Exhibit D – Research Project Requirement Template

Measuring the Last-Mile: Leveraging Synthetic Data to Evaluate the Effects of Urban Freight Interventions

Recipient/Grant (Contract) Number: The University of Texas at Austin; The City College of New York/Grant # 69A3552344815 and 69A3552348320

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

Research Priority: Improving Mobility of People and Goods

Principal Investigator(s): Alison Conway, Michael Grossberg

Project Partners: New York City Department of Transportation (in-kind)

Research Project Funding: $160,000

Project Start and End Date: 06/01/2025 – 8/31/2026

Project Description: In most urban areas, there is currently a misalignment between difficult-to-measure freight vehicle demands and infrastructure capacities (e.g., parking and loading zones) to accommodate these demands. This misalignment typically results in high costs for industry (e.g., wasted time, wasted fuel, parking fines) as well as in congestion, traffic conflicts, and other externalities for the surrounding community. To better manage this supply-demand mismatch, many cities in the US (e.g., New York, Seattle, Philadelphia, Miami, Los Angeles, Washington) and around the world are exploring policy interventions (e.g., active curb management approaches, local access restrictions, pricing) or city logistics strategies (e.g., off-hour deliveries, micro-hubs, parcel lockers, consolidation centers) to induce freight travel behavior changes – such as mode or vehicle type shifts, temporal shifts, or collaboration between carriers – or to better align freight transportation supply and demand. However, local governments often lack access to the granular data needed both to understand baseline conditions and to simulate the effects of such policy and infrastructure interventions or new city logistics approaches at a system scale. While granular location-based data can be used to derive detailed information about truck travel activity, carriers are often hesitant to share such data with public agencies due to data privacy concerns.

Building on results from our previous project reviewing potential methods to synthesize local freight data useful for decision-making, the goal of this project is to develop, implement, and evaluate a machine-learning based framework to synthesize an anonymized truck GPS dataset with suitable granularity for evaluating urban freight policy interventions. We will develop a simulation approach that leverages appropriate machine learning techniques for encoding/decoding real truck GPS data, enriched by other publicly-available information, to simulate detailed path segments between traffic analysis zones (TAZs). We will implement additional machine learning techniques to assign these segments to sequences, constrained by other aggregate data sources, to produce realistic, high-resolution synthetic truck paths. This synthesized data can be used to characterize individual truck activity as well as to evaluate aggregate activities within a TAZ.

Using the synthesized data, we will then develop three case studies to evaluate the utility of the synthetic data produced to measure and characterize local truck travel behavior, and to quantify traffic, parking, air pollution, or other effects for before-after implementation scenarios for each case study.

US DOT Priorities: This project directly addresses several USDOT's Freight Planning and Performance research objectives (p. 24): (1) to "develop data and tools to assess freight system performance and support performance-based freight planning and policies"; (2) to "improve the ability to measure current and future conditions and support operation of the freight transportation network through the incorporation of more

accurate, real-time, and localized freight data"; and (3) to "provide data, tools, and technical assistance to support the integration of freight considerations in the transportation planning and programming process."

Outputs: The primary output of this project will be a new, transferable framework for synthesizing anonymized truck activity data useful to inform local freight-related policy decisions while maintaining operator privacy. The simulation framework, the lessons learned from its development, and the results from the three case study implementations will be detailed in the final project report and relevant academic outputs. The project is also expected to produce recommendations for future data collection efforts to improve the quality of synthesized data. The synthetic dataset produced and code for executing city-logistics case study evaluations will be notated and made publicly available for use and replication by other researchers and agencies.

Outcomes/Impacts: This project addresses two persistent challenges for data-driven local freight planning in the US (1) a general lack of granular data to measure and characterize truck trip, tour, and parking behavior, and (2) privacy concerns of individual carriers when sharing data with the public sector. By developing an approach to produce a synthetic truck GPS dataset useful for local freight decision-making, this project can help advance improved data-driven freight planning decisions by local agencies and can provide a potential mechanism for improved freight data sharing between the private and public sectors. Advancing local access to granular truck activity data will improve the ability of agencies to make informed infrastructure allocation decisions and will reduce hesitance to innovate among both public and private sector stakeholders by alleviating uncertainties when considering the potential costs and benefits from urban freight policy and city logistics interventions. Ultimately, improved planning and industry innovation can reduce the traffic congestion, safety conflicts, and high costs to industry that result from inefficient local freight activities.

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