

TRANSPORTATION POOLED FUND PROGRAM QUARTERLY PROGRESS REPORT

Lead Agency: Utah Department of Transportation

INSTRUCTIONS:

Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.

Transportation Pooled Fund Program Project # TPF-5(485)		Transportation Pooled Fund Program - Report Period: <input type="checkbox"/> Quarter 1 (January 1 – March 31, 2024) <input type="checkbox"/> Quarter 2 (April 1 – June 30, 2024) <input checked="" type="checkbox"/> Quarter 3 (July 1 – September 30, 2024) <input type="checkbox"/> Quarter 4 (October 1 – December 31, 2024)	
Project Title: Consequences-Based Analysis of Undrained Shear Behavior of Soils and Liquefaction Hazards, Phase 1: Filling the Data Gaps			
Name of Project Manager(s): David Stevens	Phone Number: 801-589-8340	E-Mail davidstevens@utah.gov	
Lead Agency Project ID: FINET 42107, ePM PIN 20158 UDOT PIC No. UT19.409	Other Project ID (i.e., contract #): UDOT Contract No. (pending)	Project Start Date: September 2021 (TPF study #)	
Original Project End Date: September 2025	Current Project End Date: September 2027	Number of Extensions:	

Project schedule status:

☐ On schedule
 ☐ On revised schedule
 ☐ Ahead of schedule
 ☒ **Behind schedule**

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
Total commitments = \$540,000.00 Obligated to date = \$460,000.00 (contract pending)	Contract spent = \$0.00 Contract support = \$195.32 Total spent = \$195.32	0%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter (contract)	Total Amount of Funds Expended This Quarter (contract)	Total Percentage of Time Used to Date (project)
0%	\$0.00	51%

Project Description:

The overall objective of this multi-year, multi-phase effort is to create a true performance-based model to evaluate the consequences of undrained response in all soils, including consequences resulting from earthquake-induced liquefaction and cyclic softening. Through this overall project, a more robust method for estimating field performance of soils during undrained events (including earthquakes) will be developed and tested. Due to the ability of the CPT to collect nearly continuous profiles of data in most soil types, for these studies we will focus initially on using CPT data for analyzing undrained shear behavior and liquefaction hazards. The framework is intended to be adaptable to other methods such as Standard Penetration Test (SPT), laboratory testing and analysis, and shear wave velocity (Vs) data.

The objective of this Phase 1 study is to fill critical data gaps to document the undrained shear behavior of sands, silts, and clays for both static and dynamic loadings, and to provide a preliminary set of predictive models for the undrained shear response of soils. Later, in separate pooled fund studies, Phase 2 would focus on additional development of the models for consequences-based analysis of the undrained shear behavior of soils, and Phase 3 would focus on testing and validation of the models.

Planned tasks for this Phase 1 study are as follows:

- (1) Perform a literature review of related studies.
- (2) Conduct a field sampling program for transitional soils at sites in several states.
- (3) Perform conventional laboratory tests.
- (4) Perform advanced laboratory tests.
- (5) Compile a database of soil in-situ resistance and corresponding undrained shear strength and strains from across the United States.
- (6) As part of the Next Generation Liquefaction (NGL) Project modeling effort, develop and deliver a preliminary set of predictive models based on available field-case-history data for the monotonic and cyclic undrained shear response of soils. In addition to liquefaction triggering, these models may include excess pore pressure ratio, maximum shear strain, volumetric strain, lateral deformations, and degraded undrained shear strength.
- (7) Prepare the Phase 1 Final Report.
- (8) Meet with the multi-state study panel to discuss results, including whether further research is recommended, and what it might entail.
- (9) Conduct education, outreach, and training.

UDOT intends to hire a firm or university as the prime consultant through qualifications-based selection in the UDOT General Engineering Services Pool, Research Work Discipline. The technical advisory committee (TAC) for the study currently includes representatives from UT, AK, CA, MO, MS, OR, SC, TN, and WA state DOTs.

Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):

Tasks – Not yet finalized for contract. See a preliminary list above.

Meetings – No TAC meetings were held this quarter.

Contract – Pending. UDOT has selected a research team for the contract. This includes Brigham Young University (Dr. Kyle Rollins now as PI, instead of Dr. Kevin Franke) as the prime, and two sub-consultant universities: University of Illinois at Urbana-Champaign and Oregon State University. The research team worked on a draft work plan for the contract and entry of consultant documents into the UDOT ePM-CMS system.

Anticipated work next quarter:

Tasks – Not yet finalized for contract. See a preliminary list above.

Contract – Pending. UDOT and the selected research team will continue working on the contract work plan, with input from the TAC members, and negotiate the contract details. We anticipate starting the research contract this quarter so that the research team can begin the literature review, meet with the partner states individually, and prepare for collecting field data.

Significant Results:

None yet.

Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).

None.

Potential Implementation: