Quarterly Report – Public Page

Date of Report: *4th Quarterly Report – September 30, 2020*

Contract Number: *693JK31910005POTA*
Prepared for: *DOT PHMSA and OTD*
Project Title: ***Procedures for Selecting Locating and Excavation Technologies***
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For quarterly period ending *September 30, 2020*

1: Items Performed During this Quarterly Period

Task 5- Database Development and Web-Based Program: The incidents databases from NTSB and PHMSA records are complete. The development of the web-based program is still in progress. This work is expected to be completed by the end of the following quarter.

Task 6- Predictive Data Analysis and Visualization: Started the analysis of the effect of site characteristics and excavation practices on the probability of excavation damage. The distributions of the various incident parameters are obtained from the database results in Task 5. These parameters are implemented in a Bayesian network approach for the evaluation of the probabilities of failures. Completion of this task is due next quarter.

Task 8- Project Management: Submitted the 4th Quarterly Report [This report].

2: Items Not-Completed During this Quarterly Period

Work of Task 5 is not completed. This task is expected to be completed by the following quarter (December 31, 2020).

3: Project Technical Status

- Work in Task 5 included the development of a web-based data management program for searching, processing, and displaying datasets from the National Transportation Safety Board (NTSB) pipeline accidents reports and PHMSA pipeline incidents. These records are stored in a SQL database in an Azure cloud server for web-based access. Analysis of the data and visualization are performed using statistical analysis and MS Power BI.
- The data sets investigated in this work included the following:
  - NTSB investigation reports of pipeline accidents from 1970 to 2019,
  - PHMSA Gas Distribution (GD) incident records from 1984 to 2019,
  - PHMSA Gas Transmission and Gathering (GT&G) incident records from 1984 to 2019,
  - PHMSA Hazardous Liquid (HL) incident records from 1985 to 2019.

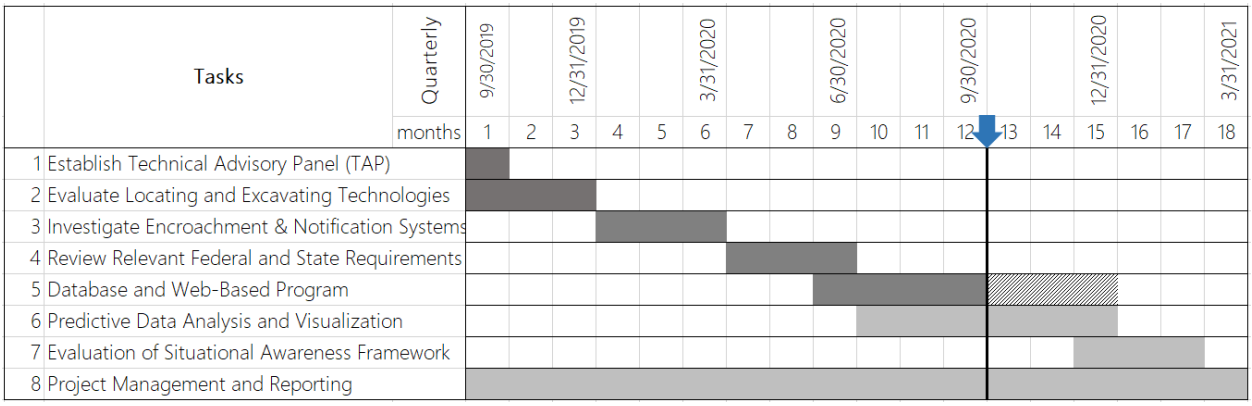
These datasets contained different fields and glossaries of definitions of incident parameters which required data cleaning and harmonization to facilitate the analysis.

- The web-based program 'Pipeline Incidents Database' is currently being developed to provide a search engine for the incidents databases in an Azure cloud service platform. Several interactive search forms will be available to the users for incidents search and data retrieval, with emphasize on excavation damage rood cause incidents.
- Work of Task 6 includes analysis of the effect of site characteristics (such as location, depth, and facilities types) and excavation practices on the probability of excavation damage. The distributions of the various site and excavation parameters are obtained from the database results and analysis in Task 5. These parameters are implemented in a Bayesian network approach for the evaluation of the probabilities of failures.

  Bayesian analysis is a framework for calculating conditional probabilities based on given input parametrical distributions. The analysis begins with a "prior distributions" which are based on the assessment of the relative likelihoods of parameters or the results of field observations. The likelihood of observed distributions is then calculated as a function of the parameters values to obtain an overall possible probability.

4: Project Schedule

The following figure shows the project schedule and progress as of the end of this quarter. Work in Task 5 is extending to the next quarter (ending on 12/31/2020) to complete the development of the web-based database program.



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