

**TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT**

Lead Agency (FHWA or State DOT): **FHWA Office of Technical Services Resource Center P&M TST**

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>(i.e., SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX))</i> <p style="text-align: center; font-size: 1.2em;">TPF 5(063)</p> | | Transportation Pooled Fund Program - Report Period: <input type="checkbox"/> Quarter 1 (January 1 – March 31) <input type="checkbox"/> Quarter 2 (April 1 – June 30) <input checked="" type="checkbox"/> Quarter 3 (July 1 – September 30) <input type="checkbox"/> Quarter 4 (October 1 – December 31) | |
| Project Title: “Improving the Quality of Pavement Profiler Measurement” | | | |
| Name of Project Manager(s): Robert L. Orthmeyer | Phone Number: (708) 283-3533 | E-Mail Robert.orthmeyer@dot.gov | |
| Lead Agency Project ID: FHWA OTS RC P&M TST | Other Project ID (i.e., contract #): DTFH61-10-D-00013 | Project Start Date: May 2003 | |
| Original Project End Date: September 2008 | Current Project End Date: September 2014 | Number of Extensions: <p style="text-align: center;">Two</p> | |

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 |
|----------------------|--------------------------------|--------------------------------------|
| \$2,832,000 | \$1,587,300 | 75% |

Quarterly Project Statistics:

| Total Project Expenses and Percentage This Quarter | Total Amount of Funds Expended This Quarter | Total Percentage of Time Used to Date |
|--|---|---------------------------------------|
| Currently Not Available | Currently Not Available | 75% |

Project Description:

Participating Agencies: California, Colorado, Connecticut, Florida, Georgia, Illinois, Kansas, Kentucky, Louisiana, Maryland, Mississippi, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, South Dakota, Texas and Wisconsin. FHWA offices include: Federal Lands, LTPP, the Office of Technical Services Resource Center and the Office of Pavement Technology (HIPT).

1. Guiding Principles

The goal of the IPQ Pooled-Fund Study (IPQ Study) is to assemble states and the Federal Highway Administration (FHWA) to (1) identify data integrity and quality issues with inertial profilers; (2) suggest approaches to addressing identified problems; (3) initiate and monitor projects intended to address identified problems; (4) disseminate results; and (5) assist in solution deployment.

2. Scope

The IPQ Pooled-Fund Study is intended to serve as a forum for the participants to identify and address operational issues that are common among various inertial profilers. The Study will focus on quality of data issues that arise from the use and operation of inertial profilers. Within these broad topic areas, the following are offered as examples issues that might be addressed within the intended scope:

- Implementation of American Association of State and Highway Transportation Officials (AASHTO) Provision Protocols for Inertial Profilers.
- Inertial profiler certification procedures.
- Establishing a reference profile.
- Certification course(s).
- Operator procedures and training i.e. NHI Course 131100 "Pavement Smoothness: Factors Affecting Inertial Profiler Measurements Used For Construction Quality Control".
- Components: i.e. Accelerometers.
- Software i.e. FHWA ProVAL – "Profile Viewer and Analyzer Software".
- System performance monitoring, evaluation, and reporting.
- Contracting and procurement practices and issues.
- The use of inertial profilers for construction quality control and quality assurance as per Title 23 Code of Federal Regulations Section 637.205.
- Bridging Filters.

The following is a list of TAC approved priorities as of September 2012:

1. Reference Profile Device (development of)
 - a. Benchmark Testing – first round completed with a second round scheduled for 2013.
 - b. Reference Device – first round completed with a second round scheduled for 2013.
2. Critical Profile Accuracy Requirements (definition) – Completed report is on the TPF 5(063) website.
3. Construction Acceptance and Correction Software (ProVAL: www.roadprofile.com) – Ongoing
4. Regional Validation Sites – Currently being undertaken by the TAC.
5. Evaluating Upper Limits of Single Accelerometer and Single Height Sensor –Phase II has been completed.
6. Emerging Technology That Enhances Profile Measurement
 - a. Automated Faulting Measurement – completed.
 - b. Low Speed and Urban IRI Measurement – contract has been awarded.
 - c. Ride quality index at different speeds – being undertaken by NCHRP.
7. Support for Road Profiler User's Group (RPUG).

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

The TAC met at a face to face meeting in Minneapolis, MN in conjunction with the RPUG annual meeting during the last week of September. The agenda included an update on potential changes that MAP-21 might have on the profiling industry, a review of the current AASHTO ride quality standards and how they need to be updated to meet network level profiling efforts, report from Dave Huft on SHA views related to regional profiler certification/verification centers, an update on low speed and urban ride measurement and an update on ProVAL software enhancements.

A statement of work (SOW) was developed by this study for our Priority Six - Validity of IRI at various speeds and was submitted to NCHRP process for part of the effort. The SOW was **approved by NCHRP** and will become Project 10-93 in FY13. The NCHRP panel will include four members from this study TAC!! A separate SOW was developed by FHWA and the Federal Lands Highway Department to address measurement issues with low speed and urban roads. **An award** was made to the University of Michigan Transportation Research Institute to complete the study by August 2014

Priority One – Reference Device(s): A SOW has been developed and delivered to contracting office to conduct another round of evaluations of potential reference devices. **An award** was made by FHWA through an Indefinite Delivery Indefinite Quantity (IDIQ) contract to SME, Inc. with a subcontract with UMTRI to assist with the Benchmark Cart. It is anticipated that the next round of evaluations will occur during the September/October 2012 time frame.

Priority Three: Another set of enhancements has been proposed for the software that includes improvements sought by MS and TX. **An award** has been made to The Transtec Group, Inc. to develop version 3.4 with enhancements to address issues presented by FL & MS. ProVAL software version 3.3 is available at the www.roadprofile.com website. Transtec has included the Optimum Weigh-in-motion Locator (OWL) module into ProVAL version 3.2 along with Automated Faulting Module (AFM) assisted by Florida DOT and Mississippi DOT.

Priority Five - Evaluating Upper Limits of Single Accelerometer and Single Height Sensor: The project has begun with Dr.'s Nicolas Gagarine and James Mekemson of Starodub, Inc. providing the research and report. The phase I report has been provided to FHWA. The second phase will quantify the aspects identified in the first phase report, provide a recommended alternative for uniform data collection at all times and has been completed. The panel would like to see a Tech Brief developed for the study, a sensitivity analysis page and an upgrade to the software to allow the initial and final IRI calculation to be displayed.

Anticipated work next quarter:

Priority One: The next round of evaluations has been postponed by the FHWA to allow additional manufacturers to participate. The anticipated schedule change will be to the spring of 2013 and occur at the MnROAD test facility near Albertville, MN.

Priority Four: Regional Calibration/Verification Centers: A subcommittee was formed within the Technical Advisory Committee (TAC) to provide guidance on how to proceed with this effort. A webinar will be held to develop process and direction for the group. Dave Huft from SDDOT developed and conducted a survey of SHA's related to need and use of a regional validation/certification center. The results will be clarified by Dave Huft and submitted to the TAC.

Priority Six: Review of FHWA Federal Lands study on measurement of ride quality for low volume and urban roads is due this quarter.

A webinar has been scheduled for October 23rd to complete the initial round of AASHTO standards updates and to review potential ProVAL software enhancements.

Significant Results:

Accomplishments to Date:

Priority One: Benchmark testing tool to evaluate potential profiler reference devices; Evaluations have been completed and report cards are available.

Final report is available on the web site. Although only one device is closest to qualifying as a reference device - the ICC SurPRO 3500. SECOND ROUND OF EVALUATIONS HAS BEEN

RE-SCHEDULED FOR THE SPRING OF 2013.

Priority Two: Critical Profile Accuracy Requirements study and report (see website for CPAR report);

Priority Three: ProVAL software and support (www.roadprofile.com) that includes grinding simulation. New version 3.3 was released on December 30th.

Priority Five: First phase of understanding the limitations of a single accelerometer. Second phase final report has been completed and is awaiting a tech brief.

Priority Six: Automated Faulting Module was completed by December 15, 2010 and included in ProVAL software.

Priority Six B & C: NCHRP Study 10-93 has been funded with a panel meeting to occur later in 2012.

An award has been made to UMTRI for a study on how to measure ride at low speeds and in urban areas.

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).

Several delays have been encountered within FHWA processes involving contract awards.

States have delayed their commitment of funds to the study. This might be due to the new processes and forms that are involved and communication with their funding resources.

Potential Implementation:

- 1. Provide a pavement profiler reference device that assists Agencies with profiler certification and validation that all inertial profilers are collecting correct pavement profiles that can be used for ride quality indices.**
- 2. Provide assistance with regional calibration/validation centers that would provide uniform quality data collection by inertial profilers. This would enhance confidence in nationwide reporting of ride quality for programs such as pavement management systems and FHWA Highway Performance Monitoring System (HPMS) and MAP-21 requirements.**

3. **Providing a standardized engineering tool - the Profile Viewer and Analysis (ProVAL) software - that removes the "black box" concept of understanding pavement profiles collected by inertial profilers. Users can import profiles from various file formats and save them in the Pavement Profile standard file type. Entire analysis projects can be saved, which preserves user information and analysis inputs. After analyses have been performed, the user can print a report of the original profiles and the results of any analyses performed. ProVAL has been adapted by many agencies around the world. www.roadprofile.com**

Types of analyses that ProVAL can perform:

- **Profile Editing (to manipulate profile data in many aspects including cropping and filtering);**
 - **Standard Ride Statistics, such as International Roughness Index (IRI), Half-car Roughness Index (HRI), Mean Roughness Index (MRI), and Ride Number (RN);**
 - **Fixed-Interval Ride Statistics (to report roughness indexes at a fixed interval);**
 - **Continuous Ride Statistics (to report roughness continuously with a sliding interval);**
 - **Power Spectral Density (PSD) (to view the wavelength or frequency content of profiles);**
 - **Profilograph Simulation (to simulate Profilograph traces, report Profilograph Indices, etc.);**
 - **Rolling Straightedge Simulation (to simulate Rolling Straightedge traces);**
 - **Cross Correlation (a powerful tool to synchronize profiles and to determine their repeatability);**
 - **Profiler Certification (a tool to produce repeatability tests and accuracy tests for profiler certification programs);**
 - **ASTM E 950 Precision and Bias (for classification of profilers based on the ASTM E-90 Spec); and**
 - **Smoothness Assurance Module (SAM) (to provide ride quality reports and improve smoothness from pavement grinding simulation).**
4. **Provide technical guidance on validity of using inertial profilers when using a single axis accelerometer.**