**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.*

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| **Transportation Pooled Fund Program Project #**  **TPF-5(338)** | | **Transportation Pooled Fund Program - Report Period:**  **x Quarter 1 (January 1 – March 31, 2016)**  \_ Quarter 2 (April 1 – June 30, 2016)  \_ Quarter 3 (July 1 – September 30, 2016)  \_ Quarter 4 (October 1 – December 31, 2016) | |
| **Project Title:**  Simplified CPT Performance-Based Assessment of Liquefaction and Effects | | | |
| **Name of Project Manager(s):**  Thomas Hales | **Phone Number:**  801-633-6226 | | **E-Mail**  [tahales@utah.gov](mailto:davidstevens@utah.gov) |
| **Lead Agency Project ID:**  FINET 54631, ePM PIN 14239  UDOT PIC No. UT15.402 | **Other Project ID (i.e., contract #):**  UDOT Contract No. (pending) | | **Project Start Date:** |
| **Original Project End Date:** | **Current Project End Date:** | | **Number of Extensions:** |

Project schedule status:

**X** On schedule \_ On revised schedule \_ Ahead of schedule \_ Behind schedule

Overall Project Statistics:

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| **Total Project Budget** | **Total Cost to Date for Project** | **Percentage of Work**  **Completed to Date** |
| Pending (current contract)  $142,000.00 (total commitments) | $0 | 0% |

***Quarterly*** Project Statistics:

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| --- | --- | --- |
| **Total Project Expenses**  **and Percentage This Quarter** | **Total Amount of Funds**  **Expended This Quarter** | **Total Percentage of**  **Time Used to Date** |
| 0% | $0 | 0% |

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| **Project Description**:  Conventional “pseudo-probabilistic” procedures to evaluate liquefaction triggering and its effects have been shown through recent research to produce estimates of liquefaction factor of safety at inconsistent and often unacceptable levels of risk. These errors are introduced through the incorrect assumption that using probabilistic ground motions in a deterministic liquefaction analysis will yield a probabilistic estimate of liquefaction factor of safety. The inconsistent consideration of liquefaction risk could contribute to undesirable performance or even collapse of various important structures such as bridges or retaining walls in the event of an earthquake. Conversely, the inconsistent consideration of liquefaction risk could also potentially contribute to the unnecessary and expensive over-design of liquefaction mitigation alternatives. Utilization of a fully-probabilistic or performance-based liquefaction triggering procedure, which considers both uncertainty in the seismic loading and the liquefaction triggering relationship, could effectively solve these problems. Furthermore, probabilistic evaluation of liquefaction triggering could potentially be taken into account when considering liquefaction effects such as lateral spreading or free-field liquefaction settlements. However, current performance-based liquefaction procedures (e.g. Kramer & Mayfield 2007) are quite complex and beyond the level of practical application for most practicing engineers. Additionally, available performance-based methods generally focus on using the standard penetration test (SPT). Increasingly, the cone penetration test (CPT) is becoming a preferred instrument for performing in-situ assessment of liquefaction hazard. Development of code-compatible simplified approximations of performance-based analysis methods for the CPT to assess liquefaction triggering and its effects could be a viable solution to overcome these challenges.  Objectives for this study include:  1. Develop simplified performance-based procedures for the CPT modeled after recent simplified performance-based procedures for the SPT [Study No. TPF-5(296)] to closely approximate the performance-based analysis results for liquefaction triggering, lateral spread displacement, and post-liquefaction free-field settlement at select return periods (475, 1033, and 2475 years).  2. Develop the tools and analysis necessary to validate and perform the new simplified liquefaction evaluation procedures in each of the participating states.  Tasks for this study include, regarding the participating states:  *(Tasks are being formulated for the research contract and will be reflected here in later quarters.)*  Dr. Kevin Franke of BYU is the Principal Investigator for this research project. The technical advisory committee (TAC) for the study currently includes representatives from UT, CT, OR, and SC state DOTs. |

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| **Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):**  UDOT worked with BYU to develop a draft scope of work for the research contract. |
| **Anticipated work next quarter**:  UDOT and BYU will finalize the scope of work and execute the contract. They will contact the TAC members and hold a kickoff meeting (web conference) to discuss the project. BYU will begin working on the initial tasks of the project. |

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| **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. |

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| **Potential Implementation:** |