**CAAP Quarterly Report**

Date of Report: 4/10/2024

Prepared for: *U.S. DOT Pipeline and Hazardous Materials Safety Administration*

Contract Number: 693JK32050008CAAP

Project Title: Effectiveness Assessment of Pipeline Cathodic Protection System Using Remote Sensing, Advanced Modeling, and Data Analytics

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For quarterly period ending: 3/31/2024

**Business and Activity Section**

# Contract Activity

The subaward to University of Akron has been issued. The work at U. of Akron will start in the next quarter.

The current graduate student (Xiao Chen) who was working on a previous PHMSA project started working on this project with the postdoc (Jay Shah). A new graduate student will be recruited at both Rutgers University and University of Akron in fall 2024 to work on this project.

# Status Update of Past Quarter Activities

The project team continued literature review on the project topic by searching the relevant publications in journals, conference proceedings, government reports, and national and international standards.

The PI had meetings with the industry partners (one pipeline operator and one consultant firm) to discuss the project plan, collect relevant information, and explore collaboration opportunities.

# Cost Share Activity

Cost share is provided by Rutgers University during this quarterly period as budgeted in the proposal.

# Technical Approach

Task 1 Literature Review, Information Collection, and Refinement of Work Plan

The literature review includes but not limit to the following topics: 1) pipe CP system design, survey, and effectiveness assessment; 2) remote sensing of pipe corrosion and the related soil properties; 3) modeling and simulation of CP system and corrosion rate; and 4) data analytics of CP survey and pipe inspection data.

The first part of literature is focused on CP system and effectiveness assessing, including the following parts:

* CP design pipeline and criteria
* Factors affecting CP effectiveness
  + Soil condition (moisture, pH, oxygen/salt content, etc.)
  + Coating defects
  + AC/DC current
* CP effectiveness assessment
  + Field test (CIPS, DCVG, coupon test)
  + Numerical modeling
  + Data analytics
* Conclusions and recommendations

The second part of literature review focused on field measurements and remote sensing of in-situ soil corrosivity that can be used as inputs for assessment of CP effectiveness, including the follow parts:

* Field measurements of soil corrosivity
* Empirical (statistical) models of soil corrosivity
* Remote sensing methods (HIS, GPR, satellite)
  + Working principle
  + Prediction models with machine learning or deep learning
* Conclusions and recommendations

The PI had an online meeting with the industry partner (one pipeline operator) to discuss and refined the project plan. The industry partner has agreed to provide corroded pipe samples from the field that will be embedded in the soil box for detection of soil corrosivity and corrosion location. In addition, the research team will acquire the new pipe for comparative experiments. After the development of remote sensing method for soil corrosivity, the industry partner will provide the access for field measurement at the location close to CP test station.

The PI attended the annual conference of Association for Materials Protection and Performance (AMPP) in March 2024. During the conference, the PI discussed the project with the industry partner (one consulting firm) on various topics such as obtaining feedback from field corrosion experts, sharing the data on CP records, providing summer internship for graduate and undergraduate students.