Estimated Summer Hot-Soak Distributions for Denver's Ken Caryl I/M Station Fleet

Final Report

EPA United States Environmental Protection Agency

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Final Report

Assessment and Standards Division
Office of Transportation and Air Quality
U.S. Environmental Protection Agency

Prepared for EPA by
Eastern Research Group, Inc.
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Final Report
Version 8

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December 20, 2013

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Estimated Summer Hot-Soak Distributions for Denver's Ken Caryl I/M Station Fleet

FINAL REPORT
Version 8

as part of
Work Assignment 5-4

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1.0 Executive Summary

The primary goal of the Ken Caryl project was to estimate distributions of hot-soak emission levels for gasoline-fueled light-duty vehicles, using a quick and inexpensive procedure to conduct a survey of an in-use fleet. Innovative strategies were used to measure evaporative emissions data on 175 vehicles representative of the fleet entering Ken Caryl station.

The vehicle sample evaluated during the study was drawn from vehicles visiting an I/M station in Denver during the summer months. Classes of vehicles measured included LDV, LDT1, and LDT2 as defined by EPA regulations. A random sample of vehicles was selected for measurement with “probability proportional to Index” (ppEI). The index was calculated from the value of a remote-sensing measurement obtained as each vehicle entered the I/M station. The sampling process used the index to improve the efficiency with which vehicles with “elevated” evaporative emissions could be selected for recruitment (as opposed to sampling the fleet fully at random). The success of the ppEI approach in identifying vehicles with elevated evaporative emissions has confirmed earlier work demonstrating the utility of a screening index in reducing the level of effort and cost needed to estimate the prevalence of vehicles with elevated evaporative emissions [1].

The hot-soak emissions of participating vehicles were measured using the “portable SHED” (PSHED) enclosure following a procedure developed to mimic the hot-soak portion of the Federal Test Procedure as best as possible in a field setting. This approach serves as a good surrogate for corresponding laboratory results, but did not fully meet measurement requirements for a laboratory SHED.[1] Several parameters known to affect hot-soak emissions were not controlled but were recorded: ambient temperature, barometric pressure, fuel tank level, fuel metering technology, evaporative emissions control technology, and the repair status of related vehicle systems. Results show a reasonable degree of correspondence between values of the ppEI and corresponding hot-soak measurements.

Using the measurements obtained in the PSHED, we estimated distributions of hot-soak emissions, for the entire sampled fleet and by model-year group, assuming that the model-year groupings act as a surrogate for important changes in fuel-system and emissions control technology. To obtain representative results in relation to the fleet sampled, it was necessary to develop and apply two sets of weights to represent the processes of sampling and differential participant response by model-year group. These weights reflect the different sampling probabilities assigned to vehicles based on their screening indices, plus different levels of participant response by model-year group.

Nonetheless, the ppEI did not give a perfectly reliable result for this fleet of vehicles. The presence of “false negatives” or “false positives” in the sample reduces the efficiency of the index in guiding sampling, but does not impair the usefulness of the sample for purposes of this report. Each vehicle was drawn into the sample at a known level of probability, ranging from 6% for the lowest screening indices to 100% for vehicles with the highest indices. In analyzing the sample, the probability with which each vehicle was drawn determines its weight in the analysis, meaning the number of vehicles in the sampled fleet that it represents. Because sampling weights

[1] “Sealed Housing for Evaporative Determination,” as specified in 40 CFR 86, Subpart B.

are assigned for all vehicles receiving PSHED measurements, the set of PSHED measurements can be used to estimate the prevalence of elevated emissions.

The analysis shows the value of model-year groups as a surrogate for fuel-system and emissions-control technology. The hot-soak results among model-year groups span about three orders of magnitude and are consistent with the combined effects of evaporative emission control technologies and vehicle age. Older model year groups had substantially higher estimated hot-soak values than newer model year groups. All vehicles manufactured prior to 1981 (when measured at 29+ years of age) are expected to have PSHEDs greater than 1.0 g/Qhr (g/quarter-hour). This rate corresponds to a cumulative leak of 0.020 inches in diameter, or the size of the smallest fuel/evaporative control system vapor leak that OBD systems are required to detect. For vehicles manufactured between 1981 and 1995 (measured at 14+ years of age), 26% and 39% of vehicles are expected to exceed 1.0 and 0.30 g/Qhr, respectively (with the latter value corresponding to the hot-soak portion of the 1996-and-later enhanced emission standard). For vehicles manufactured between 1996 and 2003 (measured at 5-13 years of age), and employing both OBD systems and enhanced evaporative emission control technology, corresponding fractions are 3.3% and 6.4%, respectively. Evaluation of an assumption that all measurements were overestimated by 50% indicated that these frequencies would be reduced by margins of 12% and 5%, respectively, giving "lower-bound" values of 2.9% and 6.1%. Finally, no vehicles manufactured in 2004-2010 are expected to have PSHEDs greater than 0.3 g/Qhr, although these conclusions are based on a relatively small set of 13 measured vehicles.

Despite the quick and rudimentary nature of the physical inspection, it was often possible to isolate vapor emissions to specific components of the fuel-delivery or emission-control systems. Specific vapor sources were identified for 44% and 17% of all PSHED results in the pre-1996 and the 1996-2010 model-year groups, respectively. However, for the vehicles having PSHED results ≥0.3 g/Qhr, the fractions are higher, with vapor sources identified for 54% and 76% of results in the pre-1996 and 1996-2010 model-year groups. Overall, 13 specific vapor sources were isolated, with the most common being the fuel tank, fill pipe, and canister. These three locations account for 66% of identified sources for all PSHED results. Results also show that most identified vapor sources exceeded 0.3 g/Qhr, with 64% to 70% of sources exceeding this threshold attributed to these three locations.

The distributions of summer hot-soak emissions estimated from the measurements obtained at Ken Caryl station represent new data that is relevant to characterizing evaporative emissions at the fleet level in other contexts. However, the specific limitations of the study imply that the results cannot necessarily be generalized broadly without taking steps to account for differences in conditions. The effects of ambient temperature, fuel volatility, and barometric pressure (altitude), among other factors, need to be considered in generalizing the application and interpretation of these results.

Taken together, the emission data and the mechanics' inspection results discussed in the report suggest that the "hot soak" emissions measured in this work emanate from either canister breakthrough or as a result of leaks in the fuel and evaporative emission control systems.

2.0 Background

Evaporative emissions from motor vehicles arise from the release of low molecular-weight hydrocarbon components from the fuel (typically gasoline). Unlike exhaust emissions, which are emitted primarily from the tailpipe, evaporative emissions can be released from any part of the fuel-delivery or evaporative emissions control systems. Due to the delocalized nature of evaporative emissions, they have historically proven difficult to isolate and measure for individual vehicles and to forecast for fleets.

Historically, four classes or types of evaporative emissions have been recognized. "Running-loss" emissions occur while engine is operating. For vehicles with functional control systems these emissions are captured but when these systems malfunction or fail, hydrocarbon vapors can escape into the environment. "Hot-soak" emissions occur after the engine has been turned off and residual heat results in fuel evaporation. For vehicles with fuel injection, hot-soak emissions are generated primarily from the fuel tank. For older vehicles with carburetion, such emissions are also generated from the carburetor bowl. "Permeation" losses are low-level emissions occurring by diffusion through fuel-system materials or through junctions where components meet, such as fittings. Finally, "diurnal" emissions occur as the vehicle heats up as ambient temperature increases during the day. Note, however, that these emissions classes are not mutually exclusive and that similar physical processes may be in operation in multiple "types," i.e., with the engine on or off, etc.

In addition to vehicle characteristics, fuel characteristics influence evaporative emissions. In general, increased fuel volatility results in increased evaporation. In addition, the fuel level in the tank determines the volume of vapor available for release or evaporation, with the result that evaporative emissions tend to increase when the fuel tank level is low, other factors equal.

The generalizations above apply to vehicles with properly functioning emissions control systems. However, if the control system is malfunctioning or the integrity of the system is compromised, resulting in leaks of various sizes, additional volumes of vapor can be lost to the atmosphere from numerous locations.[2] This phenomenon was recognized by EPA and industry over 35 years ago and served as a major reason for requirement of the SHED test in lieu of the older canister method [2].

It is important to note that vehicles having "elevated" running-loss or hot-soak emissions are not necessarily "malfunctioning" or "leaking." For obvious reasons, the levels of evaporative emissions expected depend heavily on the technology of the fuel-delivery and evaporative emission-control systems at the time of manufacture. Before 1971, light-duty gasoline vehicles had no regulations on evaporative emissions. For those vehicles, fuel tanks were typically vented directly to the atmosphere. In the years since 1970, certification test procedures and standards have become increasingly comprehensive and stringent. However, running-losses were not directly addressed until the introduction of "enhanced" evaporative emissions control requirements for model-year 1996-and-later gasoline-powered light-duty vehicles (LDVs) and light-duty trucks (LDTs). On the other hand, the existence of a leak in the fuel or vapor control

[2] Leaks in the fuel/vapor control system can result from poor design approaches, poor connections, component deterioration as a result of poor material selection or mis-assembly of components and systems.

system would likely result in substantially increased vapor emissions, regardless of the technology employed or level of emissions control required.

For purposes of emissions inventory estimation, the MOBILE models classified evaporative emissions as described above. In development of the Motor Vehicle Emissions Simulator (MOVES), however, the terms "hot-soak" "cold-soak" and "operation" are defined as "operating modes." During these modes, emissions may be generated by one or more "processes," defined as "vapor venting" (primarily from the tank), "permeation," or "leaks" (vapor or liquid).

2.1 Laboratory Measurement of Evaporative Emissions

Because evaporative emissions can emanate from many locations on a vehicle, the measurement of a vehicle's evaporative emissions is different and in some ways more difficult than the measurement of exhaust emissions. Placing vehicles in a sealed enclosure, such as the "Sealed Housing for Evaporative Determination" (SHED) makes it possible to quantify total vapors emitted during various test conditions. However, because evaporative emissions vary with physical process and operating mode during constantly changing ambient conditions, the dependence of evaporative emissions on environmental factors such as ambient temperature, fuel volatility, atmospheric pressure, and driving history is complex.

To explore the relationships between evaporative emissions and the vehicles' operating environment, modeling is one useful approach. Between 1987 and 1992, the Coordinating Research Council sponsored work to use available data to develop a model to estimate fleet-average evaporative emissions in relation to changing environmental conditions [3, 4, 5]. The resulting model (EVAP 3.0) estimated hot-soak and diurnal (but not running-loss) emissions at the fleet scale [3]. This model did not estimate fractions of vehicles having elevated evaporative emissions as a result of leaks. However, this model and others like it served to guide additional research by clarifying the importance of different physical processes or modes in various situations.

More recently, additional work sponsored by the Coordinating Research Council (CRC), in cooperation with EPA and the Department of Energy, has focused on specific questions concerning the processes by which evaporation emissions occur [6]. One set of studies, focused on permeation, first developed a test procedure and then applied it in a larger program to estimate emissions from vehicles with differing control technologies, e.g., "pre-enhanced" (pre 1996), "enhanced" (MY 1996-2000), and "partial-zero emissions vehicles" (PZEV)[3]. In the E-77 pilot program, one vehicle was measured with and without an artificially-induced leak of the minimum diameter necessary to set an OBD code. Results showed that the presence of a leak can increase emissions by several orders of magnitude and underscored the importance of estimating the prevalence of leaks in the in-use fleet. While evaporative mass emissions have been quantified in previous studies [7, 8, 9], frequencies of leaking vehicles in the in-use fleet have been estimated based on very limited data [8, 9, 10].

Follow-up efforts with artificially-induced "implanted" leaks of similar diameters at differing locations (such as the gas cap) showed that the magnitude of emissions is associated

[3] PZEVs, 2004 and later vehicles, an option for compliance under the California ZEV mandate.

with the locations of leaks [6]. One finding was that systems equipped with on-board refueling vapor recovery (ORVR) can mitigate the effects of leaks in some locations, depending on the ORVR design employed. However, leaks at specific locations, such as the top of the tank or in connection to the canister, were found to result in higher emissions.

2.2 The Denver Inspection and Maintenance Program

As in a number of urban areas throughout the U.S., vehicles registered with addresses in the Denver Metropolitan Area are subject to the requirements of an Inspection-and-Maintenance Program (I/M). The Colorado Automobile Inspection and Readjustment program is an enhanced I/M program with the goal of detecting and repairing high-emitting gasoline vehicles[4]. The program covers nine counties and portions of counties in and around Denver. The program is registration-enforced and applies to all heavy- and light-duty gasoline-powered vehicles with the exception of vehicles less than 4 years old, which are exempt. Vehicle owners moving into the area must have their vehicles inspected prior to registration unless they are less than three years old. Other exempt vehicles are those older than model year 1975 with collector license plates, motorcycles, and hybrid and other alternatively-powered vehicles. Vehicles not exempt from the program are due for inspection every two years and when they change ownership.

The program emphasizes testing of exhaust emissions. Vehicles manufactured since 1982 undergo testing of transient emissions on the IM240 cycle performed on chassis dynamometers. Vehicles manufactured prior to 1982 are measured using a two-speed idle test. A scan of the on-board diagnostic (OBD) system is performed for vehicles manufactured since 1996 but is used for advisory purposes only, not for determining test results. The only program requirement specific to evaporative emissions is a test of gas-cap integrity. This test is performed for all vehicles manufactured since 1975.

In addition to these requirements, the program includes collection of remote-sensing measurements throughout the area on an ongoing basis. Vehicles receiving two such measurements rated as "clean" are exempted from their next routine I/M test. This "clean-screen" component reduces the demand on the I/M stations and saves time and money for the motorists.

The Colorado Department of Public Health and Environment (CDPHE) has an interest in improving the methods available to identify vehicles with elevated evaporative emissions. Since 2006, CDPHE and the Regional Air Quality Council (RAQC) have collaborated in a program to identify vehicles needing repairs to reduce their hydrocarbon emissions, using remote sensing as a screening tool. An unexpected result of the effort was the apparent ability of the RSD4000 instrument to detect and identify vehicles with "elevated" evaporative emissions. Several such vehicles were found to pass IM240 final exhaust cutpoints but to have vapor or liquid leaks.

Concurrently, EPA was engaged in development of the evaporative emissions components of the MOVES model, which involved updating the estimates of "leak frequencies" previously used in MOBILE6.

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[4] The program is run by Envirotest Systems Corp., a subsidiary of Environmental Systems Products, Inc. (ESP), under contract to the State of Colorado.

As a result of these mutual interests, CDPHE and EPA entered into a Cooperative Research and Development Agreement (CRADA) to study evaporative emissions by developing measurement and screening procedures and applying them to assess evaporative emissions in the in-use fleet. Collaborative efforts under this agreement were pursued in Denver to capitalize on work already underway and to take advantage of research facilities and staff made available by CDPHE and ESP. In addition, existing contract relationships between CDPHE and ESP and between EPA and ERG facilitated the timely and cost-effective completion of this work, including the current project.

2.3 Measurement of Evaporative Emissions by Remote-Sensing

Remote sensing is a technique capable of obtaining a brief measurement of emissions from vehicles during normal operation, without the need to bring vehicles into the laboratory for more intensive or costly measurements. The instrument projects beams of infrared and ultraviolet light across a roadway at approximately the height of the tailpipe. When vehicles drive past the instrument and the beams pass through the emissions plume, the presence and concentration of exhaust gases (relative to that of CO_2) is detected by attenuation of light energy by specific chemical species in the plume [11]. The technique typically detects carbon monoxide (CO), nitrogen oxides (as NO) and hydrocarbons (as propane or hexane equivalents).

Since the late 1980's this technique has been used to measure emissions for large and broad samples of vehicles from in-use fleets [12, 13]. Because of this capability, remote-sensing has been favored as a method to identify "high emitters" of exhaust pollutants. This project is the largest effort to date to investigate the use of remote sensing to screen for "high emitters" of evaporative emissions.

When the emission plume of a vehicle is measured by remote sensing, the vehicle is in the "operating" mode. Thus, evaporative emissions occurring at that time would be broadly classified as "running-loss." Nevertheless, these emissions can occur through one or more of the processes described above (e.g., permeation, vapor venting, hot soak, etc). Generally, if leaks exist in the fuel or control systems, it is plausible that they would be evident during either "running-loss" or "hot-soak" conditions, depending on their location and size.

In 2006 and 2007, personnel at CDPHE found evidence suggesting that remote-sensing instruments could detect evaporative emissions and identify vehicles with "elevated" emissions. A simple, semi-quantitative follow-up experiment used an RSD4000 instrument with metered amounts of propane, unmetered amounts of liquid gasoline, and known concentrations of simulated exhaust from an "audit" truck. These results seemed to corroborate the claim that the remote-sensing instrument could identify vapor and liquid leaks. Results obtained from the audit truck showed that measurements for two "leak" conditions, "gas-cap removed" and "canister disconnected," were approximately two and seven times higher than those for a "no problem" condition.

2.3.1 Development of Evaporative Screening Indices

Additional experimentation was needed to explore the possibility that a remote-sensing instrument could detect and potentially quantify evaporative emissions. An audit truck and several test vehicles were equipped to emit simulated running-losses, as well as simulated or actual exhaust emissions. Several thousand measurements were acquired [14] from these vehicles under various test conditions including emissions type (propane, gasoline), point of release, release rate, vehicle speed, exhaust emissions level, and leak type. The raw spectroscopic data obtained by the instrument from those measurements was analyzed to show that a remote-sensing instrument that is used to measure exhaust emissions could detect “running-losses” but that the sensitivity of the approach was affected by vehicle speed, exhaust emissions concentration, point of release, and sources of random error. Overall, results indicated that a quick and inexpensive estimate of evaporative emissions, or evaporative emissions “index,” could be developed using some function of the instrument-internal spectroscopic data.

For the purposes of sampling, an “index” need not provide a precise measurement of emissions; it is only necessary that an index show a reasonable degree of correlation with evaporative emissions (as measured by more intensive methods). Subsequent efforts have explored various approaches to use remote-sensing measurements to characterize evaporative emissions [1, 14] and to develop and evaluate additional measures that could serve as indices. Latter efforts have focused on patterns in hydrocarbon attenuation relative to those for CO_2, which is produced only by combustion.

The remote-sensing technique assumes that exhaust gases exiting the tailpipe are well mixed and disperse into ambient air at the same rate. The instrument operates by measuring the attenuation of a beam of infrared or ultraviolet light by chemical species in the emissions plume (CO_2, CO, NO, HC). For each vehicle passing the sensor, 50 attenuation measurements are captured at intervals of 10 msec. If only exhaust emissions are present, and if background concentrations are negligible, the degree of attenuation for the several species measured remains roughly constant, even as the plume disperses and concentrations decline. Using an example from experimental work described above, Figure 2-1 shows time series for measurement of a plume containing only exhaust emissions. Despite differences in scaling, the four species follow similar relative trends over the time interval.

If these assumptions hold, plots of attenuation measurements for each species (ppm-cm) against attenuation of CO_2 (%-cm) should show a linear relationship with a low degree of variation around the trend and with trends passing through the origin. Experimental results show this to be the case, as shown in Figure 2-2.

Several proposed screening indices considered have relied on the assumption that when evaporative hydrocarbons as well as exhaust hydrocarbons are present in the exhaust plume, the time series for HC attenuation will differ from those for CO and NO. An implication of this result is that the trend of HC attenuation vs. CO_2 attenuation will show a “high” degree of scatter, as assessed by examination of residuals of a simple least-square fit of HC vs. CO_2 attenuation. Experimental results displaying this pattern are shown in Figure 2-3. Development of indices through analyses of the behavior of residuals from the regression of HC on CO_2 attenuation is further discussed in Appendix A.

Figure 2-1. Attenuation Time Series for an Experimental Condition Simulating Zero Evaporative Emissions (0.00 scfh propane) and Exhaust Emissions (30 scfm of 1100 ppmC$_3$ HC, 3.0% CO, 500 ppm NO, 12.92% CO_2, balance N_2, dry)

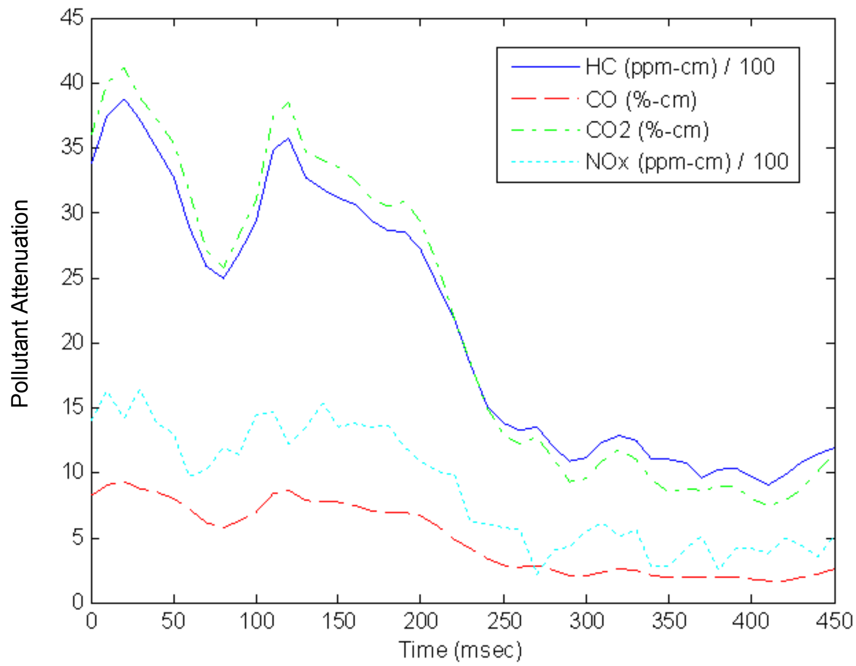


Figure 2-2. Attenuation Measurements for Three Pollutants vs. CO_2 Attenuation: Zero Evaporative Emissions (0.00 scfh propane) and Simulated Exhaust Emissions (30 scfm of 1100 ppmC$_3$ HC, 3.0% CO, 500 ppm NO, 12.92% CO_2, balance N_2, dry)

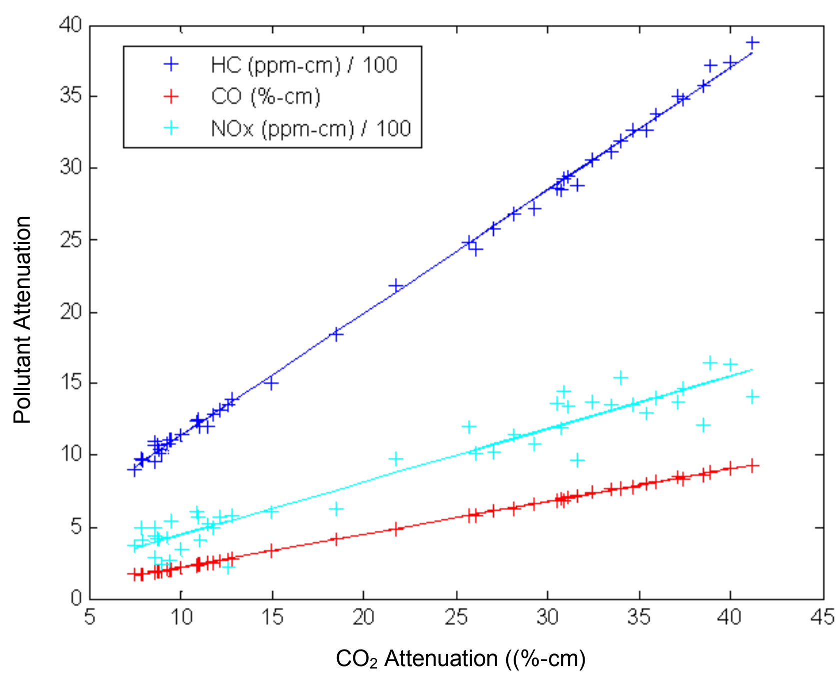
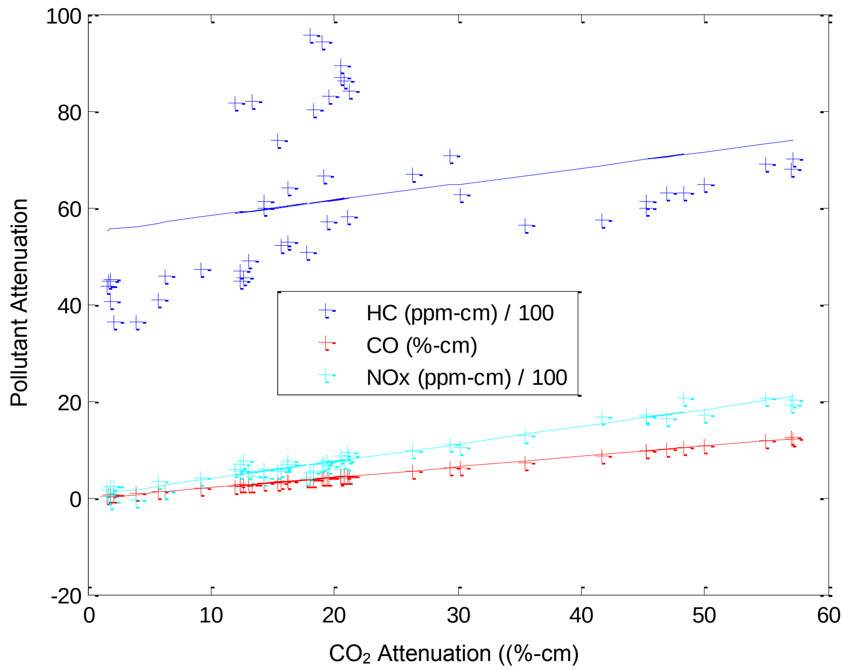


Figure 2-3. Attenuation Measurements for Three Pollutants vs. CO_2 Attenuation: Simultaneous Simulated Evaporative Emissions (15 scfh propane) and Simulated Exhaust Emissions (30 scfm of 1100 ppmC$_3$ HC, 3.0% CO, 500 ppm NO, 12.92% CO_2, balance N_2, dry)



2.3.2 A Screening Index for Evaporative Emissions

The evaporative index applied in the current study is based on examination of residuals from a linear fit of HC attenuation against CO_2 attenuation. As the twenty-third candidate index based on this principle, we refer to it as "EI23." The largest residual is not used as it is considered more susceptible to random error. The mean of all residuals is not used as it is more susceptible to contamination from exhaust hydrocarbons in the plume.

Evaluation of the performance of EI23 using experimental results showed that the index can detect high running-loss rates, but that its effectiveness as a predictive tool is affected by vehicle speed, exhaust hydrocarbon concentration, and other sources of variability inherent in remote-sensing measurements. Generally, the effectiveness of the index as a predictive tool declines: (1) with increasing vehicle speed, which tends to reduce all residuals, and (2) with increasing exhaust emissions, which can confound the evaporative component in the plume. Random error or "noise" also tends to confound the index as the index itself is premised on the assumption that the presence of evaporative hydrocarbons manifests as increased "error" in the attenuation trend. Pilot work has demonstrated that indices are more effective at detecting evaporative vapors when the vehicles' speeds are "low" when passing the instrument. For this reason, every attempt was made to limit the speed of vehicles to about 12 mph when passing the instrument during collection of data intended for use in calculating EI23.

The index is calculated in a series of steps. For each set of raw spectroscopic measurements, the first four measurements and any invalid measurements are deleted. An ordinary least-squares regression of HC attenuation vs. CO_2 attenuation is performed on the remaining observations, and residuals are calculated for all measurements used in the linear fit. Note that this regression is fit so as to allow non-zero intercepts. The number of residuals n is divided by 10 and the result rounded to the nearest integer, designated as *X*. After sorting the absolute residuals by size from smallest to largest (retaining negative values), the *X*th largest residual, which represents an approximation of the 90th percentile residual, is taken as the value of EI23.

To address the effects of uncertainty in the index values introduced by vehicle speed and other factors additional steps are taken. The initial value of EI23 is transformed into logarithmic space, and a calculation made to account for the exhaust component in the plume. The result is assigned to one of seven classes in which class 1 and class 7 represent the lowest and highest levels of evaporative emissions, respectively. The transformed and classified values of EI23 were used as a screening index for this project and will be referred to as "EI23 Bin." A detailed description of the calculation of EI23 and EI23 Bin is provided in Appendix A.

2.3.3 Unequal Probability Sampling Using an Evaporative Index

Prior to the exploratory work initiated in Denver in 2008 [1], estimates of the fraction of "leaking" vehicles in the light-duty fleet (which would be expected to have elevated evaporative emissions) were on the order of 1/100 for the overall fleet, and lower for recently manufactured vehicles. If this estimate was correct, samples of vehicles drawn fully at random from the in-use fleet would need to be prohibitively large to access adequate samples of vehicles with evaporative "leaks." For example, if the prevalence of "leaks" in a target fleet were 1% and assuming an owner response rate of 33% could be obtained, it would be necessary to solicit participation for 3,000 vehicles and to measure 1,000 vehicles to acquire a sample of 10 vehicles with evaporative "leaks."

In this situation, in which the majority of vehicles are "clean" or "properly functioning" and the incidence of "leaks" is relatively rare, sampling with unequal probabilities based on a screening measure for evaporative emissions could greatly improve the efficiency with which vehicles with "elevated" emissions could be identified for measurement. As described above, initial testing has demonstrated that a measure such as EI23 Bin, while not perfect, is associated with the probability that a vehicle has elevated evaporative emissions. In particular, EI23 Bin, which attempts to reduce EI23's dependence on exhaust HC concentration, can be used as a screening measure that can increase the likelihood that a sampled vehicle actually has high evaporative emissions. Accordingly, EI23 Bin was used to screen vehicles for purpose of sampling in this project, as described in the next section.

2.4 Glossary of Terms

As-received condition – The fuel type, fuel tank level, and repair condition of a test vehicle when it is recruited from the fleet.

Audit truck – See RSD audit truck.

Background concentration – The concentration of a gas in the ambient air around a test vehicle.

Bench-purge – The process of back flushing the evaporative emissions control canister to remove adsorbed hydrocarbons by pulling ambient air through the canister using laboratory equipment rather than the vehicle's emission control components.

Bias – A systemic offset in measured vs. true values, caused by the experimental process.

CDPHE – Colorado Department of Public Health and Environment.

Canister – The device in an evaporative emissions control system that captures and stores evaporative emissions generated within the vehicle for later combustion by the engine. The canister typically contains activated carbon as an adsorbent.

Catalytic converter – A device located in a vehicle's exhaust system that reduces the concentrations of combustion pollutants (usually HC, CO, and NOx emissions for gasoline-fueled vehicles) through chemical reactions on the surface of a catalytic material.

Certification – The regulatory process by which newly developed prototype vehicles are tested for compliance with emissions regulations.

Chassis dynamometer – A laboratory apparatus that a vehicle can be operated on without the vehicle actually moving.

Clean-screening – A procedure or measurement that uses RSD or some other technique to select vehicles not likely to have elevated emissions.

CO_2 absorbance – The amount of light absorbed by the CO_2 in a particular volume of gas, and therefore does not pass through for detection.

Combustion stoichiometry – The ratios of reactants (e.g. fuel and air) and products (exhaust constituents) present in a combustion reaction.

CRC – Coordinating Research Council, an organization that sponsors research and communications for the automobile and oil industries.

Data packets – Templates used by project staff to both guide the test procedure and serve as a place to record relevant vehicle and test data.

Demographics – Statistical data concerning a population or subgroups of that population.

Detection limit – The lowest concentration of a substance that can be distinguished from an absence of that substance by an analytical process with some level of statistical confidence, generally 99%.

Diurnal – A daily process or event; in evaporative emissions it is a gradual warming and cooling of a vehicle fuel that simulates being parked outside during the daytime.

Diurnal heat builds – During evaporative emissions measurement, the artificial warming of an enclosure containing a test vehicle to simulate ambient diurnals.

Dynamometer – A device that allows a test vehicle to be driven over a variety of road loads and speeds while remaining stationary in a laboratory.

EI23 – The 23^{rd} running-loss index created under ERG's RSD evaporative emissions study, calculated based on a regression of the HC vs. CO_2 concentration*pathlengths captured during an RSM.

EI23 Bin – A transformation of EI23 values that was created to reduce the dependence of EI23 measurements on vehicle speed and exhaust hydrocarbon concentration.

Enhanced – The emissions certification standards for light-duty gasoline vehicles that were phased in during the 1996-1998 model years, were fully in place for the 1999-2003 model years, and were phased out during the 2004-2006 model years.

Enhanced I/M program – A type of Inspection and Maintenance program that meets the EPA designation of "enhanced" according to the Clean Air Act of 1990, including requirements for annual vehicle testing, dynamometer loading of test vehicles, and/or On-Board Diagnostic (OBD) testing.

EPA – U.S. Environmental Protection Agency.

ERG – Eastern Research Group, Inc.

ESP – Environmental Systems Products, Inc.

Evaporative emission control system – The group of devices and design properties of a vehicle that serve to prevent fuel vapors from escaping into the atmosphere.

Evaporative emissions – Unburned fuel that escapes into the atmosphere from a vehicle and does not get burned in the engine.

Evaporative emissions (Evap) index - A mathematical method for a measurement of evaporative emissions based on raw values collected during an RSD measurement.

Evaporative emissions mode – The operational condition of a vehicle in which evaporative emissions are released, either during operation (engine running), hot-soaking (engine recently turned off and still warm), or cold-soaking (engine off and at ambient temperature).

Evaporative emissions process – The method by which evaporative emissions are released from a vehicle into the atmosphere, either by direct vapor venting, permeation of components, or liquid fuel leaks.

Exhaust emissions – Emissions that are released primarily from a vehicle's tailpipe.

Federal Test Procedure (FTP) – The process that must be followed to test a vehicle for exhaust and evaporative emissions in order to receive EPA certification for the sale of new vehicles.

FTP-specification – A test, laboratory configuration, or method that satisfies all of the requirements of the FTP, as given in Part 86 of the Code of Federal Regulations.

FTP-75 – The primary transient chassis dynamometer test cycle given in the FTP; a speed vs. time trace that is driven on a dynamometer for the measurement of vehicle emissions that simulates the vehicle traveling about 11 miles at approximately 21 mph.

Fuel-delivery system – The group of components of a vehicle that are designed to store fuel and transport it to the engine for combustion.

g/Qhr – grams per quarter hour, grams per 15 minutes.

Gross liquid leakers – Vehicles that have extremely high evaporative emissions rates due to liquid leaks from their fuel systems.

HC – Hydrocarbon.

HC time trace – The 50 raw measurements of HC concentration*pathlength, taken periodically over the 0.5 s duration of an RSM.

HLDT – Heavy light-duty truck; a truck with a gross vehicle weight between 6,000 and 8,500 lbs.

Hot-soak – The condition in which a vehicle's engine has recently been switched off but still has an elevated temperature compared to ambient conditions.

I/M – Inspection/Maintenance. A program that attempts to reduce or maintain low emissions for vehicles in the fleet by identifying vehicles that have emissions higher than they were designed to emit and forcing them to be repaired.

I/M lane – A lane within an I/M station that is equipped with emissions-inspecting and/or safety-inspecting personnel and equipment.

I/M station – A facility with emissions and/or safety inspection personnel and equipment that is part of an I/M program.

IM240 – A specific 240 second transient chassis dynamometer driving schedule used to operate a vehicle for consistent testing of vehicle exhaust emissions.

Implanted leak – a liquid or vapor leak deliberately made to a test vehicle's fuel metering or emission control systems for research purposes.

IR – Infra-red electromagnetic radiation.

LDGV – Light-duty gasoline vehicle.

LDT1 – Light-duty truck, category 1; a truck with less than 6000 lbs. gross vehicle weight and less than 3750 lbs. loaded vehicle weight.

LDT2 - Light-duty truck, category 2; a truck with less than 6000 lbs. gross vehicle weight and between 3750 and 5750 lbs. loaded vehicle weight.

Light-duty vehicle – A passenger car or passenger car derivative capable of seating 12 passengers or less.

MCM – Modified California Method; a method of inspecting the fuel handling system and evaporative emissions control system of a vehicle using visual, olfactory (smelling), and electronic HC detector.

MOVES – Motor Vehicle Emissions Simulator; the most recent model used by EPA for the estimation of pollutant emissions from the national fleet of in-use vehicles.

NO – Nitric oxide; a combustion pollutant that typically makes up the majority of nitrogen oxides in gasoline vehicle exhaust and oxidizes to NO_2 in the atmosphere.

Noise – Random variability that is introduced to the measured value from any of a variety of sources. In general, noise degrades the detection limit of an analytical system.

NO_2 – Nitrogen dioxide; a toxic gas and a combustion pollutant that typically makes up a small part of nitrogen oxides in gasoline vehicle exhaust.

NO_x – Nitrogen oxides; in exhaust, the sum of NO, NO_2 , and other lower-concentration nitrogen/oxygen compounds.

Olfactory inspection –The process of searching for evaporative emissions based on smell.

OBD - On-board diagnostics; an automotive system with the ability to continually track the functionality of emissions control and other components and alert the driver or vehicle inspector when a problem is found.

ORVR – On-board refueling vapor recovery; an evaporative emissions control system that captures fuel vapors that are displaced during vehicle refueling; also a test procedure in the FTP that measures the system’s effectiveness.

Offgassing / offgassed – The emissions of hydrocarbons from non-fuel related and solid sources such as plastics and rubber.

Oxygenates – Fuel additives that contain oxygen, such as alcohols and ethers, which reduce CO formation during combustion.

Pathlength – The linear distance through a medium that a light beam must travel; in this study, the distance between the emitter and detector units of the RSD which was effectively twice the distance across the vehicle measurement lane.

Permeation – The seeping of hydrocarbon through its containment vessel, either fuel hose, tank, or other solid fuel system component; one of the evaporative emissions processes.

Precision – A quantification of the repeatability or reproducibility of a particular measurement process.

Pre-enhanced – The emissions certification standards for light-duty gasoline vehicles that were in force before the enhanced standards. Pre-enhanced standards were fully in place for the 1981-1995 model years, and were phased out during the 1996-1998 model years.

PSHED – A portable SHED. A portable version of the SHED developed for low cost and field deployment.

RSD – Remote Sensing Device. Instrumentation that uses a light beam shining across the road to measure the near-instantaneous emissions of the vehicle as it drives past the instrument.

RSD attenuation data – The time series of measured light concentration*pathlength values of HC, CO, NO, and CO_2 in the vehicle plume measured each 10ms over the 0.5 second duration of an RSM.

RSD audit truck – A truck used to test RSD instruments by presenting them with synthetic exhaust emissions with known concentrations. These exhaust emissions are commonly produced by the release of dry bottled gas through a simulated tailpipe while the real engine exhaust is routed through a real tailpipe high over the cab so that they do not enter the RSD light beam.

RSM – remote-sensing measurement.

Running-loss – Evaporative emissions that occur while a vehicle is operating.

RVP – Reid vapor pressure; a measure of the volatility of gasoline at 100°F.

SAS – Statistical Analysis System.

scfh – Standard cubic feet per hour. A unit for volumetric gas flow at standard temperature and pressure.

Seal barometric pressure – The ambient barometric pressure at the time that the PSHED door was closed and sealed with the test vehicle inside the PSHED.

Seal temperature – The temperature of the air inside the PSHED at the time that the PSHED door was closed and sealed with the test vehicle inside the PSHED.

SHED – Sealed Housing for Evaporative Determination. A special enclosure used to measure evaporative emissions of a vehicle by placing the vehicle in the enclosure and measuring the concentration of emissions building up in the enclosure's air.

"Sniffer" – An electronic device for detecting HC vapor; used in the MCM procedure.

Spitback – The quantity of liquid fuel that is ejected during filling as the tank approaches full capacity; a procedure in the FTP that measures for this quantity at a certain specified fill rate.

Tier 2 – The set of vehicle emissions standards and test practices mandated by EPA that was phased in during 2004-2006 model years and was fully in effect beginning in 2007.

Two-speed-idle test – An exhaust emissions concentration test, typically performed by enhanced I/M stations on vehicles that cannot be tested on a chassis dynamometer, that involves measuring HC and CO emissions at low and medium engine speeds with the vehicle stationary and in neutral.

Unequal probability sampling – A type of selection in which individuals from a population do not all have the same likelihood of selection.

UV – Ultra-violet electromagnetic radiation.

VDF – The unique serial number given to each RSM by a particular RSD unit, usually reset to 1 at the beginning of each test day.

Vehicle Emissions Control Information (VECI) Label – An under-hood placard containing a summary of the emissions standards that the vehicle meets, along with its engine and evaporative emissions control system family codes.

VECI engine family – The engine family as shown on the VECI label.

VECI evap family – The evaporative emissions control system family as shown on the VECI label.

VECI model year – The model year of the emissions control standards that the engine was certified to as shown on the VECI label.

Vehicle specific power (VSP) – A quantification of the power output of a vehicle divided by its weight in order to compare engine output levels among different types of vehicles; usually expressed in units of kW/Mg.

Vehicle conditioning – The process of operating a vehicle over a known and repeatable cycle with the intent of ensuring that each test vehicle has similar levels of evaporative canister loading as well as stabilized engine temperatures.

VIN – For 1981 and newer vehicles a 17-digit alpha-numeric string that contains encoded information about the make, model, model year, engine, manufacturer and other vehicle information. VINs are unique to individual vehicles. Before 1981 VINs did not have a standardized format among all manufacturers.

VIN stem – The first through ninth plus eleventh characters of a 1981 or newer VIN. The VIN stem is not unique to an individual vehicle but does contain the encoded information about make, model, model year, engine, manufacturer, and other vehicle information.

Visual inspection – The process of a technician looking at vehicle components for presence or damage; I/M inspections include a visual inspection for the presence of a catalytic converter, and the MCM includes visual inspection for liquid leaks or fuel stains.

3.0 Methods

3.1 Project Goals

The substantive goal of the project is to estimate the cumulative distributions of evaporative emissions in the light-duty vehicle and light-duty truck fleets. For a given definition of “elevated” emissions, defined as hot-soak emissions for this project, the distributions indicate the frequencies of vehicles expected to meet these emission characteristics. These distributions are to be estimated for a set of model-year groups representing important combinations of fuel-delivery systems technology and evaporative emissions standards.

In conducting this work, there were two methodological goals. One methodological goal was to apply cost-effective and efficient methods of measuring evaporative emissions. A second methodological goal was to apply a screening method to improve the efficiency of identifying and sampling vehicles with “elevated” evaporative emissions.

3.1.1 Key Variables

For purposes of the project, the term “evaporative emissions” denotes the mass of hydrocarbons measured during a specified period of time during which the engine is hot after operation but is not running, i.e., “hot-soak” emissions. Additionally, “elevated” emissions are defined as emissions exceeding a specified rate for the measurement technique used. However, as will be discussed, the frequency of “elevated” emissions depends on the threshold or thresholds used, i.e., frequencies increase as the threshold decreases. For this project, emissions were measured as the mass of hydrocarbon vapor measured during a 15-minute hot-soak in an enclosed space (g/Qhr).

3.1.2 Target Population and Sampled Fleet

The population of vehicles targeted by the study includes gasoline-fueled light-duty vehicles (LDV) and light-duty trucks (LDT)s manufactured between 1960 and 2010 and operating in the Denver metropolitan area. Vehicle classes considered eligible for measurement included LDV, LDT1, and LDT2, due to size limitations in the measurement enclosure.

The pool of vehicles available for sampling and measurement includes privately-owned vehicles entering the Ken Caryl Station to undergo maintenance inspections for purposes of vehicle registration during the months of July-September, 2009.[5]

Note that the pool of vehicles entering the station does not include vehicles exempted from inspection through the City’s “clean-screen” program. On an ongoing basis, remote-sensing measurements are conducted on vehicles traveling throughout the city. A vehicle receiving two or more measurements rated as “clean” is exempted from its next emissions inspection. It is estimated that 30-40% of vehicles are exempted from inspection through the clean-screen program.

[5] Measurements were conducted between June 29 and September 4, 2009.

3.2 Screening, Sampling, and Recruitment

3.2.1 Sampling

As vehicles entered the I/M station, they were sampled with "probability proportional to evaporative index" (ppEI). The index used was "EI23 Bin." When vehicles entered the station, they passed a remote-sensing instrument operating in the driveway. A sign instructed drivers to come to a stop about 40 feet before the remote-sensing unit and then to accelerate past the van. As each vehicle passed, instrumentation measured its emissions, speed, and acceleration. After passing the instruments, each vehicle joined a queue of vehicles awaiting their inspections or parking in the station parking area to the northwest of the driveway.

After obtaining a measurement for each vehicle, an algorithm immediately assigned each vehicle to an EI23 Bin. Vehicles assigned to the lowest and highest Bins (Bin 1 and Bin 7, respectively) are expected to have the lowest and highest probabilities of having elevated evaporative emissions.

Concurrently, a random number generator in the remote-sensing software determined whether each vehicle was drawn into the sample. Each EI23 Bin was assigned a specific sampling fraction, with the lowest bins sampled at low rates and the highest three bins sampled "with certainty." The sampling fractions for the index bins are shown in Table 3-1. Since each vehicle was drawn into a bin with a known sampling fraction, the fractions can be used during analysis to relate the results to the fleet from which they were drawn.

In addition, as a standard step in remote-sensing, an estimate of vehicle-specific power (VSP) was calculated for each vehicle using its speed and acceleration. The VSP value represents the tractive power exerted by the vehicle against the road surface at the time of measurement, normalized by the vehicle's weight. A mild acceleration as vehicles pass the sensor is considered the optimal condition for acquiring remote-sensing measurements, interpreted as a VSP range of 5-30 kW/Mg. If this criterion was met, the vehicle was targeted for recruitment if it was also drawn into the sample. Vehicles with VSP values outside this range were not recruited, even if they were "sample hits," as their values of the index were not considered reliable.

Table 3-1. Sampling Fractions by EI23 Bin

EI23 Bin	Sampling Fraction
1	0.06
2	0.06
3	0.06
4	0.30
5	1.0
6	1.0
7	1.0

Figure 3-1 shows a typical remote-sensing unit set-up – although this photograph was taken at Lipan Street I/M station. The photograph shows the remote-sensing van, the source/detector module and retro-reflector on the left and right sides of the driveway. The speed/acceleration measurement components are located about six feet up-traffic from the remote-sensing unit. A video camera is located about 30 feet to the rear of the van to obtain digital photographs of the vehicle and license plate images from the rear. Traffic cones direct control the flow and speed of vehicles as they drive through the RSD measuring area. These components were set up similarly at Ken Caryl station.

Figure 3-1. Remote-Sensing Van and Instruments in Operation

3.2.2 Recruitment

If a vehicle was targeted, a recruiter visited with the driver and briefly described the nature of the project as well as rental car availability and the cash incentive. At this time, the recruiter also completed the first page of the data packet (see page C-1 of Appendix C), taking down information including the vehicle make, model, color, and license plates. During this meeting with the driver, the recruiter determined whether the vehicle was eligible to participate in the study (see page C-2 of Appendix C). The primary reason why vehicles were considered ineligible was that they were too large to fit into the measurement enclosure. If the vehicle was found to be eligible, the recruiter then asked the driver to participate. If the vehicle was ineligible or if the driver chose not to participate, the meeting was concluded and the vehicle released.

If the driver agreed to participate in the study, the recruiter completed the driver questionnaire with the participant (see page C-3 of Appendix C) while the vehicle concurrently went through the I/M lane for its inspection. If the driver had come to the I/M station for business other than an inspection, the vehicle was still eligible as the occurrence of the inspection was incidental to this project. The recruiter then issued a rental car to the participant, if desired, and estimated the time when testing would be complete to allow the participant to plan accordingly (see page C-4 of Appendix C).

3.3 Vehicle Inspection (The "Modified California Method")

Following sampling and recruitment, the fuel-delivery and evaporative-control systems of each vehicle were inspected. This type of investigation consisted of a visual and olfactory inspection of each vehicle, supplemented by the use of a handheld instrument capable of detecting hydrocarbon vapors, i.e., a "sniffer." A staff member inspected the gas cap and fuel filler, the fuel tank and lines under the vehicle, engine components under the hood, and the evaporative emissions control system, including canister, vapor lines, and any other accessible component. A portion of the inspection was conducted with the engine running and the remainder with the engine off. Inspectors recorded any observations concerning detection of vapors or liquid fuel, whether detected visually, by smell or by the detector (see page C-6 of Appendix C). This procedure, known as the "Modified California Method" (MCM)[6], was performed to enable follow-up investigation of measurements obtained from the sample of recruited vehicles.

The device used was the Combustible Gas Detector (Snap-On Tools, Stock# ACT790), shown in Figure 3-2. The unit can be used to detect the presence of hydrocarbon vapors in the immediate vicinity of the probe. Detectable compounds include acetylene, methane, ethane, propane, isobutene, hydrogen, acetone, methanol, and gasoline. The battery-operated unit uses a solid electrolyte to detect hydrocarbons with a propane sensitivity of < 10 ppm, although the detection is mostly qualitative, not quantitative (i.e., three levels of sensitivity are reported).

Figure 3-2. Hydrocarbon Vapor Detector

[6] The "Original California Method" included only visual and olfactory inspections; the method is considered "modified" primarily due to inclusion of the hydrocarbon detector.

The MCM Inspection consisted of the following steps:

With engine warmed up and running:

- Inspect the seal of the gas cap to the filler neck flange.
- Inspect underbody fuel delivery and return lines.
- Inspect bottom of fuel pump.
- Inspect pressure line from fuel pump to fuel metering assembly.
- Inspect in-line fuel filter (if so equipped).
- Inspect fuel inlet to carburetor or fuel rail.
- Inspect fuel rail and fuel rail connectors (if so equipped).
- Inspect individual fuel injectors (if so equipped).
- Check floor under vehicle for any sign of fuel accumulation.

With the engine turned off:

- Check fuel fill pipe, particularly around joint to tank.
- Check bottom of tank, particularly around rust spots, mounting straps, and any spots showing road damage.
- Check any non-OEM installations (particularly second fuel tank add-ons) that merit close inspection.

During and after the inspection, the inspector noted the components that appeared to be sources of hydrocarbon vapors, classifying each in terms of its relative severity. Also, the inspector noted whether detected sources involved loss of fuel vapor or liquid fuel, and if possible, whether the mechanism of loss involved expulsion or permeation. Because the MCM was conducted in two steps with the engine running and then turned off, the inspection was intended to find sources of both running-loss and hot-soak emissions. As the MCM inspection took place in the open I/M station it was subject to the ambient conditions of the outdoor air. Due to its nature, and lack of access to components and connections in very confined or inaccessible areas, the inspection could not identify or isolate every source of hydrocarbon vapors.

3.4 Measuring Hot-Soak Emissions (portable SHED)

In the laboratory, a facility designed for measurement of evaporative emissions is designated as a “Sealed Housing for Evaporative Determination” (SHED). The enclosure allows for measurement of hydrocarbon emissions from a stationary vehicle. During measurement, the engine may be running or off, and hot or cold (hot-soak or cold-soak). A laboratory SHED, capable of complying with the federal test procedure for evaporative emissions certification[7], is expensive to build, maintain, and operate. Laboratory SHEDs are typically used for assessment of hot-soak and diurnal emissions.

For purposes of this project, a more practical and cost-effective approach was devised to enable timely measurement of the relatively large sample of vehicles included in the study. The basis of the approach adopted is a “portable” or “temporary” vehicle shelter tent. The tent used had nominal dimensions of 20’0” long × 10’8” wide × 9’9” high, giving an internal volume of

[7] As specified in 40 CFR Part 86, Subpart B.

approximately 1,788 ft^3. The enclosure did not have a floor or well-sealed joints where the different pieces of fabric met. For this study, project staff placed sheet plastic on the floor and across fabric joints and sealed the plastic to the enclosure fabric with duct tape. Additionally, a removable sheet of plastic was used for a second layer on the floor. This sheet was checked between tests to ensure that no fluid leaks caused increases in background concentrations and to prevent damage caused by vehicles driving in and out. The background concentration was monitored between tests to detect additional sources of hydrocarbon vapors. As necessary, the flooring sheet was cleaned if such sources were identified. This enclosure will be referred to as the "portable SHED" (PSHED).

To promote mixing of air and vapors throughout the enclosure and reliable measurement of vapor concentrations, two 10-inch diameter floor fans were used along with one 20-inch box fan. The smaller fans were located coaxially in series at the top of the enclosure returning air backwards over the top of the vehicle, and the box fan was located behind the vehicle facing forward, directing air under the center rear of the vehicle. The adequacy of air circulation was confirmed by monitoring the time dependence of hydrocarbon concentrations during releases of propane inside the enclosure.

The PSHED was instrumented to continuously measure hydrocarbon concentrations, temperature, and barometric pressure. The HC analyzer and control software dedicated to the I/M lane housing the PSHED were modified to read the HC concentration in the enclosure. Sensors for temperature and pressure were also plumbed into the lane's control computer to facilitate the density calculations required to convert relative HC concentration (ppm) to HC mass (g). Each PSHED test produced a separate data file including a time series for HC concentration, temperature, and ambient barometric pressure.

After the PSHED was constructed, calibration procedures were followed to verify that it functioned properly. Background HC checks were performed to measure the hydrocarbons off-gassed from the enclosure components into the enclosed air. In this test, the PSHED was closed with no vehicle inside and the HC concentration measured over time. An additional calibration test involved measurement of vapor retention and recovery within the PSHED. This test measures both leakage and the ability of the HC analyzer to accurately detect vapors inside the enclosure. In this test, a known quantity of propane was injected and then measured by the HC analyzer over time for verification.

Figure 3-3 shows the PSHED with its door open and ventilating in preparation for a test. Note the floor fan used to circulate air beneath the vehicle during the test. The two smaller fans mounted to the ceiling are not visible. Also note that the PSHED is itself indoors to reduce effects of direct sunlight and other weather elements on equipment and measurements.

Figure 3-3. Portable SHED (PSHED) with Door Open

3.4.1 Performance

The PSHED and the test procedure used in this project was designed to mimic the hot-soak portion of the Federal Test Procedure (FTP) used for emissions certification. The full FTP requires several days to conduct conditioning, refueling, and specific tests of diurnal, hot-soak and hot-running emissions. The PSHED procedures resemble the hot-soak portion of the FTP, and were designed to facilitate rapid and cost-effective measurement of emissions from large numbers of vehicles within the I/M facility. Several aspects of the performance of the PSHED are described below.

Accuracy. The accuracy of the PSHED value can be estimated from the retention and recovery tests performed twice a day during field measurements. An analysis of retention and recovery results from the Lipan Street I/M station pilot study revealed that the average recovery of a known amount of propane was 97.6% with a standard deviation of 3.3%. After 15 minutes the average retention was 95.7% with a standard deviation of 2.3%. Thus, typical accuracies were in the range of 91 to 104% for the 15-minute hot-soak measurement period.

Precision. The standard deviations of the retention and recovery tests give an indication of the precision of measurements within the PSHED. Standard deviations of 2.3 to 3.3% seem to be typical. While, these values are derived from propane injected into the empty PSHED, rather than to actual measurements on sampled vehicles, they provide an estimate of measurement variability attributable to the construction of the enclosure. Additional estimates of uncertainty due to measurement variability arising from other sources were assessed through data on repeat measurements in laboratory SHEDs (LSHED) and PSHEDs [15]. See Appendix D for comparison of PSHED and LSHED data.

Limit of Quantitation. The hot-soak measurement in the PSHED was obtained from a cumulative time series of concentrations with a vehicle inside. Off-gassing tests were also made by monitoring the PSHED HC concentration over a period of time when a vehicle was not inside. Examination of the HC time series from the off-gassing tests and the background measurements in the few minutes before a vehicle was placed into the PSHED indicates that the enclosure is capable of quantifying a change in vapor concentrations over 15 minutes equivalent to a mass rate of approximately 0.01 g/Qhr or more.

Bias. To assess correspondence between PSHED and LSHED measurements, CDPHE staff measured hot-soak emissions from 15 vehicles over a 15-minute period in both enclosures. An analysis of data is included in Appendix D. It shows that the PSHED tends to show a slight negative bias relative to the LSHED. This result appears to agree with the tendency of the retentions and recoveries of the PSHED to be less than 100%. In any case, the PSHED serves as a reasonable surrogate for the LSHED in that the correlation between PSHED and LSHED is approximately as high as that seen between repeat measurements in either the PSHED or the LSHED.

3.5 Procedure

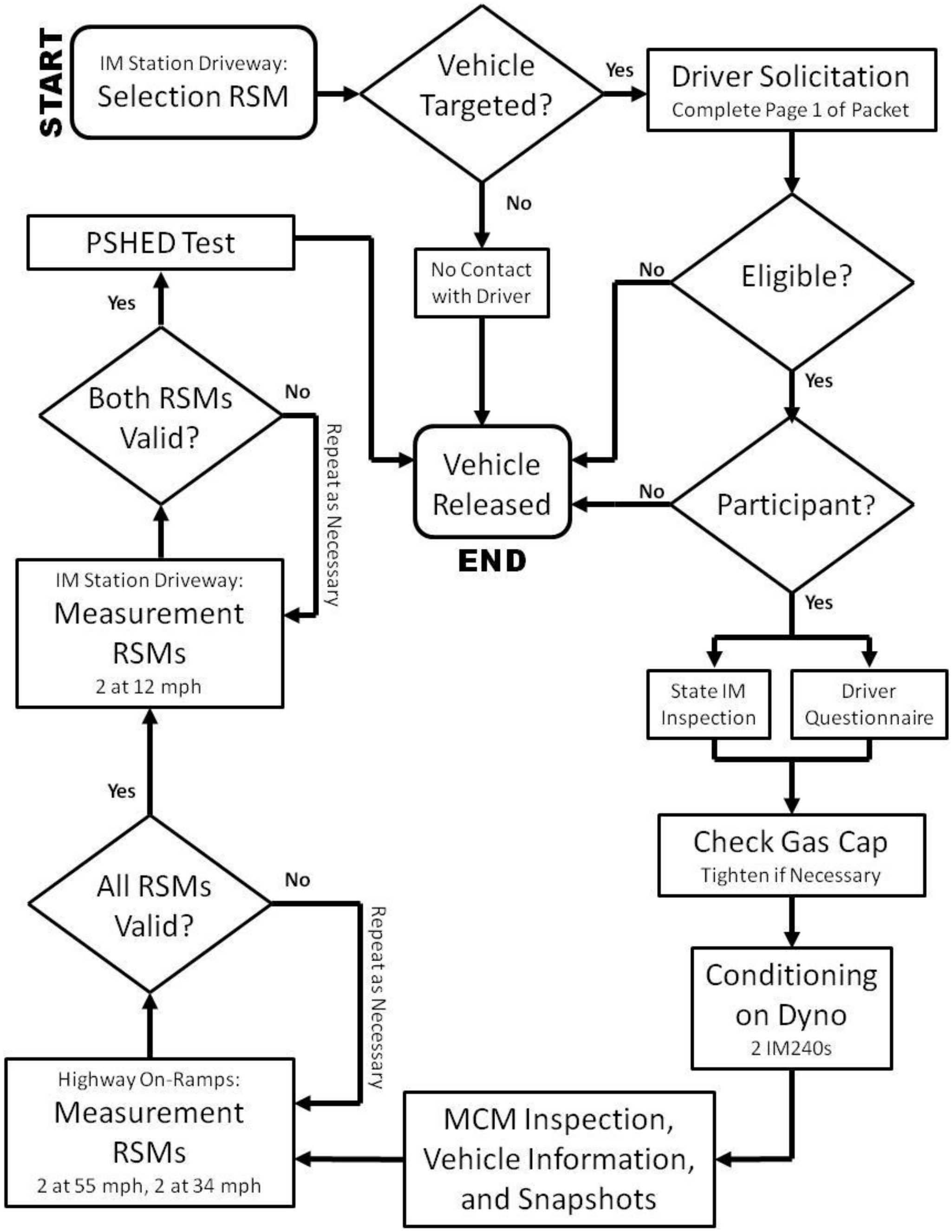
After a vehicle was recruited, the following procedure was followed. The steps are summarized in Figure 3-4.

- **Check gas cap** – After the I/M test was complete, which included a gas cap pressure check, project staff checked that the vehicle gas cap was installed properly and tightly.

- **Condition in I/M Lane** – For conditioning, the vehicles were driven over two consecutive IM240 cycles on the dynamometer in the unused lane of the station; emissions of the vehicle were not measured during these cycles. If the lane was not available, or if the vehicle was all-wheel drive or had permanent traction control, a member of the staff drove the vehicle on the road for approximately 10 minutes on Kipling Parkway.

- **Perform MCM Inspection** – The vehicle was then immediately moved to a reserved location in the building without turning off the engine. The vehicle was parked and staff member performed an initial inspection, following the “Modified California Method,” as described above. This step included a visual inspection of the evaporative and fuel systems as well as the air surrounding these components with a hydrocarbon vapor detection tool, or “sniffer.” The inspector followed a checklist in the data packet as a guide (see page C-10 of Appendix C). The inspector made notes describing unusual findings, including components that could not be located.

Figure 3-4. Procedure for Sampling, Recruitment, and Testing at Ken Caryl Station



- **Record Vehicle Information** – The inspector then recorded detailed vehicle information such as the vehicle identification number (VIN), engine and evaporative families, and the fuel level (see page C-12 of Appendix C). Finally, a staff member took digital pictures of the front and rear of the vehicle, the VIN, and the under-hood emissions family (VECI) label. The front and rear pictures included both the license plate as well as a board displaying the packet ID number to positively connect the vehicle pictures to the corresponding data packet.

- **Condition on the Road** – Following the inspection, the vehicle was driven over a specified drive route to stabilize the engine at operating temperature. The route took approximately 15 minutes and is shown in Figure 3-5. During the conditioning run, additional remote-sensing measurements were obtained on each vehicle. However, these measurements were not used in the analysis and are not discussed further.

- **Ventilate PSHED** – While the vehicle was on the conditioning route, the PSHED was opened with the fans circulating to minimize background HC levels by flushing vapors remaining from the previous vehicle.

- **Warm up vehicle** – When the vehicle returned from its conditioning run, it was brought to the PSHED entrance with the engine running.

- **Initiate PSHED software** – The operator started the SHED test procedure in the software and recorded the time, HC concentration, temperature, and ambient barometric pressure as "Initial PSHED" conditions in the data packet (see page C-16 of Appendix C). The operator started continuous (1 Hz) electronic data collection through the modified I/M lane analyzer and software.

- **Bring the vehicle into the PSHED** – The driver drove the vehicle toward the PSHED entrance and shut off the engine prior to entering. The driver then coasted into the PSHED and stopped when the door could be closed behind the vehicle. The operator placed the box fan behind the vehicle facing forward. Concurrently, the driver quickly exited the vehicle and assisted the operator in zipping the door shut and attaching a magnetic flap at the bottom of the door. The operator recorded the time, HC concentration, temperature, and ambient barometric pressure as "Door Sealed" conditions in the data packet.

- **Perform Hot-Soak Test** – The vehicle was left to soak in the PSHED for 15 minutes. Conditions within the enclosure including the hydrocarbon concentration were measured continuously at 1 Hz during this period.

- **Record final conditions** – After the hot-soak was complete at 900 seconds after sealing the door, the operator recorded the HC concentration, temperature, and pressure inside the PSHED as the "Final PSHED" conditions in the data packet. The software then calculated the total mass of hydrocarbons released by the vehicle during the 900-second period. The hot-soak value for each vehicle was calculated as the difference in hydrocarbon concentration observed over the 900 sec period following the "door sealed" point.

- **Remove vehicle** – The PSHED was then opened, the vehicle driven out, and fans left circulating in order to ventilate the PSHED for the next test vehicle.

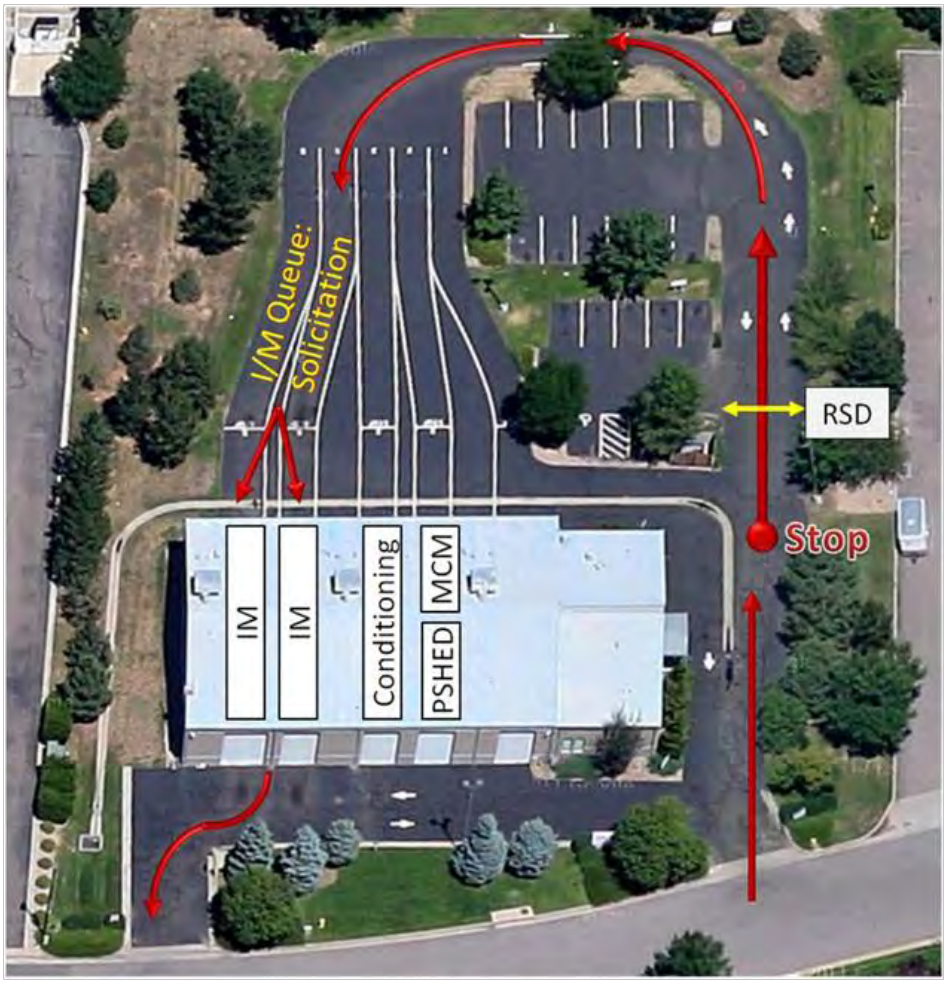
- **Repeat Tests** – If a problem was encountered with the measurement systems during the PSHED test, the vehicle was conditioned again over duplicate I/M240s and tested again. Such problems were uncommon.

- **Release the Vehicle** – The final step of the process for most vehicles was meeting with the driver again, paying the incentive, receiving the rental car if loaned, and returning the keys and vehicle to the driver.

Figure 3-5. Conditioning Route and Locations of Remote-Sensing Instruments

The data collection process occupied two lanes of the I/M station. Figure 3-6 shows the lanes that were used for vehicle warm-up/conditioning on the dynamometer, the inspection, and the PSHED. The two leftmost lanes in the photograph were those that were in use for the I/M inspections.

Figure 3-6. Study Layout at Ken Caryl Station



3.6 Data Quality-Control Procedures

A paper data packet (Appendix C) was started for each vehicle to be recruited. Each packet was labeled with a unique identification number. Packets and packet numbers were assigned to solicitations that resulted in non-participants as well as those that resulted in participants. Occasionally, vehicles were selected more than once by the Driveway RSD unit. In those cases, an individual vehicle had more than one packet assigned to it.

Information about each vehicle was recorded in the packet. For non-participating vehicles, the packet information included the recruiter contact date and time, remote-sensing measurements, and EI23 Bin, as well as vehicle information such as make, model, model year, license plates, and study eligibility status (see page C-1and C-2 of Appendix C). For participating vehicles, additional detailed information was recorded in the packet, including vehicle history, conditioning information, I/M gas cap inspection result, inspection results and PSHED results. A total of 569 Packet ID Numbers were created.

The paper data packets were transcribed into an Excel spreadsheet that included all available information for each packet ID number. This spreadsheet was then read into SAS format as the foundation of a database for the study.

A paper log was maintained by the operators of each remote-sensing unit. Each participating vehicle that passed the unit was recorded in the paper log, including date, time, rear license plate, make and model. The logs were transcribed and read into SAS format. The log data was matched to the packet data, and any disagreement between the two (such as differing license plates, or incorrect dates or times) was investigated and resolved. The investigation included (as needed) inspection of photographs of the rear of each vehicle, inspection photos of the vehicle, VIN, and VECI label, and the original paper packet and log sheets.

The data file containing all remote-sensing observations was read into SAS format and merged with the packet and RSD log. Again, any discrepancies were investigated and resolved.

All I/M inspection records for the Ken Caryl station for the dates of this study were obtained and read into SAS. These were matched to the packet, remote-sensing log, and remote-sensing data, and again any discrepancies were investigated and resolved.

At this point, a complete database had been created, containing all vehicle information, remote-sensing information, gas-cap result, inspection results, PSHED, and IM240 results, for each vehicle with a packet ID number.

4.0 Analysis

4.1 Data Examination

During the project, nearly 6,000 vehicles entering Ken Caryl station were screened. In Table 4-1, the screening results for the entire set are tabulated by model-year group. The majority of vehicles were in the 1996-2003 model-year group (57%), although substantial fractions were in the 1981-1995 and 2004-2010 model-year groups (24% and 17%, respectively). Not unexpectedly, vehicles manufactured prior to 1980 formed a small fraction of incoming vehicles (1.6%).

From the set of screened vehicles, 550 individual vehicles were targeted for solicitation for evaporative emissions measurement. These vehicles fell into three groups: 50 ineligible vehicles, 325 eligible non-participating vehicles, and 175 participating vehicles. Thus, these counts indicate that 35% (=175/500) of eligible vehicles participated in the intensive evaporative emissions testing.

Ineligible Vehicles – Ineligibility was determined at the time of solicitation by the recruiter in consultation with other members of the project staff. The reasons for ineligibility were "Too Big" (26 vehicles), "Heavy-Duty" (1 vehicle), "Motorhome" (19 vehicles), and "ESP employee[8]" (4 vehicles). The "Too Big," "Heavy-Duty," and "Motorhome" vehicles were ineligible because they would not be able to fit inside the PSHED. Occasionally, the vehicles of ESP employees assisting with the project would be targeted by the remote-sensing unit as they entered the I/M station grounds. Since these vehicles were not vehicles entering the station for an inspection, they were not considered eligible for solicitation.

Eligible Non-Participants – A subset of vehicles designated as "Commercial Vehicle" (1 vehicle), "Dealer" (7 vehicles), "Fleet Vehicle" (3 vehicles), "Not Owner" (10 vehicles) were not included in the study even though the project staff considered them eligible. "Dealer" vehicles were brought to the I/M station for inspection by an automobile dealer. "Not Owner" vehicles were driven by a party other than the owner who was not comfortable committing the vehicle to the project. The drivers of the remaining 304 eligible not-participating vehicles chose not to participate for a variety of reasons.

Participants – Table 4-2 and Table 4-3 show the distributions of EI23 Bin by model year group for the 500 eligible vehicles and 175 participants, respectively. Both tables show that vehicles in older model-year groups tend to have higher index values than those in newer model-year groups. Figure 4-1 and Figure 4-2 show the model-year distributions of the sets of eligible and participating vehicles, respectively. The figures show that sixteen MY 2006-2009 vehicles were eligible, but none of the owners of those vehicles chose to participate. In the analysis that follows, the 2004-2010 model year group is represented by the 13 vehicles in MY 2004-2005. Eligible vehicles in the 2004-2005 model year group assigned to EI23 Bins 4 and 5 did not participate.

[8] The inspection and maintenance program is run by Environmental Systems Products (ESP) under contract to the State of Colorado.

Table 4-1. Screening Index (EI23 Bin) by Model-Year Group for Screened Vehicles

EI23 Bin	Model Year Group					Total
	1961-1970	1971-1980	1981-1995	1996-2003	2004-2010	
1	0	5	227	761	247	1,240
2	3	14	482	1,425	456	2,380
3	4	14	395	911	285	1,609
4	5	16	150	187	33	391
5	4	7	67	19	4	101
6	2	6	33	19	0	60
7	2	9	30	8	0	49
Total	**20**	**71**	**1,384**	**3,330**	**1,025**	**5,830**

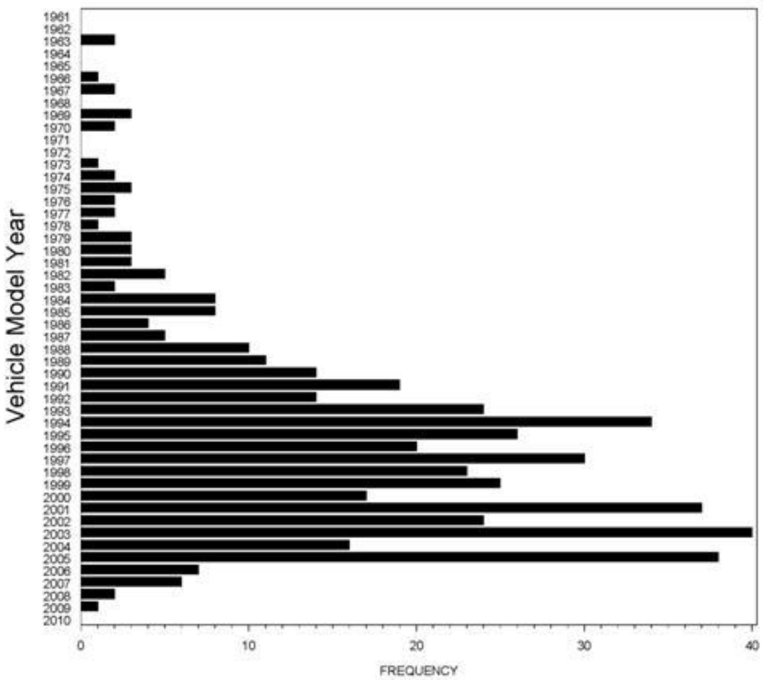
Table 4-2. Screening Index (EI23 Bin) by Model-Year Group for Eligible Vehicles in the Sample

EI23 Bin	Model Year Group					Total
	1961-1970	1971-1980	1981-1995	1996-2003	2004-2010	
1	0	0	10	41	12	63
2	1	0	27	69	28	125
3	0	0	28	36	20	84
4	2	4	38	38	7	89
5	4	4	36	12	3	59
6	2	6	22	15	0	45
7	1	3	26	5	0	35
Total	**10**	**17**	**187**	**216**	**70**	**500**

Table 4-3. Screening Index (EI23 Bin) by Model-Year Group for Participating Vehicles

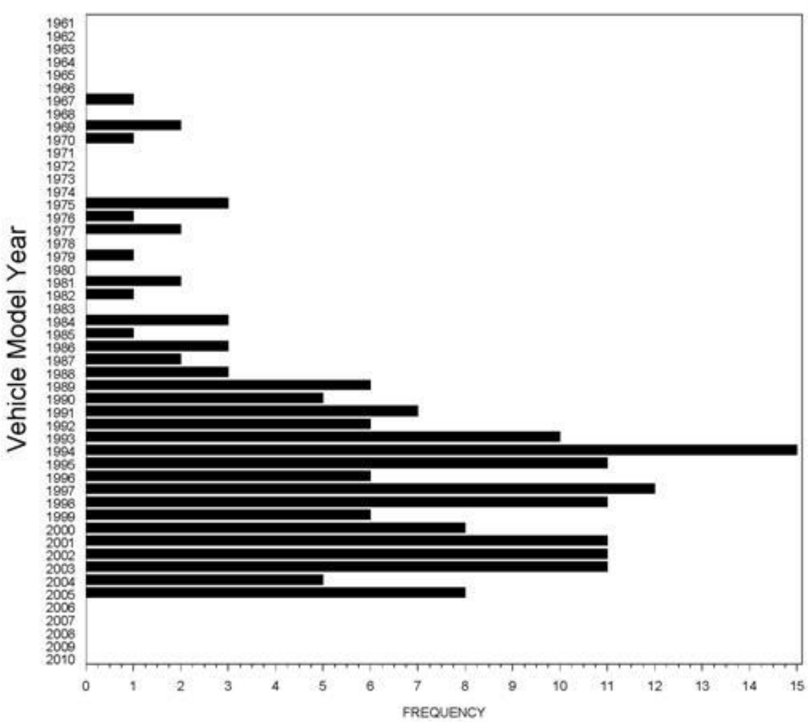
EI23 Bin	Model Year Group					Total
	1961-1970	1971-1980	1981-1995	1996-2003	2004-2010	
1	0	0	5	17	3	25
2	0	0	11	24	6	41
3	0	0	12	9	4	25
4	1	0	9	10	0	20
5	2	3	14	5	0	24
6	1	2	9	6	0	18
7	0	2	15	5	0	22
Total	**4**	**7**	**75**	**76**	**13**	**175**

Figure 4-1. Model-Year Distribution for Eligible Vehicles



Vehicle Model Year	FREQ.	CUM. FREQ.	PCT.	CUM. PCT.
1961	0	0	0.0	0.0
1962	0	0	0.0	0.0
1963	2	2	0.4	0.4
1964	0	2	0.0	0.4
1965	0	2	0.0	0.4
1966	1	3	0.2	0.6
1967	2	5	0.4	1.0
1968	0	5	0.0	1.0
1969	3	8	0.6	1.6
1970	2	10	0.4	2.0
1971	0	10	0.0	2.0
1972	0	10	0.0	2.0
1973	1	11	0.2	2.2
1974	2	13	0.4	2.6
1975	3	16	0.6	3.2
1976	2	18	0.4	3.6
1977	2	20	0.4	4.0
1978	1	21	0.2	4.2
1979	3	24	0.6	4.8
1980	3	27	0.6	5.4
1981	3	30	0.6	6.0
1982	5	35	1.0	7.0
1983	2	37	0.4	7.4
1984	8	45	1.6	9.0
1985	8	53	1.6	10.6
1986	4	57	0.8	11.4
1987	5	62	1.0	12.4
1988	10	72	2.0	14.4
1989	11	83	2.2	16.6
1990	14	97	2.8	19.4
1991	19	116	3.8	23.2
1992	14	130	2.8	26.0
1993	24	154	4.8	30.8
1994	34	188	6.8	37.6
1995	26	214	5.2	42.8
1996	20	234	4.0	46.8
1997	30	264	6.0	52.8
1998	23	287	4.6	57.4
1999	25	312	5.0	62.4
2000	17	329	3.4	65.8
2001	37	366	7.4	73.2
2002	24	390	4.8	78.0
2003	40	430	8.0	86.0
2004	16	446	3.2	89.2
2005	38	484	7.6	96.8
2006	7	491	1.4	98.2
2007	6	497	1.2	99.4
2008	2	499	0.4	99.8
2009	1	500	0.2	100.0
2010	0	500	0.0	100.0

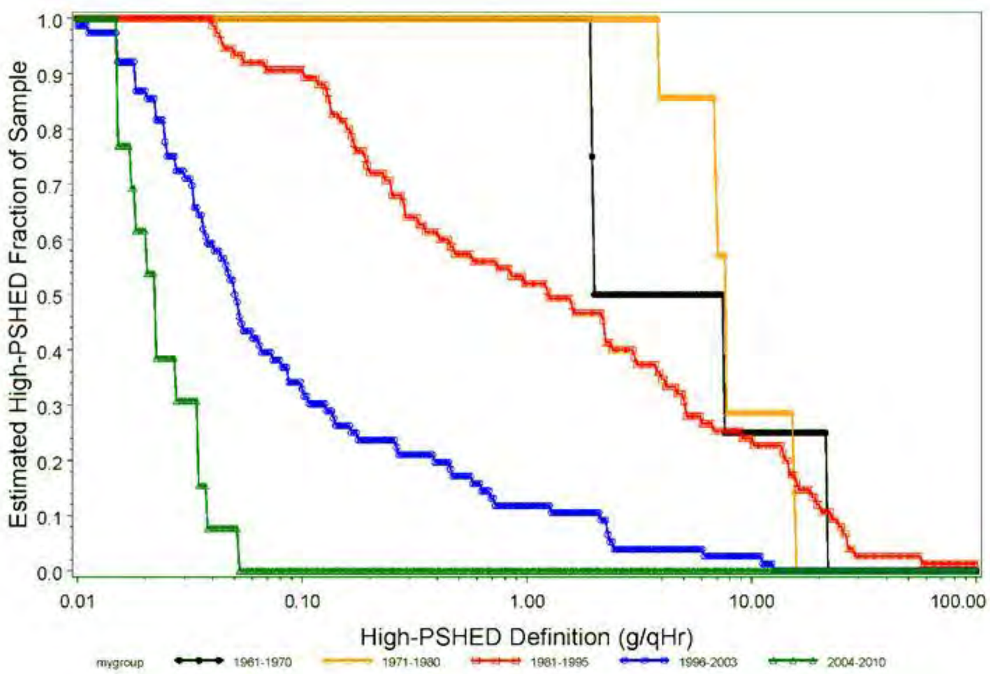
Figure 4-2. Model-Year Distribution for Participating Vehicles



Vehicle Model Year	FREQ.	CUM. FREQ.	PCT.	CUM. PCT.
1961	0	0	0.00	0.00
1962	0	0	0.00	0.00
1963	0	0	0.00	0.00
1964	0	0	0.00	0.00
1965	0	0	0.00	0.00
1966	0	0	0.00	0.00
1967	1	1	0.57	0.57
1968	0	1	0.00	0.57
1969	2	3	1.14	1.71
1970	1	4	0.57	2.29
1971	0	4	0.00	2.29
1972	0	4	0.00	2.29
1973	0	4	0.00	2.29
1974	0	4	0.00	2.29
1975	3	7	1.71	4.00
1976	1	8	0.57	4.57
1977	2	10	1.14	5.71
1978	0	10	0.00	5.71
1979	1	11	0.57	6.29
1980	0	11	0.00	6.29
1981	2	13	1.14	7.43
1982	1	14	0.57	8.00
1983	0	14	0.00	8.00
1984	3	17	1.71	9.71
1985	1	18	0.57	10.29
1986	3	21	1.71	12.00
1987	2	23	1.14	13.14
1988	3	26	1.71	14.86
1989	6	32	3.43	18.29
1990	5	37	2.86	21.14
1991	7	44	4.00	25.14
1992	6	50	3.43	28.57
1993	10	60	5.71	34.29
1994	15	75	8.57	42.86
1995	11	86	6.29	49.14
1996	6	92	3.43	52.57
1997	12	104	6.86	59.43
1998	11	115	6.29	65.71
1999	6	121	3.43	69.14
2000	8	129	4.57	73.71
2001	11	140	6.29	80.00
2002	11	151	6.29	86.29
2003	11	162	6.29	92.57
2004	5	167	2.86	95.43
2005	8	175	4.57	100.00
2006	0	175	0.00	100.00
2007	0	175	0.00	100.00
2008	0	175	0.00	100.00
2009	0	175	0.00	100.00
2010	0	175	0.00	100.00

Cumulative distributions of the raw unweighted PSHED results by model-year group for the 175 participants are shown in Figure 4-3. The scale on the x-axis shows that the fractions of vehicles interpreted as having "high" emissions depends on the values assigned as threshold(s). Note that these distributions do not reflect the effects of unequal-probability sampling or differential response rates. Therefore, these distributions cannot be taken as representative of the fleet sampled. The process involved in incorporating these factors is described in the next section and will produce substantially different distributions.

Figure 4-3. Cumulative Unweighted Cumulative Distributions of PSHED Measurements by Model-Year Group



4.2 Distributions of Hot-Soak Emissions

The previous section presented results for the 175-vehicle sample. However, because the vehicles were sampled with unequal rather than equal probabilities, additional analysis is required to develop representative results. Due to the sampling method used, the sample is likely to contain more vehicles with elevated PSHED values than the population as a whole. Nevertheless, it is possible to estimate the distributions of the PSHED values for the sampled population by considering the differential sampling rates. In addition, it is necessary to account for potential effects of differential non-response, which may be considered as a secondary "sampling" process.

When vehicles enter the sample with different selection probabilities, it is necessary to assign them different weights during analysis. With respect to sampling, the weight assigned to each vehicle is the reciprocal of its sampling probability. Thus, vehicles in the seven EI23 Bins sampled at probabilities of 0.06, 0.30, or 1.0 were assigned sampling weights of 16.67, 3.33, or 1.00, respectively. In each case, the weight represents the number of vehicles in the sampled fleet represented by each vehicle drawn into the sample. A related result is that the weights of all vehicles in the sample should sum to the number of vehicles in the sample pool.

However, in this project, the weights of the 175 measured vehicles do not sum to this total, because measurements for all vehicles in the sample were not obtained, as not all owners solicited elected to participate. For a variety of reasons 35% of drivers chose to participate and 65% chose not to participate.

It is important to recognize that non-response can change the intended structure of a sample, if response rates follow differential patterns by the important variables describing the structure of the population. If the rate of positive response to the solicitation is a function of the response variables for the project, or important variables characterizing the population, classifying response rates by these variables allows response to be treated as a secondary "sampling" process that also occurred with unequal probability. Table 4-4 shows the counts of eligible vehicles that were solicited and measured, by model-year group, as well as corresponding response rates. Overall, response rate was 35%, but the response rates suggest that owners of newer vehicles were less likely to participate than owners of older vehicles.

Table 4-4. Solicitation Response Rate by Model-Year Group

Model-Year Group	No. Eligible Vehicles Solicited	No. Eligible Vehicles Participating	Response Rate
1961 – 1970	10	4	0.400
1971 – 1980	17	7	0.412
1981 – 1995	187	75	0.401
1996 – 2003	216	76	0.352
2004 – 2010	70	13	0.186
Overall	**500**	**175**	**0.350**

Table 4-5. Solicitation Response Rate by EI23 Bin

EI23 Bin	No. Eligible Vehicles Solicited	No. Eligible Vehicles Participating	Response Rate
1	63	25	0.397
2	125	41	0.328
3	84	25	0.298
4	89	20	0.225
5	59	24	0.407
6	45	18	0.400
7	35	22	0.629
Overall	**500**	**175**	**0.350**

The low response rate for the 2004-2010 model year group suggests that drivers of new vehicles could be reluctant to release their vehicles into the care of project staff, or that they may simply not have wanted to assume the burden of participation. While drivers were certainly not aware of their EI23 Bin, the recruiters were. In fact, recruiters were given the EI23 Bin assignments of each vehicle to be solicited so that they could make special efforts to recruit vehicles in the highest three Bins. These efforts could have contributed to the noticeably higher response rate for Bin 7, as shown in Table 4-5.

4.2.1 Calculation of Weighted Frequencies

If response is viewed a secondary "sampling" process, response rates can be viewed as "sampling probabilities" and used to construct "response" weights that can supplement the initial set of sampling weights. For the purposes of this project the response structure based on model year group as shown in Table 4-4 was used. On this basis, a combined or "final" weight (w_{final}) can be calculated as the product of the sampling and response weights (w_{sample}, w_{response}), as shown in Equation 4-1. The equation can also be expressed as the product of the reciprocals of the sampling fractions and response rates f_{sample} and f_{response}.

$$w_{\text{final}} = w_{\text{sample}} w_{\text{response}} = \left(\frac{1}{f_{\text{sample}}}\right)\left(\frac{1}{f_{\text{response}}}\right)$$

Equation 4-1

After a final weight has been assigned to each vehicle, it is possible to relate the sample measurements to the population under study. As a first step, it can be shown that the sum of the final weights is an estimate of the size of the sample pool (5,830 vehicles). In addition, estimates of the fractions of vehicles with "elevated" evaporative emissions can be calculated, once a definition of "elevated" has been specified, by summing the weights of vehicles with "elevated" levels and dividing this total by the sum of weights for all vehicles, as shown in Equation 4-2.

$$f_{\text{elevated}} = \frac{\sum_{\text{elevated}} w_{\text{final}}}{\sum_{\text{Total}} w_{\text{final}}}$$

Equation 4-2

As model-year group is an important surrogate for important differences in technology and emissions standards, we performed this calculation by model-year group, as well as for the entire fleet sampled. The use of model-year groups as surrogates for technology and standard levels is approximate, and is imprecise during phase-in periods when the composition of vehicles entering the market is in flux. Nonetheless, it was adopted as a reasonable practical compromise, because while characterizing vehicles by their standards would have been ideal (and probably superior), it would also have been extremely burdensome for vehicles manufactured between 1994 and 2000, and probably impossible for vehicles manufactured prior to 1994.

Despite the fact that the processes of screening and sampling did not distinguish model year prior to drawing vehicles into the sample, fractions of vehicles with "elevated" emissions can be calculated by model-year group, as each subset of measured vehicles in each group can be taken as an independent subsample of the total sample.

4.2.2 Utility of the Screening Index

An example can illustrate the utility of the screening index as well as the importance of accounting for unequal sampling fractions and differential response rates in analysis. We have used the results from the 1991-95 model years.

For purposes of this calculation we have assigned thresholds to define “elevated” emissions for both the screening index and the PSHED measurements. For the screening index, a value greater than 200 is defined as “elevated,” and for the hot-soak measurement, a value greater than 1.0 g/Qhr is defined as “elevated.” Note that the index is assumed to indicate the probability that vehicles have elevated emissions, and that the PSHED is taken as a “truth measurement” relative to the screening index.

Figure 4-4 shows a scatter plot of unweighted hot-soak measurements vs. screening indices for this model-year group. This presentation suggests a strong correlation between the measurement and the index, and that a high fraction of vehicles have elevated emissions, as defined for this example. Figure 4-5 shows a scatter plot of the same results, accounting for the effects of unequal sampling and response rates. To incorporate these factors, each measurement was replicated w_{final} times in the plot, with a random disturbance then applied to the replicate measurements to make all data points visible (i.e., “dithering”). These steps account for the fact that cleaner vehicles, sampled at lower rates, represent correspondingly more vehicles in the fleet than “dirtier” vehicles, sampled at correspondingly higher rates. In the “weighted” presentation, it is still evident that the index shows some utility, but that the fraction of vehicles with elevated emissions is lower than the unweighted presentation would suggest.

As we are using a set of two thresholds in this example, one for the index and another for the PSHED, this framework lends itself to expression in a 2×2 table, both for estimating fractions of vehicles with elevated emissions and for assessing the usefulness of the index.

Table 4-6 shows both unweighted vehicle counts in a table format corresponding to the figures. If we take these counts at face value, and neglect the effects of unequal sampling and response rates, we would estimate the “elevated” fraction as 42/98 vehicles, or 43%.

Table 4-7 shows the corresponding analysis accounting for unequal-probability sampling and response rates. Rather than estimating the frequency based on raw vehicle counts, we use sums of final weights as shown in Equation 4-2. On this basis we estimate the “elevated” fraction as 172.5/1,222, or 14%. Having accounted for the effects of sampling and response, we interpret the weighted value as more representative of the sampled fleet than the raw unweighted value.

Figure 4-4. Unweighted Hot-Soak (PSHED) Measurements vs. Evaporative Indices (EI23) for Measured Vehicles in the 1991-1995 Model-Year Group

(Note: This presentation does not account for unequal sampling or response rates.)

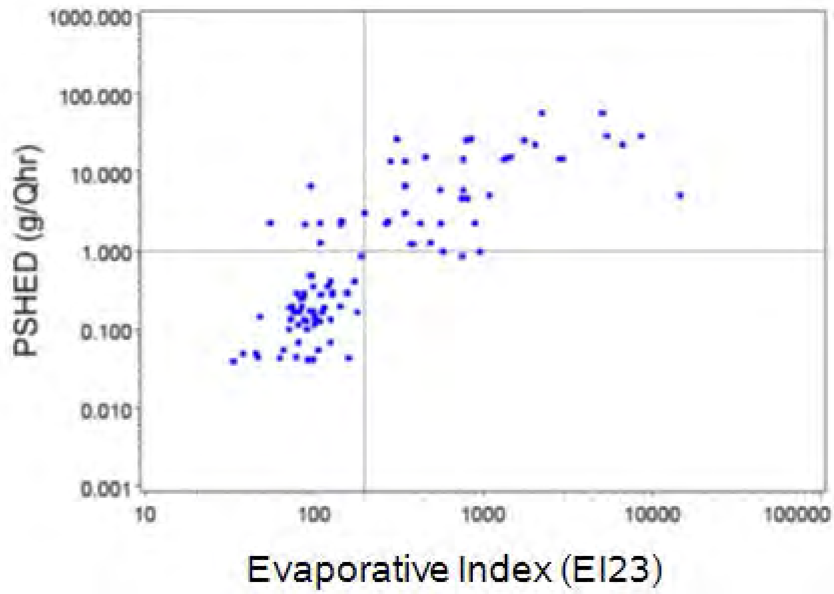


Figure 4-5. Weighted Hot-Soak (PSHED) Measurements vs. Evaporative Indices (EI23) for Measured Vehicles in the 1991-1995 Model-Year Group

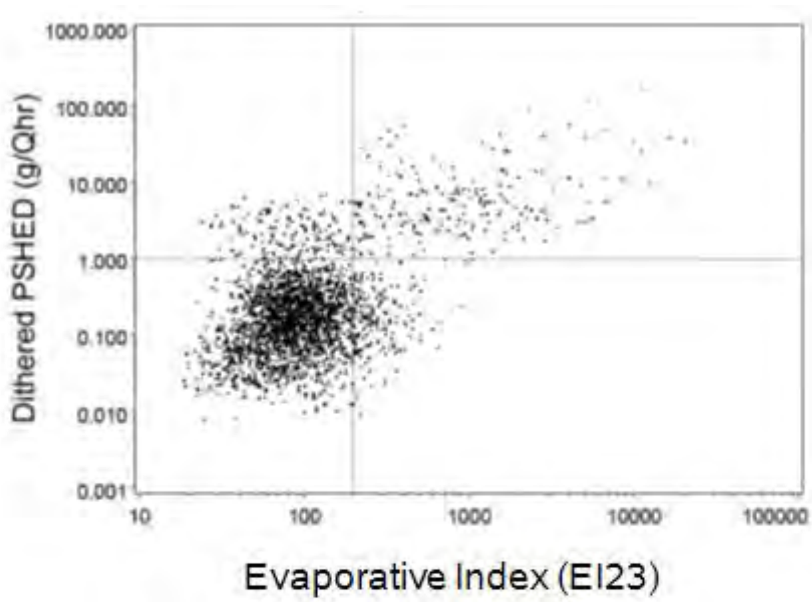


Table 4-6. Counts of Measured Vehicles Having Index and PSHED Values Less Than and Greater Than Designated Thresholds for the 1991-1995 Model-Year Group

		High EI23: NO	High EI23: YES	Total
High PSHED	YES	*c* 8	*a* 34	*a+c* 42
	NO	*d* 53	*b* 3	*b+d* 56
Total		*c+d* 61	*a+b* 37	*a+b+c+d* 98

Sensitivity = *a*/(*a*+*c*) = 34/42 = 81.0%.
Specificity = *d*/(*b*+*d*) = 53/56 = 94.6%.
Positive Predictive Value = *a*/(*a*+*b*) = 34/37 = 91.9%
Negative Predictive Value = *d*/(*c*+*d*) = 53/61 = 86.7%.

NOTE: fraction of vehicles with PSHED measurements > 1.0 g/Qhr = 42/98 = 0.43

Table 4-7. Sums of Final Weights Having Index and PSHED Values Less Than and Greater Than Designated Thresholds for the 1991-1995 Model-Year Group

		High EI23: NO	High EI23: YES	Total
High PSHED	YES	*c* 72.0	*a* 100.5	*a+c* 172.5
	NO	*d* 961.5	*b* 88.0	*b+d* 1,049.5
Total		*c+d* 1,033.5	*a+b* 188.5	*a+b+c+d* 1,222.0

Sensitivity = *a*/(*a*+*c*) = 100.5/172.5 = 58.2%.
Specificity = *d*/(*b*+*d*) = 961.5/1,049.5 = 91.6%.
Positive Predictive Value = *a*/(*a*+*b*) = 100.5/188.5 = 53.3%
Negative Predictive Value = *d*/(*c*+*d*) = 961.5/1,033.5 = 93.0%.

NOTE: fraction of final weights with PSHED measurements > 1.0 g/Qhr = 172.5/1,222 = 0.14.

4.2.3 Effectiveness of the Screening Index

In addition to estimating "elevated" frequencies, we can use the 2×2 table format to assess the effectiveness of the screening index for this model-year group, using measures commonly used to assess screening in epidemiology. For this purpose it is appropriate to use sums of weights rather than vehicle counts, as the weighted results describe we would expect if we sampled the population fully at random. The measures considered include sensitivity, specificity, negative predictive value, and positive predictive value.

Two of these measures concern the validity of a screening measure. In our context, "sensitivity" is defined as the probability of screening "positive" if the "disease" is present, i.e., a high screening index if the vehicle does in fact have high hot-soak emissions (high PSHED). "Specificity" is defined as the probability of screening "negative" if in fact the "disease" is absent, i.e., obtaining a low index if the vehicle has low hot-soak emissions (low PSHED). Thus a screening measure that is "sensitive" or "specific" is expected to produce few "false negatives" or "false positives," respectively.

The two remaining measures are used to assess the effectiveness and feasibility of the index. "Negative predictive value" is the probability that the "disease" is absent if the screening test is negative, i.e., a low EI23 value if vehicles in fact have low hot-soak emissions. The measure of greatest interest to us in this project is the "positive predictive value," i.e., the probability that vehicles will prove to have high PSHED measurements if their EI23 values are high. For purposes of sampling this measure suggests the "yield" of vehicles with high hot-soak emissions expected to be available for measurement if the index is applied in sampling. In contrast to sensitivity and specificity, negative and positive predictive values assess rates of "true negatives" and "true positives," respectively.

The calculation of all four measures is demonstrated in Table 4-6 and Table 4-7, for unweighted and weighted results, respectively. Based on weighted results, the index appears to perform reasonably well based on all four measures for the 1991-95 model-year group. This index appears to be quite specific (few false positives) and to have higher negative prediction (>90%) than positive prediction. These results suggest that the use of the index was effective in improving the efficiency of sampling for purposes of measurement. Based on the example shown, applying the index can yield a sample of vehicles in which 5.3/10 vehicles screening "high" are expected to test "high" in the PSHED, as opposed to sampling fully at random, for which these results suggest that 1.4/10 vehicles sampled might be expected to test "high." Similarly, approximately 9/10 vehicles screening "low" are expected to test "low."

However, the measures of effectiveness, particularly the positive predictive value, are in part a function of the prevalence of "high" emissions in the vehicle population. Thus we would expect the index to be useful, but somewhat less effective for vehicle sub-populations in which vehicles with "elevated" emissions are rarer than in the example discussed to this point. This conclusion appears to hold for MY 1996-2003, which represents improved technologies and control systems measured at younger ages than MY 1991-95. Based on sums of weights, the specificity and positive predictive value for 1996-2003 are 94% and 14%, respectively. However, for this group, the relatively low sensitivity (23%) indicates that more false negatives are to be expected than in older vehicles. This result underscores the importance of measuring vehicles with low as well as high values of the screening index.

Using the same definition as in the example described above (1.0 g/Qhr), Table 4-8 shows estimated fractions for elevated emissions in each of the five model-year groups, using both unweighted vehicle counts and sums of final weights. Clearly and as expected, the fractions of "high" PSHED values decline with model-year group, illustrating the combined effects of technology, emission controls, and vehicle age.

Table 4-8. Sample Calculations for a 1.0 g/Qhr High-PSHED Definition, by Model-Year Group

Model Year Group	Number of Vehicles	Number of Vehicles with High PSHED	Fraction with High PSHED		Positive Predictive Value
			Unweighted	Weighted	
1961 – 1970	4	4	1.00	1.00	
1971 – 1980	7	7	1.00	0.95	
1981 – 1990	26	18	0.69	0.54	0.86
1991 – 1995	49	21	0.43	0.14	0.53
1996 – 2003	76	9	0.12	0. 03	0.14
2004 – 2010	13	0	0.00	0.00	
Overall	**175**		**0.34**	**0.12**	

The table above shows results for a specific definition of "elevated" hot-soak emissions. The definition used simply illustrates the calculation of "elevated" fractions across model-year groups as well as the utility of the screening index. The relationships of the estimated high-PSHED fractions to a range of high-PSHED definitions (0.01-100 g/Qhr) across the model-year groups are shown in Figure 4-6. This presentation represents cumulative distributions of high-PSHED fractions with respect to varying thresholds, accounting for unequal-probability sampling and response rates. Thus, these results are estimates for the fleet of vehicles sampled at Ken Caryl station during the project. Similar results for the fleet as a whole are shown in Figure 4-7. The distributions shown in the figures imply ranges of PSHED values for each model-year group, and for the fleet as a whole. For purposes of illustration, selected percentile values for weighted distributions are shown in Table 4-9.

Figure 4-6. Weighted Cumulative Distributions of PSHED Hot-Soak Emissions, by Model-Year Group

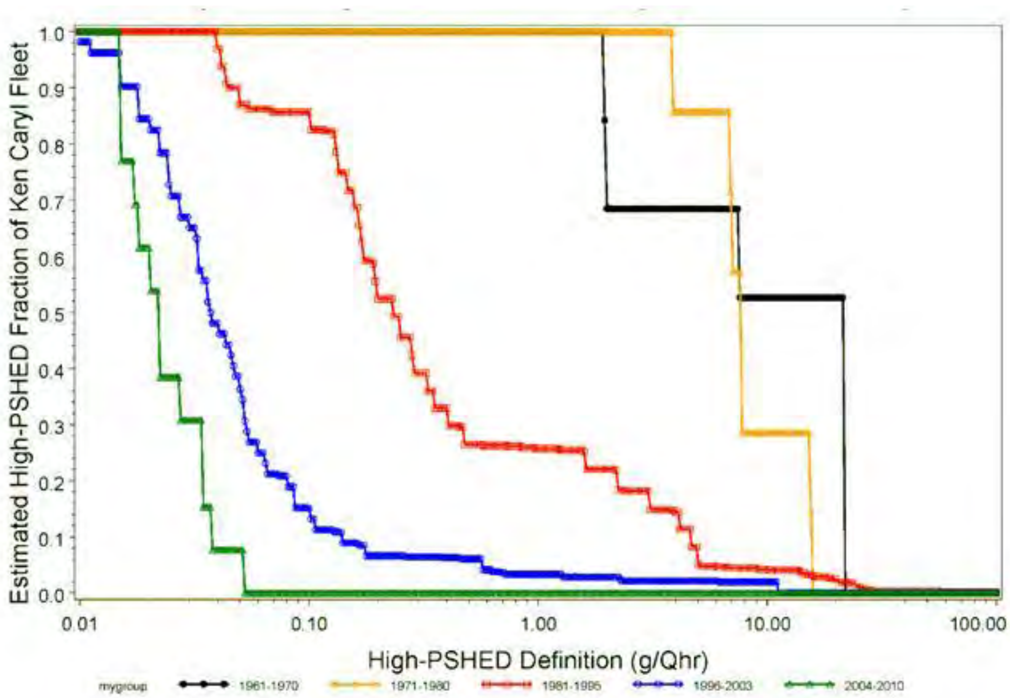


Figure 4-7. Weighted Cumulative Distributions of PSHED Hot-Soak Emissions for the Sampled Fleet

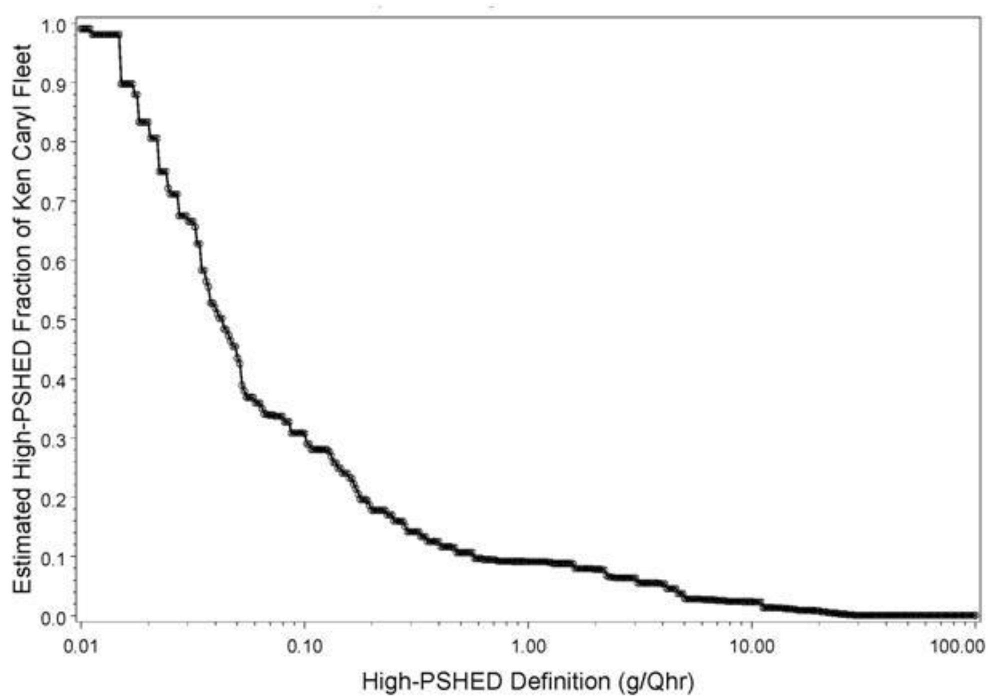


Table 4-9. Selected Percentile Values for PSHED Measurements (g/Qhr), based on Weighted Distributions

Model Year Group	10th Percentile	50th Percentile (Median)	90th Percentile
1961 – 1970	-	13	-
1971 – 1980	est. 5	7.6	est. 20
1981 – 1995	0.047	0.23	4.6
1996 – 2003	0.017	0.037	0.14
2004 – 2010	0.015	0.022	0.038
Overall	**0.015**	**0.043**	**0.57**

4.3 Discussion

4.3.1 Fleet Composition and Representativeness

The vehicle fleet to be sampled was accessed through the Ken Caryl station during the months of July to September. Vehicles sampled, recruited, and measured comprised a pool of vehicles coming to the station, primarily for purposes of receiving routine inspections. That the sampled fleet was accessed in this manner has implications that must be considered in the interpretation of the results.

First, the pool of vehicles entering the station does not include vehicles exempted from inspections through the clean-screen program. As the criteria for exemption include measurements of exhaust CO and NO, as well as HC, it is difficult to assess the probable effects of this factor on the representativeness of the sample of vehicles undergoing PSHED measurements. It is plausible that the sets of vehicles in recent model years available for recruitment was lower than it would have been, absent the existence of "clean screen." However, it is not clear that exempted vehicles would differ markedly in terms of their evaporative emissions from those not exempted. At most sites typically selected for remote-sensing, such as freeway on-ramps, drivers pass the instrument at speeds of 30 mph or higher. However, remote-sensing instruments are not effective at detecting evaporative emissions at these speeds, for which reason, clean-screen would not be expected to exempt vehicles preferentially based on their evaporative emissions.

Second, Ken Caryl station is located in the southwest corner of the Denver metropolitan area. As the area served by this station is likely to be more affluent than areas served by other stations or the metropolitan area as a whole, it is possible that fleet composition and repair status may differ from those in other areas. One implication is that the model-year distributions at Ken Caryl might be different than at other stations, with older and recent model years being less and more prevalent at Ken Caryl than elsewhere, respectively. This difference is presumably neutralized to a large degree by analyzing the results by model-year group. However, the results obtained at Ken Caryl might be unrepresentative of the Denver Metropolitan Area if higher affluence were correlated with frequent maintenance and general "repair status." If we assume that improved maintenance status was associated with lower prevalence of "elevated" evaporative emissions, we can surmise that the results observed in this project can be construed as somewhat conservative, relative to rates expected for a wider geographic area.

A variety of factors related to vehicles, fuels, and ambient conditions can influence the rates or levels of evaporative emissions. As this project was designed as a survey rather than as a controlled experiment, a number of factors were not controlled. Some factors were measured and others were not. Table 4-10 summarizes the major factors that presumed to influence evaporative emissions during the project, and whether the factor was measured.

Table 4-10. Control and Measurement of Factors Affecting Evaporative Emissions

Factor	Degree of control	Measurement Method
Vehicle Factors		
Fuel Metering technology	Variable	Engine Family
Emissions control technology	Variable	Engine Family
Maintenance history/status	Variable	Modified California Method
Driving history before sampling/recruitment	Variable	Questionnaire
Fuel Factors		
Ethanol Content	Variable	Not measured
Volatility of fuel in tank	Variable	Not Measured
Fuel level in tank	Variable	Fuel Gauge
Test/Ambient Conditions		
Conditioning	Standardized	IM240 cycles/Drive route
Ambient Temperature	Variable	Remote-sensing instrument
PSHED Temperature	Variable	I/M Lane Analyzer
Barometric Pressure	Variable	I/M Lane Analyzer

In laboratory studies of evaporative emissions, many of the factors listed in the table are held constant. Holding factors constant allows the results from different tests to be compared on an equal basis. Alternatively, one or more factors can be held constant or systematically varied to investigate the effects of single or multiple variables. As this study was designed to estimate the prevalence of "elevated" evaporative emissions in a vehicle population, it was necessary to apply quick and inexpensive methods to allow relatively rapid measurements of large numbers of vehicles. At the same time, some of the factors, including temperatures, pressure and fuel volatility were effectively limited to relatively narrow ranges by the fact that the project was conducted at one location during the summer. Nonetheless, these advantages also imply that these factors must be accounted for in interpretation and application of the results.

The maintenance status of vehicle fuel metering systems and evaporative emissions control systems was subjectively characterized using the visual, olfactory, and hydrocarbon sniffer results of the Modified California Method. In addition, the presence and source of hydrocarbon vapors or liquid fuel was ascertained when possible. The results of these inspections are reported in Appendix F.

4.3.2 Effects of Ambient Conditions

It is known that vehicle evaporative emission rates can be affected by a number of environmental factors, including ambient temperature, ambient pressure, and the level of fuel in the fuel tank of the vehicle. It was beyond the scope of this study to control for each of these factors, but they were recorded.

Figure 4-8 shows the distributions of temperatures inside the PSHED at the beginning of each test at the time that the door was sealed with the participating vehicle inside. These values range from 65°F to 95°F, with the median around 82°F. The median values agree closely, as expected, although the maxima are 15-20°F cooler than measured at the remote-sensing van.

In Figure 4-9, the PSHED temperatures at the beginning and at the end of the 15-minute test are plotted against each other and in relation to a one-to-one line. The figure shows good correlation between beginning and ending temperatures, as expected, and that the temperature inside the PSHED tended to increase by about 10°F as a result of heat released from the warmed-up vehicle.

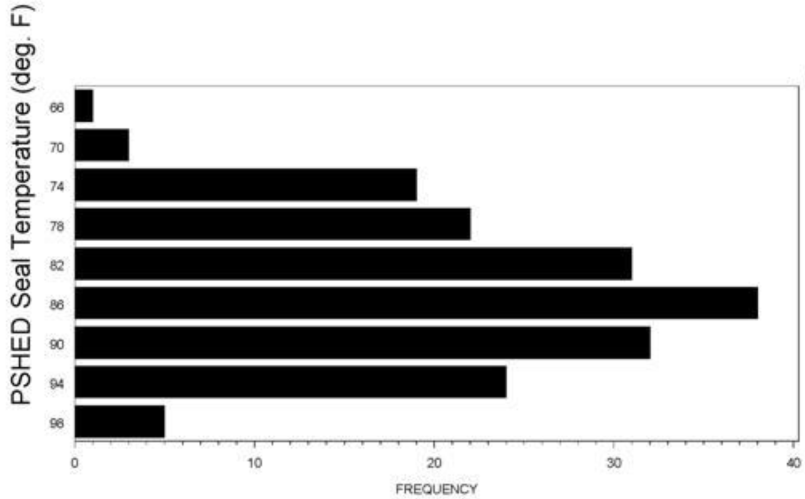
In Figure 4-10, the outdoor temperature at the remote-sensing van is plotted against the initial PSHED temperature. Not unexpectedly, the correlation between these two measures is lower than between the beginning and ending PSHED results. The increased variability may be due to a variety of factors affecting the temperature at the van, including solar heat load, shade from nearby trees, and wind. Factors affecting the PSHED temperature can include residual heat from the previous test and the lack of direct sun and wind.

The standard barometric pressure for sea level is 29.92 inches Hg. The distribution of barometric pressure as measured at the PSHED for each participant test is shown in Figure 4-11. Note that the median barometric pressure is about 24.4 inches Hg, about 82% of the standard sea-level value.

The distribution of fuel tank levels for study participants is shown in Figure 4-12. Levels ranged from nearly empty to full, with the median level between 40 and 50% full.

Fuel volatility also affects evaporative emissions. In this study all vehicles were tested with "as-received" fuel in the vehicle's tank. According to CDPHE, the regulations for dispensed gasoline from June 1 to September 15, 2009 (which includes the time period for the measurements in this study) were a maximum Reid vapor pressure (RVP) of the clear gasoline of 7.8 psi and a maximum denatured ethanol content of 10 vol%. CDPHE also has a program to measure the volatility and ethanol content of dispensed gasoline in Colorado. During this same time period, the measurements from this program indicated that the typical gasoline properties for the time period were 8.5 psi RVP and 9.3 vol% of the gasoline/ethanol blend. Since the regulations allow a 1.0 psi RVP increase per 10 vol% of ethanol, the maximum allowed RVP on a 9.3 vol% gasoline/ethanol blend would be 8.6 psi. Thus, the observed typical gasoline for the study meets the regulations and lies within a relatively narrow range, reducing one source of variability in the PSHED measurements.

Figure 4-8. Distribution of PSHED Seal Temperature for Participating Vehicles



FREQ.	CUM. FREQ.	PCT.	CUM. PCT.
1	1	0.57	0.57
3	4	1.71	2.29
19	23	10.86	13.14
22	45	12.57	25.71
31	76	17.71	43.43
38	114	21.71	65.14
32	146	18.29	83.43
24	170	13.71	97.14
5	175	2.86	100.00

Figure 4-9. Initial PSHED Temperature vs. Final PSHED Temperature

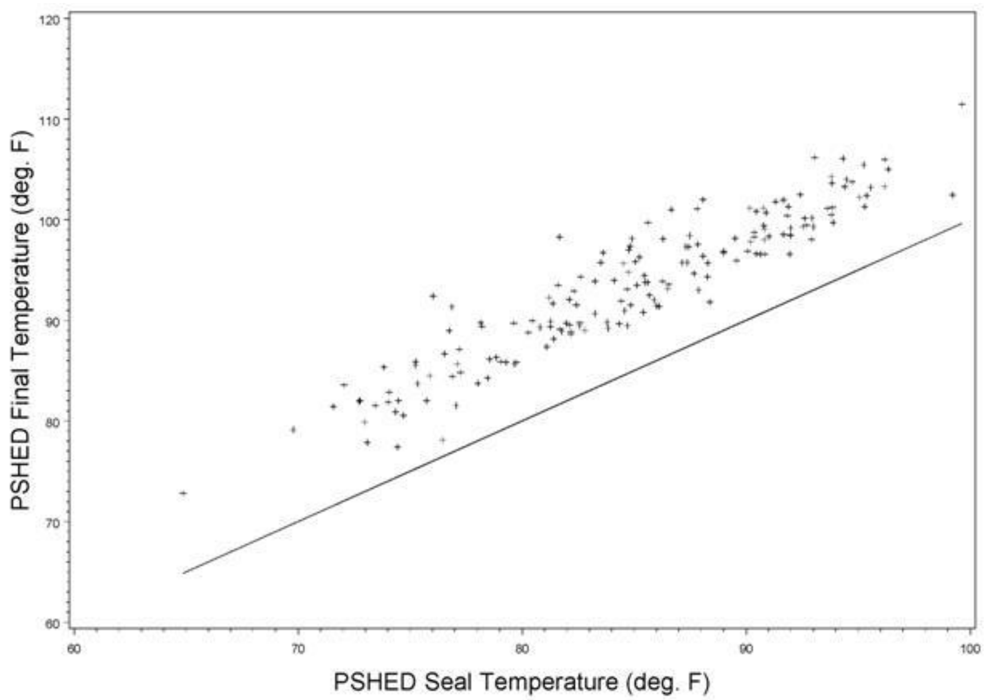


Figure 4-10. Selection RSD Temperature vs. Initial PSHED Temperature

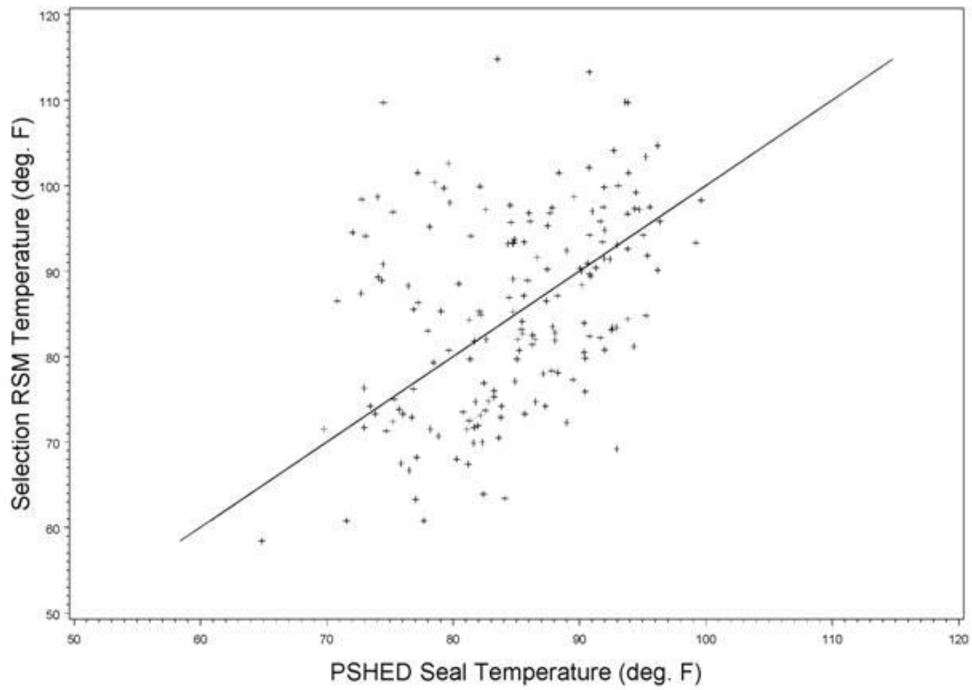
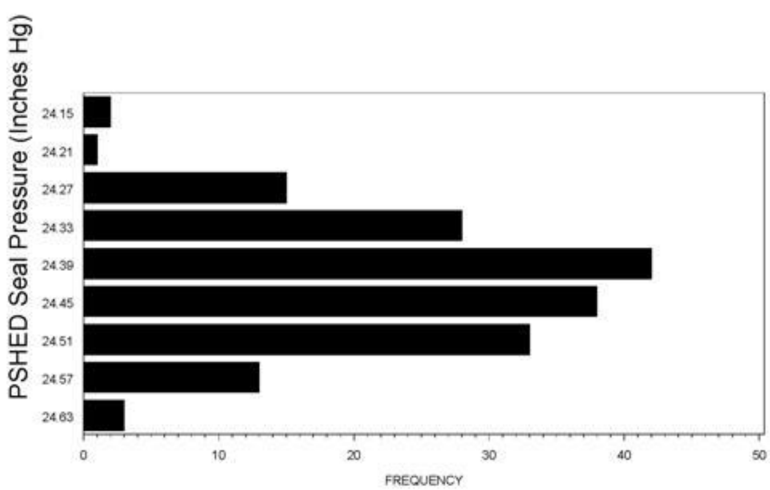
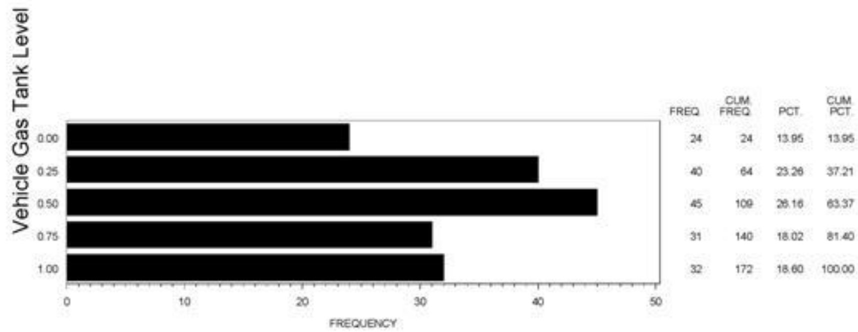


Figure 4-11. Barometric Pressure at PSHED Sealing



FREQ.	CUM. FREQ.	PCT.	CUM. PCT.
2	2	1.14	1.14
1	3	0.57	1.71
15	18	8.57	10.29
28	46	16.00	26.29
42	88	24.00	50.29
38	126	21.71	72.00
33	159	18.86	90.86
13	172	7.43	98.29
3	175	1.71	100.00

Figure 4-12. Fuel Tank Levels for Participating Vehicles



4.3.3 Interpretation

The results in Figure 4-6 and Table 4-9 show trends in hot-soak emissions (as measured by PSHED) with model year group for the Ken Caryl fleet. The median values cover almost three orders of magnitude. The strong trends with model-year group reflect improvements in fuel-metering and evaporative emissions control technologies, as well as, presumably, the effect of vehicle age.

The results in Section 4.2 can also be related to the expectations for vehicles manufactured since MY 1996, which have onboard diagnostics systems as well as enhanced emission controls. For vehicles manufactured prior to 1996, these levels are simply convenient references but have no regulatory significance. One such reference level is 1.0 g/Qhr, which in terms of size, roughly corresponds to a cumulative leak of 0.020 inches in diameter, or the size of the smallest leak in the fuel-system or evaporative emissions-control system required to be detected by an OBD system under regulations promulgated by the California Air Resources Board. A second level is 0.30 g/Qhr, which corresponds roughly to the hot-soak portion of the enhanced evaporative emission standard of 2.0-2.5 g. EPA has estimated that the vast majority of properly-operating vehicles with enhanced evaporative emission controls would have PSHED values less than 0.30 g/Qhr.[9]

Table 4-11 shows the estimated fractions of the sampled fleet having PSHED hot-soak values, exceeding a range of thresholds, of which the lowest is 0.3 g/Qhr. The fractions were estimated from the estimated cumulative distributions shown in Figure 4-6. In addition to mean proportions, estimated from weighted frequencies as shown in Equation 4-2, upper and lower 95% confidence limits are shown for two model-year groups. The bounds are calculated as an "exact" binomial confidence interval, in which the upper and lower limits are estimated using the Beta distribution, as shown in Equation 4-3 and Equation 4-4[10].

$$\hat{p}_{\text{upper}} = 1 - B\left\{\frac{\alpha}{2}, n-k, k+1\right\}$$ **Equation 4-3**

$$\hat{p}_{\text{lower}} = 1 - B\left\{1 - \frac{\alpha}{2}, n-k+1, k\right\}$$ **Equation 4-4**

In the equations, the level of α is set to 0.05, *n* is the number of vehicles measured, and *k* is the expected number of vehicles with "elevated" emissions out of *n* trials, given a weighted mean proportion, calculated as shown in Equation 4-2.

The table shows that all vehicles manufactured prior to 1981 (when measured at 29+ years of age) are expected to have PSHEDs greater than 1.0 g/Qhr. For vehicles manufactured

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[9] EPA has estimated that a PSHED (hot-soak) value of 0.3 g/Qhr corresponds to the enhanced evaporative emissions standard of 2.0-2.5 g. They arrived at this estimate by assuming that 20% of the 2 grams is attributable to the 1-hour hot-soak portion of the standards, and that 75% of the 1-hour hot-soak emissions occurs in the first 15 minutes of the hot-soak.

[10] Clopper, C.; Pearson, S. The use of confidence or fiducial limits illustrated in the case of the Binomial. *Biometrika* 26:404-413. 1934.

between 1981 and 1995 (measured at 14+ years of age), 26% and 39% of vehicles are expected to exceed 1.0 and 0.30 g/Qhr, respectively (corresponding lower-bound estimates are 16% and 28%). For vehicles manufactured between 1996 and 2003 (measured at 5-13 years of age), and employing both OBD systems and enhanced emission controls, corresponding fractions are 4.3% and 6.4%, respectively (with lower-bound estimates of 1.0% and 2.1%). Finally, no vehicles manufactured in 2004-2010 are expected to have PSHEDs greater than 0.3 g/Qhr, although this conclusion is based on a relatively small set of 13 measured vehicles. As previously noted, eligible vehicles in EI23 Bins 4 and 5 for MY 2004-2010 were sampled, but the owners of these vehicles elected not to participate in the study. However, previous experimental work using vehicles in this model-year group acquired from the in-use fleet found some vehicles to have leaks of various sizes [6].

For the entire fleet of vehicles accessed through Ken Caryl station, 14% of the vehicles are expected to have PSHEDs greater than 0.3 g/Qhr. Again, note that these specific values apply to LDVs, LDT1s, and LDT2s measured under summer conditions.

Table 4-11. Fractions of PSHED Values Exceeding Selected Hot-Soak Emission Thresholds (Based on Weighted Distributions)

Model Year Group	n_{veh}[1]	Parameter[2]	Fleet Fraction Exceeding PSHED Hot-Soak Value (g/Qhr)							
			0.3	1.0	2.0	5.0	10	20	50	100
1961 – 1970	4	Mean	1.0	1.0	0.68	0.68	0.53	0.53	0.0	0.0
1971 – 1980	7	Mean	1.0	1.0	1.0	0.85	0.30	0.0	0.0	0.0
1981 – 1995	75	Upper	0.51	0.37	0.33	0.17	0.12	0.092	0.056	0.060
		Mean	0.39	0.26	0.22	0.083	0.042	0.026	0.004	0.004
		Lower	0.28	0.16	0.13	0.032	0.009	0.003	0.000	0.000
1996 – 2003	76	Upper	0.145	0.10	0.096	0.084	0.082	0.047		
		Mean	0.064	0.033	0.029	0.021	0.020	0.0	0.0	0.0
		Lower	0.021	0.006	0.004	0.002	0.001	0.00		
2004 - 2010	13		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Overall	175		0.14	0.091	0.079	0.037	0.024	0.0084	0.001	0.0005

[1] Number of vehicles measured.
[2] "Mean" = mean proportion, calculated as shown in Equation 4-2, "Upper" = upper bound of 95% confidence interval, calculated as shown in Equation 4-3; "Lower" = lower bound of 95% confidence interval, calculated as shown in Equation 4-4.

In addition to considering the distributions of PSHED results, it is helpful to relate them to the results of the visual inspection. These results are summarized in Table 4-12, for two broad model-year groups, pre-1996 and 1996-2010. The table also distinguishes counts for all PSHED results and for those results ≥ 0.3 g/Qhr.

Table 4-12. Results of Physical Inspection: Identified Vapor Sources by Location for Two Model-Year Groups

Location	All Vehicles			Vehicles with PSHED result > 0.3 g/Qhr		
	MY 1995 & earlier	MY 1996 & Later	Total	MY 1995 & earlier	MY 1996 & Later	Total
Exhaust manifold	0	1	1	0	0	0
Fuel pump	0	1	1	0	1	1
PCV	1	0	1	0	0	0
Carburetor	2	0	2	2	0	2
Fuel rail	1	1	2	1	1	2
Injector	2	0	2	2	0	2
Purge line	2	0	2	2	0	2
Cap	3	0	3	3	0	3
Fuel lines	2	1	3	2	1	3
Canister	7	2	9	6	2	8
Fill pipe	8	1	9	5	0	5
Tank	10	7	17	10	7	17
Other	0	1	1	0	1	1
SubTotal	38	15	53	33	13	46
Nothing Found	49	74	123	28	4	32
Total	87	89	176	61	17	78

Despite the quick and rudimentary nature of the inspection, it was often possible to isolate vapor emissions to specific components of the fuel-delivery or emission-control systems. Specific vapor sources were identified for 44% and 17% of all PSHED results in the pre-1996 and the 1996-2010 model-year groups, respectively. However, for the vehicles having PSHED results ≥ 0.3 g/Qhr, the fractions are higher, with vapor sources identified for 54% and 76% of results in the pre-1996 and 1996-2010 model-year groups.

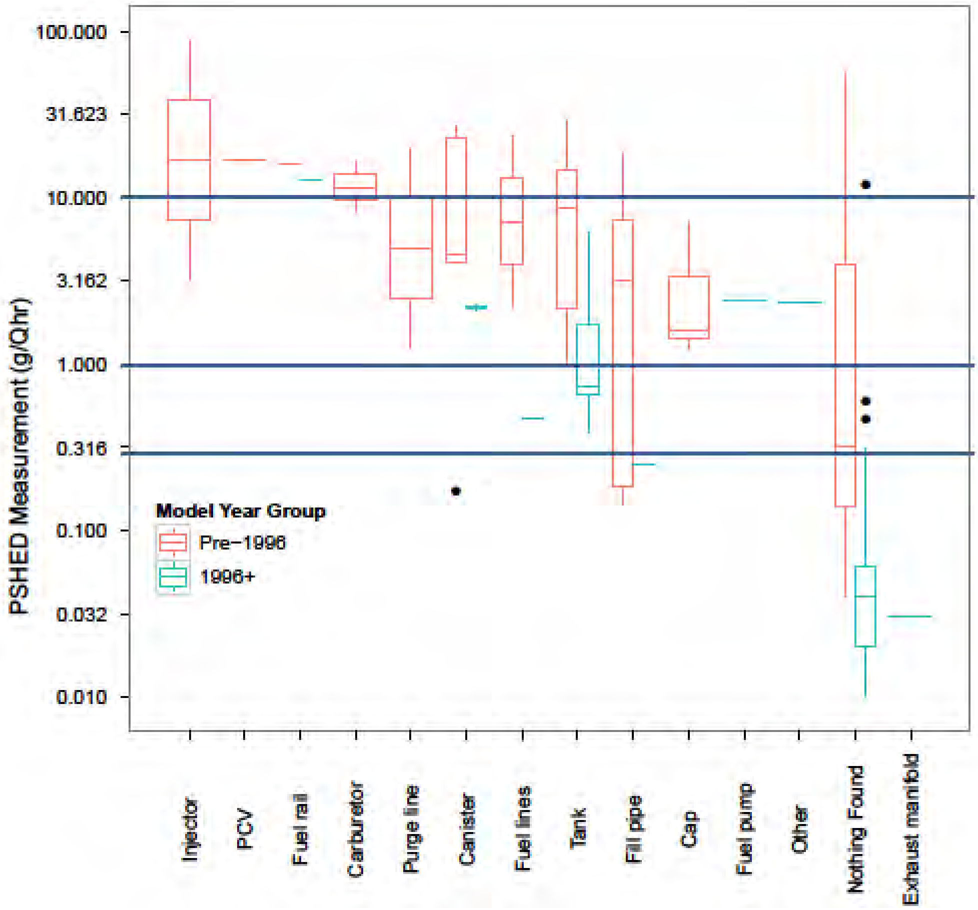
Overall, 13 specific vapor sources were isolated, with the most common being the fuel tank, fill pipe, and canister. These three locations account for 66% of identified sources for all PSHED results. Results also show that most identified vapor sources exceeded 0.3 g/Qhr, with 64% to 70% of sources exceeding this threshold attributed to these three locations. Vapor from the canister can result from insufficient purge leading to breakthrough emissions or from compromised hose connections to the canister resulting from normal maintenance. Components in engine compartments are packed very tightly and often the canister must be moved to service other components, and then replaced. During this process seals can be compromised, resulting in tiny leaks.

Figure 4-13 also shows the magnitude of PSHED results in relation to vapor source for the two broad model-year groups. At the outset, the figure makes it clear that hot-soak emissions are highly variable, ranging over three orders of magnitude for vehicles in both model year groups. Not surprisingly, the figure shows that the hot-soak rates for the pre-1996 vehicles are generally substantially higher than for the 1996-2010 vehicles. For pre-1996 vehicles, the largest hot-soak rates isolated were attributed to the injector location, which exceed even those attributed to the carburetor. For the 1996-2010 vehicles, the highest result was attributed to the fuel rail. The three sites most frequently identified, tank, fill pipe, and canister, do not necessarily have higher hot-soak rates than other sources, although the rates for these three sources differ between the model-year groups, with the 1996-2010 group showing consistently lower rates.

An interesting outcome for the 1996-2010 model-year group is that the PSHED results isolated to specific sites are markedly higher than those not so isolated (with three exceptions identified as outliers on the plot). This outcome also holds for the pre-1996 group, although not to the same degree. For the 1996-2010 group, however, the plot shows that roughly half of these results identified as exceeding 0.3 g/Qhr in Table 4-9 in fact exceed 1.0 g/Qhr, and with two results exceeding 10 g/Qhr.

When one views the potential sources of vapor emissions from in-use vehicles, they can be placed into two broad categories. The first is vapor breakthrough from the evaporative emissions canister as a result of purge system malfunction, canister related problems, off-cycle fuel characteristics or atypical driving behaviors. The second is vapor emitted from very small "micro-cracks" or orifices of very small diameter in various components of the system. Vapor leaks from these cracks and orifices could emanate from failed seals in junctions between various components, durability problems resulting from materials degradation and in-use wear due to phenomena such as vibration, environmental factors, etc. Mal-maintenance, mis-installation or mis-assembly of systems and components could also potentially contribute to the in-use rates. Unlike canister related problems, vapor leaks could potentially emanate from points in the system from the gas cap to vapor lines to the canister and engine. In some cases, the source(s) of the "hot-soak" emission values measured in the PSHED could not be identified or isolated. In these cases, it is reasonable to assume that these emissions arose from leaks from various undetermined locations and sizes in the fuel and evaporative control systems. This may especially be the case since measurements were made with vehicles and fuels in hot conditions over a brief 15-minute period. The measured emission levels and the short measurement periods reduce the probability that measured emissions arose from other processes such as permeation or diurnal losses.

Figure 4-13. Magnitude of PSHED Hot-soak Results by Model-Year Group and Location of Vapor Source



4.3.4 Assessment of Measurement Repeatability

In addition to sampling error, estimated above through estimation of confidence intervals, it is important to consider the potential effects of measurement variability (from all sources) on the distributions of elevated hot-soak emissions. In general, measurements for emissions measurements tend to show a high degree of variability, both within and among vehicles. This pattern holds for both exhaust and evaporative emissions.

As mentioned, this study was conducted as a survey with vehicles recruited from private owners for a brief period following a maintenance inspection. When working with vehicles recruited from the public in the I/M lane, it was not practical to take the time necessary to obtain replicate measurements, as desirable as that outcome would have been.

It was thus not possible to obtain estimates of test-to-test variability during the project itself. The best estimates of repeatability available can be obtained from the limited set of paired PSHED and LSHED measurements presented and discussed in Appendix D. These measurements were initially performed to assess the association between PSHED and LSHED measurements, and were thus generally conducted in sequences of 1st PSHED, 1st LSHED, 2nd

PSHED, 2nd LSHED. Prior to conducting the sequence, each vehicle's canister was removed from the vehicle and purged on a laboratory bench overnight, and then reloaded during a consistent one-hour diurnal procedure. Prior to each SHED test, a uniform conditioning sequence was performed, consisting of running for five minutes on the dynamometer at 55 mph, followed by phase 1 of the FTP cycle run with the engine hot ("hot 505"). Thus, despite the question of whether the paired measurements (1st PSHED, 2nd PSHED) can be interpreted as "true" replicates, given the possibility of cumulative changes in vehicle conditioning during the test sequence, these data remain the best estimates of repeatability available for the PSHED procedure.

We used the paired measurements to derive estimates of measurement repeatability. We performed a log-log regression of the second PSHED on the first. For this purpose we used only tests performed in an "as received" condition, and excluded two tests for which the first PSHED measurement was recorded as 0.0. One such vehicle, (HE-3555) was interpreted as showing a steadily increasing leak condition which did not allow its measurements to be considered as replicates.[11] In the second vehicle (631-SWU), as well as in the first, the presence of zero values was interpreted as reflecting errors in measurement or transcription that did not allow the pairs of measurements to be considered as replicates, as was necessary for this analysis. In addition, the use of logarithms precluded the use of zero values.

A scatter plot of the results used is shown in Figure 4-14. Fit results for the model are shown in Table 4-13. The regression equation is $\log x_2 = -0.00786 + 0.8801 \log x_1$, where x_1 and x_2 are the first and second PSHED measurements, respectively. The intercept is not significantly different from 0.0 ($p = 0.94$), whereas the slope term is significantly different from 0.0 ($p = 0.0002$). However, as the slope term is not significantly different from 1.0 for this sample ($p = 0.44$), we conclude that the second PSHED is unbiased with respect to the first.

Based on the regression, we estimated the standard error of prediction and the width of a 90% prediction interval for individual vehicles. With the mean-square-error for the regression designated as s^2, the standard error of prediction is given by:

$$s_{(y-\hat{y})} = \sqrt{s^2\left[1+\frac{1}{n}+\frac{(x_p-\bar{x})^2}{SS_{xx}}\right]}$$ **Equation 4-5**

where n is the number of vehicles measured, x_p is the measured PSHED mass for which the prediction is to be made, x-bar is the mean of the 1st PSHED measurements, and SS_{xx} is the sum of squares for the set of 1st PSHED measurements.

For the set of vehicles measured, the standard error of prediction (for log x_2) ranged from 0.2866 to 0.3203. Because this parameter is fairly uniform in logarithmic terms, the prediction interval is similarly uniform and we can translate the prediction interval in percentage terms as an approximate range of -60% to +200%. We apply this range in an assessment of the effect of measurement repeatability below.

[11] The sequence of measurements for this vehicle, arranged as 1P, 1L , 2P, 2L were 0.0, 4.7, 9.9 and 55.5 g/Qhr.

Figure 4-14. Paired Portable-SHED results: 2nd Replicate vs. 1st Replicate

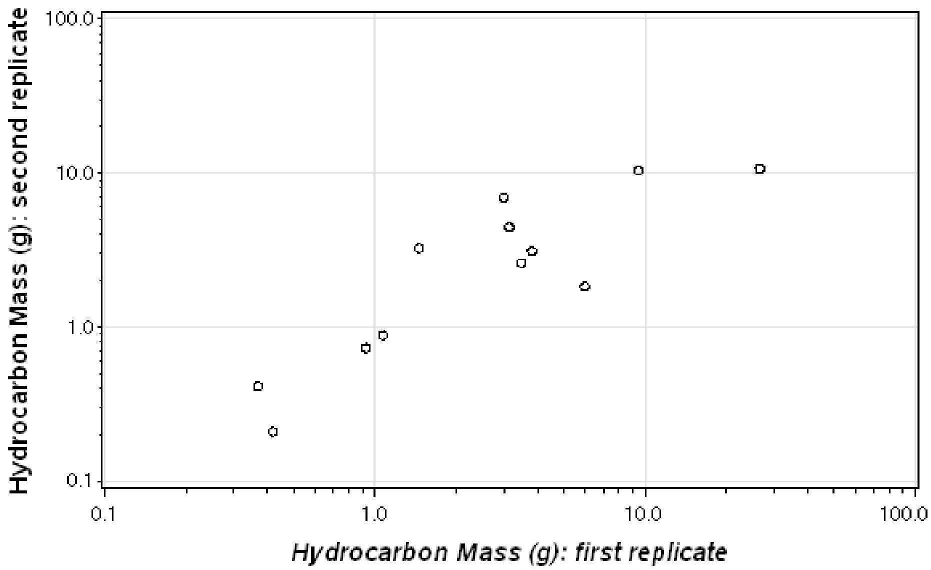


Table 4-13. Model-Fitting Results for Regression of log(2nd PSHED) on log(1st PSHED)

Source	d.f.	Sum of Squares	Mean Square	F-statistic[2]	Pr>F
Model	1	2.53821	2.53821	33.70	0.0002
Error	10	0.75321	0.07532		
Total[1]	11	3.29142			

[1] Vehicles for which either of the paired measurements was recorded as 0.0 g were not included in model fitting.
[2] Adjusted $r^2 = 0.7483$.

Using the range suggested by the prediction interval, we addressed the effects of measurement repeatability by re-estimating the fractions of "elevated" emissions for two scenarios. The first, a "lower-bound" scenario, assumes that the measured values are higher than those obtained in subsequent replicates. The second, an "upper-bound" scenario, assumes that the measured values are lower than those for subsequent replicates.

For each scenario, the analysis assumes that three replicates were obtained for each vehicle. One value is the measured value acquired during the project, and the two remaining values are at the lower or upper limits of the prediction interval, for the lower-bound and upper-bound scenarios, respectively. If the measured hydrocarbon mass for each vehicle is x, then the values of the lower-bound replicates as assigned as 0.4x. Similarly the values of the upper-bound replicates are assigned as 3x, or (1+2.0)x. In both cases, the "actual" emissions status of the vehicle is taken as the geometric mean of the three replicates. For the lower-bound and upper-bound scenarios, the "measurement" for each vehicle is thus = $(x \cdot 0.4x \cdot 0.4x)^{1/3}$ and $(x \cdot 3x \cdot 3x)^{1/3}$, respectively. After assigning the replicate values and calculating geometric means, the fractions of elevated emissions are recalculated, using the adjusted PSHED results for each scenario. Results are presented for two model-year groups, 1981-1995 and 1996-2003.

Table 4-14. Fractions of PSHED Values Exceeding Selected Hot-Soak Emission Thresholds (based on weighted distributions)

Model Year Group	n_{veh}[1]	Parameter[2]	Fleet Fraction Exceeding PSHED Hot-Soak Value (g/Qhr)							
			0.3	1.0	2.0	5.0	10	20	50	100
1981 – 1995	75	Upper bound	0.75	0.27	0.26	0.18	0.083	0.042	0.017	0.004
		Mean	0.39	0.26	0.22	0.083	0.042	0.026	0.004	0.004
		Lower bound	0.26	0.22	0.15	0.042	0.027	0.0037	0.0019	0.0
1996 – 2003	76	Upper bound	0.089	0.061	0.033	0.022	0.021	0.020	0.0	0.0
		Mean	0.064	0.033	0.029	0.021	0.020	0.0	0.0	0.0
		Lower bound	0.061	0.029	0.021	0.020	0.0	0.0	0.0	0.0

[1] Number of vehicles measured.
[2] "Mean" = mean proportion, calculated as shown in Equation 4-2, "Upper bound" = estimate for upper-bound scenario; "Lower bound" = estimate for lower-bound scenario.

Based on the scenarios presented, the results suggest that the leak frequencies are not highly sensitive to assumptions of uncertainty due to measurement repeatability in the range of -55% for the lower-bound scenario. For the 1996-2003 model-year group, estimated frequencies for the 0.3 g/Qhr and 1.0 g/Qhr thresholds are 5% and 12% lower than the corresponding mean values. For the 1981-1995 model-year group, sensitivities are somewhat higher, with lower-bound frequencies for the 0.3 and 1.0 g/Qhr thresholds estimated as 33% and 15% lower than mean values.

For the upper-bound scenario, sensitivities are somewhat higher in relation to assumptions of uncertainty due to measurement repeatability in the range of +100%. For the 1996-2003 model-year group, estimated frequencies for the 0.3 and 1.0 g/Qhr thresholds are 39% and 85% higher than mean proportions. For the 1981-1995 model-year group, the upper-bound frequencies for the 0.3 and 1.0 g/Qhr thresholds are estimated as 92% and 4% higher than corresponding means.

5.0 Summary and Conclusions

The primary goal of the Ken Caryl project was to estimate distributions of hot-soak emissions of a fleet of gasoline-fueled light-duty vehicles. The objective of this field study was to measure hot-soak emissions using a quick and inexpensive procedure.

A number of strategies were used to obtain evaporative emissions data on 175 in-use vehicles that were representative of the fleet entering the I/M station at a reasonable level of effort and cost:

1. The population of vehicles accessed during the study was limited to the fleet visiting one I/M station in Denver during the summer months. Classes of vehicles measured included LDV, LDT1, and LDT2.

2. A random sample of vehicles was selected for measurement with "probability proportional to the Index" of evaporative emissions (ppEI). The index was calculated from the value of a remote-sensing measurement obtained as each vehicle entered the I/M station. The sampling process used the index to improve the efficiency with which vehicles with "elevated" emissions could be selected for recruitment (as opposed to sampling the fleet fully at random). To achieve this goal, vehicles with high index values sampled "with certainty" whereas those with lower values were sampled at lower rates, from 6/100 to 30/100 vehicles.

3. A number of parameters that are known to affect the hot-soak emissions were not controlled but were recorded: ambient temperature, barometric pressure, fuel tank level, fuel metering technology, evaporative emissions control technology, and the maintenance status of related vehicle systems.

4. The hot-soak emissions of participating vehicles were measured using the "portable SHED" (PSHED) enclosure. The procedure used in the enclosure was developed to mimic the hot-soak portion of the Federal Test Procedure in the field in much less time and at lower cost. The PSHED results are assumed to serve as a good surrogate for the rigorous hot-soak results obtained in a laboratory environment.

5. Using the measurements obtained in the PSHED, we estimated distributions of hot-soak emissions, for the entire sampled fleet and by model-year group, assuming that model-year group acts as a surrogate for important changes in fuel-system and emissions control technology. To obtain representative results in relation to the fleet sampled, it was necessary to develop and apply two sets of weights to represent the processes of sampling and differential participant response by model-year group.

The project has confirmed earlier work by demonstrating the utility of a screening index in reducing the level of effort and cost needed to estimate the prevalence of "elevated evaporative emissions." Results show a reasonable degree of correspondence between values of the index and corresponding hot-soak measurements. However, the relation between the index and the measurements shows variability, particularly at lower emission levels. Aside from the high known variability in remote-sensing data, experimental results suggest that EI23 values are influenced by vehicle speed and exhaust hydrocarbon emissions levels, as well as by running-loss emission rates. To compensate for the potential effects of these influences, vehicle selection was based on EI23 Bin rather than individual EI23 values, with several of the highest Bins sampled with certainty. It is nonetheless possible that influences such as vehicle speed or exhaust levels or other unknown effects influence erroneous class assignments. Such misclassifications can be expected to lead to "clean" vehicles being sampled as "elevated" and "elevated" vehicles as "clean," i.e., "false positives" and "false negatives" respectively.

However, while the presence of classification errors reduces the efficiency of the index in guiding sampling, it does not impair the usefulness of this sample in estimating distributions of hot-soak values. This conclusion holds because the probability with which each vehicle is sampled determines its weight in the analysis, not the value of PSHED measurement obtained after sampling and recruitment. Accordingly, a "false negative" receives the same (higher) weight in the analysis as a "true negative" and a "false positive" receives the same (lower) weight as a "true positive." Thus, if the index classifies vehicles accurately, it can greatly reduce the effort and cost required to conduct inspections and measurements and to estimate the prevalence of elevated evaporative emissions. However, if the index performs poorly it does not guide sampling efficiently, resulting in a situation more similar to sampling fully at random. Nonetheless, because the sampling probabilities for each measured vehicle are known, the resulting set of measurements can still be used to estimate the prevalence of "elevated evaporative emissions."

The analysis shows the value of model-year groups as a surrogate for fuel-system and emissions-control technology. While the screening and sampling processes did not explicitly take model year into account, we nonetheless analyzed the results by model-year group, treating each group as an independent subsample of the whole fleet. It might have been preferable to have stratified vehicles by model year at the screening step and prior to sampling, and to have applied differing sets of sampling fractions by model-year group, as the utility of the index is expected to decrease with improving emissions control. However, this refinement was not achieved for this project, because it was not feasible to acquire model year when it would be needed to inform a sampling determination immediately after vehicles passed the remote-sensing van.

The hot-soak results among model-year groups span about three orders of magnitude and are consistent with the combined effects of evaporative emission control technologies and vehicle age. Older model year groups had substantially higher estimated hot-soak values than newer model year groups. All vehicles manufactured prior to 1981 (when measured at 29+ years of age) are expected to have PSHEDs greater than 1.0 g/Qhr (which corresponds to a cumulative leak of 0.020 inches in diameter, or the size of the smallest fuel/evaporative control system vapor leak that OBD systems are required to detect). For vehicles manufactured between 1981 and 1995 (measured at 14+ years of age), 26% and 39% of vehicles are expected to exceed 1.0 and 0.30 g/Qhr, respectively (with the latter value corresponding to the hot-soak portion of the EPA enhanced evaporative emission standard). Evaluation of an assumption that all measurements were overestimated by 50% estimated that these fractions for these two thresholds would be reduced to values of 22% and 26%, respectively. For vehicles manufactured between 1996 and 2003 (measured at 5-13 years of age), and employing both OBD systems and enhanced emission controls, corresponding fractions are 3.3% and 6.4%, respectively. As with the pre-1996 vehicles, a similar assessment of uncertainty due to measurement variability estimates reduced fractions of 2.9% and 6.1%, respectively. Finally, no vehicles manufactured in 2004-2010 are expected to have PSHEDs greater than 0.3 g/Qhr, although these conclusions are based on a relatively small subset of 13 measured vehicles. As previously noted, eligible vehicles in EI23 Bins 4 and 5 for MY 2004-2010 were sampled, but the owners of these vehicles elected not to participate in the study. However, previous experimental work using vehicles in this model-year group acquired from the in-use fleet found some vehicles to have leaks of various sizes [6].

Despite the quick and rudimentary nature of the inspection, it was often possible to isolate vapor emissions to specific components of the fuel-delivery or emission-control systems. Specific vapor sources were identified for 44% and 17% of all PSHED results in the pre-1996 and the 1996-2010 model-year groups, respectively. However, for the vehicles having PSHED results ≥ 0.3 g/Qhr, the fractions are higher, with vapor sources identified for 54% and 76% of results in the pre-1996 and 1996-2010 model-year groups. Overall, 13 specific vapor sources were isolated, with the most common being the fuel tank, fill pipe, and canister. These three locations account for 66% of identified sources for all PSHED results. Results also show that most identified vapor sources exceeded 0.3 g/Qhr, with 64% to 70% of sources exceeding this threshold attributed to these three locations.

The distributions of hot-soak emissions during the summer estimated from the measurements obtained at Ken Caryl station represent new data that is relevant to characterizing evaporative emissions at the fleet level in other contexts. However, the specific limitations of the study imply that the results cannot necessarily be generalized broadly without taking steps to account for differences in conditions. The effects of ambient temperature, fuel volatility, and barometric pressure need to be considered in generalizing these results.

However, taken together, the emission data and the mechanic's inspection information suggest that the "hot-soak" emissions measured in this work occur as a result of either canister breakthrough or leaks in the fuel and evaporative emission control systems of the vehicles evaluated. Furthermore, in many cases, the measured rates exceeded the 0.3 g/Qhr value expected for a hot-soak.

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Appendix A
Measurement of Exhaust and Evaporative Hydrocarbons by Remote-Sensing

Some background on the operation of remote-sensing instruments and calculations performed on raw remote-sensing measurements is useful for understanding the conditions under which this technique might be capable of detecting running-loss emissions from vehicles. The detailed calculations are specific to the instruments used in the Ken Caryl study; however, the use of the optical data should, in general, apply to any remote-sensing instrument.

The pollutants in the exhaust plume emitted from the tailpipe of a vehicle are assumed to be well mixed and are assumed to be released from only the tailpipe. It is also assumed that after emission from the tailpipe, the HC, CO, NO, and CO_2 components of the plume disperse into the ambient air at the same rate.

When a vehicle drives past the remote-sensing instrument, the light beam passes through a portion of the dispersing tailpipe plume. The instrument measures the attenuation of infrared (IR) or ultraviolet (UV) light caused by the presence of the chemical species in the plume. For each vehicle, the degree of attenuation is measured 50 times at intervals of 10 msec. The degree of attenuation is the product of the concentration and the pathlength and therefore takes units of ppm-cm for HC and NO and %-cm for CO and CO_2. If the only source of the pollutants is the tailpipe exhaust, and if the ambient air has no pollutants, then the ratios of attenuations of any two pollutants will be constant for multiple readings taken in a vehicle's exhaust plume even though the pollutant concentrations change as the plume disperses. Figure A-1 shows example time traces of the attenuations of HC, CO, NO, and CO_2 as recorded by a remote-sensing instrument for a specific set of experimental conditions [14]. The plot clearly shows that for this case, which does not include evaporative emissions, the attenuations follow similar proportional trends with time. That is, ignoring the different vertical scales, the time traces of all four pollutants have very similar shapes.

However, the purpose of the technique is not to assess the temporal dependence of the pollutant attenuations but rather to calculate the exhaust concentrations of measured pollutants at the instant the vehicle passes the sensor. Estimating the pollutant exhaust concentrations requires two steps. In the first step, the calculation applies an assumption that exhaust pollutant gases disperse similarly from the common emission point. If this condition is obtained, then plots of the attenuations of any pollutant against that for CO_2 should produce a straight line passing through the origin, assuming that background contamination in the ambient air is negligible. Figure A-2 shows the HC, CO, and NO attenuations plotted against the CO_2 attenuations for the data shown in Figure A-1. The plot shows that the lines are quite straight with little scatter and pass near the origin.

If ambient pollutants are present before the vehicle passes by, then the instrument will also register attenuations from the background concentrations. Some instruments (such as the ESP4600) attempt to correct for background concentrations by taking a measurement of all four pollutants just before a vehicle passes the instrument. These "front bumper" background attenuation values are subtracted from the raw tailpipe plume attenuation values to arrive at the background-corrected attenuation values that are used to calculate the tailpipe emissions concentrations. For example the set of attenuations shown in Figures A-1 and A-2 incorporate background corrections.

Figure A-1. Attenuation Time Series for an Experimental Condition Simulating Zero Running-Loss Emissions (0.00 scfh propane) and Exhaust Emissions (30 scfm of 1100 ppmC_3 HC, 3.0% CO, 500 ppm NO, 12.92% CO_2, balance N_2, dry)

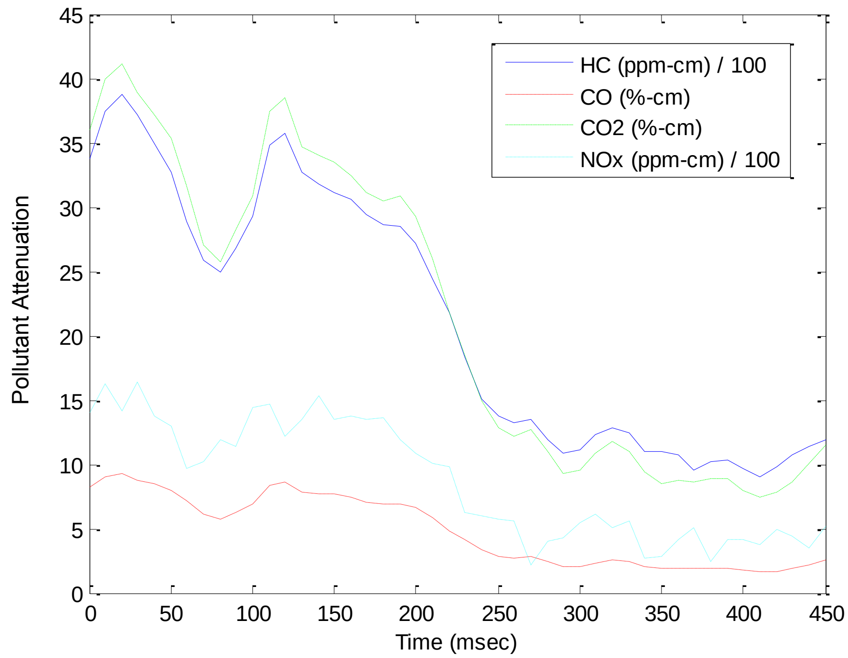
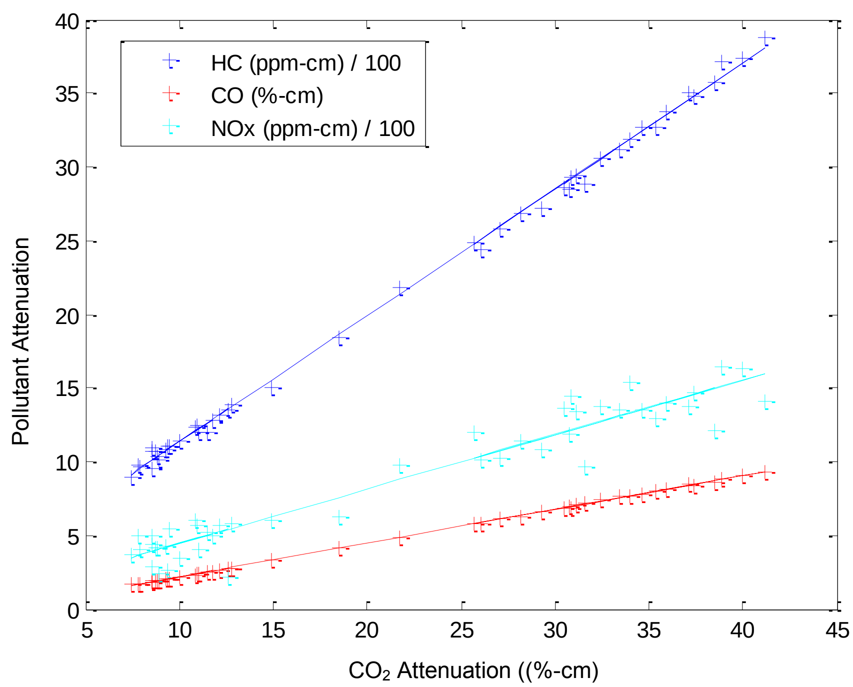


Figure A-2. Pollutant vs. CO_2 Attenuations for an Experimental Condition Simulating Zero Running-Loss Emissions (0.00 scfh propane) and Exhaust Emissions (30 scfm of 1100 ppmC_3 HC, 3.0% CO, 500 ppm NO, 12.92% CO_2, balance N_2, dry)



In estimating pollutant concentrations in the plume, relative to that for CO_2, the calculation makes use of the slope terms of the regressions of the attenuations. The slope values obtained can differ, depending on whether the background correction is obtained by the instrument and whether the intercepts are forced to zero.

After obtaining an attenuation slope in the first step, the second step in the calculation uses combustion stoichiometry. The calculations assume a particular composition for gasoline that contains carbon, hydrogen, and oxygen in specific proportions, which when combusted with air, will produce a corresponding mixture of HC, CO, NO, and CO_2. The balanced chemical equation for this reaction is then used to convert the relative pollutant concentrations estimated from the attenuation slopes into estimates of absolute pollutant concentrations.

Now, consider the situation when evaporative emissions are present. Running-loss emissions are predominantly hydrocarbons (some oxygenates may be present if the fuel contains them) and can be emitted from the vehicle from multiple sources, with the exception of the tailpipe. Accordingly, the characteristics of dispersion of running-loss emissions differ from those for tailpipe emissions. Running-loss emissions can be emitted as vapor or as liquid. Since the remote-sensing instrument can detect only vapor, liquid fuel must at least partially evaporate before it can be detected. A vehicle's running-loss emissions plume will not necessarily intermingle with its tailpipe plume. However, the running-loss emissions plume may pass through the instrument's light beam at the same time that the tailpipe plume is passing through the light beam. When a running-loss emissions plume intercepts the beam, it will cause the HC attenuation to be larger than were it not present.

Figure A-3 shows a set of attenuation time series for a set of experimental conditions in which both simulated exhaust and evaporative emissions were present. In this case, the shapes of the time series for CO, NO, and CO_2 are similar to each other, but the shape of the time series for HC differs markedly. Comparison of the HC trend with the CO, NO, and CO_2 trends indicates that the HC attenuation has a large increase beginning at about 100 msec. This difference is more obvious when the attenuations for the time series are plotted versus the CO_2 attenuations as shown in Figure A-4. Note that the trend lines shown in the figure are not forced through the origin. While the CO versus CO_2 and NO versus CO_2 plots remain as straight lines, the HC versus CO_2 curve shows an increase in HC attenuation relative to CO_2 attenuation and also shows a non-linear behavior. The quantification of this behavior can be used to develop a running-loss emissions index based on the remote-sensing measurements.

Attenuation measurements can be analyzed in diverse ways, leading to a variety of potential candidate indices. Approaches considered include the use of the difference between forcing and not forcing the intercepts of the HC vs. CO_2 attenuation slopes to zero, correlation coefficients between HC and CO_2 attenuation, and principal-components analysis of attenuation for HC, CO, NO and CO_2. After these approaches were ruled out as showing limited utility, attention shifted to examination of the sets of residuals for the regression of HC vs. CO_2 attenuation. One option considered was to order the residuals as a time series and apply techniques of signal processing, with the expectation that cases with high evaporative emissions would show higher degrees of low-frequency content relative to cases with low evaporative emissions. However, additional work showed that equal or superior predictive capabilities could be obtained with simple statistics calculated from sets of residuals.

Figure A-3. Attenuation Time Series for an Experimental Condition Simulating Simultaneous Running-Loss Emissions (15 scfh propane) and Exhaust Emissions (30 scfm of 1100 ppmC$_3$ HC, 3.0% CO, 500 ppm NO, 12.92% CO_2, balance N_2, dry)

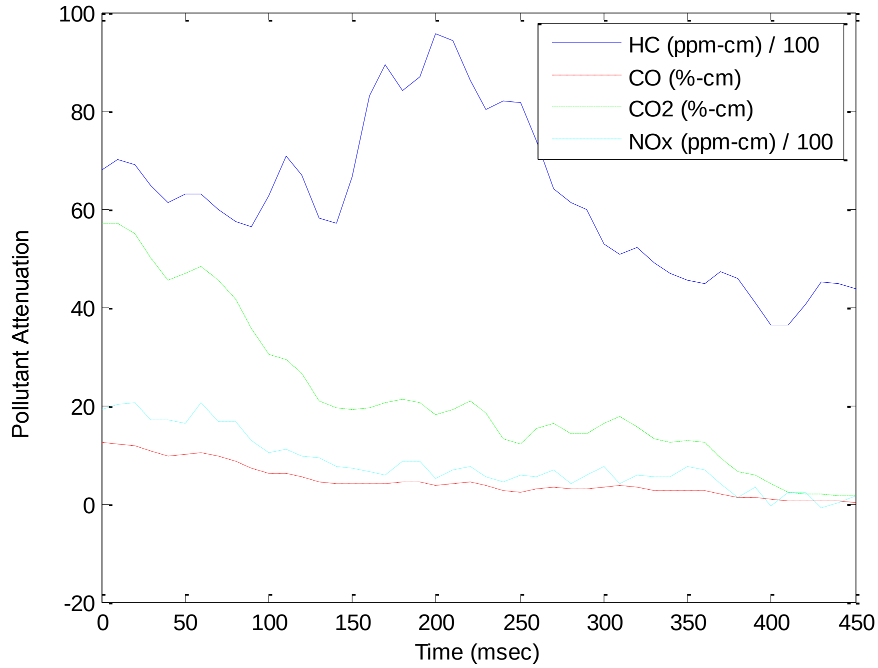
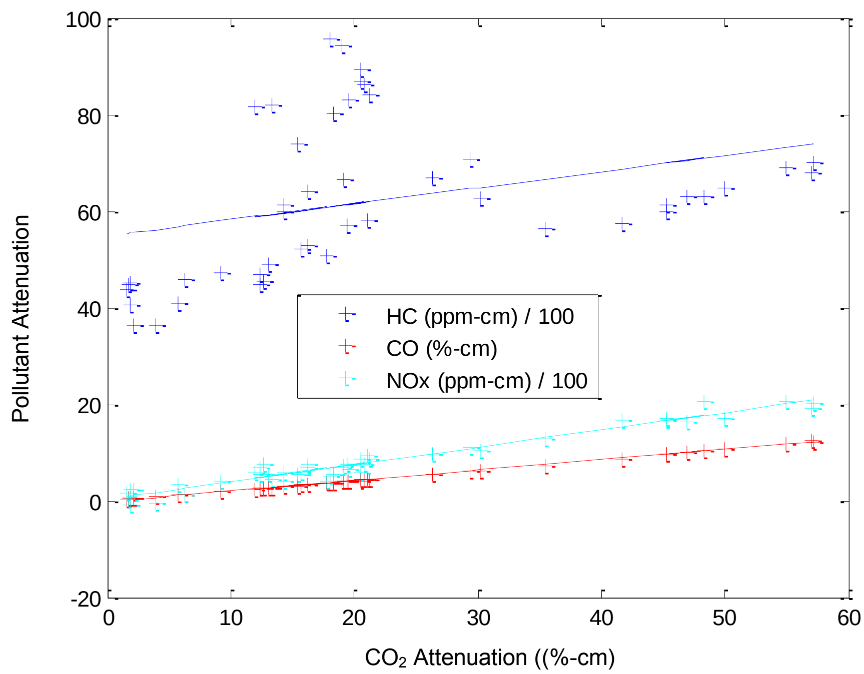


Figure A-4. Pollutant vs. CO_2 Attenuations for an Experimental Condition Simulating Simultaneous Running-Loss Emissions (15 scfh propane) and Exhaust Emissions (30 scfm of 1100 ppmC$_3$ HC, 3.0% CO, 500 ppm NO, 12.92% CO_2, balance N_2, dry)



In pursuit of this vein, additional candidate indices were examined. One option, the “trimmed mean residual” involved calculation of the mean of the absolute value of the residuals, after excluding the two largest residuals (in absolute value). Another measure was the sum of the absolute values of the residuals, after excluding the first four residuals. Experimentation with statistics led to the index used in the Ken Caryl project. As the twenty-third such candidate considered, it was labeled as “EI23.” The calculation of EI23 is described below.

Calculation of EI23

The key concept for EI23 is that the degree of scatter around the regression trend for HC vs. CO_2 attenuation is correlated with the running-loss rate. The concept is that the ninetieth percentile residual (approximately) of the regression of the HC vs. CO_2 attenuations is a measure of running-loss emissions. The largest residual is not used as it would be quite susceptible to random variation. The average residual is not used because the running-loss plume might waft through the light beam for just a fraction of the 500 msec sensing period. Both such events were observed during experimental work.

The index is calculated from sets of HC and CO_2 concentration-pathlength attenuation values obtained by the instrument. Note that the concentration-pathlength measurements, also sometimes known as optical depths, are standard quantities measured by many types of spectrometers including remote sensing instruments. They are not unique or proprietary to instruments produced by any particular manufacturer.

a) Acquire a set 50 HC and CO_2 measurements representing the passage of a vehicle by the instrument. Number the observations 0 through 49.
b) Delete observations 0, 1, 2, and 3.
c) Delete all observations flagged as “truncated plume.” This label applies when the plume is truncated by an object such as a following vehicle and no subsequent attenuation information is available for the current plume.
d) Delete all observations flagged as “interrupted plume.” This condition occurs when data acquisition from the current plume is temporarily interrupted but additional information is available from the plume after the interruption.
e) Count the number of observations (n) remaining after performing steps b), c), and d).
f) Perform a linear ordinary least squares regression of HC attenuation (ppm-cm) on CO_2 attenuation using the remaining n observations. Note that the regression is fit with a non-zero intercept ($a_{HC} = \beta_0 + \beta_1 a_{CO2}, \beta_0 \neq 0$) .
g) Calculate the residual for each of the n observations in the regression. The residual is defined as the observed (or measured) HC minus the predicted (or fitted) HC.
h) Divide n (the number of remaining observations) by 10. Round the result to the nearest whole number and call the result X.
i) Sort the n residuals from the largest to the smallest. (Note: -6 is smaller than -4)
j) Find the Xth largest residual. This value is taken as EI23.

Factors Influencing the Index

An evaluation of the performance of EI23 was made against a set of experimental remote-sensing data for which “running-loss” emissions rates were simulated at known rates.

The evaluation revealed that while EI23 could detect high running-loss rates, it was also affected by vehicle speed, exhaust HC concentration, and random variation in the attenuation data. These influences are explained as follows. As vehicle speed increases, the data points on the HC vs. CO_2 attenuation plot move toward the origin and the value of EI23 decreases because all regression residuals are smaller. As the exhaust HC concentration increases, the signal from running-loss HC is swamped by the signal from exhaust HC. Random variation in the attenuation data can confound the running-loss "signal" in the data as running-loss emissions are assumed to manifest as additional "noise."

Because of the dependences of EI23 on speed and exhaust HC concentration, a transformation of EI23, called "EI23 Bin" was created in an attempt to reduce the influence of these factors on vehicle selection. Appendix B provides a comparison of RSD evaporative emissions index EI23 with known running-loss emission rates.

Development of a Strategy for Classifying Raw EI23 Values

In 2008, the Colorado Department of Public Health and Environment (CDPHE) performed an experiment to examine the performance of EI23 at differing levels of simulated exhaust and evaporative emissions. An ESP 4600 remote-sensing instrument was used to collect a set of measurements for multiple passes of an RSD audit truck. The engine exhaust of the audit truck was routed high over the cab so that it was less likely to be detected by the light beams. The truck was equipped with a gas bottle system that could release (at 30 scfm) one of the following three gas mixtures designed to simulate exhaust emissions:

- 0 ppmC_3 HC, 0.0% CO, 0.0 ppm NO, and 15.07% CO_2, dry
- 1100 ppmC_3 HC, 3.0% CO, 500 ppm NO, and 12.92% CO_2, dry
- 6015 ppmC_3 HC, 5.0% CO, 250 ppm NO, and 11.55% CO_2, dry

The audit truck was also equipped with a system to release 100% propane at metered rates spanning a 100-fold range. These propane releases were used to simulate evaporative running-loss emissions.

A total of 598 measurements, including sets of 50 10-msec concentration×pathlength photometric measurements for HC, CO, NO, and CO_2, were collected when the audit truck was driven at 12 mph. For each measurement, [HC] was calculated, using regressions of HC on CO_2 attenuation, fit with zero and non-zero intercepts. The 50 photometric measurements of each pass by the RSD instrument were used to calculate an EI23 value for each vehicle passing the sensor.

The three simulated exhaust mixtures and the six propane release rates created 18 test conditions. Table A-1 shows the number of EI23 measurements taken at each test condition and statistics on the replicate EI23 measurements at each test condition.

The results in the table indicate that: 1) EI23 increases with propane release rate at constant exhaust HC concentration, 2) EI23 increases with exhaust HC concentration at constant propane release rate, and 3) the variance of the EI23 increases as the EI23 increases.

Table A-1. Summary of Test Conditions and EI23 Results (Audit Truck driven at 12 mph)

Test Condition			Evaporative Index (EI23)		
Propane Release Rate (scfh)	Exhaust HC Concentration ($ppmC_3$)	Number of RSD Measurements	Mean	Standard Deviation	Variance
0	0	100	90	24	591
	1100	100	83	21	453
	6015	98	189	84	7,054
0.15	0	20	110	32	997
	1100	20	139	80	6,383
	6015	20	177	67	4,539
0.45	0	20	104	34	1,131
	1100	20	152	94	8,855
	6015	20	234	137	18,885
1.5	0	20	145	58	3,408
	1100	20	200	111	12,227
	6015	20	260	125	15,530
4.5	0	20	888	499	248,619
	1100	20	782	593	351,627
	6015	20	692	449	201,862
15	0	20	1808	1807	3,265,574
	1100	20	1432	768	590,145
	6015	20	1569	1567	2,454,228

To further explore the patterns evident in these results, the 598 12-mph EI23 values were modeled against the propane release rate and the reported HC concentrations (calculated from regressions with non-zero intercepts). Due to the large degree of variability across test conditions, as shown in Table A-1, the EI23 values were modeled using a weighted ordinary least-squares regression using the inverses of the variances in Table A-1 as weights. An initial regression indicated that a two-way interaction between propane release rate and the HC concentration was not significant. Therefore, the final regression included only terms for propane release rate and HC concentration. The final regression gives predicted EI23 values according to:

$$EI23 = 78.536 + 79.005*PRR + 0.014181*EXHC \qquad \textbf{Equation A-1}$$

where PRR = propane release rate (scfh), and
EXHC = exhaust HC concentration ($ppmC_3$) as calculated by the remote-sensing instrument from regression of the HC attenuation vs. CO_2 attenuation plot when the intercept is not forced to zero.

For the field study at the Ken Caryl I/M station, some sort of estimate of the running-loss emissions of each vehicle entering the station driveway was needed to determine if the vehicle should be included in the PSHED evaporative emissions testing. Since the exhaust HC concentration would be known as soon as a vehicle passed the RSD instrument, that measured exhaust HC concentration can be substituted into the Equation A-1 to give the predicted EI23 as a function of propane release rate. The field approach was to classify each vehicle's running-loss emissions tendency by comparing each vehicle's measured EI23 value with seven EI23 reference values that are associated with seven reference propane release rates. Classifying each vehicle with seven EI23 reference values amounts to placing each vehicle's remote-sensing measurement into one of eight "EI23 Bins." The discussion below shows how the 12-mph data collected on the simulated running-loss and exhaust emissions on the audit truck were used to define the EI23 Bins.

Figure A-7 shows the measured vs. predicted plot for the regression that produced Equation A-1. The figure shows the large range of variances for the 18 test conditions. Because the variances are large and change greatly depending on propane release rate (see Table A-1), for the purposes of classifying the measured EI23 values, the EI23 values were transformed by taking the natural log of the natural log, which makes the variability more nearly homogeneous across the test conditions. This is demonstrated by Figure A-8, which also shows the linear trend of the measured vs. predicted values of ln(ln(EI23)). An analysis of the ln(ln(EI23)) across the 18 test conditions indicates a standard deviation of 0.091.

The measured values of ln(ln(EI23)) were classified into EI23 Bins by dividing the full range of values observed in the audit truck study into eight bins that move higher as the observed exhaust HC concentration increases. The movement of the bins accounts for the dependence of EI23 on exhaust HC concentration by using Equation A-1. According to Figure A-8, the range of ln(ln(EI23)) values extends from a low point about 2 standard deviations below the estimated value of ln(ln(EI23)) for a propane release rate of 0 scfh and an exhaust [HC] of 0 ppm (the bottom of the cluster of green circles on the left of the plot) to a high point about 2 standard deviations above the estimated value of ln(ln(EI23)) for a propane release rate of 15 scfh and an exhaust [HC] of 6015 ppm (the top of the cluster of red dots on the right side of the plot). These ln(ln(EI23)) values are estimated by the regression equation to be 1.291 and 2.157, respectively. That range was divided into 8 bands that were used to assign each EI23 value to a bin that corresponds to an approximate range of propane release rates, which are in turn estimates of running-loss emission rates. The locations of the bin dividers move up as the exhaust [HC] moves up. Figures A-9, A-10, and A-11 show where measured EI23 values for the audit truck fall with respect to their EI23 Bins, for exhaust HC concentrations of 0, 1100, and 6015 ppmC_3, respectively. The ln-ln transformation of EI23 values was used to allow the EI23 binning scheme to be independent of running-loss emission rate and exhaust HC concentration without changing the width of the bins.

Figure A-7. Measured vs. Predicted EI23 for the 12-mph Audit Truck Tests

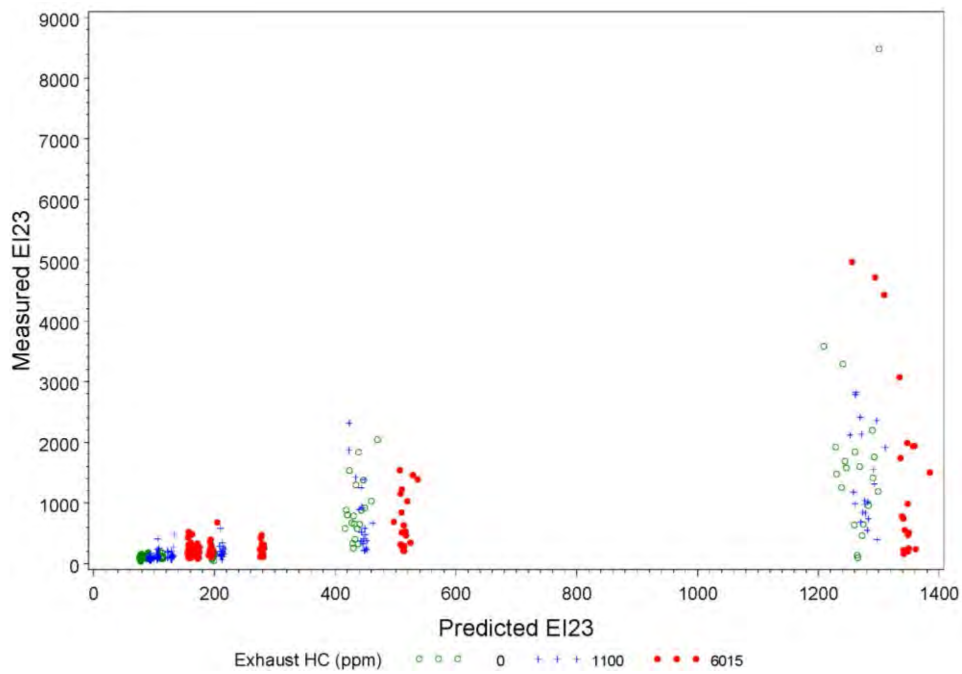


Figure A-8. Measured vs. Predicted ln(ln(EI23)) for the 12-mph Audit Truck Tests

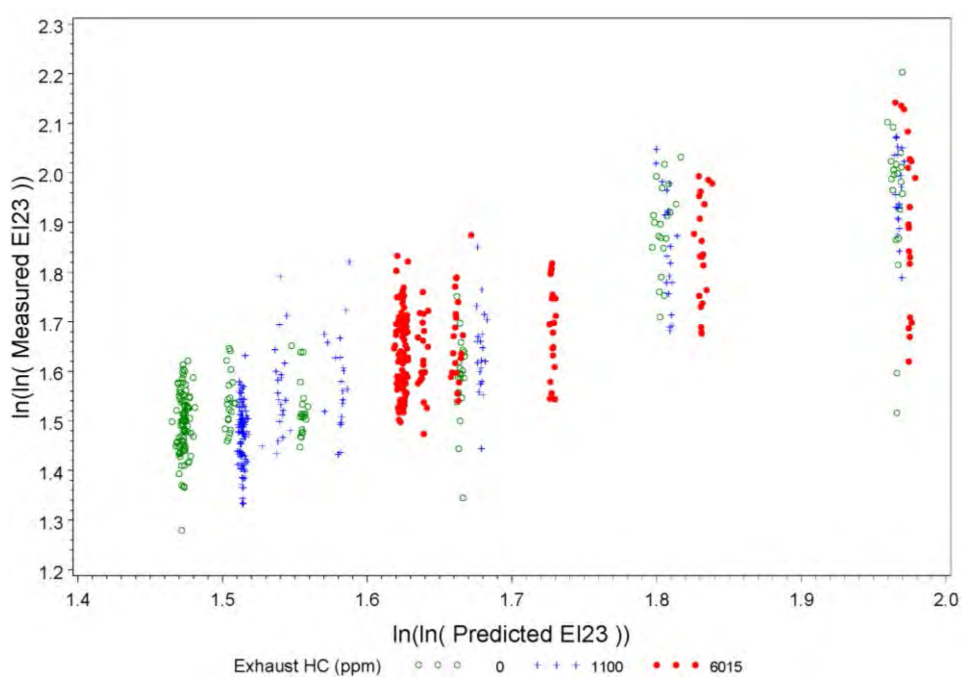


Figure A-9. Comparison of Measured ln(ln(EI23)) with EI23 Bins for Propane Release Rate Varied Across Its Range at Low Exhaust Emissions Concentrations (0 ppmC$_3$ HC, 0.0% CO, 0 ppm NO, 15.07% CO_2)

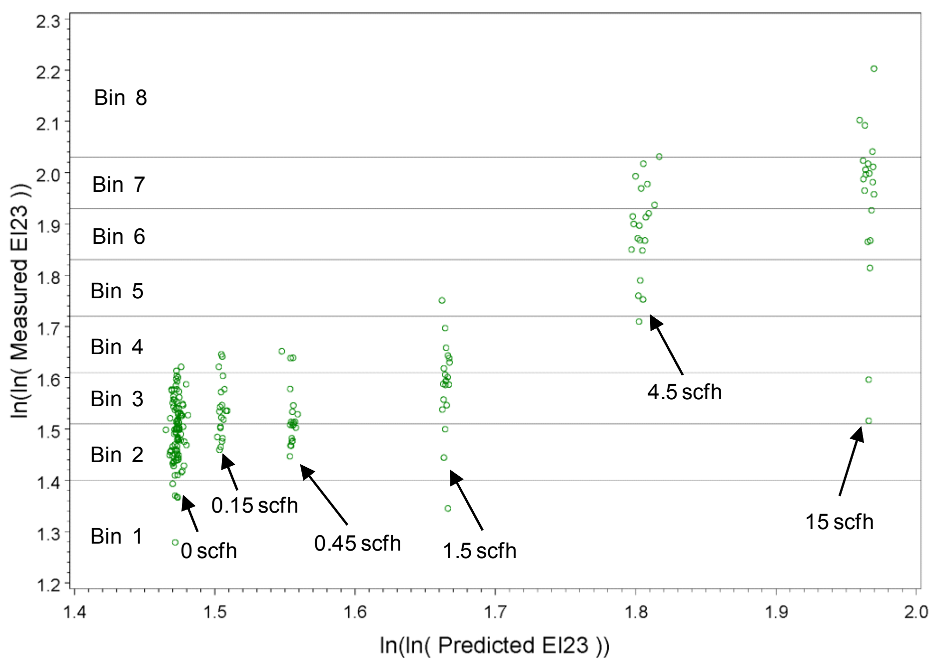


Figure A-10. Comparison of Measured ln(ln(EI23)) with EI23 Bins for Propane Release Rate Varied Across Its Range at Medium Exhaust Emissions Concentrations (1100 ppmC$_3$ HC, 3.0% CO, 500 ppm NO, 12.92% CO_2)

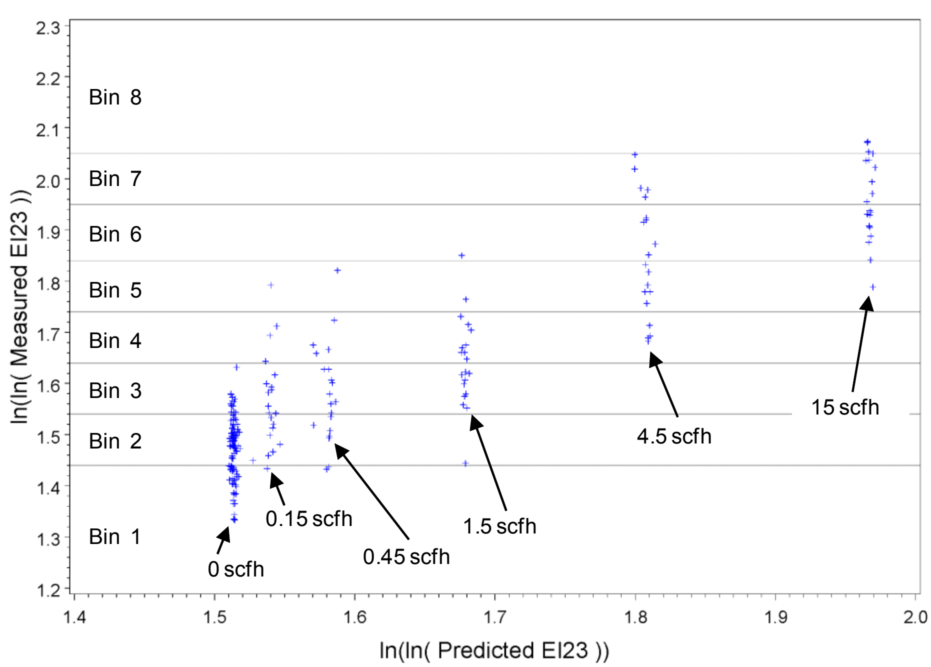
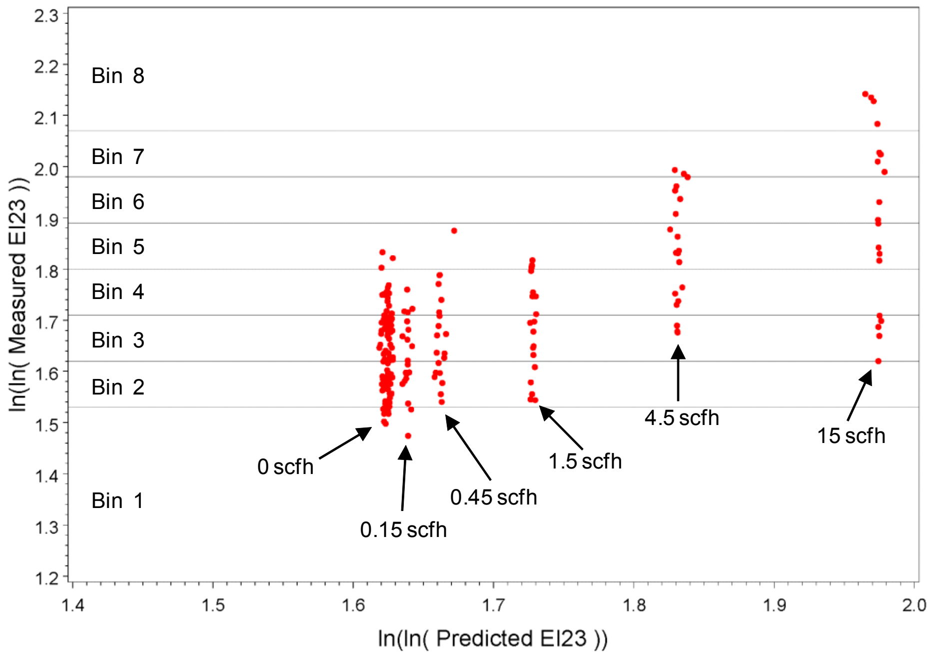


Figure A-11. Comparison of Measured ln(ln(EI23)) with EI23 Bins for Propane Release Rate Varied Across Its Range at High Exhaust Emissions Concentrations (6015 ppmC$_3$ HC, 5.0% CO, 250 ppm NO, 11.55% CO_2)



EI23 Bin: Classifying Raw EI23 Values

We have attempted to discount for exhaust HC concentration and other unknown influences by transforming and assigning individual EI23 values to classes ("bins") before using the index to guide sampling of individual vehicles. The classification is designed so as to be independent of the observed exhaust HC concentration. The calculation of EI23 Bin is described below.

a) For a set of attenuation values, calculate the estimated [HC] (ppmC$_3$). For this purpose, use a regression of HC on CO_2 attenuation fit with a non-zero intercept.

b) For each measurement, calculate the lowest and highest expected values of ln(ln(EI23), denoted as l

$$l_{low} = \ln [\ln(78.536 + 79.005 * (0.0) + 0.014181 * \text{EXHC})] - 2 * (0.091)$$

$$l_{high} = \ln [\ln(78.536 + 79.005 * (15.0) + 0.014181 * \text{EXHC})] + 2 * (0.091)$$

Note that these values represent upper and lower bounds for EI23, predicted on basis of experimental work with simulated evaporative and exhaust emissions, as described above. The constant taking values of 0.0 and 15.0 represents release rates of propane, simulating evaporative hydrocarbons, expressed in scfh. The coefficients are taken from the regression equation presented above (Equation A-1), and the constant 0.091 represents one standard deviation of l across all test conditions.

c) Divide the range of expected l into eight increments. The size of the increment for each measurements is given by:

$$i = \frac{l_{high} - l_{low}}{8}$$

d) Then, for values of j ranging from 1 to 7, calculate the values of EI23 that define a set of bins for each measurement:

$$b_j = \exp(\exp(l_{low} + ji))$$

f) Now, assign the value of EI23 for the current measurement to the appropriate bin, following the assigned logic:

if	EI23 $\leq b_1$	then Bin = 1
else if	$b_1 <$ EI23 $\leq b_2$	then Bin = 2
else if	$b_2 <$ EI23 $\leq b_3$	then Bin = 3
else if	$b_3 <$ EI23 $\leq b_4$	then Bin = 4
else if	$b_4 <$ EI23 $\leq b_5$	then Bin = 5
else if	$b_5 <$ EI23 $\leq b_6$	then Bin = 6
else if	$b_6 <$ EI23 $\leq b_7$	then Bin = 7
else if	$b_7 <$ EI23	then Bin = 8

Because few field measurements were expected in Bin 8, Bins 7 and 8 were combined and treated as “Bin 7.”

Interpretation of EI23 Bins

Vehicles that fall into the higher bins tend to have higher evaporative emissions than those in lower bins. However, the EI23 Bins should not be interpreted as if the evaporative emissions are proportional to the bin number. For example, vehicles in Bin 6 do not have twice the evaporative emissions of vehicles in Bin 3.

The width of each EI23 Bin represents approximately one standard deviation of the variability of a single EI23 measurement after accounting for the effects of the exhaust HC concentration on EI23. Thus, for a single remote-sensing measurement, EI23 Bin differences of two or more bins can be thought of as statistically significant.

Appendix B
Comparison of RSD Evaporative Emissions Index EI23 with Known Running-Loss Emission Rates

The EI23 evaporative emissions index was used to select vehicles as they entered the driveway of the Ken Caryl I/M station for possible inclusion in this study's sample. In this appendix selected data taken in the feasibility study is used to demonstrate the influence of various factors on the value of EI23 to show that EI23 carries information about running-loss emissions rate in the I/M station Driveway RSD measurement environment. In summary, EI23s measured at the low speeds in the driveway (about 12 mph) can detect running-loss emissions only under the best circumstances if the running-loss emission rate is above about 18 g/Qhr (grams per 15 minutes). However, under some circumstances when running-loss rates are lower than 18 g/Qhr, EI23 can still carry running-loss information, meaning that EI23 is associated with the probability that running-losses are greater than zero. These findings mean that EI23 has potential in the Ken Caryl study to be used as an evaporative emissions screening tool to enrich the sample with elevated evaporative emissions vehicles.

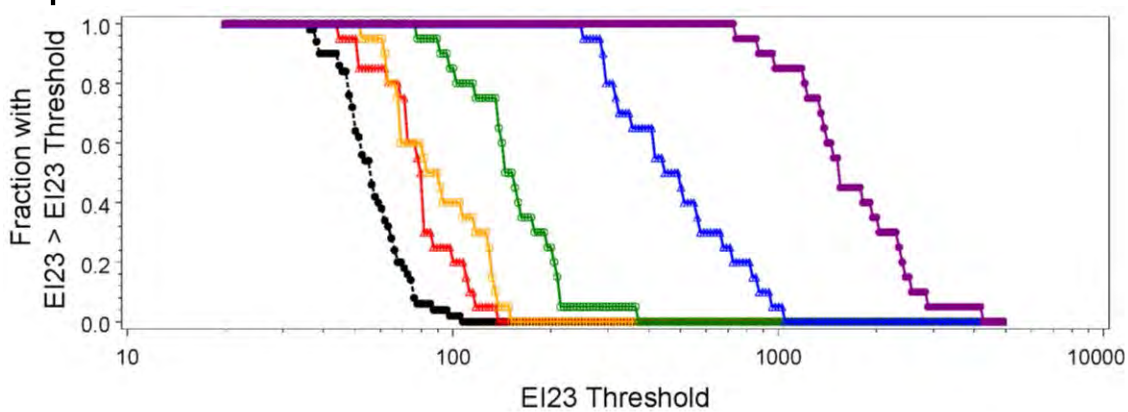
The Ken Caryl I/M station fleet of interest in this study is made up of light-duty gasoline vehicles with model years from 1961 to 2010. These vehicles will have a wide range of exhaust emissions and running-loss emissions. They will drive past the Driveway RSD unit at relatively low speeds near 12 mph, but the speeds will not be the same for all vehicles. The running-losses of the vehicles may be generated from gasoline vapor or liquid gasoline and they may be generated at one or more locations on the vehicle. The feasibility study data indicates that EI23 can be used in this study to detect elevated running-losses in many, but not all, situations.

The figures in this section present a portion of the feasibility data. Each plot in the figures shows the cumulative distribution of 20 replicate EI23 values measured at each test condition. These plots can be used to judge if a given running-loss rate is capable of being detected by a single EI23 measurement. The commonly used standard for detection used for analytical instruments is applied to the EI23 and running-loss situation: If the mean of the EI23 when running-losses are present and the mean EI23 when running-losses are not present are different by more than three standard deviations of the distribution of EI23s when running-losses are not present, then the running-loss is detected. For the purposes of visually judging detection from the plots in this section, the definition is approximated for this evaluation by: If the median of the EI23 when running-losses are present is larger than the largest EI23 value of the 20 values in the EI23 distribution when running-losses are not present, then the running-loss is detected.

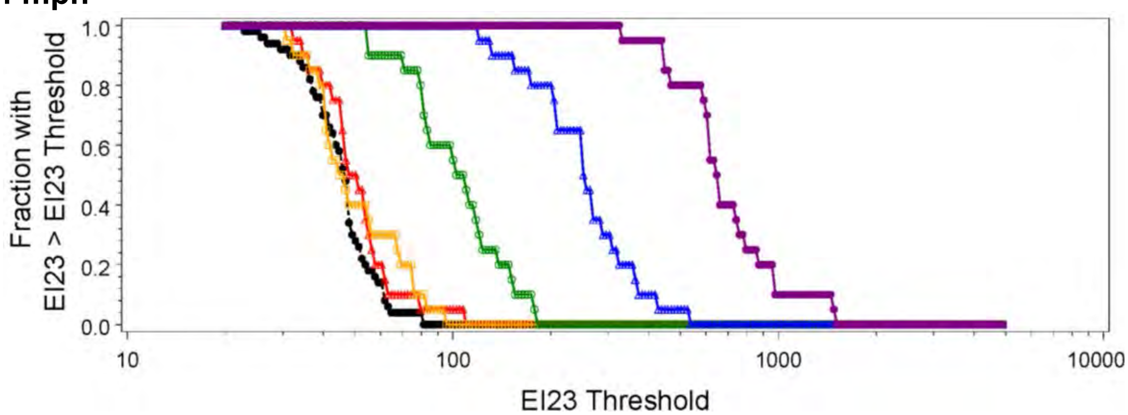
Figure B-1 shows some of the results for Test Vehicle 1, a 2008 Ford Escape, which had an average exhaust HC concentration near 0 ppmC3. The EI23 values were measured at 12, 34, and 55 mph and with under-hood propane release rates of 0, 0.15, 0.45, 1.5, 4.5, and 15 scfh. Typically, 20 replicate RSD measurements were made at each speed / propane release rate combination. Each cumulative EI23 curve in each Figure B-1 plot shows the range of EI23 values for each condition with the values sorted in ascending order. For example, the blue curve in Figure B-1a indicates that for 12 mph and 4.5 scfh propane the EI23 values ranged from about 250 to 1000 with a median of about 500. The repeatability for EI23s at this condition is therefore about +200% and -50%. The black curve with the dots shows the location of the EI23 distribution when no propane was released (0 scfh propane). Thus, the difference in location of a colored curve and the black curve shows the effect of the propane being released.

Figure B-1. EI23 Distributions for 6 Propane Under-Hood Propane Release Rates for Test Vehicle 1 (Exhaust HC = 0 ppmC3) at 3 Speeds

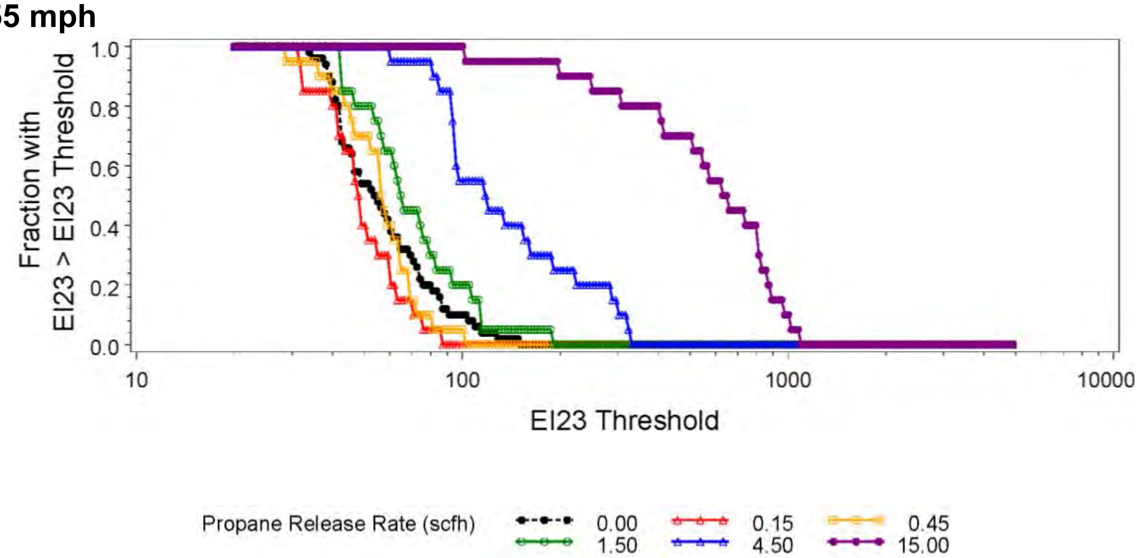
a) 12 mph



b) 34 mph



c) 55 mph



Using the definition of detection discussed earlier, Figure B-1a, which is for 12 mph, indicates that the upper three propane release rates (1.5, 4.5, and 15 scfh) are detected by EI23. Note that in Figure B-1a the median (y-axis = 0.5) of the green curve for 1.5 scfh is just larger than the largest value of the 0 scfh curve (black dots). But the medians of the red and orange curves for 0.15 and 0.45 scfh are within the range of the 0 scfh EI23 values. This behavior suggests that at 12 mph, EI23 can distinguish propane release rates of 1.5 scfh or larger (18 g/Qhr or larger) from zero running-loss emissions. EI23 carries running-loss information for release rates below 1.5 scfh since the red 0.15 scfh curve and the orange 0.45 scfh curve are slightly above the black 0 scfh curve, but the noise in the EI23 values makes detection of running-loss emissions unreliable for release rates below 1.5 scfh based on a single RSD measurement for a vehicle. However, Figure B-1a suggests that at release rates below 1.5 scfh, EI23 may best be used as a screening test to increase the probability of selecting a vehicle that has elevated running-loss emissions.

At 34 mph, Figure B-1b shows that 0.15 and 0.45 scfh propane are not distinguishable from 0 scfh. Therefore, at those running-loss levels EI23 does not carry much running-loss information and certainly cannot detect propane. Since the medians for the 1.5 scfh, 4.5 scfh, and 15 scfh curves are all above the largest 0 scfh EI23 value, these running-loss rates ate detectable at 34 mph.

Similarly, Figure B-1c shows that at 55 mph the EI23 distributions for 0.15 scfh, 0.45 scfh, and 1.5 scfh are close to the same location as for 0 scfh, and therefore those running-loss rates are not detected. The median for the blue curve for 4.5 scfh is not larger than the largest 0 scfh value, but the blue curve is substantially shifted with respect to the 0 scfh curve. In this situation, running-losses are not able to be detected based on a single EI23 value. However, because the blue curve is shifted with respect to the black curve, EI23 can be used to estimate the probability that the running-loss is greater than 0 scfh. In contrast, the purple 15 scfh EI23 distribution is almost completely resolved from the black 0 scfh distribution, indicating that at 55 mph 15 scfh can be detected.

Taken altogether, the plots in Figure B-1 show that as speed increases, the EI23 distributions for all non-zero propane release rates shift lower toward the EI23 distribution for 0 scfh propane. As the vehicle speed increases, EI23 becomes less able to detect the propane releases and, for those low running-loss rates that cannot be detected, EI23 becomes less able to estimate even the probability that the running-loss is greater than 0 scfh. However, since EI23 was used to select vehicles in the Ken Caryl study using EI23 at 12 mph in the station driveway, the EI23 performance in the vicinity of 12 mph needs to be examined in more detail. The next two paragraphs evaluate the effects of running-loss release point and exhaust HC concentration while keeping speed constant at 12 mph.

Another area of testing in the feasibility study was the influence of the release point of the propane on the vehicle. Figure B-2 shows the results for release location testing on Test Vehicle 2, a 1992 Oldsmobile Eighty-Eight at 12 mph. The spark plug wire on cylinder 5 was disconnected to cause this vehicle to have an exhaust HC concentration of about 2000 ppmC3. On this vehicle, propane was released at 4.5 scfh under the hood, at the top of the gas tank, and at the fuel fill door. Comparison of the 4.5 scfh EI23 distributions in the figure show that while the three locations produced shifts with respect to each other, all three locations were clearly distinguishable from the 0 scfh EI23 distributions. The EI23 could detect the running-loss emissions in any of the three release locations.

Because the RSD instrument has a single HC detection channel, exhaust HC may interfere with the detection of running-loss HC. The test results in Figure B-3 show this effect for the audit truck. In these tests the audit truck had a simulated exhaust gas that contained CO, CO_2, NO, and either 0, 1100, or 6015 ppmC3 propane, but no water vapor. The running-loss propane release rate was either 0 or 4.5 scfh. The plots show that as the exhaust HC concentration increases, the separation between the 0 scfh and the 4.5 scfh EI23 distributions gets smaller. The plots indicate that this is caused by an increase in the EI23 values for the 0 scfh situation rather than a decrease in the EI23 values for the 4.5 scfh situation. In any case, while the presence of exhaust HC tends to reduce the running-loss signal as measured by EI23, EI23 is still able to detect the running-losses when the exhaust HC is 0 or 1100 ppmC3. However, when the exhaust HC is 6015 ppmC3, the detection of 4.5 scfh was just barely detectable.

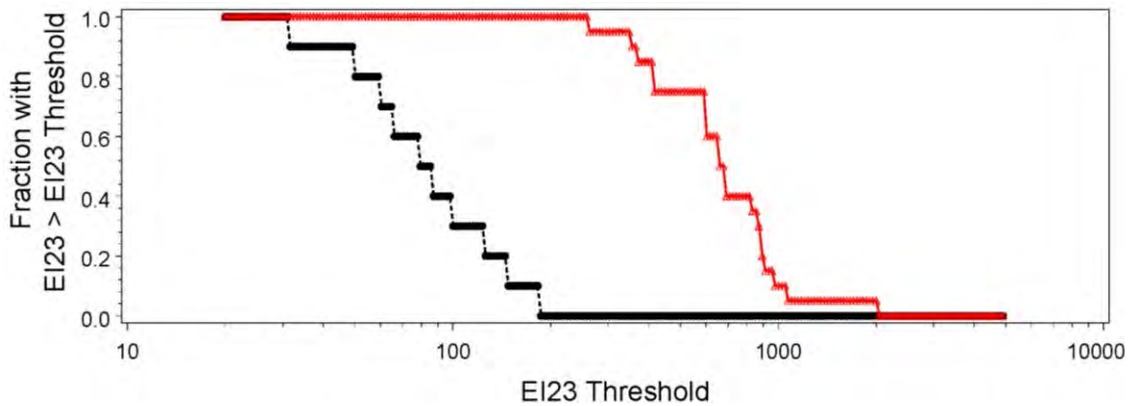
In some situations running-losses occur by the direct release of liquid gasoline. The feasibility study tested this situation at 12 mph by metering gasoline releases from a thin plastic tubing so that drops could fall directly to the pavement without first hitting the vehicle or being rolled over by the tires. When the vehicle was at rest, the drops of gasoline were confirmed to be hitting the pavement. However, as the vehicle moves – even at 12 mph – the rate of gasoline evaporation from the droplets is expected to be higher than when the vehicle is at rest. RSD can detect HC only in the vapor phase; therefore, some evaporation of the gasoline is required for liquid running-losses to be detected. This requirement for volatilization imposes a greater burden on EI23 to detect liquid gasoline running-losses.

Figure B-4 shows the results for liquid gasoline releases at 0, 0.05, 0.1, 0.5 and 1 mL/s from the front bumper and the rear bumper with the vehicle traveling at 12 mph. Test Vehicle 7 was a 2001 Chevrolet Blazer with an average exhaust HC concentration near 0 ppmC3. The EI23 distributions in Figure B-4a and B-4b show increasing EI23 distributions as the gasoline release rate increases. Figure B-4a shows that 0.1, 0.5, and 1 mL/s liquid gasoline releases from the front bumper were detected by EI23. The 0.05 mL/s rate was border-line detected. However, Figure B-4b shows that only 0.5 and 1 mL/s liquid gasoline releases from the rear bumper were detected. The distributions of the EI23 values for the rear bumper are lower than those for the front bumper, presumably because releases from the front bumper have more time to evaporate than releases from the back bumper. The 0.1 mL/s release rate EI23 distributions are both distinguishable from their 0 mL/s EI23 distributions and therefore under those conditions EI23 carries some running-loss information. A 0.1 mL/s gasoline release rate is approximately equal to 68 grams of gasoline per 15 minutes.

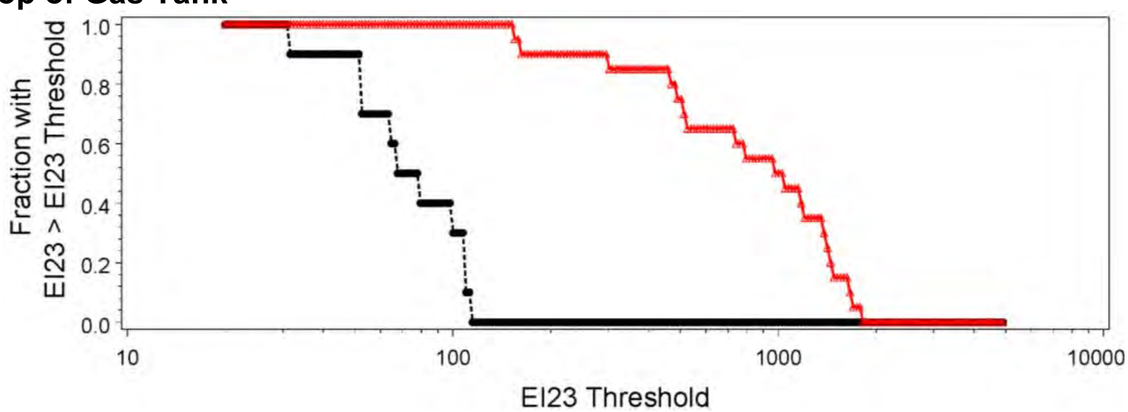
Finally, Figure B-5 shows the same type of liquid gasoline testing on Test Vehicle 6, which was a mal-maintained 1990 Chevrolet Lumina with an exhaust HC concentration of about 19,000 ppmC3. In this situation, which was similar to but more extreme than the high exhaust HC concentration results shown in Figure B-3c, the high exhaust HC concentration hindered the EI23's ability to clearly detect the liquid gasoline releases. Nevertheless, the curves in the figures show some ability to estimate the probability that the running-loss emissions were larger than 0 scfh from the front and rear bumpers of the vehicle.

Figure B-2. EI23 Distributions for 2 Propane Release Rates for Test Vehicle 2 (Exhaust HC = 2000 ppmC3) at 12 mph at 3 Locations

a) Under Hood



b) Top of Gas Tank



c) Fuel Fill Door

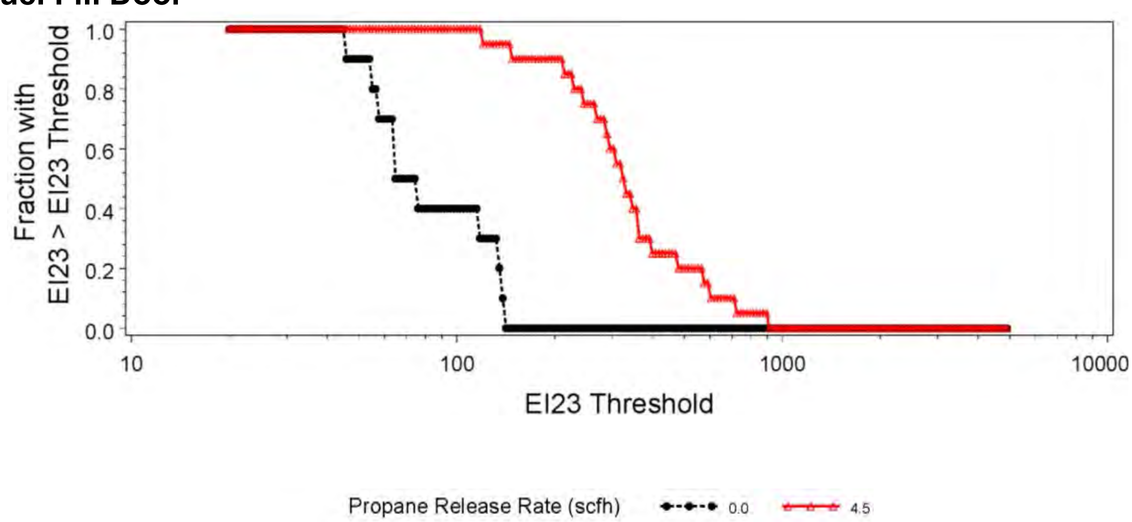


Figure B-3. EI23 Distributions for 2 Propane Fuel-Fill-Door Propane Release Rates for Audit Truck at 12 mph for 3 Exhaust HC Concentrations

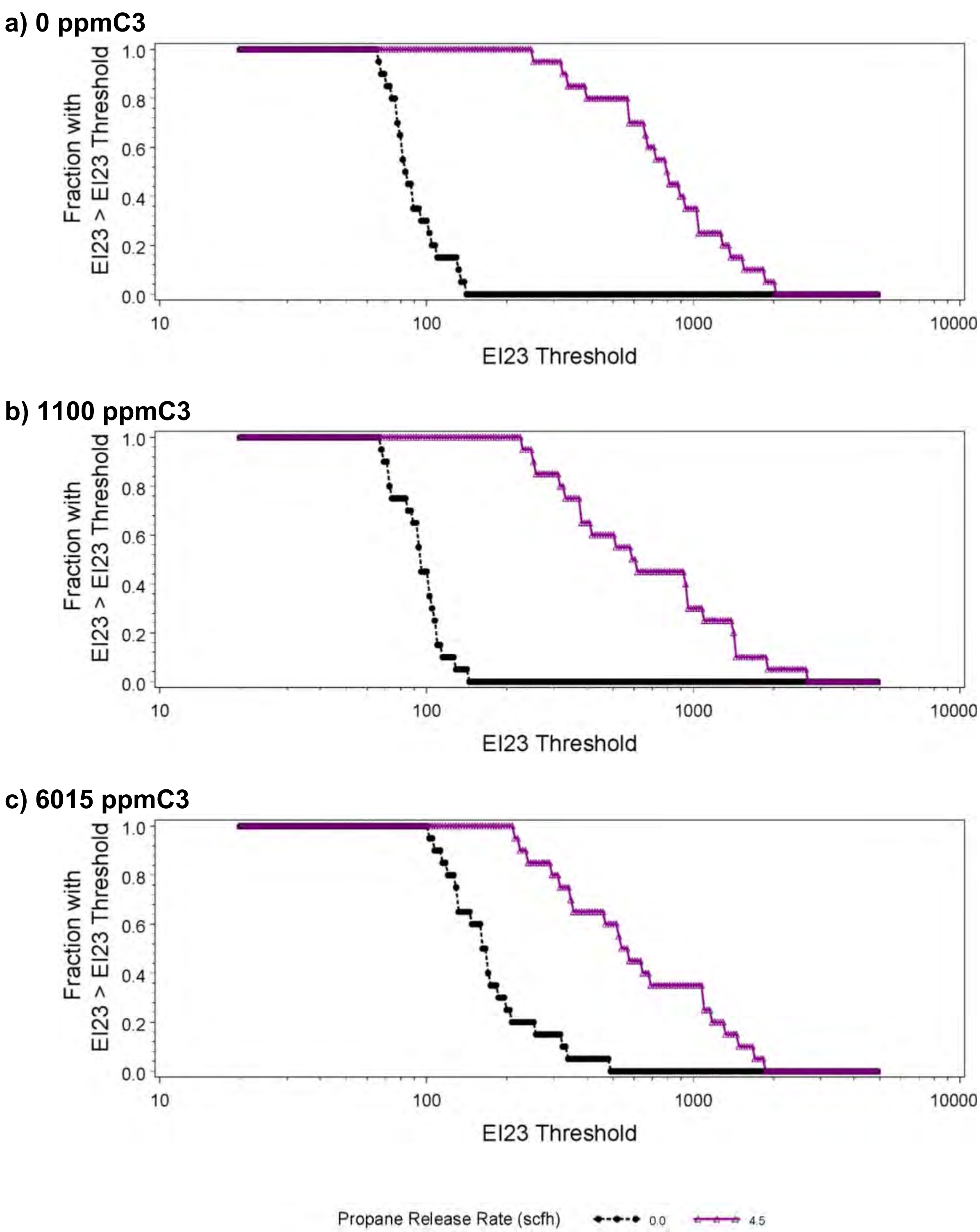
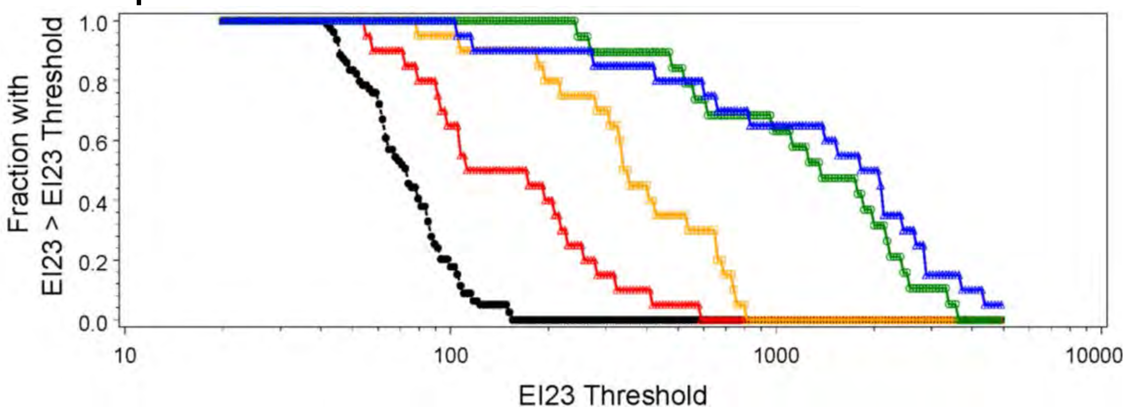


Figure B-4. EI23 Distributions for 5 Liquid Gasoline Release Rates for Test Vehicle 7 (Exhaust HC = 0 ppmC3) at 12 mph at 2 Locations

a) Front Bumper



b) Rear Bumper

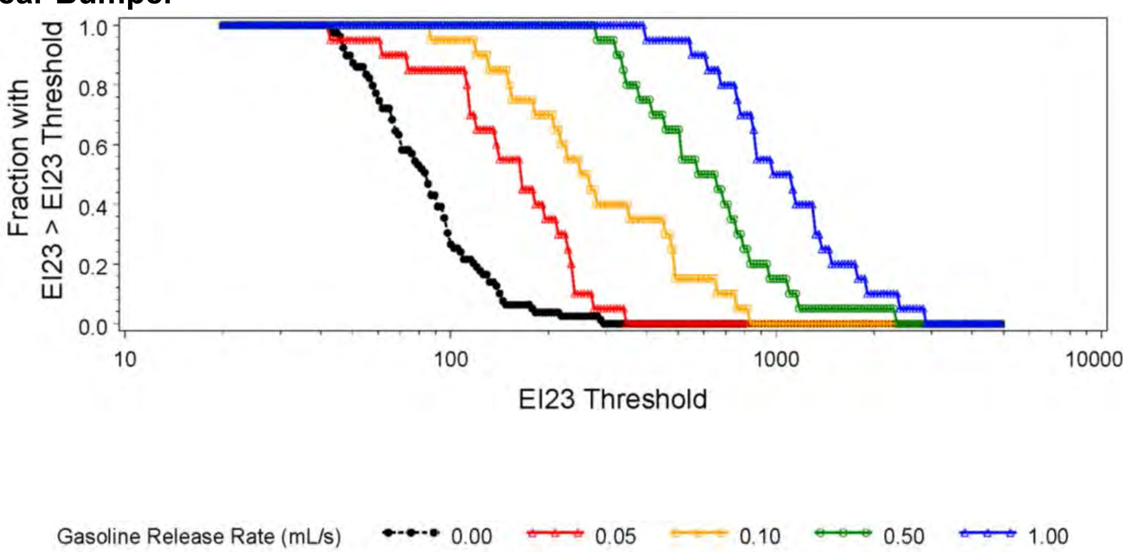
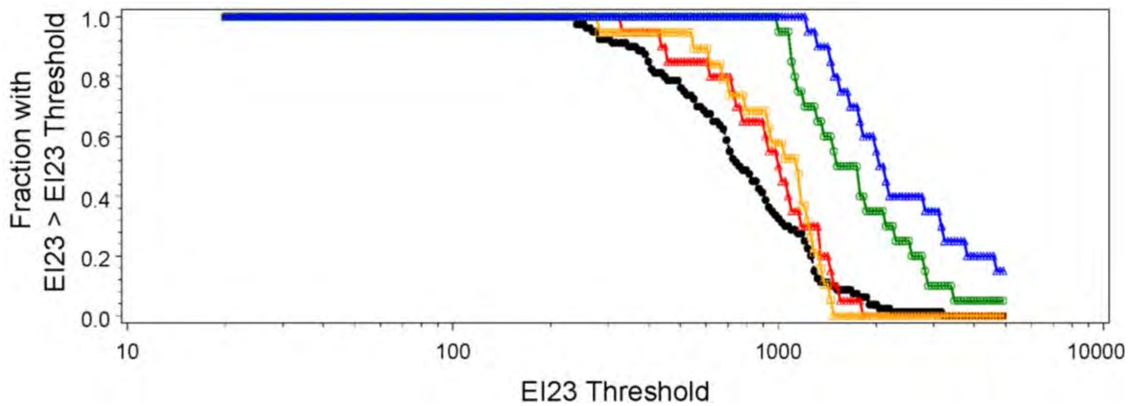
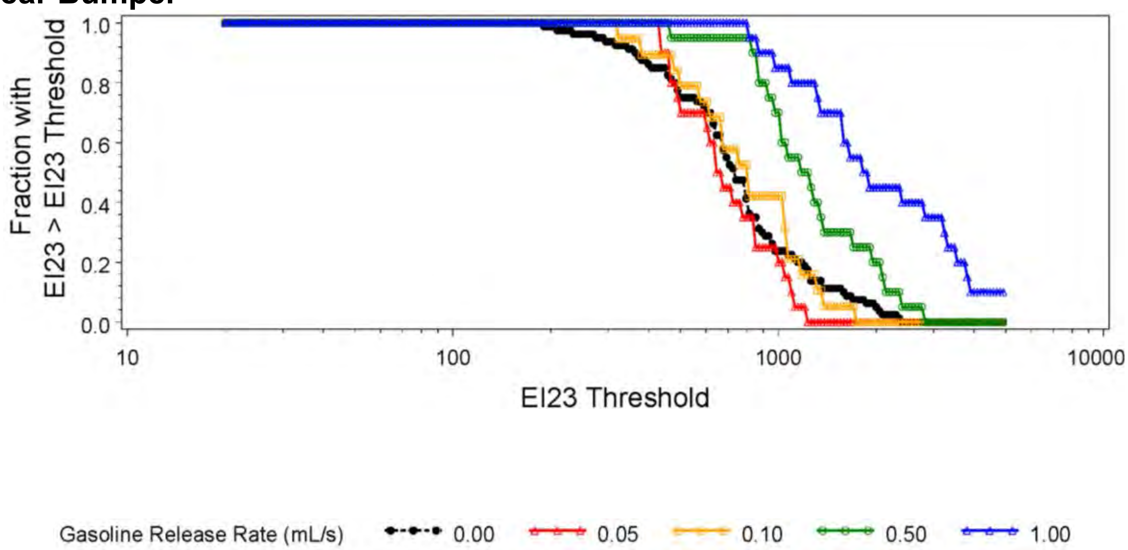


Figure B-5. EI23 Distributions for 5 Liquid Gasoline Release Rates for Test Vehicle 6 (Exhaust HC = 19000 ppmC3) at 12 mph at 2 Locations

a) Left Front Wheel



b) Rear Bumper



Overall, the feasibility testing results indicate that EI23 can detect running-loss emissions on vehicles traveling at about 12 mph if the conditions are favorable.

1. EI23 can distinguish propane release rates of 1.5 scfh or larger (18 grams per 15 minutes or larger) from zero running-loss emissions.

2. At release rates below 1.5 scfh propane, EI23 may be used as a screening test to select vehicles with a higher probability of having elevated running-loss emissions.

3. EI23 can detect running-losses from different release locations on the vehicle.

4. EI23 can detect liquid gasoline releases but with a poorer detection limit than for vapor releases.

5. Exhaust HC reduces EI23's sensitivity to running-losses, but the effect is small for exhaust HC concentrations from 0 to 6000 ppmC3, which is the dominant range of exhaust HC concentrations for fleet vehicles.

Appendix C
Sample Blank Data Packet

Packet ID________(give to all RSD vans)

Selection VDF________Bin___

(get from Selection RSD van)

Recruiter Contact Date _________
Recruiter Contact Time _________

Make___________ Model__________
MY_____________ Color__________

Y N Full Time or All Wheel Drive or Traction Control

Rear Plate _______State___ Metal Paper
Front Plate_______State___ Metal Paper
Other Plate_______State___ Metal Paper

Participant: Yes No

Participant First Name _______________

Ken Caryl IM Station
10727 Centennial Road
Littleton, Colorado 80127

Packet ID:__________

Recruiter First Contact

Are you the owner of this vehicle?	Y	N
Is this a Fleet Vehicle?	Y	N
Is this your normal, every-day car? (no cream puffs, collector's cars, mechanics specials)	Y	N
Your vehicle is eligible for this study. Are you interested in hearing about the project?	Y	N

I, ______________________, would like to participate in this study.
(printed name)

I have received $_________ to participate in this project.

____
Signature

____
Date

Driver Questionnaire

1. On average, approximately how many miles is this vehicle driven annually (12,000 is average)?

   (a)< 8,000 (b) 8,000-12,000 (c)12,000-24,000 (d) > 24,000 (e) Don't know

2. How long have you owned your car? ________ months / years OR
   We got this vehicle on _______________ (month/year date) Don't know

3. At night, do you park this vehicle:
   (a) Inside a garage (b) Outside/Carport (c) Both

4. When was the last time you fueled your vehicle?
   (a) Last 24 hours (b) 1 to 2 days ago (c) 3 to 5 days ago
   (d) Greater than 5 days ago (e) Don't know

5. Does this vehicle get regular, routine maintenance?
   (a) Yes (b) No (c) Don't know

6. When was the last time you had each of the listed services performed on this vehicle?

	a	b	c	d	e	f
Oil Change:	0-3 months	4-6 months	7-12 months	>12 months	Don't Know	Never
Tune Up:	0-3 months	4-6 months	7-12 months	>12 months	Don't Know	Never
NewGasCap:	0-3 months	4-6 months	7-12 months	>12 months	Don't Know	Never
Fuel System:	0-3 months	4-6 months	7-12 months	>12 months	Don't Know	Never
MajEngWrk:	0-3 months	4-6 months	7-12 months	>12 months	Don't Know	Never

7. Have you ever noticed a gasoline smell around your vehicle? Yes No
   If yes, please describe the circumstance.

   If yes, have you done anything to fix it?

8. Has the vehicle ever been in an accident severe enough that repairs had to be made before it could be operated again? Yes No Don't Know

Rental Car Checkout

Attach Photocopy of Driver's License (front and back) here.

Which rental vehicle given out: __________________________

When owner will return: Date: _________ Time: _________

Circle Primary Phone Number to Contact:

Home (_____) _______–___________

Work (_____) _______–___________

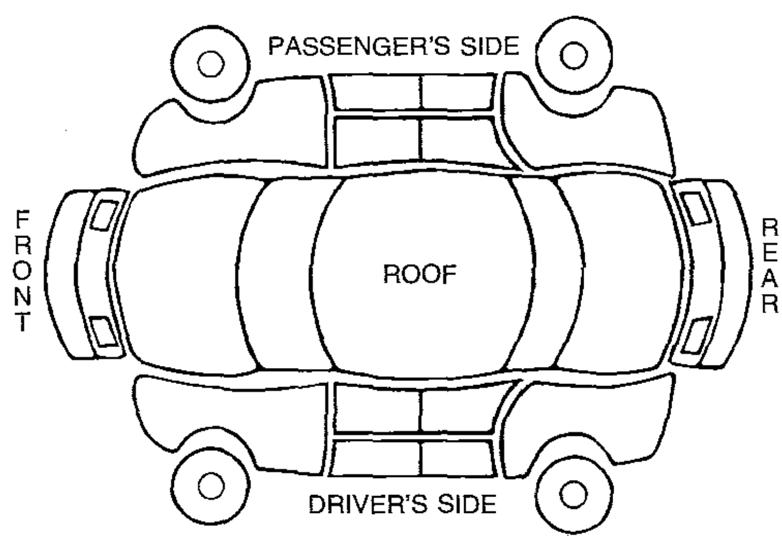
Cell (_____) _______–___________

Visual Pre-Inspection of Owner's Vehicle

D - Dent

S - Scratch

M - Missing



IM Inspection Results and Copy of Vehicle Inspection Report

(staple copy of report here)

Gas cap result: Pass Fail N/A

Modified California Method Date: ___________

Verify that Gas Cap is on and is tight. Initials: __________

Record 2 warm-up IM240 times: ____:____ ____:____

Engine warm after driving and still running

(Check one descriptor for each Location and each of the 2 methods.)

Location	Visual Liquid	Sniffer
Gas Cap	0 m S G NP	Y N NP
Underbody fuel lines	0 m S G NP	Y N NP
Bottom of fuel pump	0 m S G NP	Y N NP
Fuel pump to metering	0 m S G NP	Y N NP
In-line fuel filter	0 m S G NP	Y N NP
Fuel rail + connectors	0 m S G NP	Y N NP
All fuel-injectors	0 m S G NP	Y N NP
Ground under vehicle	0 m S G NP	Y N NP

Engine off

(Check one descriptor for each Location and each of the 2 methods.)

Location	Visual Liquid	Sniffer
Fuel fill pipe to tank joint	0 m S G NP	Y N NP
Tank: rust,straps,damage	0 m S G NP	Y N NP
Non-OEM installations	0 m S G NP	Y N NP

Detailed comments:

Descriptors:

- 0 =No visual evidence of liquid fuel leaks
- m =Minor signs of fuel (staining, damp spots), wicking<1"
- S =Significant leaks with single drops of fuel from vehicle to the ground, wicking>1"
- G =Gross leaks, regular flow of drops to the ground, or a large pool of fuel, wicking>1"
- NP =Not Performed
- Y =Positive Sniffer Response
- N =Negative Sniffer Response

Packet ID:__________

Vehicle Information Sheet

Photos (after shooting, verify that photo is in focus):

1. Front Quarter View with License Plate visible and readable (with white board and Packet ID#)
2. Vehicle Emission Control Info label **close-up** photo (get engine family, evap family, certification year)
3. VIN **close-up** photo (windshield or door frame)
4. Rear View with License Plate visible and readable (with white board and Packet ID#)

Under Hood:

Fuel Metering Type: Carbureted Fuel-Injected

VECI Certification Year: ____________

VECI Engine Family: ________________________

VECI Evap Family: ________________________

VIN (print very carefully, e.g. V, U, S, 5, 7, Y, X, 9, 4):

Interior:

Transmission Type: Manual Automatic

Fuel Level (circle one) F 3/4 1/2 1/4 <1/4

Odometer Reading ________________________

Odometer Digit Resolution (circle one) 5 6

<u>RSD Testing</u> Date:____________

55 mph RSD #2 (Highway). VDF:________Time: ____________
(Get VDF from RSD operator by radio)

55 mph RSD #3 (Highway). VDF:________Time: ____________
(Get VDF from RSD operator by radio)

- -

Date: ____________

34 mph RSD #4 (Highway). VDF:________Time: ____________
(Get VDF from RSD operator by radio)

34 mph RSD #5 (Highway). VDF:________Time: ____________
(Get VDF from RSD operator by radio)

- -

Date: ____________

12 mph RSD #6 (Driveway). VDF:________Time: _________
(Get VDF from RSD operator by radio)

12 mph RSD #7 (Driveway). VDF:________Time: _________
(Get VDF from RSD operator by radio)

- -

<u>Optional RSD Testing</u> Date: ____________

__ mph Drive past RSD #8. VDF:________Time: ____________
(Get VDF from RSD operator by radio)

__ mph Drive past RSD #9. VDF:________Time: ____________
(Get VDF from RSD operator by radio)

PSHED Testing

Label FID file as: S ___ ___ ___ ___ ___ ___ ___ .csv
S (PacketID) (α) (m) (d d) .csv

	Time	HC (ppmC)	T (°F)	P_{baro} ("Hg)
Initial PSHED				

Put vehicle in PSHED and seal the door.

	Time	HC (ppmC)	T (°F)	P_{baro} ("Hg)
Door Sealed				
Final PSHED (@900s)				

Remove vehicle from PSHED.

Total mass of HC at end of the test (grams)_______________

- -

Optional PSHED Testing

Label FID file as: S ___ ___ ___ ___ ___ ___ ___ .csv
S (PacketID) (α) (m) (d d) .csv

	Time	HC (ppmC)	T (°F)	P_{baro} ("Hg)
Initial PSHED				

Put vehicle in PSHED and seal the door.

	Time	HC (ppmC)	T (°F)	P_{baro} ("Hg)
Door Sealed				
Final PSHED (@900s)				

Remove vehicle from PSHED.

Total mass of HC at end of the test (grams)_______________

Data Packet QC Check

As project on-site manager, I have carefully examined every data blank in this data packet and certify that all data entries have been made and are legible and understandable.

____
(initials)

Evap Repairs and Follow-Up Testing

Shop:____
Phone:____

Date and time picked up:_______________________________
Name of person picking up vehicle:_______________________
Signature:____

Vehicle return date and time:____________________________
Name of person receiving:_______________________________
Date and time of return:________________________________
Attach all repair order forms ☐

Total labor cost: $_________________________________
Total parts cost: $_________________________________

Record 2 warm-up IM240 times: ____:____ ____:____

12 mph RSD Date: _______Time:________VDF:__________

12 mph RSD Date: _______Time:________VDF:__________

Perform SHED test (results on next page)

Notify owner vehicle ready for pickup

Date and time:____________________________________

Customer pickup date and time:______________________
Name of person receiving:____________________________
Signature:_______________________________________

After-Repair PSHED Testing

Label FID file as: S ___ ___ ___ ___ ___ ___ ___ .csv
S (PacketID) (α) (m) (d d) .csv

	Time	HC (ppmC)	T (°F)	P_{baro} (“Hg)
Initial PSHED				

Put vehicle in PSHED and seal the door.

Door Sealed				
Final PSHED (@900s)				

Remove vehicle from PSHED.

Total mass of HC at end of the test (grams)_______________

- -

Optional After-Repair PSHED Testing

Label FID file as: S ___ ___ ___ ___ ___ ___ ___ .csv
S (PacketID) (α) (m) (d d) .csv

	Time	HC (ppmC)	T (°F)	P_{baro} (“Hg)
Initial PSHED				

Put vehicle in PSHED and seal the door.

Door Sealed				
Final PSHED (@900s)				

Remove vehicle from PSHED.

Total mass of HC at end of the test (grams)_______________

Appendix D
Comparison of PSHED and LSHED

From June through October 2009, the Colorado Department of Public Health and Environment (CDPHE) undertook testing to compare the hot-soak emissions measurements in a portable SHED (PSHED) and in its laboratory SHED (LSHED) [16]. During this period, CDPHE measured evaporative emissions on 15 vehicles. The results of this testing are shown in Table D-1. The table shows the results of hot-soak measurements and heat-build (diurnal evaporative emissions) measurements. The heat-build measurements were only performed in the LSHED and therefore will not be discussed here but are shown in the table for completeness.

The objective of the testing was to compare hot-soak results from LSHED and PSHED tests in back-to-back testing using the same procedures for each. To make the results obtained from both enclosures comparable, tests in both the PSHED and LSHED were conducted as hot-soaks of 15 minutes duration. The results reported in Table D-1 are for 15 minutes both for the PSHED and LSHED.

The LSHED used for the testing is located at CDPHE's Aurora test facility near Denver, Colorado. The PSHED was also set up at the Aurora Facility. As in the testing at Ken Caryl Station, the PSHED used at Aurora consisted of a 10 x 20 x 8 foot enclosure, which was sealed using sheet plastic and duct tape. The details and performance of the PSHED enclosure have been discussed earlier [15]. Hydrocarbon concentrations inside the PSHED were measured using a lab-grade flame ionization detector analytical system with a 10 point calibration.

Colorado has a program to test and repair vehicles identified using its on-going on-road RSD measurement program in the Denver metropolitan area. Vehicles with elevated RSD values are required to bring their vehicles to CDPHE for tailpipe testing and visual inspection. A subset of these vehicles was selected for the LSHED/PSHED comparison test. Specifically, vehicles that initially passed an exhaust emissions test (on the IM240 cycle), but which were identified as potential "high evaporative emitters," were sent to LSHED/PSHED comparison testing. Vehicles were identified as candidates if they failed the intrusive pressure test, produced a strong odor or visible leak, or had OBD evaporative codes.

For the LSHED/PSHED comparison testing, the following test sequence was used. The vehicle was temperature stabilized overnight while its evaporative emissions canister was bench purged. The next day, with the purged canister back in the vehicle, the vehicle underwent a one-hour diurnal test in the LSHED which loaded the canister using a consistent procedure. Next, the vehicle was conditioned for the first SHED test. The conditioning involved driving for five minutes at 55 mph on the dynamometer and then driving the speed trace for the first phase of the FTP cycle (although with the engine hot, i.e., "Hot505"). This same conditioning sequence was used prior to each LSHED or PSHED test.

Table D-1 shows the sequence of testing for each vehicle according to the test date and test time. The table shows that this sequence was always performed: PSHED, LSHED, PSHED, LSHED. Most vehicles received four SHED tests made up of two PSHED tests and two LSHED tests with the sequence given by the column named CDPHE Test ID: 1P, 1L, 2P, 2L. In most cases the vehicles received the PSHED and LSHED tests in their as-received condition, but in a few cases they were also tested after repair.

In the analysis in this section the back-to-back measurements made by the PSHED will be compared with those made by the LSHED. In addition, the repeatability of duplicate PSHED measurements and the repeatability of LSHED measurements will be examined. While the "back-to-back" SHED measurements follow each other as closely as possible, those measurements were not made simultaneously. Accordingly, the state of the vehicle and its evaporative emissions control system may be different for any pair of measurements in spite of the conditioning procedure. For example, in the test sequence 1P, 1L, 2P, 2L, the 1P and 2P are nominally replicates of each other. However, there may be uncontrolled differences in vehicle condition between 1P and 2P due to factors such as cumulative conditioning, canister purging, etc. The influence of such differences in vehicle state could contribute to the observed differences in the measured SHED hot-soak values.

Comparison of PSHED hot-soaks with LSHED hot-soaks – The data in Table D-1 contains 33 paired PSHED and LSHED measurements. For the purposes of this analysis, pairing was assigned between successive tests on the same vehicle. Thus, 1P is paired with 1L, 2P with 2L, 3P with 3L, etc. However, in every instance the LSHED measurement follows the PSHED measurement and, therefore, time effects may influence comparisons between the PSHED and LSHED results.

Table D-1. CDPHE Data Comparing LSHED and PSHED 15-Minute Hot-Soak Results

Vehicle ID	Year	Make	Model	VIN Stem (digits 1 to 8, 10, 11)	Test Date	Test Time (end)	Odometer	CDPHE Test ID	SHED Used	Test Type	Evap Emissions (g/Qhr)	CDPHE Comments
HE-2279	1994	Ford	Ranger	1FTCR15X.RP……	6/16/09	10:30:01	96761	HB(HB1)	Lab	Heat Build	28.300	As received
					6/16/09	13:47:34	96769	1P	Portable	HotSoak	5.997	As received
					6/16/09	14:37:17	96778	1L	Lab	HotSoak	12.257	As received
					6/16/09	16:00:15	96794	2P	Portable	HotSoak	1.839	As received
					6/16/09	16:31:37	96798	2L	Lab	HotSoak	3.094	As received
					6/18/09	9:49:39	96798	3L(HB2)	Lab	Heat Build	0.846	After repair
					6/18/09	12:39:27	96805	3P	Portable	HotSoak	0.441	Correlation after I/M240 & preps
					6/18/09	13:26:51	96812	3L	Lab	HotSoak	5.899	Hot-soak
					6/18/09	14:06:30	96820	4P	Portable	HotSoak	6.783	Correlation
					6/18/09	14:47:49	96827	4L	Lab	HotSoak	10.244	Hot-soak
HE-2969	1995	Saturn	SL2	1G8ZJ527.SZ……	6/23/09	15:35:26	219834	1L(HB1)	Lab	Heat Build	18.561	As received
					6/24/09	9:50:02	219841	1P	Portable	HotSoak	1.073	As received
					6/24/09	10:29:12	219848	1L	Lab	HotSoak	1.131	As received
					6/24/09	11:05:21	219855	2P	Portable	HotSoak	0.888	As received
					6/24/09	11:58:39	219862	2L	Lab	HotSoak	0.219	As received
					6/25/09	9:28:49	219882	4L(HB2)	Lab	Heat Build	13.590	After repair
					6/25/09	11:26:34	219869	3P	Portable	HotSoak	0.163	After repair + auxiliary canister
					6/25/09	12:05:00	219875	3L	Lab	HotSoak	0.242	After repair + auxiliary canister
					6/25/09	12:51:32	219881	4P	Portable	HotSoak	0.280	After repair + auxiliary canister
					6/25/09	13:42:11	219888	4L	Lab	HotSoak	0.242	After repair + auxiliary canister
					6/26/09	11:35:54	219888	7L(HB3)	Lab	Heat Build	0.678	After repair new canister
HE-3091	1990	Buick	Century	1G4AH54N.L6……	6/30/09	9:15:52	245472	1L(HB1)	Lab	Heat Build	29.516	As received
					6/30/09	12:40:54	245707	1P	Portable	HotSoak	3.502	As received
					6/30/09	13:14:48	245715	1L	Lab	HotSoak	7.721	As received
					6/30/09	13:50:42	245723	2P	Portable	HotSoak	2.611	As received
					6/30/09	14:26:06	245730	2L	Lab	HotSoak	6.919	As received
					7/1/09	13:48:27	2454731	4L(HB2)	Lab	Heat Build	3.190	After repair

Table D-1. CDPHE Data Comparing LSHED and PSHED 15-Minute Hot-Soak Results (Continued)

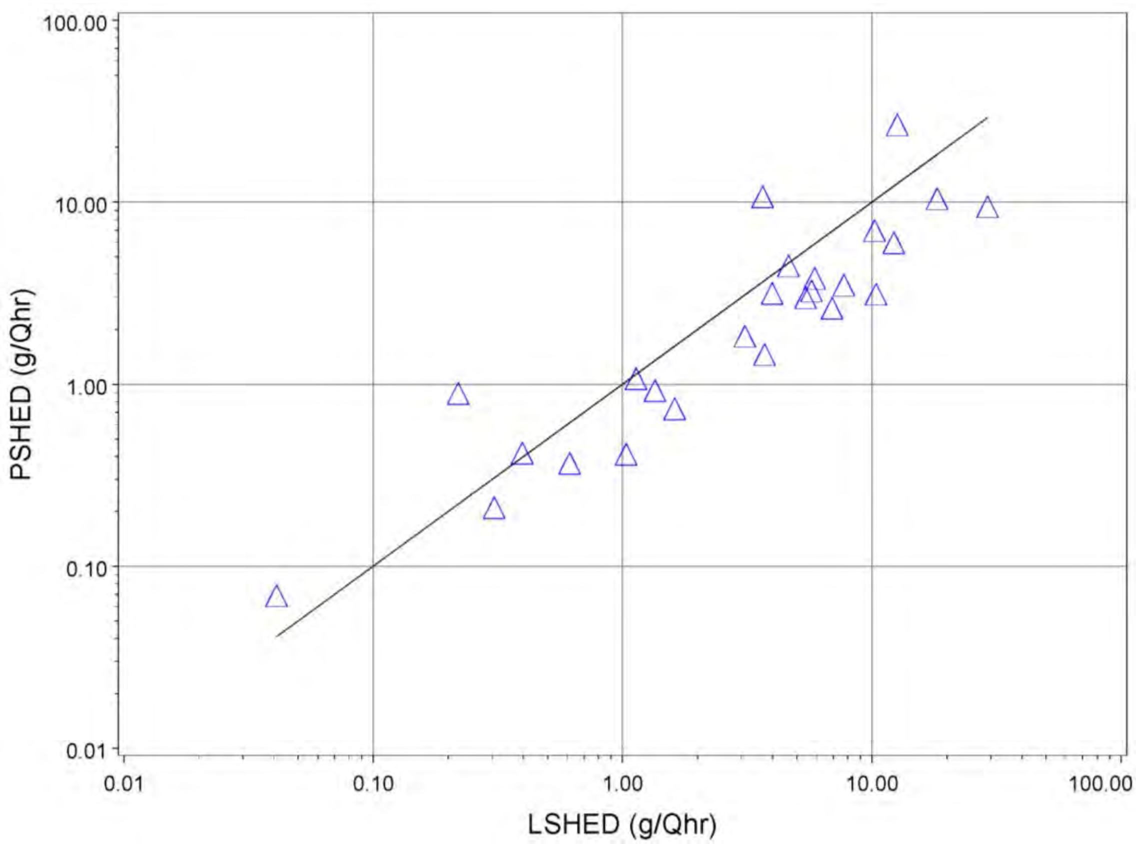
Vehicle ID	Year	Make	Model	VIN Stem (digits 1 to 8, 10, 11)	Test Date	Test Time (end)	Odometer	CDPHE Test ID	SHED Used	Test Type	Evap Emissions (g)	CDPHE Comments
720PHW (R)	1996	Honda	Passport	4S6CM58V.T4……	7/15/09	9:56:27	181810	HB1	Lab	Heat Build	40.319	As received
					7/15/09	10:52:19	181817	1P	Portable	HotSoak	3.148	As received
					7/15/09	11:26:08	181826	1L	Lab	HotSoak	3.982	As received
					7/15/09	13:46:53	181831	2P	Portable	HotSoak	4.472	As received
					7/15/09	14:20:46	181844	2L	Lab	HotSoak	4.632	As received
HE-3394	1993	Oldsmobile	Cutlass	1G3AG54N.P6……	7/21/09	9:29:04	95439	HB1	Lab	Heat Build	32.159	As received
					7/21/09	10:22:01	95445	1P	Portable	HotSoak	1.459	As received
					7/21/09	10:55:35	95450	1L	Lab	HotSoak	3.713	As received
					7/21/09	11:26:58	95454	2P	Portable	HotSoak	3.258	As received
					7/21/09	12:01:19	95462	2L	Lab	HotSoak	5.736	As received
					7/23/09	9:39:54	95476	HB2	Lab	Heat Build	0.210	After repair
HE-3790	1995	Ford	Ranger	1FTDR15X.SP……	8/18/09	9:23:45	163650	HB1	Lab	Heat Build	10.090	As received
					8/18/09	9:59:16	163657	1P	Portable	HotSoak	2.999	As received
					8/18/09	10:31:09	163664	1L	Lab	HotSoak	5.429	As received
					8/18/09	11:01:23	163671	2P	Portable	HotSoak	6.979	As received
					8/18/09	11:36:37	163678	2L	Lab	HotSoak	10.265	As received
					8/20/09	9:43:52	163682	HB2	Lab	Heat Build	0.475	After repair
HE-3555	1996	SAAB	900SE	YS3DF58N.T2……	8/26/09	9:14:21	193145	HB1	Lab	Heat Build	93.708	As received
					8/26/09	13:56:16	193149	1P	Portable	HotSoak	0.000	As received
					8/26/09	14:30:24	193156	1L	Lab	HotSoak	4.659	As received
					8/26/09	15:01:12	193161	2P	Portable	HotSoak	9.945	As received
					8/26/09	15:37:01	193167	2L	Lab	HotSoak	55.507	As received
					8/31/09	14:32:33	193145	HB2	Lab	Heat Build	1.406	After repair
631-SWU	1996	Toyota	Camry	JT2BG12K.T0……	9/1/09	11:01:26	248058	HB1	Lab	Heat Build	7.278	As received
					9/1/09	13:49:59	248065	1P	Portable	HotSoak	0.000	As received
					9/1/09	14:27:17	248074	1L	Lab	HotSoak	0.041	As received
					9/1/09	15:03:00	248080	2P	Portable	HotSoak	0.069	As received
					9/1/09	15:36:51	248090	2L	Lab	HotSoak	0.041	As received
					9/10/09	9:59:35	248095	HB2	Lab	Heat Build	0.039	Junker Corr
HE-3863	1994	Ford	Explorer	1FMDU34X.RU……	9/22/09	9:51:56	284456	HB1	Lab	Heat Build	0.978	As received
					9/22/09	10:39:24	284462	1P	Portable	HotSoak	0.369	As received
					9/22/09	11:01:25	284469	1L	Lab	HotSoak	0.614	As received
					9/22/09	14:16:18	284477	2P	Portable	HotSoak	0.413	As received
					9/22/09	14:43:11	284484	2L	Lab	HotSoak	1.033	As received
					9/24/09	10:12:57	0	HB2	Lab	Heat Build	1.017	After repair

Table D-1. CDPHE Data Comparing LSHED and PSHED 15-Minute Hot-Soak Results (Continued)

Vehicle ID	Year	Make	Model	VIN Stem (digits 1 to 8, 10, 11)	Test Date	Test Time (end)	Odometer	CDPHE Test ID	SHED Used	Test Type	Evap Emissions (g)	CDPHE Comments
HE-3649	1987	Ford	Thunderbird	1FABP64W.HH……	9/23/09	9:40:27	118616	HB1	Lab	Heat Build	90.936	As received
					9/23/09	10:29:36	118622	1P	Portable	HotSoak	0.926	As received
					9/23/09	11:05:37	118629	1L	Lab	HotSoak	1.348	As received
					9/23/09	13:29:12	118634	2P	Portable	HotSoak	0.733	As received
					9/23/09	14:05:29	118641	2L	Lab	HotSoak	1.621	As received
XXX3400	1992	Dodge	Caravan	2P4GH253.NR……	7/14/09	10:28:00	209454	HB1	Lab	Heat Build	40.261	As received
					7/14/09	13:47:44	209462	1P	Portable	HotSoak	26.671	As received
					7/14/09	14:25:34	209468	1L	Lab	HotSoak	12.655	As received
					7/14/09	15:11:56	209475	2P	Portable	HotSoak	10.721	As received
					7/14/09	15:46:01	209484	2L	Lab	HotSoak	3.651	As received
HE-3358	1994	Mercury	Villager	4M2DV11W.RD……	8/12/09	8:39:45	217852	HB1	Lab	Heat Build	74.551	As received
					8/13/09	9:29:56	217859	1P	Portable	HotSoak	3.814	As received
					8/13/09	9:53:06	217866	1L	Lab	HotSoak	5.900	As received
					8/13/09	10:24:50	217872	2P	Portable	HotSoak	3.122	As received
					8/13/09	11:00:02	217879	2L	Lab	HotSoak	10.398	As received
					8/17/09	9:54:40	218292	HB2	Lab	Heat Build	0.213	After repair
HE-3491	1994	Cadillac	Seville	1G6KS52Y.RU……	8/25/09	11:45:56	143333	HB1	Lab	Heat Build	19.588	As received
					8/25/09	14:21:11	144715	1P	Portable	HotSoak	9.469	As received
					8/25/09	14:55:05	144720	1L	Lab	HotSoak	29.125	As received
					8/26/09	11:25:01	144726	2P	Portable	HotSoak	10.450	As received
					8/26/09	12:03:27	144731	2L	Lab	HotSoak	18.244	As received
					9/2/09	9:59:28	144740	HB2	Lab	Heat Build	3.091	After repair
HE-4006	1996	Ford	Ranger	1FTCR14U.TP……	9/16/09	9:22:26	96363	HB1	Lab	Heat Build	27.520	As received
					9/16/09	10:15:05	96370	1P	Portable	HotSoak	0.419	As received
					9/16/09	10:40:24	96376	1L	Lab	HotSoak	0.396	As received
					9/16/09	13:34:31	96382	2P	Portable	HotSoak	0.210	As received
					9/16/09	13:59:37	96387	2L	Lab	HotSoak	0.306	As received
5702	1992	Oldsmobile	Eighty Eight	1G3HN53L.NH……	6/8/09	15:42:33	168568	1L(HB1)	Lab	Heat Build	0.144	As received - retest
					6/11/09	8:10:01	168594	1P	Portable	HotSoak	0.140	As received
					6/11/09	10:02:42	168602	2L(1L)	Lab	HotSoak	0.172	As received

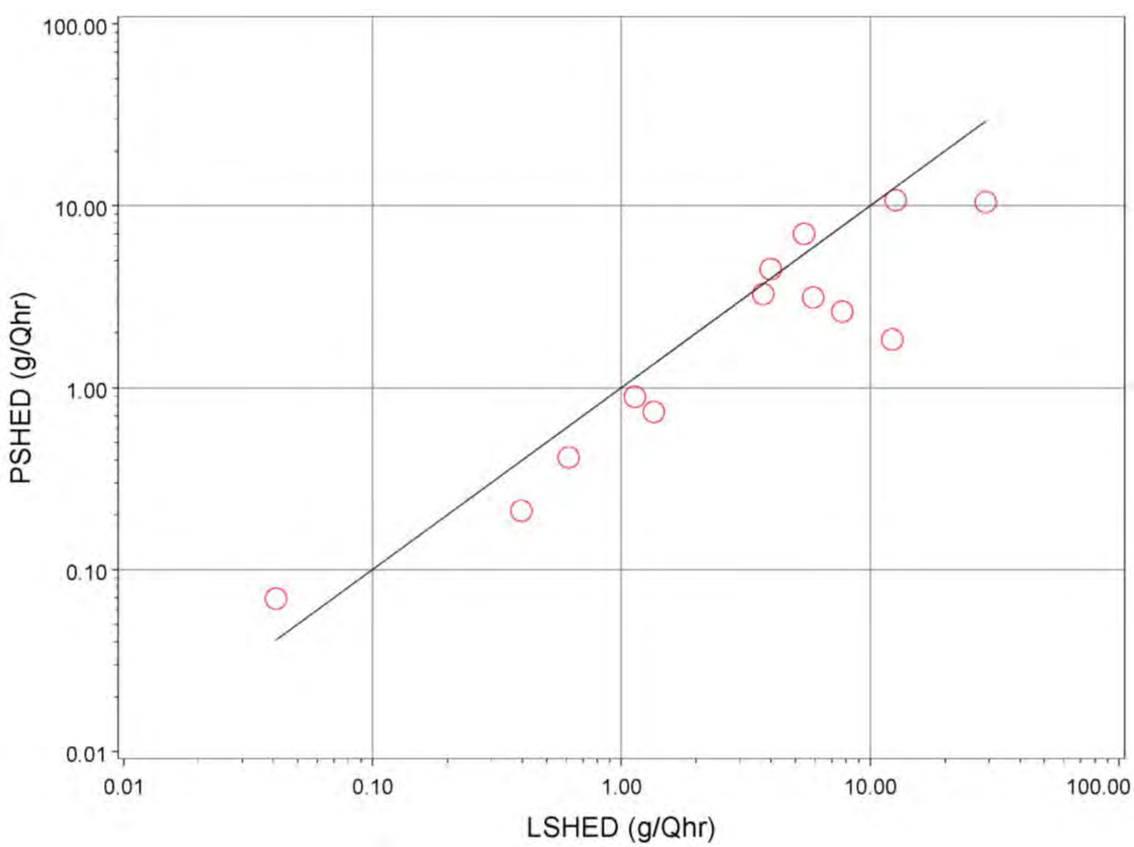
Figure D-1 shows a plot of the PSHED versus LSHED measurements on a log-log scale. Logarithmic scales provide an advantage when viewing the set of measurements, which covers three orders of magnitude. In addition, the scatter of the data points in the plot near the parity line indicate that the variability of the PSHED measurements on these vehicles appears to be better described by a constant relative variability than by a constant absolute variability. The plot indicates a tendency for the PSHED values to be lower than the LSHED values since more points are below the parity line than above. This behavior could arise either because the LSHED measurements always occur after the PSHED measurements in the pairs or because of a real difference in the PSHED measurements relative to LSHED measurements.

Figure D-1. PSHED vs LSHED Hot-Soaks (LSHED follows PSHED)



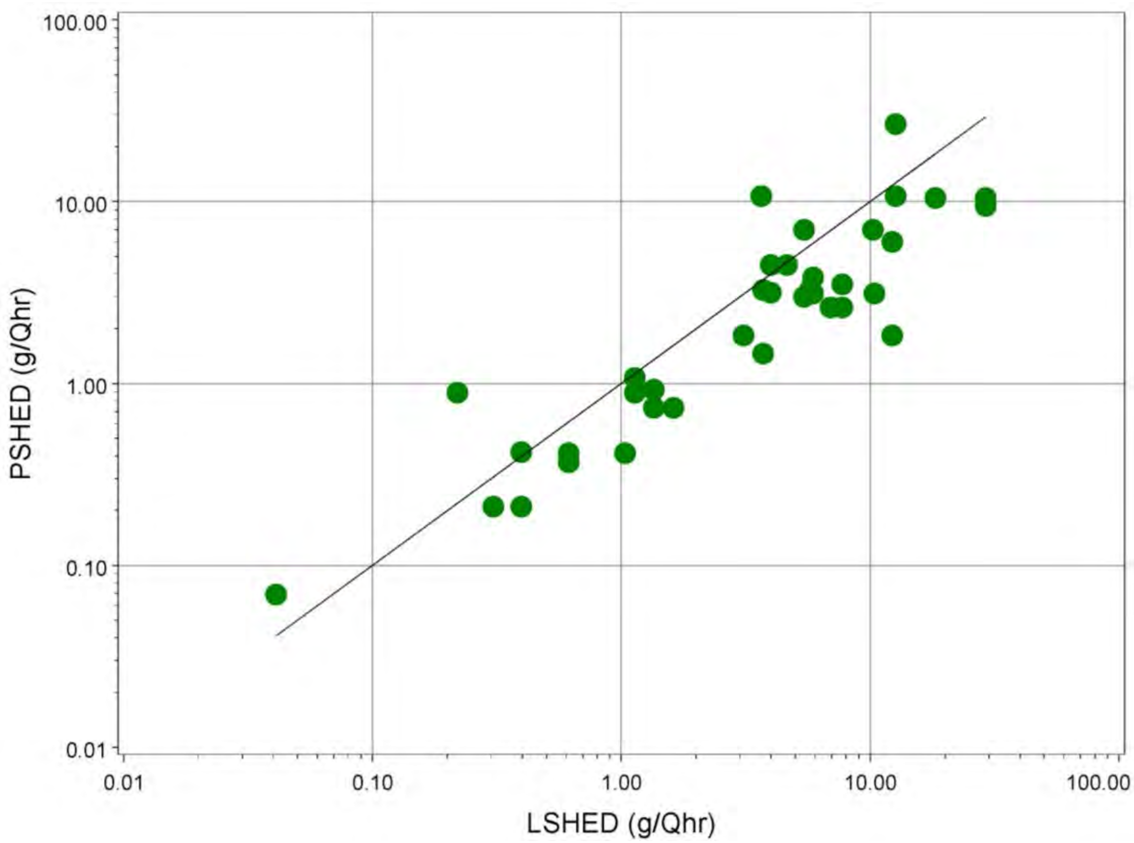
To determine whether the apparent difference in PSHED versus LSHED values in Figure D-1 arises from a bias between the PSHED and LSHED tests or whether the difference reflects an order effect, the LSHED and PSHED data values are paired in a different way. For this analysis, the values for each vehicle are paired such that the LSHED is tested before the PSHED measurement. For example, the 1Ls are paired with the 2Ps. When this new repairing of the data is plotted, the result is Figure D-2. This plot uses the same scales as Figure D-1, but note that the number of available pairs is reduced by approximately half. The plot shows that as in Figure D-1, there is a tendency for the PSHEDs to have lower values than the LSHEDs even though, in this case, the LSHED preceded the PSHED test. When considered together, Figures D-1 and D-2 show that the differences between LSHED and PSHED measurements in this dataset are not caused by the order of the LSHED and PSHED tests but instead reflect a bias between the LSHED and PSHED measurements. Specifically, the PSHED values tend to be smaller than the LSHED values for the same vehicle.

Figure D-2. PSHED vs LSHED Hot-Soaks (LSHED preceeds PSHED)



If the two datasets in Figures D-1 and D-2 are combined in one plot, the result is Figure D-3. The 38 data points in the plot show the overall tendency of the PSHED to produce lower values with respect to the LSHED when all of the data is considered together.

Figure D-3. PSHED vs LSHED Hot-Soaks



PSHED and LSHED hot-soak emission variability – The analysis in the previous discussion demonstrated that the PSHED measurements tended to produce hot-soak values somewhat lower than LSHED measurements as shown in Figure D-3. However, that figure also showed a large scatter of the individual data points. In this discussion, the degree of scatter produced by replicate SHED measurements is examined.

Figures D-4 and D-5 show plots of replicate PSHED and LSHED measurements, respectively. For both plots, the horizontal axis is the first SHED measurement, for example, 1P, and the vertical axis is the second SHED measurement, for example, 2P. In all cases, the first and second SHED measurements are separated by a period of time during which a SHED measurement of the other type was performed. The sequence of tests for each vehicle can be seen in Table D-1.

Both Figures D-4 and D-5 show a similar scatter of points about the parity line for both duplicate PSHED tests and duplicate LSHED tests. First, in both figures the scatter of points about the parity line is relatively symmetrical which indicates that the order of testing for the dataset as a whole did not influence the measured value. This result is consistent with the same finding from the analysis of the comparison of LSHED and PSHED values discussed above.

The second important feature of Figures D-4 and D-5 is that scatter of points about the parity line for the two plots is quite similar – at least from a visual comparison of the two plots.

The third feature of Figures D-4 and D-5 that is notable is the relatively homogeneous scatter of the data points about the parity line across the two orders of magnitude range of the SHED data. This homogeneous scatter supports the notion that the hot-soak variability of vehicles tends to be proportional to the value of the hot-soak measurements. That is, the variability can be expressed as a percentage of the hot-soak measurement value.

The similar hot-soak variabilities in the PSHED and in the LSHED are consistent with the notion that the variabilities are dominated by the hot-soak emission variability of the vehicles themselves. The measurement variability due to the performance of the test in either the PSHED or the LSHED is a small component of the total variability of the measured values as demonstrated by the propane recovery and retention tests performed in the PSHED during the testing at Ken Caryl station.

Figure D-4. Hot-Soak Variability in PSHED

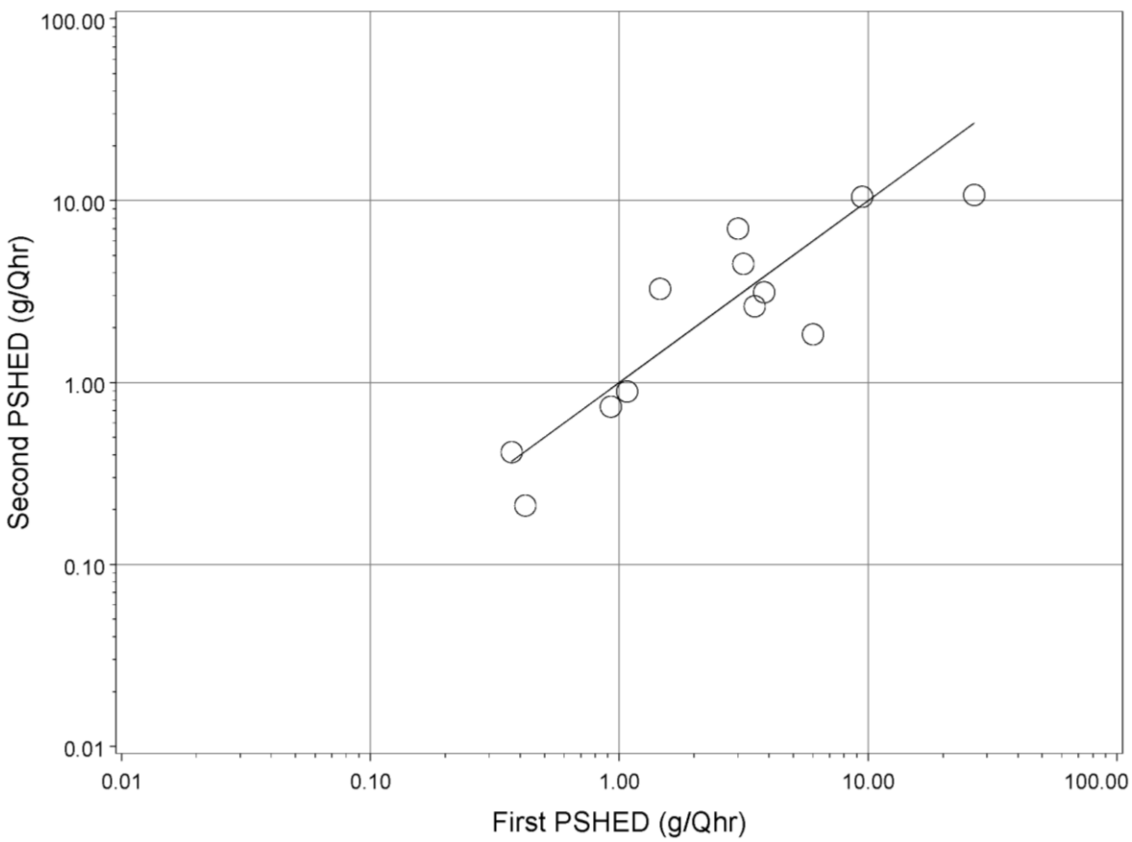
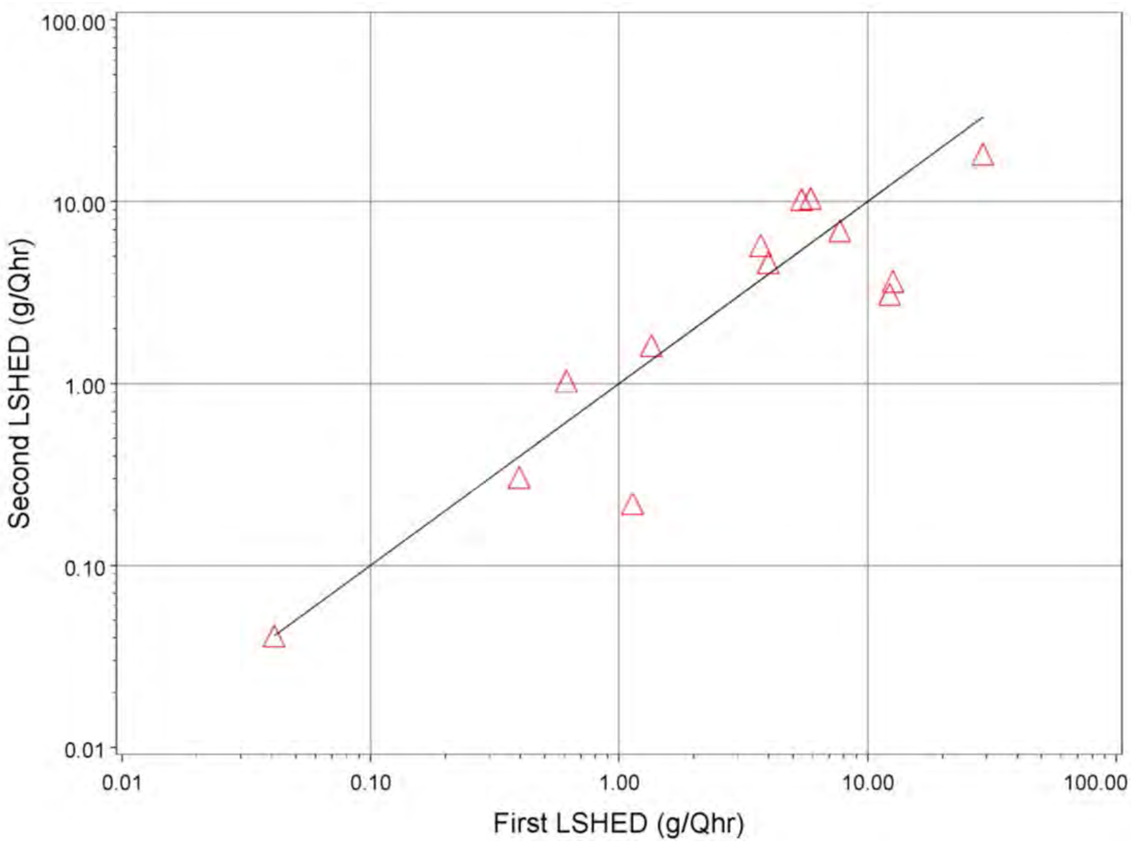


Figure D-5. Hot-Soak Variability in LSHED



Since the variability of the duplicate PSHED values in the log-log plot Figure D-4 looks homogeneous, we will consider the PSHED data in log-log space. A regression of the natural logarithm of the second PSHED against that of the first PSHED1 indicates ln(PSHED2) = -0.018 + 0.881*ln(PSHED1). A regression of the ln(PSHED1) against ln(PSHED2) indicates ln(PSHED1) = 0.219 + 0.876*ln(PSHED2). However, the x-values of these two regressions have variability of about the same size as the y-values, and therefore the assumption of ordinary least squares regression (all variability is in the y-variable and that the x-variable is measured "without error") is not satisfied. According "to measurement-error modeling," in such a situation, the slopes calculated by the regressions are low-biased [17]. Because the slopes for the regressions are similar to each other (0.88) and are expected to both be biased low, we expect that the slopes for measurement error models, which take into account the variability in the x-variable as well as the y-variable, would both produce slopes near 1.

Thus, a simple analysis of the paired PSHED and LSHED data values will provide a reasonable estimate of the relative bias between the first and second PSHED and an estimate of the variability in a PSHED measurement. The differences of the natural logarithm of the first PSHED minus the natural logarithm of the second PSHED or the twelve pairs of data points had a mean difference of 0.124 and a standard deviation of 0.621. The mean difference of 0.124 was not significantly different from 0 (p=0.5027), and therefore this dataset is not able to detect a significant difference between the first and second PSHED values. The standard deviation of

0.621 indicates that a single PSHED measurement has a 90% confidence interval from 36% (=exp(-1.645*0.621)) to 278% (=exp(+1.645*0.621)) relative to a single PSHED measurement at 100%. This estimate of PSHED variability is based on the assumption that the relative variability is independent of PSHED level, which is suggested by the apparent homogeneous scatter of data about the 1:1 line in Figure D-4.

Appendix E
Descriptions and Data for Non-Participating Vehicles

Table E-1. Vehicle Description and Selection RSMs for Ineligible Non-Participating Vehicles

Combined Packet ID (unique to vehicle)	Reason for Evaporative Testing Ineligibility	Year	Make	Model	Remote Sensing Measurement (RSM)													
					Type (Selection; Measurement)	Location	DateTime	Speed (mph)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
6	TooBig	2002	GMC	3500 Savana	Selection	IMStationDriveway	29JUN09:08:42:59	17	71	33	39	1	86	38	0.17	229	14.92
10	TooBig	2003	GMC	Sierra	Selection	IMStationDriveway	29JUN09:10:23:42	13	83	110	49	1	-27	-8	0.02	240	15.03
26	TooBig	2005	Toyota	Tacoma	Selection	IMStationDriveway	30JUN09:11:49:26	13	93	169	79	2	-11	-49	0.05	11	15.02
31	TooBig	1994	Chevrolet	Blazer	Selection	IMStationDriveway	30JUN09:15:45:47	10	99	318	573	5	2724	2687	-0.09	480	15.02
40	TooBig	1996	Chevrolet	1500	Selection	IMStationDriveway	02JUL09:08:36:31	13	70	18	100	3	0	-13	0.03	25	15.03
61	Motorhome	1995	Chevrolet	G30 Van/Motorhome	Selection	IMStationDriveway	07JUL09:13:15:27	9	89	188	832	6	482	273	0.17	1982	14.85
67	TooBig	1996	GMC	Jimmy	Selection	IMStationDriveway	08JUL09:16:17:50	11	104	282	680	6	2181	-1497	0.04	42	14.96
86	Motorhome	1999	Ford	Stripped Chassis Motorhome	Selection	IMStationDriveway	13JUL09:09:40:18	10	83	60	343	5	1170	-1130	0.05	14	14.98
90	Motorhome	1993	Ford	E350	Selection	IMStationDriveway	13JUL09:12:31:01	8	100	147	250	4	82	-57	0.07	2104	14.93
94	Motorhome	1984	Chevrolet	P30	Selection	IMStationDriveway	14JUL09:11:58:55	9	88	111	389	5	1774	3851	4.27	608	11.92
102	Motorhome	1983	Chevrolet	P30	Selection	IMStationDriveway	15JUL09:11:59:34	8	85	82	588	5	7576	7697	0.85	1677	14.16
105	TooBig	1995	Ford	Super Duty	Selection	IMStationDriveway	15JUL09:13:43:55	11	91	133	326	5	1373	963	1.99	1139	13.55
118	TooBig	2003	GMC	Van	Selection	IMStationDriveway	16JUL09:16:06:33	11	98	237	603	6	229	138	0.15	69	14.94
132	Motorhome	1984	PAA	MT	Selection	IMStationDriveway	20JUL09:10:15:36	10	90	51	938	6	485	109	6.29	650	10.50
137	TooBig	2005	Ford	E350	Selection	IMStationDriveway	20JUL09:12:41:04	14	98	134	45	1	-34	203	-0.03	-133	15.08
145	Motorhome	1979	Ford	El Dorado Motorhome	Selection	IMStationDriveway	20JUL09:15:54:39	13	94	256	1268	7	5315	256	2.42	1210	13.12
170	TooBig	2001	Ford	F250	Selection	IMStationDriveway	24JUL09:08:11:19	12	75	10	55	1	26	3	0.20	-68	14.91
171	Motorhome	1984	Ford	Econoline Mobile Truck	Selection	IMStationDriveway	23JUL09:14:52:49	12	107	188	2836	7	1118	778	2.04	1816	13.49
172	Motorhome	1994	Ford	E350 Montana Tioga	Selection	IMStationDriveway	24JUL09:08:11:58	15	75	13	3010	7	6212	4360	4.22	152	11.84
176.353	ESPemployee	1997	Chevrolet	Lumina	Selection	IMStationDriveway	24JUL09:10:30:22	16	88	62	480	5	1826	1263	0.78	234	14.43
180	Motorhome	1989	Chevrolet	G30	Selection	IMStationDriveway	24JUL09:14:29:19	11	99	173	168	4	89	60	0.36	908	14.76
195	Motorhome	1988	Ford	Tioga	Selection	IMStationDriveway	27JUL09:13:59:41	13	94	258	390	5	320	190	0.29	404	14.82
198	Motorhome	1990	Ford	E350	Selection	IMStationDriveway	27JUL09:14:20:06	15	97	270	288	5	373	275	6.33	480	10.49
204	TooBig	1993	Ford	F150	Selection	IMStationDriveway	28JUL09:11:06:02	14	68	113	155	4	253	116	3.86	368	12.27
206	TooBig	2001	Ford	F450	Selection	IMStationDriveway	28JUL09:11:29:07	8	68	134	152	4	22	-47	0.09	509	14.97
208	TooBig	1989	Ford	F250 Lariat	Selection	IMStationDriveway	28JUL09:14:12:56	13	73	247	547	6	817	92	3.90	711	12.21
240	TooBig	1976	Ford	Custom Camper	Selection	IMStationDriveway	31JUL09:10:04:40	11	81	42	1940	7	2235	-284	3.16	1066	12.69
260	TooBig	2000	Ford	Excursion	Selection	IMStationDriveway	03AUG09:09:22:44	11	80	35	146	3	42	49	0.06	9	15.01
269	ESPemployee	1981	Cadillac	Seville	Selection	IMStationDriveway	03AUG09:12:27:01	18	93	147	104	3	314	262	3.62	814	12.42
276	TooBig	1994	Ford	Econoline	Selection	IMStationDriveway	03AUG09:13:50:43	13	97	188	70	2	168	153	4.50	203	11.81
279	TooBig	1988	GMC	Sierra	Selection	IMStationDriveway	03AUG09:15:03:06	12	96	225	312	5	164	129	0.38	12	14.78
298	TooBig	1993	Chevrolet	G20 Conversion Van	Selection	IMStationDriveway	06AUG09:09:55:04	12	77	49	828	6	1037	3833	4.73	25	11.63
303	Motorhome	1985	Chevrolet	G30 van	Selection	IMStationDriveway	06AUG09:15:06:01	13	82	176	421	5	724	1297	6.01	247	10.72

Table E-1. Vehicle Description and Selection RSMs for Ineligible Non-Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Reason for Evaporative Testing Ineligibility	Year	Make	Model	Remote Sensing Measurement (RSM)												
					Type (Selection; Measurement)	Location	DateTime	Speed (mph)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
319	TooBig	2004	GMC	Yukon	Selection	IMStationDriveway	07AUG09:17:01:25	14	98	300	46	1	1	-1	0.49	26	14.70
390	TooBig	1988	Chevrolet	Silverado	Selection	IMStationDriveway	18AUG09:16:45:57	11	76	176	362	5	300	51	0.91	1645	14.33
399	TooBig	1987	Ford	F250	Selection	IMStationDriveway	19AUG09:15:31:59	10	100	194	191	4	.	-184	.	.	.
408	Motorhome	1983	Ford	E350	Selection	IMStationDriveway	20AUG09:14:13:54	12	92	182	712	6	.	3459	.	.	.
414	TooBig	2001	Dodge	Ram 1500	Selection	IMStationDriveway	21AUG09:09:59:01	16	71	70	101	3	123	22	4.48	146	11.83
441	Motorhome	1977	GMC	Van Dura	Selection	IMStationDriveway	24AUG09:16:25:59	9	77	262	390	5	687	-973	4.17	462	12.02
445	ESPemployee	2001	Ford	Escort	Selection	IMStationDriveway	25AUG09:09:19:36	13	69	47	49	1	0	-40	-0.07	70	15.10
455	Motorhome	1992	Ford	E350	Selection	IMStationDriveway	25AUG09:14:03:01	9	73	198	332	5	192	9	0.09	1168	14.94
456	ESPemployee	2001	Dodge	Dakota	Selection	IMStationDriveway	25AUG09:15:16:27	14	69	232	200	4	86	41	0.05	-16	15.02
461	HeavyDuty	1971	International	Loadstar	Selection	IMStationDriveway	26AUG09:09:44:17	11	67	47	515	6	978	-150	5.63	490	10.97
465	TooBig	2000	Ford	F350	Selection	IMStationDriveway	26AUG09:14:59:56	12	90	179	79	2	23	-8	0.48	17	14.71
471	TooBig	1996	Ford	F350	Selection	IMStationDriveway	27AUG09:13:18:13	11	88	138	172	4	47	33	0.15	519	14.92
477	TooBig	1991	UMC	Aeromate	Selection	IMStationDriveway	27AUG09:16:07:18	14	102	222	80	2	267	232	2.08	2378	13.47
480	Motorhome	1984	Ford	E350	Selection	IMStationDriveway	28AUG09:08:24:43	13	67	9	413	5	225	220	4.57	187	11.77
484	Motorhome	1994	Ford	F350	Selection	IMStationDriveway	28AUG09:09:17:33	12	69	34	208	5	391	-1761	0.30	3014	14.72
487	Motorhome	2000	Chevrolet	Express 3500	Selection	IMStationDriveway	28AUG09:10:34:48	16	72	75	114	3	36	7	0.03	1230	14.99
514	TooBig	1995	Ford	F250	Selection	IMStationDriveway	31AUG09:11:46:39	14	77	174	335	5	150	19	0.28	1340	14.80

[1] Concentration calculated when the regression intercepts of HC, CO, and NO attenuations versus CO_2 attenuation are forced to zero.

[2] Concentration calculated when the regression intercepts of HC, CO, and NO attenuations versus CO_2 attenuation are not forced to zero.

Table E-2. Vehicle Descriptions and Selection RSMs for Eligible Non-Participating Vehicles

Combined Packet ID (unique to vehicle)	Reason for Evaporative Testing Ineligibility	Year	Make	Model	Remote Sensing Measurement (RSM)												
					Type (Selection; Measurement)	Location	DateTime	Speed (mph)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
8	Eligible	2001	BMW	330i	Selection	IMStationDriveway	29JUN09:09:30:41	10	77	66	61	2	16	-5	0.29	-6	14.85
11	Eligible	2001	Subaru	Legacy	Selection	IMStationDriveway	29JUN09:11:13:20	12	89	155	53	1	22	24	0.10	70	14.98
12	Eligible	1978	Ford	Bronco	Selection	IMStationDriveway	29JUN09:11:34:17	10	89	173	262	4	1000	1283	3.38	580	12.58
13	Eligible	2006	Toyota	4Runner	Selection	IMStationDriveway	29JUN09:12:03:45	14	89	194	46	1	5	-71	0.08	-9	15.00
14	Eligible	1999	Chevrolet	Blazer	Selection	IMStationDriveway	29JUN09:12:39:41	10	92	216	39	1	243	-1	0.10	491	14.96
15	Eligible	1988	Dodge	Ram	Selection	IMStationDriveway	29JUN09:12:45:58	12	93	227	60	2	.	242	.	.	.
16	Eligible	2002	Toyota	RAV4	Selection	IMStationDriveway	29JUN09:12:53:42	11	93	234	44	1	.	-50	.	.	.
19	Eligible	1997	Ford	Escort LX	Selection	IMStationDriveway	29JUN09:15:06:38	8	97	336	558	6	1084	835	0.37	87	14.75
22	Eligible	1998	Buick	LeSabre	Selection	IMStationDriveway	30JUN09:09:41:49	10	80	77	59	2	26	96	0.03	15	15.03
23	Eligible	2005	Cadillac	CTS	Selection	IMStationDriveway	30JUN09:10:38:52	12	88	104	83	2	7	11	0.02	17	15.04
24	Eligible	2004	Honda	Pilot	Selection	IMStationDriveway	30JUN09:11:38:00	13	93	153	80	2	74	62	0.04	-13	15.02
29	Eligible	1982	Ferrari	308	Selection	IMStationDriveway	30JUN09:14:42:48	10	100	269	310	5	1158	829	3.74	272	12.33
30	Eligible	1989	Ford	Probe	Selection	IMStationDriveway	30JUN09:15:14:52	11	100	284	2912	7	2095	-5169	0.07	1701	14.88
32	Eligible	2003	Dodge	Dakota	Selection	IMStationDriveway	01JUL09:08:57:31	12	75	29	38	1	20	-48	0.02	61	15.03
33	Eligible	1997	Ford	F150	Selection	IMStationDriveway	01JUL09:11:10:58	9	90	108	111	3	68	-44	0.02	71	15.04
35	Eligible	1984	Buick	Riviera	Selection	IMStationDriveway	01JUL09:11:22:37	8	92	115	203	4	373	308	0.07	738	14.97
36	Eligible	1993	Jeep	Grand Cherokee	Selection	IMStationDriveway	01JUL09:12:31:56	10	100	143	795	6	1870	-596	0.17	263	14.87
37	Eligible	1990	Honda	Accord LX	Selection	IMStationDriveway	01JUL09:13:40:50	9	103	182	945	6	3120	1965	8.90	48	8.58
38	Eligible	1984	Excaliber		Selection	IMStationDriveway	01JUL09:15:22:13	11	93	224	681	6	2837	2658	0.06	3721	14.79
41	Eligible	2003	Jeep	Liberty	Selection	IMStationDriveway	02JUL09:10:20:07	13	80	67	51	1	51	40	0.11	-26	14.98
43	Eligible	2003	Buick	Park Avenue	Selection	IMStationDriveway	06JUL09:11:51:23	13	89	170	82	2	12	25	0.04	13	15.02
47	Eligible	1997	Nissan	XE Pickup	Selection	IMStationDriveway	06JUL09:12:31:12	14	92	204	101	3	60	20	0.11	6	14.97
50	Eligible	1997	Mitsubishi	Eclipse	Selection	IMStationDriveway	06JUL09:13:34:40	12	100	260	1033	6	2507	2008	0.13	402	14.87
51	Eligible	1995	Chevrolet	Cheyenne C1500	Selection	IMStationDriveway	06JUL09:15:01:58	13	94	330	56	1	107	37	1.67	1329	13.81
52	Eligible	2002	Nissan	Maxima	Selection	IMStationDriveway	06JUL09:15:30:57	10	93	345	74	2	42	-4	0.54	11	14.66
54	Eligible	2005	Chevrolet	Trailblazer	Selection	IMStationDriveway	06JUL09:16:14:44	11	88	370	71	2	11	-16	0.17	10	14.93
55	Eligible	1996	Mitsubishi	Eclipse GST	Selection	IMStationDriveway	06JUL09:16:29:35	13	87	389	348	5	1011	1707	0.30	1739	14.75
56	Dealer	2003	BMW	XS	Selection	IMStationDriveway	07JUL09:07:59:21	15	68	8	59	2	-4	-7	0.03	39	15.03
58	Eligible	2003	Honda	Odyssey	Selection	IMStationDriveway	07JUL09:09:45:52	10	80	49	61	2	-5	8	0.00	-18	15.05
59	Eligible	2005	Chrysler	Crossfire	Selection	IMStationDriveway	07JUL09:11:20:52	14	92	109	81	2	-1	4	0.03	196	15.03
60	Eligible	1999	Jeep	Cherokee Sport	Selection	IMStationDriveway	07JUL09:11:42:23	10	94	119	90	3	106	-12	0.03	411	15.01
63	Eligible	1987	Oldsmobile	Delta 88	Selection	IMStationDriveway	08JUL09:10:50:22	7	90	92	95	3	374	252	2.56	212	13.20
65	Eligible	2000	Ford	Ranger	Selection	IMStationDriveway	08JUL09:11:47:31	11	94	127	71	2	43	-53	0.01	9	15.04

Table E-2. Vehicle Descriptions and Selection RSMs for Eligible Non-Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Reason for Evaporative Testing Ineligibility	Year	Make	Model	Remote Sensing Measurement (RSM)												
					Type (Selection; Measurement)	Location	DateTime	Speed (mph)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
66	Eligible	1994	Saturn	STL	Selection	IMStationDriveway	08JUL09:13:24:00	10	103	183	93	3	4	-189	0.45	139	14.73
70	Eligible	1994	Ford	Explorer	Selection	IMStationDriveway	09JUL09:09:43:54	10	74	70	78	2	24	-4	-0.01	43	15.06
71	Eligible	1993	Toyota	Corolla	Selection	IMStationDriveway	09JUL09:10:24:17	8	78	88	62	2	32	27	0.18	90	14.92
72	Eligible	2008	Pontiac	Torrent	Selection	IMStationDriveway	09JUL09:12:27:19	7	88	156	98	3	4	2	0.02	-7	15.04
73	Eligible	1980	Ford	Ranger F250	Selection	IMStationDriveway	09JUL09:13:31:18	10	94	185	913	6	1574	1191	10.36	450	7.56
74	Eligible	2003	Dodge	Durango	Selection	IMStationDriveway	09JUL09:10:17:01	12	78	84	80	2	15	0	0.09	13	14.99
76	Eligible	1994	Mazda	MX-6	Selection	IMStationDriveway	10JUL09:09:50:36	12	85	60	83	2	55	53	0.43	566	14.73
78	Eligible	1997	Toyota	4Runner	Selection	IMStationDriveway	10JUL09:09:52:21	12	85	62	60	2	56	-7	0.16	82	14.93
80	Eligible	1997	Isuzu	Rodeo	Selection	IMStationDriveway	10JUL09:11:30:46	10	91	120	178	3	1660	1404	1.31	373	14.05
81	Eligible	2001	Toyota	Corolla	Selection	IMStationDriveway	10JUL09:11:42:22	12	94	127	428	5	2879	1079	0.04	245	14.93
83	Eligible	2007	Toyota	Sequoia	Selection	IMStationDriveway	10JUL09:13:53:29	14	100	191	56	1	5	-33	0.19	-4	14.92
84	Eligible	1991	Honda	Accord	Selection	IMStationDriveway	10JUL09:13:55:02	13	100	193	399	5	380	51	0.11	63	14.96
87	Eligible	2005	Honda	Pilot	Selection	IMStationDriveway	13JUL09:10:59:14	11	91	92	83	2	8	12	0.03	8	15.03
88	Eligible	1997	Toyota	Tacoma	Selection	IMStationDriveway	13JUL09:11:30:43	14	93	113	40	1	17	27	0.18	169	14.92
89	Eligible	1969	Chevrolet	Camaro SS	Selection	IMStationDriveway	13JUL09:12:06:08	8	97	129	335	5	1310	1582	3.46	286	12.52
97	Dealer	2006	BMW	325xi	Selection	IMStationDriveway	14JUL09:12:33:33	17	94	137	45	1	21	13	0.02	-2	15.04
98	Eligible	2008	Jeep	Liberty	Selection	IMStationDriveway	14JUL09:12:45:22	9	95	143	138	3	8	19	0.04	-27	15.03
99	Eligible	1999	Honda	Passport	Selection	IMStationDriveway	14JUL09:12:57:21	9	94	147	181	4	36	27	0.37	182	14.78
101	Eligible	2001	Pontiac	Montana	Selection	IMStationDriveway	15JUL09:11:41:09	11	83	80	105	3	17	-15	0.06	227	15.00
104	Eligible	2006	Toyota	Highlander	Selection	IMStationDriveway	16JUL09:09:40:08	14	80	21	32	1	-10	-6	0.01	-4	15.04
106	Eligible	1988	Honda	Prelude	Selection	IMStationDriveway	16JUL09:10:54:29	9	88	61	500	5	595	314	0.92	1867	14.31
107	Eligible	2003	Volvo	S60	Selection	IMStationDriveway	16JUL09:11:13:29	8	89	77	76	2	61	-27	0.01	112	15.04
111	Eligible	1995	Jeep	Wagoneer	Selection	IMStationDriveway	16JUL09:13:15:59	13	96	139	1049	6	.	2079	.	.	.
113	Eligible	1985	Ford	F250	Selection	IMStationDriveway	16JUL09:13:44:22	10	96	160	721	6	524	49	3.78	11	12.33
114	Eligible	1991	Subaru	XT6	Selection	IMStationDriveway	16JUL09:14:35:18	13	96	189	64	2	12	-5	0.14	1695	14.89
115	Eligible	1990	Toyota	Camry	Selection	IMStationDriveway	16JUL09:14:50:50	11	98	201	85	2	54	35	0.27	1858	14.79
116	Eligible	1996	Saturn	SL	Selection	IMStationDriveway	16JUL09:15:03:32	6	98	206	60	1	.	367	.	.	.
117	NotOwner	1997	Chevrolet	Cavalier	Selection	IMStationDriveway	16JUL09:15:21:31	14	98	212	909	6	5952	3470	0.65	164	14.41
119	Eligible	1993	VW	Fox GL	Selection	IMStationDriveway	17JUL09:08:21:37	12	69	19	273	5	559	-691	0.12	118	14.94
123	Eligible	1999	Isuzu	Amigo	Selection	IMStationDriveway	17JUL09:14:03:43	12	97	214	864	6	977	-239	0.04	25	15.00
124	Eligible	2005	Nissan	350Z	Selection	IMStationDriveway	17JUL09:14:24:17	11	97	230	85	2	17	9	0.04	6	15.02
125	NotOwner	2005	Mitsubishi	Eclipse GST	Selection	IMStationDriveway	17JUL09:14:50:30	10	101	243	107	3	0	1	0.12	3	14.97
126	NotOwner	1979	Jeep		Selection	IMStationDriveway	17JUL09:15:04:11	13	100	248	582	6	1649	237	7.54	263	9.59
128	Eligible	2003	Chrysler	Town and Country	Selection	IMStationDriveway	20JUL09:08:32:47	18	76	13	40	1	-12	-36	0.14	659	14.93
129	Eligible	1992	Mazda	Navajo	Selection	IMStationDriveway	20JUL09:09:33:59	10	87	32	161	4	9	-17	0.87	11	14.43
133	Eligible	2001	Toyota	Highlander	Selection	IMStationDriveway	20JUL09:10:29:36	8	94	62	56	1	39	-88	0.09	109	14.98

Table E-2. Vehicle Descriptions and Selection RSMs for Eligible Non-Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Reason for Evaporative Testing Ineligibility	Year	Make	Model	Remote Sensing Measurement (RSM)												
					Type (Selection; Measurement)	Location	DateTime	Speed (mph)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
136	Eligible	1996	Toyota	4Runner	Selection	IMStationDriveway	20JUL09:12:22:49	7	97	121	157	4	389	328	0.01	2711	14.94
140	Eligible	1994	Ford	Explorer	Selection	IMStationDriveway	20JUL09:14:27:11	13	99	198	78	2	182	136	8.75	-5	8.78
141	Eligible	1997	Ford	Ranger	Selection	IMStationDriveway	20JUL09:14:39:47	13	101	204	630	6	1740	872	0.05	904	14.93
142	Eligible	1998	Ford	Windstar	Selection	IMStationDriveway	20JUL09:14:44:16	9	101	207	352	5	1849	1567	0.12	121	14.91
143	Eligible	1983	Mercedes	380SL	Selection	IMStationDriveway	20JUL09:15:08:39	13	103	228	251	4	525	83	5.70	81	10.95
144	Eligible	1993	VW	EuroVan	Selection	IMStationDriveway	20JUL09:15:34:48	13	101	246	50	1	-25	-37	0.50	762	14.67
146	Eligible	2005	Toyota	Camry	Selection	IMStationDriveway	20JUL09:16:04:52	14	93	264	65	2	-4	5	0.02	-2	15.04
147	Eligible	1989	Chevrolet	1500	Selection	IMStationDriveway	21JUL09:09:14:28	12	73	44	294	5	157	119	2.26	679	13.40
148	Eligible	1997	Honda	Civic	Selection	IMStationDriveway	21JUL09:10:07:55	14	76	66	52	1	41	30	0.17	293	14.92
149	Eligible	2003	Ford	Expedition	Selection	IMStationDriveway	21JUL09:11:24:10	8	79	103	87	2	58	-11	0.24	35	14.88
150	Eligible	2001	Dodge	Grand Caravan	Selection	IMStationDriveway	21JUL09:13:58:21	15	86	165	62	2	-5	-16	0.06	34	15.01
151	Dealer	2003	Audi	A4	Selection	IMStationDriveway	21JUL09:12:22:52	18	84	127	69	2	6	9	1.62	3	13.89
152	Eligible	2003	Toyota	Camry	Selection	IMStationDriveway	21JUL09:14:00:52	15	86	167	44	1	-11	-25	0.01	-2	15.04
153	Eligible	2003	Subaru	Outback	Selection	IMStationDriveway	21JUL09:16:12:44	12	80	227	43	1	-2	1	0.18	11	14.92
154	Eligible	2005	Audi	A6	Selection	IMStationDriveway	22JUL09:08:27:50	11	71	7	65	2	5	8	0.07	-15	15.00
155	Eligible	2003	Acura	MDX	Selection	IMStationDriveway	22JUL09:09:49:48	12	80	32	76	2	3	-19	0.03	1	15.03
160	Eligible	2009	Toyota	Corolla	Selection	IMStationDriveway	22JUL09:15:00:38	12	102	181	77	2	-43	-26	0.05	59	15.02
164.169	Eligible	1993	Buick	Riviera	Selection	IMStationDriveway	23JUL09:15:18:00	14	107	192	88	2	65	81	0.39	147	14.77
165	Eligible	1991	Toyota	MR2	Selection	IMStationDriveway	23JUL09:16:43:56	12	101	236	162	4	217	191	0.05	580	14.99
166	Eligible	2001	Jeep	Grand Cherokee	Selection	IMStationDriveway	23JUL09:12:57:27	11	101	132	185	4	193	112	0.26	151	14.86
167	Eligible	1984	Jeep	CJ7	Selection	IMStationDriveway	23JUL09:13:18:26	13	102	138	288	4	.	5819	.	.	.
173	Eligible	2002	Jeep	Liberty	Selection	IMStationDriveway	24JUL09:09:17:20	18	82	38	99	3	163	169	5.18	247	11.33
174	NotOwner	1984	Ford	Ranger	Selection	IMStationDriveway	24JUL09:09:32:25	11	83	42	161	4	712	289	10.74	204	7.33
175	Eligible	2005	Buick	LeSabre	Selection	IMStationDriveway	24JUL09:08:58:11	14	79	30	105	3	66	-42	1.72	19	13.82
179	Eligible	1998	Chevrolet	S-10	Selection	IMStationDriveway	24JUL09:11:57:55	13	97	99	989	6	2512	1606	0.10	34	14.90
181	Eligible	2007	Toyota	4Runner	Selection	IMStationDriveway	24JUL09:14:42:24	15	98	177	48	1	-41	-114	0.07	-41	15.00
182	Eligible	1981	Jeep	CJ7	Selection	IMStationDriveway	24JUL09:14:24:34	13	99	172	882	6	1130	517	7.19	75	9.86
183	Eligible	1992	Mitsubishi	Eclipse GSX	Selection	IMStationDriveway	24JUL09:14:39:37	12	98	174	2370	7	6102	2448	0.17	38	14.75
187	Eligible	2001	Subaru	Forester	Selection	IMStationDriveway	27JUL09:09:40:49	13	78	66	46	1	87	66	0.21	133	14.89
191.411	Eligible	1991	Dodge	Stealth	Selection	IMStationDriveway	27JUL09:10:59:20	14	85	122	638	6	963	864	3.62	1404	12.38
196	Eligible	1996	Chevrolet	Astro Van	Selection	IMStationDriveway	27JUL09:14:34:39	12	95	280	138	3	91	31	0.03	322	15.02
199	Eligible	1985	Nissan	300ZX	Selection	IMStationDriveway	28JUL09:08:16:54	9	65	12	167	4	723	758	0.87	2390	14.33
200	Eligible	1999	Pontiac	Grand Am	Selection	IMStationDriveway	28JUL09:09:56:34	13	68	57	82	2	2	0	0.03	-1	15.03
201	Eligible	2000	Toyota	Camry	Selection	IMStationDriveway	28JUL09:10:03:33	17	67	61	124	3	233	173	2.69	869	13.09
202	Dealer	1999	Audi	A4	Selection	IMStationDriveway	28JUL09:10:42:21	18	68	89	63	2	16	18	0.15	45	14.94
207	Eligible	1993	Ford	Ranger	Selection	IMStationDriveway	28JUL09:12:16:17	15	68	162	885	6	1310	1512	1.69	425	13.79

Table E-2. Vehicle Descriptions and Selection RSMs for Eligible Non-Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Reason for Evaporative Testing Ineligibility	Year	Make	Model	Remote Sensing Measurement (RSM)												
					Type (Selection; Measurement)	Location	DateTime	Speed (mph)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
209	NotOwner	2001	Jeep	Cherokee Sport	Selection	IMStationDriveway	28JUL09:14:13:51	15	73	248	70	2	174	171	3.57	39	12.49
210	Eligible	1995	Jeep	Wrangler	Selection	IMStationDriveway	28JUL09:15:01:50	12	73	283	181	4	185	68	0.47	308	14.70
211	Eligible	1989	Ford	F150	Selection	IMStationDriveway	28JUL09:15:39:29	12	74	300	1931	7	791	213	0.52	705	14.63
215	NotOwner	2001	Chevrolet	Pickup	Selection	IMStationDriveway	28JUL09:16:16:23	13	74	322	96	3	168	152	4.23	155	12.01
216	Eligible	1998	Subaru	Legacy	Selection	IMStationDriveway	28JUL09:16:34:06	10	73	331	67	2	58	48	0.53	311	14.66
222	Eligible	2001	Chevrolet	Blazer	Selection	IMStationDriveway	29JUL09:12:07:52	17	71	132	95	3	185	164	3.23	30	12.73
223.256	Eligible	1995	Chevrolet	Blazer	Selection	IMStationDriveway	29JUL09:13:25:41	13	71	169	2325	7	8565	6415	8.11	947	8.95
224	Eligible	1995	Jeep	Grand Cherokee	Selection	IMStationDriveway	29JUL09:13:33:47	17	72	171	102	3	393	223	2.95	1028	12.89
225	Eligible	1990	Chevrolet	Van 20	Selection	IMStationDriveway	29JUL09:16:29:42	15	69	285	548	6	420	510	3.96	649	12.18
226	Eligible	1994	Ford	Ranger	Selection	IMStationDriveway	29JUL09:14:02:23	12	72	197	1021	6	5072	6898	0.08	-69	14.85
227	Eligible	2004	Honda	Pilot	Selection	IMStationDriveway	29JUL09:15:21:33	15	79	250	185	4	17	8	0.04	2	15.02
228	Eligible	2003	Toyota	RAV4	Selection	IMStationDriveway	29JUL09:15:37:00	14	78	255	45	1	-11	-12	0.20	79	14.91
229	Eligible	1997	GMC	Jimmy	Selection	IMStationDriveway	30JUL09:10:59:22	15	60	50	106	3	55	-60	0.32	524	14.80
230	Dealer	2005	Nissan	Altima	Selection	IMStationDriveway	30JUL09:11:20:32	17	60	61	114	3	6	8	0.01	33	15.05
231	Eligible	1993	Buick	LeSabre	Selection	IMStationDriveway	30JUL09:11:48:26	8	59	81	58	1	163	55	0.12	5921	14.75
233	Eligible	2000	Chevrolet	Suburban	Selection	IMStationDriveway	30JUL09:12:05:16	7	59	87	162	4	20	21	0.05	42	15.01
234	Eligible	2007	Nissan	Altima	Selection	IMStationDriveway	30JUL09:12:55:04	13	60	120	118	3	7	12	0.16	21	14.94
235	Eligible	2007	Toyota	Tundra	Selection	IMStationDriveway	30JUL09:13:36:36	13	61	155	91	3	5	-31	0.01	32	15.05
236	Eligible	2003	Chevrolet	Corvette	Selection	IMStationDriveway	30JUL09:14:41:33	10	61	172	62	2	4	3	0.02	19	15.04
237	Eligible	1992	Mazda	Miata	Selection	IMStationDriveway	30JUL09:15:15:51	11	64	190	117	3	87	85	0.25	348	14.86
239	Eligible	1996	Nissan	Pathfinder	Selection	IMStationDriveway	30JUL09:15:59:13	13	74	207	156	4	40	-54	0.13	1361	14.91
241	Eligible	1990	Dodge	Ram	Selection	IMStationDriveway	31JUL09:08:26:00	14	66	15	530	5	669	689	10.14	101	7.76
245	Eligible	2002	Daewoo	Leganza	Selection	IMStationDriveway	31JUL09:08:43:46	13	68	17	64	2	14	42	0.13	3	14.96
247	Eligible	2001	Toyota	Tacoma	Selection	IMStationDriveway	31JUL09:10:29:50	16	82	64	59	2	.	-186	.	.	.
248	Eligible	2004	Chevrolet	Impala	Selection	IMStationDriveway	31JUL09:10:43:46	8	83	72	151	4	-2	-39	0.07	78	15.00
250	Eligible	1983	Jeep	CJ7	Selection	IMStationDriveway	31JUL09:11:58:25	15	84	131	158	4	265	224	3.90	504	12.23
251	Eligible	1988	Mercedes	300E	Selection	IMStationDriveway	31JUL09:12:03:19	14	84	133	378	5	417	42	0.68	357	14.54
253	Eligible	1996	Toyota	Tacoma	Selection	IMStationDriveway	31JUL09:12:22:59	14	81	143	77	2	-44	6	0.09	120	14.98
254	Eligible	2005	Scion	XA	Selection	IMStationDriveway	31JUL09:13:52:25	14	88	198	40	1	-69	-13	-0.01	1612	15.01
257	Eligible	1994	Geo	Metro	Selection	IMStationDriveway	31JUL09:16:20:58	14	78	270	259	4	.	87	.	.	.
258	Eligible	1996	Jeep	Cherokee	Selection	IMStationDriveway	31JUL09:16:27:25	17	79	274	133	3	123	52	0.37	1833	14.72
259	Eligible	1993	Ford	Mustang	Selection	IMStationDriveway	31JUL09:16:36:46	11	81	280	138	3	116	-17	0.06	373	14.99
264	Eligible	1982	Ford	F150	Selection	IMStationDriveway	03AUG09:11:10:19	10	93	93	503	5	760	144	4.50	569	11.78
265	Eligible	2004	Honda	Pilot	Selection	IMStationDriveway	03AUG09:11:23:44	11	93	106	66	2	-17	37	0.02	32	15.04
267	Eligible	1991	Toyota	Camry	Selection	IMStationDriveway	03AUG09:12:06:25	13	95	136	446	5	1511	1431	4.08	176	12.08
268	Dealer	2007	Honda	Pilot	Selection	IMStationDriveway	03AUG09:12:10:41	19	95	138	87	2	5	5	0.02	-11	15.04

Table E-2. Vehicle Descriptions and Selection RSMs for Eligible Non-Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Reason for Evaporative Testing Ineligibility	Year	Make	Model	Remote Sensing Measurement (RSM)												
					Type (Selection; Measurement)	Location	DateTime	Speed (mph)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
270	Eligible	1999	Ford	Explorer	Selection	IMStationDriveway	03AUG09:12:55:31	9	97	162	112	3	4	-23	0.15	11	14.95
272	Eligible	1991	Toyota	Long Bed	Selection	IMStationDriveway	03AUG09:13:26:42	11	93	175	61	2	166	95	0.58	1704	14.58
273	Eligible	1988	Ford	Mustang	Selection	IMStationDriveway	03AUG09:13:41:14	6	93	179	883	6	2570	898	0.36	265	14.71
274	Eligible	2001	Nissan	Frontier	Selection	IMStationDriveway	03AUG09:13:41:40	10	93	180	344	6	.	-2651	.	.	.
275	Eligible	1984	Ford	Tempo	Selection	IMStationDriveway	03AUG09:13:47:10	13	97	183	1453	7	5315	6178	2.41	317	13.16
277	Eligible	2004	Honda	Accord	Selection	IMStationDriveway	03AUG09:14:26:17	12	98	207	151	4	31	16	1.60	-29	13.91
280	Eligible	1994	Ford	F150	Selection	IMStationDriveway	04AUG09:11:14:58	11	84	104	222	4	394	169	3.08	160	12.83
281	Eligible	2005	Jeep	Liberty	Selection	IMStationDriveway	04AUG09:10:41:31	10	81	80	100	3	16	-29	0.07	-13	15.00
282	Eligible	1974	Ford	F250	Selection	IMStationDriveway	04AUG09:11:21:24	10	86	107	360	5	329	91	0.73	1471	14.47
283	Eligible	2002	Dodge	Ram	Selection	IMStationDriveway	04AUG09:11:36:16	12	87	116	165	4	29	6	0.01	59	15.04
284	Eligible	1982	Ford	F250	Selection	IMStationDriveway	04AUG09:14:17:22	11	102	131	521	6	1039	421	4.34	213	11.90
286	Eligible	2006	Jeep	Laredo	Selection	IMStationDriveway	04AUG09:15:24:51	13	96	171	72	2	6	-10	0.05	-1	15.02
287	Eligible	1966	Volvo	122	Selection	IMStationDriveway	04AUG09:15:53:15	14	97	181	388	5	941	702	1.92	1466	13.59
288	FleetVehicle	1998	Chevrolet	1500	Selection	IMStationDriveway	04AUG09:16:17:36	12	94	198	61	2	-2	9	0.03	474	15.01
289	Eligible	1991	Buick	Century	Selection	IMStationDriveway	05AUG09:10:29:06	13	80	59	294	5	532	788	-0.01	986	15.01
291	Dealer	1995	Buick	Century	Selection	IMStationDriveway	05AUG09:12:33:04	14	90	125	2219	7	2659	-797	0.08	571	14.89
292	Eligible	2005	Chevrolet	Silverado	Selection	IMStationDriveway	05AUG09:13:04:23	14	91	136	167	4	21	21	0.10	79	14.98
293	Eligible	1994	Ford	F150	Selection	IMStationDriveway	05AUG09:13:14:34	12	95	146	457	5	902	356	0.05	179	14.99
296	Eligible	1995	Subaru	Outback	Selection	IMStationDriveway	05AUG09:15:17:35	13	103	190	95	3	203	44	1.67	206	13.84
297	Eligible	1963	Chevrolet	C10	Selection	IMStationDriveway	06AUG09:09:07:27	13	75	32	551	6	1446	-942	6.41	465	10.40
299	FleetVehicle	2005	GMC	Sierra	Selection	IMStationDriveway	06AUG09:09:57:38	10	78	50	314	5	545	178	0.07	71	14.98
300	Eligible	2005	Buick	Century	Selection	IMStationDriveway	06AUG09:10:04:27	9	78	52	43	1	-9	-7	0.01	-13	15.05
304	Eligible	2006	Ford	F150	Selection	IMStationDriveway	07AUG09:08:14:31	15	71	15	105	3	37	14	0.08	-1	14.99
307	Eligible	1995	Ford	Taurus	Selection	IMStationDriveway	07AUG09:10:14:50	17	82	88	308	5	1427	914	4.26	707	11.93
308	NotOwner	1996	Mazda	626	Selection	IMStationDriveway	07AUG09:10:54:37	15	85	101	81	2	9	1	0.07	271	14.99
310	Eligible	2001	BMW	Z3	Selection	IMStationDriveway	07AUG09:13:32:47	14	99	190	152	4	7	25	0.12	31	14.97
312	Eligible	2003	Ford	Focus	Selection	IMStationDriveway	07AUG09:14:40:37	14	110	228	86	2	4	12	1.09	-9	14.27
313	Eligible	1994	Toyota	Land Cruiser	Selection	IMStationDriveway	07AUG09:14:44:01	8	110	229	170	4	28	30	0.05	100	15.01
314	Eligible	2005	Honda	Civic	Selection	IMStationDriveway	07AUG09:15:03:47	11	110	236	96	3	39	4	2.02	22	13.60
315	Eligible	1990	Honda	Accord	Selection	IMStationDriveway	07AUG09:15:55:24	9	105	265	104	3	12	39	0.12	641	14.95
317	Eligible	2005	Dodge	SRT-4	Selection	IMStationDriveway	07AUG09:16:30:59	16	100	283	278	5	274	257	0.03	104	15.02
318	Eligible	1995	Nissan	Maxima	Selection	IMStationDriveway	07AUG09:16:36:00	12	105	286	493	5	914	728	1.42	173	14.00
322	Eligible	1998	BMW	Z3	Selection	IMStationDriveway	10AUG09:11:30:17	14	80	89	195	4	28	0	0.09	80	14.99
323	Eligible	2007	Ford	Taurus	Selection	IMStationDriveway	10AUG09:12:21:25	13	85	119	61	2	-40	-60	0.05	59	15.02
324	Eligible	2004	Honda	Accord	Selection	IMStationDriveway	10AUG09:12:44:13	15	88	130	86	2	45	20	3.12	22	12.82
326	Eligible	1991	Saturn	SL2	Selection	IMStationDriveway	10AUG09:15:38:21	12	100	225	334	5	440	54	0.29	990	14.80

Table E-2. Vehicle Descriptions and Selection RSMs for Eligible Non-Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Reason for Evaporative Testing Ineligibility	Year	Make	Model	Remote Sensing Measurement (RSM)												
					Type (Selection; Measurement)	Location	DateTime	Speed (mph)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
328	Eligible	2005	Volvo	S40	Selection	IMStationDriveway	10AUG09:16:30:56	11	104	239	63	2	-7	-3	0.04	47	15.02
330	Eligible	2001	Mercedes	ML320	Selection	IMStationDriveway	11AUG09:10:21:17	12	79	50	63	2	-20	-14	0.03	9	15.03
333	Eligible	2003	Dodge	Caravan	Selection	IMStationDriveway	11AUG09:11:45:52	10	91	90	89	2	-6	-47	0.03	-7	15.03
334	Eligible	1999	Toyota	Sienna	Selection	IMStationDriveway	11AUG09:12:04:50	13	92	98	210	4	228	194	0.67	188	14.56
335	Eligible	2003	BMW	540i	Selection	IMStationDriveway	11AUG09:12:20:56	13	92	101	113	3	24	19	0.01	3	15.04
336	Eligible	1980	Chevrolet	Malibu	Selection	IMStationDriveway	11AUG09:12:24:00	12	93	103	972	6	2177	369	2.22	1405	13.34
338	Eligible	1999	Chevrolet	Van	Selection	IMStationDriveway	11AUG09:15:52:54	13	112	214	79	2	20	24	0.21	384	14.89
340	Eligible	1994	Ford	Ranger	Selection	IMStationDriveway	11AUG09:16:10:12	15	115	229	2073	7	3888	-1680	0.22	3986	14.64
341	Eligible	1998	Toyota	4Runner	Selection	IMStationDriveway	11AUG09:17:03:35	10	117	246	260	4	238	70	0.02	15	15.03
342	NotOwner	1999	Dodge	Ram 2500	Selection	IMStationDriveway	12AUG09:10:13:02	11	82	41	187	4	169	116	0.49	2480	14.61
344	Eligible	1988	Chevrolet	Corvette	Selection	IMStationDriveway	12AUG09:10:22:17	11	83	50	211	4	131	53	0.02	2820	14.94
345	Eligible	1996	Ford	F150	Selection	IMStationDriveway	12AUG09:10:48:36	12	87	72	164	4	48	-54	0.01	50	15.05
346	Eligible	2003	Honda	Accord	Selection	IMStationDriveway	12AUG09:10:48:46	15	87	73	30	1	-23	1	0.01	25	15.04
347	Eligible	1992	Chevrolet	Half-Ton	Selection	IMStationDriveway	12AUG09:11:19:25	9	91	90	181	4	549	279	0.25	990	14.82
349	Eligible	1985	Toyota	Pickup	Selection	IMStationDriveway	12AUG09:13:01:05	7	101	138	196	4	446	-1094	0.13	3071	14.84
351	Eligible	1999	Ford	Explorer	Selection	IMStationDriveway	12AUG09:15:10:16	14	110	203	63	2	-12	15	0.05	18	15.02
356	Eligible	2005	Dodge	Dakota	Selection	IMStationDriveway	13AUG09:10:23:14	11	85	58	270	5	16	1	0.09	124	14.98
358	Eligible	1997	Chevrolet	Malibu	Selection	IMStationDriveway	13AUG09:12:03:56	17	93	119	96	3	4	7	0.03	-12	15.03
359	Eligible	2000	Ford	Ranger	Selection	IMStationDriveway	13AUG09:15:10:04	12	78	188	66	2	8	8	0.09	1849	14.93
360	Eligible	2001	Chevrolet	Suburban	Selection	IMStationDriveway	13AUG09:16:09:14	13	97	211	161	4	16	1	0.05	322	15.01
363	Eligible	2003	Dodge	Stratus	Selection	IMStationDriveway	14AUG09:09:58:10	12	74	64	146	3	18	3	0.04	6	15.03
366	Eligible	2003	BMW	530i	Selection	IMStationDriveway	14AUG09:12:43:41	13	81	153	37	1	118	65	0.39	140	14.77
368	Eligible	1994	Toyota	Camry	Selection	IMStationDriveway	14AUG09:15:35:07	16	94	249	122	3	185	187	0.06	818	14.98
369	Eligible	1993	Ford	Ranger	Selection	IMStationDriveway	14AUG09:16:36:47	10	83	278	77	2	22	0	1.52	3	13.96
372	Eligible	1996	Toyota	Corolla	Selection	IMStationDriveway	17AUG09:09:31:03	12	65	41	200	4	348	87	0.17	1103	14.88
373	Eligible	1997	Subaru	Outback/Legacy	Selection	IMStationDriveway	17AUG09:09:49:29	15	66	49	113	3	284	177	2.13	684	13.49
374	Eligible	2003	Jaguar	XKR	Selection	IMStationDriveway	17AUG09:09:56:58	18	66	57	46	1	-7	-13	0.04	13	15.03
376	Eligible	1993	Pontiac	Trans Am	Selection	IMStationDriveway	17AUG09:12:32:45	16	77	146	291	4	826	1321	0.64	1197	14.53
377	Eligible	1992	Acura	Integra	Selection	IMStationDriveway	17AUG09:13:10:10	7	81	153	157	4	97	112	0.74	213	14.51
378	Eligible	2004	Toyota	Corolla	Selection	IMStationDriveway	17AUG09:13:20:57	13	83	157	71	2	83	-40	0.06	231	15.00
380	Eligible	1987	Chevrolet	3/4 Ton Pickup	Selection	IMStationDriveway	17AUG09:15:07:27	13	86	224	155	4	63	11	0.14	2279	14.87
382	Eligible	2001	Toyota	Sienna	Selection	IMStationDriveway	17AUG09:15:22:46	12	86	233	56	1	18	19	0.11	120	14.97
384	Eligible	1985	Jeep	Wagoneer	Selection	IMStationDriveway	18AUG09:08:18:12	12	63	12	214	4	610	159	7.32	179	9.78
386	Eligible	1998	Ford	Escort	Selection	IMStationDriveway	18AUG09:10:00:29	12	69	57	92	3	-6	4	0.02	140	15.04
388	Eligible	1992	Honda	Accord	Selection	IMStationDriveway	18AUG09:12:34:50	16	82	125	54	1	36	40	1.04	108	14.30
389	Eligible	2001	Chevrolet	Astro	Selection	IMStationDriveway	18AUG09:14:54:27	13	65	141	60	2	5	-47	0.02	47	15.04

Table E-2. Vehicle Descriptions and Selection RSMs for Eligible Non-Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Reason for Evaporative Testing Ineligibility	Year	Make	Model	Remote Sensing Measurement (RSM)												
					Type (Selection; Measurement)	Location	DateTime	Speed (mph)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
394	Eligible	1991	Ford	Taurus	Selection	IMStationDriveway	19AUG09:13:13:58	9	87	127	2530	7	3186	3850	0.06	1399	14.87
398	Eligible	1990	Plymouth	Acclaim	Selection	IMStationDriveway	19AUG09:14:22:20	14	93	163	263	5	770	-225	1.16	103	14.19
400	Eligible	2006	Toyota	Tacoma	Selection	IMStationDriveway	20AUG09:08:32:02	15	61	7	109	3	.	-313	.	.	.
403	Eligible	2003	Ford	Crown Victoria	Selection	IMStationDriveway	20AUG09:12:14:20	15	80	121	139	3	153	69	0.09	38	14.98
406	Eligible	2005	Chrysler	Crossfire	Selection	IMStationDriveway	20AUG09:13:32:47	11	87	151	81	2	11	27	0.07	8	15.00
407	Eligible	1995	Geo	Prizm	Selection	IMStationDriveway	20AUG09:13:48:28	12	89	165	341	5	485	210	0.32	173	14.81
409	Eligible	1994	Toyota	Celica	Selection	IMStationDriveway	20AUG09:14:50:35	13	96	196	104	3	218	226	1.09	741	14.24
410	Eligible	2005	Subaru	Legacy	Selection	IMStationDriveway	20AUG09:15:22:05	16	99	203	153	4	15	19	0.03	199	15.03
412	Eligible	2005	Dodge	Grand Caravan	Selection	IMStationDriveway	20AUG09:16:25:11	12	104	228	170	4	13	50	0.54	-18	14.67
413	Eligible	1995	Ford	F150	Selection	IMStationDriveway	20AUG09:16:54:41	13	103	239	207	4	268	67	2.94	252	12.93
415	Eligible	2005	Ford	Escape	Selection	IMStationDriveway	21AUG09:10:11:41	14	71	76	92	3	-3	-19	0.01	61	15.04
417	Eligible	2002	GMC	Denali	Selection	IMStationDriveway	21AUG09:10:34:51	11	73	94	152	4	14	-26	0.01	93	15.05
418	Eligible	2002	Kia	Sedona	Selection	IMStationDriveway	21AUG09:11:53:26	12	78	145	68	2	-12	-23	0.03	22	15.04
419	Eligible	1987	GMC	Jimmy	Selection	IMStationDriveway	21AUG09:12:14:29	10	80	158	123	3	278	299	0.33	718	14.78
421	Eligible	2001	Honda	Civic	Selection	IMStationDriveway	21AUG09:12:57:17	14	85	183	106	3	75	-8	1.35	-23	14.09
422	Eligible	1994	GMC	Sierra	Selection	IMStationDriveway	21AUG09:13:45:31	15	92	217	229	4	292	324	6.41	326	10.44
423	FleetVehicle	2004	Dodge	Ram 1500	Selection	IMStationDriveway	21AUG09:13:48:02	15	93	220	163	4	18	-22	0.01	66	15.04
426	Eligible	1993	Toyota	Corolla	Selection	IMStationDriveway	24AUG09:09:15:41	12	79	12	85	2	293	257	1.16	556	14.19
429	Eligible	2003	Acura	RSX-S	Selection	IMStationDriveway	24AUG09:10:28:30	15	80	62	45	1	-23	-25	0.00	55	15.05
433	Eligible	1997	Isuzu	Rodeo	Selection	IMStationDriveway	24AUG09:11:37:04	11	86	107	280	4	1345	1283	1.27	447	14.09
434	Eligible	1994	Chevrolet	Cavalier	Selection	IMStationDriveway	24AUG09:11:48:11	12	86	113	52	1	341	265	1.73	506	13.79
435	NotOwner	2001	Toyota	Sequoia	Selection	IMStationDriveway	24AUG09:13:24:31	15	88	167	153	4	8	-8	0.04	995	14.99
436	Eligible	1990	Toyota	Camry	Selection	IMStationDriveway	24AUG09:13:56:42	11	87	184	88	2	486	401	9.96	34	7.89
440	Eligible	2001	Toyota	Corolla	Selection	IMStationDriveway	24AUG09:15:08:08	13	83	220	62	2	209	148	1.44	139	14.01
442	Eligible	1985	Chevrolet	S-10	Selection	IMStationDriveway	24AUG09:16:26:06	13	77	263	1168	7	680	563	1.92	235	13.65
443	Eligible	1982	Chevrolet	Suburban	Selection	IMStationDriveway	24AUG09:16:56:49	11	76	274	459	4	14173	13771	5.30	1945	10.76
444	Eligible	2003	GMC	Envoy	Selection	IMStationDriveway	25AUG09:08:00:24	13	66	6	70	2	30	-1	0.04	104	15.02
446	Eligible	2004	Oldsmobile	Alero	Selection	IMStationDriveway	25AUG09:09:50:38	16	72	61	120	3	6	12	0.03	6	15.04
447	Eligible	2003	Chevrolet	Cavalier	Selection	IMStationDriveway	25AUG09:10:15:11	11	72	84	62	2	8	-19	0.05	601	14.99
448	Eligible	2001	Jeep	Wagoneer/Cherokee	Selection	IMStationDriveway	25AUG09:10:22:07	13	72	86	72	2	73	25	0.32	64	14.82
449	Eligible	1999	Mazda	Protege	Selection	IMStationDriveway	25AUG09:10:30:22	10	72	93	150	3	4	-8	0.10	1245	14.94
450	Eligible	1993	Volvo	240	Selection	IMStationDriveway	25AUG09:10:42:14	10	73	100	223	4	662	538	9.43	168	8.27
451	Eligible	1994	Ford	F250	Selection	IMStationDriveway	25AUG09:10:53:08	14	74	108	1643	7	7831	9751	4.12	1038	11.83
452	Eligible	1994	Toyota	Camry	Selection	IMStationDriveway	25AUG09:11:34:51	16	77	132	74	2	20	16	0.03	139	15.02
453	Eligible	1973	Ford	XLT Ranger	Selection	IMStationDriveway	25AUG09:11:49:11	13	77	139	3434	7	3834	-250	4.18	700	11.92
457	Eligible	2000	Subaru	Legacy	Selection	IMStationDriveway	25AUG09:16:01:00	15	79	265	103	3	119	174	5.65	42	11.00

Table E-2. Vehicle Descriptions and Selection RSMs for Eligible Non-Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Reason for Evaporative Testing Ineligibility	Year	Make	Model	Remote Sensing Measurement (RSM)												
					Type (Selection; Measurement)	Location	DateTime	Speed (mph)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
458	Eligible	1988	Jeep	Wrangler	Selection	IMStationDriveway	25AUG09:16:14:14	14	80	270	163	4	414	314	6.39	179	10.45
459	Eligible	1996	Jeep	Grand Cherokee	Selection	IMStationDriveway	26AUG09:09:02:19	15	67	36	179	4	110	94	0.41	272	14.75
462	Eligible	2000	Saab	95	Selection	IMStationDriveway	26AUG09:12:43:11	13	80	134	188	4	222	116	1.04	238	14.29
463	CommercialVehicle	2000	Chevrolet	Astro	Selection	IMStationDriveway	26AUG09:13:35:29	12	82	155	70	2	11	24	0.04	-8	15.03
464	Eligible	1998	Ford	Taurus	Selection	IMStationDriveway	26AUG09:13:49:35	11	82	158	432	5	2078	970	0.08	110	14.93
467	Eligible	2001	Chevrolet	Corvette	Selection	IMStationDriveway	27AUG09:12:08:41	8	84	113	66	2	10	-4	0.13	-2	14.96
470	Eligible	2006	Nissan	Armada SE	Selection	IMStationDriveway	27AUG09:13:17:30	16	88	137	71	2	29	-5	0.02	99	15.04
472	Eligible	1999	Jeep	Cherokee	Selection	IMStationDriveway	27AUG09:13:47:06	11	91	151	97	3	15	-6	0.37	243	14.78
473	Eligible	1995	Chevrolet	C-1500	Selection	IMStationDriveway	27AUG09:14:26:50	15	95	174	61	2	116	113	0.83	55	14.45
474	Eligible	1970	Chevrolet	Custom 10 350	Selection	IMStationDriveway	27AUG09:15:00:29	12	95	190	99	2	869	756	7.95	291	9.32
476	Eligible	1986	Jeep	Wagoneer	Selection	IMStationDriveway	27AUG09:15:27:51	15	100	201	306	5	473	361	3.42	475	12.57
478	Eligible	2004	Pontiac	Grand Am	Selection	IMStationDriveway	27AUG09:16:29:47	15	103	232	99	3	-5	-4	0.03	9	15.03
479	Eligible	1990	Jeep	Cherokee	Selection	IMStationDriveway	27AUG09:16:47:34	13	103	241	165	4	320	274	5.40	511	11.15
483	Eligible	1998	Chevrolet	Corvette	Selection	IMStationDriveway	28AUG09:08:59:56	16	68	19	88	2	25	22	0.04	62	15.03
485.534	Eligible	1985	Ford	F250	Selection	IMStationDriveway	28AUG09:09:48:16	17	70	46	304	5	506	443	6.66	698	10.24
488	Eligible	2000	Dodge	Ram 1500	Selection	IMStationDriveway	28AUG09:10:40:05	15	72	79	170	4	27	-50	0.07	30	15.00
490	Eligible	2002	Lexus	GS430	Selection	IMStationDriveway	28AUG09:12:03:56	12	76	129	81	2	-2	9	0.03	161	15.02
491	Eligible	1999	Ford	Explorer	Selection	IMStationDriveway	28AUG09:12:10:10	16	77	134	535	6	472	-39	2.76	42	13.06
492	Eligible	2003	Chevrolet	Avalanche	Selection	IMStationDriveway	28AUG09:12:17:55	12	77	140	78	2	39	-30	0.06	403	14.99
493	Eligible	1979	Ford	Ranger	Selection	IMStationDriveway	28AUG09:12:32:29	13	79	144	189	4	84	9	3.26	349	12.70
495	Eligible	2000	Jeep	Cherokee	Selection	IMStationDriveway	28AUG09:14:04:30	13	91	205	153	4	93	-32	0.16	-1	14.94
496	Eligible	2001	GMC	Sonoma	Selection	IMStationDriveway	28AUG09:14:15:45	16	92	218	199	4	60	60	3.41	13	12.60
499	Eligible	2005	Toyota	Camry	Selection	IMStationDriveway	28AUG09:15:18:09	15	102	254	54	1	0	-15	0.06	-5	15.01
500	Eligible	1999	Honda	Accord	Selection	IMStationDriveway	28AUG09:15:21:32	10	102	259	224	4	427	333	0.81	541	14.44
501	Eligible	1994	Toyota	4Runner	Selection	IMStationDriveway	28AUG09:15:52:12	12	101	266	68	2	195	214	3.10	2	12.83
502	Eligible	2001	GMC	Jimmy	Selection	IMStationDriveway	28AUG09:15:53:43	10	101	267	130	3	31	43	0.07	455	14.98
503	Eligible	1990	Chevrolet	Corvette	Selection	IMStationDriveway	28AUG09:16:55:00	12	108	298	611	6	666	506	1.50	212	13.95
505	Eligible	1991	Toyota	MR2	Selection	IMStationDriveway	31AUG09:09:25:02	14	65	71	62	2	27	28	0.11	246	14.96
506	Eligible	1988	Toyota	4Runner	Selection	IMStationDriveway	31AUG09:09:51:55	11	70	92	260	4	61	13	0.83	363	14.44
508	Eligible	1998	Chevrolet	S-10	Selection	IMStationDriveway	31AUG09:10:38:04	15	70	124	56	1	-28	-58	0.05	340	15.01
509	Eligible	1997	Ford	Explorer	Selection	IMStationDriveway	31AUG09:10:59:10	16	73	134	378	5	1293	1019	2.70	170	13.08
510	Eligible	1985	Ford	Ranger	Selection	IMStationDriveway	31AUG09:11:02:38	14	73	138	118	3	.	295	.	.	.
511	Eligible	1992	Lexus	SL400	Selection	IMStationDriveway	31AUG09:11:18:04	9	74	147	132	3	10	9	0.08	599	14.98
513	Eligible	2002	Chevrolet	Avalanche	Selection	IMStationDriveway	31AUG09:11:40:58	7	77	172	240	4	42	-4	0.05	91	15.01
515	Eligible	2005	Mercedes	ML350	Selection	IMStationDriveway	31AUG09:11:50:18	7	78	176	58	2	100	-56	0.03	11	15.03
516	Eligible	1974	VW	Vanagon	Selection	IMStationDriveway	31AUG09:11:37:46	11	77	167	551	6	4437	110	5.51	692	10.95

Table E-2. Vehicle Descriptions and Selection RSMs for Eligible Non-Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Reason for Evaporative Testing Ineligibility	Year	Make	Model	Remote Sensing Measurement (RSM)													
					Type (Selection; Measurement)	Location	DateTime	Speed (mph)	Temperature (F)	VDF	EI23	EI23 Bin	HC 1 (ppmC3)	HC 2 (ppmC3)	CO 1 (%)	NO 1 (ppm)	CO_2 1 (%)
519	Eligible	1997	Pontiac	Grand Am	Selection	IMStationDriveway	31AUG09:13:35:12	12	83	255	85	2	56	40	0.02	422	15.02
520	Eligible	1980	Jeep	Wagoneer	Selection	IMStationDriveway	31AUG09:13:41:53	12	83	260	203	4	258	259	0.16	1929	14.86
522	Eligible	2004	Audi	A4	Selection	IMStationDriveway	31AUG09:14:15:44	11	84	285	82	2	4	12	0.02	0	15.04
523	Eligible	1989	Jeep	Wrangler	Selection	IMStationDriveway	31AUG09:14:22:18	12	85	290	252	4	300	148	0.83	458	14.44
524	Eligible	1997	Isuzu	Rodeo	Selection	IMStationDriveway	31AUG09:14:43:16	16	85	305	158	4	206	150	2.86	273	12.99
525	Eligible	2005	Pontiac	Vibe	Selection	IMStationDriveway	31AUG09:15:06:14	13	83	317	103	3	16	3	0.03	4	15.03
526	Eligible	1999	Land Rover	Range Rover	Selection	IMStationDriveway	31AUG09:15:14:31	13	82	323	171	4	11	-3	0.01	-3	15.04
528	Eligible	1994	Jeep	Cherokee	Selection	IMStationDriveway	31AUG09:16:00:56	8	86	351	498	5	1995	1014	0.28	1640	14.74
529	Eligible	2003	Oldsmobile	Silhouette	Selection	IMStationDriveway	31AUG09:16:19:04	11	86	359	167	4	34	-33	0.05	344	15.01
530	Eligible	1996	Chevrolet	Blazer	Selection	IMStationDriveway	31AUG09:16:54:05	14	80	375	48	1	74	18	0.06	-38	15.01
531	Eligible	2002	Ford	Expedition	Selection	IMStationDriveway	01SEP09:08:27:11	15	65	13	71	2	5	-8	0.20	37	14.91
532	Eligible	1967	Chevrolet	Camaro	Selection	IMStationDriveway	01SEP09:08:36:30	13	66	18	2459	7	4289	3569	4.27	1073	11.82
533	Eligible	1991	Nissan	Maxima	Selection	IMStationDriveway	01SEP09:08:59:12	11	68	28	384	5	609	312	0.10	189	14.96
535	Eligible	2001	Ford	Taurus	Selection	IMStationDriveway	01SEP09:10:26:39	14	78	71	401	5	335	4	4.66	7	11.71
536	Eligible	2005	Hyundai	Sonata	Selection	IMStationDriveway	01SEP09:10:40:15	14	80	78	75	2	-32	-13	0.01	4847	14.88
537	Eligible	1996	Ford	F150	Selection	IMStationDriveway	01SEP09:11:39:39	9	85	106	61	2	16	112	0.04	18	15.03
538	Eligible	1993	Toyota	Tacoma	Selection	IMStationDriveway	01SEP09:11:48:01	6	86	110	93	3	117	119	0.20	1536	14.85
539	Eligible	1963	Chevrolet	C-10	Selection	IMStationDriveway	01SEP09:12:13:23	15	90	127	192	4	646	517	8.28	349	9.09
541	Eligible	2002	GMC	Yukon	Selection	IMStationDriveway	01SEP09:14:26:35	11	93	176	347	5	407	116	3.48	116	12.54
543	Eligible	1995	Toyota	Camry	Selection	IMStationDriveway	01SEP09:15:58:26	11	94	228	307	5	713	632	0.38	704	14.73
544	Eligible	1993	Jeep	Cherokee	Selection	IMStationDriveway	01SEP09:16:15:03	12	92	235	201	4	.	151	.	.	.
545	Eligible	2002	Lexus	RX300	Selection	IMStationDriveway	02SEP09:08:34:39	11	69	11	112	3	18	12	0.06	164	15.00
548	Eligible	1991	Toyota	MR2	Selection	IMStationDriveway	02SEP09:10:37:20	16	75	74	322	5	276	249	4.71	108	11.67
549	Eligible	1995	Chevrolet	Blazer	Selection	IMStationDriveway	02SEP09:13:13:01	10	91	142	1989	7	1085	667	0.03	102	14.99
551	Eligible	1997	Jeep	Grand Cherokee	Selection	IMStationDriveway	02SEP09:15:33:13	14	100	206	78	2	16	28	0.19	132	14.91
552	Eligible	1996	Infiniti	G20	Selection	IMStationDriveway	03SEP09:08:53:13	13	69	24	55	1	2	233	0.58	-27	14.64
553	Eligible	2002	Toyota	4Runner	Selection	IMStationDriveway	03SEP09:09:13:03	13	71	36	596	6	1178	269	2.45	35	13.26
554	NotOwner	2005	Chrysler	Pacifica	Selection	IMStationDriveway	03SEP09:09:20:52	9	72	39	60	2	5	-14	0.04	-2	15.02
555	Eligible	1994	Ford	Bronco	Selection	IMStationDriveway	03SEP09:11:02:54	13	80	70	144	3	56	44	0.55	226	14.65
556	Eligible	2003	Dodge	Ram 2500	Selection	IMStationDriveway	03SEP09:11:19:41	16	80	79	96	3	15	-53	0.04	2017	14.95
557	Eligible	1995	Ford	F150	Selection	IMStationDriveway	03SEP09:11:25:09	15	81	81	276	4	1629	479	3.96	245	12.16
558	Eligible	1999	Dodge	Neon	Selection	IMStationDriveway	03SEP09:11:45:51	12	83	88	122	3	66	-81	0.05	533	14.99
560	Eligible	2005	Chevrolet	Trailblazer	Selection	IMStationDriveway	03SEP09:12:21:38	10	86	105	127	3	13	-47	0.04	45	15.02
561	Eligible	1999	Mercedes	E320	Selection	IMStationDriveway	03SEP09:13:00:43	11	89	112	51	1	7	16	0.04	27	15.02
562	Eligible	1992	Range Rover	LR	Selection	IMStationDriveway	03SEP09:13:15:51	13	91	118	102	3	49	-14	0.36	168	14.79
564	Eligible	1999	Chevrolet	Suburban K1500	Selection	IMStationDriveway	03SEP09:15:15:34	9	104	167	172	4	59	-6	0.03	166	15.02

Table E-2. Vehicle Descriptions and Selection RSMs for Eligible Non-Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Reason for Evaporative Testing Ineligibility	Year	Make	Model	Remote Sensing Measurement (RSM)												
					Type (Selection; Measurement)	Location	DateTime	Speed (mph)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
565	Eligible	1976	Ford	Granada	Selection	IMStationDriveway	03SEP09:16:05:54	13	93	202	165	4	417	254	2.67	404	13.12
566	Eligible	2005	VW	Beetle	Selection	IMStationDriveway	04SEP09:10:21:02	13	72	88	47	1	-30	-21	0.11	28	14.98
567	Eligible	1989	Honda	Civic	Selection	IMStationDriveway	04SEP09:10:26:45	13	74	91	113	3	134	106	1.10	590	14.24
569	Eligible	1998	Subaru	Legacy	Selection	IMStationDriveway	04SEP09:11:15:40	10	78	116	50	1	74	54	0.04	43	15.02

[1] Concentration calculated when the regression intercepts of HC, CO, and NO attenuations versus CO_2 attenuation are forced to zero.

[2] Concentration calculated when the regression intercepts of HC, CO, and NO attenuations versus CO_2 attenuation are not forced to zero.

Appendix F
Descriptions and Data for Participating Vehicles

Appendix F provides selected data on the 175 vehicles whose drivers agreed to participate in the intensive evaporative emissions portion of the project.

Table F-1 provides descriptions of the participating vehicles. Besides model year, make, and model, the table gives fuel metering type, Vehicle Emissions Control Information (VECI), VIN stem, transmission type, fuel level, and odometer readings. The transcriptions for the blue-background entries of the VECI information and VINs have been verified as correct by examining digital photographs of the VECI labels and VIN stamps during the data quality-control process. The use of the VIN stem for 1981 and newer vehicles, which is the first through ninth plus eleventh digits of the VIN, allows the decoding of VINs while protecting the identity of private vehicles.

Table F-2 provides information on the Selection RSMs and Measurement RSMs. The Combined PacketID in the first column provides linkage of the results to the Table F-1 information. Just as for ineligible vehicles and eligible non-participants, each participant was assigned a Selection RSM EI23 Bin based on the EI23 value determined from the Selection RSM raw data. Once a vehicle became a participant it typically received six Measurement RSMs – duplicate RSMs at nominally 12, 34, and 55 mph. For each participant Table F-2 shows the Selection and Measurement RSMs in chronological order. Additionally, some vehicles were sent for evaporative emissions repairs. After repair these vehicles received two additional Measurement RSMs at nominally 12 mph. These RSMs are also shown in Table F-2. The Measurement RSMs and the after-repair results are not analyzed in this report and are simply included in the appendices for completeness.

Table F-3 shows the results of the PSHED measurements that were performed on the participating vehicles. Again, the Combined PacketID in the first column provides linkage of the results to the Table F-1 information. Also, the table includes after-repair PSHED measurements for the vehicles that were sent for evaporative emissions repairs. The last column of the table gives the hot-soak value in grams per quarter-hour (g/Qhr) as measured in the PSHED. The model year, EI23 Bin, and PSHED from this table coupled with the targeting fractions by Evap Index Bin and with solicitation response rates provide the information used to characterize the distribution of PSHED values for the Ken Caryl fleet. These distributions will be determined in Section 5.2.

Table F-4 provides the results of the Modified California Method and IM gas cap integrity inspection results for the participants. As the table shows, the MCM examined a variety of locations on the vehicle’s fuel handling and evaporative emissions control system. However, in many cases some portions of these systems were not accessible for examination, for example, because of shrouds or other components manufactured into the vehicle. In these instances the table indicates NP for not performed. If the technician examining the vehicles recorded any comments about the MCM inspection, they are presented in the table. The table also includes the before-repair PSHED result for comparison with the MCM results.

Table F-1. Descriptions of Participating Vehicles

Combined Packet ID (unique to vehicle)	Year	Make	Model	Fuel Metering Type (C;F)	VECI Year	VECI Engine Family	VECI Evap Family	VIN Stem (digits 1 to 9 and 11)	Trans Type (M;A)	Fuel Gauge (1.00 0.75 0.50 0.25 0.00)	Odometer	Odometer Resolution (5; 6)
7	1998	Ford	Explorer	F	1998	WFMXT04.0HAA	WFMXE0120BAE	1FMZU34E1.Z…...	A	0.25	150752	6
9	1992	Saturn	SL	F	1992	N4G1.9V5JPH5	NAO-4B	1G8ZG549X.Z…...	M	0.75	183866	6
17	1993	Mercury	Grand Marquis	F	1993	PFM4.6V5FDF2	F3AE-9C485-JJT	2MELM75W8.X…...	A	0.00	123479	6
18	2003	VW	Passat	F	2003	3ADXV01.8342	3ADXR0140232	WVWPD63B1.P…...	A	0.75	90785	6
20	1990	Nissan	Pathfinder	F	1990	LNS3.0T5FCF2	FI6-3	JN8HD17Y0.W…...	.	0.00	131594	6
21	1991	Jeep	Wrangler	F	1991	MCR2.5T5FEL3	MT-2.5M-1P	2J4FY19P0.J…...	M	0.50	186399	6
25	2000	Audi	A6	F	2000	YADXV02.8334	YADXR0140233	WAUEH24B0.N…...	A	0.75	170206	6
27	1992	Jeep	Wrangler	F	1992	NCR2.5T5FEL4	NT-2.5J-1S or NT-2.5M-1P	2J4FY19P8.J…...	M	0.25	123991	6
28	1989	Dodge	Raider	F	1991	MMT3.0T5FB16	1	JB7FJ43S9.J…...	M	0.25	270017	6
34	1995	Ford	Ranger	F	1995	SFM2.318GFEA	2.3L-SFM1045AYPOA	1FTCR10A6.P…...	M	1.00	250342	6
39	1994	Jeep	Grand Cherokee	F	1994	RCR5.288GAEA	RCR1058AYPOA	1J4GZ58Y6.C…...	A	0.25	180985	6
42	1987	Dodge	Power Ram	C	1987	HCR5.2T2HEM8	HCRTX; HCRTY	1B7HW14TX.S…...	M	.	22091	5
44	1989	Chevrolet	Caprice	C	1989	KIG5.7V5NEA4	KB0-1P	1G1BN51E1.R…...	A	0.50	23960	5
45	1997	Ford	F150	F	1997	VFM5.458GFEK	VFM1160AYMFD	1FTEX18LX.K…...	A	1.00	81284	6
46	1990	Ford	Taurus	F	1990	LFM3.0V5FXG5	F0AE-9C485UKB 3.0L-9HM	1FACP52U3.A…...	A	0.25	61972	5
48	1994	Chevrolet	Camaro	F	1994	R1G3.4V8GAEA	R1G1058AYMOA	2G1FP22S4.2…...	M	0.25	127080	6
49	1994	Mazda	929	F	1994	RTK3.0VJGFEA	RTK1078BYM03	JM1HD4619.0…...	A	0.25	172864	6
53	1997	Pontiac	Grand Am	F	1997	VGM2.4VJGKEK	VGM1095AYMEA	1G2NE52T3.M…...	A	0.00	151915	6
57	1996	Ford	Explorer XLT	F	1996	TFM4.028GKFK	4.0L-TFM1120AYMED	1FMDU32X1.U…...	M	0.25	146781	6
62	2003	Toyota	Tundra	F	2003	3TYXTG4.7HBY	3TYXR0190A30	5TBBT4417.S…...	A	1.00	91529	6
64	1976	Oldsmobile	Omega	C	.	.	.	.	A	1.00	27334	5
68	2001	Jeep	Wrangler	F	2001	1CRXT04.0200	1CRXE0101GCS	1J4FA49S4.P…...	A	0.50	117117	6
69	2002	Land Rover	Freelander	F	2002	2LRXTO2.5001	2LRXR0124002	SALNY2221.A…...	A	0.75	51650	6
75.096	1986	Toyota	MR2	F	1986	GTY1.6V5FBB9	EV-E	JT2AW15C1.0…...	M	0.25	164392	6
77	1987	Saab	900 Turbo	F	1987	HSA2.0V5FTBX	None Listed	YS3AT35L6.2…...	M	0.75	167729	6
79	1988	Chevrolet	1500 Pickup	C	1988	J3G5.7T5TYA2	JFO-3C	1GCDK14K6.E…...	A	0.25	108501	6
82	1993	Cadillac	El Dorado	F	1993	P1G4.6V8X8B9	PCO-1A	1G6EL12Y3.U…...	A	0.75	113203	6
85	1996	Dodge	Ram 1500	F	1996	TCR36OH8G1EK	TCR1073AYPOB	1B7HF16Z0.S…...	A	0.75	215632	6
91	1977	Chevrolet	Blazer	C	.	.	.	.	A	0.75	48390	5
92	1997	Ford	F150	F	1997	VFM1160AYMFD	VFM5.458GFEK	1FTEX18L0.K…...	A	0.75	97618	6
93	2003	Dodge	Durango	F	2003	3CRXT04.75BO	3CRXE0101GDH	1D4HS48NX.F…...	A	0.75	136907	6
95	1998	Nissan	Quest	F	1998	WNSXT03.0A4A	WNSXE0057MAA	4N2ZN111X.D…...	A	0.50	203363	6
100	1984	Chevrolet	Suburban	C	1984	EGM05.7ABB8	.	1G8GK26M0.F…...	A	0.25	9014	5
103.122	1988	Toyota	Camry	F	1988	JTY2.0V5FBB8	EV-E	JT2SV22E6.3…...	A	0.50	192553	6
108	1995	Cadillac	SLS	F	1995	S1G4.6VJGFEA	S1G1089AYPOA	1G6KS52YO.U…...	A	0.50	117743	6
109	1995	Toyota	Avalon	F	1995	STY3.0VJGFEK	200201MZ-FE	4T1GB10EX.U…...	A	1.00	216382	6
110	2005	Toyota	Avalon	F	2005	5TYXV03.5PEA	5TYXR0130A11	4T1BK36BX.U…...	.	0.50	33990	6
112	1986	Ford	LTD	F	1986	GFM3.8V5HHF9	E6AE9C485AER	1FABP3930.G…...	A	0.25	22403	5

Table F-1. Descriptions of Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Fuel Metering Type (C;F)	VECI Year	VECI Engine Family	VECI Evap Family	VIN Stem (digits 1 to 9 and 11)	Trans Type (M;A)	Fuel Gauge (1.00 0.75 0.50 0.25 0.00)	Odometer	Odometer Resolution (5; 6)
120	1989	Chevrolet	Camaro	F	1991	M1G5.7VANTA8	MBO-1A	1G1FP2189.L…...	A	0.25	62617	5
121	1994	Isuzu	Amigo	F	1994	RSZ2.678GAFA	RSZ1046BYM00	JACCG07E2.9…...	M	1.00	151681	6
127	1993	Jeep	Cherokee	F	1993	PCR4.0T5FGA5	PTATR OR PTASS	1J4FJ28S7.L…...	A	0.50	119955	6
130	1995	Ford	Explorer	F	1995	SFM4.028GFEA	4.0L-SFM1120AYMOB	1FMDU34X4.Z…...	M	0.75	161106	6
131	1997	Subaru	Outback	F	1997	VFJ2.5VJGKEK	VFJ1030BYMA3	4S3BG6853.6…...	M	0.75	106677	6
134	2003	Chevrolet	Impala	F	2003	3GMXV03.8044	3GMXR0124919	2G1WH52K4.9…...	A	0.00	61112	5
135	2001	Chrysler	Sebring	F	2001	1DSXV03.0GNG	1DSXR0165A1F	4C3AG52H4.E…...	M	0.75	72977	6
138	2002	Suzuki	Vitara	F	2002	2SKXT1.59LC1	2SKXE0089S56	2S3TD52V4.6…...	M	1.00	89695	6
139	2002	Pontiac	Sunfire	F	.	sticker damaged	.	1G2JB1246.7…...	A	0.50	50442	6
156	1999	Ford	Explorer	F	1999	4.0L.XFMXE0120BAE	XFMXT04.02GF	1FMDU34E4.Z…...	A	0.50	141863	6
157	1982	Ford	F150 Explorer	C	1982	CFM5.0T2AAF4	2DP	1FTDF15F8.P…...	A	0.00	80147	5
158	2005	Chevrolet	Cobalt	F	2005	5GMXV02.2026	5GMXR0124919	1G1AK52F5.7…...	A	0.50	50434	6
159	1990	Mazda	MX-6	F	1990	LTK2.2V5FFG3	J	1YVGD31B8.5…...	M	0.00	190264	6
161	2001	Saturn	SC-1	F	2001	1GMXV01.9002	1GMXR0080902	1G8ZN1282.Z…...	M	0.50	94138	6
162.332	1995	Jeep	Wrangler	F	1995	SCR2.578GAEA	SCR1058AYMON and SCR1058AYPON	1J4FY19P8.P…...	M	0.75	110145	6
163	2002	Volvo	S60	F	2002	B15244T	2VVXR0133AAA	YV1RH58D0.2…...	A	1.00	58198	6
168	1994	Saturn	SL2	F	1994	R4G1.9VHGBEA	R4G1035AGPOC	1G8ZK5576.Z…...	A	0.00	126153	6
177	2004	Dodge	Ram 1500	F	2004	4CRXT05.75J0	4CRXR0218GDH	1D7HU18D6.S…...	M	1.00	51576	6
178	1969	VW	CP - Dunebuggy	C	.	.	.	.	M	.	71185	5
184	1998	VW	Jetta	F	.	.	.	3VWTD81H8.M…...	M	0.00	53494	6
185	2002	Toyota	Echo	F	2002	2TYXV01.5FFA	2TYXR0075AK1	JTDBT1239.5…...	A	0.50	68028	6
186	1995	Ford	F150	F	1995	SFM1045AYMOA	SFM5.888GBJA	1FTEX14HX.K…...	A	0.50	147811	6
188	2005	Lexus	GX-470	F	2005	5TYXT04.7PKX	5TYXR0190P30	JTJBT20X7.0…...	A	0.75	35753	.
189	1993	GMC	Safari	.	1993	P3G4.3T5TAA6	PFO-3A	1GDDM19Z2.B…...	A	0.75	212226	6
190	2001	Ford	Expedition	F	2001	1FMXT05.4RF8	1FMXE0155BBG	1FMPU18L5.L…...	A	0.50	164049	6
192	1991	Infiniti	Q45	F	1991	MNS4.5V5FAA9	F18-1	JNKNG01C7.M…...	A	0.50	202128	6
193	2003	Ford	Focus	F	2003	3FMXV02.0VH1	3FMXR0080BBE	1FAFP33P8.W…...	M	0.50	94337	.
194	1994	Geo	Prizm	F	1994	RNT1.6VHGAFA	RNT1047DYM00	1Y1SK5361.Z…...	M	1.00	162187	6
197	2000	Honda	Accord	F	2000	YHNXV03.0FA3	YHNXR0130AAA	1HGCG2253.A…...	A	0.00	115971	6
203.205	1991	Jeep	Wrangler	F	1991	MCR4.0T5FED1	MT-4.0M-1P	2J4FY29S7.J…...	M	0.25	108432	6
212	1977	Ford	Econoline	C	1977	.	.	.	A	0.25	9900	5
213	1979	Dodge	D-150	C	1979	9TD-360-2CP	9K-7	.	A	0.25	91164	5
214	2000	Chevrolet	S-10	F	2000	YGMXT04.3182	YGMXE0095904	1GCCT19W9.8…...	A	1.00	76888	.
217	1994	Ford	Ranger	F	1994	RFM4.077GAEA	RFM1045AYPOA	1FTCR10X7.P…...	M	1.00	70206	6
218	1990	VW	Cabriolet	F	1990	LVW1.8V5FWD7	LWC2	WVWCB5158.K…...	M	0.25	159869	6
219	1991	Lexus	LS400	F	1991	MTY4.0V5FBB5	EV-SE	JT8UF11E3.0…...	A	0.00	96587	6
220	1994	Toyota	Tacoma	F	1994	RTY3.087GAFA	RTY1047DYM00	JT4VN13D0.5…...	M	1.00	78987	6
221	1994	Ford	Bronco	F	1994	RFM5.888GBJA	RFM1045AYMOA	1FMEU15H2.L…...	A	0.50	163745	6
232	1992	Ford	Explorer	F	1992	NFM4.0T5FYH8	F2AE-9C485-HHA	1FMDU34X0.U…...	A	0.25	45600	5
238	1993	Jeep	Wrangler	F	1993	PCR4.0T5FGA5	PTAPR OR PTASS	1J4FY29S7.P…...	M	0.50	48277	6
246	2003	Chevrolet	Suburban	F	2003	3GMXT05.3175	3GMXE0133916	3GNFK16Z7.G…...	A	0.50	126891	6

Table F-1. Descriptions of Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Fuel Metering Type (C;F)	VECI Year	VECI Engine Family	VECI Evap Family	VIN Stem (digits 1 to 9 and 11)	Trans Type (M;A)	Fuel Gauge (1.00 0.75 0.50 0.25 0.00)	Odometer	Odometer Resolution (5; 6)
249	1997	BMW	328i	F	1997	VBM2.8VJGKEK	VBM1156AYPEO	WBABK832X.E…...	A	0.75	115006	6
252	2002	Toyota	Tacoma	F	2002	2TYXT03.4FFP	2TYXR0135AKO	5TEHN72N3.Z…...	A	0.50	100762	6
255	2004	Lexus	RX330	F	2004	4TYXT03.3PEM	4TYXR0165P21	JTJHA31U4.0…...	A	0.75	51333	6
261	1994	GMC	Suburban	F	1994	R3G5.785GAEB	R3G1085AYMOA	1GKFK16K5.J…...	A	0.50	163611	6
262	1984	Nissan	720	C	1984	ENS2.4T2AAFO	4CAB-3	JN6ND06Y1.W…...	M	0.25	116994	6
263	1997	Honda	Accord	F	1997	VHN2.2VJGKFK	VHN1090AYMEA	1HGCD7130.A…...	M	0.00	91510	6
266	2002	Chevrolet	Tahoe	F	2002	2GMXT05.3188	2GMXE0133915	1GNEK13Z7.J…...	A	1.00	145201	6
271	1997	GMC	Sierra	F	1997	VGM5.75PGFEK	VGM1098AYMBA	2GTEK19R6.1…...	A	0.25	132808	6
278	2002	Dodge	Dakota	F	2002	2CRXT04.72D1	2CRXE0101GCS	1B7GG42N6.S…...	A	0.50	153682	6
285	1998	Honda	CRV	F	1998	WHNXT02.0UF1	WHNXE0080AAB	JHLRD186X.C…...	A	0.50	166819	6
290	2005	Acura	TSX	F	2005	5HNXV02.4KBP	5HNXR0140BBA	JH4CL9684.C…...	A	0.50	70166	6
294	1985	Ford	F150	C	1985	FFM5.8T2HGG1	5FAE-9C4G5	1FTDF15F9.P…...	A	0.50	93586	5
295	1999	Mazda	626	F	1999	XTKXV02.0VBA	XTKXR0125BFA	1YVGF22C7.5…...	A	0.75	108547	6
301	1981	GMC	Sierra K1500	C	1981	18L4HANA	1D4D-8	1GTEK14H2.J…...	A	0.25	81898	5
302	1989	Dodge	Pickup	F	1989	KCR3.9T5HFM9	KCRTD	1B7GG26X5.S…...	M	0.50	184015	6
305	1997	Dodge	Ram 1500	F	1997	VCR5.968GFEK	VCR1073AYPBB	3B7HF13Z3.G…...	A	1.00	147531	6
306	1967	Chevrolet	Chevelle	C	.	.	.	.	A	0.50	44500	5
309	2001	Nissan	Sentra	F	2001	1NSXV01.8D1A	1NSXR0085RCA	3N1CB51D9.L…...	A	1.00	101164	6
311	2002	VW	Passat	F	2002	2ADXV02.8334	2ADXR0140233	WVWTH63B0.P…...	A	0.25	64049	.
316	2003	Hyundai	Accent	F	2003	3HYXV01.6BLS	3HYXR0105PEA	KMHCF35C0.U…...	M	0.50	104439	6
320	2004	Chevrolet	Cavalier	F	2004	4GMXV02.2025	4GMXR0124919	1G1JF52F2.7…...	A	0.50	62915	.
321	1997	Chevrolet	S-10	F	1997	VGM2.218G1EK	VGM1095AYMEA	1GCCS1440.K…...	.	0.25	130259	6
325	2000	Chevrolet	Prizm	F	2000	YNTXV01.8FFA	YNTXR0115AK1	1Y1SK5481.Z…...	M	0.50	122120	6
327	1981	BMW	320i	F	1981	.	.	WBAAG3304.8…...	M	0.00	342673	6
329	1969	Jeep	Commando	C	.	.	.	.	M	0.75	88099	5
331	1994	Chevrolet	Blazer	F	1994	R3G4.329GFEA	R3G1058AYMON	1GNDT13W8.2…...	A	0.00	195091	6
337	2001	Nissan	Xterra	F	2001	1NSXT03.3C5A	1NSXR0120RCA	5N1ED28Y7.C…...	M	0.00	100174	6
339	1994	Toyota	4Runner	F	1994	RTY3.087GAFA	RTY1047DYM00	JT3VN39W1.0…...	M	0.00	213353	6
343	1991	VW	Golf	F	1991	MVW1.8V5FWB6	VAP	3VWFA21G6.M…...	M	0.25	251793	6
348.432	1990	Dodge	Ram Charger	C	.	.	.	3B4GM07Y3.M…...	A	0.25	217996	6
350	2005	Subaru	Outback	F	2005	5FJXX02.5MJS	5FJXR01253CJ	4S4BP61C2.7…...	A	1.00	40203	6
352	2001	Chevrolet	Astro	F	2001	1GMXT04.3181	1GMXE0212924	1GNEL19W8.B…...	A	0.75	108973	6
354	1989	Jeep	Cherokee	F	1989	KAM242T5LND8	KT-242H-1S	1J4FJ58LX.L…...	A	1.00	171562	6
355	1993	Toyota	Corolla	F	1993	PTY1.8V5FFD9	EV-E	1NXAE09E8.Z…...	M	0.25	164799	6
357	1997	Nissan	Pathfinder	F	1997	VNS3.328G2EK	VNS1110AYMEA	JN8AR05Y5.W…...	A	1.00	166353	6
361	1995	VW	Golf	F	1995	SVW2.0V8GFEA	SVW1045BYPOV	3VWFC81H6.M…...	A	1.00	90050	.
362	2001	Audi	TT Quatro	F	2001	1ADXV01.8336	1ADXR0130242	TRUUT28N3.1…...	M	0.50	75014	.
364	1995	Buick	Roadmaster	F	1995	S1G5.7V8GAEA	S1G1058AYPOF	1G4BN52P9.R…...	A	1.00	58162	6
365	2002	Ford	Mustang	F	2002	2FMXV03.8VFB	2FMXR0105BAE	1FAFP4041.F…...	A	0.00	95551	6
367	1993	Chevrolet	Van 20 / G20	F	1993	P3G5.7T5TYA8	PF0-3C	1GBEG25K5.F…...	A	0.75	193004	6
370	2003	Land Rover	Discovery	F	2003	3LRXT04.6001	3LRXE0124001	SALTL1644.A…...	A	0.50	97938	.

Table F-1. Descriptions of Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Fuel Metering Type (C;F)	VECI Year	VECI Engine Family	VECI Evap Family	VIN Stem (digits 1 to 9 and 11)	Trans Type (M;A)	Fuel Gauge (1.00 0.75 0.50 0.25 0.00)	Odometer	Odometer Resolution (5; 6)
371	1996	Toyota	Corolla	F	1996	TTY1.8VJGFFK	TTY1047DYMAO	1NXBA02E3.Z…...	A	1.00	115405	6
375	2005	Ford	Focus	F	2005	5FMXV02.31D4	5FMXR0120GAK	3FAFP37N7.R…...	A	0.25	74792	6
379	1993	Subaru	Legacy	F	.	.	.	4S3BC6331.9…...	A	0.00	146307	6
381	1998	Jeep	Cherokee	F	1998	WCRXT0242220	WCRXE0101G2S	1J4GZ48S4.C…...	A	0.25	119882	6
383	1994	Chevrolet	S-10	C	1994	R3G4.375GAEA	R3G1108WYMOC	1GCCT14Z2.8…...	M	0.50	155277	6
385	2001	Dodge	Dakota	F	2001	1CRXT04.72D2	1CRXE0101GCH	1B7GG2AN6.S…...	A	0.75	114101	6
387	2000	Jeep	Grand Cherokee	F	.	.	.	1J4GW48N8.C…...	A	0.50	113318	6
391	1999	Isuzu	Rodeo	F	1999	XSZXT03.52EK	XSZXT0095ME0	4S2CM58W5.4…...	A	1.00	146398	6
392	1999	Honda	Accord	F	1999	XHNXV03.0FF1	XHNXR0130AAA	1HGCG1652.A…...	A	0.25	102999	6
393	2001	Toyota	Solara	F	.	.	.	2T1CF22P1.C…...	A	0.25	85136	.
395	1997	Chevrolet	S-10	F	1997	VGM4.31PGKEK	VGM1095AYMEA	1GCCS19X7.8…...	A	0.50	135474	6
396	2000	Mercury	Mystique	F	2000	YFMXV02.5VBC	YFMXR0115BBE	1MEFM66L0.K…...	A	1.00	107568	6
397	2005	Ford	Freestyle	F	2005	5FMXV03.02EC	5FMXR0185GBK	1FMZK0215.G…...	A	0.75	58994	6
401	1995	Lexus	SC 300	F	1995	STY3.0VJGAFA	STY1080DYM00	JT8JZ31C9.0…...	A	0.50	97225	6
402	2004	Hyundai	Elantra	F	2004	4HYXV02.0XW4	4HYXR0148PDX	KMHDN46D3.U…...	M	0.00	97587	6
404	1998	Isuzu	Rodeo	F	1998	WSZXT03.52EK	WSZXT0095ME0	4S2CM58W9.4…...	A	0.25	133367	6
405	1996	Chevrolet	Cavalier	F	1996	TGM2.2V8GKEK	TGM1089AYMEA	1G1JC5241.7…...	A	0.75	137833	6
416	1999	Mazda	Protege	F	1999	XTKXV01.6VBA	XTKXR0125BFB	JM1BJ2224.0…...	A	0.25	117953	6
420	1996	Jeep	Grand Cherokee	F	1996	TCR4.028GKEK	TCR1073AYPBP	1J4GZ58S5.C…...	A	0.75	162205	6
424	1970	VW	Beetle	C	1970	.	.	.	M	.	3141	5
425	1998	Mitsubishi	Eclipse	F	1998	.	.	4A3AK44Y7.E…...	M	0.25	108341	6
427	1984	Toyota	Land Cruiser	C	1984	ETY4.2T2AFF4	EV-F	JT3FJ60GX.0…...	M	0.00	167153	6
428	1975	Chevrolet	C-10	C	1975	350 cid; 2bbl	.	.	A	0.75	63242	5
430	2002	Jeep	Wrangler	.	2002	2CRXT04.02D2	2CRXE0101GCS	1J4FA39S5.P…...	M	0.25	56704	.
431	1993	Mitsubishi	3000 GT	F	1993	PMT3.0V5FF26	1F	JA3BM64J3.Y…...	M	0.25	115444	6
437	1991	Chevrolet	S-10	C	1991	M3G4.3T5XEB2	MBO-3E	1GCCT19Z2.2…...	A	0.50	205451	6
438	1975	Chevrolet	C-10	C	1975	GM113 350 cid	.	.	A	0.00	42455	5
439	1998	Pontiac	Grand Prix	F	1998	WGMXV03.1041	WGMXR0133918	1G2WJ52M7.F…...	A	0.75	151899	6
454	1988	BMW	M6	F	1988	JBM3.5V5FMS4	EV50	WBAEE1411.2…...	M	0.75	23065	6
460	2003	Dodge	Durango	F	2003	3CRXTO5.95B2	3CRXE0101GDH	1D8HS78Z3.F…...	A	0.50	83160	6
466	2003	Acura	RSX	F	2003	3HNXV02.0XKC	3HNXR0099AAA	JH4DC548X.C…...	A	0.50	29398	6
468	2004	Subaru	Outback	F	2004	4FJXV02.5NKR	4FJXR01254CE	4S3BH6750.6…...	M	0.00	71196	6
469	2000	Nissan	Pathfinder	F	2000	YNSXT03.325A	YNSXE0110MBA	JN8AR07Y2.W…...	A	0.50	101775	6
475	2000	Chevrolet	Astro	F	2000	YGMXT04.3183	YGMXE0111911	1GNEL19W1.B…...	A	0.00	131985	6
481	2003	Nissan	Frontier	F	2003	3NSXT03.3C6A	3NSXR0120MAA	1N6MD29Y1.C…...	A	0.00	57875	.
482	1992	Nissan	Stanza	F	1992	NNS2.4V5FAAX	F14-2	JN1FU21P9.T…...	A	1.00	127769	6
486	1993	Jeep	Cherokee	F	1993	PCR4.0T5FGA5	PTAPR	1J4GZ58S9.C…...	A	0.25	106403	6
489	1991	Ford	Bronco	F	1991	.	.	1FMEU15H2.L…...	M	0.50	49350	5
494	1995	Mazda	MX-6	F	1995	STK2.0VJ6FEA	STK1065BYP02	1YVGE31C1.5…...	M	0.50	204521	6
497	1994	Buick	Century	F	1994	R1G3.4V8GAEA	R1G1058AYM0A	1G4AG55M6.6…...	A	0.25	107759	6
498	1998	Honda	Accord	F	1998	WHNXV02.3PA3	WHNXR0130AAA	1HGCG5555.A…...	M	0.50	197136	6

Table F-1. Descriptions of Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Fuel Metering Type (C;F)	VECI Year	VECI Engine Family	VECI Evap Family	VIN Stem (digits 1 to 9 and 11)	Trans Type (M;A)	Fuel Gauge (1.00 0.75 0.50 0.25 0.00)	Odometer	Odometer Resolution (5; 6)
504	1992	Ford	F150	F	1992	NFM5.8T5HZC1	F2AE-9C485	1FTEX14N8.K…...	.	1.00	189852	6
507	2001	Toyota	Sequoia	F	2001	1TYXT04.7JBW	1TYXE0190AF0	5TDBT44A3.S…...	A	0.25	129155	6
512	2005	Hyundai	Santa Fe	F	2005	5HYXT03.5MM5	5HYXR0175PES	KM8SC73EX.U…...	.	0.25	93921	6
517	1999	Chevrolet	Lumina	F	1999	XGMXV03.4041	XGMXE0095904	2G1WL52M8.9…...	A	1.00	110145	6
521	1994	Nissan	Sentra	.	1994	RNS1.6VJGFEA	RNS1030BYM0A	JN1EB31P2.U…...	.	0.50	125478	6
527	1995	Eagle	Talon	F	1995	SDS2.0VJGFEA	SDS1062AYM0H	4E3AK44Y7.E…...	A	0.25	143162	6
540	1998	Honda	Accord	F	.	.	.	1HGCG5643.A…...	A	1.00	146347	6
542	1986	Subaru	GL10	F	1986	GFJ1.8V5HCNX	MU	JF2AN55B4.D…...	M	1.00	157417	6
546	1996	Geo	Prizm	F	1996	TNT1.8VJGFFK	TNT1047DYMAO	1Y1SK5264.Z…...	A	1.00	103065	6
547	1975	Ford	Ranger F250	C	1975	.	.	.	M	1.00	6780	5
550	1992	Ford	Taurus	F	1992	NFM3.8V5FJF9	.	1FALP5347.A…...	A	1.00	70615	5
559	1989	Oldsmobile	Regency	F	1989	K2G3.8V8XEBI	KBO-2D	1G3CW54C6.1…...	A	0.75	348697	6
563	1998	Ford	Taurus	F	1998	WFMXV03.0NAA	WFMXE0115BAE	1FAFP53S2.A…...	A	0.75	48551	6
568	1997	Saturn	SL1	F	1997	VGM1.9VJGKEK	VGM1035AYPAA	1G8ZK5275.Z…...	A	0.00	104441	6

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
7	1998	Ford	Explorer	Selection	IMStationDriveway	29JUN09:09:29:15	Before	11	7	77	63	55	1	20	10	0.16	34	14.94
7	1998	Ford	Explorer	Measurement	Caryl&470	29JUN09:10:47:22	Before	36	19	89	391	252	4	27	-202	0.05	121	15.01
7	1998	Ford	Explorer	Measurement	Caryl&470	29JUN09:10:53:34	Before	38	21	89	408	247	4	38	-247	0.03	212	15.02
7	1998	Ford	Explorer	Measurement	Caryl&470	29JUN09:10:59:55	Before	37	19	89	426	214	4	139	-108	0.03	191	15.02
7	1998	Ford	Explorer	Measurement	Kipling&470	29JUN09:11:13:18	Before	51	18	87	836	279	5	139	81	0.04	113	15.02
7	1998	Ford	Explorer	Measurement	Caryl&470	29JUN09:11:21:07	Before	38	19	90	490	354	5	129	-115	0.07	2	15.00
7	1998	Ford	Explorer	Measurement	Kipling&470	29JUN09:11:25:47	Before	52	-5	87	870	125	3	28	-184	0.15	165	14.94
7	1998	Ford	Explorer	Measurement	IMStationDriveway	29JUN09:11:42:38	Before	10	5	89	180	125	3	24	6	0.02	127	15.03
7	1998	Ford	Explorer	Measurement	IMStationDriveway	29JUN09:11:45:02	Before	10	6	89	183	80	2	2	9	0.01	297	15.04
9	1992	Saturn	SL	Selection	IMStationDriveway	29JUN09:09:52:47	Before	14	5	81	86	3828	7	.	18755	.	.	.
9	1992	Saturn	SL	Measurement	Kipling&470	29JUN09:13:22:42	Before	52	17	90	57	420	5	2877	2866	0.13	2001	14.80
9	1992	Saturn	SL	Measurement	Caryl&470	29JUN09:13:24:54	Before	38	18	90	887	637	5	3455	3098	0.19	462	14.79
9	1992	Saturn	SL	Measurement	Kipling&470	29JUN09:13:29:48	Before	51	20	90	78	313	4	.	4293	.	.	.
9	1992	Saturn	SL	Measurement	Caryl&470	29JUN09:13:31:05	Before	36	19	90	910	496	5	2533	2477	0.09	174	14.90
9	1992	Saturn	SL	Measurement	IMStationDriveway	29JUN09:13:43:42	Before	10	7	94	278	14595	2	9868	-7130	0.55	1051	14.32
9	1992	Saturn	SL	Measurement	IMStationDriveway	29JUN09:13:45:36	Before	10	4	94	280	1098	6	4832	5350	0.68	521	14.41
9	1992	Saturn	SL	Measurement	IMStationDriveway	07JUL09:09:18:33	After	11	8	76	35	312	5	.	-173	.	.	.
9	1992	Saturn	SL	Measurement	IMStationDriveway	07JUL09:09:20:45	After	12	12	76	37	242	4	445	40	0.38	326	14.76
17	1993	Mercury	Grand Marquis	Selection	IMStationDriveway	29JUN09:13:08:21	Before	12	6	93	242	1589	7	5501	1565	3.97	584	12.02
17	1993	Mercury	Grand Marquis	Measurement	Kipling&470	29JUN09:15:00:21	Before	54	16	91	271	224	4	475	188	0.65	284	14.56
17	1993	Mercury	Grand Marquis	Measurement	Caryl&470	29JUN09:15:03:12	Before	38	17	93	1190	272	4	638	520	0.06	603	14.97
17	1993	Mercury	Grand Marquis	Measurement	Caryl&470	29JUN09:15:13:21	Before	40	22	88	1216	295	4	1490	1007	0.05	919	14.94
17	1993	Mercury	Grand Marquis	Measurement	Kipling&470	29JUN09:15:19:17	Before	51	19	91	336	205	4	955	317	0.40	263	14.73
17	1993	Mercury	Grand Marquis	Measurement	Caryl&470	29JUN09:15:21:18	Before	38	18	89	1244	340	5	1568	1069	0.12	729	14.89
17	1993	Mercury	Grand Marquis	Measurement	IMStationDriveway	29JUN09:15:37:29	Before	10	3	96	361	5071	7	10304	3749	2.31	686	13.06
17	1993	Mercury	Grand Marquis	Measurement	IMStationDriveway	29JUN09:15:39:17	Before	9	7	96	363	2227	7	7710	5520	2.69	1106	12.85
17	1993	Mercury	Grand Marquis	Measurement	IMStationDriveway	06JUL09:09:36:41	After	11	5	78	66	56	1	949	760	3.41	526	12.56
17	1993	Mercury	Grand Marquis	Measurement	IMStationDriveway	06JUL09:09:38:00	After	14	14	78	69	45	1	1105	1023	2.08	1582	13.47
18	2003	VW	Passat	Selection	IMStationDriveway	29JUN09:15:01:43	Before	12	14	97	330	4958	7	10939	8943	1.00	34	14.01
18	2003	VW	Passat	Measurement	Caryl&470	29JUN09:16:55:27	Before	40	21	92	1534	368	5	344	170	-0.04	25	15.07
18	2003	VW	Passat	Measurement	Kipling&470	29JUN09:17:01:09	Before	50	7	89	625	174	4	.	112	.	.	.
18	2003	VW	Passat	Measurement	Caryl&470	29JUN09:17:03:29	Before	36	22	92	1554	298	5	314	110	-0.03	57	15.07
18	2003	VW	Passat	Measurement	Kipling&470	29JUN09:17:09:15	Before	51	10	89	669	242	4	.	-7	.	.	.

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
18	2003	VW	Passat	Measurement	IMStationDriveway	29JUN09:17:20:36	Before	10	5	95	434	84	2	37	31	0.04	31	15.02
18	2003	VW	Passat	Measurement	IMStationDriveway	29JUN09:17:22:58	Before	12	8	95	437	74	2	83	16	0.05	0	15.01
20	1990	Nissan	Pathfinder	Selection	IMStationDriveway	29JUN09:15:27:48	Before	10	8	97	353	97	3	26	-17	0.03	-27	15.03
20	1990	Nissan	Pathfinder	Measurement	Caryl&470	30JUN09:09:22:19	Before	34	7	86	380	193	4	.	-177	.	.	.
20	1990	Nissan	Pathfinder	Measurement	Caryl&470	30JUN09:09:51:02	Before	35	24	88	476	236	4	101	37	1.22	45	14.17
20	1990	Nissan	Pathfinder	Measurement	Caryl&470	30JUN09:10:09:59	Before	36	25	90	531	242	4	154	62	1.15	99	14.22
20	1990	Nissan	Pathfinder	Measurement	Caryl&470	30JUN09:10:18:33	Before	51	42	88	553	165	4	168	307	1.82	724	13.72
20	1990	Nissan	Pathfinder	Measurement	Caryl&470	30JUN09:10:24:46	Before	55	47	90	580	319	5	281	154	2.94	1420	12.89
20	1990	Nissan	Pathfinder	Measurement	IMStationDriveway	30JUN09:10:38:36	Before	14	-1	88	103	80	2	26	-28	0.08	86	14.99
20	1990	Nissan	Pathfinder	Measurement	IMStationDriveway	30JUN09:10:41:21	Before	13	0	88	107	64	2	39	-9	0.10	84	14.98
21	1991	Jeep	Wrangler	Selection	IMStationDriveway	30JUN09:08:11:07	Before	8	5	69	10	377	5	1435	431	-0.04	335	15.03
21	1991	Jeep	Wrangler	Measurement	Caryl&470	30JUN09:10:49:49	Before	34	16	86	661	322	5	149	8	0.21	930	14.86
21	1991	Jeep	Wrangler	Measurement	Caryl&470	30JUN09:10:56:07	Before	38	18	85	681	200	4	167	113	0.30	860	14.80
21	1991	Jeep	Wrangler	Measurement	Kipling&470	30JUN09:11:09:47	Before	53	25	92	211	167	4	311	254	2.42	1040	13.27
21	1991	Jeep	Wrangler	Measurement	Kipling&470	30JUN09:11:16:04	Before	53	29	92	234	179	4	424	259	1.58	1652	13.85
21	1991	Jeep	Wrangler	Measurement	IMStationDriveway	30JUN09:11:30:18	Before	10	5	92	144	110	3	545	240	0.11	271	14.95
21	1991	Jeep	Wrangler	Measurement	IMStationDriveway	30JUN09:11:32:09	Before	9	4	92	149	489	5	1875	990	0.06	1146	14.92
25	2000	Audi	A6	Selection	IMStationDriveway	30JUN09:11:46:34	Before	11	7	93	163	354	5	565	422	0.53	64	14.65
25	2000	Audi	A6	Measurement	Caryl&470	30JUN09:13:21:06	Before	39	20	93	1178	322	5	.	-99	.	.	.
25	2000	Audi	A6	Measurement	Caryl&470	30JUN09:13:27:19	Before	39	22	92	1193	325	5	347	265	0.00	16	15.05
25	2000	Audi	A6	Measurement	Caryl&470	30JUN09:13:33:31	Before	57	30	92	1211	338	5	490	483	0.28	50	14.84
25	2000	Audi	A6	Measurement	Caryl&470	30JUN09:13:39:51	Before	52	39	92	1237	299	5	233	188	2.91	13	12.96
25	2000	Audi	A6	Measurement	IMStationDriveway	30JUN09:13:54:41	Before	12	6	100	235	112	3	374	78	0.03	23	15.02
25	2000	Audi	A6	Measurement	IMStationDriveway	30JUN09:13:57:10	Before	12	9	99	236	92	2	449	295	0.06	11	15.00
27	1992	Jeep	Wrangler	Selection	IMStationDriveway	30JUN09:13:00:47	Before	10	11	96	213	1633	7	2273	-4867	0.48	1088	14.60
27	1992	Jeep	Wrangler	Measurement	Caryl&470	30JUN09:15:09:21	Before	39	12	93	1506	229	4	178	-21	0.13	1034	14.92
27	1992	Jeep	Wrangler	Measurement	Caryl&470	30JUN09:15:17:30	Before	38	19	92	1536	206	4	529	191	0.09	1265	14.93
27	1992	Jeep	Wrangler	Measurement	Kipling&470	30JUN09:15:23:25	Before	53	16	92	380	310	5	2369	1317	3.20	1886	12.62
27	1992	Jeep	Wrangler	Measurement	Kipling&470	30JUN09:15:31:05	Before	52	-4	92	420	222	4	.	2418	.	.	.
27	1992	Jeep	Wrangler	Measurement	IMStationDriveway	30JUN09:15:42:12	Before	10	7	99	312	770	7	4442	-4988	0.55	415	14.51
27	1992	Jeep	Wrangler	Measurement	IMStationDriveway	30JUN09:15:44:31	Before	14	11	99	315	561	6	1635	-1427	0.30	1327	14.74
27	1992	Jeep	Wrangler	Measurement	IMStationDriveway	06JUL09:10:16:17	After	12	8	83	94	57	1	608	527	0.96	2362	14.26
27	1992	Jeep	Wrangler	Measurement	IMStationDriveway	06JUL09:10:18:09	After	12	7	83	96	85	2	451	362	0.41	2335	14.66
28	1989	Dodge	Raider	Selection	IMStationDriveway	30JUN09:14:00:00	Before	11	7	99	238	668	6	1086	804	0.75	167	14.48
28	1989	Dodge	Raider	Measurement	Kipling&470	30JUN09:16:49:22	Before	49	-5	89	700	169	4	453	371	0.64	2659	14.48
28	1989	Dodge	Raider	Measurement	Caryl&470	30JUN09:16:51:25	Before	36	17	94	1783	453	5	474	659	0.28	1597	14.78

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
28	1989	Dodge	Raider	Measurement	Caryl&470	30JUN09:16:59:29	Before	37	20	95	1823	254	4	248	115	0.41	1201	14.71
28	1989	Dodge	Raider	Measurement	Kipling&470	30JUN09:17:05:45	Before	53	8	89	764	143	3	646	518	2.67	2076	13.05
28	1989	Dodge	Raider	Measurement	IMStationDriveway	30JUN09:17:17:48	Before	10	6	93	375	251	4	760	255	0.31	231	14.80
28	1989	Dodge	Raider	Measurement	IMStationDriveway	30JUN09:17:19:58	Before	9	3	93	376	272	5	609	-191	0.02	1094	14.98
28	1989	Dodge	Raider	Measurement	IMStationDriveway	02JUL09:10:31:17	After	12	10	81	78	128	3	56	-1	0.09	1248	14.94
28	1989	Dodge	Raider	Measurement	IMStationDriveway	02JUL09:10:34:08	After	10	11	81	80	113	3	232	171	0.72	501	14.51
34	1995	Ford	Ranger	Selection	IMStationDriveway	01JUL09:11:13:20	Before	12	11	90	112	363	5	1423	922	0.11	144	14.92
34	1995	Ford	Ranger	Measurement	Caryl&470	01JUL09:12:42:20	Before	33	11	97	989	215	4	1253	661	0.08	76	14.96
34	1995	Ford	Ranger	Measurement	Caryl&470	01JUL09:12:49:39	Before	34	7	97	1017	553	6	725	400	0.10	88	14.96
34	1995	Ford	Ranger	Measurement	Caryl&470	01JUL09:13:02:15	Before	51	35	92	1069	201	4	547	580	5.92	158	10.79
34	1995	Ford	Ranger	Measurement	Caryl&470	01JUL09:13:08:27	Before	51	35	92	1085	299	5	469	329	1.66	402	13.84
34	1995	Ford	Ranger	Measurement	IMStationDriveway	01JUL09:13:23:10	Before	13	13	100	169	200	4	551	461	0.59	43	14.61
34	1995	Ford	Ranger	Measurement	IMStationDriveway	01JUL09:13:24:42	Before	11	10	100	171	346	5	649	576	0.04	36	15.01
34	1995	Ford	Ranger	Measurement	IMStationDriveway	07JUL09:13:05:43	After	10	4	89	181	82	2	336	199	0.05	-1	15.01
34	1995	Ford	Ranger	Measurement	IMStationDriveway	07JUL09:13:07:04	After	10	5	89	183	92	3	194	108	0.04	26	15.02
39	1994	Jeep	Grand Cherokee	Selection	IMStationDriveway	01JUL09:16:01:08	Before	11	8	89	243	112	3	55	-3	0.08	435	14.98
39	1994	Jeep	Grand Cherokee	Measurement	Kipling&470	02JUL09:09:15:17	Before	51	7	76	536	168	4	.	143	.	.	.
39	1994	Jeep	Grand Cherokee	Measurement	Caryl&470	02JUL09:09:17:18	Before	39	20	77	407	320	5	55	-39	0.16	585	14.92
39	1994	Jeep	Grand Cherokee	Measurement	Caryl&470	02JUL09:09:23:29	Before	38	20	77	433	225	4	96	-48	0.17	761	14.90
39	1994	Jeep	Grand Cherokee	Measurement	Kipling&470	02JUL09:09:28:24	Before	51	33	78	566	242	4	164	149	5.87	389	10.83
39	1994	Jeep	Grand Cherokee	Measurement	IMStationDriveway	02JUL09:09:39:31	Before	11	8	78	50	75	2	96	67	0.23	771	14.86
39	1994	Jeep	Grand Cherokee	Measurement	IMStationDriveway	02JUL09:09:41:48	Before	10	8	78	54	74	2	123	81	0.13	384	14.94
42	1987	Dodge	Power Ram	Selection	IMStationDriveway	06JUL09:10:08:24	Before	13	11	82	91	177	4	793	734	7.92	347	9.34
42	1987	Dodge	Power Ram	Measurement	Caryl&470	06JUL09:12:02:55	Before	.	.	83	640	451	5	2625	1257	9.51	445	8.14
42	1987	Dodge	Power Ram	Measurement	Kipling&470	06JUL09:12:05:48	Before	.	.	86	1059	359	5	1042	1304	6.48	721	10.35
42	1987	Dodge	Power Ram	Measurement	Caryl&470	06JUL09:12:09:10	Before	39	23	83	660	115	3	905	817	10.26	267	7.66
42	1987	Dodge	Power Ram	Measurement	Kipling&470	06JUL09:12:11:58	Before	39	11	86	1072	485	5	532	349	4.28	732	11.94
42	1987	Dodge	Power Ram	Measurement	Caryl&470	06JUL09:12:19:17	Before	.	.	83	696	521	5	1607	1114	9.47	554	8.20
42	1987	Dodge	Power Ram	Measurement	IMStationDriveway	06JUL09:12:31:05	Before	13	8	92	203	325	5	996	939	10.86	186	7.23

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
42	1987	Dodge	Power Ram	Measurement	IMStationDriveway	06JUL09:12:35:37	Before	12	6	93	210	127	3	398	280	2.47	821	13.24
44	1989	Chevrolet	Caprice	Selection	IMStationDriveway	06JUL09:12:09:27	Before	13	8	90	183	925	6	4444	3464	0.12	2021	14.76
44	1989	Chevrolet	Caprice	Measurement	Caryl&470	06JUL09:15:33:11	Before	34	15	93	1303	161	3	1311	851	0.11	1992	14.86
44	1989	Chevrolet	Caprice	Measurement	Kipling&470	06JUL09:15:36:54	Before	52	14	89	431	149	3	.	439	.	.	.
44	1989	Chevrolet	Caprice	Measurement	Caryl&470	06JUL09:15:41:34	Before	34	16	90	1325	140	3	575	201	0.81	813	14.42
44	1989	Chevrolet	Caprice	Measurement	Kipling&470	06JUL09:15:44:52	Before	51	13	89	459	326	5	1024	689	1.24	1186	14.09
44	1989	Chevrolet	Caprice	Measurement	IMStationDriveway	06JUL09:15:52:49	Before	13	5	91	359	373	5	1540	1024	0.21	939	14.82
44	1989	Chevrolet	Caprice	Measurement	IMStationDriveway	06JUL09:15:54:22	Before	13	4	91	363	268	4	2057	636	0.15	1190	14.84
45	1997	Ford	F150	Selection	IMStationDriveway	06JUL09:12:14:31	Before	15	19	90	190	52	1	-25	75	-0.03	2812	14.98
45	1997	Ford	F150	Measurement	Kipling&470	06JUL09:14:09:03	Before	54	26	90	187	213	4	278	203	0.29	745	14.81
45	1997	Ford	F150	Measurement	Caryl&470	06JUL09:14:12:52	Before	40	22	83	1070	104	3	-1	28	0.04	126	15.02
45	1997	Ford	F150	Measurement	Kipling&470	06JUL09:14:15:37	Before	55	10	90	202	207	4	128	-18	0.10	493	14.96
45	1997	Ford	F150	Measurement	Caryl&470	06JUL09:14:19:06	Before	39	21	83	1087	87	2	16	-101	0.04	704	15.00
45	1997	Ford	F150	Measurement	IMStationDriveway	06JUL09:14:31:04	Before	11	6	95	307	46	1	10	-124	0.05	107	15.02
45	1997	Ford	F150	Measurement	IMStationDriveway	06JUL09:14:32:32	Before	11	6	91	310	101	3	39	132	0.15	365	14.93
46	1990	Ford	Taurus	Selection	IMStationDriveway	06JUL09:12:27:16	Before	9	6	92	200	58	2	16	44	0.16	20	14.94
46	1990	Ford	Taurus	Measurement	Caryl&470	06JUL09:16:09:17	Before	36	11	89	1418	72	2	11	6	0.07	56	15.00
46	1990	Ford	Taurus	Measurement	Kipling&470	06JUL09:16:12:51	Before	53	18	88	573	162	4	.	73	.	.	.
46	1990	Ford	Taurus	Measurement	Caryl&470	06JUL09:16:17:04	Before	38	14	89	1439	68	2	-8	-13	0.03	140	15.03
46	1990	Ford	Taurus	Measurement	Kipling&470	06JUL09:16:20:43	Before	53	7	88	590	170	4	.	91	.	.	.
46	1990	Ford	Taurus	Measurement	IMStationDriveway	06JUL09:16:26:59	Before	12	3	87	386	404	5	825	992	0.09	8	14.96
46	1990	Ford	Taurus	Measurement	IMStationDriveway	06JUL09:16:27:50	Before	12	3	87	388	320	5	636	520	0.06	-23	14.99
48	1994	Chevrolet	Camaro	Selection	IMStationDriveway	06JUL09:13:04:52	Before	10	5	97	238	1067	7	196	-133	0.07	9	15.00
48	1994	Chevrolet	Camaro	Measurement	Kipling&470	06JUL09:17:03:22	Before	41	13	87	756	185	4	78	12	0.47	1303	14.67
48	1994	Chevrolet	Camaro	Measurement	Caryl&470	06JUL09:17:15:02	Before	.	.	81	1627	81	2	89	-50	0.45	327	14.72
48	1994	Chevrolet	Camaro	Measurement	IMStationDriveway	06JUL09:17:23:03	Before	12	2	82	428	96	3	35	9	0.21	18	14.90
48	1994	Chevrolet	Camaro	Measurement	IMStationDriveway	06JUL09:17:23:58	Before	12	2	82	430	347	5	513	-360	1.20	39	14.18
48	1994	Chevrolet	Camaro	Measurement	IMStationDriveway	08JUL09:14:30:28	After	11	5	105	229	78	2	142	108	0.63	76	14.59
48	1994	Chevrolet	Camaro	Measurement	IMStationDriveway	08JUL09:14:32:30	After	12	9	105	232	114	3	222	205	2.33	68	13.37
49	1994	Mazda	929	Selection	IMStationDriveway	06JUL09:13:34:29	Before	12	5	100	259	1069	7	1188	725	0.37	1384	14.71
49	1994	Mazda	929	Measurement	Kipling&470	07JUL09:10:57:55	Before	53	19	86	878	131	3	564	572	0.45	2451	14.62
49	1994	Mazda	929	Measurement	Caryl&470	07JUL09:10:59:37	Before	37	11	89	758	330	5	773	575	0.60	1028	14.57
49	1994	Mazda	929	Measurement	Kipling&470	07JUL09:11:04:27	Before	55	20	86	890	241	4	.	187	.	.	.
49	1994	Mazda	929	Measurement	Caryl&470	07JUL09:11:07:04	Before	38	12	92	778	354	5	.	693	.	.	.
49	1994	Mazda	929	Measurement	Kipling&470	07JUL09:11:11:49	Before	55	24	87	911	225	4	426	349	3.90	1281	12.20
49	1994	Mazda	929	Measurement	Caryl&470	07JUL09:11:13:23	Before	37	17	92	801	334	5	1212	661	0.21	1157	14.83

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
49	1994	Mazda	929	Measurement	IMStationDriveway	07JUL09:11:21:34	Before	12	10	92	110	458	5	1059	650	0.61	1471	14.53
49	1994	Mazda	929	Measurement	IMStationDriveway	07JUL09:11:22:31	Before	13	11	92	112	1448	7	1656	793	0.64	2256	14.46
53	1997	Pontiac	Grand Am	Selection	IMStationDriveway	06JUL09:15:36:16	Before	14	20	93	350	438	5	1072	741	2.66	1166	13.07
53	1997	Pontiac	Grand Am	Measurement	Kipling&470	07JUL09:09:01:06	Before	55	31	80	576	180	4	383	304	4.31	1855	11.88
53	1997	Pontiac	Grand Am	Measurement	Caryl&470	07JUL09:09:03:16	Before	36	13	79	363	498	6	533	-552	0.55	127	14.64
53	1997	Pontiac	Grand Am	Measurement	Kipling&470	07JUL09:09:08:08	Before	56	8	81	600	157	4	480	311	1.66	1732	13.79
53	1997	Pontiac	Grand Am	Measurement	Caryl&470	07JUL09:09:10:49	Before	38	18	79	388	189	4	334	245	0.17	317	14.91
53	1997	Pontiac	Grand Am	Measurement	IMStationDriveway	07JUL09:09:19:14	Before	13	6	76	36	127	3	131	72	0.09	404	14.97
53	1997	Pontiac	Grand Am	Measurement	IMStationDriveway	07JUL09:09:21:08	Before	11	5	76	38	135	3	281	144	0.12	299	14.95
57	1996	Ford	Explorer XLT	Selection	IMStationDriveway	07JUL09:09:13:10	Before	12	11	76	33	68	2	-8	-14	0.04	188	15.02
57	1996	Ford	Explorer XLT	Measurement	Caryl&470	07JUL09:11:47:04	Before	36	22	90	918	311	5	165	-67	0.07	181	14.99
57	1996	Ford	Explorer XLT	Measurement	Kipling&470	07JUL09:11:51:50	Before	50	0	88	1029	112	3	.	-56	.	.	.
57	1996	Ford	Explorer XLT	Measurement	Caryl&470	07JUL09:11:54:33	Before	33	14	86	940	308	5	27	-205	0.00	29	15.05
57	1996	Ford	Explorer XLT	Measurement	Kipling&470	07JUL09:11:59:21	Before	53	27	88	1050	166	4	45	-100	0.72	71	14.54
57	1996	Ford	Explorer XLT	Measurement	IMStationDriveway	07JUL09:12:06:38	Before	14	5	91	143	69	2	8	15	0.00	-7	15.05
57	1996	Ford	Explorer XLT	Measurement	IMStationDriveway	07JUL09:12:07:49	Before	12	6	91	145	75	2	33	34	0.13	-6	14.96
62	2003	Toyota	Tundra	Selection	IMStationDriveway	07JUL09:16:02:53	Before	10	7	94	266	35	1	-37	-46	0.02	144	15.03
62	2003	Toyota	Tundra	Measurement	Caryl&470	07JUL09:16:59:07	Before	37	19	85	1830	153	4	67	-198	0.26	-8	14.86
62	2003	Toyota	Tundra	Measurement	Kipling&470	07JUL09:17:04:49	Before	56	24	88	812	120	3	67	-3	0.08	123	14.99
62	2003	Toyota	Tundra	Measurement	Caryl&470	07JUL09:17:07:11	Before	37	19	84	1861	343	5	181	-210	0.02	-47	15.03
62	2003	Toyota	Tundra	Measurement	Kipling&470	07JUL09:17:12:52	Before	55	25	88	850	181	4	68	45	0.22	86	14.89
62	2003	Toyota	Tundra	Measurement	IMStationDriveway	07JUL09:17:25:16	Before	12	7	87	302	54	1	-19	-5	0.12	590	14.95
62	2003	Toyota	Tundra	Measurement	IMStationDriveway	07JUL09:17:26:55	Before	11	7	87	305	64	2	4	-29	-0.01	464	15.04
64	1976	Oldsmobile	Omega	Selection	IMStationDriveway	08JUL09:11:02:59	Before	12	13	92	101	640	6	2145	-1320	5.98	40	10.70
64	1976	Oldsmobile	Omega	Measurement	Caryl&470	08JUL09:12:55:52	Before	39	18	93	942	328	5	698	706	8.58	77	8.88
64	1976	Oldsmobile	Omega	Measurement	Caryl&470	08JUL09:13:03:19	Before	38	16	93	958	242	4	1072	785	5.64	-22	10.98
64	1976	Oldsmobile	Omega	Measurement	Kipling&470	08JUL09:13:16:51	Before	52	27	91	33	233	4	938	971	11.55	60	6.75
64	1976	Oldsmobile	Omega	Measurement	Kipling&470	08JUL09:13:30:45	Before	52	12	92	75	196	4	1166	1167	7.93	155	9.33
64	1976	Oldsmobile	Omega	Measurement	IMStationDriveway	08JUL09:13:38:33	Before	12	8	104	192	3835	7	2608	1467	0.16	71	14.86
64	1976	Oldsmobile	Omega	Measurement	IMStationDriveway	08JUL09:13:39:37	Before	11	7	104	194	1209	7	3287	1249	0.15	456	14.83
68	2001	Jeep	Wrangler	Selection	IMStationDriveway	09JUL09:09:23:27	Before	12	11	76	65	115	3	89	55	0.16	-48	14.94
68	2001	Jeep	Wrangler	Measurement	Caryl&470	09JUL09:10:29:31	Before	35	19	74	620	288	5	289	-290	0.07	128	14.99
68	2001	Jeep	Wrangler	Measurement	Kipling&470	09JUL09:10:34:14	Before	56	24	78	841	183	4	203	94	0.42	161	14.74
68	2001	Jeep	Wrangler	Measurement	Caryl&470	09JUL09:10:35:50	Before	36	19	75	637	453	5	560	230	0.03	-37	15.02
68	2001	Jeep	Wrangler	Measurement	Kipling&470	09JUL09:10:40:25	Before	55	24	78	857	265	4	186	63	0.31	125	14.82
68	2001	Jeep	Wrangler	Measurement	IMStationDriveway	09JUL09:10:48:24	Before	10	9	78	105	94	3	106	128	0.10	-2	14.98

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)															
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
68	2001	Jeep	Wrangler	Measurement	IMStationDriveway	09JUL09:10:49:36	Before	11	10	78	108	91	3	45	-2	0.02	1	15.04
69	2002	Land Rover	Freelander	Selection	IMStationDriveway	08JUL09:15:30:02	Before	13	8	103	264	57	1	19	25	0.28	56	14.85
69	2002	Land Rover	Freelander	Measurement	Kipling&470	08JUL09:17:15:35	Before	52	17	90	780	252	4	205	103	1.76	867	13.75
69	2002	Land Rover	Freelander	Measurement	Caryl&470	08JUL09:17:17:13	Before	35	17	96	1728	251	4	249	97	0.02	4	15.03
69	2002	Land Rover	Freelander	Measurement	Kipling&470	08JUL09:17:22:49	Before	50	11	90	812	157	4	79	3	0.66	72	14.58
69	2002	Land Rover	Freelander	Measurement	Caryl&470	08JUL09:17:25:11	Before	35	15	96	1757	172	4	215	220	0.04	-10	15.02
75.096	1986	Toyota	MR2	Selection	IMStationDriveway	09JUL09:13:33:45	Before	9	9	94	189	181	4	811	728	1.32	1564	14.03
75.096	1986	Toyota	MR2	Measurement	Caryl&470	09JUL09:15:15:01	Before	36	27	84	1525	294	4	1345	1225	1.98	2298	13.51
75.096	1986	Toyota	MR2	Measurement	Kipling&470	09JUL09:15:20:47	Before	51	24	86	571	139	3	1263	1111	2.53	1639	13.14
75.096	1986	Toyota	MR2	Measurement	Caryl&470	09JUL09:15:23:03	Before	37	26	81	1540	337	5	1034	943	1.66	1812	13.77
75.096	1986	Toyota	MR2	Measurement	Kipling&470	09JUL09:15:36:41	Before	51	34	86	625	154	3	1024	755	2.40	1712	13.24
75.096	1986	Toyota	MR2	Measurement	IMStationDriveway	09JUL09:15:44:33	Before	12	9	95	242	195	4	1004	906	3.87	835	12.22
75.096	1986	Toyota	MR2	Measurement	IMStationDriveway	09JUL09:15:46:34	Before	12	11	95	244	222	4	1003	943	3.08	1178	12.77
77	1987	Saab	900 Turbo	Selection	IMStationDriveway	09JUL09:15:28:26	Before	10	9	97	233	10087	7	9399	7434	0.49	1097	14.38
77	1987	Saab	900 Turbo	Measurement	Caryl&470	09JUL09:17:03:10	Before	34	17	79	1875	271	4	329	200	0.36	825	14.76
77	1987	Saab	900 Turbo	Measurement	Kipling&470	09JUL09:17:08:48	Before	49	10	84	993	325	5	212	79	0.09	1497	14.93
77	1987	Saab	900 Turbo	Measurement	Caryl&470	09JUL09:17:11:20	Before	36	16	79	1912	304	5	282	221	0.54	858	14.63
77	1987	Saab	900 Turbo	Measurement	Kipling&470	09JUL09:17:32:49	Before	51	-27	85	1115	138	3	223	115	0.04	763	14.99
77	1987	Saab	900 Turbo	Measurement	IMStationDriveway	09JUL09:17:39:56	Before	12	10	85	275	369	5	1450	995	0.21	1396	14.81
77	1987	Saab	900 Turbo	Measurement	IMStationDriveway	09JUL09:17:41:05	Before	11	10	85	277	595	6	1339	1361	0.19	1159	14.83
77	1987	Saab	900 Turbo	Measurement	IMStationDriveway	15JUL09:12:59:18	After	11	8	87	117	96	3	158	117	0.47	1392	14.66
77	1987	Saab	900 Turbo	Measurement	IMStationDriveway	15JUL09:13:00:11	After	11	7	87	118	111	3	126	67	0.27	1332	14.81
79	1988	Chevrolet	1500 Pickup	Selection	IMStationDriveway	10JUL09:11:32:02	Before	11	7	91	121	298	5	635	-21	0.53	727	14.63
79	1988	Chevrolet	1500 Pickup	Measurement	Kipling&470	10JUL09:13:14:51	Before	55	6	92	888	230	4	489	188	2.23	881	13.41
79	1988	Chevrolet	1500 Pickup	Measurement	Kipling&470	10JUL09:13:28:18	Before	55	0	92	943	1765	7	1147	679	6.61	705	10.26
79	1988	Chevrolet	1500 Pickup	Measurement	Caryl&470	10JUL09:13:30:51	Before	39	20	89	1253	330	5	679	186	0.42	985	14.70
79	1988	Chevrolet	1500 Pickup	Measurement	Kipling&470	10JUL09:13:43:12	Before	53	27	93	978	168	4	396	330	7.80	280	9.44
79	1988	Chevrolet	1500 Pickup	Measurement	Caryl&470	10JUL09:13:44:34	Before	39	17	92	1302	425	5	986	-73	0.47	1136	14.65
79	1988	Chevrolet	1500 Pickup	Measurement	IMStationDriveway	10JUL09:13:54:50	Before	12	8	100	192	1519	7	3871	-1673	0.61	927	14.47
79	1988	Chevrolet	1500 Pickup	Measurement	IMStationDriveway	10JUL09:13:56:22	Before	11	7	100	196	2673	7	3636	-1624	0.25	995	14.73
79	1988	Chevrolet	1500 Pickup	Measurement	IMStationDriveway	16JUL09:09:15:11	After	14	7	80	12	1758	7	3087	4911	1.34	1389	13.95
79	1988	Chevrolet	1500 Pickup	Measurement	IMStationDriveway	16JUL09:09:17:19	After	17	21	80	14	120	3	194	150	0.52	2095	14.60
82	1993	Cadillac	El Dorado	Selection	IMStationDriveway	10JUL09:13:13:51	Before	17	28	97	175	55	1	276	263	4.89	56	11.54
82	1993	Cadillac	El Dorado	Measurement	Kipling&470	10JUL09:15:03:42	Before	56	23	93	1221	171	4	260	284	6.41	71	10.45
82	1993	Cadillac	El Dorado	Measurement	Caryl&470	10JUL09:15:04:58	Before	34	18	94	1563	287	5	271	178	0.08	262	14.98
82	1993	Cadillac	El Dorado	Measurement	Kipling&470	10JUL09:15:11:28	Before	55	18	93	1253	227	4	385	233	5.16	-38	11.34

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
82	1993	Cadillac	El Dorado	Measurement	Caryl&470	10JUL09:15:13:03	Before	35	19	93	1588	333	5	350	-12	-0.02	537	15.04
82	1993	Cadillac	El Dorado	Measurement	IMStationDriveway	10JUL09:15:23:05	Before	12	7	102	240	96	3	32	35	0.19	161	14.91
82	1993	Cadillac	El Dorado	Measurement	IMStationDriveway	10JUL09:15:24:38	Before	11	6	102	243	98	3	79	36	0.42	29	14.75
85	1996	Dodge	Ram 1500	Selection	IMStationDriveway	10JUL09:14:43:13	Before	11	9	102	220	1521	7	1070	513	0.86	132	14.40
85	1996	Dodge	Ram 1500	Measurement	Caryl&470	16JUL09:12:08:15	Before	32	12	87	978	345	5	613	83	0.20	15	14.89
85	1996	Dodge	Ram 1500	Measurement	Kipling&470	16JUL09:12:10:16	Before	55	17	89	1055	185	4	198	362	4.25	800	11.97
85	1996	Dodge	Ram 1500	Measurement	Kipling&470	16JUL09:12:17:57	Before	57	27	89	1078	298	5	206	52	0.68	441	14.54
85	1996	Dodge	Ram 1500	Measurement	Caryl&470	16JUL09:12:21:53	Before	34	16	86	1043	375	5	666	583	-0.05	224	15.06
85	1996	Dodge	Ram 1500	Measurement	IMStationDriveway	16JUL09:12:28:03	Before	12	6	94	120	265	4	366	145	0.04	49	15.01
85	1996	Dodge	Ram 1500	Measurement	IMStationDriveway	16JUL09:12:29:29	Before	10	5	94	122	404	5	413	-51	0.12	326	14.94
91	1977	Chevrolet	Blazer	Selection	IMStationDriveway	14JUL09:08:55:37	Before	16	16	73	34	408	5	857	844	12.25	183	6.24
91	1977	Chevrolet	Blazer	Measurement	Kipling&470	15JUL09:10:38:25	Before	53	21	74	525	158	3	458	387	12.72	175	5.92
91	1977	Chevrolet	Blazer	Measurement	Caryl&470	15JUL09:10:42:00	Before	39	12	68	686	183	4	457	452	3.18	1580	12.70
91	1977	Chevrolet	Blazer	Measurement	Kipling&470	15JUL09:10:44:21	Before	55	12	74	540	145	3	584	417	9.51	415	8.21
91	1977	Chevrolet	Blazer	Measurement	Caryl&470	15JUL09:10:49:23	Before	38	8	71	708	341	5	381	233	4.14	570	12.05
91	1977	Chevrolet	Blazer	Measurement	IMStationDriveway	15JUL09:10:54:55	Before	12	6	76	58	323	5	710	737	1.63	2422	13.78
91	1977	Chevrolet	Blazer	Measurement	IMStationDriveway	15JUL09:10:55:55	Before	12	6	76	60	901	6	1280	1206	2.13	2267	13.41
91	1977	Chevrolet	Blazer	Measurement	IMStationDriveway	24JUL09:09:45:55	After	13	7	85	50	122	3	230	197	3.20	1010	12.71
91	1977	Chevrolet	Blazer	Measurement	IMStationDriveway	24JUL09:09:50:51	After	14	8	85	54	138	3	290	290	3.62	1136	12.41
92	1997	Ford	F150	Selection	IMStationDriveway	14JUL09:09:28:56	Before	14	17	78	45	148	4	69	-546	0.02	137	15.03
92	1997	Ford	F150	Measurement	Kipling&470	14JUL09:10:44:57	Before	55	9	83	693	136	3	.	-136	.	.	.
92	1997	Ford	F150	Measurement	Caryl&470	14JUL09:10:46:50	Before	36	19	85	646	273	5	233	-272	0.08	1672	14.93
92	1997	Ford	F150	Measurement	Kipling&470	14JUL09:10:51:32	Before	56	23	83	707	112	3	57	-58	1.45	593	13.99
92	1997	Ford	F150	Measurement	Caryl&470	14JUL09:10:53:09	Before	37	18	85	671	286	5	510	-288	0.08	23	14.98
92	1997	Ford	F150	Measurement	IMStationDriveway	14JUL09:11:05:14	Before	11	3	85	86	73	2	31	-88	0.02	86	15.04
92	1997	Ford	F150	Measurement	IMStationDriveway	14JUL09:11:06:20	Before	10	3	85	89	96	3	22	-95	0.01	574	15.02
93	2003	Dodge	Durango	Selection	IMStationDriveway	14JUL09:10:35:29	Before	15	12	83	71	70	2	47	17	0.89	-6	14.41
93	2003	Dodge	Durango	Measurement	Kipling&470	14JUL09:13:00:55	Before	54	16	86	80	219	4	25	-67	1.48	42	13.99
93	2003	Dodge	Durango	Measurement	Caryl&470	14JUL09:13:01:51	Before	35	17	92	1070	432	5	102	-90	0.01	11	15.05
93	2003	Dodge	Durango	Measurement	Kipling&470	14JUL09:13:06:35	Before	55	19	86	93	179	4	74	35	0.08	90	14.99
93	2003	Dodge	Durango	Measurement	Caryl&470	14JUL09:13:08:12	Before	38	20	91	1096	373	5	170	-22	0.03	29	15.02
93	2003	Dodge	Durango	Measurement	IMStationDriveway	14JUL09:13:17:57	Before	12	8	95	155	87	2	9	5	0.01	-3	15.04
93	2003	Dodge	Durango	Measurement	IMStationDriveway	14JUL09:13:19:05	Before	11	6	95	158	79	2	2	-37	0.01	26	15.04
95	1998	Nissan	Quest	Selection	IMStationDriveway	14JUL09:12:05:02	Before	14	13	89	118	727	6	663	52	3.23	4	12.72
95	1998	Nissan	Quest	Measurement	Kipling&470	15JUL09:08:58:14	Before	55	32	70	272	154	3	356	384	9.50	84	8.23
95	1998	Nissan	Quest	Measurement	Caryl&470	15JUL09:09:01:58	Before	37	11	76	343	295	5	754	704	0.03	-80	15.01

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
95	1998	Nissan	Quest	Measurement	Kipling&470	15JUL09:09:04:02	Before	56	41	70	290	222	4	287	315	9.30	119	8.37
95	1998	Nissan	Quest	Measurement	Caryl&470	15JUL09:09:08:08	Before	37	11	77	365	192	4	495	435	-0.03	959	15.03
95	1998	Nissan	Quest	Measurement	IMStationDriveway	15JUL09:09:15:11	Before	13	10	72	32	76	2	226	60	0.00	2470	14.95
95	1998	Nissan	Quest	Measurement	IMStationDriveway	15JUL09:09:16:30	Before	13	8	72	35	199	4	157	58	0.06	1701	14.94
100	1984	Chevrolet	Suburban	Selection	IMStationDriveway	15JUL09:09:19:59	Before	11	12	72	36	1175	7	516	-49	4.74	826	11.61
100	1984	Chevrolet	Suburban	Measurement	Kipling&470	15JUL09:11:48:31	Before	48	4	78	690	212	4	581	531	7.77	71	9.46
100	1984	Chevrolet	Suburban	Measurement	Caryl&470	15JUL09:11:53:10	Before	34	11	77	941	353	5	820	694	1.52	521	13.92
100	1984	Chevrolet	Suburban	Measurement	Kipling&470	15JUL09:11:55:25	Before	49	11	78	710	210	4	810	652	4.77	427	11.60
100	1984	Chevrolet	Suburban	Measurement	Caryl&470	15JUL09:11:59:28	Before	34	12	79	962	645	6	875	384	2.10	645	13.50
100	1984	Chevrolet	Suburban	Measurement	IMStationDriveway	15JUL09:12:05:12	Before	12	8	86	85	1926	7	833	531	3.48	598	12.51
100	1984	Chevrolet	Suburban	Measurement	IMStationDriveway	15JUL09:12:06:02	Before	13	6	86	87	2432	7	1680	2035	4.57	578	11.70
100	1984	Chevrolet	Suburban	Measurement	IMStationDriveway	23JUL09:16:42:42	After	14	11	101	234	281	5	1024	18	3.54	465	12.47
100	1984	Chevrolet	Suburban	Measurement	IMStationDriveway	23JUL09:16:44:10	After	11	7	101	237	927	6	2032	-871	3.18	508	12.70
103.122	1988	Toyota	Camry	Selection	IMStationDriveway	16JUL09:09:04:19	Before	14	16	78	9	144	3	622	292	3.31	811	12.63
103.122	1988	Toyota	Camry	Measurement	Kipling&470	16JUL09:10:28:21	Before	53	5	83	800	133	3	.	514	.	.	.
103.122	1988	Toyota	Camry	Measurement	Caryl&470	16JUL09:10:31:55	Before	34	18	87	645	206	4	267	190	0.17	2593	14.83
103.122	1988	Toyota	Camry	Measurement	Kipling&470	16JUL09:10:35:11	Before	51	14	84	818	144	3	355	316	5.62	1261	10.97
103.122	1988	Toyota	Camry	Measurement	Caryl&470	16JUL09:10:39:27	Before	33	16	89	670	230	4	282	157	0.29	1367	14.79
103.122	1988	Toyota	Camry	Measurement	IMStationDriveway	16JUL09:10:46:39	Before	8	0	88	53	218	4	517	227	0.22	1432	14.83
103.122	1988	Toyota	Camry	Measurement	IMStationDriveway	16JUL09:10:47:40	Before	11	6	88	56	277	5	424	267	0.25	1815	14.80
103.122	1988	Toyota	Camry	Measurement	IMStationDriveway	17JUL09:13:23:25	After	14	14	94	189	160	4	371	307	0.22	1901	14.82
103.122	1988	Toyota	Camry	Measurement	IMStationDriveway	17JUL09:13:24:34	After	14	14	94	192	269	4	306	186	0.20	1844	14.84
108	1995	Cadillac	SLS	Selection	IMStationDriveway	16JUL09:11:18:48	Before	10	11	89	78	1375	7	1123	536	0.06	402	14.96
108	1995	Cadillac	SLS	Measurement	Caryl&470	16JUL09:13:46:50	Before	37	17	89	1355	265	4	3224	2885	0.04	657	14.90
108	1995	Cadillac	SLS	Measurement	Caryl&470	16JUL09:13:53:19	Before	37	22	89	1375	391	5	3276	3362	0.03	693	14.91
108	1995	Cadillac	SLS	Measurement	Kipling&470	16JUL09:13:55:29	Before	53	10	86	250	435	5	2982	2236	0.33	489	14.71
108	1995	Cadillac	SLS	Measurement	Kipling&470	16JUL09:14:01:27	Before	56	22	86	265	372	5	1791	2099	4.36	272	11.87
108	1995	Cadillac	SLS	Measurement	IMStationDriveway	16JUL09:14:08:23	Before	13	10	97	174	6713	7	3493	1942	0.09	87	14.88
108	1995	Cadillac	SLS	Measurement	IMStationDriveway	16JUL09:14:09:19	Before	12	11	97	177	2031	7	2753	1414	0.02	729	14.93
108	1995	Cadillac	SLS	Measurement	IMStationDriveway	23JUL09:16:04:32	After	14	11	104	216	62	2	59	62	0.17	321	14.92
108	1995	Cadillac	SLS	Measurement	IMStationDriveway	23JUL09:16:05:51	After	11	11	104	219	83	2	33	28	0.06	206	15.01
109	1995	Toyota	Avalon	Selection	IMStationDriveway	16JUL09:12:30:46	Before	14	19	94	123	328	5	163	-58	0.03	275	15.02
109	1995	Toyota	Avalon	Measurement	Kipling&470	20JUL09:14:49:31	Before	54	13	92	386	394	5	195	-43	0.14	14	14.95
109	1995	Toyota	Avalon	Measurement	Caryl&470	20JUL09:14:54:17	Before	36	16	90	1401	303	5	131	-70	0.02	419	15.02
109	1995	Toyota	Avalon	Measurement	Kipling&470	20JUL09:14:56:26	Before	51	20	92	401	296	5	169	-115	0.08	182	14.99
109	1995	Toyota	Avalon	Measurement	Caryl&470	20JUL09:15:00:36	Before	37	23	90	1424	280	5	222	29	0.02	81	15.03

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)															
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
109	1995	Toyota	Avalon	Measurement	IMStationDriveway	20JUL09:15:09:30	Before	15	11	103	229	147	3	153	-136	0.04	36	15.02
109	1995	Toyota	Avalon	Measurement	IMStationDriveway	20JUL09:15:11:06	Before	14	13	104	232	276	5	142	-40	0.03	43	15.03
109	1995	Toyota	Avalon	Measurement	IMStationDriveway	20JUL09:15:50:19	After	14	11	94	252	80	2	11	-1	0.03	49	15.03
109	1995	Toyota	Avalon	Measurement	IMStationDriveway	20JUL09:15:51:14	After	13	5	94	254	87	2	-1	-4	0.03	261	15.03
110	2005	Toyota	Avalon	Selection	IMStationDriveway	16JUL09:13:02:28	Before	14	22	96	136	114	3	17	36	0.03	7	15.03
110	2005	Toyota	Avalon	Measurement	Kipling&470	16JUL09:16:05:03	Before	54	19	86	656	218	4	.	176	.	.	.
110	2005	Toyota	Avalon	Measurement	Caryl&470	16JUL09:16:09:21	Before	38	12	89	1783	287	5	.	127	.	.	.
110	2005	Toyota	Avalon	Measurement	Kipling&470	16JUL09:16:12:27	Before	55	18	85	675	282	5	69	-35	0.28	-2	14.85
110	2005	Toyota	Avalon	Measurement	Caryl&470	16JUL09:16:17:31	Before	36	16	89	1808	243	4	287	194	0.04	51	15.01
110	2005	Toyota	Avalon	Measurement	IMStationDriveway	16JUL09:16:24:24	Before	11	8	99	243	86	2	6	-3	0.02	21	15.04
110	2005	Toyota	Avalon	Measurement	IMStationDriveway	16JUL09:16:25:21	Before	12	12	99	245	95	3	-3	-8	0.00	12	15.05
112	1986	Ford	LTD	Selection	IMStationDriveway	16JUL09:13:38:56	Before	10	8	98	156	1003	6	2328	750	0.04	1530	14.90
112	1986	Ford	LTD	Measurement	Caryl&470	16JUL09:15:23:26	Before	37	11	86	1655	564	6	1538	700	0.06	1409	14.91
112	1986	Ford	LTD	Measurement	Kipling&470	16JUL09:15:26:33	Before	54	9	85	516	371	5	752	313	0.72	1417	14.46
112	1986	Ford	LTD	Measurement	Caryl&470	16JUL09:15:31:22	Before	38	13	87	1667	444	5	1739	809	0.04	2132	14.90
112	1986	Ford	LTD	Measurement	Kipling&470	16JUL09:15:34:48	Before	53	18	86	538	336	5	1034	796	6.14	126	10.62
112	1986	Ford	LTD	Measurement	IMStationDriveway	16JUL09:15:41:41	Before	11	7	99	224	2091	7	4672	2155	0.00	1479	14.86
112	1986	Ford	LTD	Measurement	IMStationDriveway	16JUL09:15:42:30	Before	11	7	96	226	626	6	2932	-1101	0.19	1933	14.76
112	1986	Ford	LTD	Measurement	IMStationDriveway	07AUG09:12:05:17	After	14	13	93	143	119	3	424	300	6.86	119	10.12
112	1986	Ford	LTD	Measurement	IMStationDriveway	07AUG09:12:06:28	After	15	13	93	144	204	4	253	59	3.48	78	12.55
120	1989	Chevrolet	Camaro	Selection	IMStationDriveway	17JUL09:10:21:37	Before	17	28	80	76	161	4	389	305	3.12	1033	12.77
120	1989	Chevrolet	Camaro	Measurement	Kipling&470	17JUL09:11:33:15	Before	61	30	83	950	245	4	286	194	1.24	1221	14.11
120	1989	Chevrolet	Camaro	Measurement	Caryl&470	17JUL09:11:36:51	Before	42	18	87	796	241	4	338	303	0.74	705	14.49
120	1989	Chevrolet	Camaro	Measurement	Kipling&470	17JUL09:11:38:55	Before	62	36	83	970	186	4	142	115	0.34	2538	14.72
120	1989	Chevrolet	Camaro	Measurement	Caryl&470	17JUL09:11:44:21	Before	38	9	85	815	286	5	279	172	1.36	36	14.07
120	1989	Chevrolet	Camaro	Measurement	IMStationDriveway	17JUL09:11:50:44	Before	12	12	89	130	298	5	432	309	1.04	889	14.26
120	1989	Chevrolet	Camaro	Measurement	IMStationDriveway	17JUL09:11:53:01	Before	11	10	89	134	177	4	518	365	0.96	1027	14.31
121	1994	Isuzu	Amigo	Selection	IMStationDriveway	17JUL09:10:46:26	Before	13	8	82	85	604	5	6781	4390	0.23	1034	14.65
121	1994	Isuzu	Amigo	Measurement	Caryl&470	17JUL09:12:19:17	Before	38	15	89	946	340	5	377	83	0.33	824	14.78
121	1994	Isuzu	Amigo	Measurement	Kipling&470	17JUL09:12:21:33	Before	45	11	86	52	185	4	14	-219	0.03	2177	14.95
121	1994	Isuzu	Amigo	Measurement	Caryl&470	17JUL09:12:25:41	Before	38	13	90	971	366	5	243	131	0.11	1662	14.91
121	1994	Isuzu	Amigo	Measurement	Kipling&470	17JUL09:12:29:20	Before	44	20	85	75	284	5	308	-94	0.09	2602	14.89
121	1994	Isuzu	Amigo	Measurement	IMStationDriveway	17JUL09:12:37:12	Before	12	5	92	163	101	3	47	-94	0.15	625	14.92
121	1994	Isuzu	Amigo	Measurement	IMStationDriveway	17JUL09:12:38:04	Before	13	7	92	165	81	2	24	-5	0.13	852	14.93
127	1993	Jeep	Cherokee	Selection	IMStationDriveway	17JUL09:15:51:25	Before	10	19	100	272	456	6	1240	-1152	4.15	176	12.03
127	1993	Jeep	Cherokee	Measurement	Kipling&470	17JUL09:16:38:53	Before	54	18	88	855	279	5	.	264	.	.	.

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
127	1993	Jeep	Cherokee	Measurement	Caryl&470	17JUL09:16:43:30	Before	36	11	93	1779	615	6	235	-153	0.04	935	14.99
127	1993	Jeep	Cherokee	Measurement	Kipling&470	17JUL09:16:46:24	Before	55	29	88	885	381	5	380	209	0.08	484	14.97
127	1993	Jeep	Cherokee	Measurement	Caryl&470	17JUL09:16:51:19	Before	37	13	94	1820	232	4	1032	693	0.06	152	14.98
127	1993	Jeep	Cherokee	Measurement	IMStationDriveway	17JUL09:16:58:08	Before	11	8	96	297	852	6	3715	606	0.09	119	14.87
127	1993	Jeep	Cherokee	Measurement	IMStationDriveway	17JUL09:16:59:03	Before	11	9	96	299	310	5	3146	-507	0.02	205	14.94
127	1993	Jeep	Cherokee	Measurement	IMStationDriveway	24JUL09:08:59:42	After	14	7	79	31	63	2	177	1	0.25	211	14.86
127	1993	Jeep	Cherokee	Measurement	IMStationDriveway	24JUL09:09:00:45	After	13	6	79	34	90	2	101	64	0.76	104	14.50
130	1995	Ford	Explorer	Selection	IMStationDriveway	20JUL09:09:44:43	Before	11	11	88	40	57	1	30	38	0.49	118	14.70
130	1995	Ford	Explorer	Measurement	Kipling&470	20JUL09:10:52:09	Before	49	21	86	744	137	3	23	-27	0.40	158	14.76
130	1995	Ford	Explorer	Measurement	Caryl&470	20JUL09:10:57:59	Before	35	7	85	679	197	4	132	45	-0.04	-44	15.08
130	1995	Ford	Explorer	Measurement	Kipling&470	20JUL09:11:00:11	Before	50	26	86	762	176	4	120	135	0.09	2633	14.89
130	1995	Ford	Explorer	Measurement	Caryl&470	20JUL09:11:04:16	Before	35	16	85	699	375	5	207	-59	0.01	265	15.03
130	1995	Ford	Explorer	Measurement	IMStationDriveway	20JUL09:11:11:22	Before	17	15	94	83	38	1	10	34	1.31	47	14.11
130	1995	Ford	Explorer	Measurement	IMStationDriveway	20JUL09:11:14:16	Before	12	7	94	86	45	1	-27	-40	0.06	258	15.01
131	1997	Subaru	Outback	Selection	IMStationDriveway	20JUL09:10:12:22	Before	11	5	90	49	49	1	-5	-8	0.08	36	14.99
131	1997	Subaru	Outback	Measurement	Kipling&470	20JUL09:12:01:01	Before	49	13	89	923	162	3	.	683	.	.	.
131	1997	Subaru	Outback	Measurement	Kipling&470	20JUL09:12:08:51	Before	49	12	89	947	157	4	.	135	.	.	.
131	1997	Subaru	Outback	Measurement	Caryl&470	20JUL09:12:13:04	Before	38	14	84	940	188	4	448	189	0.54	810	14.63
131	1997	Subaru	Outback	Measurement	Caryl&470	20JUL09:12:20:31	Before	38	23	85	965	162	4	206	-162	-0.09	1153	15.07
131	1997	Subaru	Outback	Measurement	IMStationDriveway	20JUL09:12:27:05	Before	15	18	97	122	49	1	2	-11	0.12	263	14.96
131	1997	Subaru	Outback	Measurement	IMStationDriveway	20JUL09:12:28:42	Before	14	13	97	124	68	2	6	9	0.10	41	14.98
134	2003	Chevrolet	Impala	Selection	IMStationDriveway	20JUL09:11:04:40	Before	13	18	93	82	42	1	-25	-49	0.05	55	15.01
134	2003	Chevrolet	Impala	Measurement	Kipling&470	20JUL09:13:31:16	Before	51	13	93	202	128	3	.	-171	.	.	.
134	2003	Chevrolet	Impala	Measurement	Caryl&470	20JUL09:13:35:28	Before	38	19	86	1168	260	4	203	-54	0.00	20	15.05
134	2003	Chevrolet	Impala	Measurement	Caryl&470	20JUL09:13:41:49	Before	39	22	86	1185	226	4	253	128	0.02	28	15.03
134	2003	Chevrolet	Impala	Measurement	Kipling&470	20JUL09:13:43:53	Before	54	7	93	229	174	4	.	9	.	.	.
134	2003	Chevrolet	Impala	Measurement	IMStationDriveway	20JUL09:13:51:17	Before	15	12	94	170	64	2	-14	-28	0.05	-5	15.02
134	2003	Chevrolet	Impala	Measurement	IMStationDriveway	20JUL09:13:52:26	Before	15	13	94	172	75	2	-9	-3	0.04	21	15.02
135	2001	Chrysler	Sebring	Selection	IMStationDriveway	20JUL09:12:08:49	Before	9	12	97	115	105	3	0	-2	0.05	250	15.01
135	2001	Chrysler	Sebring	Measurement	Kipling&470	21JUL09:09:59:57	Before	51	18	78	634	162	4	.	-82	.	.	.
135	2001	Chrysler	Sebring	Measurement	Kipling&470	21JUL09:10:07:33	Before	53	0	79	658	197	4	.	-146	.	.	.
135	2001	Chrysler	Sebring	Measurement	Caryl&470	21JUL09:10:13:09	Before	39	31	73	548	251	4	85	-36	0.03	49	15.03
135	2001	Chrysler	Sebring	Measurement	Caryl&470	21JUL09:10:20:44	Before	39	28	72	574	326	5	185	-99	0.03	188	15.02
135	2001	Chrysler	Sebring	Measurement	IMStationDriveway	21JUL09:10:28:18	Before	14	12	77	74	52	1	17	11	0.02	-5	15.04
135	2001	Chrysler	Sebring	Measurement	IMStationDriveway	21JUL09:10:29:32	Before	11	7	77	76	82	2	0	-2	0.11	11	14.97
138	2002	Suzuki	Vitara	Selection	IMStationDriveway	20JUL09:14:24:54	Before	15	9	99	194	66	2	12	23	0.04	-41	15.03

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
138	2002	Suzuki	Vitara	Measurement	Kipling&470	21JUL09:08:50:48	Before	50	16	74	463	175	4	.	91	.	.	.
138	2002	Suzuki	Vitara	Measurement	Caryl&470	21JUL09:08:55:35	Before	37	22	74	294	164	4	230	170	0.05	53	15.01
138	2002	Suzuki	Vitara	Measurement	Kipling&470	21JUL09:08:57:49	Before	52	22	75	480	128	3	208	145	0.28	-36	14.85
138	2002	Suzuki	Vitara	Measurement	Caryl&470	21JUL09:09:01:57	Before	34	13	74	316	255	4	-22	-238	-0.04	51	15.08
138	2002	Suzuki	Vitara	Measurement	IMStationDriveway	21JUL09:09:11:06	Before	14	11	73	41	70	2	-8	-8	0.01	48	15.05
138	2002	Suzuki	Vitara	Measurement	IMStationDriveway	21JUL09:09:14:44	Before	13	11	73	45	45	1	30	27	0.10	-10	14.98
139	2002	Pontiac	Sunfire	Selection	IMStationDriveway	20JUL09:14:25:01	Before	15	18	99	195	56	1	-35	11	2.32	26	13.39
139	2002	Pontiac	Sunfire	Measurement	Caryl&470	20JUL09:16:43:19	Before	39	21	86	1755	223	4	34	-143	0.05	79	15.02
139	2002	Pontiac	Sunfire	Measurement	Kipling&470	20JUL09:16:46:29	Before	51	7	90	782	142	3	-44	-75	0.09	195	14.98
139	2002	Pontiac	Sunfire	Measurement	Kipling&470	20JUL09:16:54:24	Before	52	14	90	812	138	3	.	-79	.	.	.
139	2002	Pontiac	Sunfire	Measurement	Caryl&470	20JUL09:16:59:21	Before	39	19	85	1813	239	4	147	-126	-0.02	6	15.07
139	2002	Pontiac	Sunfire	Measurement	IMStationDriveway	20JUL09:17:07:14	Before	14	11	90	287	66	2	-50	-9	0.00	16	15.05
139	2002	Pontiac	Sunfire	Measurement	IMStationDriveway	20JUL09:17:08:12	Before	13	11	90	289	56	1	-7	-6	0.05	-2	15.02
156	1999	Ford	Explorer	Selection	IMStationDriveway	22JUL09:10:08:52	Before	15	16	82	37	54	1	7	-9	0.09	-15	14.99
156	1999	Ford	Explorer	Measurement	Kipling&470	22JUL09:11:11:57	Before	52	13	84	777	214	4	159	-38	0.19	39	14.91
156	1999	Ford	Explorer	Measurement	Caryl&470	22JUL09:11:15:34	Before	36	17	80	793	360	5	231	52	0.05	205	15.00
156	1999	Ford	Explorer	Measurement	Kipling&470	22JUL09:11:18:07	Before	54	19	84	793	299	5	152	47	0.37	163	14.78
156	1999	Ford	Explorer	Measurement	Caryl&470	22JUL09:11:23:04	Before	37	20	80	822	587	6	155	-19	-0.01	157	15.05
156	1999	Ford	Explorer	Measurement	IMStationDriveway	22JUL09:11:30:41	Before	13	11	90	89	91	3	29	-2	0.04	59	15.02
156	1999	Ford	Explorer	Measurement	IMStationDriveway	22JUL09:11:32:29	Before	13	12	90	93	136	3	38	-29	0.03	69	15.03
157	1982	Ford	F150 Explorer	Selection	IMStationDriveway	22JUL09:10:45:54	Before	14	17	84	54	515	6	558	190	2.92	1117	12.91
157	1982	Ford	F150 Explorer	Measurement	Kipling&470	22JUL09:13:45:42	Before	53	-1	87	247	250	4	795	203	5.35	596	11.17
157	1982	Ford	F150 Explorer	Measurement	Caryl&470	22JUL09:13:50:29	Before	40	20	85	1305	358	5	252	9	1.08	2253	14.19
157	1982	Ford	F150 Explorer	Measurement	Kipling&470	22JUL09:13:52:35	Before	53	22	87	262	247	4	246	327	3.32	992	12.63
157	1982	Ford	F150 Explorer	Measurement	Kipling&470	22JUL09:14:01:23	Before	54	22	87	291	238	4	674	381	3.59	1404	12.41
157	1982	Ford	F150 Explorer	Measurement	Caryl&470	22JUL09:14:05:27	Before	41	17	88	1346	276	5	462	259	2.68	1280	13.07
157	1982	Ford	F150 Explorer	Measurement	IMStationDriveway	22JUL09:14:11:46	Before	13	14	99	156	366	5	779	264	0.19	1883	14.82
157	1982	Ford	F150 Explorer	Measurement	IMStationDriveway	22JUL09:14:13:13	Before	14	13	99	159	169	4	479	248	0.57	1531	14.58
157	1982	Ford	F150 Explorer	Measurement	IMStationDriveway	22JUL09:15:24:39	After	13	12	102	194	123	3	537	374	3.84	435	12.27
157	1982	Ford	F150 Explorer	Measurement	IMStationDriveway	22JUL09:15:26:16	After	14	9	102	200	128	3	692	535	6.60	164	10.29
158	2005	Chevrolet	Cobalt	Selection	IMStationDriveway	22JUL09:10:10:36	Before	8	13	82	40	95	3	9	22	0.00	100	15.05
158	2005	Chevrolet	Cobalt	Measurement	Caryl&470	22JUL09:12:29:20	Before	38	23	83	1036	364	5	33	-73	0.02	22	15.04
158	2005	Chevrolet	Cobalt	Measurement	Kipling&470	22JUL09:12:34:01	Before	54	14	85	30	254	4	120	-53	0.14	149	14.94
158	2005	Chevrolet	Cobalt	Measurement	Caryl&470	22JUL09:12:38:04	Before	39	21	84	1064	311	5	35	-90	0.04	1	15.03
158	2005	Chevrolet	Cobalt	Measurement	Kipling&470	22JUL09:12:40:54	Before	53	12	85	44	249	4	.	-491	.	.	.
158	2005	Chevrolet	Cobalt	Measurement	IMStationDriveway	22JUL09:12:48:39	Before	14	12	95	116	56	1	5	9	0.01	13	15.04

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
158	2005	Chevrolet	Cobalt	Measurement	IMStationDriveway	22JUL09:12:49:42	Before	14	12	95	118	57	2	1	7	0.01	5	15.05
159	1990	Mazda	MX-6	Selection	IMStationDriveway	22JUL09:16:12:14	Before	11	15	94	212	1195	6	3836	5781	1.44	171	13.90
159	1990	Mazda	MX-6	Measurement	Caryl&470	23JUL09:09:11:46	Before	38	18	82	393	152	3	222	167	0.05	96	15.01
159	1990	Mazda	MX-6	Measurement	Kipling&470	23JUL09:09:16:13	Before	54	12	81	252	125	3	199	182	0.23	377	14.87
159	1990	Mazda	MX-6	Measurement	Caryl&470	23JUL09:09:20:30	Before	37	24	83	421	175	4	502	385	0.11	138	14.96
159	1990	Mazda	MX-6	Measurement	Kipling&470	23JUL09:09:24:02	Before	51	14	81	272	157	4	235	162	0.56	1257	14.60
159	1990	Mazda	MX-6	Measurement	IMStationDriveway	23JUL09:09:31:45	Before	13	9	79	39	267	4	419	273	0.24	115	14.87
159	1990	Mazda	MX-6	Measurement	IMStationDriveway	23JUL09:09:32:46	Before	13	11	79	41	501	5	702	622	0.14	130	14.92
161	2001	Saturn	SC-1	Selection	IMStationDriveway	22JUL09:16:28:37	Before	9	11	92	219	56	1	4	-159	0.01	505	15.03
161	2001	Saturn	SC-1	Measurement	Caryl&470	23JUL09:10:37:44	Before	38	19	91	666	320	5	313	78	0.00	584	15.02
161	2001	Saturn	SC-1	Measurement	Kipling&470	23JUL09:10:40:16	Before	49	19	86	466	182	4	.	-66	.	.	.
161	2001	Saturn	SC-1	Measurement	Caryl&470	23JUL09:10:44:19	Before	37	17	93	684	256	5	549	-377	0.00	954	15.00
161	2001	Saturn	SC-1	Measurement	Kipling&470	23JUL09:10:46:26	Before	50	22	86	480	189	4	174	117	0.16	364	14.92
161	2001	Saturn	SC-1	Measurement	IMStationDriveway	23JUL09:10:54:07	Before	13	10	88	69	90	2	132	111	0.26	1577	14.81
161	2001	Saturn	SC-1	Measurement	IMStationDriveway	23JUL09:10:55:27	Before	13	9	88	70	63	2	55	111	0.04	609	15.00
162.332	1995	Jeep	Wrangler	Selection	IMStationDriveway	11AUG09:11:36:03	Before	14	15	90	87	95	3	.	-123	.	.	.
162.332	1995	Jeep	Wrangler	Measurement	Kipling&470	11AUG09:13:59:39	Before	51	15	90	215	222	4	222	61	1.26	101	14.14
162.332	1995	Jeep	Wrangler	Measurement	Caryl&470	11AUG09:14:03:13	Before	35	21	89	1098	73	2	1	-4	0.05	304	15.01
162.332	1995	Jeep	Wrangler	Measurement	Kipling&470	11AUG09:14:06:50	Before	51	35	90	243	159	4	121	51	2.88	201	12.98
162.332	1995	Jeep	Wrangler	Measurement	Caryl&470	11AUG09:14:09:22	Before	37	24	89	1114	84	2	-37	-92	0.08	657	14.98
162.332	1995	Jeep	Wrangler	Measurement	IMStationDriveway	11AUG09:14:18:09	Before	13	13	103	160	82	2	49	21	0.22	510	14.88
162.332	1995	Jeep	Wrangler	Measurement	IMStationDriveway	11AUG09:14:19:25	Before	14	12	103	162	77	2	220	104	0.74	243	14.51
163	2002	Volvo	S60	Selection	IMStationDriveway	23JUL09:12:15:48	Before	13	20	97	113	59	2	74	5	0.04	37	15.02
163	2002	Volvo	S60	Measurement	Kipling&470	23JUL09:13:15:38	Before	55	15	93	93	272	5	.	-1125	.	.	.
163	2002	Volvo	S60	Measurement	Kipling&470	23JUL09:13:22:36	Before	54	17	93	112	439	5	391	116	0.25	-13	14.87
163	2002	Volvo	S60	Measurement	Caryl&470	23JUL09:13:26:45	Before	38	19	94	1202	362	5	88	-24	0.01	15	15.04
163	2002	Volvo	S60	Measurement	Kipling&470	23JUL09:13:29:06	Before	56	20	93	131	236	4	144	-94	0.07	-18	15.00
163	2002	Volvo	S60	Measurement	Caryl&470	23JUL09:13:33:03	Before	37	19	94	1219	513	6	281	117	0.01	63	15.04
163	2002	Volvo	S60	Measurement	IMStationDriveway	23JUL09:13:40:24	Before	14	7	106	153	53	1	42	9	0.12	1	14.96
163	2002	Volvo	S60	Measurement	IMStationDriveway	23JUL09:13:42:07	Before	15	11	106	156	44	1	14	23	0.07	-12	15.01
168	1994	Saturn	SL2	Selection	IMStationDriveway	23JUL09:13:30:20	Before	12	15	105	143	4061	7	14893	-736	0.41	486	14.30
168	1994	Saturn	SL2	Measurement	Kipling&470	23JUL09:14:36:51	Before	52	16	94	304	140	3	.	78	.	.	.
168	1994	Saturn	SL2	Measurement	Caryl&470	23JUL09:14:41:45	Before	37	15	92	1432	168	4	.	406	.	.	.
168	1994	Saturn	SL2	Measurement	Caryl&470	23JUL09:14:50:28	Before	36	18	93	1455	310	5	198	82	0.04	155	15.01
168	1994	Saturn	SL2	Measurement	Kipling&470	23JUL09:14:52:33	Before	53	16	94	358	210	4	.	-93	.	.	.
168	1994	Saturn	SL2	Measurement	IMStationDriveway	23JUL09:14:59:55	Before	13	10	107	189	1754	7	2613	-76	0.19	45	14.84

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)															
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
168	1994	Saturn	SL2	Measurement	IMStationDriveway	23JUL09:15:01:09	Before	12	8	107	191	799	6	1799	144	0.97	118	14.30
177	2004	Dodge	Ram 1500	Selection	IMStationDriveway	24JUL09:13:00:15	Before	18	24	98	126	102	3	59	-47	0.42	36	14.75
177	2004	Dodge	Ram 1500	Measurement	Kipling&470	24JUL09:16:04:32	Before	50	14	95	716	202	4	92	-63	0.03	-7	15.03
177	2004	Dodge	Ram 1500	Measurement	Caryl&470	24JUL09:16:08:50	Before	36	14	105	1542	130	3	20	-59	0.02	-42	15.04
177	2004	Dodge	Ram 1500	Measurement	Kipling&470	24JUL09:16:12:39	Before	53	16	95	746	209	4	106	81	0.01	45	15.04
177	2004	Dodge	Ram 1500	Measurement	Caryl&470	24JUL09:16:16:41	Before	37	16	108	1568	73	2	143	136	0.01	30	15.04
177	2004	Dodge	Ram 1500	Measurement	IMStationDriveway	24JUL09:16:24:43	Before	14	5	102	214	93	3	18	-24	0.21	-4	14.91
177	2004	Dodge	Ram 1500	Measurement	IMStationDriveway	24JUL09:16:25:52	Before	15	11	102	216	60	2	59	21	0.32	10	14.82
178	1969	VW	CP - Dunebuggy	Selection	IMStationDriveway	24JUL09:11:21:43	Before	14	17	93	77	429	5	1168	234	7.46	1562	9.62
178	1969	VW	CP - Dunebuggy	Measurement	Kipling&470	24JUL09:12:59:11	Before	.	.	93	144	210	4	972	789	3.76	2729	12.23
178	1969	VW	CP - Dunebuggy	Measurement	IMStationDriveway	24JUL09:13:11:29	Before	14	13	100	132	217	4	1153	687	5.42	1349	11.09
178	1969	VW	CP - Dunebuggy	Measurement	IMStationDriveway	24JUL09:13:13:30	Before	14	11	100	135	160	3	1676	687	5.52	1107	11.01
184	1998	VW	Jetta	Selection	IMStationDriveway	24JUL09:15:24:17	Before	12	16	102	197	363	5	253	88	0.08	504	14.97
184	1998	VW	Jetta	Measurement	Kipling&470	27JUL09:09:18:01	Before	53	28	79	634	98	3	14	-50	0.10	315	14.97
184	1998	VW	Jetta	Measurement	Caryl&470	27JUL09:09:25:09	Before	33	32	71	337	72	2	44	28	0.11	106	14.97
184	1998	VW	Jetta	Measurement	Kipling&470	27JUL09:09:27:41	Before	54	27	79	661	119	3	13	-109	0.80	22	14.48
184	1998	VW	Jetta	Measurement	Caryl&470	27JUL09:09:31:11	Before	34	25	71	356	81	2	2	-4	0.02	58	15.04
184	1998	VW	Jetta	Measurement	IMStationDriveway	27JUL09:09:40:24	Before	12	12	78	63	45	1	28	30	0.06	7	15.01
184	1998	VW	Jetta	Measurement	IMStationDriveway	27JUL09:09:41:51	Before	12	12	78	69	75	2	12	8	0.04	19	15.03
185	2002	Toyota	Echo	Selection	IMStationDriveway	27JUL09:09:00:02	Before	13	15	73	30	53	1	5	20	0.05	624	15.00
185	2002	Toyota	Echo	Measurement	Kipling&470	27JUL09:10:29:33	Before	55	20	84	776	210	4	320	283	-0.13	92	15.13
185	2002	Toyota	Echo	Measurement	Caryl&470	27JUL09:10:32:23	Before	37	20	76	551	73	2	50	13	0.02	38	15.04
185	2002	Toyota	Echo	Measurement	Kipling&470	27JUL09:10:35:04	Before	54	17	85	789	228	4	.	-14	.	.	.
185	2002	Toyota	Echo	Measurement	Caryl&470	27JUL09:10:39:44	Before	35	20	75	567	61	2	-4	-2	0.00	12	15.06
185	2002	Toyota	Echo	Measurement	IMStationDriveway	27JUL09:10:46:12	Before	12	13	85	111	65	2	-12	-26	0.09	49	14.99
185	2002	Toyota	Echo	Measurement	IMStationDriveway	27JUL09:10:47:42	Before	11	13	85	112	85	2	7	36	0.08	138	14.99
186	1995	Ford	F150	Selection	IMStationDriveway	27JUL09:09:30:58	Before	8	6	77	55	66	2	80	9	0.11	325	14.96
186	1995	Ford	F150	Measurement	Kipling&470	27JUL09:11:35:23	Before	55	26	85	939	140	3	61	72	1.37	1801	14.01
186	1995	Ford	F150	Measurement	Caryl&470	27JUL09:11:38:35	Before	36	17	80	750	63	2	26	38	0.08	1223	14.95
186	1995	Ford	F150	Measurement	Kipling&470	27JUL09:11:41:19	Before	54	22	85	957	213	4	154	110	2.19	1387	13.43
186	1995	Ford	F150	Measurement	Caryl&470	27JUL09:11:44:47	Before	36	19	79	771	92	3	6	-41	0.38	543	14.76
186	1995	Ford	F150	Measurement	IMStationDriveway	27JUL09:11:53:44	Before	12	7	91	158	101	3	49	21	0.11	541	14.95

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)															
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
186	1995	Ford	F150	Measurement	IMStationDriveway	27JUL09:11:55:12	Before	11	8	91	161	48	1	262	233	4.91	69	11.52
188	2005	Lexus	GX-470	Selection	IMStationDriveway	27JUL09:09:43:07	Before	19	29	78	70	89	2	1	-22	0.01	4	15.05
188	2005	Lexus	GX-470	Measurement	Kipling&470	27JUL09:12:42:32	Before	55	21	86	16	309	5	150	-57	1.67	66	13.85
188	2005	Lexus	GX-470	Measurement	Caryl&470	27JUL09:12:46:12	Before	34	21	81	976	65	2	-10	-40	0.01	-4	15.05
188	2005	Lexus	GX-470	Measurement	Kipling&470	27JUL09:12:50:10	Before	54	23	86	38	233	4	201	-110	0.84	-37	14.45
188	2005	Lexus	GX-470	Measurement	Caryl&470	27JUL09:12:53:37	Before	33	18	82	1001	101	3	15	-73	0.01	6	15.05
188	2005	Lexus	GX-470	Measurement	IMStationDriveway	27JUL09:13:02:15	Before	12	13	93	215	138	3	11	-10	0.03	5	15.03
188	2005	Lexus	GX-470	Measurement	IMStationDriveway	27JUL09:13:03:37	Before	12	11	93	217	108	3	-5	-38	0.03	-6	15.03
189	1993	GMC	Safari	Selection	IMStationDriveway	27JUL09:12:40:50	Before	15	15	92	202	89	2	238	215	2.17	406	13.47
189	1993	GMC	Safari	Measurement	Kipling&470	27JUL09:14:24:15	Before	54	17	86	294	191	4	210	-118	3.26	2010	12.64
189	1993	GMC	Safari	Measurement	Caryl&470	27JUL09:14:27:26	Before	34	17	83	1257	96	3	76	122	0.09	332	14.97
189	1993	GMC	Safari	Measurement	Kipling&470	27JUL09:14:30:19	Before	54	18	87	318	192	4	294	224	5.07	908	11.38
189	1993	GMC	Safari	Measurement	Caryl&470	27JUL09:14:33:37	Before	35	16	84	1273	76	2	120	81	0.04	949	14.99
189	1993	GMC	Safari	Measurement	IMStationDriveway	27JUL09:14:40:22	Before	11	8	95	283	88	2	74	7	0.12	262	14.96
189	1993	GMC	Safari	Measurement	IMStationDriveway	27JUL09:14:42:07	Before	10	6	95	286	80	2	292	302	1.70	113	13.82
190	2001	Ford	Expedition	Selection	IMStationDriveway	27JUL09:13:36:30	Before	12	11	95	245	70	2	9	7	0.24	-15	14.89
190	2001	Ford	Expedition	Measurement	Kipling&470	28JUL09:10:03:10	Before	53	17	73	226	120	3	17	-14	0.05	47	15.01
190	2001	Ford	Expedition	Measurement	Caryl&470	28JUL09:10:07:53	Before	34	15	62	526	318	5	137	-53	0.01	26	15.04
190	2001	Ford	Expedition	Measurement	Kipling&470	28JUL09:10:10:04	Before	55	19	72	243	220	4	114	61	0.03	95	15.03
190	2001	Ford	Expedition	Measurement	Caryl&470	28JUL09:10:15:19	Before	34	15	62	547	452	5	74	-59	0.09	133	14.98
190	2001	Ford	Expedition	Measurement	IMStationDriveway	28JUL09:10:22:42	Before	12	8	67	72	118	3	13	-22	0.04	-1	15.02
190	2001	Ford	Expedition	Measurement	IMStationDriveway	28JUL09:10:23:50	Before	12	10	67	76	91	3	4	-3	0.01	1	15.04
192	1991	Infiniti	Q45	Selection	IMStationDriveway	27JUL09:11:07:32	Before	17	19	87	127	62	2	24	23	0.09	1089	14.95
192	1991	Infiniti	Q45	Measurement	Caryl&470	28JUL09:08:21:25	Before	36	22	65	88	204	4	120	92	0.20	178	14.90
192	1991	Infiniti	Q45	Measurement	Caryl&470	28JUL09:08:29:44	Before	36	19	66	130	315	5	82	11	0.09	41	14.99
192	1991	Infiniti	Q45	Measurement	Caryl&470	28JUL09:08:36:49	Before	55	38	66	170	198	4	201	213	1.98	467	13.61
192	1991	Infiniti	Q45	Measurement	Caryl&470	28JUL09:08:45:17	Before	55	33	65	226	258	4	149	68	0.11	1397	14.92
192	1991	Infiniti	Q45	Measurement	IMStationDriveway	28JUL09:08:52:18	Before	13	8	69	21	161	4	39	32	0.09	100	14.99
192	1991	Infiniti	Q45	Measurement	IMStationDriveway	28JUL09:08:53:47	Before	13	9	69	24	63	2	32	38	0.08	150	14.99
193	2003	Ford	Focus	Selection	IMStationDriveway	27JUL09:11:54:57	Before	13	16	91	160	35	1	5	5	0.10	32	14.98
193	2003	Ford	Focus	Measurement	Kipling&470	28JUL09:09:10:10	Before	54	32	75	107	156	4	96	62	1.62	107	13.88
193	2003	Ford	Focus	Measurement	Caryl&470	28JUL09:09:14:15	Before	35	22	65	354	153	4	79	62	0.02	43	15.03
193	2003	Ford	Focus	Measurement	Kipling&470	28JUL09:09:16:29	Before	53	31	75	126	173	4	12	-9	0.24	-36	14.88
193	2003	Ford	Focus	Measurement	Caryl&470	28JUL09:09:20:32	Before	37	19	64	375	144	3	-15	-50	0.01	5	15.04
193	2003	Ford	Focus	Measurement	IMStationDriveway	28JUL09:09:27:47	Before	14	14	72	38	45	1	-1	6	0.03	30	15.03
193	2003	Ford	Focus	Measurement	IMStationDriveway	28JUL09:09:28:58	Before	13	14	70	39	55	1	-11	-7	0.02	67	15.04

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)															
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
194	1994	Geo	Prizm	Selection	IMStationDriveway	27JUL09:13:54:24	Before	14	18	94	257	58	1	323	290	2.29	363	13.39
194	1994	Geo	Prizm	Measurement	Kipling&470	28JUL09:10:57:23	Before	47	23	71	342	216	4	39	-122	1.24	566	14.15
194	1994	Geo	Prizm	Measurement	Caryl&470	28JUL09:11:01:43	Before	32	18	64	688	171	4	234	243	0.07	1019	14.96
194	1994	Geo	Prizm	Measurement	Caryl&470	28JUL09:11:07:55	Before	34	19	63	709	219	4	58	17	0.06	551	14.99
194	1994	Geo	Prizm	Measurement	Kipling&470	28JUL09:11:10:29	Before	53	27	71	382	119	3	170	58	3.10	810	12.80
194	1994	Geo	Prizm	Measurement	IMStationDriveway	28JUL09:11:24:06	Before	14	13	68	130	34	1	53	100	0.16	291	14.93
194	1994	Geo	Prizm	Measurement	IMStationDriveway	28JUL09:11:24:49	Before	13	15	68	132	33	1	373	396	1.92	339	13.66
197	2000	Honda	Accord	Selection	IMStationDriveway	27JUL09:15:24:34	Before	12	11	89	316	57	1	1	3	0.05	3	15.01
197	2000	Honda	Accord	Measurement	Kipling&470	28JUL09:12:23:04	Before	52	23	71	84	123	3	63	69	0.02	112	15.03
197	2000	Honda	Accord	Measurement	Caryl&470	28JUL09:12:27:49	Before	34	18	64	968	144	3	39	-30	0.02	-59	15.04
197	2000	Honda	Accord	Measurement	Kipling&470	28JUL09:12:29:58	Before	54	29	71	107	135	3	55	-32	0.01	-25	15.04
197	2000	Honda	Accord	Measurement	Caryl&470	28JUL09:12:34:06	Before	37	22	64	979	145	3	91	-41	-0.01	-2	15.06
197	2000	Honda	Accord	Measurement	IMStationDriveway	28JUL09:12:51:06	Before	13	13	72	185	59	2	1	-2	0.01	21	15.05
197	2000	Honda	Accord	Measurement	IMStationDriveway	28JUL09:12:52:05	Before	13	12	72	187	52	1	10	12	0.06	-15	15.01
203.205	1991	Jeep	Wrangler	Selection	IMStationDriveway	28JUL09:11:19:32	Before	12	9	68	118	5863	7	4766	2190	0.05	91	14.87
203.205	1991	Jeep	Wrangler	Measurement	Caryl&470	28JUL09:14:15:27	Before	31	16	72	1296	850	6	1652	1031	0.07	104	14.95
203.205	1991	Jeep	Wrangler	Measurement	Kipling&470	28JUL09:14:18:41	Before	52	30	75	426	247	4	918	462	0.15	407	14.90
203.205	1991	Jeep	Wrangler	Measurement	Caryl&470	28JUL09:14:22:58	Before	33	17	72	1315	517	5	838	381	0.09	34	14.96
203.205	1991	Jeep	Wrangler	Measurement	Kipling&470	28JUL09:14:26:52	Before	52	13	75	452	190	4	921	663	0.08	674	14.94
203.205	1991	Jeep	Wrangler	Measurement	IMStationDriveway	28JUL09:14:42:44	Before	11	7	72	273	347	5	390	236	0.14	43	14.94
203.205	1991	Jeep	Wrangler	Measurement	IMStationDriveway	28JUL09:14:43:44	Before	10	9	72	275	285	5	460	205	0.14	58	14.94
203.205	1991	Jeep	Wrangler	Measurement	IMStationDriveway	31JUL09:11:41:17	After	9	6	88	122	168	4	226	172	0.97	57	14.35
203.205	1991	Jeep	Wrangler	Measurement	IMStationDriveway	31JUL09:11:42:31	After	11	6	88	123	114	3	51	55	0.27	48	14.86
212	1977	Ford	Econoline	Selection	IMStationDriveway	28JUL09:15:18:32	Before	14	15	73	290	1104	7	1308	264	3.53	505	12.47
212	1977	Ford	Econoline	Measurement	Kipling&470	28JUL09:16:33:07	Before	48	19	76	842	214	4	907	665	3.99	821	12.14
212	1977	Ford	Econoline	Measurement	Caryl&470	28JUL09:16:37:05	Before	32	11	71	1710	428	5	1148	853	2.79	1111	12.98
212	1977	Ford	Econoline	Measurement	Kipling&470	28JUL09:16:40:23	Before	48	17	75	884	291	5	873	580	4.71	538	11.63
212	1977	Ford	Econoline	Measurement	Caryl&470	28JUL09:16:45:10	Before	35	17	71	1746	1046	7	663	18	2.46	460	13.25
212	1977	Ford	Econoline	Measurement	IMStationDriveway	28JUL09:16:54:42	Before	12	7	72	346	168	4	924	578	2.36	924	13.30
212	1977	Ford	Econoline	Measurement	IMStationDriveway	28JUL09:16:56:00	Before	13	8	72	348	254	4	1106	759	2.36	939	13.29
213	1979	Dodge	D-150	Selection	IMStationDriveway	28JUL09:15:25:34	Before	11	9	72	293	1442	7	8544	4998	3.78	1309	12.04
213	1979	Dodge	D-150	Measurement	Kipling&470	29JUL09:09:17:36	Before	49	19	65	184	740	5	7526	5788	4.30	1160	11.70
213	1979	Dodge	D-150	Measurement	Caryl&470	29JUL09:09:21:15	Before	33	12	66	108	963	6	4316	3626	1.78	1226	13.60
213	1979	Dodge	D-150	Measurement	Kipling&470	29JUL09:09:24:57	Before	48	13	66	198	536	5	8695	3896	3.92	1302	11.94
213	1979	Dodge	D-150	Measurement	Caryl&470	29JUL09:09:29:49	Before	33	16	67	136	490	5	6308	5502	2.29	1313	13.17
213	1979	Dodge	D-150	Measurement	IMStationDriveway	29JUL09:09:38:05	Before	10	7	70	38	382	4	7108	6092	4.86	1595	11.30

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
213	1979	Dodge	D-150	Measurement	IMStationDriveway	29JUL09:09:39:15	Before	11	8	70	40	422	4	6361	6236	2.96	1449	12.69
214	2000	Chevrolet	S-10	Selection	IMStationDriveway	28JUL09:16:07:32	Before	14	15	74	319	560	6	198	-397	-0.07	-69	15.10
214	2000	Chevrolet	S-10	Measurement	Kipling&470	29JUL09:10:58:56	Before	54	17	73	454	153	4	114	100	0.01	43	15.04
214	2000	Chevrolet	S-10	Measurement	Caryl&470	29JUL09:11:03:26	Before	37	20	68	452	72	2	23	52	0.03	49	15.03
214	2000	Chevrolet	S-10	Measurement	Kipling&470	29JUL09:11:06:17	Before	54	24	73	472	106	3	62	65	0.04	162	15.02
214	2000	Chevrolet	S-10	Measurement	Caryl&470	29JUL09:11:09:51	Before	36	18	66	468	50	1	23	8	0.02	553	15.02
214	2000	Chevrolet	S-10	Measurement	IMStationDriveway	29JUL09:11:16:23	Before	12	10	74	105	88	2	62	46	0.04	-16	15.02
214	2000	Chevrolet	S-10	Measurement	IMStationDriveway	29JUL09:11:17:22	Before	12	8	74	107	144	3	65	18	0.03	-4	15.03
217	1994	Ford	Ranger	Selection	IMStationDriveway	28JUL09:17:00:31	Before	15	19	72	349	356	5	432	373	0.18	2093	14.83
217	1994	Ford	Ranger	Measurement	Caryl&470	29JUL09:13:25:59	Before	33	20	66	932	56	1	97	80	0.54	516	14.65
217	1994	Ford	Ranger	Measurement	Kipling&470	29JUL09:13:28:53	Before	52	24	71	145	119	3	110	77	0.08	4111	14.84
217	1994	Ford	Ranger	Measurement	Caryl&470	29JUL09:13:33:30	Before	33	22	67	958	77	2	71	49	0.75	13	14.52
217	1994	Ford	Ranger	Measurement	Kipling&470	29JUL09:13:36:09	Before	53	6	71	164	120	3	268	220	4.52	178	11.80
217	1994	Ford	Ranger	Measurement	IMStationDriveway	29JUL09:13:43:32	Before	13	16	72	179	192	4	141	168	0.27	689	14.83
217	1994	Ford	Ranger	Measurement	IMStationDriveway	29JUL09:13:44:34	Before	14	21	72	181	755	6	404	309	0.15	755	14.91
218	1990	VW	Cabriolet	Selection	IMStationDriveway	29JUL09:08:45:39	Before	13	16	63	10	50	1	68	64	0.27	321	14.84
218	1990	VW	Cabriolet	Measurement	Kipling&470	29JUL09:10:20:26	Before	53	15	70	350	149	4	10	-200	0.43	844	14.71
218	1990	VW	Cabriolet	Measurement	Caryl&470	29JUL09:10:24:45	Before	34	20	72	325	80	2	53	1	0.20	202	14.90
218	1990	VW	Cabriolet	Measurement	Kipling&470	29JUL09:10:27:40	Before	52	19	72	372	221	4	.	128	.	.	.
218	1990	VW	Cabriolet	Measurement	Caryl&470	29JUL09:10:32:13	Before	34	17	72	356	59	2	.	118	.	.	.
218	1990	VW	Cabriolet	Measurement	IMStationDriveway	29JUL09:10:39:23	Before	14	15	76	80	68	2	146	-55	0.25	338	14.86
218	1990	VW	Cabriolet	Measurement	IMStationDriveway	29JUL09:10:40:32	Before	12	11	76	81	64	2	152	6	0.12	56	14.96
219	1991	Lexus	LS400	Selection	IMStationDriveway	29JUL09:10:23:03	Before	15	18	75	69	96	3	7	4	0.06	686	14.98
219	1991	Lexus	LS400	Measurement	Kipling&470	29JUL09:14:16:56	Before	56	19	71	262	150	3	49	16	0.09	888	14.96
219	1991	Lexus	LS400	Measurement	Caryl&470	29JUL09:14:25:40	Before	34	19	69	1080	89	2	21	-2	0.46	40	14.72
219	1991	Lexus	LS400	Measurement	Kipling&470	29JUL09:14:28:48	Before	55	19	71	299	231	4	-18	-129	0.12	1522	14.92
219	1991	Lexus	LS400	Measurement	Caryl&470	29JUL09:14:33:27	Before	37	21	69	1095	75	2	4	12	0.07	194	14.99
219	1991	Lexus	LS400	Measurement	IMStationDriveway	29JUL09:14:41:23	Before	13	12	73	213	72	2	5	14	0.04	263	15.01
219	1991	Lexus	LS400	Measurement	IMStationDriveway	29JUL09:14:43:15	Before	12	15	73	219	91	3	12	12	0.09	386	14.98
220	1994	Toyota	Tacoma	Selection	IMStationDriveway	29JUL09:11:40:57	Before	13	12	71	118	173	4	59	-8	0.05	48	15.01
220	1994	Toyota	Tacoma	Measurement	Kipling&470	29JUL09:15:19:20	Before	53	22	73	433	153	4	109	81	3.51	31	12.53
220	1994	Toyota	Tacoma	Measurement	Caryl&470	29JUL09:15:24:33	Before	36	22	72	1232	42	1	18	3	0.01	305	15.03
220	1994	Toyota	Tacoma	Measurement	Caryl&470	29JUL09:15:32:26	Before	33	20	71	1256	85	2	2	23	0.03	615	15.01
220	1994	Toyota	Tacoma	Measurement	Kipling&470	29JUL09:15:36:08	Before	52	19	74	478	154	4	123	87	0.27	36	14.86
220	1994	Toyota	Tacoma	Measurement	IMStationDriveway	29JUL09:15:43:45	Before	12	13	75	256	47	1	-5	-12	0.02	45	15.04
220	1994	Toyota	Tacoma	Measurement	IMStationDriveway	29JUL09:15:44:54	Before	14	16	75	258	79	2	15	28	0.01	96	15.05

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
221	1994	Ford	Bronco	Selection	IMStationDriveway	29JUL09:10:37:10	Before	15	20	76	76	61	2	193	129	2.59	303	13.18
221	1994	Ford	Bronco	Measurement	Kipling&470	29JUL09:11:56:03	Before	52	17	73	585	91	2	287	291	5.00	377	11.45
221	1994	Ford	Bronco	Measurement	Caryl&470	29JUL09:11:59:45	Before	34	16	65	669	60	2	79	64	0.15	356	14.93
221	1994	Ford	Bronco	Measurement	Kipling&470	29JUL09:12:03:39	Before	55	24	73	611	133	3	328	234	4.21	344	12.02
221	1994	Ford	Bronco	Measurement	Caryl&470	29JUL09:12:07:17	Before	36	17	65	702	50	1	-3	-36	0.17	-78	14.93
221	1994	Ford	Bronco	Measurement	IMStationDriveway	29JUL09:12:16:12	Before	13	10	71	141	100	3	203	208	1.46	136	14.00
221	1994	Ford	Bronco	Measurement	IMStationDriveway	29JUL09:12:17:19	Before	11	8	71	143	93	3	4	-79	0.08	235	14.99
232	1992	Ford	Explorer	Selection	IMStationDriveway	30JUL09:11:54:57	Before	14	14	58	85	118	3	53	-95	0.04	2316	14.94
232	1992	Ford	Explorer	Measurement	Kipling&470	30JUL09:13:17:31	Before	55	19	63	94	104	3	126	171	1.61	222	13.89
232	1992	Ford	Explorer	Measurement	Caryl&470	30JUL09:13:20:19	Before	35	17	55	463	399	5	249	-63	0.07	1975	14.93
232	1992	Ford	Explorer	Measurement	Kipling&470	30JUL09:13:23:32	Before	54	19	63	112	141	3	110	117	1.49	109	13.98
232	1992	Ford	Explorer	Measurement	Caryl&470	30JUL09:13:26:36	Before	35	24	55	488	367	5	241	153	1.77	19	13.78
232	1992	Ford	Explorer	Measurement	IMStationDriveway	30JUL09:13:32:56	Before	14	10	61	147	113	3	71	12	0.06	190	15.00
232	1992	Ford	Explorer	Measurement	IMStationDriveway	30JUL09:13:34:12	Before	12	10	61	149	181	4	116	-6	0.11	2330	14.89
238	1993	Jeep	Wrangler	Selection	IMStationDriveway	30JUL09:15:45:28	Before	13	9	72	203	378	5	758	522	0.10	123	14.96
238	1993	Jeep	Wrangler	Measurement	Caryl&470	30JUL09:16:53:08	Before	36	18	66	948	368	5	299	-324	0.24	177	14.87
238	1993	Jeep	Wrangler	Measurement	Kipling&470	30JUL09:16:57:48	Before	53	25	67	502	310	5	272	135	1.03	1188	14.26
238	1993	Jeep	Wrangler	Measurement	Caryl&470	30JUL09:17:01:06	Before	37	21	67	974	268	5	188	-99	0.06	181	15.00
238	1993	Jeep	Wrangler	Measurement	Kipling&470	30JUL09:17:05:02	Before	54	22	67	535	226	4	301	482	0.34	893	14.77
238	1993	Jeep	Wrangler	Measurement	IMStationDriveway	30JUL09:17:11:35	Before	11	6	72	242	130	3	99	24	0.08	95	14.99
238	1993	Jeep	Wrangler	Measurement	IMStationDriveway	30JUL09:17:12:44	Before	12	9	72	244	158	4	94	43	0.18	147	14.92
246	2003	Chevrolet	Suburban	Selection	IMStationDriveway	31JUL09:08:58:44	Before	16	16	71	20	46	1	7	-68	0.14	307	14.94
246	2003	Chevrolet	Suburban	Measurement	Caryl&470	31JUL09:10:02:52	Before	36	16	85	546	278	5	166	27	0.05	5	15.01
246	2003	Chevrolet	Suburban	Measurement	Caryl&470	31JUL09:10:10:20	Before	35	17	85	566	349	5	296	238	0.14	9	14.94
246	2003	Chevrolet	Suburban	Measurement	Caryl&470	31JUL09:10:33:52	Before	57	24	88	652	186	4	144	21	0.17	395	14.92
246	2003	Chevrolet	Suburban	Measurement	Caryl&470	31JUL09:10:41:25	Before	58	24	88	679	291	5	395	130	0.56	216	14.63
246	2003	Chevrolet	Suburban	Measurement	IMStationDriveway	31JUL09:10:47:23	Before	12	10	83	76	67	2	33	-29	0.19	58	14.91
246	2003	Chevrolet	Suburban	Measurement	IMStationDriveway	31JUL09:10:48:36	Before	12	10	85	79	124	3	18	-32	0.30	56	14.84
249	1997	BMW	328i	Selection	IMStationDriveway	31JUL09:11:55:24	Before	14	17	87	130	51	1	105	106	0.43	501	14.73
249	1997	BMW	328i	Measurement	Kipling&470	31JUL09:12:56:04	Before	53	20	82	159	142	3	78	-8	0.07	333	14.99
249	1997	BMW	328i	Measurement	Caryl&470	31JUL09:13:00:02	Before	32	20	86	1175	458	5	262	82	-0.01	236	15.04
249	1997	BMW	328i	Measurement	Kipling&470	31JUL09:13:03:31	Before	53	24	82	189	202	4	144	59	0.03	1225	14.98
249	1997	BMW	328i	Measurement	Caryl&470	31JUL09:13:06:54	Before	34	22	90	1199	520	6	170	58	0.01	138	15.03
249	1997	BMW	328i	Measurement	IMStationDriveway	31JUL09:13:13:59	Before	12	12	86	172	116	3	24	1	0.12	32	14.97
249	1997	BMW	328i	Measurement	IMStationDriveway	31JUL09:13:15:04	Before	12	11	86	174	82	2	16	33	0.21	38	14.90
252	2002	Toyota	Tacoma	Selection	IMStationDriveway	31JUL09:14:58:55	Before	16	19	74	223	39	1	-59	-37	0.10	71	14.98

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)															
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
252	2002	Toyota	Tacoma	Measurement	Caryl&470	31JUL09:16:05:09	Before	34	18	78	1664	169	4	94	10	0.04	32	15.02
252	2002	Toyota	Tacoma	Measurement	Kipling&470	31JUL09:16:09:01	Before	54	18	78	796	147	3	67	58	0.00	-7	15.05
252	2002	Toyota	Tacoma	Measurement	Caryl&470	31JUL09:16:13:05	Before	36	21	79	1692	213	4	73	-59	0.02	-44	15.04
252	2002	Toyota	Tacoma	Measurement	Kipling&470	31JUL09:16:17:12	Before	53	17	78	835	121	3	72	-194	0.04	150	15.02
252	2002	Toyota	Tacoma	Measurement	IMStationDriveway	31JUL09:16:23:54	Before	11	9	79	272	142	3	52	-12	0.06	37	15.01
252	2002	Toyota	Tacoma	Measurement	IMStationDriveway	31JUL09:16:24:59	Before	10	9	79	273	136	3	29	-53	0.03	59	15.03
255	2004	Lexus	RX330	Selection	IMStationDriveway	31JUL09:15:36:01	Before	15	24	75	243	89	2	10	1	1.84	-10	13.74
255	2004	Lexus	RX330	Measurement	Kipling&470	31JUL09:16:49:56	Before	52	9	79	968	123	3	37	11	0.08	49	14.99
255	2004	Lexus	RX330	Measurement	Caryl&470	31JUL09:16:53:13	Before	35	20	76	1843	263	4	50	-35	0.00	9	15.05
255	2004	Lexus	RX330	Measurement	Kipling&470	31JUL09:16:57:52	Before	54	22	79	996	107	3	-87	-169	0.02	-8	15.04
255	2004	Lexus	RX330	Measurement	Caryl&470	31JUL09:17:01:05	Before	35	19	74	1871	188	4	78	54	-0.02	10	15.07
255	2004	Lexus	RX330	Measurement	IMStationDriveway	31JUL09:17:08:34	Before	12	13	78	285	116	3	21	-9	0.00	15	15.05
255	2004	Lexus	RX330	Measurement	IMStationDriveway	31JUL09:17:09:32	Before	12	13	78	286	180	4	25	-34	0.01	-10	15.05
261	1994	GMC	Suburban	Selection	IMStationDriveway	03AUG09:09:33:22	Before	10	5	81	40	97	3	14	0	0.15	2	14.94
261	1994	GMC	Suburban	Measurement	Kipling&470	03AUG09:12:31:18	Before	50	4	92	50	85	2	.	-118	.	.	.
261	1994	GMC	Suburban	Measurement	Kipling&470	03AUG09:12:37:10	Before	52	5	93	66	181	4	277	197	3.77	762	12.32
261	1994	GMC	Suburban	Measurement	Caryl&470	03AUG09:12:39:44	Before	35	20	91	902	126	3	198	185	5.95	69	10.78
261	1994	GMC	Suburban	Measurement	Kipling&470	03AUG09:12:43:23	Before	55	14	93	82	190	4	204	31	3.86	1083	12.24
261	1994	GMC	Suburban	Measurement	Caryl&470	03AUG09:12:45:57	Before	38	21	91	921	103	3	259	190	6.09	90	10.68
261	1994	GMC	Suburban	Measurement	IMStationDriveway	03AUG09:12:53:14	Before	12	12	95	160	174	4	331	246	5.36	145	11.19
261	1994	GMC	Suburban	Measurement	IMStationDriveway	03AUG09:12:54:26	Before	15	11	95	161	126	3	121	37	0.66	25	14.58
262	1984	Nissan	720	Selection	IMStationDriveway	03AUG09:09:49:36	Before	10	10	83	48	104	3	235	553	0.51	1124	14.64
262	1984	Nissan	720	Measurement	Kipling&470	03AUG09:13:45:16	Before	45	22	92	268	184	4	206	104	3.50	1486	12.48
262	1984	Nissan	720	Measurement	Caryl&470	03AUG09:13:48:26	Before	40	23	93	1107	70	2	394	298	2.55	2093	13.14
262	1984	Nissan	720	Measurement	Kipling&470	03AUG09:13:53:15	Before	45	26	92	291	208	4	228	123	4.25	1420	11.95
262	1984	Nissan	720	Measurement	Caryl&470	03AUG09:13:56:00	Before	36	21	94	1127	81	2	377	243	2.00	1899	13.54
262	1984	Nissan	720	Measurement	IMStationDriveway	03AUG09:14:03:02	Before	11	9	98	196	55	1	555	-21	0.33	593	14.78
262	1984	Nissan	720	Measurement	IMStationDriveway	03AUG09:14:04:40	Before	12	8	98	199	220	4	538	-164	0.75	373	14.48
263	1997	Honda	Accord	Selection	IMStationDriveway	03AUG09:10:02:01	Before	14	18	85	50	76	2	.	9	.	.	.
263	1997	Honda	Accord	Measurement	Kipling&470	03AUG09:11:15:05	Before	52	6	99	358	200	4	.	-274	.	.	.
263	1997	Honda	Accord	Measurement	Caryl&470	03AUG09:11:22:09	Before	35	24	92	645	98	3	22	34	0.08	55	15.00
263	1997	Honda	Accord	Measurement	Kipling&470	03AUG09:11:25:54	Before	51	20	99	390	209	4	30	-22	0.19	21	14.92
263	1997	Honda	Accord	Measurement	Caryl&470	03AUG09:11:29:38	Before	37	25	92	672	81	2	-3	-12	0.02	1464	14.99
263	1997	Honda	Accord	Measurement	IMStationDriveway	03AUG09:11:43:18	Before	14	15	95	125	39	1	22	-7	0.12	54	14.96
263	1997	Honda	Accord	Measurement	IMStationDriveway	03AUG09:11:44:32	Before	13	15	95	127	49	1	-23	-21	0.13	113	14.96
266	2002	Chevrolet	Tahoe	Selection	IMStationDriveway	03AUG09:11:16:59	Before	13	17	93	102	91	2	49	51	1.05	65	14.30

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
266	2002	Chevrolet	Tahoe	Measurement	Caryl&470	12AUG09:09:48:43	Before	37	22	86	472	212	4	71	-23	0.03	146	15.03
266	2002	Chevrolet	Tahoe	Measurement	Caryl&470	12AUG09:09:54:53	Before	37	22	87	493	208	4	136	-159	0.06	248	14.99
266	2002	Chevrolet	Tahoe	Measurement	Caryl&470	12AUG09:10:01:05	Before	58	28	89	512	271	5	260	-48	0.18	259	14.91
266	2002	Chevrolet	Tahoe	Measurement	Caryl&470	12AUG09:10:07:04	Before	58	37	89	524	181	4	177	161	0.12	758	14.93
266	2002	Chevrolet	Tahoe	Measurement	IMStationDriveway	12AUG09:10:15:56	Before	14	16	82	43	93	3	11	-7	0.04	543	15.01
266	2002	Chevrolet	Tahoe	Measurement	IMStationDriveway	12AUG09:10:17:03	Before	16	17	82	45	77	2	15	9	0.11	111	14.97
271	1997	GMC	Sierra	Selection	IMStationDriveway	03AUG09:13:20:57	Before	12	12	95	171	200	4	88	14	0.09	153	14.98
271	1997	GMC	Sierra	Measurement	Kipling&470	04AUG09:08:37:18	Before	53	19	85	504	103	3	94	112	0.12	535	14.95
271	1997	GMC	Sierra	Measurement	Caryl&470	04AUG09:08:40:47	Before	38	33	77	205	335	5	195	150	0.10	546	14.96
271	1997	GMC	Sierra	Measurement	Kipling&470	04AUG09:08:44:48	Before	53	5	87	527	143	3	66	-25	0.32	278	14.81
271	1997	GMC	Sierra	Measurement	Caryl&470	04AUG09:08:47:37	Before	38	27	77	235	337	5	161	55	0.05	691	14.99
271	1997	GMC	Sierra	Measurement	IMStationDriveway	04AUG09:08:54:36	Before	13	10	72	34	98	3	57	-13	0.07	243	14.99
271	1997	GMC	Sierra	Measurement	IMStationDriveway	04AUG09:08:55:37	Before	14	11	73	36	109	3	51	-14	0.06	308	14.99
278	2002	Dodge	Dakota	Selection	IMStationDriveway	03AUG09:15:20:38	Before	16	19	90	236	105	3	40	15	3.90	2	12.25
278	2002	Dodge	Dakota	Measurement	Kipling&470	04AUG09:11:06:05	Before	54	9	95	871	182	4	301	216	-0.06	60	15.08
278	2002	Dodge	Dakota	Measurement	Caryl&470	04AUG09:11:09:01	Before	39	23	87	662	232	4	145	-153	0.05	-21	15.01
278	2002	Dodge	Dakota	Measurement	Kipling&470	04AUG09:11:12:26	Before	54	21	95	894	412	5	205	-157	1.04	252	14.29
278	2002	Dodge	Dakota	Measurement	Caryl&470	04AUG09:11:16:36	Before	36	20	89	683	310	5	357	-464	0.02	6	15.03
278	2002	Dodge	Dakota	Measurement	IMStationDriveway	04AUG09:11:24:29	Before	13	9	86	112	94	3	17	84	0.03	48	15.03
278	2002	Dodge	Dakota	Measurement	IMStationDriveway	04AUG09:11:25:26	Before	13	12	86	113	71	2	35	-26	0.04	98	15.02
285	1998	Honda	CRV	Selection	IMStationDriveway	04AUG09:14:25:13	Before	12	11	102	135	64	2	3	-17	0.26	230	14.86
285	1998	Honda	CRV	Measurement	Kipling&470	04AUG09:15:32:32	Before	49	21	93	523	92	3	10	-79	0.51	186	14.68
285	1998	Honda	CRV	Measurement	Caryl&470	04AUG09:15:36:49	Before	39	18	93	1490	187	4	5	-79	0.07	90	15.00
285	1998	Honda	CRV	Measurement	Kipling&470	04AUG09:15:41:04	Before	52	20	94	553	160	4	156	7	0.64	396	14.58
285	1998	Honda	CRV	Measurement	Caryl&470	04AUG09:15:45:00	Before	36	19	92	1526	223	4	151	29	0.05	183	15.01
285	1998	Honda	CRV	Measurement	IMStationDriveway	04AUG09:15:53:07	Before	14	13	97	180	67	2	-2	-6	0.21	56	14.90
285	1998	Honda	CRV	Measurement	IMStationDriveway	04AUG09:15:54:18	Before	16	11	97	183	77	2	-18	-28	0.81	36	14.47
290	2005	Acura	TSX	Selection	IMStationDriveway	05AUG09:10:52:01	Before	13	13	83	69	70	2	-3	-2	0.01	4	15.05
290	2005	Acura	TSX	Measurement	Caryl&470	05AUG09:12:11:16	Before	39	25	86	939	343	5	96	-4	0.05	10	15.01
290	2005	Acura	TSX	Measurement	Caryl&470	05AUG09:12:18:34	Before	39	25	86	959	346	5	191	81	0.07	4	15.00
290	2005	Acura	TSX	Measurement	Caryl&470	05AUG09:12:47:31	Before	49	32	90	1049	243	4	166	111	0.02	-20	15.03
290	2005	Acura	TSX	Measurement	Caryl&470	05AUG09:12:53:43	Before	56	40	90	1070	177	4	133	71	0.10	-22	14.98
290	2005	Acura	TSX	Measurement	IMStationDriveway	05AUG09:13:00:38	Before	15	14	93	134	95	3	2	4	0.05	3	15.02
290	2005	Acura	TSX	Measurement	IMStationDriveway	05AUG09:13:01:41	Before	15	9	93	135	91	3	0	3	0.02	-8	15.04
294	1985	Ford	F150	Selection	IMStationDriveway	05AUG09:13:36:24	Before	15	17	91	148	354	5	827	372	2.62	961	13.12
294	1985	Ford	F150	Measurement	IMStationDriveway	05AUG09:14:55:11	Before	13	9	101	183	56	1	509	513	4.80	661	11.58

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
294	1985	Ford	F150	Measurement	IMStationDriveway	05AUG09:14:56:15	Before	14	11	101	185	63	2	555	493	3.79	1064	12.28
295	1999	Mazda	626	Selection	IMStationDriveway	05AUG09:14:30:21	Before	11	10	95	166	80	2	364	308	5.97	344	10.75
295	1999	Mazda	626	Measurement	Kipling&470	05AUG09:16:03:30	Before	54	18	88	627	163	4	373	489	4.35	1523	11.87
295	1999	Mazda	626	Measurement	Caryl&470	05AUG09:16:06:54	Before	38	19	89	1647	286	5	184	-261	0.35	163	14.79
295	1999	Mazda	626	Measurement	Kipling&470	05AUG09:16:10:35	Before	56	32	88	649	191	4	334	83	4.61	1203	11.69
295	1999	Mazda	626	Measurement	Caryl&470	05AUG09:16:14:56	Before	38	19	89	1687	395	5	302	172	0.13	191	14.94
295	1999	Mazda	626	Measurement	Kipling&470	05AUG09:16:18:45	Before	54	31	88	679	192	4	446	340	1.95	1398	13.59
295	1999	Mazda	626	Measurement	IMStationDriveway	05AUG09:16:26:43	Before	15	14	110	218	70	2	-27	-3	0.03	78	15.03
295	1999	Mazda	626	Measurement	IMStationDriveway	05AUG09:16:27:55	Before	13	13	110	220	61	2	-10	16	0.02	1192	15.00
301	1981	GMC	Sierra K1500	Selection	IMStationDriveway	06AUG09:13:13:14	Before	13	11	93	127	440	5	.	-253	.	.	.
301	1981	GMC	Sierra K1500	Measurement	IMStationDriveway	07AUG09:09:07:42	Before	12	10	77	42	150	3	1103	808	9.46	336	8.22
301	1981	GMC	Sierra K1500	Measurement	IMStationDriveway	07AUG09:09:08:45	Before	12	10	77	43	95	2	1612	762	8.19	138	9.13
302	1989	Dodge	Pickup	Selection	IMStationDriveway	06AUG09:13:15:36	Before	13	15	93	130	125	3	246	234	2.80	938	13.01
302	1989	Dodge	Pickup	Measurement	Caryl&470	06AUG09:15:10:38	Before	40	22	80	1209	285	5	298	24	0.35	1456	14.74
302	1989	Dodge	Pickup	Measurement	Caryl&470	06AUG09:15:18:42	Before	36	22	79	1237	336	5	170	93	0.27	1908	14.79
302	1989	Dodge	Pickup	Measurement	Caryl&470	06AUG09:15:26:40	Before	42	17	79	1267	191	4	268	132	3.19	676	12.73
302	1989	Dodge	Pickup	Measurement	Kipling&470	06AUG09:15:30:45	Before	49	11	80	287	120	3	275	278	6.15	213	10.63
302	1989	Dodge	Pickup	Measurement	Caryl&470	06AUG09:15:34:33	Before	52	31	77	1289	439	5	200	84	3.77	549	12.32
302	1989	Dodge	Pickup	Measurement	IMStationDriveway	06AUG09:15:43:15	Before	15	19	79	195	118	3	184	182	3.24	817	12.69
302	1989	Dodge	Pickup	Measurement	IMStationDriveway	06AUG09:15:45:00	Before	14	17	79	197	95	3	193	207	4.41	693	11.86
305	1997	Dodge	Ram 1500	Selection	IMStationDriveway	07AUG09:08:26:49	Before	13	13	72	20	61	2	-62	-246	0.40	2103	14.69
305	1997	Dodge	Ram 1500	Measurement	Caryl&470	07AUG09:10:37:32	Before	36	19	90	607	420	5	530	-961	0.08	3879	14.84
305	1997	Dodge	Ram 1500	Measurement	Kipling&470	07AUG09:10:40:27	Before	53	27	83	422	174	4	85	72	0.76	1919	14.44
305	1997	Dodge	Ram 1500	Measurement	Caryl&470	07AUG09:10:43:38	Before	36	22	90	633	291	5	371	-109	0.07	3580	14.86
305	1997	Dodge	Ram 1500	Measurement	Kipling&470	07AUG09:10:46:42	Before	54	18	83	449	151	3	80	147	1.61	1989	13.83
305	1997	Dodge	Ram 1500	Measurement	IMStationDriveway	07AUG09:10:54:19	Before	14	9	85	99	72	2	3	-8	0.00	2910	14.95
305	1997	Dodge	Ram 1500	Measurement	IMStationDriveway	07AUG09:10:55:42	Before	15	13	86	103	101	3	65	100	0.34	2335	14.73
306	1967	Chevrolet	Chevelle	Selection	IMStationDriveway	06AUG09:15:18:00	Before	14	11	84	182	189	4	1176	764	8.40	292	8.99
306	1967	Chevrolet	Chevelle	Measurement	IMStationDriveway	06AUG09:16:31:15	Before	14	13	74	222	368	5	1473	1313	7.64	614	9.51
306	1967	Chevrolet	Chevelle	Measurement	IMStationDriveway	06AUG09:16:32:10	Before	17	13	74	224	152	3	1303	1156	8.19	693	9.12
309	2001	Nissan	Sentra	Selection	IMStationDriveway	07AUG09:13:11:58	Before	8	9	98	177	506	5	1399	865	-0.01	2098	14.94
309	2001	Nissan	Sentra	Measurement	Caryl&470	07AUG09:14:37:23	Before	37	20	98	1380	231	4	266	213	0.06	3654	14.87
309	2001	Nissan	Sentra	Measurement	Kipling&470	07AUG09:14:40:33	Before	50	16	89	1222	158	4	.	320	.	.	.
309	2001	Nissan	Sentra	Measurement	Caryl&470	07AUG09:14:43:43	Before	36	20	97	1405	461	5	517	280	0.02	1015	14.99
309	2001	Nissan	Sentra	Measurement	Kipling&470	07AUG09:14:46:47	Before	.	.	89	1245	159	3	.	652	.	.	.
309	2001	Nissan	Sentra	Measurement	IMStationDriveway	07AUG09:14:54:53	Before	16	16	110	231	506	5	859	302	0.12	4098	14.79

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)															
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
309	2001	Nissan	Sentra	Measurement	IMStationDriveway	07AUG09:14:55:48	Before	13	13	110	234	251	4	388	219	0.09	3307	14.86
311	2002	VW	Passat	Selection	IMStationDriveway	07AUG09:14:36:53	Before	7	8	110	227	160	4	7	-34	0.03	29	15.03
311	2002	VW	Passat	Measurement	Kipling&470	07AUG09:15:48:38	Before	54	22	90	1448	152	3	185	174	0.02	-10	15.04
311	2002	VW	Passat	Measurement	Caryl&470	07AUG09:15:52:48	Before	36	19	93	1584	349	5	201	81	0.01	26	15.04
311	2002	VW	Passat	Measurement	Kipling&470	07AUG09:15:56:51	Before	53	18	90	1495	217	4	.	-81	.	.	.
311	2002	VW	Passat	Measurement	Caryl&470	07AUG09:16:00:47	Before	35	18	95	1615	244	4	140	12	0.03	57	15.02
311	2002	VW	Passat	Measurement	IMStationDriveway	07AUG09:16:09:26	Before	15	17	110	271	107	3	1	-12	0.17	-4	14.93
311	2002	VW	Passat	Measurement	IMStationDriveway	07AUG09:16:10:17	Before	14	10	110	272	110	3	18	37	0.06	9	15.01
316	2003	Hyundai	Accent	Selection	IMStationDriveway	07AUG09:16:14:44	Before	12	14	110	273	1164	7	1846	-2780	0.05	2429	14.87
316	2003	Hyundai	Accent	Measurement	Caryl&470	10AUG09:09:10:57	Before	32	33	70	262	55	1	203	125	0.06	151	15.00
316	2003	Hyundai	Accent	Measurement	Kipling&470	10AUG09:09:14:04	Before	53	26	73	571	115	3	.	702	.	.	.
316	2003	Hyundai	Accent	Measurement	Kipling&470	10AUG09:09:20:22	Before	54	10	74	582	123	3	.	593	.	.	.
316	2003	Hyundai	Accent	Measurement	Caryl&470	10AUG09:09:23:13	Before	36	26	70	302	87	2	41	-24	0.04	18	15.02
316	2003	Hyundai	Accent	Measurement	IMStationDriveway	10AUG09:09:33:02	Before	10	7	71	31	167	4	244	-772	0.44	306	14.72
316	2003	Hyundai	Accent	Measurement	IMStationDriveway	10AUG09:09:34:15	Before	9	3	71	33	802	5	.	-8466	.	.	.
320	2004	Chevrolet	Cavalier	Selection	IMStationDriveway	10AUG09:09:38:42	Before	12	18	71	35	53	1	16	16	2.22	-19	13.46
320	2004	Chevrolet	Cavalier	Measurement	Kipling&470	10AUG09:10:34:41	Before	53	10	77	778	164	4	.	123	.	.	.
320	2004	Chevrolet	Cavalier	Measurement	Kipling&470	10AUG09:10:40:37	Before	52	19	78	796	223	4	354	141	0.07	147	14.99
320	2004	Chevrolet	Cavalier	Measurement	Caryl&470	10AUG09:10:43:11	Before	33	22	73	523	119	3	-15	-32	0.07	-24	15.00
320	2004	Chevrolet	Cavalier	Measurement	Caryl&470	10AUG09:10:50:36	Before	36	22	73	546	87	2	-34	-55	0.03	7	15.04
320	2004	Chevrolet	Cavalier	Measurement	IMStationDriveway	10AUG09:10:58:31	Before	14	14	76	71	107	3	16	-47	0.06	7	15.01
320	2004	Chevrolet	Cavalier	Measurement	IMStationDriveway	10AUG09:10:59:51	Before	13	10	76	76	70	2	-1	12	0.02	-32	15.04
321	1997	Chevrolet	S-10	Selection	IMStationDriveway	10AUG09:10:13:27	Before	9	11	73	50	1839	7	3733	-1367	0.45	1989	14.55
321	1997	Chevrolet	S-10	Measurement	Caryl&470	10AUG09:12:11:51	Before	34	25	78	806	232	4	1692	1360	0.36	1403	14.69
321	1997	Chevrolet	S-10	Measurement	Caryl&470	10AUG09:12:18:09	Before	33	23	79	825	459	5	1298	653	0.32	958	14.75
321	1997	Chevrolet	S-10	Measurement	Kipling&470	10AUG09:12:29:16	Before	53	3	83	1044	416	5	.	3877	.	.	.
321	1997	Chevrolet	S-10	Measurement	Caryl&470	10AUG09:12:31:42	Before	55	34	80	854	114	3	1445	1197	5.92	671	10.74
321	1997	Chevrolet	S-10	Measurement	IMStationDriveway	10AUG09:12:41:00	Before	15	15	86	124	785	6	2266	1175	0.41	1187	14.65
321	1997	Chevrolet	S-10	Measurement	IMStationDriveway	10AUG09:12:42:00	Before	15	15	88	126	1151	7	1671	1802	0.45	975	14.64
321	1997	Chevrolet	S-10	Measurement	IMStationDriveway	17AUG09:10:54:47	After	13	11	71	89	78	2	200	113	0.64	1540	14.54
321	1997	Chevrolet	S-10	Measurement	IMStationDriveway	17AUG09:10:55:38	After	12	9	71	90	93	3	202	66	0.35	465	14.78
325	2000	Chevrolet	Prizm	Selection	IMStationDriveway	10AUG09:15:35:52	Before	12	15	100	224	75	2	-12	-14	0.02	1674	14.98
325	2000	Chevrolet	Prizm	Measurement	Kipling&470	11AUG09:09:19:22	Before	50	23	75	122	108	3	.	-108	.	.	.
325	2000	Chevrolet	Prizm	Measurement	Caryl&470	11AUG09:09:21:52	Before	34	25	73	206	60	2	37	-10	0.02	2290	14.95
325	2000	Chevrolet	Prizm	Measurement	Kipling&470	11AUG09:09:25:29	Before	52	11	76	137	139	3	.	-162	.	.	.
325	2000	Chevrolet	Prizm	Measurement	Caryl&470	11AUG09:09:29:12	Before	35	22	74	231	57	1	12	3	0.01	101	15.04

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)															
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
325	2000	Chevrolet	Prizm	Measurement	IMStationDriveway	11AUG09:09:37:20	Before	13	16	75	34	84	2	10	21	0.11	155	14.97
325	2000	Chevrolet	Prizm	Measurement	IMStationDriveway	11AUG09:09:38:17	Before	14	15	75	35	66	2	2	4	0.03	160	15.02
327	1981	BMW	320i	Selection	IMStationDriveway	10AUG09:14:49:37	Before	9	9	89	195	1253	7	.	3332	.	.	.
327	1981	BMW	320i	Measurement	Kipling&470	10AUG09:17:05:19	Before	47	13	86	835	126	3	.	663	.	.	.
327	1981	BMW	320i	Measurement	Caryl&470	10AUG09:17:08:16	Before	35	17	90	1660	72	2	235	194	2.06	281	13.56
327	1981	BMW	320i	Measurement	Kipling&470	10AUG09:17:13:17	Before	48	20	85	880	134	3	445	415	2.23	690	13.42
327	1981	BMW	320i	Measurement	Caryl&470	10AUG09:17:16:10	Before	33	16	87	1689	90	2	136	99	1.28	479	14.11
327	1981	BMW	320i	Measurement	IMStationDriveway	10AUG09:17:25:35	Before	10	6	94	266	208	4	571	326	0.33	1115	14.76
327	1981	BMW	320i	Measurement	IMStationDriveway	10AUG09:17:26:47	Before	11	7	94	268	234	4	755	16	0.37	1241	14.72
329	1969	Jeep	Commando	Selection	IMStationDriveway	11AUG09:09:42:19	Before	12	16	75	38	801	6	1358	-648	5.77	741	10.85
329	1969	Jeep	Commando	Measurement	Kipling&470	11AUG09:10:38:23	Before	49	22	82	329	220	4	849	673	4.31	894	11.91
329	1969	Jeep	Commando	Measurement	Caryl&470	11AUG09:10:41:47	Before	41	25	81	447	57	1	519	457	4.18	802	12.01
329	1969	Jeep	Commando	Measurement	Kipling&470	11AUG09:10:45:23	Before	53	28	83	356	271	4	769	464	6.29	478	10.51
329	1969	Jeep	Commando	Measurement	Caryl&470	11AUG09:10:47:58	Before	40	10	82	471	164	4	1287	458	7.28	540	9.78
329	1969	Jeep	Commando	Measurement	IMStationDriveway	11AUG09:10:55:53	Before	13	17	84	64	1987	7	1530	623	5.20	592	11.26
329	1969	Jeep	Commando	Measurement	IMStationDriveway	11AUG09:10:56:56	Before	15	18	84	66	1708	7	1709	373	4.48	744	11.76
331	1994	Chevrolet	Blazer	Selection	IMStationDriveway	11AUG09:11:01:46	Before	12	7	84	70	118	3	658	329	0.03	26	15.01
331	1994	Chevrolet	Blazer	Measurement	Kipling&470	11AUG09:12:19:43	Before	51	16	88	596	232	4	149	-155	0.07	330	14.99
331	1994	Chevrolet	Blazer	Measurement	Caryl&470	11AUG09:12:23:06	Before	34	18	87	797	104	3	38	90	0.04	1355	14.97
331	1994	Chevrolet	Blazer	Measurement	Kipling&470	11AUG09:12:28:09	Before	48	20	88	626	253	4	230	393	0.06	516	14.99
331	1994	Chevrolet	Blazer	Measurement	Caryl&470	11AUG09:12:30:53	Before	30	20	88	826	108	3	325	260	0.07	604	14.97
331	1994	Chevrolet	Blazer	Measurement	IMStationDriveway	11AUG09:12:39:23	Before	13	13	93	116	753	6	1206	1067	0.04	82	14.98
331	1994	Chevrolet	Blazer	Measurement	IMStationDriveway	11AUG09:12:40:36	Before	13	11	93	117	817	6	1443	967	0.03	269	14.98
337	2001	Nissan	Xterra	Selection	IMStationDriveway	11AUG09:15:12:11	Before	17	25	110	186	79	2	12	-3	1.05	7	14.30
337	2001	Nissan	Xterra	Measurement	Kipling&470	11AUG09:16:53:47	Before	53	33	89	802	168	4	100	94	4.96	371	11.48
337	2001	Nissan	Xterra	Measurement	Caryl&470	11AUG09:16:56:05	Before	39	26	105	1616	66	2	3	93	0.10	-46	14.98
337	2001	Nissan	Xterra	Measurement	Kipling&470	11AUG09:17:00:55	Before	53	19	89	840	167	4	100	-127	0.39	120	14.77
337	2001	Nissan	Xterra	Measurement	Caryl&470	11AUG09:17:04:34	Before	38	32	105	1650	72	2	23	51	3.14	33	12.80
337	2001	Nissan	Xterra	Measurement	IMStationDriveway	11AUG09:17:12:59	Before	14	12	118	248	53	1	4	-12	0.14	136	14.95
337	2001	Nissan	Xterra	Measurement	IMStationDriveway	11AUG09:17:14:03	Before	14	12	118	249	63	2	-4	-6	0.23	11	14.89
339	1994	Toyota	4Runner	Selection	IMStationDriveway	11AUG09:15:59:53	Before	15	18	113	220	124	3	330	246	3.06	270	12.84
339	1994	Toyota	4Runner	Measurement	Kipling&470	12AUG09:11:22:17	Before	51	14	94	190	139	3	188	227	2.33	93	13.37
339	1994	Toyota	4Runner	Measurement	Caryl&470	12AUG09:11:24:56	Before	35	18	97	791	250	4	244	-134	0.04	773	14.99
339	1994	Toyota	4Runner	Measurement	Kipling&470	12AUG09:11:27:53	Before	50	23	94	205	181	4	183	114	4.28	572	11.96
339	1994	Toyota	4Runner	Measurement	Kipling&470	12AUG09:11:35:56	Before	35	17	94	225	172	4	106	35	0.03	1126	14.99
339	1994	Toyota	4Runner	Measurement	IMStationDriveway	12AUG09:11:44:06	Before	14	12	93	102	56	1	81	25	0.37	79	14.78

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
339	1994	Toyota	4Runner	Measurement	IMStationDriveway	12AUG09:11:44:58	Before	14	15	93	103	109	3	18	-28	0.05	1853	14.95
343	1991	VW	Golf	Selection	IMStationDriveway	12AUG09:10:19:47	Before	10	11	83	46	609	6	600	441	0.07	341	14.98
343	1991	VW	Golf	Measurement	Caryl&470	12AUG09:13:01:09	Before	36	21	95	1099	265	5	61	-31	0.12	646	14.95
343	1991	VW	Golf	Measurement	Kipling&470	12AUG09:13:04:48	Before	49	6	93	93	136	3	.	335	.	.	.
343	1991	VW	Golf	Measurement	Caryl&470	12AUG09:13:07:28	Before	35	22	97	1123	187	4	139	17	0.17	363	14.92
343	1991	VW	Golf	Measurement	Kipling&470	12AUG09:13:10:47	Before	50	9	93	117	159	3	.	777	.	.	.
343	1991	VW	Golf	Measurement	IMStationDriveway	12AUG09:13:19:22	Before	16	20	104	147	582	6	888	562	0.18	841	14.86
343	1991	VW	Golf	Measurement	IMStationDriveway	12AUG09:13:20:05	Before	13	16	104	148	962	6	720	594	0.18	384	14.89
348.432	1990	Dodge	Ram Charger	Selection	IMStationDriveway	12AUG09:12:33:26	Before	12	8	97	124	308	5	382	292	0.72	1300	14.48
348.432	1990	Dodge	Ram Charger	Measurement	IMStationDriveway	12AUG09:14:40:04	Before	12	8	101	181	115	3	470	406	1.39	1240	14.00
348.432	1990	Dodge	Ram Charger	Measurement	IMStationDriveway	12AUG09:14:40:55	Before	12	9	101	183	166	4	408	334	0.79	1702	14.41
350	2005	Subaru	Outback	Selection	IMStationDriveway	12AUG09:14:52:02	Before	13	17	104	187	54	1	-7	-29	0.02	16	15.04
350	2005	Subaru	Outback	Measurement	Caryl&470	12AUG09:15:52:51	Before	36	22	98	1566	251	4	177	204	0.00	-18	15.05
350	2005	Subaru	Outback	Measurement	Kipling&470	12AUG09:15:56:50	Before	53	24	93	528	180	4	137	68	0.47	-37	14.71
350	2005	Subaru	Outback	Measurement	Caryl&470	12AUG09:16:00:47	Before	36	19	98	1601	294	5	130	35	0.01	-25	15.04
350	2005	Subaru	Outback	Measurement	Kipling&470	12AUG09:16:04:37	Before	54	19	93	561	232	4	353	306	0.08	61	14.98
350	2005	Subaru	Outback	Measurement	IMStationDriveway	12AUG09:16:11:52	Before	14	14	115	229	51	1	54	-51	0.15	23	14.94
350	2005	Subaru	Outback	Measurement	IMStationDriveway	12AUG09:16:14:05	Before	13	14	115	232	79	2	-9	-59	0.10	-3	14.98
352	2001	Chevrolet	Astro	Selection	IMStationDriveway	12AUG09:16:04:18	Before	11	12	115	220	103	3	65	-210	0.05	3421	14.89
352	2001	Chevrolet	Astro	Measurement	Kipling&470	13AUG09:09:18:26	Before	51	6	80	574	100	3	241	93	5.10	419	11.38
352	2001	Chevrolet	Astro	Measurement	Caryl&470	13AUG09:09:25:22	Before	35	29	78	270	168	4	51	-76	0.10	356	14.97
352	2001	Chevrolet	Astro	Measurement	Kipling&470	13AUG09:09:29:13	Before	51	8	80	602	129	3	313	344	7.41	148	9.73
352	2001	Chevrolet	Astro	Measurement	Caryl&470	13AUG09:09:31:51	Before	37	22	79	300	139	3	50	69	0.10	-19	14.98
352	2001	Chevrolet	Astro	Measurement	IMStationDriveway	13AUG09:09:41:11	Before	15	13	81	32	197	4	67	88	0.10	2062	14.90
352	2001	Chevrolet	Astro	Measurement	IMStationDriveway	13AUG09:09:42:42	Before	12	10	81	35	109	3	65	28	0.10	575	14.96
354	1989	Jeep	Cherokee	Selection	IMStationDriveway	13AUG09:09:46:59	Before	10	7	81	38	1153	7	2835	1110	0.63	1797	14.45
354	1989	Jeep	Cherokee	Measurement	Caryl&470	13AUG09:12:50:42	Before	40	20	91	971	162	4	471	381	0.43	2185	14.65
354	1989	Jeep	Cherokee	Measurement	Caryl&470	13AUG09:13:00:36	Before	39	20	87	996	116	3	438	239	0.36	2156	14.70
354	1989	Jeep	Cherokee	Measurement	Caryl&470	13AUG09:13:07:57	Before	59	47	86	1018	208	4	1430	469	6.36	453	10.43
354	1989	Jeep	Cherokee	Measurement	Caryl&470	13AUG09:13:14:17	Before	56	41	86	1036	714	6	1468	199	4.85	497	11.52
354	1989	Jeep	Cherokee	Measurement	IMStationDriveway	13AUG09:13:21:57	Before	13	11	91	152	9350	7	11162	9613	0.30	2309	14.42
354	1989	Jeep	Cherokee	Measurement	IMStationDriveway	13AUG09:13:23:01	Before	13	12	91	154	575	6	2754	1066	0.53	2424	14.50
354	1989	Jeep	Cherokee	Measurement	IMStationDriveway	21AUG09:12:42:39	After	13	9	83	171	95	3	389	306	0.53	2048	14.59
354	1989	Jeep	Cherokee	Measurement	IMStationDriveway	21AUG09:12:44:02	After	12	9	83	173	75	2	323	176	0.44	2095	14.65
355	1993	Toyota	Corolla	Selection	IMStationDriveway	13AUG09:10:00:16	Before	10	6	82	42	418	5	2816	1424	0.24	1102	14.76
355	1993	Toyota	Corolla	Measurement	Kipling&470	13AUG09:11:11:59	Before	52	26	86	896	136	3	340	269	0.16	2048	14.86

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
355	1993	Toyota	Corolla	Measurement	Caryl&470	13AUG09:11:14:24	Before	39	26	88	641	89	2	342	157	0.13	926	14.92
355	1993	Toyota	Corolla	Measurement	Kipling&470	13AUG09:11:17:51	Before	53	17	86	915	144	3	.	686	.	.	.
355	1993	Toyota	Corolla	Measurement	Kipling&470	13AUG09:11:25:56	Before	37	22	87	938	236	4	707	510	0.05	2109	14.92
355	1993	Toyota	Corolla	Measurement	IMStationDriveway	13AUG09:11:33:43	Before	15	3	90	103	899	5	.	23662	.	.	.
355	1993	Toyota	Corolla	Measurement	IMStationDriveway	13AUG09:11:35:17	Before	13	17	90	106	427	5	2899	-953	0.45	1129	14.61
357	1997	Nissan	Pathfinder	Selection	IMStationDriveway	13AUG09:12:10:31	Before	13	15	95	122	672	6	1008	592	0.29	2694	14.72
357	1997	Nissan	Pathfinder	Measurement	Kipling&470	21AUG09:15:28:12	Before	51	14	88	645	184	4	52	-69	0.15	1516	14.89
357	1997	Nissan	Pathfinder	Measurement	Caryl&470	21AUG09:15:33:32	Before	36	18	96	1472	70	2	33	12	0.04	149	15.02
357	1997	Nissan	Pathfinder	Measurement	Kipling&470	21AUG09:15:36:18	Before	49	27	88	678	217	4	76	20	0.03	880	15.00
357	1997	Nissan	Pathfinder	Measurement	Caryl&470	21AUG09:15:41:41	Before	36	20	96	1500	100	3	10	-1	0.06	116	15.01
357	1997	Nissan	Pathfinder	Measurement	IMStationDriveway	21AUG09:15:49:31	Before	16	16	102	292	816	6	624	487	0.07	756	14.96
357	1997	Nissan	Pathfinder	Measurement	IMStationDriveway	21AUG09:15:50:44	Before	14	15	102	294	307	5	314	66	0.06	544	14.98
361	1995	VW	Golf	Selection	IMStationDriveway	13AUG09:16:18:48	Before	12	14	98	216	92	2	288	187	3.54	1342	12.46
361	1995	VW	Golf	Measurement	Caryl&470	14AUG09:10:07:20	Before	37	23	74	379	155	4	208	128	0.58	2666	14.54
361	1995	VW	Golf	Measurement	Kipling&470	14AUG09:10:10:36	Before	53	29	73	526	156	4	137	92	0.50	2661	14.59
361	1995	VW	Golf	Measurement	Caryl&470	14AUG09:10:14:47	Before	38	22	74	404	166	4	188	199	0.59	2159	14.55
361	1995	VW	Golf	Measurement	Kipling&470	14AUG09:10:17:52	Before	52	9	73	544	117	3	23	-17	0.73	1791	14.47
361	1995	VW	Golf	Measurement	IMStationDriveway	14AUG09:10:25:19	Before	17	16	74	72	99	3	169	145	0.52	2344	14.60
361	1995	VW	Golf	Measurement	IMStationDriveway	14AUG09:10:26:31	Before	15	14	75	74	94	3	163	111	0.49	2418	14.61
362	2001	Audi	TT Quatro	Selection	IMStationDriveway	14AUG09:09:56:04	Before	15	23	74	63	222	4	53	46	0.63	306	14.59
362	2001	Audi	TT Quatro	Measurement	Kipling&470	14AUG09:11:38:26	Before	53	12	74	787	106	3	160	169	0.10	393	14.96
362	2001	Audi	TT Quatro	Measurement	Caryl&470	14AUG09:11:41:14	Before	38	32	79	707	178	4	163	145	0.03	159	15.02
362	2001	Audi	TT Quatro	Measurement	Kipling&470	14AUG09:11:44:08	Before	54	32	74	803	155	4	69	69	0.32	1197	14.78
362	2001	Audi	TT Quatro	Measurement	Caryl&470	14AUG09:11:48:34	Before	35	20	78	734	234	4	153	47	0.15	82	14.94
362	2001	Audi	TT Quatro	Measurement	IMStationDriveway	14AUG09:11:57:02	Before	13	6	81	125	46	1	29	21	0.21	42	14.90
362	2001	Audi	TT Quatro	Measurement	IMStationDriveway	14AUG09:12:00:31	Before	15	12	81	130	65	2	73	24	0.44	59	14.74
364	1995	Buick	Roadmaster	Selection	IMStationDriveway	14AUG09:11:23:21	Before	10	14	77	109	443	5	1976	767	0.13	434	14.89
364	1995	Buick	Roadmaster	Measurement	Caryl&470	14AUG09:13:26:12	Before	37	20	82	1070	258	4	397	401	-0.05	159	15.07
364	1995	Buick	Roadmaster	Measurement	Caryl&470	14AUG09:13:32:27	Before	37	19	82	1098	284	5	271	205	0.00	-6	15.04
364	1995	Buick	Roadmaster	Measurement	Kipling&470	14AUG09:13:35:39	Before	53	16	77	237	169	4	296	214	0.03	-7	15.03
364	1995	Buick	Roadmaster	Measurement	Caryl&470	14AUG09:13:39:43	Before	58	39	76	1116	312	5	242	113	0.01	116	15.04
364	1995	Buick	Roadmaster	Measurement	IMStationDriveway	14AUG09:13:47:34	Before	18	19	83	186	375	5	1088	183	0.02	40	15.01
364	1995	Buick	Roadmaster	Measurement	IMStationDriveway	14AUG09:13:48:58	Before	14	16	83	188	386	5	939	137	0.02	280	15.00
365	2002	Ford	Mustang	Selection	IMStationDriveway	14AUG09:12:19:43	Before	11	7	82	146	75	2	19	19	0.05	-7	15.02
365	2002	Ford	Mustang	Measurement	Kipling&470	14AUG09:16:27:42	Before	52	20	85	765	129	3	32	1	0.05	-12	15.02
365	2002	Ford	Mustang	Measurement	Caryl&470	14AUG09:16:30:39	Before	37	22	79	1650	204	4	122	-72	0.01	595	15.02

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
365	2002	Ford	Mustang	Measurement	Kipling&470	14AUG09:16:34:33	Before	54	23	84	796	154	4	39	-22	0.04	91	15.02
365	2002	Ford	Mustang	Measurement	Caryl&470	14AUG09:16:38:48	Before	39	24	77	1687	300	5	182	-33	0.00	46	15.05
365	2002	Ford	Mustang	Measurement	IMStationDriveway	14AUG09:16:47:40	Before	16	17	81	280	70	2	-25	-62	0.00	27	15.05
365	2002	Ford	Mustang	Measurement	IMStationDriveway	14AUG09:16:48:56	Before	4	0	81	282	109	3	11	-83	0.00	1781	14.99
365	2002	Ford	Mustang	Measurement	IMStationDriveway	14AUG09:16:50:36	Before	16	17	81	283	80	2	26	18	0.03	12	15.03
367	1993	Chevrolet	Van 20 / G20	Selection	IMStationDriveway	14AUG09:13:34:05	Before	15	16	89	178	858	6	911	1117	4.50	620	11.78
367	1993	Chevrolet	Van 20 / G20	Measurement	Caryl&470	14AUG09:15:00:03	Before	34	24	83	1364	375	5	413	275	1.17	1701	14.14
367	1993	Chevrolet	Van 20 / G20	Measurement	Kipling&470	14AUG09:15:03:01	Before	50	9	82	536	148	3	270	286	3.72	1402	12.33
367	1993	Chevrolet	Van 20 / G20	Measurement	Caryl&470	14AUG09:15:06:50	Before	39	20	82	1390	365	5	348	402	0.61	718	14.58
367	1993	Chevrolet	Van 20 / G20	Measurement	Kipling&470	14AUG09:15:18:41	Before	51	26	83	599	200	4	262	253	1.24	1622	14.10
367	1993	Chevrolet	Van 20 / G20	Measurement	IMStationDriveway	14AUG09:15:26:58	Before	13	7	94	244	769	6	1160	1833	0.82	430	14.41
367	1993	Chevrolet	Van 20 / G20	Measurement	IMStationDriveway	14AUG09:15:28:53	Before	12	8	94	247	1339	7	1882	3890	0.49	457	14.63
367	1993	Chevrolet	Van 20 / G20	Measurement	IMStationDriveway	18AUG09:15:29:14	After	11	6	73	148	813	6	551	521	0.46	418	14.69
367	1993	Chevrolet	Van 20 / G20	Measurement	IMStationDriveway	18AUG09:15:31:34	After	12	8	73	151	1010	6	1026	1331	0.42	648	14.70
370	2003	Land Rover	Discovery	Selection	IMStationDriveway	17AUG09:08:34:11	Before	16	21	61	10	85	2	15	-24	0.04	30	15.03
370	2003	Land Rover	Discovery	Measurement	Kipling&470	17AUG09:09:48:28	Before	51	30	75	550	124	3	-8	-51	0.01	67	15.04
370	2003	Land Rover	Discovery	Measurement	Caryl&470	17AUG09:09:51:08	Before	38	19	70	504	243	4	88	-101	0.00	60	15.05
370	2003	Land Rover	Discovery	Measurement	Kipling&470	17AUG09:09:54:09	Before	54	35	75	581	174	4	37	-54	0.24	10	14.88
370	2003	Land Rover	Discovery	Measurement	Caryl&470	17AUG09:09:57:27	Before	37	22	69	526	303	5	127	22	0.01	39	15.04
370	2003	Land Rover	Discovery	Measurement	IMStationDriveway	17AUG09:10:04:47	Before	13	9	67	61	137	3	24	-33	0.00	20	15.05
370	2003	Land Rover	Discovery	Measurement	IMStationDriveway	17AUG09:10:06:22	Before	13	9	67	63	118	3	16	15	0.02	13	15.04
371	1996	Toyota	Corolla	Selection	IMStationDriveway	17AUG09:08:39:23	Before	19	20	61	12	39	1	173	208	0.94	527	14.36
371	1996	Toyota	Corolla	Measurement	Kipling&470	17AUG09:13:10:47	Before	52	37	80	167	199	4	261	345	3.63	1114	12.40
371	1996	Toyota	Corolla	Measurement	Caryl&470	17AUG09:13:14:49	Before	35	15	79	1121	215	4	.	254	.	.	.
371	1996	Toyota	Corolla	Measurement	Kipling&470	17AUG09:13:17:47	Before	53	31	80	189	219	4	449	475	4.08	892	12.09
371	1996	Toyota	Corolla	Measurement	Caryl&470	17AUG09:13:21:06	Before	38	19	79	1147	259	4	.	112	.	.	.
371	1996	Toyota	Corolla	Measurement	IMStationDriveway	17AUG09:13:29:03	Before	15	14	84	164	87	2	17	27	0.00	1086	15.01
371	1996	Toyota	Corolla	Measurement	IMStationDriveway	17AUG09:13:29:49	Before	15	14	84	166	76	2	45	-5	0.10	589	14.96
375	2005	Ford	Focus	Selection	IMStationDriveway	17AUG09:10:23:15	Before	15	19	68	77	53	1	7	-2	0.02	19	15.04
375	2005	Ford	Focus	Measurement	Kipling&470	17AUG09:11:46:40	Before	56	19	78	842	171	4	.	-132	.	.	.
375	2005	Ford	Focus	Measurement	Caryl&470	17AUG09:11:56:05	Before	39	17	75	890	303	5	164	-6	0.00	28	15.05
375	2005	Ford	Focus	Measurement	Kipling&470	17AUG09:11:59:08	Before	56	28	79	868	185	4	300	165	0.10	-107	14.98
375	2005	Ford	Focus	Measurement	Caryl&470	17AUG09:12:03:34	Before	37	13	76	912	307	5	-3	-86	-0.06	9	15.10
375	2005	Ford	Focus	Measurement	IMStationDriveway	17AUG09:12:11:31	Before	15	18	76	131	98	3	23	-3	0.03	-3	15.03
375	2005	Ford	Focus	Measurement	IMStationDriveway	17AUG09:12:13:14	Before	14	19	76	133	72	2	7	1	0.03	1260	14.99
379	1993	Subaru	Legacy	Selection	IMStationDriveway	17AUG09:14:31:47	Before	9	6	85	208	164	4	27	2	0.06	725	14.99

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
379	1993	Subaru	Legacy	Measurement	Kipling&470	17AUG09:15:41:59	Before	53	25	79	610	117	3	279	146	3.60	840	12.43
379	1993	Subaru	Legacy	Measurement	Caryl&470	17AUG09:15:46:32	Before	38	20	72	1577	238	4	1	-79	0.07	740	14.98
379	1993	Subaru	Legacy	Measurement	Kipling&470	17AUG09:15:50:24	Before	55	25	79	648	179	4	325	258	4.58	736	11.74
379	1993	Subaru	Legacy	Measurement	Caryl&470	17AUG09:15:54:33	Before	37	20	71	1604	264	4	95	33	0.72	343	14.52
379	1993	Subaru	Legacy	Measurement	IMStationDriveway	17AUG09:16:03:01	Before	14	12	80	252	81	2	59	14	0.14	496	14.94
379	1993	Subaru	Legacy	Measurement	IMStationDriveway	17AUG09:16:04:03	Before	12	13	79	254	126	3	43	29	0.10	520	14.96
381	1998	Jeep	Cherokee	Selection	IMStationDriveway	17AUG09:15:14:17	Before	17	22	86	228	190	4	133	96	2.00	1314	13.57
381	1998	Jeep	Cherokee	Measurement	Kipling&470	17AUG09:16:30:42	Before	50	23	78	792	290	5	201	142	0.91	2646	14.30
381	1998	Jeep	Cherokee	Measurement	Caryl&470	17AUG09:16:34:24	Before	40	22	69	1708	339	5	198	32	0.64	2647	14.50
381	1998	Jeep	Cherokee	Measurement	Kipling&470	17AUG09:16:38:45	Before	56	35	78	837	134	3	98	97	0.65	2892	14.48
381	1998	Jeep	Cherokee	Measurement	Caryl&470	17AUG09:16:42:42	Before	39	20	69	1732	317	5	117	49	0.47	2327	14.63
381	1998	Jeep	Cherokee	Measurement	IMStationDriveway	17AUG09:16:52:34	Before	14	12	75	266	142	3	62	45	0.37	1853	14.72
381	1998	Jeep	Cherokee	Measurement	IMStationDriveway	17AUG09:16:53:23	Before	14	15	75	268	112	3	52	-18	0.35	1978	14.73
383	1994	Chevrolet	S-10	Selection	IMStationDriveway	17AUG09:16:59:41	Before	12	18	74	271	830	6	737	557	4.76	217	11.61
383	1994	Chevrolet	S-10	Measurement	Kipling&470	18AUG09:09:12:04	Before	53	21	76	563	179	4	.	58	.	.	.
383	1994	Chevrolet	S-10	Measurement	Caryl&470	18AUG09:09:16:01	Before	38	22	73	312	260	4	215	-66	0.03	678	15.00
383	1994	Chevrolet	S-10	Measurement	Kipling&470	18AUG09:09:20:45	Before	53	26	76	585	151	4	76	-179	0.65	317	14.58
383	1994	Chevrolet	S-10	Measurement	Caryl&470	18AUG09:09:24:56	Before	36	27	74	348	179	4	114	129	0.04	2627	14.93
383	1994	Chevrolet	S-10	Measurement	IMStationDriveway	18AUG09:09:34:31	Before	12	7	68	46	89	2	36	20	0.05	1749	14.95
383	1994	Chevrolet	S-10	Measurement	IMStationDriveway	18AUG09:09:36:05	Before	13	12	68	48	145	3	114	66	0.30	257	14.83
385	2001	Dodge	Dakota	Selection	IMStationDriveway	18AUG09:08:32:20	Before	13	19	64	15	138	3	33	10	4.40	15	11.90
385	2001	Dodge	Dakota	Measurement	Kipling&470	18AUG09:11:05:22	Before	51	30	81	859	181	4	53	13	4.45	0	11.86
385	2001	Dodge	Dakota	Measurement	Caryl&470	18AUG09:11:09:25	Before	41	28	83	689	280	5	104	29	0.12	32	14.96
385	2001	Dodge	Dakota	Measurement	Kipling&470	18AUG09:11:12:52	Before	54	13	81	878	191	4	115	-12	0.38	29	14.78
385	2001	Dodge	Dakota	Measurement	Caryl&470	18AUG09:11:16:01	Before	36	23	83	713	319	5	229	-90	0.02	21	15.03
385	2001	Dodge	Dakota	Measurement	IMStationDriveway	18AUG09:11:24:44	Before	13	9	81	94	110	3	20	-18	0.01	-7	15.04
385	2001	Dodge	Dakota	Measurement	IMStationDriveway	18AUG09:11:25:38	Before	14	11	81	96	70	2	-2	5	0.03	4	15.04
387	2000	Jeep	Grand Cherokee	Selection	IMStationDriveway	18AUG09:11:22:01	Before	18	26	79	93	99	3	13	-36	0.05	254	15.01
387	2000	Jeep	Grand Cherokee	Measurement	Kipling&470	18AUG09:12:33:33	Before	53	18	83	26	142	3	46	53	0.07	105	15.00
387	2000	Jeep	Grand Cherokee	Measurement	Caryl&470	18AUG09:12:38:10	Before	36	25	78	1000	307	5	241	204	0.00	32	15.05
387	2000	Jeep	Grand Cherokee	Measurement	Kipling&470	18AUG09:12:41:29	Before	52	27	83	42	105	3	72	-48	0.09	193	14.98
387	2000	Jeep	Grand	Measurement	Caryl&470	18AUG09:12:45:55	Before	37	22	76	1031	288	5	83	-1	0.00	7	15.05

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)															
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
			Cherokee															
387	2000	Jeep	Grand Cherokee	Measurement	IMStationDriveway	18AUG09:12:59:34	Before	13	8	78	132	76	2	5	2	-0.01	919	15.03
387	2000	Jeep	Grand Cherokee	Measurement	IMStationDriveway	18AUG09:13:00:47	Before	15	14	78	134	67	2	13	17	0.00	1120	15.01
391	1999	Isuzu	Rodeo	Selection	IMStationDriveway	19AUG09:10:09:08	Before	15	19	76	51	58	2	-4	-1	0.07	412	14.99
391	1999	Isuzu	Rodeo	Measurement	Kipling&470	19AUG09:11:19:52	Before	51	20	83	857	148	3	398	264	3.39	1409	12.56
391	1999	Isuzu	Rodeo	Measurement	Caryl&470	19AUG09:11:23:16	Before	40	22	79	724	241	4	184	97	0.05	959	14.97
391	1999	Isuzu	Rodeo	Measurement	Kipling&470	19AUG09:11:26:39	Before	52	24	84	876	129	3	283	254	2.27	1877	13.35
391	1999	Isuzu	Rodeo	Measurement	Caryl&470	19AUG09:11:42:11	Before	38	25	79	790	323	5	197	-146	0.09	600	14.96
391	1999	Isuzu	Rodeo	Measurement	IMStationDriveway	19AUG09:11:49:50	Before	12	8	81	95	77	2	65	-24	0.07	173	15.00
391	1999	Isuzu	Rodeo	Measurement	IMStationDriveway	19AUG09:11:50:51	Before	13	10	81	98	81	2	22	-23	0.12	189	14.96
392	1999	Honda	Accord	Selection	IMStationDriveway	19AUG09:12:24:37	Before	17	23	83	110	110	3	32	207	3.78	43	12.34
392	1999	Honda	Accord	Measurement	Kipling&470	19AUG09:14:03:09	Before	49	18	85	305	238	4	132	103	3.56	409	12.48
392	1999	Honda	Accord	Measurement	Caryl&470	19AUG09:14:07:14	Before	35	25	82	1273	348	5	191	108	0.26	91	14.86
392	1999	Honda	Accord	Measurement	Caryl&470	19AUG09:14:13:25	Before	33	26	82	1287	237	4	75	26	0.14	18	14.95
392	1999	Honda	Accord	Measurement	Kipling&470	19AUG09:14:16:36	Before	51	34	85	343	136	3	102	81	5.18	179	11.33
392	1999	Honda	Accord	Measurement	Caryl&470	19AUG09:14:20:55	Before	34	21	82	1309	285	5	74	-33	0.30	35	14.84
392	1999	Honda	Accord	Measurement	IMStationDriveway	19AUG09:14:28:20	Before	15	14	94	164	78	2	-3	12	0.05	20	15.01
392	1999	Honda	Accord	Measurement	IMStationDriveway	19AUG09:14:29:32	Before	13	14	94	167	95	3	-2	2	0.03	26	15.03
393	2001	Toyota	Solara	Selection	IMStationDriveway	19AUG09:12:41:55	Before	13	22	84	115	536	6	332	-113	0.07	469	14.98
393	2001	Toyota	Solara	Measurement	Caryl&470	19AUG09:15:04:25	Before	33	19	84	1428	277	5	92	-4	0.00	3373	14.93
393	2001	Toyota	Solara	Measurement	Kipling&470	19AUG09:15:08:23	Before	52	28	84	477	319	5	217	114	0.79	48	14.48
393	2001	Toyota	Solara	Measurement	Caryl&470	19AUG09:15:12:20	Before	37	19	84	1454	425	5	203	120	0.00	3243	14.93
393	2001	Toyota	Solara	Measurement	Kipling&470	19AUG09:15:16:22	Before	53	29	84	511	141	3	88	64	0.19	71	14.91
393	2001	Toyota	Solara	Measurement	IMStationDriveway	19AUG09:15:30:23	Before	13	10	100	191	125	3	124	97	0.01	1003	15.00
393	2001	Toyota	Solara	Measurement	IMStationDriveway	19AUG09:15:32:16	Before	12	14	100	195	584	6	286	254	0.01	3518	14.91
395	1997	Chevrolet	S-10	Selection	IMStationDriveway	19AUG09:13:53:27	Before	14	13	87	144	162	4	186	243	0.70	82	14.54
395	1997	Chevrolet	S-10	Measurement	Kipling&470	20AUG09:09:28:45	Before	58	27	74	692	163	4	281	76	3.16	541	12.76
395	1997	Chevrolet	S-10	Measurement	Caryl&470	20AUG09:09:32:04	Before	45	26	71	381	271	5	146	-21	0.13	-14	14.96
395	1997	Chevrolet	S-10	Measurement	Kipling&470	20AUG09:09:35:11	Before	56	27	74	708	110	3	68	60	0.12	2159	14.89
395	1997	Chevrolet	S-10	Measurement	Caryl&470	20AUG09:09:38:22	Before	38	25	71	409	309	5	303	28	0.02	14	15.03
395	1997	Chevrolet	S-10	Measurement	IMStationDriveway	20AUG09:09:45:58	Before	13	10	66	37	177	4	257	-328	0.02	165	15.02
395	1997	Chevrolet	S-10	Measurement	IMStationDriveway	20AUG09:09:47:06	Before	13	16	66	38	312	5	194	62	0.10	82	14.97
396	2000	Mercury	Mystique	Selection	IMStationDriveway	19AUG09:14:15:38	Before	12	11	93	157	61	2	103	71	0.92	50	14.39
396	2000	Mercury	Mystique	Measurement	Kipling&470	19AUG09:16:35:00	Before	50	36	85	757	166	4	320	193	4.87	76	11.55

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
396	2000	Mercury	Mystique	Measurement	Caryl&470	19AUG09:16:38:28	Before	37	19	85	1708	229	4	132	-236	-0.02	-18	15.06
396	2000	Mercury	Mystique	Measurement	Kipling&470	19AUG09:16:42:18	Before	55	17	85	793	220	4	150	102	8.64	44	8.85
396	2000	Mercury	Mystique	Measurement	Caryl&470	19AUG09:16:46:32	Before	35	18	85	1744	260	4	149	-43	0.14	-13	14.95
396	2000	Mercury	Mystique	Measurement	IMStationDriveway	19AUG09:16:55:17	Before	14	13	103	224	74	2	-25	-80	0.20	-12	14.91
396	2000	Mercury	Mystique	Measurement	IMStationDriveway	19AUG09:16:58:18	Before	12	14	104	231	90	3	-27	-115	0.22	38	14.90
397	2005	Ford	Freestyle	Selection	IMStationDriveway	19AUG09:16:32:51	Before	11	16	103	220	84	2	-14	16	0.01	-13	15.05
397	2005	Ford	Freestyle	Measurement	Kipling&470	20AUG09:11:11:24	Before	50	34	81	951	250	4	56	-82	0.00	136	15.04
397	2005	Ford	Freestyle	Measurement	Caryl&470	20AUG09:11:14:38	Before	35	23	77	720	256	4	.	12	.	.	.
397	2005	Ford	Freestyle	Measurement	Kipling&470	20AUG09:11:17:28	Before	53	34	81	974	177	4	80	-36	0.03	50	15.03
397	2005	Ford	Freestyle	Measurement	Caryl&470	20AUG09:11:20:42	Before	33	17	77	742	272	5	.	-93	.	.	.
397	2005	Ford	Freestyle	Measurement	Kipling&470	20AUG09:11:24:02	Before	52	27	81	994	167	4	-1	-47	0.04	60	15.02
397	2005	Ford	Freestyle	Measurement	Caryl&470	20AUG09:11:28:20	Before	38	20	77	767	215	4	.	119	.	.	.
397	2005	Ford	Freestyle	Measurement	IMStationDriveway	20AUG09:11:40:28	Before	16	-33	77	110	53	1	-2	-156	-0.02	-61	15.07
397	2005	Ford	Freestyle	Measurement	IMStationDriveway	20AUG09:11:41:30	Before	14	12	77	111	75	2	-2	-15	0.07	-17	15.00
401	1995	Lexus	SC 300	Selection	IMStationDriveway	20AUG09:10:42:20	Before	16	20	72	75	88	2	3	-23	0.07	832	14.98
401	1995	Lexus	SC 300	Measurement	Caryl&470	20AUG09:12:12:43	Before	37	22	80	903	223	4	264	114	0.01	178	15.03
401	1995	Lexus	SC 300	Measurement	Kipling&470	20AUG09:12:16:12	Before	54	60	81	1145	314	5	272	-133	0.02	1898	14.96
401	1995	Lexus	SC 300	Measurement	Caryl&470	20AUG09:12:19:40	Before	38	23	80	924	292	5	299	85	-0.02	247	15.05
401	1995	Lexus	SC 300	Measurement	Kipling&470	20AUG09:12:22:45	Before	55	32	81	1166	207	4	53	-78	0.02	16	15.04
401	1995	Lexus	SC 300	Measurement	IMStationDriveway	20AUG09:12:30:14	Before	14	11	82	128	100	3	1	-5	0.01	40	15.04
401	1995	Lexus	SC 300	Measurement	IMStationDriveway	20AUG09:12:31:15	Before	13	12	82	129	121	3	12	10	0.01	21	15.04
402	2004	Hyundai	Elantra	Selection	IMStationDriveway	20AUG09:11:13:08	Before	13	17	75	88	77	2	.	372	.	.	.
402	2004	Hyundai	Elantra	Measurement	Kipling&470	20AUG09:13:50:09	Before	52	18	82	251	122	3	.	60	.	.	.
402	2004	Hyundai	Elantra	Measurement	Caryl&470	20AUG09:13:53:21	Before	39	28	80	1226	484	5	1264	40	0.79	-35	14.45
402	2004	Hyundai	Elantra	Measurement	Kipling&470	20AUG09:13:56:15	Before	56	29	83	263	195	4	.	-605	.	.	.
402	2004	Hyundai	Elantra	Measurement	Caryl&470	20AUG09:13:59:30	Before	38	23	80	1249	403	5	365	253	0.08	-27	14.99
402	2004	Hyundai	Elantra	Measurement	IMStationDriveway	20AUG09:14:07:00	Before	15	17	92	174	93	3	-20	-91	0.04	15	15.03
402	2004	Hyundai	Elantra	Measurement	IMStationDriveway	20AUG09:14:08:07	Before	13	13	92	178	86	2	-7	65	0.06	-69	15.01
404	1998	Isuzu	Rodeo	Selection	IMStationDriveway	20AUG09:13:17:53	Before	17	12	85	144	93	3	91	55	0.34	258	14.80
404	1998	Isuzu	Rodeo	Measurement	Kipling&470	20AUG09:16:43:15	Before	52	25	82	852	98	3	470	379	4.10	1371	12.05
404	1998	Isuzu	Rodeo	Measurement	Caryl&470	20AUG09:16:46:22	Before	38	23	85	1795	285	5	174	4	0.22	586	14.87
404	1998	Isuzu	Rodeo	Measurement	Kipling&470	20AUG09:16:50:19	Before	53	23	82	878	186	4	301	199	1.90	1880	13.62
404	1998	Isuzu	Rodeo	Measurement	Caryl&470	20AUG09:16:54:22	Before	36	19	85	1821	326	5	294	196	0.08	168	14.98
404	1998	Isuzu	Rodeo	Measurement	IMStationDriveway	20AUG09:17:03:14	Before	13	14	103	242	83	2	6	12	0.07	234	14.99
404	1998	Isuzu	Rodeo	Measurement	IMStationDriveway	20AUG09:17:04:19	Before	12	10	103	243	85	2	38	42	0.11	210	14.97
404	1998	Isuzu	Rodeo	Measurement	IMStationDriveway	26AUG09:08:48:19	After	12	8	67	24	95	3	31	51	0.09	32	14.99

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
404	1998	Isuzu	Rodeo	Measurement	IMStationDriveway	26AUG09:08:49:43	After	13	10	67	28	83	2	60	34	0.12	115	14.96
405	1996	Chevrolet	Cavalier	Selection	IMStationDriveway	20AUG09:13:25:04	Before	16	18	87	146	66	2	184	210	2.56	285	13.20
405	1996	Chevrolet	Cavalier	Measurement	Kipling&470	20AUG09:15:22:23	Before	52	18	83	514	177	4	278	204	4.27	366	11.97
405	1996	Chevrolet	Cavalier	Measurement	Caryl&470	20AUG09:15:26:19	Before	37	21	84	1532	274	5	.	-166	.	.	.
405	1996	Chevrolet	Cavalier	Measurement	Kipling&470	20AUG09:15:30:10	Before	51	18	83	534	245	4	650	865	4.12	645	12.06
405	1996	Chevrolet	Cavalier	Measurement	Caryl&470	20AUG09:15:34:07	Before	34	26	84	1552	256	4	232	285	2.15	174	13.50
405	1996	Chevrolet	Cavalier	Measurement	IMStationDriveway	20AUG09:15:43:32	Before	12	6	99	209	82	2	10	-8	0.08	-13	15.00
405	1996	Chevrolet	Cavalier	Measurement	IMStationDriveway	20AUG09:15:44:37	Before	12	9	99	211	118	3	63	71	0.11	295	14.97
416	1999	Mazda	Protege	Selection	IMStationDriveway	21AUG09:10:29:47	Before	12	10	73	92	177	4	20	-5	0.12	817	14.94
416	1999	Mazda	Protege	Measurement	Caryl&470	21AUG09:11:40:56	Before	35	23	74	733	120	3	24	4	0.10	632	14.96
416	1999	Mazda	Protege	Measurement	Kipling&470	21AUG09:11:42:32	Before	54	34	84	1010	185	4	.	-118	.	.	.
416	1999	Mazda	Protege	Measurement	Caryl&470	21AUG09:11:47:08	Before	37	19	75	748	94	3	68	89	0.03	3143	14.91
416	1999	Mazda	Protege	Measurement	Kipling&470	21AUG09:11:48:44	Before	53	29	85	1028	110	3	80	15	4.88	630	11.53
416	1999	Mazda	Protege	Measurement	IMStationDriveway	21AUG09:11:56:27	Before	14	14	79	150	83	2	-4	-16	0.07	941	14.97
416	1999	Mazda	Protege	Measurement	IMStationDriveway	21AUG09:11:57:25	Before	13	13	79	151	94	3	16	16	0.19	349	14.91
420	1996	Jeep	Grand Cherokee	Selection	IMStationDriveway	21AUG09:12:41:37	Before	13	15	83	170	187	4	125	140	0.27	808	14.83
420	1996	Jeep	Grand Cherokee	Measurement	Kipling&470	21AUG09:13:51:46	Before	51	35	87	314	261	4	273	24	2.13	1928	13.45
420	1996	Jeep	Grand Cherokee	Measurement	Caryl&470	21AUG09:13:56:00	Before	39	26	80	1131	77	2	-5	13	0.32	349	14.81
420	1996	Jeep	Grand Cherokee	Measurement	Kipling&470	21AUG09:13:57:33	Before	52	14	87	330	229	4	458	394	4.00	1099	12.14
420	1996	Jeep	Grand Cherokee	Measurement	Caryl&470	21AUG09:14:03:26	Before	39	22	82	1159	88	2	11	-57	0.07	422	14.99
420	1996	Jeep	Grand Cherokee	Measurement	IMStationDriveway	21AUG09:14:09:50	Before	13	10	96	234	118	3	156	73	0.14	322	14.94
420	1996	Jeep	Grand Cherokee	Measurement	IMStationDriveway	21AUG09:14:10:54	Before	14	10	96	235	103	3	112	5	0.12	501	14.95
424	1970	VW	Beetle	Selection	IMStationDriveway	21AUG09:15:07:35	Before	13	10	102	263	766	5	4839	6587	4.53	1309	11.61
424	1970	VW	Beetle	Measurement	IMStationDriveway	21AUG09:16:32:40	Before	13	13	107	300	90	2	1249	638	3.41	1775	12.51
424	1970	VW	Beetle	Measurement	IMStationDriveway	21AUG09:16:33:43	Before	11	10	107	301	176	4	1010	202	2.50	2007	13.16
425	1998	Mitsubishi	Eclipse	Selection	IMStationDriveway	24AUG09:08:47:43	Before	13	11	73	315	57	1	36	23	0.09	511	14.97
425	1998	Mitsubishi	Eclipse	Measurement	Kipling&470	24AUG09:09:58:08	Before	51	24	81	794	84	2	123	125	0.27	780	14.83
425	1998	Mitsubishi	Eclipse	Measurement	Kipling&470	24AUG09:10:05:04	Before	54	26	81	816	125	3	170	78	2.56	1017	13.18
425	1998	Mitsubishi	Eclipse	Measurement	Caryl&470	24AUG09:10:09:21	Before	37	26	80	517	75	2	-5	-2	-0.01	152	15.05

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)															
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
425	1998	Mitsubishi	Eclipse	Measurement	Kipling&470	24AUG09:10:11:19	Before	34	16	81	832	131	3	43	-103	0.03	52	15.03
425	1998	Mitsubishi	Eclipse	Measurement	IMStationDriveway	24AUG09:10:19:24	Before	14	11	80	54	65	2	3	12	0.03	240	15.03
425	1998	Mitsubishi	Eclipse	Measurement	IMStationDriveway	24AUG09:10:20:20	Before	14	12	80	57	73	2	7	6	0.03	26	15.03
427	1984	Toyota	Land Cruiser	Selection	IMStationDriveway	24AUG09:09:19:40	Before	13	14	80	16	355	5	1364	1235	2.82	1308	12.94
427	1984	Toyota	Land Cruiser	Measurement	Kipling&470	24AUG09:13:25:35	Before	48	28	83	178	125	3	388	375	2.66	1816	13.07
427	1984	Toyota	Land Cruiser	Measurement	Caryl&470	24AUG09:13:32:10	Before	35	15	85	1109	71	2	497	417	0.10	1610	14.91
427	1984	Toyota	Land Cruiser	Measurement	Kipling&470	24AUG09:13:36:18	Before	44	25	83	205	205	4	355	281	2.76	1858	13.00
427	1984	Toyota	Land Cruiser	Measurement	Caryl&470	24AUG09:13:42:08	Before	38	19	86	1140	132	3	666	504	0.19	2597	14.80
427	1984	Toyota	Land Cruiser	Measurement	IMStationDriveway	24AUG09:13:49:48	Before	12	10	87	180	871	6	2422	2687	1.32	1405	13.98
427	1984	Toyota	Land Cruiser	Measurement	IMStationDriveway	24AUG09:13:50:55	Before	14	10	87	181	3625	7	2857	4244	0.44	2054	14.58
428	1975	Chevrolet	C-10	Selection	IMStationDriveway	24AUG09:09:27:42	Before	15	14	80	19	574	5	6058	5217	6.66	649	10.07
428	1975	Chevrolet	C-10	Measurement	Kipling&470	24AUG09:14:58:06	Before	46	25	83	402	572	5	5274	4909	3.49	1396	12.34
428	1975	Chevrolet	C-10	Measurement	Caryl&470	24AUG09:15:03:43	Before	39	20	85	1361	234	3	5817	5316	4.91	727	11.33
428	1975	Chevrolet	C-10	Measurement	Kipling&470	24AUG09:15:06:17	Before	50	24	83	429	615	5	4378	2953	3.28	1254	12.53
428	1975	Chevrolet	C-10	Measurement	Caryl&470	24AUG09:15:11:42	Before	42	23	84	1391	119	2	5210	4124	6.14	613	10.48
428	1975	Chevrolet	C-10	Measurement	IMStationDriveway	24AUG09:15:20:03	Before	13	12	80	227	1305	7	4576	3939	3.80	701	12.17
428	1975	Chevrolet	C-10	Measurement	IMStationDriveway	24AUG09:15:21:22	Before	13	11	80	230	895	6	4490	3923	4.42	640	11.73
430	2002	Jeep	Wrangler	Selection	IMStationDriveway	24AUG09:10:30:27	Before	12	18	81	63	171	4	148	-28	0.07	18	15.00
430	2002	Jeep	Wrangler	Measurement	Kipling&470	24AUG09:11:46:47	Before	54	39	81	1029	89	2	39	100	0.02	149	15.04
430	2002	Jeep	Wrangler	Measurement	Caryl&470	24AUG09:11:52:03	Before	39	26	87	823	80	2	-17	-4	0.02	37	15.04
430	2002	Jeep	Wrangler	Measurement	Kipling&470	24AUG09:11:53:41	Before	54	10	81	1047	96	3	29	-95	1.62	-32	13.89
430	2002	Jeep	Wrangler	Measurement	Caryl&470	24AUG09:11:59:05	Before	42	34	87	848	73	2	43	6	0.35	3	14.80
430	2002	Jeep	Wrangler	Measurement	IMStationDriveway	24AUG09:12:05:54	Before	13	9	85	116	94	3	21	-5	0.03	22	15.03
430	2002	Jeep	Wrangler	Measurement	IMStationDriveway	24AUG09:12:07:00	Before	12	11	85	119	82	2	-2	-21	0.03	30	15.03
431	1993	Mitsubishi	3000 GT	Selection	IMStationDriveway	24AUG09:10:33:25	Before	15	25	81	66	167	4	500	475	1.79	931	13.72
431	1993	Mitsubishi	3000 GT	Measurement	Kipling&470	24AUG09:16:34:51	Before	51	24	80	710	128	3	175	87	0.37	678	14.76
431	1993	Mitsubishi	3000 GT	Measurement	Caryl&470	24AUG09:16:39:35	Before	35	28	74	1638	62	2	61	36	0.20	430	14.89
431	1993	Mitsubishi	3000 GT	Measurement	Kipling&470	24AUG09:16:42:19	Before	52	27	79	753	120	3	115	10	0.25	2047	14.79
431	1993	Mitsubishi	3000 GT	Measurement	Caryl&470	24AUG09:16:47:47	Before	35	23	74	1675	61	2	20	10	0.04	854	15.00
431	1993	Mitsubishi	3000 GT	Measurement	IMStationDriveway	24AUG09:16:55:41	Before	15	14	76	273	66	2	180	130	0.17	469	14.91
431	1993	Mitsubishi	3000 GT	Measurement	IMStationDriveway	24AUG09:16:57:09	Before	13	11	76	275	107	3	143	127	0.21	194	14.89
437	1991	Chevrolet	S-10	Selection	IMStationDriveway	24AUG09:14:12:37	Before	15	16	88	189	70	2	316	317	4.21	743	12.00
437	1991	Chevrolet	S-10	Measurement	Caryl&470	25AUG09:14:05:53	Before	33	18	68	1179	202	4	204	61	0.34	1328	14.75
437	1991	Chevrolet	S-10	Measurement	Caryl&470	25AUG09:14:13:16	Before	35	19	67	1198	234	4	170	66	0.22	224	14.88
437	1991	Chevrolet	S-10	Measurement	Caryl&470	25AUG09:14:20:35	Before	51	21	66	1214	173	4	173	-21	0.28	2751	14.75
437	1991	Chevrolet	S-10	Measurement	Caryl&470	25AUG09:14:26:57	Before	52	24	66	1237	226	4	164	34	0.19	2473	14.82

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
437	1991	Chevrolet	S-10	Measurement	IMStationDriveway	25AUG09:14:34:19	Before	13	10	71	209	104	3	47	75	0.06	1223	14.97
437	1991	Chevrolet	S-10	Measurement	IMStationDriveway	25AUG09:14:35:21	Before	14	10	69	211	73	2	19	17	0.05	1607	14.96
438	1975	Chevrolet	C-10	Selection	IMStationDriveway	24AUG09:14:37:48	Before	15	15	86	206	723	6	3478	3486	6.04	731	10.59
438	1975	Chevrolet	C-10	Measurement	Caryl&470	25AUG09:16:26:22	Before	37	19	71	1604	227	4	522	353	1.88	1850	13.63
438	1975	Chevrolet	C-10	Measurement	Kipling&470	25AUG09:16:30:18	Before	53	18	73	369	189	4	372	364	6.99	626	10.01
438	1975	Chevrolet	C-10	Measurement	Caryl&470	25AUG09:16:34:28	Before	37	20	72	1634	256	4	1117	603	1.51	1902	13.87
438	1975	Chevrolet	C-10	Measurement	Kipling&470	25AUG09:16:38:12	Before	53	21	73	413	232	4	429	324	7.54	416	9.62
438	1975	Chevrolet	C-10	Measurement	IMStationDriveway	25AUG09:16:46:01	Before	12	9	75	280	531	5	3412	4307	0.81	2439	14.28
438	1975	Chevrolet	C-10	Measurement	IMStationDriveway	25AUG09:16:47:07	Before	13	9	75	281	1391	7	2717	1985	0.74	2196	14.36
439	1998	Pontiac	Grand Prix	Selection	IMStationDriveway	24AUG09:15:03:46	Before	12	11	83	216	1310	7	2541	1363	2.16	29	13.43
439	1998	Pontiac	Grand Prix	Measurement	Kipling&470	25AUG09:15:36:08	Before	53	33	72	179	90	2	262	299	6.88	138	10.11
439	1998	Pontiac	Grand Prix	Measurement	Caryl&470	25AUG09:15:40:14	Before	40	21	72	1449	173	4	.	-104	.	.	.
439	1998	Pontiac	Grand Prix	Measurement	Kipling&470	25AUG09:15:44:33	Before	55	28	72	215	166	4	-36	-197	0.14	210	14.95
439	1998	Pontiac	Grand Prix	Measurement	Caryl&470	25AUG09:15:48:10	Before	31	19	72	1474	326	5	172	56	0.04	272	15.01
439	1998	Pontiac	Grand Prix	Measurement	IMStationDriveway	25AUG09:15:57:23	Before	13	11	79	263	42	1	11	13	0.04	253	15.02
439	1998	Pontiac	Grand Prix	Measurement	IMStationDriveway	25AUG09:15:58:31	Before	14	12	79	264	112	3	16	-2	0.05	93	15.02
454	1988	BMW	M6	Selection	IMStationDriveway	25AUG09:13:59:57	Before	16	19	73	196	342	5	.	403	.	.	.
454	1988	BMW	M6	Measurement	Caryl&470	25AUG09:14:54:24	Before	53	37	63	1321	147	3	45	-48	0.03	3	15.03
454	1988	BMW	M6	Measurement	Caryl&470	25AUG09:15:02:09	Before	51	36	64	1344	255	4	195	127	0.00	99	15.05
454	1988	BMW	M6	Measurement	Caryl&470	25AUG09:15:10:21	Before	35	11	66	1374	242	4	142	-75	0.01	156	15.04
454	1988	BMW	M6	Measurement	Caryl&470	25AUG09:15:18:27	Before	35	13	66	1401	196	4	.	-26	.	.	.
454	1988	BMW	M6	Measurement	IMStationDriveway	25AUG09:15:27:03	Before	13	10	73	236	140	3	20	6	0.05	25	15.02
454	1988	BMW	M6	Measurement	IMStationDriveway	25AUG09:15:30:09	Before	10	8	73	240	202	4	21	13	0.01	16	15.04
460	2003	Dodge	Durango	Selection	IMStationDriveway	26AUG09:09:47:04	Before	18	24	67	48	89	2	18	-52	0.11	1708	14.92
460	2003	Dodge	Durango	Measurement	Kipling&470	26AUG09:10:51:37	Before	55	25	77	910	229	4	188	111	0.30	490	14.82
460	2003	Dodge	Durango	Measurement	Caryl&470	26AUG09:10:55:39	Before	36	20	83	706	256	4	189	-127	0.05	57	15.01
460	2003	Dodge	Durango	Measurement	Kipling&470	26AUG09:10:58:43	Before	54	15	77	925	179	4	78	44	0.23	40	14.88
460	2003	Dodge	Durango	Measurement	Caryl&470	26AUG09:11:03:13	Before	36	24	83	733	370	5	364	-287	-0.01	2330	14.96
460	2003	Dodge	Durango	Measurement	IMStationDriveway	26AUG09:11:12:52	Before	11	7	80	89	159	4	87	-23	0.02	334	15.03
460	2003	Dodge	Durango	Measurement	IMStationDriveway	26AUG09:11:13:57	Before	11	7	81	90	133	3	76	-47	0.05	23	15.01
466	2003	Acura	RSX	Selection	IMStationDriveway	27AUG09:12:06:30	Before	10	15	84	108	125	3	38	-13	0.14	31	14.95
466	2003	Acura	RSX	Measurement	Kipling&470	27AUG09:13:27:54	Before	52	30	85	127	162	4	86	16	-0.02	53	15.07
466	2003	Acura	RSX	Measurement	Caryl&470	27AUG09:13:30:45	Before	41	21	86	564	179	4	49	-90	0.05	45	15.01
466	2003	Acura	RSX	Measurement	Kipling&470	27AUG09:13:33:50	Before	54	36	85	145	210	4	18	-60	1.96	6	13.65
466	2003	Acura	RSX	Measurement	Caryl&470	27AUG09:13:38:33	Before	36	30	88	588	316	5	114	-48	0.01	-5	15.04
466	2003	Acura	RSX	Measurement	IMStationDriveway	27AUG09:13:46:22	Before	14	14	91	150	100	3	13	19	0.03	6	15.03

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
466	2003	Acura	RSX	Measurement	IMStationDriveway	27AUG09:13:47:28	Before	15	13	91	152	78	2	-1	-4	0.05	10	15.01
468	2004	Subaru	Outback	Selection	IMStationDriveway	27AUG09:13:01:48	Before	10	13	87	132	73	2	-12	-90	0.02	-5	15.04
468	2004	Subaru	Outback	Measurement	Kipling&470	27AUG09:15:14:35	Before	51	32	85	460	140	3	173	152	2.12	19	13.53
468	2004	Subaru	Outback	Measurement	Caryl&470	27AUG09:15:18:16	Before	39	22	89	879	253	4	207	-20	-0.02	52	15.06
468	2004	Subaru	Outback	Measurement	Kipling&470	27AUG09:15:22:39	Before	53	37	86	495	144	3	118	94	5.85	-2	10.86
468	2004	Subaru	Outback	Measurement	Caryl&470	27AUG09:15:26:09	Before	40	22	89	912	181	4	133	-16	0.00	98	15.04
468	2004	Subaru	Outback	Measurement	IMStationDriveway	27AUG09:15:35:40	Before	14	13	99	207	71	2	15	36	0.04	3	15.02
468	2004	Subaru	Outback	Measurement	IMStationDriveway	27AUG09:15:36:47	Before	12	12	99	208	77	2	-22	-45	0.02	6	15.04
469	2000	Nissan	Pathfinder	Selection	IMStationDriveway	27AUG09:13:03:58	Before	13	11	87	133	85	2	40	32	0.10	26	14.98
469	2000	Nissan	Pathfinder	Measurement	Kipling&470	27AUG09:14:01:58	Before	43	31	85	237	212	4	118	-5	5.04	415	11.42
469	2000	Nissan	Pathfinder	Measurement	Caryl&470	27AUG09:14:05:46	Before	37	17	89	653	354	5	116	-62	0.01	218	15.03
469	2000	Nissan	Pathfinder	Measurement	Kipling&470	27AUG09:14:08:36	Before	54	38	85	257	237	4	85	38	4.71	318	11.67
469	2000	Nissan	Pathfinder	Measurement	Caryl&470	27AUG09:14:13:09	Before	37	19	89	674	329	5	184	-26	-0.02	284	15.05
469	2000	Nissan	Pathfinder	Measurement	IMStationDriveway	27AUG09:14:20:47	Before	12	9	95	172	92	3	36	-66	0.06	231	15.00
469	2000	Nissan	Pathfinder	Measurement	IMStationDriveway	27AUG09:14:21:53	Before	12	9	95	173	90	2	30	75	0.02	12	15.04
475	2000	Chevrolet	Astro	Selection	IMStationDriveway	27AUG09:15:21:29	Before	11	14	98	196	1035	6	438	662	0.12	380	14.94
475	2000	Chevrolet	Astro	Measurement	Kipling&470	27AUG09:16:35:11	Before	49	27	84	766	273	5	86	-91	0.08	717	14.97
475	2000	Chevrolet	Astro	Measurement	Caryl&470	27AUG09:16:38:18	Before	38	19	89	1144	270	5	234	-177	0.02	524	15.01
475	2000	Chevrolet	Astro	Measurement	Kipling&470	27AUG09:16:42:24	Before	53	25	84	819	234	4	216	262	0.19	1217	14.87
475	2000	Chevrolet	Astro	Measurement	Caryl&470	27AUG09:16:46:21	Before	37	19	88	1184	175	4	267	-172	0.05	267	15.00
475	2000	Chevrolet	Astro	Measurement	IMStationDriveway	27AUG09:16:55:13	Before	13	9	102	243	3560	7	1444	1537	0.29	67	14.80
475	2000	Chevrolet	Astro	Measurement	IMStationDriveway	27AUG09:16:57:54	Before	13	8	102	246	457	5	731	558	0.44	59	14.72
481	2003	Nissan	Frontier	Selection	IMStationDriveway	28AUG09:08:26:52	Before	12	13	67	10	64	2	28	-109	0.00	-14	15.05
481	2003	Nissan	Frontier	Measurement	Kipling&470	28AUG09:09:32:21	Before	52	26	83	663	228	4	245	335	10.58	28	7.46
481	2003	Nissan	Frontier	Measurement	Caryl&470	28AUG09:09:36:54	Before	38	22	74	400	259	4	121	-10	0.05	23	15.01
481	2003	Nissan	Frontier	Measurement	Kipling&470	28AUG09:09:39:53	Before	55	25	83	683	261	4	75	78	5.74	76	10.93
481	2003	Nissan	Frontier	Measurement	Caryl&470	28AUG09:09:43:15	Before	37	23	74	427	254	4	158	-32	0.05	15	15.01
481	2003	Nissan	Frontier	Measurement	IMStationDriveway	28AUG09:09:51:27	Before	13	9	70	49	115	3	35	-30	0.01	4	15.05
481	2003	Nissan	Frontier	Measurement	IMStationDriveway	28AUG09:09:52:26	Before	13	10	70	51	86	2	20	-12	0.03	239	15.02
482	1992	Nissan	Stanza	Selection	IMStationDriveway	28AUG09:08:50:04	Before	14	15	68	16	75	2	69	38	0.97	173	14.35
482	1992	Nissan	Stanza	Measurement	Kipling&470	28AUG09:10:51:29	Before	52	21	87	853	323	5	59	-259	0.27	836	14.83
482	1992	Nissan	Stanza	Measurement	Caryl&470	28AUG09:10:54:27	Before	36	21	82	664	370	5	143	-98	0.71	363	14.53
482	1992	Nissan	Stanza	Measurement	Kipling&470	28AUG09:10:58:35	Before	53	24	87	868	137	3	-1	-104	0.21	360	14.89
482	1992	Nissan	Stanza	Measurement	Caryl&470	28AUG09:11:02:03	Before	37	21	82	681	279	5	90	40	0.57	206	14.64
482	1992	Nissan	Stanza	Measurement	IMStationDriveway	28AUG09:11:09:53	Before	15	14	74	101	144	3	82	69	0.35	282	14.79
482	1992	Nissan	Stanza	Measurement	IMStationDriveway	28AUG09:11:11:22	Before	13	14	74	103	85	2	19	10	0.16	217	14.93

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
486	1993	Jeep	Cherokee	Selection	IMStationDriveway	28AUG09:09:56:37	Before	14	12	70	56	55	1	356	306	0.70	3865	14.40
486	1993	Jeep	Cherokee	Measurement	Kipling&470	28AUG09:12:30:39	Before	50	25	85	42	193	4	155	182	0.42	2092	14.67
486	1993	Jeep	Cherokee	Measurement	Caryl&470	28AUG09:12:34:32	Before	35	18	85	969	588	6	303	-30	0.09	688	14.95
486	1993	Jeep	Cherokee	Measurement	Kipling&470	28AUG09:12:37:50	Before	54	25	85	67	219	4	237	7	0.90	1238	14.36
486	1993	Jeep	Cherokee	Measurement	Caryl&470	28AUG09:12:42:00	Before	38	22	86	988	394	5	175	-200	0.07	662	14.97
486	1993	Jeep	Cherokee	Measurement	IMStationDriveway	28AUG09:12:49:15	Before	15	19	81	157	129	3	192	130	2.58	340	13.18
486	1993	Jeep	Cherokee	Measurement	IMStationDriveway	28AUG09:12:50:34	Before	3	0	81	160	110	3	249	158	2.94	276	12.93
489	1991	Ford	Bronco	Selection	IMStationDriveway	28AUG09:11:26:04	Before	13	14	74	108	4431	7	3452	3419	4.27	381	11.88
489	1991	Ford	Bronco	Measurement	Kipling&470	28AUG09:14:05:36	Before	46	13	84	389	364	4	3872	3994	10.80	410	7.18
489	1991	Ford	Bronco	Measurement	Kipling&470	28AUG09:14:13:55	Before	48	22	84	422	1171	6	3948	3231	10.13	316	7.66
489	1991	Ford	Bronco	Measurement	Kipling&470	28AUG09:14:22:31	Before	46	18	84	443	433	5	2090	1785	8.57	275	8.84
489	1991	Ford	Bronco	Measurement	Kipling&470	28AUG09:14:28:42	Before	32	16	84	469	339	5	1674	1044	6.37	209	10.43
489	1991	Ford	Bronco	Measurement	Kipling&470	28AUG09:14:36:12	Before	34	15	84	497	313	5	888	1178	1.39	181	14.03
489	1991	Ford	Bronco	Measurement	IMStationDriveway	28AUG09:14:43:57	Before	11	6	98	238	8618	7	4132	3047	0.58	486	14.49
489	1991	Ford	Bronco	Measurement	IMStationDriveway	28AUG09:14:45:12	Before	11	7	98	241	5404	7	8811	9569	0.71	129	14.28
494	1995	Mazda	MX-6	Selection	IMStationDriveway	28AUG09:12:58:06	Before	15	19	81	166	219	4	595	722	3.82	275	12.29
494	1995	Mazda	MX-6	Measurement	Kipling&470	28AUG09:15:46:39	Before	53	23	85	771	214	4	51	63	0.18	2961	14.81
494	1995	Mazda	MX-6	Measurement	Caryl&470	28AUG09:15:50:18	Before	36	22	87	1566	307	5	111	34	0.22	860	14.86
494	1995	Mazda	MX-6	Measurement	Kipling&470	28AUG09:15:54:04	Before	52	1	86	795	258	4	.	1013	.	.	.
494	1995	Mazda	MX-6	Measurement	Caryl&470	28AUG09:15:58:17	Before	37	23	87	1588	173	4	76	-1	0.08	318	14.98
494	1995	Mazda	MX-6	Measurement	IMStationDriveway	28AUG09:16:09:57	Before	17	12	105	285	72	2	478	492	4.47	315	11.82
494	1995	Mazda	MX-6	Measurement	IMStationDriveway	28AUG09:16:11:10	Before	14	19	105	287	116	3	572	384	3.80	121	12.31
497	1994	Buick	Century	Selection	IMStationDriveway	28AUG09:14:41:39	Before	11	12	98	236	183	4	34	-58	-0.05	2009	15.02
497	1994	Buick	Century	Measurement	Kipling&470	31AUG09:10:13:11	Before	55	36	79	810	159	4	109	100	0.41	980	14.72
497	1994	Buick	Century	Measurement	Caryl&470	31AUG09:10:16:54	Before	37	23	72	487	240	4	270	206	0.11	189	14.96
497	1994	Buick	Century	Measurement	Kipling&470	31AUG09:10:20:09	Before	55	49	77	831	231	4	235	287	1.15	824	14.19
497	1994	Buick	Century	Measurement	Caryl&470	31AUG09:10:25:33	Before	36	23	73	504	335	5	250	31	0.04	290	15.01
497	1994	Buick	Century	Measurement	IMStationDriveway	31AUG09:10:33:10	Before	12	10	70	120	109	3	266	335	0.31	1321	14.78
497	1994	Buick	Century	Measurement	IMStationDriveway	31AUG09:10:34:10	Before	13	9	70	121	90	2	178	102	0.12	578	14.94
498	1998	Honda	Accord	Selection	IMStationDriveway	28AUG09:15:00:38	Before	10	13	100	245	59	2	66	64	0.59	111	14.62
498	1998	Honda	Accord	Measurement	Kipling&470	31AUG09:11:15:39	Before	52	50	88	955	213	4	388	406	5.70	489	10.94
498	1998	Honda	Accord	Measurement	Caryl&470	31AUG09:11:19:37	Before	33	23	84	643	239	4	168	157	1.73	-30	13.81
498	1998	Honda	Accord	Measurement	Kipling&470	31AUG09:11:23:36	Before	52	34	88	976	178	4	166	16	2.74	114	13.08
498	1998	Honda	Accord	Measurement	Caryl&470	31AUG09:11:28:18	Before	37	19	85	674	385	5	143	-94	0.02	84	15.03
498	1998	Honda	Accord	Measurement	IMStationDriveway	31AUG09:11:38:39	Before	15	18	77	168	71	2	1	-11	0.21	89	14.90
498	1998	Honda	Accord	Measurement	IMStationDriveway	31AUG09:11:39:30	Before	15	17	77	170	72	2	29	111	0.34	119	14.81

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)														
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
504	1992	Ford	F150	Selection	IMStationDriveway	31AUG09:09:01:58	Before	12	5	63	49	260	4	148	-74	0.09	153	14.98
504	1992	Ford	F150	Measurement	Kipling&470	31AUG09:14:04:07	Before	48	26	82	263	119	3	417	271	5.06	420	11.40
504	1992	Ford	F150	Measurement	Caryl&470	31AUG09:14:09:28	Before	37	22	82	1076	321	5	237	-9	0.00	623	15.02
504	1992	Ford	F150	Measurement	Kipling&470	31AUG09:14:12:24	Before	49	27	82	278	178	4	205	233	4.14	579	12.06
504	1992	Ford	F150	Measurement	Caryl&470	31AUG09:14:15:38	Before	36	24	85	1090	389	5	209	-235	0.02	645	15.01
504	1992	Ford	F150	Measurement	IMStationDriveway	31AUG09:14:24:37	Before	12	12	85	292	89	2	167	100	0.08	672	14.97
504	1992	Ford	F150	Measurement	IMStationDriveway	31AUG09:14:28:18	Before	13	11	85	298	127	3	103	60	0.04	659	15.00
507	2001	Toyota	Sequoia	Selection	IMStationDriveway	31AUG09:09:57:39	Before	18	21	70	95	69	2	-14	8	0.00	281	15.04
507	2001	Toyota	Sequoia	Measurement	Caryl&470	31AUG09:12:32:00	Before	37	19	83	849	309	5	41	-77	0.04	30	15.03
507	2001	Toyota	Sequoia	Measurement	Caryl&470	31AUG09:12:40:41	Before	38	23	83	868	263	4	130	-27	0.02	40	15.03
507	2001	Toyota	Sequoia	Measurement	Kipling&470	31AUG09:12:44:58	Before	58	24	83	31	313	5	125	75	2.39	229	13.33
507	2001	Toyota	Sequoia	Measurement	Caryl&470	31AUG09:12:48:14	Before	53	50	81	891	243	4	121	-28	7.05	114	9.99
507	2001	Toyota	Sequoia	Measurement	IMStationDriveway	31AUG09:13:04:45	Before	14	12	85	227	78	2	-23	-24	-0.02	35	15.06
507	2001	Toyota	Sequoia	Measurement	IMStationDriveway	31AUG09:13:05:49	Before	15	10	85	230	72	2	-3	-31	0.06	32	15.01
512	2005	Hyundai	Santa Fe	Selection	IMStationDriveway	31AUG09:11:18:24	Before	14	20	74	148	103	3	20	49	0.04	-31	15.03
512	2005	Hyundai	Santa Fe	Measurement	Kipling&470	31AUG09:16:28:52	Before	55	25	82	706	85	2	-13	-50	0.11	41	14.98
512	2005	Hyundai	Santa Fe	Measurement	Caryl&470	31AUG09:16:32:13	Before	36	22	79	1516	246	4	107	18	0.00	-13	15.05
512	2005	Hyundai	Santa Fe	Measurement	Kipling&470	31AUG09:16:36:09	Before	51	29	81	747	135	3	30	15	0.05	116	15.02
512	2005	Hyundai	Santa Fe	Measurement	Caryl&470	31AUG09:16:40:22	Before	35	20	79	1558	326	5	148	-34	0.00	8	15.05
512	2005	Hyundai	Santa Fe	Measurement	IMStationDriveway	31AUG09:16:49:10	Before	15	20	81	371	94	3	-5	-53	0.02	-8	15.04
512	2005	Hyundai	Santa Fe	Measurement	IMStationDriveway	31AUG09:16:50:07	Before	15	17	81	373	87	2	4	-51	0.02	3	15.04
517	1999	Chevrolet	Lumina	Selection	IMStationDriveway	31AUG09:13:07:15	Before	13	12	85	233	68	2	-3	-9	0.02	233	15.03
517	1999	Chevrolet	Lumina	Measurement	Kipling&470	01SEP09:10:01:57	Before	55	22	94	697	99	3	.	-53	.	.	.
517	1999	Chevrolet	Lumina	Measurement	Caryl&470	01SEP09:10:08:17	Before	37	19	77	486	52	1	26	20	0.02	572	15.02
517	1999	Chevrolet	Lumina	Measurement	Kipling&470	01SEP09:10:09:46	Before	54	23	94	717	118	3	-27	-211	0.11	561	14.96
517	1999	Chevrolet	Lumina	Measurement	Caryl&470	01SEP09:10:14:27	Before	37	20	77	505	74	2	-12	-27	0.01	394	15.03
517	1999	Chevrolet	Lumina	Measurement	IMStationDriveway	01SEP09:10:20:48	Before	14	13	77	68	105	3	7	-4	0.03	566	15.01
517	1999	Chevrolet	Lumina	Measurement	IMStationDriveway	01SEP09:10:21:50	Before	14	12	77	69	103	3	35	20	0.06	556	14.99
521	1994	Nissan	Sentra	Selection	IMStationDriveway	31AUG09:14:03:22	Before	12	10	83	275	78	2	32	10	0.04	1348	14.98
521	1994	Nissan	Sentra	Measurement	Kipling&470	31AUG09:15:28:55	Before	44	25	83	486	88	2	294	312	6.27	130	10.55
521	1994	Nissan	Sentra	Measurement	Caryl&470	31AUG09:15:32:08	Before	37	18	84	1322	124	3	73	-27	0.02	89	15.04
521	1994	Nissan	Sentra	Measurement	Kipling&470	31AUG09:15:36:05	Before	51	23	84	512	101	3	212	140	5.92	83	10.80
521	1994	Nissan	Sentra	Measurement	Caryl&470	31AUG09:15:40:11	Before	38	16	84	1350	190	4	23	-73	0.05	225	15.01
521	1994	Nissan	Sentra	Measurement	IMStationDriveway	31AUG09:15:56:22	Before	13	10	86	345	87	2	328	481	2.62	266	13.15
521	1994	Nissan	Sentra	Measurement	IMStationDriveway	31AUG09:15:57:23	Before	12	6	86	348	84	2	316	297	1.34	140	14.08
527	1995	Eagle	Talon	Selection	IMStationDriveway	31AUG09:15:19:13	Before	12	13	82	324	1293	7	2043	2642	2.74	237	13.02

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)															
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC 1 (ppmC3)	HC 2 (ppmC3)	CO 1 (%)	NO 1 (ppm)	CO_2 1 (%)
527	1995	Eagle	Talon	Measurement	Caryl&470	01SEP09:11:20:46	Before	35	19	84	699	63	2	169	110	0.04	1148	14.98
527	1995	Eagle	Talon	Measurement	Caryl&470	01SEP09:11:27:00	Before	36	15	84	722	299	5	.	226	.	.	.
527	1995	Eagle	Talon	Measurement	Kipling&470	01SEP09:11:28:54	Before	50	23	91	893	112	3	324	331	3.28	317	12.68
527	1995	Eagle	Talon	Measurement	Caryl&470	01SEP09:11:33:14	Before	37	25	85	740	110	3	713	518	0.14	1520	14.88
527	1995	Eagle	Talon	Measurement	Kipling&470	01SEP09:11:34:52	Before	54	34	92	917	171	4	611	481	4.66	594	11.68
527	1995	Eagle	Talon	Measurement	IMStationDriveway	01SEP09:11:51:45	Before	13	12	86	112	267	4	1103	831	0.08	1258	14.92
527	1995	Eagle	Talon	Measurement	IMStationDriveway	01SEP09:11:53:14	Before	13	11	86	116	566	6	770	672	0.08	1260	14.93
540	1998	Honda	Accord	Selection	IMStationDriveway	01SEP09:13:40:20	Before	15	19	96	160	427	5	333	45	1.30	-27	14.12
540	1998	Honda	Accord	Measurement	Kipling&470	01SEP09:14:36:23	Before	47	28	91	332	172	4	66	37	1.28	-29	14.14
540	1998	Honda	Accord	Measurement	Caryl&470	01SEP09:14:43:09	Before	40	15	89	1293	47	1	80	47	0.01	18	15.05
540	1998	Honda	Accord	Measurement	Kipling&470	01SEP09:14:44:41	Before	52	28	91	358	247	4	128	52	-0.03	13	15.07
540	1998	Honda	Accord	Measurement	Caryl&470	01SEP09:14:49:23	Before	35	18	89	1308	78	2	161	129	0.05	-11	15.01
540	1998	Honda	Accord	Measurement	IMStationDriveway	01SEP09:14:55:43	Before	14	12	100	196	334	5	933	933	0.03	-35	15.00
540	1998	Honda	Accord	Measurement	IMStationDriveway	01SEP09:14:56:44	Before	15	16	100	199	1050	7	694	237	0.03	38	15.01
542	1986	Subaru	GL10	Selection	IMStationDriveway	01SEP09:15:55:19	Before	14	15	96	225	80	2	25	60	1.20	91	14.19
542	1986	Subaru	GL10	Measurement	Caryl&470	01SEP09:17:07:32	Before	41	23	83	1716	49	1	.	-3	.	.	.
542	1986	Subaru	GL10	Measurement	Kipling&470	01SEP09:17:10:12	Before	45	29	86	955	160	4	61	22	5.72	10	10.95
542	1986	Subaru	GL10	Measurement	Caryl&470	01SEP09:17:15:30	Before	40	22	83	1753	81	2	175	148	3.95	72	12.21
542	1986	Subaru	GL10	Measurement	Kipling&470	01SEP09:17:17:56	Before	51	32	86	991	149	3	183	69	8.89	49	8.67
542	1986	Subaru	GL10	Measurement	IMStationDriveway	01SEP09:17:25:26	Before	13	12	90	254	51	1	-8	-14	0.53	133	14.67
542	1986	Subaru	GL10	Measurement	IMStationDriveway	01SEP09:17:26:22	Before	15	14	90	255	87	2	-10	-25	0.05	197	15.01
546	1996	Geo	Prizm	Selection	IMStationDriveway	02SEP09:09:10:10	Before	14	15	72	24	249	4	668	339	0.22	849	14.85
546	1996	Geo	Prizm	Measurement	Kipling&470	02SEP09:11:47:44	Before	52	31	90	1034	201	4	323	266	5.22	743	11.28
546	1996	Geo	Prizm	Measurement	Caryl&470	02SEP09:11:51:35	Before	36	21	85	1383	143	3	182	172	0.18	729	14.89
546	1996	Geo	Prizm	Measurement	Kipling&470	02SEP09:11:54:31	Before	51	31	89	1052	93	2	405	319	5.04	565	11.41
546	1996	Geo	Prizm	Measurement	Caryl&470	02SEP09:11:57:55	Before	36	20	82	1396	222	4	448	399	0.43	250	14.72
546	1996	Geo	Prizm	Measurement	IMStationDriveway	02SEP09:12:07:05	Before	14	13	84	121	460	5	1745	-135	0.54	647	14.59
546	1996	Geo	Prizm	Measurement	IMStationDriveway	02SEP09:12:08:06	Before	14	14	84	122	526	6	1219	-1155	0.52	434	14.63
547	1975	Ford	Ranger F250	Selection	IMStationDriveway	02SEP09:09:11:11	Before	16	22	72	30	385	5	1318	504	8.42	486	8.96
547	1975	Ford	Ranger F250	Measurement	Kipling&470	02SEP09:10:26:29	Before	49	30	84	860	197	4	1341	728	8.15	515	9.15
547	1975	Ford	Ranger F250	Measurement	Caryl&470	02SEP09:10:30:14	Before	36	21	78	1158	274	4	696	663	4.05	1601	12.07
547	1975	Ford	Ranger F250	Measurement	Kipling&470	02SEP09:10:33:10	Before	51	33	84	872	162	3	1432	1625	8.70	585	8.75
547	1975	Ford	Ranger F250	Measurement	Caryl&470	02SEP09:10:36:34	Before	37	25	83	1169	222	4	909	724	3.40	1618	12.53
547	1975	Ford	Ranger F250	Measurement	IMStationDriveway	02SEP09:10:45:53	Before	14	8	76	81	82	2	1161	624	4.39	714	11.84
547	1975	Ford	Ranger F250	Measurement	IMStationDriveway	02SEP09:10:46:59	Before	12	8	76	83	85	2	1300	554	4.37	792	11.85
550	1992	Ford	Taurus	Selection	IMStationDriveway	02SEP09:14:19:25	Before	12	8	97	168	3050	7	4015	-2117	0.14	301	14.82

Table F-2. Selection RSMs and Measurement RSMs for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Remote Sensing Measurement (RSM)															
				Type (Selection; Measurement)	Location	DateTime	Timing (RSM is Before Repair or After Repair)	Speed (mph)	VSP (kW/Mg)	Temperature (F)	VDF	EI23	EI23 Bin	HC [1] (ppmC3)	HC [2] (ppmC3)	CO [1] (%)	NO [1] (ppm)	CO_2 [1] (%)
550	1992	Ford	Taurus	Measurement	Kipling&470	02SEP09:15:18:55	Before	54	-3	86	375	137	3	557	467	5.39	241	11.17
550	1992	Ford	Taurus	Measurement	Caryl&470	02SEP09:15:21:55	Before	36	19	87	1985	474	5	345	120	0.10	248	14.96
550	1992	Ford	Taurus	Measurement	Kipling&470	02SEP09:15:25:47	Before	55	1	85	399	153	3	696	596	1.01	230	14.30
550	1992	Ford	Taurus	Measurement	Caryl&470	02SEP09:15:30:39	Before	34	17	89	2002	303	4	1847	1490	-0.03	-36	15.02
550	1992	Ford	Taurus	Measurement	IMStationDriveway	02SEP09:15:38:37	Before	12	8	102	207	2959	7	3192	-395	0.16	415	14.83
550	1992	Ford	Taurus	Measurement	IMStationDriveway	02SEP09:15:39:44	Before	10	6	102	209	2839	7	3000	-166	0.08	681	14.88
559	1989	Oldsmobile	Regency	Selection	IMStationDriveway	03SEP09:12:12:14	Before	14	14	85	94	115	3	389	-148	0.40	410	14.74
559	1989	Oldsmobile	Regency	Measurement	Kipling&470	03SEP09:13:12:59	Before	53	22	87	114	178	4	226	304	6.73	807	10.20
559	1989	Oldsmobile	Regency	Measurement	Caryl&470	03SEP09:13:19:07	Before	39	21	82	1073	73	2	157	109	0.17	648	14.91
559	1989	Oldsmobile	Regency	Measurement	Kipling&470	03SEP09:13:20:37	Before	54	17	87	134	143	3	-51	-341	0.07	2600	14.91
559	1989	Oldsmobile	Regency	Measurement	Caryl&470	03SEP09:13:26:39	Before	37	20	82	1092	78	2	322	199	0.19	676	14.89
559	1989	Oldsmobile	Regency	Measurement	IMStationDriveway	03SEP09:13:34:26	Before	14	14	92	132	351	5	704	-832	0.08	1045	14.94
559	1989	Oldsmobile	Regency	Measurement	IMStationDriveway	03SEP09:13:35:24	Before	15	12	92	133	361	5	299	-306	0.06	520	14.98
563	1998	Ford	Taurus	Selection	IMStationDriveway	03SEP09:14:53:24	Before	16	23	100	164	72	2	209	212	5.12	83	11.37
563	1998	Ford	Taurus	Measurement	Kipling&470	03SEP09:15:56:40	Before	56	24	84	615	163	4	130	117	2.71	60	13.10
563	1998	Ford	Taurus	Measurement	Caryl&470	03SEP09:16:01:12	Before	39	25	83	1571	55	1	39	45	0.02	22	15.04
563	1998	Ford	Taurus	Measurement	Kipling&470	03SEP09:16:03:51	Before	57	31	84	641	113	3	149	149	5.88	155	10.83
563	1998	Ford	Taurus	Measurement	Caryl&470	03SEP09:16:09:08	Before	39	24	82	1598	74	2	28	21	0.04	65	15.03
563	1998	Ford	Taurus	Measurement	IMStationDriveway	03SEP09:16:17:32	Before	13	11	89	207	86	2	-8	5	-0.01	13	15.06
563	1998	Ford	Taurus	Measurement	IMStationDriveway	03SEP09:16:18:56	Before	13	13	89	209	105	3	-9	17	0.01	105	15.04
568	1997	Saturn	SL1	Selection	IMStationDriveway	04SEP09:10:38:59	Before	16	20	75	95	603	6	896	-707	2.92	577	12.91
568	1997	Saturn	SL1	Measurement	Kipling&470	04SEP09:11:31:15	Before	55	22	94	796	138	3	.	-2	.	.	.
568	1997	Saturn	SL1	Measurement	Caryl&470	04SEP09:11:36:37	Before	39	21	79	1236	68	2	46	65	0.02	18	15.04
568	1997	Saturn	SL1	Measurement	Kipling&470	04SEP09:11:38:08	Before	55	23	94	826	223	4	.	143	.	.	.
568	1997	Saturn	SL1	Measurement	Caryl&470	04SEP09:11:44:07	Before	38	20	79	1268	76	2	221	211	0.03	78	15.03
568	1997	Saturn	SL1	Measurement	IMStationDriveway	04SEP09:11:50:44	Before	12	7	83	117	4456	7	2848	-980	0.10	15	14.90
568	1997	Saturn	SL1	Measurement	IMStationDriveway	04SEP09:11:51:10	Before	14	1	83	118	439	5	.	778	.	.	.

[1] Concentration calculated when the regression intercepts of HC, CO, and NO attenuations versus CO_2 attenuation are forced to zero.

[2] Concentration calculated when the regression intercepts of HC, CO, and NO attenuations versus CO_2 attenuation are not forced to zero.

Table F-3. Before-Repair and After-Repair PSHED Measurements for Participating Vehicles

Combined Packet ID (unique to vehicle)	Year	Make	Model	PSHED Measurement					
				Seal DateTime	Timing (PSHED is Before Repair or After Repair)	Seal Temperature (F)	Final Temperature (F)	Seal Barometric Pressure ("Hg)	Measure PSHED HC at 15 Minute Soak (g/Qhr)
7	1998	Ford	Explorer	29JUN09:11:42:00	Before	90	98	24.39	0.176
9	1992	Saturn	SL	29JUN09:13:43:00	Before	92	98	24.36	5.039
9	1992	Saturn	SL	07JUL09:09:24:00	After	80	98	24.29	0.193
17	1993	Mercury	Grand Marquis	29JUN09:15:35:00	Before	93	99	24.34	56.424
17	1993	Mercury	Grand Marquis	06JUL09:09:10:00	After	79	99	24.38	0.082
18	2003	VW	Passat	29JUN09:17:20:00	Before	94	100	24.32	0.099
20	1990	Nissan	Pathfinder	30JUN09:10:37:00	Before	88	98	24.38	0.234
21	1991	Jeep	Wrangler	30JUN09:11:52:00	Before	93	100	24.38	1.241
25	2000	Audi	A6	30JUN09:13:54:00	Before	94	104	24.36	0.266
27	1992	Jeep	Wrangler	30JUN09:15:42:00	Before	96	105	24.34	5.939
27	1992	Jeep	Wrangler	06JUL09:10:20:00	After	85	105	24.39	0.268
28	1989	Dodge	Raider	30JUN09:17:16:00	Before	94	104	24.32	19.380
28	1989	Dodge	Raider	02JUL09:10:32:00	After	83	104	24.49	0.329
34	1995	Ford	Ranger	01JUL09:13:21:00	Before	96	106	24.31	2.996
34	1995	Ford	Ranger	07JUL09:13:09:00	After	92	106	24.26	0.281
39	1994	Jeep	Grand Cherokee	02JUL09:09:40:00	Before	80	90	24.48	0.194
42	1987	Dodge	Power Ram	06JUL09:12:38:00	Before	88	102	24.36	24.117
44	1989	Chevrolet	Caprice	06JUL09:16:01:00	Before	90	97	24.29	14.015
45	1997	Ford	F150	06JUL09:14:35:00	Before	90	101	24.30	0.043
46	1990	Ford	Taurus	06JUL09:16:33:00	Before	92	97	24.28	3.058
48	1994	Chevrolet	Camaro	06JUL09:17:27:00	Before	86	91	24.30	6.667
48	1994	Chevrolet	Camaro	08JUL09:14:35:00	After	95	91	24.24	0.916
49	1994	Mazda	929	07JUL09:11:28:00	Before	92	98	24.27	15.588
53	1997	Pontiac	Grand Am	07JUL09:09:49:00	Before	84	90	24.27	0.258
57	1996	Ford	Explorer XLT	07JUL09:12:12:00	Before	90	97	24.28	0.033
62	2003	Toyota	Tundra	07JUL09:17:29:00	Before	91	98	24.24	0.011
64	1976	Oldsmobile	Omega	08JUL09:13:41:00	Before	95	102	24.24	15.649
68	2001	Jeep	Wrangler	09JUL09:10:51:00	Before	77	91	24.40	0.087
69	2002	Land Rover	Freelander	08JUL09:17:38:00	Before	95	105	24.19	0.054
75.096	1986	Toyota	MR2	09JUL09:15:48:00	Before	85	92	24.35	0.249
77	1987	Saab	900 Turbo	09JUL09:17:43:00	Before	83	90	24.35	3.906
77	1987	Saab	900 Turbo	15JUL09:13:02:00	After	85	90	24.49	0.417
79	1988	Chevrolet	1500 Pickup	10JUL09:13:59:00	Before	92	102	24.46	18.250
79	1988	Chevrolet	1500 Pickup	16JUL09:09:21:00	After	84	102	24.54	0.597
82	1993	Cadillac	El Dorado	10JUL09:15:26:00	Before	95	104	24.41	0.473
85	1996	Dodge	Ram 1500	16JUL09:12:32:00	Before	91	101	24.54	6.077
91	1977	Chevrolet	Blazer	15JUL09:10:58:00	Before	76	92	24.52	15.176
91	1977	Chevrolet	Blazer	24JUL09:09:52:00	After	90	92	24.40	18.463
92	1997	Ford	F150	14JUL09:11:08:00	Before	87	96	24.35	0.022

Table F-3. Before-Repair and After-Repair PSHED Measurements for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	PSHED Measurement					
				Seal DateTime	Timing (PSHED is Before Repair or After Repair)	Seal Temperature (F)	Final Temperature (F)	Seal Barometric Pressure ("Hg)	Measure PSHED HC at 15 Minute Soak (g/Qhr)
93	2003	Dodge	Durango	14JUL09:13:21:00	Before	93	100	24.32	0.051
95	1998	Nissan	Quest	15JUL09:09:19:00	Before	74	83	24.53	0.451
100	1984	Chevrolet	Suburban	15JUL09:12:08:00	Before	82	98	24.50	10.130
100	1984	Chevrolet	Suburban	23JUL09:16:46:00	After	96	98	24.38	20.847
103.122	1988	Toyota	Camry	16JUL09:10:49:00	Before	88	96	24.55	5.011
103.122	1988	Toyota	Camry	17JUL09:13:28:00	After	93	96	24.55	7.744
108	1995	Cadillac	SLS	16JUL09:14:11:00	Before	91	101	24.53	22.449
108	1995	Cadillac	SLS	23JUL09:16:08:00	After	96	101	24.37	0.256
109	1995	Toyota	Avalon	20JUL09:15:13:00	Before	95	102	24.32	2.352
109	1995	Toyota	Avalon	20JUL09:15:53:00	After	92	102	24.33	0.066
110	2005	Toyota	Avalon	16JUL09:16:27:00	Before	92	99	24.52	0.038
112	1986	Ford	LTD	16JUL09:15:47:00	Before	92	101	24.51	9.116
112	1986	Ford	LTD	07AUG09:12:08:00	After	93	101	24.22	0.517
120	1989	Chevrolet	Camaro	17JUL09:12:00:00	Before	90	101	24.56	20.322
121	1994	Isuzu	Amigo	17JUL09:12:40:00	Before	92	102	24.56	0.115
127	1993	Jeep	Cherokee	17JUL09:17:00:00	Before	93	106	24.50	26.376
127	1993	Jeep	Cherokee	24JUL09:09:02:00	After	85	106	24.40	0.523
130	1995	Ford	Explorer	20JUL09:11:16:00	Before	90	98	24.38	0.049
131	1997	Subaru	Outback	20JUL09:12:30:00	Before	91	102	24.37	0.100
134	2003	Chevrolet	Impala	20JUL09:13:54:00	Before	92	100	24.36	0.024
135	2001	Chrysler	Sebring	21JUL09:10:32:00	Before	75	86	24.48	0.047
138	2002	Suzuki	Vitara	21JUL09:09:16:00	Before	74	82	24.51	0.020
139	2002	Pontiac	Sunfire	20JUL09:17:10:00	Before	90	96	24.35	0.027
156	1999	Ford	Explorer	22JUL09:11:34:00	Before	83	94	24.45	0.015
157	1982	Ford	F150 Explorer	22JUL09:14:54:00	Before	94	104	24.42	5.074
157	1982	Ford	F150 Explorer	22JUL09:15:28:00	After	95	104	24.41	3.217
158	2005	Chevrolet	Cobalt	22JUL09:12:52:00	Before	85	93	24.44	0.015
159	1990	Mazda	MX-6	23JUL09:09:35:00	Before	81	88	24.42	0.728
161	2001	Saturn	SC-1	23JUL09:11:01:00	Before	89	97	24.40	0.015
162.332	1995	Jeep	Wrangler	11AUG09:14:21:00	Before	91	99	24.50	0.166
163	2002	Volvo	S60	23JUL09:13:44:00	Before	94	103	24.39	0.052
168	1994	Saturn	SL2	23JUL09:15:03:00	Before	96	103	24.36	25.565
177	2004	Dodge	Ram 1500	24JUL09:16:28:00	Before	100	111	24.35	0.034
178	1969	VW	CP - Dunebuggy	24JUL09:13:15:00	Before	99	102	24.37	1.975
184	1998	VW	Jetta	27JUL09:09:44:00	Before	77	87	24.50	0.137
185	2002	Toyota	Echo	27JUL09:10:50:00	Before	82	89	24.49	0.018
186	1995	Ford	F150	27JUL09:11:58:00	Before	85	98	24.47	0.145
188	2005	Lexus	GX-470	27JUL09:13:05:00	Before	88	101	24.45	0.015
189	1993	GMC	Safari	27JUL09:14:44:00	Before	87	101	24.41	0.282
190	2001	Ford	Expedition	28JUL09:10:26:00	Before	72	84	24.44	0.045
192	1991	Infiniti	Q45	28JUL09:08:56:00	Before	71	.	24.44	0.043
193	2003	Ford	Focus	28JUL09:09:34:00	Before	74	77	24.45	0.053

Table F-3. Before-Repair and After-Repair PSHED Measurements for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	PSHED Measurement					
				Seal DateTime	Timing (PSHED is Before Repair or After Repair)	Seal Temperature (F)	Final Temperature (F)	Seal Barometric Pressure ("Hg)	Measure PSHED HC at 15 Minute Soak (g/Qhr)
194	1994	Geo	Prizm	28JUL09:11:27:00	Before	73	78	24.44	0.039
197	2000	Honda	Accord	28JUL09:12:54:00	Before	74	81	24.43	0.025
203.205	1991	Jeep	Wrangler	28JUL09:14:45:00	Before	76	84	24.40	13.730
203.205	1991	Jeep	Wrangler	31JUL09:11:45:00	After	89	84	24.36	0.592
212	1977	Ford	Econoline	28JUL09:16:58:00	Before	77	89	24.37	7.620
213	1979	Dodge	D-150	29JUL09:09:46:00	Before	75	86	24.35	3.830
214	2000	Chevrolet	S-10	29JUL09:11:21:00	Before	76	82	24.36	0.025
217	1994	Ford	Ranger	29JUL09:13:46:00	Before	73	80	24.36	0.841
218	1990	VW	Cabriolet	29JUL09:10:42:00	Before	77	82	24.36	0.325
219	1991	Lexus	LS400	29JUL09:14:45:00	Before	75	84	24.33	0.100
220	1994	Toyota	Tacoma	29JUL09:15:47:00	Before	75	81	24.37	0.044
221	1994	Ford	Bronco	29JUL09:12:20:00	Before	73	.	24.35	0.041
232	1992	Ford	Explorer	30JUL09:13:36:00	Before	65	73	24.47	0.164
238	1993	Jeep	Wrangler	30JUL09:17:15:00	Before	70	79	24.42	0.287
246	2003	Chevrolet	Suburban	31JUL09:10:51:00	Before	84	97	24.37	0.024
249	1997	BMW	328i	31JUL09:13:18:00	Before	87	96	24.34	0.141
252	2002	Toyota	Tacoma	31JUL09:16:27:00	Before	83	89	24.35	0.036
255	2004	Lexus	RX330	31JUL09:17:11:00	Before	82	89	24.38	0.018
261	1994	GMC	Suburban	03AUG09:12:58:00	Before	94	106	24.38	0.403
262	1984	Nissan	720	03AUG09:14:07:00	Before	93	98	24.36	1.603
263	1997	Honda	Accord	03AUG09:11:48:00	Before	95	101	24.39	0.030
266	2002	Chevrolet	Tahoe	12AUG09:10:19:00	Before	86	100	24.51	0.037
271	1997	GMC	Sierra	04AUG09:08:58:00	Before	78	90	24.48	1.283
278	2002	Dodge	Dakota	04AUG09:11:28:00	Before	87	97	24.46	0.060
285	1998	Honda	CRV	04AUG09:15:57:00	Before	94	100	24.42	0.022
290	2005	Acura	TSX	05AUG09:13:04:00	Before	88	96	24.50	0.017
294	1985	Ford	F150	05AUG09:14:59:00	Before	91	97	24.48	3.788
295	1999	Mazda	626	05AUG09:16:30:00	Before	92	99	24.43	0.033
301	1981	GMC	Sierra K1500	07AUG09:09:11:00	Before	85	97	24.24	16.107
302	1989	Dodge	Pickup	06AUG09:15:47:00	Before	85	89	24.31	0.156
305	1997	Dodge	Ram 1500	07AUG09:10:58:00	Before	89	97	24.24	0.107
306	1967	Chevrolet	Chevelle	06AUG09:16:34:00	Before	81	89	24.31	21.643
309	2001	Nissan	Sentra	07AUG09:14:57:00	Before	96	103	24.16	2.264
311	2002	VW	Passat	07AUG09:16:12:00	Before	94	101	24.14	0.165
316	2003	Hyundai	Accent	10AUG09:09:36:00	Before	74	82	24.54	0.691
320	2004	Chevrolet	Cavalier	10AUG09:11:02:00	Before	79	86	24.53	0.034
321	1997	Chevrolet	S-10	10AUG09:12:45:00	Before	86	93	24.50	12.329
321	1997	Chevrolet	S-10	17AUG09:10:57:00	After	76	93	24.47	0.129
325	2000	Chevrolet	Prizm	11AUG09:09:40:00	Before	79	86	24.55	0.034
327	1981	BMW	320i	10AUG09:17:28:00	Before	86	92	24.46	1.565
329	1969	Jeep	Commando	11AUG09:11:00:00	Before	87	94	24.55	7.535
331	1994	Chevrolet	Blazer	11AUG09:12:44:00	Before	90	98	24.52	4.608

Table F-3. Before-Repair and After-Repair PSHED Measurements for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	PSHED Measurement					
				Seal DateTime	Timing (PSHED is Before Repair or After Repair)	Seal Temperature (F)	Final Temperature (F)	Seal Barometric Pressure ("Hg)	Measure PSHED HC at 15 Minute Soak (g/Qhr)
337	2001	Nissan	Xterra	11AUG09:17:16:00	Before	94	101	24.46	0.066
339	1994	Toyota	4Runner	12AUG09:11:47:00	Before	91	99	24.48	2.236
343	1991	VW	Golf	12AUG09:13:22:00	Before	93	99	24.45	0.963
348.432	1990	Dodge	Ram Charger	12AUG09:14:43:00	Before	91	98	24.43	0.567
350	2005	Subaru	Outback	12AUG09:16:17:00	Before	93	99	24.40	0.022
352	2001	Chevrolet	Astro	13AUG09:09:45:00	Before	84	96	24.42	0.565
354	1989	Jeep	Cherokee	13AUG09:13:25:00	Before	90	99	24.40	133.986
354	1989	Jeep	Cherokee	21AUG09:12:47:00	After	85	99	24.52	0.224
355	1993	Toyota	Corolla	13AUG09:11:37:00	Before	91	97	24.40	2.216
357	1997	Nissan	Pathfinder	21AUG09:15:52:00	Before	87	98	24.45	2.323
361	1995	VW	Golf	14AUG09:10:29:00	Before	80	86	24.34	0.171
362	2001	Audi	TT Quatro	14AUG09:12:02:00	Before	81	89	24.33	0.127
364	1995	Buick	Roadmaster	14AUG09:13:51:00	Before	82	92	24.30	1.209
365	2002	Ford	Mustang	14AUG09:16:52:00	Before	82	89	24.28	0.024
367	1993	Chevrolet	Van 20 / G20	14AUG09:15:31:00	Before	85	97	24.27	14.561
367	1993	Chevrolet	Van 20 / G20	18AUG09:15:33:00	After	75	97	24.30	5.826
370	2003	Land Rover	Discovery	17AUG09:10:08:00	Before	72	81	24.48	0.015
371	1996	Toyota	Corolla	17AUG09:13:32:00	Before	78	.	24.46	0.087
375	2005	Ford	Focus	17AUG09:12:15:00	Before	77	86	24.47	0.052
379	1993	Subaru	Legacy	17AUG09:16:13:00	Before	79	86	24.44	0.068
381	1998	Jeep	Cherokee	17AUG09:16:55:00	Before	77	85	24.45	0.050
383	1994	Chevrolet	S-10	18AUG09:09:38:00	Before	73	82	24.40	2.161
385	2001	Dodge	Dakota	18AUG09:11:27:00	Before	82	92	24.37	0.022
387	2000	Jeep	Grand Cherokee	18AUG09:13:03:00	Before	78	84	24.35	0.018
391	1999	Isuzu	Rodeo	19AUG09:11:53:00	Before	83	94	24.27	0.080
392	1999	Honda	Accord	19AUG09:14:31:00	Before	86	94	24.27	0.046
393	2001	Toyota	Solara	19AUG09:15:33:00	Before	85	94	24.26	0.464
395	1997	Chevrolet	S-10	20AUG09:09:49:00	Before	73	82	24.49	0.718
396	2000	Mercury	Mystique	19AUG09:17:00:00	Before	85	93	24.26	0.038
397	2005	Ford	Freestyle	20AUG09:11:43:00	Before	80	90	24.48	0.027
401	1995	Lexus	SC 300	20AUG09:12:33:00	Before	82	90	24.48	0.349
402	2004	Hyundai	Elantra	20AUG09:14:10:00	Before	83	91	24.47	0.015
404	1998	Isuzu	Rodeo	20AUG09:17:06:00	Before	85	95	24.44	11.063
404	1998	Isuzu	Rodeo	26AUG09:08:52:00	After	71	95	24.51	0.046
405	1996	Chevrolet	Cavalier	20AUG09:15:47:00	Before	84	92	24.43	0.040
416	1999	Mazda	Protege	21AUG09:11:59:00	Before	81	90	24.52	0.015
420	1996	Jeep	Grand Cherokee	21AUG09:14:13:00	Before	86	98	24.49	2.260
424	1970	VW	Beetle	21AUG09:16:36:00	Before	88	92	24.45	1.935
425	1998	Mitsubishi	Eclipse	24AUG09:10:23:00	Before	84	90	24.38	0.008
427	1984	Toyota	Land Cruiser	24AUG09:13:54:00	Before	85	96	24.38	26.900
428	1975	Chevrolet	C-10	24AUG09:15:24:00	Before	81	92	24.41	7.751
430	2002	Jeep	Wrangler	24AUG09:12:09:00	Before	85	96	24.38	0.073

Table F-3. Before-Repair and After-Repair PSHED Measurements for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	PSHED Measurement					
				Seal DateTime	Timing (PSHED is Before Repair or After Repair)	Seal Temperature (F)	Final Temperature (F)	Seal Barometric Pressure ("Hg)	Measure PSHED HC at 15 Minute Soak (g/Qhr)
431	1993	Mitsubishi	3000 GT	24AUG09:16:59:00	Before	80	86	24.40	0.054
437	1991	Chevrolet	S-10	25AUG09:14:37:00	Before	76	78	24.50	0.133
438	1975	Chevrolet	C-10	25AUG09:16:49:00	Before	77	84	24.47	6.933
439	1998	Pontiac	Grand Prix	25AUG09:16:03:00	Before	78	84	24.48	0.018
454	1988	BMW	M6	25AUG09:15:32:00	Before	74	85	24.48	0.455
460	2003	Dodge	Durango	26AUG09:11:16:00	Before	81	92	24.52	0.032
466	2003	Acura	RSX	27AUG09:13:53:00	Before	88	93	24.56	0.018
468	2004	Subaru	Outback	27AUG09:15:39:00	Before	86	94	24.55	0.022
469	2000	Nissan	Pathfinder	27AUG09:14:24:00	Before	88	94	24.56	0.052
475	2000	Chevrolet	Astro	27AUG09:17:00:00	Before	85	96	24.54	2.454
481	2003	Nissan	Frontier	28AUG09:09:55:00	Before	77	87	24.65	0.036
482	1992	Nissan	Stanza	28AUG09:11:14:00	Before	80	89	24.64	0.195
486	1993	Jeep	Cherokee	28AUG09:12:53:00	Before	82	93	24.62	0.277
489	1991	Ford	Bronco	28AUG09:14:46:00	Before	87	97	24.57	28.800
494	1995	Mazda	MX-6	28AUG09:16:13:00	Before	86	94	24.54	0.190
497	1994	Buick	Century	31AUG09:10:38:00	Before	73	82	24.39	0.126
498	1998	Honda	Accord	31AUG09:11:40:00	Before	79	86	24.37	0.027
504	1992	Ford	F150	31AUG09:14:28:00	Before	84	94	24.33	0.132
507	2001	Toyota	Sequoia	31AUG09:13:08:00	Before	82	93	24.36	0.064
512	2005	Hyundai	Santa Fe	31AUG09:16:52:00	Before	84	89	24.31	0.020
517	1999	Chevrolet	Lumina	01SEP09:10:23:00	Before	82	89	24.45	0.033
521	1994	Nissan	Sentra	31AUG09:15:58:00	Before	85	91	24.30	0.248
527	1995	Eagle	Talon	01SEP09:11:55:00	Before	87	93	24.43	2.202
540	1998	Honda	Accord	01SEP09:14:58:00	Before	86	91	24.40	2.098
542	1986	Subaru	GL10	01SEP09:17:28:00	Before	85	91	24.39	0.130
546	1996	Geo	Prizm	02SEP09:12:10:00	Before	81	87	24.52	0.622
547	1975	Ford	Ranger F250	02SEP09:10:47:00	Before	78	89	24.52	6.837
550	1992	Ford	Taurus	02SEP09:15:41:00	Before	88	95	24.46	14.696
559	1989	Oldsmobile	Regency	03SEP09:13:37:00	Before	82	92	24.46	4.127
563	1998	Ford	Taurus	03SEP09:16:21:00	Before	82	90	24.42	0.050
568	1997	Saturn	SL1	04SEP09:11:53:00	Before	83	89	24.43	0.387

Table F-4. Before-Repair PSHED, IM Gas Cap, and Modified California Method Results for Participating Vehicles

Combined Packet ID unique to vehicle)	Year	Make	Model	Measured PSHED (g/Qhr)	IM Gas Cap Inspection Result	MCM Date	MCM Time	Gas Cap		Fuel Lines		Fuel Pump		Fuel Pump to Metering		Fuel Filter		Fuel Rail		Fuel Injectors		Ground		Fill Pipe Joint		Tank		nonOEM	
								Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*
7	1998	Ford	Explorer	0.176	Pass	6/29/2009	10:03	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	NP	N	.	.
								Tank is located inside a metal shroud. Ran sniffer around shroud.																					
9	1992	Saturn	SL	5.039	Pass	6/29/2009	11:40	0	N	NP	NP	NP	NP	NP	NP	NP	NP	0	N	0	N	0	N	m	Y	m	N	.	.
								Sniffed at connections at fuel tank. Looks wet but sniff is negative. PCV disconnected. Sniff is positive. Minor rust on tank straps.																					
17	1993	Mercury	Grand Marquis	56.424	Pass	6/29/2009	14:15	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	NP	N	0	N	NP	NP
								Straps rusty. Tank in good shape. Had one brief sniffer hit near left front engine. Unable to replicate. Vague fuelish odor when hood open.																					
18	2003	VW	Passat	0.099	Pass	6/29/2009	16:13	0	N	0	N	NP	NP	0	N	NP	NP	0	N	NP	NP	0	N	NP	N	0	N	.	.
								.																					
20	1990	Nissan	Pathfinder	0.234	.	6/30/2009	8:34	0	Y	NP	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	.	.
								Only 3 of 6 injectors visible. Sniffer did not detect anything on either fuel rail.																					
21	1991	Jeep	Wrangler	1.241	Pass	6/30/2009	10:09	0	N	NP	NP	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	.	.
								Canister purge line to air intake was a hit with sniffer. Air intake disconnected from filter at manifold. Fuel tank in metal shroud.																					
25	2000	Audi	A6	0.266	N/A	6/30/2009	12:41	0	N	NP	N	NP	NP	NP	NP	0	N	NP	NP	NP	NP	0	N	NP	N	0	N	.	.
								Engine with shroud. Could only poke sniffer around edges and back. Sniffed around fuel tanks and filter. I could get sniffer into places I could not see.																					
27	1992	Jeep	Wrangler	5.939	Pass	6/30/2009	14:24	0	N	0	N	NP	NP	0	Y	NP	NP	0	N	0	N	0	Y	0	Y	0	Y	NP	NP
								Major leak appears to be fuel filler to tank. Sniffer went nuts a couple of times under vehicle in front of tank. Couldn't see anything or reproduce. Weak gasoline odor below vehicle.																					
28	1989	Dodge	Raider	19.380	Pass	6/30/2009	16:12	0	N	NP	N	NP	NP	NP	N	0	N	0	N	0	N	0	N	0	Y	0	N	NP	NP
								Tank metal shroud rusted and dented. Right side fuel rail visible - left side is not. Sniffer did not detect underhood HCs. Mild gas odor when driving on dyno. The purge line is missing from the canister.																					

Table F-4. Before-Repair PSHED, IM Gas Cap, and Modified California Method Results for Participating Vehicles (Continued)

Combined Packet ID unique to vehicle)	Year	Make	Model	Measured PSHED (g/Qhr)	IM Gas Cap Inspection Result	MCM Date	MCM Time	Gas Cap		Fuel Lines		Fuel Pump		Fuel Pump to Metering		Fuel Filter		Fuel Rail		Fuel Injectors		Ground		Fill Pipe Joint		Tank		nonOEM	
								Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*
34	1995	Ford	Ranger	2.996	Pass	7/1/2009	11:59	0	N	NP	NP	NP	NP	0	Y	NP	NP	0	Y	0	Y	0	N	0	N	m	N	NP	NP
								Can smell gasoline with hood open. Huge leak in fuel rail/ injector/intake air. No visible leakage. Tank has stains but might be heavier oil.																							
39	1994	Jeep	Grand Cherokee	0.194	Pass	7/2/2009	8:19	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	.	.
								Nothing suspicious. Engine has vague oily smell.																							
42	1987	Dodge	Power Ram	24.117	Pass	7/6/2009	11:15	0	N	0	N	NP	NP	0	N	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Dripping oil. Some wetness on outside of tank Did not affect sniffer. Grease? Vehicle appears to be carbureted. Left suction on TP due to extraordinarily high CO and HC emissions on IM240 test. Occasional whiff of gasoline odor walking around vehicle.																							
44	1989	Chevrolet	Caprice	14.015	Fail	7/6/2009	14:53	0	Y	0	Y	NP	NP	NP	NP	0	Y	NP	NP	NP	NP	0	Y	m	Y	0	Y	.	.
								Anytime sniffer approached top of fuel tank it lit up. No damage visible to tank.																							
45	1997	Ford	F150	0.043	Pass	7/6/2009	13:33	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																							
46	1990	Ford	Taurus	3.058	Pass	7/6/2009	15:27	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																							
48	1994	Chevrolet	Camaro	6.667	Pass	7/6/2009	16:26	0	Y	0	N	NP	NP	0	N	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	NP
								.																							
49	1994	Mazda	929	15.588	Pass	7/7/2009	10:20	0	N	NP	NP	NP	NP	0	N	NP	NP	0	Y	.	.	0	N	NP	N	NP	NP	NP	NP
								Only right bank visible. No leaks. Left bank not visible but there is a leak at rear of left fuel rail. Tank well hidden.																							
53	1997	Pontiac	Grand Am	0.258	Fail	7/7/2009	8:21	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	m	N	NP	NP
								Minor rust at connection to fuel filler near top rear of fuel tank. Check engine light on.																							
57	1996	Ford	Explorer XLT	0.033	Pass	7/7/2009	10:58	0	N	0	N	NP	NP	0	N	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Fuel lines under hood to pressure regulator and to throttle body. All OK.																							
62	2003	Toyota	Tundra	0.011	Pass	7/7/2009	16:28	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																							

Table F-4. Before-Repair PSHED, IM Gas Cap, and Modified California Method Results for Participating Vehicles (Continued)

Combined Packet ID unique to vehicle)	Year	Make	Model	Measured PSHED (g/Qhr)	IM Gas Cap Inspection Result	MCM Date	MCM Time	Gas Cap		Fuel Lines		Fuel Pump		Fuel Pump to Metering		Fuel Filter		Fuel Rail		Fuel Injectors		Ground		Fill Pipe Joint		Tank		nonOEM	
								Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*
64	1976	Oldsmobile	Omega	15.649	Pass	7/8/2009	12:15	0	N	0	N	NP	NP	NP	NP	NP	NP	NP	NP	NP	Y	0	N	0	N	0	N	NP	NP
								Vehicle is carbureted. Sniffer lit up anytime I approached the base of the carb from any direction. Gasoline odor under hood. Intake manifold looks rusty. Carb dirty on exterior.																					
68	2001	Jeep	Wrangler	0.087	Pass	7/9/2009	9:52	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	NP	N	0	N	NP	NP
								.																					
69	2002	Land Rover	Freelander	0.054	Pass	7/8/2009	16:35	0	N	NP	NP	NP	NP	0	N	NP	NP	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Saddle tank. One side may have lost shrouding. Some rust visible. Nothing extreme.																					
75.096	1986	Toyota	MR2	0.249	Pass	7/9/2009	14:36	0	N	0	N	0	NP	0	N	NP	NP	0	N	0	N	0	Y	0	N	0	N	NP	NP
								Rear engine vehicle running rich. Has exhaust leaks as well. Sniffer was inconsistent on finding leaks. I think that what sniffer was picking up was exhaust. PCV hose wet. Lots of rust on vehicle on bottom.																					
77	1987	Saab	900 Turbo	3.906	Pass	7/9/2009	16:26	0	N	NP	NP	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	N	0	N	NP	NP
								Tank looks greasy and there was grease burning off of exhaust system during IM240s. Engine is amazingly clean for mileage on vehicle.																					
79	1988	Chevrolet	1500 Pickup	18.250	Pass	7/10/2009	12:26	0	Y	0	N	NP	NP	0	N	0	N	NP	NP	NP	NP	0	N	m	N	0	N	NP	NP
								Canister purge disconnect is source of under hood HC emissions.																					
82	1993	Cadillac	El Dorado	0.473	Pass	7/10/2009	14:45	0	N	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Engine and underbody heavily shrouded.																					
85	1996	Dodge	Ram 1500	6.077	Pass	7/16/2009	11:23	0	N	0	N	NP	NP	0	N	.	NP	0	N	0	N	0	N	0	N	m	N	NP	NP
								Tank looks stained possibly from gasoline. I can smell gasoline when lying under vehicle by filler neck. The vent line clamp is rusted and looks like it has been wet but sniffer is inconsistent about sensing fumes in that area.																					
91	1977	Chevrolet	Blazer	15.176	Pass	7/15/2009	9:45	0	Y	0	N	0	NP	NP	NP	0	N	NP	NP	NP	NP	0	N	0	Y	0	N	NP	NP
								Connection from fuel filler to top of tank not visible. All of top of gas tank was hot spot for sniffer. Mechanically vehicle looks well cared for.																					
92	1997	Ford	F150	0.022	Pass	7/14/2009	10:09	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								Some rust on clamps on fuel filler and evap lines.																					
93	2003	Dodge	Durango	0.051	Pass	7/14/2009	12:23	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																					

Table F-4. Before-Repair PSHED, IM Gas Cap, and Modified California Method Results for Participating Vehicles (Continued)

Combined Packet ID unique to vehicle)	Year	Make	Model	Measured PSHED (g/Qhr)	IM Gas Cap Inspection Result	MCM Date	MCM Time	Gas Cap		Fuel Lines		Fuel Pump		Fuel Pump to Metering		Fuel Filter		Fuel Rail		Fuel Injectors		Ground		Fill Pipe Joint		Tank		nonOEM	
								Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*
95	1998	Nissan	Quest	0.451	Pass	7/15/2009	8:26	0	N	m	Y	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								Smaller lines near fuel tank - looked like a bit of wetness. Main fuel filler line is ok. Only front bank of injectors and front rail available for testing. Sniffer hot spot around PCV hose connections to air intake.																					
100	1984	Chevrolet	Suburban	10.130	Pass	7/15/2009	11:00	0	N	0	N	0	NP	0	N	NP	NP	NP	NP	NP	NP	0	N	0	Y	0	N	NP	NP
								Cannot see fuel filler connection at top of tank but sniffer went nuts. Also smaller leak around PCV connection to right valve cover. Base of carburetor looked damp but sniffer did not detect anything.																					
103.122	1988	Toyota	Camry	5.011	Pass	7/16/2009	9:51	0	Y	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								Gas cap "clicking" felt very weak. Fuel filter wet with oil. Sniffer negative.																					
108	1995	Cadillac	SLS	22.449	Pass	7/16/2009	13:10	0	N	0	N	NP	NP	S	Y	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								There are two holes in metal line fuel supply to engine. Gasoline squirts out in fine streams. Puddles of gasoline in engine compartment. Did not reach ground.																					
109	1995	Toyota	Avalon	2.352	Fail	7/20/2009	14:22	0	Y	0	N	NP	NP	0	N	NP	NP	0	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Unable to access injectors due to shrouding. Moist looking tank but did not look like gasoline. Looked more like grease and did not set off sniffer.																					
110	2005	Toyota	Avalon	0.038	Pass	7/16/2009	15:27	0	N	0	N	NP	NP	0	N	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Engine shrouded. Unable to see fuel rail or injectors. Sniffer could not get that close either.																					
112	1986	Ford	LTD	9.116	Pass	7/16/2009	14:30	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	NP
								Evap canister under hood? If so there are no lines connected to it. Lots of oil on engine. Was smoking off engine during IM240. Lots of oil on ground.																					
120	1989	Chevrolet	Camaro	20.322	Pass	7/17/2009	11:04	0	N	NP	NP	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								Vehicle too low to see fuel lines. Same is true for most of gas tank. Canister is leaking or full. That is where sniffer found HCs.																					
121	1994	Isuzu	Amigo	0.115	Pass	7/17/2009	11:37	0	N	0	N	NP	NP	0	N	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Vague odor of gas when exiting vehicle after IM240. Did not detect anything with sniffer.																					
127	1993	Jeep	Cherokee	26.376	Fail	7/17/2009	16:20	0	Y	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								Tank shroud has sizable dent in it. Evap canister set sniffer off anywhere around it.																					
130	1995	Ford	Explorer	0.049	Pass	7/20/2009	10:23	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								Some rust on fuel filler neck lines but no leaks.																					

Table F-4. Before-Repair PSHED, IM Gas Cap, and Modified California Method Results for Participating Vehicles (Continued)

Combined Packet ID unique to vehicle)	Year	Make	Model	Measured PSHED (g/Qhr)	IM Gas Cap Inspection Result	MCM Date	MCM Time	Gas Cap		Fuel Lines		Fuel Pump		Fuel Pump to Metering		Fuel Filter		Fuel Rail		Fuel Injectors		Ground		Fill Pipe Joint		Tank		nonOEM	
								Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*
131	1997	Subaru	Outback	0.100	Pass	7/20/2009	11:30	0	N	NP	NP	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								Under body fuel lines not visible.																					
134	2003	Chevrolet	Impala	0.024	Pass	7/20/2009	13:04	0	N	0	N	NP	NP	NP	NP	0	N	0	N	NP	NP	0	N	NP	N	0	N	NP	NP
								Engine shrouded and injectors not visible. Could reach sniffer toward fill pipe to tank junction but could not see the connection. The car has been repainted.																					
135	2001	Chrysler	Sebring	0.047	Pass	7/21/2009	9:48	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								Only front fuel rail and injectors are visible. Sniffed in area of rear bank.																					
138	2002	Suzuki	Vitara	0.020	Pass	7/21/2009	8:28	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																					
139	2002	Pontiac	Sunfire	0.027	Pass	7/20/2009	16:18	0	N	0	N	NP	NP	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	NP	NP
								Unable to sniff injectors as there is no access. There is blue paint where filler goes into tank and it looks a lot cleaner than rest of car. Some rust on metal parts of fuel filler pipes.																					
156	1999	Ford	Explorer	0.015	Pass	7/22/2009	10:30	0	N	0	N	NP	NP	0	N	0	N	0	N	0	NP	0	N	0	N	0	N	NP	NP
								Unable to see injectors. Sniff in their vicinity.																					
157	1982	Ford	F150 Explorer	5.074	Fail	7/22/2009	13:16	0	Y	0	N	NP	NP	0	N	0	N	NP	NP	NP	NP	0	N	.	.	.	.	.	.
								Filler neck of rear tank under vehicle looked wet. Metal fuel lines are rusting. Area around PCV is wet and set sniffer off.																					
158	2005	Chevrolet	Cobalt	0.015	Pass	7/22/2009	11:59	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	NP
								Engine shrouded injectors. Not visible along with a lot of the fuel rail.																					
159	1990	Mazda	MX-6	0.728	Pass	7/23/2009	8:29	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								Some rust on clamps holding connections to full filler neck to tank.																					
161	2001	Saturn	SC-1	0.015	Pass	7/23/2009	10:07	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								Fuel pipe (rubber) connector from filler next to tank looks new.																					
163	2002	Volvo	S60	0.052	Pass	7/23/2009	12:40	0	N	NP	NP	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	N	0	N	NP	NP
								Under body fuel lines only partially visible. Could not see junction from filler to tank but could reach sniffer in that area																					

Table F-4. Before-Repair PSHED, IM Gas Cap, and Modified California Method Results for Participating Vehicles (Continued)

Combined Packet ID unique to vehicle)	Year	Make	Model	Measured PSHED (g/Qhr)	IM Gas Cap Inspection Result	MCM Date	MCM Time	Gas Cap		Fuel Lines		Fuel Pump		Fuel Pump to Metering		Fuel Filter		Fuel Rail		Fuel Injectors		Ground		Fill Pipe Joint		Tank		nonOEM	
								Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*
168	1994	Saturn	SL2	25.565	Pass	7/23/2009	14:09	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								Whole engine bay reaks of gasoline. Could not identify point source there. Evap canister hidden under right front fender. Could not see but could stick sniffer in there. Suspect that is source of fumes.																					
177	2004	Dodge	Ram 1500	0.034	Pass	7/24/2009	15:30	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																					
178	1969	VW	CP - Dunebuggy	1.975	N/A	7/24/2009	11:50	0	Y	NP	NP	NP	NP	NP	NP	0	Y	NP	NP	NP	NP	0	N	NP	NP	NP	NP	NP	NP
								Fuel cap feeds directly into tank. Suspect lines around fuel filter are defective. Tank not visible inside "trunk" in front of vehicle which does not open. This is basically a kit car. Exhaust output is elevated above normal.																					
184	1998	VW	Jetta	0.137	Pass	7/27/2009	8:42	0	N	0	N	0	N	0	N	NP	NP	NP	NP	NP	NP	0	N	NP	NP	0	N	NP	NP
								Could only see end of fuel rail and not injectors. Could not see fill pipe to tank junction.																					
185	2002	Toyota	Echo	0.018	Pass	7/27/2009	9:50	0	N	0	N	NP	NP	0	N	NP	NP	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Could reach in and sniff fuel rail but could not really see. Injectors not visible.																					
186	1995	Ford	F150	0.145	Pass	7/27/2009	10:56	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	NP
								Could only see injector. Rest hidden from view.																					
188	2005	Lexus	GX-470	0.015	Pass	7/27/2009	12:07	0	N	0	N	NP	NP	0	N	NP	NP	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Engine completely shrouded. Got sniffer inside a few places but fuel rail injectors not visible.																					
189	1993	GMC	Safari	0.282	Pass	7/27/2009	13:39	0	N	0	N	NP	NP	NP	NP	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Most of engine is accessible through cowling inside van. Did not want to open due to messy condition of vehicle. What I could probe on engine was negative for sniffer. One hot spot was near frame rail below passenger seat. Might have been exhaust leak.																					
190	2001	Ford	Expedition	0.045	Pass	7/28/2009	9:39	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																					
192	1991	Infiniti	Q45	0.043	N/A	7/27/2009	14:59	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP	0	N	NP	NP	NP	NP	NP	NP
								Fuel filler and gas tank hidden somewhere. Disconnect (open) line at canister but did not see anything to connect it to (purge?). Vehicle has been bashed around and neglected. Dents on bottom of spare tire well (is that where tank is?).																					
193	2003	Ford	Focus	0.053	Pass	7/28/2009	8:19	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																					

Table F-4. Before-Repair PSHED, IM Gas Cap, and Modified California Method Results for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Measured PSHED (g/Qhr)	IM Gas Cap Inspection Result	MCM Date	MCM Time	Gas Cap		Fuel Lines		Fuel Pump		Fuel Pump to Metering		Fuel Filter		Fuel Rail		Fuel Injectors		Ground		Fill Pipe Joint		Tank		nonOEM	
								Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*
194	1994	Geo	Prizm	0.039	Pass	7/28/2009	10:28	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																					
197	2000	Honda	Accord	0.025	Pass	7/28/2009	11:55	0	N	NP	NP	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								Underbody fuel lines not visible inside of covers.																					
203.205	1991	Jeep	Wrangler	13.730	Pass	7/28/2009	13:30	0	N	0	N	0	N	0	N	NP	NP	0	N	0	N	G	Y	.	.	G	Y	NP	NP
								Also load line (I think) to canister or canister itself set off sniffer. May be fuel return line to tank. Gasoline drips stop when vehicle is off.																					
212	1977	Ford	Econoline	7.620	Pass	7/28/2009	15:48	0	N	0	N	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Full filler pipe looks dented. Rust present and dents in tank. Engine is mostly inside van under cowling. Sniffer found a hot spot on left side of engine ~8 inches left of carburetor. Vague smell of gasoline in engine bay.																					
213	1979	Dodge	D-150	3.830	Pass	7/29/2009	8:23	0	N	0	N	NP	NP	NP	NP	0	Y	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Exhaust manifold leaks and vehicle is running very rich. Hard to tell if fuel filter area is leaking or I am just seeing exhaust fumes. Same is true under right front of vehicle.																					
214	2000	Chevrolet	S-10	0.025	Pass	7/29/2009	9:17	0	N	0	N	NP	NP	0	NP	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								.																					
217	1994	Ford	Ranger	0.841	Pass	7/29/2009	12:25	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	N	0	N	NP	NP
								Fill pipe goes into top of tank. Unable to see but could stick sniffer in there.																					
218	1990	VW	Cabriolet	0.325	.	7/29/2009	9:50	0	Y	0	N	NP	NP	0	N	NP	NP	0	N	NP	N	0	N	0	N	0	N	NP	NP
								Unable to see injectors. Roads were wet so am discounting moisture seen around fuel filler neck which was exposed to splash. Same is true for moisture in engine. Neither set sniffer off.																					
219	1991	Lexus	LS400	0.100	Pass	7/29/2009	13:50	0	N	NP	NP	NP	NP	0	N	NP	NP	NP	NP	NP	NP	0	N	NP	NP	NP	NP	NP	NP
								Everything is pretty much hidden away; fuel filler pipe; gas tank; under hood fuel system; fuel lines; injectors; and canister.																					
220	1994	Toyota	Tacoma	0.044	Pass	7/29/2009	14:50	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	NP
								Could sniff in area of injectors but could not see them.																					
221	1994	Ford	Bronco	0.041	Pass	7/29/2009	11:27	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	NP
								Unable to see injectors or right fuel rail. Some rust on fuel fill pipe.																					

Table F-4. Before-Repair PSHED, IM Gas Cap, and Modified California Method Results for Participating Vehicles (Continued)

Combined Packet ID unique to vehicle)	Year	Make	Model	Measured PSHED (g/Qhr)	IM Gas Cap Inspection Result	MCM Date	MCM Time	Gas Cap		Fuel Lines		Fuel Pump		Fuel Pump to Metering		Fuel Filter		Fuel Rail		Fuel Injectors		Ground		Fill Pipe Joint		Tank		nonOEM	
								Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*
232	1992	Ford	Explorer	0.164	Pass	7/30/2009	12:43	0	Y	0	N	NP	NP	0	N	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Canister under hood set sniffer off. Vague gasoline smell in that area.																					
238	1993	Jeep	Wrangler	0.287	Pass	7/30/2009	16:20	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								While crawling under vehicle there is gasoline odor. There is gasoline smell around vehicle. The fuel rail does not look OEM but no leaks found. Could not find fuel filter.																					
246	2003	Chevrolet	Suburban	0.024	Pass	7/31/2009	9:30	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																					
249	1997	BMW	328i	0.141	Pass	7/31/2009	12:33	0	N	0	N	NP	NP	NP	NP	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Engine shrouded. Difficult to see or sniff components. A lot of underbody fuel lines are also hidden.																					
252	2002	Toyota	Tacoma	0.036	Pass	7/31/2009	15:37	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								Left fuel rail and injectors not visible.																					
255	2004	Lexus	RX330	0.018	Pass	7/31/2009	16:15	0	N	0	N	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Everything under hood (fuel lines rail injectors etc) all hidden under shroud.																					
261	1994	GMC	Suburban	0.403	Pass	8/3/2009	11:50	0	N	0	N	NP	NP	0	N	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								TB injection no fuel rail or injectors.																					
262	1984	Nissan	720	1.603	Pass	8/3/2009	13:05	0	Y	0	N	0	N	0	N	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Despite gas cap pass sniffer found HC's around cap and nowhere else.																					
263	1997	Honda	Accord	0.030	Pass	8/3/2009	10:45	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																					
266	2002	Chevrolet	Tahoe	0.037	Pass	8/12/2009	8:43	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																					
271	1997	GMC	Sierra	1.283	Fail	8/3/2009	15:48	0	Y	0	N	NP	NP	0	N	0	N	.	NP	.	NP	0	N	NP	N	0	Y	NP	NP
								Cannot see filler to tank connection. Fuel tank skid plate has some damage. Around top of tank on fill pipe side (right) the sniffer went off particularly near the front of tank.																					
278	2002	Dodge	Dakota	0.060	Pass	8/4/2009	10:25	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								Greasy almost tar like substance just below filler neck on fill tube. K&N air intake but no fuel mods.																					

Table F-4. Before-Repair PSHED, IM Gas Cap, and Modified California Method Results for Participating Vehicles (Continued)

Combined Packet ID unique to vehicle)	Year	Make	Model	Measured PSHED (g/Qhr)	IM Gas Cap Inspection Result	MCM Date	MCM Time	Gas Cap Visual (0;m;S;G;NP)	Gas Cap *Sniffer (Y;N;NP)*	Fuel Lines Visual (0;m;S;G;NP)	Fuel Lines *Sniffer (Y;N;NP)*	Fuel Pump Visual (0;m;S;G;NP)	Fuel Pump *Sniffer (Y;N;NP)*	Fuel Pump to Metering Visual (0;m;S;G;NP)	Fuel Pump to Metering *Sniffer (Y;N;NP)*	Fuel Filter Visual (0;m;S;G;NP)	Fuel Filter *Sniffer (Y;N;NP)*	Fuel Rail Visual (0;m;S;G;NP)	Fuel Rail *Sniffer (Y;N;NP)*	Fuel Injectors Visual (0;m;S;G;NP)	Fuel Injectors *Sniffer (Y;N;NP)*	Ground Visual (0;m;S;G;NP)	Ground *Sniffer (Y;N;NP)*	Fill Pipe Joint Visual (0;m;S;G;NP)	Fill Pipe Joint *Sniffer (Y;N;NP)*	Tank Visual (0;m;S;G;NP)	Tank *Sniffer (Y;N;NP)*	nonOEM Visual (0;m;S;G;NP)	nonOEM *Sniffer (Y;N;NP)*
285	1998	Honda	CRV	0.022	Pass	8/4/2009	14:45	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								New Jersey vehicle. Lots of rust on fuel fill pipe especially clamps on hoses connecting to fuel tank.																					
290	2005	Acura	TSX	0.017	Pass	8/5/2009	11:33	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	NP
								Injectors not visible.																					
294	1985	Ford	F150	3.788	Pass	8/5/2009	13:55	0	N	0	N	NP	NP	NP	NP	0	N	NP	NP	NP	NP	0	N	NP	N	0	N	NP	NP
								Could not see fill pipe to tank connection. When engine is off there is a strong smell of gasoline at right front of engine. The sniffer identified canister as source. Did not detect with engine running as there was too much air movement from fan.																					
295	1999	Mazda	626	0.033	Pass	8/5/2009	15:30	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																					
301	1981	GMC	Sierra K1500	16.107	Pass	8/7/2009	8:30	0	N	0	N	0	N	NP	NP	0	N	.	NP	.	NP	0	N	0	N	0	N	NP	NP
								Tank has minor scrapes and dings. PCV valve is mounted in valve cover without gasket - lots of vapor is escaping. Also carb looks new or recently rebuilt and may have leaks - no liquid seen.																					
302	1989	Dodge	Pickup	0.156	Pass	8/6/2009	13:55	0	N	0	N	NP	NP	0	N	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								See photos. Some moisture near first connection after fuel rail inlet. Fuel pipe goes into tank through grommet which looks dry but rubber is rotting.																					
305	1997	Dodge	Ram 1500	0.107	Pass	8/7/2009	9:59	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								Fill pipe to rubber connector looked skewed as if someone had not fully aligned pieces before tightening clamp. Looked dry.																					
306	1967	Chevrolet	Chevelle	21.643	N/A	8/6/2009	15:51	0	N	0	N	0	N	.	NP	NP	NP	NP	NP	NP	NP	0	Y	0	N	0	N	NP	NP
								Connection at tank badly rusted. Vehicle runs rich and has exhaust leaks especially at manifold. Sniffer was going off almost continuously due to exhaust fumes.																					
309	2001	Nissan	Sentra	2.264	Pass	8/7/2009	13:55	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	Y	0	N	0	N	NP	NP
								Ground under vehicle below canister. Canister is behind left rear tire and vent is source of gasoline odor and sets sniffer off. Owner left premises to fill gas tank between emissions test and the MCM sniff test.																					
311	2002	VW	Passat	0.165	Pass	8/7/2009	15:10	0	N	0	N	NP	NP	NP	NP	0	N	NP	NP	NP	NP	0	N	NP	NP	0	N	NP	NP
								Everything under hood is shrouded. Fuel pipe to tank connections are mostly hidden as well as connection to tank. What was visible appeared to be in good shape.																					

Table F-4. Before-Repair PSHED, IM Gas Cap, and Modified California Method Results for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Measured PSHED (g/Qhr)	IM Gas Cap Inspection Result	MCM Date	MCM Time	Gas Cap		Fuel Lines		Fuel Pump		Fuel Pump to Metering		Fuel Filter		Fuel Rail		Fuel Injectors		Ground		Fill Pipe Joint		Tank		nonOEM	
								Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*
316	2003	Hyundai	Accent	0.691	Pass	8/10/2009	8:32	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	Y	0	Y	NP	NP
								Something seems to be damaged or leaking at top of fuel tank. Sniffer active many places around top pipe to tank joint. Looks dry - tank appears to have evaporated fluid of some kind but that did not activate sniffer.																					
320	2004	Chevrolet	Cavalier	0.034	Pass	8/10/2009	10:07	0	N	0	N	NP	NP	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	NP	NP
								Injectors not accessible for visual check or sniffer.																					
321	1997	Chevrolet	S-10	12.329	Pass	8/10/2009	11:32	0	N	0	N	NP	NP	0	N	NP	NP	G	Y	NP	NP	0	N	0	N	0	N	NP	NP
								Major gasoline leak with gas puddling on engine. Not sure where leak is exactly. Some part of supply or injector to TBI system?																					
325	2000	Chevrolet	Prizm	0.034	Pass	8/11/2009	8:42	0	N	0	N	NP	NP	0	N	NP	NP	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Fuel rail and injectors hidden under shroud.																					
327	1981	BMW	320i	1.565	Pass	8/10/2009	16:25	0	N	0	N	NP	NP	0	N	0	NP	0	N	0	N	0	N	0	N	0	Y	NP	NP
								Area around tank - up high where I can't see set sniffer off in multiple locations. Suspect something wrong with plumbing at top of tank.																					
329	1969	Jeep	Commando	7.535	N/A	8/11/2009	10:08	0	Y	0	N	0	N	0	N	0	N	NP	NP	NP	NP	0	N	0	N	0	N	0	N
								Non-OEM tank looks patched. Vented fuel cap. Carburetor seems to have leak around bowl seal area and perhaps around base. No liquid seen. Gas cap appears to have had gasket modified.																					
331	1994	Chevrolet	Blazer	4.608	Pass	8/11/2009	11:40	0	N	0	N	NP	NP	0	N	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Left front engine compartment reeks of gasoline. Suspect fault with evap canister.																					
162.332	1995	Jeep	Wrangler	0.166	Pass	8/11/2009	13:26	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								Metal shroud around tank a little banged up. No leaks detected from tank.																					
337	2001	Nissan	Xterra	0.066	Pass	8/11/2009	16:25	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	NP	N	0	N	NP	NP
								Only right fuel rail and injectors visible. Could not see actual fill pipe to tank junction.																					
339	1994	Toyota	4Runner	2.236	Pass	8/12/2009	10:48	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	N	0	N	NP	NP
								Right side fuel rail and injectors not visible. Could not see fill pipe to tank junction.																					
343	1991	VW	Golf	0.963	Pass	8/12/2009	12:21	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	Y	0	N	NP	NP
								Cannot see filler pipe to tank connection. There is a leak of some sort at top of fuel tank. Sniffer goes off when reaching above tank on right and right-front of tank. Fill door is on right.																					

Table F-4. Before-Repair PSHED, IM Gas Cap, and Modified California Method Results for Participating Vehicles (Continued)

Combined Packet ID unique to vehicle)	Year	Make	Model	Measured PSHED (g/Qhr)	IM Gas Cap Inspection Result	MCM Date	MCM Time	Gas Cap		Fuel Lines		Fuel Pump		Fuel Pump to Metering		Fuel Filter		Fuel Rail		Fuel Injectors		Ground		Fill Pipe Joint		Tank		nonOEM	
								Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*
348.432	1990	Dodge	Ram Charger	0.567	Pass	8/12/2009	13:52	0	N	0	N	NP	NP	0	N	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Vehicle has exhaust leak at right manifold. This would allow untreated exhaust plume to be mixed with after cat plume from tailpipe. Vehicle failed for emissions.																					
350	2005	Subaru	Outback	0.022	Pass	8/12/2009	15:20	0	N	NP	N	NP	NP	0	N	NP	NP	NP	NP	NP	NP	0	N	NP	N	0	N	NP	NP
								Flat 4 engine. Fuel distribution is buried below intake runners. Fuel lines hidden in underbody shrouding. Could not see fill pipe to tank connection. Could only reach with sniffer.																					
352	2001	Chevrolet	Astro	0.565	Pass	8/13/2009	8:42	0	N	0	N	NP	NP	NP	NP	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Van with engine mostly under cover between front seats. Most engine related fuel system components not visible. Weak odor of gasoline while situated below fuel tank. Nothing visual or detected by sniffer.																					
354	1989	Jeep	Cherokee	133.986	Pass	8/13/2009	12:13	0	N	0	N	NP	NP	0	N	0	N	0	N	0	Y	0	N	0	N	0	N	NP	NP
								Injector #4 may be leaking. Sniffer thought so. Evap canister is ripe and set sniffer off once one got within a couple of inches of it. Vehicle also leaks oil onto hot exhaust pipe and that smokes.																					
355	1993	Toyota	Corolla	2.216	Pass	8/13/2009	10:35	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								Sniffer goes off when exposed to areas around top of tank. Tank looks like it might be newer than car (shiny metal). Could smell gasoline when under car around tank.																					
357	1997	Nissan	Pathfinder	2.323	Pass	8/21/2009	14:50	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								There is some sort of contraption that sets sniffer off back between fuel tank and canister (see photo).																					
361	1995	VW	Golf	0.171	Pass	8/14/2009	9:30	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	NP	NP	0	N	NP	NP
								Could not see fuel pipe to tank junction nor guess exactly where it was. Area was clean according to sniffer.																					
362	2001	Audi	TT Quatro	0.127	Pass	8/14/2009	11:30	0	N	0	N	NP	NP	0	Y	NP	NP	0	N	0	N	0	N	0	N	NP	NP	NP	NP
								Could not see filler to fill pipe connection. Fuel pressure regulator area set of sniffer but inconsistently.																					
364	1995	Buick	Roadmaster	1.209	Pass	8/14/2009	12:50	m	Y	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								Fuel fill at rear behind license plate. Some staining on filler pipes. Canister set sniffer off as well.																					
365	2002	Ford	Mustang	0.024	Pass	8/14/2009	16:00	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																					

Table F-4. Before-Repair PSHED, IM Gas Cap, and Modified California Method Results for Participating Vehicles (Continued)

Combined Packet ID unique to vehicle)	Year	Make	Model	Measured PSHED (g/Qhr)	IM Gas Cap Inspection Result	MCM Date	MCM Time	Gas Cap Visual (0;m;S;G;NP)	Gas Cap *Sniffer (Y;N;NP)*	Fuel Lines Visual (0;m;S;G;NP)	Fuel Lines *Sniffer (Y;N;NP)*	Fuel Pump Visual (0;m;S;G;NP)	Fuel Pump *Sniffer (Y;N;NP)*	Fuel Pump to Metering Visual (0;m;S;G;NP)	Fuel Pump to Metering *Sniffer (Y;N;NP)*	Fuel Filter Visual (0;m;S;G;NP)	Fuel Filter *Sniffer (Y;N;NP)*	Fuel Rail Visual (0;m;S;G;NP)	Fuel Rail *Sniffer (Y;N;NP)*	Fuel Injectors Visual (0;m;S;G;NP)	Fuel Injectors *Sniffer (Y;N;NP)*	Ground Visual (0;m;S;G;NP)	Ground *Sniffer (Y;N;NP)*	Fill Pipe Joint Visual (0;m;S;G;NP)	Fill Pipe Joint *Sniffer (Y;N;NP)*	Tank Visual (0;m;S;G;NP)	Tank *Sniffer (Y;N;NP)*	nonOEM Visual (0;m;S;G;NP)	nonOEM *Sniffer (Y;N;NP)*
367	1993	Chevrolet	Van 20 / G20	14.561	Pass	8/14/2009	14:26	0	N	0	N	NP	NP	NP	NP	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Fuel filler and tank had light staining. No damage other than some rust. Same for tank. Engine is mostly under cowling inside of van and inaccessible.																					
370	2003	Land Rover	Discovery	0.015	Pass	8/17/2009	9:05	0	N	0	N	NP	NP	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	NP	NP
								Injectors hidden below intake manifold.																					
371	1996	Toyota	Corolla	0.087	Pass	8/17/2009	12:46	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																					
375	2005	Ford	Focus	0.052	Fail	8/17/2009	11:24	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																					
379	1993	Subaru	Legacy	0.068	Pass	8/17/2009	15:05	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								Vehicle has major exhaust leak on right bank. There is at least one bolt missing from exhaust flange. Exhaust (raw) is enough to excite sniffer. Possibly some other minor leak such as cold start valve on manifold area.																					
381	1998	Jeep	Cherokee	0.050	Pass	8/17/2009	16:00	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								Did not find fuel filter.																					
383	1994	Chevrolet	S-10	2.161	Pass	8/18/2009	8:31	0	N	0	N	NP	NP	NP	NP	0	N	NP	NP	NP	NP	0	N	0	N	m	N	0	N
								Carburetted? Tank has non-standard looking screw in place of drain bolt. Canister vent line disconnected at fill pipe (see photos). In evening when vehicle was parked there was gas odor on left rear of vehicle. Canister?																					
385	2001	Dodge	Dakota	0.022	Pass	8/18/2009	10:25	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																					
387	2000	Jeep	Grand Cherokee	0.018	Pass	8/18/2009	11:58	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	NP	N	0	N	NP	NP
								Could not see fuel fill pipe to tank connection but could reach sniffer to that location.																					
391	1999	Isuzu	Rodeo	0.080	Pass	8/19/2009	10:45	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																					
392	1999	Honda	Accord	0.046	Pass	8/19/2009	13:07	0	N	NP	N	NP	NP	0	N	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Fuel lines inside shroud but sniffer would have detected leak. Under hood fuel rail and injectors hidden from view and sniffer.																					

Table F-4. Before-Repair PSHED, IM Gas Cap, and Modified California Method Results for Participating Vehicles (Continued)

Combined Packet ID unique to vehicle)	Year	Make	Model	Measured PSHED (g/Qhr)	IM Gas Cap Inspection Result	MCM Date	MCM Time	Gas Cap		Fuel Lines		Fuel Pump		Fuel Pump to Metering		Fuel Filter		Fuel Rail		Fuel Injectors		Ground		Fill Pipe Joint		Tank		nonOEM	
								Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*
393	2001	Toyota	Solara	0.464	Fail	8/19/2009	13:49	0	N	NP	N	NP	NP	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	NP	NP
								Underbody-fuel lines not visible but accessible to sniffer. Fuel injectors pretty much hidden below intake manifold.																					
395	1997	Chevrolet	S-10	0.718	Pass	8/20/2009	8:30	0	N	0	N	NP	NP	0	N	NP	NP	NP	NP	NP	NP	0	N	0	N	0	Y	NP	NP
								Tank is severely dented. Cannot see liquid fuel but top of fuel tank activates sniffer. Can hear fuel pump whining while driving.																					
396	2000	Mercury	Mystique	0.038	Pass	8/19/2009	15:59	0	N	0	N	NP	NP	0	N	NP	NP	NP	NP	NP	NP	0	N	NP	N	0	N	NP	NP
								Massive intake manifold hides almost all of fuel rail and all injectors. Did not locate fuel filter. Could not see fill pipe to tank junction but it was accessible to sniffer.																					
397	2005	Ford	Freestyle	0.027	Pass	8/20/2009	10:35	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP	0	N	NP	NP
								Could not see or be certain that sniffer reached fuel pipe to tank connection. Back of engine (transverse V6) not accessible to sniff fuel rail or injectors.																					
401	1995	Lexus	SC 300	0.349	Pass	8/20/2009	11:24	0	Y	0	N	NP	NP	0	N	0	N	0	N	NP	NP	0	N	NP	NP	0	N	NP	NP
								Limited visibility and access to fuel rail and in particular injectors. Could not see fill pipe to tank junction nor most of fill pipe.																					
402	2004	Hyundai	Elantra	0.015	Pass	8/20/2009	13:16	0	N	0	N	NP	NP	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	NP	NP
								Only one fuel injector visible. Others hidden from view and sniffer. Could not find fuel filter.																					
404	1998	Isuzu	Rodeo	11.063	Pass	8/20/2009	16:14	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																					
405	1996	Chevrolet	Cavalier	0.040	Pass	8/20/2009	14:42	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																					
416	1999	Mazda	Protege	0.015	Pass	8/21/2009	11:04	0	N	NP	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								Could not see underbody fuel lines but access was vented so sniffer should have picked up a leak. Did not find fuel filter.																					
420	1996	Jeep	Grand Cherokee	2.260	Pass	8/21/2009	13:17	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	m	Y	NP	NP
								Staining on outside of fuel tank. Fill pipe to tank connections (see photo) look good but sniffer went off when exposed to top of fuel tank. Could not find evap canister (not where diagram indicates). Missing? Purge valve present.																					

Table F-4. Before-Repair PSHED, IM Gas Cap, and Modified California Method Results for Participating Vehicles (Continued)

Combined Packet ID (unique to vehicle)	Year	Make	Model	Measured PSHED (g/Qhr)	IM Gas Cap Inspection Result	MCM Date	MCM Time	Gas Cap Visual (0;m;S;G;NP)	Gas Cap *Sniffer (Y;N;NP)*	Fuel Lines Visual (0;m;S;G;NP)	Fuel Lines *Sniffer (Y;N;NP)*	Fuel Pump Visual (0;m;S;G;NP)	Fuel Pump *Sniffer (Y;N;NP)*	Fuel Pump to Metering Visual (0;m;S;G;NP)	Fuel Pump to Metering *Sniffer (Y;N;NP)*	Fuel Filter Visual (0;m;S;G;NP)	Fuel Filter *Sniffer (Y;N;NP)*	Fuel Rail Visual (0;m;S;G;NP)	Fuel Rail *Sniffer (Y;N;NP)*	Fuel Injectors Visual (0;m;S;G;NP)	Fuel Injectors *Sniffer (Y;N;NP)*	Ground Visual (0;m;S;G;NP)	Ground *Sniffer (Y;N;NP)*	Fill Pipe Joint Visual (0;m;S;G;NP)	Fill Pipe Joint *Sniffer (Y;N;NP)*	Tank Visual (0;m;S;G;NP)	Tank *Sniffer (Y;N;NP)*	nonOEM Visual (0;m;S;G;NP)	nonOEM *Sniffer (Y;N;NP)*
424	1970	VW	Beetle	1.935	Pass	8/21/2009	16:00	0	Y	NP	NP	0	N	0	N	0	N	NP	NP	NP	NP	NP	NP	S	Y	0	N	NP	NP
								Fuel connections to tank are some strange fibrous material that is saturated with gasoline. Some evidence of gasoline below fuel filler connection at tank.																					
425	1998	Mitsubishi	Eclipse	0.008	Pass	8/24/2009	9:14	0	N	NP	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								Underbody fuel lines not visible. Could not find fuel filter. Replacement hood? No VECI labels.																					
427	1984	Toyota	Land Cruiser	26.900	Pass	8/24/2009	12:40	0	N	0	N	0	N	0	N	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Exhaust leaks around catalytic converter and air injection system under hood.																					
428	1975	Chevrolet	C-10	7.751	N/A	8/24/2009	14:20	0	N	0	N	0	N	0	N	NP	NP	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Did not locate fuel filter. Left side exhaust manifold to tailpipe is leaking.																					
430	2002	Jeep	Wrangler	0.073	Pass	8/24/2009	11:06	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								Did not see fuel filter.																					
431	1993	Mitsubishi	3000 GT	0.054	Pass	8/24/2009	15:58	0	N	NP	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								Could not find fuel filter. Underbody fuel lines hidden from view. Rear fuel rail and injectors not visible. Transverse V6.																					
437	1991	Chevrolet	S-10	0.133	Pass	8/25/2009	13:28	0	N	0	N	NP	NP	0	N	0	N	NP	NP	NP	NP	NP	NP	0	N	0	N	NP	NP
								Vague odor of gasoline around driver side engine compartment. Cannot find anything with sniffer.																					
438	1975	Chevrolet	C-10	6.933	Pass	8/25/2009	17:10	0	N	0	N	0	N	0	N	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Right tank set off sniffer around top of tank on outboard side. Left fuel cap looks damaged but seems tight. Some evidence of fuel having been spilled below left fuel cap. Right fuel cap different and newer.																					
439	1998	Pontiac	Grand Prix	0.018	Pass	8/25/2009	16:28	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	NP
								Transverse V6. Rear fuel rail and injectors not accessible. Limited access to front.																					
454	1988	BMW	M6	0.455	Pass	8/25/2009	15:57	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								.																					
460	2003	Dodge	Durango	0.032	Pass	8/26/2009	10:24	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	.	.
								Did not locate fuel filter. Left side exhaust manifold to tailpipe is leaking.																					
466	2003	Acura	RSX	0.018	Pass	8/27/2009	12:36	0	N	0	N	NP	NP	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	NP	NP
								Did not locate fuel filter. Most of fuel rail and injectors hidden from view.																					

Table F-4. Before-Repair PSHED, IM Gas Cap, and Modified California Method Results for Participating Vehicles (Continued)

Combined Packet ID unique to vehicle)	Year	Make	Model	Measured PSHED (g/Qhr)	IM Gas Cap Inspection Result	MCM Date	MCM Time	Gas Cap		Fuel Lines		Fuel Pump		Fuel Pump to Metering		Fuel Filter		Fuel Rail		Fuel Injectors		Ground		Fill Pipe Joint		Tank		nonOEM	
								Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*
468	2004	Subaru	Outback	0.022	Pass	8/27/2009	14:30	0	N	NP	N	NP	NP	0	N	NP	NP	NP	N	NP	NP	0	N	NP	NP	0	N	NP	NP
								Could not see fuel pipe to tank connection. Did not locate fuel filter. Injectors buried (flat 4 engine). Could sniff in area of fuel rails but could not see them.																					
469	2000	Nissan	Pathfinder	0.052	Pass	8/27/2009	13:31	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	NP
								Fuel injectors hidden below intake manifold.																					
475	2000	Chevrolet	Astro	2.454	Pass	8/27/2009	16:00	0	N	0	N	NP	NP	NP	NP	0	N	NP	NP	NP	NP	0	N	0	Y	0	N	NP	NP
								Suspect that fuel pump replacement damaged gasket. Areas on top of tank and near tank to fill pipe connect set sniffer off. Also evap canister set sniffer off. No access to engine and that part of fuel system.																					
481	2003	Nissan	Frontier	0.036	Pass	8/28/2009	9:02	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	NP
								Fuel injectors buried under intake manifold.																					
482	1992	Nissan	Stanza	0.195	Pass	8/28/2009	10:21	0	N	0	N	NP	NP	0	Y	0	N	0	Y	0	Y	0	N	0	N	0	N	NP	NP
								Sniffer went off in a variety of areas associated with fuel delivery. Sometimes injector sometimes rail sometimes fuel pressure regulator. Could not pinpoint exact source of fumes.																					
486	1993	Jeep	Cherokee	0.277	Pass	8/28/2009	11:43	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	NP	NP	0	N	NP	NP
								Did not locate fuel filter. Could not be sure that sniffer reached fill pipe to tank connection. Could not see connection.																					
489	1991	Ford	Bronco	28.800	Pass	8/28/2009	13:28	0	N	0	N	NP	NP	0	Y	0	N	NP	NP	NP	NP	0	Y	0	N	0	Y	NP	NP
								Fuel rail injectors below custom intake manifold. Sniffer went off near fuel pressure regulator but there are a lot of exhaust leaks. This is what set sniffer off below vehicle. Sniffer went off when exposed to top area of fuel tank.																					
494	1995	Mazda	MX-6	0.190	Pass	8/28/2009	15:19	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								Could not locate fuel filter.																					
497	1994	Buick	Century	0.126	Pass	8/31/2009	9:38	0	N	0	N	0	N	0	N	0	N	0	N	0	N	0	N	m	Y	0	N	0	N
								.																					
498	1998	Honda	Accord	0.027	Pass	8/31/2009	10:35	0	N	0	N	NP	NP	0	N	.	.	0	N	0	N	0	N	0	N	0	N	NP	NP
								No non-OEM installations.																					
504	1992	Ford	F150	0.132	Pass	8/31/2009	13:24	0	Y	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								302 V-8. Passenger side injectors inaccessible. No non-OEM installations.																					

Table F-4. Before-Repair PSHED, IM Gas Cap, and Modified California Method Results for Participating Vehicles (Continued)

Combined Packet ID unique to vehicle)	Year	Make	Model	Measured PSHED (g/Qhr)	IM Gas Cap Inspection Result	MCM Date	MCM Time	Gas Cap		Fuel Lines		Fuel Pump		Fuel Pump to Metering		Fuel Filter		Fuel Rail		Fuel Injectors		Ground		Fill Pipe Joint		Tank		nonOEM	
								Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*
507	2001	Toyota	Sequoia	0.064	Pass	8/31/2009	11:52	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	NP	N	NP	NP
								Tank covered in metal shield. No evidence of damage/rust. No non-OEM installations.																					
512	2005	Hyundai	Santa Fe	0.020	Pass	8/31/2009	15:48	0	N	0	N	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								.																					
517	1999	Chevrolet	Lumina	0.033	Pass	9/1/2009	9:22	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								No non-OEM installations.																					
521	1994	Nissan	Sentra	0.248	Pass	8/31/2009	15:05	0	N	NP	NP	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								Underbody fuel lines inaccessible. Low ground clearance. No non-OEM equipment.																					
527	1995	Eagle	Talon	2.202	Pass	9/1/2009	10:35	0	N	0	N	NP	NP	0	N	NP	NP	0	Y	0	N	0	N	0	Y	0	Y	.	.
								Did not find fuel filter. Sniffer detected leak at pressure regulator. Sniffer leaks detected where fuel lines exit tank. Exhaust manifold leaks.																					
540	1998	Honda	Accord	2.098	Pass	9/1/2009	14:05	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	NP	NP
								Sniffer leak detected at vapor canister. No non-OEM installations. Did not find fuel filter. Canister leak = vapor not liquid.																					
542	1986	Subaru	GL10	0.13	Pass	9/1/2009	16:35	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	NP	NP	0	N	0	N	NP	NP
								No non-OEM installations.																					
546	1996	Geo	Prizm	0.622	Pass	9/2/2009	11:19	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	N	NP	NP
								While lying below fuel tank area I thought I got a faint whiff of gasoline. Bruce said same as we were closing PSHED door.																					
547	1975	Ford	Ranger F250	6.837	Pass	9/2/2009	9:45	m	Y	NP	NP	0	N	0	N	0	N	NP	NP	NP	NP	0	N	0	N	0	N	NP	NP
								Fuel cap leaks when gasoline sloshes in tank. Fuel comes out of gas cap (when) tank is full.																					
550	1992	Ford	Taurus	14.696	Pass	9/2/2009	14:43	0	N	0	N	NP	NP	0	N	0	Y	0	N	0	N	0	N	0	N	0	Y	NP	NP
								Sniffer went off around fuel tank area. But fuel filter is also right next to tank. Could not see or feel liquid from fuel filter.																					
559	1989	Oldsmobile	Regency	4.127	Pass	9/3/2009	12:45	0	N	0	N	NP	NP	0	N	NP	NP	0	N	0	N	0	Y	0	N	0	N	NP	NP
								Did not locate fuel filter. Most fuel injectors not visible - below intake. Ground under vehicle set off sniffer and left front of vehicle. This is where the charcoal canister is located. There was a hole in the bottom of canister as if some sort of plug was missing.																					

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Combined Packet ID (unique to vehicle)	Year	Make	Model	Measured PSHED (g/Qhr)	IM Gas Cap Inspection Result	MCM Date	MCM Time	Gas Cap		Fuel Lines		Fuel Pump		Fuel Pump to Metering		Fuel Filter		Fuel Rail		Fuel Injectors		Ground		Fill Pipe Joint		Tank		nonOEM	
								Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*	Visual (0;m;S;G;NP)	*Sniffer (Y;N;NP)*
563	1998	Ford	Taurus	0.050	Pass	9/3/2009	15:30	0	N	0	N	NP	NP	0	N	0	N	0	N	NP	N	0	N	0	N	0	N	NP	NP
								Transverse V6. Rear injectors not accessible. Part of fuel rail not visible.																							
568	1997	Saturn	SL1	0.387	Pass	9/4/2009	11:08	0	N	0	N	NP	NP	0	N	0	N	0	N	0	N	0	N	0	N	0	Y	NP	NP
								Sniffer goes off inconsistently in area of fuel tank especially around top. Odor of gasoline under vehicle in fuel tank area.																							