Research Project Name: Coastal pavement maintenance and rehabilitation decision making based on both surface and subsurface conditions (TXST)

Improving the Durability and Extending the Life of Transportation Infrastructure

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Project Partners: Texas Department of Transportation (TxDOT)

Research Project Funding:
Federal: $85,518 Match: $45,571 (TxDOT/TXST)

Project Start Date: 01/01/2026 **Project End Date:** 06/30/2027

Project Description: Texas has approximately 3,359 miles of coastline spanning five geographically distinct districts. Pavements in these regions are exposed to highly variable subgrade soils, diverse traffic loading levels, and unique climatic challenges, including hurricanes, storm surges, and recurrent flooding. Effective decision-making for pavement Maintenance and Rehabilitation (M&R) is therefore critical to ensuring resilient infrastructure, optimizing project selection, and allocating limited resources efficiently. Current M&R selection practices primarily rely on surface-level indicators—such as distress manifestations (cracking, rutting, etc.) and ride quality. While these measures are useful, they fail to provide a comprehensive understanding of the pavement's structural health. To address this limitation, this study will propose an integrated framework that combines both surface and subsurface information for M&R decision-making. In particular, subsurface conditions derived from non-destructive testing will be emphasized as a means to bridge the existing knowledge gap, enabling a more holistic and data-driven approach to pavement management.

US DOT Priorities: *Section left blank until USDOT's new priorities and RD&T strategic goals are available in Spring 2026.*

Outputs: The anticipated output of this project includes the development of a new data-driven technology framework for pavement Maintenance and Rehabilitation (M&R) decision-making that integrates various datasets, advanced non-destructive testing, and machine-learning prediction models. By leveraging both surface and subsurface condition data, the project will generate holistic M&R decision trees that enable agencies to move beyond traditional surface condition-based assessments toward predictive, proactive, and cost-efficient management strategies.

Outcomes/Impacts: This research is expected to deliver several key products: (1) a data-driven decision-making process that integrates both surface and subsurface pavement condition data; (2) holistic maintenance and rehabilitation (M&R) decision trees that incorporate machine-learning–based performance prediction models; and (3) a scalable framework for integrating advanced non-destructive testing results into pavement management systems. Together, these products will enable transportation agencies to transition from conventional, surface-focused evaluations toward a more predictive and proactive asset management practice.

The outcomes of this research will positively affect the surface transportation system in multiple dimensions. By more accurately assessing structural health, the proposed framework

will improve reliability of pavements and accuracy of pavement design, reducing the likelihood of unexpected failures and closures. Enhanced prediction models and decision trees will guide more effective interventions, extending durability and service life of pavements, particularly in coastal regions vulnerable to flooding and extreme weather. Moreover, optimized resource allocation and timely interventions will lead to significant cost savings, minimizing life-cycle expenses while ensuring taxpayer funds are used efficiently. Collectively, these practice changes will strengthen the resilience of the transportation network, ultimately supporting safer and more dependable mobility for both freight and passenger movement.

Final Research Report: URL to final Report will be provided upon completion.