Exhibit D

Research Project Requirement Template

Smart Transportation Digital Infrastructure: Advancing System Equity, Resilience, and Safety through Multi-Source Open-Standard Data Integration

Recipient/Grant (Contract) Number: The University of Texas at Austin/Grant # 69A3552344815 and 69A3552348320

Center Name: Center for Understanding Future Travel Behavior and Demand (TBD)

Research Priority: Improving Mobility of People and Goods

Principal Investigator(s): Xuesong Zhou, with Co-PIs Dajiang Suo and Irfan Batur

Project Partners: N/A

Research Project Funding: $150,000 (Federal + non-Federal funding)

Project Start and End Date: 9/1/2024 - 5/31/2026

Project Description: The recently emerging trend of sensor technology, ubiquitous and high-performance computing is creating a revolutionary paradigm shift in the coming years. Through data and feedback, both simulated and real, a Digital Infrastructure (DI) for smart cities has received increasing attention. The pandemic, in many cases, is accelerating this need, as there are critical needs for analyzing the health and safety of citizens. With the rise of the digital infrastructure, cities have many adoptions in transportation, utilities, buildings, and citizen services. For community mobility applications, the pairing of the virtual and physical world allows analysis of data and monitoring of systems, evaluating different improvement strategies, and planning the future by using simulations. Smart Transportation Digital Infrastructure (STDI) is to create sustainable urban systems that benefit the citizens and societies at large. It represents a fundamentally new approach for close-loop large-scale system modeling, ubiquitous communication, and diverse data synthesis and can provide an integrated solution for data, simulation, connection, and human interaction, which are the four key elements of achieving the paradigm's main functions for smart community applications.

There are three critical challenges for STDI: digital at scale, decision intelligence in data-intensive systems, and consistency between objectives, decisions, and execution. Open-STDI could not only dramatically reduce the cost and complexity of managing computers and simulation models but also redefines what is tractable regarding dispersed bi-directional intra-system communication between different community stakeholders and citizens. Therefore, connected and smart communities represent an ideal DI application, but one that requires transformative advances both within the traditional domains of city planning, community policy analysis, network behavior, and demand forecasting but also within the emerging field of DI itself.

This project aims to develop an Open data hub and Open-source data analysis platform for transportation-focused Open-STDI applications. That is, the proposed framework Open-STDI will deliver rapid prototyping of STDI and enable smarter multimodal policy decisions for transforming the livability, sustainability, and resilience of the community. A successful STDI in the project will enable both: (1) integration of a variety of legacy and emerging transportation data sources, covering supply, demand, resilience, safety, and security aspects, etc.; and (2) integration of data analysis, data visualization, traffic estimation on a unified platform. Designers, faculties, and engineers can use the integrated platform for quick, inexpensive prototyping of new ideas, which further provides a potential for creating new forms of citizen engagement by communities and new approaches to city operations and management by city planners. This project, in collaboration with the IEEE Department of Global Sales & Customer Operations,

will primarily utilize data from IEEE National Performance Management Research Data Set (NPMRDS) and OpenStreetMap data to understand mobility characteristics, and use Google mobility data to discover resilience features of transportation system.

US DOT Priorities: The first contribution is in both Integrated System-of-Systems and Data-Driven Insights of Transformation. By developing an open-source digital infrastructure that integrates multi-source, open-standard data, it supports the objectives of "Develop the technology, concept of operations, and standards to establish a fully functional, reliable, and secure foundation of transportation system digital infrastructure; Develop and make accessible data sources, data analysis, and visualization tools to support transportation stakeholders and researchers; Support the development and integration of open geospatial data to support implementation of emerging technologies to inform research, planning, and policies." Second contribution is in Equity. When decision-makers considering justice forty in data assessment, it supports the objective of "developing data and analytical methodologies to measure the transportation needs of underserved and disadvantaged communities". With more transparent and correct datahubs on the market, this will reduce unnecessary research and data collection efforts support the objective of "Develop and promote the use of tools and data to improve understanding of the environmental impacts of transportation projects and activities and to evaluate mitigation strategies".

Outputs: The project will produce new Smart Transportation Digital Infrastructure (STDI) that integrates multi-source, open-standard data to enhance system equity, resilience, and safety. This datahub and analytics platform will integrate advanced computational techniques, including aspects of machine learning or network modelling, tailored to provide a potential for creating new forms of citizen engagement by communities and new approaches to city operations and management by city planners. Findings from the research will be disseminated through academic papers, policy papers, and presentations at relevant conferences. A major output will be the development of open-source software, available on platforms like GitHub, for implementing the proposed location selection algorithms. Alongside, a comprehensive database of the study's findings, including data on traffic patterns, user demand, and infrastructure capabilities, will be made publicly accessible.

Outcomes/Impacts: The outcomes of this research will significantly impact urban transportation. The new open transportation digital infrastructure will reduce unnecessary research and data collection efforts, brighten hidden insights, and influence urban planning policies, leading to more sustainable and safety transportation infrastructures. Increased awareness and knowledge dissemination through publications and an interactive platform will guide policymakers and professionals in making informed decisions. The open-source tools and educational resources developed will facilitate the adoption of advanced practices in transportation planning, enhancing skills and processes in the sector. This project will contribute to a shift towards environmentally friendly transportation systems and improved urban planning methodologies.

The project's impacts extend across environmental, societal, and scientific domains. Open-Standard Data Integration will encourage improved system performance metrics, and robust policy recommendations to guide future transportation infrastructure developments. These improvements in urban transportation contribute to sustainability and resilience. In the scientific realm, the project enriches the knowledge base in urban planning and sustainable transportation, fostering innovation. Additionally, the outputs and outcomes of the research will nurture a more skilled and knowledgeable transportation workforce. Collectively, these impacts signify a pivotal shift towards advancing transportation sciences and technologies, contributing significantly to societal welfare by making transportation systems more equitable, resilient, and safe.

Final Research Report: A URL link to the final report will be provided upon completion of the project.