**TRANSPORTATION POOLED FUND PROGRAM**

**QUARTERLY PROGRESS REPORT**

Lead Agency (FHWA or State DOT): \_FHWA\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**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 #***(i.e, SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX)**TPF-5(461)* | **Transportation Pooled Fund Program - Report Period:**□Quarter 1 (January 1 – March 31) 2023□Quarter 2 (April 1 – June 30) 2023□Quarter 3 (July 1 – September 30) 2023🗹Quarter 4 (October 1 – December 31) 2023 |
| **Project Title:**Soil and Erosion Testing Services for Bridge Scour Evaluations |
| **Name of Project Manager(s):***Kornel Kerenyi* | **Phone Number:***(202) 493-3142* | **E-Mail***kornel.kerenyi@dot.gov* |
| **Lead Agency Project ID:** | **Other Project ID (i.e., contract #):** | **Project Start Date:**  |
| **Original Project End Date:** | **Current Project End Date:** | **Number of Extensions:** |

Project schedule status:

🗹 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** |
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***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** |
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| **Project Description**:

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| **Objectives:**The objective of these pooled funds is to provide and/or support soil and erosion testing services for bridge projects over water crossings managed or coordinated by State DOTs, to provide technical assistance to design, fabricate, and install erosion testing devices to support and seek to broaden the use of erosion testing devices among State Department of Transportations, and to compile and analyze the collected soil and erosion testing data in a broader research effort to more accurately estimate reliable scour design depths given the soil conditions and hydraulic load during a given storm event. |
| **Scope of Work:**Task 1: Soil Erosion Test in the Turner Fairbank Highway Research Center (TFHRC) Hydraulics and/or Geotechnical Lab for various bridge projects: The Hydraulics and Geotechnical Lab staff will conduct soil and erosion tests utilizing the Ex-situ Scour Testing Device (ESTD) and/or Erosion Function Apparatus (EFA) on soil samples shipped to the Laboratories for bridge projects managed or coordinated by State DOTs.Task 2: Soil Erosion Test in the field for various bridge projects: The Hydraulics Lab staff will conduct soil erosion tests in the field using the In-Situ Scour Testing Device (ISTD) or Portable Scour Testing Device (PSTD) and collect samples for ESTD and/or EFA tests in the TFHRC Hydraulics Laboratory for projects managed or coordinated by State DOTs.Task 3: Laboratory and In-situ Soil Testing: The TFHRC Geotechnical Lab staff will conduct index testing (e.g. particle-size distribution, unit weight, moisture content, Atterberg limits, etc.) and other, more specialized laboratory soil tests (e.g. undrained shear strength, consolidation, etc.) in the TFHRC Geotechnical Laboratory to determine key soil parameters that may impact erosional resistance. Geotechnical Lab staff will coordinate Cone Penetration Testing at the site with the State DOTs.Task 4: Fabrication of an Erosion Testing Device: The TFHRC Hydraulics Lab staff will design and fabricate an Erosion Testing Device (e.g. ISTD or PSTD) to conduct soil erosion tests for projects managed or coordinated by State DOTs.Task 5: Soil Erosion Tests Support. TFHRC Hydraulics Lab staff will provide technical assistance for conducting and analyzing soil erosion tests in the field or in a Laboratory for projects managed or coordinated by State DOTs.Task 6: Laboratory and In-situ Soil Testing Support. TFHRC Geotechnical lab staff will provide technical assistance for conducting and analyzing ex- and in-situ soil testing for projects managed or coordinated by State DOTs.Task 7: Scour along Longitudinal Structures: This task will use NextScour principles (hydraulic loading functions versus soil erosion resistance), Computational Fluid Dynamics (CFD), Flume Experiments and Case Studies to research scour prediction for various flow conditions on longitudinal structure types and configurations in a riverine environment.   |

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| **Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):*** Updated the shear stress decay procedure for pier and abutment scour by decaying shear stress for contraction scour first, after incorporating the suggestion from the HEC-18 update team
* Continuously updated the temporal scour equation to fit literature data and used Van Rijn’s pick-up function to compute the shear stress decay along with the scour hole development near piers and abutments
* Researched the general shear stress decay function using maximum scour depth instead of bridge structure’s geometric parameters to incorporate the influence of flow angle, structure type and shape and etc.
* Researched how to incorporate layered soil resistance in the general shear stress decay function for multiple-layered soils
* Outlined the flowchart on using NextScour decay function for computing scour depths at bridges and presented a few design cases to the team
* Continued preparing bridge and culvert 3D models for the CFD simulation of the MSDOT Lynch Creek bridge scour project
* Continued the erosion tests and indexing tests of Shelby tube samples from MSDOT
* Continued the monthly NextScour meetings to discuss the progress of the NextScour research
* Collected more temporal pier scour data from the literature
* Continued the flume scour tests with wing-wall abutment in the MFS flume at TFHRC’s Hydraulics Lab with different blockage ratios and velocities
* Completed more than 400 cases of CFD and 2D simulations with longitudinal walls (three different slopes) and determined shear stress amplification factors
* Worked on the piping of the clay flume and designed relative components
* Conducted the erosion of a small-scaled pier in the ESTD’s Shelby tube to test soil strength and flow erosion power, which helped to determine the compaction pressure of the soil samples for the clay flume scour tests
* Analyzed the critical shear stress for MSDOT soils
* Revised the FDOT riprap study report
* Discussed the flume test setup for longitudinal scour and started the flow condition simulations using CFD
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| **Anticipated work next Quarter**:* Continue refining NextScour shear stress decay function and the design case studies
* Finalize the critical shear stress analysis for MSDOT soils
* Revise the NCDOT draft report and resubmit it for HRTM and HPA review
* Finalize the FDOT riprap study report, collect review comments, and submit it for HRTM and HPA review
* Continue the CFD simulation for the MSDOT Lynch Creek bridge scour project
* Collect more scour depth rate data from the literature for pier and abutment scour tests, convert scour depth rate to shear stress and populate the shear stress decay function data
* Activate the clay flume and prepare scour tests with pier, abutment and longitudinal walls in clay
* Draft the NextScour research report combining the updates from both Hydraulic and Geotechnical disciplines
* Organize the 2nd in-person NextScour update meeting with HEC-18 update team
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| **Significant Results:** |
| **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 to report. |