TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): ____Maryland 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(285)*	**Transportation Pooled Fund Program - Report Perio** □Quarter 1 (January 1 – March 31) ■Quarter 2 (April 1 – June 30) □Quarter 3 (July 1 – September 30) □Quarter 4 (October 1 – December 31)

Project Title:
Standardizing Lightweight Deflectometer Measurements for QA and Modulus Determination in Unbound Bases and Subgrades

Name of Project Manager(s): Rodney Wynn	**Phone Number:** 443-572-5043	**E-Mail** RWynn@sha.state.md.us
Lead Agency Project ID: TPF-5(285)	**Other Project ID (i.e., contract #**	**Project Start Date:** January/15/2014
Original Project End Date: December/31/2015	**Current Project End Date:** December/31/2015	**Number of Extensions:** 0

Project schedule status:
□ On schedule □ On revised schedule □ Ahead of schedule ■ Behind schedule

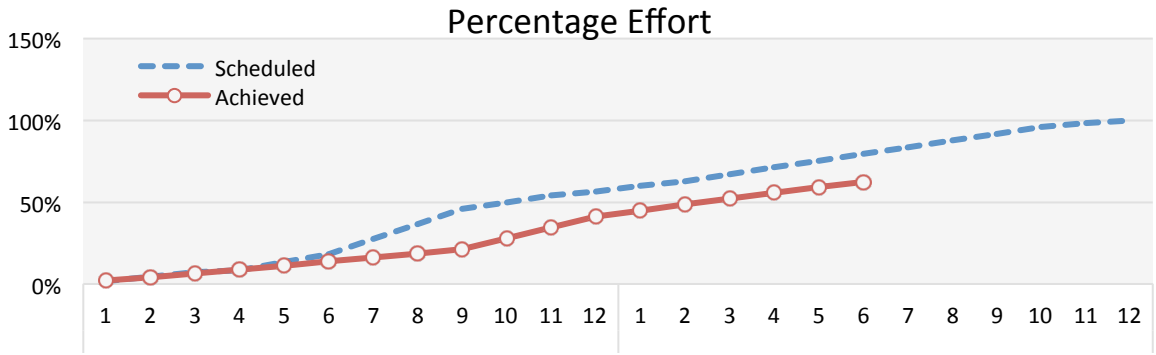
Overall Project Statistics:

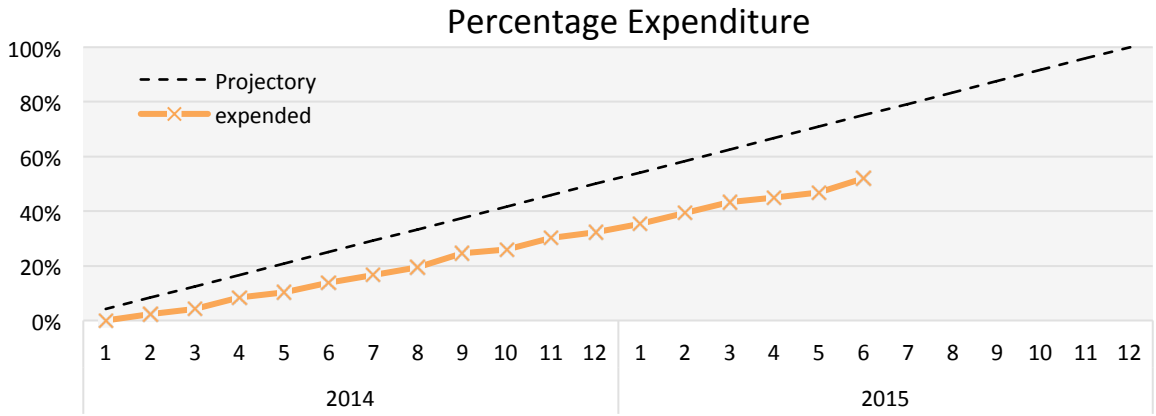
Total Project Budget	Total Cost to Date for Projec	Percentage of Work Completed to Date
$371,984	**$ 192,802.64**	**52%**

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
$ 31,699.22 **8.5%**	**$ 31,699.22**	**62%**

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





The progress with respect to each Task is as followed:

Task 1: Literature Review (3.3% of the total effort). Percent completion: 100%

The personnel continue the review of the current and upcoming literature when deemed necessary.

Project personnel participating in these activities: Schwartz, Khosravifar, Afsharikia.

Task 2: Equipment Evaluation (2.4% of the total effort). Percent completion: 100%

Task 3: Model Refinement/Development (12.6% of the total effort). Percentage completion: 87%

Several of the models refined/developed in Task 3 are in conjunction with laboratory efforts performed in Task 4.

Experimental models from Laboratory resilient modulus testing and LWD testing on proctor mold.

Triaxial M_R tests were performed according to AASHTO T-307 with additional sequences of higher stress levels similar to what is imposed by LWD tests on the Proctor mold.

LWD tests on mold are performed at lower heights to decrease the induced stress, and associated permanent

deformation.

The measured triaxial M_R at LWD stress levels had a good correlation with LWD modulus on the mold. However, triaxial M_R is slightly higher than E-LWDmold after correcting for the stress levels.

Given the good correlation between measured E-LWD and measured triaxial M_R, there is a good potential of using LWD measurement during Proctor compaction curve establishment as a reference for field QA.

Modeling of Soil Drying

SVFlux and SVHeat model from SoilVision office software is being used to perform a parametric study and sensitivity analysis of soil post-compaction moisture variations to the soil and climate inputs.

Project personnel participating in these activities: Schwartz, Khosravifar, Afsharikia.

Task 4: Controlled Trials (18.8% of the total effort). Percentage completion: 80%

Laboratory LWD tests on Proctor Compacted Specimens:
The process of LWD testing on Proctor molds were continued using 3 to 5 different heights on the soils used in the construction of the test pits.

The presentation in Appendix G shows a summary of the performed tests.

Laboratory resilient modulus tests:
Laboratory resilient modulus tests are being performed on the three soils used in the construction of the test pits.

Controlled soil box tests:
The preparation and construction of the test pits was the main focus during this quarter and will continue into the next quarter. The summary of the construction is provided in the presentation in Appendix H.

Project personnel participating in these activities: Schwartz, Khosravifar, Afsharikia.

Task 5: Field Validation (53.7% of the total effort). Percentage completion: 25%

Field site visit planning is undergoing. The presentation in Appendix I reviews the upcoming field validation projects in the participating states.

Task 6: Draft Test Specifications (3.3% of the total effort). Percentage completion: 0%

No progress was made on this task during the reporting period.

Task 7: Workshop and Final Report (5.8% of the total effort). Percentage completion: 2%

A two-day workshop was held for the TAC on June 2nd and 3rd at University of Maryland.
Mr. Nayyar Zia Siddiki of Indiana DOT and John Siekmeier of Minnesota DOT gave presentations on their state's experience with LWD as compaction control tool.
Presentations were given by UMD on the overview of the project, status of the project and the current issues.
Test pits and lab facility at TFHRC of FHWA were visited.
Upcoming projects for field validation were discussed.
Appendix A includes the agenda for this workshop. Appendices B through I contain the presentation slides.

UMD personnel contact information:

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Anticipated work next quarter:

- The continued monitoring and documentation of the literature.
- Task 3, 4, and 5 will be the main focus of the next quarter.
  1. Test pit construction and testing
  2. Continued resilient modulus testing
  3. Continued LWD Proctor testing with new modifications using the Zorn, Dynatest, and Olson LWDs.
  4. Evaluation of test pit and field results using the laboratory resilient modulus and LWD measurements using the models.
  5. Model refinement: Drying, stress dependency, finite layer, spatial variability in the field

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).

Potential Implementation:

LWDs should be implemented more widely and this should be done using standardized testing procedures and data interpretation methods. LWDs are a tool for performance based construction quality assurance testing, which not only results in a better product but also provides the quantitative measures critical to better understanding the connection between pavement design and long term pavement performance. As the benefits of performance based quality assurance testing become increasingly apparent, more public agencies and private consultants are expected to acquire these tools and implement standardized procedures during their use. The product of this research will allow state DOT construction specifications to be modified to include this new light weight deflectometer (LWD) option during construction quality assurance.