

**TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT**

Date: January 5, 2021

Lead Agency (FHWA or State DOT): Washington State DOT

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(332)	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 type="checkbox"/> Quarter 3 (July 1 – September 30) <input checked="" type="checkbox"/> Quarter 4 (October 1 – December 31)	
Project Title: LTPP Forensic Evaluations		
Name of Project Manager(s): Jeff Uhlmeyer, P.E. Mustafa Mohamedali P.E. M.ASCE PMP	Phone Number: 360-709-5485 360-704-6307	E-Mail UhlmeyJ@wsdot.wa.gov MohameM@wsdot.wa.gov
Lead Agency Project ID: Y-12005	Other Project ID (i.e., contract #): Y-12005	Project Start Date: December 11, 2017
Original Project End Date: November 30, 2019	Current Project End Date: June 30, 2021	Number of Extensions: 2

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
Current contract = \$590,989.00 (Y-12005)	\$445,104.05	75.3%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
\$445,104.05 (10.2% spent this quarter)	\$60,045.79	65.4%

Project Description:

The objective of this project is to perform forensic evaluations on Long-Term Pavement Performance (LTPP) test sections as they go out of service, in general accordance with the guidelines provided in the Transportation Research Board's National Cooperative Highway Research Program (NCHRP) Report 747: "Guide for Conducting Forensic Investigations of Highway Pavements."

The forensic evaluations are to be performed on LTPP test sections, capturing data on exactly why the section performed as it did, and what ultimately led to its removal from the program. Consistent with the NCHRP Report 747 Guidelines, LTPP test sections considered for forensic evaluation will first undergo a desktop study to determine additional data needs, if any, to explain its performance. Follow-up investigations may entail trenching and coring, measuring lift deflection, and potential lab testing of field samples for materials characteristics.

The project is task order based and its scope consists of the four tasks detailed below. The task orders associated with each task have been executed and a summary of the progress to date for each task is also detailed below:

1. Project Management (Task Orders AA and AE)

All project management activities under this task are up to date and on schedule. The contract's period of performance was extended from December 31, 2020 through June 30, 2021, and \$87,989.00 in additional funding was obligated to the project bringing the total contract budget to \$590,989.00.

2. Test Section Selection (Task Orders AB and AF)

Well over 100 LTPP test sections have been identified for potential forensic evaluation. Nominations have been submitted and approved for 57 test sections at 23 different locations in 22 States: Arizona, Arkansas, California, Colorado, Florida, Georgia, Indiana, Iowa, Kansas, Maine, Maryland, Minnesota, Mississippi, Montana, New Mexico, Ohio, Oklahoma, Pennsylvania, South Carolina, Texas, Utah, and Washington.

During the reporting period in question, nominations were submitted and approved for 6 test sections in three states— one in Minnesota, four in Arkansas (SPS-8 project), and one in Pennsylvania. It is anticipated additional test section nominations will be submitted through mid-March 2021 in order to allow sufficient time for completion of the associated desktop studies and follow-up investigations prior to completion of the project on June 30, 2021.

Desktop studies and the associated technical memoranda documenting the studies have been completed for 52 of the 57 approved test sections. During the period in question, desktop study memoranda were completed for test sections in Maryland, Indiana, and Minnesota. In addition, revised desktop study memoranda were complete for test sections in Montana (error was found in deflection predictive equation) and Utah (input received from DOT, which corrected information contained in the LTPP database). Desktop studies and preparation of the associated memoranda have also been started for the remaining 5 of 57 test sections—four of them in Arkansas (SPS-8 project) and one in Pennsylvania.

3. Forensic Evaluations (Task Orders AC and AG)

Follow-up forensic evaluations and the associated documentation have been completed, were not required, or could not be pursued for the test sections in Arizona, California, Colorado, Florida, Georgia, Indiana, Kansas, Maine, Maryland, Minnesota, Montana, New Mexico, Ohio, Oklahoma, South Carolina, Texas, Utah, and Washington.

During the reporting period in question, follow-up investigations were completed for the New Mexico SPS-8 project (2 test sections). In addition, follow-up investigations are ongoing or being pursued for test sections in Iowa, Mississippi, and Texas.

4. Final Project Report (Task Order AD)

Activities associated with the preparation of the final report continued during the reporting period in question. A detailed report outline has been prepared and approved by the WSDOT, and report writing activities have commenced – the introductory chapter has been completed and individual summaries for several of the forensic investigations to date have been prepared and incorporated into the report.

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

The following work activities were completed during the period of October 1 through December 31, 2020.

Project Management (Task Orders AA and AE)

- Continued working on those management activities necessary for the successful completion of the project including cost control, subcontractor control, preparation of progress reports and invoices, and participation in meeting/conference calls with WSDOT.
- As part of the above bullet item and working with WSDOT staff, completed and submitted the eleventh quarterly progress report for the project covering the period of October 1 to December 31, 2020. Also, prepared and submitted invoices for the months of October, November and December 2020.
- Working with WSDOT, completed contract modification extending period of performance from December 31, 2020 to June 30, 2021 and obligating \$87,989.00 in additional funding to the project bringing the total budget to \$590,989.00.
- Prepared for and participated in routine internal project status meeting to review the work done and planned as well as to address issues that may be affecting the project.
- As needed, communicated with WSDOT staff via telephone or message to address issues related to the project and the associated task orders.
- Continued communication and coordination activities with the FHWA LTPP team and the LTPP Data Collection Contractor (DCC) team.
- Prepared for and participated in the October 8, 2020 FHWA LTPP Team meeting to give an update on the LTPP forensic investigations pooled fund study.

Test Section Selection (Task Orders AB and AF)

- Completed and submitted to WSDOT nominations for forensic investigations at the following three LTPP test section locations:
 - Pennsylvania test section 42_1597 on October 19, 2020 and approval to proceed with the desktop study was given by WSDOT on the same day. The study is intended to address (1) cause(s) of fatigue cracking following mill and overlay event in 2000, (2) whether cracking observed prior to the mill and overlay was reflected following the mill and overlay, (3) cause(s) of high IRI and rutting values prior to mill and overlay event in 2000, and (4) differences in initiation and propagation of cracking prior to and following mill and overlay event.
 - Minnesota test section 27_6251; nomination was submitted on November 5, 2020 and approval to proceed with the desktop study was given by WSDOT on the same day. The objectives are to investigate (1) further assess the relationship between pavement deflection, pavement temperature, and subgrade moisture content, (2) cause(s) for reduction in cracking area between 2015 and 2016, (3) whether non-wheelpath longitudinal cracking or transverse cracking observed following overlay event is reflection cracking, and (4) reason(s) for low IRI on pavement section following overlay event.
 - Arkansas test sections 05_0803, 05_0804, 05_0809 and 05_0810 on November 2, 2020 and approval to proceed with the desktop study was given by WSDOT on November 3, 2020. The objectives are to examine (1) cause(s) for increase in fatigue cracking in 2016 on AC test sections, (2) cause(s) for spike in longitudinal cracking in 2014 on AC test sections, (3) reason(s) for the spike in transverse cracking reported in 2014 on AC test sections and subsequent decrease in transverse cracking, and (4) differences in reported faulting of JPCP test sections over time.
 - The project team continued to reach out to the LTPP Data Collection Contractor regarding plans for the next several months to help identify additional candidate test sections.
- Worked on the following forensic investigation desktop studies:
 - Completed desktop study for Maryland test section 24_1634; technical memorandum was submitted to WSDOT on November 2, 2020—follow-up investigations were not possible because it was determined during the desktop study that test section was recently milled and overlaid. Memorandum was also submitted to the FHWA LTPP Team, the LTPP Data Collection Contractor and to the Maryland DOT.
 - Completed desktop study for Indiana test section 18_1037; technical memorandum was submitted to WSDOT on November 18, 2020—follow-up investigations were not possible because it was determined during the desktop study that test section was recently milled and overlaid. Memorandum was also submitted to the FHWA LTPP Team, the LTPP Data Collection Contractor and to the Indiana DOT.
 - Completed desktop study for Minnesota test section 27_6251; technical memorandum was submitted to WSDOT on December 11, 2020—follow-up investigations were not possible because it was determined during the desktop study that test section was recently milled and overlaid. Memorandum was also submitted to the FHWA LTPP Team, the LTPP Data Collection Contractor and to the Minnesota DOT.

- An updated desktop study technical memorandum was prepared for Montana test section 24_1634 and submitted to WSDOT on November 3, 2020. This updated memorandum corrected an error identified in the pavement deflection as a function of temperature and moisture model for the Montana test section.
- An updated desktop study technical memorandum was prepared for Utah test sections 49_7082, 49_7085 and 49_7086 and submitted to WSDOT on November 20, 2020. As noted in the previous quarterly progress report, the decision was made by the project team to further pursue information on construction events at the three test sections, which differ from what is presented in the LTPP database. The updated memorandum reflects the information gathered as well as their possible impact on the performance of the pavements.

Forensic Evaluations (Task Orders AC and AG)

- Worked with DOT staff and LTPP Data Collection Contractor staff to carry out follow-up forensic evaluations for the following test sections:
 - Completed follow-up investigations for the New Mexico test sections 35_0801 and 35_0802. Revised technical memorandum was submitted to WSDOT on December 28, 2020. Memorandum will also be submitted to the FHWA LTPP Team and to the New Mexico DOT.
 - Continued working on the follow-up investigations for Iowa test section 19_1044. The field data collection activities at this test section were completed during the month of September 2020.
 - Follow-up investigations are also ongoing for Mississippi test section 28_5025 and Texas test section 48_1096.

Project Report (Task Order AD)

- Continued writing draft portions of report. To date, a draft of the Chapter 1 Introduction has been completed, selected tables of the Chapter 2 Test Sections Investigated have been completed (including timeline for all test section investigations), and draft write-ups of the Florida, Georgia, Indiana, Kansas, Maryland, Montana, South Carolina, Utah and Washington portions of the Chapter 3 Test Section Investigation Summaries have been completed.

Anticipated work next quarter:

The following work activities will be conducted throughout the period of January 1 through March 31, 2021.

Project Management (Task Orders AA and AE)

Continue working on those management activities necessary for successful completion of project including cost control, subcontractor control preparation of progress report, preparation of invoices, and participation in meetings/conference calls with WSDOT and other TPF personnel.

Test Section Selection (Task Orders AB and AF)

- Continue to identify candidate LTPP test sections for forensic evaluation and, as appropriate, submit to WSDOT for review and approval consideration. Cut-off date for this activity is mid-March 2021.
- Complete desktop study and associated technical memoranda for Arkansas test sections 05_0803, 05_0804, 05_0809 and 05_0810, Pennsylvania test section 42_1597, and other LTPP test sections approved by WSDOT.

Forensic Evaluations (Task Orders AC and AG)

- Continue to work on follow-up investigation activities for the following test sections:
 - Once data from the follow-up field investigations has been processed and entered in the LTPP database, prepare updated technical memoranda for Iowa test section 19_1044.
 - As needed, pursue follow-up investigations for Mississippi test section 28_5025 and Texas test section 48_1096. This includes potential field investigations, data analyses and memorandum preparation.

Project Report (Task Order AD)

- Continue working on Chapter 2 Test Sections Investigated and Chapter 3 Test Section Investigation Summaries of the final project report.

Significant Results:

Technical memoranda for desktop studies addressing 52 LTPP test sections have been completed and similar memoranda for another 5 test sections are presently underway. These memoranda provide valuable information explaining the performance of the 57 test section pavements and, as appropriate, recommending follow-up investigations to better explain their performance. In addition, the technical memoranda that have been generated to date or are under preparation could potentially support the respective agencies with their M&R decision-making processes related to the test section(s) in question.

Follow-up forensic evaluation activities have been or are being carried out for the above referenced test sections, and as appropriate, the associated technical memoranda have been or are being updated to include the results from these

evaluations. In turn, the resulting memoranda have been or will be submitted to the FHWA LTPP for inclusion into the LTPP AIMS for use by data analysts and other users.

It is also worthwhile to point out that several important findings have been made because of these forensic evaluations, which directly affect and will improve the LTPP database. For example, coring performed as part of the California test section 06_7451 and New Mexico test sections 35_0801 and 35_0802 follow-up investigations showed the thicknesses for some layers did not match what was in the LTPP database. Similarly, the Utah test sections 49_7082, 49_7085 and 49_7086 desktop study revealed there may be significant differences between the climatic data contained in the LTPP virtual weather station (VWS) tables of the LTPP database and those data contained in the MERRA tables. It is our understanding that the LTPP program will be removing the VWS tables, as the newer MERRA tables are considered of superior quality. Also, on these sections in Utah, some questions were raised regarding maintenance and rehabilitation activities that will result in updates to the LTPP database. Another example is what happened at the Ohio test section 39_5003, Minnesota test section 27_6251, Indiana test section 18_1037, and Maryland test section 24_1634 where the LTPP database showed the test section as active, but recent mill and overlay moved the test sections to the out-of-study category, which prevented the planned follow-up activities. And yet another example is the differences identified between the non-wheel path longitudinal cracking reported in the manual distress survey sheets and the distress information reported in InfoPave for Minnesota test section 27_6251, which occurred because the final version of the survey sheets was not loaded to LTPP Ancillary Information System (AIMS).

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).

No significant problems, challenges or issues have been encountered to date and none are anticipated. However, should Covid-19 impact the follow-up field investigations, it is the intention of the project team to shift effort towards the nomination of test sections and to desktop studies assuming a portion of the travel and ODC funds under Task Order AG can be transferred to Task Order AF. Alternatively, targeted studies could be pursued (e.g., study of rutting source for the asphalt concrete LTPP test sections) under Task Order AG without the need to transfer funds.

Potential Implementation:

Please see "Significant Results" write-up at the top of this page.