SUPPORTING INFORMATION

Emulating Near-Roadway Exposure to Traffic-Related Air Pollution via Real-Time Emissions from a Major Freeway Tunnel System

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Figure S1. Photo montage of the various systems comprising the Caldecott Tunnel Exposure Facility (CTEF).

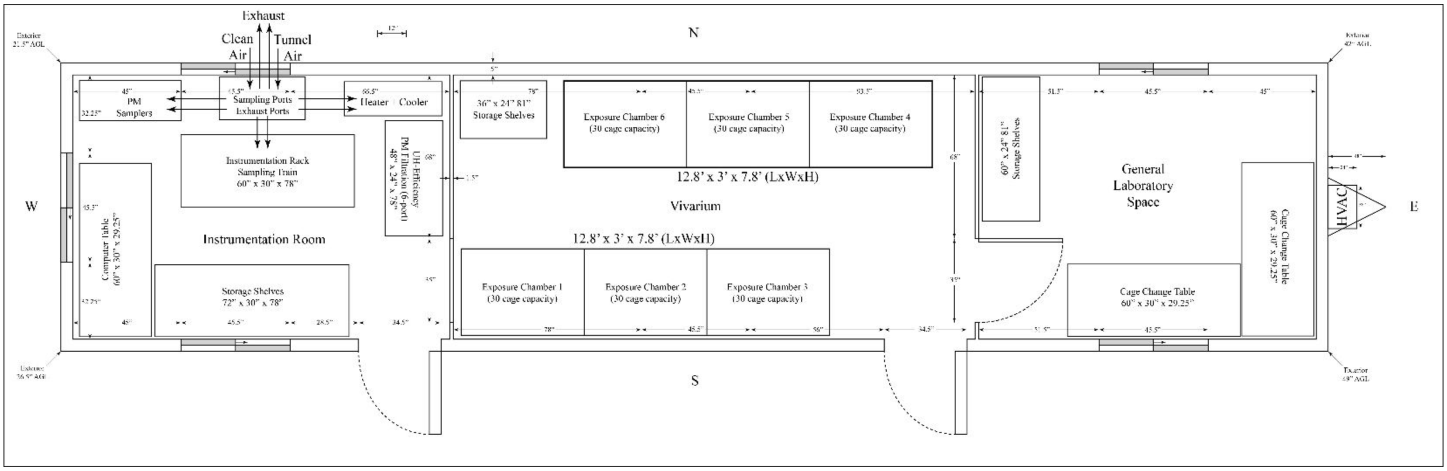

Figure S2. Onsite CTEF office trailer floorplan showing the general layout of the various rooms, including the instrumentation room, vivarium with exposure chambers, and general laboratory and storage space.

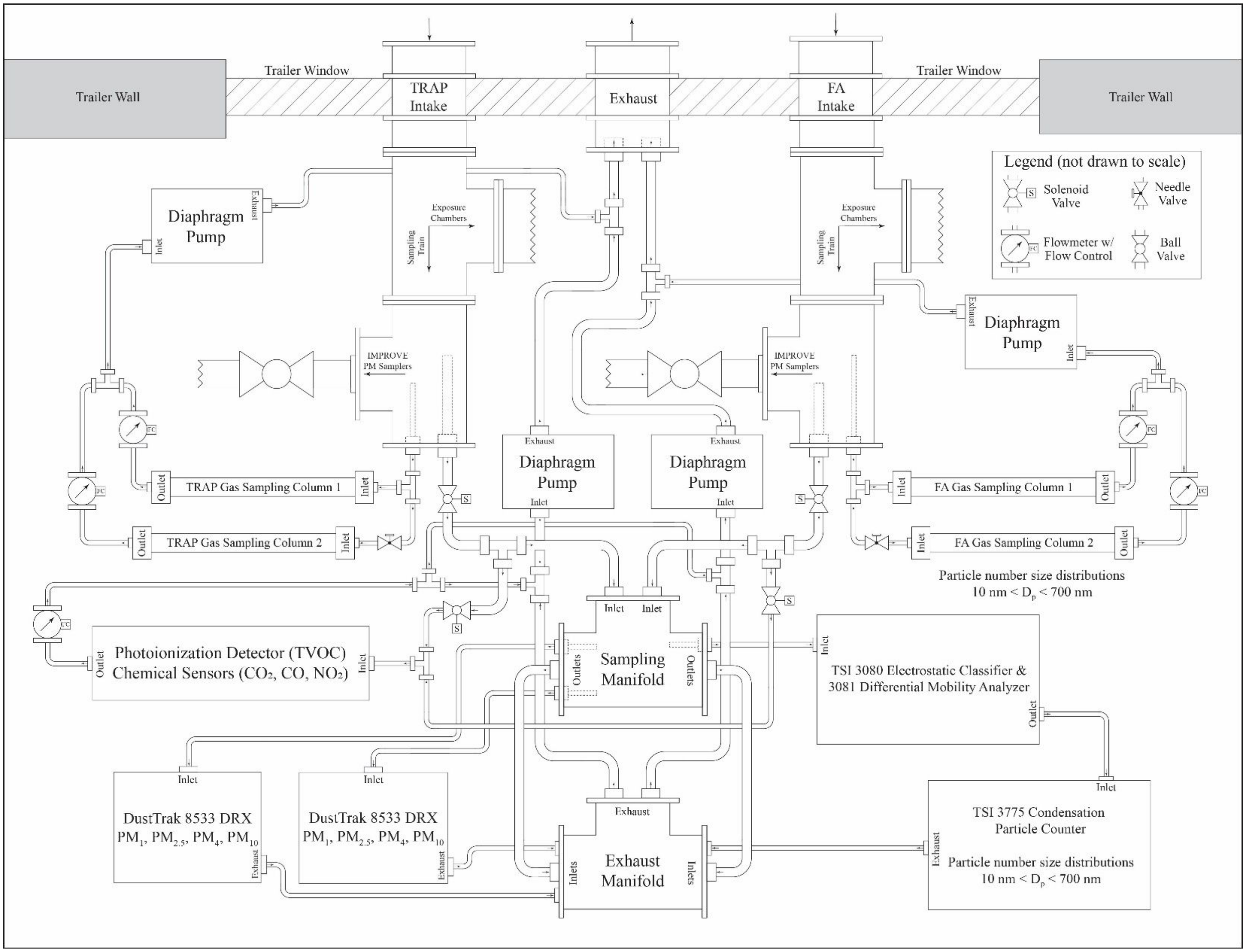

Figure S3. Schematic and flow diagram of the centralized air sampling train located in the CTEF instrument room for distributing flow to all gas and PM sampling equipment and continuous monitoring instrumentation.

Emission Control Technologies. Ambient air is drawn through a series of emissions control technologies housed in a storage shed immediately adjacent to the onsite exposure facility to provide clean filtered air (FA) for negative control exposure groups. Following the flow, emission controls begin with coarse filtration for removing large debris/dust coupled to an activated carbon scrubber for removing volatile organic compounds (Phresh® HGC701018 Air Carbon Filter; 8”×39”; 950 cfm max flowrate). The flow is then split into 3 parallel streams and each stream subjected to an additional inline activated carbon scrubber (Phresh® HGC701180 Inline Air Carbon Filter; 8”×24”; 750 cfm max flowrate) followed by three-way catalytic converters (MagnaFlow® 445006; CARB-compliant) for removing nitrogen oxides, hydrocarbons and carbon monoxide. The flows are recombined, plumbed to the air flow control systems situated beneath the facility, and then pumped through an inline, custom-made, ultrahigh-efficiency particle filtration system housed inside the instrumentation room for removing ultrafine, fine, and coarse mode particulate matter (PM). The filtration system consists of six parallel 8” diameter ducts coupled by inlet and outlet manifolds. Each duct terminates with a stainless-steel wire mesh filter support and Teflon-coated borosilicate glass microfiber filter with woven glass backing (Pallflex® Emfab™ TX40) that are compression sealed to the outlet manifold via quick-disconnect couplings and PTFE seals. The outlet is then plumbed to an array of sampling ports that direct airflow to: *(1)* exposure chambers, *(2)* PM samplers and *(3)* the air sampling train for air quality monitoring.

All activated carbon scrubbers are industry-specified to have 24-month lifetimes for continuous operation at maximum flowrates under moderate pollution and relative humidity levels. Multiple scrubbers were used in parallel at a fraction of specified maximum flowrates (15 cfm operational versus 750 cfm maximum) to significantly increase lifetimes so that changing the scrubbers was not necessary for this 18-month study. Similarly, new catalytic converters are mandated by EPA to have 5-year/50,000-mile warranties and we used multiple converters in parallel at a fraction of tailpipe exhaust flowrates so that changing catalytic converters was also unnecessary. For the particle filtration system, pressure taps were placed upstream and downstream of the filters to continuously monitor pressure drop to evaluate filter loading and thus the need for filter replacement. The system was designed to minimize filter replacement frequency by spreading the air flow over six parallel filtration channels with each channel containing an 8" diameter filter. In total, all six filters were replaced twice throughout the 18-month study.