

Heavy-Duty Idling Activity Characterization and Emissions Inventory Survey Protocol

Truck Stops, Rest Stops, and Picnic Areas

Purpose

The trucking industry is a major part of North America's economy, transporting over 80% of the nation's goods, and it is growing rapidly.¹ The population of large trucks is estimated at 4.2 million, 1.3 million of which are "long haul" trucks equipped with sleeper cabs and powered by diesel engines.² Due to increases in truck traffic on IH-35 and the requirement to identify emission sources for modeling, an inventory of truck stops is a necessity.

The Department of Transportation requires rest of 10 hours after every 11 hours driving for property-carrying commercial motor vehicle (CMV) drivers.³ Interstate 35, Interstate 10, and other major highways converge in San Antonio, so drivers frequently use truck stops and other facilities in the San Antonio area to comply with mandatory rest breaks. It is not uncommon for truck drivers to idle their engines throughout their rest periods to provide electricity for cooling and heating their cabins, or to keep their engine fluids warm.⁴ This extended idling consumes fuel, creates air and noise pollution, and is an inefficient use of the nation's energy supply. According to an estimate by the US Department of Energy, each year in the U.S., trucks consume over 25 million barrels of fuel a year for overnight truck idling.⁵

The Texas Commission on Environmental Quality (TCEQ), in an interagency contract with the Texas Transportation Institute (TTI), conducted phase 1 of a statewide study on the magnitude of emissions from heavy-duty truck idling in 2003. The report provides an account of the heavy-duty (long-haul) trucks using truck stops and a review of methodologies to calculate the truck idling emission factors.⁶ This report paved the way for the second TCEQ report prepared by the Eastern Research Group Inc., which provided annual truck idling emission estimates for the base year 2004 through 2030 on a county-based level.⁷ The latter study expanded the truck stop database by determining their

¹ IdleAire Technologies Corp., August 2007. "Diesel Idling and the IdleAire Solution Fact Sheet". Available online: <http://www.idleaire.com/images/Users/1/pdf/Diesel%20Idling%20Fact%20Sheet.pdf>. Accessed 08/23/10.

² *Ibid.*

³ Department of Transportation Federal Motor Car Safety Administration, November 18, 2008. "Hours-of-Service Regulations". 49 CFR Parts 385 and 395. Washington D.C. Available online: <http://www.fmcsa.dot.gov/rules-regulations/topics/hos/HOS-2005.htm>. Accessed 08/23/10.

⁴ EPA, January 2004. "Guidance for Quantifying and Using Long Duration Truck Idling Emission Reductions in State Implementation Plans and Transportation Conformity". Research Triangle Park, North Carolina. p. 2. Available online: <http://www.epa.gov/otaq/smartway/documents/420b04001.pdf>. Accessed 08/23/10.

⁵ Dr. Linda Gaines and Terry Levinson Argonne National Laboratory September 23, 2009. "Idling Reduction Makes Sense". U.S. Department of Energy, Energy Efficiency and Renewable Energy. Available online: http://www1.eere.energy.gov/cleancities/pdfs/idle_reduction.pdf. Accessed 08/23/10.

⁶ TTI, Aug. 2003. "HDDV Idling Activity and Emissions, Study: Phase 1, Study Design and Estimation of Magnitude of the Problem". Sponsored by TCEQ. College Station, Texas. Available online: http://www.tceq.state.tx.us/assets/public/implementation/air/am/contracts/reports/mob/HDDV_Idle_Activity_and_EI_Phase1-tti.pdf. Accessed 08/23/10.

⁷ Eastern Research Group, Inc., Cambridge Systematics, Inc., and Alliance Transportation Group, Inc., August 31, 2004. "Heavy-Duty Vehicle Idle Activity and Emissions Characterization Study, Final Report". Sponsored by TCEQ. Austin, Texas. Available online: http://www.tceq.state.tx.us/assets/public/implementation/air/am/contracts/reports/mob/HDDV_Idle_Activity_and_EI_Phase2-tti.pdf. Accessed 08/23/10.

locations and capacities and calculating existing and future emissions. Both these reports lack a complete survey of all the truck idling facilities in the San Antonio area and the reports are out of date because of changes in locations of truck stops, idling characteristics, and fuel prices.

Because San Antonio may become a non-attainment region in the near future, the importance of assessing idling emissions from heavy-duty diesel trucks is evident. This assessment should provide key information on the impact of increased truck traffic and the impact on local ozone readings. The goal of this protocol is to establish a foundation for a comprehensive visual survey of truck idling activities at truck stops, rest stops, and picnic areas. The spatial and temporal allocation of long term heavy duty truck idling will be collected through the survey to provide data needed to calculate emissions.

Study Area

The survey will encompass the 8 county area of the San Antonio MSA, which includes Bexar, the most populous county of the region, and the 7 adjacent counties of Atascosa, Bandera, Comal, Guadalupe, Kendall, Medina and Wilson.

Definition of Heavy-Duty Trucks

The focus of this protocol is a visual survey of engine idling practices by long-haul truck drivers. The survey will provide inputs that can be used to estimate extended idling emissions for the combination (tractor/trailer) long-haul truck category, which is the only source use type within the current version of the Motor Vehicle Emission Simulator model (MOVES)⁸ for which extended idling emissions can be estimated. This vehicle category is more commonly referred to as diesel-powered five-axle “eighteen-wheelers”, but other four-axle and six-axle configurations are also included in this category. Combination Long-haul Truck are classified in MOVES as trucks with majority of operation outside of 200 miles of home base⁹

The primary inputs needed by MOVES to estimate idling emissions are the number of hours operating (SHO) in extended idling mode by source type. Since EPA has required that states begin using the MOVES model for on-road inventory development, this report will not use any on-road emission inventories developed with the MOBILE6.2 model. Likewise, the simplified extended idling emission estimation procedure outlined by EPA for use with MOBILE6.2 in the January 2004 “Guidance for Quantifying and Using Long Duration Truck Idling Emission Reductions in State Implementation Plans and Transportation Conformity”¹⁰ will not be used.

⁸ U.S. EPA, December 2009. Office of Transportation and Air Quality Washington, DC. Motor Vehicle Emission Simulator. Available online: <http://www.epa.gov/otaq/models/moves/index.htm>. Accessed 07/21/10.

⁹ John Koupal, Mitch Cumberworth, and Megan Beardsley, June 9, 2004. “Introducing MOVES2004, the initial release of EPA’s new generation mobile source emission model”. U.S. EPA Office of Transportation and Air Quality, Assessment and Standards Division. Ann Arbor, MI. Available online: <http://www.epa.gov/ttn/chief/conference/ei13/ghg/koupal.pdf>. Accessed 08/20/10.

¹⁰ EPA, January 2004. “Guidance for Quantifying and Using Long Duration Truck Idling Emission Reductions in State Implementation Plans and Transportation Conformity”. EPA420-B-04-001. Transportation and Regional Programs Division Office of Transportation and Air Quality and Air Quality Strategies and Standards Division Office of Air Quality Planning and Standards. Available online: <http://www.epa.gov/smartway/documents/420b04001.pdf>. Accessed 08/24/10.

Location of Long Term Truck Idling Facilities

Drivers typically idle their trucks' engines at the following locations:

- Truck Stops
- Rest Stops
- Picnic Areas
- Other Idling Locations

Extensive research has been conducted in an effort to identify and locate all such facilities in the San Antonio MSA. Should additional truck stops, rest stops, and picnic areas be identified during the course of conducting the truck idling surveys, however, they will be added to the inventory of facilities for further review. All identified truck stops, rest stops, and picnic areas will be included in the survey.

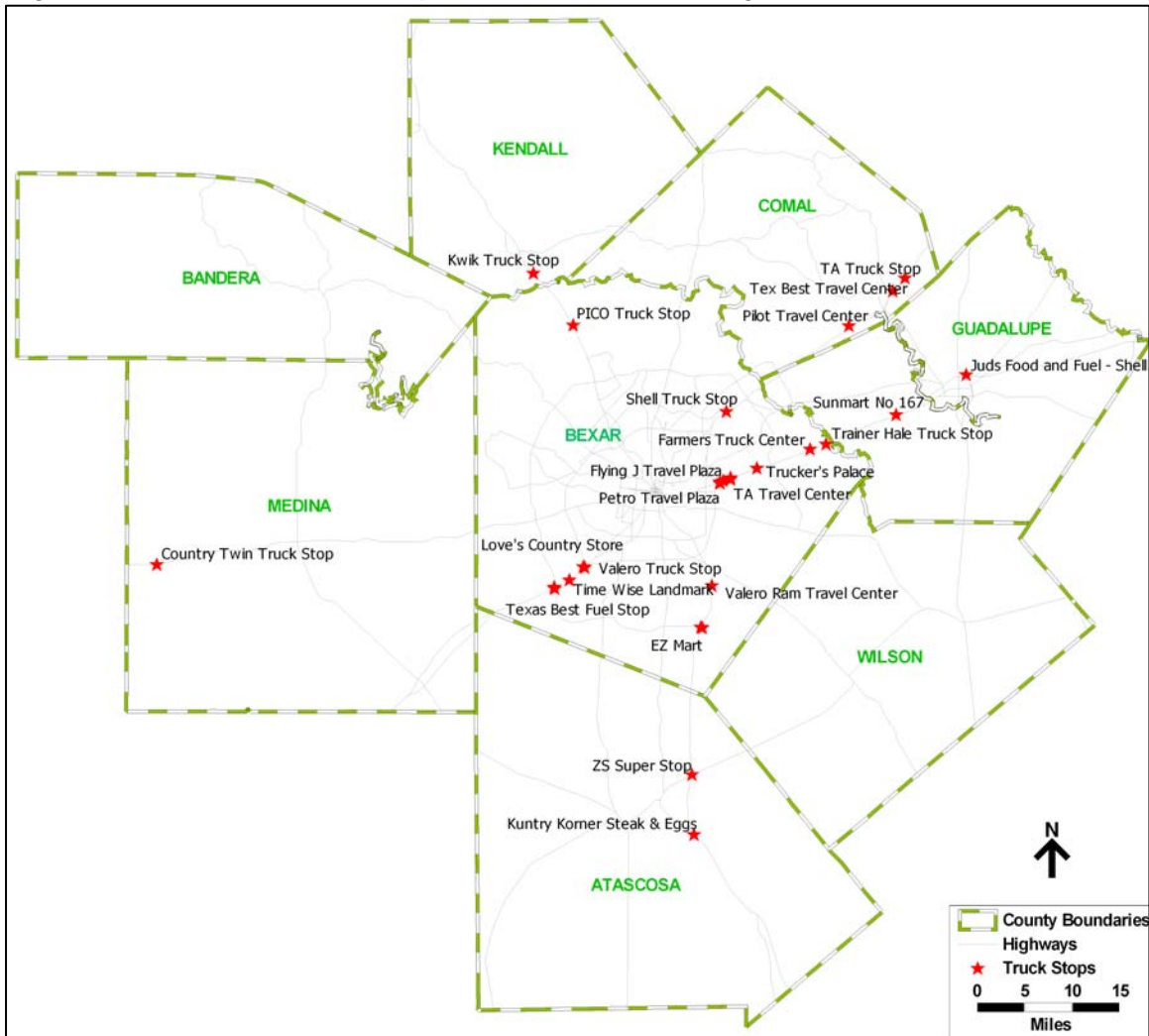
Truck Stops

AACOG staff compared information collected from the sources mentioned above to develop a geographic dataset of local truck stops, gas stations, restaurants, and travel plazas that have parking facilities for long term idling of heavy-duty trucks. Truck stop data was collected from TxDOT, Yahoo yellow pages, trucking industry web pages, facility managers, TTI research, and the ERG reports. According to the ERG, "there is no single comprehensive list of truck stops available for Texas" and, subsequently, for the San Antonio region.¹¹

Regional aerial images were also used to verify the accuracy of location information and determine the number of available parking spaces. Assigning geographic coordinates to the truck stops facilitated the development of a visual tool for analyzing their dispersion throughout the region as well as the creation of a grid-based input file for use in the photochemical model. As indicated in figure 1, truck stops are primarily clustered in the eastern section of the region, off IH-10. However, comparisons of collected data indicated that the parking capacity of existing truck stops located off IH-35 and IH-37 has increased recently. Table 1 provides a list of all truck stops in the AACOG region and the number of estimated parking spaces at each facility.

¹¹ Eastern Research Group, Inc., Cambridge Systematics, Inc., and Alliance Transportation Group, Inc., August 31, 2004. "Heavy-Duty Vehicle Idle Activity and Emissions Characterization Study, Final Report". Sponsored by TCEQ. Austin, Texas. p 3-1. Available online: http://www.tceq.state.tx.us/assets/public/implementation/air/am/contracts/reports/mob/HDDV_Idle_Activity_and_EI_Phase2-tti.pdf. Accessed 08/23/10.

Figure 1: Locations of Truck Stops in the San Antonio Region



Plot Date: September 2, 2010
 Map Compilation: September 2, 2010
 Source: Yahoo Yellow Pages, truck industry web sites, aerial images, 2000 TIGER files

Table 1: Truck Stops in the San Antonio MSA

| Truck Stop | Address | County | Exit Number | Parking Spaces* |
|------------------------------|----------------------------------|-----------|-------------|-----------------|
| Trucker's Palace | 5855 IH 10 E, San Antonio | Bexar | 581 | 60 |
| Petro Travel Plaza | 1112 Ackerman Rd, San Antonio | Bexar | 582 | 250 |
| Pilot Travel Center | 5619 IH 10 E, San Antonio | Bexar | 582 | 50 |
| TA Travel Center | 6170 IH 10 E, San Antonio | Bexar | 583 | 198 |
| Flying J Travel Plaza | 1815 Foster Rd., San Antonio | Bexar | 583 | 228 |
| Shell Truck Stop | 8755 IH 10 E, Converse | Bexar | 585 | 50 |
| Farmers Truck Center | 13183 IH 10, Converse | Bexar | 591 | 50 |
| Trainer Hale Truck Stop | 14462 IH 10, Converse | Bexar | 593 | 15 |
| Texas Best Fuel Stop (Exxon) | 14650 IH 35, Von Ormy | Bexar | 140 | 10 |
| Valero AAA Travel Center | 14555 IH 35, Von Ormy | Bexar | 140 | 57 |
| Shell Time Wise Landmark | 13437 IH 35, IH 35, Von Ormy | Bexar | 141 | 28 |
| Love's Country Store | 11361 IH 35, S Von Ormy | Bexar | 144 | 95 |
| Valero | IH 35, S Von Ormy | Bexar | 144 | 35 |
| Shell Truck Stop | 11607 N IH 35, San Antonio | Bexar | 169 | 150 |
| EZ Mart | 15537 IH 37, Elmendorf | Bexar | 125 | 10 |
| Tex Best Travel Center | 20290 IH 37, Elmendorf | Bexar | 125 | 50 |
| Valero Ram Travel Center | IH 37, Elmendorf | Bexar | 130 | 15 |
| PICO | 25284 IH 10, San Antonio | Bexar | 550 | 15 |
| Pilot Travel Center | 4142 Loop 337, New Braunfels | Comal | 184 | 70 |
| Tex Best Travel Center | 2735 N IH 35, New Braunfels | Comal | 191 | 18 |
| TA Truck Stop | 4817 IH 35, New Braunfels | Comal | 193 | 123 |
| Sunmart No 167 | 6150 W IH 10, Seguin | Guadalupe | 601 | 40 |
| Juds Food and Fuel - Shell | IH10/Hwy 123, Seguin | Guadalupe | 610 | 30 |
| Kuntry Korner Steak & Eggs | IH 37 / Jim Brite Rd, Pleasanton | Atascosa | 104 | 50 |
| ZS Super Stop | IH 37 / FM 97, Pleasanton | Atascosa | 109 | 24 |
| Country Twin Truck Stop | C.R 411 & US HWY 90, D'Hanis | Medina | | 15 |
| Kwik Truck Stop | 31700 IH 10 W, Boerne | Kendall | 543 | 11 |
| Total | | | | 1,747 |

*Data on number of parking spaces were collected by means of studying aerial images, phoning the managers, Internet, and published reports.

Rest Stops and Picnic Areas

TxDOT was contacted for information on the location of rest stops and to answer questions about newly built or renovated facilities in the AACOG region.¹² An official Texas Travel Map was also acquired to locate regional picnic areas. TxDOT is sponsoring a program whereby modern safety rest stops are being built to encourage drivers to stop more frequently. These facilities help drivers fight driving-related fatigue, which is a major cause of serious accidents: "attractive, safe, and clean rest area facilities are invitations to entice travelers to stop and rest. TxDOT's new generation of Safety Rest Areas feature regional designs, modern restrooms, interpretive displays, exhibits of local features, separate parking for cars and trucks, and wireless Internet access."¹³ Longer mandatory resting times for

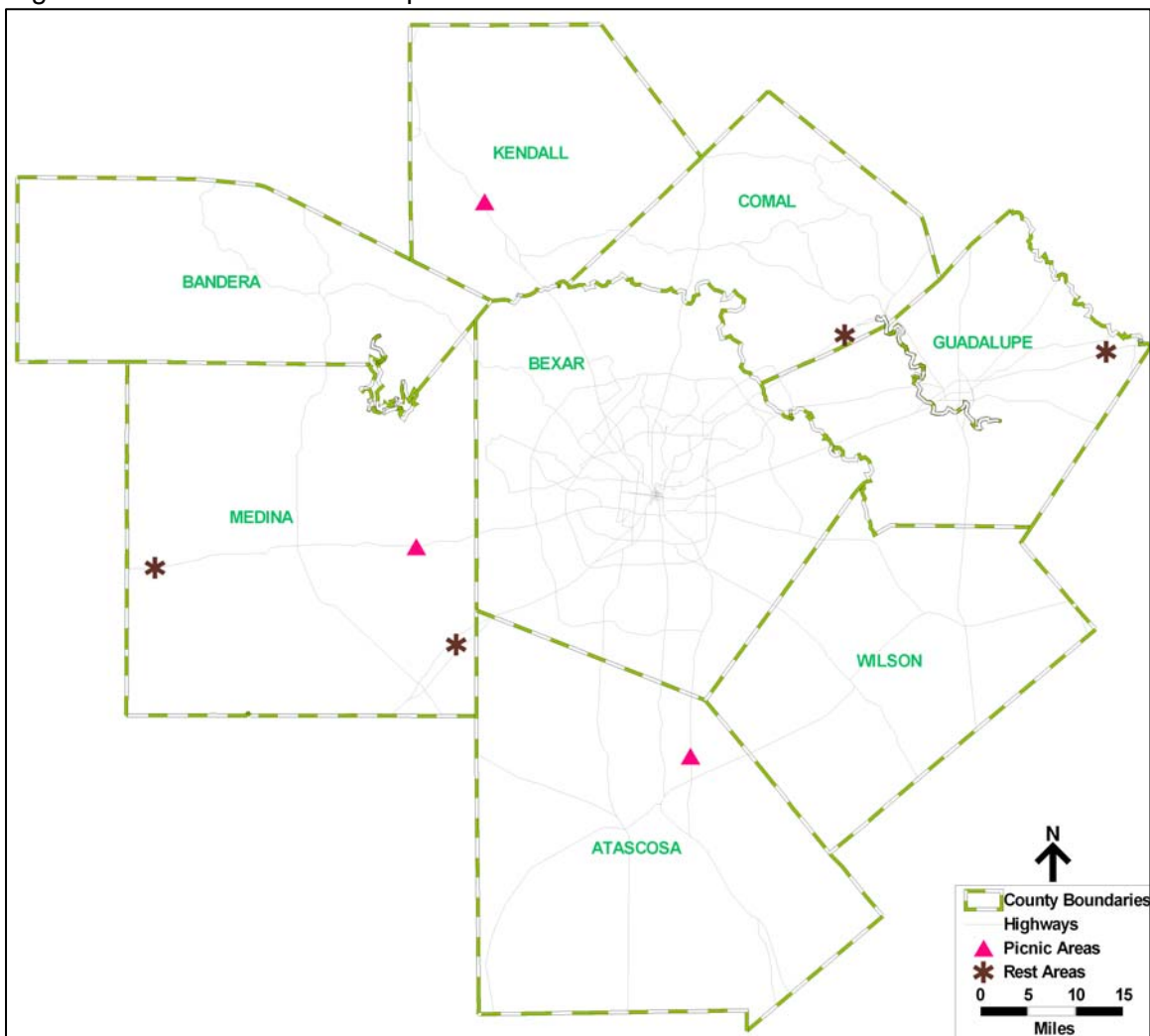
¹² TxDOT Expressway, "Safety Rest Area Maps". Austin, Texas. Available online: <http://www.dot.state.tx.us/mnt/sra/map.htm>. Accessed 08/23/10.

¹³ TxDOT, Sept. 2009. "Texas Safety Rest Area Program". Available online: http://ftp.dot.state.tx.us/pub/txdot-info/library/pubs/travel/sra_brochure.pdf. Accessed 08/23/10.

truck drivers and construction of new rest stops with designated truck parking spaces and better amenities, such as air conditioned TV rooms and wireless Internet access, have made rest stops suitable resting places for long-haul truckers.

A geographic database was created with information collected on rest stops and picnic areas in the region (figure 2). Truck drivers frequently use picnic areas alongside major freeways for their mandatory rest periods. Large picnic areas along major highways will be included in the survey of truck idling activities. There are several other smaller picnic areas located in the 8-county San Antonio MSA not on major highways, but they cannot handle more than 1 or 2 trucks and they will not be surveyed. A list of all the rest stops and picnic areas that will be surveyed, with the number of estimated parking spaces, is provided in table 2.

Figure 2: Locations of Rest Stops and Picnic Areas in the San Antonio MSA



Plot Date: September 2, 2010
Map Compilation: September 2, 2010
Source: Texas official travel map, aerial images, 2000 TIGER files

Table 2: Rest Areas and Picnic Areas in the San Antonio Region

| Type | Location | County | Parking Spaces* |
|-------------|--------------------|-----------|-----------------|
| Rest Stop | Northbound - IH 35 | Comal | 12 |
| | Southbound - IH 35 | Comal | 12 |
| | Eastbound - IH 10 | Guadalupe | 42 |
| | Westbound - IH 10 | Guadalupe | 39 |
| | Northbound - IH 35 | Medina | 13 |
| | Southbound - IH 35 | Medina | 18 |
| | US 90 | Medina | 24 |
| Picnic area | Northbound - IH 37 | Atascosa | 28 |
| | Southbound - IH 37 | Atascosa | 28 |
| | Eastbound - IH 10 | Kendall | 28 |
| | Westbound - IH 10 | Kendall | 28 |
| | US 90 | Medina | 6 |

Other Idling Locations

Long term heavy duty diesel truck idling occurs at other sites not listed above. These sites include restaurants, shopping centers, highway ramps, road shoulders, vacant properties, and facilities located near major highways. Since long-haul truck idling is less predictable and tends to be minimal at these other locations due to limited space and facilities, they will not be included in the truck idling survey. Nevertheless, truck idling at weigh stations will be checked to determine if idling rates are significant. Examples of these other local sites where long term truck idling may occur include:

- Weigh Station IH-10E, Mile Marker: 621, Seguin
- Weigh Station IH-10W, Mile Marker: 621, Seguin
- Weigh Station IH-35, Devine
- Wal-Mart Supercenter IH-10, Ex 540 (Hwy46), Boerne
- Wal-Mart US 181, Floresville
- Wal-Mart Supercenter US 90, Hondo
- Wal-Mart Supercenter IH-35 Ex 187, New Braunfels
- Wal-Mart Supercenter IH-35 Ex 172, San Antonio
- Wal-Mart Hwy 410 Ex 13b, San Antonio
- Wal-Mart Supercenter US 281, San Antonio
- Wal-Mart Supercenter Hwy 536, San Antonio
- Wal-Mart Supercenter I-10, Ex 610 (Hwy123), Seguin¹⁴

Data Collection Methodology for Idling Emissions at Truck Stops

The goal of conducting a truck idling survey in the San Antonio MSA is to obtain information that allows for the development of temporal and spatial profiles of truck idling and vehicle information sufficient to estimate idling emissions. The data collection template is provided at the end of this protocol. Data collected will include survey location, facility type, date of survey, time of survey, and meteorological conditions. The number of parking spaces, truck spaces filled, the number of trucks idling, condition of the parking lot, data on any electrification system, and any other information relevant to truck idling will be collected at each location. Facilities at each location will be noted including:

¹⁴ TruckMaster Logistics Systems, Inc. 2008. "Truck Stops In Texas". Jerome, ID. Available online: <http://www.truckmaster.com/truck-stop-in-tx>. Accessed 09/03/10.

- Restrooms
- Information center
- Fuel
- Showers
- Public phone
- Vending machine
- Convenience store
- Fast food restaurant
- Sit down restaurant
- Hotel
- Certified scales
- Wireless Internet
- Truck wash
- ATM
- Western Union
- Money orders

The surveyor will spend at least half an hour at each location to ensure the trucks identified are idling for sustained periods.

Time of Day Variation

Based on the time periods determined by ERG to be statistically significant,¹⁵ observations on truck idling will be collected during the following three time periods:

- Morning (5 a.m. – 10 a.m.)
- Daytime (10 a.m. – 10 p.m.)
- Evening/Night (10 p.m. – 5 a.m.)

For data collected on weekdays, the morning and daytime periods will include observations during local “rush hours” for consistency with how travel demand modeling is conducted.

Day of the Week Variation

The extended idling data set will include the number of idling trucks at each location for the two day-of-the-week categories: weekday (Monday-Friday) and weekend (Saturday-Sunday).

Additional Random Sampling

Additional random surveys will be conducted at locations that were already surveyed to determine a margin of error for the collected data. After several random surveys are conducted, the margin of error will be reviewed to determine if additional sampling is required.

Truck Stop Electrification Programs

In May 2001, President Bush issued the *National Energy Policy* directing the EPA and the Department of Transportation (DOT) to work with the trucking industry to establish a program to reduce emissions and fuel consumption from the use of long-haul trucks. Responding to this directive, the EPA initiated a comprehensive program to reduce idling and exhaust emissions from long haul trucks.¹⁶ The IdleAire Technologies Corporation is one of the companies that provide truck stop electrification (TSE) technology throughout the nation. IdleAire has determined that their “...system removes 100% of emissions associated with extended diesel idling, including nitrogen oxides (NOx), and volatile organic compounds

¹⁵ Eastern Research Group, Inc., Cambridge Systematics, Inc., and Alliance Transportation Group, Inc., August 31, 2004. “Heavy-Duty Vehicle Idle Activity and Emissions Characterization Study, Final Report”. Sponsored by TCEQ. Austin, Texas. p. 6-15. Available online: http://www.tceq.state.tx.us/assets/public/implementation/air/am/contracts/reports/mob/HDDV_Idle_Activity_and_EI_Phase2-tti.pdf. Accessed 08/23/10.

¹⁶ EPA. “SmartWay Transport”. Office of Transportation and Air Quality (OTAQ). Available online: <http://nsdi.epa.gov/otag/smartway/transport/index.htm>. Accessed 08/24/10.

(VOC). The system has a net reduction of 98% of criteria pollutants under the Clean Air Act after accounting for the electricity from the grid used to power the system.”¹⁷

In the San Antonio region, IdleAire provides individual electrical service for 60 parking spaces at the Travel Centers of America (TA) truck stop #147, located at the intersection of Foster Road and IH-10 East, and 72 parking spaces at TA #232, at the intersection of Conrads Road and IH-35 North in New Braunfels. These sites will be surveyed as part of the project to determine utilization rates.

Table 3: Location of IdleAire facilities in San Antonio

| County | Location | IdleAire Parking Space |
|--------|--|------------------------|
| Comal | TA #232, Conrads Rd at I-35, New Braunfels | 72 |
| Bexar | TA #147, Foster Rd at IH-10, San Antonio | 60 |
| Total | | 132 |

Data Availability

The idling survey data collected will be provided in an organized electronic format that can be readily incorporated into on-road inventory development with the MOVES model. It is expected that the results of any extended idling data collection effort will be used by the Texas Transportation Institute for development of on-road emission inventories with the MOVES model.

¹⁷ IdleAire Technologies Corp., August 2007. “Diesel Idling and the IdleAire Solution Fact Sheet”. Available online: <http://www.idleaire.com/images/Users/1/pdf/Diesel%20Idling%20Fact%20Sheet.pdf>. Accessed 08/23/10.

Example Survey Template

Survey Location: _____

Facility Type: _____

Adjacent Highway: _____

Mile Marker: _____

Date of Survey: _____

Time of Survey: _____

Meteorological Conditions (i.e. cloud cover, temperature, etc.):

Number of Truck Spaces: _____

Number of Spaces Filled: _____

Number of Trucks Idling: _____

Parking lot: Paved: _____ **Unpaved:** _____

Is a Truck Stop Electrification facility located at the site? _____

How many trucks are using the Truck Stop Electrification Facility? _____

Amenities available at the site:

- | | | | |
|------------------------------|-------|----------------------------|-------|
| Restrooms | _____ | Sit down restaurant | _____ |
| Information center | _____ | Hotel | _____ |
| Fuel | _____ | Certified scales | _____ |
| Showers | _____ | Wireless Internet | _____ |
| Public phone | _____ | Truck wash | _____ |
| Vending machine | _____ | ATM | _____ |
| Convenience store | _____ | Western Union | _____ |
| Fast food restaurants | _____ | Money order | _____ |

Other Comments: _____
