

TRANSPORTATION POOLED FUND PROGRAM QUARTERLY PROGRESS REPORT

Date: April 1, 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 checked="" type="checkbox"/> Quarter 1 (January 1 – March 31, 2021) <input type="checkbox"/> Quarter 2 (April 1 – June 30) <input type="checkbox"/> Quarter 3 (July 1 – September 30) <input 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)	\$495,359.90	83.8%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
\$495,359.90 (8.5% spent this quarter)	\$50,255.95	72.3%

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 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 end of the contract's period of performance remains June 30, 2021, and total obligated funding remains at \$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 63 test sections at 26 different locations in 23 different States: Arizona, Arkansas, California, Colorado, Florida, Georgia, Idaho, Indiana, Iowa, Kansas, Maine, Maryland, Minnesota, Mississippi, Montana, New Mexico, Ohio, Oklahoma (2 locations), Pennsylvania, South Carolina, Texas (2 locations), Utah, and Washington (2 locations).

During the reporting period in question, nominations were submitted and approved for 6 test sections in three states – one in Idaho, one in Oklahoma and four in Washington (SPS-8 project). Few, if any, additional test section nominations are anticipated in the coming reporting period as only three months remain before the end of the contract – all desktop studies and follow-up investigations need to be completed by the end of May 2021 to incorporate the results into the final project report.

Desktop studies and the associated technical memoranda documenting the studies have been completed for 57 of the 63 approved test sections. During the period in question, desktop study memoranda were completed for five test sections in Arkansas (4) and Pennsylvania (1). In addition, revised desktop study memoranda were completed for test sections in Texas (updated prior to follow-up investigations) and Iowa (based on input received from DOT, which may affect information contained in the LTPP database). Desktop studies and preparation of the associated memoranda have also been started for the remaining 6 of 63 test sections – one in Idaho, one in Oklahoma and four in Washington (SPS-8 project).

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 (test section 48_1111), Utah, and Washington.

During the reporting period in question, the follow-up investigations were completed for the Iowa test section, although confirmation by the Iowa DOT of a construction event is still pending. In addition, follow-up investigations are ongoing for test sections in Pennsylvania and Texas (test section 48_1096). Follow-up investigations are also being considered for the test sections in Mississippi and Arkansas.

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 are well along – the introductory chapter has been completed, the test sections chapter is well underway, and the individual summaries for 57 of the 63 test sections have been completed 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 January 1 through March 31, 2021.

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.
- Completed eleventh quarterly progress report covering the period of October 1 to December 31, 2020 and submitted it to WSDOT on January 5, 2021. Also, prepared and submitted invoices for the months of January, February, and March 2021.
- Working with WSDOT, completed contract modification shifting ODCs and travel funds (remaining due to the Covid-19 pandemic) to labor funds to allow for more work to be completed under the project.
- 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 as well as with the State DOTs affected by the forensic evaluations.
- Began preparing for the April 22, 2021 FHWA LTPP webinar on TPF-5(332) Forensic Evaluations. A draft version of the presentation that will be used during the webinar was submitted to WSDOT for review and approval on March 15, 2021.
- On January 4, 2021, as requested by WSDOT, provided copy of all desktop study and follow-up investigation memoranda produced to date for posting on the TPF-5(332) website.
- Began working with WSDOT on a possible April 2021 TAC meeting to be held in conjunction with the LTPP SPS-2 TPF, which is also managed by the WSDOT.

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:
 - Idaho test section 16_1020; nomination was submitted on February 25, 2021 and approval to proceed with the desktop study was given by WSDOT on the same day. The objectives of this study are to examine the key reasons for the relatively good performance of the test section, the key cause(s) of rutting at this test section, and why rutting failed to impact the section's overall performance, particularly with regards to IRI.
 - Oklahoma test section 40_4157; nomination was submitted on March 3, 2021 and approval to proceed with the desktop study was given by WSDOT on the same day. The objectives of the proposed desktop study are to examine and identify those factors that have contributed to the excellent performance of the test section, study the history of joint LTE of the test section prior to the application of the 2012 treatments and identify those factors contributing to the low joint LTE values, and study the effects of the treatments applied in 2012 on the performance of the test section, with a particular focus on IRI and faulting.
 - Washington State test sections 53_0801, 53_0802, 53_A809 and 53_A810; nomination was submitted on February 11, 2021 and approval to proceed with the desktop study was given by WSDOT on the same day. The study is intended to assess and compare the performance of the test sections with a focus on the differences in pavement deflections, IRI, and pavement surface distresses over time – recognizing that the AC and PCC pavement test sections were constructed five years apart and hence will need to be made based on age. Some of the issues to be investigated include:
 - Deflections are highest for the thin AC test sections (53_0801), followed in decreasing order by the thicker AC test section (53_0802), the thinner PCC test section (53_A809) and the thicker PCC test section (53_A810), which seems logical. However, fatigue/alligator cracking has appeared in the thick AC test section but not the thin one.
 - PCC test sections have little if any pavement surface distresses, yet they all have similar IRI values over time (although IRI is slightly lower for the PCC test sections).
 - The thin AC test section 53_0801 has 40 transverse cracks versus only 11 for the thick AC test section 53_0802, yet the total length of transverse cracking is about the same for both (80 to 90 ft).
 - In late 2015, a chip seal was applied to the AC test sections, which hid non-wheel path longitudinal cracking for a little more than a year, but it does not appear to have affected the remaining distresses.
 - As in previous quarters, 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 the Arkansas test sections 05_0803, 05_0804, 05_0809 and 05_0810; technical memorandum was submitted to WSDOT on February 29, 2021– follow-up investigations that include continued monitoring, deflection testing, coring and interview of Arkansas were recommended.
 - Completed desktop study for Pennsylvania test section 42_1597; technical memorandum was submitted to WSDOT on January 23, 2021 – closeout monitoring occurred on the test section in September 2020. This test section is anticipated to go out of study soon and therefore the follow-up investigations listed below were recommended:
 - Coring to confirm layer thicknesses and that some NWP longitudinal and transverse cracking is reflection cracking.
 - Identify issues with bonding between the AC lifts via visual inspection.
 - Identify rutting failure layer via visual inspection.
 - Determine location of construction joints of the pavement section to determine whether they are aligned with the observed NWP longitudinal cracking.
 - Analysis of transverse profile information collected during the September 2020 data collection.
 - Investigate evolution of smoothness specifications within PennDOT to better understand the trend in IRI over time.
 - An updated desktop study technical memorandum was prepared for Texas test section 48_1096 in advance of the March 15, 2021 meeting with TxDOT and follow-up investigations to be carried out on April 8, 2021.
 - An updated desktop study technical memorandum was prepared for Iowa test section 19_1044 based on input received from the Iowa DOT via conference call on February 18, 2021, which may affect the information contained in the LTPP database.

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 Iowa test section 19_1044. Revised technical memorandum will be submitted to WSDOT after confirmation by the Iowa DOT of unrecorded construction event, which is anticipated early in the upcoming reporting period.
 - Began working on the follow-up investigations for the Pennsylvania test section 42_1597 and continued working on the follow-up investigations for Texas test section 48_1096.

Project Report (Task Order AD)

- Continued writing draft portions of report. To date, a draft of Chapter 1 Introduction has been completed, selected portions of the Chapter 2 Test Sections Investigated have been completed, and draft write-ups for 57 of the 63 test sections approved for forensic investigation have been completed and incorporated into the Chapter 3 Test Section Investigation Summaries.

Anticipated work next quarter:

The following work activities will be conducted throughout the period of April 1 through June 30, 2021, which is when the project is scheduled to end.

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. Also prepare for and participate in the April 22, 2021 FHWA LTPP webinar on the TPF-5(332) Forensic Evaluations as well as the possible April 2021 TAC meeting to be held in conjunction with the SPS-2 TPF.

Test Section Selection (Task Orders AB and AF)

- Complete desktop study and associated technical memoranda for Idaho test section 16_1020, Oklahoma test section 40_4157, Washington test sections 53_0801, 53_0802, 53_A809 and 53_A810, 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:
 - Pennsylvania test section 41_1597 and Texas test section 48_1096. This includes potential field investigations, data analyses and memorandum preparation.
 - As needed, pursue follow-up investigations for Arkansas test sections 05_0803, 05_0804, 05_0809 and 05_0810, Idaho test section 16_1020, Mississippi test section 28_5025, Oklahoma test section 40_4157 and Washington State test sections 53_0801, 53_0802, 53_A809 and 53_A810. This includes potential field investigations, data analyses and memorandum preparation.

Project Report (Task Order AD)

- Complete draft of final project report and submit to WSDOT and the TAC members for review and comment. Once input has been received from WSDOT and the TAC members, prepare final version of project report and submit to WSDOT.

Significant Results:

Technical memoranda for desktop studies addressing 57 LTPP test sections have been completed and similar memoranda for another 6 test sections are presently underway. These memoranda provide valuable information explaining the performance of the 63 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 several of 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). Lastly, through this project, traffic data for the Arkansas SPS-8 test sections was found to be mismatched for two of the reported years with data, leading the project team to submit a Data Analysis Operations Feedback Report (DAOFR) to the FHWA LTPP.

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 for the last quarter of the project.

Potential Implementation:

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