

## State Planning and Research Program Quarterly Report

**PROJECT TITLE:** *Evaluation of Indoor Automated Stockpile Measurement Systems*

**OBJECTIVES:** The goal of this project is to conduct a data-driven evaluation of currently available automated or semi-automated indoor salt stockpile measuring systems in order to improve agencies' day-to-day management of their salt stockpile inventories.

**PERIOD COVERED:** Q1 2022 (January 1, 2022 through March 31, 2022)

**PARTICIPATING AGENCIES:** Minnesota Department of Transportation and the Clear Roads Technical Advisory Committee

**PROJECT MANAGER:**  
Hafiz Munir / Tom Peters

**SP&R PROJECT NO:**  
MnDOT Contract No.  
1030951

**PROJECT IS:**

**LEAD AGENCY:** MnDOT

Planning  
 Research & Development

**PRINCIPAL INVESTIGATOR:**  
Brian Hirt, CTC & Associates

Federal Project Number:  
TPF-5(353)

**ANNUAL BUDGET:** \$84,727.00  
(18-month project budget)

**PROJECT EXPENDITURES TO DATE:** \$29,236.67

**WORK COMPLETED:**

- **Task 1: Project Management.** Coordinated communication among Technical Advisory Panel members. Planned next steps for the project.
- **Task 5: Methodology for System Evaluation.** Finalized the evaluation methodology document and data collection forms with input from TAP. *Task 5 is complete*
- **Task 6: Data Collection.** Continued coordination with participating states to collect data on automated and semi-automated indoor salt stockpile measuring systems in identified storage facilities:
  - Met periodically with individual state teams (TAP members, test site staff, and vendors) to review progress and status at each site, addressed any challenges related to data collection, and step through the process for data collection.
  - Set up web-based measurement recording spreadsheet for use with test and control runs at Texas DOT.
  - Based on rough analysis of data (Task 7), proposed and coordinated systematic tests at four sites: Bullfrog (WA), Happy (TX), Decatur (TX) and Gravel Hill (CT). These included measurements with manual tools (tape/wheel), handheld lidar, and experimental equipment on a controlled salt pile:
    - Original pile
    - Pile moved into different configurations with no changes in volume
    - Pile after a known volume was removed
  - Coordinated, scheduled, facilitated and documented two member–vendor demonstration webinars for all Clear Roads participants to learn about progress to date and ask specific questions of participants. Posted webinar recordings and presentations to the Clear Roads members-only web page.
    - Washington State DOT, Texas DOT and Stockpile Reports (photogrammetry system) webinar conducted on March 22, 2022
    - Connecticut DOT and Carlson (FiX1 lidar system) webinar conducted on March 29, 2022
- **Task 7: Data Analysis of System Performance.** Performed rough analysis of selected data to inform site-specific data collection (see Task 6).
- **Task 8: Final Report and Brief.** Began drafting project report.

**SUMMARY OF ACTIVITIES EXPECTED TO BE PERFORMED NEXT QUARTER:**

- **Task 1: Project Management.** Convene the project TAP in spring to review progress.
- **Task 6: Data Collection.** Continue data collection process through the end of the spring:
  - Continue periodic meeting with state teams to plan final measurement collection efforts as sheds are stocked up for the next winter season.
  - Work with vendors to collect remaining experimental data:
    - Analysis using fewer cameras in Washington State with the photogrammetry system.
    - Analysis using a coarser scan (fewer data points) in Connecticut with the lidar system.
  - Explore the possible inclusion of the Indiana/Purdue lidar system in this study; it would likely be a reporting on Indiana DOT's experience with the system this winter and/or a short demonstration of data collection.
- **Task 7: Data Analysis of System Performance.** Conduct full analysis of data. Address possible areas of improvement with vendors, if possible.
- **Task 8: Final Report and Brief.** Continue drafting project report.

**STATUS AND COMPLETION DATE:**

This project is on track for completion by November 30, 2022.