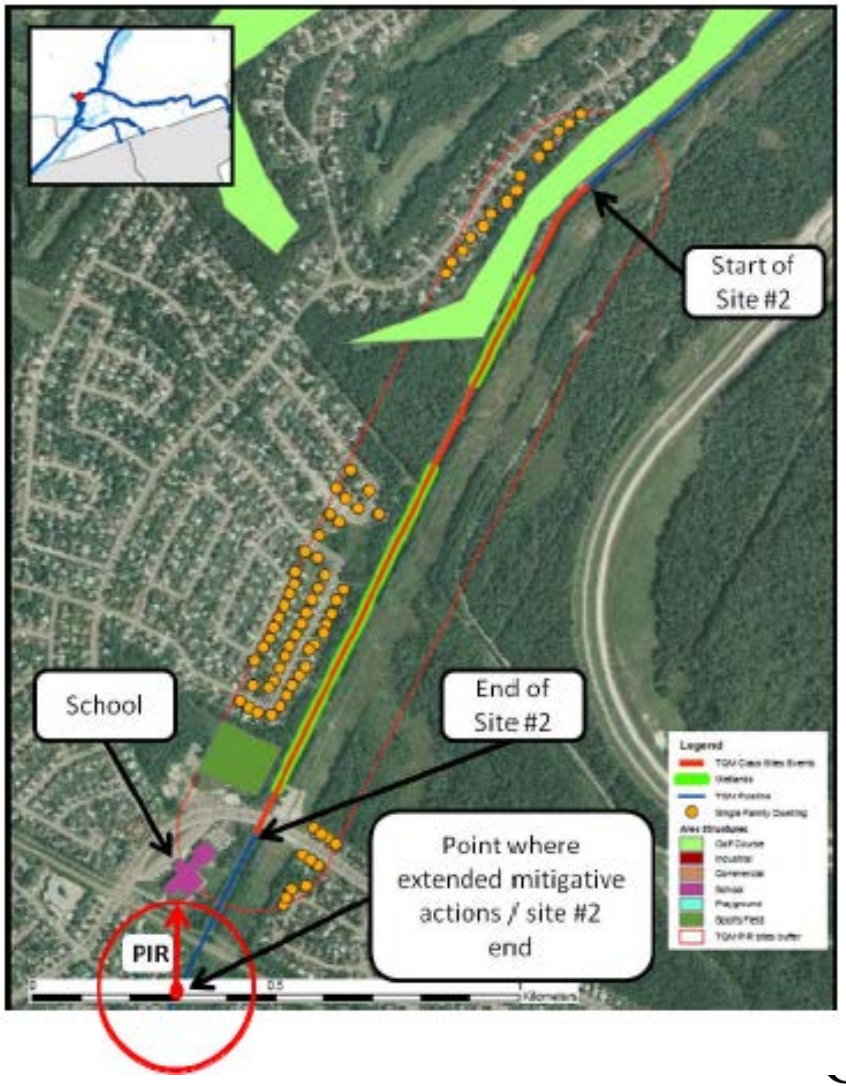


Case Study 1 (Concluded)

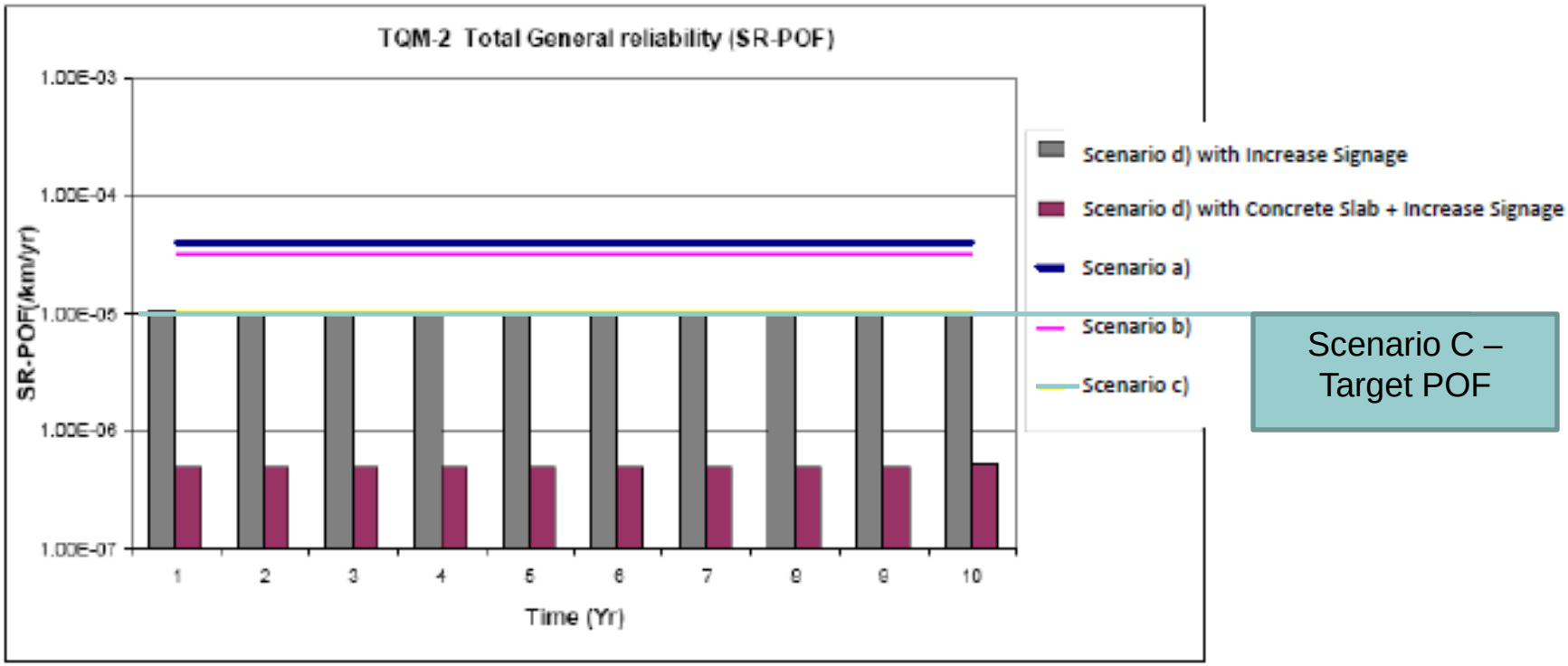
- Mitigation actions:
  - Additional excavations for ILI-reported dents
  - Re-inspection and reassessment interval of 5 years
  - Depth of cover survey interval of 5 years
  - Assessment of the effectiveness of CP (e.g. via CIS or DCVG)
  - Enhanced leak detection program
  - Enhanced engagement with the land owners and regional utility companies that have access to the RoW
  - Enhanced RoW Monitoring

Case study 2

- Natural Gas Pipeline:
  - High Pressure (7067 kPa)
  - Diameter (NPS 24)
  - Length (1500 m)
  - In Proximity residences (approximately 63)
- NEB Requirements in case of a change in class location:
  - Pipe replacement; or
  - Pressure reduction; or
  - **Engineering Assessment**



Case study 2 - POF scenarios



Scenario C – Target POF

Case study 2 (Concluded)

- Mitigation actions:
  - Increased signage
  - Concrete slabs
  - Public awareness program
  - Enhanced leak detection system
  - Defined re-inspection intervals for ILI (geometry, crack, and metal loss)
  - Depth of cover survey interval of 5 years

Questions and Discussion