TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): FHWA

INSTRUCTIONS:
Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.

Transportation Pooled Fund Program Project # *(i.e, SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX)* TPF-5(176) --Traffic Analysis and Simulation Pooled Fund Study	**Transportation Pooled Fund Program - Report Period:** ☐ Quarter 1 (January 1 – March 31) ☐ Quarter 2 (April 1 – June 30) ☑ Quarter 3 (July 1 – September 30) ☐ Quarter 4 (October 1 – December 31)	
Project Title: Trajectory Investigation for Enhanced Microsimulation Calibration Guidance		
Name of Project Manager(s): Rachel James	**Phone Number:** 202-493-3205	**E-Mail** Rachel.James@dot.gov
Lead Agency Project ID: DTFH61-16-D-00030-T0 T0 18F-252	**Other Project ID (i.e., contract #):**	**Project Start Date:** September 12, 2018
Original Project End Date: September 12, 2020	**Current Project End Date:** September 12, 2020	**Number of Extensions:** 0

Project schedule status:

☑ On schedule ☐ On revised schedule ☐ Ahead of schedule ☐ Behind schedule

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
$366,784	$230,457.48	52%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
$61,872.48 (16.9%)	$61,872.48	52%

Project Description:

In recent years, the advent of more advanced traffic sensors, video processing techniques, and connected vehicle and infrastructure technologies makes possible the provision of real-time, high-fidelity and wide-coverage information on highway traffic. With these technologies, vehicle trajectories and infrastructure information can be precisely recorded along a long roadway stretch at high frequencies and negligible communication latencies. These opportunities enable us to improve the existing traffic models by developing microscopic data-driven based models that can be calibrated with such real-time high-resolution data. To fully harvest these opportunities, we need to propose appropriate techniques for massive trajectory data processing, data-driven traffic modeling, trajectory-based calibration and validation, and real-time microscopic control.

Due to the importance of robust and accurate microsimulation models to address the freeway bottleneck problem, this project aims to:

1. Collect and process multiple sources of full-set trajectory-level data.
2. Investigate and develop a method to calibrate the driver behavior components (e.g., car-following, lane changing, etc.) of traffic simulation software using the full-set trajectory-level data. Apply this methodology to fully calibrate a traffic simulation model (e.g., driver behavior, demand, route choice, etc.).
3. Validate the developed calibration procedure.
4. Compare the accuracy and level-of-effort required to calibrate models with new methodology against more traditional methods.
5. Investigate recurring congestion via corroborative full-set trajectory-level data sources through the successive stages of congestion (onset, peak, and dissipation periods) using models.
6. Develop and enhance guidance documentation for microsimulation model calibration and validation incorporating full-set trajectory-level data.

Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):

Task 1 - Project Management - Estimated completion date: 09/12/2020 | On schedule, 52% complete
Held bi-weekly status meetings, held bi-monthly stakeholder update, and submitted monthly progress reports.

Task 2 - Literature Synthesis and Site and Data Collection Mechanism Selection - 100% complete as of 11/12/2018
Completed.

Task 3 - Data Collection and Processing - Estimated completion date: 11/15/2019 | Behind schedule, 95% complete
All data was collected on I-270, I-95, I-15, and I-75 in May and June. Traditional data for four sites, raw trajectory video data for four sites, cleaned processed trajectory data for one site (I-75), metadata documentation for making data available to the public, raw and cleaned datasets for corroborative sources of data for four sites, and data collection lessons learned documents from Quality Counts, Gotham Filmworks, and USF were delivered on 07/12/2019. Initial evaluation of the datasets revealed that there were instances of crossing trajectories in the data, which indicated that a small subset of the data had instances where the following vehicle traveled through the leading vehicle (negative inter-vehicle spacings). Upon inspection of this problem, USF identified that the issues was happening because the drones were not perfectly stable in the air - as the drones moved, the defined travel lanes also needed to be adjusted. USF has implemented changes to the data post-processing and has resolved the problem. USF is expected to deliver the data to FHWA in quarter 4.

Task 4 - Modeling in Microsimulation - Estimated completion date: 01/12/2020 | On schedule, 30% complete
Demand calibration completed for the I-15 California site. The team is currently performing traditional calibration (following the guidance in the Traffic Analysis Toolbox Vol. 3) for the models; this is complete for the I-95 VA site. The team is also developing the new trajectory-level calibration procedure. This was presented to the stakeholder group for review in the

Anticipated work next quarter:

Task 1 - Project Management - Estimated completion date: 09/12/2020
* On-going bi-weekly meetings
* On-going bi-monthly meetings with special interests groups

Task 2 - Literature Synthesis and Site and Data Collection Mechanism Selection - 100% complete as of 11/12/2018.

Task 3 - Data Collection and Processing - Estimated completion date: 11/30/2019
* Corrected trajectory-level data will be delivered to FHWA.
* Documentation of verification of the trajectory-level data will be delivered to FHWA.
* Documentation of the post-processing procedures to derive the trajectory-level data will be delivered to FHWA.

Task 4 - Modeling in Microsimulation - Estimated completion date: 01/12/2020
* The traditional calibration methodology will be applied to all models. Results (root mean squared error of the selected performance metric(s)) will be obtained and recorded for comparison.
* The trajectory-level calibration methodology will be applied to all models. Results (root mean squared error of the selected performance metric(s)) will be obtained and recorded for comparison.

Task 5 - Final Report and Documentation - Estimated completion date: 09/12/2020
(No updates)

Significant Results:

* Traditional calibration completed for the I-95 Virginia site.
* Demand calibration completed for the I-15 California site.
* Trajectory-level calibration framework developed.
* Post-processed trajectory-level data for our four sites delivered. Will be updated in quarter 4.

Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).

There was a slight delay to schedule due to the originally identified helicopter data collection company going out of business. A new company was identified to collect the data, but this took additional time and resources for administrative paperwork. Permission was granted to delay the delivery of all trajectory level data until 09/12/2019 by COR, however, this is not anticipated to impact any of the remaining project schedule.

Potential Implementation:

It is hoped that the project may produce insights and guidance that profoundly influence the way practitioners and agencies calibrate their simulation models, by incorporating vehicle trajectories into the process.