UTC Project Information – **Center for Transportation, Environment, and Community Health**	
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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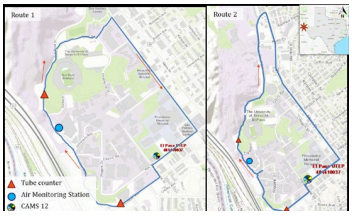
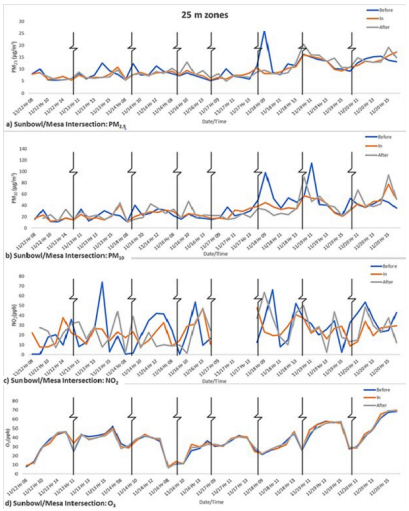
Agency ID or Contract Number	Sponsor Source: Federal Government CFDA #: 20.701 Agreement ID: 69A3551747119
Start and End Dates	10/01/2019 – 06/30/2021
Brief Description of Research Project  Figure 1 Study Area and Mobile Monitoring Routes  Figure 2 Air Quality Mobile Station	This project evaluated the feasibility of using transit vehicles traveling on fixed routes for near-road exposure assessment. Continuous on-road measurements of four pollutants ($PM_{2.5}$, PM_{10}, NO_2, and O_3) were recorded in conjunction with GPS locations. The data can be used to quantify exposure experiences by pedestrians, passengers, bus users, and near-road residents. Concurrent near-road measurements were used to verify and provide associations with the on-road data. The study tested two hypotheses: 1) community exposures to transportation pollutants that can be represented by short-term spatio-temporal measurements using on-road air monitors; and 2) near-road receptors that are not affected by the traffic emissions from surface street emissions and that can be represented by on-road air monitors. The objectives of this study were to 1) provide reliable exposure concentration estimates for a community using transit vehicles equipped with mobile air monitors, and 2) evaluate associations of short-term transportation related air pollutant (TRAP) concentrations with hourly exposure concentrations for near-road communities. Mobile monitoring was conducted along two designated routes around the UTEP campus shown in Figure 1, with UTEP researchers driving at a speed of less than 30 miles per hour. In both routes, a detour was made on Schuster Avenue to take the mobile monitoring

	station (Figure 2) closer to the CAMS 12 site, which was located approximately 50 feet off Rim Road, so that a comparison could be made between the air pollutant data collected by the mobile monitoring station's instruments and CAMS 12 FRM data. In addition, a fixed site with the same air quality monitoring instruments was installed on Sun Bowl Drive to provide another location for data comparison. Each trip lasted about 12-15 minutes, including stop-and-go at all traffic intersections. The air monitoring campaign made a total of 282 trips (170 outer loops and 112 inner loops) and collected $PM_{2.5}$, PM_{10}, NO_2, O_3, and GPS data every second. Data were analyzed in conjunction with the fixed station data.
Describe Implementationof Research Outcomes (or why not implemented)  Figure 3 Comparison of On-road and Near-road TRAP Concentrations  Figure 4 TRAP Concentrations at MESA and Sun Bowl Intersection	This project provided on-road TRAP data recorded by the mobile monitors, as well as near-road TRAP data recorded at fixed stations. The on-road data were found to be representative of that recorded at fixed stations. Figure 3 shows the comparison at one of the two stations implying that community exposures to transportation pollutants are well represented by short-term spatio-temporal measurements using on-road air monitors. Furthermore, the on-road TRAP concentrations were indistinguishable immediately off and in the intersection, as seen in Figure 4, implying that the on-road and off-road exposures to the TRAPs at traffic stops are practically the same for the community. Mobile real-time air monitoring provides a time lagged snapshot of air pollution over a large three-dimensional spatio-temporal concentration domain via a fast-moving vehicle. Our study demonstrates that mobile air monitoring in a less travelled community can correctly detect the exposure concentrations that are representative of the community as well as near-road receptors. Our study design could be extended in the future to any community located near a busy interstate highway. The implementation of this project provides a cost and time effective method for estimating the burden of traffic population on near-road community exposure to TRAPs. It appears promising that community exposures to transportation pollutants can be represented by short-term spatio-temporal measurements using mobile air monitors. Further research on how the mobile data can be used in exposure and health assessment and how the technique can be applied to characterize exposure concentrations at locations that stationary monitoring is not allowed or possible.

Impacts/Benefits of Implementation (actual, not anticipated)	This study provided a methodology to assess the on-road transportation-related air pollutant data against data obtained at fixed near-road stations. This study has provided additional scientific knowledge regarding the differences between on-road and near-road pollution levels.
Web Links • *Reports* • *Project website*	http://ctech.cee.cornell.edu/final-project-reports