TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): Minnesota Department of Transportation (MnDOT)

INSTRUCTIONS:
Lead Agency contacts 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 (504)	**Transportation Pooled Fund Program - Report Period:** ☒ Quarter 1 (January 1 – March 31) ☐ Quarter 2 (April 1 – June 30) ☐ Quarter 3 (July 1 – September 30) ☐ Quarter 4 (October 1 – December 31)
TPF Study Number and Title: TPF-5 (504) – Continuous Bituminous Pavement Stripping Assessment Through Non-Destructive Testing	

Lead Agency Contact: Eyoab Zegeye	**Lead Agency Phone Number:** 651-366-5517 (work)	**Lead Agency E-Mail** eyoab.zegeye@state.mn.us
Lead Agency Project ID: TPF1550	**Other Project ID (i.e., contract #):**	**Project Start Date:** May 1, 2023 – Start date
Original Project Start Date:	**Original Project End Date:**	**If Extension has been requested, updated project End Date:**

Project schedule status:

☒ On schedule ☐ On revised schedule ☐ Ahead of schedule ☐ Behind schedule

Overall Project Statistics:

Total Project Budget	Total Funds Expended This Quarter	Percentage of Work Completed to Date
$1,075,000	$323,335 Committed $210,235 Encumbered as per 2025	%20

Project Description:

Stripping is a critical pavement subsurface distress affecting the performance and durability of asphalt pavement systems: full-depth asphalt, recycled, or composite. In full-depth asphalt pavements, stripping can be caused by moisture infiltration in the pavement system, leading to the loss of bond between the aggregate particles and the asphalt binder composing the mixture. The bond failure leads to the formation of an unbonded mixture and ultimately reduces the pavement bearing capacity. In asphalt overlays over concrete (composite), stripping is generally caused by moisture trapped in the interface above the concrete. Stripping leads to the formation of potholes, cracking, slippage cracking, tearing, and ultimately reduced strength and serviceability of pavements if not detected and addressed early.

Over the years, substantial progress has been made in developing bituminous mixtures less prone to stripping, thanks mainly to improved material selection tools, anti-stripping additives, modified asphalt binders, and improved drainage practices. However, stripping continues to be a dominant issue in pavement design and scoping processes for various reasons. To cite a few examples: a) placing new stripping-resistant mixtures on top of old bituminous mixtures that are likely to be affected by stripping; b) increased use of recycled and multi-recycled materials; and c) asphalt overlays on concrete and d) quality control-related section or spot failures (i.e., binder content deficiency).

This pooled fund study has been established to serve as a research consortium to evaluate the potential of using 3D-GPR, which is particularly suitable for high-speed continuous and lane-width data collection and is already being incorporated in project scoping processes for thickness determination, and other NDE technologies, such as FWD and TSD, will also be considered to complement, evaluate, verify and validate the 3D-GPR findings. The study will also investigate using IE/SASW, MIRA, and Thermal Imaging for localized spot verifications. Furthermore, the pooled fund will include contemporary 2D and 3D-GPR testing on limited projects to compare and identify advantages and disadvantages. The tools (i.e., equipment, testing procedures, data processing algorithms, specifications) advanced through this project will assist state transportation agencies in rapidly and confidently detecting the extent, depth, and severity of stripping in their roads.

The scope of work for this pooled fund are:

- Task 1 – Finalizing the Scope of Work
- Task 2 – Survey and Literature Review
- Task 3 – Building GPR Signal Stripping Signature Database
- Task 4 – Building and Evaluating Artificially Stripped Section in MN ROAD
- Task 5 – Development of a Software for Automated Detection and Quantification of Stripping
- Task 6 – Data collection on Roads from Participant States
- Task 7- Review, Analysis, Data Fusion, and Interpretation of the collected data
- Task 8 – Development of AASHTO Specification - Testing and Analysis Procedures
- Task 9 – Training and Technical Assistance
- Task 10 – Support and Communication
- Task 11 – Strategic Technology Promotion

Progress this Quarter

Task 1 – Finalizing the scope of work

- Welcomed North Dakota Department of Transportation to the pooled fund study.

Task 2 – Survey and Literature Review

Task 3 – Building GPR Signal Stripping Signature Database

- MnDOT and Infrasense have started looking into the MNROAD test section data to identify signature GPR reflectic

Task 4 – Building and Evaluating Artificially Stripped Section in MN ROAD

- Test sections were built, and costs and expenses for the construction of MnROAD test sections have been finalized.
- MnDOT is continuing to monitor the test section through regular PSBA, FWD and GPR testing

Task 5 – Development of a Software for Automated Detection and Quantification of Stripping

- Ken Maser's team continues to collect pavement data.

Task 6 – Data collection on Roads from Participant States

- Infrasense to collect and receive GPR, TSD, coring, and historical information for these roads.
- A summary of data was sent from state members to Infrasense
- MnDOT started coordinating with NDOT for additional 3DGPR data collection on roads known to have stripping issues. MNDOT will assist in the data collection, processing and reporting. The data will also be shared with Infrasense to employed for the development of the algorithm. Ken Maser was included in the selection of the routes.

Task 9, 10 & 11 – Support and Communication & Strategic Technology Promotion

- A technical brief summarizing the pooled fund's background and goals is currently in development.
- On March 27, 2025 MnDOT hosted the quarterly business meeting from 9:00 AM to 1:00 PM. The meeting was well attended by representatives of members states, manufactures, friends of the study but also representative of states participating in the TSD pool fund study. The meeting included: progress updates, discussion of results from the MnROAD test sections, update on data received for state members. In addition, a **2 hours on-hand training on using Examiner was provided by Kontur** in response to a request made by state members. Kontur also agreed to provide a three months free trial of Examiner to the state members
- Refer to meeting notes for further details
- The group agreed to work with the TPF-5(518) for a combined annual meeting in September in Virginia, because there are many overlapping state members and overlapping interest in the GPR and TSD applications

Anticipated work next quarter:

- The pooled fund will host a virtual quarterly meeting in ~~April~~ March 2025, and updates will be provided on all tasks.
- AARB's TSD data collection truck is expected to travel to Minnesota for testing several state routes and the MnRO test section
- MnDOT will be collecting 3DGPR data in NDOT routes and share the data with Infrasense
- Post or publish first brief of the study
- Start planning and drafting agenda for the upcoming in-person meeting and coordinate with TPF-5(318) for the preparation

Significant Results:

- See Progress this Quarter section.

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.

Potential Implementation:
The final objective of the pool fund study is to develop testing procedures and algorithms (software) that can reliably and automatically detect stripping and other moisture-related damages from 3D-GPR images of bituminous and composite pavements. This will significantly improve the use of 3D-GPR in project scoping practices beyond just measuring the layer thickness. State engineers will have data that can better support their rehabilitation selection processes and will be able to quickly identify sections of the road that require particular attention and thus avoid one-solution-fits-all approaches.