EPA NPAP TTP PE SOP COMPENDIUM (DRAFT FINAL, 1-12-05):README FIRST

This document is a set of SOPs, listed below as separate sections, in increasing numerical order, starting with the front material (CPTOC), containing the Cover page(CP) and the Table of Contents (TOC); followed by SOP sections 1-11; and Appendix D. The tabs on the left of the text, when clicked on with your mouse, will pull up the individual sections of the Compendium. The sections of this document (NPAP TTP PE SOP Compendium) are in a Draft Final PDF version.

We welcome comments and recommendations for improvement, both for editorial clarity and correctness and technical content issues. These SOPs have been reviewed and revised internally, for technical content, by the EPA NPAP TTP Workgroup, and in use by the EPA Regional network of TTP PE Mobile Lab Field Scientist Operators. We are now seeking to provide access to the broader ambient air monitoring community.

After discussion of any comments or recommendations sent to OAQPS, responses will be made to the senders. Any changes agreed to by the Workgroup will be made according to the change procedure in the NPAP TTP implementation plan (undergoing internal review and revision, prior to posting on AMTIC). The procedure is the same as the current PEP SOP change procedure, in the PEP Implementation Plan, already posted on AMTIC.

After January 31, 2006, open solicitation of comments will close. As soon after workgroup review and any revisions have been issued according to the change procedure, the Compendium will be reposted. Note that the status of this document is guidance, not a requirement, except where it is being used for the performance of EPA NPAP (National) TTP Performance Evaluations, by EPA contractor or other qualified staff person. This is the same status as is the case for the PEP Field and Lab SOP Compendia.

U.S EPA - REGIONS and OAQPS-

MONITORING

QUALITY ASSURANCE

DRAFT

STANDARD OPERATING PROCEDURES

For Through-The-Probe (TTP)

PERFORMANCE EVALUATIONS (PEs)

OF AMBIENT

AIR QUALITY MONITORING OF

CRITERIA AIR POLLUTANTS

TABLE OF CONTENTS

**THROUGH-THE-PROBE (TTP) PROCEDURES
FOR EPA'S NATIONAL PERFORMANCE EVALUATION (PE) PROGRAM
(NPEP) FOR
GASEOUS CRITERIA POLLUTANTS**

SECTION **SOP Number**

FIGURES

TABLES

Field Standard Operating Procedures for the EPA TTP National Performance Evaluation Program [1]

Operation: Overview of Performance Evaluation(PE) Field Activities

SOP: NPEP-1.01

Name: Printed	Signature	Date

Contents
(applicable to this SOP)

[1]TTP National Performance Evaluation Program

1. Scope and Applicability

This SOP Compendium applies to the performance of field operations for the EPA's Through-the-Probe (TTP, as opposed to Back-of-the-Analyzer, or BOA) method of the EPA National Performance Evaluation (formerly Audit) Program for the delivery by independent, onsite, EPA-certified personnel, of single-blind test samples of EPA Criteria Pollutant gases. The performance test gas samples are dynamically generated and independently verified by EPA funded personel onsite. The test gas samples are delivered to and through the entire ambient air monitoring sampling system of the organization being evaluated, starting with entry into the monitoring station's sampling inlet, or "probe".

This first SOP section in the compendium provides background for and then an overview of the detailed SOPs that follow. An amplification of this overview section is attached at the end of the section as a training overview.

2. Summary of Method

A PE for determining total bias for National Ambient Air Quality Standard (NAAQS) Criteria Pollutant gases involves independent onsite generating, verifying, delivery, station result recording, and preliminary report preparation and delivery.

Background and general information on the regulatory requirements for the NPAP (and now NPEP) and on the EPA method requirements and guidance used for the evaluation procedures and personnel training are provided first.

A) A summary of each TTP Compendia SOP follows.

Section 2 includes subsections on Mobile PE Lab Inventory (lists and related tasks and procedures), and communications requirements, responsibilities, and procedures), both very related to the corresponding PEP Field SOP Section.

Section 3 contains procedures, frequencies and criteria for independently recertifying (quantitatively recharacterizing) the generation system component, NIST-traceable standards and the overall system performance that must occur before going on an audit trip.

Section 4 procedures are activities that must occur for the exterior and interior of the mobile lab before each trip to a planned PE starts.This includes generation system warmup, operation and conditioning, powered by the onboard generators.
Section 5 procedures are the ones that must be performed successfully at the PE

site before the actual PE analysis by the site operator can start.This includes collection of station information, zeroing and checking of ozone analyzer, and preparation for (flow need determination) and connection to the station inlet.

Section 6 procedures detail the pre-PE calibrations, verfication of generation system output, and delivery of zero and upscale concentrations of ozone and/or the blended gases.

Section 7 contains the Post PE procedures at the PE site.

Section 8 contains the Interior and Exterior shut down procedures at the PE site.

Section 9 contains the Mobile TTP PE Lab Maintenance procedures, including spare parts and expendable lists, preventive and corrective actions, frequencies, specific references etc.

Section 10 contains a tabular summary of the QC and QA Criteria for the NPEP TTP SOP.

Section 11 contains a summary of the requirements and organization of the EPA NPEP record management, retention and archiving proceures.

B) Finally, summaries are provided, *primarily for training*, of the EPA TTP Mobile Lab: Purposes and Function; Lab system support, verification, and Delivery components: and system component configuration

3. Definitions

Appendix D contains a glossary of terms used in the NPEP TTP.

4. Cautions

- To prevent personal injury, all personnel must heed any warnings that are associated with installation and operation of the TTP tow vehicle, hitch, trailer, auxillary power, PE gas generation, verification, delivery and venting components, and any supporting equipment and supplies. Specific health and safety warnings will generally be found at the point in the SOP compendia, and referenced operating manual of troubleshooting guide where they are most applicable.

- Because the mobile audit lab and components will be moved from site to site, it is of critical importance that it be maintained and calibrated as required and that all aspects of its operation be checked and verified after it is set up at each new site. To function as a reliable standard of comparison, its operational parameters must be kept within tight control limits. Consequently, procedures for verifying a mobile lab sampler's calibration and operability are an important part of the field SOPs.

- The generation, verification and delivery components of the TTP system will rarely if ever be installed and dismantled in the course of the PE trips. Caution must be taken to install and maintain the TTP system components properly to prevent damage. Be particularly attentive to maintenance of the auxillary generators, air conditioners, API 701, Env 9100, analyzers (CO and ozone), ensuring the soundness of electrical and pneumatic connections that will be assembled and disassembled, and to cleaning of the interior and exterior surfaces of the manifolds, connecting tubing, and delivery hose lines. Pack and/or secure components for safe transport by vehicle. Refer to the operations manual for exact instructions for packing and /or securing the major TTP instruments. Immediately after installation, leak checks must be performed and verification checks of all components, including temperature, barometric pressure, and flow rates sensors must be made and recorded. Establish and always use individual instrument logs for this (recording) purpose. Keep the logs with the instruments at all times. All necessary corrective actions must be taken before PE can begin with the TTP system.

- Equipment that must be checked prior to and during each trip to ensure that it is operating correctly: 8 tow vehicle and trailer tires for air, 2 Auxilliary generators for oil leaks, 2 roof A/C units for Freon (or EPA -approved-substitute), genrator fuel tank leaks (use dip stick), brake fluid leaks(remove rubber seal cap on each wheel hub center); roof platform guard rail lockdown mechanism; interior cabinet and drawer latches, storage tie downs, cylinder rack tie downs, presence and use of regular and yellow clamshell safety cylinder caps; emergency and all other lights; exterior trailer door, port, and fuel tank locks; inflation pressure of each of the 8 instrument rack pneumatic, floor-mounted shock absorbers; test switch for battery indicator of CO monitor/alarm; status of fire extinguisher and safety kit.

- Use Exerior and Interior checklists, amended as needed, to help remember to check all components *(TTP SOP Section 4)*
- Location of cylinder hazard placards, readiness of hitch brake emergancy disconnects.
- The TTP system components used for PE are potentially vulnerable to contamination and damaged. Exercise care in handling new components. Avoid touch the flow path component interior surfaces; normally handle the components only by touching the exterior surfaces. If details concerning component labeling and connection are not followed precisely, errors will result. Rough handling of used components during packaging or transport should be avoided.

- Care should be taken, and labels used, in the use of instruments and their connections. Do not intermix the packing boxes, connecting tubing, fittings, spare parts, etc., of various brands or types of TTP component instruments.

- When EPA PE equipment is dismantled, be sure to remove any debris adhering to it and seal any openings with correctly fitting, air tight caps or plugs before storing it for transport, to minimize contamination. Use instrument labeled baggies to keep cleaned, conditioned fittings, tubing , or other packing items ready and readily retrievable for any packing that does become necessary.

- Protect any barometers or pressure sensors from mechanical shock and sudden changes in pressure.

5.0 Interferences

The interferences associated with this method are those factors that can cause alterations in the weight of the filter and/or sampled $PM_{2.5}$ and alterations to the flow rate of the sampler. A small particle of dust or pollen, if inadvertently transferred to the filter surface in the sample collection filter enclosure, will alter the sample weight dramatically. Interferences can be avoided by following these guidelines:

- Avoid handling potentially unexposed or exposed fittings or inner surfaces in any way that could add or subtract contamination such as solvents, moisture or body oil, dander,etc. For example, rough handling could cause weight loss, exposing of the filter to dusts or pollen could cause weight gain and allowing the face of the filter to touch surfaces could cause either weight gain or loss.

- Take all steps to minimize sampling and analysis residence times, including tubing and other flowpath component lengths and diameters, dead spaces, leaks, unnecessary path resistance (due to sharp bends, kinks, etc.).

- Read the interference sections of all pertinent TTP system manuals, especialy those of the API 701, Environics 9100, and the 2 TECO (or equivalent) analyzers, and in the EPA QA Handbook on Ambient Air Monitoring, Volume II Part 1.

- Ensure proper cleaning of the PE test gas flowpath's interior surfaces, including manifolds, tubing, fittings, delivery /presentation hose pipe connections and liner, to avoid any contamination of the flow path and analytical devices; use required techniques for leak checks to identify and correct any leaks found within the flow system, although maintaining the required positive pressure in the system components will minimize negative leak consequences.

6.0 Personnel Qualifications

All personnel responsible for conducting EPA TTP PEs at field sites must be certified by the U.S. EPA as completing a required training program. These persons are designated as Field Scientists (FS). During this training program, the operators of the samplers must successfully complete an extensive, hands-on training session specified by EPA/OAQPS. A FS must pass both written and performance tests before he or she is eligible to conduct TTP PEs. These training programs will be conducted as required at locations throughout the U.S. to ensure all operators of the portable samplers are certified and an adequate number of PE field scientists are available in each EPA Region. Contact the Regional EPA Office or OAQPS for

more information about training schedules and locations. Supplemental courses such as those offered by Air Pollution Training Institute (APTI) may be useful in providing general background to personnel with limited prior experience with air monitoring and/or quality assurance.

The mobile labs are either track or trailer -mounted (see subsection 7 for detailed description). The FS shall be prepared to drive the TTP Mobile lab parking spaces at the h0ome base to parking spaces as close as possible to - ideally within 150 feet of -various ambient air monitoring sampling platforms, including the tops of buildings or distant rural settings. The FS will have to maneuver the lab in forward and reverse gears, and on various roads at speeds up to 50 mph without damaging the TTP system. EPA has begun providing an appropriate training program for towing boat trailers and it has already been modified for towing mobile labs, to a certain extent. More will be added over time.

7.0 Equipment and Supplies

Each organization responsible for performing the TTP PE will develop a standard "kit" of equipment, materials, and supplies suitable for the make(s) and model(s) of mobile TTP lab components to be used. The contents of this "kit" will also be determined by the different requirements of the sites to be visited for TTP PEs. For example, mounting equipment will, in part, be dictated by how the sites are constructed and where they are mounted (building roof, wooden platform, concrete pad, and so on).

SOP NPEP TTP-2.01 contains a complete field inventory list and discusses the procedures for field equipment and resupply. That list of generic equipment and supplies must be translated into a specific checklist of equipment and materials that can be customized as necessary. Communications between the FS and site personnel prior to the visit are essential and assist greatly in knowing what will be required at each site.

7.1 Mobile Lab Platforms: The mobile labs are either track- or trailer -mounted. The truck is an enclosed cutaway cab-and-chassis with an approx. 5-7ft long cab and a 16 foot long, 8 ft wide, 12 ft hi (including distance from bottom of wheels to top of AC units) body. The trailers have a dester dual axle, are 18 feet long, and approx the same width and height as the truck-based body (the lab), with another approx 3 feet length of hitch. Ideally the tow vehicle is at least the equivalent to a Ford 350, preferably dual tire (dually) on the rear axle, and a hitch package that minimizes sway- preferably a weight distributing hitch, aauto matic disconnect, lights and brakes, on a 7 (not a 5-)-prong connector. The bodies are aluminum sheet panels layered over and riveted to reinforced aluminum ribs. The labs have 2 electrical power source alternativ es, and can be switched from one to the other as needed. When the system is in motion, power is provided by one of 2 7.7 KW auxilliary ONAN Generators. If the local home base or visted site has the correct specific electrical hook-up available, then power can be derived from a shore (“land”) line that the mobile lab carries onboard.

7.2.. Mobile Lab Components and Configuration

7.2.1. The Mobile Lab consists of several components located near and connected to each other in the front of the mobile laboratory interior.The component roles have to do with

either providing or controlling the electrical power for or the gas flow for the PEs.

7.2.1.1 The AC electrical flow path starts with either the land/shore line or one of the auxilliary generators, contiues through the electrical source selector switch, then the NEMA service breaker (fuse) box, then to either the mobile lab support eipment, including the interior lights, the 2 roof mounted AC units, the 2 roof mounted ventilation units; or for the mobile lab's sensitive instrument power, through the Major Power Powerware UPS-PLC. From the UPS, the electrical flow is distributed to the PE test gas generating and verifying equipment in the APW racks. The contractor that prepared the mobile labs has provided electrical wiring diagrams for each mobile lab, showing the complete flow path,

7.2.1.2 The test gas flow path starts with the API 701 Continuous Zero Air Generator and the 4 compressed gas cylinders. The gas flow path diagram is below.

7.2.2 There are 2 verticle APW instrument racks. They are approx 71" high, Powder Blue, shock mounted with pneumatically adjustible shock mounts, one on each of the 8 corners of the 2 instrument rack bottoms. One mount is located on the bottom of each rack corner. The 2 racks contain:

7.2.2.1 The Major Power Powerware 9125-2000, a combined power line conditioner (PLC) and uninterrupted power source(UPS) which receives power from a land line plugged into the station or home base power, or from 1 or 2 of the 2 auxiliary, ONAN-CMM, gasoline-fueled generators. The power flow goes from one of the 2 power (115VAC) sources, through a source selector switch, then to the service panel, then to the Powerware 9125-2000, on the bottom of one rack.

7.2.2.2. API Model 701, a continuous Zero Air Generator,.on bottom of 2nd rack; this is connected by tubing to the ENVIRONICS 9100, and plugged into the Power Ware 9125-2000.

7.2.2.3 TECO 48C CO and 49C-PS Ozone Analyzers, located above the API 701, and below the Environics 9100. Both are plugged into the Powerware 9125 and connected by tubing to one (the
verification manifold) of the 2 glass manifold system on the wall.

7.2.2.4 Environics 9100 Calibrator, which is connected by tubing inputs from the API 701 and the blended (CO,SO2, and NO) gas cylinder located next to the instrument racks; and by tubing output to the 2nd (delivery) glass manifold; and is plugged for power into the Powerware 9125.

7.2.2.5 Flow Control Panel. Figure 2, below, is a photograph of the panel at the top of

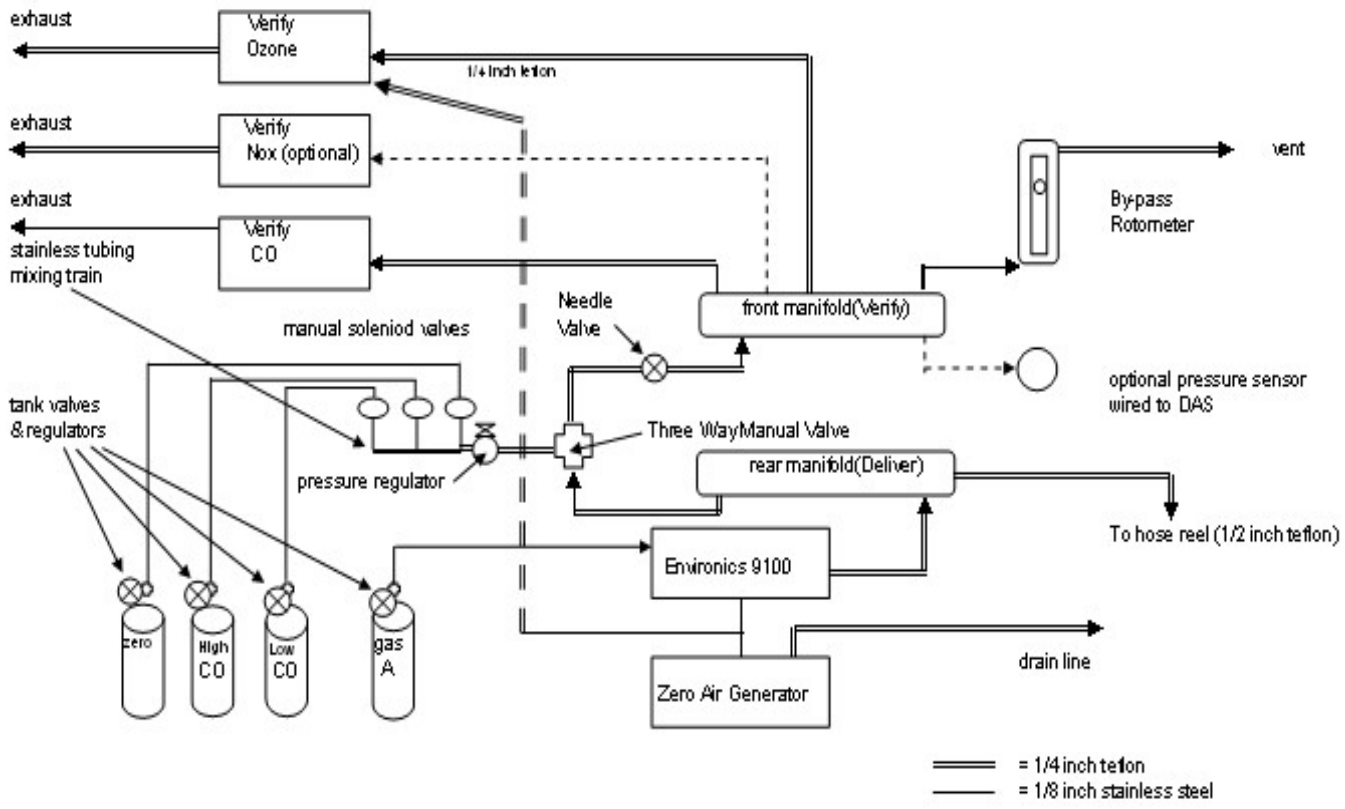
one of the 2 APW verticle instrument racks. The panel contains Manifold Flow Path Control and Excess Flow/Pressure Check components. The 3 toggle switches are wired to the three 2-way solenoid valves controlling the low and high ambient CO flows and the ultra pure air cylinder flow into the verification manifold. The 3-way manual valve allows control switching of the gas flow path from the verification manifold, to the delivery manifold- see EPA TTP gas flow path diagram (Figure 2), Flow and pressure indication and adjustment are provided by the Dwyer excess flow sufficiency rotameter, the flow adjusting Needle Valve; and the manifold outlet pressure regulator/excess pressure indicator.

7.2.3. A 2nd, non-power component of the EPA NPEP TTP system consists of 4 compressed gas cylinders mounted to the interior passenger's side of the lab wall, by cylinder brackets, next to the 2 APW verticle racks. The 1 blended gas, 2 (High and Low concentration) ambient level CO, and 1 Ultra pure gas cylinders are mounted here.

7.2.4. The 3rd non-power component of the mobile audit system is the 2 wall-mounted glass manifolds, composed of the 2 strut channel mounts, with 2 clamps and end caps each, and the Nylon Swagelok connecting fittings for the 2 ends and the 8 ports on each manifold.

7.2.5. The 4th non-power component is the NEMA Enclosure containing the three 2-way solenoids involved in controlling the flow from the 1 UP Air and 2 CO ambient level gas cylinders into the front, or verifying manifold gas flow path.

NPEP Mobile Lab, Through the Probe Audit Vehicle Plumbing Schematic



8.0 Procedure

The FS will perform the following activities:

1. The FS will receive equipment and consumables, inventory each item and ensure supplies are adequate to perform field activities.

2. The FS will periodically receive recertified standards from a national laboratory (Region 2,7 or the RTP-based audit support contractor). The ozone line loss factor of the TTP PE delivery hose will be verified quarterly. Ozone standard devices will be compared to a NIST-traceable and manufactured SRP quarterly. The compressed gas standards will be compared against independent NIST-traceable compressed gas standards semiannually, if possible. The FS will confirm receipt of the decertified standards by informing the sending laboratory and use them in the order they are received. DO NOT INTENTIONALLY USE A CYLINDER BELOW 325 PIG.

3. The FS will assist in developing a plan for the implementation of field activities and gather pertinent information for each site on a Site Data Sheet.
4. The FS will transport the appropriate EPA TTP mobile lab equipment from the home base or intermediate scheduled PEP site to scheduled TTP sites. A series of checklists will be used prior to leaving the home base or intermediate location. The first checklist is used to verify that the mobile lab, and tow vehicle, if trailer-based, is safely prepared for travel. The 2nd and 3rd lists are used to ensure that the exterior and then the interior of the mobile lab are present and acceptably operational. The FS then turns on the lab power and takes the other warmup and pre-arrival conditioning and stabilization procedures, to minimize time needed in these steps at the PE site.

5. Upon arrival at the scheduled site, the FS will park the mobile lab so as to facilitate connection of the delivery hose(line) to the station inlet..

6. Assuming stabilization has already occurred at or near the beginning of arrival of the Mobile Lab at the scheduled site, the FS will change power to land line if available, make contact with the station operator and/or other agency personnel, and obtain any necessary access and information necessary to complete or correct the pre-arrival information on the station form, and finalize generation and delivery flow and concentration calculations. The FS makes the delivery hose connection to the station inlet.

7. The FS will zero and span the onboard analyzers to make sure that they are correctly operational , in comparison to pre-PE trip performance tests. The FS will then make and record the results of the zero and upscale settings that should result in the flows and concentrations that his/her calculation have indicated. The FS will check that the PE gas being generated by the Mobile lab is within acceptable limits of those values indicated by the calculations, using the ozone and/or CO analyzers for the onsite verification. The EMC. data strip charting and Dell-based recording and HP printout are used to track, record, and document the stabilization profile of the process.
8. Once the FS has verified that the Mobile TTP PE lab values are correct and stable, the FS asks the station operator to provide the station values, following any and all procedures they normally follow to get their own field monitoring results. The station and Mobile PE Lab results are recorded by the

FS on the ozone and/or blended gas PE result forms.

9. The FS provides the station operator with a Preliminary PE Data Form, and conducts shutdown tasks according to the TTP SOP and associated checklists.

10. If scheduling and resources allow, the FS may leave this TTP location to set up additional 24-hour PEs at other routine sampling locations or perform additional activities at the site if so tasked. The FS may also perform any required maintenance or repair of the mobile TTP lab components.

11. If necessary during TTP stabilizing steps, the FS will return to a PEP site after the 24-hour PEP sampling period, remove and properly store the PEP filter for transport, download the stored electronic monitoring data, enter additional information as required, and disassemble and pack the sampler.

12. The FS, if a contractor, shall participate in or assist with scheduled quality assurance activities of the NPEP TTP, if and as required by contract Task order and TDF.

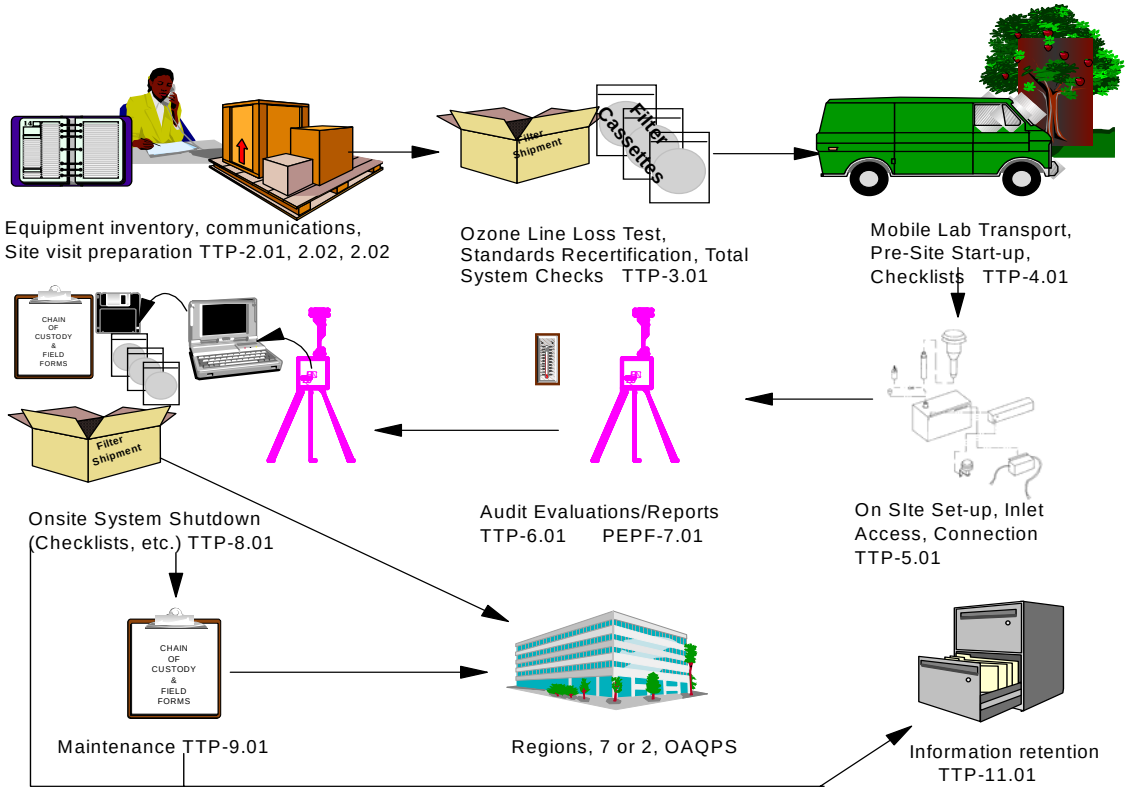


Figure 1. EPA TTP PE SOP Tasks

9.0 References

1. U.S. Environmental Protection Agency.1997. Part 50 promulgated as 50 FR62138 amendments to Title 50.

2. U.S. Environmental Protection Agency. 1997. Part 58 promulgated as 50 FR62138 amendments to Title 58.
3. Thermo Environmental Instruments, Inc. Instruction Manual for Model 48C

4. Thermo Environmental Instruments, Inc. Instruction Manual for Model 49C-PS

5. Environics Series 9100 Operating Manual

6. Advanced Pollution Instrumentation, Inc. Instruction Manual for Model 701

7. Powerware 9125, User's Guide

8. ONAN Commercial Mobile Power, Operator's Manual (Models HGJAD, HGJAE, HGJAF)

9. Duo-Therm 579, Series BRISK AIR

10. WELLS CARGO Owner's Manual

11. DEXTER AXLE, Operation Maintenance Service Manual

12. Atwood Battery Operated **Carbon Monoxide** Alarm User's Guide

Field Standard Operating Procedures for the EPA TTP National Performance Evaluation Program [1]

Section 2.0 Planning and Preparing for Site Visits

Operation: Equipment Inventory and Storage
SOP: NPEP-2.01

Name: Printed	Signature	Date

Contents
(applicable to this SOP)

1.0 Scope and Applicability

This SOP explains the activities involved in inventorying existing laboratory equipment, receiving new equipment and consumables, and maintaining the equipment.

[1]TTP National Performance Evaluation Program

2.0 Definitions

Appendix D will contain a glossary of the terms that will be used in the NPEP TTP.

3.0 Personnel Qualifications

Certification by having passed the written examination and the hands-on practical examination for the mobile TTP PE laboratory components of Federal reference method-based PE training.

4.0 Equipment and Supplies

The FS will use the following apparatus and materials to perform the procedures in this section:

- Table 2-1 providing a listing of the equipment and consumables needed for the field.
- Field Inventory Form INV-01
- Field Procurement Log PRO-01

5.0 Procedure

5.1 Equipment Inventory

During the summer and fall of 1998, OAQPS purchased the necessary equipment and consumables for the field activities. Table 2-1 provides a listing of the capital equipment and consumables required. The FS will follow the procedure below:

1. Select Field Inventory Form INV-01.

2. Take a complete inventory of all equipment and supplies.

3. Keep an original copy and file under AIRP/486. Provide a copy of the inventory to the Work Assignment Manager (WAM.).

The FS should maintain a 2-months' supply of consumables. During the first weeks of implementation, the FS will determine how quickly he/she is using consumable equipment and develop a purchasing schedule to ensure an adequate supply is maintained.

Table 2-1 must be translated into a specific checklist of equipment and materials that can be customized as necessary. Communications between the FS and site personnel prior to the visit are essential and assist greatly in knowing what will be required at each site.

NOTE: *Backup equipment: Thien Bui in Region 7 already has our backup API 701.

Table 2-1. Equipment and Supplies

Qty.	NPEP Field Equipment and Supplies	**Vendor/Catalog #**	**Make/Model #**	✓
	Monitoring Equipment and Supplies			
	Item Number: 15655WT Spare wheel and tire for mobile audit trailer			✓
	Transport cases for loose equipment/consumables	Forestry Suppliers/31113	Collapsible crate	?
1	Cylinder Hand-Transport Carts	Fisher Scientific	23-1200 air products	✓
	Operations manual(s)			✓
	Field notebook(s)			✓
	Clipboard (8 x 14")	Forestry Suppliers /53283	Cruiser mate	
	Grip Binders	Office Depot/501-627	Presstex	
	NPEP TTP Field SOPs (this document)			✓
	Documentation forms or data sheets, preprinted			
1	Laptop computer			
1	Data Collxtn Process, Display (Lab contractor purchase)	EMC Station Manager	Data Logger/Dell PC Platform	✓
	Magnetic compass or other means of determining site orientation (optional)	Forestry Suppliers/ 37177	Suunto Partner II	
	Tape Measure (metric)	Forestry Suppliers/ 39651	Lufkin/ W 9210ME	
	Cellular phone			✓
	Mechanical Pencils Markers (indelible)	Skilcraft Sharpees	9mm Ultrafine	

Qty.	NPEP Field Equipment and Supplies	**Vendor/Catalog #**	**Make/Model #**	✓
	Connecting(Mounting)Equipment/Manifold System (See Calibration/Verification Standards and Related Equipment)			✓
2	Glass (Annealed Borosilicate) Manifolds	Research & Dev. Glass Products & Equipment		✓
	FEP Teflon Tubing - 1/4" O.D. - 1/8 I.D. - 1/16" Wall thickness	Cole-Parmer Instr Co 1-800-323-4340		✓
16	Nylon 1/4" plug- Should be FEP Teflon Equivalent	Georgia Valve and Fitting	Swagelok Part No. NY-400-P	✓
16	Nylon reducing unions, 5/16:x1/4" -Should be FEP Teflon Equivalent	Georgia Valve and Fitting	Swagelok Part No. NY-500-6-4	✓
1	Nylon reducing unions, ½" x 3/8" -Should be FEP Teflon Equivalent	Georgia Valve and Fitting	Swagelok Part No. NY-810-06-06	✓
1	Nylon reducing unions, ½"x1/4" -Should be FEP Teflon Equivalent	Georgia Valve and Fitting	Swagelok Part No. NY-810-6	✓
1	Nylon 3/8" plug-Should be FEP Teflon Equivalent	Georgia Valve and Fitting	Swagelok Part No. NY-600-P	✓
4	Part No.3190T6 - vibration & noise control strut mount clamp for 3/4" tube OD	MCMASTER-CARR SUPPLY CO		✓
2	13/16" single channel strut, 24" long	MCMASTER-CARR SUPPLY CO	Part No.3310T612	✓
4	strut channel end cap, frame style, for 13/16"single channel (15/8" x 13/16")	MCMASTER-CARR SUPPLY CO	Part No. 3312T41	✓
1	Glass (Annealed Borosilicate) Inlet Connctor T's-	Research & Dev. Glass Product & Equipment		✓
1	Needle Valve	Cross Instruments	Model 4Z-V4LN-SS (sharp stem)	✓
1	Line Loss Kit: ½" by 150" stainless steel braided line with a needle valve, stainless steel tee, and 2' of Teflon line	Cross Instruments Parker-Hannifin		✓

Qty.	NPEP Field Equipment and Supplies	**Vendor/Catalog #**	**Make/Model #**	✓
1	Clean room regulator, Aluminum body, 1/4" pipe, 70 max SCFM, .05 to .85 MPA range	MCMASTER-CARR SUPPLY CO	Part No. 6747K1	✓
1	Rotameter (flowmeter)	Dwyer Instruments	Model VFA-21	✓
3; 1	Two-way 24 VDC solenoid valve; three-way manual valve to actuate the zero air supply and gas cyclinders (Trailer Contractor purchase)		ASCO Red Hat	✓, ✓
1	Rack Mount Kit (4 post rack support kit for 19" racks for #9125-4 post UPS	Major Power		✓
2	Instrument Racks (Pioneer Series) Lab Contractor Purchase)		APW	✓
	Masking tape Packaging tape Strapping tape	GSA-7510-00-283-0612 GSA-7510-00-079-7906 GSA-7510-00-159-4450		
	Tool box with basic tools			✓
	Rope for hoisting equipment			
	16 foot - Type 1A- Articulated Ladder			✓
	Flashlight with spare batteries			
	Heavy-duty, grounded, weatherproof electrical extension cord with multiple outlets (25 ft. length) Heavy-duty, grounded, weatherproof electrical extension cord with multiple outlets (12 ft. length)	Unicor Unicor	Style3 Class2 Series2 Style3 Class2 Series2	
3	Electrical Receptacles and extension cable(cord) with matching plugs (Reg 9,6, and??; Made in Las Vegas)	Leviton 3-wire 50amp-125V	CS63-70	✓

Qty.	NPEP Field Equipment and Supplies	**Vendor/Catalog #**	**Make/Model #**	✓
	Calibration/Verification Standards and Related Equipment (See Manifold System Above)			
1	HPDeskjet 1220 Cxl color printers	CDW-G	HP-C2694A#ABA	✓
1	UPS + Power Line Conditioner	Major Power	POWERWARE 9125-2000	✓
1	Audit Hose Assembly, Braided Stainless Steel(SS), Teflon Lined, 150ft long, ½" O D	Parker-Hannifin	P919TUTU80808C	✓
1	S S Hose Connector	Georgia Valve and Fitting	Swagelok , Part No. SS-810-1-8	✓
1	S S Hose Connector	Georgia Valve and Fitting	Swagelok, Part No. SS-810-5-6	✓M
1	Continuous Zero Air Generator	API	API Model 701	✓
1	Computerized Ambient Calibrator (with ozone generator	Environics	Environics 9100	✓
1	CO Analyzer	TECO	TECO 48C	✓
1	Ozone Analyzer (with Generator)	TECO	TECO 49C-PS	✓
1	Combined UPS and PLC	Major Power	Major Power PowerWare 9125-2000	✓
2	6.8 KW Auxiliary Gasoline Generator(Mfr: Onan)	Cummins	ONAN CMM	✓
1	Ultra Pure Air	Scott-Marin, Inc		✓
1	Regulator for Blended CO, SO2 and NO (325 or 160ppm)	National Welders/	CONCOA 442-2301-660	✓
2	Regulators for Ambient CO, 6-8 ppm	National Welders	CONCOA 422-2301-590	✓
4	Clam shell covers for cylinders with regulators	Griftan Inc. PO Box 1296 Georgetown, SC 29442 www.griftaninc.com		✓
1	Quick connects/disconnects	Parker-Hannefin	Part #s:1/4": 4Z-Q4VY-SS; 1/4": 4Z-Q4CY-SS	

Qty.	NPEP Field Equipment and Supplies	**Vendor/Catalog #**	**Make/Model #**	✓
1	Compressed gas cylinder - CO, High Ambient, Approx 40 ppm, NIST Traceable EPA Protocol Gas	Scott-Marrin, Inc	Size 150	✓
1	Compressed gas cylinder of CO - low ambient, Approx. 6-8 ppm, NIST Traceable EPA Protocol Gas	Scott-Marrin, Inc		✓
1	Compressed gas cylinder, Size 150, blended gas (CO=15000ppm, NO=325ppm (R7-160ppm), SO2=150ppm , NIST Traceable EPA Protocol Gas	Scott-Marrin, Inc		✓
1	20 ft 316 SS tubing	GA Valve & Fitting	Swagelok Part No. SS-T4 S-035RL	✓
1	SS micron in-line filter	GA Valve & Fitting	Swagelok Part No.SS4F-7	✓
1	Male Connector, SS, 1/4" pipe to 1/8" tube	GA Valve & Fitting	Swagelok SS-200-2-4	✓
3?	SS Plug, 1/4" O.D.	GA Valve & Fitting	Swagelok SS-400-P	✓
1	Control panel with six on-off switches, eight 1-amp 400 Peak Inverse Voltage clamping diodes (Do we have/need these?) and one 24 VDC rack mounted power supply (Does this equal UPS/PLC?)			?(F. B.)
	0-30 1pm Mass Flow Meter: Optional- may help in ID of Station and TTP flow issues/problems			?(F. B.)
	Portable (?electronic) barometric pressure,tem perature device (NIST-traceable)	DPI Absolute PSItronix?		
	Delta-Cal temperature, pressure, and flow verification device	BGI Delta-Cal	DC-1	?
	Temperature verification/calibration standard (NIST-traceable) with probe	VWR	61220-601	?
	Thermos container for temperature calibrations			?
	Accurately set timepiece			?
	Hand calculator (scientific)	Office Depot/397-554	Casio	?
	JD-22-5995 Pair of Motorola T5920 talk about FM Radios (Reg 7, others?-Reg 5?, in addition to Cell Phones))	Cabela's 1-800-237-4444		✓?
	147-0860 Fuel filter for Onan generator	Cummings Mid-America 1-816-414-8200		✓?

Qty.	NPEP Field Equipment and Supplies	**Vendor/Catalog #**	**Make/Model #**	✓
	140-3116 Element air cleaner for Onan generator	Cummings Mid-America		
	122-0836 Oil filter for Onan generator	Cummings Mid-America		
	167-1638 Spark Plugs for Onan generator	Cummings Mid-America		
	326-5336 Onamax 15@40 oil for Onan generator	Cummings Mid-America		
	Air Compressor to inflate tires			
	TOW VEHICLE			
	Spare Parts and Optional Equipment			
	Spare Teflon tubing and fittings			
	Spare Batteries (for all battery-powered equipment)			?
	Fuses, as required by all equipment used			?
	Spare in-line filters (if required by the..			?
	Voltmeter/ammeter for troubleshooting			?
	Walkie/Talkie for trailer (Reg 4, 6, 7, and 9 have one.) Reg 2 and 5? (Pair of Motorola talk about FM Radio)	Motorola	JD-22-59995	
	REPLACEMENT PARTS (FROM ENVIRONICS SERIES 9100			

Qty.	NPEP Field Equipment and Supplies	**Vendor/Catalog #**	**Make/Model #**	✓
	ELECTRONICS Parts # Description PC201 Transputer Board PC202 Analog Board PC203 Rom Board PC204 Comm/Driver Board PC208 Motherboard PC210 Ozone Board PC216 Status I/O Board PC224 Pressure Transducer Ozone Module (Lamp replacement) Display Power Supplies and Power Entry Module Inline filters(20 Teflon particulate filters 0.5 micron and 3 filter holder -necessary to keep the Environics pneumatics clean)(See Miscellaneous Fluidhandling Products at www.entergrisfluidlandling.)			

Qty.	NPEP Field Equipment and Supplies	**Vendor/Catalog #**	**Make/Model #**	✓
	REPLACEMENT PARTS (FROM THERMO ENVIRONMENTAL INSTRUMENTS INSTRUCTION MANUAL FOR MODEL 48C FRM CO ANALYZER) (As of 5/2002) [2] Part # Description 9831 Motherboard 9837 Processor Board 9849 Analog/Digital Board 9839 Digital/Analog Board 8931 Power Supply Board 8938 Detector Assembly (Preamplifier Board 7363) 9989 Input Board 8933 Bias Power Supply Board 8935 Temperature Control Board 9835 Clock Board 9936 Pressure Transducer 9934 Flow sensor 4735 Chopper Motor 7336 Capillary - 18mil 8606 Pump Rebuild Kit 8550 ?Pump 110V (Chuck suggested that since the pump is the same in both the CO and Ozone instrument that maybe one pump (part number 8550) can be used for both instruments)) Chopper Motor Sample pump **Part # Description** **7361 IR Source** **7336 Capillary** **4510 Fuse - T, 3A, 250V (115V)** **14009 Fuse - T, 25A, 250V (220V)** **8606 Pump Rebuild Kit (KNF)** ~~**8907 Pump Rebuild Kit (ASF)**~~			

[2]Thermo Environmental Instruments - Model 48C **Instruction Manual**

Bold print = Added to list of Spare Parts Strikeout = Delete

Qty.	NPEP Field Equipment and Supplies	**Vendor/Catalog #**	**Make/Model #**	✓
	SPARE PARTS KITS For TEI Pump 8550 115V/60Hz Kit Part Number: 8606 9.1.3 REPLACEMENT PARTS (FROM THERMO ENVIRONMENTAL INSTRUMENTS MANUAL (MODEL 49C OZONE ANALYZER/GENERATOR) (As of 5/2002)[13] Part # Description 9837 Processor Board 10761 Analog to Digital Board 9839 Digital to Analog Board 9956 Optional I/O Board 9843 C-Link Board 9833 Motherboard 9847 Power Supply Board 10758 Lamp Power Supply Board 8592 Detector System 10763 Lamp Block Heater 8540 Source Lamp (ozone free) 4124 Capillary - 15 mil (short purple) 9877 Pressure Transducer 9934 Flow Sensor 4509 Fuse - 2 amp slo-blo 8573 Solenoid Valve (need at least 2) 8606 Pump Rebuild Kit (suggested by **Scott Hamilton)** **8550 Pump 110V** ~~**8551 Pump 220V**~~ **SPARE PARTS** **Parts # Description**			

[13]Thermo Environmental Instruments - Model 49CPS **Instruction Manual**

Qty.	NPEP Field Equipment and Supplies	Vendor/Catalog #	Make/Model #	✓
	SPARE PARTS LIST FOR API MODEL 701 ZERO AIR SYSTEM (As of 5/2002)[14] **Parts # DESCRIPTION** 005960000 Activated Charcoal, 6 lbs. 005970000 Purafil, 6 lbs., IZS or Valve VER. 006900000 Charcoal Retainer Pads M100/M200 006900100 Charcoal Retainer Pads M400 014340000 Valve, Shuttle, Drier 015450000 Assembly, Pressure Switch M701 015980000 **M701 Expendables Kit** 016880000 M701 Level 1 Spare Parts Kit (for 10 units) 016880100 **M701 Spares Kit for 1 Unit** 016920000 Mole Sieve, 11 ozs (CH033) 018490000 Pressure Gauge 017320000 **HC Scrubber** **021660000** PCA. Control Board 024710000 Tubing: 6', 1/8" CLR 024780000 Tubing: 6', 1/4" OD 5/32" ID CLR FA0000006 Fan, 115Vac FL0000007 Filter, Coalescing FL0000015 Filter, Air 150LPM, M701 FL0000016 Filter Element Paper for FL015 HW0000101 Shock Isolator (Pump) KIT000040 Retrofit, HC Scrubber, M701 KIT000049 Retrofit, M701 CO Scrubber			

[14]**API** MODEL 701 Zero Air System **Operating Manual**

Qty.	NPEP Field Equipment and Supplies		Vendor/Catalog #	Make/Model #	✓
	015980000 M701 Expendables Kit INCLUDES:				
	005960000	**Activated Charcoal, 6 lbs.**			
	005970000	Purafil, 6 lbs, IZS or Valve VER.			
	006900000	Charcoal Retainer Pads M100/M200			
	006900100	Charcoal Retainer Pads M400			
	016920000	Mole Sieve, 11 ozs (CH033)			
	FL0000016	Filter Element Paper for FLO15			
	OR0000035	O-Ring, Drier Column			
	OR0000059	O-Ring, Scrubber			
	016880000 M701 Level 1 Spare parts Kit (For 10 UNITS) INCLUDES:				
	014340000	Valve, Shuttle, Drier			
	FA0000006	Fan, 115Vac			
	FL0000007	Filter, Coalescing			
	OR0000030	O-Ring, 2-141V			
	VA0000011	Valve, 4-Way, Drier			
	VA0000017	Valve, 2-Way (Water Drain)			
	FL0000007	**Filter, Coalescing**			
	VA0000014	**Pressure Regulator**			
	VA0000016	**Valve, CHECK**			
	VA0000017	**Valve, 2-Way (Water Drain)**			

Qty.	NPEP Field Equipment and Supplies	Vendor/Catalog #	Make/Model #	✓
	016880100 M701 Spares Kit for 1 Unit **INCLUDES: (Non-Expendables)** FL0000007 **Filter, Coalescing** VA0000014 **Pressure Regulator** VA0000016 **Valve, CHECK** VA0000017 **Valve, 2-Way (Water Drain)**			
	Noncontaminating Dipstick for Aux. Gen.Fuel Tank			
	Cleaning Supplies and Equipment			
	Low-lint laboratory wipes for cleaning TTP equipment	Daigger/AX5661	Kay-Pees Disposable paper towels	?
	Large locking plastic bag for cleanup of debris, wipes, etc			?
	Soft brush,			?
	Supply of deionized water for cleaning and rinsing equipment			?
	Isopropyl alcohol to aid in removal of grease and dirt			?
	Penetrating oil			?
?	Lint-free pipe cleaners			?
?	Safety pin dental pick			?
?	Lint-free cotton-tipped swabs			?
	wooden dowel, and cloth wads to clean downtube			?
?	Spray Bottle			?
	Garbage can			
	Place to put broom			
	Cleaning supplies; rags to clean counter tops			
	Additional Equipment and other Items			
1	Office chair			
1	Spare tire & jack - and a place to store			
	Maintenance Schedule Tables; Trailer checklist			

Qty.	NPEP Field Equipment and Supplies	**Vendor/Catalog #**	**Make/Model #**	✓
	*Backup equipment needed: Suggestion: Have a least 1 of each (Environics, TECO 48c and 49c, API 701, UPS) at OAQPS to share among the regions.			

5.2 Procurement

As consumables run low or new equipment purchases are necessary, the FS will be responsible for assisting in the procurement of these items following the policy and requirements described in the ESAT scope of work. The FS should continue purchasing consumable equipment with the same model numbers as initially procured unless the WAM suggests a different item due to improved quality, reduced contamination, ease of use, or lower cost (without sacrificing quality). The following procedures will be required.

1. The FS will develop procurement requests as per EPA requirements.
2. Upon order, add items to the Field Procurement Log PRO-01.
3. Once a month provide a copy of Form PRO-01 to the WAM.
4. File Form PRO-01 in file AIRP/486.

5.3 Equipment Consumable Receipt

Upon receiving equipment and consumables, the FS will perform the following activities:

1. Pull the appropriate purchase order for the incoming items from the files.
2. Fill out a Field Receiving Report Form REC-01 comparing the items and quantity against the purchase order and inspecting the condition of each item.
3. If the items received match the purchase order and the condition of the equipment or consumables is acceptable, signify this on the form and file it in

AIRP/486.

4. If the quantity, items, or condition are not acceptable, complete REC-01 with appropriate remarks and send a copy of the form to the WAM.
5. Add receipt information to the Field Procurement Log Form PRO-01

5.4 Equipment Storage

When equipment is not in use, store it in a clean, dry, and safe location. After completion of a field trip and return to the field office, the sampler(s) and associated verification gear should be cleaned, maintained as scheduled, and stored for the next trip. All equipment should be clearly identified, and readily available for the next scheduled field trip.

5.5 Equipment Shipping of Government Equipment

Federal Express Declared Value:

Reminder - please ensure that the declared value of property being shipped via Federal Express is not written on the airbill. The Government is self-insured. FYI - each time someone declares a value, this agency is billed $50.00+

Field Inventory Form (INV-0					
Item	**Vendor**	**Model #**	**Quantity**	**Purchase Date**	**Warranty**
Form INV-0					

Field Equipment/Consumable Receiving Report
(REC-01)
Date:_____

Received From:				
Shipped From:				
Shipped Via:				
Shipping Charge	Prepaid	Collect	Freight Bill #	
Purchase Order Number				
Quantity	Description Of Item			Condition
Remarks:	Accept Shipment _____		Problem_____	
Notes:				

Form REC-01

Procurement Log

(PRO-01)

Item	Model #	Qty	PO#	Vendor	Date		Cost	Initials	Accept/Rejec
					Ordered	Received			

Form PRO-01									

6.0 **References**

1. Thermo Environmental Instruments - Model 48C **Instruction Manual**
2. Thermo Environmental Instruments - Model 49CPS **Instruction Manual**
3. **API** MODEL 701 Zero Air System **Operating Manual**

Field Standard Operating Procedures for the PM 2.5 FRM National Performance Evaluation Program [15]

Section 2.0 Planning and Peparing for Site Visits

Operation: Communications

SOP: NPEP 2.02

Name: Printed	Signature	Date

Contents
(applicable to this SOP)

1.0 Scope and Applicability

[15]TTP National Performance Evaluation Program - Field Training

This procedure describes the required activities for PEP FS to communicate technical information to organizations intimately involved in the PEP and includes:

- ESAT WAM for the FS
- ESAT WAMs for the Laboratory Analyst (LA)
- ESAT LAs
- OAQPS

This SOP does not describe additional ESAT communication obligations described in the ESAT Scope of Work. Communications will include reports, e-mail messages and phone calls.

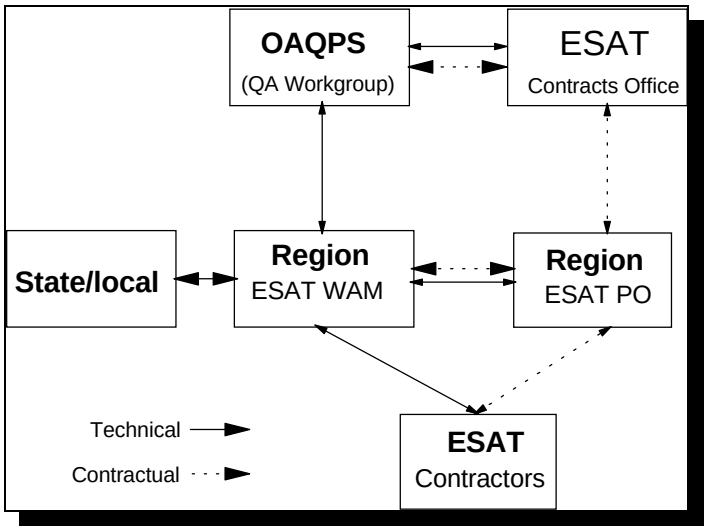


Figure 2.2.1 Line of communication

2.0 Summary of Method

An organized communications framework is needed to facilitate the flow of information among the participating organizations as well as among other users of the information produced by the $PM_{2.5}$ network. Figure 2.2.1 represents the principal communications pathways. In general, ESAT contractors will be responsible for informing Regional WAMs and Project Officers (POs) on technical progress, issues, and contractual obligations. On the technical side, the EPA Regional WAMs will be responsible for communicating with State and local agencies and informing OAQPS on issues that require technical attention. Contractual issues will be conveyed from the ESAT contractor through POs to the ESAT Contracts Office and, if necessary, to OAQPS. Table 2-1 at the end of this SOP lists the important EPA ESAT contacts.

The ESAT contractors will have frequent communication with the Regional WAMs about the progress of their activities and any problems/issues associated with them. Resolution of these issues should take place in the Regions unless the issue could affect

the implementation of the program at a national level, where it should be discussed and resolved through an ESAT Workgroup conference call.

3.0 Definitions

Appendix D contains a glossary of terms used in the NPEP TTP.

4.0 Equipment and Supplies

The following capital and consumable equipment will be required for communications:

- Telephone
- Laboratory PC - with Internet and EPA E-Mail capabilities
- Printer
- Field Communication Notebook
- Writing utensils
- Appropriate Forms
  - COM-1 - Phone Communication Form
  - COM-2 - Monthly Progress Report

5.0 Communication Procedures

5.1 Phone Communications

5.1.1 Issue-Related Calls

A call may be initiated by the WAM(s), the FS, or the laboratory at any time during implementation. During the conversation, the phone communication form (COM-1), in the field communications notebook, will be used by the FS to record the highlights of the conversation. Notes will include the following:

- Date
- Time
- Personnel involved
- Issue(s)
- Decision(s)
- Follow-up action(s)
- Follow-up action responsibility
- Follow-up action completed by (date)

If follow-up action is required by the FS, these actions will be included in the monthly progress reports (see Section 5.2). At a minimum , the FS will keep the original hardcopy in the field communications notebook. The FS may also choose to keep an electronic record of this information on a PC.

5.1.2 Field Communications

Field communications can take place either by phone or e-mail. Phone messages or conversations will be recorded in the field communications notebook. E-mail messages should be printed and stored in the field communications notebook
NOTE: The FS must document communications, however, there is some flexibility in exactly how it can be done. The COM forms are a guide, and may be used and archived as described above or as the FS sees fit. The FS is not required to have a separate notebook just for logging communications, but it must be logged in some fashion.

5.1.2.3 ESAT Conference Calls

The FS may be asked to participate in ESAT Workgroup conference calls to discuss progress or resolution of issues. The WAM will inform the FS of information that needs to be prepared for the call at least 3 days prior to the call. During the call, the FS will use the Phone Communication Form (COM-1) to record issues and action items that pertain to his or her activities. These items will be included in the next monthly progress report.

5.1.2.4 Communicating with Reporting Organizations and Site Operators

Dates for the FRM PE visits should be coordinated with the site's normal operating schedule. This coordination must be done in advance so that both the FS and the site operator have ample advance notice and time to prepare for the on-site visit. The procedure for such communications follows:

- The WAM (FS in attendance) will contact each site operator (by telephone) no less than 1 month prior to the site visit. Points to be covered include the following:

  field implementation schedule; setting a location and time to meet
  - providing assistance in setting up the *mobile PE laboratory, and delivery connection to station* instruments and other assistance
  - briefing the operator on what will occur during the evaluation

- discussing the tasks that the site operator will be requested to do to assist with the evaluation
- additional information needed for the Site Data Sheet
- answering any questions that the site operator may have
- emphasizing that the site's equipment will not be adjusted in any way and that the operator should do nothing out of the ordinary routine to prepare for the PE
- ensuring that all clearances have been obtained so that the site can be accessed as necessary. A site representative must be there. If a representative other than the site operator plans on being at the site the name and number of this representative must be identified and recorded.
- verifying if sufficient electric power is available for powering the TTP Mobile PE Laboratory
- determining if special logistic concerns exist (training, equipment, etc.)

If problems are identified in the preliminary discussions with the site operator, arrangements will be made to take corrective actions. Below are some suggested corrective actions for various commonly encountered problems:

- Climbing or other special safety equipment required:
  1. buy or rent appropriate equipment prior to the site visit
  2. borrow the necessary equipment from the site operator or the operator's organization
  3. postpone visit until the situation requiring special safety equipment is remedied (if feasible)

- Insufficient power at the site to operate the TTP Mobile PE Laboratory (and other site monitors and equipment) simultaneously:
  - obtain permission to run an extension power cord from a nearby outlet
  - cancel the site visit and request that adequate power be installed

- The site will not accommodate the TTP Mobile PE Laboratory within siting requirements:
  - perform the evaluation, flag the situation and resulting data; and contact the EPA Regional Office about the situation.

- Special restrictions on site access are in force, such as a requirement for a lengthy background check at certain high-security Federal installations. (Note: FS are required to observe laws, rules, regulations, and policies regarding access to restricted sites on public or private land. The Performance Evaluator shall not "borrow" the operator's key or access card without the knowledge and

permission of the site owner.) Options for dealing with this type of situation include:

- obtain necessary permissions, keycards, etc. in advance
- request that the reporting organization or the EPA Regional Office to secure the necessary permissions to access the site on behalf of the FS
- make arrangements for a "cleared" escort to accompany the Evaluator at all times (if this is acceptable at the particular site)

2. About one week prior to the actual evaluation, the FS will call the site operator to confirm that the PE visit remains on schedule and to confirm meeting arrangements.

5.2 Monthly Progress Reports

The FS will provide to the WAM a progress report in writing at the end of each month. The monthly progress report Form COM-2 will be used to convey the following information:

- Reporting Date - beginning and end date that report covers
- Reporter - person writing reports
- Progress - progress on field activities
  Evaluations scheduled within reporting date
  Evaluations conducted within reporting date
- Issues -
  Old issues- issues reported in earlier reports that have not been resolved
  New issues- arising within reporting date
- Actions- Action necessary to resolve issues including: the person(s)responsible for resolving them and the anticipated dates when they will be resolved.

6.0 Records Management

Monthly progress reports will be archived in the field reporting package file under AIRP/484. Phone communications will be archived in the field reporting package file under SAMP/502/COM. See Section 11 for details.

Phone Communication Form (COM-1)		
Date:	**Time:**	**Recorder:**
Personnel on call:		
Issue(s):		
Decisions(s):		
Follow-up Action(s):		
Follow-up Responsibilities:		
Completion Dates for Follow-up Actions:		

Monthly Progress Report (COM-2)	
Reporting Date: Start: **End:**	**Reporter**:
Progress	
Sites Scheduled for Month:	**Sites Evaluated during Month:**
Issues	
Old:	**New:**
Actions:	**Actions:**

Free Form Notes:

Table 2-1 ESAT Contacts

Name	Address	Phone Number	Electronic Mail
ESAT			
Angela Edwards Kathleen Engel Monica McEaddy Colleen Walling	U.S. EPA 401 M Street, SW. Washington, DC 20460. Monica and Colleen 5203G Kathleen and Angie 3805R	(703) 603-8709 (202) 564-4504 (202) 564-4503	edwards.angela@epa.gov engel.kathleen@epa.gov mckeaddy.monica@epa.gov walling.colleen@epa.gov
OAQPS			

Name	Address	Phone Number	Electronic Mail
Dennis Crumpler Michael Papp David Musick* Tim Hanley Mark Shanis	USEPA Office of Air Quality, Planning & Standards MQAG (C339-02) RTP, NC 27711 *EPA-ORIA-LV	(919) 541-0871 (919) 541-2408 (919) 541-2396 (919) 541-4417 (919) 541-1323	crumpler.dennis@epa.gov papp.michael@epa.gov musick.david@epa.gov hanley.tim@epa.gov shanis.mark@epa.gov
REGIONS			
Region 1 WAM Mary Jane Cuzzupe **PO** Tony Palermo	USEPA-Region 1 New England Regional Lab OEME 11 Technology Dr. North Chelmsford, MA 01863	(617) 918-8383 (617) 918-8682	cuzzupe.maryjane@epa.gov palermo.anthony@epa.gov

Name	Address	Phone Number	Electronic Mail
Region 2 **WAM** Mark Winter Avraham Teitz* **PO** Yolanda Guess	USEPA-Region 2 Raritan Depot / MS103 2890 Woodbridge Ave Edison, NJ 08837-3679	(732) 321-4360 (732) 321-6606 (732) 906-6875	winter.mark@epa.gov teitz.avraham@epa.gov guess.yolanda@epa.gov
Region 3 **WAM** Andrew Hass,Victor Guide **PO** Kin Cho Thaung	USEPA-Region 3 1650 Arch. St. (3ES10) Philedelphia, PA 19103 USEPA-Region 3 Environmental Science Center Mail Code 3ES20 701 Mapes Rd. Fort Meade, MD 20755-5350	(215) 814-2049 (410) 305-2743	hass.andrew@epa.gov thaung.kincho@epa.gov

Name	Address	Phone Number	Electronic Mail
WAM Greg Noah **PO** Mike Birch	US-EPA Reg 4 Science and Ecosystem Support Division 980 College Station Road Athens, Georgia 30605-2720 USEPA-Region 4 APTMD Atlanta Federal Center 61 Forsyth St. SW Atlanta, GA 30303-3104	(706) 355-8737 (706) 355-8552	barden.herbert@epa.gov birch.mike@epa.gov
Region 5 WAM Scott Hamilton **PO** Jay Thakkar	USEPA-Region 5 77 West Jackson Blvd. / AR18J Chicago, IL 60604-3507 ** same as above **	(312) 353-4775 (312) 886-1972	hamilton.scott@epa.gov thakkar.jay@epa.gov

Name	Address	Phone Number	Electronic Mail
Region 6 WAM John Lay **PO** Melvin Ritter	USEPA-Region 6 Laboratory, Houston Branch/ 6MD-HC 10625 Fallstone Road Houston,TX USEPA Region 6 Laboratory Houston Branch/ 6MD-HC 10625 Fallstone Road Houston TX 77099	(214) 665-8345 (281) 983-2146	chung.kuenja@epa.gov ritter.melvin@epa.gov

Name	Address	Phone Number	Electronic Mail
Region 7 WAM Thien Bui **PO** Harold Brown	USEPA-Region 7 ENSV / EMWC 25 Funston Road Kansas City, KS 66115 USEPA Region 7 726 Minnesota Ave/ENSV/ RLAB Kansas City, KS 66101	(913) 551-9079 (913) 551-5127	thien.bui@epa.gov brown.harold@epa.gov
Region 8 WAM Kenneth Distler, (Michael Copeland) **PO** John Gillis	USEPA-Region 8 999 18th Street /8P2-A Suite #500 Denver, CO 80202-2466 ** same as above **	(303) 312-6448 (303) 312-7824	distler.kenneth@epa.gov gillis.john@epa.gov

Name	Address	Phone Number	Electronic Mail
Region 9 WAM Catherine Brown, Mathew Plate **PO** Rose Fong	USEPA-Region 9 75 Hawthorne St. /PMD-3 San Francisco, CA 94105 ** same as above **	(415) 972-3799 (415) 972-3812	plate.mathew@epa.gov fong.rose@epa.gov
Region 10 WAM Chris Hall **PO** Christopher Pace	USEPA-Region 10 1200 Sixth Ave / ES-095 Seattle, WA 98101 USEPA Region 10 Manchester Laboraory 7411 Beach Drive East Port Orchard, WA 9836	(206) 553-0521 (206) 553-8728	hall.christopher@epa.gov pace.christopher@epa.go

Field Standard Operating Procedures for the EPA TTP National Performance Evaluation Program [16]

Section 2.0 Planning and Preparing for Site Visits

Operation: Site Visit Preparation

SOP: NPEP-2.03

Name: Printed	Signature	Date

Contents
(applicable to this SOP)

[16] TTP National Performance Evaluation Program - Field Training

1.0 Scope and Applicability

This SOP applies to .....

2.0 Summary of Method

Preparation for site visits in the NPEP TTP requires attention to many details and interaction among several different organizations. This SOP outlines the planning steps necessary to successfully conduct PEs at one or more sites.

3. 0 Definitions

Appendix D contains a glossary of terms used in the NPEP TTP..

4.0 Personnel Qualifications

Certification by having passed the written examination and the hands-on practical examination for the mobile TTP PE laboratory components of Federal reference method-based PE training.

5.0 Cautions

- the FS must obey all laws, ordinances, and policies regarding access to monitoring sites and use of the property of others
- the FS shall not represent himself or herself as an employee of EPA or of the Federal Government
- the FS may not gain access to a monitoring site without the knowledge and permission of the site owner or site operator
- in transporting equipment and supplies, the FS must comply with all applicable laws and regulations, including those of the FAA and DOT
- FS must comply with licensing requirements and "union shop" agreements, where applicable. In general, the FS is expected to perform the tasks necessary to install and operate the FRM PE equipment. However, electrical rewiring or other modifications to monitoring site equipment must be done by qualified and properly licensed tradesmen

6.0 Equipment and Supplies

- Implementation Schedule
- Site Data Sheet(s) (SD-01)
- Reporting Organization contact information

7.0 Procedure

7.1 Development of Implementation Schedule

State and local organizations will work with the EPA Regions to select and develop a list of sites for the evaluations conducted in each calendar year on or before October 1, of the previous year. The Regional WAMS, with the assistance of the ESAT contractors, will attempt to determine the most efficient site visit schedule. This schedule should be based upon the following:

- the criteria in CFR
- meeting the same monitoring schedule as the routine sampler being evaluated
- the sites that are closest in proximity to each other (can be visited within the same day or week)

Once this site schedule is developed, it must be sent to all affected reporting organizations. Based upon this schedule, the FS will make appropriate travel arrangements.

7.2 Development of the Site Data Sheet

For each site, the FS contractor will develop a Site Data Sheet (Form SD-01) that contains information such as:

AIRS Monitor Site ID	Monitor ID
Method Designation	Monitor Make and Model
Site Coordinates	Site Type (NAMS/SLAMS)
Reporting Organization	Reporting Organization Contact
Street address	Directions to the site (from Regional Office)
Directions to the site from major thoroughfare	Safety concerns
Additional equipment needed (ropes, ladders etc.)	Closest Hospital (address)
Closest Express Mail Facility	Closest Hardware Store
Recommended Hotel (address/phone)	Important free form notes

Closest site 2nd closest site
*Availability of electrical hookup, inlet manifold type,
Gas analyzer ranges
Note: If any of the criteria pollutant gas analyzers are not in a typical TTP acceptable range, consult TOPO or Tech consultant (EPA). For example, trace level or greater than 1.0 ppm full scale range.

The information listed above will be kept in a site file (filed by AIRS Site ID) and included in a site notebook for each FS. Software such as MapQuest™ (Internet accessible) can help provide information on directions to sites. In addition, maps for each State and city where a monitor is located will be acquired. Site locations can be placed on these maps along with the site IDs.

Issue: Emphasize the importance of having site operator with you on site:
If the station operator does not record the agency's final concentration values, but only interim voltage readings, then the field scientist will make sure that this and similarly needed informations for TTP audits will be collected or discussed with appropriate agency personnel during the field site information gathering phase of the work. The WAM may need to be the lead in discussions with the agency in which EPA is asking the agency to provide support

Preparation for one or more PE trips will involve communication among various organizations including the FS's organization (ESAT), the monitoring reporting organization, and the site operator. A schedule will need to be set; operators notified; travel arrangements made, and all equipment and supplies gathered, packed, inventoried, and readied for shipping. The following sections discuss the necessary steps.

7.3 Site Visit Preparation

It is difficult to give a general procedure for scheduling site visits because of the number of variables such as the number of sites, the number of samplers at each site, the distance between sites, the sampling schedule, and the site access restrictions.

PEs should be implemented on a normal sampling day so that it does not create additional work for the State and local agencies. Thus, for sites that only sample one day in three or one day in six, this schedule must be taken into account when scheduling a PE site visit. However, if the State and local agency is amenable to perform a PE on a day other than a routine sampling day, the visit can be scheduled.

The scheduling approach should attempt to minimize travel costs and maximize the

number of sites visited. Some suggestions for efficient scheduling include the following:

- prioritizing sites that are expected to be near or above the NAAQS
- ?carrying two or more portable FRMs, setting up one or two on day one, then moving to another site to set up another, then returning to the first site to retrieve the sample, etc.
- ?prioritizing sites that are sampled less than every day. Visits to sites on a daily sampling cycle can be more flexible because the PE sample can be taken on any day. Because delays and schedule changes tend to accumulate during a circuit of sites, it may be best to prioritize sites on less frequent sampling cycles.
- selecting the sites to be evaluated by geographic area so that travel between sites is minimized.
- building in "downtime" for weather, sickness, or other unplanned delays.

NOTE: See SOP PEPF-2.02 for procedures on communicating with reporting organization site operators prior to a site visit

7.4 Site Visit Information Collection including Travel Arrangements

NOTE:Before making Site visit travel arrangements, check: station inlet configuration to help in hooking delivery hose to station inlet manifold blower/flow rate, monitor Mfr., model, age; and parking & ladder logistics.

The FS and/or the contractor administrative staff is responsible for making travel arrangements, which should be made early enough to provide a convenient location for the TTP Mobile PE Laboratory to park prior to and upon arrival at the site, with access to the site(s) ambient air monitors that he/she will visit. Step-by-step procedures for making travel arrangements are beyond the scope of this SOP. Here are some suggestions:

- ground transport is the preferable method for moving sensitive equipment because of the potential for rough handling by airlines or commercial carriers
- make arrangements well in advance to ensure the availability of hotel rooms, and vehicles parkikng and servicing provisions

- for trips involving multiple sites, leave some flexibility in the schedule in case of bad weather and other unexpected delays.plan adequate time at each site to perform the PE.

7.5 Site Visit Equipment Preparation

Prior to an evaluation excursion and based upon the number of sites to be visited, the following will occur:

- *PE* equipment and consumables will be inspected to ensure proper operation and adequate supplies.
- *TTP PE* equipment should be on hand.
- *PE* equipment will be selected and stored appropriately (per SOPs) for transport to the sites.
- *PE calibrated equipment and certified standards* should be checked to ensure they have not gone past their *acceptable use* periods.
- Site Data Sheets will be available for each site. For initial visits some of the information on the Site Data Sheets may be blank and must be completed during the first visit.
- the FS will review the site schedule to be sure that they understand which tasks will be implemented at the sites they are visiting that week.

Upon completion of preparation activities, the Regional WAM should be contacted or a meeting scheduled to review the preparation activities.

Site Data Sheet(SD-01)	
AIRS Monitor Site ID: Site Name:	Monitor ID: Monitoring Freq. (1/6, 1/3, daily)
AIRS Method Designation:	Monitor Make/Model:
Site Coordinates Lat: Long:	Site Type (SLAMS/NAMS)
Reporting Org. Address:	Reporting Org. Contact: Name: Phone Number: E-Mail:

Directions to Site from Field Office: Direction from major thoroughfare: Obstacles to access for Mobile Lab: (For example: high curb entrance from street; low tree limbs) Parking location at site for Mobile Lab:	
Location of electrical hookup: Compatibility details:	
Location of inlet manifold: Access: Description:	
Gas analyzer(s)/range(s)	
Safety Concerns:	Additional Equipment Needed:
Closest Hospital Address and directions from site:	Closet Federal Express Facility:

Closest Hardware Store:	Recommended Hotel (Address/Phone #):
Closest Monitoring Site:	2nd Closest Monitoring Site :
Free Form Notes:	

8.0 References

1.

Field Standard Operating Procedures for the EPA TTP National Performance Evaluation Program [1]

Operation: Periodic Non (Pre-) PE QA Checks (Verification) Procedures
SOP: NPEP-3.01

Name: Printed	Signature	Date

Contents
(applicable to this SOP)

[1]TTP National Performance Evaluation Program

1.0 Scope and Applicability

Applies to preparation QA activities necessary to be completed within specified frequency and acceptable values, prior to finalizing specific PE schedules, using standard EPA TTP Regional Mobile PE Laboratories to test the proficiency of ambient air monitoring and AQS-reporting stations for EPA NAAQS Criteria Pollutant gases (currently Ozone, CO, SO2, NO, and NO2) in EPA Regions 1,2,3,4,5,6,7,8,9, and 10. These activities include periodic independent recertification of PE gas delivery standards, delivery system components (ozone line loss factor for the150 ft PE gas delivery hose), and entire delivery system.

2.0 Summary of Method

Periodically use independent standards and equipment, at least (also use other, qualified independent personnel and approved procedures, when resources and other conditions allow) to perform verifications of TTP Delivery hose line loss factor for ozone (quarterly), ozone equipment (quarterly) and blended gas cylinder standards (semiannually; or, if not feasible, than at least annually); and cross-check of entire (end-of-the-delivery line or hose) EPA Regional TTP mobile PE lab against an equivalent system (annually, if possible).

3. 0 Definitions

Appendix D contains a glossary of terms used in the NPEP TTP..

4.0 Personnel Qualifications

Certification by having passed the written examination and the hands-on practical examination for the mobile TTP PE laboratory components of Federal reference method-based PE training.

5.0 Cautions

Be sure to keep moisture away from the mobile audit lab instrumentation, and especially from the electrical and pneumatic areas

Be sure to provide adequate venting and leak-sensing/alarm equipment.

6.0 Equipment and Supplies

For subsections 7.1 and 7.2:

1. Ozone Line Loss Test Form
2. Ozone line loss test apparatus
3. Major Power UPS-PLC or equivalent
4. API 701 or equivalent
5. Environics 9100 or equivalent

6. EPA TTP dual manifold and flow path control system or equivalent
7. EMC PC, attached printer, and Station Manager software set up to carry out TTP StripCharting function or equivalent.
8. TECO 49C-PS, set up as and certified as a primary or transfer standard, or equivalent

For subsections 7.3 and 7.4, need 1-8, plus:

9. EPA Protocol Gas Blended Gas cylinder of compressed CO, SO2, and NO, at nominal concentration, certified by mfr, and connected to manifolds by CGA 660 regulator, tubing, and fittings. Surfaces exposed to the criteria gases are of EPA-approved materials (borosilicate glass and Teflon; and 316 stainless steel, where applicable), as specified in 40CFR and in EPA Air Guidance documents (QA Handbook, Vol 2 part 1).
   011. Certified CO in dry air or nitrogen at low and high % FS (percent of full scale; typically 50PPM FS) “span” concentrations (about 7-9 and 38-40 ppm)
10. EPA Protocol Independent Ultrapure air standard, to verify that continuous independent zero air supply has no contaminants
11. Regional EPA NIST made, upgraded, and certified ozone Standard Reference Photometer (SRP)

For subsection 7.4, need 1-11, plus:

12. Independent air standards and recently calibrated analyzing lab, with certified NIST SRMs and EPA protocol commercial standards, for the Criteria Gaseous pollutants; with zero air supply and certified calibrator, etc.

7.0 Procedure

7.1 Quarterly “Ozone Line Loss” Test start-Up

The "Ozone Line Loss" test is conducted quarterly to determine the actual ozone concentration being delivered to the station’s inlet probe. By analyzing the ozone concentration before and after the "Line", it is possible to determine the actual amount of ozone loss attributed to the "Line". This loss percentage is used to correct for "true" ozone, so as not to bias audit results.

1. Plug in the audit Mobile PE Lab "Land" line or start the generator.

2. Make certain the Land Line/Generator switch is in the correct position.

3. Turn on the power to the Major Power Powerware, API 701, Environics 9100, TEI 49C -PS (or another ozone standard), HP Printer and EMC Data Logging System.

4. To use the strip chart mode of the EMC data system, begin by clicking on Control; print screen

a) From the Main menu - click on strip charts
b) From the Parameter list, choose just ozone, or ozone and CO, as needed; or if predefined; Ozone or CO
c) Click on display Range, etc. Should have set up before – Need steps(?)

EMC: To use the strip chart mode of the EMC data system, begin by clicking on
a) From the Main menu - click on strip charts
b) From the Parameter list, choose just ozone, or ozone and CO, as needed; or if predefined; Ozone or CO
c) If you are looking at 'real time', this button is depressed by default. If you want 'yesterday' or 'historical' chart then click on either of those buttons
d) Select 'vertical' or 'horizontal' for strip chart orientation.
e) Click on display. This will bring up the strip chart program. The chart markings will be, by default, 0-100%. If you want to see the ranges for the parameters shown by the chart, click on the "scale' button. This will change the chart range to the first parameter. If you click on it again, it will change to the next range, an so on.

5. Make certain that the EMC is logging data. If not, hit the reset button on the interface unit of the EMC located on the rear of the instrument rack.

EMC: Make certain that the EMC is logging data. This means that the 'rx/tx' lights are flashing. If not, hit the reset button on the interface unit of the EMC located on the rear of the instrument rack. If that does not help, please shutdown and restart the Station Manager P.C.

Mike, Steve: Rather than rely on just these few words in item 5 above, we have had 3 of the 6 Regional Operators experience the same problem, and we want you to provide to us one procedure that all 6 operators will use for the problem described next:

We are starting or in the middle of strip chart recording of 1 or more ambient gas analyzers, connected by RS232 cables, responding to zero or upscale concentrations of our ozone or CO/SO/ NO/NO2 concentrations. Problem: The data control (collection) unit stops or does not start talking to the Dell PC. EMC, provide corrective action steps/procedure, choices. Also note any pages in the users a manual that is/are relevant to resolving and/or preventing this problem from recurring.

[Steve says he will have to do more research on this and get back to us.]

6. Regarding labeling of data in the EMC strip chart mode, there are some limitations, in formatting and in the number of spaces available for each label. For consistency and ease of comparability, within the constraints of the EMC system, use these current standard EMC strip chart annotation labels for both ozone and blended gas (BG) peaks:
A) label content
    1) concentration - ppm
    2) type of point: calibration, audit or line loss
    3) pollutant - CO, SO2, or ozone
    4) operator initials
B) Formatting Rule:: * don't resize text box

7 Putting the Excel forms on the Dell.

Note: The PEP field scientists have upgraded laptops. The Dells are primarily for recording PE data from the analyzers and any other instruments that get connected appropriately to the data loggers. Forms can be done on paper, but for ease of use, the Dells should be able to handle what else is needed for the TTP work

EMC: If you can send me on of you 'sysman.ini' file from one of the Station Manager data logger. You will find this file in the default Windows directory in Windows Explorer. Just make a copy of this and e-mail it to me and I can modify it, after I see it, so you could add these 'xls' docs. If I can get this file by Friday, I will have it back to you via e-mail by Monday.
As also mentioned we will be adding new macros to help with this in the next 90 days.

8. Record the instrument model number, serial number, date, quarter, and the previous quarter line loss on the Ozone Line Loss Test Form.

9. Make certain the temperature in the mobile audit lab is between 68°F - 84°F (20°C-30°C) and record this temperature on the Ozone Line Loss Test Form.

10. In preparing for the Ozone Line Loss Test, the operator needs to determine whether or not to condition the line with Ozone before starting the test.

    10.1 That decision depends on the Pre-test Ozone condition status of the line. The bottom line criteria is that the ozone analyzer signal should be consistently stable before the values are taken upon which the calculation is based.

10.2 If the mobile lab had been used to do PEs all week, and then was brought back to home base, or used to do the test while still out in the field, the need to condition would be significantly less than if the system was turned on, for the first time in about 2 months. If the system that is off for 2 months is then turned on for a Line Loss Test, 3 or 4 days before a PE, for about 4-5 hours, and then shut completely down again the % line loss may or will be too high (3-4%), although not 5%. To resolve this problem, perform a simple overnight continuous conditioning. The value will drop to close to 2%.

10.3 A more rigorous approach with better results, leading to less EPA/ESAT-caused % differences in EPA vs audited sites results is to condition the line more before the Line Loss Test. Specifically, Region 4 , in 2004, during the first year of operation, ran a line loss of 0.25% the 2nd quarter and a line loss of 0.15% in the 1st quarter of operation.

11.0 At least, complete a visual inspection and a leak check, quarterly, **prior** to doing the Line Loss Test.

7.2 Conducting the Quarterly "Ozone Line Loss" Test

Two lines (**Tygon Tubing (To evacuate exhaust outside, approximately 10')**)are used during the quarterly "Ozone Line Loss" test. These will be referred to as the "Inside" and "Outside" lines.

INSIDE: ¼" Teflon line from the 3-way manual switch valve to the front manifold.

OUTSIDE: ½" by 150' stainless steel braided line with a needle valve, stainless steel tee, and 2' of 1/4" Teflon line (this is the presentation line connected to the ozone line loss apparatus).

NOTE 1: The Mobile PE Lab uses two glass manifolds for gas distribution to the Mobile PE Lab and station instruments. The "rear" manifold supplies audit gas concentrations to the station and a portion of the+ sample is supplied to the "front" manifold through a three-way manual valve which supplies the Ozone, NOX, and CO instruments

1. Allow the API 701, TEI 49C -PS, and the Environics 9100 calibrator to warm up for at least one hour prior to conducting the "Ozone Line Loss" test.

2. Uncap the audit Mobile PE Lab presentation line. Attach the line loss apparatus to the end of the presentation line.

NOTE 2: (Line Loss Spreadsheet Form-in Excel) is located in Appendix C.2, Data Forms)

3. Switch the *3-way manual valve* on the control panel to the *Rear Manifold* position. With the ENV.9100 calibrator in the "READY" mode ("CONC MODE" displayed on the lower left button), press "CONC MODE " on the front panel of the calibrator. Using the arrow keys, cursor to "TOTAL FLOW" and enter "16.0". Cursor to "TARGET GAS" CO and enter "0.0" if not displayed. Cursor to "O3" and enter "0.000" if not displayed. Press the "START" button on the front panel of the calibrator to deliver zero air to the front manifold and to the presentation line.

4. With the "Inside" line connected to the front manifold, adjust the needle valve that regulates the air flow going from the rear manifold to the front manifold until a by-pass flow of 0.3-0.4 lpm is indicated on the rotameter. After a stable response has been achieved, and recorded on the EMC, take a 5 minute average reading from the EMC Data Logging System for the TEI 49C-PS (or another SRP -traceable ozone transfer standard) and record this response under the Inside Line column for the Pre-Zero Test Point on the Ozone Line Loss Form (Figure 3.5).

NOTE: Regarding how to determine the 5 minute reading: Rough stability is indicated by the strip chart record, but the exact number i sdetermined fiom the regulary updated number table read-out. In order to get an accurate 5 minute average, you need to look at the 1 minute table to verify that your 5 minute average is correct. In other words, if you do a quick visual verification of the last five 1 minute averages, it should be very close to your 5 minute average. If you dont do this, your 5 minute average could be off if the software is taking 4 minutes showing stability and one that is before stability is achieved. In other words, the software is averaging 84 (not a stable track), 70, 71, 70, and 70 the average will be biased high since stability is not achieved. EMC summary:

5. Disconnect the "Inside" line from the front manifold and connect the "Outside" line to this same port. Make sure the by-pass tubing on the line loss apparatus is vented outside. Using the needle valve on the line loss test apparatus, adjust the flow until a 0.3-0.4 lpm by-pass flow is indicated on the rotameter. After a stable response has been achieved, take a 5 minute average reading from the EMC Data Logging System for the TEI 49C-PS (or another ozone standard) and record this response under the Outside Line column for the Pre-Zero Point on the Ozone Line Loss Form.

6. Cursor down to “O3" on the Environics, enter “0.400" and press “UPDATE”. After a stable response has been achieved, take a 5 minute average reading from the EMC Data Logging System for the TEI 49C-PS (or another ozone standard) and record this response under the Outside Line column for the 0.400 Test Point on the Ozone Line Loss Form.

7. Disconnect the "Outside" line and reconnect the "Inside" line to the front manifold. Readjust the by-pass flow if necessary. After a stable response has been achieved, take a 5 minute average reading from the EMC Data Logging System for the TEI 49C-PS (or another ozone standard) and record this response under the Inside Line column for the 0.400 Test Point on the Ozone Line Loss Form.

8. Cursor down to “O3" on the Environics, enter “0.175" and press “UPDATE”. After a stable response has been achieved, take a 5 minute average reading from the EMC Data Logging System for the TEI 49C-PS (or another ozone standard) and record this response under the Inside Line column for the 0.175 Test Point on the Ozone Line Loss Form.

9. Disconnect the "Inside" line and reconnect the "Outside" line to the front manifold. Readjust the by-pass flow on the line loss apparatus if necessary. After a stable response has been achieved, take a 5 minute average reading from the EMC Data Logging System for the TEI 49C-PS (or another ozone standard) and record this response under the Inside Line column for the 0.175 test point on the Ozone Line Loss Form.

10. Cursor down to “O3" on the Environics, enter “0.070" and press “UPDATE”. After a stable response has been achieved, take a 5 minute average reading from the EMC Data Logging System for the TEI 49C-PS (or another ozone standard) and record this response under the Outside Line column for the 0.070 Test Point on the ozone line loss form.

11. Disconnect the "Outside" line and reconnect the "Inside" line to the front manifold. Readjust the by-pass flow if necessary. After a stable response has been achieved, take a 5 minute average reading from the EMC Data Logging System for the TEI 49C-PS (or another ozone standard) and record this response under the Inside Line column for the 0.070 Test Point on the Ozone Line Loss Form.

12. Cursor down to “O3" on the Environics, enter “0.000" and press “UPDATE”. After a stable response has been achieved, take a 5

minute average reading from the EMC Data Logging System for the TEI 49C-PS (or another ozone standard) and record this response under the Inside Line column for the Post-Zero Test Point on the Ozone Line Loss Form.

13. Disconnect the "Inside" line and reconnect the "Outside" line to the front manifold. Readjust the by-pass flow on the line loss apparatus if necessary. After a stable response has been achieved, take a 5 minute average reading from the EMC Data Logging System for the TEI 49C-PS (or another ozone standard) and record this response under the Outside Line column for the Post-Zero Test Point on the Ozone Line Loss Form.

14. Disconnect the "Outside" line and reconnect the inside line to the front manifold. Turn off the API 701. After the pressure gauge on the API 701 reaches zero, press stop on the Environics and turn it off. Turn off the TEI 49C-PS.

15. Calculate the Quarterly Ozone Line Loss using the following formulae:

NOTE: Before calculating "Quarterly Ozone Line Loss", subtract zero response at each test level.

$$\%D = \frac{(\text{Outside Line} - \text{Ave. Zero}) - (\text{Inside Line} - \text{Ave. Zero}) \times 100}{(\text{Inside Line} - \text{Ave. Zero})}$$

Average % Difference = (%D@Test Point 0.400 + %D@Test Point0.175 + %D@Test Point 0.070)/3

Current Quarter Line Loss = (Previous Quarter Line Loss + Average %Difference) / 2

Current Line Loss Factor = 1 + Current Quarter Line Loss

WARNING: The Average % Difference of the three points should be within +2.5%. If not, corrective action should be performed to identify and correct the problem and the line loss test redone.

16. Remove the ozone line loss apparatus from the presentation line, cap it, and wind it back on the hose reel.

7.3 Quarterly Ozone Instrument and Semi-Annual Gas Cylinder Re-certification

NOTE: For ozone transfer std, if zero is over 5ppb(?), fails (see guidance). If over 5, don't proceed.

1. TEI 49C -PS Ozone Analyzer (or another ozone standard) –

1.1. The Standards Laboratory recertifies the Photometer against a Primary Photometer quarterly and must be within ±3% of the slope and ±3ppb of the intercept. If not, recalibrate the Photometer against the Lab Primary Photometer and recertify the Photometer. The SRP user's Manual allows for an SRP Zero of ± 2 ppb ozone.

1.2 In almost all cases, the host (home base) Region of the TTP PE Mobile lab has an EPA NIST SRP operator. The Host Regions have all agreed to have their SRP Operator, or an equivalent, check their TTP PE Primary Standard ozone analyzer quarterly. The operator uses the same, standard SRP procedure used to certify the Region's state, local, tribal and (if the Region agrees to), private agency or organizations' ozone (equivalent method) primary or transfer standards. The operator uses the same procedure used to compare the Regional SRP against the coordinating SRP(currently from EPA ORIA LV)

2. Compressed Cylinder Gases – Vendor Certified Uncertainty at ± 1% of the certified concentration; Verfication /Recertification should be within ±2%, and not greater than ±3% of the old (original) certification; *if falls outside that range, a) discuss data invalidation; b) stop using as standard*

2.1 The High CO (40 ppm), Low CO (7 ppm), and Superblend Cylinders are recertified semi-annually, *if possible, and if not, at least annually,* by comparison to an independent set of first generation NIST certified standards. The certified gas concentrations are used to determine the audit Mobile PE Lab "True" gas values.

2.2 The compressed gas cylinders of ambient concentration gases (CO Lo and Hi spans) are compared against "first generation" (Traceable to a NIST SRM or equivalent by no more than one step away), by using the G.1 (straight in, no dilution) EPA Protocol for Certfying Compressed Gas Cylinder traceablity to NIST). Note, the vendor's initial certification for the Lo CO is only 6 months, and must be recertified in time to be acceptable before use in TRTP PE. This coverage must be planned ahead by the Region and OAQPS.

2.3 Cylinders of high concentration blended gases will be recertified using the

G.2 portion of the EPA Calibration Gas Traceability Protocol.

2.4 This may be done by PR service arrangement with the original cylinder vendor, or equivalent proven highest quality vendors of compressed gas cylinder standards using the EPA Protocol for Establishing Calibration Gas Traceability. The work may also be done, using G.1 or G.2, s appropriate, by the proven established independent gas certification laboratories in EPA Region 2, 7, EPA's Audit Support contractor for NPAP, or proven established equivalent found acceptable to EPA OAQPS by means of a Performance test comparison.

7.4 Quarterly (If Possible/Needed);At Least Annually: Cross-check with Independent Standards Laboratory

At the beginning of each quarter, where an in-house independent lab is available (EPA Regions 2 and 7, and in EPA RTP), and audts are performed each quarter, an in-house cross-check is performed by comparison to a set of independent analyzers calibrated against independent standards. If access to an independent air lab is not available locally, and the TTTP work is done less frequently than quarterly, the crosscheck must be done atleast annually. The purpose of this multipoint cross-check is to verify the actual concentrations of the diluted gases at the end of the audit Mobile PE Lab's "Line"(also termed delivery or presentation hose). This cross-check is conducted using the same procedures outlined in this document and should be within ± 3.5%. *However, in the event that a difference greater than ± 3.5% is determined, there is most likely a problem, and corrective actions to identify and correct the problem should be done*. Cross-Regional Mobile Lab comparisons will be acceptable, *but must include SO2, and especially, NO2 analyzers that have been multipoint checked independently against NIST traceable standards that have themselves been compared repeatedly, over time, to NIST SRMs, preferably inhouse.*

8.0 References

1. User's Manual, API 701 - Zero Air System
2. User's Manual, TEI 49C PS- Photometric Ozone Calibrator
3. User's Manual, Environics 9100 - Computerized Ambient Monitoring Calibrator
4. User's Manual, EMC Station Manager Data Logger/Dell PC /HP Printer

Figure 3.7.1.1 Line Loss Apparatus- Focus on Fitting Assembly

Figure 3.7.1.2 Line Loss Apparatus - Entire Apparatus

Figure 3.7.1.3 Line Loss Apparatus View 3

Instrument _____ SN# _____ Date _____ Temp. _____

Quarter _____

Previous Quarter Line Loss -2.15

Test Point	Inside Line	Outside Line	%D corrected for zero
Pre-Zero	0	0.003	
0.4	0.392	0.385	-2.68
0.175	0.1721	0.172	-2.10
0.07	0.0676	0.0663	-7.15
Post-Zero	0.001	0.005	
Ave. Zero	0.0005	0.004	

Average % Difference -3.98

Current Quarter Line Loss -3.06

Current Line Loss Factor 0.9694

$$\%D = \frac{(\text{Outside Line} - \text{Ave. Zero}) - (\text{Inside Line} - \text{Ave. Zero})}{(\text{Inside Line} - \text{Ave. Zero})}$$

Average % Difference = (%D Test Point 0.400 + %D Test Point 0.175 + %D Test Point 0.070)/3

Current Quarter Line Loss = (Previous Quarter Line Loss + Average % Difference)/2

Current Line Loss Factor = 1+ Current Quarter Line Loss

Figure 3.7.2 Ozone Line Loss Form

Field Standard Operating Procedures for the EPA TTP National Performance Evaluation Program[1]

Operation: Start-up-Procedure

SOP: NPEP - 4.01

Name: Printed	Signature	Date

Contents

(Applicable to this SOP)

[1]TTP National Performance Evaluation Program (NPEP)

1.0 Scope and Applicability

This SOP applies to use of an EPA Regional TTP Mobile PE Laboratory for generating NAAQS criteria pollutant gases to conduct evaluations of operations of US, state, local, tribal, or private PSD-permitted ambient air monitoring stations to independently indicate the proficiency of the operation. The Mobile TTP lab is contained in an insulated double walled shell set on a truck or trailer chassis. The trailer is towed by a vehicle, to which it is connected to by a hitch apparatus.

This SOP specifically describes required, sequential, pre-travel inspection checks and startup procedures that must be performed at a home base or at an interim location, prior to traveling to the site of the day's PE. They are used to verify that the tow vehicle, hitch, and trailer travel and mobile lab safety and TTP PE equipment are present, and in correct working order. Any problems should be identified and feasible corrective action taken, so that the problems do not jeopardize the TTP PE personnel and equipment.

2.0 Summary of Method

TTP PE staff carry out the safety and pre-trip performance checks and procedures, using the checklists in the order of their occurrence in the SOP. First the truck (Region 4) or tow vehicle and trailer hitch (Regions 2, 5, 6, 7, and 9/10) safety feature presence and condition and/or performance are checked. Then the presence and performance of the interior mobile TTP lab required operational safety and support features are checked for presence and then condition or performance. Finally, if all checks and conditions are acceptable, the critical support and TTP warm up and conditioning procedures are initiated, so that the TTP system will be as close to ready to start the PE as soon as possible, upon arrival at the PE site.

3.0 Definitions

Appendix D contains a glossary of terms used in the NPEP TTP.

4.0 Personnel Qualifications

Certification by having passed the written examination and the hands-on practical examination for the mobile TTP PE laboratory components of Federal reference method-based PE training. EPA/EPA contractor's Driver training, specifically for towing trailers, of the size class of the Regional Mobile PE Labs. This training is available through certified instructors at various EPA Regional and National laboratories.

5.0 Cautions

1. The *recommended* location for the crank for the 4 exterior jacks is *in the tow vehicle*. Before disconnection from tow vehicle, put the jacks down.

2. In auxiliary generators compartment doors mode during travel on road, leave locking clasp locked and key lock - unlocked before you start traveling to audit site. **This is a DOT safety requirement.**

3. Safety Caps for compressed gas cylinders - Griftan, yellow metal clam-shell caps are a safety requirement for moving mobile audit labs, especially when the compressed gas cylinders have regulators, fitting and tubing attached. Movement of the Mobile labs is forbidden if it contains pressurized cylinders without either the standard compressed cylinder cap or the clam-shells securely fastened, especially if there is a regulator and any other connections attached to the cylinder stem. The clamshells should be left on the cylinders at all times when out in the field, unless the cylinder is empty. In this way, there are fewer chances for unintnended changes in flow , pressure, or leak seals to occur as a result of making a mistake or change to system aerodynamic characteristics when reconnecting fittings and lines.

   There may be situations when not moving but at a PE or pre-PE site that require you to turn the main cylinder valve on or off, and therefore warrant opening a clamshell cap to allow that activity- such as turning the main valve off to conserve blended gas. You can do that with the clamshells on, but open. Keep the clamshells on, and closed unless you have a specific need. The purpose of this precaution is, in case the trailer is accidently moved or struck by a significant force. If it is parked near other vehicles, or near a hill where other vehicles are located, they may accidently hit the trialer. If high winds occur, or some other unexpected force acts against the trailer, the jacks may fail.

4. Keep the regular cylinder caps belonging to the cylinders in the lab, in case you need to move the cylinder from the lab unexpectedly.

5. Motel reservations: When making motel reservations, make sure that the motel can safely accommodate the Mobile Lab. *Beware of high curbs, steep driveway entrances, etc, in comparison to your rear clearance dimensions*. Even if you ask during pre-trip info collection stage, you do not know until you arrive, because you don't know if the large vehicle slots are already taken by other visitors before you arrive-apparently, there is no reserving of the slots, but first come, first serve.

7. The shoreline receptacle on the outside of the passenger side of the mobile lab body, and the plug that is connected to it, may heat up and may short out. If this happens, remove and replace the plug and receptacle.

   There are two possible causes for such a short. 1) Water could get into the plug/receptacle, but if water got into the system the breaker would trip and the damage to the receptacle would be different. To prevent future moisture-caused shorts, check for dryness before plug-in. If wet, do not plug in. 2) There is a flaw in the wiring of the plug. To prevent it from happening again, check for this possibility and correct if it occurs.
   .
   3) Case in which only one of the posts on the plug is affected. The connection could be loose or a stray wire(s) attaching to the plug could touch something it shouldn't. This makes the most sense for the damage in this case. It possibly could be a combination of the two. Watch it carefully. Replacements for the plug and receptacle are available. Instal when the appropriate professional staff are available to do the repair. In addition, have more of the wiring checked. The connection is actually a twist connection. This safety -lock feature might aggravate the wiring connection problem. Always check for loose connections and moisture before connecting electrical power source components.

8. All Mobile Labs, Caution/To do: New FS -Count to 10 to hold down the Major Power PowerWare 9125- 2000 power-on/off button on the UPS-PLC. The experience of some FS operators is that a three count will usually do for turning on and off the UPS. The indicators on the unit itself are not very user friendly on first use, but there is no problem when you get used to it.

9. Equipment Design problem/To Do: The edges of the hose hatch through which the braided stainless steel delivery hose line is put out to the station inlet is not lined with a tough but smooth protective material, although it should be. The lack of this protective material may result in early fraying - and potential kinking of the line. This possibility could have 2 negative consequences. If the edges are being abraded early and breaking into little sharp open pieces, and the bare metal threads that are being cut are sticking out, they can puncture bare hands holding the hose. PE FS/Operators handling the line must use gloves that will protect hands from the punctures.
   The fraying on the hose may not be very visible.FS have experienced the rough nature of the hose from the first day of use. It may just be one of the characteristics of a braided hose. Even if the hatch wear is premature, look into

ways of minimizing the wear. Look for the symptom of a groove developing in the plastic framing of the portholes of the trailers used for hose exits. Look for material that would be better, such as replaceable leather Any time there is one material moving against another there will be friction and wear. Minimizing it is the key.

10. Ensure that the safety chains and brake wire are properly attached between the tow vehicle and the trailer, with the brake wire slightly longer in length than the safety chains.

11. Stabilizer bars are for use during highway travel only and should not be in place on the trailer while attempting to maneuver or position the trailer.

12. Ensure that fire extinguishers (inspection sticker by Regional SHEM or Contractor personnel or contractor) are up to date.

13. Examine the distribution of any additional load (portable sampler cases, single pieces of equipment, tools, etc) placed in the trailer or tow vehicle for travel. Ensure that no unnecessary load is added to the tongue-weight of the trailer, or beyond the design tolerance of the rear or front axles, and that distribution is carefully balanced throughout the entire vehicle system, including in storage spaces in both towing and towed spaces, forward, center, and rear, and on both sides of a centerline going down the middle of the vehicles with the storage spaces.

6.0 Equipment and Supplies

1. Check lists for Trailer Towing Pre-Trip Safety Inspection, and Road and Functionality Tests
2. Operator's Manuals for auxiliary generators, Trailer (Axles and wheels), AC Units
3. Cylinder caps

Note: See Clarification at the end of Section 4.

7.0 Procedure

7.1 Mobile PE Lab Exterior

Note: See Figure 4.7.1 Check List for Trailer Towing Pre-Trip Safety Inspection, and then Figure 4.7.2 for Road and Functionality Test. Use for initial

receipt and during each start-up of Mobile PE Lab Trailer.

1. For both the truck-based Region 4 Mobile PE lab and the trailer-based Mobile PE labs in Regions 2,5,6,7, and 9, open the generator compartment door and verify that the oil is in the "Safe"operating range.

2. Breaking in a New Engine for the Auxiliary Generators: See Page 12 of (Onan) Operator's Manual". See Engine Oil Recommendations (page 6 of Operator's Manual). Check oil level twice a day or every 4 hours during the first 20 hours of operation and change the oil after the first 20 hours of operation.

3. Storing the Genset: Proper storage is essential for preserving top genset performance and reliability when the genset cannot be exercised regularly and will be idle for more than 120 days. (See page 12 of Operator's Manual.)

4. Remove the "Dust Cap" from the end of the 150' audit gas presentation "Line".

5. Don't forget about the need for DOT - approved placards about the compressed gas cylinders that apparently may need to be put on the outside of the mobile lab. *Be aware that some states may require the use of placards regarding the compressed gas cylinders inside the trailer*. Note: Some states may require a commercial driver's license if have the placard on the outside of the vehicle. Make sure you know and comply with whatever the EPA Regional Office Safety officer requires.

6. For trailers equipped with rooftop platforms, they come with rails which lock down with 2 pins on the front and back. To erect, remove locking pins, reinsert at top of corners to lock into and erect position. (Only for sampling mode)

7. **Trailer Anchoring Jack -** The *recommended* location for the crank for the 4 exterior jack is *in the tow vehicle.*

7.2. Mobile PE Lab Interior

Note: For initial receipt and during start-up of Mobile PE Lab Trailer (and truck?)

1. Make certain that the generator/land line power source selector is in the

neutral (unloaded) position (if so equipped).

2. *__Safety Caution__ - In auxiliary generators compartment doors mode during travel on road, leave locking clasp locked and key lock - unlocked before you start traveling to audit site. **This is a safety requirement.**

3. Check to make certain that all circuit breakers are "ON".

4. Start generator(s) as needed. After the generator speed is stable (5 minutes) place the power control switch in the generator (loaded) position if it is not equipped with an automatic switch over.

   API 701 warm up issue:

   Note: The CFR requirement for the operating ambient air monitoring analyzers is 68-84 degrees F / 20-30 degrees C. To achieve this requirement when conditions include cold wet or very hot moist outside air, on sart up of the AC units, first vent the air out of the trailer, then heat or cool as needed. The temperature should be achieved in as little as 15 minutes, using this procedure.
   Then turn on the instruments.

5. Turn "ON" the power to the Powerware line voltage and frequency conditioner.

6. Turn "ON" the power to the API 701 zero air module.

7. Visually inspect the Borosilicate glass (or any FEP teflon) manifold and transparent connecting tubes of the flow path for any discoloration or particulate or other debris Use of a pressure sensor is recommended to verify optimum pressure and identify any potential pressure problems. If one is available, turn "ON" the power to it.

8. Turn on the following instruments when conducting audits for:
   a. Ozone: Environics 9100 and TEI 49C-PS
   b. Ozone, and/or CO, and /or SO2, and /or NO/NO2: Environics 9100, API 401a, TECO 48c, and (if available) TECO 42c

9. (For turn on of the EMC Data Logger System for the first time Start-up, the prompt will ask for a password. Use EMCEMC for the first time

only).
Turn “ON” the power to the EMC Data System and HP printer. Press “RECORD”.

10. Allow a 1-hour warm-up time for the TECO 49C-PS and a 3 ½ -hour warm-up time for the TECO 48C, (if included) and TECO 42C.

11. If not done already, install the clam shell covers for the cylinders with regulators.

12. *__Safety Caution__ - Safety Caps for compressed gas cylinders - Griftan, yellow metal clam shell caps safety requirement for moving mobile audit lab when the compressed gas cylinders have regulators, fitting and tubing attached. Keep the regular cylinder caps belonging to the cylinder in the lab, in case you need to move it from the lab unexpectedly. To be prepared for that same possibility, do not forget that metal-toed safety shoes are required when moving a compressed gas cylinder.

13. *If not done already*, install the q
uick connects/disconnects following the regulator on the blended gas cylinder to allow the auditor to vent the gas out to the Stainless Steel (SS) 1/8" line coming from the cylinder regulator to the back of the Environics 9100. Vent the regulator and the line before starting any dilution of the blended gas cylinder.

14. As necessary to mimimize the time it takes to get a stable reading from the end of the hose, set up the flow system (it should already be set up) to and allow the ozone upscale concentration to condition the entire flow path, including the vented, coiled delivery hose. The amount of time necessary to provide conditioning depends on the amount of time since the last conditioning. Ozone is used because it takes the longest to achieve stable conditioning of the teflon lining of the hose. The longer the time since the last stable generation, the longer the time needed to recondition ahead of arrival at the site of an ozone PE. 24-48 hours at a high concentration should be adequate for a downtime of 2-4 weeks or more. The more experience one has with the particular system, the more exactly willl one know the necessary amount of time.

From Jason Brown, ESAT, Region 4:

NPAP Protocol for power failure during an NPAP audit:

Determine the source of the power failure.

Sources for power failure:

*Power cord has become disconnected from power source.
*Gas level have become to low. (Be sure that vehicle is parked on level surface.)
*Power circuits may have been tripped.
*UPS system is not receiving power.
*Instruments have become unplugged.
*If connected to shore power the site it self may have loss power. Check with site operator.

After determining the cause of power failure and determining that the audit is safe to proceed as planned.

?Bring the instruments back on line and after determining that the instruments are functioning properly resume the audit at the last completed set point.?

8.0 Ref eren

ces

1. ONAN Commercial Mobile Power Operator's Manual

2. EPA Tow Vehicle Training

3. EPA QA Handbook for Air Measurements, Vol II, Part 1,1998

4. Mobile Lab Notebook of TTP system Component vendor literature and Wells Cargo Trailer manuals

Tow Vehicle-Trailer Pre-Trip Safety Inspection Checklist for Region _____

Date:_____ Reviewer_____

Review the following checklist and indicate whether each item is satisfactory (SAT.), unsatisfactory (UNSAT.), while including applicable notes. All unsatisfactory issues must be properly addressed before the trailer can be towed.	**SAT.**	**UNSAT.**	**NOTES LEGEND**
I. Tow Vehicle			
1. The tow vehicle has enough power to safely tow the trailer load.			
2. The tow vehicle has received regular preventative maintenance work.			
3. The tow vehicle has adequate fuel, battery power, oil, and engine coolant.			
4. The tow vehicle tires are properly inflated and balanced, and do not show excessive wear or damage.			
5. The wheel fasteners (lug nuts) are present, tight, and free of rust.			
6. Wheel rims are free from damage.			
7. Tow vehicle is level when attached to the loaded trailer.			
8. All lights (dash lights, head lights, tail lights, clearance lights, brake lights, directional signals, hazard light, high beams, reflectors) are in proper working order.			

9. Weight is properly distributed between the trailer and the tow vehicle			
10. All brakes are in proper working order.			
11. Side view mirrors provide an unobstructed rear view on both sides of the vehicle.			
II. Hitching Apparatus			
1. The receiver is properly mounted to the tow vehicle.			
2. The receiver, draw bar, hitch ball, coupler, sway control device, spring bars, safety chains, and power connection wiring are all functional and compatible with the tow vehicle and trailer.			
3. The power and brake control connections between the trailer and tow vehicle are compatible, provide enough slack for turning, are in good working order and are of proper length for brake to be activated if the trailer separates from the hitch.			
4. The landing gear (trailer jack) is functional.			
5. The hitch ball and coupler are the same size. When attached, the ball is firmly seated in the coupler, and the latching mechanism is locked.			

Figure 4.7.1.Tow Vehicle Trailer Safety Training

Road Test and Functionality Test for Region _____

Date:_____

Road Test

Description	Test Parameter	Results
Running lights	Illuminates with tow vehicle	
Brake lights	Illuminates with tow vehicle	
Turning signal	Illuminates with tow vehicle	
Electrical braking system	Engages with tow vehicle braking	
Stowing of internal equipment	Internal components stable during road test	
Trailer tongue jack	Jack operates properly to raise or lower trailer tongue	
Trailer leveling jacks	Four each jacks operate properly to level trailer	
Trailer electrical connector	Sufficient length to connect to tow vehicle and lights/braking system is operational.	
ONAN Generator One	Provides power to instrument rack units, data logger, computer, and air conditioner/heater while under tow.	
Road Test Cont....		

Description	Test Parameter	Results
ONAN Generator Two	Provides power to instrument rack units, data logger, computer, and air conditioner/heater while under tow.	
Roof Mounted Platform	Platform folds and stores in secure manner; safely assembles upon set up.	

Functionality Test

Description	Test Parameter	Results
Shore line electrical cable	Shore line electrical services to main breaker	
	Each secondary breaker supplies power to the respective outlets	
	All rack mounted instruments are functional	
	EMC data logger and computer are functional	
	Interior wall outlets have 120V electrical service	
	Exterior lightning is functional	
	Exterior outlets have 120V electrical service	
	Air Conditioner/Heating functional	
	Internal lightning functional	
	Roof mount platform exterior outlets have 120V electrical service	
UPS System	Energizes upon shore line, generator one or generator two power interruption	
ONAN Generator One	Electrical service to main breaker after setting power selector switch	
Functionality Test Cont.....		

Description	Test Parameter	Results
	Each secondary breaker supplies power to the respective outlets	
	All rack mounted instruments are functional	
	EMC data logger and computer are functional	
	Interior wall outlets have 120V electrical service	
	Exterior lightning is functional	
	Exterior outlets have 120V electrical service	
	Air Conditioner/Heater functional	
	Internal lightning is functional	
	Roof mount platform exterior outlets have 120V electrical service	
ONAN Generator Two	Electrical service to main breaker after setting power selector switch	
	All rack mounted instruments are functional	
	EMC data logger and computer are functional	
	Interior wall outlets have 120V electrical service	

Functionality Test Cont....		
Description	**Test Parameter**	**Results**
	Exterior lightning is functional	
	Exterior outlets have 120V electrical service	
	Air Conditioner/Heater functional	
	Internal lightning functional	
	Roof mounted platform exterior outlets have 120V electrical service	

Figure 4.7.2 Road/Functionality Test Check List

Mobile Platform:Trailer, Tow Vehicle, and Hitch Operating Features,Issues and Requirements

Capacity:

1)The model EW 1824 Wells Cargo trailers, modified by the addition of a lab body, and TTP PE equipment, and additionally loaded with 5 PM2.5 Portable FRM sampler sets, should weigh no more than 6000 pounds.
2) Regarding stability due to weight and design, tow vehicles equivalent to a Ford 150 or 250 pickup truck have been proven to be, by themselves, unsafe for this application. I have the pictures to prove it. They may be used successfully for a number of trips, but can then flip , just due to the initiation of sway, as a result of the passage of a semi, on a clear day, with no precipitation, or even with no other wind. Once sway starts, the critical issue for the operator is to be able to bring the trailer back under control.

Clearance:
The real problem for ground clearance will be the trailer, especially due to the jacks or steps, if they are not raised during prior to trailer motion. Care must be taken when driving the tow vehicle and trailer into and out of parking situations in which there is a curb or other obstacle due to the detaills of the off-road location of some of the ambient air monitoring stations that will be visited. Overhead clearance must also alway be considered, when going under trees, bridges, or upon entering buildings (such as the warehouse in EPA Region 5).

The overall length of the trailer is 18 feet plus the length of the back bumper/step/plate and the front A-

frame that carries the auxilliary gas fuel tank and the trailer hitch, or about 20.5 ft total. The overall width of the trailer is 8 ft. The interior height of the trailer is 7ft. then there is also the ground clearance of 6-10" above the ground, to the bottom of the trailer, The overall height of the trailer is 10.5 ft. Of course, the driver has to consider the additional height of the roof platform (about 4-6" of plywood base), and that when the railings are locked in the erected position (safety railings about about 30 " added height). The main additional trailer height, with the railings locked down, is the height of the 2 AC Units' exterior housings.

Trailer Hitch and safety equipment:
1) The stability and ability of the tow vehicle will be improved in all cases by the addition of a sway (stabilization) bars and a weight distributing hitch. A Chevy suburban and, especially (better) a Chevy "dually" vehicle, and a Ford Expedition have each been operated for may travel miles, without incident, - but they have both the weight-distributing and sway stabilization bar apparatus added top their basic hitch. The basic hitch for this application is a minimum of a Class #3 ball-type hitch, with a 2 5/16th inch hitch ball.

I read from the vendor literature that the normal GVWR for the loaded Wells Cargo Model EWW 1824, 18 ft long tandem (twin) axle, 4 ton model is 10,000 pounds. In our application , we have planned for normally less than 6,000 pounds, loaded, including the platform weight. The Region 9 ESAT contractor says that the normal class 3 max loaded tow weight for his Ford Expedition is 8000 pounds, and that the maximum rated tongue weight (TW), without added sway and wieght distribution control features, is 600 pounds (from my vendor lierature, I think that that is base on 10-15% of the GVWR). Estimates of the maximum allowable Tongue Weight (TW) for the Region 9 Mobile lab have lead to an estimate of 900 pounds, when the auxilliary generator gas fuel tank is full. The Class 3 TW maximum, with the weight distributing hitch and the sway bars on, is 895 pounds. However, it is not necessary to operate with the tank full. There have been no problems observed. The Region 9 mobile lab is not operated with the auxilliary tank full.

2) The Mobile lab trailers have electric brakes, and chains(?DOT-compliant 5/16" safety chain with Clevis Safety Slip Hook and Latch) to connect to the hitch, and 2 cables that connect to either side of the hitch, and disconnnect in the event of loss of control of the trailer. The disconnection triggers the trailer's electric brakes in that emergency situation. To provide for both the trailer liights and electric brakes, the tow vehicle should have a 7-lead wire harness connector that will operate electric trailer brakes. Safety during maneuvering is ehanced by adding mirrors that allow the driver to see around the 8 foot width of the basic trailer body .

Field Standard Operating Procedures for the EPA TTP National Performance Evaluation Program [1]

Operation: Site Set-up Procedures

SOP: NPEP-5.01

Name: Printed	Signature	Date

Contents
(applicable to this SOP)

[1]TTP National Performance Evaluation Program

1.0 Scope and Applicability

This SOP applies to the use of information, normally recorded by the TTP staff, from contacts with PE site agency or organization personnel, prior to the trip to the state, local, private, or tribal monitoring station. The procedure described in this SOP is performed using standard or pre-approved substitute equivalent EPA Regional Mobile TTP PE lab equipment. The activities described occur at the intended site of the PE, following adequate preparation activities that have occurred prior to arrival at the site.

2.0 Summary of Method

On site station information is used to verify or correct previous estimations of the parking, sampling inlet location and flow requirements**,** criteria pollutant gas type, concentration, resulting API 701and Environics 9100 settings, and estimated delivery hose output. Ozone analyzer should have been on for an hour or more, warming up. Check Instrument operational parameters to insure proper performance. Procedure describes options for connecting Mobile Lab's Delivery Hose ("line") to station inlet, depending on the particulars of the station inlet and flow.

3. 0 Definitions

Appendix D contains a glossary of terms used in the NPEP TTP.

4.0 Personnel Qualifications

Certification by having passed the written examination and the hands-on practical examination for the mobile TTP PE laboratory components of Federal reference method-based PE training. EPA/EPA contractor's Driver training, specifically for towing trailers, of the size class of the Regional Mobile PE Labs. This training is available through certified instructors at various EPA Regional and National laboratories

5.0 Cautions

N/A

6.0 Equipment and Supplies

1. Mobile PE Lab Pre-warmed up and conditioned-Major Power UPS PLC, API 701, Environics 9100, Primary or Transfer Standard for Ozone (TECO 49C-PS, Plumbed for Primary Function); TTP PE operator's pre-arrival site information and operator experience, and sufficient on-site assistance, normally by the agency's site operator, in determining and carrying out activities to bring and park the mobile platform close enough to the sampling inlet of the site to allow the connection of the end of the 150 ft TTP PE gas delivery /presentation hose (line) to the inlet.

2. Lab and Station Data Worksheets
3. Mobile PE Lab's EMC or equivalent strip (analyzer signal trace) recording chart and station chart

4. Mobile PE Lab ‘s TTP Gas Delivery (presentation) Line (Hose), Borosilicate(Pyrex) glass T, or EPA approved equivalent., for connecting mobile lab line to station inlet, with one arm for vent), and Assorted Tubing sections for connection; may need none-contaminating 1 or 2 hole stoppers

5. TTP PE Flow path compatible, Certified Pressure and/or flow sensor, if available

7.0 Procedure

7.1. Initial Site TTP PE Set-Up: Total Flow Need Estimation and Connection Preparation

1. Attach a 2-foot section of ¼" OD Teflon tubing to the end of the 150 ft audit gas delivery hose or "Line".

2. Verify that the API 701 and all instruments are operating properly.

3. Record the site name, site number, date of audit, and the auditors' names on the Mobile PE Lab chart and station chart (if so equipped).

4. Enter the beginning audit time, ending audit time, and the auditors' names, in the station logbook or computer.

5. Before attaching the "Line" to the station's inlet probe, record the value of the station magnehelic (used to measure manifold inlet pressure), if so equipped, on the QA PE Station Data Worksheet (station worksheet, Figure 5.6) as the "Before PE Magnehelic Reading".

NOTE: See Mobile Lab Configuration on Page 6 of TTP SOP Section 1.

6. Determine the Mobile PE Lab's actual output flow at the end of the "Line" (also called delivery or presentation hose) using a Mass Flow Meter (MFM) or Rotometer. The output flow should be greater than 11 lpm. The site's inlet flow can be determined by totaling the flow of all instruments, in addition to *pull from any* auxiliary pumps *used by the station staff* to reduce residence time. Record both flows on the Mobile PE Lab’s *Station* Data Worksheet (Mobile PE Lab Station Worksheet, Figure 5.6).

NOTE: The "Line" output flow must be at least 2 lpm greater than the station's inlet flow. If the TTP PE Gas Delivery Hose or "Line" output flow is not within this range, disable (or reduce the flow) to the auxiliary pump on the station's instrument manifold. If this is not done, dilution of the PE gases will occur, and the PE will be invalid.

16 LPM = Normal Total Flow from the Environics 9100. Dialed in

Blended gas concentration, mixes in API dilution air; maybe only use 15.96 LPM of the Total dilution air flow and +0.04 LPM of multi-blend gas; (note on PE Lab?) chart and station chart
Even with a transfer standard audit, most stations have a short inlet probe. Even if carry, put in inlet probe, that flow is about 5 LPM

Regarding ozone concentrations and flows: The ozone generator in the Environics 9100 does not have a photometer. It will drift over time. The ozone photometer in the TECO 49C-PS is used to measure the actual ozone output Do not be concerned with what the Environics flow meters say. Use the analyzers to check the (stability of the) concentration and flows at the same time.

7. If the "Line" output flow exceeds the station's inlet flow by more than 5 lpm, make certain that the excess flow is properly by-passed (vented), usually from one arm of the connecting “T”.

   EXAMPLE: A glass tee of equal interior diameter may be used as a by-pass by inserting the Teflon tubing attached to the "Line" into the side port. Secure the "Line" to the probe and attach the station's inlet probe to the top port and allow the excess flow to be vented out the bottom port (see this section(TTP SOP 5), item 7.3.1.a). On very windy days, attach an equal diameter Tygon tubing, at least 10" in length, to the open port of the glass tee to prevent ambient air from diluting the audit gases.

8. Check the Mobile PE Lab’s front manifold by-pass flow. If the by-pass flow is not 0.3-0.4 lpm, adjust the flow using the needle valve for the by-pass rotameter.
   NOTE: See Mobile Lab Configuration on Page 6 of TTP SOP Section 1.

7.2. Mobile PE Lab Ozone Instrument Operational Check

1. After a 1-hour warm-up, review the test values on the front panel of the TEI 49C -PS by selecting Diagnostics (TECO Manual, page 3-27) or, if a problem occurs, select Service Menu by first selecting Instrument controls (page 3-55) from the Main Menu. Then select Service Mode from the

Instrument Controls Menu. When the Instrument is in the service mode, the Main Menu extends to include the Service Mode menu. If Diagnostics is selected, use the up and down arrow pushbuttons move the cursor up and down. Choices include Voltages, Pressure, Flows, Cells A/B O3, Intensities, Test Analog Inputs, and Option switches. Check the following parameters:

a. Ozone reference and Ozone measure: TEST function values should be between 4200 and 4700 mV.(Ask TECO, or Thien Bui or Avi Teitz, or see TECO 49C-PS manual pages 3-33 to 3-36)

Critical Note: A state agency has developed data indicating that recently purchased 49C-and C-PSs may have a design and, in some cases, a solenoid problem that together could mask data errors.

There is a simple QC check that will identify that the problem they suspect is occuring in a particular analyzer. The ozone reference and ozone measure checks must be done using the default override Procedure in the manual that allows the FS to see, not the average for the 2 measurement cells, as is the default, but the individual readings for each cell.

If the readings are not close (within 50 -100 units of each other), that may indicate that material has come from the cell's solenoid. The investigating agency question that the 4200-4700mv spread, given the averaging default, is too wide to indicate when the problem they have observed has occurred. This can be confirmed by looking at the inside of the cell. Do not look inside the cell in the field. Call your trouble shooting helpers, or your SRP operators, to assist you in further identification of a problem, beyond the taking and recording of the individual, rather than the average, readings.

b. Pressure: Should be 29" to 30" Mercury-Absolute at sea level. Other values will be displayed at different altitudes (see instrument manual, page 3-31)

c. Sample Flow: Should be 800 cc/min (± 10%). However sample flow can be as low as 600 cc/min and still operate properly. Do not operate the TEI 49C -PS at low flow for prolonged periods of time. If the sample flow is below 600 cc/min, it will be necessary to clean the orifice to bring the sample flow back into the proper

range (page 3-32). As a primary std, ozone (lamp generating) flow is shut off

d. Sample Temperature: Ambient temperature (± 10° C).(Page 3-30)

e. Analytical Lamp Temperature: 52° C. This value should remain stable.(Page 3-30)

f. DC Power Supply: 2500 mV (± 50 mV). This value should be within the range indicated.(Page 3-29)

g. Press "TEST" until the analyzer flow is displayed.

NOTE: The inlet pressure to the calibrator must be maintained at 35 psi. Adjust the pressure regulator inside the API 701 if this pressure greater than ± 10% from target pressure (see instrument manual).

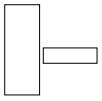
NOTE: When adjusting the Mobile PE Lab's manifold pressure with the calibrator off, use the needle valve attached to the three-way solenoid near the rear manifold inlet. (See the Mobile Lab Configuration on Page 6).

7.3. Final Site Set-Up:"Hose to Inlet" [2]

1. Connect the "Line" to the station's inlet probe, venting the excess flow to the atmosphere. The following are suggestions to accomplish this task.

   a. At all monitoring stations with ¼" to ½" outside diameter Teflon inlet probes, the top port of the glass tee should be connected to the probe inlet. Connect the ¼" Teflon tubing (attached to the "Line") to the side port of the tee. Allow the excess flow to vent out the bottom port.

   Top Port (attach to station inlet probe)



   Side Port (attach Teflon tubing from "Line")

[2]See Email insert, located in 9.2. Preventive Maintenance and Schedules(9.2.11) in reference to: Cleaning Procedure for 150ft Delivery Hose.

Bottom Port (vent excess flow)

b. Connecting the tee to the station inlet).

Clarification Note:
Recommendations of apparatus to have available for connecting to different station inlets

Keep an array of short Teflon pieces to use to connect the tee to the station inlet probe that range in size from ½ " OD to 3/8 " OD. Sometimes however, it is necessary to come up with something a little different, due to the inside diameter of the station inlet probe. If the ID of the station inlet probe is larger than ½ inch, don't connect a glass tee to the probe. Attach a two foot piece of 1/4 inch Teflon to the end of the audit presentation line. Then insert this into the station probe inlet. Sometimes one can insert a rubber or (?silicone?) stopper with two 1/4 inch openings into the station inlet probe. Insert the 1/4 inch line on the end of the audit presentation line into one hole and leave the other open as a vent/by-pass. Use stoppers that are impervious to Ozone so as to not affect the audit result.

For multiple single lines coming out of an inlet, Region 6 has used a Swagelok Stainless Steel cross-fitting from Swagelok: (Insert part number) One of the fitting openings is connected to the station inlet side (arm) of the Tee. This still leaves one end of the Tee as a vent.

Use as an alternate connection from mobile audit lab delivery hose to the end of the station inlet being audited. Some of the sites do not use a glass manifold. Texas has a number of sites with individual teflon lines, grouped together inside the station sampling inlet tube, each coming from an analyzer inside the station, and emerging from the outer end of the inlet probe.

Another side bar. On windy days it is necessary to put a tail on the vent arm of the tee to avoid diluting the audit gases with ambient air. Generally, use a piece of tygon tubing with the same outside diameter as the inside diameter of the tee. The piece is use is about 8 to 12 inches in length. This will avoid the mixing problem.

The first thing you need to ascertain when auditing a station is the total flow. If the station is drawing more flow than you are putting out, you need to be creative in your hook-ups. You also need to reduce the flow of the station booster pump until the total station flow is about 1 ½ lpm less than you are putting out.

c. If the probe inlet is configured with a calibration port, disconnect the station's calibration line from the probe inlet and connect the "Line" to the calibration port using ¼" Teflon tubing.

d. Clarification notes on Laminar Flow

Regarding laminar flow as a problem:
Some audited air monitoring agencies may still use a type of
laminar flow. They may use a glass probe and manifold system with an internal diameter of 1 ½ inches, and their total flow exceeded 50 lpm. To audit such a system, turn off the pump and close off the outlet to the system. Then introduce the audit presentation
line into the probe inlet. Close off part of the inlet to
maintain a small by-pass flow and flood the entire system.

Using this approach, one gets good audit results. However, one can argue that in this approach, one is not doing the audit in the way the stations are operating.
Recommend to such agencies that it would be better to go to a smaller diameter line. If more flow is needed to keep the residence time down, the agency could use a smaller demand kicker pump on the manifold.
In California, districts that operate this type of system have not changed over, but the major district has not only changed over but is now conducting through-the-probe span checks on a weekly basis.

2. After securing the "Line" to the station's inlet probe, recheck the station's manifold pressure (if so equipped). Record this value on the station worksheet in the space next to "During Audit".

3. Recheck the Mobile PE Lab by-pass flow. The by-pass flow should be 0.3 to 0.4 lpm as indicated by the by-pass rotameter.
Readjust the flow using the needle valve if necessary.

8.0. CARB Recommendations, Clarifications on Section 7

7.1.7 Initial Site Set-up
1. Some stations have pumps (but not blowers) for boosting flow to keep residence time no greater than 10 seconds. Note: Residence time must be no more than 10 sec to the manifold, 20 sec to the instrument (back of the analyzer).

If agency can, should try to use station manifold booster pump with variable flow control. If station manifold booster pump total is 3 lpm, if (audit system total) put out is 16 lpm. Fred found

out, over years of experience, from Zero Air Generator to Environics, if run(Mobile Audit Lab is running the CO , Ozone, and NOx analyzers, takes 3 lpm off the total output of the Zero air generator's 16 lpm.. If the station pulls in 12 lpm, and the TTP audit system output is at 12 lpm, then if you go to the station bypass pump and find that it is variable, turn down until get 1-2 lpm bypass (inside the station- where there will be a measurer of the bypass flow rate). The bypass flow will be hooked on to one of the ports of the station manifold that is located inside of the station.

2 Q: Where do you actually measure flow to determine excess flow? A: Open end of station inlet;
Openings (ports on manifolds?) not used are capped

go back up to the station inlet- use (?measure with) a "Vol-O-Flow"?

3. Q. What do you do about stations with inlets of Inner diameters above ½: A: With station inlets above ½" (ID), put 1/4" (OD) Teflon line approximately 18" long on the end of the audit presentation line, insert it down into the cane (or other inlet); block off most of the inlet, let excess go out.

FB A: If the station has a 1" ID or greater inlet probe, use a 2-hole stopper in the inlet. Insert the rubber stopper into the probe inlet. Next, insert the 1/4" Teflon line (on the end of the audit presentation line) into one of the open 1/4" holes, using the 2nd hole as a vent. If the station flow is greater than the van output flow, the pump or blower will need to be isolated from the system. I usually accomplish this by shutting it off and capping the outlet of the pump or blower.

?x/x? " glass ID

Cap off inside station, where blower motor is.

A lot of blowers have a hydraulic lock on them; if they do, close off the end, only go back up or into the instrument; if that way, flood the instrument. Like San Diego's sites. Stabilize(?) Very quickly, never had a failure.

FB: The easiest it to try to get them all on the same inlet probe using a glass manifold. This way they share a common manifold and inlet probe. It recommend this as a good idea to set up the stations in this manner. For stations with more equipment, simply use a larger manifold (eight port for example).

This procedure also makes it easier for station operators to calibrate their analyzers.

If find 3 separate probes (sampling station inlets), 1 for CO, 1 for SO2, 1 for (NO2) ; then

CARB used a glass manifold with only 4 ports; a line in one hooked up to the other 3. Check, make sure bypass flow is adequate but not too much.

7.3. Final Site Set-up
1.b
1. Q: Regarding T connection to Station Inlets. If find a modified version of the glass cane (½ " Outer Diameter (OD)), do not usually use glass or Teflon. Most ARB stations use a --cane, with a cane Inner Diameter (ID) of ½".

FB A: On an audit I bring an array of short Teflon tubing pieces (from ½"OD to 1/4" OD); for use on the end of the audit presentation (MBS calls it audit delivery) line (braided SS hose with Teflon liner) I put a 10-12"piece of 1/4" tubing. This is easiest to do. Remove the "cow" line. If not, put ½ " OD Teflon into ½" ID Station I. Some may be 3/8" ID. But ours is ½" ID tube. Hook the Teflon piece into the station inlet probe; holds together just by a friction fit. Fred just hangs the connected T-tube in a convenient spot by the station inlet, unless it is windy. If it is windy, Fred puts the 12 "tail piece on the bottom of the T to prevent turbulence from the wind.

Hook the presentation line to the bottom of the T; one end of the T into the station inlet. Check the bottom of the T for Excess flow- Can tell by feel.

2.. Q: What do you recommend for stations with multiple inlets?

A: I did once, when I ran 3 CO analyzers separately with inlets that were close to each other.

Field Standard Operating Procedures for the EPA TTP National Performance Evaluation Program [1]

Operation: Through-the-Probe (TTP) or Back-of-the-Analyzer Performance Evaluation (PE)

SOP: NPEP-6.01

Name: Printed	Signature	Date

[1]TTP National Performance Evaluation Program

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1.0 Scope and Applicability

This SOP describes the procedure for the performance of Through-The-Probe (TTP) Performance Evaluations (PEs) of the Ozone, CO , SO2, and NOx ambient air instruments operated by:

1) State or Local agencies as part of the NAMS/SLAMS network (proposed for future as NCOR),
2) permitted private organizations in PSD networks.

The PEs are conducted by trained and certified EPA or EPA contractor field staff, using the standard configuration of the EPA Mobile TTP PE Laboratory.

2.0 Summary of Method

This SOP describes the steps for generating, verifying, and delivering test atmospheres of ozone or a CO/SO2/NOx gas blend, at the CFR-specified concentrations required for a PE. These concentrations are zero, 70-90% of the audited instrument upper range limit (URL), 30-40% of the URL, 6-16% of the URL. A final zero point is also run, with the results of the 2 zero points being averaged. A dedicated spreadsheet for this audit, TTP spreadsheet version 7.1, is used for recording, calculating, and determining audit performance of the instruments tested.

Test atmospheres are generated by the EPA TTP Laboratory through dilution of gas standards, using an Environics 9100 gas phase titration calibrator and an API 701 continuous zero air generator. Gasses are delivered to the instruments under test through the TTP Laboratory dual glass manifold and a 150ft long, ½ in wide, teflon lined, braided stainless steel gas delivery hose or presentation line. Delivered gas concentrations are verified by the TECO 49CPS Ozone calibrator and a TECO 48 CO analyzer in the TTP laboratory, which are fed by a 1/4" teflon lines that tap into the TTP dual glass manifold.

A summary of the sequence of events at a TTP PE audit is as follows:

1) The presentation line is conditioned with ozone prior to arrival at the audit site
2) The TTP CO analyzer is warmed up prior to arrival at the audit site
3) The TTP TECO 48 CO analyzer is calibrated
4) The presentation line is connected to the station manifold
5) A stable zero concentration is generated
6) Upscale ozone concentrations are generated using the Environics 9100
7) Final zero concentration is generated

8) With zero gas flowing, the presentation line is connected to the manifolds of the other instruments that will be audited
9) Upscale audit points for the other pollutants are generated using the TTP Environics 9100 and the TTP blended gas standard
10) A final zero point is generated

In this SOP, reference is made to specific instruments, i.e., TECO 49CPS, API 701, etc. as they are the instruments that are present in most of the TTP PE Air Labs. Configurations may differ in some TTP trailers. The use of other instruments is acceptable, provided that the replacement instruments are designated as EPA reference or equivalent standards for the pollutant of intereset.

3. 0 Definitions

Appendix D contains a glossary of terms used in the NPEP TTP.

4.0 Personnel Qualifications

Certification through a written examination and a hands-on practical examination using the TTP PE laboratory.

5.0 Cautions

1. Refer to Item 7.3.6 c. in this SOP for caution before using TECO 48C to perform action noted.

6.0 Equipment and Supplies

1. Complete Standard Regional TTP Mobile PE Lab: Major Power UPS-PLC, API 701, ENVIRONICS 9100, EMC data System (Dell PC and HP Printer), TECO 49C-PS and 48C; Dual Manifold, Flow path control system.

NOTE: In the original plumbing of the trailer, the use of the front panel needle valve to throttle flow to the bypass rotameter may cause system pressures to increase, which can affect the accuracy of the TECO 49CPS Ozone instrument and the TECO 48C CO analyzer. To eliminate this interference, various TTP Lab operators have devised plumbing modifications that allow for a second needle valve between the front and back manifolds, allowing for minimal pressure build-up. This needle valve will then be used to adjust system flow to the on-board analyzers in the TTP trailer.

Additionally this needle valve is used to adjust the by-pass flow, which is monitored by the front panel rotameter. The front panel needle valve should be kept "wide open". Other stratagems have also been proposed by other TTP Lab operators. Each case of replumbing must be approved prior to use. In any case, the factory set-up of the TTP PE trailer should not be used until this pressurization issue is addressed.

NOTE: API 701 performance should be tracked on an ongoing basis by recording the absolute concentration for zero obtained by the TTP Laboratory Ozone and CO analyzers over time. For CO, compare values for the UP air Cylinder vs the API generated zero. Region 7 typically finds a difference 0.1 ppm for CO. A specification of 0.5 ppm is used in this SOP.

2. UP Air; CO Ambient Level Standards (approx 7 and 38 PPM); Blended Gas standard

NOTE: The blended gas vendor, Scott-Marrin, states on each cylinder certification tag, "Do not use below 150psig". Current EPA recomendations specify a minimum tank pressure of 250 psig. When the UP air cylinder has 400 or 450 psig, a new cylinder should be ordered. Until a new cylinder can be procured, , use the UP cylinder to check the 701 zero, but not for generating Zero air calibration points - use the 701 for this purpose. In that way UP air gas will be conserved until the new cylinder is obtained..

3. TTP PE Lab Spreadsheet version 7.1

7. Procedure: Through-the-Probe (TTP) Performance Evaluation (PE) [2]

[2]EPA Revision of CA ARB SOP Performance Audit Procedures for TTP Criteria Audits, Section E.1.2, Date: 3-6-02

7.1. Mobile Lab/Station Data Retrieval /Recording

The station instrument responses for each pollutant are taken from the data acquisition system used at the site for data-of-record. This data acquisition system may be a strip chart recorder, data logger, computer, or telemetry. The audited station instrument responses are read or interpreted by the station operator, and reported to the auditor. The auditor records these responses on the TTP spreadsheet for calculation of the final results.

With current technology, many monitoring stations are using electronic data loggers that store data at the site until collected on a set schedule. The data from the electronic data logger is handled in the same manner as the strip chart data, except that it is read directly from an electronic display at each audit level.

Some remote stations use a telemetry system. The telemetry system is updated every few minutes on dedicated phone lines. The data are averaged and stored in a centrally located computer. The station instrument responses are generally obtained by the site operator/technician calling for the analyzer responses. In some monitoring stations this is accomplished by dialing the computer directly through a telephone modem. **In all cases, the audited station responses are interpreted by the station operator or audited agency personnel, and then reported to the TTP PE Lab operator.** The TTP Lab operator then records this information in the TTP Lab Spreadsheet Program, "TTP audit spreadsheet v7.2.xls".

Data points from the TTP Lab instruments are collected using the EMC data software package, which is loaded into the TTP Lab computer. **The EMC data logger program is the TTP Lab's Data of Record.** All TTP Lab instrument data to be recorded must be taken from the EMC strip charts and data averages.

NOTE: The TTP PE Lab Spreadsheet program references calibration information (such as the ozone line loss factor and gas certification data) to calculate the TTP PE Lab's true responses at each audit point. After data has been entered into the TTP PE Lab software program for each audit level, percent differences between the TTP Lab and the audited station are calculated automatically.

1. Activate the "Instrument Information" Worksheet in TTP audit spreadsheet v7.2.xls. Fill in all relevant parameters for the TTP PE Lab and monitoring station instruments for the audits to be performed. This information will include:

A: Station ozone analyzer manufacturer/model #
B: Property Number
C: Calibration Date
D: Slope/Intercept
E: Indicated Flow
F: Date when the In-Line Filter was changed
G: Manifold type
H: Manufacturer, Model # and Serial # of the photometer standard
I: Certification expiration date of the photometer standard
J: Any unusual events outside or inside the shelter

After all data is entered in the "Instrument Information" worksheet, save the worksheet.

NOTE: If, at a particular station, not all parameters are to be audited, i.e., only SO2 and CO instruments are being evaluated, only fill out the data for the audited instruments. Leave the other data fields in the spreadsheet blank. **This applies for station data as well as the individual data points that will be entered later in the course of the audit .**

NOTE: During the course of the audit, data points for the TTP PE Lab will be obtained using a 5 minute average from the EMC software. In order to ensure that this average is accurate, it must be verified. This is done by monitoring the 1 minute average column in the EMC software during the collection of the 5 minute average. Verify that the last five 1 minute averages correspond closely to the 5 minute average displayed in the EMC software. Neglecting this point may result in error if, for example, the 5 minute average is a result of four 1 minute averages showing stability and one 1 minute average that was folded into the 5 minute average, but taken before stability was achieved.

7.2. Ozone PE Procedure

NOTE: True Ozone is calculated by multiplying the TTP PE Lab TECO 49CPS readings (as shown on the EMC Data program) by the ozone line loss correction factor according to the following

formula:

True Ozone (ppm) = TECO 49CPS Response (ppm) x TECO 49CPS Ozone Line Loss Correction Factor

This is done automatically in the TTP spreadsheet.

NOTE: TTP PE laboratory results should be read from the on board computer using the EMC data logger software. This software will also provide the 5 minute average for the TTP PE Lab instrument results.

1. Activate the "Ozone Audit" worksheet, in TTP audit spreadsheet v7.2.xls".

2. After a 1-hour warm-up, press the "CONC" mode button on the front panel of the ENVIRONICS 9100 Calibrator. Cursor to "TARGET FLOW" and enter "16.0" if it is not indicated. Cursor to "TARGET GAS" and enter "0.0" if it is not indicated. Switch the 3-way valve to the Rear Manifold position.

3. Audit Point 1: Press the "START" button on the front panel of the calibrator to deliver zero air to the Mobile PE Lab instruments and the air monitoring station. Adjust the flow to the by-pass rotameter until 0.3-0.4 lpm by-pass flow is indicated. When the Mobile PE Lab and station analyzers are stable, take the 5 minute average from the EMC data table and obtain the station results from the site operator. Record the data in the "Ozone Audit" Worksheet as follows:

Cell E18 = Environics 9100 ozone setting
Cell F18 = TTP Lab response from EMC generated 5 minute average.
Cell H18 = Station response obtained from site operator

NOTE: Remember to verify the accuracy of the 5 minute average at this point, and all other points using the procedure outlined in section 7.1 of this SOP.

4. Annotate the EMC strip chart to indicate the end point of Audit Point 1.

5. Audit Point 2: Cursor to "O3" on the front panel of the calibrator and enter a "Level 1" concentration of 0.350-0.450 ppm (0.400 ppm is the default value to use). Press "UPDATE". When the Mobile PE Lab and station analyzers are stable, take a 5 minute average from the EMC data logger and record the data in the "Ozone Audit" Worksheet, as follows:

   Cell E19 = Environics 9100 ozone setting
   Cell F19 = TTP Lab response from EMC generated 5 minute average.
   Cell H19 = Station response obtained from site operator

6. Annotate the EMC strip chart to indicate the end point of Audit Point 2.

   NOTE: Make certain the calibrator updates after pressing the "UPDATE" button. Observe the "TARGET" and "ACTUAL" ozone values on the front panel display of the calibrator. These values should be identical. If they are not, press "UPDATE" again.

   NOTE: Entering in 0.400ppm on the ENVIRONICS may generate a concentration less than 0.400ppm due to degradation of the lamp. Increase the ENVIRONICS ozone concentration setting as necessary, to obtain readings of 400 ppb. Record the ENVIRONICS setting for this point in cell E19. Should the worksheet be protected (i.e. you can't enter values), unprotect the worksheet by entering Tools>Protection>Unprotect Sheet on the program menu.

7. Audit Point 3: Cursor to "O3" on the front panel of the calibrator and enter a "Level 2" concentration of 0.150-0.200 ppm (0.175 ppm is the default value to use). Press "UPDATE". When the Mobile PE Lab and station analyzers are stable, take a 5 minute average from the EMC data logger and record the data in the "Ozone Audit" Worksheet, as follows:
   Cell E20 = Environics 9100 ozone setting
   Cell F20 = TTP Lab response from EMC generated 5 minute average.
   Cell H20 = Station response obtained from site operator

8. Annotate the EMC strip chart to indicate the end point of Audit Point 3.

NOTE: In audit point 3, if the ENVIRONICS setting of 0.175 ppm is insufficient to generate the required ozone concentration, increase the ozone concentration setting on the ENVIRONICS 9100 until an ozone concentrations of 0.175 ppm is achieved.

9. Audit point 4: Cursor to "O3" on the front panel of the calibrator and enter a "Level 2" concentration of 0.030-0.080 ppm (0.070 ppm is the default value to use). Press "UPDATE". When the Mobile PE Lab and station analyzers are stable, take a 5 minute average from the EMC data logger and record the data in the “Ozone Audit” Worksheet, as follows:

   Cell E21 = Environics 9100 ozone setting
   Cell F21 = TTP Lab response from EMC generated 5 minute average.
   Cell H21 = Station response obtained from site operator

10. Annotate the EMC strip chart to indicate the end point of Audit Point 4.

    NOTE: In audit points 4, if the ENVIRONICS setting of 0.070 ppm is insufficient to generate the required ozone concentration, increase the ozone concentration setting on the ENVIRONICS 9100 until an ozone concentration of 0.070 ppm is achieved.

11. Audit Point 5: Cursor to "O3" on the front panel of the calibrator and enter 0.000 ppm. Press "UPDATE". When the TTP PE Lab and station analyzers are stable, take a 5 minute average and record the data in the “Ozone Audit” Worksheet as follows:

    Cell E22 = Environics 9100 ozone setting
    Cell F22 = TTP Lab response from EMC generated 5 minute average.
    Cell H22 = Station response obtained from site operator

12. Annotate the EMC strip chart to indicate the end point of Audit Point 5.

13. Press "STOP" on the front panel of the ENVIRONICS.

14. Save the “Ozone Audit” Worksheet.

7.3. Carbon Monoxide Analyzer Pre-Calibration Procedure

Introduction

The TECO 48C is used during a performance audit to analyze the amount of CO present in a diluted gas sample. Prior to each audit (pre-), the TECO 48C is calibrated using Ultrapure Air and NIST traceable CO gases at concentrations of 7 ppm and 40 ppm. The TECO 48C is rechecked following the performance audit (post-), using Ultrapure Air and NIST traceable CO gas at 40 ppm. The pre- and post- TECO 48c analyzer responses are used to calculate true CO concentrations.

Two multi-port glass manifolds are used during a performance audit. The "Rear Manifold" accepts gas from the Environics 9100 and delivers it to the presentation line. An additional tap from the rear manifold is attached to the front panel 3 way valve.

The "Front Manifold" is connected to the front panel 3 way valve, which acts as the master control for input to this manifold. Taps from the front manifold direct output to the TTP CO and Ozone instruments and the bypass rotameter. The front panel 3 way valve directs various input streams into the front manifold according to which position is selected. The positions are labeled as follows: "Tank Gas", "Off" and "Rear Manifold Deliver". The flow path for each of these positions are as follows:

Tank Gas Position - Routes flow from the three TTP PE Lab Gas Cylinders (Ultra Pure Air, High CO, and Low CO) to the front manifold via three solenoid valves and a front panel pressure regulator. The solenoid valves, one for each gas cylinder, are used to turn gas on/off from each gas cylinder to the 3 way valve. The front manifold then feeds the TTP Ozone and CO instruments as well as the bypass rotameter. When in this position, gas from the Environics 9100 still flows to the presentation line via the rear manifold, but the front manifold is "cut off" from this gas stream.

Off Position - Cuts all flow to the front manifold.

Rear Manifold Deliver - Routes a portion of gas from the rear manifold to the front manifold. Input from the gas cylinders is blocked from reaching the front manifold. The taps from the front manifold delivers gas to the TTP Ozone and CO instruments and the bypass rotameter.

NOTE: As mentioned in section 6.0 of this SOP, when the front panel 3 way valve is in the "Rear Manifold Delivery" position, excess pressures may build up in the front manifold, and affect TTP PE Lab instrument accuracy. To alleviate this problem, all TTP PE labs have been outfitted with a second needle valve, or equivalent, to "gate" the flow to the front manifold. This needle valve is located between the front panel 3 way valve (when in the "rear manifold deliver" position) and the front manifold.

Start of Procedure

NOTE: TTP PE laboratory results should be read from the on board computer using the EMC data logger software. This software will also provide the 5 minute average required for the TTP PE Lab instrument results.

1. Allow the TECO 48C to warm-up for at least 3½ hours.

2. If an ozone audit was conducted prior to the TECO 48C calibration, turn the power to the TECO 49CPS "OFF".

3. Activate the "Multi-blend Audits" Worksheet. Record the certificate concentration of the gas cylinders as follows:

   Cell F22 = High CO cylinder certificate concentration,
   Cell F23 = Low CO Cylinder certificate concentration
   Cell F24 = Ultrapure Air cylinder certificate concentration

   Cell F26 = High CO Cylinder certificate concentration
   Cell F27 = Ultrapure Air cylinder certificate concentration

4. Switch the 3-way manual valve to the Tank Gas Position.

5. Open the valve on the regulator for the high CO, low CO and Ultrapure cylinders. Adjust the pressure to 20psi. If a stop valve is installed on the regulator, open it fully at this time.

   NOTE: Some TTP PE operators have reported that there has been leaking of gas across the solenoid valves and/or the

pressure regulator on the front panel resulting in a blending of the gas standards. If this is suspected, an alternative procedure is recommended, which is outlined at the end of this method (Page 33).

6 Toggle valve 1 up (ON) the front control panel. This would allow ultrapure air to flow into the front manifold then to the TECO 48C CO analyzer.

7. Adjust bypass flow until 0.3-0.4 lpm is indicated on the rotameter.

NOTE: If all the pressure on all the regulators is adjusted to 20 psi, the by-pass flow should not need to be adjusted after it is set the first time.

8. Once the TECO 48C response is stable and reads ±0.1 ppm, take a 5 minute average from the EMC data software enter the response in the Multi-blend worksheet as follows:

Cell E24 = TECO 48C response to Pre Audit Ultrapure Zero Air

If the TECO 48C response is not within ±0.1 ppm, do the following to calibrate the zero:

a. Press the "MENU" button on the TECO 48C.

b. Scroll down to "CALIBRATION" and press "ENTER".

c. Scroll down to "CALIBRATE ZERO" and press "ENTER". The TECO 48C will force the reading to zero.

d. Press "RUN" on the TECO 48C to return the regular sampling mode.

e. Once the TECO 48C response is stable and it reads ±0.1 ppm, take a 5 minute average from the EMC data software and enter the response in the Multi-blend Audit worksheet as follows:

Cell E24 = TECO 48C response to Pre Audit Ultrapure Zero Air

If the TECO 48C response is not ±0.1 ppm, go back to step a.

9. Annotate the EMC strip chart to indicate the end of data collection for the zero calibration of the TECO 48C.

10. Toggle valve 1 down (OFF) and valve 2 up (ON). This will allow the High CO gas to enter the front manifold and to the TECO 48C. Adjust the by-pass flow to 0.3-0.4 lpm if necessary.

11. Once the CO response is stable and within ±0.1 ppm of the concentration of the High CO tank, take a 5 minutes average from the EMC data software and record this value on the Multi-blend Audit worksheet as follows:

    Cell E22 = TECO 48C response to Pre Audit High CO cylinder

12. If the TECO 48C response doesn't match the High CO tank within ±0.1 ppm, do the following to calibrate the span of the TECO 48C:

    a. Press the "MENU" button on the TECO 48C.

    b. Using the down arrow, scroll down until "CALIBRATION" is displayed and press "ENTER".

    c. Scroll down until "CALIBRATION CO" is displayed. If the correct span value is displayed, press "ENTER" twice. The span value should be the concentration of the high CO tank. If the correct span value is not displayed, us the arrow keys to input the correct HIGH CO tank concentrations under "SET TO". When the correct span value is displayed, press "ENTER". The TECO 48C will reset its reading to the span value of the High CO tank concentration. Press the "RUN" button to return to sampling mode.

    d. Allow the TECO 48C to stabilize. When the CO response is stable and reads within ±0.1 ppm of the High CO tank concentration, take a 5 minute average from the EMC data software and record this value in the Multi-blend Audit worksheet as follows:

       Cell E22 = TECO 48C response to Pre Audit High CO cylinder

If the instrument response is not within ±0.1 ppm as the High CO tank, go back to step a.

13. Annotate the EMC strip chart to indicate the end of the pre audit span calibration of the TECO 48C.

14. Toggle valve 2 down (OFF) and valve 3 up (ON). This will allow the low CO gas to enter the front manifold and to the TECO 48C. Adjust the by-pass flow to 0.3-0.4 lpm if necessary.

15. Allow the TECO 48C to stabilize and take a 5 minute average reading from the EMC software. Enter this value on the Multi-blend Audit worksheet as follows:

    Cell E23 = TECO 48C response to Pre Audit Low CO cylinder.

16. Annotate the EMC strip chart to indicate the end of the pre audit Low CO calibration of the TECO 48C.

17. Toggle valve 3 down (OFF).

7.4. CO, SO2, NO/NOx PE Procedure

NOTE: In the cases where all three parameters (CO, SO2, NO/NOx) are not being audited, leave the data fields in the Multi Blend audit worksheet blank for the data fields that do not apply.

1. Calibrate the TECO 48C as outlined in Section 7.3.

2. Turn on the API 701 if it is not already on.

3. Toggle the 3-way manual valve to the Rear Manifold position.

4. With the calibrator in the "READY MODE" ("CONC MODE" displayed on the lower left button), press the "MAINTAIN PORTS" button. Press "2". Enter the Superblend concentrations for CO, NO, SO2. Enter the cylinder identification number, if needed. If these parameters were previously entered, check them against the current certification values to make certain they were entered correctly. Press the "EXIT" button twice to return to the "READY" mode.

NOTE: The superblend concentration should be entered into the ENVIRONICS the first time the instrument is set up. The data will be saved in the instrument for subsequent runs. New concentrations have to be entered when a new tank or an old tank with new certified concentrations is installed.

5. Activate the “Multi blend Audits” worksheet and enter the concentrations of CO, SO2, NO, and NOx in the superblend tank in cells D16, E16, F16, and G16 respectively.

6. In the “Multi blend Audits” worksheet, highlight cells F39 to K48, right click the mouse, and select “clear contents.” This will reset the spreadsheet.

7. Press the "CONC MODE" button on the front panel of the calibrator to enter the concentration mode. If "MFC Port 2" is not displayed, cursor to the "MFC Port" and enter "2". “TARGET FLOW” will default to 16.0 lpm. If this is not the case, or a different flow setting is desired, consult the ENVIRONICS Manual for the appropriate procedure. Cursor to "TARGET GAS" NO and enter "0.0" unless it is displayed. Cursor to "O3" and enter "0.000" unless it is displayed. Press "UPDATE".

8. Press "START" on the front panel of the calibrator to deliver zero air to the Mobile PE Lab and station instruments. Adjust the flow to the by-pass rotameter until a flow of 0.3-0.4 lpm is indicated.

9. Audit Point 1: When the Mobile PE Lab and station responses are stable, take a 5 minute average from the EMC software, and record the following on the Multi-blend Audit worksheet:

   Cell D39 = ENVIRONICS low flow mass flow controller reading
   Cell F39 = TTP Lab TECO 48C reading
   Cell G39 = Station SO2 reading
   Cell H39 = Station CO reading
   Cell I39 = Station NO reading
   Cell J39 = Station NO2 reading
   Cell K39 = Station NOx reading

NOTE: If there is a difference of more than (±) 0.5ppm in the readings between the Ultrapure and the API zero air, investigate any potential problems before continuing with the audit. Replace charcoal and purafil in the API 701 if necessary.

10. Annotate the EMC strip chart to indicate the end of data collection for multi blend audit point 1.

NOTE: Before starting Audit Point 2, check the operating range of the station's NO/NOX instrument. If the NO/NOX instrument is operating on a range less than 0-1 ppm, disconnect the instrument from the manifold and cap the open manifold port. The instrument may be reconnected to the manifold when the target vales for NO/NOX are within the instrument's operating range.

11. **Purge the regulator on the superblend cylinder as follows:**

   a. Close the regulator valve if it's not already closed.
   b. Disconnect the gas line from the back of the calibrator and vent this line to the outside.
   c. Open and quickly close the cylinder valve.
   d. Adjust the regulator pressure to 20 psi.

e. Open the regulator outlet valve to bleed off the regulator pressure until both gauges read zero.
f. Close the regulator output valve.
g. Repeat step a through e 4 times.
h. Reattach the gas line to the back of the calibrator.

NOTE: Since the line to the calibrator is metal, and secured via cable ties, it may be more convenient to remove the line at the regulator, and attach a separate Teflon line to the regulator, in order to accomplish venting of the regulator during purging.

12. Audit Point 2: Open the superblend gas cylinder and the regulator valve. Adjust the pressure regulator to 20 psi. Cursor to "TARGET GAS" on the front panel of the calibrator and enter a "HIGH NO" concentration (0.800-0.900 ppm) for analyzers operating on the 0-1 ppm range. This point is used for the "Level 1" concentrations for CO (35-45 ppm) and SO2 (0.350-0.450 ppm). Press the "UPDATE" button on the front panel of the calibrator. When the Mobile PE Lab and station readings are stable, take a 5 minute average from the EMC data software and record the responses on the Multiblend Audit worksheet as follows:

    Cell D40 = ENVIRONICS low flow mass flow controller reading
    Cell F40 = TTP Lab TECO 48C reading
    Cell G40 = Station SO2 reading
    Cell H40 = Station CO reading

    NOTE: During most performance audits, NO values are entered to achieve audit level concentrations of NO/NOX, CO, and SO2. If NO/NOX instruments are not present, CO values are entered to achieve audit level concentrations of CO and SO2.

    NOTE: With the Stock TTP PE Lab, high level audits of NO/NO2/NOx (>800 ppb) can not be done, as the ENVIRONICS 9100 will not provide sufficient ozone to achieve an NO2 level above 600-650 ppb. Therefore the cells I40, J40, and K40, corresponding to NO, NO2, and NOx station readings at this point are blacked out.

13. Annotate the EMC spreadsheet to indicate the end of data collection for

multi blend audit point 2.

14. Audit Point 3: Cursor to "TARGET GAS" NO and enter a "Level 1" NO value of 0.350-0.450 ppm. This point is also used for the "Level 2" concentration for CO (15-20 ppm) and SO2 (0.150-0.200 ppm). Press "UPDATE". When the Mobile PE Lab and station readings are stable, take a 5 minute average from the EMC data software and record the responses on the Multiblend Audit worksheet as follows:

    Cell D41 = ENVIRONICS low flow mass flow controller reading
    Cell F41 = TTP Lab TECO 48C reading
    Cell G41 = Station SO2 reading
    Cell H41 = Station CO reading
    Cell I41 = Station NO reading
    Cell J41 = Station NO2 reading
    Cell K41 = Station NOx reading

    NOTE: 40CFR Part 58 App. A 3.2.1.2 and 3.2.1.3, specify the ranges required for auditing ambient air analyzers. The CFR also requires that, for all NO2 audit points, NO must remain in the audit sample at a concentration > 0.080 ppm. Furthermore, the NO remaining should not be "substantially higher" than 0.080 ppm.

    NOTE: In the case of a combination audit (NO with either CO/SO2), Audit Point 3 should have NO concentrations as close as possible to 0.450 ppm, while keeping the CO/SO2 concentrations under 0.200 ppm. This is done so that a) the CFR requirement for a "level 1" concentration of 0.350-0.450 ppm for NO and NO2 is met, while ensuring that 0.080 ppm NO remains during the NO2 "level 1" audit point, and b) the CO/SO2 concentrations meet the CFR mandated "level 2" concentration range of 15-20 ppm CO/0.150-0.200 ppm SO2.

    When using the multi blend gas cylinder supplied as standard equipment with the TTP PE Lab (CO/SO2/NO @ concentrations of 15000 ppm/150 ppm/330ppm), Audit Point 3 should contain an actual NO concentration of 0.430-0.435 ppm, which would yield concentrations of

SO2 at 0.198-0.200 ppm, and CO at 19.6 - 19.8 ppm. If these ranges can not be met for all parameters, the priority should be given to ensuring that the NO concentration is in the range of 0.430-0.450 ppm.

15. Annotate the EMC spreadsheet to indicate the end of data collection for multi blend audit point 3.

16. Audit Point 4: Audit point for NO2 only. Without changing the ENVIRONICS concentrations, cursor to "Ozone" on the front panel of the calibrator and enter a "Level 1" titration point of 0.400. Press "UPDATE". Make any necessary ozone adjustments to get the nominal NO2 within the range of 0.350 - 0.450 ppm. The nominal NO2 concentration can be found in Cell I75 of the multi blend audit worksheet. The value for Cell I75 will be calculated when the instrument responses for this point are entered into the spreadsheet as delineated below (in cells D42, E42, etc.) When the Mobile PE Lab and station readings are stable, take a 5 minute average from the EMC data software and record the responses on the Multiblend Audit worksheet as follows:

Cell D42 = ENVIRONICS low flow mass flow controller reading
Cell E42 = ENVIRONICS Ozone setting
Cell F42 = TTP Lab TECO 48C reading
Cell I42 = Station NO reading
Cell J42 = Station NO2 reading
Cell K42 = Station NOx reading

NOTE: During a combination audit (NOx and SO2/CO), when using the multi blend gas cylinder supplied as standard equipment with the TTP PE Lab, a nominal NO2 concentration of 0.350-0.355 ppm should be generated, since this would allow for 0.080 ppm of NO to remain.

NOTE: The nominal NO2 concentration is an estimation of the true NO2 concentration. The final true NO2 calculation will be calculated after all points are recorded, using the final regression curve of the NO responses. An alternate method of calculating the nominal NO2 concentration is: [Site NO Response (audit point 3) - Site NO Response (audit point 4)] x [1 + True NO (audit point 3) - Site NO Response

(audit point 3)].

17. Annotate the EMC spreadsheet to indicate the end of data collection for multi blend audit point 4.

18. Audit Point 5: Audit point for NO/NOx only. Cursor to “Ozone” on the front panel of the calibrator and enter 0.000. Cursor to "TARGET GAS" NO and enter a "Level 2" NO value of 0.275. Press "UPDATE”. When the Mobile PE Lab and station readings are stable, take a 5 minute average from the EMC data software and record the responses on the Multiblend Audit Worksheet as follows:

    Cell D43 = ENVIRONICS low flow mass flow controller reading
    Cell F43 = TTP Lab TECO 48C reading
    Cell I43 = Station NO reading
    Cell J43 = Station NO2 reading
    Cell K43 = Station NOx reading

20. Annotate the EMC spreadsheet to indicate the end of data collection for multi blend audit point 5.

21. Audit Point 6: Audit point for NO2 only. Without changing the concentrations, cursor to "Ozone" on the front panel of the calibrator and enter a "Level 2" titration point of 0.170. Press "UPDATE". Make any necessary ozone adjustments to get the nominal NO2 within the range of 0.150 - 0.200 ppm. The nominal NO2 concentration can be found in Cell I76 of the multi blend audit worksheet. The value for Cell I76 will be calculated when the instrument responses for this point are entered into the spreadsheet as delineated below (in cells D44, E44, etc.). When the Mobile PE Lab and station readings are stable, take a 5 minute average from the EMC data software and record the responses on the Multiblend Audit worksheet as follows:

    Cell D44 = ENVIRONICS low flow mass flow controller reading
    Cell E44 = ENVIRONICS Ozone setting
    Cell F44 = TTP Lab TECO 48C reading
    Cell I44 = Station NO reading
    Cell J44 = Station NO2 reading
    Cell K44 = Station NOx reading

NOTE: An alternate calculation for nominal NO2 is: [Site NO Response (audit point 5) - Site NO Response (audit point 6)] x [1 + True NO (audit point 5) - Site NO Response (audit point 5)].

22. Annotate the EMC spreadsheet to indicate the end of data collection for multi blend audit point 6.

23. Audit Point 7: Cursor to “Ozone” on the front panel of the calibrator and enter 0.000. Cursor to "TARGET GAS" NO and enter a "Level 3" NO concentration of 0.170. This is also used for "Level 3" concentrations of CO (3-8 ppm), and SO2 (0.03-0.08 ppm). Press "UPDATE". When the Mobile PE Lab and station readings are stable, take a 5 minute average from the EMC data software and record the responses on the Multiblend Audit Worksheet as follows:

Cell D45 = ENVIRONICS low flow mass flow controller reading
Cell F45 = TTP Lab TECO 48C reading
Cell G45 = Station SO2 reading
Cell H45 = Station CO reading
Cell I45 = Station NO reading
Cell J45 = Station NO2 reading
Cell K45 = Station NOx reading

24. Annotate the EMC spreadsheet to indicate the end of data collection for multi blend audit point 7.

25. Audit Point 8: Audit point for NO2 only. Without changing the concentrations, cursor to "Ozone" on the front panel of the calibrator and enter a "Level 3" titration point 0.070. Press "UPDATE". Make any necessary ozone adjustments to get the nominal NO2 within the range of 0.030 - 0.080 ppm. The nominal NO2 concentration can be found in Cell I77 of the multi blend audit worksheet. The value for Cell I77 will be calculated when the instrument responses for this point are entered into the spreadsheet as shown delineated below (in cells D44, E44, etc.). When the Mobile PE Lab and station readings are stable, take a 5 minute average from the EMC data software and record the responses on the Multiblend Audit worksheet as follows:
Cell D46 = ENVIRONICS low flow mass flow controller reading
Cell E46 = ENVIRONICS Ozone setting

Cell F46 = TTP Lab TECO 48C reading
Cell I46 = Station NO reading
Cell J46 = Station NO2 reading
Cell K46 = Station NOx reading

NOTE: An alternative calculation for the nominal NO2 concentration is: [Site NO Response (audit point 7) - Site NO Response (audit point 8)] x [1 + True NO (audit point 7) - Site NO Response (audit point 7)].

26. Annotate the EMC spreadsheet to indicate the end of data collection for multi blend audit point 8.

27. Audit Point 9: Audit point for NO/NOx only. Cursor to “Ozone” on the front of the calibrator and enter 0.000. Cursor to "TARGET GAS" NO and enter a “Level 4" concentration of 0.070. Press "UPDATE". When the Mobile PE Lab and station readings are stable, take a 5 minute average from the EMC data software and record the responses on the Multiblend Audit worksheet as follows:

    Cell D47 = ENVIRONICS low flow mass flow controller reading
    Cell F47 = TTP Lab TECO 48C reading
    Cell I47 = Station NO reading
    Cell J47 = Station NO2 reading
    Cell K47 = Station NOx reading

28. Annotate the EMC spreadsheet to indicate the end of data collection for multi blend audit point 9.

29. Audit Point 10: Cursor to “Target Gas” NO on the front of the calibrator and enter 0.000. When the Mobile PE Lab and station readings are stable, take a 5 minute average from the EMC data software and record the responses on the Multiblend Audit worksheet as follows:

    Cell D48 = ENVIRONICS low flow mass flow controller reading
    Cell F48 = TTP Lab TECO 48C reading
    Cell G48 = Station SO2 reading
    Cell H48 = Station CO reading
    Cell I48 = Station NO reading
    Cell J48 = Station NO2 reading

Cell K48 = Station NOx reading

30. Annotate the EMC spreadsheet to indicate the end of data collection for multi blend audit point 10.

31. Switch the API zero air unit off. Allow the pressure on the API zero air regulator to decreased to zero. Press “STOP” on the front panel of the calibrator. Switch off the calibrator.

7.5. Carbon Monoxide Analyzer Post-Calibration Procedure CO, SO2, NO2 PE Procedure

NOTE: If leaking or cross contamination of the CO tank gas standards is suspected, use the 7.5 alternate procedure, found at the end of this SOP on Page 37.

1. Switch the 3-way manual valve to the Tank Gas position.

2. Toggle valve 1 up (ON) on the front control panel. This would allow ultrapure air to flow into the front manifold then to the TECO 48C CO analyzer.

3. Adjust system flow until a by-pass of 0.3-0.4 lpm is indicated on the rotameter.

4. Once the TECO 48C response is stable, take a 5 minute average reading from the EMC data software and enter the response in the Multi-blend Audit worksheet as follows:

   Cell E26 = Instrument Response, Post Audit Ultrapure Zero

5. Annotate the EMC spreadsheet to indicate the end of data collection for the Post Audit Ultrapure Zero point.

6. Toggle valve 1 down (OFF) and valve 2 up (ON) on the front control panel. This would allow High CO gas to enter the front manifold and then to the TECO 48C CO analyzer.

7. Adjust the system flow until a by-pass of 0.3-0.4 lpm is indicated on the rotameter, if necessary.

8. Once the TECO 48C response is stable, take a 5 minute average reading from the EMC data software and enter it in the Multi-blend Audit worksheet as follows:

   Cell E27 = Instrument Response, Post Audit High CO

9. Annotate the EMC spreadsheet to indicate the end of data collection for the Post Audit High CO point.

10. Toggle valve 2 down (OFF) and close off the valves on the regulators of all gas and Ultrapure air cylinders. Close off cylinder valves of all gas and ultrapure cylinders.

7.6 Calculations of Converter Efficiency/True Pollutant Concentrations

1. **True Pollutant Concentrations**: Ambient level concentrations for each pollutant are determined by multiplying a dilution ratio by the concentration value for each pollutant at each audit level. The dilution ratio and ambient level concentrations are determined using the following formulae:

$$\text{True value} = \frac{(\text{PE Lab CO} - \text{CO Intercept})}{(\text{CO Slope})} * \frac{(\text{Super blend X concentration value})}{(\text{Super blend CO Concentration Value})}$$

Where:

PE Lab CO = Value from the TTP PE Lab CO instrument
X = Values for NO, NOX, SO2,CO concentration in Super blend cylinder
CO Intercept = From calibration of TTP CO Analyzer (cell H30)
CO Slope = From calibration of TTP CO Analyzer (cell E30)

NOTE: In the "Multi blend Audit" worksheet, true pollutant concentrations are calculated automatically and can be seen as follows:

True CO/SO2 values = Cell ranges F55..G59
True NO values = Cell Ranges F64..H69

2. **True NO2 Concentrations:** True ambient level concentrations for NO2 are calculated using the following formulae:

$$\text{True NO2 value} = (NO_{[original]} - NO_{[remaining]}) + \text{NO2 impurity}$$

where:

$$NO_{[original]} = \frac{(\text{PE Lab CO} - \text{CO intercept})}{(\text{CO slope})} * \frac{(\text{Superblend NO concentration})}{(\text{Superblend CO concentration})}$$

PE Lab CO is the reading of the TTP CO analyzer when the NO2 point was generated

$$NO_{[remaining]} = (\text{Station NO reading}) - (\text{NO intercept})$$

(NO slope)

Station NO reading is the audited instrument's NO reading when the NO2 point was generated.

$$\text{NO2 impurity} = \frac{\text{(PE Lab CO - CO intercept)}}{\text{(CO slope)}} * \frac{\text{(Superblend NO2 impurity)}}{\text{(Superblend CO concentration)}}$$

NOTE: In the "Multi blend Audit" worksheet, true pollutant concentrations are calculated automatically and can be seen as follows:

True NO2 values = Cell Ranges G74..I77

3. Converter Efficiency: The converted NO2 concentration is used at each point to determine NO/NOX analyzer converter efficiency. The converter efficiency is calculated as follows:

$$\%\ CE = \frac{\Delta\ NO - \Delta\ NOx}{\Delta\ NO} \times 100$$

Where:

CE = Converter Efficiency

Δ NO = (([NO] original - NO intercept)-([NO] remainder - NO Intercept)) / NO Slope

Δ NOx =(([NOx] original - NOx Intercept) - ([NOx] remainder- NOx Intercept)) / NOX Slope

NOTE: The measurement of coversion efficiency is done by comparing the station NO and NOx instrument response at a given dilution of the superblend cylinder before and after the addition of ozone in the gas phase titration (GPT) step. NO[original] and NOx[original] are the instrument responses prior to GPT, and NO[remainder] and NOx [remainder] are the instrument responses after the ozone GPT. In all instances, the station instrument responses are corrected for calibration/drift bias by the NO and NOx calibration curves.

If the derived converter efficiency falls below 96%, an Air Quality Data Action (AQDA) request will be issued. All data will be deleted for the period of time that the converter efficiency is outside the 96% or greater converter efficiency control limit.

> **NOTE:** In the "Multi blend Audit" worksheet, converter efficiency is calculated automatically and can be seen in cell ranges D89..F91

TTP Audit Site Information

AUDIT AGENCY EPA REGION 2

Site Name:	**EPA Edison Lab**	**Airs ID:**	**34-0030005**
Auditor:	**Avi Teitz & Mustafa Mustafa/US EPA Region 2**	**Audit Date:**	**7/19/2005**
Station Manager:	**Keith Kramer**		

TTP PE Lab Instument and Standards

Instrument	**Ozone**	**CO**
Manufacturer	Thermo	Thermo
Model	49CPS	48
Serial Number		
Calibration Date	6/3/05	Calibrated
Slope	1.0025	on
Intercept	-0.0045	day of audit

GPS Readings

	Degrees	Minutes
Latitude (N)		
Longitude (W)		
Altitude (Ft.)		

Station Instrument Information

Instruments	**Ozone**	**CO**	**SO2**	**NO/NOX**
Manufacturer/Model #	Dasibi 1008RS			Thermo 42
Property Number	6458			42-34149-246
Calibration Date	07/14/05			6/30/2005
Slope/Intercept	% Bias -0.04000			NO %Bias-175% NO2 %Bias 7.58%
Indicated Flow	2 L/min			n/a
In-Line Filter Change	7/705			06/30/05
Manifold type	2" Glass			2" Glass

Station Pollutant Standards

Standards	**Ozone**	**CO**	**SO2**	**NO/NOX**
Type	Ozone Generator			Gas Cylinder
Manufacturer/serial #	Thermo 146 146T-43361269			Praxair CC79442
Concentration	0-500 ppb 03			51 ppm
Cert. expiration date	n/a			manufactured 4/10/03

Station Gas calibrator(s)

Manufacturer	**Model #**	**Serial #**	**Certification expiration**	**Notes**
Thermo	146	146T-43361269		

Comments:

Figure 6.7.6.1 TTP Site Information

	Site Name:	EPA Edison Lab								Airs ID:	34-0030005
	Auditor:	Avi Teitz & Mustafa Mustafa/US EPA Region 2								Audit Date:	07/19/05
	Site Manager:	Keith Kramer									

Ozone Line Loss Test (06/06/05)

Environics Ozone setting	Inside	Outside	%D corrected for zero
Pre Zero	-0.0008	-0.0008	
0.400	0.4024	0.4004	-0.50
0.175	0.1740	0.1720	-1.15
0.070	0.0692	0.0691	-0.14
Post Zero	0.0001	0.0001	
Ave. Zero	-0.0004	-0.0004	

Ave %Difference=	-0.60
Prev. Qtr Line Loss=	-0.23
Current Qtr. Line Loss=	-0.42
Current Line Loss Factor=	0.9958

NPEP Thermo 49 CPS Verification					
Date	original cal	Slope	original cal	Intercept	original cal

TTP Ozone Audit

Ozone Audit Responses

Audit Point #	Audit Point Description	Environics Ozone setting	NPEP Thermo 49 CPS Response (ppm)	NPEP Thermo 49 CPS Corrected for line loss (ppm)	Audited Station Response (ppm)	% Difference
1	Pre Zero	0.000	-0.0001	0.000	-0.0012	
2	Level 1 O3	0.420	0.4074	0.406	0.4051	-0.2
3	Level 2 O3	0.178	0.1711	0.170	0.1692	-0.5
4	Level 3 O3	0.075	0.0723	0.072	0.0713	-1.0
5	Post Zero	0.000	-0.0009	-0.001	-0.0012	
				Average %Difference		-0.6

Figure 6.7.6.2 Ozone Audit

Site Name: EPA Edison Lab — Airs ID:
Auditor: Avi Teitz & Mustafa Mustafa/US EPA Region 2 — Audit Date:
Site Manager: Keith Kramer

Color Code:
= data from the TTP trailer - auditor fills in
= data from the TTP trailer - auditor fills in post audit
= data from the audited station - auditor fills in
= data for computation and results, values imported from "Audit Fill In Chart Step By Step"
= data for CO calibration cylinder, auditor fills in

NPEP Cylinder Information

Cylinder	CO	SO2	NO	NOx	Serial #	CGA VALVE
Ultrapure	0	0	0	0	**CA06573**	590 Brass
High CO	38.6	0	0	0	**CA06149**	590 Brass
Low CO	7.85	0	0	0	**CA06197**	590 Brass
Superblend	15150	152.4	335	335	**CA05718**	660 SS

Superblend NO2 impurity (ppm)	0.0

NPEP CO Analyzer Calibration

		Instrument Response	True Value	% Difference
Pre Audit	Ultrapure Zero	0.01	0.00	
	High CO	38.61	38.60	0.0
	Low CO	7.73	7.85	-1.5
	Environics zero	0.09		
Post Audit	Environics zero	0.00		
	Ultrapure Zero	0.06	0.00	
	High CO	38.85	38.60	0.7

CO Analyzer slope 1.0034 — CO Analyzer Intercept -0.0076

Array for regression calculation for CO analyzer	
0.007	0.00
38.61	38.60
7.73	7.85
0.06	0.00
38.85	38.60
1.0034	-0.0076

Prior to starting the audit, clear cells by 1) highlighting cells F39 to K48, 2) right clicking the mouse, 3) and clicking "clear contents"

Audit Fill In Chart Step By Step

Audit Point #	Audit Point Description	Environics Concentration Setting	Environics Ozone Setting	NPEP Thermo 48C CO reading	Station Analyzer readings SO2	CO	NO	NO2	NOx
1	Pre Zero	0.00		0.09	0.000	0.290	0.006	0.002	0.003
2	Level 1 CO and SO2	42.00		39.70	0.403	41.400			
3	Level 1 NO and Level 2 CO/SO	20.20		20.15	0.189	19.340	0.482	0.010	0.491
4	Level 1 NO2	20.20	0.367	20.11			0.102	0.385	0.488
5	Level 2 NO	12.44		12.22			0.295	0.007	0.302
6	Level 2 NO2	12.44	0.195	12.22			0.092	0.210	0.303
7	Level 3 NO Level 3 CO/SO2	8.00		7.42	0.074	8.590	0.181	0.005	0.186
8	Level 3 NO2	8.00	0.088	7.41			0.090	0.097	0.187
9	Level 4 NO	4.00		2.98			0.071	0.003	0.075
10	Post Zero	0.00		0.00	0.000	0.856	0.006	0.002	0.003

TTP and Station Values - Logical Test for Matched Pairs for Regression

NO		NOx		NO2		SO2		C
TTP Value	Station Value	TTP Value	Station Value	TTP Value	Station Value	TTP Value	Station Value	TTP Value
0.002	0.006	0.002	0.003	0.001	0.010	0.001	0.000	0.100
0.444	0.482	0.444	0.491	0.352	0.385	0.398	0.403	39.570
0.269	0.295	0.269	0.302	0.187	0.210	0.202	0.189	20.090
0.164	0.181	0.164	0.186	0.084	0.097	0.074	0.074	7.410
0.066	0.071	0.066	0.075			0.000	0.000	0.010
0.000	0.006	0.000	0.003					

Test for 2% bias on NO/NOx

FALSE
FALSE
FALSE

Figure 6.7.6.3 Multi-blend Audits

TABLE 6.1
Audit Levels (PPM)

Audit Level	Ozone	NO/NOX	CO	SO2
1	0.35 - 0.45	0.35 - 0.45	35 - 45	0.35 0.45
2	0.15 - 0.20	0.15 - 0.20	15 - 20	0.15 - 0.20
3	0.03 - 0. 08	0.03 - 0.08	03 - 08	0.03 - 0.08
4		0.70-0.90		

TABLE 6.2
Multi Blend Audit Points And Their Respective Pollutant Concentrations (PPM)

Audit	Ozone **OFF**		Ozone **ON**				
Point	NO	NOX	NO	NOX	NO2	CO	SO2
1	Zero	Zero				Zero	Zero
2						35 – 45	.35 - .45
3	0.450	0.450				15 – 20	.15 - .20
4			.08	.450	0.370		
5	0.275	0.275					
6			.100	.275	.175		
7	0.170	0.170				03 – 08	.03 - .08
8			.100	.170	.070		
9	0.070	0.070					
10	Zero	Zero				Zero	Zero

7.7 PE Failures/Troubleshooting

1. In the event of a failed audit, an investigation is necessary to determine the possible cause of the failure. It may be necessary to inspect everything, beginning with the Mobile PE Lab operation and ending with the station operation.

   NOTE: If the cause for the failure is determined during any point in the investigation, resolve the problem (if possible) and resume the audit. The site operator should be notified of the "As Is" failure. If the cause of the failure is determined to be the audit Mobile PE Lab set up, the problem should be resolved and the audit restarted. Delete the results of the first audit.

2. Beginning with the audit Mobile PE Lab, all instruments need to be checked to verify proper operation. This will include all of the following, unless the cause of the failure is discovered and resolved at any point during the investigation process.

   a. Mobile PE Lab Calibrator. If conducting an ozone audit, is the airflow set correctly? What values do the mass flow controllers indicate? Is the correct ozone value selected for the appropriate audit point? Does the display of the TECO 49C -PS indicate the correct ozone level?

   b. If conducting a gaseous audit. Is the airflow set correctly? What value do the mass flow controllers indicate? Does the TECO 48C indicate the correct CO range? Is the correct CO range selected on the Environics 9100 calibrator?

   c. Is the compressor in the API 701 running? Is there sufficient output pressure (40-45 psi) to maintain a constant pressure of 30-35 psi to the Environics 9100 calibrator? Is the regulator pressure set at 35-40 psi? Is there sufficient pressure in the gas cylinder (at least 200 psig, preferably 325 psig)? Is the by-pass rotameter set for a flow of 0.3-0.4 lpm? Is the correct gas port selected?

d. Are all lines correctly connected to the manifolds? Are the lines to the instruments connected? Are there any apparent leaks? Are the filters installed correctly?

3. When these checks have been completed and all instruments checked for proper operation, the next step is to verify that the station is receiving enough flow to their inlet probe. This flow can be easily checked with a mass flow meter. If there is not enough flow to the inlet probe, disconnect any booster pump that the station may be using. The Mobile PE Lab flow needs to be at least 1 lpm greater than the station flow requirement.

4. If the cause for the failure still can not be determined, check the flow path of the audit gas from the station inlet probe to the back of the station instruments. Make certain to check all lines and in-line filters for leaks or breaks.

5. If the cause for the failure can not be determined during this examination, remove the "Line" from the station inlet probe and connect it to the station's instrument manifold. Recheck the instruments for the proper response.

6. If the instrument still indicates a failure, remove the "Line" from the instrument manifold and check for the response at the back of the instrument using a glass tee and a by-pass.

7. If the cause for the failed condition can not be determined after a thorough investigation, draw a diagram of the audit set-up. The diagram should show how the "Line" is connected to the station's inlet probe and the sampling system from the inlet probe to the instruments. Include a brief comment on all trouble shooting measures performed.

8. When the investigation is completed, issue an Preliminary Audit Data and Recommended Corrective Action Reports as described in Section 7.2.

Note: Troubleshooting information (from Henry Gerard):See TTP Supplement to the Environics Troubleshooting Table in SOP, sect. 9.7.3, Limited Corrective Main.
Ozone Stablization Issue - p.25
Environics start up problem - p.27

7.3 Alternative Procedure for CO Pre Calibration

1. Allow the TECO 48C to warm-up for at least 3½ hours.

2. If an ozone audit was conducted prior to the TECO 48C calibration, turn the power to the TECO 49CPS "OFF".

3. Activate the “Multi-blend Audits” Worksheet. Record the certificate concentration of the gas cylinders as follows:

   Cell F22 = High CO cylinder certificate concentration,
   Cell F23 = Low CO Cylinder certificate concentration
   Cell F24 = Ultrapure Air cylinder certificate concentration

   Cell F26 = High CO Cylinder certificate concentration
   Cell F27 = Ultrapure Air cylinder certificate concentration

4. Switch the 3-way manual valve to the Tank Gas Position.

5. Open the valve on the regulator for the Ultrapure Air cylinder. If a stop valve is installed on the regulator, open it fully at this time. Adjust the pressure to 20psi.

6. Toggle valve 1 up (ON) the front control panel. This would allow ultrapure air to flow into the front manifold then to the TECO 48C CO analyzer.

7. Adjust bypass flow until 0.3-0.4 lpm is indicated on the rotameter.

8. Once the TECO 48C response is stable and reads ±0.1 ppm, take a 5 minute average from the EMC data software enter the response in the Multi-blend worksheet as follows:

   Cell E24 = TECO 48C response to Pre Audit Ultrapure Zero Air

   If the TECO 48C response is not within ±0.1 ppm, do the following to calibrate the zero:

a. Press the "MENU" button on the TECO 48C.

b. Scroll down to "CALIBRATION" and press "ENTER".

c. Scroll down to "CALIBRATE ZERO" and press "ENTER". The TECO 48C will force the reading to zero.

d. Press "RUN" on the TECO 48C to return the regular sampling mode.

e. Once the TECO 48C response is stable and it reads ±0.1 ppm, take a 5 minute average from the EMC data software and enter the response in the Multi-blend Audit worksheet as follows:

Cell E24 = TECO 48C response to Pre Audit Ultrapure Zero Air

If the TECO 48C response is not ±0.1 ppm, go back to step a.

9. Annotate the EMC strip chart to indicate the end of data collection for the pre audit zero calibration of the TECO 48C

10. Close the Ultrapure Air cylinder and allow the remainder of the zero gas in the system to bleed out. The amount of gas in the system may be monitored by the by-pass rotameter and the gauges on the cylinder regulator, both of which will go to zero. After the system has been depleted of zero gas, Toggle valve 1 down (OFF).

11. Open the high CO cylinder. If a stop valve is installed on the regulator, open it fully at this time. Adjust the pressure to 20psi. Turn valve 2 up (ON). This will allow the High CO gas to enter the front manifold and to the TECO 48C. Adjust by-pass flow to 0.3-0.4 lpm if necessary.

12. Once the CO response is stable and within ±0.1ppm of the High CO tank, take a 5 minute average from the EMC data software and record this value on the Multi-blend Audit worksheet as follows:

Cell E22 = TECO 48C Response to Pre Audit High CO cylinder

13. If the instrument response doesn't match the High CO tank within ±0.1 ppm, do the following to calibrate the span of the TECO 48C:

    a. Press the "MENU" button on the TECO 48C.

    b. Using the down arrow, scroll down until "CALIBRATION" is displayed and press "ENTER".

    c. Scroll down until "CALIBRATION SPAN" is displayed. If the correct span value is displayed, press "ENTER" twice. The span value is the concentration of the high CO tank. If the correct span value is not displayed, us the arrow keys to input the correct HIGH CO tank concentration under "SET TO". When the correct span value is displayed, press "ENTER". The TECO 48C will reset its reading to the span value of the High CO tank concentration. Press the "RUN" button to return to sampling mode.

    d. Allow the TECO 48C to stabilize. When the CO response is stable and reads within ±0.1 ppm of the High CO tank concentration, take a 5 minute average from the EMC data software record this value on the Multi-blend Audit worksheet as follows:

       Cell E22 = TECO 48C Response to Pre Audit High CO cylinder

       If the response is not the same as the High CO tank, go back to step a.

14. Annotate the EMC strip chart to indicate the end of data collection for the Pre Audit span calibration of the TECO 48C.

15. Close the High CO cylinder and allow the remainder of the gas in the system to bleed out. The amount of gas in the system may be monitored by the by-pass rotameter and the gauges on the cylinder regulator, both of which will go to zero. After the system has been depleted of zero gas, Toggle valve 2 down (OFF).

16. Open the Low CO cylinder. Adjust the pressure to 20psi. If a stop valve is installed on the regulator, open it fully at this time. Turn valve 3 up (ON). This will allow the Low CO gas to enter the front manifold and to the TECO 48C. Adjust by-pass flow to 0.3-0.4 lpm if necessary

17. Allow the TECO 48C to stabilize and take a 5 minute average reading from the EMC data software. . Enter this value on the Multi-blend Audit worksheet as follows:

    Cell E23 = TECO 48C response to Pre Audit Low CO cylinder

18. Annotate the EMC strip chart to indicate the end of data collection for the Pre Audit Low CO point calibration of the TECO 48C.

19. Close the Low CO cylinder and allow the remainder of the gas in the system to bleed out. The amount of gas in the system may be monitored by the by-pass rotameter and the gauges on the cylinder regulator, both of which will go to zero. After the system has been depleted of zero gas, Toggle valve 3 down (OFF).

7.5. Alternate Procedure for Carbon Monoxide Analyzer Post-Calibration Procedure CO, SO2, NO2 PE Procedure

1. Switch the 3-way manual valve to the Tank Gas position.

2. Open the Ultrapure Zero Gas cylinder. If a stop valve is installed on the regulator, open it fully at this time. Adjust the pressure to 20 psi. Toggle valve 1 up (ON) on the front control panel. This will allow ultrapure air to flow into the front manifold then to the TECO 48C CO analyzer.

3. Adjust system flow until a by-pass of 0.3-0.4 lpm is indicated on the front panel rotameter.

4. Once the TECO 48C response is stable, take a 5 minute average reading from the EMC data software and enter it on the Multi-blend Audit worksheet as follows:

   Cell E26 = TECO 48C Response to Post Audit Ultrapure Zero.

5. Annotate the EMC strip chart to indicate the end of data collection for the Post Audit zero point.

6. Close the Ultrapure Air cylinder and allow the remainder of the zero gas in the system to bleed out. The amount of gas in the system may be monitored by the by-pass rotameter and the gauges on the cylinder regulator, both of which will go to zero. After the system has been depleted of zero gas, Toggle valve 1 down (OFF).

7. Open the high CO cylinder. If a stop valve is installed on the regulator, open it fully at this time. Adjust the pressure to 20psi. Turn valve 2 up (ON). This will allow the High CO gas to enter the front manifold and to the TECO 48C.

8. Adjust system flow until a by-pass of 0.3-0.4 lpm is indicated on the rotameter, if necessary.

9. Once the TECO 48C response is stable, take a 5 minute average reading from the EMC data software and enter it on the Multi-blend Audit worksheet as follows:

SO2 and CO Station Audit

	NPEP Trailer Readings		Actual Concentration (ppm)		Station readings (ppm)		% Difference	
Audit Point Description	Environics Low MFC Setting	NPEP Thermo 48C CO reading	SO2	CO	SO2	CO	SO2	CO
Pre Zero	0.00	0.09	0.001	0.10	0.000	0.290		
Level 1 SO2/CO	42.00	39.70	0.398	39.57	0.403	41.400	1.3	4.6
Level 2 SO2/CO	20.20	20.15	0.202	20.09	0.189	19.340	-6.4	-3.7
Level 3 SO2/CO	8.00	7.42	0.074	7.41	0.074	8.590	0.0	15.9
Post Audit Zero	0.00	0.00	0.000	0.01	0.000	0.856		

NO and NOx Station Audit

	NPEP Trailer Readings		Actual Concentration (ppm)			Station readings (ppm)			% Diff
Audit Point Description	Environics Low MFC Setting	NPEP Thermo 48C CO reading	NO	NO2	NOx	NO	NO2	NOx	NO
Pre Zero	0.00	0.09	0.002	0.000	0.002	0.006	0.002	0.003	
Level 1 NO/NOx	20.20	20.15	0.444	0.000	0.444	0.482	0.010	0.491	8.5
Level 2 NO/NOx	12.44	12.22	0.269	0.000	0.269	0.295	0.007	0.302	9.8
Level 3 NO/NOx	8.00	7.42	0.164	0.000	0.164	0.181	0.005	0.186	10.6
Level 4 NO/NOx	4.00	2.98	0.066	0.000	0.066	0.071	0.003	0.075	8.0
Post Audit Zero	0.00	0.00	0.000	0.000	0.000	0.006	0.002	0.003	

NO2 Station Audit

	NPEP Trailer Readings			Actual Concentration (ppm)				Station readings (p	
Audit Point Description	Environics Low MFC Setting	Environics Ozone Setting	NPEP Thermo 48C CO reading	NO original (Pre O3 addition)	NO Remaining	NO2	NOx	NO	NO2
Zero NO2 @ Level 1 NO	20.20	0.000	20.15	0.444	0.443	0.001	0.444	0.482	0.010
Level 1 NO2	20.20	0.367	20.11	0.443	0.091	0.352	0.443	0.102	0.385
Level 2 NO2	12.44	0.195	12.22	0.269	0.082	0.187	0.269	0.092	0.210
Level 3 NO2	8.00	0.088	7.41	0.164	0.080	0.084	0.164	0.090	0.097

Regression Curves

	NO	NOx	NO2	SO2	CO
Slope	1.0781	1.1057	1.0704	1.0051	1.0195
Intercept	0.0039	0.0024	0.0081	-0.0025	0.3977

Converter Efficiency

A	B	C
delta NO	Delta NOx	Conversion Efficiency
0.352	0.003	99.2%
0.189	0.000	100.2%
0.085	0.000	100.5%

Cell E27 = TECO 48C response to Post Audit High CO.

10. Annotate the EMC strip chart to indicate the end of data collection for the Post Audit High CO point.

11. Close the High CO cylinder and allow the remainder of the gas in the system to bleed out. The amount of gas in the system may be monitored by the by-pass rotameter and the gauges on the cylinder regulator, both of which will go to zero. After the system has been depleted of zero gas, Toggle valve 2 down (OFF).

Field Standard Operating Procedures for the EPA TTP National Performance Evaluation Program [1]

Operation: Post PE Results Procedures
SOP: NPEP-7.01

Name: Printed	Signature	Date

Contents
(applicable to this SOP)

[1]TTP National Performance Evaluation Program

1.0 Scope and Applicability

Only applies to the content, responsibilities, and procedure for completing and distributing the preliminary and final results of an EPA TTP PE performed in an EPA Region with a TTP Mobile PE Lab by EPA Regional or EPA Regional Contractor FS who have been certified by OAQPS -approved or provided training and delivered by or under the supervision of EPA OAQPS and Regional Personnel.

Upon completion of the PE, reporting results to the station operator is mandatory to ensure clear communication of PE results. A "Preliminary NPEP Through-The-Probe PE Data Report" has been developed to deliver at the time the PE is complete.The PE values in the spreadsheets are taken directly from the corresponding PE data sheet form TTP SOP section 6 directly from the station PE spreadsheet and therefore, the report is formatted as 'protected'. The values are taken by the corresponding cells in the form directly from relevant spreadsheet cells and should not differ from the final reported values in those forms.

2.0 Summary of Method

Sect. 7 has 2 parts; the first addresses the field scientist (FS) giving the Preliminary Data Report (PDR) for the scheduled TTP PE to the station agency's designated recipient(See pre-trip information gathering Communication SOP 2.03. The second part of 7.01 addresses the final report, which will come from the EPA Region, copied to OAQPS, and include both PE operator/FS's statement of and any specifics of post PE validation performed, and any Regional EPA recommendations for change or other corrective actions.

3. 0 Definitions

Appendix D contains a glossary of terms used in the NPEP TTP..

4.0 Personnel Qualifications

Certification by having passed the written examination and the hands-on practical examination for the mobile TTP PE laboratory components of Federal reference method-based PE training.

5.0 Cautions

6.0 Equipment and Supplies

1. Preliminary PE Report
2. Mobile PE Lab and station worksheets

7.0 Procedure

7.1 Preliminary PE Data Results Report (Red above is Region 9)

1. **The preliminary report has one form for each pollutant**; Copies of the forms- one each for Ozone, CO, SO_2 , and NO/NO_2 - are at the end of this section 7, i.e, following subsection 7.2 (below) (Figure 7.1.1 for Ozone; Figure 7.1.2 for CO; Figure 7.1.3 for SO_2; Figure 7.1.4 for NO/NO_2 .

   Each form should contain:

   A table containing the Site location ID info; PE Date; the PE Lab monitor and station monitor ID info; and Preliminary PE result values for the Mobile PE lab and the corresponding values for the site/station monitor, for the standard sequence of Criteria Pollutant Gas Points, at Pre-PE Zero, High, Medium, Low, and Post - PE Zero concentrations (Levels) of the % Full Scale Range of the monitors.

   A block to note the EPA staff person notified in case of a PE failure.

   A signature block for the PE FS.

   A comments field.

   A field that notes additional evaluations completed.

2. After the final Ozone point or CO calibration, verify that the site and PE data are updated and correct. If there are two PE FSs in the field this should be done by the PE FS that didn't input this information.

3. Access the PE program to be used and verify that all Mobile PE Lab and station information has been entered correctly.

4. If any of the PE criteria (less than 15% difference at each point of the test sequence) were not met, the EPA TOPO/WAM or designee should be contacted and their name should be entered on the PE sheet.

   Note: If a site or agency exceeds the PE result acceptance limit (±15% difference between station and EPA PE Point) they should take immediate

action to correct the out of control situation and may potentially invalidate data. If a site or agency exceeds the warning limits (± 10% difference) they should evaluate the effectiveness of their monitor or monitoring network.

5. If any evaluations beyond the normal scope of the PE, these should be detailed in the appropriate report section.

6. Any other comments should be added to the comment section.

7. The PE FS should print out (HP Printer) and sign 3 copies of the Preliminary Report. One copy is given to the site operator, one copy is provided to the EPA TOPO/WAM in the monthly report, and the final copy is retained in the site file.

8. Remove the strip chart trace from the Mobile PE Lab's HP Printer. Record the site name, number, date, and auditor's names on it. Attach the chart, along with all Mobile PE Lab and station worksheets, to the EPA copy of the Preliminary PE results (data report).

PRELIMINARY NPEP THROUGH-THE-PROBE AUDIT REPORT
AUDIT AGENCY EPA REGION 2
OZONE REPORT

Site Name:	EPA Edison Lab			Airs ID:	34-0030005
Auditor:	Avi Teitz & Mustafa Mustafa/US EPA Region 2			Audit Date:	07/19/05
Station Manager:	Keith Kramer				

MOBIL PE LAB INSTRUMENTS

Instrument:	Ozone	CO
Manufacturer:	Thermo	Thermo
Model:	49CPS	48
Serial Number:	0	0
Calibration Date:	06/03/05	Calibrated
Slope	1.0025	on
Intercept	-0.0045	day of audit

STATION INSTRUMENT INFORMATION

Instrument:	Ozone	
Manufacturer/Model #:	Dasibi	1008RS
Property Number:	6458	
Calibration Date:	07/14/05	
Slope/Intercept:	% Bias	-0.0400
Indicated Flow:	2 L/min	
In-Line Filter Change:	7/705	
Manifold Type:	2" Glass	

PRELIMINARY OZONE AUDIT RESULTS

NPEP O3 Concentration (ppm)	Site Response (ppm)	Percent Difference
0.000	**-0.001**	
0.406	**0.405**	**-0.2**
0.170	**0.169**	**-0.5**
0.072	**0.071**	**-1.0**
-0.001	**-0.001**	

	Pass/Fail	Warning
Ozone Audit Level 1	**Pass**	
Ozone Audit Level 2	**Pass**	
Ozone Audit Level 3	**Pass**	

Audit Limits	
Pass	Less than or equal to ±15%
Fail	Greater than ±15%
Warning	Greater than ±10%

Auditor _____
Print
_____
Signature

EPA person notified in case of audit failure _____

Comments:

Fig

ure 7.1.1 Preliminary Ozone PE Report

PRELIMINARY NPEP THROUGH-THE-PROBE AUDIT REPORT						
AUDIT AGENCY EPA REGION 2						
CARBON MONOXIDE REPORT						
Site Name:	EPA Edison Lab				Airs ID:	34-0030005
Auditor:	Avi Teitz & Mustafa Mustafa/US EPA Region 2				Audit Date:	07/19/05
Station Manager:	Keith Kramer					
		MOBIL PE LAB INSTRUMENTS				
Instrument:		Ozone	CO			
Manufacturer:		Thermo	Thermo			
Model:		49CPS	48			
Serial Number:		0	0			
Calibration Date:		06/03/05	Calibrated			
Slope		1.0025	on			
Intercept		-0.0045	day of audit			
		STATION INSTRUMENT INFORMATION				
Instrument:		CO				
Manufacturer/Model #:		0	0			
Property Number:		0				
Calibration Date:		01/00/00				
Slope/Intercept:		0.00	0.00			
Indicated Flow:		0				
In-Line Filter Change:		0				
Manifold Type:		0				

PRELIMINARY CARBON MONOXIDE AUDIT RESULTS

NPEP CO Concentration (ppm)	Site Response (ppm)	Percent Difference
0.10	0.29	
39.57	41.40	4.6
20.09	19.34	-3.7
7.41	8.59	15.9
0.01	0.86	

	Pass/Fail	Warning
CO Audit Level 1	Pass	
CO Audit Level 2	Pass	
CO Audit Level 3	Fail	

Audit Limits	
Pass	Less than or equal to ±15%
Fail	Greater than ±15%
Warning	Greater than ±10%

Auditor _____
Print
_____
Signature

EPA person notified in case of audit failure _____

Comments:

7.1.2 Preliminary CO PE Report

PRELIMINARY NPEP THROUGH-THE-PROBE AUDIT REPORT
AUDIT AGENCY EPA REGION 2
SULFUR DIOXIDE REPORT

Site Name:	EPA Edison Lab			Airs ID:	34-0030005
Auditor:	Avi Teitz & Mustafa Mustafa/US EPA Region 2			Audit Date:	07/19/05
Station Manager:	Keith Kramer				

MOBIL PE LAB INSTRUMENTS

Instrument:	Ozone	CO
Manufacturer:	Thermo	Thermo
Model:	49CPS	48
Serial Number:	0	0
Calibration Date:	06/03/05	Calibrated
Slope	1.0025	on
Intercept	-0.0045	day of audit

STATION INSTRUMENT INFORMATION

Instrument:	SO2	
Manufacturer/Model #:	0	0
Property Number:	0	
Calibration Date:	01/00/00	
Slope/Intercept:	0.000	0.000
Indicated Flow:	0	
In-Line Filter Change:	0	
Manifold Type:	0	

PRELIMINARY SULFUR DIOXIDE AUDIT RESULTS

NPEP SO_2 Concentration (ppm)	Site Response (ppm)	Percent Difference
0.001	0.000	
0.398	0.403	1.3
0.202	0.189	-6.4
0.074	0.074	0.0
0.000	0.000	

	Pass/Fail	Warning
SO_2 Audit Level 1	Pass	
SO_2 Audit Level 2	Pass	
SO_2 Audit Level 3	Pass	

Audit Limits	
Pass	Less than or equal to ±15%
Fail	Greater than ±15%
Warning	Greater than ±10%

Auditor _____ Print

_____ Signature

EPA person notified in case of audit failure _____

Comments:

7.1.3 Preliminary SO2 PE Report

PRELIMINARY NPEP THROUGH-THE-PROBE AUDIT REPORT
AUDIT AGENCY EPA REGION 2
NITROGEN OXIDES REPORT

Site Name:	EPA Edison Lab				Airs ID:	34-0030005
Auditor:	Avi Teitz & Mustafa Mustafa/US EPA Region 2				Audit Date:	07/19/05
Station Manager:	Keith Kramer					

MOBIL PE LAB INSTRUMENTS		
Instrument:	Ozone	CO
Manufacturer:	Thermo	Thermo
Model:	49CPS	48
Serial Number:	0	0
Calibration Date:	06/03/05	Calibrated
Slope	1.0025	on
Intercept	-0.0045	day of audit

STATION INTRUMENT INFORMATION		
Instrument:	NO/NOX	
Manufacturer/Model #:	Thermo	42
Property Number:	42-34149-246	
Calibration Date:	06/30/05	
Slope/Intercept:	% Bias-1.72	% Bias 7.58%
Indicated Flow:	n/a	
In-Line Filter Change:	38533	
Manifold Type:	2" Glass	

PRELIMINARY NO AUDIT RESULTS

NPEP NO Concentration (ppm)	Site Response (ppm)	Percent Difference
0.002	0.006	
0.444	0.482	8.5
0.269	0.295	9.8
0.164	0.181	10.6
0.066	0.071	8.0
0.000	0.006	

	Pass/Fail	Warning
NO Audit Level 1	Pass	
NO Audit Level 2	Pass	
NO Audit Level 3	Pass	Warning
NO Audit Level 4	Pass	

PRELIMINARY NOx AUDIT RESULTS

NPEP NO_x CONCENTRATION (ppm)	SITE RESPONSE (ppm)	Percent Difference
0.002	0.000	
0.444	0.491	10.6
0.269	0.302	12.3
0.164	0.186	13.5
0.066	0.075	12.9
0.000	0.003	

	Pass/Fail	Warning
NOx Audit Level 1	Pass	Warning
NOx Audit Level 2	Pass	Warning
NOx Audit Level 3	Pass	Warning
NOx Audit Level 4	Pass	Warning

PRELIMINARY NO_2 AUDIT RESULTS

NPEP NO_2 Concentration (ppm)	Site Response (ppm)	Percent Difference	Converter Efficiency
0.001	0.01		
0.352	0.385	9.2	99.2%
0.187	0.210	12.2	100.2%
0.084	0.097	14.9	100.5%

Audit Limits

Pass	Less than or equal to ±15%
Fail	Greater than ±15%
Warning	Greater than ±10%

Converter Efficiency Audit Limits

Pass	Between 96% and 104%
Fail	<96% or >104%
Warning	Between 96%-97% or 103%-104%

	Pass/Fail	Warning
NO_2 Audit Level 1	Pass	
NO_2 Audit Level 2	Pass	Warning
NO_2 Audit Level 3	Pass	Warning
Converter Efficiency Point 1	Pass	
Converter Efficiency Point 2	Pass	
Converter Efficiency Point 3	Pass	

Auditor

Print

Signature

Comments:

EPA person notified in case of audit failure

7.1.4 Preliminary NO/NOx PE Report

PRELIMINARY SUMMARY AUDIT REPORT				
AUDIT AGENCY EPA REGION 2				
Site Name: EPA Edison Lab				Audit Date:
Parameter	**NPEP Lab Response (ppm)**	**Station Response (ppm)**	**Percent Difference**	**Pass/Fail**
Ozone				
Ozone Audit level 1	0.406	0.405	-0.2	**Pass**
Ozone Audit level 2	0.170	0.169	-0.5	**Pass**
Ozone Audit level 3	0.072	0.071	-1.0	**Pass**
Carbon Monoxide				
CO Audit Level 1	39.6	41.4	4.6	**Pass**
CO Audit Level 2	20.1	19.3	-3.7	**Pass**
CO Audit Level 3	7.4	8.6	15.9	**Fail**
Oxides of Nitrogen				
NO Audit Level 1	0.444	0.482	8.5	**Pass**
NO Audit Level 2	0.269	0.295	9.8	**Pass**
NO Audit Level 3	0.164	0.181	10.6	**Pass**
NO Audit Level 4	0.066	0.071	8.0	**Pass**
NOx Audit Level 1	0.444	0.491	10.6	**Pass**
NOx Audit Level 2	0.269	0.302	12.3	**Pass**
NOx Audit Level 3	0.164	0.186	13.5	**Pass**
NOx Audit Level 4	0.066	0.075	12.9	**Pass**
NO2 Audit Level 1	0.352	0.385	9.2	**Pass**
NO2 Audit Level 2	0.187	0.210	12.2	**Pass**
NO2 Audit Level 3	0.084	0.097	14.9	**Pass**
Converter Efficiency NO2 Audit Level 1	99.2%			**Pass**
Converter Efficiency NO2 Audit Level 2	100.2%			**Pass**
Converter Efficiency NO2 Audit Level 3	100.5%			**Pass**
Sulfur Dioxide				
SO2 Audit Level 1	0.398	0.403	1.3	**Pass**
SO2 Audit Level 2	0.202	0.189	-6.4	**Pass**
SO2 Audit Level 3	0.074	0.074	0.0	**Pass**

7.1.5 Preliminary Summary PE Report

7.2 Final PE Data and Report

1. Upon delivery by the FS of the Preliminary NPEP TTP PE Report and any comments, observations, or recommendations, to the EPA WAM or TOPO, that person will, alone or in conjunction with appropriate Regional contractor and EPA PE oversight personnel (such as the appropriate EPA Regional QA person), finalize the Preliminary Report. This is usually the person who follows up on any PE point excedances, unless the WAM is not the NPAP contact, for example, for an agency in a TTP-shared Region. The WAM will send the contractor comments, observations, recommendations, and all the Preliminary Data worksheets and Reports, to the shared Regional NPEP contacts, within 2 - 5 workdays of the WAMs' receipt of the reports.

2. The Regional PE oversight person (WAM or Shared Regional NPEP contact) prepares a finalized report. A finalized report is prepared from the Preliminary Report by electronically saving a copy of the report, and then editing out the form heading word "Preliminary," and the following headings and fill-in spaces in the lower right corner: Auditor, Print, signature, and "EPA person notified in case of and Audit failure". An EPA cover letter (see template in Figure 7.2.1) is prepared and added to the finalized report(s) and is sent to the agency contact, along with the name and contact /delivery information of the evaluated agency's designated final report recipient, to that recipient, and to the NPEP Coordinator in EPA OAQPS in RTP, NC. A copy of any excedance followup may also be sent. If the audited agency is in a TTP shared Region, the shared regional NPAP contact will send the final report with cover letter to the appropriate State, Local, or Tribal agency and cc: to the Regional ESAT WAM, and OAQPS.

2. 3. The report data will be added to the NPEP database maintained for EPA OAQPS in RTP .

NOTE: The audited agency's Region will normally issue a request for followup/corrective action for acceptance limit excedances (RCA). RCAs are issued when the PE indicates that the station's instrument(s) are not operating within the control limits defined in EPA's QA Handbook Volume II, Part 1.

If the station has failed the PE, or a portion of the PE, the

audited agency's Regional EPA will contact the agency to request a report of the follow-up action taken.

Followup will be at the discretion of the agency's Region.

Performance Evaluated State, Local, or Tribal Agency

Region _____
Date: _____

Agency _____
_____
_____

Dear

One or more of the PE point results for your agency's (O_3, SO_2, CO, or NO/NO_2) monitor for _____, _____ (month, year) _____ (did /did not) exceed the PE acceptance limit for each of the individual or average absolute percent difference(s). The final data report is attached. The PE limits are included on each of the individual reports.

When a % difference is greater than the acceptance limit for a performance evaluation, we recommend that the cause for the exceedance be identified so corrective action can be taken. The EPA NPEP Regional Office Contact for your agency may have already contacted appropriate staff in your agency.

Comments, Recommendations: (Use, or put N/A) _____
_____
Followup will be at the discretion of the Region.
If you have any questions, please call me at _____.

Sincerely yours,

EPA NPEP Regional Contact: _____
Regional Group: _____
Regional Office: _____

City, State: _____, _____

Enclosure
cc: name
Region
OAQPS

Figure 7.2.1 Cover Letter for Final PE Report

NATIONAL PERFORMANCE EVALUATION PROGRAM
U. S. ENVIRONMENTAL PROTECTION AGENCY

Request for Corrective Action

Date: _____

Agency: _____
_____
Site(s) evaluated: _____
_____

Dear Mr.

One or more of the performance evaluation (PE) point results for your agency's (O3, SO2, CO, or NO/NO2) monitor, for date: _____, exceeded 15% for the individual or average absolute percent difference(s). The final data report is attached.

When a % difference is greater than ± 15% for a performance evaluation, we recommend that the cause for the exceedance be identified so corrective action can be taken.

Comments, Recommendations: _____
_____

Follow-up will be at the discretion of the EPA Region. If you have any questions, please call me at: _____.

Sincerely,

EPA NPEP Regional Contact: _____
Regional Office: _____
EPA Region: _____
City, State: _____

Attachment:

cc:

Figure 7.2.2 Cover Letter for Exceedence

NATIONAL PERFORMANCE EVALUATION PROGRAM
Performance Evaluated State, Local, or Tribal Agency

Date: _____

Agency: _____
_____
_____
Site(s) evaluated: _____
_____

Dear Mr.

Performance Evaluation (PE) Audits were performed in _____ (month, year) on _____ sites of your air monitoring network. The results for the audited monitors (O3, SO2, CO, or NO/NO2) did not exceed the PE acceptance limit for each of the individual or average absolute percent difference(s). The final data report is attached including the PE limits on each of the individual reports.

Please feel free to call me at _____with any questions or comments.

Sincerely,

EPA NPEP Regional Contact: _____
Regional Group: _____
Regional Office: _____
EPA Region: _____
City, State: _____

Attachment:

cc:

Figure 7.2.3 Cover Letter for Non-Exceedence

References

EPA QA Handbook Volume II, Part 1, 1998

Field Standard Operating Procedures for the EPA TTP National Performance Evaluation Program [1]

Operation: Shut-down Procedures
SOP: NPEP-8.01

Name: Printed	Signature	Date

Contents
(applicable to this SOP)

[1]TTP National Performance Evaluation Program

1.0 Scope and Applicability

This section of the compendium is intended for use with one of the 5 trailer-based (Regions 2,5,6,7, and 9) or one truck-based (Region 4) EPA TTP PE Mobile Laboratories; it is used to prepare the mobile lab for transport to another location, following 2 or more hours parked (but not normally overnight) as close as possible (to a maximum of the length of the 150 ft TTP test gas delivery hose ("line") to an ambient air monitoring station, performing on-site TTP PEs, powered by landline connection to the station or by one of the mobile lab's 2 auxilliary generators. The same checklists for ensuring a) trailer towing feature safety, b) exterior and c) lab interior TTP system feature safe shutdown and pre-transport readiness status.

2.0 Summary of Method

Involves reversal of the on-site TTP PE start-up steps performed as described in Section 4.Gas flow path conrols are checked to endure that they are in the off positions, with no gas flow , or leaks, occuring. Check to be sure that the 2 (or optionally, 3 or 4) criteria pollutant analyzer power switches are shut off. Then check for off position for the switches of the calibrator power, then continuous zero air generator, then the Major Power Powerware PLC/UPS. Then check the interior light and ventilation and/or AC switches, and then the auxilliary generator switches. The last switch for the Truck -based mobile lab is by the driver's seat in the cab.

3. 0 Definitions

Appendix D contains a glossary of terms used in the NPEP TTP..

4.0 Personnel Qualifications

Certification by having passed the written examination and the hands-on practical examination for the mobile TTP PE laboratory components of Federal reference method-based PE training. Certification by having taken and passed the EPA ORD towed trailer training is strongly recomnmended. Review and discussion of the training materials is requred as soon as they become availble to all Region.

5.0 Cautions

1. The *recommended* location for the crank for the 4 exterior jacks is *in the tow vehicle*. Before disconnection from tow vehicle, if required for any reason, crank the 4 exterior jacks down.

2. Safety Caps for compressed gas cylinders - Griftan, yellow metal clam-shell caps are a safety requirement for moving mobile audit labs, especially when the compressed gas cylinders have regulators, fitting and tubing attached. Movement of the Mobile labs is forbidden if it contains pressurized cylinders without either the standard compressed cylinder cap or the clam-shells securely fastened, especially if there is a regulator and any other connections attached to the cylinder stem.

3. Keep the regular cylinder caps belonging to the cylinders in the lab, in case you need to move the cylinder from the lab unexpectedly. To be prepared for that same possibility, do not forget that the metal-toes safety shoes are required when moving one or more compressed gas cylinders by hand.

For discussion and finalization:

4. All Mobile Labs, Caution/To do: Count to 10 to hold down the Major Power PowerMate 2000 power-on/off button on the UPS-PLC
   Greg's comment: A three count will do for turning on and off the UPS. The indicators on the unit itself are not very user friendly on first use, but there is no problem when you get used to it.

5. Equipment Design problem/To Do:(This is a problem for trucks for sure. Trailer Operators, could this be a problem for you?) The edges of the hose hatch for the Region 4 Mobile Lab's braided stainless steel delivery hose line were not line with a tough but smooth protective material, as had been discussed between GSA and myself. The lack of this protective material has resulted in early fraying - and potential kinking of the line. This has 2 negative consequences. The edges are being abraded early and breaking into little sharp open en pieces and the bare metal threads that are being cut are sticking out and can puncture bare hands holding the hose. PE FS/Operators handling the line must use gloves that will protect hands from the punctures.
   Greg's comment: We've noticed the potential for cuts while reeling in the hose also. We haven't made a trip out to our field equipment center to obtain gloves, but that is on our low priority list. The fraying on the hose is not very visible and I have experienced the rough nature of the hose from day one. It may just be one of the characteristics of a braided hose. Haven't seen anything that suggested this is premature, but we need to look into ways of minimizing the wear. I remember seeing a groove developing in the plastic framing of the portholes of the trailers that they use for hose exits. I don't know what material would be better, but we will keep our eyes open for something that will work. Any time there is one material moving against another there will be friction and wear. Minimizing it is the key.

6.0 Equipment and Supplies

1. Check lists for Trailer Towing Pre-Trip Safety Inspection, and Road and Functionality Tests

2. Operator's Manuals for auxiliary generators, Trailer (Axles and wheels), AC Units

7.0 Procedure

7.1 INTERIOR

Note: See (Figure 8.7.1 and 8.7.2) Check Lists for Trailer Towing Pre-Trip Safety Inspection, and Road and Functionality Test. Use for initial receipt and during each start-up of Mobile PE Lab Trailer. Region 4 will modify and use for their truck-based Mobile PE Lab.

1. After printing the audit report, exit the computer program and shut down the computer.

2. Turn off the power to the printer and chart recorder.

3. Turn off the power to the Environics 9100 calibrator, TEI 49C -PS, TECO 48c, and TECO 42c. (If in the mobile lab)

4. Turn off the power to the API 701 zero air system. (Separate from the other audit system?)

5. Close the valves on all compressed gas cylinders.

6. Turn off the power to the Powerware UPS/ voltage and line conditioner.

7. Turn off the air conditioning units.

8. After shutting off all overhead lighting, turn off the generator (s).

9. For truck-based Region 4 Mobile PE lab only, turn off the DC power switch by driver's seat in truck cab.

7.2 EXTERIOR

1. Remove the "Line" from the station's inlet probe.

2. Reel the "Line" into the audit Mobile PE Lab and cap the end. Make certain the end of the "Line" is placed into the "Line" cradle, and lock the hose reel into position.

3. Secure the ladder and (any) safety cones.

4. Remove the (any) wheel chocks. Crank up the 4 exterior jacks back up.

Tow Vehicle-Trailer Pre-Trip Safety Inspection Checklist for Region _____

Date:_____ Reviewer_____

Review the following checklist and indicate whether each item is satisfactory (SAT.), unsatisfactory (UNSAT.), while including applicable notes. All unsatisfactory issues must be properly addressed before the trailer can be towed.	**SAT.**	**UNSAT.**	**NOTES LEGEND**
I. Tow Vehicle			
1. The tow vehicle has enough power to safely tow the trailer load.			
2. The tow vehicle has received regular preventative maintenance work.			
3. The tow vehicle has adequate fuel, battery power, oil, and engine coolant.			
4. The tow vehicle tires are properly inflated and balanced, and do not show excessive wear or damage.			
5. The wheel fasteners (lug nuts) are present, tight, and free of rust.			
6. Wheel rims are free from damage.			
7. Tow vehicle is level when attached to the loaded trailer.			
8. All lights (dash lights, head lights, tail lights, clearance lights, brake lights, directional signals, hazard light, high beams, reflectors) are in proper working order.			
	SAT	**UNSAT**	**NOTES LEGEND**
9. All brakes are in proper working order.			

10. Side view mirrors provide an unobstructed rear view on both sides of the vehicle.			
II. Hitching Apparatus			
1. The receiver is properly mounted to the tow vehicle.			
2. The receiver, draw bar, hitch ball, coupler, sway control device, spring bars, safety chains, and power connection wiring are all functional and compatible with the tow vehicle and trailer.			
3. The power and brake control connections between the trailer and tow vehicle are compatible, provide enough slack for turning and are in good working order.			
4. The landing gear (trailer jack) is functional.			
5. The hitch ball and coupler are the same size. When attached, the ball is firmly seated in the coupler, and the latching mechanism is locked.			

Figure 8.7.1.Tow Vehicle Trailer Safety Training

US EPA Mobile Audit Laboratory
Road Test and Functionality Test for Region _____

Date:_____

Road Test

Description	Test Parameter	Results
Running lights	Illuminates with tow vehicle	
Brake lights	Illuminates with tow vehicle	
Turning signal	Illuminates with tow vehicle	
Electrical braking system	Engages with tow vehicle braking	
Stowing of internal equipment	Internal components stable during road test	
Trailer tongue jack	Jack operates properly to raise or lower trailer tongue	
Trailer leveling jacks	Four each jacks operate properly to level trailer	
Trailer electrical connector	Sufficient length to connect to tow vehicle and lights/braking system is operational.	
ONAN Generator One	Provides power to instrument rack units, data logger, computer, and air conditioner/heater while under tow.	
ONAN Generator Two	Provides power to instrument rack units, data logger, computer, and air conditioner/heater while under tow.	
Road Test Cont....		
Description	**Test Parameter**	**Results**

Roof Mounted Platform	Platform folds and stores in secure manner; safely assembles upon set up.	

Functionality Test

Description	**Test Parameter**	**Results**

Shore line electrical cable	Shore line electrical services to main breaker	
	Each secondary breaker supplies power to the respective outlets	
	All rack mounted instruments are functional	
	EMC data logger and computer are functional	
	Interior wall outlets have 120V electrical service	
	Exterior lightning is functional	
	Exterior outlets have 120V electrical service	
	Air Conditioner/Heating functional	
	Internal lightning functional	
	Roof mount platform exterior outlets have 120V electrical service	
UPS System	Energizes upon shore line, generator one or generator two power interruption	
ONAN Generator One	Electrical service to main breaker after setting power selector switch	
	Each secondary breaker supplies power to the respective outlets	
Functionality Test Cont.....		
Description	**Test Parameter**	**Results**

	All rack mounted instruments are functional	
	EMC data logger and computer are functional	
	Interior wall outlets have 120V electrical service	
	Exterior lightning is functional	
	Exterior outlets have 120V electrical service	
	Air Conditioner/Heater functional	
	Internal lightning is functional	
	Roof mount platform exterior outlets have 120V electrical service	
ONAN Generator Two	Electrical service to main breaker after setting power selector switch	
	All rack mounted instruments are functional	
	EMC data logger and computer are functional	
	Interior wall outlets have 120V electrical service	
	Exterior lightning is functional	
	Exterior outlets have 120V electrical service	
Functionality Test Cont....		
Description	**Test Parameter**	**Results**

	Air Conditioner/Heater functional	
	Internal lightning functional	
	Roof mounted platform exterior outlets have 120V electrical service	

Figure 8.7.2. Road/Functionality Test Check List

8.0 References

1. User's Manual for the Environics 9100 Computerized Ambient Monitoring Calibration System

2. User's Manual for the TEI 49C-PS Ozone Calibrator
3. User's Manual for the TEI 48C CO Analyzer
4. User's Manual for the API 701 Continuous Zero Air System
5. User's Manual for Powerware UPS
6. Operator's Manual for the ONAN Commercial Mobile Power Generator

Field Standard Operating Procedures for the EPA TTP National Performance Evaluation Program [1]

Operation: Maintenance Checks and Procedures
SOP: NPEP-9.01

Name: Printed	Signature	Date

Contents
(applicable to this SOP)

[1] TTP National Performance Evaluation Program

1.0 Scope and Applicability

This maintenance section has 3 parts-spare parts and expendable supplies; preventive maintenance; and corrective maintenance- which are specific to the equipment contained in the EPA standard Mobile TTP PE Laboratories.

2. Summary of Method

Subsection , 9.7.1,- Spare Parts and Expendables Inventory- is large, with many subparts. It will be headed by a table of contents, to facilitate finding equipment of interest. It contains the spare parts and expendable materials in lists from the manufacturers' documentation (Operators and related user manuals/vendor literature) of the TTP PE Mobile Laboratories' standard system, organized by the item of component equipment. Recommended spare parts that have been purchased and held at either the RTP or Region 7 TTP support locations are highlighted in bold and the storage locations identified.

Subsection 9.7.2.- scheduled, or preventive maintenance tasks. This subsection contains excerpts of the TTP system component manufacturers' and/or vendor's literature in step-by-step procedures, lists, or tabular form. The subsection has enough subparts for the user to also benefit from a list, or table of contents, at the beginning of the subsection;

Subsection 9.7.3- unscheduled, or corrective maintenance-- which lists recommended trouble-shooting steps as first sequential diagnostic component system checks or tests, followed, when the problem has been identified, by one of the recommended checks, by corrective actions. Common corrective action steps are often cleaning, regeneration, or replacement of a subcomponent or the whole component. Parts which move, or carry current heat moves, and consequently may heat up, wear out, or become loose, have a limited useful period, and are the most common cause of symptoms and problems.

3. 0 Definitions

Appendix D contains a glossary of terms used in the NPEP TTP SOP..

4.0 Personnel Qualifications

Certification by having passed the written examination and the hands-on practical examination for the mobile TTP PE laboratory components of Federal reference method-based PE training.

5.0 Cautions : See Manuals and excerpts from equipment manuals that are provided below in subsection 7.2.

6.0 Equipment and Supplies

1. Operators and related user manuals/vendor literature) of the TTP PE Mobile Laboratories' standard system component equipment: Environics 9100, TECO 48C and 49C-PS, API 701, EMC Data System, Dexter Axle, Wells Cargo EWW 1824 trailer, Atwood Carbon Monoxide Alarm, Major Power UPS - PLC Powerware 9125, ONAN (CMN?) 6.8 K Generator, Duo-Therm Roof Top Air Conditioner

7.0 Procedure

7.1 Spare Parts

(Spare parts available from Mark Shanis (RTP) or Thien Bui (Region 7) are indicated in **Bold** in each of the lists of replacement parts for Envr 9100 (Subsection 7.1.1, page,) Thermo Envr Instr - Models 48C (subsection 7.1.2, page) and 49C (subsection 7.1.3,
page), and API 701 (subsection 7.1.4, page). For the 701 expendable materials are also available..

7.1.1 **REPLACEMENT PARTS (FROM ENVIRONICS SERIES 9100 (CALIBRATOR) OPERATING MANUAL (As of 5/2002)** [2]

ELECTRONICS

Parts #	Description
PC201	Transputer Board
PC202	Analog Board
PC203	Rom Board
PC204	**Comm/Driver Board (1 at Reg 7)**
PC208	**Motherboard (1 at RTP)**
PC210	**Ozone Board (1 at RTP; 1 at Region 7)**

[2] **Environics Series 9100** Computerized Ambient Monitoring Calibration System **Operating Manual**

PC216 Status I/O Board
PC224 Pressure Transducer
Ozone Module (Lamp replacement) (1 at RTP; 1 at Region 7)
Display
Power Supplies and Power Entry Module
Inline filters (20 Teflon particulate filters 0.5 micron and 3 filter holder - necessary to keep the Environics pneumatics clean)(See Miscellaneous Fluid handling Products at www.entegrisfluidhandling.)

7.1.2 **REPLACEMENT PARTS (FROM THERMO ENVIRONMENTAL INSTRUMENTS INSTRUCTION MANUAL FOR MODEL 48C FRM CO ANALYZER) (As of 5/2002)** [3]

Part #	Description
9831	Motherboard
9837	Processor Board
9849	Analog/Digital Board
9839	Digital/Analog Board
8931	Power Supply Board
8938	Detector Assembly (Preamplifier Board 7363)
9989	Input Board
8933	Bias Power Supply Board
8935	Temperature Control Board
9835	Clock Board
9936	Pressure Transducer
9934	Flow sensor
4735	**Chopper Motor (1 at RTP; 1 at Reg 7)**
7336	Capillary - 18mil
8606	**Pump Rebuild Kit (2 at RTP; 2 at Reg 7)**
8550	Pump 110V (Chuck suggested that since the pump is the same in both the CO and Ozone instrument that maybe one pump (part number 8550) can be used for both instruments))
8550	**Sample pump (1 at RTP;1 at Reg 7)**

[3]Thermo Environmental Instruments - Model 48C **Instruction Manual**

Part #	Description
7361	**IR Source (1 at RTP; 1 at Reg 7)**
7336	**Capillary (1 at RTP; 1 at Reg 7)**
4510	**Fuse -** T, 3A, 250V (115V) **(1 at RTP; 2 at Reg 7)**
14009	Fuse - T, 25A, 250V (220V)
8606	Pump Rebuild Kit (KNF)
7368	**Solenoid Valve (3 way) (1 at RTP)**

SPARE PARTS KITS

For TEI Pump 8550
115V/60Hz

7.1.3 **REPLACEMENT PARTS (FROM THERMO ENVIRONMENTAL INSTRUMENTS MANUAL (MODEL 49C OZONE ANALYZER/GENERATOR)** (As of 5/2002)[4]

Part #	Description
9837	Processor Board
10761	Analog to Digital Board
9839	Digital to Analog Board
9956	Optional I/O Board
9843	C-Link Board
9833	Motherboard
9847 **(#8595)**	**Power Supply Board (1 #8595 at RTP; 1 at Reg 7)**
10758	Lamp Power Supply Board
8592	Detector System
10763	Lamp Block Heater
8540	Source Lamp (ozone free)
4124	Capillary - 15 mil (short purple)
9877 **(8511)**	**Pressure Transducer (#8511- 1 at RTP; 1 at Reg 7)**
9934	Flow Sensor
4509	**Fuse -** 2 amp slo-blo **(1 at RTP)**
8573	**Solenoid Valve (1 at RTP)**

[4]Thermo Environmental Instruments - Model 49C-PS **Instruction Manual**

8606 Pump Rebuild Kit
8550 Pump 110V

SPARE PARTS

Parts #	Description
8540	**Photometer Lamp (1 at RTP;1 at Reg 7)**
8573	**Solenoid Valve (1 at RTP)**
4124	Capillary - 15 mil
4111	Capillary - 28 mil
8606	Pump Rebuild Kit
4509	Fuse - 115V T, 2A, 250V
14009	Fuse - 220V T, 1.25A, 250V
8645	**Ozonator Lamp (1 at RTP;1 at Reg 7)**
9994	Model 49C Primary Standard Instruction Manual

7.1.4 **SPARE PARTS LIST FOR API MODEL 701 ZERO AIR SYSTEM (As of 5/2002)**[5]

Parts #	**DESCRIPTION**
005960000	Activated Charcoal, 6 lbs.
005970000	Purafil, 6 lbs., IZS or Valve VER.
006900000	Charcoal Retainer Pads M100/M200
006900100	Charcoal Retainer Pads M400
014340000	Valve, Shuttle, Drier
015450000	Assembly, Pressure Switch M701
015980000	**M701 Expendables Kit**
016880000	M701 Level 1 Spare Parts Kit (for 10 units)
016880100	**M701 Spares Kit for 1 Unit**
016920000	Mole Sieve, 11 ozs (CH033)
018490000	Pressure Gauge
017320000	HC Scrubber

[5] **API** MODEL 701 Zero Air System **Operating Manual**

021660000	PCA. Control Board
024710000	Tubing: 6', 1/8" CLR
024780000	Tubing: 6', 1/4" OD 5/32" ID CLR
FA0000006	Fan, 115Vac
FL0000007	Filter, Coalescing
FL0000015	Filter, Air 150LPM, M701
FL0000016	Filter Element Paper for FL015
HW0000101	Shock Isolator (Pump)
KIT000040	Retrofit, HC Scrubber, M701
KIT000049	Retrofit, M701 CO Scrubber
KIT000060	Leak Checker for M701
OR0000030	O-Ring, 2-141V
OR0000035	O-Ring Drier Column
OR0000059	O-Ring, Scrubber
PU0000018	Pump, 115V/60Hz
PU0000021	Pump, 220V/50Hz
PU0000023	Pump Rebuild Kit
SW0000017	Pressure Switch
VA0000011	Valve, 4-way, Drier
VA0000012	Valve, Pressure Relief
VA0000014	Pressure Regulator
VA0000016	Valve, CHECK
VA0000017	Valve, 2-way (Water Drain)

015980000 **M701 Expendables Kit**
INCLUDES: (2 kits at RTP; 2 kits at Reg 7)

005960000	**Activated Charcoal, 6 lbs.**
005970000	**Purafil, 6 lbs, IZS or Valve VER**.
006900000	**Charcoal Retainer Pads M100/M200**
006900100	**Charcoal Retainer Pads M400**
016920000	**Mole Sieve, 11 ozs (CH033**)
FL0000016	**Filter Element Paper for FLO15**

OR0000035 **O-Ring, Drier Column**
OR0000059 **O-Ring, Scrubber**

016880000 M701 Level 1 Spare parts Kit (For 10 UNITS) INCLUDES:

014340000 Valve, Shuttle, Drier
FA0000006 Fan, 115Vac
FL0000007 Filter, Coalescing
OR0000030 O-Ring, 2-141V
VA0000011 Valve, 4-Way, Drier
VA0000017 Valve, 2-Way (Water Drain)

016880100 M701 Spares Kit for 1 Unit
(Non-Expendables)
(2 kits at RTP; 1 kit at Reg 7)

INCLUDES:
FL0000007 **Filter, Coalescing**
VA0000014 **Pressure Regulator**
VA0000016 **Valve, CHECK**
VA0000017 **Valve, 2-Way (Water Drain)**

7.2. Preventive Maintenance

TABLE OF CONTENTS FOR SUBSECTION 7.2 (Preventive Maintenance)		
Heading:Inst. Function and Model	**Manufacturer, SubSect. Page#**	**Page # in Operator's Manual**
Gas Filter Correlation CO Analyzer TECO Model 48C	THERMO Environmental Instruments (TEI, TECO), p.10	Chapter 5, p.5-1
Primary Standard UV Photometric Ozone Calibrator- TECO Model 49C-PS	THERMO Environmental Instruments p.10, 11	Chapter 4, p. 4-1
Continuous zero Air Generator-Model 701	Advanced Pollution Instruments (API), p.11-13	Sect. p. 5 - 13
UPS + Power Line Conditioner	Powerware 9125, p.14	Sect. 7, p.45
ONAN 6.8K Auxilliary Generator	Commercial Mobile Power, p.15,16	p. 15 - 21
Roof Top Air Conditioner	Duo-Therm 579 Series BRISK AIR, p.16,17	p. 9
WELLS CARGO 18' Express Wagon	WELLS CARGO, p. 17-19	p. 12 - 19
DEXTER AXLE	DEXTER AXLE, p. 19- 21	Inside Front Cover. Also pages 12, 31, 38, 40, 44, 49, 50, 51

Carbon Monoxide Alarm	Atwood p. 21	p. 25, 26
Initial and Quarterly Cleaning Procedure for TTP Delivery Hose	150' long Stainless Steel braided hose with ?? p. 21	CARB - FB

7.2.1.Gas Filter Correlation CO Analyzer - TECO Model 48C

Table: CO Analyzer - Model 48C - Preventive Maintenance

ITEM	**ACTION**	**FREQUENCY**	**PROCEDURE REFERENCE**
Sample Pump	Check	?FB	Chpt 5, p. 5-2 to 5-3 Instr. Manual
Solenoid Valves	Check	?FB	Chpt 5, p. 5-2 to 5-3 Instr. Manual
IR Source	Check	?FB	Chpt 5, p. 5-2 Instr. Manual
Optics	Check/Clean	?FB	Chpt 5, p. 5-1 to 5-2 Instr. Manual
P/T transducers	Check/Calibrate	?FB	Chpt 3, p. 3-35 to 3-36 Instr. Manual p. 3-47 to 3-52

7.2.2. Primary Standard UV Photometric Ozone Calibrator - TECO Model 49C-PS

Table: O_3 Calibrator - Model 49C-PS- Preventive Maintenance

ITEM	ACTION	FREQUENCY	PROCEDURE REFERENCE
Sample Pump	Check/Replace	Regular calendar basis	Chpt 4, p. 4-3 Operator's Manual
Solenoid Valve	Check/Replace	Regular calendar basis	Chpt 4, p 4-3 Op. Man
Lamp	Check/Replace	Regular calendar basis	Chpt 4, p 4-2 Op. Man.
Optical Bench	Clean	Regular calendar basis	Chpt 4, p 4-2 Op. Man.
P/T transducers	Calibration check	Regular calendar basis	Chpt 5, p 5- 4; Chpt 6, p 6-12 to 6-13

7.2.3. Computerized Ambient Monitoring Calibration System - Environics

7.2.4. Continuous Zero Air Generator - API 701 (See insert for Maintenance Schedule Template for API 701).

The following table has a good tracking format for Scheduled Preventive Maintenance. So, we provided it in case you want to use it:

[6]Environics Series 9100 Operating Manual, Appendix, Section C, Page 45.

Table: API 701 Zero Air Module - Example Template for Scheduled Preventive Maintenance

Date Instrument Was Received: _____													
Item	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Recommended Action**
Charcoal													Annually
Purafil													Annually
HC Scrubber													When contaminated
Co Scrubber													When contaminated
Regen. Drier													When contaminated
Particulate Filter on Rear Panel													Annually or as needed

Table: Preventive Maintenance for API 701 Zero Air Module

ITEM	ACTION	FREQUENCY	PROCEDURE REFERENCE
Charcoal	Clean/Check		p 5-13, 5-14 Operator's Manual
Purafil	Clean/Check		p 5-13, 5-14 Operator's Manual
HC Scrubber	Clean/Check		p 5-13,5-14 Operator's Manual
Co Scrubber	Clean/Check		p 5-13,5-14 Operator's Manual
Regen. Drier	Clean/Check		p 5-13,5-14 Operator's Manual
Particulate Filter on Rear Panel	Clean/Check		p 5-13,5-14 Operator's Manual

Cleaning	
	1. Occasionally, depending upon the local conditions, check the inside of the 701 for excessive dirt or dust.
	2. Particularly, check the cooling fan, cooling coil and fan inlet.
	3. Remove any dirt or dust with a vacuum cleaner.
	Do not use an air jet. This will only redistribute the dirt and will not remove it.
Checking the Tubing	
	1. Under the vibration of the compressor, it is possible for some parts of the TFE tubing to abrade against nearby objects. This is most likely to occur with the tubing directly attached to the compressor.
	2. Check to see if any signs of abrasion are present, and , if so, re-dress the tubing.

	3. If any section of tubing appears to be heavily abraded, remove and replace it.

7.2.5. UPS + Power Line Conditioner - Powerware 9125

UPS Preventive Maintenance

ITEM	ACTION	FREQUENCY	PROCEDURE REF
UPS	Keep the area around the UPS clean and dust-free.	If the atmosphere is very dusty, clean the outside of the system with a vacuum cleaner	User's Guide, p45
Battery	For full battery life, keep the UPS at an ambient temperature of 25° C (77° F).		User's Guide, p45
Storing	If you store the UPS for a long period, recharge the battery by plugging the UPS into a power outlet.	Every 12 months. Recommend that batteries charge 24 hrs after a long-term storage.	User's Guide, p45
Replace battery	Conduct a self-test by pressing and holding the Test/Alarm Reset button for three seconds. If the battery indicator stays on, contact your service rep to order. **Consider all warnings, cautions, and notes before replacing batteries.**	When battery indicator illuminates	Ref: Figure 15, p 27, User's Guide

7.2.6. ONAN 6.8K Generator - ONAN Commercial Mobile Power

Table: ONAN Generator - Preventive Maintenance

ITEM	ACTION	FREQUENCY	PROCEDURE REF
General Inspections	Check	Every day or every 8 hrs	p 16 Operator's Manual
Engine Oil Level	Check	Every day or 8 hrs	p 17 Operator's Manual
Battery	Clean/Check	Every month[3]	p 19 Op. Man.
Spark Arrestor	Clean	Every 50 hrs	p 21 Op. Man.
Engine Oil & Filter	Change	After first 20 hrs[1] Every 150 hrs[2 3 4]	p 18 Op. Man.
Air Filter Element	Replace	Every 150 hrs[2]	p 19 Op. Man.

[1]As a part of engine break-in, change the engine oil after the first 20 hours of operation.

[2]Perform more often when operating in dusty environments.

[3]Perform more often when operating in hot weather.

[4]Perform at least once a year.

[5]Perform sooner if engine performance deteriorates.

Spark Plugs	Replace	Every 450 hr[5]	p 20 Op. Man.
Engine Cooling Fins	Clean	Every 450 hrs[2]	
Fuel Filter	Replace	every 450 hrs[5] [6]	
Valve Lash	Adjust	Every 450 hrs[6]	
Cylinder Heads	Clean/Replace	Every 450 hrs[6]	

7.2.7. Duo-Therm Roof Top Air Conditioner

Table: Duo-Therm® Roof Top Air Conditioner

ITEM	ACTION	FREQUENCY	PROCEDURE REFERENCE
Air Filter	Remove the return Air Filter. Wash with soap and warm water. Dry and reinstall.[i]	Periodically	p 9, Duo-Therm Installation & Operating Instructions
Air Box Housing	Clean air box housing	Periodically	p 9, Duo-Therm

[6] Must be performed by a qualified mechanic (authorized Onan dealer).

	and control panel with a soft cloth dampened with a mild detergent. Never use furniture polish or scouring powders		Installation & Operating Instructions
Fan Motor	Factory lubricated and requires no service under normal use.		p 9, Duo-Therm Installation & Operating Instructions
Frost Formation on Cooling Coil	If frost forms on the evaporator coil, inspect the filter and clean if dirty. Make sure air louvers are not obstructed. (Air conditioners have a greater tendency to frost when outside temperature is relatively low. This may be prevented by adjusting the thermostat control knob to warmer setting).		p 9, Duo-Therm Installation & Operating Instructions

7.2.8. WELLS CARGO 18' Express Wagon

ROUTINE MAINTENANCE CHECKLIST					
CHECK:	**WHAT TO DO:**	**Every Trip**	**Every 3000 Miles**	**Every 6000 Miles**	**See p.# for details**

Tire Air Pressure	Inflate to Proper Pressure Indicated on Sidewall	**			p.14 Owner's Manual
Wheel Lugs Bolts & Nuts	Tighten to Proper Torque Specifications		**		p. 14 Owner's Manual
CHECK:	**WHAT TO DO:**	**Every Trip**	**Every 3000 Miles**	**Every 6000 Miles**	
Wheels	Check for Damage and /or Out of Round			**	p. 14 Owner's Manual
Coupler Ball or 5th Wheel & Pin	Check for Sufficient Lube. Check Lock Mechanism. Check for Unusual Wear.	**			p. 15 Owner's Manual
Safety Chains at Hitch Ball	Check for abrasion, distortion and general integrity of links	**			p. 16 Owner's Manual
Coupler	Check for proper fastening & Hitch Pin in position and secure	**			p. 15 Owner's Manual
Brakes	Check for proper adjustment & operation	**			p. 16 Owner's Manual
Breakaway Switch	Test Switch Operation and Connections	**			p. 17 Owner's Manual
Breakaway Battery	Pull Switch Pin, Check Charge Indicator Light	**			p. 17 Owner's .Manual

Doors, Windows & Roof Vents	Check all Windows/Doors/Roof Vents. Make sure all are closed & locked.	**			p. 18 Owner's Manual
Load Distribution	Check load Distribution & Security	**			p. 18 Owner's Manual
CHECK:	**WHAT TO DO:**	**Every Trip**	**Every 3000 Miles**	**Every 6000 Miles**	
Leveling Jacks	Check Fastenings. Lube	**			p. 18 Owner's Manual
Welds	Check All Weld Beads for Cracks or Separations.			**	p. 19 Owner's Manual
Hinges	Grease zerks with a Lithium complex grease.		**		p. 19 Owner's Manual
Tie-Down Devices	Check for fracturing, distortion and improper anchoring.		**		p. 19 Owner's Manual
Electrical: Lights & Signals	Check to make sure all are working properly. Replace burned out bulbs.	**			p. 21 Owner's Manual

7.2.9. DEXTER AXLE

Table: DEXTER AXLE Maintenance Schedule

ITEM	ACTION	FREQUENCY	PROCEDURE REFERENCE
Brakes	Test that they are operational	At every use	p 5, 22 Operator's Manual
Brake Adjustment	Adjust to proper operating clearance	3 months or 3000 miles	p 12 Operator's Manual
ITEM	**ACTION**	**FREQUENCY**	**PROCEDURE REFERENCE**
Brake Magnets	Inspect for wear and current draw	6 months or 6000 miles	p 14 Operator's Manual
Brake Linings	Inspect for wear or contamination	12 months or 12000 miles	p 15, 31 Operator's Manual
Brake Controller	Check for correct amperage & modulation	6 months or 6000 miles	p 11
Brake Cylinders	Check for leaks, sticking	12 months or 12000 miles	p 26, 31
Brake Lines	Inspect for cracks, leaks, kinks	12 months or 12000 miles	p 31
Trailer Brake Wiring	Inspect wiring for bare spots, fray, etc.	12 months or 12000 miles	p 8
Breakaway System	Check battery charge and switch operation.	At every use	p 7
Hub/Drum	Inspect for abnormal	12 months or 12000	p 32

	wear or scoring	miles	
Wheel Bearings & Cups	Inspect for corrosion or wear. Clean & repack.	12 months or 12000 miles	p 34
Seals	Inspect for leakage. Replace if removed.	12 months or 12000 miles	p 38
Springs	Inspect for wear, loss of arch.	12 months or 12000 miles	p 41
Suspension Parts	Inspect for bending, loose fasteners, wear.	6 months or 6000 miles	p 41
ITEM	**ACTION**	**FREQUENCY**	**PROCEDURE REFERENCE**
Hangers	Inspect Welds	12 months or 12000 miles	p 41
Wheel Nuts and Bolts	Tighten to specified torque values.	3 months or 3000 miles	p 47
Wheels	Inspect for cracks, dents, or distortion.	6 months or 6000 miles	p 46
Tire Inflation Pressure	Inflate tires to mfg's specifications.	Weekly	p 48
Tire Condition	Inspect for cuts, wear, bulging, etc.	3 months or 3000 miles	p 49

7.2.10. Carbon Monoxide Alarm[7]

7.2.11. Initial and Quarterly Cleaning */as needed* Procedure for 150 ft. TTP Delivery Hose *(and Manifold)* (4-21-03, CARB, FB).GN, R4, does not use cotton ball, to avoid leaving cotton fiber residue

[7]Atwood Battery Operated **Carbon Monoxide Alarm** User's Guide, Caring for your Atwood Battery Operated CO Alarm, Page 25,26.

CAUTION: The new 150ft PE Gas delivery line/hose may arrive with fluid or viscous oil inside. Before first installation of the 150 foot line, soak the inside of the line in alcohol, as described next.

1.1 Pour enough alcohol into the line to allow complete washing of the inside of the line.
1.2. Cap both ends and allow the alcohol to stay in the line overnight.

1.3 The next day, empty the alcohol out of the line.

1.4 When emptying is completed, shoot cotton balls soaked in alcohol through the line to make certain that all
the contaminants have been removed. Generally, shoot about 10 cotton balls soaked with alcohol followed by about 10 cotton balls soaked with deionized or ultrapure water.

1.5 Be very sure to recover all the cotton balls that have been shot through the line. Verify that all the balls have been retrieved and that there is nothing stuck inside the line when finished.

1.6 Run clean dry air through the line for an hour or so.

1.7 Hook the line up in the van and generate 500 ppb of ozone for 24 hours to condition the line before use.

2. Perform a line-loss test to see how much loss there is. It
should be less than 1.5%. If it is more than this, generate the ozone at 500 ppb for another day and repeat the line-loss test.

Note 1: Regarding which type of Teflon is best for the liner of the delivery hose, extruded PTFE is best. However, CARB has been buying FEP & it has been ok so far. It is OK as long as it does not off-gas; if it does, you might observe higher values, and not as stable. Out put line (the liner of the braided SS) is made of PTFE – 150ft.
Note2: Regarding the need to clean the line for the blended gas delivery. CAR has never had to do liner cleaning for the blended gas; if do, do same as for O3; but need analyzer to do. Hook

SO2 analyzer to manifold.

7.3. Limited Corrective Maintenance

NOTE: Lead for Limited Corrective Maintenance TTP Network operators contacts for Troubleshooting are: Region 2 & 7 (Avi Teitz and Thien Bui); or ask Mark Shanis, and he will ask Fred Burriell of CARB

7.3.1.Gas Filter Correlation CO Analyzer - TECO Model 48C[8]

7.3.2. Primary Standard UV Photometric Ozone Calibrator - TECO Model 49C-PS [9]

7.3.3 Computerized Ambient Monitoring Calibration System - Environics Series 9100

Table: Environics - Series 9100 -TROUBLESHOOTING Appendix C, p. 45 -51

The Environics 9100, with few moving parts and a durable electronics package, should provide a high level of reliability. In the event that there is a failure the following troubleshooting guide may be useful in isolating and solving the problem.

PROBLEM	**POSSIBLE SOLUTIONS**
No display	Adjust Contrast knob. Check poser cable, line voltage, and fuse. Check cable between display module and motherboard. Be sure all boards are seated properly.

[8]Thermo Environmental Instruments, Inc. Instruction Manual for Model 48C, Chapter 6, Page 6-1.

[9]Thermo Environmental Instruments, Inc. Instruction Manual for Model 49C-PS, Chapter 5, Page 5-1.

Slow display	RS232 enabled with slow baud rate. Disable RS232 if not in use, or use a higher baud rate.
No display back light	Check display back light connectors.
No power	Check power hookup and look for blown fuse. Check line voltage. Check for loose cables/boards.
No keypad response	Check keypad cable for proper connection. Check for loose boards.
PROBLEM	**POSSIBLE SOLUTIONS**
Erratic Fan	Check for wiring problems with fan connection. Check +24 volts. Possible coil failure. Check and replace if necessary. Possible seal problem. Check and replace if necessary. Possible contamination(dirt). Check and clean.
No Flow	Check port connections. Check solenoids for proper operation. Check calibration tables. Try using Volts Mode to command flow controller. If Volts mode operates, be sure FLOW/CONC MODE and MAINTAIN PORTS setup is correct. Check flow controller cable. Check +15 and -15 volts. Check response and command test points on the motherboard (PC208) and analog board (PC202).

TTP Supplement to the Environics Troubleshooting Table above:
From Henry Gerard in EPA Region 6

Ozone Stabilization Issue (Region 6)
Symptoms: (Region 6)
Recently, it has been taking a while for the Environics 9100 Ozone generator to get up to the target concentration. Just yesterday, It took an hour and 20. minutes to get up to 450 ppb. Instead of the usual 130 percent shot at the beginning, the ozone went only as high as 420 ppb then went down to about 370 ppb and started creeping back up to 450 ppb. It usually takes 30 min to get up to this concentration. 40 min at the most.
Problem:
To determine what is causing this long ozone stabilization time. (Provided by Environics)
Troubleshooting:
Regarding the ozone response issue, based on the parameters that given by the Environics Service Tecnician (Mr. Parker) relating the ozone data, the generator flow is the only thing that looks low. This should be closer to 500 ccm and could be affecting the response time. Recommendation: Adjust the generator flow and re-run the ozone at .450 ppm at 15 LPM as was done previously.
Procedure for adjusting this flow (See attachment at the end of Troubleshooting). If the regulator
already reads 25 psig as outlined in the procedure, then only adjust needle valve. As

you will see in the procedure, adjusting one component may affect the other, but this is more evident when adjusting the pressure regulator.
I set the flow at 501.2 ccm and it worked great!!! I used 0.4 ppm as my test point which is also my high point in the audit. The overshoot went up as high as 0.492 ppm and I got up to 0.4 in 20 minutes. I originally had it at 496.2 ccm and the overshoot only went as high as 0.410 ppm and then it took 45 min to get to 0.4 ppm. For some reason, it worked well if the flow is over 500ccm. Needless to say, everything is running fine right now.
If the system has to come back, the minimum charge would be $200.00 , the additional costs would not be known until a specific component was determined to be causing the problem and needed replacement. At that point we would notify you first of the diagnosis and how much it would cost. Only upon approval would we continue with the repair.
We did have another idea that you may be able to do in order to fix the problem. This may keep the system from having to be returned depending on the results found.
With the power off, you remove the cover and access the ozone generator PC board by removing the black enclosure, you can monitor the ozone command voltage. This is different than the lamp drive voltage. This will show what is happening when a command is first started related to the overshoot. Once the cover to the ozone generator is removed, you can use the test point labeled 03COM (located in the middle of the back of the board between O3fdbk and IN/OUT test points) for the command voltage and use TP14 (GNDA)at the top of the board for the ground. Monitor and record the command voltage when first starting your ozone point and continue for two minutes then record it again. There should be some difference as the overshoot should apply a higher voltage for the first 90 seconds as configured in the software. Send me these results and we will determine if there is any adjustment that can
be made to fix the problem.

If this does not improve the response time and allow the ozone to
overshoot as it should, then the next step would be for us to evaluate the system here for full diagnosis.

Troubleshooting (From Henry Gerard)
Environics Start up Problem:
For some reason, the instrument cannot get past the self test. It is suppose to go into ready mode after a short self test. The manual, that is the part on Troubleshooting tips or any additional info on the self test, doesn't really give that much info about it.
If one cannot reset and thereby restart the system, conduct the procedure that follows (The procedure to initialize and input calibration settings):

RE-INITIALIZATION PROCEDURE FOR GEN2 SYSTEMS

This procedure will re-initialize the instrument to its factory settings. This should be done if a system lockup occurs. You must have the system configuration data that was shipped with the system or obtain another copy from ENVIRONICS before starting this procedure.

WARNING: All user data will be erased (such as MAINTAIN PORTS settings, stored FLOW/CONC set-ups and stored SEQUENCER set-ups). Be sure to record any relevant information before proceeding.

1. Turn the system off.
2. Remove the top cover to the system.
3. Remove both batteries (yellow) located on the board closest to the front of the system.
4. Wait approximately 10 seconds, then replace the batteries, making sure to observe the correct polarity.
5. Turn the system back on. After several seconds, the front panel should display a message indicating the loss of battery back-up power. If not, go back to step 1 or call ENVIRONICS for assistance.
6. Press any key, as prompted by the display panel. The system should proceed to the READY mode. If it does not, call ENVIRONICS for assistance.
7. Press the following keys to enter the service mode:
   <9>, <UP ARROW>, <DOWN ARROW>,
   <F7> (2nd key from the right, in the bottom row of keys)
   <F8> (rightmost key in the bottom row of keys).
8. Press the INIT MENU key.
9. Press the following keys:
   CLR SETUP (wait 5 seconds)
   CLR MEMX (wait 5 seconds)
   CLR FLOW (wait 5 seconds)
   CLR RS232 (wait 5 seconds)

   IMPORTANT- Be sure to wait for the "XXXXXX INITIALIZED" message to disappear after each key press before pressing the next key.

10. Press DO LOGO, press ENV LOGO and EXIT.
11. If you have a SERIES 9100 instrument, press the INIT 9100 key, otherwise go to the next step.
12. Press ANALOG SET and enter the information from the sheet entitled Analog Assignment Editor. Perform the following steps for each item indicated in parentheses ( ) on the Analog Assignment Editor sheet. If you have an S9100, these tables will automatically initialize. However, the flow controller sizes in your system may vary in size. Verify the information in this table if you have an S9100:

    a. Move the cursor to the "SIZE" row, just below the DAC or ADC number and enter the value indicated on the sheet.
    b. Move the cursor down to "Device#" and enter the number listed on the sheet.
    c. Press the key marked: ADC/DAC (ON)/OFF
    Parentheses should appear around the DAC or ADC number as shown in the sheet.
    d. If a number is listed in the row "ADC Link" on the sheet, move the cursor to the "ADC Link" row and enter the number indicated.

Once all data on the screen matches EXACTLY the data in the ANALOG ASSIGNMENT EDITOR sheet, press EXIT once and press EXIT again.

13. Press SYS MAXS. Enter the information from the sheet entitled SYSTEM SETUP or simply verify the information if you have an S9100. (Note: The sheet may indicate "OZONE INSTALLED=NO", even if high ozone, S2010, is installed.)
14. Press EXIT.
15. Press MFC PORTS. Enter the information from the sheet entitled LEGAL PORT EDITOR or verify if you have an S9100. Use the TOGGLE key to add or delete information to match the sheet.
16. Press EXIT.
17. Press PORT MAP.
18. Enter the MFC number from the sheet entitled PORT TO SOLENOID MAP EDITOR. There should be a separate sheet for each MFC (flow controller). The MFC number is identified in the lower left corner of the sheet.
19. Enter the information from the PORT TO SOLENOID MAP EDITOR for that flow controller or verify if you have an S9100. Use the TOGGLE key to add or delete information to match the sheet. When complete, press EXIT. Repeat steps 18 and 19 for each flow controller.
20. Press EXIT twice. This will return you to the READY screen.
21. Press MORE until the TIME/DATE key appears. Press TIME/DATE.
22. Enter the time (24 hour format HH:MM:SS). Cursor down to the date field and enter the date (in DD:MM:YY format). Press UPDATE, and then EXIT.
23 Press MORE until the CALIBRATE MODE key appears. Press CALIBRATE MODE key.
24. If the SYSTEM SETUP sheet indicates "OZONE INSTALLED=NO", skip to step 26.
25. Press the OZONE key. Press INIT ALL, then press YES. Update the calibration pressure field to the pressure shown in the CALIBRATION PRESSURE FIELD IN THE LIVE DATA OZONE CALIBRATION TABLE. Do not update any other data in this table. Next, press SAVE DATA followed by YES. Then press EXIT.
26. Press MFC FLOW.
27. If you have a SERIES 9100 instrument, skip to step 31.
28. Enter the MFC number from the sheet entitled FLOW CALIBRATION. There should be a sheet for each flow controller. Press ACCEPT twice.
29. Press the INIT CAL key, then press YES. Change the "TRUE FLOW" data to match the information from the FLOW CONTROLLER CALIBRATION sheet for that flow controller. When complete, press SAVE CAL and then press EXIT. Repeat steps 28 and 29 for each flow controller.
30. Go to step 33.
31. Enter the MFC number from the sheet entitled FLOW CALIBRATION. There should be a sheet for each flow controller. Press ACCEPT.
32. Press the INIT COMMAND key. Press INIT TRUE and then YES. Change the "TRUE FLOW" data to match the information from the FLOW CONTROLLER CALIBRATION sheet for that flow controller. When complete, press CALC and then YES. Next, press SAVE CAL DATA and then YES. Press EXIT. Repeat steps 31 and 32 for each flow controller.
33. Press EXIT. This will return you to the main CALIBRATION screen.
34. If you have ADC DEVICE CALIBRATION sheets, go to step 35, otherwise skip to step 38.
35. Press DEVICE ADC.
36. Enter the device number. Enter the calibration data from the ADC DEVICE CALIBRATION SHEET. Press SAVE CAL and EXIT. Repeat step 36 for each ADC DEVICE.
37. Press EXIT.

38. If you have DAC DEVICE CALIBRATION sheets, go to step 39, otherwise skip to step 41.
39. Press DEVICE DAC.
40. Enter the device number. Enter the calibration data from the DAC DEVICE CALIBRATION SHEET. Press SAVE CAL and EXIT. Repeat step 40 for each DAC DEVICE.
41 Press EXIT twice. The instrument should be at the READY screen.

The instrument is now re-initialized to its factory settings. All user configurable data (such as MAINTAIN PORTS, stored FLOW/CONC set-ups and stored SEQUENCER set-ups) must be re-entered.

NOTE: If you have an S2010 with High Ozone, you must enter the NOX test Select MFCs Mode to set up the flow controller to port configuration, refer to NOX CONVERTER EFFICIENCY TEST MFC AND PORT SETUP sheet enclosed with this procedure.

The following procedure gives the steps <u>to do next</u> if suggestions from the Region 6 TTP Supplement to the Environics Troubleshooting Table, above, concerning

the Ozone Stabilization Issue doesn't work. If this procedure, below, doesn't help, then the next step would be to contact the manufacturer and arrange to ship the equipment back to them.

7.3.4. Continuous Zero Air Generator - API 701 [10]

[10]Advanced Pollution Instrumentation, Inc. Instruction Manual for Model 701,

7.3.5. UPS + Power Line Conditioner - Powerware 9125 [11]

7.3.6. ONAN 6.8K Generator - ONAN Commercial Mobile Power[12]

7.3.7. Duo-Therm Roof Top Air Conditioner[13]

7.3.8. WELLS CARGO 18' Express Wagon[14]

7.3.9. DEXTER AXLE[15]

7.3.10. Carbon Monoxide Alarm[16]

Section
6-1.

[11] UPS + Power Line Conditioner - Powerware 9125, Section 9, Pages 55 - 57

[12]ONAN Commercial Mobile Power, Operator's Manual (Models HGJAD, HGJAE, HGJAF), Troubleshooting, Pages 22 - 28.

[13]Duo-Therm 579, Series BRISK AIR, 590 Series QUICK COOL, 595 Series QUICK COOL, Roof Top Air Conditioner Installation & Operating Instructions, Service, Page 9.

[14]WELLS CARGO Owner's Manual, Troubleshooting, Page 22

[15]DEXTER AXLE, Operation Maintenance Service Manual, Troubleshooting, Pages 16, 20, 21, and 30.

[16]Atwood Battery Operated Carbon Monoxide Alarm, User's Guide, Troubleshooting Guide, Page 27.

1. **Note**: Never run the A/C without return air filter in place. This may plug the unit evaporator coil with dirt and may substantially affect the performance of the unit.

2. **Note**: Corrective Action (Per Henry Gerard) - Region 6 had the TTP Mobile Trailer vent replaced at an overall cost of $163.47. (August 2004)

8.0 References

1. Environics 9100 Operator's Manual
2. TEI Model 48C - Instruction Manual TEI Model 49C - Instruction Manual
3. Instruction Manual for the API 701, Continuous Zero Air System
4. User's Guide for Powerware 9125
5. EMC Data System
6. Dexter Axle, Operation & Maintenance Service Manual
7. Owner's Manual for Wells Cargo
8. Operator's Manual for ONAN Commercial Mobile Power
9. Installation & Operating Instructions for Duo-Therm 579 Series Brisk Air; 590 Series Quick Cool; 595 Series Quick Cool Roof Top Air Conditioner
10. Atwood Battery Operated Carbon Monoxide Alarm User's Guide

Field Standard Operating Procedures for the NPEP TTP Performance Evaluation Program

Operation: Quality Assurance / Quality Control

SOP: NPEP-10.01

Name: Printed	Signature	Date

Contents
(applicable to this SOP)

1.0 Scope and Applicability

This procedure summarizes the QA procedures that will be implemented at prescribed frequencies during routine NPEP activities.

2.0 Summary of Method

This procedure summarizes the important quality assurance and quality control procedures.

3.0 Definitions

Appendix A contains a glossary of the terms to be used in the NPEP.

4.0 Personnel Qualifications

Personnel who conduct the TTP PEs must have passed the written and the hands-on practical training examinations for the field component in the NPEP TTP. EPA/EPA contractor's Driver training, specifically for towing trailers, of the size class of the Regional Mobile PE Labs. This training is available through certified instructors at various EPA Regional and National laboratories

5.0 Cautions

The activities described in the procedure below refer to other SOPs where the procedure is described. The referenced SOPs provide the appropriate cautions.

6.0 Equipment and Supplies

The activities described in the procedure below refer to SOPs where the activity is described. The referenced SOPs provide the appropriate equipment and supply list.

7.0 Procedure

Three tables are included in this procedure. These tables summarize QA/QC performed to ensure NPEP data quality meets program objectives. These tables also reflect how data should be evaluated in the validation process.

Table 10-1 summarizes the QC criteria that must be met to produce valid NPEP audit data. These quality checks must be accomplished and verified prior to issuance of a preliminary audit report. If any of these criteria are not met NPEP audits should not proceed or a field report should not be issued.

Table 10-2 summarizes QC checks which may indicate poor performance of the audit system. These checks may or may not be representative of individual audits. The check in Table 10-2 should be performed and evaluated prior to issuing a final audit report. Failures of any check in Table 10-2 should be discussed in the final audit reports of effected audits. In some instances these checks may be used to invalidate audit data.

Table 10-3 summarizes QC evaluations completed to determine the effectiveness of the audit program. The result of these evaluations will be used to identify areas for program improvement and will be summarized in EPA Regional or National reports.

7.1 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained (i.e planned). Each Region has the expected number of sites that need a PE. The NPEP is expected to obtain valid data for at least 85% of these mailed + TTP sites for each year (with every site being completed about every five years) for each gaseous criteria pollutant, with ozone as the highest priority.

Note: Our annual desired goal is 20% of all sites. If we only achieve 85% of that goal in one year, then we have to make it up the next year. Regions sharing mobile TTP PE labs may take more time than one year to achieve the 20% goal.

7.2 Manifold Delivery System

Ozone line loss test- The TTP PE 150ft Performance test gas delivery system is **tested quarterly.** *The line loss factor is updated from the last test, based on latest test, and that factor used in calculating ozone concentrations during a PE.(MBS addition, 9-22-05)*

Shall be cleaned initially upon receipt and as needed thereafter according to procedure for cleaning the hose. (TTP PE SOP Sxn 9.01 7.2.11) At least, complete a visual inspection and a leak check quarterly prior to doing the Line Loss Test (TTP PE Sxn 3.01, 3.7.1) and in the field, at.or by start-up (TTP PE Sxn 4).

Note: If you find fibers from the cotton balls used in the cleaning procedure, you may omit their use, as Region 4 has done at times. However, you are still responsible for elimination of any solid matter that hangs up on the tubing, manifold or interior fitting surfaces, which just fluid solvent and clean air blow out may not dislodge.

7.3 Field QC Checks

Visual inspection of :all indicated flows and pressures; of cleanliness of tubing and manifolds for

visible contamination; of at least hand-tightness of all connections; absence of crimping in all tubing; correct numerical values and expected position of all switches, readouts, valves, needle dial, and rotameter settings. Since all of the system should be under positive pressure, there should be no PE concentration problems from leaks. However, standard gases are too valuable to be wasted, and so a leak check using Snoop or equivalent may be done to confirm that no leaks have developed..

7.4 Analyzer Linearity Checks (Independent Multipoint Calibrations) for Ozone, CO, SO2, NO/NO2

Independent CO analyzer multipoint calibrations (3 points-zero and 2 upscale) are performed on site in the TTP PE Mobile lab prior to the performance of each audit. Independent ozone analyzer multipoint calibrations are performed quarterly, against (in comparison to) the Region's SRP, in multiple runs of 10 points each.

At this time the ozone generator's flow controllers are, indirectly, also checked. The TTP QA group has discussed doing MFC checks, for perception, using the PEP flow standards and a procedure that will be written by the Region 7 SRP and TTP operator.

The annual cross-mobile TTP PE lab, hose-to-hose checks, described in subsection 10.7.6, below, provide annual independent multipoint linearity checks of the system SO2 and NO2 outputs, which are normally not checked by the 4 Regions that do not have the ability to provide that support. Regions 2 and 7 do, and have done those checks, at least annually..

7.5 Standards Recertifications

Initially and thereafter all primary standards shall be verified and transfer standards will be certified as NIST- traceable and will have minimum1-year warranties. Agreements have been set up to provide this certification service. EPA will inform the FS of where and when to send standards for this recertification. Note: Scott-Marrin only certifies its Protocol gas cylinders to bbe within ± 1% of the tag concentration. The low CO in Air standard is only certified, initially, for the first 6 months.

Regional WAMS and ESAT or EPA FS are responsible for ensuring that the cylinders are rechecked after the initial vendor's certification period expires (6 months for the low CO), and at least, for auditee confidence, at least annually, although the vendor's certifications covers at least twice that time.

These checks are to be done according to the EPA Gas Protocol requirement for a G1 procedure, for the ambient level zero, low and high ambient CO cylinders; and G2 procedure, for cylinders, specifically the TTP PE blended gas cylinders, with concentrations greater than ambient.

7.6 Collocated Accuracy

7.6.1 Once-A-Year Collocation (Delivery Hose to Delivery Hose)

A Mobile TTP PE system is used to generate all points in a EPA TTP PE SOP, Section 6 protocol (TTP PE for the Criteria pollutant gases). The gases are delivered to the analyzers of an independent laboratory, or of a mobile lab supplemented by SO2 and NO2 analyzers. The analyzers must be calibrated against NIST SRMs, or against standards that are one (traceable) step from NIST SRMs, at the required frequency for monitoring, and preferably just before the PE.

The % difference should be less than 5%. If it is not, sources of errors should be sought, identified, corrected, and re-tested. Checks for sources of error can include hose to back-of-the-analyzer; independent qualified standard checks; linearity (multipoint calibration) checks, calculation checks, etc.

7.7 Data Validation Process

This procedure describes the QA procedures that will be implemented to verify and validate field data Verification concerns the process of examining a result of a given activity to determine conformance to the stated requirements. Validation refers to examining a result to determine conformance to user needs.

7.7.1 Field Validation

Prior to issuance of the preliminary report

7.7.2 Final Validation

FS and then EPA Final report writer cross-check all primary and supporting data before finalizing the preliminary report.

7.8 Annual / Bi-Annual Reports

On an annual or Biannual basis each Region and/or OAQPS will issue a report which summarize the audits performed and effectiveness of the NPEP program.

Table 10-1 Critical Quality Control Checks.

Requirement	Frequency	Acceptance Criteria	SOP Reference
Manifold Delivery System			
Visual defect check	each audit	See reference	NPEP 4.01, 4.7.2
Field QC Checks			
Zero Air Verification(UPcyl vs 701)	each audit	± 0.1ppm	NPEP-6.01 7.3
CO Calibration Zero, & Hi CO	each audit	± 0.1ppm	NPEP 6.01 7.3
Flow	each audit	0.3-0.4 LPM excess flow	NPEP-3,5, & 6
Manifold Pressure	each audit	near ambient pressure	
Leak checks	each audit		
TTP CO/ O3 Instrument Stability	each audit	5 to 10 min. per point, after 1st point	NPEP-3.01, 5.01
Ozone analyzer flow	each audit	800 (± 10%) cc/min	NPEP-5.01 7.2
Calibration/Verification of Line, 49CPS			
Ozone Line Loss Test	quarterly	<2.5% Average Loss	NPEP-3.01 7.2
Ozone standard calibration	quarterly prior to audit	< 3% slope from SRP <3ppb intercept	NPEP-3.01 7.3.1
CO Calibration	Quarterly, every audit		NPEP-6.01 7.3
Standards Recertifications			
CO (Hi & lo), blended(CO,SO2,and NO), & UP AIR	1/yr, by independent NIST standards;except for 1st Lo CO Recert,	within 3% of Orig. Conc;mfr certs.within 1% at spec.conc.	NPEP-3.01 7.3; Mfr. cert. doc.

Table 10-2 Operational Quality Control Checks.

Requirement	Frequency	Acceptance Criteria	SOP Reference
Manifold Delivery System Clean and throughly inspect: Determine both visually and by analyzer readings	Qrtly/Annual min.	See reference	NPEP- 9.01 7.2.11
QC Checks Activities Zero Air Generator: For each audit using visual & analytical indications Dilution Device (Env 9100: MFC ck)	per audit per audit performance ck	If problem, change out component, see result Verify Operation	NPEP-9.01 7.2.4 NPEP-9.01 7.2.3
9100 vs CO & Ozone Calibration/Verification of Analyzer * Flow Rate (FR) calibration FR multipoint verification	if multipoint failure 1/yr	± 2% of transfer standard ± 2% of transfer standard	3.01 & 6.01: 7.3
Accuracy "Cross-check" of TTP instruments	quarterly	<3.5% difference vs primary standard	NPEP-3.01 7.4

* Ask Thien for MFC Calibration Procedure-Bios - Dry Cal.(By dry piston)

Table 10-1 Systematic Quality Control Checks.

Requirement	Frequency	Acceptance Criteria	SOP Reference
Data Completeness	each site every 2 yrs(85%) all sites every 4-5 yrs	85%	NPEP-10.01
Collocated Accuracy Compare to two TTP vehicles	once per year	<5% difference	NPEP-3.01 7.5
Field Scientist Re-Certification for TTP and Mobile Platform Operation	once per year	Aware of proper NPEP procedures Pass written &hands-on tests	NPEP 1.01 6.?.? (Sections 1-11, +Apps.)

Field Standard Operating Procedures for the NPEP TTP Performance Evaluation Program

Operation: Information Retention

SOP: NPEP-11.01

Name: Printed	Signature	Date

Contents
(applicable to this SOP)

1.0 Scope and Applicability

This SOP defines which records are critical to the project and what information needs to be included in reports, as well as the data reporting format and the document control procedures to be used.

The following information describes the document and records procedures for the NPEP field activities. In EPA's QAPP regulation and guidance, EPA uses the term "reporting package". This term is defined here as all the information required to support the concentration data reported to EPA, which includes all data required to be collected as well as data deemed important by the PEP. Table 11-1 identifies these documents and records.

2.0 Procedures

2.1 Information Included in the Reporting Package

2.1.1 Data Reporting Package Format and Document Control

The NPEP has structured its records management in a similar manner to EPA's records management system (EPA-220-B-97-003) and follows the same coding scheme in order to facilitate easy retrieval of information during EPA technical systems audits (TSAs) and reviews. Table 10-1 includes the documents and records that will be filed according to the statute of limitations discussed in Section 2.3. Table 11-1 also includes a reference to more detailed instruction on the kind and type of data to be included in each record. In order to archive the information as a cohesive unit, all the NPEP information will be filed under the major code "NPEP", followed by the codes in Table 11-1

Table 11-1 $PM_{2.5}$ Reporting Package Information.

Categories	Record/Document Types	File Codes	Reference
Management and Organization	Organizational structure Personnel qualifications and training Training certification Quality management plan EPA directives Support contracts	ADMI/106 PERS/123 AIRP/482 AIRP/216 DIRE/007 CONT/003	NPEP Sec 2 NPEP Sec 2-11 NPEP Sec 2-11
Site Information	Site characterization file (Site Data Sheets) Site maps Site Pictures	AIRP/237 AIRP/237 AUDV/708	

Categories	Record/Document Types	File Codes	Reference
Field and Laboratory Environmental Data Operations	QA project plans Standard operating procedures (SOPs) Field notebooks and communications Sample handling/custody records Inspection/Maintenance records	PROG/185 SAMP/223 SAMP/502/COM TRAN/643 AIRP/486	NPEP QAPP NPEP-Sec 1-11 NPEP- ?? NPEP-Sec 3, 6, 7 NPEP-Sec 9
Raw Data	Any original data (routine and QC data) including data entry forms	SAMP/223	NPEP- Sec 3, 6
Data Reporting	Data/summary/progress reports Journal articles/papers/presentations	AIRP/484 PUBL/250	NPEP- Sec 2, 7
Data Management	Data algorithms Data management plans/flowcharts PM2.5 data Data management systems	INFO/304 INFO/304 INFO/160 INFO/304	
Quality Assurance	Data quality assessments QA reports Response/Corrective action reports Site audits	SAMP/223 OVER/203 PROG/082 OVER/203	

2.1.2 Field Notebooks

The NPEP will issue notebooks to each FS. This notebook will be uniquely numbered and associated with the NPEP TTP Program. Although data entry forms are associated with all routine environmental data operations, the notebooks can be used to record additional information about these operations.

Sample Receipt

One notebook will be issued to each field receiving facility. This notebook will be uniquely numbered and associated with the NPEP TTP Program. For use in logging in sample receipt.

2.1.3 Field Binders

Field binders will also be issued to each FS. These notebooks will be 3-ring binders that will containing the appropriate data forms for routine operations as well as the inspection and maintenance forms and SOPs.

2.1.4 Electronic Data Collection

All raw data required for the calculation of a NPEP TTP concentration, the submission to the AIRS database, and QA/QC data will be collected electronically or on data forms that are included in the field SOP sections. Data listed in Table 11-2 will be collected electronically, as well as the laboratory pre and postsampling weights. Therefore, both primary field and laboratory data will be collected electronically and the calculation of the primary data into a final concentration will also be electronically calculated.

It is anticipated that other data may eventually be electronically collected. In order to reduce the potential for data entry errors, automated systems will be used where appropriate to record the same information found on the data entry forms. In order to provide a back-up, a hardcopy of automated data collection information will be stored for the appropriate time frame in project files.

Table 11-2. Field Measurements.

Information to be Provided	Appendix L Section Reference	Availability				Format	
		Anytime	End of period	Visual display	Data output	Digital reading ??	Units
Station Flow rate, 30-second maximum interval	7.4.5.1	✔	—	✔	*	XX.X	L/min
Flow rate, average for the sample period	7.45.2	*	✔	*	✔	XX.X	L/min
Station ?? Time?	7.4.5.2	*	✔	*	✔●	XX.X	%
TTP Lab Flow Rate (Delivery hose = flow rate	7.4.5.2	✔	✔	✔	✔●	On/Off	
Volume - Manifold ??	7.4.5.2	*	✔	✔	✔●	XX.X	m^3
Temperature, ambient, 30-second interval	7.4.8	✔	—	✔	—	XX.X	°C
Temperature, ambient, min., max., average for the sample period	7.4.8	*	✔	✔	✔●	XX.X	°C
Barometric pressure, ambient, 30-second interval	7.4.9	✔	—	✔	—	XXX	mmHg
Barometric pressure, ambient, min., max., average for the sample period	7.4.9	*	✔	✔	✔●	XXX	mmHg
~~Filter temperature, 30-second interval~~	~~7.4.11~~	~~✔~~	~~—~~	~~✔~~	~~—~~	~~XX.X~~	~~°C~~
~~Filter temperature, differential, 30-minute interval, out of spec. (FLAG)~~[f]	~~7.4.11~~	~~*~~	~~✔~~	~~✔~~	~~✔●~~	~~On/Off~~	
~~Filter temperature, maximum differential from ambient, date, time of occurrence~~	~~7.4.11~~	~~*~~	~~*~~	~~*~~	~~*~~	~~X.X, YY/MM/DD HH:mm~~	~~°C, Yr/Mo/ Day Hr min~~
PE datee and time	7.4.12	✔	—	✔	—	YY/MM/DD HH:mm	Yr/Mo/ Day Hr min

Information to be Provided	Appendix L Section Reference	Availability				Format	
		Anytime	End of period	Visual display	Data output	Digital reading ??	Units
PE Sample start and stop time settings	7.4.12	✔	✔	✔	✔	YY/MM/DD HH:mm	Yr/Mo/ Day Hr min
PE Sample period start time	7.4.12	—	✔	✔	✔●	YYYY/MM M/DD HH:mm	Yr/Mo/ Day Hr min
Elapsed sample time	7.4.13	✱	✔	✔	✔●	HH:mm	Hr min
Elapsed sample time out of spec. (FLAG)[f]	7.4.13	—	✔	✔	✔●	On/Off	
Power interruptions >1 min, start time of first 10	7.4.15.5	✱	✔	✱	✔	1HH:mm, 2HH:mm, etc.	Hr min
User-entered information, such as sampler and site identification	7.4.16	✔	✔	✔	✔●	As entered	

2.1.5 Hand Entered Data

A number of data forms will be entered by hand. These can be found at the end of each field SOP. All hardcopy information will be filled out in indelible ink. Corrections will be made by inserting one line through the incorrect entry, initialing this correction, and placing the correct entry alongside the incorrect entry, if this can be accomplished legibly, or by providing the correct information on a new line.

2.2 Reports to Management

In addition to the reporting package, various reports will be required.

2.2.1 Field Monthly Report

See SOP PEPF-1.01.

2.3 Data Retention/Archive

The information listed in Table 11-1 will be retained by the ESAT contractor for 3 years based on a calendar year (i.e., all data from calendar year 2003 will be archived until 12/31/2006). Upon reaching the 3-year archival date, the ESAT contractor will inform OAQPS that the material has met the archive limit and will ask for a decision on further archiving or disposal.

Appendix D

Glossary

The following glossary is taken from three documents: 1) ANSI/ASQ E4 - 2004(Quality Systems for Environmental Data and Technology Programs - Requirements with Guidance for Use; 2) *EPA Guidance For Quality Assurance Project Plans* EPA QA/G-5; 3) Volume II: Part 1 Ambient Air Quality Monitoring Quality System Development, Date: August 1998

Glossary

Acceptance criteria — Specified limits placed on characteristics of an item, process, or service defined in requirements documents. (ASQC Definitions)

Accuracy — A measure of the closeness of an individual measurement or the average of a number of measurements to the true value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; the EPA recommends using the terms *"precision"* and *"bias"*, rather than "accuracy," to convey the information usually associated with accuracy. Refer to *Appendix D, Data Quality Indicators* for a more detailed definition.

Activity — An all-inclusive term describing a specific set of operations of related tasks to be performed, either serially or in parallel (e.g., research and development, field sampling, analytical operations, equipment fabrication), that, in total, result in a product or service.

Assessment — The evaluation process used to measure the performance or effectiveness of a system and its elements. As used here, assessment is an all-inclusive term used to denote any of the following: audit, performance evaluation (PE), management systems review (MSR), peer review, inspection, or surveillance.

American National Standards Institute (ANSI)- Administrator and coordinator of the U.S. private sector voluntary standardization system.

American Society for Testing and Materials (ASTM) -A professional organization that develops and distributes protocols for testing and provides reference standards.

Analyst - A staff member who weighs the new and used filters and computes the concentration of $PM_{2.5}$ in $\mu g/m^3$.

ANSI/ASTM Class 1 and 2 standards -The standards for weighing operations with a microbalance that are certified by their manufacturer as being in conformance with ASTM's standard specification for laboratory weights and precision mass standards (E 617-9) and particularly the Class 1 and 2 specifications. These standards are traceable to NIST.

Audit of Data Quality (ADQ) — A qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data are of acceptable quality.

Audit (quality) — A systematic and independent examination to determine whether quality activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve objectives.

Authenticate — The act of establishing an item as genuine, valid, or authoritative.

Bias — The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value). Refer to *Appendix D, Data Quality Indicators,*for a more detailed definition.

Blank — A sample subjected to the usual analytical or measurement process to establish a zero baseline or background value. Sometimes used to adjust or correct routine analytical results. A sample that is intended to contain none of the analytes of interest. A blank is used to detect contamination during sample handling preparation and/or analysis.

Calibration — A comparison of a measurement standard, instrument, or item with a standard or instrument of higher accuracy to detect and quantify inaccuracies and to report or eliminate those inaccuracies by adjustments.

Calibration drift — The deviation in instrument response from a reference value over a period of time before recalibration.

Cassette - A device supplied with $PM_{2.5}$ samplers to allow a weighed Teflon® filter to be held in place in the sampler and manipulated before and after sampling without touching the filter and to minimize damage to the filter and/or sample, during such activities

Certification — The process of testing and evaluation against specifications designed to document, verify, and recognize the competence of a person, organization, or other entity to perform a function or service, usually for a specified time.

Chain of custody — An unbroken trail of accountability that ensures the physical security of samples, data, and records.

Characteristic — Any property or attribute of a datum, item, process, or service that is distinct, describable, and/or measurable.

Check standard — A standard prepared independently of the calibration standards and analyzed exactly like the samples. Check standard results are used to estimate analytical precision and to indicate the presence of bias due to the calibration of the analytical system.

Collocated samples — Two or more portions collected at the same point in time and space so as to be considered identical. These samples are also known as field replicates and should be identified as such.

Comparability — A measure of the confidence with which one data set or method can be compared to another.

Completeness — A measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct, normal conditions. Refer to *Appendix D, Data Quality Indicators*, for a more detailed definition.

Computer program — A sequence of instructions suitable for processing by a computer. Processing may include the use of an assembler, a compiler, an interpreter, or a translator to prepare the program for execution. A computer program may be stored on magnetic media and referred to as "software," or it may be stored permanently on computer chips, referred to as "firmware." Computer programs covered in a QAPP are those used for design analysis, data acquisition, data reduction, data storage (databases), operation or control, and database or document control registers when used as the controlled source of quality information.

Conditioning environment -A specific range of temperature and humidity values in which unexposed and exposed filters are to be conditioned for at least 24 hours immediately preceding their gravimetric analysis.

Confidence Interval — The numerical interval constructed around a point estimate of a population parameter, combined with a probability statement (the confidence coefficient) linking it to the population's true parameter value. If the same confidence interval construction technique and assumptions are used to calculate future intervals, they will include the unknown population parameter with the same specified probability.

Confidentiality procedure — A procedure used to protect confidential business information (including proprietary data and personnel records) from unauthorized access.

Configuration — The functional, physical, and procedural characteristics of an item, experiment, or document.

Conformance — An affirmative indication or judgment that a product or service has met the requirements of the relevant specification, contract, or regulation; also, the state of meeting the requirements.

Consensus standard — A standard established by a group representing a cross section of a particular industry or trade, or a part thereof.

Contractor — Any organization or individual contracting to furnish services or items or to perform work.

Control chart - A graphical presentation of quality control (QC) information over a period of time. If a procedure is "in control," the results usually fall within established control limits. The chart is useful in detecting defective performance and abnormal trends or cycles, which can then be corrected promptly.

Corrective action - Any measures taken to rectify conditions adverse to quality and, where possible, to preclude their recurrence.

Correlation coefficient — A number between -1 and 1 that indicates the degree of linearity between two variables or sets of numbers. The closer to -1 or +1, the stronger the linear relationship between the two (i.e., the better the correlation). Values close to zero suggest no correlation between the two variables. The most common correlation coefficient is the product-moment, a measure of the degree of linear relationship between two variables.

Data Quality Objectives (DQOs) — The qualitative and quantitative statements derived from the DQO Process that clarify study's technical and quality objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions.

Data Quality Assessment (DQA) — The scientific and statistical evaluation of data to determine if data obtained from environmental operations are of the right type, quality, and quantity to support their intended use. The five steps of the DQA Process include: 1) reviewing the DQOs and sampling design, 2) conducting a preliminary data review, 3) selecting the statistical test, 4) verifying the assumptions of the statistical test, and 5) drawing conclusions from the data.

Data usability — The process of ensuring or determining whether the quality of the data produced meets the intended use of the data.

Data of known quality — Data that have the qualitative and quantitative components associated with their derivation documented appropriately for their intended use, and when such documentation is verifiable and defensible.

Data Quality Objectives (DQO) Process — A systematic strategic planning tool based on the scientific method that identifies and defines the type, quality, and quantity of data needed to satisfy a specified use. The key elements of the DQO process include:

Data reduction — The process of transforming the number of data items by arithmetic or statistical calculations, standard curves, and concentration factors, and collating them into a more useful form. Data reduction is irreversible and generally results in a reduced data set and an associated loss of detail.

Data Quality Indicators (DQIs) — The quantitative statistics and qualitative descriptors that are used to interpret the degree of acceptability or utility of data to the user. The principal data quality indicators are bias, precision, accuracy (bias is preferred), comparability, completeness, representativeness.

Deficiency — An unauthorized deviation from acceptable procedures or practices, or a defect in an item.

Demonstrated capability — The capability to meet a procurement's technical and quality specifications through evidence presented by the supplier to substantiate its claims and in a manner defined by the customer.

Design change — Any revision or alteration of the technical requirements defined by approved and issued design output documents and approved and issued changes thereto.

Design review — A documented evaluation by a team, including personnel such as the responsible designers, the client for whom the work or product is being designed, and a quality assurance (QA) representative but excluding the original designers, to determine if a proposed design will meet the established design criteria and perform as expected when implemented.

Design - The specifications, drawings, design criteria, and performance requirements. Also, the result of deliberate planning, analysis, mathematical manipulations, and design processes.

Detection Limit (DL) - A measure of the capability of an analytical method to distinguish samples that do not contain a specific analyte from samples that contain low concentrations of the analyte; the lowest concentration or amount of the target analyte that can be determined to be different from zero by a single measurement at a stated level of probability. DLs are analyte- and matrix-specific and may be laboratory-dependent.

Distribution — 1) The appointment of an environmental contaminant at a point over time, over an area, or within a volume; 2) a probability function (density function, mass function, or distribution function) used to describe a set of observations (statistical sample) or a population from which the observations are generated.

Document — Any written or pictorial information describing, defining, specifying, reporting, or certifying activities, requirements, procedures, or results.

Document control — The policies and procedures used by an organization to ensure that its documents and their revisions are proposed, reviewed, approved for release, inventoried, distributed, archived, stored, and retrieved in accordance with the organization's requirements.

Dry-bulb temperature -The actual temperature of the air, which is used for comparison with the wet-bulb temperature.

Duplicate samples — Two samples taken from and representative of the same population and carried through all steps of the sampling and analytical procedures in an identical manner. Duplicate samples are used to assess variance of the total method, including sampling and analysis. See also *collocated sample*.

Electrostatic charge buildup- A buildup of static electrical charge on an item, such as the $PM_{2.5}$ filter, which makes it difficult to handle, attracts or repels particles, and can influence its proper weighing

Environmental technology — An all-inclusive term used to describe pollution control devices and systems, waste treatment processes and storage facilities, and site remediation technologies and their components that may be utilized to remove pollutants or contaminants from, or to prevent them from entering, the environment. Examples include wet scrubbers (air), soil washing (soil), granulated activated carbon unit (water), and filtration (air, water). Usually, this term applies to hardware-based systems; however, it can also apply to methods or techniques used for pollution prevention, pollutant reduction, or containment of contamination to prevent further movement of the contaminants, such as capping, solidification or vitrification, and biological treatment.

Environmental data — Any parameters or pieces of information collected or produced from measurements, analyses, or models of environmental processes, conditions, and effects of pollutants on

human health and the ecology, including results from laboratory analyses or from experimental systems representing such processes and conditions.

Environmental programs — An all-inclusive term pertaining to any work or activities involving the environment, including but not limited to: characterization of environmental processes and conditions; environmental monitoring; environmental research and development; the design, construction, and operation of environmental technologies; and laboratory operations on environmental samples.

Environmental processes — Any manufactured or natural processes that produce discharges to, or that impact, the ambient environment.

Environmental monitoring — The process of measuring or collecting environmental data.

Environmental conditions — The description of a physical medium (e.g., air, water, soil, sediment) or a biological system expressed in terms of its physical, chemical, radiological, or biological characteristics.

Environmental data operations — Any work performed to obtain, use, or report information pertaining to environmental processes and conditions.

Equilibration chamber- A clean chamber usually constructed of plastic or glass, held at near constant temperature and humidity, used to store and condition $PM_{2.5}$ filters until they and their collected particulate sample (if the filters have been exposed) have reached a steady state of moisture equilibration.

Estimate — A characteristic from the sample from which inferences on parameters can be made.

Evidentiary records — Any records identified as part of litigation and subject to restricted access, custody, use, and disposal.

Expedited change — An abbreviated method of revising a document at the work location where the document is used when the normal change process would cause unnecessary or intolerable delay in the work.

Field blank filter- New filters, selected at random, that are weighed at the same time that presampling weights are determined for a set of $PM_{2.5}$ filters and used for QA purposes. These field blank filters are transported to the sampling site in the same manner as filter intended for sampling, installed in the sampler, removed from the sampler without sampling, stored in their protective containers inside the sampler's case at the sampling site until the corresponding exposed filter(s) is (are) retrieved, and returned for postsampling weighing in the laboratory, where it is handled in the same way as an actual sample filter and reweighed as a QC check to detect weight changes due to filter handling

Field (matrix) spike — A sample prepared at the sampling point (i.e., in the field) by adding a known mass of the target analyte to a specified amount of the sample. Field matrix spikes are used, for example, to determine the effect of the sample preservation, shipment, storage, and preparation on analyte recovery efficiency (the analytical bias).

Field split samples — Two or more representative portions taken from the same sample and submitted for analysis to different laboratories to estimate interlaboratory precision.

Field blank — A blank used to provide information about contaminants that may be introduced during sample collection, storage, and transport. A clean sample, carried to the sampling site, exposed to sampling conditions, returned to the laboratory, and treated as an environmental sample.

Filter chamber assembly — As shown in Figures 5.1.6 and 5.1.7, this is referencing the mechanism in the interior of the BGI main unit. This assembly contains the WINS impactor assembly in the upper half and the filter cassette or holder assembly in the lower half.

Financial assistance — The process by which funds are provided by one organization (usually governmental) to another organization for the purpose of performing work or furnishing services or items. Financial assistance mechanisms include grants, cooperative agreements, and governmental interagency agreements.

Finding — An assessment conclusion that identifies a condition having a significant effect on an item or activity. An assessment finding may be positive or negative, and is normally accompanied by specific examples of the observed condition.

Goodness-of-fit test — The application of the chi square distribution in comparing the frequency distribution of a statistic observed in a sample with the expected frequency distribution based on some theoretical model.

Grade — The category or rank given to entities having the same functional use but different requirements for quality.

Graded approach — The process of basing the level of application of managerial controls applied to an item or work according to the intended use of the results and the degree of confidence needed in the quality of the results. (See also *Data Quality Objectives (DQO) Process.*)

Guidance — A suggested practice that is not mandatory, intended as an aid or example in complying with a standard or requirement.

Guideline — A suggested practice that is not mandatory in programs intended to comply with a standard.

Hazardous waste — Any waste material that satisfies the definition of hazardous waste given in 40 CFR 261, "Identification and Listing of Hazardous Waste."

HEPA filter -A high efficiency particulate air filter is an extended-media dry-type filter with a minimum collection efficiency of 99.97% when tested with an aerosol of essentially monodisperse 0.3 μm particles.

Holding time — The period of time a sample may be stored prior to its required analysis. While exceeding the holding time does not necessarily negate the veracity of analytical results, it causes the qualifying or "flagging" of any data not meeting all of the specified acceptance criteria.

Hygrothermograph - Instrument resulting from the combination of a thermograph and a hygrograph and furnishing, on the same chart, simultaneous time recording of ambient temperature and humidity Laboratory blank filter New filters that are weighed at the time of determination of the presampling (tare) weight of each set of $PM_{2.5}$ filters intended for field use. These laboratory blank filters remain in the laboratory in protective containers during the field sampling and are reweighed in each weighing session as a QC check.

Identification error — The misidentification of an analyte. In this error type, the contaminant of concern is unidentified and the measured concentration is incorrectly assigned to another contaminant.

Independent assessment — An assessment performed by a qualified individual, group, or organization that is not a part of the organization directly performing and accountable for the work being assessed.

Inspection — The examination or measurement of an item or activity to verify conformance to specific requirements.

Internal standard — A standard added to a test portion of a sample in a known amount and carried through the entire determination procedure as a reference for calibrating and controlling the precision and bias of the applied analytical method.

Item — An all-inclusive term used in place of the following: appurtenance, facility, sample, assembly, component, equipment, material, module, part, product, structure, subassembly, subsystem, system, unit, documented concepts, or data.

Laboratory analyst- The generic term used to describe the ESAT contractor(s) responsible for the actvities described in the standard operating procedures.

Laboratory split samples — Two or more representative portions taken from the same sample and analyzed by different laboratories to estimate the interlaboratory precision or variability and the data comparability.

Limit of quantitation — The minimum concentration of an analyte or category of analytes in a specific matrix that can be identified and quantified above the method detection limit and within specified limits of precision and bias during routine analytical operating conditions.

Local Standard Time — The time used in the geographic location of the sample site that is set to standard time. Standard time is used in the FRM program to match continuous instruments to filter based instruments. During the winter months all areas of the country use standard time, however in the summer, some areas may go to daylight savings time (one hour ahead of standard).

Management system — A structured, nontechnical system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for conducting work and producing items and services.

Management Systems Review (MSR) — The qualitative assessment of a data collection operation and/or organization(s) to establish whether the prevailing quality management structure, policies, practices, and procedures are adequate for ensuring that the type and quality of data needed are obtained.

Management — Those individuals directly responsible and accountable for planning, implementing, and assessing work.

Mass reference standard - NIST-traceable weighing standards, generally in the range of weights expected for the filters.

Matrix spike — A sample prepared by adding a known mass of a target analyte to a specified amount of matrix sample for which an independent estimate of the target analyte concentration is available. Spiked samples are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

May — When used in a sentence, a term denoting permission but not a necessity.

Mean squared error — A statistical term for variance added to the square of the bias.

Mean (arithmetic) — The sum of all the values of a set of measurements divided by the number of values in the set; a measure of central tendency.

Measurement and Testing Equipment (M&TE) — Tools, gauges, instruments, sampling devices, or systems used to calibrate, measure, test, or inspect in order to control or acquire data to verify conformance to specified requirements.

Memory effects error — The effect that a relatively high concentration sample has on the measurement of a lower concentration sample of the same analyte when the higher concentration sample precedes the lower concentration sample in the same analytical instrument.

Method — A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification), systematically presented in the order in which they are to be executed.

Method blank — A blank prepared to represent the sample matrix as closely as possible and analyzed exactly like the calibration standards, samples, and quality control (QC) samples. Results of method blanks provide an estimate of the within-batch variability of the blank response and an indication of bias introduced by the analytical procedure.

Microbalance - A type of analytical balance that can weigh to the nearest 0.001 mg (that is, one microgram or one-millionth of a gram).

Mid-range check — A standard used to establish whether the middle of a measurement method's calibrated range is still within specifications.

Mixed waste — A hazardous waste material as defined by 40 CFR 261 Resource Conservation and Recovery Act (RCRA) and mixed with radioactive waste subject to the requirements of the Atomic Energy Act.

Must — When used in a sentence, a term denoting a requirement that has to be met.

Nonconformance — A deficiency in a characteristic, documentation, or procedure that renders the quality of an item or activity unacceptable or indeterminate; nonfulfillment of a specified requirement.

Objective evidence — Any documented statement of fact, other information, or record, either quantitative or qualitative, pertaining to the quality of an item or activity, based on observations, measurements, or tests that can be verified.

Observation — An assessment conclusion that identifies a condition (either positive or negative) that does not represent a significant impact on an item or activity. An observation may identify a condition that has not yet caused a degradation of quality.

Organization structure — The responsibilities, authorities, and relationships, arranged in a pattern, through which an organization performs its functions.

Organization — A company, corporation, firm, enterprise, or institution, or part thereof, whether incorporated or not, public or private, that has its own functions and administration.

Outlier — An extreme observation that is shown to have a low probability of belonging to a specified data population.

Parameter — A quantity, usually unknown, such as a mean or a standard deviation characterizing a population. Commonly misused for "variable," "characteristic," or "property."

Peer review — A documented critical review of work generally beyond the state of the art or characterized by the existence of potential uncertainty. Conducted by qualified individuals (or an organization) who are independent of those who performed the work but collectively equivalent in technical expertise (i.e., peers) to those who performed the original work. Peer reviews are conducted to ensure that activities are technically adequate, competently performed, properly documented, and satisfy established technical and quality requirements. An in-depth assessment of the assumptions, calculations, extrapolations, alternate interpretations, methodology, acceptance criteria, and conclusions pertaining to specific work and of the documentation that supports them. Peer reviews provide an evaluation of a subject where quantitative methods of analysis or measures of success are unavailable or undefined, such as in research and development.

Performance Evaluation (PE) — A type of audit in which the quantitative data generated in a measurement system are obtained independently and compared with routinely obtained data to evaluate the proficiency of an analyst or laboratory.

$PM_{2.5}$ sampler - A sampler used for monitoring $PM_{2.5}$ in the atmosphere that collects a sample of

particulate matter from the air based on principles of inertial separation and filtration. The sampler also maintains a constant sample flow rate and may record the actual flow rate and the total volume sampled. $PM_{2.5}$ mass concentration is calculated as the weight of the filter catch divided by the sampled volume. A sampler cannot calculate $PM_{2.5}$ concentration directly

$PM_{2.5}$- Particulate matter (suspended in the atmosphere) having an aerodynamic diameter less than or equal to a nominal 2.5 μm, as measured by a reference method based on 40 CFR Part 50, Appendix L, and designated in accordance with 40 CFR Part 53.

Pollution prevention — An organized, comprehensive effort to systematically reduce or eliminate pollutants or contaminants prior to their generation or their release or discharge into the environment.

Polonium-210 (^{210}Po) antistatic strip - A device containing a small amount of ^{210}Po that emits α particles (He^{2+}) that neutralize the static charge on filters, making them easier to handle and their weights more accurate.

Polytetrafluoroethylene (PTFE)- The polymer that is used to manufacture the 46.2-mm diameter filters for $PM_{2.5}$ Federal Reference Method (FRM) and Federal Equivalent Method (FEM) samplers. Also known as Teflon®.

QA supervisor or coordinator - A staff member who assists in preparation of the reporting organization's quality plan, makes recommendations to management on quality issues (including training), oversees the quality system's control and audit components, and reports the results.

Population — The totality of items or units of material under consideration or study.

Precision — A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions expressed generally in terms of the standard deviation. Refer to *Appendix D, Data Quality Indicators,* for a more detailed definition.

Procedure — A specified way to perform an activity.

Process — A set of interrelated resources and activities that transforms inputs into outputs. Examples of processes include analysis, design, data collection, operation, fabrication, and calculation.

Project — An organized set of activities within a program.

Qualified services — An indication that suppliers providing services have been evaluated and determined to meet the technical and quality requirements of the client as provided by approved procurement documents and demonstrated by the supplier to the client's satisfaction.

Qualified data — Any data that have been modified or adjusted as part of statistical or mathematical evaluation, data validation, or data verification operations.

Quality control (QC) sample — An uncontaminated sample matrix spiked with known amounts of analytes from a source independent of the calibration standards. Generally used to establish intra-laboratory or analyst-specific precision and bias or to assess the performance of all or a portion of the measurement system.

Quality improvement — A management program for improving the quality of operations. Such management programs generally entail a formal mechanism for encouraging worker recommendations with timely management evaluation and feedback or implementation.

Quality management — That aspect of the overall management system of the organization that determines and implements the quality policy. Quality management includes strategic planning, allocation of resources, and other systematic activities (e.g., planning, implementation, and assessment)

pertaining to the quality system.

Quality Control (QC) — The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality. The system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against "out of control" conditions and ensuring the results are of acceptable quality.

Quality — The totality of features and characteristics of a product or service that bears on its ability to meet the stated or implied needs and expectations of the user.

Quality Assurance (QA) — An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client.

Quality Assurance Program Description/Plan — See *quality management plan*.

Quality Assurance Project Plan (QAPP) — A formal document describing in comprehensive detail the necessary quality assurance (QA), quality control (QC), and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. The QAPP components are divided into four classes: 1) Project Management, 2) Measurement/Data Acquisition, 3) Assessment/Oversight, and 4) Data Validation and Usability. Guidance and requirements on preparation of QAPPs can be found in EPA QA/R-5 and QA/G-5.

Quality system — A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required quality assurance (QA) and quality control (QC).

quality system audit
a documented activity performed to verify, by examination and evaluation of objective evidence, that applicable elements of the quality system are appropriate and have been developed, documented, and effectively implemented in accordance and in conjunction with specified requirements.

Quality Management Plan (QMP) — A formal document that describes the quality system in terms of the organization's structure, the functional responsibilities of management and staff, the lines of authority, and the required interfaces for those planning, implementing, and assessing all activities conducted.

Radioactive waste — Waste material containing, or contaminated by, radionuclides, subject to the requirements of the Atomic Energy Act.

Readability - The smallest difference between two measured values that can be read on the microbalance display. The term "resolution" is a commonly used synonym.

Readiness review — A systematic, documented review of the readiness for the start-up or continued use of a facility, process, or activity. Readiness reviews are typically conducted before proceeding beyond project milestones and prior to initiation of a major phase of work.

Record (quality) — A document that furnishes objective evidence of the quality of items or activities and that has been verified and authenticated as technically complete and correct. Records may include photographs, drawings, magnetic tape, and other data recording media.

Recovery — The act of determining whether or not the methodology measures all of the analyte contained in a sample. Refer to *Appendix D, Data Quality Indicators,* for a more detailed definition.

Remediation — The process of reducing the concentration of a contaminant (or contaminants) in air, water, or soil media to a level that poses an acceptable risk to human health.

Repeatability - A measure of the ability of a microbalance to display the same result in repetitive weighings of the same mass under the same measurement conditions. The term "precision" is sometimes used as a synonym.

Repeatability — The degree of agreement between independent test results produced by the same analyst, using the same test method and equipment on random aliquots of the same sample within a short time period.

Reporting limit — The lowest concentration or amount of the target analyte required to be reported from a data collection project. Reporting limits are generally greater than detection limits and are usually not associated with a probability level.

Representativeness — A measure of the degree to which data accurately and precisely represent a characteristic of a population, a parameter variation at a sampling point, a process condition, or an environmental condition. See also *Appendix D, Data Quality Indicators.*

Reproducibility — The precision, usually expressed as variance, that measures the variability among the results of measurements of the same sample at different laboratories.

Requirement — A formal statement of a need and the expected manner in which it is to be met.

Research (basic) — A process, the objective of which is to gain fuller knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications toward processes or products in mind.

Research (applied) — A process, the objective of which is to gain the knowledge or understanding necessary for determining the means by which a recognized and specific need may be met.

Research development/demonstration — The systematic use of the knowledge and understanding gained from research and directed toward the production of useful materials, devices, systems, or methods, including prototypes and processes.

Round-robin study — A method validation study involving a predetermined number of laboratories or analysts, all analyzing the same sample(s) by the same method. In a round-robin study, all results are compared and used to develop summary statistics such as interlaboratory precision and method bias or recovery efficiency.

Ruggedness study — The carefully ordered testing of an analytical method while making slight variations in test conditions (as might be expected in routine use) to determine how such variations affect test results. If a variation affects the results significantly, the method restrictions are tightened to minimize this variability.

Scientific method — The principles and processes regarded as necessary for scientific investigation, including rules for concept or hypothesis formulation, conduct of experiments, and validation of hypotheses by analysis of observations.

Self-assessment — The assessments of work conducted by individuals, groups, or organizations directly responsible for overseeing and/or performing the work.

Sensitivity — the capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest. Refer to *Appendix D, Data Quality Indicators,* for a more detailed definition.

Service — The result generated by activities at the interface between the supplier and the customer, and the supplier internal activities to meet customer needs. Such activities in environmental programs include design, inspection, laboratory and/or field analysis, repair, and installation.

Shall — A term denoting a requirement that is mandatory whenever the criterion for conformance with the specification permits no deviation. This term does not prohibit the use of alternative approaches or methods for implementing the specification so long as the requirement is fulfilled.

Should — A term denoting a guideline or recommendation whenever noncompliance with the specification is permissible.

Significant condition — Any state, status, incident, or situation of an environmental process or condition, or environmental technology in which the work being performed will be adversely affected sufficiently to require corrective action to satisfy quality objectives or specifications and safety requirements.

Software life cycle — The period of time that starts when a software product is conceived and ends when the software product is no longer available for routine use. The software life cycle typically includes a requirement phase, a design phase, an implementation phase, a test phase, an installation and check-out phase, an operation and maintenance phase, and sometimes a retirement phase.

Source reduction — Any practice that reduces the quantity of hazardous substances, contaminants, or pollutants.

Span check — A standard used to establish that a measurement method is not deviating from its calibrated range.

Specification — A document stating requirements and referring to or including drawings or other relevant documents. Specifications should indicate the means and criteria for determining conformance.

Spike — A substance that is added to an environmental sample to increase the concentration of target analytes by known amounts; used to assess measurement accuracy (spike recovery). Spike duplicates are used to assess measurement precision.

Split samples — Two or more representative portions taken from one sample in the field or in the laboratory and analyzed by different analysts or laboratories. Split samples are quality control (QC) samples that are used to assess analytical variability and comparability.

Standard Operating Procedure (SOP) — A written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps and that is officially approved as the method for performing certain routine or repetitive tasks.

Standard deviation — A measure of the dispersion or imprecision of a sample or population distribution expressed as the positive square root of the variance and has the same unit of measurement as the mean.

Supplier — Any individual or organization furnishing items or services or performing work according to a procurement document or a financial assistance agreement. An all-inclusive term used in place of any of the following: vendor, seller, contractor, subcontractor, fabricator, or consultant.

Surrogate spike or analyte — A pure substance with properties that mimic the analyte of interest. It is unlikely to be found in environmental samples and is added to them to establish that the analytical method has been performed properly.

Surveillance (quality) — Continual or frequent monitoring and verification of the status of an entity and the analysis of records to ensure that specified requirements are being fulfilled.

Technical Systems Audit (TSA) — A thorough, systematic, on-site qualitative audit of facilities, equipment, personnel, training, procedures, recordkeeping, data validation, data management, and reporting aspects of a system.

Technical review — A documented critical review of work that has been performed within the state of the art. The review is accomplished by one or more qualified reviewers who are independent of those who performed the work but are collectively equivalent in technical expertise to those who performed the original work. The review is an in-depth analysis and evaluation of documents, activities, material, data, or items that require technical verification or validation for applicability, correctness, adequacy, completeness, and assurance that established requirements have been satisfied.

Traceability — The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical constants or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project.

Traceability - The property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons, all having stated uncertainties. Many quality assurance programs demand traceability of standards to a national standard. In most cases this can be achieved through a standard traceable to NIST.

Trip blank — A clean sample of a matrix that is taken to the sampling site and transported to the laboratory for analysis without having been exposed to sampling procedures.

user
when used in the context of environmental programs, an organization, group, or individual that utilizes the results or products from environmental programs.

Validation — Confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use have been fulfilled. In design and development, validation concerns the process of examining a product or result to determine conformance to user needs. See also *Appendix G, Data Management.*

Variance (statistical) — A measure or dispersion of a sample or population distribution. Population variance is the sum of squares of deviation from the mean divided by the population size (number of elements). Sample variance is the sum of squares of deviations from the mean divided by the degrees of freedom (number of observations minus one).

Verification — Confirmation by examination and provision of objective evidence that specified requirements have been fulfilled. In design and development, verification concerns the process of examining a result of a given activity to determine conformance to the stated requirements for that activity.

Wet-bulb thermometer - A thermometer with a muslin-covered bulb, which is moistened and which is used to measure the wet-bulb temperature.

Wet-bulb temperature - The temperature of the wet-bulb thermometer at equilibrium with a constant flow of ambient air at a rate of from 2.5 to 10.0 meters per second.

Zero -