TRANSPORTATION POOLED FUND – 5(478)

Demonstration to Advance New Pavement Technologies

TECHNICAL ADVISORY COMMITTEE

2026 VIRTUAL MEETING

VIRTUAL MEETING REPORT

May 5, 2026

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VIRTUAL MEETING REPORT

May 5, 2026
12:30 – 3:30 p.m. (EST)

1. WELCOME AND MEETING OVERVIEW

Gina Ahlstrom, FHWA Pavement and Materials Team Leader

On behalf of the Federal Highway Administration (FHWA), Gina Ahlstrom welcomed participants to the virtual 2026 Transportation Pooled Fund (TPF) – 5(478) Demonstration to Advance New Pavement Technologies Pooled Fund Technical Advisory Committee (TAC) meeting. The primary goals of TPF-5(478) are to ensure the greatest return on investments made during the pooled fund, and to accelerate the process of delivering safe, smooth, durable pavements in a state of good repair. FHWA is leveraging Federal investments through State Department of Transportation (DOT) partnerships for the implementation and deployment of pavement technologies, practices, performances, and benefits that State DOTs could utilize to further develop lessons learned and best practices to advance the management of pavement assets.

Ahlstrom shared that the TAC serves as a forum for the 23 states participating in TPF-5(478) to share their project scope, current status, and key findings. The first hour of the virtual meeting was dedicated to FHWA administrative updates and announcements regarding TPF-5(478) activities. The agenda for this meeting can be found in "Appendix A: Virtual Meeting Agenda."

2. MEMBER ROLL CALL

TPF-5(478) TAC meeting participants were asked to provide their names and affiliations to the group. The attendance record for this meeting can be found in "Appendix B: Virtual Meeting Attendees."

3. TPF-5(478) ADMINISTRATIVE UPDATES: MEMBERSHIP, FUNDING, AND QUARTERLY REPORTS

LaToya Johnson, FHWA Transportation Asset Performance Team Leader

3.1. Points of Contact

LaToya requested that State DOTs review their following Point of Contact (POC) information and provide updates to (latoya.johnson@dot.gov).

- Alabama: Chance Armstead
- Arizona: Steven Olmsted
- California: Raghu Shrestha
- Colorado: Craig Wieden
- Connecticut: Eliana Carlson
- Georgia: Ryan Kellett
- Hawaii: Kristi Grilho
- Idaho: John Arambarri
- Illinois: John Senger

- Iowa: Chris Brakke
- Louisiana: Samuel Cooper III
- Maine: Chris Desmond
- Mississippi: Robert Vance
- Missouri: Colten Johnson
- New York: Brendan Rock
- North Dakota: Tyler Wollmuth
- Oklahoma: David Vivanco
- Oregon: Erdem Coleri
- Pennsylvania: Halley Cole
- Tennessee: Derek Gaw
- Texas: Gisel Carrasco
- Vermont: Aaron Schwartz
- Wisconsin: Casey Wierzchowski

3.2. Funding

As of April 2026, FHWA has contributed $4,936,000 in Accelerated Implementation and Deployment of Pavement Technologies (AIDPT) funding to support implementation of demonstration projects. Up to $250,000 was provided per State that submitted a project proposal. As long as the funding remains obligated, States will have the funds necessary to support the projects under TPF-5(478).

The total State contribution totals $1,119,998 from an annual $10,000 state contribution over the past five years.

TPF-5(478) is scheduled to conclude on October 30, 2026; no additional funding allocations or transfers will be made.

3.3. Quarterly Reports

Each quarter, State DOTs that have a decided project, are to provide a progress update on their TPF-5(478) efforts to FHWA. State DOTs will submit their final quarterly report project updates to Reena Bhardwaj (reena.bhardwaj.ctr@dot.gov) by Friday, June 5, 2026. All quarterly reports are published to the TPF-5(478) Study website.

If a State DOT has finished its TPF-5(478) project(s), it does not need to continue submitting quarterly report project updates. Please note that the project(s) have been completed and funds have been expended in the final quarterly report project update.

3.4. Close-Out

With participation from 23 states and the project end date on October 30, 2026, FHWA is requesting DOTs submit any produced documentation as a result of their project(s) to be uploaded to the TPF-5(478) Study website along with any previously developed case studies and final reports. If State DOTs cannot upload their documentation to the website, please email LaToya Johnson (latoya.johnson@dot.gov) and Reena Bhardwaj (reena.bhardwaj.ctr@dot.gov).

Additionally, FHWA will be developing high-level one-pager summaries for each State's project(s), providing an overview of project(s) objectives, key outcomes, and next steps. FHWA will draft the initial one-pager summaries and will share them with each State, for their review and approval, over the coming months. Final one-pager summaries will be posted on the TPF-5(478) Study website.

3.5. Contract Support Services

To support the close-out of TPF-5(478), funding has been dedicated to providing participating states with knowledge capture and technology transfer services designed to document project outcomes, share lessons learned, and highlight innovative pavement practices.

The following contract support services are available to TPF-5(478) participants:

- **Technical Summaries:** *Editing and formatting support to develop visually engaging one-page summaries.*
- **Informational/Instructional Videos:** *Development support for short videos (5-10 minutes in length) that communicate project outcomes or demonstrate innovative practices.*
- **Editorial/Design Support:** *Editing and formatting support for cross-communications deliverables, including reports, infographics, and other materials documenting implementation and findings.*
- **Knowledge Exchange Meetings:** *Support for planning and hosting virtual meetings to share results and insights with audiences identified by the State.*

Requests for the above listed contract support or any other forms of support not stated can be submitted through the Service Request Form or by emailing LaToya Johnson (latoya.johnson@dot.gov). Additionally, topic-specific contract support may be available as needed.

3.6. Final TAC Meeting

As TPF-5(478) will conclude on October 30, 2026, FHWA proposes that the final TAC meeting be hosted in-person to showcase state projects and provide time for a peer exchange of the work done in the past five years. The final in-person TAC meeting is anticipated between Fall 2026 and Spring 2027. As FHWA begins planning the logistics of this meeting, they are open to all feedback involving meeting content, preferred dates, or requests to host.

4. TPF-5(478) STATE PROJECT UPDATES

The following is an overview of the update presentations provided by the States participating in TPF-5(478). States were asked to provide and update on their efforts to advance initiatives set by the AIDPT Program, to include their project scope, status, and next steps.

4.1. Asphalt

Alabama

Presented by: Zane Hartzog, National Center for Asphalt Technology (NCAT)

Alabama DOT's TPF-5(478) study, focused on Balanced Mix Design (BMD) validation, was conducted to verify the selection of performance tests in the field, and to categorize their inherent variability. The construction of the project was completed on Route 66 in April 2024. The project is approximately six and a half miles in length, consisting of six test sections, with each section at approximately 1,000 feet in length and containing approximately 100 tons of asphalt. The NCAT mobile laboratory was used to conduct Indirect Tensile Asphalt Cracking Tests (IDEAL-CT) and High-Temperature Indirect Tension Tests (HT-IDT) in the field alongside the testing performed by contractors. Additionally, 250 pounds of each sample was collected for further testing by the DOT and NCAT. The DOT has concluded its testing, which included IDEAL-CT, HT-IDT, and Hamburg Wheel Tracking Tests (HWTT).

One of the most significant findings to date was the strong correlation between laboratory rutting performance and measured field rutting after one year in service. Although field rutting levels remained minimal, the project demonstrated a strong relationship between compacted plant mix HT-IDT results and observed field rutting performance, with an R^2 value of 0.798, providing encouraging validation of laboratory performance testing methods.

Building on the initial project, ALDOT initiated a second BMD validation effort on State Route 24. The project includes six validation sections and one control section designed to evaluate how specific mix design changes influence field performance. Rather than designing entirely separate mixtures, the study modifies a baseline ALDOT-approved mix by varying binder content, Reclaimed Asphalt Pavement (RAP) content, recycling agents, silo storage time, and potentially fiber additives to intentionally create a broad range of BMD performance characteristics. The State Route 24 project, currently scheduled to begin in August 2026, also incorporates enhanced field monitoring and testing procedures, including density coring, mobile laboratory testing, pavement condition surveys using a Pathway Van, and long-term field performance monitoring. ALDOT and NCAT will continue evaluating IDEAL-CT, HT-IDT, Hamburg, and overlay testing results on reheated and critically aged mixtures to better understand the relationship between laboratory performance testing and long-term pavement behavior under field conditions.

Connecticut

Presented by: David Howley, Connecticut DOT

Toward the end of 2023, Connecticut DOT acquired new laboratory equipment to support its TPF-5(478) study focused on BMD validation, including equipment for Hamburg Wheel Tracking, IDEAL-CT, IDEAL-RT, and mixture compaction testing. The Connecticut Advanced Pavement Laboratory (CAP Lab) at the University of Connecticut provided historical testing

data, technical support, and staff training to assist implementation efforts. Beginning in May 2024, Connecticut DOT initiated regular HWTT, IDEAL-CT, and IDEAL-RT testing on plant-produced mixtures from multiple Hot Mix Asphalt (HMA) plants across the state, including mixtures with varying binder grades and RAP contents. The DOT also began developing its own performance testing database in coordination with the Northeast BMD Working Group and participated in regional round robin and AASHTO resource proficiency testing programs to improve laboratory consistency and validation procedures.

In 2025, Connecticut DOT implemented its first BMD pilot project on Route 6, a pavement preservation project consisting of both 2.5-inch and 4.5-inch mill-and-fill sections to evaluate how pavement depth influences BMD performance. The pilot project compares standard Superpave mixtures against BMD mixtures while allowing increased RAP contents above Connecticut's current 20% maximum RAP limit, provided contractors use a softer binder grade.

Connecticut DOT also introduced several specification modifications intended to provide greater flexibility within BMD mixtures, including broader allowable air void ranges, reduced volumetric restrictions, elimination of certain gradation requirements, and removal of dust-to-binder ratio and VFA requirements from mixture approval criteria. Mechanical performance testing for the project is centered primarily on Hamburg Wheel Tracking and IDEAL-CT testing, with additional evaluation using IDEAL-RT, I-FIT, and TSR testing.

A major implementation advancement is Connecticut DOT's decision to apply production pay factor adjustments tied directly to Hamburg and IDEAL-CT test results during production, representing one of the more aggressive BMD implementation strategies among participating states. The agency is also evaluating laboratory testing frequency, staffing needs, and long-term specification adjustments as part of the pilot implementation process. Long-term benchmarking data collected by UConn's CAP Lab over the past decade showed many conventional Superpave mixtures trending toward crack-susceptible performance ranges, reinforcing the agency's push toward BMD implementation. Historical testing also showed that mixtures with higher IDEAL-CT values generally demonstrated reduced field cracking at four years of age, helping Connecticut establish an initial pilot project production target of a minimum CT Index value of 100.

Hawaii

Presented by: Fan Yin, NCAT

Hawaii DOT's TPF-5(478) study is focused on supporting the implementation of BMD through development of a long-term implementation plan and statewide benchmarking of existing asphalt mixtures. Hawaii DOT identified the need to better understand current mixture performance and establish a practical implementation timeline before pursuing broader specification changes.

To support these efforts, Hawaii DOT partnered with NCAT and industry stakeholders to conduct a series of planning meetings and an in-person BMD workshop in Honolulu in October 2024. The workshop focused on reviewing the need for BMD, discussing national implementation practices, introducing performance testing options, and establishing a common understanding of the implementation process among agency and industry participants.

Following the workshop, Hawaii initiated benchmarking testing focused on surface mixtures utilizing polymer-modified binders. The benchmarking effort evaluates rutting and cracking resistance of laboratory-prepared mixtures using gyratory specimens as part of the agency's early-stage evaluation of performance testing within the mix design process. Testing is currently approximately 65–70% complete, with preliminary results reported as promising. A key takeaway from the implementation discussions was that Hawaii DOT and industry view BMD as a performance-based framework for evaluating sustainable materials and additives, including higher RAP content and recycled plastics, while maintaining long-term pavement performance.

Louisiana

Presented by: Louay Mohammad, Louisiana State University (LSU)

Louisiana Department of Transportation and Development (DOTD) is utilizing its TPF-5(478) study to develop and implement Quality Control (QC) and QA specifications. Every mix design in Louisiana utilizes BMD; therefore, Louisiana is in Approach B for its TPF-5(478) study, performing volumetric and performance mixture testing.

In Louisiana, Loaded Wheel Testers (LWT) are utilized to measure rutting and Semi-Circular Bend (SCB) tests are utilized to measure cracking. SCB tests are only performed on samples that have undergone long-term aging. Compact samples are aged for five days at 85 degrees Celsius (AASHTO R 121) and loose mixture samples, used to mimic field aging, are aged for 12-27 days (6-20 mm) at 95 degrees Celsius [National Cooperative Highway Research Program (NCHRP) Report 871]. Because these procedures are impractical for routine QC and QA implementation, the primary objective of the study is to develop a shorter accelerated aging protocol capable of producing results equivalent to the current benchmark.

Testing included multiple asphalt mixtures from plants across the state with varying RAP contents, asphalt contents, polymer modifications, aggregate types, traffic levels, and pavement structures. Rutting performance was evaluated using AASHTO T324 Loaded Wheel Testing, while cracking performance was evaluated using SCB testing under multiple conditioning protocols. Additional rheological and chemical binder characterization was performed using frequency sweep testing, PG grading, FTIR, and GPC analysis to verify consistency between accelerated aging methods and benchmark long-term aging results.

A major finding of the study was that loose mixture conditioning at 135 degrees Celsius for six hours produced cracking and binder characterization results that closely matched Louisiana's benchmark long-term aging protocol of 85°C for five days. In contrast, conditioning at 135°C for eight hours resulted in over-aging of mixtures. Correlation analysis across mixture testing, rheological properties, and chemical characterization consistently supported the six-hour protocol as the most promising candidate for practical QA implementation. Louisiana is continuing to expand the study by increasing the number and variety of mixtures evaluated, including additional binder grades and RAP levels, to confirm that the observed trends remain consistent statewide. The long-term goal is to implement a practical accelerated aging protocol that can be used for routine cracking performance testing within Louisiana's BMD-based QC and QA specifications.

Maine

Presented by: Chris Desmond, Maine DOT

Focused on BMD implementation, with a strong emphasis on increasing stakeholder knowledge, industry involvement, and statewide familiarity with BMD concepts and testing procedures. Maine has published a special BMD provision that separates performance-based test sections from traditional volumetric control sections, with the specification being incorporated into an upcoming project and offered as an optional provision on additional projects to expand contractor participation and collect additional performance data.

Maine established preliminary BMD criteria targeting IDEAL-CT values greater than 150 for reheated mixtures and IDEAL-RT values greater than 55. While Hamburg Wheel Tracking has already been fully implemented in Maine through special provisions for several years, the current effort focuses on expanding broader BMD adoption and encouraging contractor participation through incentive-based performance sections rather than penalties.

To support implementation, Maine hosted the Mobile Asphalt Technology Center in 2025 for hands-on BMD testing demonstrations and industry outreach activities. Maine also hosted Dr. Tom Bennert from Rutgers University to provide agency and industry training focused on successful BMD implementation strategies, lessons learned, and deployment considerations from other states. Maine is additionally participating in the Northeast BMD Regional Working Group interlaboratory studies and, for the first time, included industry laboratories in the third round of testing to improve statewide familiarity and consistency with BMD testing procedures.

Future efforts include expanding laboratory testing capabilities through additional equipment purchases and utilizing third-party consultants to assist with post-construction pavement performance monitoring and data analysis, recognizing the increasing resource demands associated with long-term BMD performance evaluation.

Missouri

Presented by: Colten Johnson, Missouri DOT

Missouri DOT is moving forward with its TPF-5(478) study, focused on implementation of BMD rather than research development. Missouri has been implementing BMD for approximately five years and has directed pooled fund resources toward pilot projects, equipment acquisition, inspector training, and improving laboratory testing capabilities.

As part of implementation, Missouri outfitted district and central laboratories with additional testing equipment, including Hamburg Wheel Trackers, load frames, conditioning equipment, and testing jigs to support QC and QA performance testing. The state also deployed infrared pavement temperature cameras across project offices to improve pavement temperature monitoring during construction.

A major focus of Missouri's recent work has been improving consistency and reducing variability in BMD testing results between laboratories. Missouri partnered with the University of Missouri to conduct a statewide BMD round robin study after observing significant variability in base mix testing results across different labs. Initial findings showed that removing high and low outlier results from five sample datasets significantly reduced testing variability, lowering coefficients of variation from as high as 80% to generally below 30%.Missouri reported

substantially lower variability in surface mix testing compared to base mixes and indicated that all 9.5 mm and 12.5 mm dense-graded surface mixes statewide will move forward under Balanced Mix Design specifications. Missouri DOT noted that field performance results from BMD implementation have been very positive to date, although additional work is still needed to address testing and specification development for stone matrix asphalt mixtures.

Oregon

Presented by: Erdem Coleri, Oregon State University (OSU)

Oregon DOT has constructed five pilot projects, in different geographical regions, for its TPF-5(478) study. In comparison to Oregon's volumetric Plant Mixed, Laboratory Compacted (PLMC), the BMD PLMC test sections have shown improved cracking resistance and comparable rut depth and roughness. The DOT is performing low-cost full-scale Accelerated Pavement Testing (APT) on some of its test sections, which includes the use of a laser texture scanner, a profilometer system for surface profile monitoring, and a camera system with an image processing code for crack formation and progression monitoring.

The objectives of Oregon DOT's TPF-5(478) study are to (1) compile all findings and information from previous research projects related to BMD to understand the gaps in knowledge and critical points that need to be addressed for seamless implementation, (2) to quantify the effectiveness of the BMD process for Oregon by field performance evaluation, (3) to provide suggestions to improve the accuracy and precision of test and specimen preparation procedures for asphalt plant and DOT laboratories, (4) to evaluate field performance data and laboratory test results to update thresholds for cracking and rutting tests, and (5) to help address other potential issues during the actual BMD implementation process.

Key findings from the study showed that heating reclaimed asphalt pavement (RAP) to approximately 121°C (250°F) significantly improved cracking resistance and workability, while having minimal impact on rutting performance. The research also identified RAP source characteristics as a major factor influencing mixture performance, particularly due to differences in binder stiffness. In addition, the team demonstrated that RAP contents could be successfully increased from 20% to 30% for high-traffic mixes and from 30% to 40% for lower-traffic mixes while still meeting Balanced Mix Design performance requirements. The study additionally evaluated the use of Warm Mix Asphalt (WMA) additives and rejuvenators, finding that both approaches produced similar performance results, although rejuvenators showed slightly better effectiveness overall. All high-RAP mixtures evaluated met moisture damage resistance requirements.

Recent updates include completion of the ruggedness testing phase and initiation of round-robin laboratory testing with ODOT to verify consistency between laboratories. The research team has also begun a follow-up study focused on achieving and controlling the optimal RAP heating temperature at asphalt production plants under field conditions.

Tennessee

Presented by: Derek Gaw, Tennessee DOT

Tennessee DOT's TPF-5(478) study focused on constructing BMD validation test sections under real-world paving conditions. In 2025, Tennessee constructed ten, quarter-mile long test sections

on State Route 40 in Polk County using a typical dense-graded surface mixture placed as part of a standard mill-and-inlay project.

Rather than designing separate mixtures to meet predefined BMD targets, Tennessee modified a standard control mix by varying individual parameters across each section, including binder content, binder grade, RAP content, recycling agents, natural sand content, and fractionated RAP. One section also evaluated a contractor-designed mixture required to meet specific IDEAL-CT and Hamburg Wheel Tracking criteria.

The project produced a broad range of cracking and rutting performance results across the test sections, successfully creating meaningful variation for future specification evaluation. Tennessee reported that the mixtures generally followed expected trends, where increased rutting resistance corresponded with reduced cracking resistance and vice versa, while avoiding mixtures that performed poorly in both categories.

A major finding from the project was the difference observed between laboratory-mixed and plant-produced IDEAL-CT results. While laboratory-compacted mixtures generally produced CT Index values between 20 and 100, plant-produced mixtures showed significantly higher cracking resistance, with all sections exceeding CT Index values of 100 and some exceeding 200. Despite these differences, overall performance rankings between mixtures remained generally consistent between laboratory and plant-produced testing.

The project also generated extensive supplemental testing data, including IDEAL-CT, IDEAL-RT, High-Temperature IDT, Hamburg Wheel Tracking, critically aged specimens, and evaluations using both Marshall and gyratory specimen preparation methods. Tennessee has already begun long-term monitoring of the sections using its LCMS pavement evaluation vehicle and plans to use the field performance results to guide future BMD specification development and implementation statewide.

Texas

Presented by: Gisel Carrasco, Texas DOT

Texas DOT began working on its TPF-5(478) study in 2019 in conjunction with its BMD implementation effort that includes construction and monitoring of multiple field projects. Phase one was completed in 2022 and included nine test projects with a total of 33 sections, constructed over a period of one half to one full day each. Texas recently completed phase two (2022-2025), which included four shadow projects with eight sections, constructed over a period of two to three days each. Texas is currently in the third phase of their study where they're implementing the new special specification in pilot projects. In the future fourth phases of its study, Texas intends to construct and monitor district pilot projects and statewide projects. Please note that Texas' BMD Special Specification was introduced in 2019 and revised in 2025. Texas DOT's TPF-5(478) study is focused on BMD performance test threshold validation. Overlay Tester (OT) and IDEAL-CT results are being compared to validate cracking performance values; HWTT and IDEAL-RT results are being compared to validate rutting performance values. Some of the phase one test sections are beginning to display cracking; none of the test sections are failing. Minimal rutting has been displayed on the phase one test sections; and to date Texas believes that IDEAL-RT has correlated better with field

rutting better than HWTT. Texas has evaluated its data against WesTrack and NCAT Test Track data for correlations, to increase confidence in its thresholds.

Currently, TxDOT efforts are focused on implementing an updated statewide BMD specification using lessons learned from previous test sections, Superpave specifications, industry input, and national BMD working groups.

Key specification updates include limiting BMD implementation to surface mixes, requiring asphalt-modified binders, and increasing allowable RAP content from 20% to 35% while prohibiting RAS/shingles. Texas also implemented IDEAL-CT and IDEAL-RT alongside Hamburg and Overlay testing as part of its performance verification framework.

A major implementation change is expanded QC/QA requirements, with contractors now responsible for IDEAL performance testing and laboratory molded density verification during production.

Texas is currently expanding pilot project implementation, with two active construction projects using the updated specification. TTI and CTR collect production mix samples for continued data analysis and long-term field performance monitoring. TxDOT also trains and certifies contractors and district personnel on IDEAL testing procedures as the agency works toward a future statewide BMD specification. Note that TxDOT currently has 41 different pavement sections being monitored.

Vermont

Presented by: Aaron Schwartz, Vermont Agency of Transportation (AOT)

Vermont AOT outlined the following objectives for its TPF-5(478) study: (1) to provide training to industry on BMD tests, (2) to collect project sampling to capture production variability and benchmark mix designs, (3) to participate in interlaboratory studies to capture variability between laboratories, (4) to explore surrogate tests and QC applications, (5) to pilot BMD approaches, (6) to assess long-term pavement performance in relation to initial BMD testing, (7) to use BMD as a tool in the evaluation of mixture changes, and (8) to develop and implement BMD specifications. Vermont piloted a high-RAP project with Approach A (and beyond) BMD requirements; pavement life is to be further evaluated.

Vermont AOT hosted an FHWA BMD training workshop in December 2023 for industry partners. Vermont participated in the Northeast BMD Peer Exchange, the AIDPT Pooled Fund Peer Exchange on BMD, and has been actively participating in the Northeast BMD Working Group. Vermont hosted a research project and participated in Round Robins for performance testing, to understand interlaboratory variability. Vermont has acquired additional equipment to evaluate surrogate rutting tests (e.g., IDEAL-RT as a surrogate for HWTT) and has been utilizing IDEAL-CT as a surrogate for I-FIT. It has been collecting one performance sample per 3,000 tons on all its projects in an effort to conduct IDEAL-CT, IDEAL-RT, and HWTT on each sample. A BMD requirement for HWTT has been incorporated in standard specifications; working to incorporate a BMD requirement for IDEAL-CT.

Challenges to Vermont AOT's TPF-5(478) study include project funding impeding plans for pilot projects, a delay in establishing a cracking limit has left the standard specification

imbalanced, and difficulties in capturing long-term pavement performance (limited information available on existing pavement conditions and construction variability).

Recent updates to Vermont AOT's TPF-5(478) study include the use of benchmarking data collected from 2020–2024 construction seasons to develop minimum IDEAL-CT criteria for future mix design approval. Vermont also continued participation in Northeast BMD Working Group interlaboratory studies and expanded industry outreach and training efforts related to BMD implementation. Benchmarking data indicated Vermont's existing specifications were overly focused on rutting resistance, leading the agency to further evaluate IDEAL-RT as a surrogate for Hamburg Wheel Tracking and study relationships between reheated and long-term aged IDEAL-CT results to support future cracking criteria development. Vermont also initiated development of an FHWA STIC proposal to support future BMD validation and continued evaluation of long-term performance from its high-RAP pilot project.

Recent efforts also include participation in the third Northeast BMD Working Group interlaboratory study, which included industry laboratories for the first time, as well as continued benchmarking activities through the 2025 construction season. Vermont is also preparing to transition to PG-34 low-temperature binders beginning in 2027. Although budget constraints have temporarily delayed higher-tier BMD implementation and additional high-RAP pilot projects, Vermont recently established a dedicated pavement management section to support long-term pavement performance evaluation and future BMD implementation efforts.

Wisconsin

Presented by: Casey Wierzchowski, Wisconsin DOT

Wisconsin DOT constructed its first, informational TPF-5(478) pilot project (five BMD test sections) four years ago. The DOT has been implementing rutting and cracking data, collected annually by vans throughout the entire State highway system, to conduct long-term assessments on the five BMD test sections.

Wisconsin DOT has been conducting BMD research for the past decade. Throughout the DOT's research efforts, it has partnered with NCAT, FHWA, industry, the Consortium for Asphalt Pavement Research and Implementation (CAPRI), and Minnesota's National Road Research Alliance (NRRA). Research has assisted Wisconsin in selecting HWTT, IDEAL-RT, and IDEAL-CT as its BMD performance tests. The DOT has worked alongside NCAT, industry, and NRRA to develop an aging process to refine parameters and reduce the interlaboratory variability identified during the DOT's first informational TPF-5(478) pilot project. Wisconsin has completed some benchmarking and now has a dedicated staff member focused on BMD testing.

Recent findings showed that standardizing aging parameters, testing procedures, equipment, and specimen handling significantly improved consistency between agency and industry laboratories. Wisconsin also identified a strong correlation between Hamburg and IDEAL-RT results for its Superpave mixtures, supporting the continued evaluation of IDEAL-RT as a surrogate rutting test. However, the DOT noted that additional research is still needed for Stone Matrix Asphalt (SMA) mixtures and finer-graded mixes, where Hamburg results may not fully reflect observed field performance.

Wisconsin continues expanding testing capabilities across its seven regional laboratories through additional equipment procurement, staff training, and benchmarking activities. The DOT is also revising its BMD specifications to support additional pilot projects and evaluate higher RAP contents in asphalt mixtures. Current efforts additionally include incorporating IDEAL-RT, Hamburg, and IDEAL-CT testing during the mix design phase and pursuing FTIR testing capabilities to better evaluate emerging asphalt materials and modifiers.

4.2. Pavement Foundations

Iowa

Presented by: Chris Brakke, Iowa DOT

Iowa DOT is utilizing the TPF-5(478) study for additional funding to complete its ongoing Improving Pavement Performance through Pavement Foundation Design Modulus Verification and Construction Quality Monitoring research project. Iowa's current funding does not allow for the sustainment of its pavement system to remain in a state of good repair, which has led Iowa to research how to best extend pavement life through improved material performance, foundations, longevity, and construction quality.

Through Advanced Infrastructure Design (AID) and collaboration with NGO Geotechnics, Iowa DOT shifted from traditional spot testing and density-based specifications to continuous, 100% modulus monitoring of pavement foundations during construction. A major finding of the research was that Iowa previously had no direct process to verify whether design foundation values were being achieved in the field. Instead, construction relied primarily on density testing, moisture control, lift thickness requirements, and proof rolling as indirect indicators of performance.

Continuous monitoring and automated plate load testing revealed significant variability in resilient modulus and K-values across the state, with coefficients of variation ranging from 5% to 80% at individual sites. Most notably, only 31% of tested locations achieved Iowa DOT's target foundation value of 150 K, showing that nearly 70% of subgrades underperformed despite meeting existing specifications.

In response, Iowa DOT advanced toward engineered foundation design using large-scale laboratory testing within Geotechnics to better predict field performance and verify target K-values. Recent implementation projects designed specifically to achieve a 150 K target produced average field values of 169 K, demonstrating substantial improvement over previous practices. In June 2025, Iowa DOT expanded industry outreach through a national virtual open house attended by participants from 25 states, highlighting the necessity of permanent pavement foundations and reviewing Iowa's project. Iowa DOT has also expanded the research through an active pooled fund study, TPF-5(567), *Demonstration Projects for Engineering the Foundation Layers for Long-Life Pavement Systems*: A five-year pooled fund study focused on demonstration projects for engineered long-life pavement foundations. The effort currently includes five participating states — Iowa, Georgia, Missouri, Pennsylvania, and Virginia — along with FHWA participation. Participating states contribute $30,000 annually to implement demonstration projects utilizing Iowa's roller mapping and continuous foundation monitoring specifications to evaluate long-life pavement foundation performance under real-world construction conditions.

North Dakota

Presented by: Tyler Wollmuth and Jared Loegering, North Dakota DOT

North Dakota DOT responded to FHWA's solicitation to receive additional funding for TPF-5(478) to perform a project focused on pavement foundations, in addition to its BMD field validation project. The project's objective is to determine the subgrade strength of North Dakota's soils, through the completion of Resistance-Value (R-Value) and resilient modulus testing by a consultant, to provide training for North Dakota DOT staff to accurately obtain resilient modulus values.

As part of the effort, North Dakota DOT completed approximately 100 R-value tests and 13 resilient modulus tests on subgrade and aggregate materials across the state's major soil and aggregate types. Testing results showed resilient modulus values were generally higher than the conservative values previously used in pavement design, representing a significant finding for both pavement performance and cost efficiency.

The BMD validation effort progressed into a field phase consisting of eight approximately two-mile test sections designed to evaluate BMD criteria under real-world construction conditions. To isolate performance impacts, the projects maintained consistent aggregate sources while varying binder content and binder grade. A major outcome of the validation effort was the successful creation of a broad range of cracking test values across the sections. While the original mix design target range was 30–100, production adjustments resulted in an achieved range of 49–220, providing significant variability for long-term field performance evaluation as the sections age.

The project also served as a demonstration site for emerging technologies, including roller-mounted and vehicle-mounted density profilers and semi-autonomous rollers operating behind the paver. Based on the success of the validation effort, North Dakota is currently developing BMD criteria and specifications and plans to implement BMD specifications on 3–4 projects beginning in 2027.

4.3. Resilience

Arizona

Presented by: Steven Olmsted, Arizona DOT

Arizona DOT's first TPF-5(478) study is working to downscale climate models, specifically rutting and cracking models relative to binder grade, mid-century, and late century performance. Arizona's methodology for PG grade selection includes: (1) accessing and downloading downscaled General Circulation Model (GCM) data, (2) evaluating high and low temperature and precipitation projections, (3) observing the Localized Constructed Analogs (LOCA) statistically downscaled climate projections for North America with traffic projections, and (4) making "risk" assessments. Based on the assumptions utilized by Arizona, LOCA and early century projections have shown a higher tipping point in temperature projections between now and 2050 than are shown in late century projections, increased rutting is anticipated to occur in late century predictions, and additional evaluation is needed to anticipate cracking predictions. Arizona has developed a pavement risk assessment, which accounts for pavement grade reliability loss (hazard) and a betweenness score (pavement criticality). Improvements to the

betweenness score will continue throughout 2025, to include Arizona's entire pavement system (i.e., to include locations that have not previously registered as having notable temperature activity). Currently, early century projections display low vulnerability across most road segments, with binder grades performing well under the projected temperatures. Late century projections display a significant increase in vulnerability due to rising temperatures, indicating a higher risk of pavement performance impacts.

Arizona DOT's second TPF-5(478) study, in partnership with Arizona State University, is focused on Wildfire and Post-Wildfire Debris Flow (PFDF) threats to roadways. The study's modeling approach includes: (1) consider environmental hazards (e.g., precipitation and fire risk), (2) evaluate the infrastructure network, (3) determine PFDF (e.g., vegetation, topography, soil conditions, and watersheds) likelihood to determine infrastructure threats, and (4) set infrastructure vulnerability.

Arizona's goals for both TPF-5(478) studies is to conclude climate data analyses in 2025. Products resulting from the studies will include how-to videos, displaying the processes used to downscale climate data and reconcile the data with different pavement Mechanistic-Empirical (ME) design, and case study modeling approaches.

4.4. Sustainability

Colorado

Presented by: Craig Wieden, Colorado DOT

Colorado DOT concluded its TPF-5(478) study in June 2024. The project's objective was to assist in meeting the legislation requirements placed on the DOT by House Bill (HB) 21-1303 (i.e., the "Buy Clean Colorado" bill), to strive to achieve continuous reductions of Greenhouse Gas (GHG) emissions. Section 118 of HB 21-1303 required Colorado DOT to begin collecting Environmental Product Declarations (EPDs) on eligible materials, including asphalt and asphalt mixtures, cement and concrete mixtures, and steel. Since July 2022, Colorado has partnered with consultants and a Subject Matter Expert (SME) to engage industry partners and collect EPDs to educate them on legislation, prepare for policy creation in January 2025, which requires the DOT to set a maximum allowable Global Warming Potential (GWP).

To support implementation of the legislation, the study is to develop a methodology for collecting, reviewing, and cataloging GHG emission data through EPD submissions for eligible materials. CDOT worked with bill sponsors to modify the legislation during committee process and secure a two-year extension, allowing additional time to collect EPDs and benchmark current material mixtures under existing specifications. Beginning 2021, CDOT initiated stakeholder engagement with local materials suppliers and producers, as these entities would ultimately be responsible for providing the EPDs and would be directly impacted by the bill. CDOT engaged stakeholders to explain the purpose of the EPD requirements, provide legislative context, and introduce draft specifications for submitting EPDs at the project level. Most recently, CDOT secured Low-Carbon Transportation Materials (LCTM) grant funding to further expand the use of low-carbon transportation materials across Colorado.

Colorado DOT identified several key takeaways from its implementation efforts under the Buy Clean Colorado legislation. The agency emphasized that legislation was the primary driver for

action and highlighted the importance of developing EPDs early and benchmarking material performance before establishing requirements. CDOT also noted that engagement with SMEs was critical for industry communication and technical support, and shared that the agency has released final specifications, established GWP limits for several materials, and continues to gather stakeholder feedback to improve implementation moving forward

4.5. Pavement Management

Illinois

Presented by: John Senger, Illinois DOT

Illinois DOT is conducting a profiler certification experiment for its TPF-5(478) study. The experiment is focused on the comparison of the FHWA benchmark profiler and the Urban Low-Speed Profiler (ULSP), to determine if a high-speed inertial profiler can be used as a reference profile device. The repeatability and accuracy of the ULSP have been comparable to the benchmark profiler; although the benchmark profiler remains more accurate. Illinois DOT plans to utilize the ULSP and benchmark profiler in future research efforts related to ride quality, advancing technology for profilers, and in additional pavement measurements made with non-contact sensors.

Recent updates to the study include multiple upgrades to the ULSP system to improve speed, data collection, and operational efficiency. Enhancements included upgraded motors and servos, improved charging capabilities, updated machine vision cameras, GPS integration, upgraded computing systems, and development of a mobile GPS base station to support future large-scale profiler evaluations. Testing results showed extremely strong agreement between the ULSP and benchmark profiler, with agreement values exceeding the 0.98 threshold considered reference-level profiling accuracy. Illinois DOT also reported ULSP repeatability values approaching benchmark-level performance.

Based on these results, Illinois DOT initiated development of an internally owned High-Speed Reference Profiler (HSRP) using upgraded digital accelerometers, gyroscopes, GPS systems, and data acquisition hardware. Preliminary testing of the HSRP demonstrated repeatability values as high as 0.997, supporting future use of the system within Illinois' profiler certification program and additional pavement measurement research efforts.

5. WRAP-UP AND NEXT STEPS

LaToya Johnson, FHWA Transportation Asset Performance Team Leader

LaToya Johnson thanked participants for their attendance and TPF-5(478) state project updates before concluding the meeting with the next steps to be taken by the State DOTs and FHWA as well as a list of helpful resources, outlined below.

Next steps for the State DOTs (as applicable):

- State DOTs are to administer their pooled fund projects;
- State DOTs are to review the attached "State DOT POCs" document and provide any updates to LaToya Johnson (latoya.johnson@dot.gov).
- State DOTs are to submit their last quarterly report project updates by June 5, 2026, to Reena Bhardwaj (reena.bhardwaj.ctr@dot.gov). The attached "AIDPT Quarterly Updates" form can be used to submit project information. Previous quarterly reports are available on the TPF-5(478) website;
- State DOTs are to submit their support services requests (see "Support Services for TPF-5(478)" section below);
- State DOTs are to submit their final project reports; and
- State DOTs are to work with Weris, Inc. to finalize their 1-page project summary. Weris, Inc. will share the initial draft of your State's 1-pager, for your review, in the coming weeks.

Next steps for FHWA:

- FHWA is to finalize the last quarterly report;
- FHWA is to manage contract support;
- FHWA is to coordinate technical and support services;
- FHWA is to post final project reports and 1-pagers to the TPF-5(478) website; and
- FHWA is to plan the final TAC meeting.

Helpful Resources:

- FHWA Pavements & Materials Website
- TPF Website
- TPF-5(478) Solicitation Page
- TPF Program Procedures Manual

6. ADJOURN

7. APPENDIX A: VIRTUAL MEETING AGENDA

MAY 5, 2026	
TIME (EST)	**SESSION**
12:30 p.m.	**Welcome and Meeting Overview** *Gina Ahlstrom, FHWA Pavement Materials Team Leader* *LaToya Johnson, FHWA Transportation Asset Performance Team Leader*
12:40 p.m.	**Member Roll Call**
12:45 p.m.	**TPF-5(478) Administrative Updates: Membership, Funding, and Support Services**
1:05 p.m.	**TPF-5(478) State Project Updates** *Each State will have up to 10 minutes to provide their project scope, current status, and key findings*
3:20 p.m.	**Wrap-Up and Next Steps** *LaToya Johnson, FHWA Transportation Asset Performance Team Leader*
3:30 p.m.	**Adjourn**

8. APPENDIX B: VIRTUAL MEETING ATTENDEES

State Representation

- Alabama (4)
- Arizona (1)
- California (2)
- Colorado (3)
- Connecticut (7)
- Hawaii (2)
- Idaho (1)
- Illinois (2)
- Iowa (2)
- Louisiana (3)
- Maine (3)
- Missouri (2)
- North Dakota (2)
- Oregon (2)
- Tennessee (3)
- Texas (7)
- Vermont (2)
- Wisconsin (3)

Federal Highway Administration (FHWA) – HQ Team

- Gina Ahlstrom, *Pavement Materials Team Leader*
- LaToya Johnson, *Transportation Asset Performance Team Leader*
- Migdalia Carrion, *Sustainability Technical Lead*
- Patricia Sergeson, *Pooled Fund Program Manager*
- Reena Bhardwaj, *FHWA Program Support*
- Timothy Aschenbrener, *Asphalt Technical Lead*

Facilitators

- Eric Schulman, *Weris, Inc.*
- Erin Kurzinger, *Weris, Inc*.
- Mary Nazarian, *Weris, Inc*.

Virtual Meeting Participants

ALABAMA
- Zane Hartzog, *National Center for Asphalt Technology*
- Chance Armstead, *Alabama Department of Transportation*
- John Jennings, *Alabama Department of Transportation*
- Kristy Harris, *FHWA – Alabama Division*

ARIZONA
- Steven Olmsted, *Arizona Department of Transportation*

CALIFORNIA
- Raghu Shrestha, *California Department of Transportation*
- Christopher Long, *FHWA – California Division*

COLORADO
- Craig Wieden, *Colorado Department of Transportation*
- Thien Tran, *Colorado Department of Transportation*
- Bill Schiebel, *FHWA – Colorado Division*

CONNECTICUT
- David Howley, *Connecticut Department of Transportation*
- Eliana Carlson, *Connecticut Department of Transportation*
- Michael Judson, *Connecticut Department of Transportation*

- Scott Zakszewski, *Connecticut Department of Transportation*
- Alex Bernier, *University of Connecticut*
- Jim Mahoney, *University of Connecticut*
- Ronan Shortt, *FHWA – Connecticut Division*

HAWAII
- Fan Yin, *National Center for Asphalt Technology*
- Kristi Grilho, *Hawaii Department of Transportation*

IDAHO
- John Arambarri, *Idaho Transportation Department*

ILLINOIS
- John Senger, *Illinois Department of Transportation*
- David Adedokun, *FHWA – Illinois Division*

IOWA
- Chris Brakke, *Iowa Department of Transportation*
- Melissa Serio, *FHWA – Iowa Division*

LOUISIANA
- Louay Mohammad, *Louisiana State University*
- Samuel Cooper III, *Louisiana Department of Transportation*
- Scott Nelson, *FHWA – Louisiana Division*

MAINE
- Chris Desmond, *Maine Department of Transportation*
- Ryan Robinson, *Maine Department of Transportation*
- Jennifer Williams, *FHWA – Maine Division*

MISSOURI
- Colten Johnson, *Missouri Department of Transportation*
- Jennifer Harper, *Missouri Department of Transportation*

NORTH DAKOTA
- Tyler Wollmuth, *North Dakota Department of Transportation*
- Jared Loegering, *North Dakota Department of Transportation*

OREGON
- Erdem Coleri, *Oregon State University*
- Chris Duman, *Oregon Department of Transportation*

TENNESSEE
- Derek Gaw, *Tennessee Department of Transportation*
- Tyler Lacy, *Tennessee Department of Transportation*
- Daniel Newton, *FHWA – Tennessee Division*

TEXAS
- Gisel Carrasco, *Texas Department of Transportation*
- Wade Odell, *Texas Department of Transportation*
- Benjamin Arras, *Texas Department of Transportation*
- Enad Mahoud, *Texas Department of Transportation*
- Amy Epps Martin, *Texas A&M Transportation Institute*
- Sushanth Revelli, *Texas A&M Transportation Institute*
- Monica Jurado, *FHWA – Texas Division*

VERMONT
- Aaron Schwartz, *Vermont Agency of Transportation*
- Larkin Wellborn, *FHWA – Vermont Division*

WISCONSIN
- Casey Wierzchowski, *Wisconsin Department of Transportation*
- Daniel Kopacz, *Wisconsin Department of Transportation*
- Michelle Gehrke, *FHWA – Wisconsin Division*