

Quarterly Report - Public

Date of Report: 3rd Quarterly Report – June 30, 2023

Contract Number: 693JK32210010POTA

Prepared for: DOT PHMSA

Project Title: Risk-Based Decision Support for Rehabilitation of Natural Gas Distribution Pipelines

Prepared by: GTI Energy

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For quarterly period ending: June 30, 2023

1: Work Performed During this Quarterly Period

Completed Task 1 - Kick-off Meeting and Technical Advisory Panel: This task included identifying current pipeline rehabilitation systems and related material properties and performance. The Interim Report on this task was submitted last quarter.

Working on Task 2 – Identify Threats and Relative Importance. This work includes the evaluation of outside force, natural force, excavation damage, and corrosion threats on aged pipelines. Outside and natural forces mainly include earth movement, flooding, and thermal loads.

The 3rd quarterly deliverable is this quarterly report as shown in Figure 1.

Technical and Deliverable Milestone Schedule								
<u>Item No.</u>	<u>Task No.</u>	<u>Activity/Deliverable</u>	<u>Quarter No.</u>	<u>Expected Completion Date/Mos</u>	<u>Payable Milestone</u>	<u>Federal Payment</u>	<u>Resource-Share</u>	<u>*Total</u>
	(per proposal)	<u>ACTIVITY/DELIVERABLE</u>			<u>TITLE</u>			
5	8	Quarterly Status Report	3	9 months	Submit 3rd quarterly report	3,441.00	1,820.00	5,261.00
Third Payable Milestone			3	9 months	SUBTOTAL	3,441.00	1,820.00	5,261.00

Figure 1 – 3rd Quarterly Deliverable – June 30, 2023

2: Project Financial Tracking During this Quarterly Period

Figure 2 shows the project expenditures at the end of the 3rd Quarter.

3: Project Technical Status

An Interim Report, in the Attachment, includes the quarterly technical report.

4: Project Schedule

Figure 3 shows the project schedule and progress as of the end of third quarter. No time-related issues are reported in this quarter.

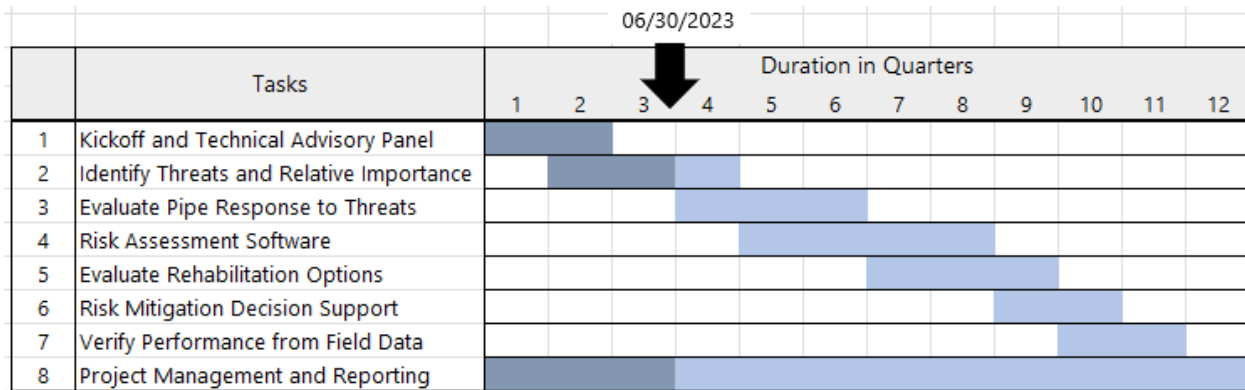


Figure 3 - Project time schedule

Task 2 - Identify Threats and Relative Importance

Identify Threats and Relative Importance: Outside force, natural forces, excavation damage, and corrosion are main threats to aged pipelines. Outside and natural forces mainly include earth movement, flooding, and thermal loads.

For cast iron pipes, damage due to these forces mostly occurs at the joints. Table 1 shows the root causes and damage indicators from these threats. Soil deformations imposed by these forces are typically unrecoverable, causing pipe breakage and permanent deformations at the joints.

Work in this task identify the threats and consequences of these root causes. Data for this analysis will be obtained from PHMSA and utility records and geographical data to identify probabilities of failure from pipe and site characteristics.

This task investigates PHMSA Incident data and reports for natural gas distribution pipelines from 1970 to 2019. These records were stored in an SQL database in Azure cloud server for access and analysis. A web-based data management program was developed for searching, processing, and displaying records of these incidents. The relationships and distributions of the incidents' parameters are investigated using a reporting tool in Microsoft Power BI to customize data display and run queries.

The following figures show the web-based program and search engine used in identifying pipeline incident threats.

Table 1. Main Threats and Damage Indicators in Cast Iron Pipes

Failure Type	Root Cause of Failure	Damage Indicators
Structural Failure	Pitting and graphitization corrosion	Coating damage, wall loss, graphitization, pitting leaks, and pressure loss
	Manufacturing defects	Cracks on pipe body and bell joints
	Soil movement, seismic loads, loss of bedding, thermal contraction	Circumferential cracks, pipe uplift, frost regions, crack leaks
	Internal Pressure, external loading	Longitudinal cracks
Leaks	Soil movement, seismic loads, loss of bedding, thermal contraction	Pipe movement, loss of support, joint leaks

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Pipeline Incidents Database

A Database Search of Natural Gas and Hazardous Liquid Pipeline Incidents



About

Safe and secure operation of natural gas transmission and distribution systems is an ongoing public interest which requires investigating the root causes of incidents with respect to pipeline properties and associated sites and operation characteristics.

This program provides a database search of natural gas and hazardous liquid pipeline incidents records from the National Transportation Safety Board (NTSB) and DOT-Pipeline and Hazardous Materials Safety Administration (PHMSA)

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Pipeline incidents from the NTSB records were obtained from pipeline accidents investigation reports from 1969 to 2020 [[Link to NTSB Accident Reports Site](#)]

The PHMSA incident database [[Link to PHMSA Incidents Records Site](#)] includes incident records from the following pipelines datasets:

1. Gas Distribution (GD) incidents records from 1984 to 2019
2. Gas Transmission and Gathering (GT&G) incidents records from 1984 to 2019
3. Hazardous Liquid (HL) incidents records 1985 to 2019

Database records were optimized for accuracy, consistency, and redundancy. The data formats were normalized from the various forms used in reporting incidents during these reporting periods.

Pipeline Incidents Database

This research program was sponsored by the U.S. DOT-PHMSA and the Operations Technology Development (OTD). Periodical updates are essential to continue the optimization process and add new incident records to the database. As such, the database search engine in the program is not comprehensive and is used mainly in identifying recognized incidents root causes.

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☐ NTSB Pipeline Incident Reports
 ☒ PHMSA Gas Distribution (GD) Incident Records
 ☐ PHMSA Gas Transmission & Gathering (GT&G) Incident Records
 ☐ PHMSA Hazardous Liquids (HL) Incident Records
 ☐ Other

Accident Year: 2011-2019, 2001-2010, 1991-2000, 1981-1990, 1971-1980

 Accident State: All

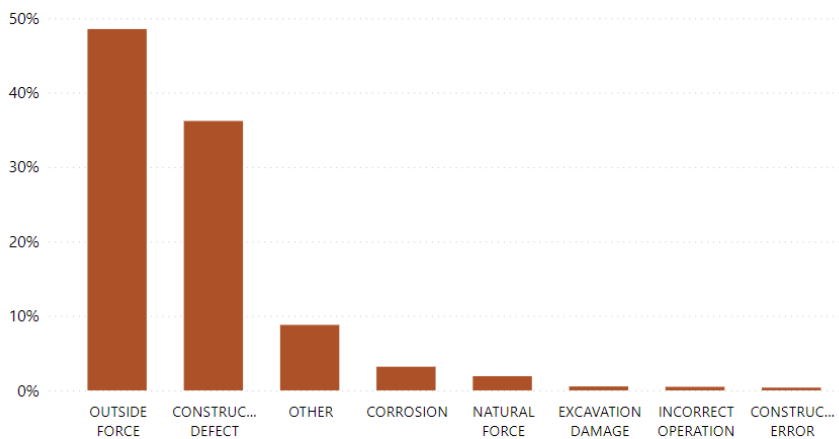
 System Part: Main

 Failed Component: All

 Root Cause: All

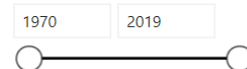
 Keyword Search: Cast Iron

GD - ROOT CAUSES



Count of Incident Records = 1887

INCIDENT YEAR



Slide Bar for Selection

MATERIAL

- ☐ ALUMINUM
- ☒ CAST IRON
- ☐ CAST/WROUGHT IRON
- ☐ COPPER
- ☐ DUCTILE IRON
- ☐ OTHER
- ☐ PLASTIC
- ☐ STEEL
- ☐ WROUGHT IRON

[END OF REPORT]