

Grant Deliverables and Reporting Requirements for UTC Grants

UTC Project Information	
Project Title	Using Transit Vehicles as Probes to Monitor Community Air Quality and Exposure
University	The University of Texas at El Paso
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Funding Source(s) and Amounts Provided (by each agency or organization)	USDOT: \$74,999 UTEP: \$37,650
Total Project Cost	\$112,649
Agency ID or Contract Number	Sponsor Source: Federal Government CFDA #: 20.701 Agreement ID: 69A3551747119
Start and End Dates	Start date: 10/01/2019 End date: 06/30/2021
Brief Description of Research Project	<p>While efforts have been made to promote transit, walking, bicycling and other non-motorized transportation modes as a healthy lifestyle, the exposure of human to pollutants while carrying out these activities is yet to be fully understood. This project will evaluate the feasibility of using transit vehicles (low emission bus) traveling on fixed routes for near-road exposure assessment. Continuous on-road measurements of three criteria pollutants (ozone, nitrogen dioxide, and particulate matter of less than 2.5 μm or $\text{PM}_{2.5}$) will be recorded in conjunction with GPS locations. Concurrent near-road measurements as well as state-operated central-site monitoring data of the same pollutants will be used to verify and provide associations with the mobile data. The data will be used to quantify exposures experienced by pedestrians, passengers, bus users, and near-road residents. The first year of this project will focus on assessing the on-board data against that obtained at fixed stations. Methodology may be developed later to separate near-road concentration from background level, which will have subsequent applications.</p> <p>This study will test two hypotheses: 1) Community exposures to transportation pollutants can be represented by short-term spatio-temporal measurements using mobile air monitors; and 2) near-</p>

road receptors are not affected by the traffic emissions from surface street emissions and can be represented by on-road low-cost mobile air monitors. The objectives of this study are to 1) provide reliable exposure concentration estimates for a community measured by transit vehicles equipped with mobile (potentially low-cost) air monitors, and 2) develop associations of short-term transportation air pollution concentrations with maximum 24-hour and annual average community exposure concentrations.

We propose to conduct a pilot-scale study to test the study design and hypotheses in a well-controlled residential community in El Paso. We anticipate to extend our study design in the future to a near-road community located in close proximity to a busy interstate highway. The first year of this project will focus on assessing the on-road data against that obtained at fixed stations. Methodology may be developed later to separate near-road concentration from background level, which will have subsequent applications. The implementation of this project will provide a cost and time effective method for estimating the burden of traffic pollution on near-road community's health. The stakeholders for this project include Sun Metro Mass Transit Department, UTEP Campus Shuttle, City of El Paso, TXDOT, Texas Department of Health.

The project is expected to be implemented in 12 months starting October 1, 2019. It will be implemented in four tasks with a sampling campaign of two 14-day periods of continuous traffic counting and air monitoring of three transportation pollutants (PM_{2.5}, NO_x, and Ozone):

Task 1: Instrumentation Setup and Route Selection

We have identified a bus route in the selected community and will equip the natural gas powered transit vehicle with three types of air monitors for PM_{2.5}, NO_x, and ozone monitoring. All instruments will be calibrated against the data recorded at the nearby state operated air monitoring station.

Task 2: Air pollution measurements

On-road transportation air pollution measurements will be conducted using the transit vehicle equipped with the air monitors. We expect to equip 1 transit vehicle and operate the on-road measurement for at least 8 trips per day for 2 two-week periods. In addition, concurrent near-road measurements will be conducted at two locations during the period of the study using the same instruments.

Task 3: Traffic measurement and emission modeling

Traffic counts will be conducted at 2-3 locations along the bus route using traffic counters concurrently to the air monitoring campaign. The traffic data will be integrated into the MOVES

	<p>emissions model to quantify vehicle emissions from different segments of the bus route.</p> <p>Task 4: Data processing and Report preparation</p> <p>The on-road data will be processed in conjunction with the GPS data for generating concentration surfaces. The on-road data will be compared to data collected at the near-road sites as well as at the state-own fixed-location, TCEQ CAMS site. Statistical analyses (including correlation analyses and linear effect mixed model) will be conducted to examine the associations among the on-road, near-road, and central regulatory compliance site.</p>
<p>Describe Implementation of Research Outcomes (or why not implemented)</p> <p>Place Any Photos Here</p>	
<p>Impacts/Benefits of Implementation (actual, not anticipated)</p>	
<p>Web Links^{SEP}</p> <ul style="list-style-type: none"> • Reports • Project website 	<p>http://ctech.cce.cornell.edu/final-project-reports/</p>