



Exhibit D

Research Project Requirement Template

Integration and Deployment of Novel Tools for Rapid Assessment of Pavement Conditions and Remaining Life

Recipient/Grant (Contract) Number: 69A3552348306 (CY1-LSU-01)

Center Name: Southern Plains Transportation Center (SPTC)

Research Priority: Improving the Durability and Extending the Life of Transportation

Principal Investigator(s): Mostafa A. Elseifi and Mahmood Jasim, Louisiana State University

Project Partners: Louisiana State University

Research Project Funding: \$50,000 (Federal) and \$53,893 (Match)

Proposed Start and End Date: 10/01/2023 to 9/30/2024

Project Description: Pavement condition evaluation is an essential component of a Pavement Management System (PMS) facilitating planning for necessary maintenance and rehabilitation activities and preserving the road network in acceptable conditions. The timely detection and accurate quantification of pavement distresses assist PMS engineers in forecasting future pavement deterioration and planning for needed repair strategies. Road surveying vehicles that are equipped with computers, sensors, cameras, and lasers, are commonly used to automatically collect high-definition pavement images and have found wide acceptance by highway agencies. However, the cost of such a survey is high and cannot be afforded by many agencies, such as those responsible for city streets and rural roads.

The ultimate goal of this study is to provide small to medium-sized road agencies (e.g., city roads, low-income areas, and underserved communities) that are responsible for a local road network with a simple tool with the ability to predict pavement condition indices, roughness, and remaining service life based on a limited set of inputs such as pavement age and classification. These inputs are commonly available to road agencies. This AI and data analytics-based tool may be used in the case of the unavailability of inertial profilers and other sophisticated and expensive tools.

To achieve the aforementioned goal, the proposed research activities are organized into five tasks. (1) Pavement performance data including pavement condition index, roughness, cracking, and rutting will be collected from PMS databases. These data are based on pavement condition measurements that are collected biennially using a road surveying vehicle that provides a continuous assessment of the road network. (2) Artificial Neural Networks (ANN) models will then be developed to predict pavement performance parameters (e.g., roughness and pavement condition index) using simple input variables including pavement age, weather parameters, and road categories. (3) A computer-based interactive tool will be developed that can be used to predict pavement performance based on simple input variables. (4) The developed interactive tool will be tested and validated based on independent performance data that were not used in the development phase. The developed tool will be available as an interactive spreadsheet or other form of computer application or phone application. (5) A final report documenting the entire research effort will be prepared and submitted.

US DOT Priorities: The proposed research study will primarily address the USDOT statutory research priority “D: Improving the Durability and Extending the Life of Transportation Infrastructure.” Under this



statutory priority, the research project will address the USDOT strategic goals “Economic Strength and Global Competitiveness” and “Safety.” Developing the proposed tool will enable pavement engineers and decision makers to select the most effective and suitable maintenance and rehabilitation strategies for maintaining the road network in adequate condition. Maintaining a well performing and sustainable infrastructure is important to support the economy.

The proposed research will address the objectives of SPTC by developing an innovative and cost-effective tool that may be used in Region 6 to predict pavement conditions and remaining service life based on a limited set of inputs. In addition, the research team will train graduate students on the latest technology in AI and data analytics. The graduate students, who will pursue their graduate degrees in transportation engineering, will be trained to gain advanced skills so that they can contribute to the workforce in the transportation sector.

Outputs: The following outputs and deliverables are expected from the research activities proposed in the study: (1) Quantify the rate of deterioration for pavement condition index and roughness based on the collected field data; (2) Develop AI models to predict pavement conditions from a limited set of inputs; (3) Develop a computer-based tool in an interactive spreadsheet to help predict pavement conditions. Use ANN models in this development; (4) Engage underrepresented groups in the proposed project by organizing a presentation for underrepresented groups as an introduction to AI applications in transportation; (5) Organize outreach activities and disseminate results through presentations and publications.

Outcomes/Impacts: This study will result in the following outcomes and impacts in Region 6: (1) Accurate prediction of pavement conditions based on a limited set of inputs; (2) Cost-effective allocation of maintenance and rehabilitation funds by DOTs; (3) Reduction of premature pavement failure due to inaccurate selection of maintenance and rehabilitation activities.

Final Research Report: