# TN Ambient Air Monitoring Plan

Tennessee Dept. of Environment and Conservation
Air Pollution Control Division

July 1, 2017

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## Annual Air Monitoring Network Plan Acronym Glossary

ANMP........ Annual Network Monitoring Plan
AQS........ Air Quality Subsystem
BAM........ Beta Attenuation Monitor
CASTNET........ Clean Air Status and Trends Network
CBSA........ Core-Based Statistical Area
CFR........ Code of Federal Regulations
CO........ Carbon Monoxide
DAPC........ Division of Air Pollution Control
DV........ Design Value
EFO........ Environmental Field Office
EPA........ Environmental Protection Agency
FEM........ Federal Equivalent Method
FRM........ Federal Reference Method
$\mu g/m^3$........ Micro Grams per Cubic Meters
NAAQS........ National Ambient Air Quality Standards
NCO........ Nashville Central Office
NCORE........ National Core Monitoring Station
NEI........ National Emissions Inventory
NFO........ Nashville Field Office
NPS........ National Park Service
$NO_2$........ Nitrogen Dioxide
$NO_x$........ Nitrogen Oxides
$NO_y$........ Reactive Oxides of Nitrogen
$O_3$........ Ozone
PAMS........ Photochemical Assessment Monitoring Station
Pb........ Lead
$PM_{2.5}$........ Particles with an average aerodynamic diameter of 2.5 microns or less
$PM_{10}$........ Particles with an average aerodynamic diameter of 10 microns or less
PWEI........ Population Weighted Emission Index
POC........ Parameter Occurrence Code
ppb........ Parts Per Billion
ppm........ Parts Per Million
PQAO........ Primary Quality Assurance Organization
PSD........ Prevention of Significant Deterioration
QAPP........ Quality Assurance Project Plan
SLAMS........ State and Local Air Monitoring Stations
$SO_2$........ Sulfur Dioxide
SOP........ Standard Operating Procedure
SPM........ Special Purpose Monitor
TEOM........ Tapered Element Oscillating Microbalance
TDEC........ Tennessee Department of Environment and Conservation
VSCC........ Very sharp cut cyclone
WINS........ Well-type Impactor Ninety-six

## Introduction to the 2017/18 Ambient Air Monitoring Plan for Tennessee

The plan that is presented in the following pages will address each of the requirements specified in the Code of Federal Regulations (CFR). An overview of the geography, general climate, wind patterns and population trends are included to provide background information that will assist the reader in understanding the current air monitoring network and reasons for placement of the existing monitoring sites. The actual regulatory requirements that specify the number and placement of air monitoring sites are found in 40 CFR 58. The sections that provide this guidance are also included in the report as a reference to help better understand the actual monitoring needs in a given area.

In many instances, the “areas” for which monitoring is required are based on population criteria in which population must be considered to allow for monitoring in the areas where populations may be affected or exposed to the various criteria pollutants of concern. Additional monitoring sites are needed to address areas where source related emission density might be elevated and impact communities in the same area. Other considerations must also be addressed when selecting and operating air monitoring sites. The local influences of some types of sources (roadway dust or emissions) may be factors that require monitoring sites to be spaced certain distances from those sources or in the case or near-road or roadway monitoring activities, the monitors must be located very close to the potential sources of mobile emissions.

The principal areas in Tennessee with air monitoring sites are depicted with a graphic showing the locations for each of the monitoring sites. The sites are further identified with a site number, an Air Quality Site Identification (AQSID) and the types of pollutants being monitored for at each location. Tables containing the relevant information for each site are also included. The tables are provided in two sections following the location graphic and have been condensed and combined from the previous year’s format so that all relevant information can be found within each area’s section of the report and relieves the reader from searching tables at the end of the report for information about a given site.

Each of the four local programs operating an air monitoring network in Tennessee provided a separate annual review. The local program’s air monitoring network plan will be submitted at the same time as the state of Tennessee’s annual ambient air monitoring plan. Where revisions were noted in the local networks, those revisions were added to the state’s overall plan see Table 2: Metropolitan Monitoring Configuration for 2017.

The recent changes in the National Ambient Air Quality Standards (NAAQS) have resulted in a need to evaluate additional air monitoring in order to comply with the new standards. In some cases (PM, $O_3$, $SO_2$ and $NO_2$), the revisions to the standard were augmented with revisions to the monitoring requirements. Some of the necessary changes to the monitoring networks have been completed while others are being planned for implementation. These changes appear in the QA Handbook Volume II January, 2017.

The state of Tennessee is required to evaluate the ambient air monitoring network each year in accordance with requirements specified in 40 CFR Subpart B 58.10 and 40 CFR 58 Appendix D. All ambient air monitoring sites are meeting these regulatory requirements. Air monitoring evaluations are shown in Appendix I: Annual Site Evaluations. The Jackson and Lawrence air monitors have approved EPA waivers shown in Appendix F: EPA Approval and Special Request Letters.

# Proposed Revisions to Tennessee's Ambient Air Monitoring Network

**$PM_{2.5}$ Monitoring:**

The state of Tennessee does not propose to shut down any of the $PM_{2.5}$ monitoring sites currently in operation but will propose adding to the sites an FEM continuous monitor so that eventually all but one of the $PM_{2.5}$ sites are equipped with an FEM continuous monitor. The following table details the proposed modifications to this network, once the FEM monitors are installed, a period of correlation testing will be performed with the FRM and FEM samplers, both operating at the same time. After suitable amounts of data are generated, the FRM samplers meeting the correlation testing will be evaluated for shutdown. Using EPA's monitoring siting criteria; colocation for the new FEM samplers will be implemented. The need for meeting colocation requirements for the remaining filter based FRM's will be addressed based on the minimum requirements for colocation. Tennessee is proposing to move the Clarksville $PM_{2.5}$ monitoring site due to safety concerns of the elevated platforms that are a part of the sampling network. Jackson and Lawrence monitoring sites have received a siting waiver and will be moved as soon as suitable locations are identified. EPA has no Source Oriented $PM_{2.5}$ network monitoring requirements. The state of Tennessee will complete the establishment of the FEM monitoring network for $PM_{2.5}$ during July 2017 through the end of December 2017.

**Table 1: PM 2.5 Change Out Schedule**

| County | $PM_{2.5}$ FRM Site ID | Street Address | Replace TEOM with a BAM 1022 | Proposed BAM 1022 FEM | Existing BAM 1022 FEM | $PM_{2.5}$ FRM Filter Based Sampler to Remain | Change out Schedule |
|---|---|---|---|---|---|---|---|
| Blount | 470090011 | 2007 Sequoyah Ave, Maryville TN 37803 | Yes | Yes | No | No | 7/1/2017 to 12/31/2017 |
| Dyer | 470450004 | 175-B Greenwood St, Dyersburg TN 38024 | Yes | Yes | Yes | No | 7/1/2017 to 12/31/2017 |
| Lawrence | 470990002 | 355 Busby Rd, Loretto, TN 38469 | Yes | Yes | No | No | 7/1/2017 to 12/31/2017 |
| Loudon | 471050108 | 1703 Roberts Rd, Loudon, TN | N/A | Yes | Yes | No | 7/1/2017 to 12/31/2017 |
| McMinn | 470071002 | 707 N Jackson St, Athens, TN 37303 | Yes | Yes | Yes | No | 7/1/2017 to 12/31/2017 |
| Madison | 471130006 | 1371-A North Pky, Jackson, TN 38301 | Yes | Yes | No | No | 7/1/2017 to 12/31/2017 |
| Maury | 471192007 | 1600 Nashville Hwy, Columbia, TN | N/A | Yes | Yes | No | 7/1/2017 to 12/31/2017 |
| Montgomery | 471251009 | 1514-C Golf Club Ln, Clarksville, TN 37040 | Yes | Yes | Yes | No | Operating |
| Putnam | 471410005 | 630 East 20th St, Cookeville, TN 38501 | N/A | Yes | Yes | No | 7/1/2017 to 12/31/2017 |
| Roane | 471450004 | 1002 N. Roan St, Harriman, TN 37748 | Yes | Yes | Yes | No | 7/1/2017 to 12/31/2017 |
| Sullivan | 471631007 | 1649 D St, Kingsport TN 37664 | Yes | Yes | Yes | No | 7/1/2017 to 12/31/2017 |
| Sumner | 471650007 | Rockland Recreation Area Old Hickory Dam Army Corp of Engineer Property | Yes | Yes | Yes | Yes | 7/1/2017 to 12/31/2017 |

**$PM_{10}$ Monitoring:**

The state of Tennessee does not operate any $PM_{10}$ monitors as a part of the state network. The last $PM_{10}$ site, Luttrel, was shut down on December 31, 2015. Additional information on the monitoring requirements can be found in Appendix E: Monitoring Network Requirements.

**Ozone Monitoring:**

The Blountville and Fairview ozone sites have been relocated to comply with federal siting criteria. The Blountville site was moved 100 feet from its 2016 location and is considered a site reconfiguration. The EPA approval letter is attached. The Fairview site was relocated on the same property to meet the 40 CFR 58 siting criteria. The Fairview site was relocated March 20, 2017 and began collecting data on March 29, 2017. Additional information can be found in Appendix F: EPA Approval and Special Request Letters and Appendix H: Fairview (471870106) Relocation Request.

**Carbon Monoxide Monitoring:**
The state of Tennessee does not operate any CO monitors as a part of the state network. Additional information on the monitoring requirements can be found in Appendix E: CO Monitoring Network Requirements.

**Nitrogen Dioxide Monitoring:**
The state of Tennessee does not operate any $NO_2$ monitors as a part of the state network. Additional information on the monitoring requirements can be found in Appendix E: $NO_2$ Monitoring Network Requirements.

**Community Wide Monitors**
An $NO_2$ monitoring site that meets the community wide monitoring requirement is already in operation in the Nashville CBSA. The $NO_2$ monitor AQS ID 47-037-0011, located on Trinity Lane in Nashville, Tennessee is identified in AQS as a SLAMS monitor. In the Memphis CBSA the state of Arkansas currently operates an $NO_2$ monitor at its Marion site, (AQS 05-035-0005).

**National Core Monitoring Station**
In October 2006, the United States Environmental Protection Agency (EPA) established the National Core (NCore) multi-pollutant monitoring network in its final amendments to the ambient air monitoring regulations for criteria pollutants (codified in 40 CFR parts 53 and 58). It is the expectation that each state will have at least one NCore site. Nationwide, approximately 50 sites will be located in urban locations and 20 sites in rural areas. The multi-pollutant monitoring approach at NCore sites will benefit health assessments, emissions strategy development, and future monitoring efforts. By providing data users, such as researchers and policy makers, with a robust suite of collocated pollutant and meteorological data, NCore sites will better characterize the numerous chemical and physical interactions between pollutants than what is traditionally available at compliance oriented monitoring sites. Shelby County operates the only required NCORE site in Tennessee. This site detailed in the Shelby's county ANMP plan. The Look Rock rural NCORE site is an optional site operated by NPS. Further details can be found in Appendix E: NCore Look Rock Monitoring Site.

**Near-Road Monitors:**
There are currently two Near Road sites in Tennessee, both operated in local program counties (Davidson and Shelby). The near-road monitoring network was initiated as part of the 2010 NO2 NAAQS review and has become a multi-pollutant (CO, $NO_2$, NO, $NO_x$, $PM_{2.5}$) monitoring network. The EPA, in cooperation with state, local, and tribal air agencies has tracked the installation of near-road NO2 monitoring stations across the country. As part of this effort, the Agency has created a list of sites and captured critical meta-data about the sites, their target roads and general operations. Additional information on near-road monitoring network can be found at https://www3.epa.gov/ttnamti1/nearroad.html and in Appendix E: Monitoring Network Requirements.

**Lead Monitoring:**
The state operates a single lead monitoring site in Sullivan County, Tennessee in the vicinity of the currently shutdown Exide facility. This site is located within the boundary of the current Bristol lead maintenance area. The site will be requested to be shutdown based on the closure of the sole lead source, now reclassified to attainment/maintenance and the surrender of air permits by the source.

**Prevention of Significant Deterioration (PSD) monitoring:**
The Prevention of Significant Deterioration (PSD) permitting program is a Clean Air Act preconstruction review program for new and modified major sources of air pollution (e.g., power plants, manufacturing facilities) where the area the source is located is classified as either in attainment or unclassifiable with the National Ambient Air Quality Standards (NAAQS). The NAAQS establishes maximum pollution concentration levels to protect public health and welfare from harmful levels of nitrogen oxides, ozone, sulfur dioxide, particulates, carbon monoxide,

and lead. A PSD increment is the maximum allowable increase in concentration towards the NAAQS from the baseline concentration for a pollutant. The baseline concentration is set for each existing pollutant at the time that the first complete PSD permit application affecting the area is submitted. PSD increments prevent the air quality in clean areas from completely consuming remaining air quality to the level set by the NAAQS. This monitoring requirement is triggered when there is insufficient ambient air quality data necessary to determine compliance with the NAAQS. Under these criteria, either pre or post construction monitoring may be required to be conducted in the area near the facility being constructed.

Currently, TDEC DAPC does not have any PSD monitors are operating in Tennessee.

**Sulfur Dioxide Monitoring:**
The state of Tennessee operates two $SO_2$ monitoring sites in the Kingsport, TN area named as nonattainment by EPA in Sullivan County, Tennessee. One is located on Skyland Drive (AQS 47-163-6002; Skyland) and the other on Wilburn Drive (AQS 47-163-6001; Ross N Robinson). These sites satisfy the PWEI (Pollution Weighted Emissions Index) requirements for the Kingsport CBSA. The state of Tennessee is investigating additional locations in the nonattainment area for $SO_2$ monitoring.

The state of Tennessee also operates an $SO_2$ monitoring site at Freels Bend (AQS 47-001-0101; Freels Bend), in Anderson County, Tennessee. This site was established to assess emission impacts from a nearby TVA fossil plant. The Knoxville CBSA is required to operate one $SO_2$ monitor based on the previous PWEI, however based upon the new 2014 NEI and 2016 CBSA population estimate; this may no longer be a requirement. TDEC DAPC will look into this further and determine the necessity when the final 2014 NEI is released.

## The Purpose of Tennessee's Ambient Air Monitoring Network

There are several criteria used to determine the need for ambient air quality monitoring. Some of the criteria are as follows:

- EPA National Ambient Air Quality Standards (NAAQS) Criteria pollutant monitoring network requirements for the NCore (National Core), formally NAMS (National Air Monitoring Site); SLAMS (State and Local Air Monitoring Site); and SPM (Special Purpose Monitoring) monitoring networks
- The Code of Federal Regulations (CFR) sets forth as regulations the requirements for air quality monitoring to be implemented by the states and EPA. These requirements are primarily organized around population and emission density in a given area with the number of required monitors and the distribution of the monitors within the networks specified by these regulations. Additionally 40CFR, Part 58, Appendix D specifies criteria that must be followed in designing the NCore and SLAMS networks. The EPA must approve design and/or modifications to these networks.
- Additional federal regulations also specify requirements for Prevention of Significant Deterioration (PSD) monitoring networks. This monitoring requirement is triggered as part of a PSD permit application review where there is no representative contemporaneous ambient air quality data for the area near the proposed PSD source site. Under these criteria, either pre or post construction monitoring may be required to be conducted in the area near the facility likely to be impacted (as determined by modeling) by emissions.
- Air quality monitoring is required to be conducted to alert citizens in given areas to elevated levels of air pollutants in cities or communities of designated population levels that are required to provide Air Quality Index (AQI) reports to the general public.
- Air quality monitoring is conducted to address the need for background air quality data.
- Special air quality monitoring studies are conducted based on identified needs for monitoring data in a given area.
- Citizen complaints and enforcement investigations related to air quality are other reasons for air quality monitoring usually in or around a specific area related to the complaint or investigation.
- Where warranted, requests from citizens for special air monitoring studies are also a reason for air monitoring activities.
- The federal regulations also specify the frequency, method, location requirements, equipment, quality assurance procedures and reporting of data collected from the ambient air monitoring networks.

## Table 2: Metropolitan Monitoring Configuration for 2017

| Census Area Identification and Population | | | Monitoring Program | Lead | | CO | | $SO_2$ | | $NO_2$ | | Ozone | | | $PM_{10}$ | | $PM_{2.5}$ | | | | $PM_{2.5}$ Speciation | | $PM_{2.5}$ Cont. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CBSA Code | Census 2010 / 2016 | CBSA Title (MS Areas) | State / PQAO | Operating | Required | Operating | Required | Operating | Required | Operating | Required | Operating | 2014 2016 8 Hr DV (ppm) | Required | Operating | Required | Operating | 2014 2016 Annual DV μg/m$^3$ | 2014 2016 24 Hr DV μg/m$^3$ | Required | Operating | Required | Operating | Required |
| 16860 | 528,143 551,632 | Chattanooga, TN-GA | GA 0437 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1(b) | 0 | 0.068 | 2 | 0 | 1(d) | 1 | 8.7(c) | 18(c) | 2 | 0 | 1(a) | 0 | 1 |
| | | | TN 0170 | 0 | | 0 | | 0 | | 0 | | 2 | | | 0(d) | | 3 | | | | 0 | | 1 | |
| | | | TN 1025 | 0 | | 0 | | 0 | | 0 | | 0 | | | 0 | | 0 | | | | 0 | | 0 | |
| 17300 | 260,625 282,349 | Clarksville, TN-KY | KY 0584 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.062 | 1 | 0 | 0 | 0 | 8.5 | 18 | 1 | 0 | 0 | 0 | 1 |
| | | | TN 1025 | 0 | | 0 | | 0 | | 0 | | 0 | | | 0 | | 1 | | | | 0 | | 1 | |
| 17420 | 115,788 121,262 | Cleveland, TN | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | | 0 | 0 | 0 | 0 | 0 |
| 27180 | 130,011 129,527 | Jackson, TN | TN 1025 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 2 | 7.7 | 16 | 0 | 0 | 0 | 2 | 1 |
| 27740 | 198,716 201,667 | Johnson City, TN | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | | 0 | 0 | 0 | 0 | 0 |
| 28700 | 309,544 306,334 | Kingsport-Bristol-Bristol, TN-VA | TN 1025 | 3 | 1 | 0 | 0 | 2 | 1 | 0 | 0 | 2 | 0.066 | 1 | 0 | 0 | 1 | 8.1(c) | 16(c) | 0 | 0 | 0 | 1 | 0 |
| | | | VA 1127 | 0 | | 0 | | 0 | | 0 | | 0 | | | 0 | | 0 | | | | 0 | | 0 | |
| 28940 | 837,571 868,546 | Knoxville, TN | TN 0581 | 3 | 1 | 0 | 0 | 0 | 1 | 0 | 1(b) | 2 | 0.069 | 2 | 3 | 1 | 4 | 10.4(c) | 33(c) | 2 | 1 | 0 | 1 | 1 |
| | | | NPS 0745 | 0 | | 1 | | 1 | | 0 | | 2 | | | 0 | | 0 | | | | 0 | | 1 | |
| | | | TN 1025 | 0 | | 0 | | 1 | | 0 | | 2 | | | 0 | | 3 | | | | 0 | | 3 | |
| 32820 | 1,324,829 1,342,842 | Memphis, TN-MS-AR | AR 0055 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 2 | 1 | 0.067 | 2 | 0 | 2 | 0 | 8.6 | 18 | 2 | 0 | 1 | 0 | 1 |
| | | | MS 073 | 0 | | 0 | | 0 | | 0 | | 1 | | | 0 | | 0 | | | | 0 | | 0 | |
| | | | TN 0673 | 1 | | 3 | | 1 | | 1 | | 3 | | | 2 | | 2 | | | | 1 | | 1 | |
| | | | TN 1025 | 0 | | 0 | | 0 | | 0 | | 0 | | | 0 | | 0 | | | | 0 | | 0 | |
| 34100 | 113,951 117,320 | Morristown, TN | TN 1025 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.068 | 1 | 0 | 0 | 0 | | | 0 | 0 | 0 | 0 | 0 |
| 34980 | 1,670,890 1,865,298 | Nashville-Davidson—Murfreesboro | TN 0682 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 0.067 | 2 | 1(d) | 2(d) | 2 | 9.6 | 20 | 2 | 0 | 1(a) | 1 | 1 |
| | | | TN 1025 | 0 | | 0 | | 0 | | 0 | | 3 | | | 0 | | 2 | | | | 0 | | 2 | |

(a) EPA has defunded the required speciation sampling in these areas. The CFR requirement has not been revised.
(b) This monitor is the near road site that may not be funded. The CFR requirement has not been revised.
(c) This data is subject to change upon EPA's concurrence of exceptional event requests.
(d) Monitoring agency receives a waiver from EPA Region 4.

## Table 3: Micropolitan Monitoring Configuration for 2017

| Census Area Identification and Population | | | Monitoring Program | Lead | | CO | | $SO_2$ | | $NO_2$ | | Ozone | | | $PM_{10}$ | | $PM_{2.5}$ | | | | $PM_{2.5}$ Speciation | | $PM_{2.5}$ Cont. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CBSA Code | Census 2010 / 2016 | CBSA Title (Micro Areas) | State / PQAO | Operating | Required | Operating | Required | Operating | Required | Operating | Required | Operating | 2014 2016 8 Hr DV (ppm) | Required | Operating | Required | Operating | 2014 2016 Annual DV ug/m3 | 2014 2016 24 Hr DV ug/m3 | Required | Operating | Required | Operating | Required |
| 11940 | 52,266<br>52,850 | Athens, TN | TN 1025 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 1 | 8.7(a) | 21(a) | 0 | 0 | 0 | 1 | 0 |
| 18260 | 106,042<br>109,548 | Cookeville, TN | TN 1025 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 1 | 7.8 | 18 | 0 | 0 | 0 | 1 | 0 |
| 29980 | 41,869<br>43,081 | Lawrenceburg, TN | TN 1025 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 1 | 7.2 | 15 | 0 | 0 | 0 | 1 | 0 |

(a) This data is subject to change upon EPA's concurrence of exceptional event requests.

## Clean Air Status and Trends Network (CASTNET)

The Clean Air Status and Trends Network (CASTNET) monitoring network is designed to measure air quality in rural areas year-round. CASTNET sites in Tennessee and the state's MSAs are managed by the EPA's Clean Air Markets Division and operated by an EPA contractor. The three CASTNET sites in rural areas of Tennessee and Kentucky are as follows:

## Table 4: CASTNET Sites in Tennessee

| Site | AQSID | County | Location | 2014 2016 DV (ppm) |
|---|---|---|---|---|
| Cadiz (CDZ171) | 21-221-9991 | Trigg | 5720 Old Dover Rd, Cadiz, KY 42211 | 0.063 |
| Edgar Evins (ESP127) | 47-041-9991 | DeKalb | Edgar Evins State Park, Smithville, TN 37166 | 0.062 |
| Speedwell (SPD111) | 47-025-9991 | Claiborne | 718 Russell Hill Rd, Speedwell, TN 37870 | 0.063 |

## Monitoring Sites and Discussion

All TDEC DAPC operated sites meets the siting criteria as found in appendix E to 40 CFR Part 58 for probe and monitoring path for $PM_{2.5}$, $O_3$, Pb, and $SO_2$. These sites will be reevaluated annually for compliance with this criterion. These sites are part of the state of Tennessee ambient air monitoring criteria pollutant monitoring network and operated to ensure continued compliance with appendix D to 40 CFR Part 58 network design requirements. These sites are summarized in Table 2: Metropolitan Monitoring Configuration for 2017 and Table 3: Micropolitan Monitoring Configuration for 2017 on pages 11 and 12 of this plan. Current site evaluations with photographs, distance measurements and confirmation of meeting the siting criteria requirements are provided in Appendix I: Annual Site Evaluations to this plan.

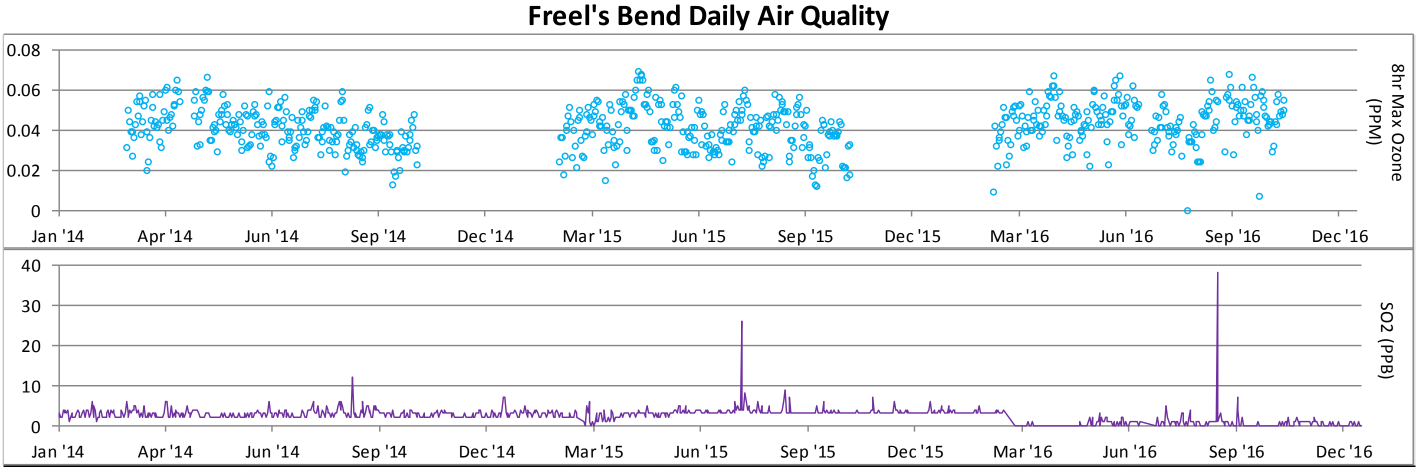
The Jackson and Lawrence sites are currently operating under an EPA approved siting criteria waiver pursuant to appendix E to 40 CFR Part 58 for probe and monitoring path for PM2.5. New sites are being evaluated during CY 2017 that will meet all of the siting criteria. Copies of the approval letters are found in Appendix F: EPA Approval and Special Request Letters. These sites are part of the state's PM2.5 criteria pollutant monitoring network and operated to ensure continued compliance with appendix D to 40 CFR Part 58 network design requirements. A summary appears in Table 2: Metropolitan Monitoring Configuration for 2017 and Table 3: Micropolitan Monitoring Configuration for 2017 on pages 11 and 12 of this plan.

## Freels Bend – Anderson County

| | | |
|---|---|---|
| Address | Freels Bend Study Area Melton Lake Oak Ridge | |
| AQSID | 470010101 | |
| CBSA | 28940 | |
| Lat, Lon | 35.96522, -84.223159 | |
| Parameter Code | 42401 | 44201 |
| Parameter Name | $SO_2$ | $O_3$ |
| Monitor Type | SLAMS | SLAMS |
| POC | 1 | 1 |
| Int | 1 | W |
| Collection Frequency | Hourly | Hourly |
| Method | 100 | 87 |
| FRM/FEM Instrument | Api Model 100 A SO2 Analyzer | Model 400 Ozone Analyzer |
| Analysis | Ultraviolet Fluorescence | Ultra Violet Absorption |
| Ref Mtd ID | EQSA-0495-100 | EQOA-0992-087 |
| Monitor Objective | Population Exposure | Population Exposure |
| Dominant Source | Area | Area |
| Measurement Scale | Urban Scale | Urban Scale |
| Land Use Type | Forest | Forest |
| Location Setting | Rural | Rural |

The Freels Bend site is located in Anderson County, Tennessee and currently supports monitoring for ozone and sulfur dioxide. The site was initially established in 1992 and is expected to operate during CY's 2017 and 2018. This site is located west of Knoxville and southeast of Oak Ridge, Tennessee. This site is an upwind site from the core Knoxville MSA area. Sulfur dioxide monitoring began 03/01/2013 to assess emission impacts from the Bull Run FP. Because of the importance this site serves in assessing both the upwind ozone levels entering the Knoxville area and the ongoing need to continue to collect $SO_2$ data to assess area impacts near the TVA facility, this site was determined to remain in operation over 5 years (2015 through 2020). The Knoxville MSA has six operating ozone sites and is required to have only two. This site also meets the MSA's requirement of having one $SO_2$ site. This site is also employed in the AQI forecasting program and currently is attaining the standards for both ozone and $SO_2$. See Appendix I: Annual Site Evaluations for further details.

**Freel's Bend Daily Air Quality**

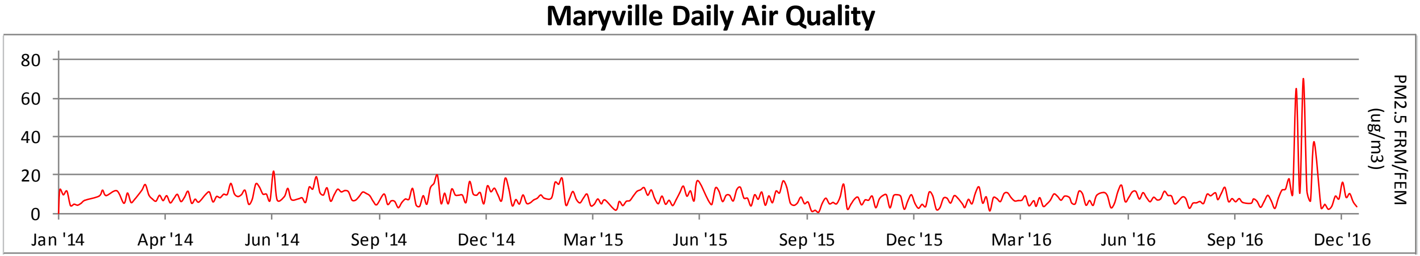


## Maryville – Blount County

| | | |
|---|---|---|
| Address | 2007 Sequoyah Avenue Maryville TN 37803 | |
| AQSID | 470090011 | |
| CBSA | 28940 | |
| Lat, Lon | 35.768847, -83.942152 | |
| Parameter Code | 88101 | 88101 |
| Parameter Name | $PM_{2.5}$ | $PM_{2.5}$ Cont |
| Monitor Type | SPM | SPM |
| POC | 1 | 3 |
| Int | 7 | 1 |
| Collection Frequency | 1 in 3 | Hourly |
| Method | 118 | 209 |
| FRM/FEM Instrument | R & P Co Plus Model 2025 | Met One BAM 1022 FEM |
| Analysis | Gravimetric | Real Time Beta Attenuation Mass Monitor |
| Ref Mtd ID | Rfps-0498-118 | EQPM-1013-209 |
| Monitor Objective | Population Exposure | |
| Dominant Source | Area | |
| Measurement Scale | Neighborhood | |
| Land Use Type | Residential | |
| Location Setting | Suburban | |

The Maryville site is located in Blount County, Tennessee and currently supports monitoring for fine particulate matter. The site was initially established in 2000 and is expected to operate during CY's 2017 and 2018. This site is located south of Knoxville and northwest of the GSMNP. Tennessee. This site is an upwind site from the core Knoxville MSA area. $PM_{2.5}$ monitoring began 05/01/2000 as a part of the original $PM_{2.5}$ state network. Continuous $PM_{2.5}$ monitoring using a non FRM/FEM or a BAM 1022 FEM method was added later to assist with the PM Fine AQI forecasting program. Because of the importance this site serves in assessing the upwind $PM_{2.5}$ levels entering the Knoxville area, this site was determined to remain in operation over 5 years (2015 through 2020). The Knoxville MSA has 6 PM2.5 FRM sites and is only required to have 2 to meet the minimum requirements. This site is a candidate site to receive an FEM continuous $PM_{2.5}$ sampler (2017) and at such time the FRM sampler will be retired upon completion of routine correlation testing. This site is also employed in the AQI forecasting program and is used to help assess impacts from precursor transport into Tennessee from Georgia and North Carolina. See Appendix I: Annual Site Evaluations for further details.

**Maryville Daily Air Quality**

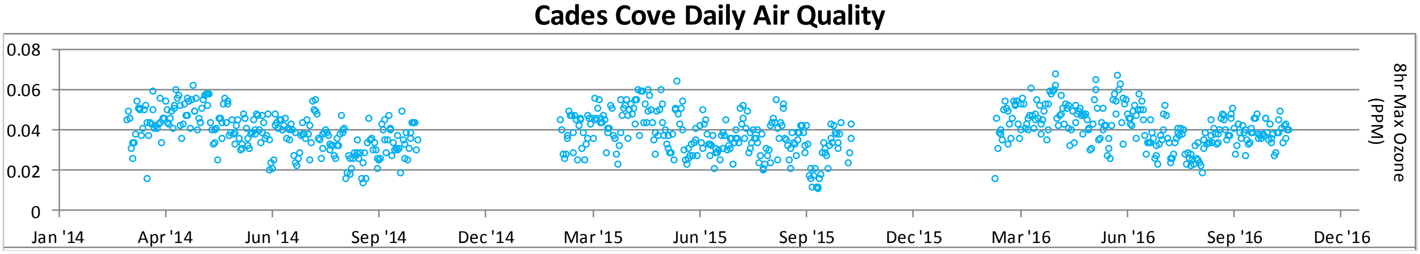


## Cades Cove – Blount County (GSM NP)

| | |
|---|---|
| Address | Great Smoky Mountains NP - Cades Cove |
| AQSID | 470090102 |
| CBSA | 28940 |
| Lat, Lon | 35.603056, -83.7836109999999 |
| Parameter Code | 44201 |
| Parameter Name | $O_3$ |
| Monitor Type | Non-EPA Federal |
| POC | 1 |
| Int | W |
| Collection Frequency | Hourly |
| Method | 53 |
| FRM/FEM Instrument | Monitor Labs 8810 |
| Analysis | Ultra Violet |
| Ref Mtd ID | EQOA-0881-053 |
| Monitor Objective | Highest Concentration |
| Dominant Source | 0 |
| Measurement Scale | Regional Scale |
| Land Use Type | Forest |
| Location Setting | Rural |

The Cades Cove site is located in Blount County, Tennessee and currently supports monitoring for ozone and meteorological parameters. The site was initially established in 05/01/1994 and is expected to operate during CY's 2017 and 2018. This site is located within the Tennessee portion of the Great Smoky Mtns. National Park. This site is within and southeast of the Knoxville MSA area. Ozone monitoring began 05/01/1994 and this site is used with the ozone AQI forecasting program for verification and to help address ozone levels found in the GSMNP area and TDEC DAPC reports the ozone data for this site to AQS. It is the responsibility of the NPS to operate, maintain, and conduct all QA/QC activities at this site in accordance with 40 CFR Part 58. The Cades Cove ozone site was determined to remain in operation over 5 years (2015 through 2020), subject to funding support from the Natural Parks Services (NPS). The NPS is responsible for verifying, validating and certifying the ozone data collected by this site.

### Cades Cove Daily Air Quality

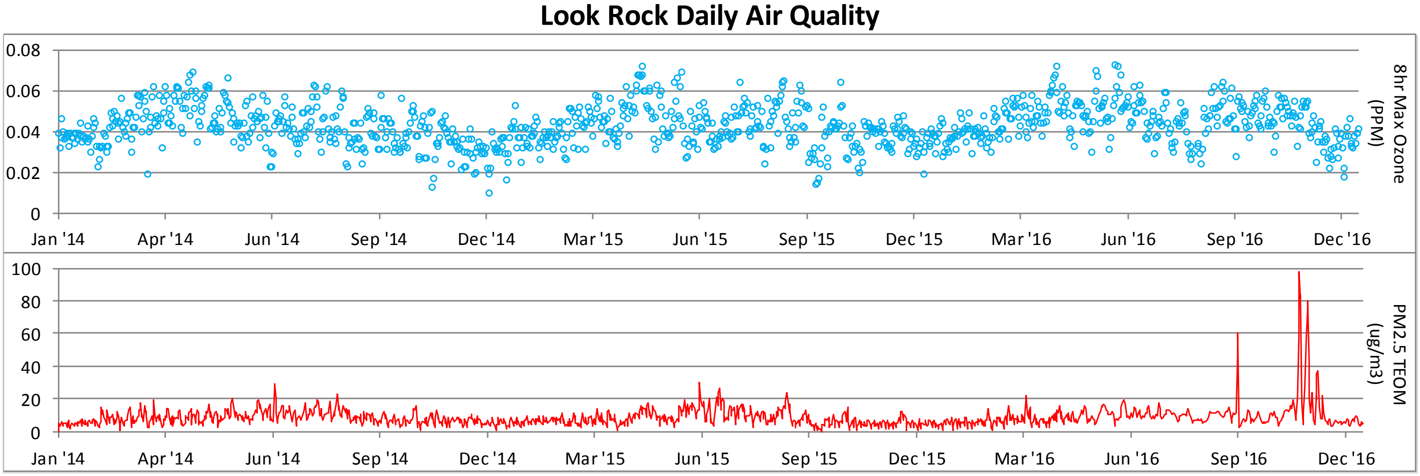


## Look Rock – Blount County (GSM NP)

| | | |
|---|---|---|
| Address | Great Smoky Mountains NP Look Rock | |
| AQSID | 470090101 | |
| CBSA | 28940 | |
| Lat, Lon | 35.6334799, -83.941605999999993 | |
| Parameter Code | 44201 | 88501 |
| Parameter Name | $O_3$ | $PM_{2.5}$ Cont |
| Monitor Type | SLAMS | SPM |
| POC | 1 | 3 |
| Int | W | 1 |
| Collection Frequency | Hourly | Hourly |
| Method | 053 | 716 |
| FRM/FEM Instrument | Monitor Labs 8810 | None |
| Analysis | Ultra Violet | TEOM Gravimetric 50 deg C |
| Ref Mtd ID | EQOA-0881-053 | None |
| Monitor Objective | General Background | |
| Dominant Source | 0 | |
| Measurement Scale | 0 | |
| Land Use Type | Forest | |
| Location Setting | Rural | |

The Look Rock site is located in Blount County, Tennessee and currently supports monitoring for ozone and other pollutants. The site was initially established in 1980 and is expected to operate during CY's 2017 and 2018. This site is located within the Tennessee portion of the Great Smoky Mtns. National Park. This site is within and southeast of the Knoxville MSA area. Ozone monitoring began 07/23/1998 and this site is used with the ozone AQI forecasting program for verification and to help address ozone levels found in the GSMNP area. $PM_{2.5}$ monitoring began 05/01/2002 and this site is used with the PM Fine AQI forecasting program for verification and to help address fine particulate levels found in the GSMNP area. TDEC DAPC reports the TEOM PM2.5 data for this site to AQS. This site is operated and maintained by the NPS and was determined to remain in operation over 5 years (2015 through 2020), subject to funding support from the NPS. See Appendix I: Annual Site Evaluations for further details. The NPS is responsible for verifying, validating and certifying the ozone data collected by this site.

**Look Rock Daily Air Quality**

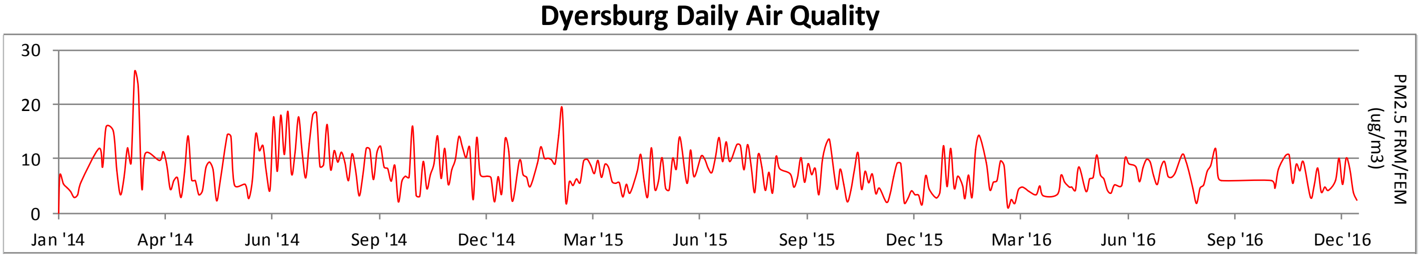


## Dyersburg – Dyer County

| | | |
|---|---|---|
| Address | 175-B Greenwood Street, Dyersburg TN 38024 | |
| AQSID | 470450004 | |
| CBSA | 20540 | |
| Lat, Lon | 36.038924, -89.382126 | |
| Parameter Code | 88101 | 88101 |
| Parameter Name | $PM_{2.5}$ | $PM_{2.5}$ Cont |
| Monitor Type | SLAMS | SLAMS |
| POC | 1 | 3 |
| Int | 7 | 1 |
| Collection Frequency | 1 In 3 | Hourly |
| Method | 118 | 209 |
| FRM/FEM Instrument | R & P Co Plus Model 2025 | Met One BAM 1022 |
| Analysis | Gravimetric | Real Time Beta Attenuation Mass Monitor |
| Ref Mtd ID | RFPS-0498-118 | EQPM-1013-209 |
| Monitor Objective | Population Exposure | |
| Dominant Source | Area | |
| Measurement Scale | Neighborhood | |
| Land Use Type | Residential | |
| Location Setting | Suburban | |

The Dyersburg site is located in Dyer County, Tennessee and currently supports monitoring for fine particulate matter. The site was initially established in 1999 and is expected to operate during CY's 2017 and 2018. This site is located northwest of Jackson and north-northeast of Memphis, Tennessee. This site is downwind from the core Memphis MSA area. $PM_{2.5}$ monitoring began 08/22/1998 as a part of the original $PM_{2.5}$ state network. Continuous $PM_{2.5}$ monitoring using a Met One BAM 1022 FEM method was added later to assist with the PM Fine AQI forecasting program. Because of the importance this site serves in assessing the area $PM_{2.5}$ levels outside of the Memphis area, this site was determined to remain in operation over 5 years (2015 through 2020). This site also received an FEM continuous $PM_{2.5}$ sampler on Jan 10, 2017 and the FRM sampler will be retired upon completion of routing correlation testing. This site is also employed in the AQI forecasting program and is used to help assess impacts from precursor transport into Tennessee from adjacent states. See Appendix I: Annual Site Evaluations for further details.

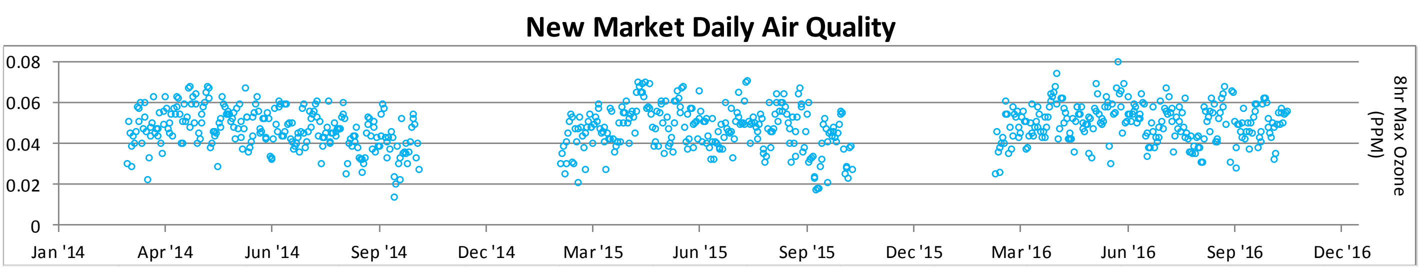
**Dyersburg Daily Air Quality**



## New Market – Jefferson County

| | |
|---|---|
| Address | 2393 Forrester Rd, New Market, TN 37820 |
| AQSID | 470890002 |
| CBSA | 34100 |
| Lat, Lon | 36.105629, -83.6020769999999 |
| Parameter Code | 44201 |
| Parameter Name | $O_3$ |
| Monitor Type | SLAMS |
| POC | 1 |
| Int | W |
| Collection Frequency | Hourly |
| Method | 87 |
| FRM/FEM Instrument | Model 400 Ozone Analyzer |
| Analysis | Ultra Violet Absorption |
| Ref Mtd ID | EQOA-0992-087 |
| Monitor Objective | Max Ozone Concentration |
| Dominant Source | 0 |
| Measurement Scale | 0 |
| Land Use Type | Agricultural |
| Location Setting | Rural |

The New Market site is located in Jefferson County, Tennessee and currently supports monitoring for ozone. The site was initially established in 1999 and is expected to operate during CY's 2017 and 2018. This site is located east northeast of Knoxville and west northwest of Morristown, Tennessee. This site is downwind from the core Knoxville MSA area. Ozone monitoring began 03/01/1999 and this site is used with the ozone AQI forecasting program for verification and to help address transport wind patterns opposite of the predominate area directions. This MSA is required to have 1 ozone site and this site meets that requirement. Because of the importance, this site serves in assessing the area ozone levels outside and downwind of the Knoxville area, this site was determined to remain in operation over 5 years (2015 through 2020). See Appendix I: Annual Site Evaluations for further details.



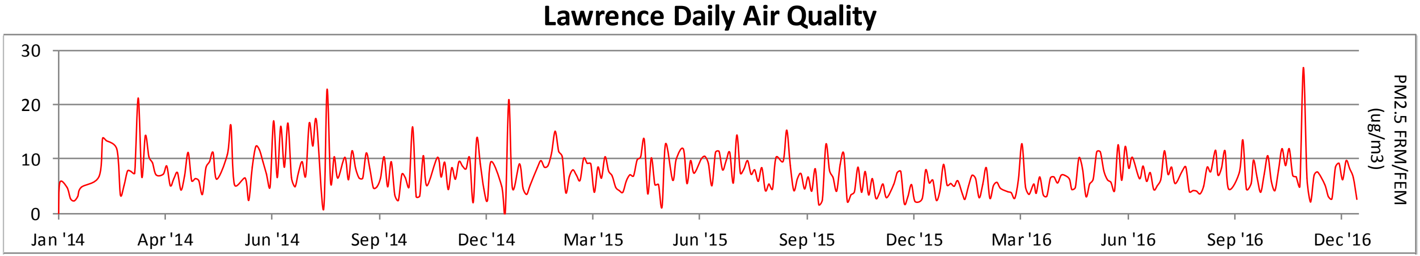
## Lawrence – Lawrence County

| | | |
|---|---|---|
| Address | 355 Busby Rd, Loretto, TN 38469 | |
| AQSID | 470990002 | |
| CBSA | 29980 | |
| Lat, Lon | 35.115968, -87.469954 | |
| Parameter Code | 88101 | 88101 |
| Parameter Name | $PM_{2.5}$ | $PM_{2.5}$ Cont |
| Monitor Type | SLAMS | SLAMS |
| POC | 1 | 3 |
| Int | 7 | 1 |
| Collection Frequency | 1 In 3 | Hourly |
| Method | 118 | 209 |
| FRM/FEM Instrument | R & P Co Plus Model 2025 | Met One BAM 1022 |
| Analysis | Gravimetric | Real Time Beta Attenuation Mass Monitor |
| Ref Mtd ID | RFPS-0498-118 | EQPM-1013-209 |
| Monitor Objective | Upwind background, population exposure | |
| Dominant Source | 0 | |
| Measurement Scale | Regional Scale | |
| Land Use Type | Agricultural | |
| Location Setting | Rural | |

The Lawrence Co. site is located in Lawrence County, Tennessee and currently supports monitoring for PM2.5. This site is located on the southern border of Tennessee north of Alabama. The site is south west of Nashville and south east of Jackson, Tennessee. This site is not located near any MSA area in Tennessee. $PM_{2.5}$ monitoring began 12/24/1998 as a part of the original $PM_{2.5}$ state network. Continuous $PM_{2.5}$ monitoring using a non FRM/FEM method was added 01/01/2003 to assist with the $PM_{2.5}$ AQI forecasting program. This site also supported a $PM_{2.5}$ Speciation and URG sampler from 12/03/2001 to 09/26/2014. This site is schedule to receive an FEM continuous $PM_{2.5}$ sampler this year and at such time the FRM sampler will be retired upon completion of routine correlation testing. Because this site serves as a background $PM_{2.5}$ site it was determined to remain in operation over 5 years (2015 through 2020). See Appendix I: Annual Site Evaluations for further details.

This site will continue to operate under an EPA site waiver until a new location can be found. See Appendix F: EPA Approval and Special Request Letters for the siting waiver from the EPA.

**Lawrence Daily Air Quality**



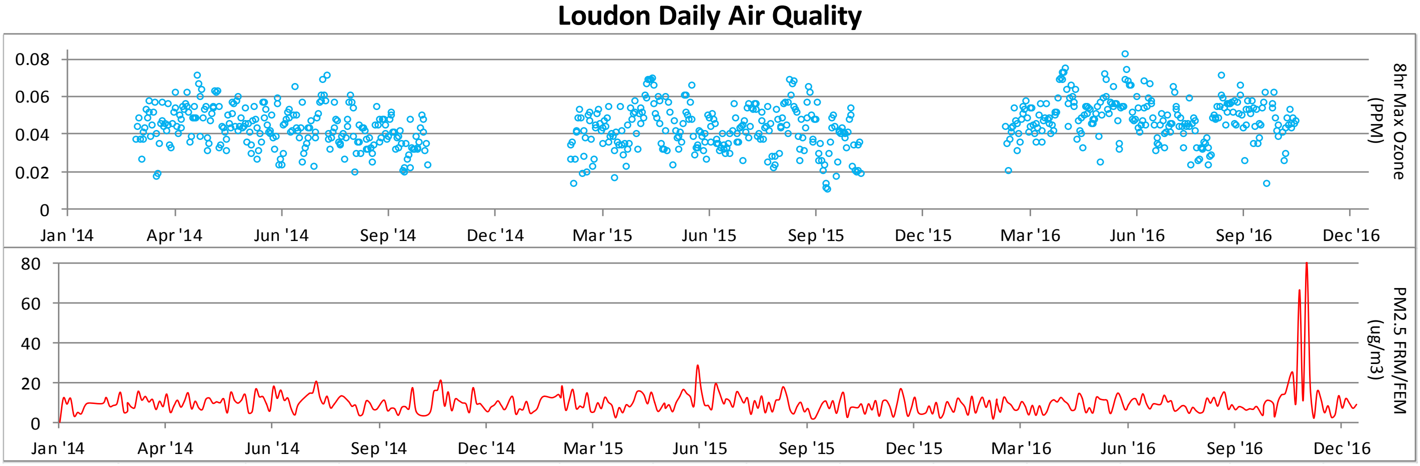
## Loudon – Loudon County

| | | | |
|---|---|---|---|
| Address | 2175 Robert Road, Loudon, TN 37774 | | |
| AQSID | 471050108 | | |
| CBSA | 28940 | | |
| Lat, Lon | 35.744539, -84.317057 | | |
| Parameter Code | 44201 | 88101 | 88101 |
| Parameter Name | $O_3$ | $PM_{2.5}$ Cont | $PM_{2.5}$ Cont |
| Monitor Type | SLAMS | SPM | SPM |
| POC | 1 | 3 | 4 |
| Int | W | 1 | 1 |
| Year | 2014 | 2017 | 2017 - planned |
| Collection Frequency | Hourly | Hourly | Hourly |
| Method | 87 | 209 | 209 |
| FRM/FEM Instrument | Model 400 Ozone Analyzer | Met One BAM 1022 | Met One BAM 1022 |
| Analysis | Ultra Violet Absorption | Real Time Beta Attenuation Mass Monitor | Real Time Beta Attenuation Mass Monitor |
| Ref Mtd ID | EQOA-0992-087 | EQPM-1013-209 | EQPM-1013-209 |
| Monitor Objective | Max Ozone Concentration | Population Exposure | Population Exposure |
| Dominant Source | Area | | |
| Measurement Scale | Neighborhood | | |
| Land Use Type | Residential | | |
| Location Setting | Suburban | | |

The Loudon Pope site has been relocated from 130 Webb Drive, Loudon, TN 37774 to 2175 Roberts Road, in Loudon County, TN 37774. The relocation approval letter can be found in Appendix F: EPA Approval and Special Request Letters. The Loudon site supports monitoring for $PM_{2.5}$ and $O_3$. This site is located southwest of Knoxville and northeast of Chattanooga, Tennessee. This site is upwind of the Knoxville Core MSA area and downwind from the Chattanooga MSA area. The ozone monitor was relocated to the Loudon Elementary School site March 3, 2017. The Knoxville MSA has 6 operating ozone sites and is only required to have 2.

$PM_{2.5}$ monitoring is scheduled to begin on June 1, 2017 as a part of the Loudon air quality study and complaint investigation. This site received an FEM continuous $PM_{2.5}$ sampler on May 8, 2017. The FRM sampler located at the on 130 Webb Drive, Loudon, TN 37774 will be retired upon completion of routine correlation testing. The Knoxville MSA has 6 operating $PM_{2.5}$ FRM sites and is required to have only 2. See Appendix I: Annual Site Evaluations for further details. The Loudon site will serve as the new $PM_{2.5}$ collocated site due to a higher 3-year design value than the current Jackson collocated site. Loudon has a 3-year design (2014-2016) value of 9.5µg/m$^3$ and Jackson has a 3-year design value of 7.7µg/m$^3$. The changeover to the collocation is projected to take place by December 31, 2017. Monitoring at this site is used by the AQI forecasting program for verification for the Knoxville MSA area. This site serves in assessing the air quality levels upwind of the Knoxville area.

### Loudon Daily Air Quality

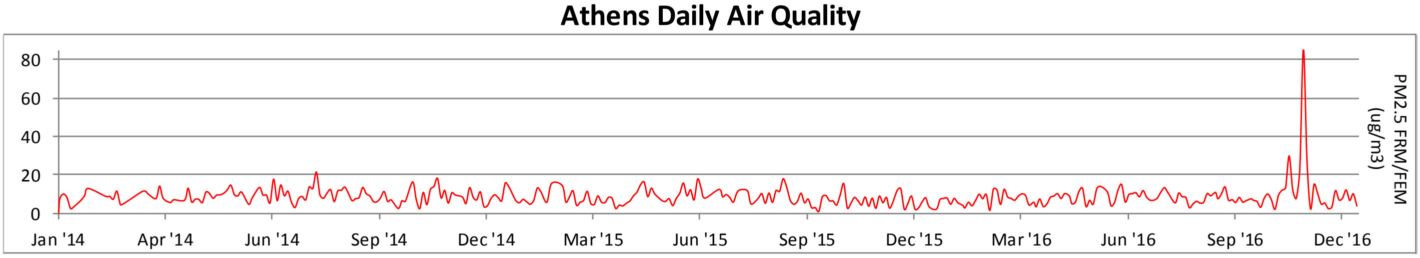


## Athens – McMinn County

| | | |
|---|---|---|
| Address | Saint Mark Ame Zion Church: 707 North Jackson St, Athens, TN 37303 | |
| AQSID | 471071002 | |
| CBSA | 11940 | |
| Lat, Lon | 35.45011499, -84.5961949999999 | |
| Parameter Code | 88101 | 88101 |
| Parameter Name | $PM_{2.5}$ | $PM_{2.5}$ Cont |
| Monitor Type | SPM | SPM |
| POC | 1 | 3 |
| Int | 7 | 1 |
| Collection Frequency | 1 In 3 | Hourly |
| Method | 118 | 209 |
| FRM/FEM Instrument | R & P Co Plus Model 2025 | Met One BAM 1022 |
| Analysis | Gravimetric | Real Time Beta Attenuation Mass Monitor |
| Ref Mtd ID | RFPS-0498-118 | EQPM-1013-209 |
| Monitor Objective | Population Exposure | |
| Dominant Source | Area | |
| Measurement Scale | Neighborhood | |
| Land Use Type | Commercial | |
| Location Setting | Urban And Center City | |

The Athens site is located in McMinn County, Tennessee and currently supports monitoring for $PM_{2.5}$. This site is located northeast of Chattanooga and southwest of Knoxville, Tennessee. This site is downwind from the Chattanooga MSA area and located in the Athens, Micropolitan area.$PM_{2.5}$ monitoring began 02/03/2000 as a part of the original $PM_{2.5}$ state network. Continuous $PM_{2.5}$ monitoring using a non FRM/FEM method was added 01/01/2005 to assist with the PM Fine AQI forecasting program. This site also received an FEM continuous $PM_{2.5}$ sampler on July 18, 2016 and the FRM sampler will be retired upon completion of routing correlation testing. This site was determined to remain in operation over 5 years (2015 through 2020). This site serves to help quantify air quality in this developing area of the state. See Appendix I: Annual Site Evaluations for further details.

**Athens Daily Air Quality**



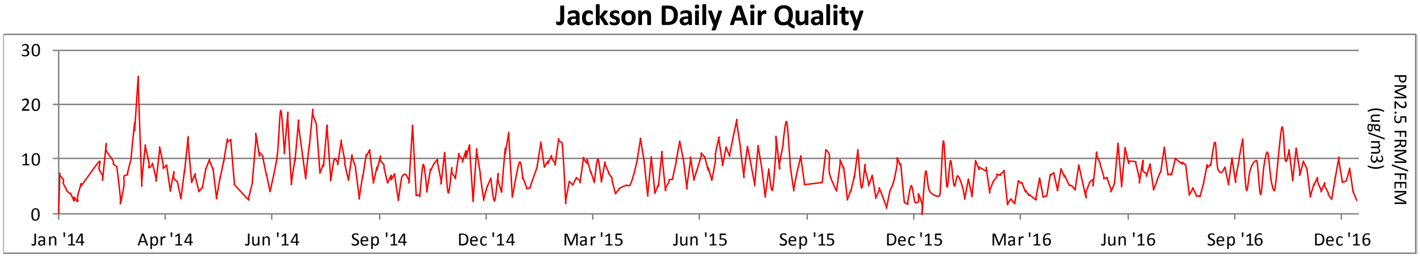
## Jackson – Madison County

| | | | |
|---|---|---|---|
| Address | 1371-A North Parkway, Jackson, TN 38301 | | |
| AQSID | 471130006 | | |
| CBSA | 27180 | | |
| Lat, Lon | 35.6513489999999, -88.809578 | | |
| Parameter Code | 88101 | 88101 | 88101 |
| Parameter Name | $PM_{2.5}$ | $PM_{2.5}$ | $PM_{2.5}$ Cont |
| Monitor Type | SLAMS | SLAMS | SLAMS |
| POC | 1 | 2 | 3 |
| Int | 7 | 7 | 1 |
| Collection Frequency | 1 In 3 | 1 In 3 | Hourly |
| Method | 118 | 118 | 209 |
| FRM/FEM Instrument | R & P Co Plus Model 2025 | | Met One BAM 1022 |
| Analysis | Gravimetric | | Real Time Beta Attenuation Mass Monitor |
| Ref Mtd ID | RFPS-0498-118 | | EQPM-1013-209 |
| Monitor Objective | Population Exposure | | |
| Dominant Source | Area | | |
| Measurement Scale | Neighborhood | | |
| Land Use Type | Residential | | |
| Location Setting | Suburban | | |

The Jackson site is located in Madison County, Tennessee and currently supports monitoring for $PM_{2.5}$. This site is located northeast of Memphis, Tennessee and southeast of Dyersburg, Tennessee. This site is located in the Jackson, TN MSA area. $PM_{2.5}$ monitoring began 11/17/2004 as a part of the original $PM_{2.5}$ state network. Continuous $PM_{2.5}$ monitoring using a non FRM/FEM method was added 01/01/2005 to assist with the PM Fine AQI forecasting program. This site is a candidate to receive an FEM continuous $PM_{2.5}$ sampler (2017) and the FRM sampler will be retired upon completion of routine correlation testing. The Jackson MSA area has a single FRM $PM_{2.5}$ sampler and is not required to operate any $PM_{2.5}$ sites. This site was determined to remain in operation over 5 years (2015 through 2020) primarily because it is the only $PM_{2.5}$ monitoring site in this region. See Appendix I: Annual Site Evaluations for further details. This site will continue to operate under an EPA site waiver until a new location can be found. Also see Appendix F: EPA Approval and Special Request Letters for the siting waiver from the EPA.

The Jackson $PM_{2.5}$ site will no longer be collocated by December 31, 2017. It will only contain a single FEM $PM_{2.5}$ monitor. The Loudon site will serve as the new collocated $PM_{2.5}$ site because it has higher 3 year (2014-2016) design value than the Jackson monitor. Loudon has a 3-year design value of 9.5$\mu$g/m$^3$ and Jackson has a 3-year design value of 7.7$\mu$g/m$^3$.

**Jackson Daily Air Quality**

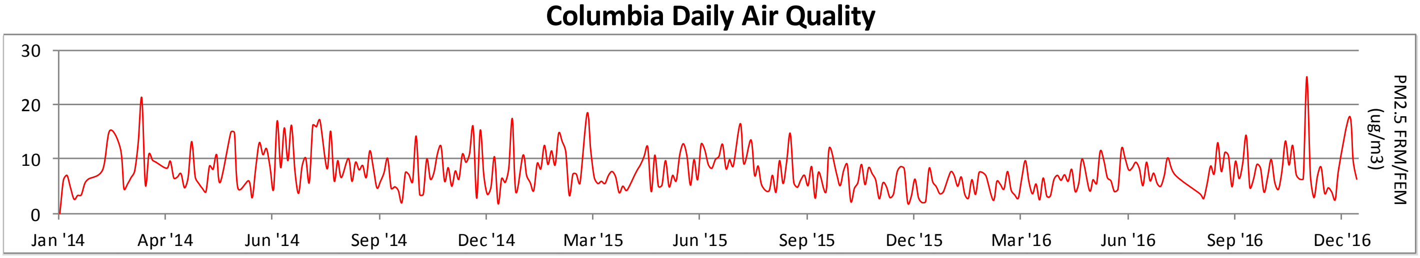


## Columbia – Maury County

| | | |
|---|---|---|
| Address | 1600 Nashville Hwy, Columbia, TN | |
| AQSID | 471192007 | |
| CBSA | 17940 | |
| Lat, Lon | 35.65187999, -87.0096 | |
| Parameter Code | 88101 | 88101 |
| Parameter Name | $PM_{2.5}$ | $PM_{2.5}$ Cont |
| Monitor Type | SPM | SPM |
| POC | 1 | 3 |
| Int | 7 | 1 |
| Collection Frequency | 1 In 3 | Hourly |
| Method | 118 | 209 |
| FRM/FEM Instrument | R & P Co Plus Model 2025 | Met One BAM 1022 |
| Analysis | Gravimetric | Real Time Beta Attenuation Mass Monitor |
| Ref Mtd ID | RFPS-0498-118 | EQPM-1013-209 |
| Monitor Objective | Population Exposure | |
| Dominant Source | Area | |
| Measurement Scale | Middle Scale | |
| Land Use Type | Commercial | |
| Location Setting | Urban And Center City | |

The Columbia site is located in Maury County, Tennessee and currently supports monitoring for $PM_{2.5}$. This site is located south-southwest of Nashville and northwest of Lewisburg, Tennessee. This site is up wind from the Nashville MSA area. $PM_{2.5}$ monitoring began 12/25/1998 as a part of the original $PM_{2.5}$ state network. This site also received an FEM continuous PM2.5 sampler on April 13, 2016 and the FRM sampler will be retired upon completion of routing correlation testing. This site was determined to remain in operation over 5 years (2015 through 2020) primarily because it is the only $PM_{2.5}$ site in this region. See Appendix I: Annual Site Evaluations for further details.

**Columbia Daily Air Quality**

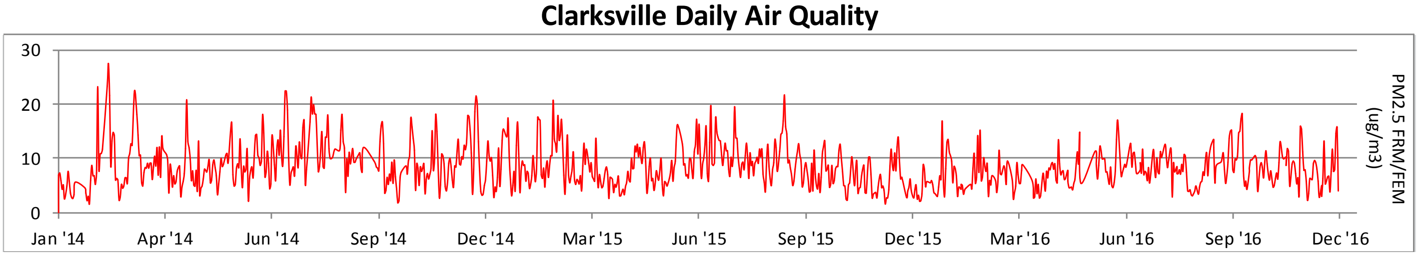


## Clarksville – Montgomery County

| | | |
|---|---|---|
| Address | 1514-C Golf Club Ln, Clarksville, TN | |
| AQSID | 471251009 | |
| CBSA | 11940 | |
| Lat, Lon | 36.514712, -87.3280469999999 | |
| Parameter Code | 88101 | 88101 |
| Parameter Name | $PM_{2.5}$ | $PM_{2.5}$ Cont |
| Monitor Type | SLAMS | SLAMS |
| POC | 1 | 3 |
| Int | 7 | 1 |
| Collection Frequency | Daily | Hourly |
| Method | 118 | 209 |
| FRM/FEM Instrument | R & P Co Plus Model 2025 | Met One BAM 1022 |
| Analysis | Gravimetric | Real Time Beta Attenuation Mass Monitor |
| Ref Mtd ID | RFPS-0498-118 | EQPM-1013-209 |
| Monitor Objective | Population Exposure | |
| Dominant Source | 0 | |
| Measurement Scale | Neighborhood | |
| Land Use Type | Residential | |
| Location Setting | Suburban | |

The Clarksville site is located in Montgomery County, Tennessee and currently supports monitoring for $PM_{2.5}$. This site is located northwest of Nashville, Tennessee and is located near the Tennessee/Kentucky border. This site is upwind from the Clarksville, TN-KY MSA area. This site is suitable for use in meeting the MSA monitoring requirement for $PM_{2.5}$ for both Tennessee and Kentucky. $PM_{2.5}$ monitoring began 01/01/1998 as a part of the original $PM_{2.5}$ state network. Continuous PM2.5 monitoring using a non FRM/FEM method was added 03/10/2008 to assist with the PM fine AQI forecasting program. The Clarksville MSA area has a single FRM $PM_{2.5}$ sampler and is not required to operate a PM2.5 site for the MSA. This site also received an FEM continuous PM2.5 sampler on Jan 7, 2017 and the FRM sampler will be retired upon completion of routing correlation testing. This site was determined to remain in operation over 5 years (2015 through 2020) primarily because it is the only $PM_{2.5}$ site in this region. Tennessee is considering removal of the elevated platforms that are a part of the sampling network for safety related concerns and is proposing to place the Clarksville $PM_{2.5}$ monitoring site on the ground near the existing location the elevated platform now occupies. If a suitable location is not available in the immediate area, Tennessee proposes to relocate the site as close as possible to the previous location. This proposed change is anticipated over the next calendar year and will be preceded by a formal written request to EPA with the relocation details. See Appendix I: Annual Site Evaluations for further details.

**Clarksville Daily Air Quality**

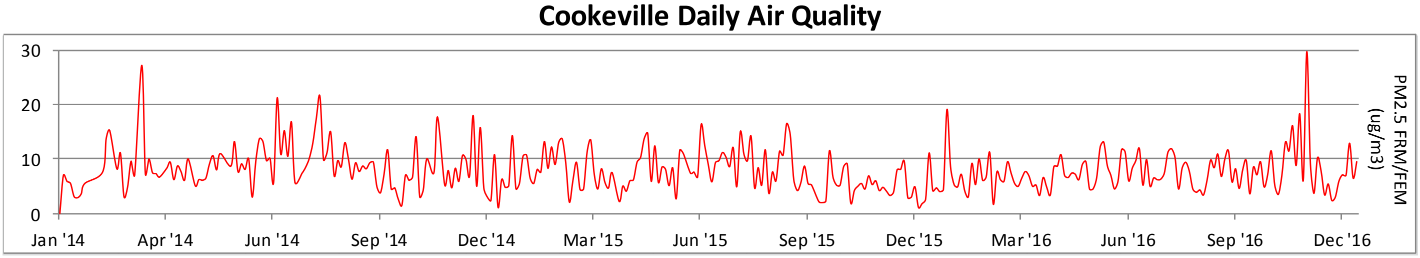


## Cookeville – Putnam County

| | | |
|---|---|---|
| Address | 630 East 20Th Street, Cookeville TN | |
| AQSID | 471410005 | |
| CBSA | 18260 | |
| Lat, Lon | 36.1857019999999, -85.492107 | |
| Parameter Code | 88101 | 88101 |
| Parameter Name | $PM_{2.5}$ | $PM_{2.5}$ Cont |
| Monitor Type | SPM | SPM |
| POC | 1 | 3 |
| Int | 7 | 1 |
| Collection Frequency | 1 In 3 | Hourly |
| Method | 118 | 209 |
| FRM/FEM Instrument | R & P Co Plus Model 2025 | Met One BAM 1022 |
| Analysis | Gravimetric | Real Time Beta Attenuation Mass Monitor |
| Ref Mtd ID | RFPS-0498-118 | EQPM-1013-209 |
| Monitor Objective | Population Exposure | |
| Dominant Source | Area | |
| Measurement Scale | Neighborhood | |
| Land Use Type | Residential | |
| Location Setting | Suburban | |

The Cookeville site is located in Putnam County, Tennessee and currently supports monitoring for $PM_{2.5}$. This site is located east of Nashville and northeast of Chattanooga, Tennessee. This site is not located in or near an MSA area. $PM_{2.5}$ monitoring began 08/15/2006 after the site was relocated. This site also received an FEM continuous PM2.5 sampler on February 9, 2017 and the FRM sampler will be retired upon completion of routing correlation testing. This site was determined to remain in operation over 5 years (2015 through 2020) primarily because it is the only $PM_{2.5}$ site in this region. See Appendix I: Annual Site Evaluations for further details.

### Cookeville Daily Air Quality

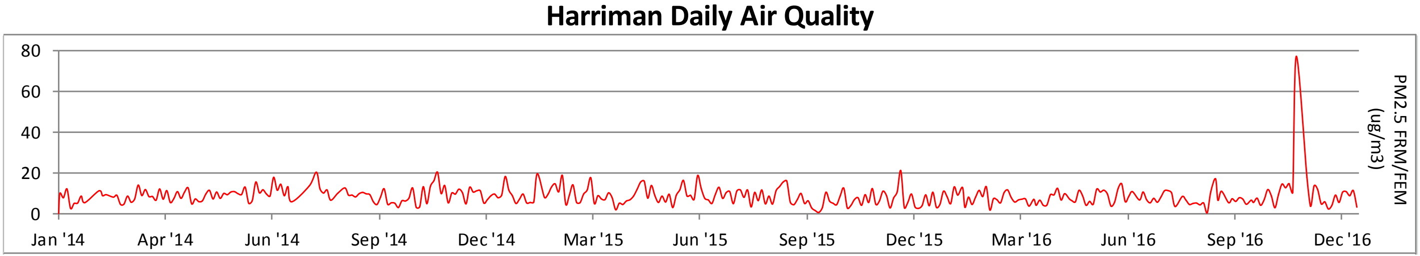


## Harriman – Roane County

| | | |
|---|---|---|
| Address | Harriman High: 1002 N. Roan St Harriman, TN | |
| AQSID | 471450004 | |
| CBSA | 11940 | |
| Lat, Lon | 35.939078, -84.5428019999999 | |
| Parameter Code | 88101 | 88101 |
| Parameter Name | $PM_{2.5}$ | $PM_{2.5}$ Cont |
| Monitor Type | SPM | SPM |
| POC | 1 | 3 |
| Int | 7 | 1 |
| Collection Frequency | 1 In 3 | Hourly |
| Method | 118 | 209 |
| FRM/FEM Instrument | R & P Co Plus Model 2025 | Met One BAM 1022 |
| Analysis | Gravimetric | Real Time Beta Attenuation Mass Monitor |
| Ref Mtd ID | RFPS-0498-118 | EQPM-1013-209 |
| Monitor Objective | Population Exposure | |
| Dominant Source | Area | |
| Measurement Scale | 0 | |
| Land Use Type | Industrial | |
| Location Setting | Suburban | |

The Harriman site is located in Roane County, Tennessee and currently supports monitoring for $PM_{2.5}$. This site is located west of Knoxville and west-southwest of Oak Ridge, Tennessee. This site is upwind from the Knoxville MSA area. $PM_{2.5}$ monitoring began 01/01/1998 as a part of the original $PM_{2.5}$ state network. Continuous PM2.5 monitoring using a non FRM/FEM method was added 01/01/2005 to assist with the PM fine AQI forecasting program. This site also received an FEM continuous PM2.5 sampler on Jan 23. 2017 and the FRM sampler will be retired upon completion of routing correlation testing. This site was determined to remain in operation over 5 years (2015 through 2020) primarily because it is in a county containing a partial $PM_{2.5}$ nonattainment area. The Knoxville MSA has six operating $PM_{2.5}$ FRM sites and is required to have only two. See Appendix I: Annual Site Evaluations for further details.

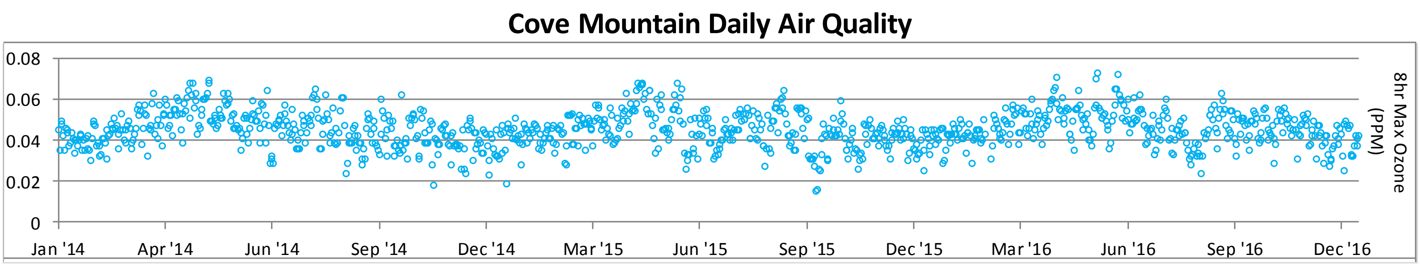
**Harriman Daily Air Quality**



## Cove Mountain – Sevier Country (GSM NP)

| | |
|---|---|
| Address | Great Smoky Mountain NP- Cove Mountain |
| AQSID | 471550101 |
| CBSA | 42940 |
| Lat, Lon | 35.6966669999999, -83.609722 |
| Parameter Code | 44201 |
| Parameter Name | $O_3$ |
| Monitor Type | NON-EPA FEDERAL |
| POC | 1 |
| Int | W |
| Collection Frequency | Hourly |
| Method | 47 |
| FRM/FEM Instrument | Thermo Electron 49 |
| Analysis | Ultra Violet |
| Ref Mtd ID | EQOA-0880-047 |
| Monitor Objective | General/Background |
| Dominant Source | Area |
| Measurement Scale | Neighborhood |
| Land Use Type | Forest |
| Location Setting | Rural |

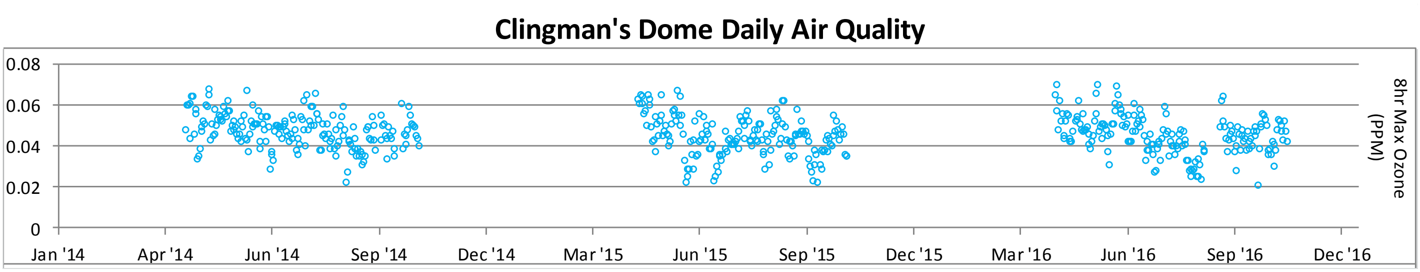
The Cove Mt. site is located in Sevier County, Tennessee and currently supports monitoring for ozone and meteorological parameters. This site is located within the Tennessee portion of the Great Smoky Mtns. National Park. This site is outside and southeast of the Knoxville MSA area. Ozone monitoring began 07/01/1988 and this site is used with the ozone AQI forecasting program for verification and to help address ozone levels found in the GSMNP area. This site is operated and maintained by the NPS and was determined to remain in operation over 5 years (2015 through 2020), subject to funding support from the NPS.



## Clingman's Dome – Sevier County (GSM NP)

| | |
|---|---|
| Address | Great Smoky Mountain Np Clingman's Dome |
| AQSID | 471550102 |
| CBSA | 42940 |
| Lat, Lon | 35.562778, -83.4981 |
| Parameter Code | 44201 |
| Parameter Name | $O_3$ |
| Monitor Type | NON-EPA FEDERAL |
| POC | 1 |
| Int | W |
| Year | 2014 |
| Collection Frequency | Hourly |
| Method | 47 |
| FRM/FEM Instrument | Thermo Electron 49 |
| Analysis | Ultra Violet |
| Ref Mtd ID | EQOA-0880-47 |
| Monitor Objective | Highest Concentration |
| Dominant Source | Area |
| Measurement Scale | Regional Scale |
| Land Use Type | Forest |
| Location Setting | Rural |

The Clingman's Dome site is located in Sevier County, Tennessee and currently supports monitoring for ozone and meteorological parameters. This site is located within the Tennessee portion of the Great Smoky Mtns. National Park. This site is outside and southeast of the Knoxville MSA area. Ozone monitoring began 04/01/1993 and this site is used with the ozone AQI forecasting program for verification and to help address ozone levels found in the GSMNP area. This site is operated and maintained by the NPS and was determined to remain in operation over 5 years (2015 through 2020), subject to funding support from the NPS. The location for the site is the highest point inside of Tennessee and the site is actually located on the border of Tennessee and North Carolina. The elevation of the site poses challenges in maintenance and access as the site is often impacted in the late fall and throughout the winter and spring by excessive snow fall and icing events that prevent access to the site. The ozone data collected at this site is truncated due to the site access issues in March and April and in some years in October due to early snowfall events.

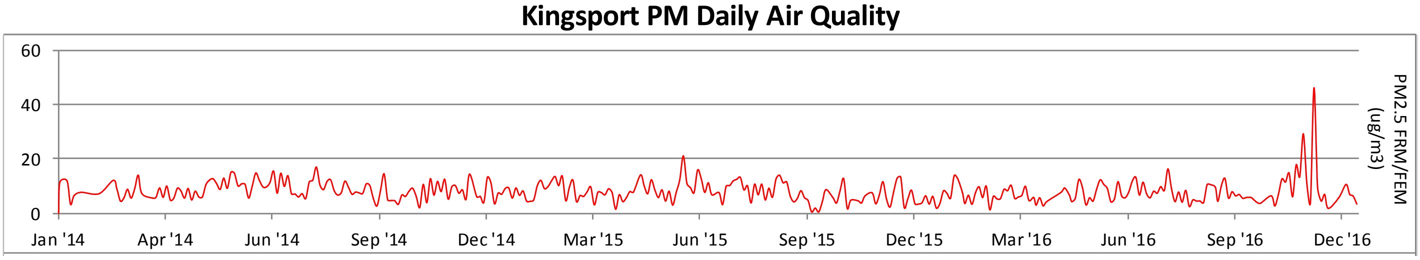


## Kingsport ($PM_{2.5}$) – Sullivan County

| | | |
|---|---|---|
| Address | 1649 D Street Kingsport TN 37664 | |
| AQSID | 471631007 | |
| CBSA | 11940 | |
| Lat, Lon | 36.5387619999999, -82.5215649999999 | |
| Parameter Code | 88101 | 88101 |
| Parameter Name | $PM_{2.5}$ | $PM_{2.5}$ Cont |
| Monitor Type | SLAMS | SPM |
| POC | 1 | 3 |
| Int | 7 | 1 |
| Collection Frequency | 1 In 3 | Hourly |
| Method | 118 | 209 |
| FRM/FEM Instrument | R & P Co Plus Model 2025 | Met One BAM 1022 |
| Analysis | Gravimetric | Real Time Beta Attenuation Mass Monitor |
| Ref Mtd ID | RFPS-0498-118 | EQPM-1013-209 |
| Monitor Objective | Population Exposure Upwind Background | Population Exposure |
| Dominant Source | Area | |
| Measurement Scale | Urban Scale | |
| Land Use Type | Residential | |
| Location Setting | Suburban | |

The Kingsport site is located in Sullivan County, Tennessee and currently supports monitoring for $PM_{2.5}$. This site is located in the far northeast corner of the state and is south of the state of Virginia on the Tennessee Virginia line. This site is upwind of Gate City, VA and downwind from the Johnson City MSA area. Kingsport is also a part of the Kingsport Bristol MSA. $PM_{2.5}$ monitoring began 10/01/1998 as a part of the original $PM_{2.5}$ state network. Continuous PM2.5 monitoring using a non FRM/FEM method was added 01/01/2005 to assist with the PM Fine AQI forecasting program. The Kingsport MSA area has a single FRM $PM_{2.5}$ sampler and is not required to operate a $PM_{2.5}$ site for the MSA. This site also received an FEM continuous PM2.5 sampler on March 13, 2017 and the FRM sampler will be retired upon completion of routing correlation testing. This site was determined to remain in operation over 5 years (2015 through 2020) primarily because it is the only $PM_{2.5}$ site in this region. See Appendix I: Annual Site Evaluations for further details.

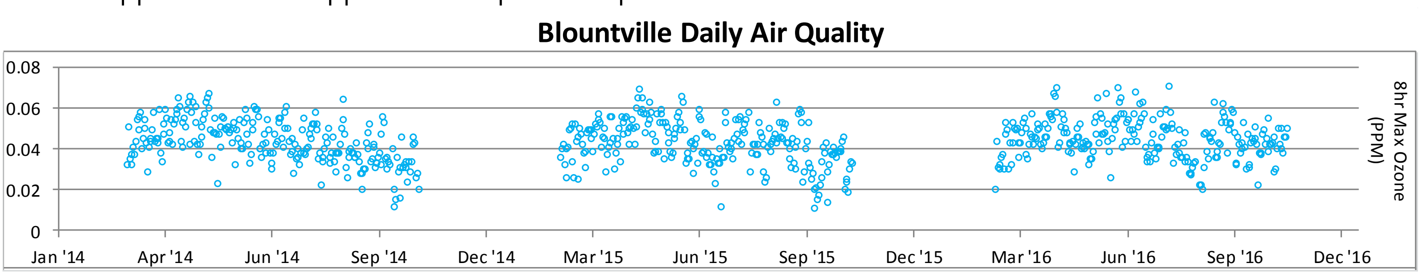
**Kingsport PM Daily Air Quality**



## Blountville – Sullivan County

| | |
|---|---|
| Address | Indian Springs School Shawnee Ave Blountville, TN |
| AQSID | 471632002 |
| CBSA | 28700 |
| Lat, Lon | 36.5414389999999, -82.424824 |
| Parameter Code | 44201 |
| Parameter Name | $O_3$ |
| Monitor Type | SLAMS |
| POC | 1 |
| Int | W |
| Collection Frequency | Hourly |
| Method | 87 |
| FRM/FEM Instrument | Model 400 Ozone Analyzer |
| Analysis | Ultra Violet Absorption |
| Ref Mtd ID | EQOA-0992-087 |
| Monitor Objective | Population Exposure |
| Dominant Source | Area |
| Measurement Scale | Neighborhood |
| Land Use Type | Residential |
| Location Setting | Rural |

The Blountville site is located in Sullivan County, Tennessee and currently supports monitoring for ozone. This site is located east of Kingsport and near the Virginia state line. This site is downwind from the Johnson City MSA area. Ozone monitoring began 01/01/1980 and this site is used with the ozone AQI forecasting program for verification and to help address the ozone impacts in the Kingsport - Bristol and Johnson City MSA area. The Kingsport MSA has 2 ozone sites operating and is required to have only 1 ozone site. TDEC will propose the shut this site down in the next year. There is another ozone monitoring site in Sullivan County that will remain operational. See Appendix I: Annual Site Evaluations for further details. This site was reconfigured in March 2017 due to failing the siting criteria requirements stated in 40 CFR 58 Appendix D. The reconfiguration letter was approved on please refer to Appendix F: EPA Approval and Special Request Letters.

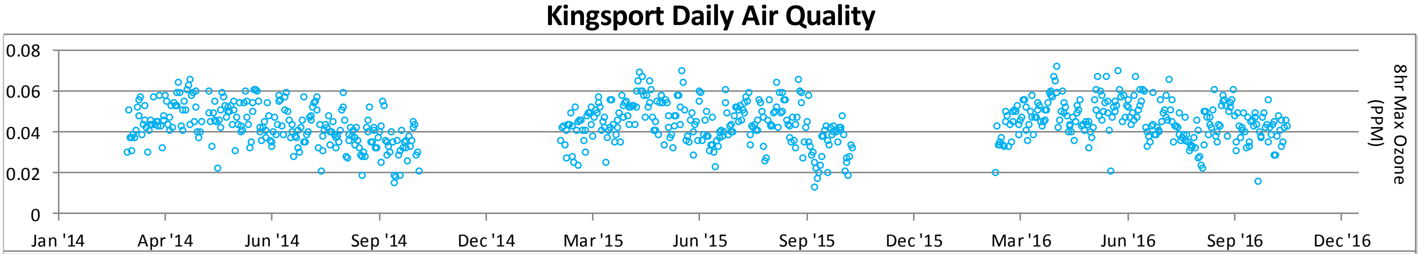


## Kingsport $O_3$ – Sullivan County

| | |
|---|---|
| Address | 3301 Bloomingdale Rd. Kingsport TN 3762 |
| AQSID | 471632003 |
| County Name | Sullivan |
| CBSA | 28700 |
| Lat, Lon | 36.58211, -82.485742 |
| Parameter Code | 44201 |
| Parameter Name | $O_3$ |
| Monitor Type | SLAMS |
| POC | 1 |
| Int | W |
| Collection Frequency | Hourly |
| Method | 87 |
| FRM/FEM Instrument | Model 400 Ozone Analyzer |
| Analysis | Ultra Violet Absorption |
| Ref Mtd ID | EQOA-0992-087 |
| Monitor Objective | Population Exposure |
| Dominant Source | 0 |
| Measurement Scale | Neighborhood |
| Land Use Type | Residential |
| Location Setting | Suburban |

The Kingsport site is located in Sullivan County, Tennessee and currently supports monitoring for ozone. This site is located in the far northeast corner of the state and is south of the state of Virginia on the Tennessee Virginia line. This site is upwind of Gate City, VA and downwind from the Johnson City MSA area. Kingsport is also a part of the Kingsport Bristol MSA Ozone monitoring began 04/01/1995 and this site is used with the ozone AQI forecasting program for verification and to help address the Kingsport-Bristol-MSA area. The Kingsport MSA has two ozone sites operating and is required to have only one ozone site. This site was determined to remain in operation over 5 years (2015 through 2020) primarily because it is located in the Kingsport area. See Appendix I: Annual Site Evaluations for further details.

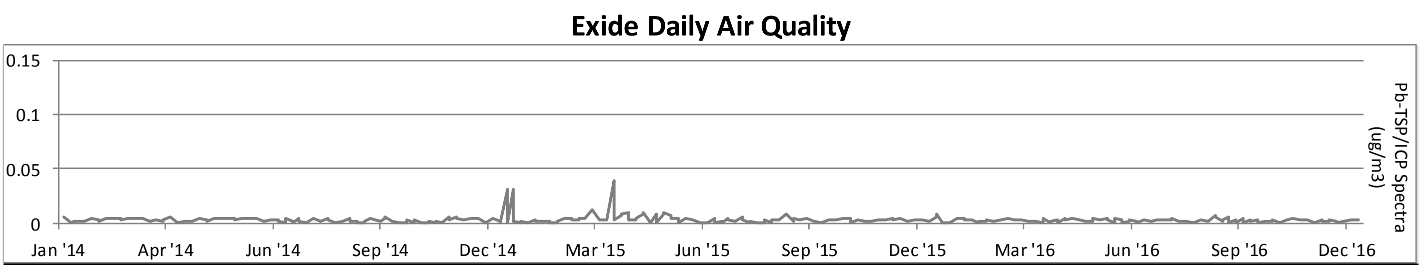
**Kingsport Daily Air Quality**



## Exide – Sullivan County

| | | |
|---|---|---|
| Address | 364 Exide Drive, Bristol TN 37620 | |
| AQSID | 471633004 | |
| County Name | Sullivan | |
| CBSA | 11940 | |
| Lat, Lon | 36.524433, -82.27261 | |
| Parameter Code | 14129 | 14129 |
| Parameter Name | Pb | Pb |
| Monitor Type | SLAMS | SLAMS |
| POC | 1 | 2 |
| Int | 7 | 7 |
| Collection Frequency | 1 In 6 | 1 In 6 |
| Method | 192 | 192 |
| FRM/FEM Instrument | Pb-TSP/ICP Spectra (ICP-MS) | Pb-TSP/ICP Spectra (ICP-MS) |
| Analysis | Inductively Coupled Plasma-Mass Spectrometry Acid Filter Extract With Hot Nitric Acid | Inductively Coupled Plasma-Mass Spectrometry Acid Filter Extract With Hot Nitric Acid |
| Ref Mtd ID | EQL-0710-192 | EQL-0710-192 |
| Monitor Objective | Source Oriented | |
| Dominant Source | Point | |
| Measurement Scale | Urban Scale | |
| Land Use Type | Industrial | |
| Location Setting | Urban And Center City | |

The Exide site is located in Sullivan County, Tennessee and currently supports monitoring for lead. This site is located east of Kingsport and northeast of Blountville on the Tennessee Virginia state lines. This site is downwind from Johnson City and Blountville and is located in the Kingsport Bristol MSA area. Lead monitoring began 01/01/2010 and this site is used to verify lead NAAQS compliance at a now shutdown lead battery plant. This area is now classified as an attainment area for lead. The former lead source has surrendered its air permits and shut down. TDEC APC is preparing to request that the monitoring site be permanently shut down reflecting the reality that the only industrial lead source is no longer operating. See Appendix I: Annual Site Evaluations for further details.

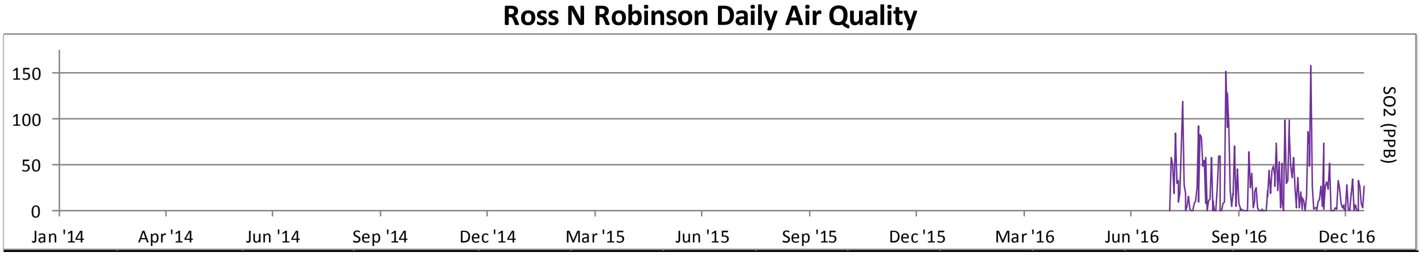


## Ross N Robinson – Sullivan County

| | |
|---|---|
| Address | Wilburn Drive |
| AQSID | 471636001 |
| County Name | Sullivan |
| CBSA | 28700 |
| Lat, Lon | 36.5326160009, -82.516306 |
| Parameter Code | 42401 |
| Parameter Name | $SO_2$ |
| Monitor Type | SLAMS |
| POC | 1 |
| Int | 1 |
| Collection Frequency | Hourly |
| Method | 100 |
| FRM/FEM Instrument | Teledyne T100 SO2 Analyzer |
| Analysis | Ultraviolet Fluorescence |
| Ref Mtd ID | EQSA-0495-100 |
| Monitor Objective | Source Oriented |
| Dominant Source | Point |
| Measurement Scale | Urban Scale |
| Land Use Type | Residential |
| Location Setting | Suburban |

The Ross N Robinson site is located in Sullivan County, Tennessee and currently supports monitoring for $SO_2$. The Ross N Robinson monitor is located within the 3-km $SO_2$ nonattainment area surrounding the Tennessee Eastman Chemical Plant and became operational in July, 2016. This monitor is one of two monitors that satisfy PWEI requirements for the Kingsport, TN CBSA and secondly, to characterize the maximum expected concentrations in the nonattainment area.

### Ross N Robinson Daily Air Quality

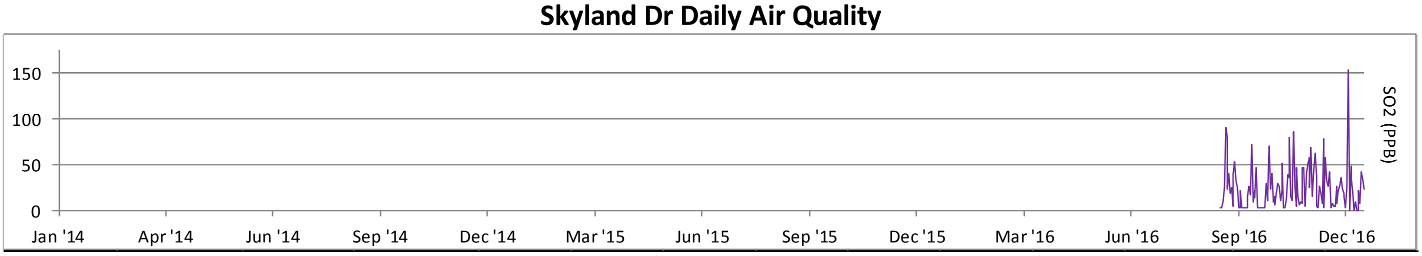


## Skyland Dr. – Sullivan County

| | |
|---|---|
| Address | Skyland Drive at Bagwell St. |
| AQSID | 471636002 |
| County Name | Sullivan |
| CBSA | 28700 |
| Lat, Lon | 36.5210200009027, -82.50244 |
| Parameter Code | 42401 |
| Parameter Name | $SO_2$ |
| Monitor Type | SLAMS |
| POC | 1 |
| Int | 1 |
| Collection Frequency | Hourly |
| Method | 100 |
| FRM/FEM Instrument | Api Model 100 E SO2 Analyzer |
| Analysis | Ultraviolet Fluorescence |
| Ref Mtd ID | EQSA-0495-100 |
| Monitor Objective | Population Exposure |
| Dominant Source | Point |
| Measurement Scale | Urban Scale |
| Land Use Type | Residential |
| Location Setting | Suburban |

The Skyland Drive ambient air monitoring site is located in Sullivan County, Tennessee and currently supports monitoring for $SO_2$. The site is located within the 3-km $SO_2$ nonattainment area surrounding the Tennessee Eastman Chemical Plant and became operational in September, 2016. The monitor was established in order, to characterize the maximum expected concentrations in the nonattainment area. This monitor is one of two monitors that satisfies PWEI requirements for the Kingsport, TN CBSA and secondly, to characterize the maximum expected concentrations in the nonattainment area.

**Skyland Dr Daily Air Quality**

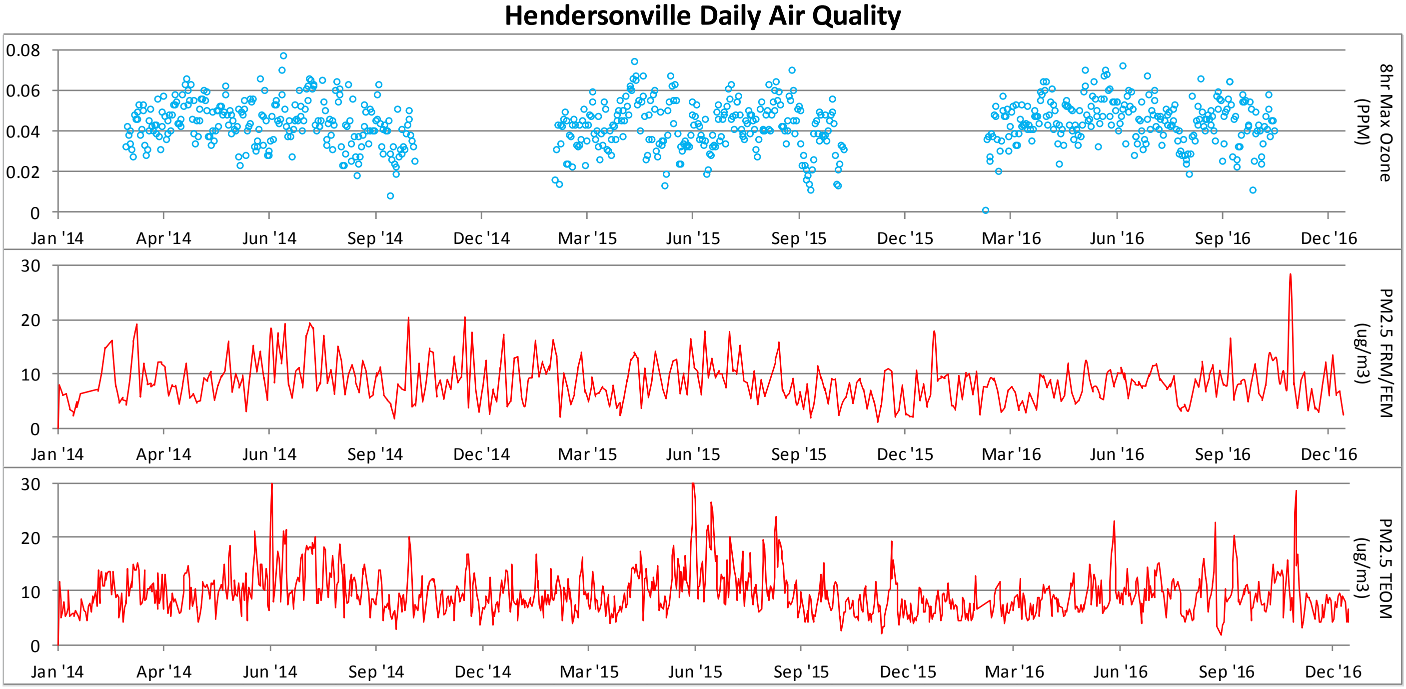


## Hendersonville - Sumner County

| | | | | |
|---|---|---|---|---|
| Address | Rockland Recreational Area, Old Hickory Dam | | | |
| AQSID | 471650007 | | | |
| CBSA | 34980 | | | |
| Lat | 36.297559999999997, -86.653137000000001 | | | |
| Parameter Code | 44201 | 88101 | 88101 | 88101 |
| Parameter Name | $O_3$ | $PM_{2.5}$ | $PM_{2.5}$ | $PM_{2.5}$ Cont |
| Monitor Type | SLAMS | SLAMS | SLAMS | SLAMS |
| POC | 1 | 1 | 2 | 3 |
| Int | W | 7 | | 1 |
| Collection Frequency | Hourly | 1 in 3 | | Hourly |
| Method | 047 | 118 | | 209 |
| FRM/FEM Instrument | Thermo Electron 49 | R&P Co Plus Model 2025 | | Met One BAM 1022 |
| Analysis | Ultra violet | Gravimetric | | Real Time Beta Attenuation Mass Monitor |
| Ref Mtd ID | EQOA-0880-047 | RFPS-0498-118 | | EQPM-1013-209 |
| Monitor Objective | Highest Conc | Population Exposure | | |
| Dominant Source | Area | Area | | |
| Measurement Scale | Neighborhood | Neighborhood | | |
| Land Use Type | Industrial | Industrial | | |
| Location Setting | Rural | Rural | | |

The Hendersonville site is located in Sumner County, Tennessee and currently supports monitoring for ozone and PM2.5. This site is located northeast of Nashville and west southwest of Gallatin, Tennessee. This site is downwind from the core Nashville MSA area. Sumner County is part of the Nashville MSA. Ozone monitoring began 01/01/1973 and this site is used with the ozone AQI forecasting program for verification and to help address NAAQS compliance in the Nashville MSA area. $PM_{2.5}$ monitoring began 10/01/1998 as a part of the original $PM_{2.5}$ state network. Continuous $PM_{2.5}$ monitoring using a non FRM/FEM method was added 01/01/2003 to assist with the PM fine AQI forecasting program. This site also received an FEM continuous PM2.5 sampler on March 10, 2017 and the FRM sampler will be retired upon completion of routing correlation testing. This site was determined to remain in operation over 5 years (2015 through 2020) primarily because it is the ozone DV site for the Nashville MSA area and is downwind from the Nashville fine particulate precursor sources. The Nashville MSA has 5 ozone monitors operating and is only required to have 2. See Appendix I: Annual Site Evaluations for further details.

### Hendersonville Daily Air Quality



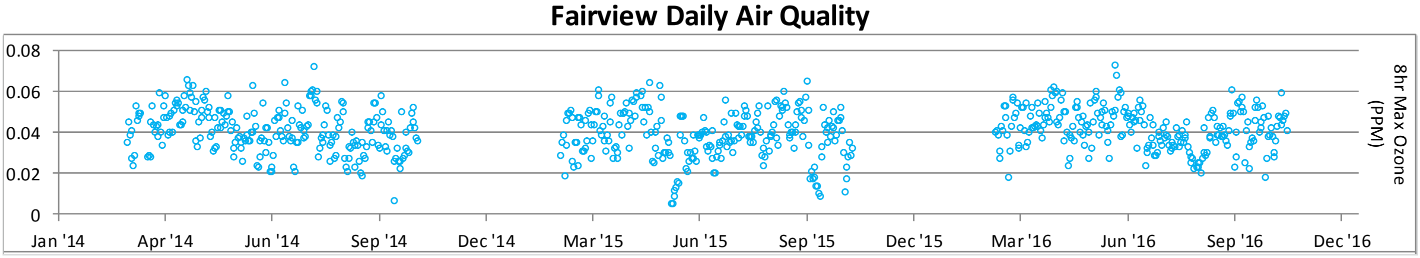
## Fairview –Williamson County

| | |
|---|---|
| Address | Fairview Middle School Crow Cut Road F |
| AQSID | 471870106 |
| CBSA | 34980 |
| Lat, Lon | 35.94985, -87.13817 |
| Parameter Code | 44201 |
| Parameter Name | $O_3$ |
| Monitor Type | SLAMS |
| POC | 1 |
| Int | W |
| Collection Frequency | Hourly |
| Method | 47 |
| FRM/FEM Instrument | Thermo Electron 49 |
| Analysis | Ultra Violet |
| Ref Mtd ID | EQOA-0880-047 |
| Monitor Objective | Population Exposure |
| Dominant Source | Area |
| Measurement Scale | Urban Scale |
| Land Use Type | Agricultural |
| Location Setting | Rural |

The Fairview site is located in Williamson County, Tennessee and currently supports monitoring for ozone. This site is located southwest of Nashville and northwest of Franklin, Tennessee. This site is upwind from the core Nashville MSA area. Ozone monitoring began on 10/30/2001 and this site is used by the ozone AQI forecasting program for verification and to help address upwind ozone concentrations entering the Nashville MSA area. The Nashville MSA has 5 ozone sites operating and is only required to have 2. Due to this site importance in assessing the area ozone levels outside and upwind of the Nashville area, it was determined to remain in operation over 5 years (2015 through 2020). See Appendix I: Annual Site Evaluations for further details.

This site was relocated in March 2017 due to failing the siting criteria requirements stated in 40 CFR 58 Appendix D. For additional information refer to the relocation request package located in Appendix H: Fairview (471870106) Relocation Request.

**Fairview Daily Air Quality**

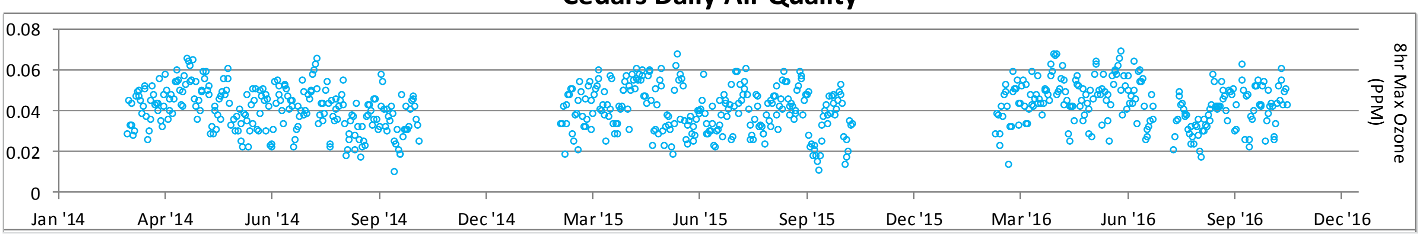


## Cedars of Lebanon – Wilson County

| | |
|---|---|
| Address | Cedars Of Lebanon State Park |
| AQSID | 471890103 |
| CBSA | 34980 |
| Lat, Lon | 36.060833, -86.2862609999999 |
| Parameter Code | 44201 |
| Parameter Name | $O_3$ |
| Monitor Type | SLAMS |
| POC | 1 |
| Int | W |
| Collection Frequency | Hourly |
| Method | 47 |
| FRM/FEM Instrument | Thermo Electron 49 |
| Analysis | Ultra Violet |
| Ref Mtd ID | EQOA-0880-047 |
| Monitor Objective | Unknown |
| Dominant Source | Area |
| Measurement Scale | Urban Scale |
| Land Use Type | Forest |
| Location Setting | Rural |

The Cedars site is located in Wilson County, Tennessee and currently supports monitoring for ozone. This site is located east of Nashville and north of Murfreesboro, Tennessee. This site is downwind from Franklin and is located within the Nashville MSA area. Ozone monitoring began 05/01/1988 and this site is used with the ozone AQI forecasting program for verification and to help address downwind ozone levels in the Nashville MSA area. The Nashville MSA has 5 ozone sites operating and is only required to have 2. Because of the importance this site serves in assessing the area ozone levels outside and downwind of the Nashville area, this site was determined to remain in operation over 5 years (2015 through 2020). See Appendix I: Annual Site Evaluations for further details.

**Cedars Daily Air Quality**



# Tennessee Geographic Regions, Descriptions and Climate

## Climate of Tennessee

***Topographic Features*** - The topography of Tennessee is quite varied, stretching from the lowlands of the Mississippi Valley to the mountain peaks in the east. The westernmost part of the state, between the bluffs overlooking the Mississippi River and western valley of the Tennessee River, is a region of gently rolling plains sloping gradually from 200 to 250 feet in the west to about 600 feet above sea level in the hills overlooking the Tennessee River. The hilly Highland Rim, in a wide circle touching the Tennessee River Valley in the west and the Cumberland Plateau in the east, together with the enclosed Central Basin make up the whole of Middle Tennessee. The Highland Rim ranges from about 600 feet in elevation along the Tennessee River to 1,000 feet in the east and rises 300 to 400 feet above the Central Basin which is a rolling plain of about 600 feet average elevation, but with a crescent of hills reaching to over 1,000 feet south of Nashville. The Cumberland Plateau, with an average elevation of 2,000 feet extends roughly northeast-southwest across the state in a belt 30 to 50 miles wide, being bounded on the west by the Highland Rim and overlooking the Great Valley of East Tennessee on the east. The Great Valley, paralleling the Plateau to the west and the Great Smoky Mountains to the east, is a funnel shaped valley varying in width from about 30 miles in the south to about 90 miles in the north. Within the valley, which slopes from 1,500 feet in the north to 700 feet in the south, is a series of northeast-southwest ridges. Along the Tennessee-North Carolina border lie the Great Smoky Mountains, the most rugged and elevated portion of Tennessee, with numerous peaks from 4,000 to 6,000 feet.

Tennessee, except for a small area east of Chattanooga, lies entirely within the drainage of the Mississippi River system. The extreme western section of the state is drained through several relatively small rivers directly into the Mississippi River. Otherwise, drainage is into either the Cumberland or Tennessee Rivers, both of which flow northward near the end of their courses to join the Ohio River along the Kentucky-Illinois border. The Cumberland River, which drains north-central portions of Tennessee rises in the Cumberland Mountains in Kentucky, flows southwestward, then south into Tennessee reaching the Nashville area before tuning northward to re-enter Kentucky. The Tennessee River is formed by the juncture of the Holston and French Broad rivers at Knoxville. It flows southwesterly along the Alabama-Mississippi line, and then flows northward across the state into Kentucky. Besides the headwater streams, other important tributaries include the: Clinch, Little Tennessee, Hiawassee, Elk and Duck Rivers.

***Temperature*** - Most aspects of the state's climate are related to the widely varying topography within its borders. The decrease of temperature with elevation is quite apparent, amounting to, on the average, three degrees Fahrenheit (°F) per 1,000 feet increase in elevation. Thus higher portions of the state, such as the Cumberland Plateau and the mountains of the east, have lower average temperature than the Great Valley of East Tennessee, which they flank, and other lower parts of the state. In the Great Valley temperature increases from north to south, reaching a value at the south end comparable to that of Middle and West Tennessee where elevation variations are a generally minor consideration. Across the state, the average annual temperature varies from over 62° F in the extreme southwest to near 45 degrees atop the highest peaks of the east. It is of interest to note that average January temperature atop a 6,000 foot peak in the Great Smokies is equivalent to that in Central Ohio, while average July temperature is duplicated along the southern edge of the Hudson Bay in Canada. While most of the state can be described as having warm, humid summers and mild winters, this must be qualified to include variations with elevation. Thus with increasing elevation, summers become cooler and more pleasant while winters become colder and more blustery.

This dependence of temperature on elevation is of considerable importance to a variety of interests. Temperature, together with precipitation, plays an important role in determination what plant and animal life are adaptable to the area. In the Great Smoky Mountains, for example, the variations in elevation from 1,000 to 6,000 feet with attendant variations in temperature contribute to a remarkable variety of plant life. The relative coolness of the mountains also contributes to the popularity of that area during the warmer part of the year.

Length of growing season is linked to topography in a way similar to temperature, varying from an average of 237 days at low-lying Memphis to a near 130 days on the highest mountains in the east. Most of the state is included in the range of 180 to 220 days. Shorter growing seasons than this are confined to the mountains forming the state's eastern border and to the northern part of the Cumberland Plateau. Longer growing seasons are found in counties bordering the Mississippi River, parts of the Central Basin of the Middle Tennessee, and the southern end of the Great Valley of East Tennessee.

***Precipitation*** - Since the principal source of moist air for this area is the Gulf of Mexico, there exists a gradual decrease of average precipitation from south to north. This effect is largely obscured however, by the overruling influence of topography. Air forced to ascend, cools and condenses out a portion of its moisture. Thus, average precipitation ranges from 46 to 54 inches, increasing from Mississippi bottomlands to the slight hills farther east. In Middle Tennessee the variation is from a minimum of 45 inches in the Central Basin to 50 to 55 inches in the surrounding hilly Highland Rim. Over the elevated Cumberland Plateau average annual precipitation is generally from 50 to 55 inches. In contrast, average annual precipitation in the Great Valley of East Tennessee increases from near 40 inches in northern portions to over 50 inches in the south. The northern minimum, lowest for the entire state, results from the shielding influence of the Great Smoky Mountains to the southeast and the Cumberland Plateau to the northwest. The mountainous eastern border of the state is the wettest, having average annual precipitation ranging up to 80 inches on the higher, and well-exposed peaks of the Smokies.

Over most of the state, the greatest precipitation occurs during the winter and early spring due to the more frequent passage of large-scale storms over and near the state during those months. A secondary maximum of precipitation occurs in midsummer in response to thunderstorm activity. This is especially pronounced in the mountains of the east where July rainfall exceeds the precipitation of any other month. Lightest precipitation, observed in the fall, is brought about by the maximum occurrence of slow moving, rain suppressing high pressure areas. Although all parts of Tennessee are generally well supplied with precipitation, there occurs on the average one or more prolonged dry spells each year during summer and fall. Studies illustrate the beneficial effects of supplemental irrigation of crops, despite usually bountiful annual precipitation.

Average annual snowfall varies from four to six inches in the southern and western parts of the state and in most of the Great Valley of East Tennessee to more than 10 inches over the northern Cumberland Plateau and the mountains of the east. Over most of the state, due to relatively mild winter temperatures, snow cover rarely persists for more than a few days.

The most important flood season is during the winter and early spring when the frequent migratory storms bring general rains of high intensity. During this period both widespread flooding and local flash floods can occur. During the summer, heavy thunderstorm rains frequently result in local flash flooding. In the fall, while flood producing rains are rare, a decadent tropical system on occasion causes serious floods. The numerous dams constructed along the Tennessee and Cumberland rivers are major features in the control of flood waters in the state.

The dams of the Tennessee and Cumberland River systems and the lakes so formed, in addition to vastly reducing flood damage have: facilitated water transportation, provided abundant low cost hydroelectric power and created extensive recreation areas. Fishing, boating, swimming and camping along the many lakes, together with the several state and national parks, have made tourism one of the major industries in the state.

***Climate and the Economy*** - Water resources of Tennessee have been a major factor in the state's industrial growth. The bountiful and good quality water supply has influenced the location of industry, especially chemical processing plants. Three major waterways, the Mississippi, Cumberland and Tennessee Rivers, are suitable for commercial traffic. Finally, the availability of low cost hydroelectric power from the multipurpose dams of the Cumberland and Tennessee rivers and tributaries has been stimulus to industry of all types. The principal types of manufacturing products are: textile mill products, primary metals, fabricated metals and lumber products.

Although surpassed in monetary value by industrial activity, agriculture remains a vital feature of Tennessee's economic life. The wide range of climates in Tennessee, from river bottom to mountaintop, coupled with a wide range of soils, has resulted in a large number of crops which thrive in the state.

Forests represent an additional important segment of Tennessee's natural resources related to the climate of the state. Timberland, containing principally hardwood types, covers approximately one-half of the total area of Tennessee. This has led to a highly diversified woodworking industry and made the area around Memphis the center of production for wood flooring. The temperate climate of the state is very favorable for logging operations, allowing full-scale activity during nine months of the year and to a lesser extent during the winter months.

**Climate descriptions of Tennessee -** Generally, Tennessee has a temperate climate, with warm summers and mild winters. However, the state's varied topography leads to a wide range of climatic conditions.

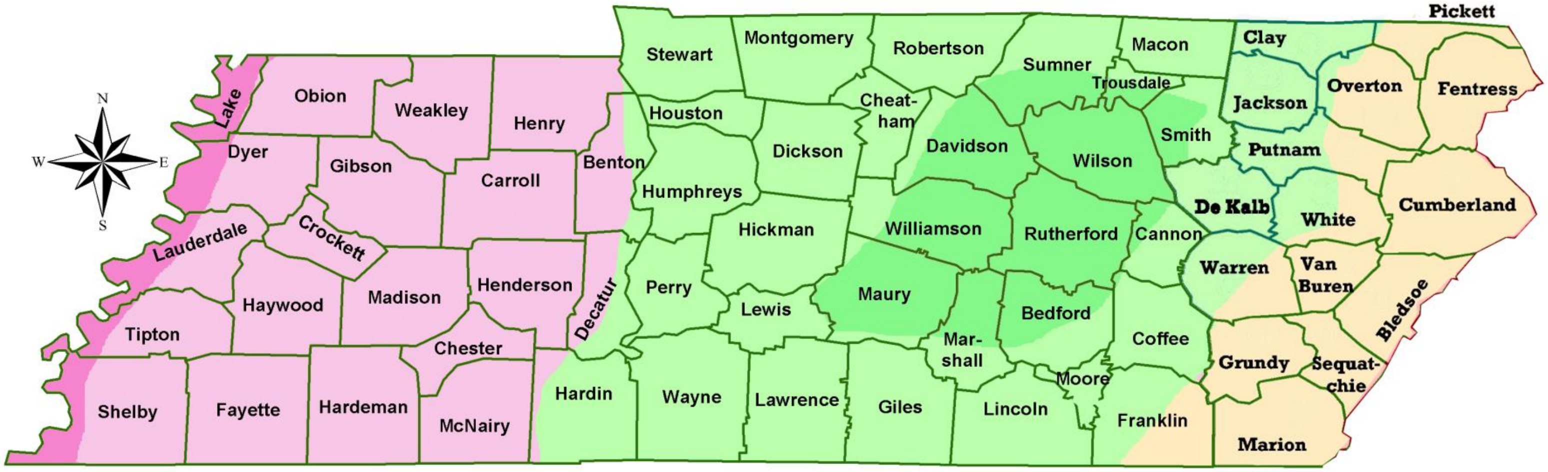
The warmest parts of the state, with the longest growing season, are the Gulf Coastal Plain, the Central Basin, and the Sequatchie Valley. In the Memphis area in the southwest, the average date of the last killing frost is 20 March, and the growing season is about 235 days. Memphis has an annual mean temperature of 62°F (17°C), 40°F (4°C) in January, and 83°F (28°C) in July. In the Nashville area, the growing season lasts about 225 days. Nashville has an annual mean of 59°F (15°C), ranging from 36°F (2°C) in January to 79°F (26°C) in July. The Knoxville area has a growing season of 220 days. The city's annual mean temperature is 60°F (16°C), with averages of 41°F (5°C) in January and 78°F (26°C) in July. In some parts of the mountainous east, where the temperatures are considerably lower, the growing season is as short as 130 days. The record high temperature for the state is 113°F (45°C), set at Perryville on 9 August 1930; the record low, –32°F (–36°C), was registered at Mountain City on 30 December 1917.

Severe storms occur infrequently. The greatest rainfall occurs in the winter and early spring, especially March; the early fall months, particularly September and October, are the driest. Average annual precipitation (1971–2000) was 54.7 in (138.9 cm) in Memphis and 48 in (122 cm) in Nashville. Snowfall varies and is more prevalent in East Tennessee than in the western section; Nashville gets about 10 in (25.4 cm) a year, Memphis only 5 in (12.7 cm).

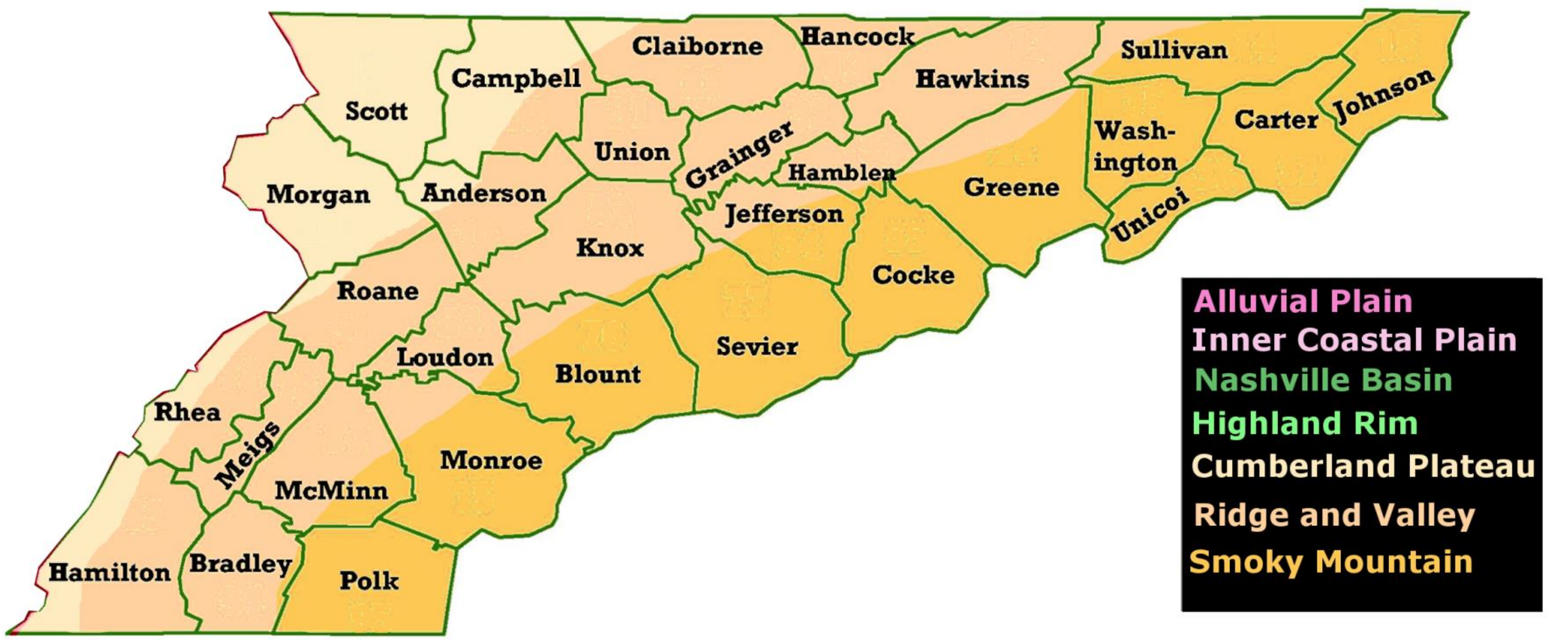
UT Institute of Agriculture > Tennessee Climatological Service > Climate Data for Tennessee

**Table 5: Map of Tennessee Geographic Regions**

Central Time Zone Regions (CST UTC-6:00, CDT UTC-5:00)




Eastern Time Zone Regions (CST UTC-5:00, CDT UTC-4:00)



**Climate Synopsis for Tennessee**

The highly varied topography of Tennessee has a significant impact on the state's climate. The landscape varies generally from west to east, starting with the gently rolling lowlands (200-600' above sea level) in the west, rising to the Highland Rim (600-1000') enclosing the Central Basin, and on up to the Cumberland Plateau (~2000') which trends northeast-southwest across the state in a belt 30-50 miles wide. East of the Plateau is the Great Valley of East Tennessee (elevations ranging from 1500' in the north down to 700' in the south) containing a series of northeast-southwest ridges. The eastern border of the state is dominated by the Great Smoky Mountains, with numerous peaks rising 4000' to 6000' above sea level.

Average annual temperatures across the state range from around 57°F to 60°F (1981-2010). Winter mean temperatures are near 39°F (1981-2010) over most of the state, while summer temperatures average between 74°F and 78°F (1981-2010). Of course, these general patterns are affected by topography: the higher mountain areas tend to have milder summers as well as colder, more blustery winters. The length of the growing season is also linked to topography: most of the state has a growing season between 180 and 220 days, but this stretches to over 235 days in the lowlands around Memphis and drops to near 130 days in the highest mountains to the east.

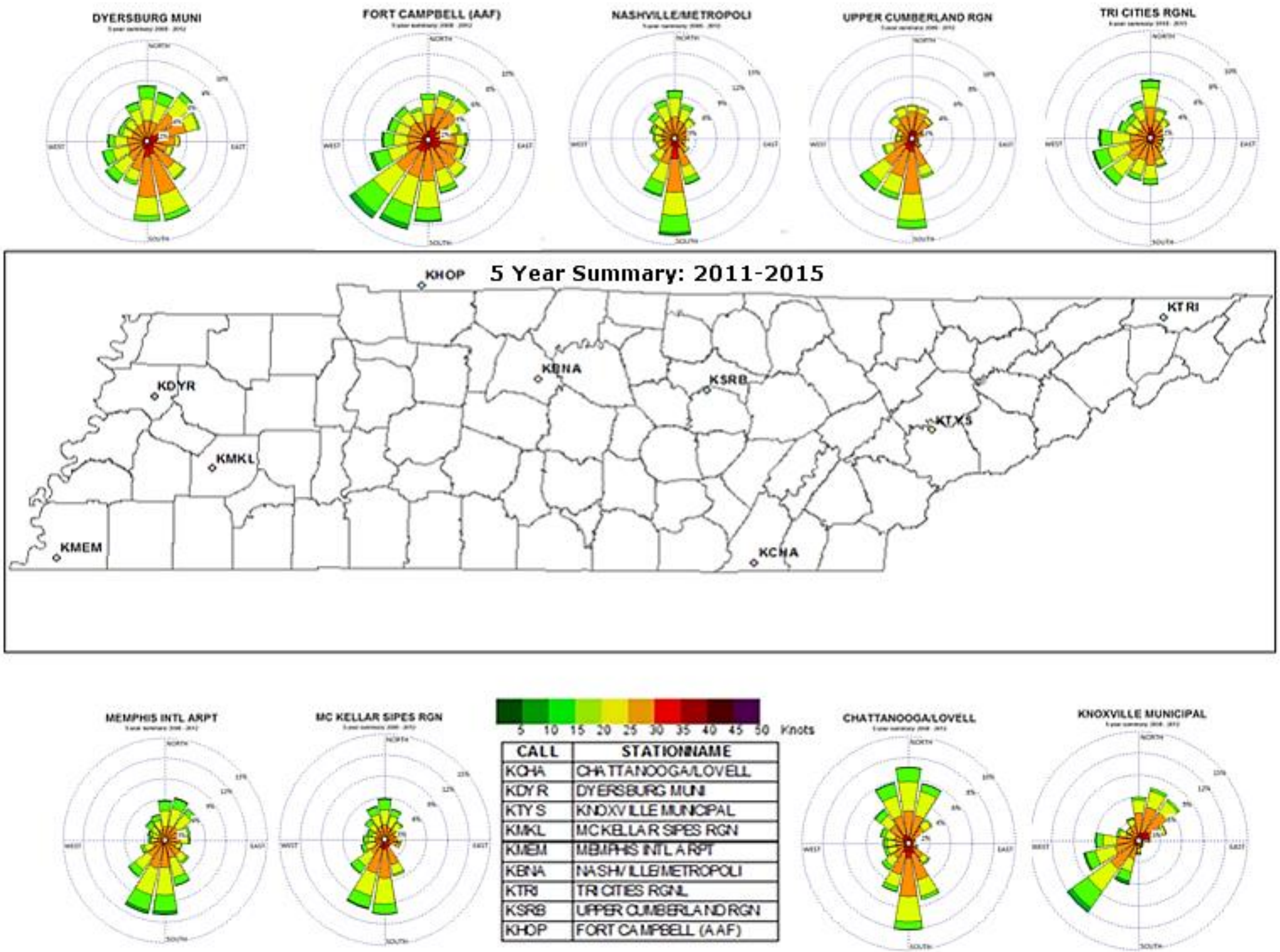
The principal source of moisture for the state is the Gulf of Mexico to the south, which results in a gradual decrease of precipitation from south to north. This gradient is largely obscured, however, by orographic effects. In West Tennessee, annual precipitation amounts range from 46 inches to 54 inches, increasing from the Mississippi bottomlands to the slight hills farther east. In Middle Tennessee, the variation is from around 45 inches in the Central Basin to 50-55 inches in the surrounding Highland Rim. The Cumberland Plateau also averages 50-55 inches per year. In the Great Valley of Eastern Tennessee, annual precipitation rises from a minimum of 40 inches in the north (the driest part of the state due to the rain shadow effect of the Great Smoky Mountains and the Cumberland Plateau) to over 50 inches in the south. The mountainous eastern border of the state is the wettest part, with annual totals of up to 80 inches in the higher, well-exposed peaks.

Over most of the state, the greatest precipitation occurs in winter and early spring owing to the more frequent passage of large-scale (frontal) storms over the region. A secondary maximum of precipitation occurs in midsummer in response to shower and thunderstorm activity, especially in July in the mountains of the east. Fall tends to be the dry season for the state, due to the higher frequency of slow-moving high pressure areas during this season. Average annual snowfall ranges from 4-6 inches in the south and west to over 10 inches in the east. Due to the relatively mild winter conditions over most of the state, snow cover rarely persists for more than a few days.

Severe storms are relatively infrequent in the state, being east of the center of tornado activity, south of most blizzard conditions, and too far inland to be often affected by hurricanes. Averages of 26 (1991-2011) tornadoes are observed in the state each year, mostly confined to areas west of the Cumberland Plateau. Hailstorms (>1") at a given location are observed 3 to 6 (2003-2012) times a year, and damaging glaze storms occur in the state every 3 or 4 years (1996-2013). Thunderstorms are frequent in the warm season, and severe thunderstorms with damaging winds are experienced at scattered locations throughout the state each year.

Adapted from: Climatography of the United States, No. 60, National Climatic Data Center
Updated 2/26/2014 by TDAPC using data from NCDC

**Table 6: Wind rose Data for Tennessee**




| CALL | STATIONNAME |
|---|---|
| KCHA | CHATTANOOGA/LOVELL |
| KDYR | DYERSBURG MUNI |
| KTYS | KNOXVILLE MUNICIPAL |
| KMKL | MCKELLAR SIPES RGN |
| KMEM | MEMPHIS INTL ARPT |
| KBNA | NASHVILLE/METROPOLI |
| KTRI | TRI CITIES RGNL |
| KSRB | UPPER CUMBERLAND RGN |
| KHOP | FORT CAMPBELL (AAF) |

## Table 7: Tennessee Metropolitan Statistical Areas and Population Estimates

| CBSA | STCOU | NAME | LSAD | CENSUS 2010 POP | POP EST 2016 |
|---|---|---|---|---|---|
| **16860** | | **Chattanooga, TN-GA** | **Metropolitan Statistical Area** | **528143** | **551632** |
| 16860 | 13047 | Catoosa County, GA | County or equivalent | 63942 | 66398 |
| 16860 | 13083 | Dade County, GA | County or equivalent | 16633 | 16257 |
| 16860 | 13295 | Walker County, GA | County or equivalent | 68756 | 67896 |
| 16860 | 47065 | Hamilton County, TN | County or equivalent | 336463 | 357738 |
| 16860 | 47115 | Marion County, TN | County or equivalent | 28237 | 28446 |
| 16860 | 47153 | Sequatchie County, TN | County or equivalent | 14112 | 14897 |
| **17300** | | **Clarksville, TN-KY** | **Metropolitan Statistical Area** | **260625** | **282349** |
| 17300 | 21047 | Christian County, KY | County or equivalent | 73955 | 72351 |
| 17300 | 21221 | Trigg County, KY | County or equivalent | 14339 | 14264 |
| 17300 | 47125 | Montgomery County, TN | County or equivalent | 172331 | 195734 |
| **17420** | | **Cleveland, TN** | **Metropolitan Statistical Area** | **115788** | **121262** |
| 17420 | 47011 | Bradley County, TN | County or equivalent | 98963 | 104490 |
| 17420 | 47139 | Polk County, TN | County or equivalent | 16825 | 16772 |
| **27180** | | **Jackson, TN** | **Metropolitan Statistical Area** | **130011** | **129527** |
| 27180 | 47023 | Chester County, TN | County or equivalent | 17131 | 17453 |
| 27180 | 47033 | Crockett County, TN | County or equivalent | 14586 | 14411 |
| 27180 | 47113 | Madison County, TN | County or equivalent | 98294 | 97663 |
| **27740** | | **Johnson City, TN** | **Metropolitan Statistical Area** | **198716** | **201661** |
| 27740 | 47019 | Carter County, TN | County or equivalent | 57424 | 56502 |
| 27740 | 47171 | Unicoi County, TN | County or equivalent | 18313 | 17719 |
| 27740 | 47179 | Washington County, TN | County or equivalent | 122979 | 127440 |
| **28700** | | **Kingsport-Bristol-Bristol, TN-VA** | **Metropolitan Statistical Area** | **309544** | **306334** |
| 28700 | 47073 | Hawkins County, TN | County or equivalent | 56833 | 56563 |
| 28700 | 47163 | Sullivan County, TN | County or equivalent | 156823 | 156667 |
| 28700 | 51169 | Scott County, VA | County or equivalent | 23177 | 21930 |
| 28700 | 51191 | Washington County, VA | County or equivalent | 54876 | 54214 |
| 28700 | 51520 | Bristol city, VA | County or equivalent | 17835 | 16960 |
| **28940** | | **Knoxville, TN** | **Metropolitan Statistical Area** | **837571** | **868546** |
| 28940 | 47001 | Anderson County, TN | County or equivalent | 75129 | 75936 |
| 28940 | 47009 | Blount County, TN | County or equivalent | 123010 | 128670 |
| 28940 | 47013 | Campbell County, TN | County or equivalent | 40716 | 39714 |
| 28940 | 47057 | Grainger County, TN | County or equivalent | 22657 | 23072 |
| 28940 | 47093 | Knox County, TN | County or equivalent | 432226 | 456132 |
| 28940 | 47105 | Loudon County, TN | County or equivalent | 48556 | 51454 |
| 28940 | 47129 | Morgan County, TN | County or equivalent | 21987 | 21554 |
| 28940 | 47145 | Roane County, TN | County or equivalent | 54181 | 52874 |
| 28940 | 47173 | Union County, TN | County or equivalent | 19109 | 19140 |
| **32820** | | **Memphis, TN-MS-AR** | **Metropolitan Statistical Area** | **1324829** | **1342842** |
| 32820 | 5035 | Crittenden County, AR | County or equivalent | 50902 | 49235 |
| 32820 | 28009 | Benton County, MS | County or equivalent | 8729 | 8264 |
| 32820 | 28033 | DeSoto County, MS | County or equivalent | 161252 | 175611 |
| 32820 | 28093 | Marshall County, MS | County or equivalent | 37144 | 35801 |
| 32820 | 28137 | Tate County, MS | County or equivalent | 28886 | 28201 |
| 32820 | 28143 | Tunica County, MS | County or equivalent | 10778 | 10234 |
| 32820 | 47047 | Fayette County, TN | County or equivalent | 38413 | 39590 |
| 32820 | 47157 | Shelby County, TN | County or equivalent | 927644 | 934603 |
| 32820 | 47167 | Tipton County, TN | County or equivalent | 61081 | 61303 |
| **34100** | | **Morristown, TN** | **Metropolitan Statistical Area** | **113951** | **117320** |
| 34100 | 47063 | Hamblen County, TN | County or equivalent | 62544 | 63785 |
| 34100 | 47089 | Jefferson County, TN | County or equivalent | 51407 | 53535 |
| **34980** | | **Nashville-Davidson--Murfreesboro--Franklin, TN** | **Metropolitan Statistical Area** | **1670890** | **1865298** |
| 34980 | 47015 | Cannon County, TN | County or equivalent | 13801 | 14027 |

| CBSA | STCOU | NAME | LSAD | CENSUS 2010 POP | POP EST 2016 |
|---|---|---|---|---|---|
| 34980 | 47021 | Cheatham County, TN | County or equivalent | 39105 | 39880 |
| 34980 | 47037 | Davidson County, TN | County or equivalent | 626681 | 684410 |
| 34980 | 47043 | Dickson County, TN | County or equivalent | 49666 | 52170 |
| 34980 | 47081 | Hickman County, TN | County or equivalent | 24690 | 24295 |
| 34980 | 47111 | Macon County, TN | County or equivalent | 22248 | 23450 |
| 34980 | 47119 | Maury County, TN | County or equivalent | 80956 | 89981 |
| 34980 | 47147 | Robertson County, TN | County or equivalent | 66283 | 69165 |
| 34980 | 47149 | Rutherford County, TN | County or equivalent | 262604 | 308251 |
| 34980 | 47159 | Smith County, TN | County or equivalent | 19166 | 19447 |
| 34980 | 47165 | Sumner County, TN | County or equivalent | 160645 | 180063 |
| 34980 | 47169 | Trousdale County, TN | County or equivalent | 7870 | 8271 |
| 34980 | 47187 | Williamson County, TN | County or equivalent | 183182 | 219107 |
| 34980 | 47189 | Wilson County, TN | County or equivalent | 113993 | 132781 |

## Table 8: Tennessee Micropolitan Statistical Areas and Population Estimates

| CBSA | STCOU | NAME | LSAD | CENSUS 2010 POP | POP EST 2016 |
|---|---|---|---|---|---|
| **11940** | | **Athens, TN** | **Micropolitan Statistical Area** | **52266** | **52850** |
| 11940 | 47107 | McMinn County, TN | County or equivalent | 52266 | 52850 |
| **18260** | | **Cookeville, TN** | **Micropolitan Statistical Area** | **106042** | **109548** |
| 18260 | 47087 | Jackson County, TN | County or equivalent | 11638 | 11566 |
| 18260 | 47133 | Overton County, TN | County or equivalent | 22083 | 22051 |
| 18260 | 47141 | Putnam County, TN | County or equivalent | 72321 | 75931 |
| **18900** | | **Crossville, TN** | **Micropolitan Statistical Area** | **56053** | **58655** |
| 18900 | 47035 | Cumberland County, TN | County or equivalent | 56053 | 58655 |
| **19420** | | **Dayton, TN** | **Micropolitan Statistical Area** | **31809** | **32442** |
| 19420 | 47143 | Rhea County, TN | County or equivalent | 31809 | 32442 |
| **20540** | | **Dyersburg, TN** | **Micropolitan Statistical Area** | **38335** | **37708** |
| 20540 | 47045 | Dyer County, TN | County or equivalent | 38335 | 37708 |
| **24620** | | **Greeneville, TN** | **Micropolitan Statistical Area** | **68831** | **68615** |
| 24620 | 47059 | Greene County, TN | County or equivalent | 68831 | 68615 |
| **29980** | | **Lawrenceburg, TN** | **Micropolitan Statistical Area** | **41869** | **43081** |
| 29980 | 47099 | Lawrence County, TN | County or equivalent | 41869 | 43081 |
| **30280** | | **Lewisburg, TN** | **Micropolitan Statistical Area** | **30617** | **31915** |
| 30280 | 47117 | Marshall County, TN | County or equivalent | 30617 | 31915 |
| **32280** | | **Martin, TN** | **Micropolitan Statistical Area** | **35021** | **33507** |
| 32280 | 47183 | Weakley County, TN | County or equivalent | 35021 | 33507 |
| **32660** | | **McMinnville, TN** | **Micropolitan Statistical Area** | **39839** | **40516** |
| 32660 | 47177 | Warren County, TN | County or equivalent | 39839 | 40516 |
| **35460** | | **Newport, TN** | **Micropolitan Statistical Area** | **35662** | **35219** |
| 35460 | 47029 | Cocke County, TN | County or equivalent | 35662 | 35219 |
| **37540** | | **Paris, TN** | **Micropolitan Statistical Area** | **32330** | **32310** |
| 37540 | 47079 | Henry County, TN | County or equivalent | 32330 | 32310 |
| **42940** | | **Sevierville, TN** | **Micropolitan Statistical Area** | **89889** | **96673** |
| 42940 | 47155 | Sevier County, TN | County or equivalent | 89889 | 96673 |
| **43180** | | **Shelbyville, TN** | **Micropolitan Statistical Area** | **45058** | **47484** |
| 43180 | 47003 | Bedford County, TN | County or equivalent | 45058 | 47484 |
| **46100** | | **Tullahoma-Manchester, TN** | **Micropolitan Statistical Area** | **100210** | **102705** |
| 46100 | 47031 | Coffee County, TN | County or equivalent | 52796 | 54682 |
| 46100 | 47051 | Franklin County, TN | County or equivalent | 41052 | 41700 |
| 46100 | 47127 | Moore County, TN | County or equivalent | 6362 | 6323 |
| **46460** | | **Union City, TN-KY** | **Micropolitan Statistical Area** | **38620** | **36757** |
| 46460 | 21075 | Fulton County, KY | County or equivalent | 6813 | 6179 |
| 46460 | 47131 | Obion County, TN | County or equivalent | 31807 | 30578 |

https://www.census.gov/data/datasets/2016/demo/popest/total-metro-and-micro-statistical-areas.html

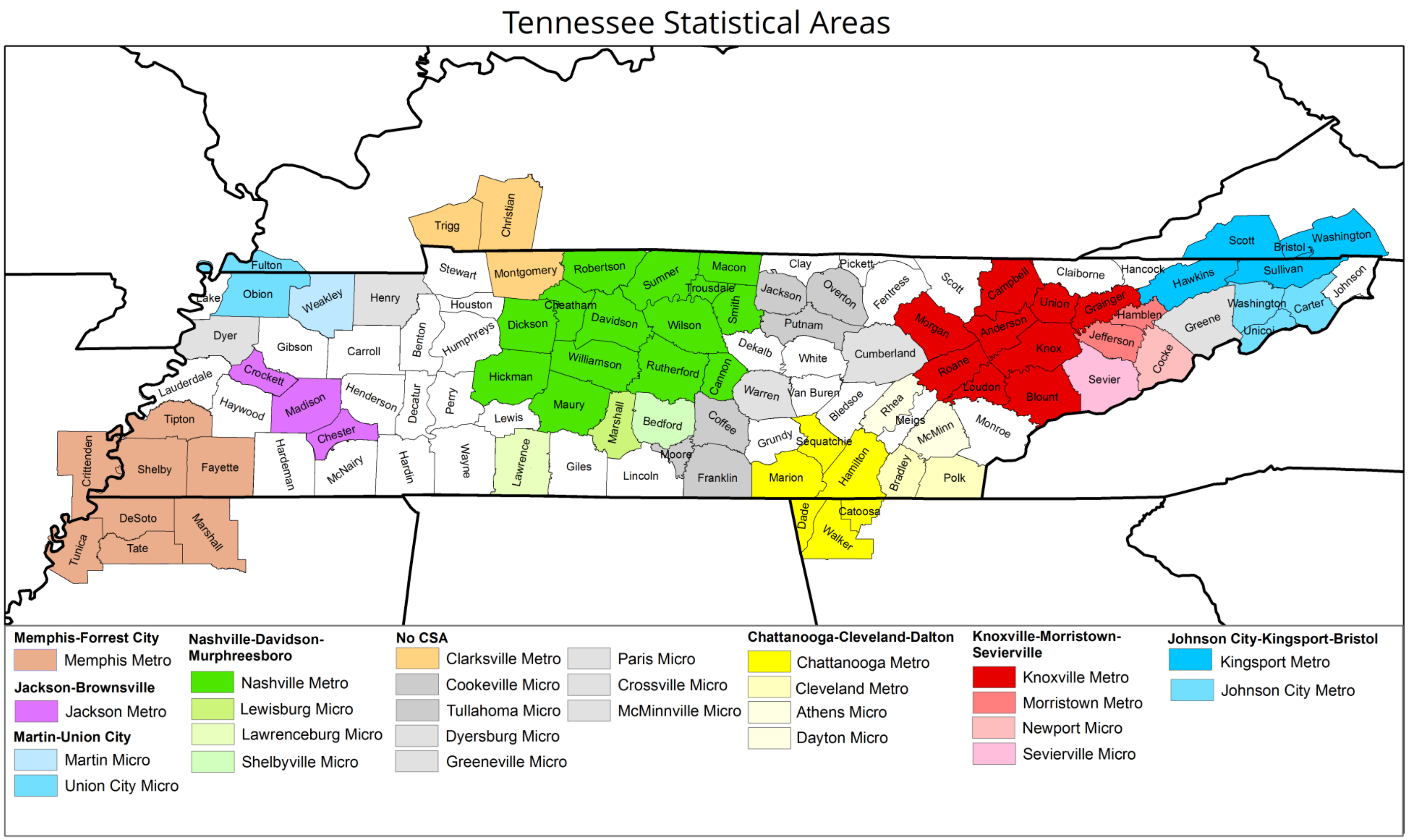
**Table 9: Tennessee County Population Data Trends**

(2010 Census and Estimates to 2016 by US Census Bureau)

| **Geography** | **April 1, 2010** | | **Population Estimate (as of July 1, 2016)** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Census | Estimate | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| Anderson | 75,129 | 75,094 | 75,126 | 75,179 | 75,326 | 75,420 | 75,347 | 75,698 | 75,936 |
| Bedford | 45,058 | 45,056 | 45,100 | 45,271 | 45,307 | 45,638 | 46,284 | 46,940 | 47,484 |
| Benton | 16,489 | 16,491 | 16,493 | 16,423 | 16,354 | 16,280 | 16,109 | 16,107 | 16,014 |
| Bledsoe | 12,876 | 12,872 | 12,874 | 12,847 | 12,791 | 13,785 | 14,535 | 14,580 | 14,675 |
| Blount | 123,010 | 123,100 | 123,241 | 123,704 | 124,069 | 124,985 | 126,092 | 127,142 | 128,670 |
| Bradley | 98,963 | 98,932 | 99,126 | 99,883 | 101,101 | 101,881 | 102,921 | 103,907 | 104,490 |
| Campbell | 40,716 | 40,723 | 40,722 | 40,579 | 40,460 | 40,229 | 39,909 | 39,728 | 39,714 |
| Cannon | 13,801 | 13,816 | 13,814 | 13,764 | 13,868 | 13,800 | 13,725 | 13,854 | 14,027 |
| Carroll | 28,522 | 28,480 | 28,445 | 28,533 | 28,707 | 28,685 | 28,471 | 28,131 | 28,092 |
| Carter | 57,424 | 57,375 | 57,313 | 57,434 | 57,309 | 56,982 | 56,312 | 56,430 | 56,502 |
| Cheatham | 39,105 | 39,103 | 39,115 | 38,986 | 39,245 | 39,387 | 39,674 | 39,690 | 39,880 |
| Chester | 17,131 | 17,143 | 17,184 | 17,222 | 17,213 | 17,340 | 17,358 | 17,413 | 17,453 |
| Claiborne | 32,213 | 32,212 | 32,234 | 32,088 | 31,770 | 31,661 | 31,630 | 31,687 | 31,757 |
| Clay | 7,861 | 7,860 | 7,843 | 7,827 | 7,801 | 7,784 | 7,733 | 7,773 | 7,752 |
| Cocke | 35,662 | 35,642 | 35,644 | 35,372 | 35,450 | 35,287 | 35,230 | 35,096 | 35,219 |
| Coffee | 52,796 | 52,800 | 52,783 | 52,882 | 53,132 | 53,324 | 53,623 | 54,279 | 54,682 |
| Crockett | 14,586 | 14,576 | 14,574 | 14,550 | 14,607 | 14,590 | 14,614 | 14,566 | 14,411 |
| Cumberland | 56,053 | 56,062 | 56,210 | 56,620 | 57,073 | 57,513 | 57,958 | 58,278 | 58,655 |
| Davidson | 626,681 | 626,580 | 628,077 | 635,503 | 649,004 | 658,990 | 668,699 | 678,323 | 684,410 |
| Decatur | 11,757 | 11,750 | 11,729 | 11,684 | 11,660 | 11,697 | 11,733 | 11,657 | 11,769 |
| DeKalb | 18,723 | 18,720 | 18,716 | 18,794 | 18,911 | 19,108 | 19,211 | 19,205 | 19,361 |
| Dickson | 49,666 | 49,658 | 49,701 | 49,946 | 50,177 | 50,211 | 50,609 | 51,461 | 52,170 |
| Dyer | 38,335 | 38,330 | 38,313 | 38,148 | 38,246 | 38,148 | 37,868 | 37,878 | 37,708 |
| Fayette | 38,413 | 38,439 | 38,435 | 38,569 | 38,662 | 38,810 | 39,072 | 39,220 | 39,590 |
| Fentress | 17,959 | 17,960 | 17,928 | 18,026 | 17,924 | 17,937 | 17,867 | 17,917 | 18,033 |
| Franklin | 41,052 | 41,064 | 40,970 | 40,862 | 40,786 | 41,313 | 41,428 | 41,514 | 41,700 |
| Gibson | 49,683 | 49,691 | 49,732 | 49,873 | 49,689 | 49,483 | 49,541 | 49,442 | 49,401 |
| Giles | 29,485 | 29,489 | 29,401 | 29,337 | 29,006 | 28,859 | 28,917 | 29,079 | 29,307 |
| Grainger | 22,657 | 22,656 | 22,714 | 22,733 | 22,649 | 22,681 | 22,830 | 22,835 | 23,072 |
| Greene | 68,831 | 68,825 | 68,826 | 68,996 | 68,654 | 68,272 | 68,416 | 68,551 | 68,615 |
| Grundy | 13,703 | 13,726 | 13,738 | 13,657 | 13,653 | 13,509 | 13,464 | 13,456 | 13,389 |
| Hamblen | 62,544 | 62,533 | 62,550 | 62,816 | 62,712 | 63,082 | 63,022 | 63,414 | 63,785 |
| Hamilton | 336,463 | 336,484 | 337,332 | 340,939 | 345,783 | 348,853 | 350,545 | 353,604 | 357,738 |
| Hancock | 6,819 | 6,815 | 6,808 | 6,711 | 6,675 | 6,638 | 6,602 | 6,554 | 6,577 |
| Hardeman | 27,253 | 27,247 | 27,154 | 26,851 | 26,528 | 26,251 | 25,927 | 25,732 | 25,435 |
| Hardin | 26,026 | 26,012 | 26,039 | 25,868 | 26,005 | 25,981 | 25,810 | 25,718 | 25,679 |
| Hawkins | 56,833 | 56,829 | 56,867 | 56,617 | 56,561 | 56,740 | 56,529 | 56,443 | 56,563 |
| Haywood | 18,787 | 18,807 | 18,787 | 18,568 | 18,281 | 18,256 | 18,226 | 18,028 | 17,853 |
| Henderson | 27,769 | 27,782 | 27,786 | 28,020 | 28,006 | 27,958 | 27,991 | 27,984 | 27,822 |
| Henry | 32,330 | 32,354 | 32,404 | 32,379 | 32,373 | 32,253 | 32,315 | 32,205 | 32,310 |
| Hickman | 24,690 | 24,689 | 24,648 | 24,344 | 24,132 | 24,153 | 24,360 | 24,315 | 24,295 |
| Houston | 8,426 | 8,425 | 8,443 | 8,338 | 8,408 | 8,275 | 8,220 | 8,131 | 8,134 |
| Humphreys | 18,538 | 18,535 | 18,569 | 18,396 | 18,271 | 18,230 | 18,109 | 18,122 | 18,347 |
| Jackson | 11,638 | 11,632 | 11,596 | 11,514 | 11,524 | 11,533 | 11,492 | 11,517 | 11,566 |
| Jefferson | 51,407 | 51,660 | 51,697 | 52,008 | 52,428 | 52,352 | 52,651 | 53,288 | 53,535 |
| Johnson | 18,244 | 18,244 | 18,285 | 18,210 | 18,121 | 17,998 | 17,919 | 17,821 | 17,754 |
| Knox | 432,226 | 432,266 | 433,056 | 436,551 | 440,793 | 444,325 | 448,125 | 451,444 | 456,132 |
| Lake | 7,832 | 7,832 | 7,821 | 7,778 | 7,710 | 7,711 | 7,662 | 7,572 | 7,560 |
| Lauderdale | 27,815 | 27,822 | 27,742 | 27,697 | 27,676 | 27,559 | 27,340 | 26,959 | 26,773 |
| Lawrence | 41,869 | 41,851 | 41,988 | 42,059 | 42,133 | 41,990 | 42,297 | 42,531 | 43,081 |
| Lewis | 12,161 | 12,171 | 12,162 | 12,152 | 11,918 | 11,969 | 11,878 | 11,866 | 11,904 |
| Lincoln | 33,361 | 33,350 | 33,411 | 33,416 | 33,442 | 33,574 | 33,556 | 33,695 | 33,645 |
| Loudon | 48,556 | 48,548 | 48,738 | 49,073 | 49,732 | 50,374 | 50,646 | 50,978 | 51,454 |

| Geography | April 1, 2010 | | Population Estimate (as of July 1, 2016) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Census | Estimate | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| McMinn | 52,266 | 52,278 | 52,197 | 52,356 | 52,429 | 52,405 | 52,710 | 52,636 | 52,850 |
| McNairy | 26,075 | 26,077 | 26,056 | 26,050 | 26,160 | 26,078 | 26,114 | 25,997 | 25,935 |
| Macon | 22,248 | 22,227 | 22,245 | 22,462 | 22,501 | 22,619 | 22,942 | 23,108 | 23,450 |
| Madison | 98,294 | 98,299 | 98,258 | 98,022 | 98,523 | 98,715 | 98,130 | 97,609 | 97,663 |
| Marion | 28,237 | 28,222 | 28,224 | 28,075 | 28,218 | 28,316 | 28,373 | 28,462 | 28,446 |
| Marshall | 30,617 | 30,606 | 30,678 | 30,885 | 30,928 | 31,082 | 31,233 | 31,518 | 31,915 |
| Maury | 80,956 | 80,930 | 81,188 | 81,415 | 81,969 | 83,611 | 85,541 | 87,735 | 89,981 |
| Meigs | 11,753 | 11,768 | 11,795 | 11,684 | 11,701 | 11,696 | 11,744 | 11,872 | 12,005 |
| Monroe | 44,519 | 44,505 | 44,618 | 44,930 | 45,150 | 45,223 | 45,390 | 45,677 | 45,970 |
| Montgomery | 172,331 | 172,362 | 173,218 | 176,655 | 185,225 | 184,637 | 189,655 | 193,294 | 195,734 |
| Moore | 6,362 | 6,345 | 6,340 | 6,401 | 6,336 | 6,302 | 6,317 | 6,290 | 6,323 |
| Morgan | 21,987 | 21,986 | 21,999 | 22,058 | 21,947 | 21,707 | 21,742 | 21,492 | 21,554 |
| Obion | 31,807 | 31,807 | 31,815 | 31,683 | 31,346 | 31,068 | 30,875 | 30,633 | 30,578 |
| Overton | 22,083 | 22,084 | 22,096 | 22,193 | 22,222 | 22,021 | 22,002 | 22,156 | 22,051 |
| Perry | 7,915 | 7,928 | 7,944 | 7,863 | 7,854 | 7,878 | 7,845 | 7,914 | 7,964 |
| Pickett | 5,077 | 5,077 | 5,072 | 5,132 | 5,070 | 5,044 | 5,081 | 5,142 | 5,142 |
| Polk | 16,825 | 16,826 | 16,810 | 16,737 | 16,606 | 16,640 | 16,722 | 16,744 | 16,772 |
| Putnam | 72,321 | 72,347 | 72,580 | 72,981 | 73,487 | 73,992 | 74,878 | 74,974 | 75,931 |
| Rhea | 31,809 | 31,802 | 31,859 | 32,051 | 32,338 | 32,526 | 32,607 | 32,392 | 32,442 |
| Roane | 54,181 | 54,193 | 54,159 | 53,856 | 53,506 | 53,035 | 52,773 | 52,726 | 52,874 |
| Robertson | 66,283 | 66,349 | 66,391 | 66,693 | 66,743 | 67,244 | 67,923 | 68,452 | 69,165 |
| Rutherford | 262,604 | 262,592 | 263,776 | 269,136 | 274,386 | 281,289 | 289,095 | 298,423 | 308,251 |
| Scott | 22,228 | 22,232 | 22,240 | 22,121 | 22,175 | 22,024 | 22,026 | 21,974 | 21,947 |
| Sequatchie | 14,112 | 14,121 | 14,137 | 14,280 | 14,426 | 14,663 | 14,773 | 14,789 | 14,897 |
| Sevier | 89,889 | 89,725 | 89,977 | 91,123 | 92,299 | 93,356 | 94,696 | 95,661 | 96,673 |
| Shelby | 927,644 | 927,684 | 928,652 | 933,011 | 938,965 | 938,091 | 937,162 | 936,131 | 934,603 |
| Smith | 19,166 | 19,149 | 19,124 | 19,145 | 19,114 | 19,050 | 19,014 | 19,253 | 19,447 |
| Stewart | 13,324 | 13,313 | 13,337 | 13,228 | 13,311 | 13,308 | 13,243 | 13,240 | 13,182 |
| Sullivan | 156,823 | 156,806 | 156,820 | 156,929 | 156,547 | 156,562 | 156,784 | 156,661 | 156,667 |
| Sumner | 160,645 | 160,617 | 161,249 | 163,882 | 166,101 | 169,110 | 172,790 | 175,866 | 180,063 |
| Tipton | 61,081 | 61,006 | 61,077 | 61,282 | 61,609 | 61,599 | 61,672 | 61,605 | 61,303 |
| Trousdale | 7,870 | 7,864 | 7,862 | 7,800 | 7,774 | 7,782 | 7,990 | 8,035 | 8,271 |
| Unicoi | 18,313 | 18,315 | 18,277 | 18,285 | 18,227 | 18,047 | 17,914 | 17,820 | 17,719 |
| Union | 19,109 | 19,109 | 19,102 | 19,213 | 19,120 | 19,055 | 18,964 | 19,126 | 19,140 |
| Van Buren | 5,548 | 5,558 | 5,557 | 5,540 | 5,635 | 5,570 | 5,625 | 5,686 | 5,689 |
| Warren | 39,839 | 39,824 | 39,851 | 39,869 | 39,745 | 39,893 | 40,003 | 40,338 | 40,516 |
| Washington | 122,979 | 123,065 | 123,423 | 123,920 | 124,907 | 125,516 | 125,999 | 126,357 | 127,440 |
| Wayne | 17,021 | 17,027 | 16,985 | 17,012 | 16,996 | 16,918 | 16,846 | 16,738 | 16,713 |
| Weakley | 35,021 | 35,015 | 35,027 | 34,907 | 34,594 | 34,186 | 34,001 | 33,831 | 33,507 |
| White | 25,841 | 25,836 | 25,838 | 26,050 | 26,096 | 26,273 | 26,346 | 26,495 | 26,653 |
| Williamson | 183,182 | 183,252 | 184,143 | 188,342 | 193,095 | 199,032 | 205,317 | 211,674 | 219,107 |
| Wilson | 113,993 | 114,057 | 114,671 | 116,780 | 119,109 | 122,014 | 125,404 | 128,772 | 132,781 |

**Table 10: 2010 Metropolitan/Micropolitan Areas of Tennessee**



# Appendix A: DAPC Monitoring Equipment Evaluation 2017 AMP Field Sites

| Site | Monitor | | Data Backup | | Data Logger | | Calibrator | | Shelter | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Model | Condition | Model | Condition | Model | Condition | Model | Condition | Model | Condition |
| Blountville | Teledyne T400 | Good | Agilaire 8872 | Good | ESC8832 | Good | Teledyne 703E | Good | | |
| Blountville | API 400A (spare) | | | | | | | | | |
| Kingsport | Teledyne T400 | Good | Agilaire 8872 | Good | ESC8832 | Good | Teledyne T703 | Good | x | Good |
| Kingsport | | | | | ESC8832 | Good | | | | |
| Cookeville | R&P 2025 | Good | | | | | Streamline Pro | Good | | |
| Cookeville | BAM1022 | Good | | | | | | | | |
| Freel's Bend | Teledyne T400 | Good | Agilaire 8872 | Good | ESC8832 | Good | Teledyne T703 | Good | 820 | Good |
| Freel's Bend | | | | | ESC8832 | Good(spare) | | | | |
| Freel's Bend | Teledyne M100E | Good | | | | | Teledyne T700 | Good | | |
| New Market | API 400E | Good | Agilaire 8872 | Good | ESC8832 | Good | Teledyne T703 | Good | 820 | Good |
| New Market | | | | | ESC8832 | Good(spare) | | | | |
| Loudon Pope | R&P 2025 | Good | | | | | Streamline Pro | | | |
| Loudon Pope | ATEC2200 | Poor | | | | | | | | Good |
| Loudon Elementary School | Teledyne T400 | Good | Agilaire 8872 | Good | ESC8832 | Good | Teledyne 703E | Good | O D I, Model 818 | Good |
| | | | | | ESC 8832 | Good(spare) | | | | |
| Kingsport | R&P 2025 | Good | | | | | Streamline Pro | Good | | |
| Kingsport | BAM 1022 | Good | | | | | | | | |
| Kingsport | TEOM1400a | Good | | | ESC8832 | Good | ESC 8832(spare) | | | |
| Bristol | Hivol | Good | | | | | | | | |
| Bristol | Hivol | Good | | | | | Kit #9 | Good | | |
| Clarksville | TEOM1400a | poor | | | ESC 8816 | Good | | | 432SP | Good |
| Clarksville | MetOne BAM1022 | Good | | | | | | | | |
| Centerhill | MIC AUC | Good | | | ESC 8816 | Good | | | | |
| Centerhill | Climatronics 101156-GO | Good | | | | | | | | |
| Cedars of Leb | TEI49C | Good | E&A | Poor | ESC8832 | Good | Teledyne 703E | Good | Trailer | Good |
| Cedars of Leb | | | | | ESC8832 | Good | | | | |
| Dyersburg | R&P 2025 | Good | | | | | | | | |
| Dyersburg | BAM 1022 | Good | | | | | | | TEOM | |
| Hendersonville | TEI49C | Good | Agilaire 8872 | Good | ESC8832 | Good | Teledyne 703E | Good | Trailer | Good |
| Hendersonville | | | | | ESC8832 | Good (spare) | | | | |
| Hendersonville | R&P 2025 | Good | | | | | | | | |
| Hendersonville | R&P 2025 | Good | | | | | | | | |
| Hendersonville | TEOM1400a | Good | | | | | | | | |
| Hendersonville | MetOne BAM1022 | Good | | | | | | | | |
| Jackson | R&P 2025 | Good | | | | | | | | |
| Jackson | R&P 2025 | Good | | | | | | | | |
| Jackson | TEOM1400a | Good | | | ESC 8832 | Good | | | 432SP | Good |
| Maryville | R&P 2025 | Good | | | | | | | | |
| Maryville | TEOM1400a | Good | | | ESC 8832 | Good | Streamline Pro | Good | TEOM | Good |
| Fairview | TEI49C | Good | Agilaire 8872 | Good | ESC8832 | Good | Teledyne T703 | Good | T&R | Good |
| Fairview | | | | | ESC8832 | Good (spare) | | | | |
| Columbia | R&P 2025 | Good | | | | | Streamline Pro | | | |
| | BAM1022 | Good | | | | | | | | |
| Lawrence | R&P 2025 | Good | | | | | | | | |
| Lawrence | TEOM1400a | Good | | | ESC 8832 | Good | | | 432SP | Good |
| Athens | R&P 2025 | Good | | | | | Streamline Pro | Good | | |
| Athens | TEOM1400a | Good | | | ESC8832 | Good | | | Exto 4325P | Good |
| Athens | BAM1022 | Good | | | | | | | | |
| Harriman | R&P 2025 | Good | | | | | | | | |
| Harriman | TEOM1400a | Good | | | ESC 8816 | Good | | | x | Good |
| Harriman | BAM1022 | Good | | | | | | | | |
| Skyland Drive | Teledyne 100E | Good | Agilaire 8872 | | ESC 8832 | | Teledyne T700 | | | |
| Ross N Robinson | Teledyne T100 | Good | Agilaire 8872 | | ESC 8832 | | Teledyne T700 | | | |
| Hatchie Refuge | | | | | | | | | x | Poor |

# Appendix B: DAPC Monitoring Equipment Evaluation 2017

| PHYSICAL LOCATION | EQUIPMENT DETAILS | | CONDITION |
|---|---|---|---|
| Nashville Field Office | Multi-gas calibrator | Portable Calibrator T750U | good |
| Nashville Field Office | Multi-gas calibrator | Portable Calibrator T750U | good |
| Bristol | HiVol variable oriface | Kit #9 | good |
| Athens | PM 2.5 Continuous | BAM 1022, FRM PM 2.5 | good |
| Athens | Data logger | ESC 8832 | good |
| Athens | PM 2.5 filter sampler | R&P 2025, FRM | good |
| Athens | PM 2.5/10 filter sampler | TEOM 1400a, PM 10 FEM | good |
| Athens | TEOM shelter | Ekto | good |
| Blountville | Data logger | Agilaire 8872 | good |
| Blountville | Chart recorder | L&N | poor |
| Blountville | Data logger | ESC 8832 | good |
| Blountville | Data logger | ESC 8832 | good |
| Blountville | Ozone analyzers | API 400A | good |
| Blountville | Trailer | T&R 8X20 | poor |
| Loudon Elementary School | Ozone Calibrator | 703E Ozone Calibrator | good |
| Blountville | Teledyne 400A | Teledyne 400A | good |
| Chattanooga | Flow Check Device | Streamline Pro | good |
| Bristol | HiVol TSP/Lead | Tisch Housing | good |
| Bristol | HiVol TSP/Lead | Tisch Housing | good |
| Columbia | Flow Check Device | Streamline Pro | good |
| Cedars of Lebanon | Data logger | Agilaire 8872 | good |
| Cedars of Lebanon | Chart recorder | E&A | poor |
| Cedars of Lebanon | Data logger | ESC 8832 | good |
| Cedars of Lebanon | Data logger | ESC 8832 | good |
| Cedars of Lebanon | TEI49C | TEI49C | good |
| Cedars of Lebanon | Ozone Calibrator | 703E Ozone Calibrator | good |
| Cookeville | Flow Check Device | Streamline Pro | good |
| Cedars of Lebanon | Ozone analyzers | T400 | good |
| NFO Storage | Ozone Calibrator | 703E Ozone Calibrator | good |
| Centerhill | Data logger | ESC 8816 | good |
| Centerhill | Weather | MIC AUC | good |
| Centerhill | Rain gauge | Climatronics 101156-GO | good |
| Centerhill | Trailer | Ozone shelter 820 | poor |
| Central Office | Data logger | Agilaire 8872 | good |
| Central Office | Data logger | Agilaire 8872 | good |
| JCFO | Flow Check Device | Streamline Pro | good |
| Clarksville | PM 2.5 Continuous | BAM 1022, FRM PM 2.5 | good |
| Clarksville | Data logger | ESC 8816 | good |
| Clarksville | PM 2.5/10 filter sampler | TEOM 1400a, PM 10 FEM | poor |
| Clarksville | TEOM shelter | Ekto | good |
| Columbia | PM 2.5 Continuous | BAM 1022, FRM PM 2.5 | good |
| Columbia | PM 2.5 filter sampler | R&P 2025, FRM | good |
| JFO | Flow Check Device | Streamline Pro | good |
| Cookeville | PM 2.5 Continuous | BAM 1022, FRM PM 2.5 | good |
| Cookeville | PM 2.5 filter sampler | R&P 2025, FRM | good |
| KFO | Flow Check Device | Streamline Pro | good |
| Dyersburg | PM 2.5 Continuous | BAM 1022, FRM PM 2.5 | good |
| Dyersburg | PM 2.5 filter sampler | R&P 2025, FRM | good |
| Dyersburg | TEOM shelter | Ekto | good |
| Fairview | Data logger | Agilaire 8872 | good |
| Fairview | Data logger | ESC 8832 | good |
| Fairview | Data logger | ESC 8832 | good |

| PHYSICAL LOCATION | EQUIPMENT DETAILS | | CONDITION |
|---|---|---|---|
| Blountville | Ozone Calibrator | 703E Ozone Calibrator | good |
| Fairview | TEI49C | TEI49C | good |
| Freel's Bend | Data logger | Agilaire 8872 | good |
| Freel's Bend | Data logger | ESC 8832 | good |
| Freel's Bend | Data logger | ESC 8832 | good |
| Loudon Elementary School | Ozone analyzers | T400 | good |
| Fairview | Ozone Calibrator | T703 Ozone Calibrator | good |
| Nashville Field Office | Air Compressor (1 of 2) | 0.5 HP | good |
| Freel's Bend | SO2 analyzers | Teledyne M100E | good |
| Freel's Bend | SO2 Calibrator | T700 SO2 Calibrator | good |
| Harriman | PM 2.5 Continuous | BAM 1022, FRM PM 2.5 | good |
| Harriman | Data logger | ESC 8816 | good |
| Nashville Field Office | Air Compressor (2 of 2) | 0.5 HP | good |
| Harriman | PM 2.5 filter sampler | R&P 2025, FRM | good |
| Harriman | PM 2.5/10 filter sampler | TEOM 1400a, PM 10 FEM | good |
| Harriman | TEOM shelter | Ekto | good |
| Hatchie Refuge | Trailer | Ozone shelter 820 | poor |
| Hendersonville | Data logger | Agilaire 8872 | good |
| Hendersonville | PM 2.5 Continuous | BAM 1022, FRM PM 2.5 | good |
| Hendersonville | Data logger | ESC 8832 | good |
| Hendersonville | Data logger | ESC 8832 | good |
| Hendersonville | PM 2.5 filter sampler | R&P 2025, FRM | good |
| Hendersonville | PM 2.5 filter sampler | R&P 2025, FRM | good |
| Hendersonville | TEI49C | TEI49C | good |
| Freel's Bend | Ozone Calibrator | T703 Ozone Calibrator | good |
| Hendersonville | PM 2.5/10 filter sampler | TEOM 1400a, PM 10 FEM | good |
| Plan to purchase* | Zero air supply | Purchase additional T701 Zero Air Supplies | good |
| Jackson | Data logger | ESC 8832 | good |
| Jackson | PM 2.5 filter sampler | R&P 2025, FRM | good |
| Jackson | PM 2.5 filter sampler | R&P 2025, FRM | good |
| Jackson | PM 2.5/10 filter sampler | TEOM 1400a, PM 10 FEM | good |
| Jackson | TEOM shelter | Ekto | good |
| Blountville | Trailer | Ozone shelter 820 | poor |
| JCFO | Trailer | Ozone shelter 820 | poor |
| Cedars of Lebanon | Trailer | Ozone shelter 820 | poor |
| Freel's Bend | Trailer | Ozone shelter 820 | poor |
| Kingsport | Data logger | Agilaire 8872 | good |
| Kingsport | PM 2.5 Continuous | BAM 1022, FRM PM 2.5 | good |
| Kingsport | Data logger | ESC 8832 | good |
| Kingsport | Data logger | ESC 8832 | good |
| Kingsport | Data logger | ESC 8832 | good |
| Kingsport | Data logger | ESC 8832 | good |
| Kingsport | PM 2.5 filter sampler | R&P 2025, FRM | good |
| Kingsport | Ozone Calibrator | T703 Ozone Calibrator | good |
| Kingsport | Teledyne T400 | Teledyne T400 | good |
| Kingsport | PM 2.5/10 filter sampler | TEOM 1400a, PM 10 FEM | good |
| Kingsport | TEOM shelter | Ekto | good |
| Harriman | TEOM shelter | Ekto | poor |
| Lawrence | Data logger | ESC 8832 | good |
| Lawrence | PM 2.5 filter sampler | R&P 2025, FRM | good |
| Lawrence | PM 2.5/10 filter sampler | TEOM 1400a, PM 10 FEM | good |
| Lawrence | TEOM shelter | Ekto | good |
| Loretto County Site | BAM 1020 Enclosure | 432SP | good |
| Loudon Elementary School | Data logger | Agilaire 8872 | good |

| PHYSICAL LOCATION | EQUIPMENT DETAILS | | CONDITION |
|---|---|---|---|
| Loudon Elementary School | Data logger | ESC 8832 | good |
| Loudon Elementary School | Data logger | ESC 8832 | good |
| New Market | Ozone Calibrator | T703 Ozone Calibrator | good |
| Blountville | Ozone Calibrator | T703 Ozone Calibrator | good |
| NFO Storage and QA | Ozone analyzers | T400 | good |
| Hendersonville | Trailer | Ozone shelter 820 | poor |
| Loudon Pope | PM 2.5 filter sampler | R&P 2025, FRM | good |
| Loudon Pope | Toxic monitor | ATEC2200 | poor |
| Maryville | Data logger | ESC 8832 | good |
| Maryville | PM 2.5 filter sampler | R&P 2025, FRM | good |
| Maryville | PM 2.5/10 filter sampler | TEOM 1400a, PM 10 FEM | good |
| Maryville | TEOM shelter | Ekto | good |
| Kingsport | Trailer | Ozone shelter 820 | poor |
| Loudon Elementary School | Trailer | O D I, Model 818 | poor |
| Nashville Field Office | Equinox, SUV | Quality Assurance Audit Vehicle | good |
| Nashville Field Office | HiVol calibration | Orifice, variable; plan to be replaced | good |
| New Market | Data logger | Agilaire 8872 | good |
| NFO Storage | Ozone Calibrator | T703 Ozone Calibrator | good |
| New Market | Trailer | Ozone shelter 820 | poor |
| New Market | Data logger | ESC 8832 | good |
| New Market | Ozone analyzers | API 400E | good |
| NFO | Flow Check Device | Streamline Pro | good |
| NFO -Quality Assurance | Flow Check Device | Streamline Pro | good |
| NFO -Quality Assurance | Flow Check Device | Streamline Pro | good |
| NFO -Quality Assurance | Flow Check Device | Streamline Pro | good |
| NFO -Quality control | Flow Check Device | Streamline Pro | good |
| NFO Storage | Flow Check Device | Streamline Pro | good |
| NFO Storage | Flow Check Device | Streamline Pro | good |
| NFO Storage | Flow Check Device | Streamline Pro | good |
| NFO Storage and QA | Data logger | Agilaire 8872 | good |
| NFO Storage and QA | Data logger | Agilaire 8872 | good |
| NFO Storage and QA | Data logger | Agilaire 8872 | good |
| NFO Storage and QA | Aircheck 224-PCXR7 | Aircheck 224-PCXR7 | poor |
| NFO Storage and QA | Aircheck 224-PCXR7 | Aircheck 224-PCXR7 | poor |
| NFO Storage and QA | Aircheck 224-PCXR7 | Aircheck 224-PCXR7 | poor |
| NFO Storage and QA | PM 2.5 Continuous | BAM 1020, FRM PM 2.5 | good |
| NFO Storage and QA | PM 2.5 Continuous | BAM 1020, FRM PM 2.5 | good |
| NFO Storage and QA | PM 2.5 Continuous | BAM 1020, FRM PM 2.5 | good |
| NFO Storage and QA | PM 2.5 Continuous | BAM 1020, FRM PM 2.5 | good |
| NFO Storage and QA | PM 2.5 Continuous | BAM 1020, FRM PM 2.5 | good |
| NFO Storage and QA | PM 2.5 Continuous | BAM 1020, FRM PM 2.5 | good |
| NFO Storage and QA | PM 2.5 Continuous | BAM 1020, FRM PM 2.5 | good |
| NFO Storage and QA | PM 2.5 Continuous | BAM 1022, FRM PM 2.5 | good |
| NFO Storage and QA | PM 2.5 Continuous | BAM 1022, FRM PM 2.5 | good |
| NFO Storage and QA | PM 2.5 Continuous | BAM 1022, FRM PM 2.5 | good |
| NFO Storage and QA | PM 2.5 Continuous | BAM 1022, FRM PM 2.5 | good |
| NFO Storage and QA | Dasisbi 1008PC | Ozone calibrator, replace with newer versions | poor |
| NFO Storage and QA | Dasisbi 1008PC | Ozone calibrator, replace with newer versions | poor |
| NFO Storage and QA | Dasisbi 1008PC | Ozone calibrator, replace with newer versions | poor |
| NFO Storage and QA | Dasisbi 1008PC | Ozone calibrator, replace with newer versions | poor |
| NFO Storage and QA | Dasisbi 1008PC | Ozone calibrator, replace with newer versions | poor |
| NFO Storage and QA | Dasisbi 1008PC | Ozone calibrator | poor |
| NFO Storage and QA | Dasisbi 1008PC | Ozone calibrator | poor |
| NFO Storage and QA | Dasisbi 1008PC | Ozone calibrator | poor |

| PHYSICAL LOCATION | EQUIPMENT DETAILS | | CONDITION |
|---|---|---|---|
| NFO Storage and QA | Dasisbi 1008PC | Ozone calibrator | poor |
| NFO Storage and QA | Dasisbi 1008PC | Ozone calibrator | poor |
| NFO Storage and QA | Dasisbi 1008PC | Ozone calibrator | poor |
| NFO Storage and QA | Dasisbi 1008PC | Ozone calibrator | poor |
| NFO Storage and QA | Dasisbi 1008PC | Ozone calibrator | poor |
| NFO Storage and QA | Dasisbi 1008PC | Ozone calibrator | poor |
| NFO Storage and QA | Dasisbi 1008PC | Ozone calibrator | poor |
| NFO Storage and QA | Dasisbi 1008PC | Ozone calibrator | poor |
| NFO Storage and QA | Dasisbi 1008PC | Ozone calibrator | poor |
| NFO Storage and QA | Data logger | ESC 8816 | good |
| NFO Storage and QA | Data logger | ESC 8816 | good |
| NFO Storage and QA | Data logger | ESC 8816 | good |
| NFO Storage and QA | Data logger | ESC 8816 | good |
| NFO Storage and QA | Data logger | ESC 8816 | poor |
| NFO Storage and QA | Data logger | ESC 8816 | good |
| NFO Storage and QA | Data logger | ESC 8816 | good |
| NFO Storage and QA | Data logger | ESC 8816 | poor |
| NFO Storage and QA | Data logger | ESC 8816 | poor |
| NFO Storage and QA | Data logger | ESC 8816 | poor |
| NFO Storage and QA | Data logger | ESC 8816 | good |
| NFO Storage and QA | Data logger | ESC 8816 | good |
| NFO Storage and QA | Data logger | ESC 8816 | poor |
| NFO Storage and QA | Data logger | ESC 8816 | poor |
| NFO Storage and QA | Data logger | ESC 8832 | good |
| NFO Storage and QA | Data logger | ESC 8832 | good |
| NFO Storage and QA | Data logger | ESC 8832 | good |
| NFO Storage and QA | Data logger | ESC 8832 | good |
| NFO Storage and QA | Data logger | ESC 8832 | good |
| NFO Storage and QA | Flow bench standard, multi gas standard QA | Mesa Labs Drycal | good |
| NFO Storage and QA | Flow bench standard, multi gas standard QA | Seirra Cal Bench | poor |
| NFO Storage and QA | Flow Check Device | BGI Challenger | good |
| NFO Storage and QA | Flow Check Device | BGI TetraCal | good |
| NFO Storage and QA | HiVol TSP/Lead | GMW 2000 | good |
| NFO Storage and QA | HiVol TSP/Lead | GMW 76-100 | good |
| NFO Storage and QA | HiVol TSP/Lead | GMW 76-100 | good |
| NFO Storage and QA | HiVol TSP/Lead | GMW 76-100 | good |
| NFO Storage and QA | HiVol TSP/Lead | GMW 76-100 | good |
| NFO Storage and QA | HiVol TSP/Lead | GMW 76-100 | good |
| NFO Storage and QA | HiVol TSP/Lead | GMW 76-100 | good |
| NFO Storage and QA | HiVol TSP/Lead | GMW 76-100 | good |
| NFO Storage and QA | HiVol TSP/Lead | GMW Housing | good |
| NFO Storage and QA | HiVol TSP/Lead | GMW Housing | good |
| NFO Storage and QA | HiVol TSP/Lead | GMW Housing | good |
| NFO Storage and QA | HiVol TSP/Lead | GMW Housing | good |
| NFO Storage and QA | HiVol TSP/Lead | Anderson 2000 | good |
| NFO Storage and QA | HiVol TSP/Lead | Tisch Housing | good |
| NFO Storage and QA | HiVol TSP/Lead | Tisch Housing | good |
| NFO Storage and QA | HiVol TSP/Lead | Tisch Housing | good |
| NFO Storage and QA | Multi-gas calibrator | Environics 6100 | good |
| NFO Storage and QA | Multi-gas calibrator | Environics Calibrator 6103 | good |
| NFO Storage and QA | Multi-gas calibrator | Environics Calibrator 6103 | poor |
| NFO Storage and QA | Multi-gas calibrator | Environics Calibrator 6103 | poor |
| NFO Storage and QA | Ozone analyzers | API 400A | poor |
| NFO Storage and QA | Ozone analyzers | API 400A | poor |

| PHYSICAL LOCATION | EQUIPMENT DETAILS | | CONDITION |
|---|---|---|---|
| NFO Storage and QA | Ozone analyzers | API 400A | good |
| NFO Storage and QA | Ozone analyzers | API 400A | poor |
| NFO Storage and QA | Ozone analyzers | API 400E | good |
| NFO Storage and QA | Ozone analyzers | API 400E | good |
| NFO Storage and QA | Ozone analyzers | API 400E | poor |
| NFO Storage and QA | Ozone analyzers | API 400E | poor |
| NFO Storage and QA | Ozone analyzers | T400 | good |
| Blountville | Ozone analyzers | T400 | good |
| Freel's Bend | Ozone analyzers | T400 | good |
| NFO Storage and QA | Ozone analyzers | TEI 49C, plan to replace with T400 | good |
| NFO Storage and QA | Ozone analyzers | TEI 49C, plan to replace with T400 | good |
| Hendersonville | Ozone Calibrator | T703 Ozone Calibrator | good |
| NFO Storage and QA | Ozone analyzers | TEI 49i (ref photometer) | good |
| NFO Storage and QA | Ozone analyzers | TEI 49i (ref photometer) | good |
| NFO Storage and QA | PM 2.5 Speciation | MetOne SASS | good |
| NFO Storage and QA | PM 2.5 Speciation | MetOne SASS | good |
| NFO Storage and QA | PM 2.5 Speciation | MetOne SASS | good |
| NFO Storage and QA | PM 2.5 Speciation | MetOne SASS | poor |
| NFO Storage and QA | PM 2.5 Speciation | MetOne SASS | good |
| NFO Storage and QA | PM10 inlet | Graseby | good |
| NFO Storage and QA | PM10 inlet | Graseby | good |
| NFO Storage and QA | PM 2.5 filter sampler | R&P 2025, FRM | poor |
| NFO Storage and QA | PM 2.5 filter sampler | R&P 2025, FRM | poor |
| NFO Storage and QA | PM 2.5 filter sampler | R&P 2025, FRM | poor |
| NFO Storage and QA | PM 2.5 filter sampler | R&P 2025, FRM | poor |
| NFO Storage and QA | PM 2.5 filter sampler | R&P 2025, FRM | poor |
| NFO Storage and QA | PM 2.5 filter sampler | R&P 2025, FRM | poor |
| NFO Storage and QA | PM 2.5 filter sampler | R&P 2025, FRM | poor |
| NFO Storage and QA | PM 2.5 filter sampler | R&P 2025, FRM | poor |
| NFO Storage and QA | PM 2.5 filter sampler | R&P 2025, FRM | poor |
| NFO Storage and QA | PM 2.5 filter sampler | R&P 2025, FRM | good |
| NFO Storage and QA | PM 2.5 filter sampler | R&P 2025, FRM | good |
| NFO Storage and QA | Orifice certification HiVol | Roots meter | good |
| NFO Storage and QA | Orifice certification HiVol | Roots meter 5M125TC | good |
| NFO Storage and QA | Flow Check Device | BGI TetraCal | good |
| NFO Storage and QA | T100 SO2 Analyzer | gas monitor | good |
| NFO Storage and QA | T100 SO2 Analyzer | gas monitor | good |
| NFO Storage and QA | SO2 Calibrator | T700 SO2 Calibrator | good |
| NFO Storage and QA | SO2 Calibrator | T700 SO2 Calibrator | good |
| Ross N Robinson | Portable zero air | T701 Zero Air Supply | good |
| Ross N Robinson | Data logger | Agilaire 8872 | good |
| NFO Storage and QA | Multi-gas calibrator | TEI 146 | poor |
| NFO Storage and QA | TEI49C | TEI49C | good |
| NFO Storage and QA | TEI49C | TEI49C | good |
| NFO Storage and QA | Ozone analyzers | TEI 49i | good |
| NFO Storage and QA | Ozone analyzers | Teledyne API 400E | good |
| NFO Storage and QA | Ozone analyzers | Teledyne API 400E | good |
| NFO Storage and QA | Ozone analyzers | Teledyne API 400E | good |
| NFO Storage and QA | Ozone analyzers | Teledyne API T400 | good |
| NFO Storage and QA | Ozone analyzers | Teledyne API T400 | good |
| NFO Storage and QA | Ozone analyzers | Teledyne API T400 | good |
| NFO Storage and QA | Ozone analyzers | Teledyne API T400 | good |
| NFO Storage and QA | SO2 analyzers | Teledyne M100E | good |
| NFO Storage and QA | SO2 analyzers | Teledyne M100E | good |

| PHYSICAL LOCATION | EQUIPMENT DETAILS | | CONDITION |
|---|---|---|---|
| NFO Storage and QA | SO2 analyzers | Teledyne T100 | good |
| NFO Storage and QA | SO2 Calibrator | T700 SO2 Calibrator | good |
| NFO Storage and QA | Multi-gas calibrator | Teledyne T750U, plan to order two additional units | good |
| NFO Storage and QA | Multi-gas calibrator | Teledyne T750U | good |
| NFO Storage and QA | PM 2.5/10 filter sampler | TEOM 1400a, PM 10 FEM | good |
| NFO Storage and QA | PM 2.5/10 filter sampler | TEOM 1400a, PM 10 FEM | good |
| NFO Storage and QA | PM 2.5/10 filter sampler | TEOM 1400a, PM 10 FEM | good |
| NFO Storage and QA | PM 2.5/10 filter sampler | TEOM 1400a, PM 10 FEM | good |
| NFO Storage and QA | PM 2.5/10 filter sampler | TEOM 1400a, PM 10 FEM | good |
| NFO Storage and QA | PM 2.5/10 filter sampler | TEOM 1400a, PM 10 FEM | poor |
| NFO Storage and QA | TEOM shelter | Ekto | good |
| NFO Storage and QA | Flow Check Device | Tetracal, for TEOM | good |
| NFO Storage and QA | Flow Check Device | Tetracal, for TEOM | good |
| NFO Storage and QA | Trailer | Ozone shelter 820 | poor |
| NFO Storage and QA | Trailer | Ozone shelter 820 | poor |
| NFO Storage and QA | Carbon speciation PM 2.5 | URG3000N | good |
| NFO Storage and QA | Carbon speciation PM 2.5 | URG3000N | good |
| NFO Storage and QA | Weather | Climatronics Sonic | good |
| NFO Storage and QA | SO2 analyzers | Teledyne M100E | good |
| Pope | Trailer | Ozone shelter 820 | poor |
| Ross N Robinson | Data logger | ESC 8832 | good |
| Ross N Robinson | SO2 analyzers | Teledyne T100 | good |
| Ross N Robinson | SO2 Calibrator | T700 SO2 Calibrator | good |
| Skyland Drive | 34 foot tower | T700 SO2 Calibrator | good |
| Skyland Drive | Portable zero air | T700 SO2 Calibrator | good |
| Skyland Drive | Data logger | Agilaire 8872 | good |
| Skyland Drive | Data logger | ESC 8832 | good |
| Skyland Drive | SO2 Calibrator | T700 SO2 Calibrator | good |

## Appendix C: Tennessee Monitoring Site Agreement Letters

### Kentucky

STATE OF TENNESSEE
**DEPARTMENT OF ENVIRONMENT AND CONSERVATION**

Division of Air Pollution Control
William R. Snodgrass TN Tower
312 Rosa L. Parks Ave., 15th Floor
Nashville, Tennessee 37243

July 2, 2014

Sean Alteri, Director
Kentucky Division for Air Quality
Kentucky Department for Environmental Protection
200 Fair Oaks Lane
Frankfort, KY 40601

Dear Mr. Alteri:

The United States Environmental Protection Agency (EPA) revised monitoring regulations found in 40 CFR Part 58, Appendix D states in part: "The EPA recognizes that there may be situations where the EPA Regional Administrator and the affected State or local agencies may need to augment or to divide the overall MSA/CSA monitoring responsibilities and requirements among these various agencies to achieve an effective network design. Full monitoring requirements apply separately to each affected State or local agency in the absence of an agreement between the affected agencies and the EPA Regional Administrator." This revision of the CFR also describes the minimum monitoring requirements for the NAAQS pollutants, including continuous PM 2.5 as it applies to MSA areas where the population is sufficient to warrant monitoring for that pollutant. Tennessee and Kentucky share the Clarksville, TN-KY MSA, which is comprised of Trigg and Christian counties in Kentucky and Montgomery county in Tennessee. The US Census Bureau lists this area as containing a population in excess of 260,000.

| CBSA Code | Geographic area | Legal/statistical Area description | July 1, 2013 Estimate | 2010 Census |
|---|---|---|---|---|
| 17300 | Clarksville, TN-KY | Metropolitan Statistical Area | 272,579 | 260,625 |

The Tennessee Division of Air Pollution Control (TDAPC) currently operates one (1) PM 2.5 FRM monitor and one (1) continuous PM 2.5 monitor in this area. The TDAPC believes the operation of the existing PM 2.5 monitors; (FRM and continuous), are sufficient to properly characterize the particulate air quality in the entire Clarksville, TN-KY MSA and comply with the requirements for both population and concentration based monitoring identified in the revised monitoring regulations as found at 40 CFR58,AppD. The TDAPC would like to invite the

Kentucky Division for Air Quality to participate in Tennessee's annual ambient air monitoring network review. Tennessee commits to sharing with Kentucky any and all quality assured ambient air monitoring data collected in the Tennessee portion of the Clarksville, TN-KY MSA. Tennessee also will notify Kentucky in advance of the intent to relocate or shutdown any of the PM 2.5 monitors referenced above so that adequate monitoring arrangements can be made to meet the entire MSA monitoring requirements for PM 2.5.

Sincerely,

Barry R. Stephens

Barry R. Stephens, PE
Director, Air Pollution Control Division

BRS/lb
Cc: Heather McTeer-Toney, US EPA Region IV

Steven L. Beshear
Governor

Leonard K. Peters
Secretary

**Energy and Environment Cabinet**
**Department for Environmental Protection**
Division for Air Quality
200 Fair Oaks Lane, 1st Floor
Frankfort, Kentucky 40601-1403
Web site: air.ky.gov

May 15, 2015

Mr. Barry R. Stephens, PE
Director
Tennessee Division of Air Pollution Control
312 Rosa L. Parks Avenue, 15th Floor
Nashville, TN 37243

Dear Mr. Stephens:

In a letter from your office dated July 1, 2014, the Tennessee Division of Air Pollution Control (TDAPC) agreed to operate a continuous $PM_{2.5}$ monitor and an intermittent FRM $PM_{2.5}$ sampler, to meet the minimum network design requirements stated in 40 CFR 58, Appendix D for the Clarksville, TN-KY metropolitan statistical area (MSA). The Kentucky Division for Air Quality (Division) appreciates TDAPC's cooperation and looks forward to participating in TDAPC's annual air monitoring network review.

The Division currently operates one (1) intermittent FRM $PM_{2.5}$ sampler and one (1) continuous ozone monitor at the Hopkinsville site (21-047-0006) in Christian County. In accordance with Table D-2 of 40 CFR 58, Appendix D, one (1) ozone monitor is required to be operated in the Clarksville, TN-KY MSA, based upon the most current population estimates from the US Census Bureau, as well as 2012-2014 ozone design values.

| Geographic Area | Area Description | 2014 USCB Population Estimate | 2014 Three-Year Ozone DV (ppm) |
|---|---|---|---|
| Christian County, KY | County | 74,250 | 0.067 |
| Trigg County, KY | County | 14,142 | 0.069 (CASTNET) |
| Montgomery County, TN | County | 189,961 | N/A |
| **Clarksville, TN-KY** | **MSA** | **278,353** | **0.069** |

To satisfy the regulatory requirement, the Division agrees to operate one ozone monitor at the Hopkinsville site. Also, the Division agrees to notify TDAPC in the event that shutdown or relocation of the ozone monitor is necessary.

Despite the fact that 2012-2014 design values show that no FRM $PM_{2.5}$ samplers are required in the Clarksville MSA, the Division will continue to operate the $PM_{2.5}$ sampler at

Hopkinsville. The Division also agrees to notify TDAPC in the event that the Hopkinsville FRM $PM_{2.5}$ sampler must be shutdown or relocated, as it is the design value monitor for the MSA.

The Division commits to sharing with TDAPC any and all quality-assured ambient monitoring data collected in the Kentucky portion of the Clarksville, TN-KY MSA. The Division also welcomes TDAPC participation in Kentucky's annual network review process. If you have any questions or concerns, please contact me at 502-564-3999.

Sincerely,

Sean Alteri

Sean Alteri,
Director

SA/jfm
c: -Heather McTeer Toney, USEPA Region IV
-Daniel Garver, USEPA Region IV

# Virginia

May 13, 2016

Michael Dowd
Director of Air Division
Virginia Department of Environmental Quality
P.O. Box 1105
Richmond, VA 23218

Dear Mr. Dowd,

This letter is in regard to ambient air monitoring in the MSA/CSA that our two states share.

The United States Environmental Protection Agency's (EPA) revised monitoring regulations found in 40 CFR Part 58, Appendix D state in part: "The EPA recognizes that there may situations where the EPA Regional Administrator and the affected State or local agencies may need to augment or divide the overall MSA/CSA monitoring responsibilities and requirements among these various agencies to achieve an effective network design. Full monitoring requirements apply separately to each affected State or local agency in the absence of an agreement between the affected agencies and the EPA Regional Administrator." This revision of the CFR also describes the minimum monitoring requirements for the NAAQS pollutants.

Tennessee and Virginia share the Kingsport-Bristol-Bristol, TN-VA MSA, which is comprised of Scott and Washington counties in Virginia, and Hawkins and Sullivan counties in Tennessee. The US Census Bureau estimates the 2015 population under 309,000; however in 2010 the census population was 309,544.

| CBSA Code | Geographic Area | Legal/Statistical Area Description | 2015 Estimate | 2010 Census |
|---|---|---|---|---|
| 28700 | Kingsport-Bristol-Bristol, TN-VA MSA | Metropolitan Statistical Area | 307,120 | 309,544 |

The Tennessee Division of Air Pollution Control (DAPC) currently operates a $PM_{2.5}$, TEOM continuous monitor at site 47-163-1007, two ozone monitors at sites 47-163-2002 and 47-163-2003, and a lead monitor at site 47-163-3004, all in Sullivan County. In addition, we are establishing two $SO_2$ monitoring sites in the Kingsport, Sullivan County nonattainment area.

Upon a 3 year data review, the records show the ozone concentrations recorded by the two ozone monitors are similar. DAPC will propose that the ozone monitor site 47-163-2002 be shut down in 2017 or at the conclusion of the 2016 ozone monitoring season. The other sites with

Division of Air Pollution Control
William R. Snodgrass Tennessee Tower  15th Floor
312 Rosa L. Parks Avenue  Nashville, TN 37243
Tel: 615-532-0554  Fax: 615-532-0614
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existing monitors in operation: (ozone, $PM_{2.5}$ FRM, and $PM_{2.5}$ continuous TEOM), are sufficient to properly characterize the air quality in the entire Kingsport-Bristol-Bristol, TN-VA MSA and comply with the requirements for both population and concentration-based monitoring, identified in the revised monitoring regulations found in 40 CFR Part 58, Appendix D. The TEOM monitor is used for air quality forecasting.

TDAPC would like to invite the Virginia Department of Environmental Quality Air Division to participate in Tennessee's annual ambient air monitoring network review. Tennessee commits to notifying the Virginia Department of Environmental Quality Air Division in advance of any proposed relocation or shut down of ozone or $PM_{2.5}$ monitors referenced above so that adequate monitoring arrangements can be made to meet the entire MSA monitoring requirements.

If you have technical questions contact Jason Stephens at 615-532-0584/ jason.stephens@tn.gov. I may be contacted at 615-532-9668/michelle.b.walker@tn.gov.

Sincerely,

Michelle Walker Owenby
Director
Department of Environment and Conservation
Division of Air Pollution Control

Cc: Heather McTeer-Toney, US EPA Region IV

## Appendix D: Sections of the CFR Referred to in the 2017/18 NMP

§ 58.10 Annual monitoring network plan and periodic network assessment.

(a)(1) Beginning July 1, 2007, the state, or where applicable local, agency shall submit to the Regional Administrator an annual monitoring network plan which shall provide for the documentation of the establishment and maintenance of an air quality surveillance system that consists of a network of SLAMS monitoring stations that can include FRM, FEM, and ARM monitors that are part of SLAMS, NCore, CSN, PAMS, and SPM stations. The plan shall include a statement of whether the operation of each monitor meets the requirements of appendices A, B, C, D, and E of this part, where applicable. The Regional Administrator may require additional information in support of this statement. The annual monitoring network plan must be made available for public inspection and comment for at least 30 days prior to submission to the EPA and the submitted plan shall include and address, as appropriate, any received comments.

(2) Any annual monitoring network plan that proposes network modifications (including new or discontinued monitoring sites, new determinations that data are not of sufficient quality to be compared to the NAAQS, and changes in identification of monitors as suitable or not suitable for comparison against the annual $PM_{2.5}$ NAAQS) to SLAMS networks is subject to the approval of the EPA Regional Administrator, who shall approve or disapprove the plan within 120 days of submission of a complete plan to the EPA.

(3) The plan for establishing required NCore multipollutant stations shall be submitted to the Administrator not later than July 1, 2009. The plan shall provide for all required stations to be operational by January 1, 2011.

(4) A plan for establishing source-oriented Pb monitoring sites in accordance with the requirements of appendix D to this part for Pb sources emitting 1.0 tpy or greater shall be submitted to the EPA Regional Administrator no later than July 1, 2009, as part of the annual network plan required in paragraph (a)(1) of this section. The plan shall provide for the required source-oriented Pb monitoring sites for Pb sources emitting 1.0 tpy or greater to be operational by January 1, 2010. A plan for establishing source-oriented Pb monitoring sites in accordance with the requirements of appendix D to this part for Pb sources emitting equal to or greater than 0.50 tpy but less than 1.0 tpy shall be submitted to the EPA Regional Administrator no later than July 1, 2011. The plan shall provide for the required source-oriented Pb monitoring sites for Pb sources emitting equal to or greater than 0.50 tpy but less than 1.0 tpy to be operational by December 27, 2011.

(5)(i) A plan for establishing or identifying an area-wide $NO_2$ monitor, in accordance with the requirements of Appendix D, section 4.3.3 to this part, shall be submitted as part of the Annual Monitoring Network Plan to the EPA Regional Administrator by July 1, 2012. The plan shall provide for these required monitors to be operational by January 1, 2013.

(ii) A plan for establishing or identifying any $NO_2$ monitor intended to characterize vulnerable and susceptible populations, as required in Appendix D, section 4.3.4 to this part, shall be submitted as part of the Annual Monitoring Network Plan to the EPA Regional Administrator by July 1, 2012. The plan shall provide for these required monitors to be operational by January 1, 2013.

(iii) A plan for establishing a single near-road $NO_2$ monitor in CBSAs having 1,000,000 or more persons, in accordance with the requirements of Appendix D, section 4.3.2 to this part, shall be submitted as part of the Annual Monitoring Network Plan to the EPA Regional Administrator by July 1, 2013. The plan shall provide for these required monitors to be operational by January 1, 2014.

(iv) A plan for establishing a second near-road $NO_2$ monitor in any CBSA with a population of 2,500,000 or more persons, or a second monitor in any CBSA with a population of 500,000 or more persons that has one or more roadway segments with 250,000 or greater AADT counts, in accordance with the requirements of Appendix D, section 4.3.2 to this part, shall be submitted as part of the Annual Monitoring Network Plan to the EPA Regional Administrator by July 1, 2014. The plan shall provide for these required monitors to be operational by January 1, 2015.

(v) A plan for establishing a single near-road $NO_2$ monitor in all CBSAs having 500,000 or more persons, but less than 1,000,000, not already required by paragraph (a)(5)(iv) of this section, in accordance with the requirements of Appendix D, section 4.3.2 to this part, shall be submitted as part of the Annual Monitoring Network Plan to the EPA Regional Administrator by July 1, 2016. The plan shall provide for these monitors to be operational by January 1, 2017.

(6) A plan for establishing $SO_2$ monitoring sites in accordance with the requirements of Appendix D to this part shall be submitted to the EPA Regional Administrator by July 1, 2011 as part of the annual network plan required in paragraph (a) (1). The plan shall provide for all required $SO_2$ monitoring sites to be operational by January 1, 2013.

(7) A plan for establishing CO monitoring sites in accordance with the requirements of Appendix D to this part shall be submitted to the EPA Regional Administrator. Plans for required CO monitors shall be submitted at least six months prior to the date such monitors must be established as required by section 58.13.

(8)(i) A plan for establishing near-road $PM_{2.5}$ monitoring sites in CBSAs having 2.5 million or more persons, in accordance with the requirements of Appendix D to this part, shall be submitted as part of the annual monitoring network plan to the EPA Regional Administrator by July 1, 2014. The plan shall provide for these required monitoring stations to be operational by January 1, 2015.

(ii) A plan for establishing near-road $PM_{2.5}$ monitoring sites in CBSAs having 1 million or more persons, but less than 2.5 million persons, in accordance with the requirements of Appendix D to this part, shall be submitted as part of the annual monitoring network plan to the EPA Regional Administrator by July 1, 2016. The plan shall provide for these required monitoring stations to be operational by January 1, 2017.

(9) The annual monitoring network plan shall provide for the required $O_3$ sites to be operating on the first day of the applicable required $O_3$ monitoring season in effect on January 1, 2017 as listed in Table D-3 of Appendix D of this part.

(10) A plan for making Photochemical Assessment Monitoring Stations (PAMS) measurements, if applicable, in accordance with the requirements of Appendix D paragraph 5(a) of this part shall be submitted to the EPA Regional Administrator no later than July 1, 2018. The plan shall provide for the required PAMS measurements to begin by June 1, 2019.

(11) An Enhanced Monitoring Plan for $O_3$, if applicable, in accordance with the requirements of Appendix D paragraph 5(h) of this part shall be submitted to the EPA Regional Administrator no later than October 1, 2019 or two years following the effective date of a designation to a classification of Moderate or above $O_3$ nonattainment, whichever is later.

(12) A detailed description of the PAMS network being operated in accordance with the requirements of Appendix D to this part shall be submitted as part of the annual monitoring network plan for review by the EPA Administrator. The PAMS Network Description described in section 5 of Appendix D may be used to meet this requirement.

(b) The annual monitoring network plan must contain the following information for each existing and proposed site:

(1) The AQS site identification number.

(2) The location, including street address and geographical coordinates.

(3) The sampling and analysis method(s) for each measured parameter.

(4) The operating schedules for each monitor.

(5) Any proposals to remove or move a monitoring station within a period of 18 months following plan submittal.

(6) The monitoring objective and spatial scale of representativeness for each monitor as defined in Appendix D to this part.

(7) The identification of any sites that are suitable and sites that are not suitable for comparison against the annual $PM_{2.5}$ NAAQS as described in §58.30.

(8) The MSA, CBSA, CSA or other area represented by the monitor.

(9) The designation of any Pb monitors as either source-oriented or non-source-oriented according to Appendix D to 40 CFR part 58.

(10) Any source-oriented monitors for which a waiver has been requested or granted by the EPA Regional Administrator as allowed for under paragraph 4.5(a)(ii) of Appendix D to 40 CFR part 58.

(11) Any source-oriented or non-source-oriented site for which a waiver has been requested or granted by the EPA Regional Administrator for the use of Pb-$PM_{10}$ monitoring in lieu of Pb-TSP monitoring as allowed for under paragraph 2.10 of Appendix C to 40 CFR part 58.

(12) The identification of required $NO_2$ monitors as near-road, area-wide, or vulnerable and susceptible population monitors in accordance with Appendix D, section 4.3 of this part.

(13) The identification of any $PM_{2.5}$ FEMs and/or ARMs used in the monitoring agency's network where the data are not of sufficient quality such that data are not to be compared to the NAAQS. For required SLAMS where the agency identifies that the $PM_{2.5}$ Class III FEM or ARM does not produce data of sufficient quality for comparison to the NAAQS, the monitoring agency must ensure that an operating FRM or filter-based FEM meeting the sample frequency requirements described in §58.12 or other Class III $PM_{2.5}$ FEM or ARM with data of sufficient quality is operating and reporting data to meet the network design criteria described in Appendix D to this part.

(c) The annual monitoring network plan must document how state and local agencies provide for the review of changes to a $PM_{2.5}$ monitoring network that impact the location of a violating $PM_{2.5}$ monitor. The affected state or local agency must document the process for obtaining public comment and include any comments received through the public notification process within their submitted plan.

(d) The state, or where applicable local, agency shall perform and submit to the EPA Regional Administrator an assessment of the air quality surveillance system every 5 years to determine, at a minimum, if the network meets the monitoring objectives defined in Appendix D to this part, whether new sites are needed, whether existing sites are no longer needed and can be terminated, and whether new technologies are appropriate for incorporation into the ambient air monitoring network. The network assessment must consider the ability of existing and proposed sites to support air quality characterization for areas with relatively high populations of susceptible individuals (e.g., children with asthma), and, for any sites that are being proposed for discontinuance, the effect on data users other than the agency itself, such as nearby states and tribes or health effects studies. The state, or where applicable local, agency must submit a copy of this 5-year assessment, along with a revised annual network plan, to the Regional Administrator. The assessments are due every five years beginning July 1, 2010.

(e) All proposed additions and discontinuations of SLAMS monitors in annual monitoring network plans and periodic network assessments are subject to approval according to §58.14.

[71 FR 61298, Oct. 17, 2006, as amended at 72 FR 32210, June 12, 2007; 73 FR 67059, Nov. 12, 2008; 73 FR 77517, Dec. 19, 2008; 75 FR 6534, Feb. 9, 2010; 75 FR 35601, June 22, 2010; 75 FR 81137, Dec. 27, 2010; 76 FR 54341, Aug. 31, 2011; 78 FR 16188, Mar. 14, 2013; 78 FR 3282, Jan. 15, 2013; 80 FR 65466, Oct. 26, 2015; 81 FR 17279, Mar. 28, 2016]

# Appendix E: Monitoring Network Requirements

**Ozone Monitoring Network Requirements**

40 CFR 58 Subpart G, Appendix D to Part 58 Revised as of July 1, 2016

4.1 Ozone ($O_3$) Design Criteria. (a) State, and where appropriate, local agencies must operate $O_3$ sites for various locations depending upon area size (in terms of population and geographic characteristics) and typical peak concentrations (expressed in percentages below, or near the $O_3$ NAAQS). Specific SLAMS $O_3$ site minimum requirements are included in Table D-2 of this appendix. The NCore sites are expected to complement the $O_3$ data collection that takes place at single-pollutant SLAMS sites, and both types of sites can be used to meet the network minimum requirements. The total number of $O_3$ sites needed to support the basic monitoring objectives of public data reporting, air quality mapping, compliance, and understanding $O_3$-related atmospheric processes will include more sites than these minimum numbers required in Table D-2 of this appendix. The EPA Regional Administrator and the responsible State or local air monitoring agency must work together to design and/or maintain the most appropriate $O_3$ network to service the variety of data needs in an area.

TABLE D–2 OF APPENDIX D TO PART 58 SLAMS MINIMUM $O_3$ MONITORING REQUIREMENTS

| MSA population[1, 2] | Most recent 3-year design value concentrations ≥85% of any $O_3$ NAAQS[3] | Most recent 3-year design value concentrations <85% of any $O_3$ NAAQS[3,4] |
|---|---|---|
| >10 million | 4 | 2 |
| 4–10 million | 3 | 1 |
| 350,000–<4 million | 2 | 1 |
| 50,000–<350,000 [5] | 1 | 0 |

1. Minimum monitoring requirements apply to the Metropolitan statistical area (MSA).
2. Population based on latest available census figures.
3. The ozone ($O_3$) National Ambient Air Quality Standards (NAAQS) levels and forms are defined in 40 CFR part 50.
4. These minimum monitoring requirements apply in the absence of a design value.
5. Metropolitan statistical areas (MSA) must contain an urbanized area of 50,000 or more population.

**CO Monitoring Network Requirements**

40 CFR 58 Subpart G, Appendix D to Part 58 Revised as of July 1, 2016

4.2.1 General Requirements. (a) Except as provided in subsection (b), one CO monitor is required to operate collocated with one required near-road $NO_2$ monitor, as required in Section 4.3.2 of this part, in CBSAs having a population of 1,000,000 or more persons. If a CBSA has more than one required near-road $NO_2$ monitor, only one CO monitor is required to be collocated with a near-road $NO_2$ monitor within that CBSA.
(b) If a state provides quantitative evidence demonstrating that peak ambient CO concentrations would occur in a near-road location which meets microscale siting criteria in Appendix E of this part but is not a near-road $NO_2$ monitoring site, then the EPA Regional Administrator may approve a request by a state to use such an alternate near-road location for a CO monitor in place of collocating a monitor at near-road $NO_2$ monitoring site.

**$NO_2$ Monitoring Network Requirements**

40 CFR 58 Subpart G, Appendix D to Part 58 Revised as of July 1, 2016

4.3.2 Requirement for Near-road $NO_2$ Monitors

(a) Within the $NO_2$ network, there must be one microscale near-road $NO_2$ monitoring station in each CBSA with a population of 1,000,000 or more persons to monitor a location of expected maximum hourly concentrations sited near a major road with high AADT counts as specified in paragraph 4.3.2(a)(1) of this appendix. An additional near-road $NO_2$ monitoring station is required for any CBSA with a population of 2,500,000 persons or more, or in any CBSA with a population of 1,000,000 or more persons that has one or more roadway segments with 250,000 or greater AADT counts to monitor a second location of expected maximum hourly concentrations. CBSA populations shall be based on the latest available census figures.
(1) The near-road $NO_2$ monitoring sites shall be selected by ranking all road segments within a CBSA by AADT and then identifying a location or locations adjacent to those highest ranked road segments, considering fleet mix, roadway design, congestion patterns, terrain, and meteorology, where maximum hourly $NO_2$ concentrations are expected to occur and siting criteria can be met in accordance with appendix E of this part. Where a state or local air monitoring agency identifies multiple acceptable candidate sites where maximum hourly $NO_2$ concentrations are expected to occur, the monitoring agency shall consider the potential for population exposure in the criteria utilized to select the final site location. Where one CBSA is required to have two near-road $NO_2$ monitoring stations, the sites shall be differentiated from each other by one or more of the following factors: fleet mix; congestion patterns; terrain; geographic area within the CBSA; or different route, interstate, or freeway designation.
(b) Measurements at required near-road $NO_2$ monitor sites utilizing chemiluminescence FRMs must include at a minimum: NO, $NO_2$, and $NO_X$.

**$SO_2$ Monitoring Network Requirements**

40 CFR 58 Subpart G, Appendix D to Part 58 Revised as of July 1, 2016

4.4 Sulfur Dioxide ($SO_2$) Design Criteria.

4.4.1 *General Requirements.* (a) State and, where appropriate, local agencies must operate a minimum number of required $SO_2$ monitoring sites as described below.
4.4.2 *Requirement for Monitoring by the Population Weighted Emissions Index.* (a) The population weighted emissions index (PWEI) shall be calculated by States for each core based statistical area (CBSA) they contain or share with another State or States for use in the implementation of or adjustment to the $SO_2$ monitoring network. The PWEI shall be calculated by multiplying the population of each CBSA, using the most current census data or estimates, and the total amount of $SO_2$ in tons per year emitted within the CBSA area, using an aggregate of the most recent county level emissions data available in the National Emissions Inventory for each county in each CBSA. The resulting product shall be divided by one million, providing a PWEI value, the units of which are million persons-tons per year. For any CBSA with a calculated PWEI value equal to or greater than 1,000,000, a minimum of three $SO_2$ monitors are required within that CBSA. For any CBSA with a calculated PWEI value equal to or greater than 100,000, but less than 1,000,000, a minimum of two $SO_2$ monitors are required within that CBSA. For any CBSA with a calculated PWEI value equal to or greater than 5,000, but less than 100,000, a minimum of one $SO_2$ monitor is required within that CBSA.
(1) The $SO_2$ monitoring site(s) required as a result of the calculated PWEI in each CBSA shall satisfy minimum monitoring requirements if the monitor is sited within the boundaries of the parent CBSA and is one of the following site types (as defined in section 1.1.1 of this appendix): population exposure, highest concentration, source impacts, general background, or regional transport. $SO_2$ monitors at NCore stations may satisfy minimum monitoring requirements if that monitor is located within a CBSA with minimally required monitors under this part. Any monitor that is sited outside of a CBSA with minimum monitoring requirements to assess the highest concentration resulting from the impact of significant sources or source categories existing within that CBSA shall be allowed to count towards minimum monitoring requirements for that CBSA.

**Table 11: TDEC DAPC Interpretation of the PWEI $SO_2$ Monitoring Requirements**

| CBSA AREA NAME | POP ESTIMATE 2016 | 2011 NEI $SO_2$ Total CBSA 03232016 | 2011 NEI Data 03/23/2016 | | | | | | | 2014 NEI $SO_2$ Total CBSA 05052017 | 2014 V1 NEI Data 5/5/2017 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | PWEI 2010 | PWEI 2011 | PWEI 2012 | PWEI 2013 | PWEI 2014 | PWEI 2015 | $SO_2$ Monitors Required | | PWEI 2016 | $SO_2$ Monitors Required* |
| Chattanooga, TN-GA | 551632 | 953 | 503 | 508 | 512 | 516 | 519 | 525 | FALSE | 3965.06 | 2187 | FALSE |
| Clarksville, TN-KY | 282349 | 431 | 112 | 114 | 119 | 118 | 120 | 122 | FALSE | 693.81 | 196 | FALSE |
| Cleveland, TN | 121262 | 5 | 1 | 1 | 1 | 1 | 1 | 1 | FALSE | 172.17 | 21 | FALSE |
| Jackson, TN | 129527 | 154 | 20 | 20 | 20 | 20 | 20 | 20 | FALSE | 211.51 | 27 | FALSE |
| Johnson City, TN | 201661 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | FALSE | 123.17 | 25 | FALSE |
| Kingsport-Bristol-Bristol, TN-VA | 306334 | 39082 | 12098 | 12080 | 12071 | 12051 | 12040 | 11972 | 1 | 22223.36 | 6808 | 1 |
| Knoxville, TN | 868546 | 28722 | 24057 | 24207 | 24351 | 24470 | 24632 | 24947 | 1 | 4946.87 | 4297 | FALSE |
| Memphis, TN-MS-AR | 1342842 | 15025 | 19905 | 20025 | 20144 | 20159 | 20182 | 20176 | 1 | 14628.18 | 19643 | 1 |
| Morristown, TN | 117320 | 21 | 2 | 2 | 2 | 2 | 2 | 3 | FALSE | 64.14 | 8 | FALSE |
| Nashville-Davidson--Murfreesboro--Franklin, TN | 1865298 | 24560 | 41038 | 41710 | 42419 | 43191 | 44028 | 45812 | 1 | 21348.61 | 39822 | 1 |

4.4.3 *Regional Administrator Required Monitoring.* (a) The Regional Administrator may require additional $SO_2$ monitoring stations above the minimum number of monitors required in 4.4.2 of this part, where the minimum monitoring requirements are not sufficient to meet monitoring objectives. The Regional Administrator may require, at his/her discretion, additional monitors in situations where an area has the potential to have concentrations that may violate or contribute to the violation of the NAAQS, in areas impacted by sources which are not conducive to modeling, or in locations with susceptible and vulnerable populations, which are not monitored under the minimum monitoring provisions described above. The Regional Administrator and the responsible State or local air monitoring agency shall work together to design and/or maintain the most appropriate $SO_2$ network to provide sufficient data to meet monitoring objectives.

4.4.5 *NCore Monitoring.* (a) $SO_2$ measurements are included within the NCore multipollutant site requirements as described in paragraph (3)(b) of this appendix. NCore-based $SO_2$ measurements are primarily used to characterize $SO_2$ trends and assist in understanding $SO_2$ transport across representative areas in urban or rural locations and are also used for comparison with the $SO_2$ NAAQS. $SO_2$ monitors at NCore sites that exist in CBSAs with minimum monitoring requirements per section 4.4.2 above shall be allowed to count towards those minimum monitoring requirements.

## Lead Monitoring Network Requirements

40 CFR 58 Subpart G, Appendix D to Part 58 Revised as of July 1, 2016

4.5 *Lead (Pb) Design Criteria.* (a) State and, where appropriate, local agencies are required to conduct ambient air Pb monitoring near Pb sources which are expected to or have been shown to contribute to a maximum Pb concentration in ambient air in excess of the NAAQS, taking into account the logistics and potential for population exposure. At a minimum, there must be one source-oriented SLAMS site located to measure the maximum Pb concentration in ambient air resulting from each non-airport Pb source which emits 0.50 or more tons per year and from each airport which emits 1.0 or more tons per year based on either the most recent National Emission Inventory (*http://www.epa.gov/ttn/chief/eiinformation.html*) or other scientifically justifiable methods and data (such as improved emissions factors or site-specific data) taking into account logistics and the potential for population exposure.

(i) One monitor may be used to meet the requirement in paragraph 4.5(a) for all sources involved when the location of the maximum Pb concentration due to one Pb source is expected to also be impacted by Pb emissions from a nearby source (or multiple sources). This monitor must be sited, taking into account logistics and the potential for population exposure, where the Pb concentration from all sources combined is expected to be at its maximum.

(ii) The Regional Administrator may waive the requirement in paragraph 4.5(a) for monitoring near Pb sources if the State or, where appropriate, local agency can demonstrate the Pb source will not contribute to a maximum Pb concentration in ambient air in excess of 50 percent of the NAAQS (based on historical monitoring data, modeling, or other means). The waiver must be renewed once every 5 years as part of the network assessment required under §58.10(d).

(iii) State and, where appropriate, local agencies are required to conduct ambient air Pb monitoring near each of the airports listed in Table D-3A for a period of 12 consecutive months commencing no later than December 27, 2011. Monitors shall be sited to measure the maximum Pb concentration in ambient air, taking into account logistics and the potential for population exposure, and shall use an approved Pb-TSP Federal Reference Method or Federal Equivalent Method. Any monitor that exceeds 50 percent of the Pb NAAQS on a rolling 3-month average (as determined according to 40 CFR part 50, Appendix R) shall become a required monitor under paragraph 4.5(c) of this Appendix, and shall continue to monitor for Pb unless a waiver is granted allowing it to stop operating as allowed by the provisions in paragraph 4.5(a)(ii) of this appendix. Data collected shall be submitted to the Air Quality System database according to the requirements of 40 CFR part 58.16.

**$PM_{2.5}$ Monitoring Network Requirements**

40 CFR 58 Subpart G, Appendix D to Part 58 Revised as of July 1, 2016

4.7.1 General Requirements. (a) State, and where applicable local, agencies must operate the minimum number of required $PM_{2.5}$ SLAMS sites listed in Table D-5 of this appendix. The NCore sites are expected to complement the $PM_{2.5}$ data collection that takes place at non-NCore SLAMS sites, and both types of sites can be used to meet the minimum $PM_{2.5}$ network requirements. Deviations from these $PM_{2.5}$ monitoring requirements must be approved by the EPA Regional Administrator.

**Table D-5 of Appendix D to Part 58—$PM_{2.5}$ Minimum Monitoring Requirements**

| MSA population[1 2] | Most recent 3-year design value ≥85% of any $PM_{2.5}$ NAAQS[3] | Most recent 3-year design value <85% of any $PM_{2.5}$ NAAQS[3 4] |
|---|---|---|
| >1,000,000 | 3 | 2 |
| 500,000-1,000,000 | 2 | 1 |
| 50,000-<500,000[5] | 1 | 0 |

[1]Minimum monitoring requirements apply to the Metropolitan statistical area (MSA).
[2]Population based on latest available census figures.
[3]The $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS) levels and forms are defined in 40 CFR part 50.
[4]These minimum monitoring requirements apply in the absence of a design value.
[5]Metropolitan statistical areas (MSA) must contain an urbanized area of 50,000 or more population.

(b) Specific Design Criteria for $PM_{2.5}$. The required monitoring stations or sites must be sited to represent area-wide air quality. These sites can include sites collocated at PAMS. These monitoring stations will typically be at neighborhood or urban-scale; however, micro-or middle-scale $PM_{2.5}$ monitoring sites that represent many such locations throughout a metropolitan area are considered to represent area-wide air quality.

(1) At least one monitoring station is to be sited at neighborhood or larger scale in an area of expected maximum concentration.

(2) For CBSAs with a population of 1,000,000 or more persons, at least one $PM_{2.5}$ monitor is to be collocated at a near-road $NO_2$ station required in section 4.3.2(a) of this appendix.

(3) For areas with additional required SLAMS, a monitoring station is to be sited in an area of poor air quality.

(4) Additional technical guidance for siting $PM_{2.5}$ monitors is provided in references 6 and 7 of this appendix.

(c) The most important spatial scale to effectively characterize the emissions of particulate matter from both mobile and stationary sources is the neighborhood scale for $PM_{2.5}$. For purposes of establishing monitoring sites to represent large homogenous areas other than the above scales of representativeness and to characterize regional transport, urban or regional scale sites would also be needed. Most $PM_{2.5}$ monitoring in urban areas should be representative of a neighborhood scale.

(1) *Micro-scale.* This scale would typify areas such as downtown street canyons and traffic corridors where the general public would be exposed to maximum concentrations from mobile sources. In some circumstances, the micro-scale is appropriate for particulate sites. SLAMS sites measured at the micro-scale level should, however, be limited to urban sites that are representative of long-term human exposure and of many such microenvironments in the area. In general, micro-scale particulate matter sites should be located near inhabited buildings or locations where the general public can be expected to be exposed to the concentration measured. Emissions from stationary sources such as primary and secondary smelters, power plants, and other large industrial processes may, under certain plume conditions, likewise result in high ground level concentrations at the micro-scale. In the latter case, the micro-scale would represent an area impacted by the plume with dimensions extending up to approximately 100 meters. Data collected at micro-scale sites provide information for evaluating and developing hot spot control measures.

(2) *Middle scale*—People moving through downtown areas, or living near major roadways, encounter particle concentrations that would be adequately characterized by this spatial scale. Thus, measurements of this type would be appropriate for the evaluation of possible short-term exposure public health effects of particulate matter pollution. In many situations, monitoring sites that are representative of microscale or middle-scale impacts are not unique and are representative of many similar situations. This can occur along traffic corridors or other locations in a residential district. In this case, one location is representative of a number of small scale sites and is appropriate for evaluation of long-term or chronic effects. This scale also includes the characteristic concentrations for other areas with dimensions of a few hundred meters such as the parking lot and feeder streets associated with shopping centers, stadia, and office buildings.

(3) *Neighborhood scale*—Measurements in this category would represent conditions throughout some reasonably homogeneous urban sub-region with dimensions of a few kilometers and of generally more regular shape than the middle scale. Homogeneity refers to the particulate matter concentrations, as well as the land use and land surface characteristics. Much of the $PM_{2.5}$ exposures are expected to be associated with this scale of measurement. In some cases, a location carefully chosen to provide neighborhood scale data would represent the immediate neighborhood as well as neighborhoods of the same type in other parts of the city. $PM_{2.5}$ sites of this kind provide good information about trends and compliance with standards because they often represent conditions in areas where people commonly live and work for periods comparable to those specified in the NAAQS. In general, most $PM_{2.5}$ monitoring in urban areas should have this scale.

(4) *Urban scale*—This class of measurement would be used to characterize the particulate matter concentration over an entire metropolitan or rural area ranging in size from 4 to 50 kilometers. Such measurements would be useful for assessing trends in area-wide air quality, and hence, the effectiveness of large scale air pollution control strategies. Community-oriented $PM_{2.5}$ sites may have this scale.

(5) *Regional scale*—These measurements would characterize conditions over areas with dimensions of as much as hundreds of kilometers. As noted earlier, using representative conditions for an area implies some degree of homogeneity in that area. For this reason, regional scale measurements would be most applicable to sparsely populated areas. Data characteristics of this scale would provide information about larger scale processes of particulate matter emissions, losses and transport. $PM_{2.5}$ transport contributes to elevated particulate concentrations and may affect multiple urban and State entities with large populations such as in the eastern United States. Development of effective pollution control strategies requires an understanding at regional geographical scales of the emission sources and atmospheric processes that are responsible for elevated $PM_{2.5}$ levels and may also be associated with elevated $O_3$ and regional haze.

4.7.2 Requirement for Continuous $PM_{2.5}$ Monitoring. The State, or where appropriate, local agencies must operate continuous $PM_{2.5}$ analyzers equal to at least one-half (round up) the minimum required sites listed in Table D-5 of this appendix. At least one required continuous analyzer in each MSA must be collocated with one of the required FRM/FEM/ARM monitors, unless at least one of the required FRM/FEM/ARM monitors is itself a continuous FEM or ARM monitor in which case no collocation requirement applies. State and local air monitoring agencies must use methodologies and quality assurance/quality control (QA/QC) procedures approved by the EPA Regional Administrator for these required continuous analyzers.

4.7.3 Requirement for $PM_{2.5}$ Background and Transport Sites. Each State shall install and operate at least one $PM_{2.5}$ site to monitor for regional background and at least one $PM_{2.5}$ site to monitor regional transport. These monitoring sites may be at community-oriented sites and this requirement may be satisfied by a corresponding monitor in an area having similar air quality in another State. State and local air monitoring agencies must use methodologies and QA/QC procedures approved by the EPA Regional Administrator for these sites. Methods used at these sites may include non-federal reference method samplers such as IMPROVE or continuous $PM_{2.5}$ monitors.

4.7.4 $PM_{2.5}$ Chemical Speciation Site Requirements. Each State shall continue to conduct chemical speciation monitoring and analyses at sites designated to be part of the $PM_{2.5}$ Speciation Trends Network (STN). The selection and modification of these STN sites must be approved by the Administrator. The $PM_{2.5}$ chemical speciation urban trends sites shall include analysis for elements, selected anions and cations, and carbon. Samples must be collected using the monitoring methods and the sampling schedules approved by the Administrator. Chemical speciation is encouraged at additional sites where the chemically resolved data would be useful in developing State implementation plans and supporting atmospheric or health effects related studies.

## Index reporting requirements

40 CFR 58 Subpart F, 58.50 Revised as of July 1, 2016

58.50 Index reporting.

(a) The state or where applicable, local agency shall report to the general public on a daily basis through prominent notice an air quality index that complies with the requirements of Appendix G: Annual Site Evaluations to this part.

(b) Reporting is required for all individual MSA with a population exceeding 350,000.

(c) The population of a MSA for purposes of index reporting is the most recent decennial U.S. census population.

| Geographic area | 2010 Census | 2016 Census Est. | Required to Have AQI Reporting | Daily AQI/Air Quality Forecasts Provided |
|---|---|---|---|---|
| Chattanooga, TN-GA | 528143 | 551632 | Yes | Yes |
| Clarksville, TN-KY | 260625 | 282349 | No | Yes |
| Cleveland, TN | 115788 | 121262 | No | No |
| Jackson, TN | 130011 | 129527 | No | No |
| Johnson City, TN | 198716 | 201661 | No | Yes Based on the combined population of both areas. |
| Kingsport-Bristol-Bristol, TN-VA | 309544 | 306334 | No | |
| Knoxville, TN | 837571 | 868546 | Yes | Yes In addition, the GSMNP has a separate AQI/Forecast provided. |
| Memphis, TN-MS-AR | 1324829 | 1342842 | Yes | Yes |
| Morristown, TN | 113951 | 117320 | No | No |
| Nashville-Davidson--Murfreesboro, TN | 1670890 | 1865298 | Yes | Yes |

## NCore Monitoring Network Requirements and $PM_{10-2.5}$

40 CFR 58 Subpart G, Appendix D to Part 58 Revised as of July 1, 2016

(a) Each State (i.e. the fifty States, District of Columbia, Puerto Rico, and the Virgin Islands) is required to operate at least one NCore site. States may delegate this requirement to a local agency. States with many MSAs often also have multiple air sheds with unique characteristics and, often, elevated air pollution. These States include, at a minimum, California, Florida, Illinois, Michigan, New York, North Carolina, Ohio, Pennsylvania, and Texas. These States are required to identify one to two additional NCore sites in order to account for their unique situations.

These additional sites shall be located to avoid proximity to large emission sources. Any State or local agency can propose additional candidate NCore sites or modifications to these requirements for approval by the Administrator. The NCore locations should be leveraged with other multipollutant air monitoring sites including PAMS sites, National Air Toxics Trends Stations (NATTS) sites, CASTNET sites, and STN sites. Site leveraging includes using the same monitoring platform and equipment to meet the objectives of the variety of programs where possible and advantageous.

(b) The NCore sites must measure, at a minimum, PM2.5 particle mass using continuous and integrated/filter-based samplers, speciated PM2.5, PM10-2.5 particle mass, O3, SO2, CO, NO/NOY, wind speed, wind direction, relative humidity, and ambient temperature.

(1) Although the measurement of NOy is required in support of a number of monitoring objectives, available commercial instruments may indicate little difference in their measurement of NOy compared to the conventional measurement of NOX, particularly in areas with relatively fresh sources of nitrogen emissions. Therefore, in areas with negligible expected difference between NOy and NOX measured concentrations, the Administrator may allow for waivers that permit NOX monitoring to be substituted for the required NOy monitoring at applicable NCore sites.

(2) The EPA recognizes that, in some cases, the physical location of the NCore site may not be suitable for representative meteorological measurements due to the site's physical surroundings. It is also possible that nearby meteorological measurements may be able to fulfill this data need. In these cases, the requirement for meteorological monitoring can be waived by the Administrator.

40 CFR 58 Subpart G, Appendix D to Part 58 Revised as of July 1, 2016

**Coarse Particulate Matter (PM10-2.5) Design Criteria.**

4.8.1 General Monitoring Requirements. (a) The only required monitors for $PM_{10-2.5}$ are those required at NCore Stations.
(b) Although microscale monitoring may be appropriate in some circumstances, middle and neighborhood scale measurements are the most important station classifications for $PM_{10-2.5}$ to assess the variation in coarse particle concentrations that would be expected across populated areas that are in proximity to large emissions sources.

**NCore Look Rock Monitoring Site**

Air quality monitoring at the Look Rock monitoring site has a long history dating at least back to about 1980. Monitoring at this site has been a joint effort of the National Park Service (NPS), EPA and the state of Tennessee.

Siting

The coordinates are:
Latitude + 35.6334N
Longitude -83.9416W
Elevation 801 Meters.

Site is approved by the EPA as a rural NCore site.

Monitoring Objective

Determine compliance with NAAQS; observe pollution trends for national data analysis, provide pollution levels for daily index reporting; and provide date for scientific studies.

Quality Assurance

All Quality Assurance procedures shall be implemented in accordance with 40 CFR 58, Appendix A.

Area of Representativeness

40 CFR Part 58 Appendix D provides design criteria for ambient air monitoring. In the case of urban NCore the spatial scales to be used are neighborhood and urban. Because the Look Rock site is located in a pristine high elevation area, it is understood that the site is ideally suited for both background and transport related measurements.

Spatial Scales for Each Pollutant

Generally regional scale.

Need For Additional Resources

All parties agree that the collaboration between the National Park Service, EPA and the state of Tennessee at the Look Rock sampling site has produced an extraordinarily diverse and in-depth air quality record and that the bulk of this data set has been validated and reported to the U.S. EPA AQS repository. However, under the present piecemeal funding by the various agencies, there is no assurance that this will continue at the site for the longer term needed for monitoring compliance with the PM NAAQS and with the regional haze rule (RHR). What is needed is a long-term commitment by EPA to coordinate the operation of this and other sites to maintain quality and relevance in the NCore network over the long term. This commitment should commence by the 2011 time frame when NCore sites are expected to become fully operational.

EPA has agreed to provide support and funding to continue the operation of the NCore site. This is the final equipment list currently in place at the site.

Air Monitoring Equipment at Look Rock

| POLLUTANT INSTRUMENT | ANALYSIS METHOD | SAMPLING REPORTING FREQ | AQS CODE | PARA METER CODE | POC | REP ORD CODE | DATE SAMPLING BEGAN | MONITOR | | SAMPLING INSTRUMENT NAME AND DESIGNATION | FED AGENCY |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Type | Comment | | |
| Sulfur Dioxide ($SO_2$) trace-level | Pulsed fluorescence | Continuous/1hr | 47-009-0101 | 42401 | 4 | 745 | 20070401 | Special Purpose | Ncore | Thermo $SO_2$ 43i TLE EQSA-0436-060 | NPS |
| Carbon Monoxide (CO) | Trace-level NDIR-GFC | Continuous/1hr | 47-009-0101 | 42101 | 1 | 745 | 20070401 | Special Purpose | Ncore | Thermo CO 48i TLE RFNA-0981-054 | NPS |
| Nitrogen oxide (NO) trace-level | Chemilumenescence with molybdenum convertor | Continuous/1hr | 47-009-0101 | 42601 | 1 | 745 | 20070401 | Special Purpose | Ncore | Thermo $NO_2$/NOy 42c TLE RFNA1289-074 | NPS |
| Total reactive nitrogen (NOy) trace-level | Chemilumenescence with molybdenum convertor | Continuous/1hr | 47-009-0101 | 42600 | 1 | 745 | 20070401 | Special Purpose | Ncore | Thermo $NO_2$/NOy 42c TLE RFNA1289-074 | NPS |
| Nitrogen dioxide ($NO_2$) trace-level | Chemilumenescence with molybdenum convertor | Continuous/1hr | 47-009-0101 | 42612 | 1 | 745 | 20070401 | Special Purpose | Ncore | Thermo $NO_2$/NOy 42c TLE RFNA1289-074 | NPS |
| Nitrogen dioxide ($NO_2$) trace-level | Cavity attenuated phase shift | Continuous/1hr | 47-009-0101 | 42602 | 4 | 745 | 20141102 | Special Purpose | Ncore | Teledyne $NO_2$ T500U CAPS | NPS |
| Calibrator | NA | Daily | NA | NA | NA | NA | 20070401 | NA | NA | Thermo Model 146c | NPS |
| Zero Air Supply | NA | NA | NA | NA | NA | NA | 20070401 | NA | NA | Thermo 111 | NPS |
| Telemetry-Data Logger | NA | 1 minute/ 1 hour | NA | NA | NA | NA | 20070401 | NA | NA | ESC 8832 | NPS |

# Appendix F: EPA Approval and Special Request Letters

### Blountville Monitoring Site

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

FEB 23 2017

Ms. Michelle Walker Owenby
Director
Division of Air Pollution Control
Tennessee Department of Environment and Conservation
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, Tennessee 37243

Dear Ms. Owenby:

Thank you for submitting a request to relocate the Blountville monitoring site (AQS # 47-163-2002), dated February 10, 2017. In order to meet 40 CFR Part 58 Appendix E siting requirements, the Tennessee Department of Environment and Conservation stated the site would be moved approximately 25 meters southwest of the current site to address drip line obstructions. Due to the proximity to the current site, the U.S. Environmental Protection Agency Region 4 considers this a reconfiguration of the site rather than a relocation; therefore, public inspection and comment are not required. The EPA approves the reconfiguration of the ozone monitor at the Blountville monitoring site. The new location will continue to report data to AQS # 47-163-2002.

Thank you for working with us to monitor air pollution and promote healthy air quality in Tennessee and the nation. If you have any questions or concerns, please contact Gregg Worley at (404) 562-9141 or Sara Waterson at (404) 562-9061.

Sincerely,

Beverly H. Banister

Beverly H. Banister
Director
Air, Pesticides and Toxics Management Division

cc: Mr. Jason Stephens
Manager 3, Tennessee Department
of Environment and Conservation

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## Lawrence and Jackson Monitoring Site

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

MAR 14 2017

Ms. Michelle Walker Owenby
Director
Division of Air Pollution Control
Tennessee Department of Environment and Conservation
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, Tennessee 37243

Dear Ms. Owenby:

Thank you for your March 6, 2017, letter requesting waivers to the 40 CFR Part 58, Appendix E siting requirements for the Jackson monitoring site (Air Quality System (AQS) # 47-113-0006) Jackson, TN and the Lawrence monitoring site (AQS # 47-099-0002) located in Loretto, TN. Based on the information provided in your request, the U.S. Environmental Protection Agency Region 4 has determined that the Tennessee Department of Environment and Conservation (TDEC) has met the requirements for waiving the monitor siting requirements for both sites and is approving the waiver requests through December 31, 2017. Below is a more detailed explanation for our approval.

The basis for your request references 40 CFR Part 58, Appendix E, Section 10, which states a waiver can be granted if "the monitor or probe cannot reasonably be located so as to meet the siting criteria because of physical constraints (e.g., inability to locate the required type of site the necessary distance from roadways or obstructions)." The TDEC noted existing trees are encroaching on the monitoring sites and the property owners will not allow the trees to be trimmed or removed. The TDEC is in the process of investigating new sites to relocate both the Jackson and Lawrence $PM_{2.5}$ monitoring sites. The new sites will be proposed in the TDEC's 2017 Annual Network Plan, and the sites will begin collecting data by January 1, 2018.

The EPA reviewed the information submitted by the TDEC and determined both sites meet the waiver requirement in 40 CFR Part 58, Appendix E, Section 10.2. The EPA also reviewed the 2015 design values (DV) and the preliminary 2016 DVs for the two sites. The Jackson site recorded a 2015 DV of 8.3 $ug/m^3$ and a preliminary 2016 DV of 7.7 $ug/m^3$. The Lawrence site recorded a 2015 DV of 7.7 $ug/m^3$ and a preliminary 2016 DV of 7.4 $ug/m^3$. These DVs are below the national ambient air quality standard (NAAQS) of 12 $ug/m^3$.

The EPA has determined that the TDEC's request for a waiver of the siting requirements is justified because: 1) the Jackson and Lawrence sites meet the waiver request requirement, 2) the DVs are below the NAAQS, and 3) the TDEC will propose new locations that meet siting requirements in the 2017 Annual Network Plan (with relocation to occur by December 31, 2017). The EPA approves the waiver requests through December 31, 2017. If the sites are not relocated and operating by January 1, 2018, the TDEC will be required to submit a new waiver request.

The EPA agrees with the TDEC that the $PM_{2.5}$ data collected at the existing sites must be flagged with an "SX" qualifier in AQS during the time the siting issues remain. If you have any questions or concerns about this matter, please contact me or have your staff contact Ms. Sara Waterson at (404) 562-9061 or waterson.sara@epa.gov.

Sincerely,

Beverly H. Banister
Director
Air, Pesticides and Toxics Management Division

cc: Dr. Jason Stephens, Environmental Manager 3
Division of Air Pollution Control

TN Department of Environment & Conservation

April 5, 2017

Ms. Beverly Banister
Division Director
Air, Pesticides, and Toxics grant Management Unit
USEPA Region IV
61 Forsyth Street
Atlanta, GA 30303-8960

Dear Ms. Banister,

This letter is to inform EPA Region 4 of the State of Tennessee's intent to request exceptional event status for the PM2.5 monitors listed in Tables 1 and 2. Multiple fires were active from October thru December of 2016. Our PM 2.5 monitors were impacted during November. Tennessee's §103 and §105 Clean Air Act grants require that TDEC DAPC report any exceedances of the national ambient air quality standards to the EPA. The State of Tennessee has identified exceedances of the 24-hour standard for PM2.5. Refer to Table 1 for the list of monitors affected.

Table 1: Initial Notification Information Specific to Each Monitor by Day

| Agency and Planning Area or Statistical Area | State | County | Event Name in AQS | Type of Event in AQS | NAAQS (24 Hr Standard greater than 35 µg/m³) | Site | AQS ID | Filter Id | Sample Date (s) of the Event | Monitor Exceedance Concentration |
|---|---|---|---|---|---|---|---|---|---|---|
| TDEC APC | TN | McMinn | US Wildfires | Flagged as "IT" | > 35 µg/m³ | Athens | 47 107 1002 | T6618756 | 11/14/2016 | 85.6 |
| TDEC APC | TN | Roane | US Wildfires | Flagged as "IT" | > 35 µg/m³ | Harriman | 47 145 0001 | T6618818 | 11/8/2016 | 77 |
| TDEC APC | TN | Sullivan | US Wildfires | Flagged as "IT" | > 35 µg/m³ | Kingsport | 47 163 1007 | T6618888 | 11/23/2016 | 46.1 |
| TDEC APC | TN | Loudon | US Wildfires | Flagged as "IT" | > 35 µg/m³ | Loudon | 47 105 0108 | T6618820 | 11/8/2016 | 66.4 |
| TDEC APC | TN | Loudon | US Wildfires | Flagged as "IT" | > 35 µg/m³ | Loudon | 47 105 0108 | T6618827 | 11/14/2016 | 80.5 |
| TDEC APC | TN | Blount | US Wildfires | Flagged as "IT" | > 35 µg/m³ | Maryville | 47 009 0011 | T6618822 | 11/8/2016 | 65 |
| TDEC APC | TN | Blount | US Wildfires | Flagged as "IT" | > 35 µg/m³ | Maryville | 47 009 0011 | T6618829 | 11/14/2016 | 70.2 |
| TDEC APC | TN | Blount | US Wildfires | Flagged as "IT" | > 35 µg/m³ | Maryville | 47 009 0011 | T6618908 | 11/23/2016 | 37.3 |

Our agency intends to request exceptional event status for these exceedances based on smoke emissions travelling from various fires in TN, NC, KY, and GA. Refer to Table 2 for specific fire information for the possible fires responsible for these exceedances. Design values are given in Table 3; these values include the data from fire-impacted filters. This is an official notice of intent to request exceptional event status for the exceedances.

Division/Office • First Address Line • Second Address Line • City, State Zipcode
Tel: 615-000-1234 • Fax: 615-000-1234 • tn.gov/agency

Table 2: Associated Wildfire Information

| Monitor | AQS ID | Exceedance Date | Associated Wildfire Information (Preliminary) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Fire Name | State | Fire Discovery | Size (acres) | Contained | 100% Containment |
| Harriman | 47 145 0001 | 11/8/2016 | Boteler | NC | 10/25/2016 | 9036 | 30% | 12/3/2016 |
| | | | Knob | NC | 11/2/2016 | 1130 | 28% | 11/26/2016 |
| | | | Rough Ridge | GA | 10/16/2016 | 27,870 | 11% | 12/6/2016 |
| Loudon | 47 105 0108 | 11/8/2016 | Boteler | NC | 10/25/2016 | 9036 | 30% | 12/3/2016 |
| | | | Knob | NC | 11/2/2016 | 1130 | 28% | 11/26/2016 |
| | | | Rough Ridge | GA | 10/16/2016 | 27,870 | 11% | 12/6/2016 |
| Maryville | 47 009 0011 | 11/8/2016 | Boteler | NC | 10/25/2016 | 9036 | 30% | 12/3/2016 |
| | | | Knob | NC | 11/2/2016 | 1130 | 28% | 11/26/2016 |
| | | | Rough Ridge | GA | 10/16/2016 | 27,870 | 11% | 12/6/2016 |
| Athens | 47 107 1002 | 11/14/2016 | Mowbray | TN | 11/9/2016 | 830 | N/A | 11/16/2016 |
| | | | White Oak Circle | TN | 11/11/2016 | 1888 | N/A | 11/17/2016 |
| | | | Clear Creek Road | TN | 11/12/2016 | 100 | N/A | 11/15/2016 |
| | | | Gatliff | KY | 11/9/2016 | 1,800 | N/A | 11/24/2016 |
| Loudon | 47 105 0108 | 11/14/2016 | Mowbray | TN | 11/9/2016 | 830 | N/A | 11/16/2016 |
| | | | White Oak Circle | TN | 11/11/2016 | 1888 | N/A | 11/17/2016 |
| | | | Clear Creek Road | TN | 11/12/2016 | 100 | N/A | 11/15/2016 |
| | | | Gatliff | KY | 11/9/2016 | 1,800 | N/A | 11/24/2016 |
| Maryville | 47 009 0011 | 11/14/2016 | Mowbray | TN | 11/9/2016 | 830 | N/A | 11/16/2016 |
| | | | White Oak Circle | TN | 11/11/2016 | 1888 | N/A | 11/17/2016 |
| | | | Clear Creek Road | TN | 11/12/2016 | 100 | N/A | 11/15/2016 |
| | | | Gatliff | KY | 11/9/2016 | 1,800 | N/A | 11/24/2016 |
| Kingsport | 47 163 1007 | 11/23/2016 | Clear Creek | NC | 11/19/2016 | 3,163 | 15% | 12/2/2016 |
| Maryville | 47 009 0011 | 11/23/2016 | Boteler | NC | 10/25/2016 | 9,036 | 77% | 12/3/2016 |
| | | | Tellico | NC | 11/3/2016 | 13,874 | 91% | 12/2/2016 |

TN Department of Environment & Conservation

Table 3: Preliminary PM2.5 Design Values as of 4/3/2017

| County | AQS ID | Address | 2014-2016 Daily DV | Valid | 2014-2016 Annual DV | Valid | Flagged for Wildfire Exclusion |
|---|---|---|---|---|---|---|---|
| Blount | 470090011 | 2007 SEQUOYAH AVENUE MARYVILLE tn 37803 | 25 | Y | 8.7 | Y | Y |
| Hamilton | 470650031 | 1517 TOMBRAS AVENUE, EAST RIDGE | 18 | Y | 8.6 | Y | Y |
| Hamilton | 470654002 | RIVERSIDE SUBSTATION 911 SISKIN DR | 17 | Y | 8.7 | Y | Y |
| Knox | 470930028 | 1000 FRANCIS ROAD | 20 | Y | 9.3 | Y | Y |
| Knox | 470931013 | 939 Stewart St. Knoxville, TN 37917 | 33 | Y | 10.4 | Y | Y |
| Knox | 470931017 | 1613 VERMONT AVENUE | 21 | Y | 9.9 | Y | Y |
| Knox | 470931020 | 4625 MILDRED DRIVE | 20 | N | 9.2 | Y | Y |
| Loudon | 471050108 | 130 WEBB DRIVE Loudon TN 37774 | 20 | Y | 9.7 | Y | Y |
| McMinn | 471071002 | SAINT MARK AME ZION CHURCH, 707 NORTH JACKSON ST. Athens TN 37303 | 21 | Y | 8.7 | Y | Y |
| Roane | 471450004 | HARRIMAN HIGH 1002 N. ROAN ST Harriman TN 37748 | 18 | Y | 8.6 | Y | Y |
| Sullivan | 471631007 | 1649 D STREET Kingsport TN 37664 | 16 | Y | 8.1 | Y | Y |

1. The daily design value (DV) standard is 35 ug/m3.
2. The annual DV standard is 12 ug/m3
3. Invalid DVs may be become valid upon further data loading or additonal analysis.
4. This data is subject to change upon EPA's concurrance of exceptional event requests.

Sincerely,

Jason Stephens, PhD
Program Manager
Department of Environment and Conservation
Division of Air Pollution Control

CC: Ms. Beverly Banister, Mr. Gregg Worley, Mr. Todd Rinck, Mr. Darren Palmer, Ms. Sara Waterson, EPA
Worley.Gregg@epa.gov
Banister.Beverly@epa.gov
Kemker.Carol@epa.gov
Worley.Gregg@epa.gov
Rinck.Todd@epa.gov
Palmer.Darren@epa.gov

Division/Office • First Address Line • Second Address Line • City, State Zipcode
Tel: 615-000-1234 • Fax: 615-000-1234 • tn.gov/agency

## Loudon Pope Relocation Request

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

MAR 21 2016 PM12:37

MAR 16 2016

Ms. Michelle Walker Owenby
Director
Division of Air Pollution Control
Tennessee Department of Environment and Conservation
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, Tennessee 37243

Dear Ms. Owenby:

Thank you for submitting a request to relocate the Loudon Pope monitoring site (AQS # 47-105-0108) to Loudon Elementary School (AQS # 47-105-0109), dated March 4, 2016. The U.S. Environmental Protection Agency Region 4 understands that the Tennessee Department of Environment and Conservation (TDEC) provided the public a 30-day review period for its draft relocation request, and no comments were received. According to 40 CFR §58.10(a)(2), since public inspection and comment have already been solicited, the EPA is not required to offer another comment period.

The TDEC requested relocation of the Loudon Pope Fine Particulate Matter ($PM_{2.5}$) and ozone monitoring site to the Loudon Elementary School (formerly the Loudon Middle School) monitoring site. The EPA approves the relocation of the $PM_{2.5}$ and ozone monitors from the Loudon Pope monitoring site to the Loudon Elementary School monitoring site. In future requests to establish, discontinue, or relocate a State and Local Air Monitoring Station site, the EPA requests TDEC follow Region 4's Draft *Region 4 Policy on Establishing, Discontinuing, or Relocating a State and Local Air Monitoring Station.* In particular, for site relocation requests it would be helpful to document that the site selection process in the appropriate EPA guidance was followed, analyze the design value trend of the site and any nearby site(s) over the most recent 5 years or more, and provide documentation of special circumstances (if applicable).

Thank you for working with us to monitor air pollution and promote healthy air quality in Tennessee and the nation. If you have any questions or concerns, please contact Gregg Worley at (404) 562-9141 or Sara Waterson at (404) 562-9061.

Sincerely,

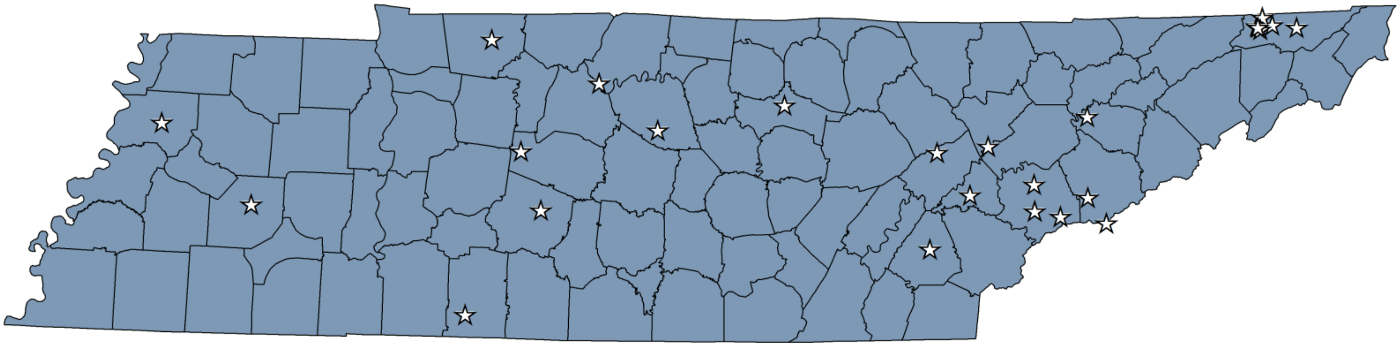
Beverly H. Banister
Director
Air, Pesticides and Toxics Management Division

cc: Mr. Jason Stephens
Environmental Manager 3, TDEC

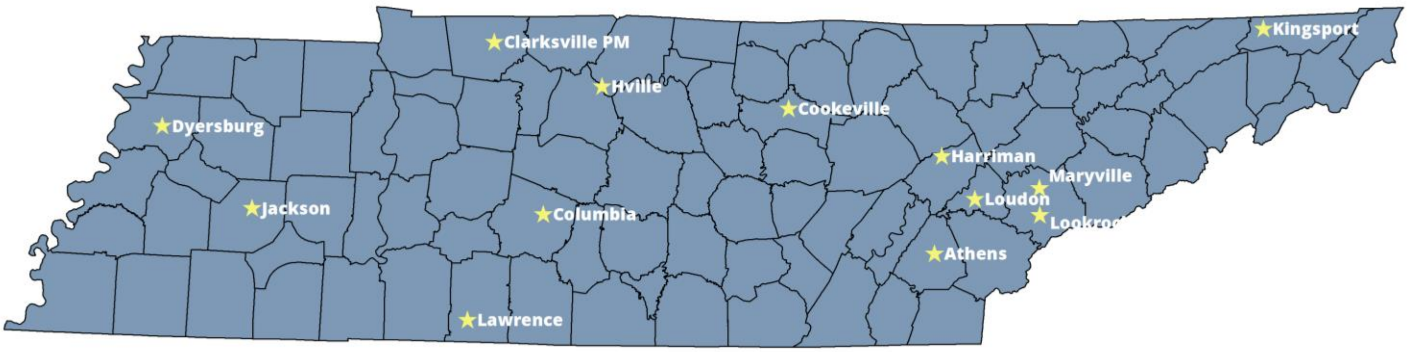
Internet Address (URL) • http://www.epa.gov
Recycled/Recyclable • Printed with Vegetable Oil Based Inks on Recycled Paper (Minimum 30% Postconsumer)

# Appendix G: Maps of TDEC DAPC Monitoring Site Locations

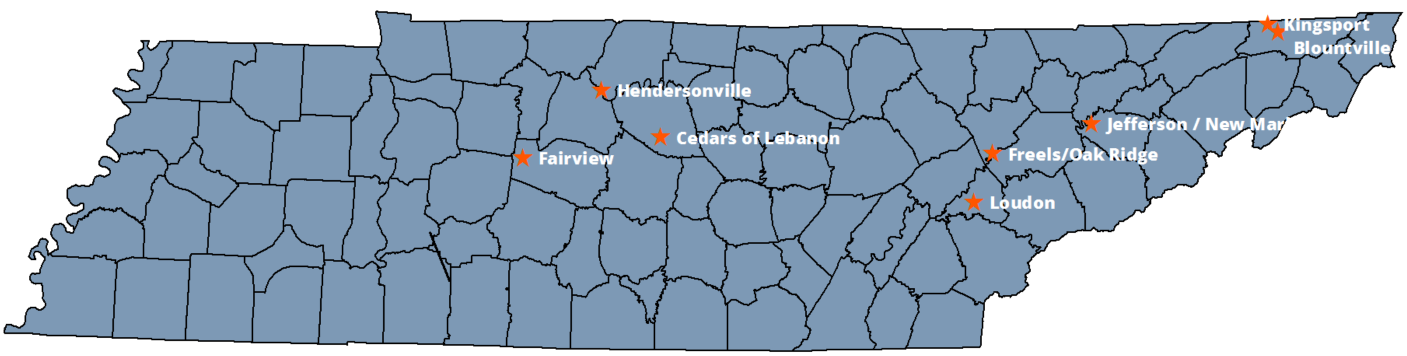
## All Monitoring Sites Operated or Reported by TDEC DAPC



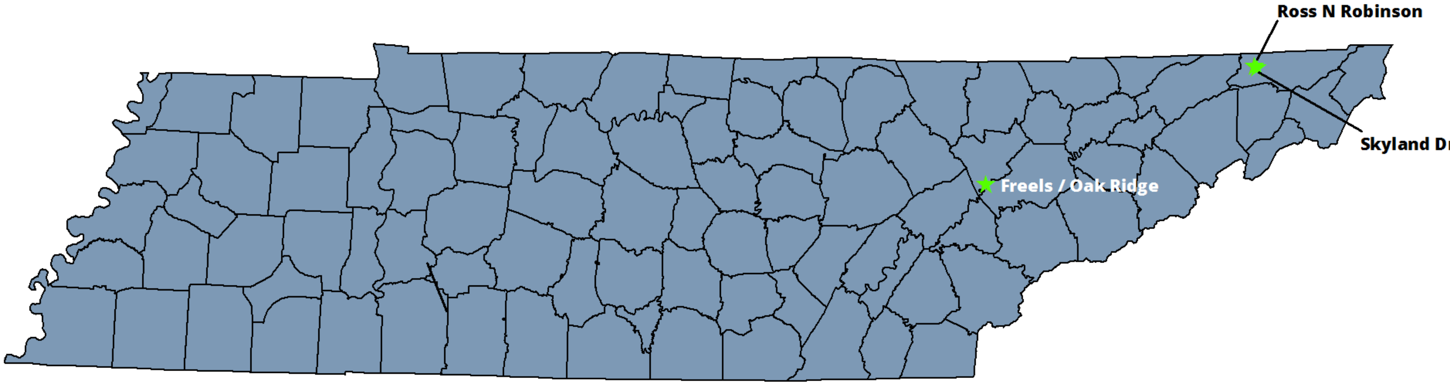
## $PM_{2.5}$ Monitor Locations



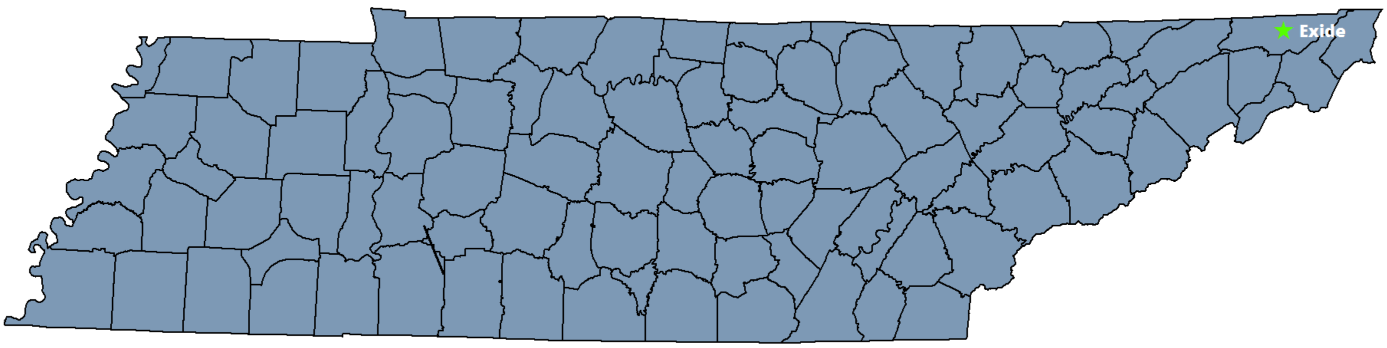

## Ozone Monitor Locations



## $SO_2$ Monitor Locations




## Lead Monitor Locations



## Appendix H: Fairview (471870106) Relocation Request

**STATE OF TENNESSEE**
**DEPARTMENT OF ENVIRONMENT & CONSERVATION**
**DIVISION OF AIR POLLUTION CONTROL**
**WILLIAM R. SNODGRASS TENNESSEE TOWER**
**312 ROSA L. PARKS AVENUE, 15TH FLOOR**
**NASHVILLE, TENNESSEE 37243**

February 1, 2017

Beverly H. Banister, Director
Air, Pesticides, & Toxics Management Division
US EPA Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth St, SW
Atlanta, GA 30303-8960

Dear Ms. Banister:

The State of Tennessee (TDEC DAPC) would like to request that the EPA approve the relocation of the Fairview ozone monitoring site located in Williamson County, Tennessee. This proposal is described in more detail in the enclosed document. The Fairview site contains one ozone monitor (AQS # 47- 187- 0106). Under the proposal, the site would be moved approximately 221.8 meters southwest of the current site to address drip line obscuration issues and render the site compliant with 40 CFR part 58 Appendix E. This monitor would cease operation and reporting data to the AQS database after the new site has begun to collect data. If approved, the State of Tennessee will start reporting data to the AQS database once the new site is fully functional. The estimated shutdown/startup would take place on or before June 2016.

The current site no longer meets EPA siting criteria. The Williamson Board of Education has agreed to allow TDEC DAPC to relocate the site. The proposed location will comply with EPA 40 CFR part 58 Appendix E requirements.

This proposal is in response to the technical systems audit (TSA) conducted on June 13-17, 2016 for the operational period from January 2013 through December 2015. The audit was conducted by EPA Region 4's Science and Ecosystem Support Division (SESD). The TSA team included Douglas Jager and Richard Guillot.

As a result of the TSA, SESD recommended that TDEC DAPC prioritize our corrective actions according to the findings detailed in Sections 4.1.1 of the TSA report:

Division of Air Pollution Control
William R. Snodgrass Tennessee Tower •15th Floor
312 Rosa L. Parks Avenue • Nashville, TN 37243
Tel: 615-532-0554 • Fax: 615-532-0614
Air.Pollution.Control@tn.gov

TN Department of Environment & Conservation

> *Nine out of eleven air monitoring stations did not meet established regulatory requirements for distance and spacing (40 CFR part 58 Appendix E).*
>
> *DAPC must address these siting issues as quickly as possible. Because SESD only inspected a subset of the monitoring stations in the air monitoring network, DAPC must evaluate the remaining sites to ensure compliance with EPA siting requirements. Corrective action measures for nonconforming sites must be completed prior to the start of the 2017 ozone season. The trees may be removed or trimmed, the probe line location(s) may be adjusted, or the sites may be relocated away from these obstacles. For some locations, however, DAPC may need to submit to EPA Region 4 APTMD a request for a waiver, in accordance with the provisions stated in 40 CFR Part 58 Appendix E §10.*
>
> *With regards to the data collected in the DAPC network, SESD recommends data associated with the violating sites (samplers/analyzers) be flagged in the AQS database. Because the length of time the sites have been out of compliance with the regulations cannot be precisely defined, data must be flagged from January 1, 2016, and continue to be flagged until evidence is provided to EPA demonstrating these siting issues have been corrected. Measurement results impacted by these siting issues must be flagged with the AQS "SX" quality assurance qualifier code (i.e., Does Not Meet Siting Criteria).*

TDEC is committed to acting upon the EPA SESD recommendations. Thank you for working with us to monitor air pollution and promote healthy air quality in Tennessee. If you have any questions or concerns, please contact Jason Stephens at (615) 532-0584.

Sincerely,

Quincy N. Styke III

for Michelle Walker Owenby, Director
Department of Environment and Conservation
Division of Air Pollution

Copy via Email to: Todd Rinck – rinck.todd@epa.gov, Sara Waterson – waterson.sara@epa.gov
Attachment: Fairview Site Information 47- 187- 0106

Division of Air Pollution Control
William R. Snodgrass Tennessee Tower • 15th Floor
312 Rosa L. Parks Avenue • Nashville, TN 37243
Tel: 615-532-0554 • Fax: 615-532-0614
Air.Pollution.Control@tn.gov

**Site Information**

**Fairview O3**

**47-187-0106**

The following proposed siting information supplements the supporting documentation section immediately following this table. Where applicable, the section from 40CFR58 is included.

| | | |
|---|---|---|
| §58.10 (a)(1) | A statement of purposes for each monitor | The current monitoring site is located southwest of Nashville and northwest of Franklin, TN. This site is upwind from the core Nashville MSA area. Ozone monitoring began 10/30/2001and this site is used by the AQI forecasting program for verification and to help address upwind ozone concentrations entering the Nashville MSA area. Current site does not met siting criteria due to tree dripline and obstacle issues. Proposed site will meet siting criteria |
| | Site photos facing from the site in each direction (N, S, E, W) | See photographs for general site information in the next sections. Photographs for the Fairview O3 proposed relocated site are included. |
| | Applicable measurements to any obstructions or trees | See measurement graphic provided in the next sections. The nearest obstruction (Small building east of proposed site) is over 37 meters away and the obstruction height is 3 meters est. height. The nearest roadway is 10 meters away (Service road for school). |
| | Estimated ozone probe height for the site and PM2.5 inlet height. | The ozone probe height is > 3 meters. |
| §58.10 (b) | (1) The AQS site identification number. | The AQS ID for the site is: 47-187-0106. Proposed relocation site is 221.8 meters SW of existing site. |
| | (2) The location, including street address and geographical coordinates. | Fairview Middle School, 7200 Cumberland Drive, Fairview, TN. Current Site: Lat. 35.951534, Long. -87.137005, Elev. 925 to 970 ft. Proposed relocated site: Lat. 35.949728, Long. -87138132 |
| | (3) The sampling and analysis method(s) for each measured parameter. | Ozone - API 400 E, Photometric ozone analyzer, Automated Equivalent Method: EQOA-0992-087. |
| | (4) The operating schedules for each monitor. | The ozone monitor operates continuously collecting 1 minute and hourly ozone data during the March 1 to October 31 ozone season. |
| | (5) Any proposals to remove or move a monitoring station within a period of 18 months following plan submittal. | This is an existing site and will operate for at least 3 years. Current License Agreement currently being renewed and will cover the period 7-1-2017 to 12-31-2021. |
| | (6) The monitoring objective and spatial scale of representativeness for each monitor as defined in appendix D to this part. | Monitoring objective: NAAQS Compliance<br>Spatial Scale: Urban scale—Defines citywide conditions with dimensions on the order of 4 to 50 kilometers. Site type: population exposure. |

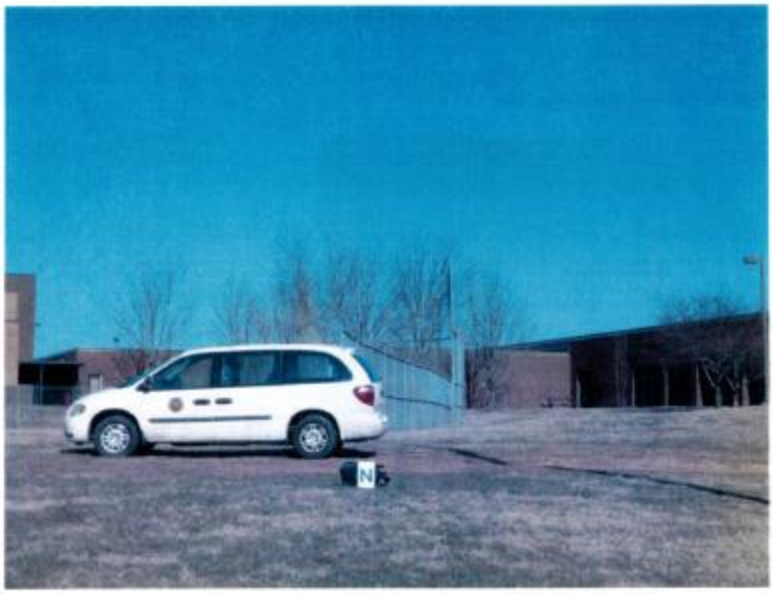
| | | |
|---|---|---|
| | (7) The identification of any sites that are suitable and sites that are not suitable for comparison against the "Ozone and PM2.5 NAAQS". | The site is suitable for comparison to the ozone NAAQS. This site is a SLAMs site. |
| | (8) The MSA, CBSA, CSA or other area represented by the monitor. | The site is located in the Nashville, TN CBSA # 34980. |

**§58.10 (a)(1)** Site photos facing from the site in each direction (N, S, E, W) Photos taken with TDEC-APC Nikon Cool-pix by Evelyn Haskin on 1/24/17.

Proposed site location at 7200 Cumberland Drive, Fairview, TN.

**View of the proposed site from the north (1/24/17)**

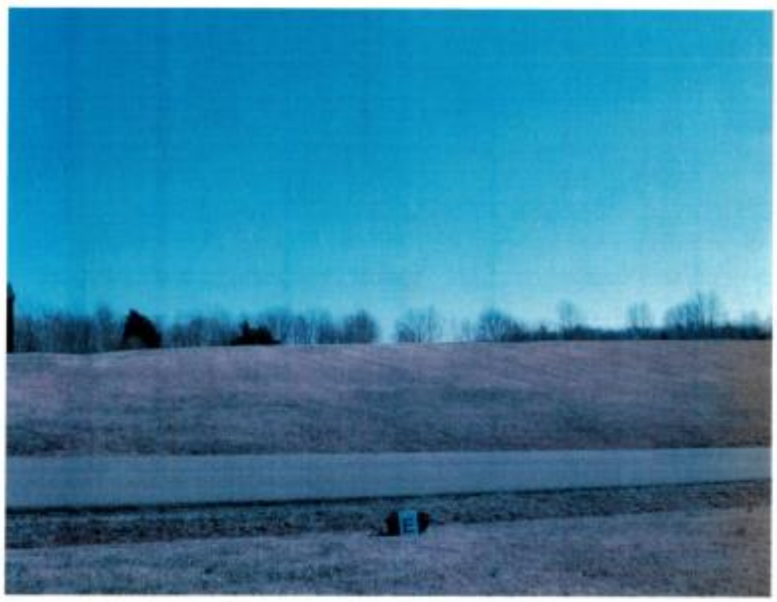
**View of the proposed site from the east (1/24/17)**



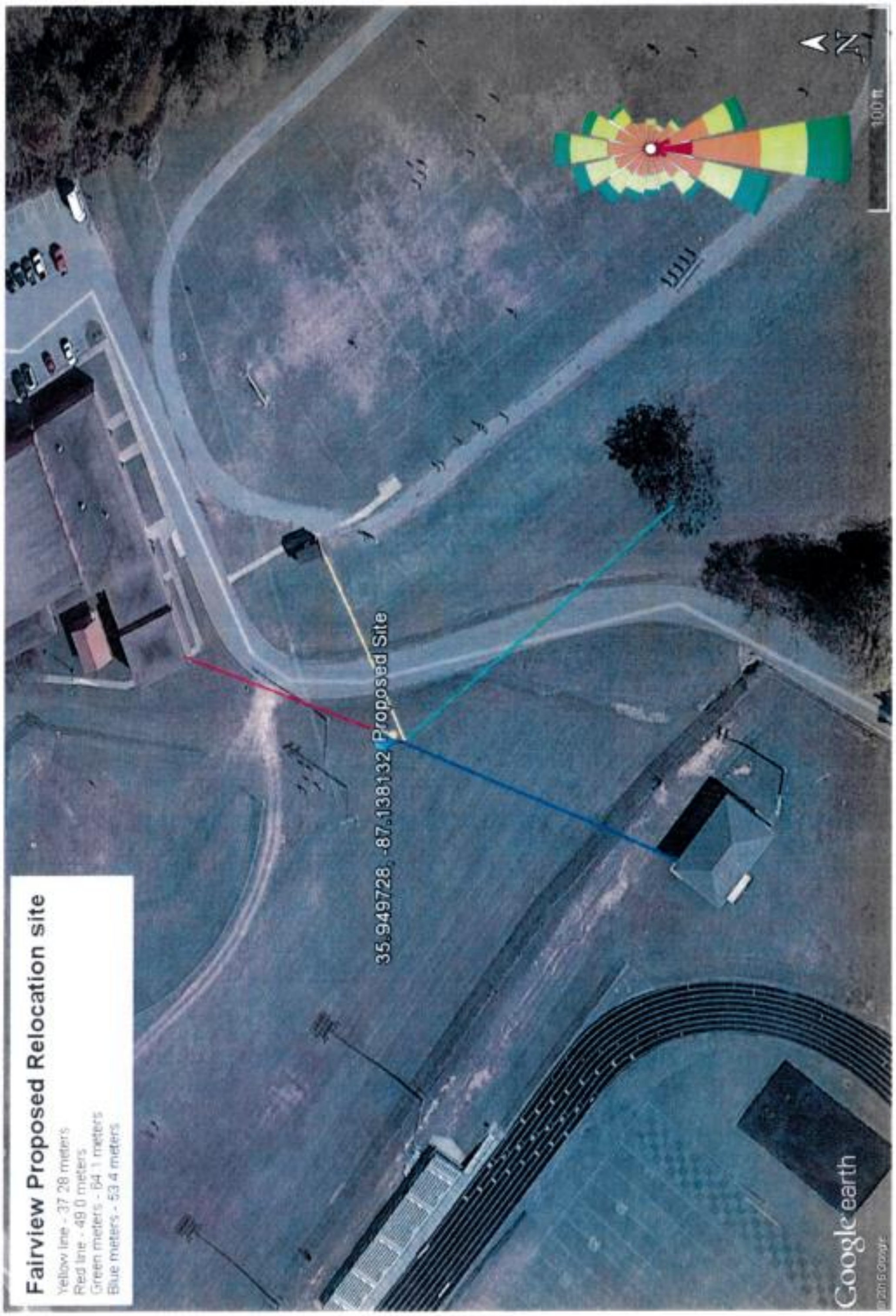

**Looking north from site (1/24/17)**


**Looking south from site (1/24/17)**

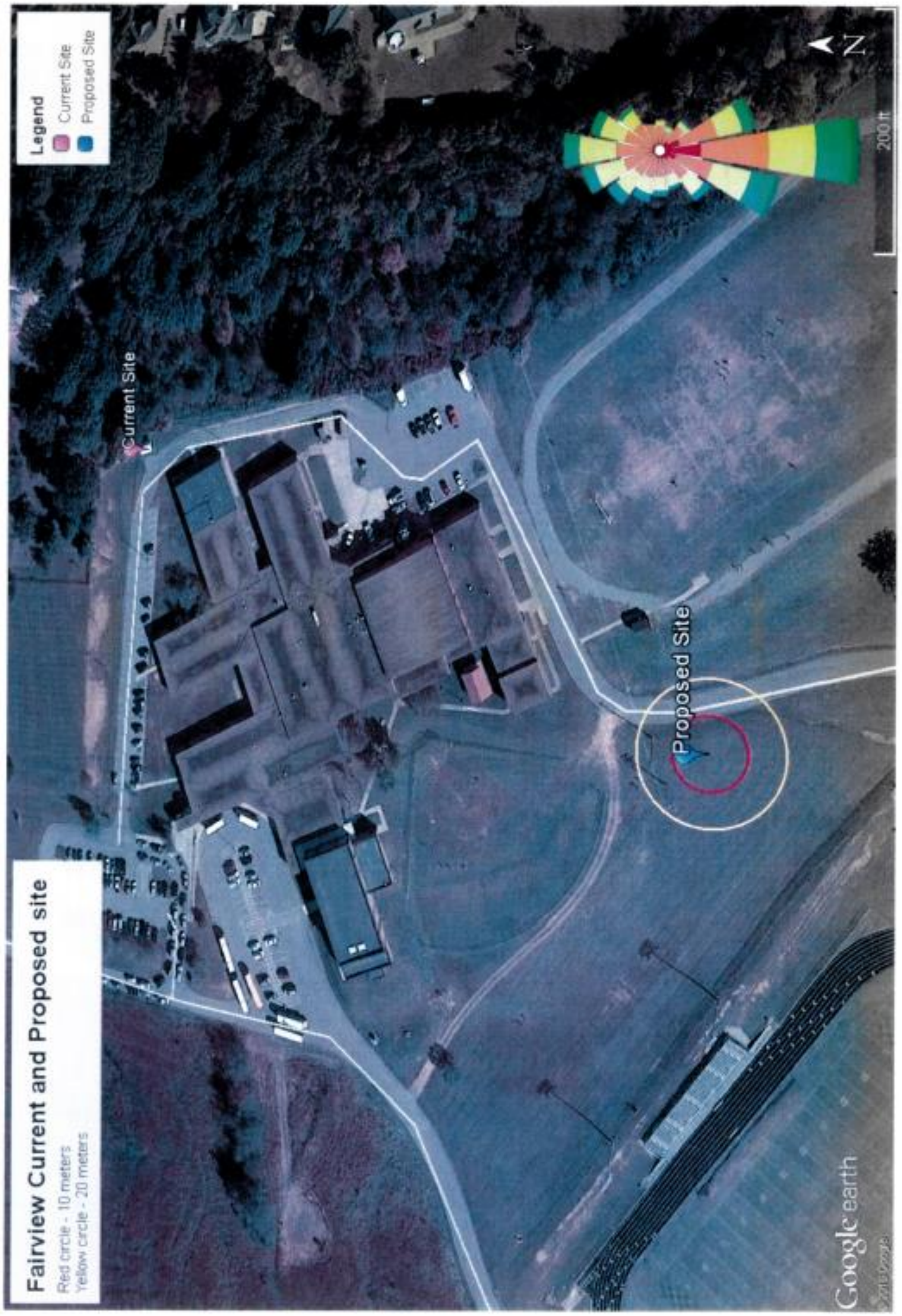

**Looking west from site (1/24/17)**




**Looking east from site (1/24/17)**



Fairview Proposed Relocation site
Yellow line - 37 28 meters
Red line - 49 0 meters
Green meters - 64 1 meters
Blue meters - 53 4 meters
35.949728, -87.138132 Proposed Site
100 ft
N
Google earth


Fairview Current and Proposed site
Red circle - 10 meters
Yellow circle - 20 meters
Legend
Current Site
Proposed Site
Current Site
Proposed Site
200 ft
N
Google earth

## Appendix I: Annual Site Evaluations

[Attached]

# Tennessee Environment and Conservation
# Division of Air Pollution Control

**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**

## Air Monitoring Site Evaluations
## TDEC APC

**Date: 3/30/17** **Location: Athens, TN**
**AQS Number: 47-107-1002**
**Site Name: Athens** **Pollutants: PM $_{2.5}$**
**Project Leader:**

**Print Name / Signature / Initials / Duties**

**1:** (Team Lead) __Evelyn Haskin ____________________________EMH_____Site Specialist______________

**2:**________________________________________________________________________________

**3:**________________________________________________________________________________

# Air Monitoring Site Evaluation Summary

**Local Site Name:** ___Athens________________________ **Initials:** _EMH________ **Date:** __3/30/17____________

**Additional Comments:**

_Windy, partly cloudy 78 $^{o}$ F

_Electric: Athens Power Meter # 11223

_Troubleshoot the internet connections for the BAM 1022, Tech Services now able to connect to internet and poll data

_Mound of soil for college baseball field covered with plastic is located near air monitoring site

_Data logger for TEOM is ESC 8832 Serial Number A0815

_Distance between monitors: BAM to TEOM is 2.0 meters, TEOM to 2025 is 2.4 meters, and 2025 to BAM is 1.6 meters

_Distance to closest road is Knoxville Ave (85.6 meters) and N. Jackson Street (105.5 meters) (Measured by using Google Earth Pro)

**MONITORING SITE EVALUATION FORM (MSEF)**

**Local Site Name:** _Athens____________________________ **Initials:** __EMH______ **Date:** __3/30/17_________

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present **[Y] Completed**

**Arrival Time:** _1:45 pm__ **Departure Time:** _3:45 pm___ **Primary Operator:** _Amelia Poe_________________

**Observer(s):** ______________________________________________________________________

**SITE**

[Y]-**Security Fence** [Y]-**Razor/Barb Wire** [NA] **Grass/Shrubs Cut** [NA] **Bare Soil Area**

[N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** _______________________ [NA] **Police Report Filed**

**Issues:** ______________________________________________________________________

**SHELTER - Interior**

**Arrival Temperature:** __NA______**°C** (from data logger) **Operator Site Visits:** __1________ per [**week** ]

[**NA**] **Leaking Roof** **[Damaged: □Ceiling / □Floor / □Walls]** [NA] **Clean / Neat** [NA] **Fire Extinguisher**

[NA] **Insect / Wildlife Issues** [NA] **Thermometer** (min/max) [**NA**] **Gasoline** (inside shelter)

**Issues:** ______________________________________________________________________

**MONITOR(s):** **Location:** Exterior Samplers **[□Roof / x Ground / □ Not Present]**

| **Monitor(s)** | **Manufacturer** | **Model** | **Serial Number** |
|---|---|---|---|
| PM $_{2.5}$ BAM | Met One | BAM 1022 | T21579 |
| PM $_{2.5}$ 2025 | R&P | 2025 | 22514 |
| PM $_{2.5}$ TEOM | R&P | 1400a | 24454 |
| | | | |
| | | | |
| | | | |

**CALIBRATOR(s):** **x Not Present** [NA] **Are QA/QC Check Gases Vented Outside Shelter?**

| **QA/QC** | **Make** | **Model** | **Serial Number** | **Certification Date** | **Expiration Date** |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line?** **[N]** If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** _Athens_________________ **Initials:** _EMH______ **Date:** __3/30/17______

**All Gas Standards Pass thru all Filters during:** [NA] **Calibrations** [NA] **Precision Checks** [NA] **Audits**

**Issues:** ______NA_________________________________________________________________________________________

**CYLINDER GAS STANDARDS:** **x Not Present**

**VENDOR:** **(PSI Reading < 200, tank is empty and should not be in service)**

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

Issues: ____________________________________________________________________________________________________

**SUPPORTING INSTRUMENTATION:** **Internal**

[NA] **Temperature Sensor** [NA] **Uninterruptable Power Supply** [NA] **On-Site Computer**

**Zero Air System:** **Commercial System** (Make / Model): _______________________________________________

**Cartridge System: [□Silica Gel [□Pink / □Blue] / □Charcoal / □Purafil / □Hopcalite / Other: ____________]**

[NA] **Needs Service** **Last Service Date:** _______________ **Condition:** ____________________________

Issues: ______NA_____________________________________________________________________________________

**Probe Line(s): [□Replaced / □Cleaned] – Frequency:** ___________ **Last Service Date:** __________________

[NA] **Clean** [NA] **Heated** [NA] **Insulated** [NA] **Moisture** [NA] **Retractable** [NA] **Old / Unused Lines** [NA] **Lo Flo Manifold ->** [NA] **Any Open Ports?** **–> How many analyzers using manifold?** ________________

Issues: ______NA_____________________________________________________________________________________

**MSEF (Page 3/5): Local Site Name:** _Athens_________________ **Initials:** __EMH_____ **Date:** __3/30/17_______

**SHELTER – Exterior** **x Not Present**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other: __________________________________]**

[NA] **Needs Maintenance** (specify) [NA] **Tied Down** [NA] **Electrically Grounded** [NA] **Roof Railing**

**Roof Access: [Stairs [Interior/Exterior] / Ladder [attached/removable] / □ Not Present]** [NA] **Loose Decking** (Trip Hazard)

**Issues:** _____NA_____________________________________________________________

**Height of Roof:** ________________**meters** **Roofing Material**: ___________________________________________

**Issues:** ____NA_____________________________________________________________

**OUTDOOR SAMPLERS** **□ Not Present**

[**Y**] **Locked** [**Y**] **Electrically Grounded** [**Y**] **Stabilized** [**Y**] **Clean Inside** [**Y**] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** _________________ **$PM_{10}$ Head Clean Schedule:** _________________

**Issue(s):** __WINS cleaned once every 5 runs; VSCC cleaned monthly_______________________________

**COLLOCATED SAMPLERS:** **x Not Present** (39.4 inches = 1 meter)

| Pollutant | Flow (Hi / Lo) | Separation Distance (meters) |
|---|---|---|
| | | |
| | | |

Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s): External** **x Not Present**

**Inlet Type:** [□Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [□Rain Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / □Stainless Steel / Other: _________]

**Probe Line(s)**: [□Teflon® / Other: _____________] **Probe Fitting(s)**: [□Teflon® / Other: ___________ / □ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

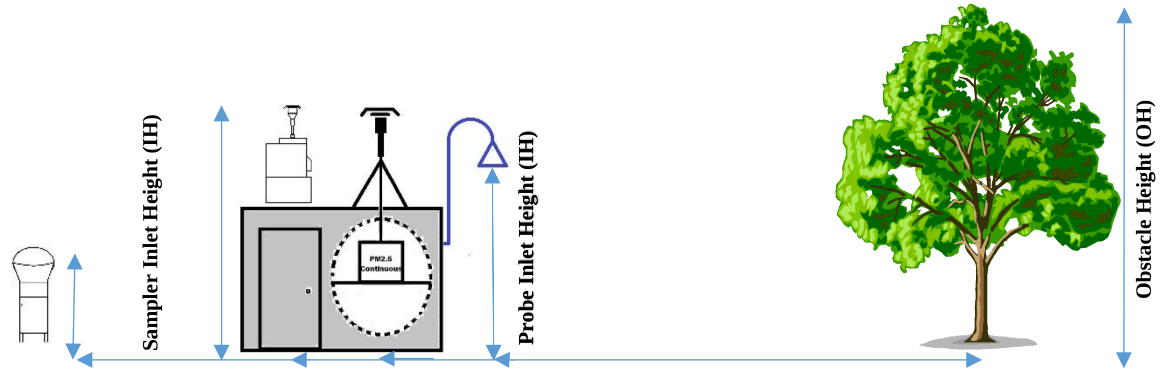
**Issue(s):** ______________________________________________________________________

| Pollutant(s) | Inlet Height (meters) | Inlet Location (Side of Shelter, Ground, Roof) | Horizontal Distance (meters) If Applicable | Vertical Distance (meters) If Applicable | Monitoring SCALE | |
|---|---|---|---|---|---|---|
| | | | | | AQS | Annual Network Plan |
| $PM_{2.5}$ TEOM | 2.5 | Ground | See Notes | | Neighborhood | Neighborhood |
| $PM_{2.5}$ BAM | 2.3 | Ground | | | Neighborhood | Neighborhood |
| $PM_{2.5}$ 2025 | 2.5 | Ground | | | Neighborhood | Neighborhood |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MSEF (Page 4/5): Local Site Name:** __Athens________________ **Initials:** _EMH______ **Date:** __3/30/17___

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** ____________inches = _________**meters** (nearest inlet to dripline) **X No Trees Present**

(39.4 inches = 1 meter) ____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ____No obstacle issues______________________________________________

**Minor Sources:**

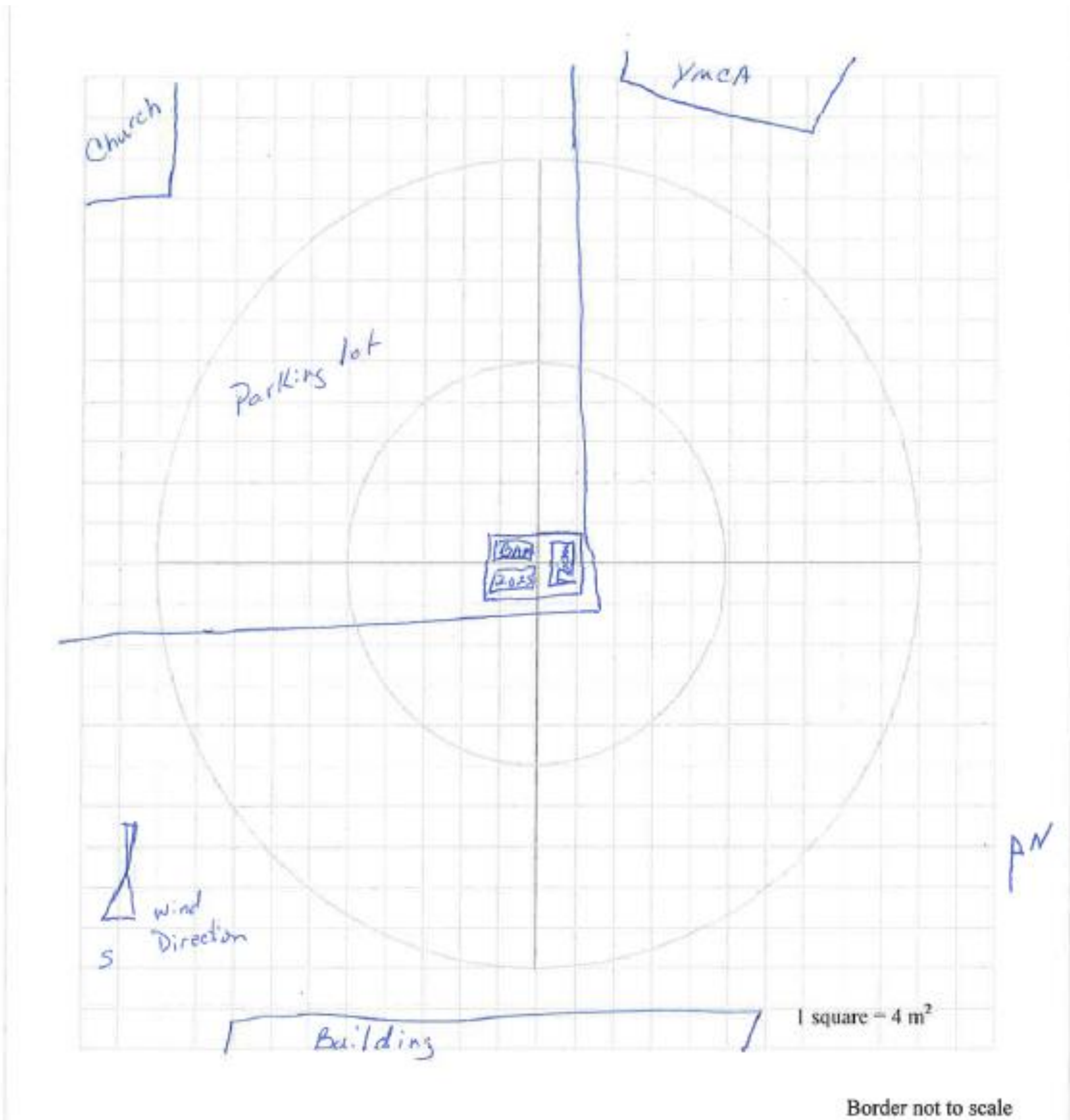
- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimneys, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

**Issues:** ___None______________________________________________________

**MSEF (Page 5/5): Local Site Name:** __Athens________________ **Initials:** _EMH______ **Date:** _3/30/17____

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: >270_____° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

# Additional Information:

| Object | Object height (OH) | Probe Height (IH) | [2*(OH – IH] | Object Distance |
|---|---|---|---|---|
| YMCA (N) | 8.6 m | 2.3 m | 12.6 m | 51.2 m |
| Church (W) | 8.0 m | 2.3 m | 11.4 m | 36.4 m |
| Green Building (S) | 6.8 m | 2.5 m | 8.6 m | 34.8 m |

## Aerial Photo with Wind Rose

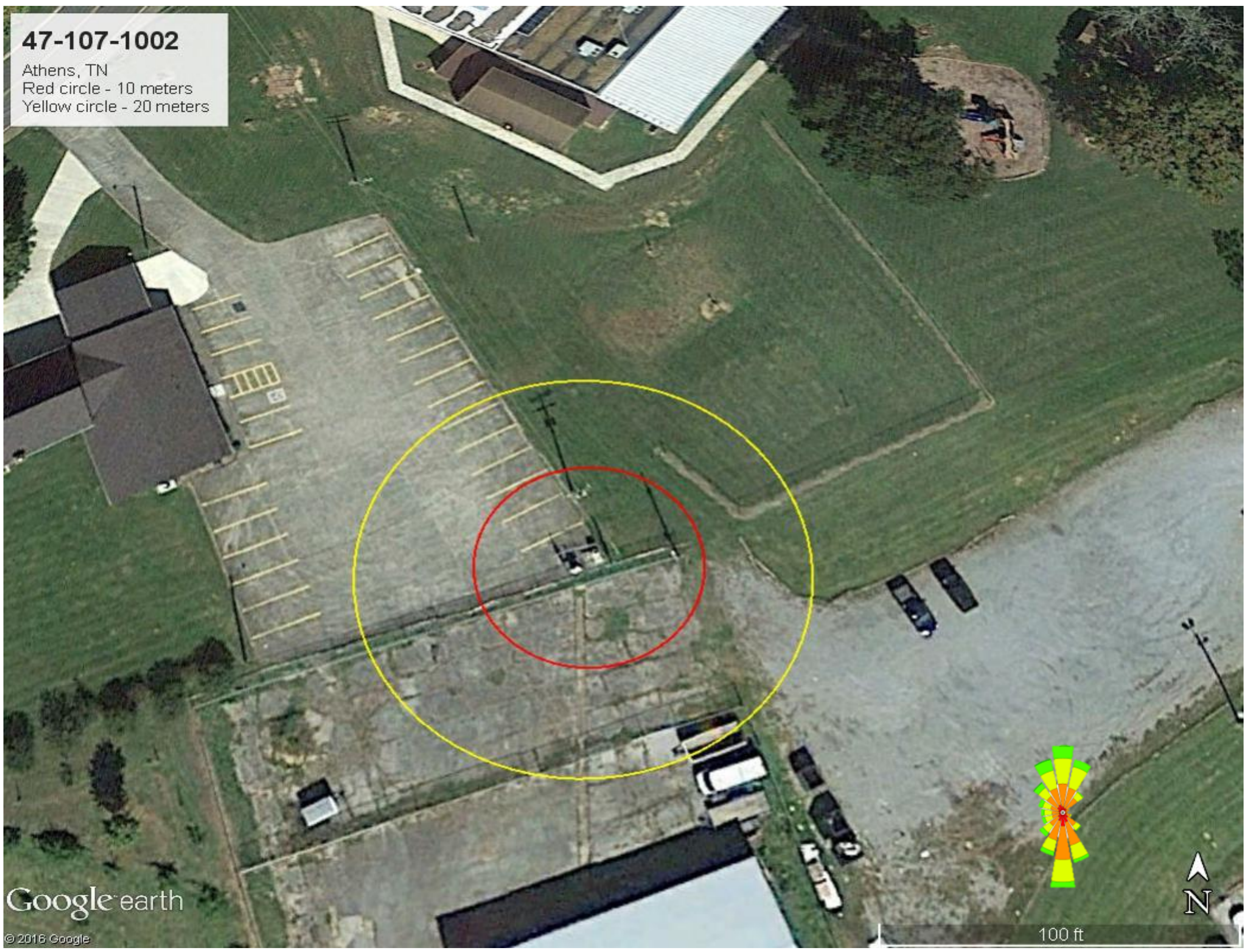


**PHOTO LOG:** **Local Site Name:** _Athens__________________ **Initials:** _EMH_____ **Date:** __3/30/17___

**Camera [x APC / □ Personal – Owner:** ________________**] Make/Model:** _Nikon Coolpix__________________

**Filename:** __001___________________ **Date:** __3/30/17__ **Time:** _1:50 pm ______ **Photographer:** __EMH_______________

**Description:** __View of site (taken from NW direction)_____________________________________________________________

**Filename:** _002____________________ **Date:** __3/30/17_ **Time:** _1:50 pm_________ **Photographer:** __EMH___________

**Description:** _View of site (taken from west direction)_____________________________________________________________

**Filename:** __003___________________ **Date:** __3/30/17_**Time:** __3:25 pm_________ **Photographer:** ___EMH___________

**Description:** __North view of site_____________________________________________________________________

**Filename:** ___004__________________ **Date:** __3/30/17 **Time:** _3:25 pm__________ **Photographer:** ___EMH__________

**Description:** _View north of site (N directional)______________________________________________________________

**Filename:** ___005__________________ **Date:** __3/30/17_ **Time:** __3:25 pm________ **Photographer:** __EMH____________

**Description:** __South view of site_____________________________________________________________________

**Filename:** ___006__________________ **Date:** _3/30/17_ **Time:** __3:25 pm__________ **Photographer:** _EMH___________

**Description:** __View south of site (S directional)______________________________________________________________

**Filename:** ___007__________________ **Date:** __3/30/17_ **Time:** __3:25 pm_________ **Photographer:** __EMH_____________

**Description:** __West view of site______________________________________________________________________

**Filename:** __008___________________ **Date:** _3/30/17_ **Time:** __3:25 pm_________ **Photographer:** __EMH___________

**Description:** __View west of site (W directional)______________________________________________________________

**Filename:** __009___________________ **Date:** __3/30/17__**Time:** __3:25 pm_______ **Photographer:** _EMH______________

**Description:** __East view of site______________________________________________________________________

**Filename:** __010___________________ **Date:** _3/30/17___ **Time:** __3:25 pm________ **Photographer:** __EMH__________

**Description:** _View east of site (E directional)________________________________________________________________

Athens:  Photo Log (2017)

001

002

003


004

005

006

007


DEPT. OF ENVIRONMENT
AND CONSERVATION
AIR POLLUTION
CONTROL DIVISION
W

008


W

009


010

# 40 CFR Part 58, Appendix E, Tables and Figures

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| $O_3$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| $SO_2$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| PM, Pb | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

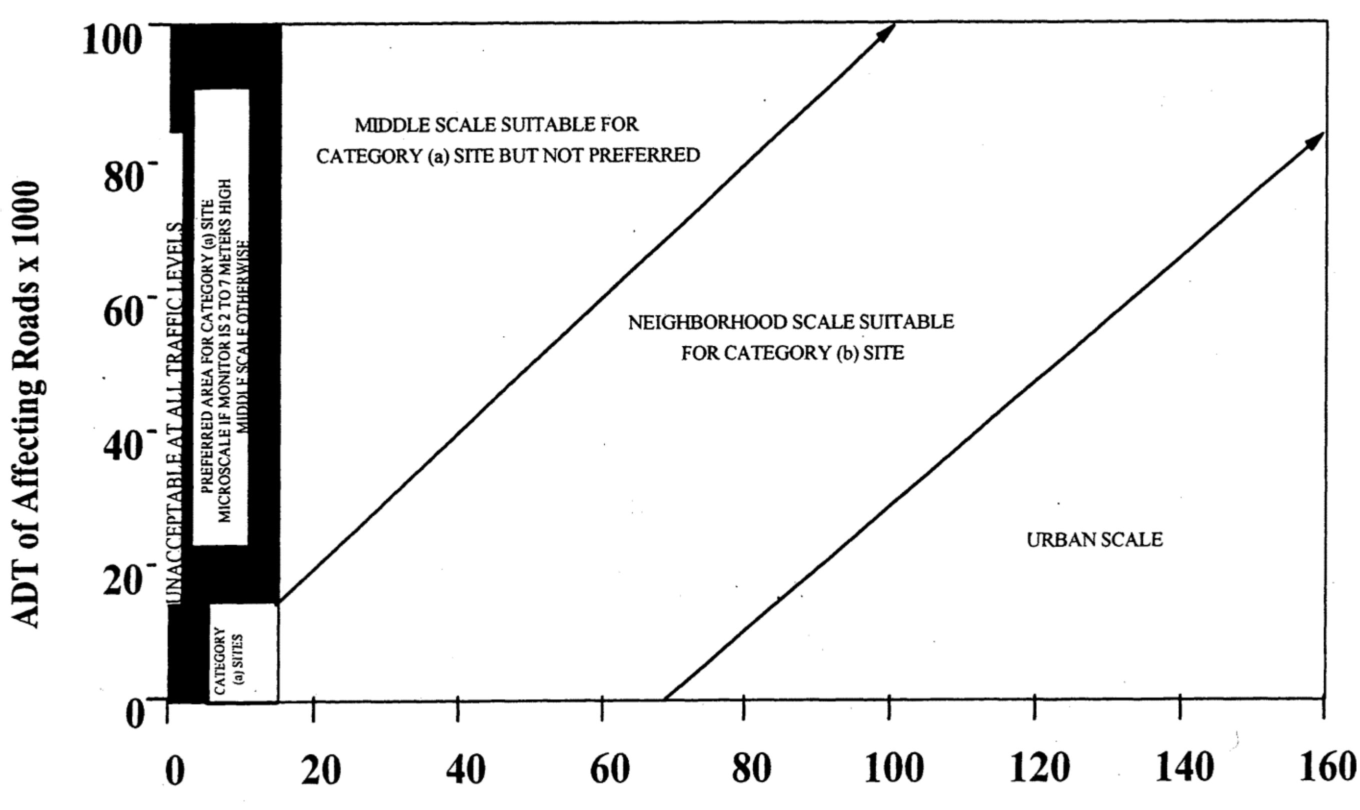



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| 1/4" Line OD / 20 Sec Residence Time | | | |
|---|---|---|---|
| **Flow Rate** | **1/8" ID** | **5/32" ID** | **3/16" ID** |
| **(liters/min)** | **feet** | **feet** | **feet** |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
| 0.6 | 82.9 | 53.0 | 36.8 |
| 0.7 | 96.7 | 61.9 | 43.0 |
| 0.8 | 110.5 | 70.7 | 49.1 |
| 0.9 | 124.3 | 79.6 | 55.3 |
| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
| 1.2 | 165.8 | 106.1 | 73.7 |
| 1.3 | 179.6 | 114.9 | 79.8 |
| 1.4 | 193.4 | 123.8 | 85.9 |
| 1.5 | 207.2 | 132.6 | 92.1 |
| 1.6 | 221.0 | 141.4 | 98.2 |
| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

**ADDITIONAL SUPPORTING INSTRUMENTATION**

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

The site uses an ESC 8832 data logger to collect data from the TEOM only. A 4G cellular modem (Sierra Wireless RV50) provides internet communications to the data logger and to the other instruments at the site via a network switch.

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**
Is the shelter tied down – physically tied with hurricane straps?
Is the shelter grounded - look for rod in the ground and lead wire connection?

Type of Shelter(s) located on site:

1. **Enclosure: Y**
2. **Trailer: N**
3. **None: N**
4. **Other: Y**

What are the shelter(s) made of?

1. ___Steel___________________________________________
2. ______________________________________________________
3. ______________________________________________________
4. __Wood____________________________________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **NA**
With roof top samplers or inlets – is a roof railing present? **NA**
Roof Access: Stairs or Ladder? **NA**
Stairs can be inside or outside – Ladders are usually permanently attached or removable? **NA**
Write additional comments on the shelters below:

__TEOM enclosure is in good condition; TEOM platform is serviceable condition and 2025 platform is in fair condition; nails in both platforms have worked their way loose and need to be nailed down to prevent tripping hazard________________________________________________

# INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

**Initials:** Initials of auditor completing form.

**Date:** current date site is entered by auditor

**Reminder:** If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

**Arrival Time:** time auditors arrive at site

**Departure Time:** time auditors depart site

**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and may be specified in agency QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites eating shelter? Ants eating operator? Wasps/Bees attacking auditor? / Larger wildlife making shelter its home

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:** document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, SO2, NO, NO2, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control


**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**


## Air Monitoring Site Evaluations
## TDEC APC

**Date: 2/21/17 & 4/3/17** **Location: Blountville, TN**
**AQS Number: 47-163-2002**
**Site Name: Blountsville** **Pollutants: $O_3$**
**Project Leader:**

**Print Name / Signature / Initials / Duties**

**1:** (Team Lead) Evelyn Haskin EMH Site Specialist

**2:** Justin E. Long JEL Site Evaluator

**3:** Thomas E. Dalton TED Site Evaulator

# Air Monitoring Site Evaluation Summary

**Local Site Name:** ___Blountville________________________ **Initials:** _TED________ **Date:** _2/21/17 & 4/3/17__

**Additional Comments:**

__Proposed site has been moved just east approximately 2.5 to 3 meters to provide space from driveway for the community center.

_Contract to move the site has been provided with work to start prior to March 1, 2017

No obstructions were identified at the new location.

The exterior of the shelter appeared to be in bad shape due to age of the building. The electrical components for the shelter were rusted and in need of replacing. Insulation was falling out of the bottom.

_Electricity was installed and the site set up for the 2017 O3 season on 3/8/17

**MONITORING SITE EVALUATION FORM (MSEF)**

**Local Site Name:** _Blountville________________________ **Initials:** __TED______ **Date:** _2/21/17 & 4/3/17___

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present

**Arrival Time:** _8:30 am **Departure Time:** _11:00 am__ **Primary Operator:** _Preston Pierce_________________

**Observer(s):** __TED/PKP______________________________________________________________________

**SITE**

[N]-**Security Fence** [N]-**Razor/Barb Wire** [Y] **Grass/Shrubs Cut** [Y] **Bare Soil Area**

[N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** ______________________ [Y/N] **Police Report Filed**

**Issues:** _Bare soil and rock around power pole___________________________________________________________

**SHELTER - Interior**

**Arrival Temperature:** __21.0______**°C** (from data logger) **Operator Site Visits:** __1________ per [**week** ]

[**N**] **Leaking Roof** [**Damaged:** □**Ceiling** / □**Floor** / **x Walls – damaged slightly**] [**Y**] **Clean / Neat** [**N**] **Fire Extinguisher** [**N**] **Insect / Wildlife Issues** [**Y** ] **Thermometer** (min/max) [ **N**] **Gasoline** (inside shelter)

**Issues:** The exterior of the shelter appears to be in bad shape due to age of shelter. Insulation was falling out of the bottom but is correctable.______________________________________________________________

**MONITOR(s):** **Location:** Exterior Samplers [□**Roof** / **x Ground** / □ **Not Present**]

| Monitor(s) | Manufacturer | Model | Serial Number |
|---|---|---|---|
| O3 | Teledyne | T400 | 2284 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**CALIBRATOR(s):** **x Not Present** [Y/**N**] **Are QA/QC Check Gases Vented Outside Shelter?**

| QA/QC | Make | Model | Serial Number | Certification Date | Expiration Date |
|---|---|---|---|---|---|
| QC | Teledyne | 703E | 303 | 2/8/17 | 2/7/18 |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line?** [**N**] If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** _Blountville____________ **Initials:** _TED______ **Date:** __2/21/17 & 4/3/17_

**All Gas Standards Pass thru all Filters during:** [Y ] **Calibrations** [Y ] **Precision Checks** [Y ] **Audits**

**Issues:** ______________________________________________________________________________

**CYLINDER GAS STANDARDS:** **x Not Present**

**VENDOR:** **(PSI Reading < 200, tank is empty and should not be in service)**

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

Issues: ______________________________________________________________________________

**SUPPORTING INSTRUMENTATION: Internal**

[Y ] **Temperature Sensor** [ N] **Uninterruptable Power Supply** [ N] **On-Site Computer**

**Zero Air System: Commercial System** (Make / Model): _Pump model 607CA22- Pressure regulator_M01320NXX_______

**Cartridge System: [□Silica Gel [□Pink / □Blue] / x Charcoal / □Purafil / □Hopcalite / Other:** _Dri-rite_____**]**

[N ] **Needs Service Last Service Date:** _3/8/17________ **Condition:** __OK____________________

Issues: _____Charcoal in line with dri-rite system__________________________________________

**Probe Line(s): [xReplaced / □Cleaned] – Frequency:** _1 per year___ **Last Service Date:** _3/8/17____________

[Y ] **Clean** [Y ] **Heated** **[** N] **Insulated** **[** N] **Moisture** [ N] **Retractable** [ N] **Old / Unused Lines** **[** N] **Lo Flo**

**Manifold ->** [**Y**/N] **Any Open Ports? –> How many analyzers using manifold?** _1_______________

Issues: _____None noted_______________________________________________________________

**MSEF (Page 3/5): Local Site Name:** _Bluntville__________ **Initials:** __TED_____ **Date:** __2/21/17 & 4/3/17__

**SHELTER – Exterior**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other:** __Aluminum___________________________________**]**

[Y] **Needs Maintenance** (specify) [Y] **Tied Down** [Y] **Electrically Grounded** [ N] **Roof Railing**

**Roof Access: [Stairs [Interior/Exterior] / Ladder [attached/removable] / x Not Present]** [N] **Loose Decking** (Trip Hazard)

**Issues:** ____Shelter needs to washed and painted___________________________________________________________________

**Height of Roof:** ___3.7______________**meters** **Roofing Material**: __Sheet metal_____________________________

**Issues:** ___None_____________________________________________________________________________________

**OUTDOOR SAMPLERS** **x Not Present**

[**NA**] **Locked** [**NA** ] **Electrically Grounded** [**NA**] **Stabilized** [Y/N] **Clean Inside** [**NA** ] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** ___________ **$PM_{10}$ Head Clean Schedule:** _________________

**Issue(s):** _____________________________________________________________________________________________

**COLLOCATED SAMPLERS:** **x Not Present** (39.4 inches = 1 meter)

| Pollutant | Flow (Hi / Lo) | Separation Distance (meters) |
|---|---|---|
| | | |
| | | |

Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s): External** **□ Not Present**

**Inlet Type:** [**x** Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [**x** Rain Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / **x** Stainless Steel / Other: _________]

**Probe Line(s)**: [**x** Teflon® / Other: _____________] **Probe Fitting(s)**: [**x** Teflon® / Other: ___________ / □ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths) **unknown**

**Issue(s):** _____________________________________________________________________________________________

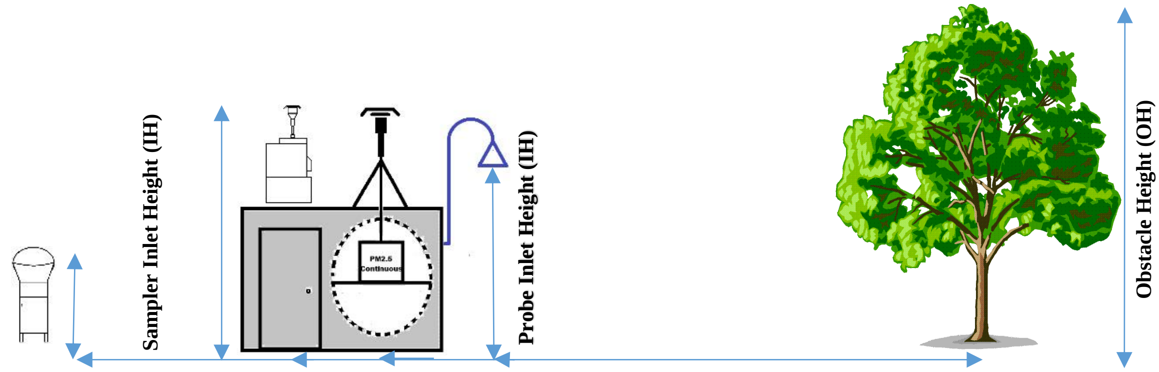
| Pollutant(s) | Inlet Height (meters) | Inlet Location (Side of Shelter, Ground, Roof) | Horizontal Distance (meters) If Applicable | Vertical Distance (meters) If Applicable | Monitoring SCALE | |
|---|---|---|---|---|---|---|
| | | | | | AQS | Annual Network Plan |
| O3 | 5.0 | Side of shelter | | | Neighborhood | Neighborhood |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**

When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MSEF (Page 4/5): Local Site Name:** __Blountville_________ **Initials:** _TED____ **Date:** _2/21/17 & 4/3/17__

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| NA | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** _____________inches = __________**meters** (nearest inlet to dripline) □ **No Trees Present**

(39.4 inches = 1 meter) _____________inches = __________**meters** (nearest inlet to dripline) ☐ Not Present

_____________inches = __________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ___No issues with dripline or obstacles_____________________________________________________

**Minor Sources:**

- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

**Issues:** _None______________________________________________________________________________

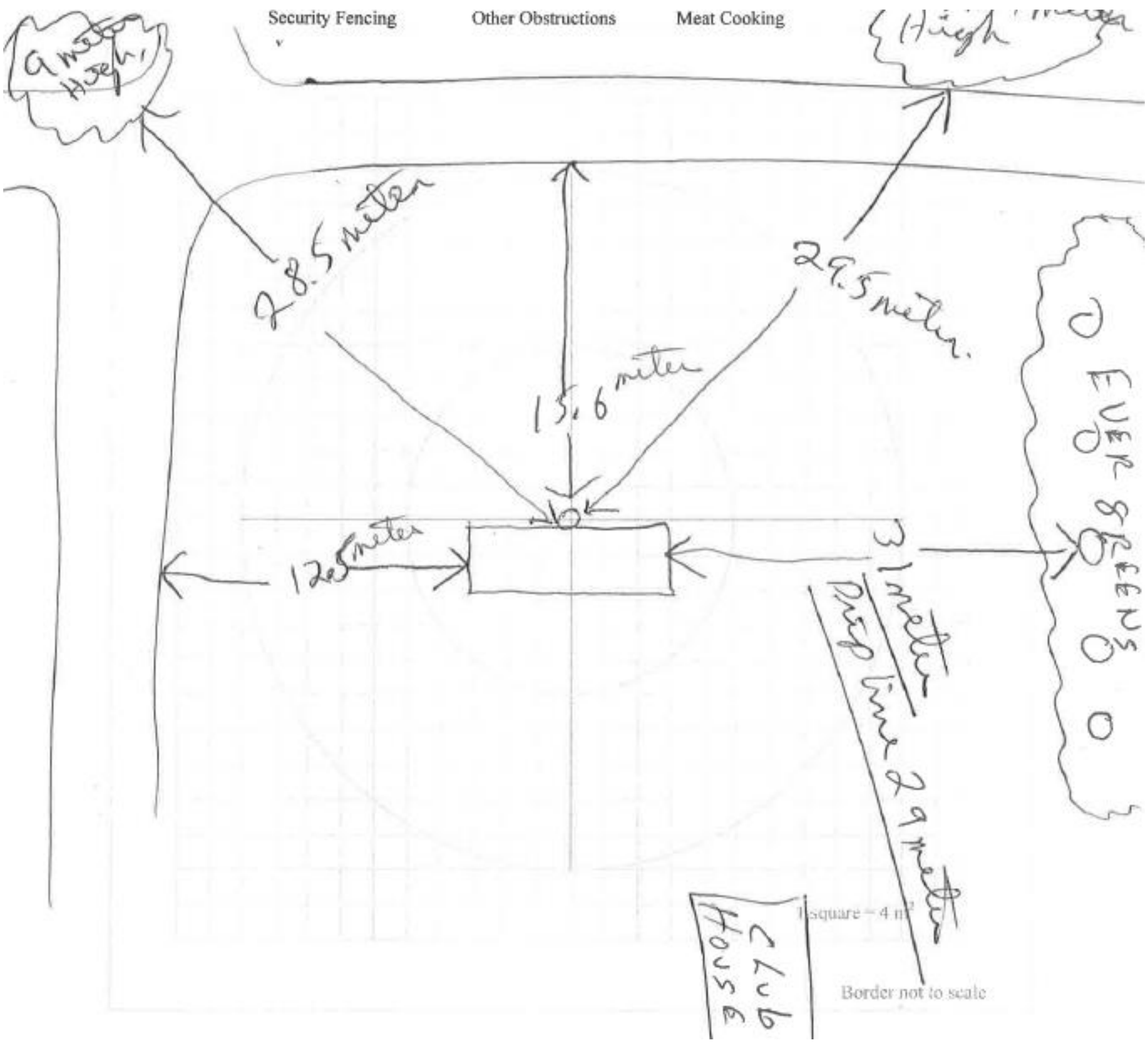
_______________________________________________________________________________________________

_______________________________________________________________________________________________

**MSEF (Page 5/5): Local Site Name:** __Blountville_________ **Initials:** _TED_____ **Date:** _2/21/17 & 4/3/17__

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: _> 270______° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

## Additional Information:

New location of monitor (Lat: 36.454351, Long: -82.42485)

Distance to closest road (Shawnee Dr.) is 16.87 meters

## Aerial Photo with Wind Rose

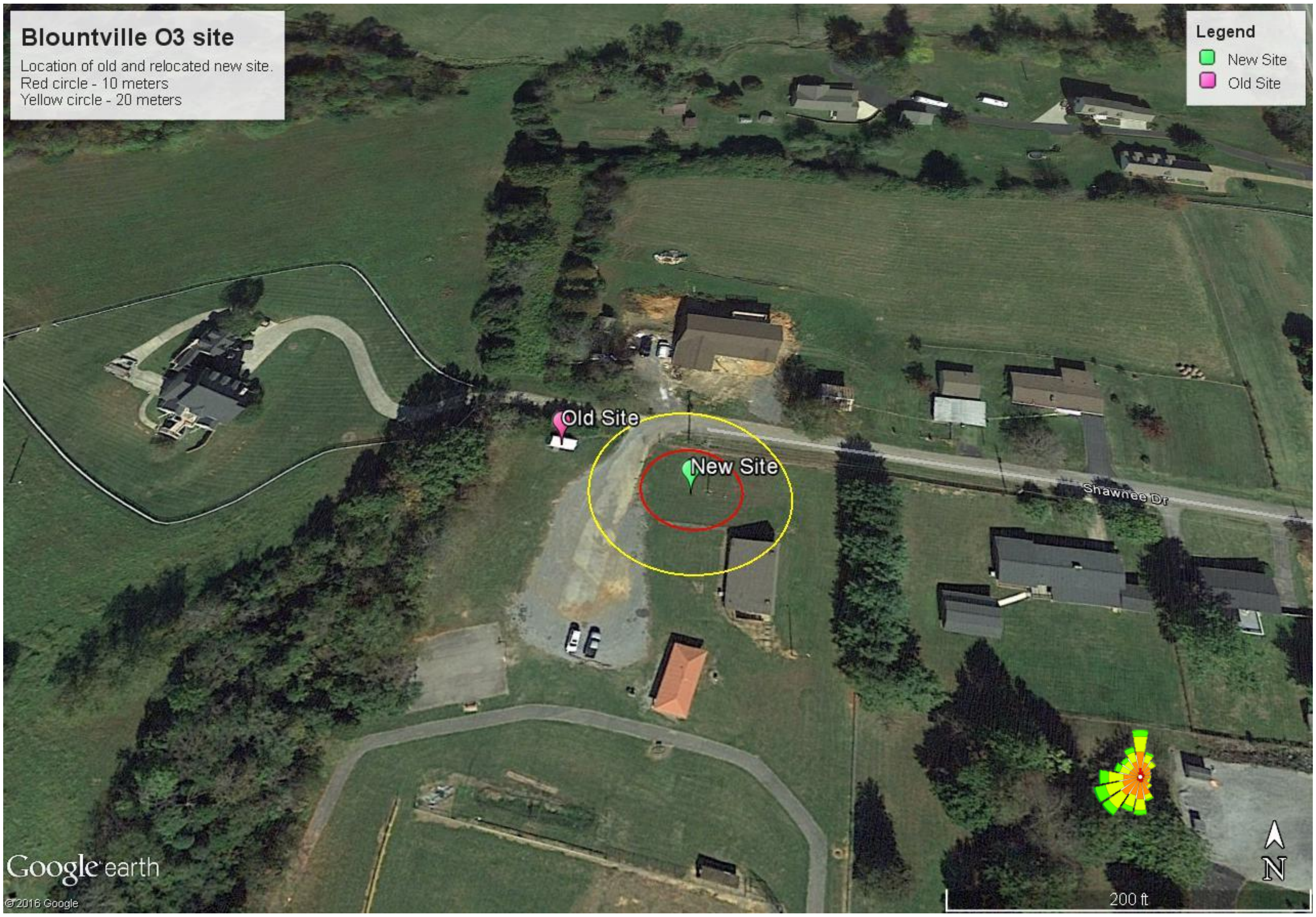


**PHOTO LOG:** **Local Site Name:** _Blountville__________ **Initials:** _TED_____ **Date:** _2/21/17 & 4/3/17_

**Camera [x APC / □ Personal – Owner:** ________________**] Make/Model:** _Nikon Coolpix___________________

**Filename:** ____001________________ **Date:** __4.3/17________ **Time:** _9:00 am_______ **Photographer:** __TED____________

**Description:** _North toward shelter_____________________________________________________________

**Filename:** __002________________ **Date:** __4.3/17________ **Time:** _9:00 am _______ **Photographer:** __TED ___________

**Description:** _North away from shelter (North directional)_____________________________________________________

**Filename:** __002a_______________ **Date:** __4.3/17________ **Time:** _9:00 am _______ **Photographer:** __TED ___________

**Description:** _North away from shelter (North directional) (Second view)________________________________________

**Filename:** __003_________________ **Date:** __4.3/17________ **Time:** __9:00 am_____ **Photographer:** ___TED__________

**Description:** _East toward shelter____________________________________________________________________

**Filename:** _004__________________ **Date:** _4.3/17_________ **Time:** __9:00 am_____ **Photographer:** ___TED __________

**Description:** _East away form shelter (East directional)__________________________________________________________

**Filename:** _004 a_________________ **Date:** _4.3/17_________ **Time:** __9:00 a _____ **Photographer:** ___TED __________

**Description:** _East away form shelter (East directional) (Second view)______________________________________________

**Filename:** __005_________________ **Date:** __4.3/17__________ **Time:** __9:00 am___ **Photographer:** __TED____________

**Description:** _South away from shelter (South directional)_________________________________________________________

**Filename:** ___006_______________ **Date:** __4.3/17__________ **Time:** _9:00 am______ **Photographer:** _TED___________

**Description:** _South toward shelter_____________________________________________________________________

**Filename:** _007__________________ **Date:** _4.3/17___________ **Time:** _9:00 am____ **Photographer:** __TED _____________

**Description:** _West toward shelt________________________________________________________________________

**Filename:** __008_________________ **Date:** _4.3/17___________ **Time:** _9:00 am___ **Photographer:** __TED______________

**Description:** _West away from shelter (W directional)_______________________________________________________

**001-North toward shelter**

**002-North away from shelter (north directional)**

**002a-North away from shelter (north directional) second view**

**003-East toward shelter**

**004-East away from shelter (east directional)**

**004a-East away from shelter (east directional) second view**

**005-South away from shelter (south directional)**

**006-South toward shelter**

## 007-West toward shelter

**008-West away from shelter (west directional)**

# 40 CFR Part 58, Appendix E, Tables and Figures

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| **$O_3$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **$SO_2$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **PM, Pb** | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

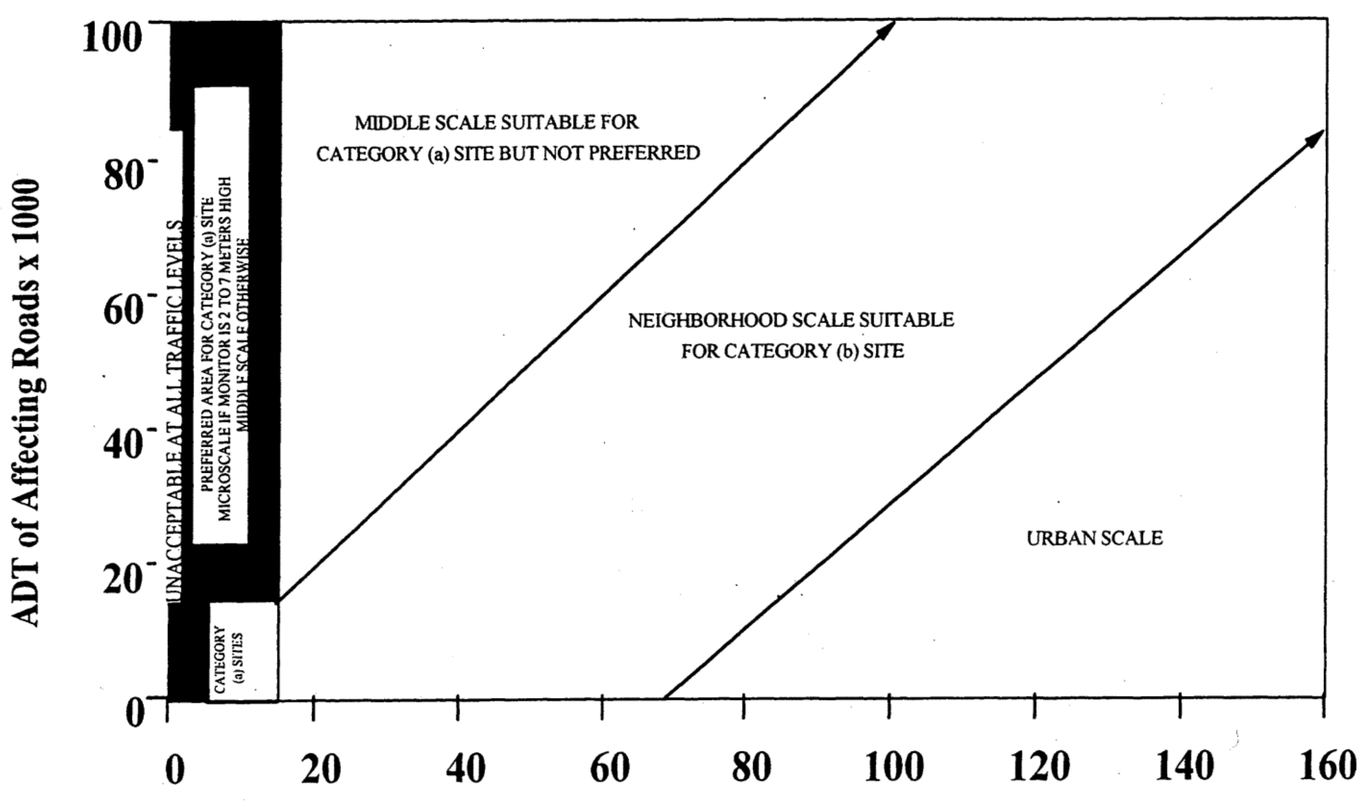



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| 1/4" Line OD / 20 Sec Residence Time | | | |
|---|---|---|---|
| **Flow Rate** | **1/8" ID** | **5/32" ID** | **3/16" ID** |
| **(liters/min)** | **feet** | **feet** | **feet** |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
| 0.6 | 82.9 | 53.0 | 36.8 |
| 0.7 | 96.7 | 61.9 | 43.0 |
| 0.8 | 110.5 | 70.7 | 49.1 |
| 0.9 | 124.3 | 79.6 | 55.3 |
| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
| 1.2 | 165.8 | 106.1 | 73.7 |
| 1.3 | 179.6 | 114.9 | 79.8 |
| 1.4 | 193.4 | 123.8 | 85.9 |
| 1.5 | 207.2 | 132.6 | 92.1 |
| 1.6 | 221.0 | 141.4 | 98.2 |
| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

**ADDITIONAL SUPPORTING INSTRUMENTATION**

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

The site uses an ESC 8832 data logger and an Agilaire 8872 PC/Data logger. The 8832 data logger serves as the primary logger and is directly connected via analog input to the analyzer at the site. The data is polled from the 8832 logger to the central server via a 4G cellular modem (Sierra Wireless RV50). The 8872 serves as a secondary, backup logger, and is used by the site operator to retrieve the electronic strip chart in local standard time. The 8872 polls data from the 8832 locally over the COM port or over the local tcp/ip network if the COM route is not working (via a network switch).

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**

Type of Shelter(s) located on site:

1. **Enclosure: N**
2. **Trailer: Y**
3. **None: N**
4. **Other: N**

What are the shelter(s) made of?

1. ____________________ ___________________________________________
2. _Aluminum_____________________________________________________
3. ________________________________________________________________
4. _________________________________________________________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **Y**
Write additional comments on the shelters below:

None______________________________________________________________________________________________

_____________________________________________________________________________________________________

_____________________________________________________________________________________________________

# INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

**Initials:** Initials of auditor completing form.

**Date:** current date site is entered by auditor

**Reminder:** If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

**Arrival Time:** time auditors arrive at site

**Departure Time:** time auditors depart site

**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and may be specified in agency QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites eating shelter? Ants eating operator? Wasps/Bees attacking auditor? / Larger wildlife making shelter its home

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:** document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, SO2, NO, NO2, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control

**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**

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## Air Monitoring Site Evaluations
## TDEC APC

**Date: 2/4/17** **Location: Lebanon, TN**
**AQS Number: 47-189-0103**
**Site Name: Cedars** **Pollutants: O3**
**Project Leader:**

---

**Print Name / Signature / Initials / Duties**

**1:** (Team Lead) _Evelyn Haskin__ _ __________________________EMH_ Site Specialist________________

**2:**________________________________________________________________________________

**3:**________________________________________________________________________________

# Air Monitoring Site Evaluation Summary

**Local Site Name:** _Cedars **Initials:** _EMH **Date:** __2/4/17

**Additional Comments:**

Sunny 29 $^{o}$ F

No logbook in shelter. Site closed down for winter; ozone season 2017 begins March 1. Calibrator was taken back to field office for beginning of the year calibration. Probe line will be replaced in Feb. prior to the beginning of ozone season.

Data loggers : ESC 8832 SN : 008802 and Agilaire 8872 SN 519

Distance to closest road (Cedar Forest) 54.3 meters

Setup of 2017 O3 season was on 2/17/17

**MONITORING SITE EVALUATION FORM (MSEF)**

**Local Site Name:** _Cedars___________________ **Initials:** _EMH_______ **Date:** ___2/4/17__________

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present **[Y] Completed**

**Arrival Time:** _10:45 am__ **Departure Time:** _12:26 pm__ **Primary Operator:** _Ray Stubblefield ___________

**Observer(s):** ________________________________________________________________

**SITE**

[ N]-**Security Fence** [ N]-**Razor/Barb Wire** [ NA] **Grass/Shrubs Cut** [Y ] **Bare Soil Area**

[ N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** ______________________ [NA] **Police Report Filed**

**Issues:** ________________________________________________________________

**SHELTER - Interior**

**Arrival Temperature:** 2.96_____**°C** (from data logger) **Operator Site Visits:** _1_____ per [**week** ]

[Y ] **Leaking Roof** **[Damaged: x Ceiling / x Floor / x Walls]** [ N] **Clean / Neat** [ N] **Fire Extinguisher**

[Y ] **Insect / Wildlife Issues** [Y ] **Thermometer** (min/max) [N ] **Gasoline** (inside shelter)

**Issues:** _Temperature – see additional notes________________________________________

**MONITOR(s):** **Location:** Exterior Samplers **[x Roof / □ Ground / □ Not Present]**

| Monitor(s) | Manufacturer | Model | Serial Number |
|---|---|---|---|
| Ozone | Teledyne | T400 | 2357 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**CALIBRATOR(s):** **x Not Present** [NA] **Are QA/QC Check Gases Vented Outside Shelter?**

| QA/QC | Make | Model | Serial Number | Certification Date | Expiration Date |
|---|---|---|---|---|---|
| QC | Teledyne | T703 | 326 | | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line? [N]** If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** _Cedars______________________ **Initials:** _EMH____ **Date:** __2/4/17_______

**All Gas Standards Pass thru all Filters during:** [Y] **Calibrations** (Not Required) [Y] **Precision Checks** (Required) [Y] **Audits** (Required)

**Issues:** ____________________________________________________________________________

**CYLINDER GAS STANDARDS:** **x Not Present**

**VENDOR:** **(PSI Reading < 200, tank is empty and should not be in service)**

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

Issues: ____________________________________________________________________________

**SUPPORTING INSTRUMENTATION: Internal**

[Y] **Temperature Sensor** [N] **Uninterruptable Power Supply**

**Zero Air System: Commercial System** (Make / Model): ________________________________________________

**Cartridge System: [□Silica Gel □Pink / □Blue] / x Charcoal / □Purafil / □Hopcalite / Other:** _Dri- rite______**]**

[NA] **Needs Service Last Service Date:** _______________ **Condition:** ______________________________

Issues: ____________________________________________________________________________

**Probe Line(s): [x Replaced / □Cleaned] – Frequency:** 1 x per year **Last Service Date:** _2/17/17___________

[Y] **Clean** [Y] **Heated** [N] **Insulated** [N] **Moisture** [N] **Retractable** [N] **Old / Unused Lines** [N] **Lo Flo**

**Manifold ->** [N] **Any Open Ports? –> How many analyzers using manifold?** ________________

Issues: ____________________________________________________________________________

**MSEF (Page 3/5): Local Site Name:** __Cedars______ _________ **Initials:** _EMH_____ **Date:** _2/4/17________

**SHELTER – Exterior** □ **Not Present**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other:** _Aluminum_________________________________ **]**

[**Y** ] **Needs Maintenance** (specify) [**Y** ] **Tied Down** [**Y** ] **Electrically Grounded** [ **N**] **Roof Railing**

**Roof Access: [**Stairs [Interior/Exterior] / Ladder [attached/removable] / **x Not Present]** [ **N**] **Loose Decking** (Trip Hazard)

**Issues:** ________________________________________________________________________________

**Height of Roof:** __3.1_____________**meters** **Roofing Material**: ___Aluminum ____________________________

**Issues:** ________________________________________________________________________________

**OUTDOOR SAMPLERS** **x Not Present**

[NA] **Locked** [NA] **Electrically Grounded** [NA] **Stabilized** [NA] **Clean Inside** [NA] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** _________________ **$PM_{10}$ Head Clean Schedule:** ________ __________

**Issue(s):** ___________________________________ ___________________________________________

**COLLOCATED SAMPLERS:** **x Not Present** (39.4 inches = 1 meter)

| **Pollutant** | **Flow (Hi / Lo)** | ***Separation Distance (meters)** |
|---|---|---|
| | | |
| | | |

*Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s): External** □ **Not Present**

**Inlet Type:** [**x** Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [**x** Rain Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / **x** Stainless Steel / Other: _________]

**Probe Line(s)**: [**x** Teflon® / Other: _____________] **Probe Fitting(s)**: [**x** Teflon® / Other: ___________ / □ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

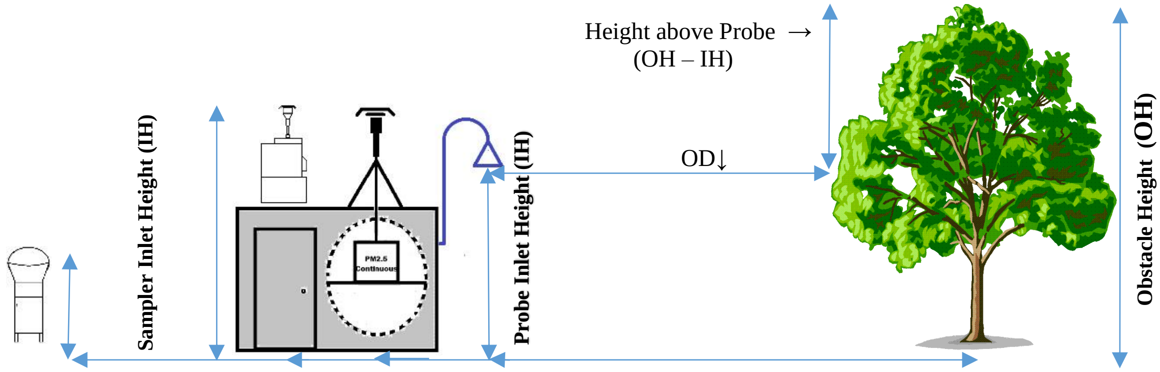
**Issue(s):** ________________________________________________________________________________

| **Pollutant(s)** | **Inlet Height (meters)** | **Inlet Location** (Side of Shelter, Ground, Roof) | ***Horizontal Distance (meters)** If Applicable | ***Vertical Distance (meters)** If Applicable | **Monitoring SCALE** | |
|---|---|---|---|---|---|---|
| | | | | | **AQS** | **Annual Network Plan** |
| O3 | 4.2 | Side of shelter | | | Urban | Urban |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MSEF (Page 4/5): Local Site Name:** _Cedars_________________ **Initials:** _EMH______ **Date:** _2/4/17_________

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**Obstacle Distance(s) (OD)**

**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** _____________inches = __________**meters** (nearest inlet to dripline) ☐ **No Trees Present**

(39.4 inches = 1 meter) _____________inches = __________**meters** (nearest inlet to dripline) ☐ Not Present

_____________inches = __________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ____No issues with driplines or obstacles_______________________________________

**Minor Sources:**

- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimneys, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

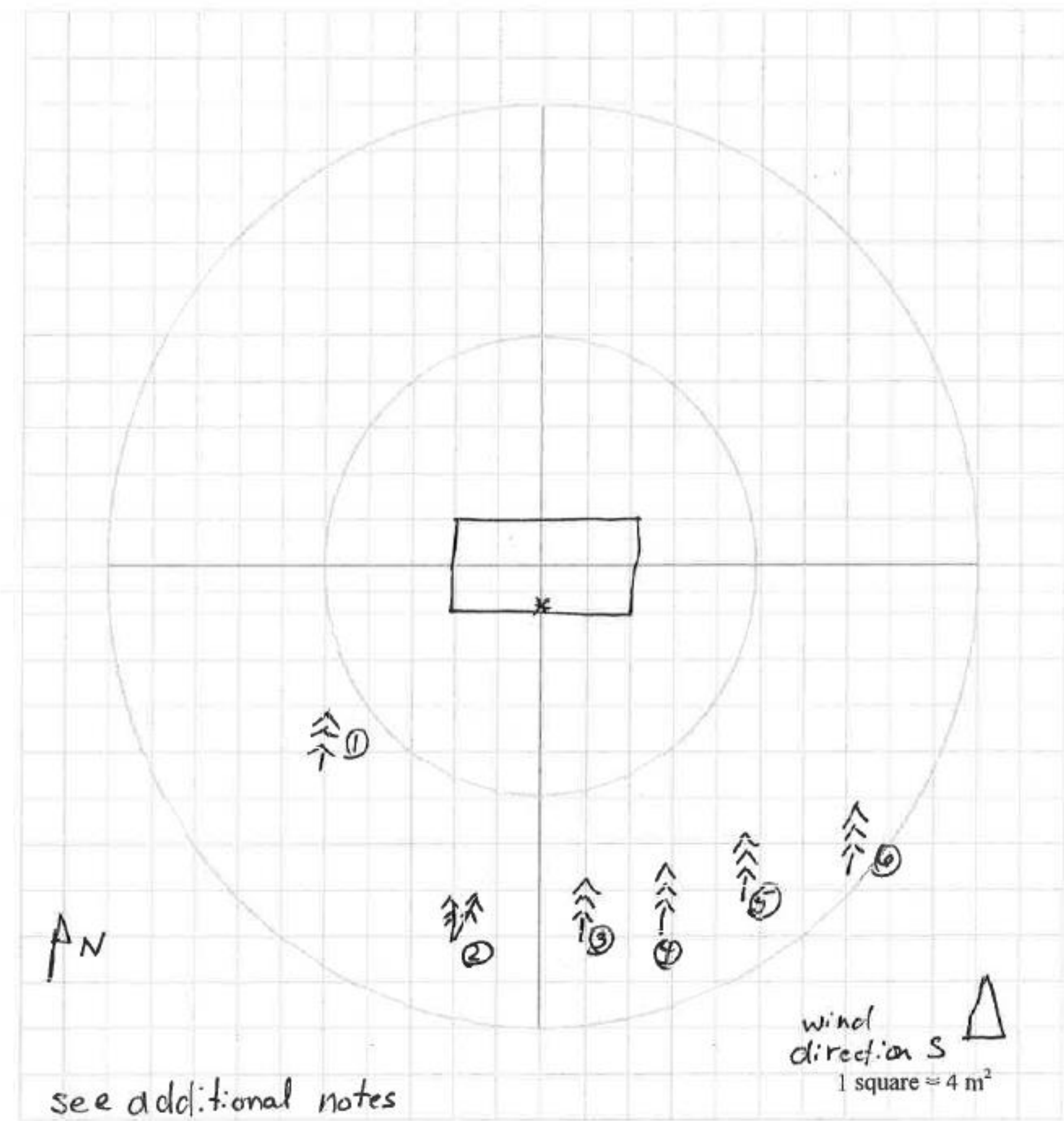
**Issues:** ___None_________________________________________________________________

_____________________________________________________________________________

**MSEF (Page 5/5): Local Site Name:** _Cedars___________ **Initials:** EMH______ **Date:** __2/4/17________

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: _>270______° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

## Additional Information:

| Tree | Height | [2* OH – IH (4.2)] | Distance |
|---|---|---|---|
| 1 | 6.4 | 4.4 | 11.4 |
| 2 | 11.0 | 13.6 | 14.4 |
| 3 | 6.4 | 4.4 | 12.4 |
| 4 | 7.8 | 7.2 | 11.4 |
| 5 | 7.8 | 7.2 | 12.8 |
| 6 | 9.2 | 10.0 | 17.2 |

Tree 4 has dripline of 10.8 meters (Cut down in future if branches get closer)
Soil is shallow to bedrock, trees grow at a slow rate

## Aerial Photo with Wind Rose

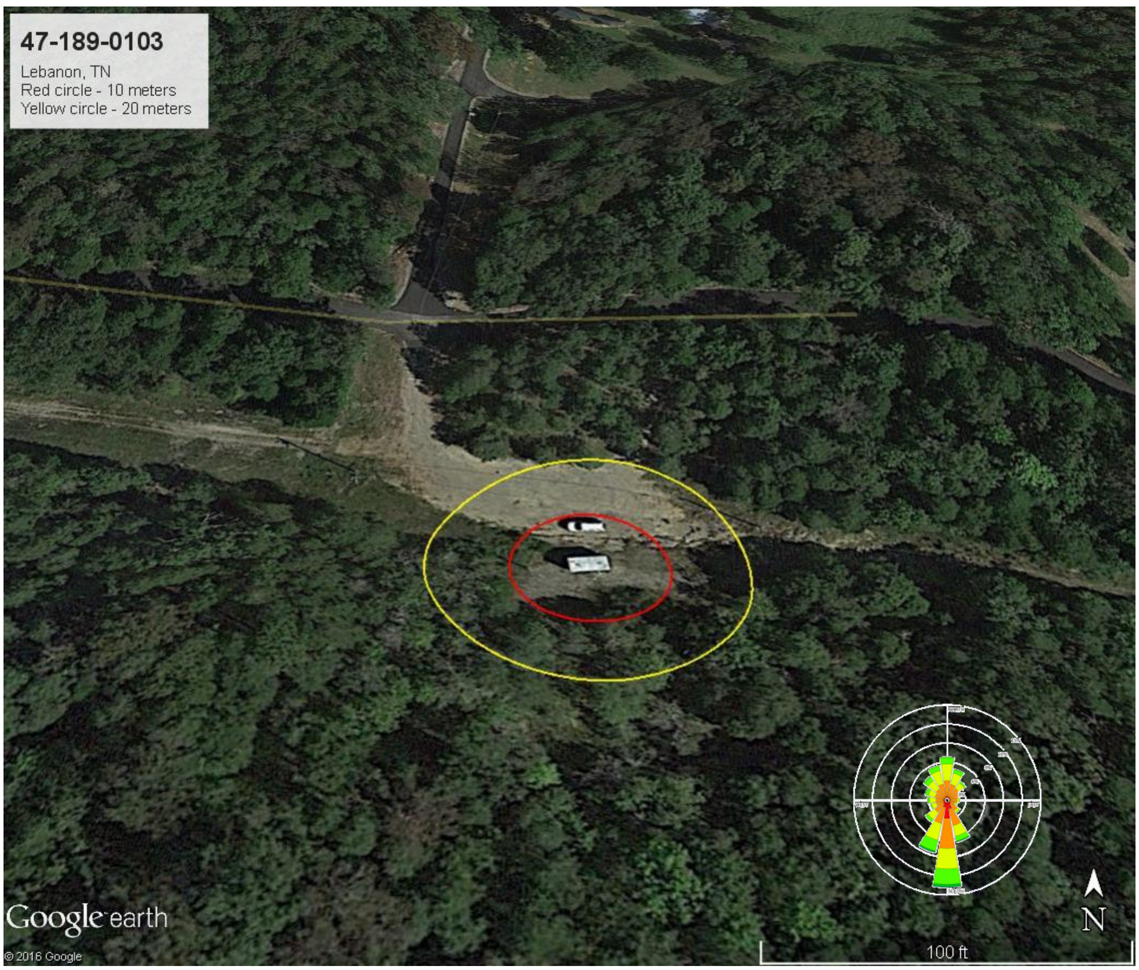


**PHOTO LOG: Local Site Name:** _Cedars__________________ **Initials:** _EMH____ **Date**: 2/4/17________

**Camera [x APC / □ Personal – Owner: ________________] Make/Model:** Nikon Coolpix____________________

**Filename:** __01____________________ **Date:** __2/4/17______ **Time:** __12:00 _pm___ **Photographer:** ___EMH____________

**Description:** _Site view from north direction_____________________________________________

**Filename:** __02____________________ **Date:** __2/4/17______ **Time:** __12:00 _pm___ **Photographer:** ___EMH____________

**Description:** __North side of site_____________________________________________

**Filename:** __03____________________ **Date:** __2/4/17______ **Time:** __12:00 _pm ___ **Photographer:** ___EMH____________

**Description:** _View North of site (N directional)_____________________________________________

**Filename:** __04____________________ **Date:** __2/4/17______ **Time:** __12:00 _pm ___ **Photographer:** ___EMH____________

**Description:** _South side of site_____________________________________________

**Filename:** __05____________________ **Date:** __2/4/17______ **Time:** __12:00 _pm _____ **Photographer:** ___EMH____________

**Description:** __View South of site (S directional)_____________________________________________

**Filename:** __06____________________ **Date:** __2/4/17______ **Time:** 12:00 _pm ______ **Photographer:** ___EMH____________

**Description:** __West side of site_____________________________________________

**Filename:** __07____________________ **Date:** __2/4/17______ **Time:** 12:00 _pm _____ **Photographer:** ___EMH____________

**Description:** __View West of site (W directional)_____________________________________________

**Filename:** __08____________________ **Date:** __2/4/17______ **Time:** 12:00 _pm ______ **Photographer:** ___EMH____________

**Description:** ___East side of site_____________________________________________

**Filename:** __09____________________ **Date:** __2/4/17______ **Time:** 12:00 _pm ______ **Photographer:** ___EMH____________

**Description:** __View East of site (E directional)_____________________________________________

Cedars:  Photo Log (2017)

001

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009

# 40 CFR Part 58, Appendix E, Tables and Figures

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| $O_3$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| $SO_2$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| PM, Pb | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

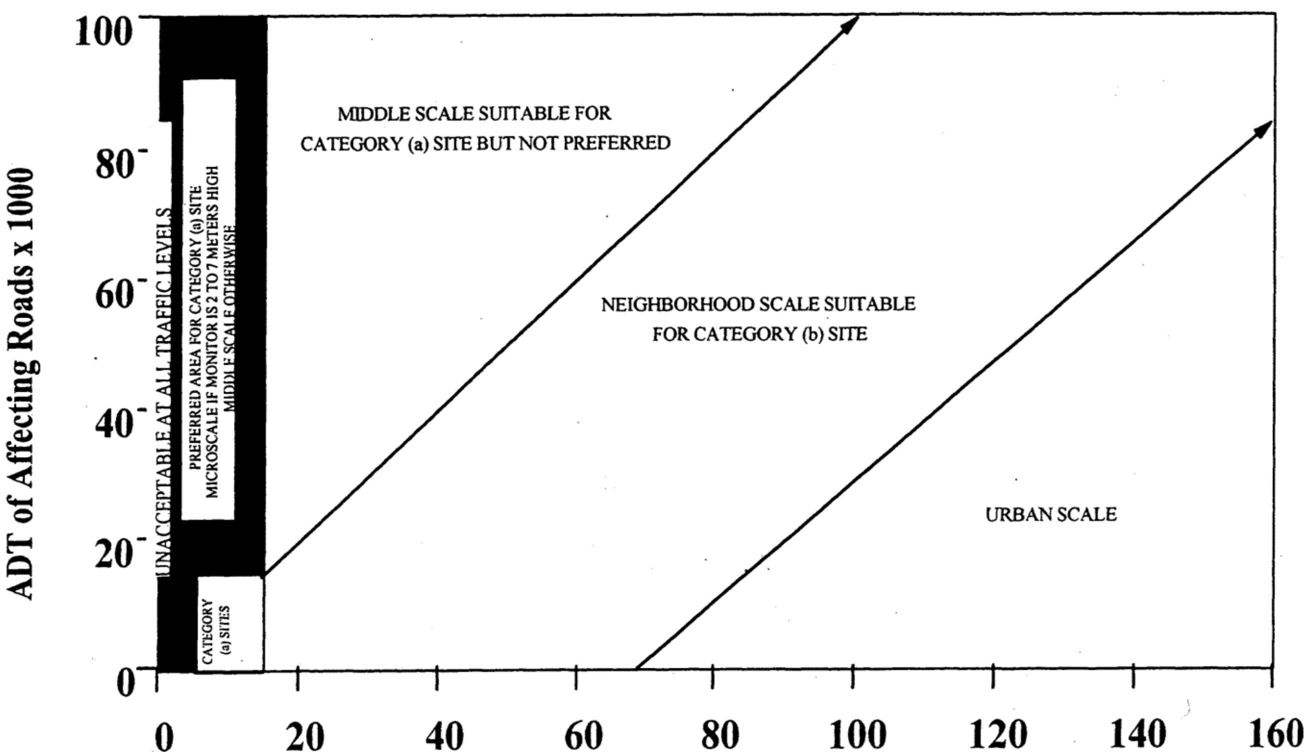


**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| 1/4" Line OD / 20 Sec Residence Time | | | |
|---|---|---|---|
| Flow Rate (liters/min) | 1/8" ID feet | 5/32" ID feet | 3/16" ID feet |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
| 0.6 | 82.9 | 53.0 | 36.8 |
| 0.7 | 96.7 | 61.9 | 43.0 |
| 0.8 | 110.5 | 70.7 | 49.1 |
| 0.9 | 124.3 | 79.6 | 55.3 |
| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
| 1.2 | 165.8 | 106.1 | 73.7 |
| 1.3 | 179.6 | 114.9 | 79.8 |
| 1.4 | 193.4 | 123.8 | 85.9 |
| 1.5 | 207.2 | 132.6 | 92.1 |
| 1.6 | 221.0 | 141.4 | 98.2 |
| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

**ADDITIONAL SUPPORTING INSTRUMENTATION**

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

The site uses an ESC 8832 data logger and an Agilaire 8872 PC/Data logger. The 8832 data logger serves as the primary logger and is directly connected via analog input to the analyzer at the site. The data is polled from the 8832 logger to the central server via a 4G cellular modem (Sierra Wireless RV50). The 8872 serves as a secondary, backup logger, and is used by the site operator to retrieve the electronic strip chart in local standard time. The 8872 polls data from the 8832 locally over the COM port or over the local tcp/ip network if the COM route is not working (via a network switch).

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**

Type of Shelter(s) located on site:

1. **Enclosure: N**
2. **Trailer: Y**
3. **None: N**
4. **Other: N**

What are the shelter(s) made of?

1. ____________________________________________
2. _Aluminum_____________________________________
3. ____________________________________________
4. ____________________________________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **Y**
Write additional comments on the shelters below:

Floor tiles broken, ceiling inside showed signs of previous leaks, insulation underneath shelter was exposed due to wildlife activity, roof rusted and needs caulking around seams_____________________________________________

# INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

**Initials:** Initials of auditor completing form.

**Date:** current date site is entered by auditor

**Reminder:** If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

**Arrival Time:** time auditors arrive at site

**Departure Time:** time auditors depart site

**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and is specified in TDEC DAPC's QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures. Teledyne analyzers are designated FEM for a range of 5-40 °C. Therefore, TDEC DAPC keeps shelters with these monitors within this range (still keeping in mind the 2 deg SD requirement). Shelters are generally kept about 25-26 °C in the warmest months to reduce condensation in sample lines and analyzer.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites? Ants? Wasps/Bees? / Larger wildlife causing problems (such as nesting in the undercarriage or walls or digging dens near the foundation/supports)?

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:** document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated. Some examples of items that can cause this problem are a leaking filter holder or fitting and an uncapped TTP system or sample line tee.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, SO2, NO, NO2, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control

**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**

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## Air Monitoring Site Evaluations
## TDEC APC

**Date: 4/4/17** **Location: Clarksville, TN**
**AQS Number: 47-125-1009**
**Site Name: Clarksville** **Pollutants: PM $_{2.5}$**
**Project Leader:**

---

**Print Name / Signature / Initials / Duties**

**1:** (Team Lead) ____Evelyn Haskin___________________________EMH___Site Specialist______________

**2:**_____________________________________________________________________________

**3:**_____________________________________________________________________________

# Air Monitoring Site Evaluation Summary

**Local Site Name:** ___Clarksville________________________ **Initials:** _EMH_________ **Date:** ___4/4/17_________

**Additional Comments:**

__Sunny 74 $^{o}$ F___________________________________________________________________________

_Electric: CDE ( Clarksville Dept. of Electricity) Meter Number: 251989_______________________________

Electrical issues in December 2016 fired the PM 2.5 2025 and TEOM monitors. The 2025 monitor was removed from site. The TEOM monitor is on site but is not operational._________________________________

Site is located inside the fence of the Mason Rudolph Golf Course.____________________________________

_Measurement to closest roads are East Thompkins Lane (27.4 meters) and Crossland Ave. (90.7 meters) (measured using Google Earth Pro)_____________________________________________________________

## MONITORING SITE EVALUATION FORM (MSEF)

**Local Site Name:** _Clarksville________________________ **Initials:** __EMH______ **Date:** _4/4/17___________

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present **[Y ] Completed**

**Arrival Time:** _11:40 am **Departure Time:** _12:45 pm__ **Primary Operator:** _John Helton_________________

**Observer(s):** ______________________________________________________________________

### SITE

[Y]-**Security Fence** [Y]-**Razor/Barb Wire** [NA] **Grass/Shrubs Cut** [NA] **Bare Soil Area**

[N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** _______________________ [NA] **Police Report Filed**

**Issues:** ____________________________________________________________________________________________

### SHELTER - Interior

**Arrival Temperature:** __NA______**°C** (from data logger) **Operator Site Visits:** __1________ per [**week** ]

[NA] **Leaking Roof** **[Damaged: □Ceiling / □Floor / □Walls]** [NA] **Clean / Neat** [NA] **Fire Extinguisher**

[NA] **Insect / Wildlife Issues** [NA] **Thermometer** (min/max) [NA] **Gasoline** (inside shelter)

**Issues:** ____________________________________________________________________________________________

### MONITOR(s):

**Location:** Exterior Samplers **[□Roof / x Ground / □ Not Present]**

| Monitor(s) | Manufacturer | Model | Serial Number |
|---|---|---|---|
| PM $_{2.5}$ BAM | Met One | BAM 1022 | T17009 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

### CALIBRATOR(s): x Not Present

[NA] **Are QA/QC Check Gases Vented Outside Shelter?**

| QA/QC | Make | Model | Serial Number | Certification Date | Expiration Date |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line? [N]** If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** _Clarksville______________ **Initials:** _EMH______ **Date:** __4/4/17_________

**All Gas Standards Pass thru all Filters during:** [NA] **Calibrations** [NA] **Precision Checks** [NA] **Audits**

**Issues:** ______NA___________________________________________________________________________

**CYLINDER GAS STANDARDS:** **x Not Present**

**VENDOR:** **(PSI Reading < 200, tank is empty and should not be in service)**

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| NA | | | | | |
| | | | | | |
| | | | | | |

Issues: ___________________________________________________________________________________________

**SUPPORTING INSTRUMENTATION:** **Internal**

[NA] **Temperature Sensor** [NA] **Uninterruptable Power Supply** [NA] **On-Site Computer**

**Zero Air System:** **Commercial System** (Make / Model): ______________________________________________

**Cartridge System: [□Silica Gel [□Pink / □Blue] / □Charcoal / □Purafil / □Hopcalite / Other: ____________]**

[NA] **Needs Service** **Last Service Date:** _______________ **Condition:** ____________________________

Issues: ______NA___________________________________________________________________________

**Probe Line(s):** **[□Replaced / □Cleaned] – Frequency:** ___________ **Last Service Date:** __________________

[NA] **Clean** [NA] **Heated** [NA] **Insulated** [NA] **Moisture** [NA] **Retractable** [NA] **Old / Unused Lines** [NA] **Lo Flo Manifold ->** [NA] **Any Open Ports?** **–> How many analyzers using manifold?** ________________

Issues: ______NA___________________________________________________________________________

**MSEF (Page 3/5): Local Site Name:** _Clarksville___________ **Initials:** __EMH_____ **Date:** __4/4/17_________

**SHELTER – Exterior** **x Not Present**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other: ___________________________________]**

[NA] **Needs Maintenance** (specify) [NA] **Tied Down** [NA] **Electrically Grounded** [NA] **Roof Railing**

**Roof Access: [Stairs [Interior/Exterior] / Ladder [attached/removable] / □ Not Present]** [NA] **Loose Decking** (Trip Hazard)

**Issues:** _____NA______________________________________________________________________________

**Height of Roof:** _________________**meters** **Roofing Material**: ________________________________________

**Issues:** ____NA_______________________________________________________________________________

**OUTDOOR SAMPLERS** **□ Not Present**

[**Y**] **Locked** [**Y** ] **Electrically Grounded** [**Y** ] **Stabilized** [NA] **Clean Inside** [**Y** ] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** __Monthly_________ **$PM_{10}$ Head Clean Schedule:** __________________

**Issue(s):** __WINS changed every five runs_____________________________________________________________

**COLLOCATED SAMPLERS:** **x Not Present** (39.4 inches = 1 meter)

| Pollutant | Flow (Hi / Lo) | Separation Distance (meters) |
|---|---|---|
| | | |
| | | |

Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s): External** **x Not Present**

**Inlet Type:** [□Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [□Rain Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / □Stainless Steel / Other: _________]

**Probe Line(s)**: [□Teflon® / Other: _____________] **Probe Fitting(s)**: [□Teflon® / Other: ___________ / □ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

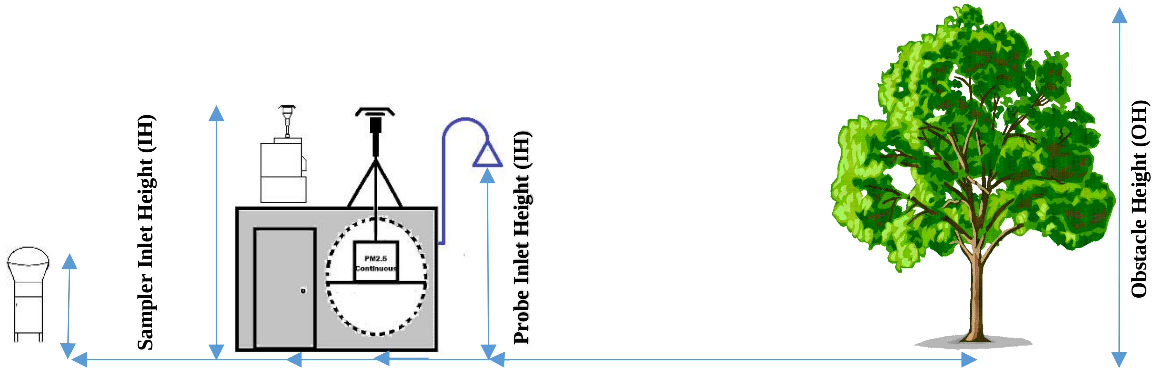
**Issue(s):** ___________________________________________________________________________________

| Pollutant(s) | Inlet Height (meters) | Inlet Location (Side of Shelter, Ground, Roof) | Horizontal Distance (meters) If Applicable | Vertical Distance (meters) If Applicable | Monitoring SCALE | |
|---|---|---|---|---|---|---|
| | | | | | AQS | Annual Network Plan |
| $PM_{2.5}$ BAM | 4.4 | Ground | | | Neighborhood | Urban |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MSEF (Page 4/5): Local Site Name:** __Clarksville____________ **Initials:** _EMH______ **Date:** _4/4/17_________

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** _____________inches = __________**meters** (nearest inlet to dripline) □ **No Trees Present**

(39.4 inches = 1 meter) _____________inches = __________**meters** (nearest inlet to dripline) □ Not Present

_____________inches = __________**meters** (nearest inlet to dripline) □ Not Present

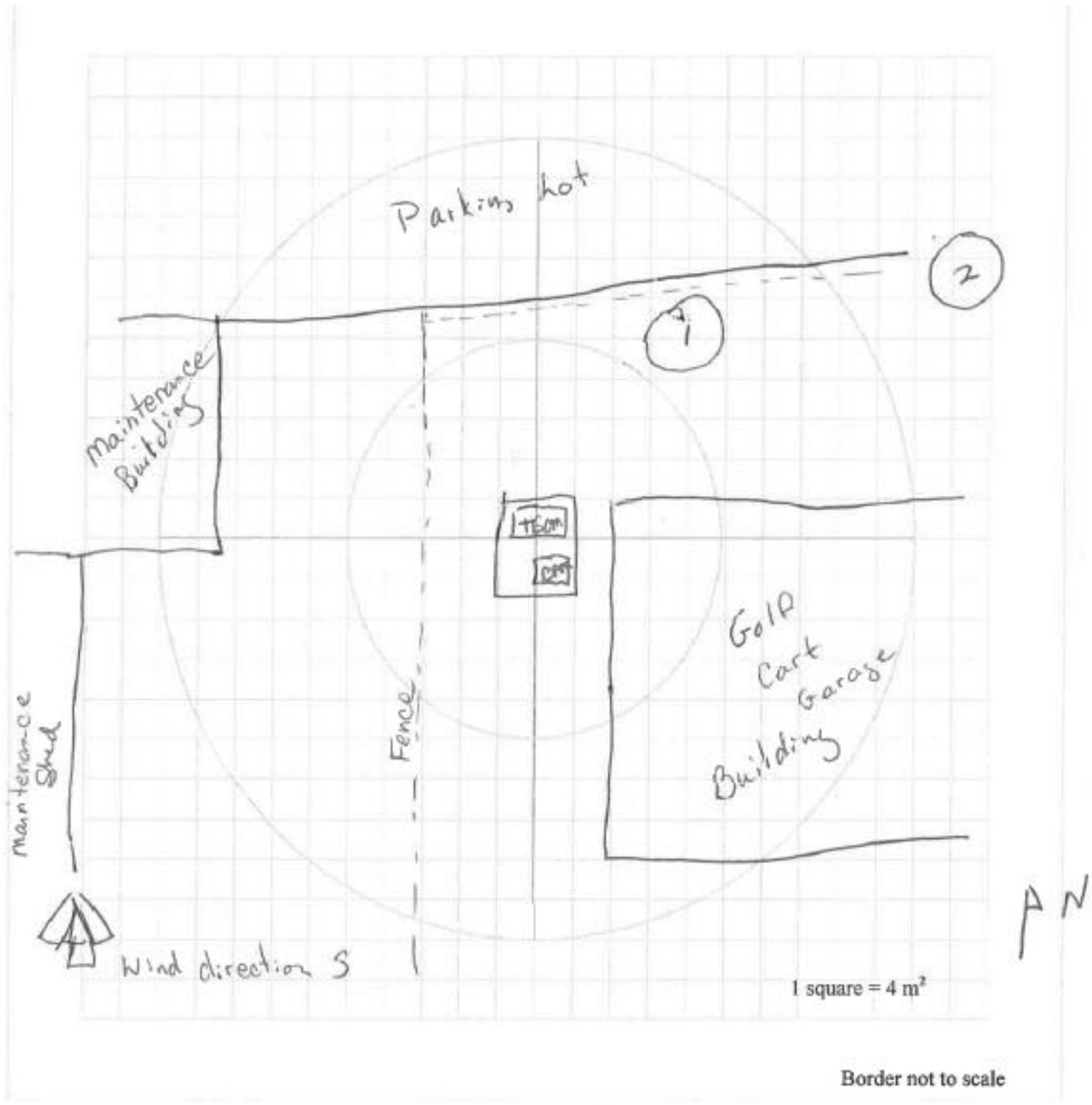
**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ___No issues with dripline or obstacles__________________________________________________

**MSEF (Page 5/5): Local Site Name:** __Clarksville___________ **Initials:** _EMH______ **Date:** _4/4/17_________

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: _> 270_______° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

## Additional Information:

| Object | Object Height | Inlet Height | [2*(OH-IH)] | Object Distance |
|---|---|---|---|---|
| Tree 1 | 6.2 m | 4.4 m | 3.6 m | 17.4 m |
| Tree 2 | 7.0 m | 4.4 m | 5.2 m | 30.4 m |
| Golf Cart Garage | 3.5 m | 4.4 m | -1.8 m | 1.4 m |
| Maint. Garage | 3.8 m | 4.4 m | -1.2 m | 11.2 m |
| Maint. Shelter | 5.0 m | 4.4 m | 1.2 m | 13.8 m |

Platform is 2.36 meters tall

## Aerial Photo with Wind Rose

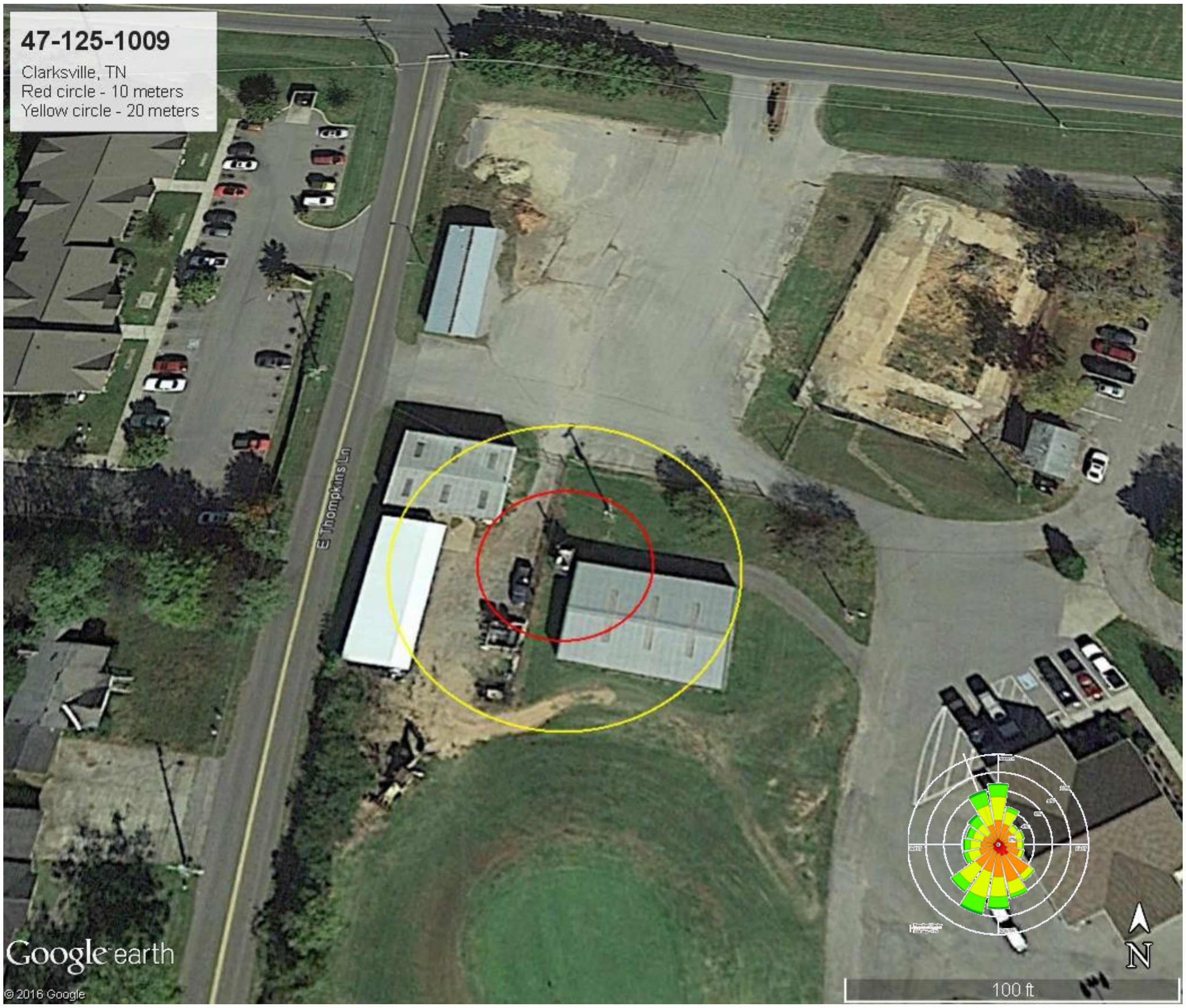


**PHOTO LOG:** **Local Site Name:** _Clarksville_____________ **Initials:** _EMH_____ **Date:** _4/4/17_______

**Camera [x APC / □ Personal – Owner:** ________________**] Make/Model:** _Nikon Coolpix___________________

**Filename:** ____001________________ **Date:** __4.4/17_______ **Time:** _12:30 pm_______ **Photographer:** __EMH____________

**Description:** _View of site (taken from NE direction)___________________________________________________________

**Filename:** __002________________ **Date:** __4.4/17________ **Time:** _12:30 pm_______ **Photographer:** __EMH___________

**Description:** _View of site (taken from north direction)_______________________________________________________

**Filename:** __003________________ **Date:** __4.4/17________ **Time:** __12:30 pm_____ **Photographer:** ___EMH___________

**Description:** _North side of site_______________________________________________________________________________

**Filename:** _004__________________ **Date:** _4.4/17_________ **Time:** __12:30 pm_____ **Photographer:** ___EMH__________

**Description:** _View North of site (N directional)_______________________________________________________________

**Filename:** __005________________ **Date:** __4.4/17__________ **Time:** __12:30 pm___ **Photographer:** __EMH_____________

**Description:** _South side of site_______________________________________________________________________________

**Filename:** ___006_______________ **Date:** __4.4/17__________ **Time:** _12:30 pm______ **Photographer:** _EMH___________

**Description:** _View South of site (S directional)_______________________________________________________________

**Filename:** _007_________________ **Date:** _4.4/17___________ **Time:** _12:30 pm____ **Photographer:** __EMH____________

**Description:** _West side of site_______________________________________________________________________________

**Filename:** __008________________ **Date:** _4.4/17___________ **Time:** _12:30 pm___ **Photographer:** __EMH___________

**Description:** _View West of site (W directional)_______________________________________________________________

**Filename:** __009________________ **Date:** _4.4/17___________ **Time:** _12:30 pm____ **Photographer:** _EMH_____________

**Description:** _East side of site________________________________________________________________________________

**Filename:** __010________________ **Date:** _4.4/17___________ **Time:** _12:30 pm____ **Photographer:** __EMH__________

**Description:** __View East of site (E directional)_______________________________________________________________

001

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# 40 CFR Part 58, Appendix E, Tables and Figures

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| **$O_3$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **$SO_2$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **PM, Pb** | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

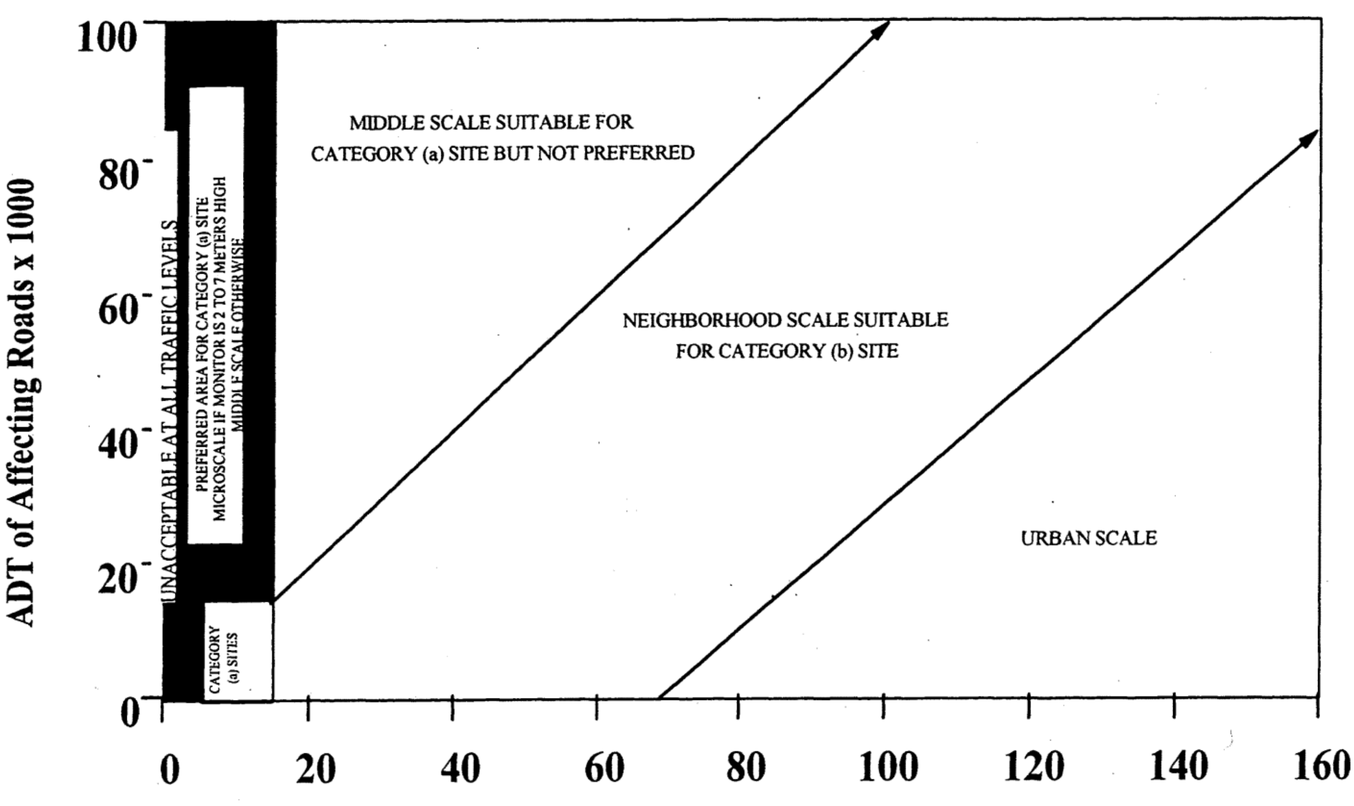


**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼” OD tubing at given flow rate - using a 20 second residence time. The ID’s shown are for thick (1/8”), intermediate (5/32”) and thin (3/16”) wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| **1/4" Line OD / 20 Sec Residence Time** | | | |
|---|---|---|---|
| **Flow Rate** | **1/8" ID** | **5/32" ID** | **3/16" ID** |
| **(liters/min)** | **feet** | **feet** | **feet** |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
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| 1.4 | 193.4 | 123.8 | 85.9 |
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| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

**ADDITIONAL SUPPORTING INSTRUMENTATION**

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

A 4G cellular modem (Sierra Wireless RV50) provides internet communications to the BAM 1022 instrument at the site via a network switch.

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**
Is the shelter tied down – physically tied with hurricane straps?
Is the shelter grounded - look for rod in the ground and lead wire connection?

Type of Shelter(s) located on site:
1. **Enclosure: Y**
2. **Trailer: N**
3. **None: N**
4. **Other: N**

What are the shelter(s) made of?

1. _TEOM Shelter – steel_________________________________________
2. _____________________________________________________________
3. _____________________________________________________________
4. __Platform - wood_____________________________________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **Y**
With roof top samplers or inlets – is a roof railing present? **N**
Roof Access: Stairs or Ladder? **N**
Stairs can be inside or outside – Ladders are usually permanently attached or removable? **N**
Write additional comments on the shelters below:

_Platform needs reinforcement if to remain at site for longer period of time. Boards located at the open end of platform are rotten and/or split; need replacement. Boards are 5.5 inches wide by 1 inch thick by 72 inches long________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________

## INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

**Initials:** Initials of auditor completing form.

**Date:** current date site is entered by auditor

**Reminder:** If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

**Arrival Time:** time auditors arrive at site

**Departure Time:** time auditors depart site

**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and may be specified in agency QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites eating shelter? Ants eating operator? Wasps/Bees attacking auditor? / Larger wildlife making shelter its home

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:** document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, $SO_2$, NO, $NO_2$, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control

**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**

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**Air Monitoring Site Evaluations**
**TDEC APC**

**Date: 2/15/17** **Location: Columbia, TN**
**AQS Number: 47-119-2007**
**Site Name: Columbia** **Pollutants: PM $_{2.5}$**
**Project Leader:**

---

**Print Name / Signature / Initials / Duties**

**1:** (Team Lead) _Evelyn Haskin____________________________EMH___Site Specialist_________________

**2:**_______________________________________________________________________________

**3:**_______________________________________________________________________________

# Air Monitoring Site Evaluation Summary

**Local Site Name:** _Columbia___________________________ **Initials:** _EMH_____ **Date:** __2/15/17____________
**Additional Comments:**

_Partly_Sunny 45 $^{o}$ __F__________________________________________________________________________________________

Electric meter: Columbia Power & Water Systems Meter # 113050_____________________________________

**MONITORING SITE EVALUATION FORM (MSEF)**

**Local Site Name:** _Columbia______________________ **Initials:** _EMH_______ **Date:** ___2/15/17________

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present

**Arrival Time:** _12:25 pm__ **Departure Time:** _1:15 pm__ **Primary Operator:** _Hattie Benet_____________

**Observer(s):** ____________________________________________

**SITE**

[Y]-**Security Fence** [Y]-**Razor/Barb Wire** [Y] **Grass/Shrubs Cut** [NA] **Bare Soil Area**

[N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** ______________________ [NA] **Police Report Filed**

**Issues:** ____________________________________________

**SHELTER - Interior**

**Arrival Temperature:** NA_____°**C** (from data logger) **Operator Site Visits:** _1-2_____ per [**week**]

[NA] **Leaking Roof** **[Damaged: □ Ceiling / □Floor / □Walls]** [NA] **Clean / Neat** [NA] **Fire Extinguisher**

[NA] **Insect / Wildlife Issues** [NA] **Thermometer** (min/max) [NA] **Gasoline** (inside shelter)

**Issues:** _____NA____________________________________________

**MONITOR(s):** **Location:** Exterior Samplers **[□Roof / x Ground / □ Not Present]**

| Monitor(s) | Manufacturer | Model | Serial Number |
|---|---|---|---|
| PM $_{2.5}$ | R& P | 2025 | 20972 |
| PM $_{2.5}$ BAM | Met one | BAM 1022 | T21582 |
| | | | |
| | | | |
| | | | |
| | | | |

**CALIBRATOR(s):** **x Not Present** [NA] **Are QA/QC Check Gases Vented Outside Shelter?**

| QA/QC | Make | Model | Serial Number | Certification Date | Expiration Date |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line? [N]** If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** _Columbia________________ **Initials:** _EMH____ **Date:** __2/15/17_______

**All Gas Standards Pass thru all Filters during:** [NA] **Calibrations** (Not Required) [NA] **Precision Checks** (Required) [NA] **Audits** (Required)

**Issues:** ____________________________________________________________

**CYLINDER GAS STANDARDS:** **x Not Present**

**VENDOR:** **(PSI Reading < 200, tank is empty and should not be in service)**

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| NA | | | | | |
| | | | | | |
| | | | | | |

Issues: ____________________________________________________________

**SUPPORTING INSTRUMENTATION: Internal**

[N ] **Temperature Sensor** [ N] **Uninterruptable Power Supply**

**Zero Air System: Commercial System** (Make / Model): ______________________________________

**Cartridge System: [□Silica Gel □Pink / □Blue] / □ Charcoal / □Purafil / □Hopcalite / Other: __________]**

[NA] **Needs Service Last Service Date:** ________________ **Condition:** ______________________________

Issues: ________NA____________________________________________________

**Probe Line(s): [□Replaced / □Cleaned] – Frequency: ___________ Last Service Date: __________________**

[NA] **Clean** [NA] **Heated** [NA] **Insulated** [NA] **Moisture** [NA] **Retractable** [NA] **Old / Unused Lines** [NA] **Lo Flo Manifold** -> [NA] **Any Open Ports?** –> **How many analyzers using manifold?** _______________

Issues: _____NA______________________________________________________

**MSEF (Page 3/5): Local Site Name:** __Columbia____________ **Initials:** _EMH_____ **Date:** _2/15/17________

**SHELTER – Exterior** **x Not Present**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other: ________________________________________]**

[**NA**] **Needs Maintenance** (specify) [**NA**] **Tied Down** [**NA**] **Electrically Grounded** [NA] **Roof Railing**

**Roof Access: [Stairs [Interior/Exterior] /** Ladder [attached/removable] **/ □ Not Present]** [NA] **Loose Decking** (Trip Hazard)

**Issues:** ________________________________________________________________________________

**Height of Roof:** ___________________**meters** **Roofing Material**: ______________________________________

**Issues:** ________________________________________________________________________________

**OUTDOOR SAMPLERS** **□ Not Present**

[Y] **Locked** [Y] **Electrically Grounded** [Y] **Stabilized** [Y] **Clean Inside** [Y] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** _________________ **$PM_{10}$ Head Clean Schedule:** _Monthly__________

**Issue(s):** WINS changed once every 5 runs : VSCC monthly____________________________________________

**COLLOCATED SAMPLERS:** **x Not Present** (39.4 inches = 1 meter)

| Pollutant | Flow (Hi / Lo) | *Separation Distance (meters) |
|---|---|---|
| | | |
| | | |

*Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s): External** **x Not Present**

**Inlet Type:** [□ Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [□ Rank Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / □ Stainless Steel / Other: _________]

**Probe Line(s)**: [□ Teflon® / Other: _____________] **Probe Fitting(s)**: [□**x** Teflon® / Other: ___________ / □ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

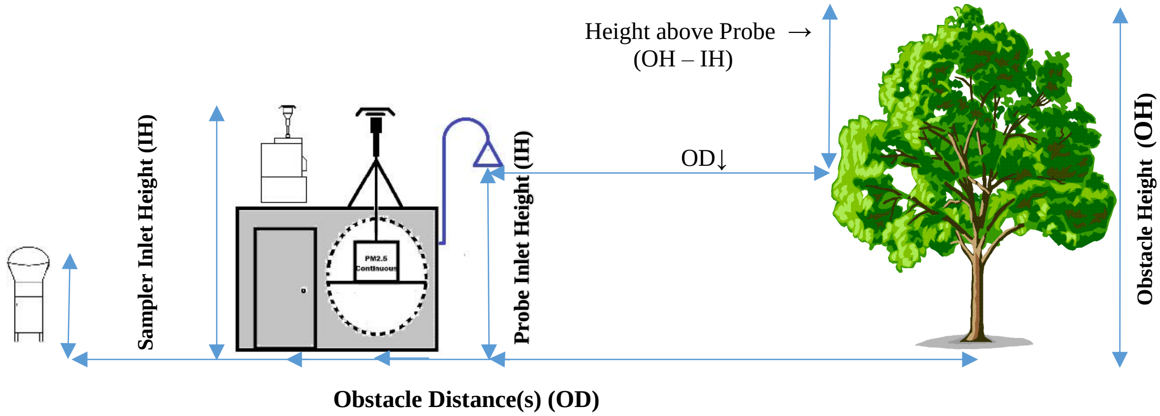
**Issue(s):** ________________________________________________________________________________

| Pollutant(s) | Inlet Height (meters) | Inlet Location (Side of Shelter, Ground, Roof) | *Horizontal Distance (meters) If Applicable | *Vertical Distance (meters) If Applicable | Monitoring SCALE | |
|---|---|---|---|---|---|---|
| | | | | | AQS | Annual Network Plan |
| $PM_{2.5}$ 2025 | 2.6 | Ground | 2.0 | | Middle | Middle |
| $PM_{2.5}$ BAM | 2.1 | Ground | 2.0 | | Neighborhood | Neighborhood |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MSEF (Page 4/5): Local Site Name:** _Columbia_________ **Initials:** _EMH______ **Date:** _2/15/17______

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** ____________inches = _________**meters** (nearest inlet to dripline) □ **No Trees Present**

(39.4 inches = 1 meter) ____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ___No issues with driplines or obstacles_______________________________

**Minor Sources:**

- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

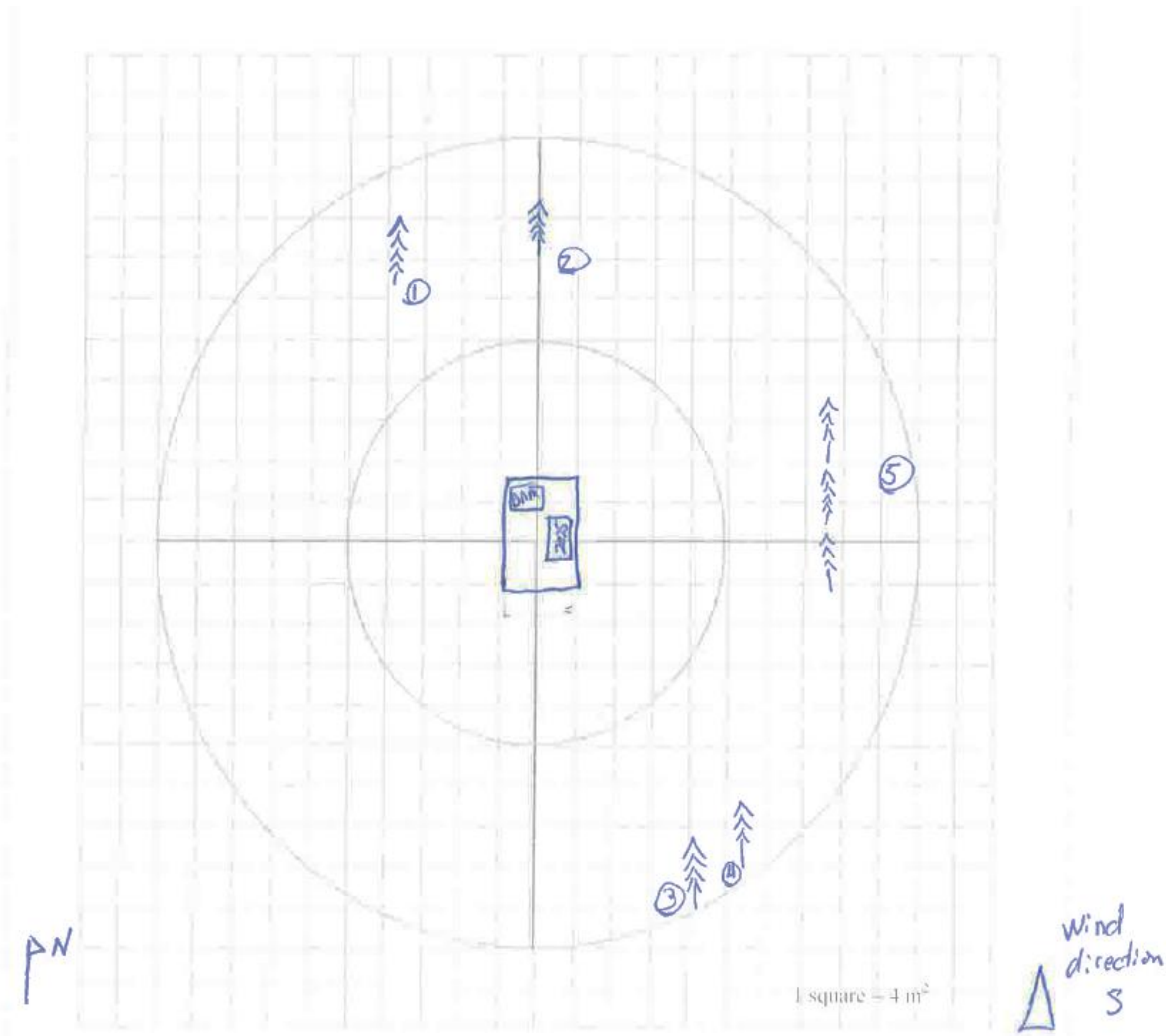
**Issues:** ___None_______________________________________

_______________________________________________

**MSEF (Page 5/5): Local Site Name:** Columbia __________ **Initials:** EMH______ **Date:** __2/15/17________

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: _>270_____° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

# Additional Information:

Distance to closest road (US 31) – 99.4 meters

| | Height | [2*OH – IH(2.6 or 2.1)] | Distance |
|---|---|---|---|
| 1 Cedar (N) | 5.6 m | 7.0 | 12.2 m |
| 2 Cedar (N) | 5.2 m | 6.2 | 12.2 m |
| 3 Cedar (SE) | 5.2 m | 5.2 | 13.4 m |
| 4 Cedar (SE) | 6.4 m | 7.6 | 12.4 m |
| 5 Cedars (E) | 4.2 -5 m | 3.2 – 4.8 | 11 – 12 m |

Trees 1 and 2 are measured from the BAM

Cedars trees north and east of site may become a problem in the future

# Aerial Photo with Wind Rose

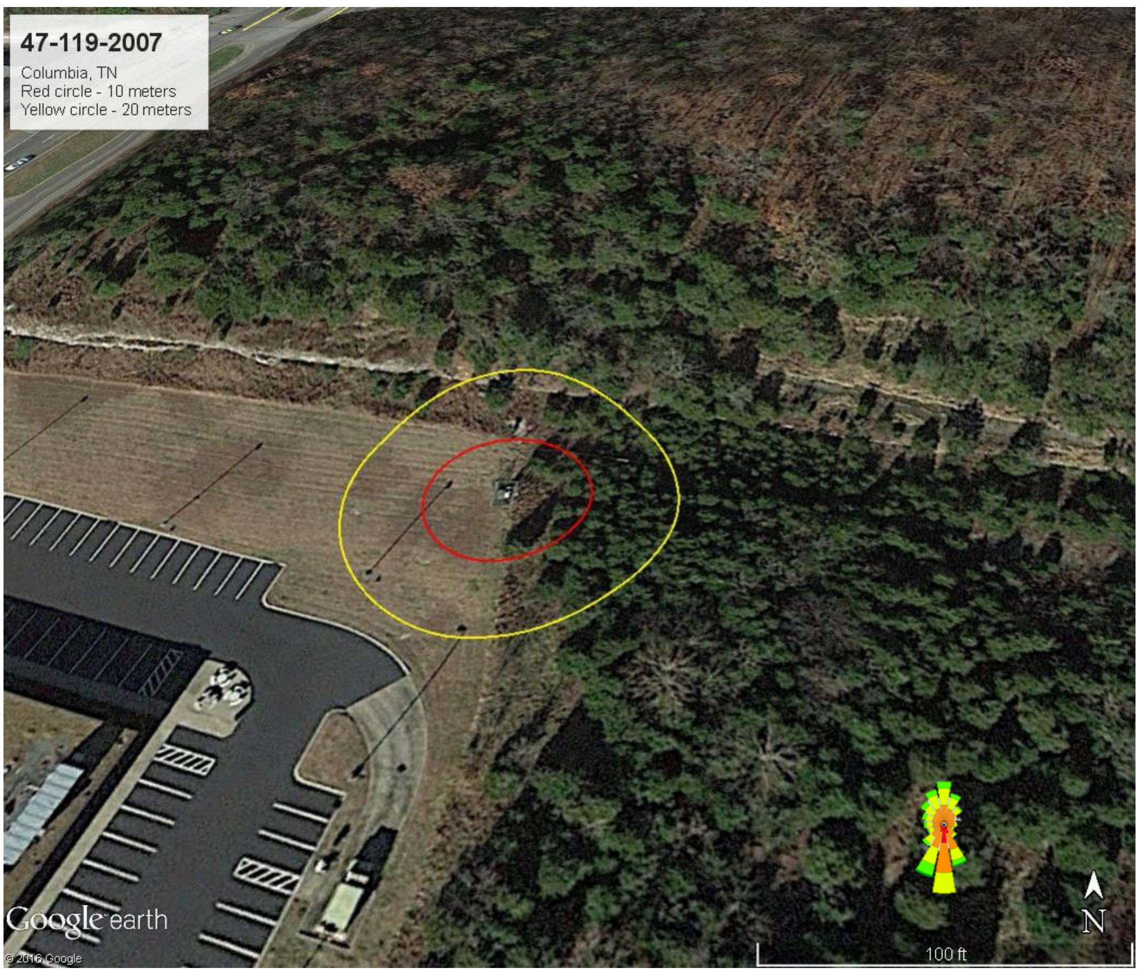


**PHOTO LOG: Local Site Name:** _Columbia__________ **Initials:** _EMH____ **Date**: 2/15/17____________

**Camera [x APC / □ Personal – Owner: ________________] Make/Model:** Nikon Coolpix___________________

**Filename:** __01___________________ **Date:** __2/15/17______ **Time:** __1:00 pm____ **Photographer:** ___EMH____________

**Description:** _Site view from west direction_____

**Filename:** __02___________________ **Date:** __2/15/17______ **Time:** __1:00 pm___ **Photographer:** ___EMH____________

**Description:** __Site view from SW direction

**Filename:** __03___________________ **Date:** __2/15/17______ **Time:** __1:00 _pm___ **Photographer:** ___EMH____________

**Description:** __North side of site

**Filename:** __04___________________ **Date:** __2/15/17______ **Time:** __1:00 _pm____ **Photographer:** ___EMH____________

**Description:** _View North of site (N directional)

**Filename:** __05___________________ **Date:** __2/15/17______ **Time:** __1:00 pm_____ **Photographer:** ___EMH____________

**Description:** _South side of site

**Filename:** __06___________________ **Date:** __2/15/17______ **Time:** __1:00 _pm____ **Photographer:** ___EMH____________

**Description:** __View South of site (S directional)

**Filename:** __07___________________ **Date:** __2/15/17______ **Time:** __1:00 _pm____ **Photographer:** ___EMH____________

**Description:** __West side of site

**Filename:** __08___________________ **Date:** __2/15/17______ **Time:** __1:00 _pm____ **Photographer:** ___EMH____________

**Description:** __View West of site (W directional)

**Filename:** __09___________________ **Date:** __2/15/17______ **Time:** __1:00 _pm____ **Photographer:** ___EMH____________

**Description:** ___East side of site

**Filename:** __10___________________ **Date:** __2/15/17______ **Time:** __1:00 pm_____ **Photographer:** ___EMH____________

**Description:** __View East of site (E directional)

001

002

003


004

005

006

007

008

009

010

# 40 CFR Part 58, Appendix E, Tables and Figures

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| **$O_3$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **$SO_2$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **PM, Pb** | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

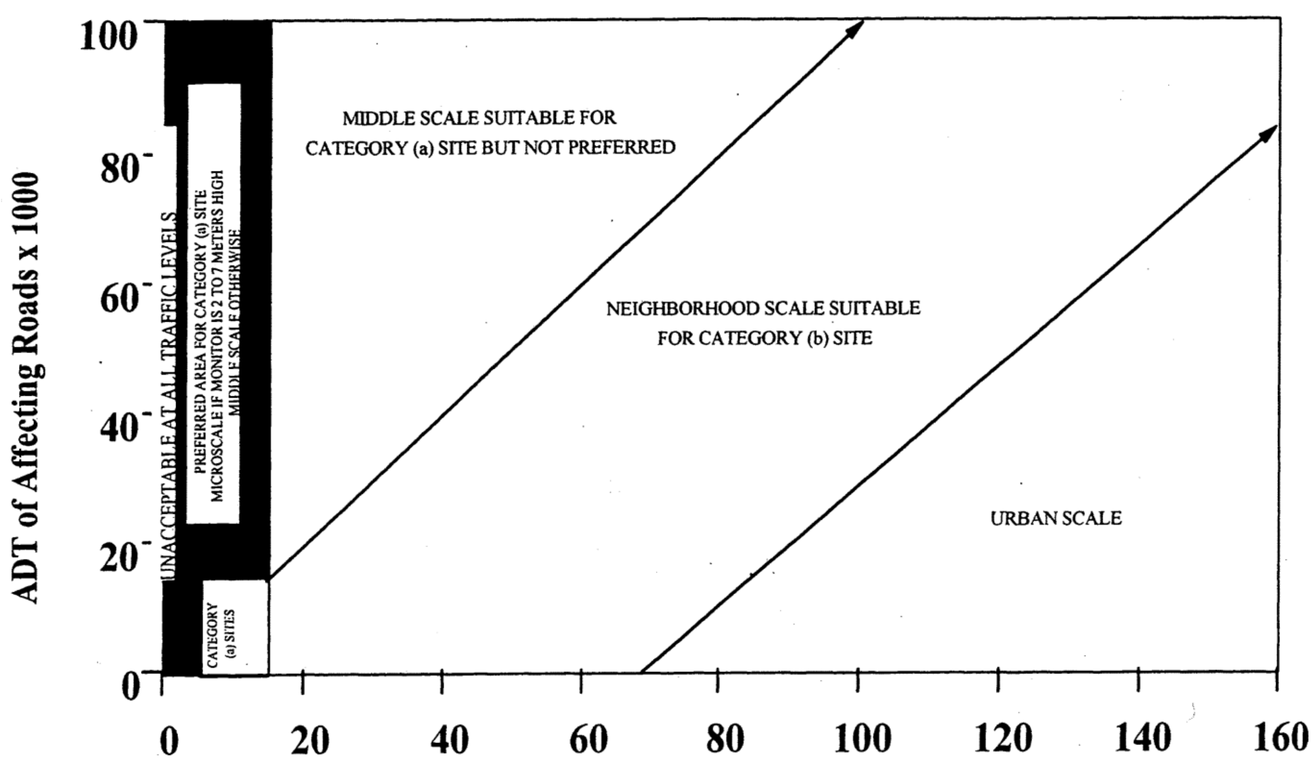



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| 1/4" Line OD / 20 Sec Residence Time | | | |
|---|---|---|---|
| Flow Rate | 1/8" ID | 5/32" ID | 3/16" ID |
| (liters/min) | feet | feet | feet |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
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**ADDITIONAL SUPPORTING INSTRUMENTATION**

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

A 4G cellular modem (Sierra Wireless RV50) provides internet communications to the BAM 1022. A US Robotics dial-up modem is used to send the ancillary data from the 2025 to the central office staff.

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**
Is the shelter tied down – physically tied with hurricane straps?
Is the shelter grounded - look for rod in the ground and lead wire connection?

Type of Shelter(s) located on site:

1. **Enclosure: Y**
2. **Trailer: N**
3. **None: N**
4. **Other: N**

What are the shelter(s) made of?

1. ______________________________________________________________
2. _____________________________________________________________
3. _____________________________________________________________
4. 2025 platform (wood) and BAM platform (plastic)_____________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **N**
Write additional comments on the shelters below:
___________________________________________NA_____________________________________________________

__________________________________________________________________________________________________

__________________________________________________________________________________________________

__________________________________________________________________________________________________

## INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

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**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and is specified in TDEC DAPC's QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures. Teledyne analyzers are designated FEM for a range of 5-40 °C. Therefore, TDEC DAPC keeps shelters with these monitors within this range (still keeping in mind the 2 deg SD requirement). Shelters are generally kept about 25-26 °C in the warmest months to reduce condensation in sample lines and analyzer.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites? Ants? Wasps/Bees? / Larger wildlife causing problems (such as nesting in the undercarriage or walls or digging dens near the foundation/supports)?

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:** document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated. Some examples of items that can cause this problem are a leaking filter holder or fitting and an uncapped TTP system or sample line tee.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, $SO_2$, NO, $NO_2$, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control

**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**

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## Air Monitoring Site Evaluations
## TDEC APC

**Date: 3/2/17** **Location: Cookeville, TN**
**AQS Number: 47-141-0005**
**Site Name: Cookeville** **Pollutants: PM $_{2.5}$**
**Project Leader:**

---

**Print Name / Signature / Initials / Duties**

**1:** (Team Lead) _Evelyn Haskin____________________________EMH___Site Specialist________________

**2:**____________________________________________________________________________

**3:**____________________________________________________________________________

# Air Monitoring Site Evaluation Summary

**Local Site Name:** _Cookeville____________________________ **Initials:** _EMH_____ **Date:** __3/2/17____________

**Additional Comments:**

__Sunny 52 °_F

Electric meter: Cookeville Electric     Meter # 20274

_Distance to closest roads: Denton Ave (East of site) is 50.5 meters and E 20th Street (North of site) is 111.4__ meters     (Measured using Google Earth Pro)

Distance between 2025 monitor and utility pole is 0.6 meters

**MONITORING SITE EVALUATION FORM (MSEF)**

**Local Site Name:** _Cookeville_______________________ **Initials:** _EMH_______ **Date:** ___3/2/17________

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present

**Arrival Time:** _2:01 pm__ **Departure Time:** _3:15 pm__ **Primary Operator:** _Joey Cannon_______________

**Observer(s):** ______________________________________________________________

**SITE**

[Y]-**Security Fence** [Y]-**Razor/Barb Wire** [Y] **Grass/Shrubs Cut** [NA] **Bare Soil Area**

[N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** _______________________ [NA] **Police Report Filed**

**Issues:** ______________________________________________________________

**SHELTER - Interior**

**Arrival Temperature:** NA_____**°C** (from data logger) **Operator Site Visits:** _1-2_____ per [**week**]

[NA] **Leaking Roof** **[Damaged: □ Ceiling / □Floor / □Walls]** [NA] **Clean / Neat** [NA] **Fire Extinguisher**

[NA] **Insect / Wildlife Issues** [NA] **Thermometer** (min/max) [NA] **Gasoline** (inside shelter)

**Issues:** ______________________________________________________________

**MONITOR(s):** **Location:** Exterior Samplers **[□Roof / x Ground / □ Not Present]**

| **Monitor(s)** | **Manufacturer** | **Model** | **Serial Number** |
|---|---|---|---|
| $PM_{2.5}$ | R& P | 2025 | 21651 |
| $PM_{2.5}$ BAM | Met One | BAM 1022 | T21580 |
| | | | |
| | | | |
| | | | |
| | | | |

**CALIBRATOR(s):** **x Not Present** [NA] **Are QA/QC Check Gases Vented Outside Shelter?**

| **QA/QC** | **Make** | **Model** | **Serial Number** | **Certification Date** | **Expiration Date** |
|---|---|---|---|---|---|
| **NA** | | | | | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line? [N]** If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** _Cookeville_______________ **Initials:** _EMH____ **Date:** __3/2/17_______

**All Gas Standards Pass thru all Filters during:** [NA] **Calibrations** (Not Required) [NA] **Precision Checks** (Required) [NA] **Audits** (Required)

**Issues:** __NA________________________________________________________________

**CYLINDER GAS STANDARDS:** **x Not Present**

**VENDOR:** **(PSI Reading < 200, tank is empty and should not be in service)**

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| NA | | | | | |
| | | | | | |
| | | | | | |

Issues: ________________________________________________________________________

**SUPPORTING INSTRUMENTATION: Internal**

[Y] **Temperature Sensor** [N] **Uninterruptable Power Supply**

**Zero Air System: Commercial System** (Make / Model): ________________________________

**Cartridge System: [□Silica Gel □Pink / □Blue] / □x Charcoal / □Purafil / □Hopcalite / Other: __________]**

[NA] **Needs Service Last Service Date:** _______________ **Condition:** ____________________________

Issues: _____NA________________________________________________________________

**Probe Line(s): [□Replaced / □Cleaned] – Frequency:** ___________ **Last Service Date:** __________________

[NA] **Clean** [NA] **Heated** [NA] **Insulated** [NA] **Moisture** [NA] **Retractable** [NA] **Old / Unused Lines** [NA] **Lo Flo Manifold ->** [NA] **Any Open Ports?** **–> How many analyzers using manifold?** _______________

Issues: ______NA_______________________________________________________________

**MSEF (Page 3/5): Local Site Name:** __Cookeville____________ **Initials:** _EMH_____ **Date:** _3/2/17________

**SHELTER – Exterior** **x Not Present**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other: __________ ________________________________]**

[**NA**] **Needs Maintenance** (specify) [**NA**] **Tied Down** [**NA**] **Electrically Grounded** [NA] **Roof Railing**

**Roof Access: [Stairs [Interior/Exterior] /** Ladder [attached/removable] **/ □ Not Present]** [NA] **Loose Decking** (Trip Hazard)

**Issues:** ______________________________________________________________________________________

**Height of Roof:** _____ _____________**meters** **Roofing Material**: ______________________________________

**Issues:** ______________________________________________________________________________________

**OUTDOOR SAMPLERS** **□ Not Present**

[**Y** ] **Locked** [**Y** ] **Electrically Grounded** [**Y** ] **Stabilized** [**Y** ] **Clean Inside** [**Y** ] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** __________________ **$PM_{10}$ Head Clean Schedule:** _Monthly__________

**Issue(s):** WINS changed once every 5 runs : VSCC monthly____________________________________________

**COLLOCATED SAMPLERS:** **x Not Present** (39.4 inches = 1 meter)

| Pollutant | Flow (Hi / Lo) | *Separation Distance (meters) |
|---|---|---|
| | | |
| | | |

*Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s): External** **x Not Present**

**Inlet Type:** [□ Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [□ Rank Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / □ Stainless Steel / Other: _________]

**Probe Line(s)**: [□ Teflon® / Other: _____________] **Probe Fitting(s)**: [□**x** Teflon® / Other: ___________ / □ Not Present]

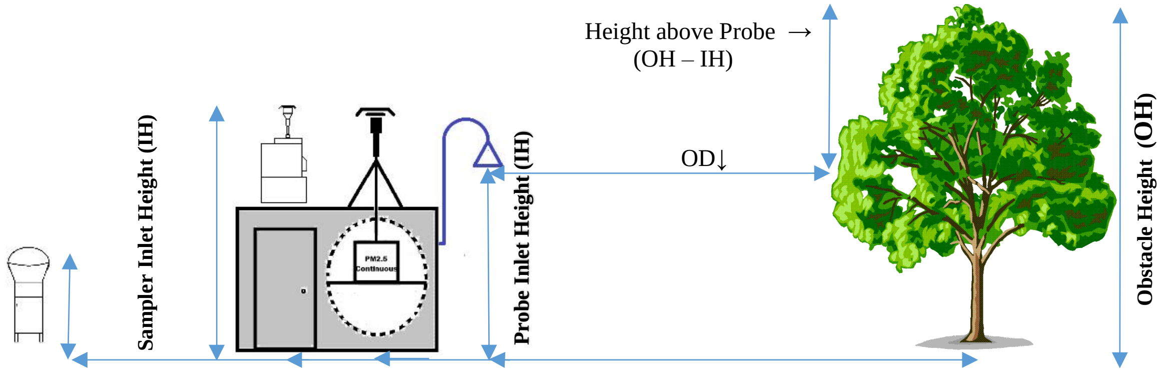
**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

**Issue(s):** ______________________________________________________________________________________

| Pollutant(s) | Inlet Height (meters) | Inlet Location (Side of Shelter, Ground, Roof) | *Horizontal Distance (meters) If Applicable | *Vertical Distance (meters) If Applicable | Monitoring SCALE | |
|---|---|---|---|---|---|---|
| | | | | | AQS | Annual Network Plan |
| $PM_{2.5}$ 2025 | 2.5 | Ground | 2.4 | | Neighborhood | Neighborhood |
| $PM_{2.5}$ BAM | 2.6 | Ground | 2.4 | | Neighborhood | Neighborhood |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| Tree 9 | 22.0 | 2.5 | 39.0 | 30.4 |
| Tree 10 | 22.0 | 2.5 | 39.0 | 25.4 |
| Tree 11 | 18.2 | 2.5 | 31.4 | 24.4 |
| Tree 12 | 22.0 | 2.5 | 39.0 | 31.8 |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** ____________inches = _________**meters** (nearest inlet to dripline) ☐ **No Trees Present**

(39.4 inches = 1 meter) ____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ___No issues with driplines ________________________________

**Minor Sources:**

- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

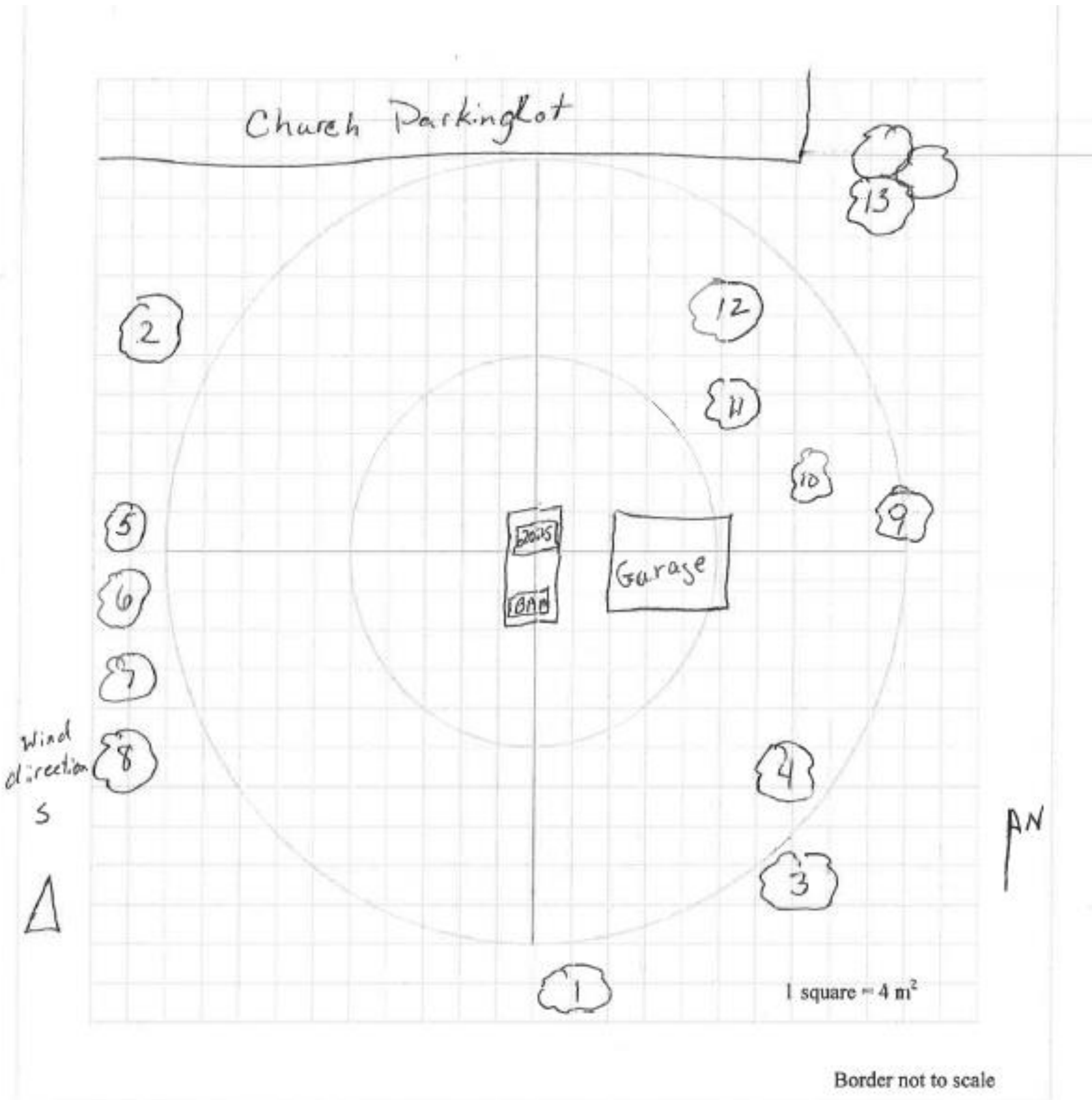
**Issues:** ___None____________________________________________

________________________________________________________________

**MSEF (Page 5/5): Local Site Name:** _Cookeville __________ **Initials:** EMH______ **Date:** __3/2/17________

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: _322 _____° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

## Additional Information:

| | Height | [2*OH – IH(2.6 or 2.5)] | Distance |
|---|---|---|---|
| | | | |
| * Tree 2 | 17.2 | 29.4 | 45.2 |
| Tree 3 | 17.2 | 29.2 | 42.4 |
| Tree 4 | 8.4 | 11.6 | 24.8 |
| *Tree 5 | 13.6 | 22.2 | 41.4 |
| Tree 6 | 16.6 | 28.0 | 41.8 |
| Tree 7 | 11.8 | 18.4 | 39.0 |
| Tree 8 | 18.2 | 31.2 | 59.6 |
| *Trees 13 | 24.2 | 43.4 | 54.4 |

*The inlet height of the 2025 monitor is used, others the BAM height

## Aerial Photo with Wind Rose

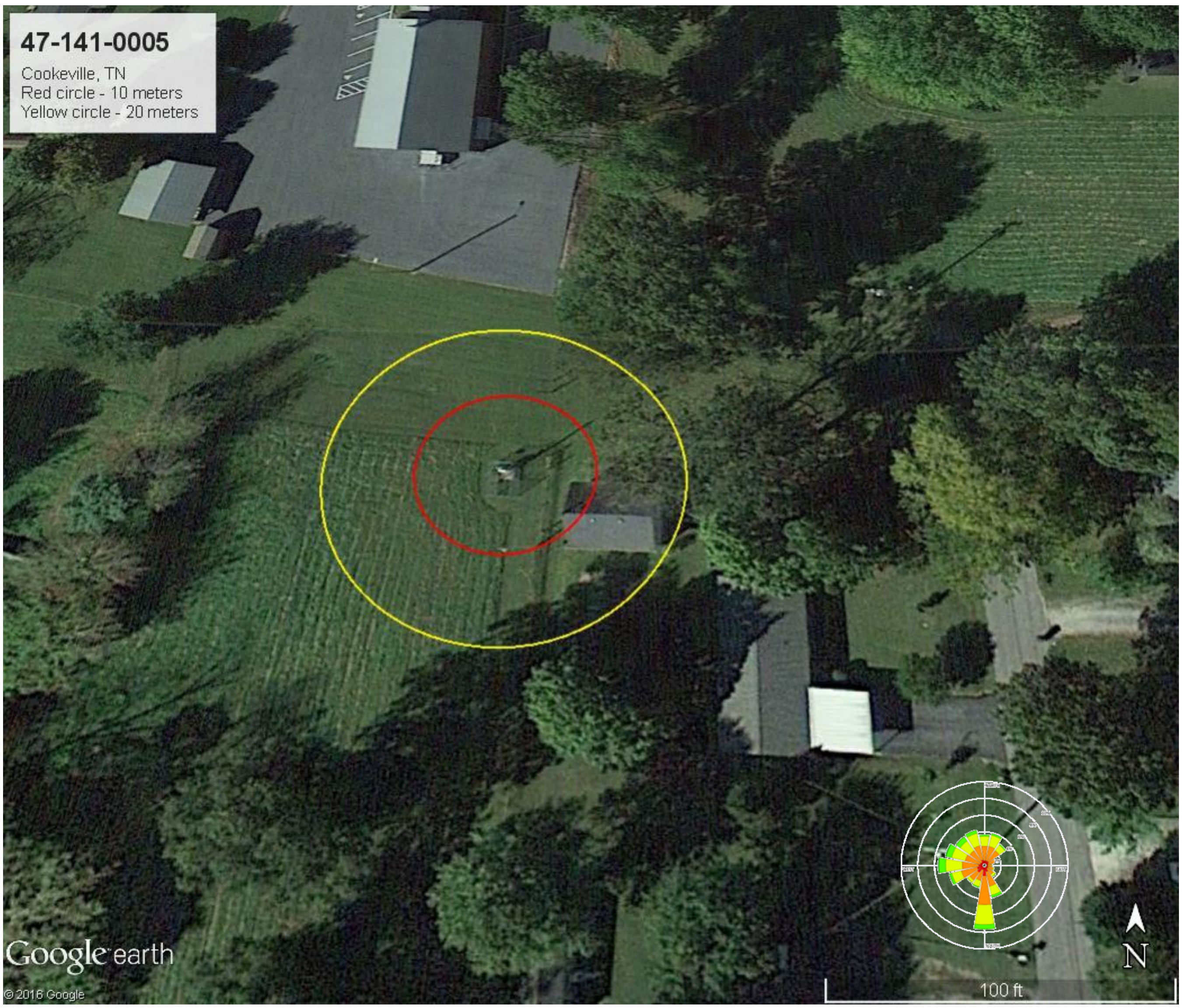


**PHOTO LOG: Local Site Name:** _Cookeville__________ **Initials:** _EMH____ **Date**:_3/2/17________

**Camera [x APC / □ Personal – Owner: ________________] Make/Model:** Nikon Coolpix_________________

**Filename:** __01____________________ **Date:** __3/2/17______ **Time:** __3:05_pm____ **Photographer:** ___EMH____________

**Description:** _Site view from north direction_____

**Filename:** __02____________________ **Date:** __3/2/17______ **Time:** __3:05 pm___ **Photographer:** ___EMH____________

**Description:** __Site view from west direction

**Filename:** __03____________________ **Date:** __3/2/17______ **Time:** __3:05_pm___ **Photographer:** ___EMH____________

**Description:** __North side of site

**Filename:** __04____________________ **Date:** __3/2/17______ **Time:** __3:05_pm____ **Photographer:** ___EMH____________

**Description:** _View North of site (N directional)

**Filename:** __05____________________ **Date:** __3/2/17______ **Time:** __3:05 pm_____ **Photographer:** ___EMH____________

**Description:** _South side of site

**Filename:** __06____________________ **Date:** __2/15/17______ **Time:** __3:05_pm____ **Photographer:** ___EMH____________

**Description:** __View South of site (S directional)

**Filename:** __07____________________ **Date:** __3/2/17______ **Time:** __3:05_pm____ **Photographer:** ___EMH____________

**Description:** __West side of site

**Filename:** __08____________________ **Date:** __3/2/17______ **Time:** __3:05_pm____ **Photographer:** ___EMH____________

**Description:** __View West of site (W directional)

**Filename:** __09____________________ **Date:** __3/2/17______ **Time:** __3:05_pm____ **Photographer:** ___EMH____________

**Description:** ___East side of site

**Filename:** __10____________________ **Date:** __3/2/17______ **Time:** __3:05 pm_____ **Photographer:** ___EMH____________

**Description:** __View East of site (E directional)

Cookeville: Photo Log (2017)

001

002

003


004

005


006

007


008

009


010

# 40 CFR Part 58, Appendix E, Tables and Figures

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| $O_3$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| $SO_2$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| PM, Pb | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

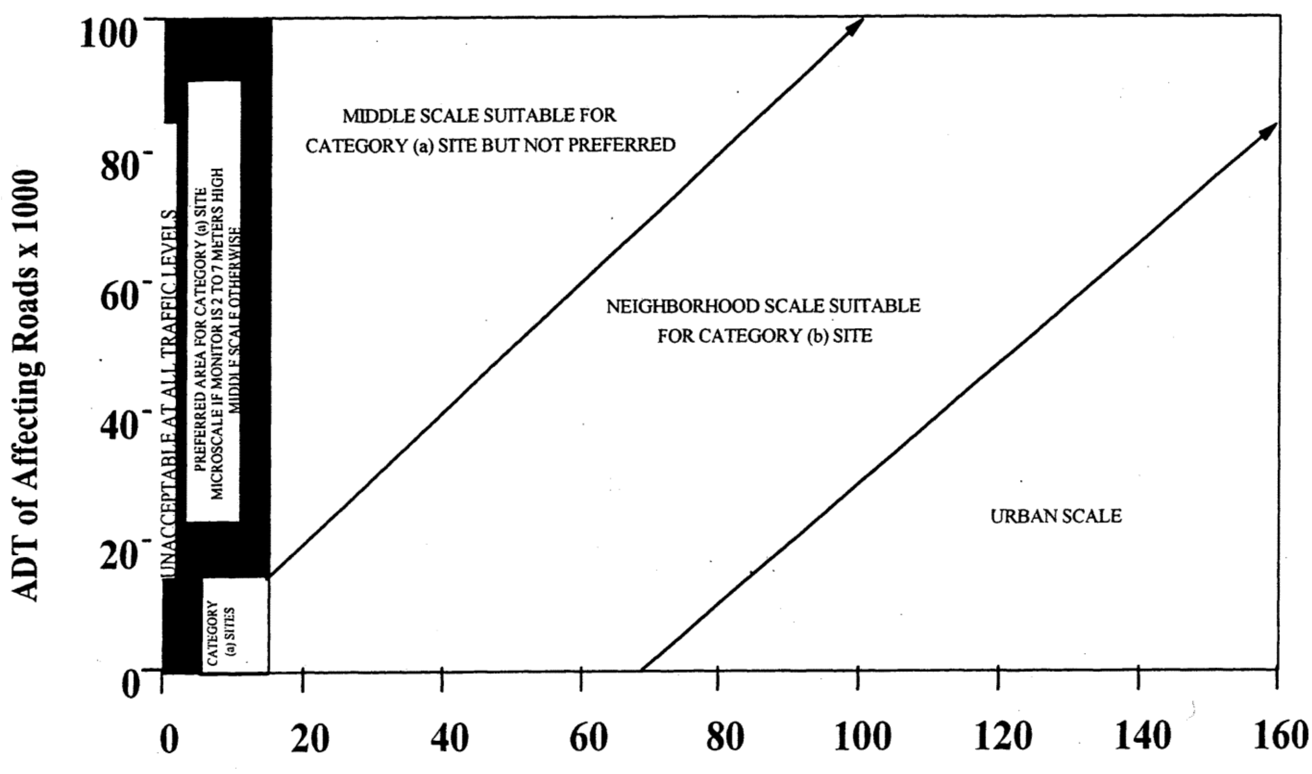



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| 1/4" Line OD / 20 Sec Residence Time | | | |
|---|---|---|---|
| **Flow Rate** | **1/8" ID** | **5/32" ID** | **3/16" ID** |
| **(liters/min)** | **feet** | **feet** | **feet** |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
| 0.6 | 82.9 | 53.0 | 36.8 |
| 0.7 | 96.7 | 61.9 | 43.0 |
| 0.8 | 110.5 | 70.7 | 49.1 |
| 0.9 | 124.3 | 79.6 | 55.3 |
| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
| 1.2 | 165.8 | 106.1 | 73.7 |
| 1.3 | 179.6 | 114.9 | 79.8 |
| 1.4 | 193.4 | 123.8 | 85.9 |
| 1.5 | 207.2 | 132.6 | 92.1 |
| 1.6 | 221.0 | 141.4 | 98.2 |
| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

**ADDITIONAL SUPPORTING INSTRUMENTATION**

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

A 4G cellular modem (Sierra Wireless RV50) provides internet communications to the BAM 1022. A US Robotics dial-up modem is used to send the ancillary data from the 2025 to the central office staff.

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**\SHELTER**
Is the shelter tied down – physically tied with hurricane straps?
Is the shelter grounded - look for rod in the ground and lead wire connection?

Type of Shelter(s) located on site:

1. **Enclosure: Y**
2. **Trailer: N**
3. **None: N**
4. **Other: Y**

What are the shelter(s) made of?

1. ______________________________
2. ______________________________
3. ______________________________
4. _2025 platform (wood) and Bam platform (plastic)____________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? Y **/ N**
Write additional comments on the shelters below:

NA______________________________

______________________________

______________________________

______________________________

# INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

**Initials:** Initials of auditor completing form.

**Date:** current date site is entered by auditor

**Reminder:** If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

**Arrival Time:** time auditors arrive at site

**Departure Time:** time auditors depart site

**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

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Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated. Some examples of items that can cause this problem are a leaking filter holder or fitting and an uncapped TTP system or sample line tee.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, $SO_2$, NO, $NO_2$, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control

**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**

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## Air Monitoring Site Evaluations
## TDEC APC

**Date: 2/16/17** **Location: Dyersburg, TN**
**AQS Number: 47-045-0004**
**Site Name: Dyersburg** **Pollutants: PM $_{2.5}$**
**Project Leader:**

---

**Print Name / Signature / Initials / Duties**

**1:** (Team Lead) _Evelyn Haskin____________________________EMH___Site Specialist_________________

**2:**______________________________________________________________________________

**3:**______________________________________________________________________________

# Air Monitoring Site Evaluation Summary

**Local Site Name:** _Dyersburg __ ___________________ **Initials:** _EMH_____ **Date:** __2/16/17____________

**Additional Comments:**

__Sunny 55 $^{o}$ __F

Electric meter: Dyersburg Electric Meter # 21103302

_Board of 2025 platform rotten; needs replacing ( 1” thick x 6” wide x 48 “ long)

Outlets, breaker box and plus are in good condition

**MONITORING SITE EVALUATION FORM (MSEF)**

**Local Site Name:** _Dyersburg_____ ____________________ **Initials:** _EMH_______ **Date:** ___2/16/17________

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present

**Arrival Time:** _2:25 pm__ **Departure Time:** _3:15 pm__ **Primary Operator:** _Brad Garrett/ Michael Cox______

**Observer(s):** ________________________________________________________________

**SITE**

[**Y**]-**Security Fence** [**Y**]-**Razor/Barb Wire** [**Y**] **Grass/Shrubs Cut** [**NA**] **Bare Soil Area**

[**N**] **Vandalism** – [□**Inside** / □**Outside**] **Date:** _______________________ [NA] **Police Report Filed**

**Issues:** ________________________________________________________________________ ______________________

**SHELTER - Interior**

**Arrival Temperature:** _NA_____ **°C** (from data logger) **Operator Site Visits:** _1-2______ per [**week** ]

[NA] **Leaking Roof** **[Damaged: □ Ceiling / □Floor / □Walls]** [NA] **Clean / Neat** [NA] **Fire Extinguisher**

[NA] **Insect / Wildlife Issues** [NA] **Thermometer** (min/max) [NA] **Gasoline** (inside shelter)

**Issues:** ____________________________________________________________ ________________________________

**MONITOR(s):** **Location:** Exterior Samplers **[□Roof / x Ground / □ Not Present]**

| **Monitor(s)** | **Manufacturer** | **Model** | **Serial Number** |
|---|---|---|---|
| PM $_{2.5}$ 2025 | R & P | 2025 | 21652 |
| PM $_{2.5}$ BAM | Met One | BAM 1022 | T21576 |
| | | | |
| | | | |
| | | | |
| | | | |

**CALIBRATOR(s):** **x Not Present** [NA] **Are QA/QC Check Gases Vented Outside Shelter?**

| **QA/QC** | **Make** | **Model** | **Serial Number** | **Certification Date** | **Expiration Date** |
|---|---|---|---|---|---|
| **NA** | | | | | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line?** **[N]** If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** _Dyersburg_______________ **Initials:** _EMH____ **Date:** __2/16/17_______

**All Gas Standards Pass thru all Filters during:** [NA] **Calibrations** (Not Required) [NA] **Precision Checks** (Required) [NA] **Audits** (Required)

**Issues:** ________NA________________________________________________________________________________

## CYLINDER GAS STANDARDS: **x Not Present**

**VENDOR:** **(PSI Reading < 200, tank is empty and should not be in service)**

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| NA | | | | | |
| | | | | | |
| | | | | | |

Issues: ________________________________________________________________________________________________

## SUPPORTING INSTRUMENTATION: Internal

[Y] **Temperature Sensor** [N] **Uninterruptable Power Supply**

**Zero Air System: Commercial System** (Make / Model): ___NA______________________________________________

**Cartridge System: [□Silica Gel □Pink / □Blue] / □x Charcoal / □Purafil / □Hopcalite / Other: __________]**

[NA] **Needs Service Last Service Date:** _______________ **Condition:** ______________________________

Issues: ________________________________________________________________________________________________

**Probe Line(s): [□Replaced / □Cleaned] – Frequency:** ___________ **Last Service Date:** __________________

[NA] **Clean** [NA] **Heated** [NA] **Insulated** [NA] **Moisture** [NA] **Retractable** [NA] **Old / Unused Lines** [NA] **Lo Flo Manifold ->** [NA] **Any Open Ports? –> How many analyzers using manifold?** _______________

Issues: ______NA________________________________________________________________________________________

**MSEF (Page 3/5): Local Site Name:** __Dyersburg ____________ **Initials:** _EMH_____ **Date:** _2/16/17________

**SHELTER – Exterior** **x Not Present**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other: __________ ________________________________]**

[**NA**] **Needs Maintenance** (specify) [**NA**] **Tied Down** [**NA**] **Electrically Grounded** [NA] **Roof Railing**

**Roof Access: [Stairs [Interior/Exterior] /** Ladder [attached/removable] **/ □ Not Present]** [NA] **Loose Decking** (Trip Hazard)

**Issues:** ________________________________________________________________________________

**Height of Roof:** ___________________**meters** **Roofing Material**: ______________________________________

**Issues:** _________________ ___________________________________________________________________

**OUTDOOR SAMPLERS** **□ Not Present**

[Y] **Locked** [Y] **Electrically Grounded** [Y] **Stabilized** [Y] **Clean Inside** [Y] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** __________________ **$PM_{10}$ Head Clean Schedule:** _Monthly__________

**Issue(s):** WINS changed once every 5 runs : VSCC monthly______________________________________________

**COLLOCATED SAMPLERS:** **x Not Present** (39.4 inches = 1 meter)

| Pollutant | Flow (Hi / Lo) | *Separation Distance (meters) |
|---|---|---|
| | | |
| | | |

*Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s): External** **x Not Present**

**Inlet Type:** [□ Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [□ Rank Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / □ Stainless Steel / Other: _________]

**Probe Line(s)**: [□ Teflon® / Other: _____________] **Probe Fitting(s)**: [□**x** Teflon® / Other: ___________ / □ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

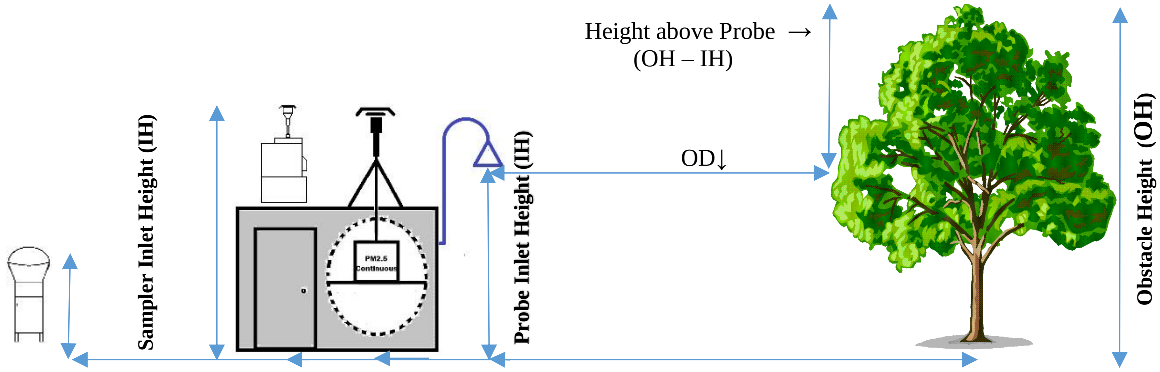
**Issue(s):** ________________________________________________________________________________

| Pollutant(s) | Inlet Height (meters) | Inlet Location (Side of Shelter, Ground, Roof) | *Horizontal Distance (meters) If Applicable | *Vertical Distance (meters) If Applicable | Monitoring SCALE | |
|---|---|---|---|---|---|---|
| | | | | | AQS | Annual Network Plan |
| $PM_{2.5}$ 2025 | 2.4 | Ground | 3.1 | | Neighborhood | Neighborhood |
| $PM_{2.5}$ BAM | 2.1 | Ground | 3.1 | | Neighborhood | Neighborhood |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MSEF (Page 4/5): Local Site Name:** _Dyersburg_________________ **Initials:** _EMH______ **Date:** _2/16/17______

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**Obstacle Distance(s) (OD)**

**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** ____________inches = _________**meters** (nearest inlet to dripline) ☐ **No Trees Present**

(39.4 inches = 1 meter) ____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ___No issues with driplines or obstacles______________________________

**Minor Sources:**

- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

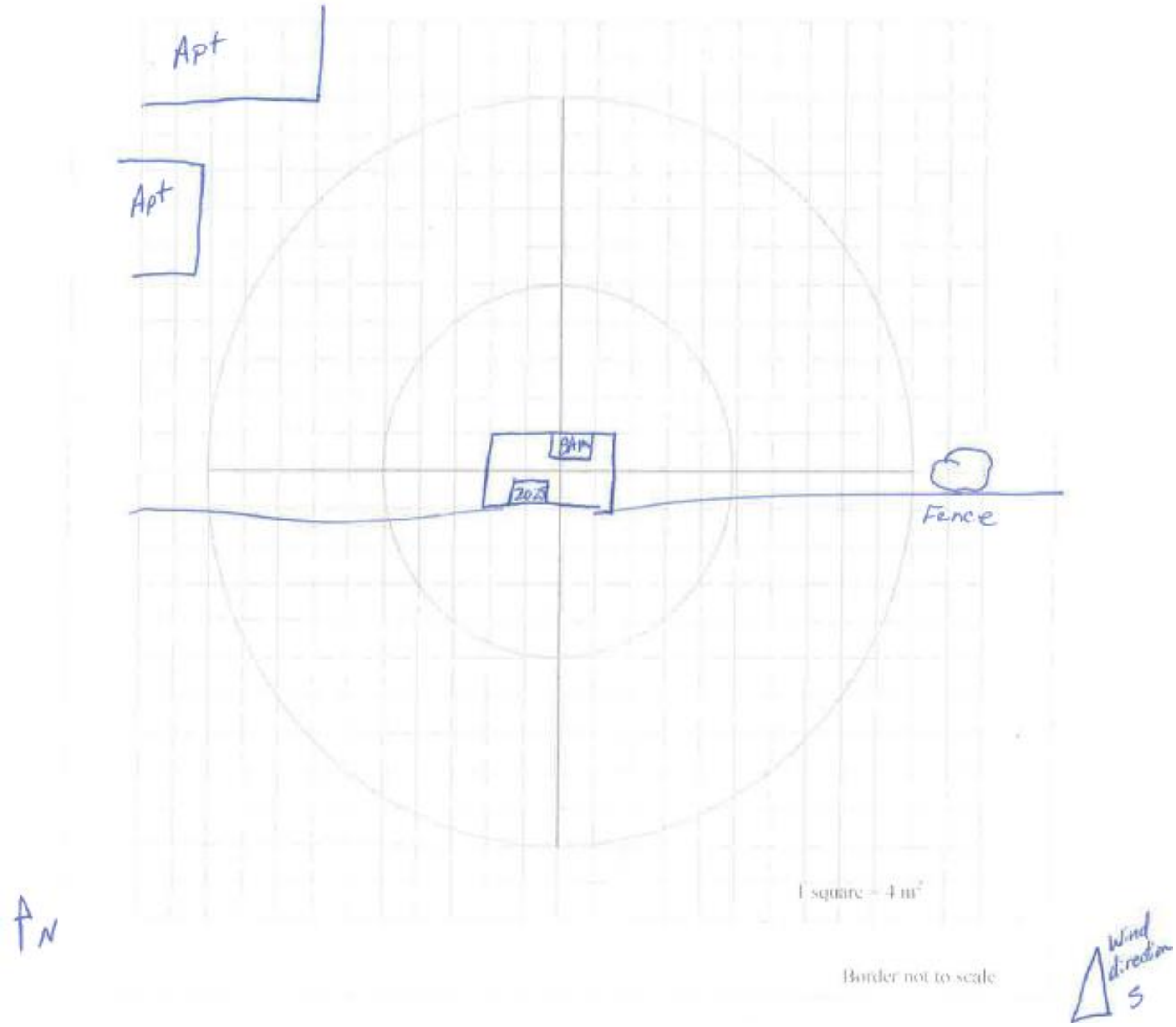
**Issues:** ___None______________________________________________

________________________________________________________________

**MSEF (Page 5/5): Local Site Name:** _Dyersburg__________ **Initials:** EMH______ **Date:** __2/16/17________

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: _>270______° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

# Additional Information:

Distance to closest road (Greenway Street) – 133.8 meters

| | Height | [2*OH – IH(2.1)] | Distance |
|---|---|---|---|
| Tree (E of site) | 10.6 m | 17.0 | 23.4 m |

# Aerial Photo with Wind Rose

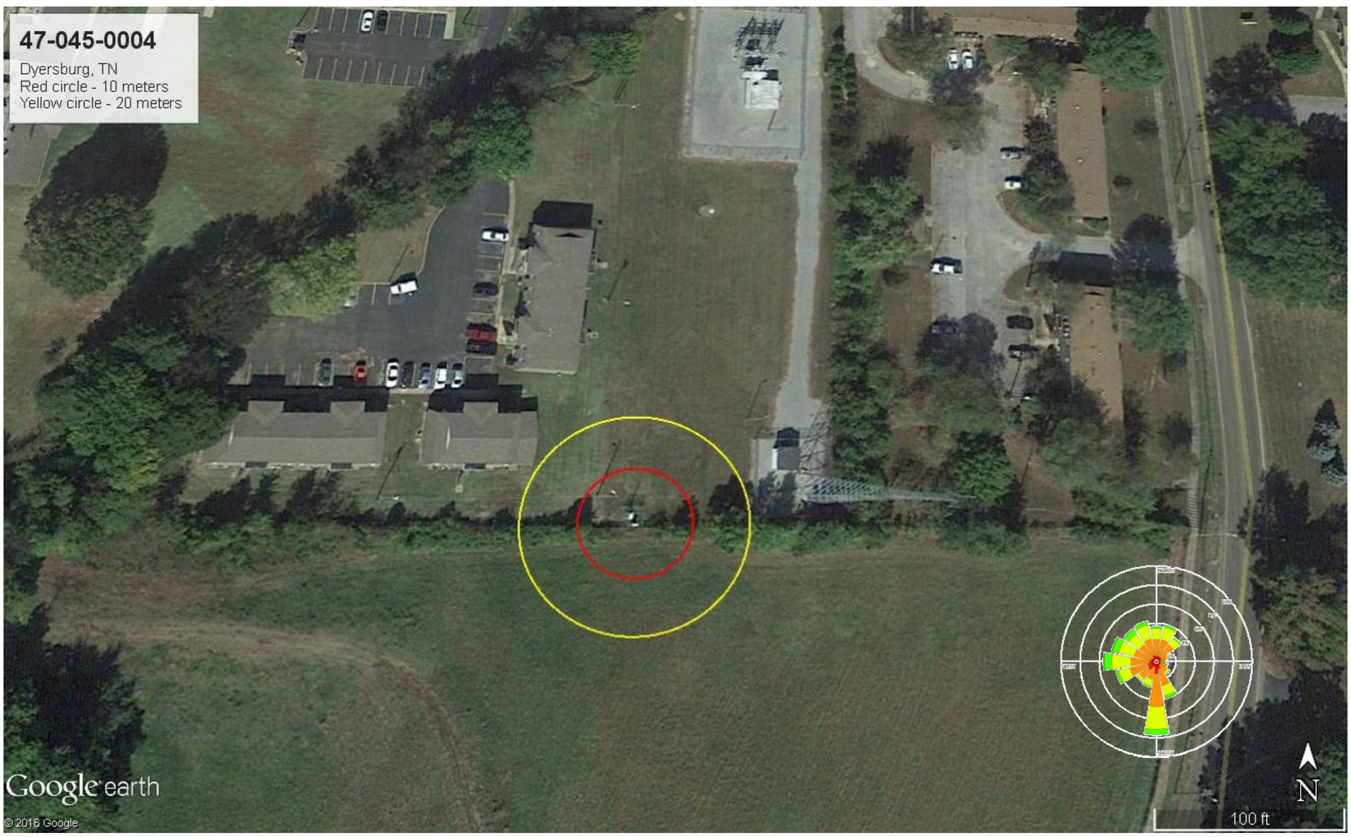


**PHOTO LOG: Local Site Name:** _Dyersburg __________ **Initials:** _EMH____ **Date**: 2/16/17________

**Camera [x APC / □ Personal – Owner:** ________________**] Make/Model:** Nikon Coolpix___________________

**Filename:** __01____________________ **Date:** __2/16/17______ **Time:** __2:55 pm____ **Photographer:** ___EMH____________

**Description:** _Site view from east direction_____

**Filename:** __02____________________ **Date:** __2/16/17______ **Time:** __2:55 pm___ **Photographer:** ___EMH____________

**Description:** __Site view from SW direction

**Filename:** __03____________________ **Date:** __2/16/17______ **Time:** __2:55 pm____ **Photographer:** ___EMH____________

**Description:** _View North of site (N directional)

**Filename:** __04____________________ **Date:** __2/16/17______ **Time:** __2:55 pm_____ **Photographer:** ___EMH____________

**Description:** _South side of site

**Filename:** __05____________________ **Date:** __2/16/17______ **Time:** __2:55 pm____ **Photographer:** ___EMH____________

**Description:** __View South of site (S directional)

**Filename:** __06____________________ **Date:** __2/16/17______ **Time:** __2:55 pm____ **Photographer:** ___EMH____________

**Description:** __West side of site

**Filename:** __07____________________ **Date:** __2/16/17______ **Time:** __2:55 pm____ **Photographer:** ___EMH____________

**Description:** __View West of site (W directional)

**Filename:** __08____________________ **Date:** __2/16/17______ **Time:** __2:55 pm____ **Photographer:** ___EMH____________

**Description:** ___East side of site

**Filename:** __09____________________ **Date:** __2/16/17______ **Time:** __2:55 pm_____ **Photographer:** ___EMH____________

**Description:** __View East of site (E directional)

Dyersburg:  Photo Log (2017)

001

002

003


004

005


006

007


008

009

# 40 CFR Part 58, Appendix E, Tables and Figures

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| **$O_3$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **$SO_2$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **PM, Pb** | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

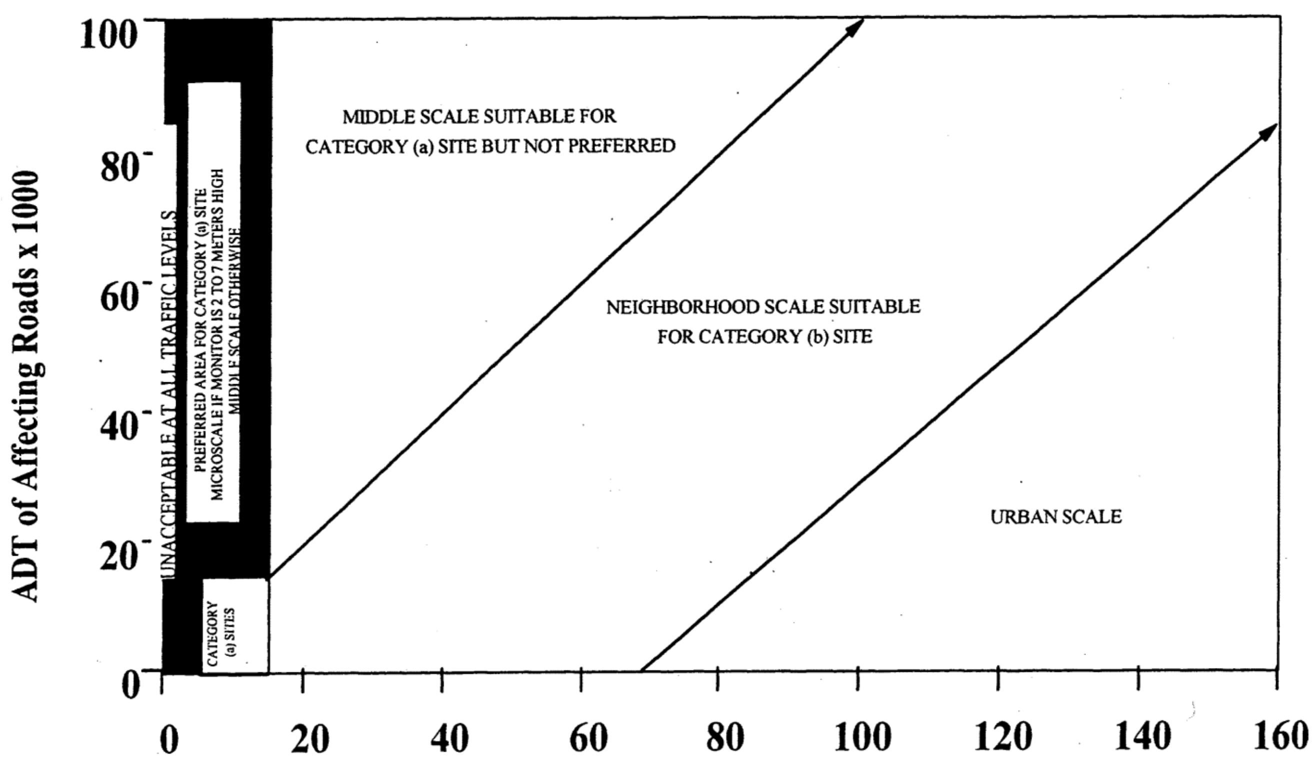



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| 1/4" Line OD / 20 Sec Residence Time | | | |
|---|---|---|---|
| **Flow Rate** | **1/8" ID** | **5/32" ID** | **3/16" ID** |
| **(liters/min)** | **feet** | **feet** | **feet** |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
| 0.6 | 82.9 | 53.0 | 36.8 |
| 0.7 | 96.7 | 61.9 | 43.0 |
| 0.8 | 110.5 | 70.7 | 49.1 |
| 0.9 | 124.3 | 79.6 | 55.3 |
| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
| 1.2 | 165.8 | 106.1 | 73.7 |
| 1.3 | 179.6 | 114.9 | 79.8 |
| 1.4 | 193.4 | 123.8 | 85.9 |
| 1.5 | 207.2 | 132.6 | 92.1 |
| 1.6 | 221.0 | 141.4 | 98.2 |
| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

**ADDITIONAL SUPPORTING INSTRUMENTATION**

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

A 4G cellular modem (Sierra Wireless RV50) provides internet communications to the BAM 1022 and to the other instruments at the site via a network switch.

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**
Is the shelter tied down – physically tied with hurricane straps?
Is the shelter grounded - look for rod in the ground and lead wire connection?

Type of Shelter(s) located on site:

1. **Enclosure: Y**
2. **Trailer: N**
3. **None: N**
4. **Other: Y**

What are the shelter(s) made of?

1. __TEOM enclosure - steel________________________________________
2. _________ ______________________________________________________
3. _______________________________________________________________
4. _Monitor platforms – wood and BAM platform - plastic________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? Y **/ N**
Write additional comments on the shelters below:
_____________________________________________NA_____________________________________________________________
___________________________________________________________________________________________________________
___________________________________________________________________________________________________________
___________________________________________________________________________________________________________

# INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

**Initials:** Initials of auditor completing form.

**Date:** current date site is entered by auditor

**Reminder:** If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

**Arrival Time:** time auditors arrive at site

**Departure Time:** time auditors depart site

**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and is specified in TDEC DAPC's QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures. Teledyne analyzers are designated FEM for a range of 5-40 °C. Therefore, TDEC DAPC keeps shelters with these monitors within this range (still keeping in mind the 2 deg SD requirement). Shelters are generally kept about 25-26 °C in the warmest months to reduce condensation in sample lines and analyzer.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites? Ants? Wasps/Bees? / Larger wildlife causing problems (such as nesting in the undercarriage or walls or digging dens near the foundation/supports)?

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:** document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated. Some examples of items that can cause this problem are a leaking filter holder or fitting and an uncapped TTP system or sample line tee.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, SO2, NO, NO2, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control

**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**

## Air Monitoring Site Evaluations
## TDEC APC

**Date: 2/23/17** **Location: Kingsport, TN**
**AQS Number: 47-163-6001**
**Site Name: Eastman Robinson** **Pollutants: $SO_2$**
**Project Leader:**

**Print Name / Signature / Initials / Duties**

**1:** (Team Lead) _Evelyn Haskin_____________________________EMH___Site Specialist_________________

**2:**_____________________________________________________________________________________

**3:**_____________________________________________________________________________________

# Air Monitoring Site Evaluation Summary

**Local Site Name:** Eastman Robinson **Initials:** EMH **Date:** 2/23/17

**Additional Comments:**

Partly sunny 57 ° F

Electric Appalachian Electric Power Meter # 428 774 544

Distance to closest road (Wilburn Dr.) – 37.5 meters

**MONITORING SITE EVALUATION FORM (MSEF)**

**Local Site Name:** _Eastman Robinson________________ **Initials:** _EMH_______ **Date:** ___2/23/17__________

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present

**Arrival Time:** _2:00 pm__ **Departure Time:** _3:15 pm__ **Primary Operator:** _Ron Wilhoite____ ___________

**Observer(s):** ______________________________________________________________

**SITE**

[ Y]-**Security Fence** [ Y]-**Razor/Barb Wire** [ NA] **Grass/Shrubs Cut** [NA ] **Bare Soil Area**

[ N] **Vandalism** – [□Inside / □Outside] **Date:** _______________________ [Y/N] **Police Report Filed**

**Issues:** ______________________________________________________________

**SHELTER - Interior**

**Arrival Temperature:** 24.5_____**°C** (from data logger) **Operator Site Visits:** _1 - 2_____ per [**week** ]

[N ] **Leaking Roof** **[Damaged: □ Ceiling / □ Floor / □ Walls]** [ Y] **Clean / Neat** [ N] **Fire Extinguisher**

[N] **Insect / Wildlife Issues** [Y ] **Thermometer** (min/max) [N ] **Gasoline** (inside shelter)

**Issues:** __________________________________ ______________________________________________

**MONITOR(s):** **Location:** Exterior Samplers **[x Roof / □ Ground / □ Not Present]**

| Monitor(s) | Manufacturer | Model | Serial Number |
|---|---|---|---|
| $SO_2$ | Teledyne | T100 | 2261 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**CALIBRATOR(s):** □ **Not Present** [Y/N] **Are QA/QC Check Gases Vented Outside Shelter?**

| QA/QC | Make | Model | Serial Number | Certification Date | Expiration Date |
|---|---|---|---|---|---|
| QC | Teledyne | T700 | 2596 | | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line? [N]** If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** _Eastman Robinson___________ **Initials:** _EMH____ **Date:** __2/23/17_______

**All Gas Standards Pass thru all Filters during:** [Y] **Calibrations** (Not Required) [Y] **Precision Checks** (Required) [Y] **Audits** (Required)

**Issues:** ______________________________________________________________________________

## CYLINDER GAS STANDARDS: **x Not Present**

**VENDOR:** **(PSI Reading < 200, tank is empty and should not be in service)**

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| QC | | | 7-7-2020 | 29.69 +/- 0.25 | FBO3900 |
| | | | | | |
| | | | | | |

Issues: ______________________________________________________________________________

## SUPPORTING INSTRUMENTATION: **Internal**

[Y] **Temperature Sensor** [N] **Uninterruptable Power Supply**

**Zero Air System: Commercial System** (Make / Model): _Teledyne T700 SN 557______________________

**Cartridge System: [□Silica Gel □Pink / □Blue] / x Charcoal / □Purafil / □Hopcalite / Other:** _Dri- rite______**]**

[N] **Needs Service Last Service Date:** _______________ **Condition:** ____________________________

Issues: ______________________________________________________________________________

**Probe Line(s): [x Replaced / □Cleaned] – Frequency:** yearly_____ **Last Service Date:** _6/9/16____________

[Y ] **Clean** [Y ] **Heated** **[** N] **Insulated** [Y ] **Moisture** [ N] **Retractable** [ N] **Old / Unused Lines** **[** N] **Lo Flo**

**Manifold ->** [ N] **Any Open Ports? –> How many analyzers using manifold?** ________________

Issues: ______________________________________________________________________________

**SHELTER – Exterior** □ **Not Present**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other:** _Aluminum_______________________________**]**

[N] **Needs Maintenance** (specify) [Y ] **Tied Down** [Y ] **Electrically Grounded** [ N] **Roof Railing**

**Roof Access: [**Stairs [Interior/Exterior] **/** Ladder [attached/removable] **/ x Not Present]** [ N] **Loose Decking** (Trip Hazard)

**Issues:** ______________________________________________________________________________

**Height of Roof:** __2.4_____________**meters** **Roofing Material**: ___Aluminum ___________________________

**Issues:** ______________________________________________________________________________

**OUTDOOR SAMPLERS** **x Not Present**

[Y/N] **Locked** [Y/N] **Electrically Grounded** [Y/N] **Stabilized** [Y/N] **Clean Inside** [Y/N] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** _________________ **$PM_{10}$ Head Clean Schedule:** __________________

**Issue(s):** ______________________________________________________________________________

**COLLOCATED SAMPLERS: x Not Present** (39.4 inches = 1 meter)

| **Pollutant** | **Flow (Hi / Lo)** | ***Separation Distance (meters)** |
|---|---|---|
| | | |
| | | |

*Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s): External** □ **Not Present**

**Inlet Type:** [**x**Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [**x** Rain Shield / □Part of Probe] **Funnel Material**: [□Teflon® / **x** Glass / □ Stainless Steel / Other: _________]

**Probe Line(s)**: [**x** Teflon® / Other: _____________] **Probe Fitting(s)**: [**x** Teflon® / Other: ___________ / □ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

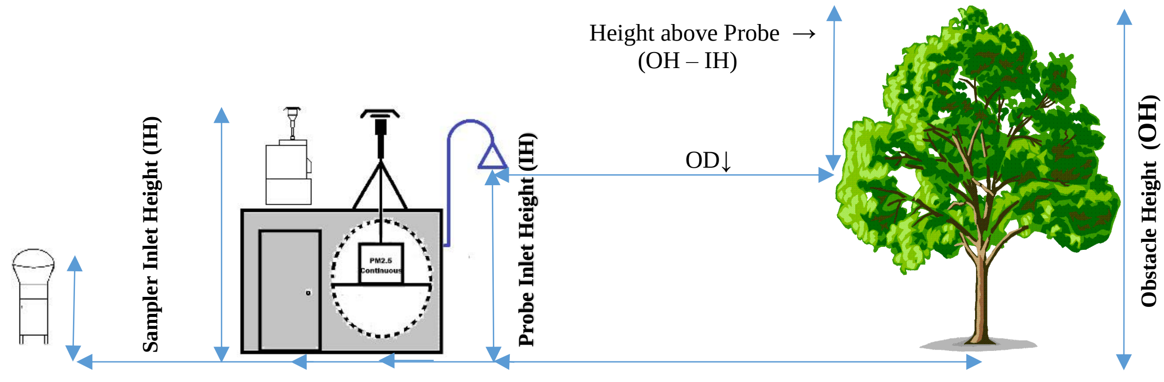
**Issue(s):** ______________________________________________________________________________

| **Pollutant(s)** | **Inlet Height (meters)** | **Inlet Location (Side of Shelter, Ground, Roof)** | ***Horizontal Distance (meters)** If Applicable | ***Vertical Distance (meters)** If Applicable | **Monitoring SCALE** | |
|---|---|---|---|---|---|---|
| | | | | | **AQS** | **Annual Network Plan** |
| $SO_2$ | 3.4 | Side of shelter | | | Neighborhood | Neighborhood |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MSEF (Page 4/5): Local Site Name:** _Eastman Robinson________ **Initials:** _EMH______ **Date:** _2/23/17_____

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** _____________inches = __________**meters** (nearest inlet to dripline) □ **No Trees Present**

(39.4 inches = 1 meter) _____________inches = __________**meters** (nearest inlet to dripline) ☐ Not Present

_____________inches = __________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ____No issues with driplines or obstacles__________________________________

**Minor Sources:**

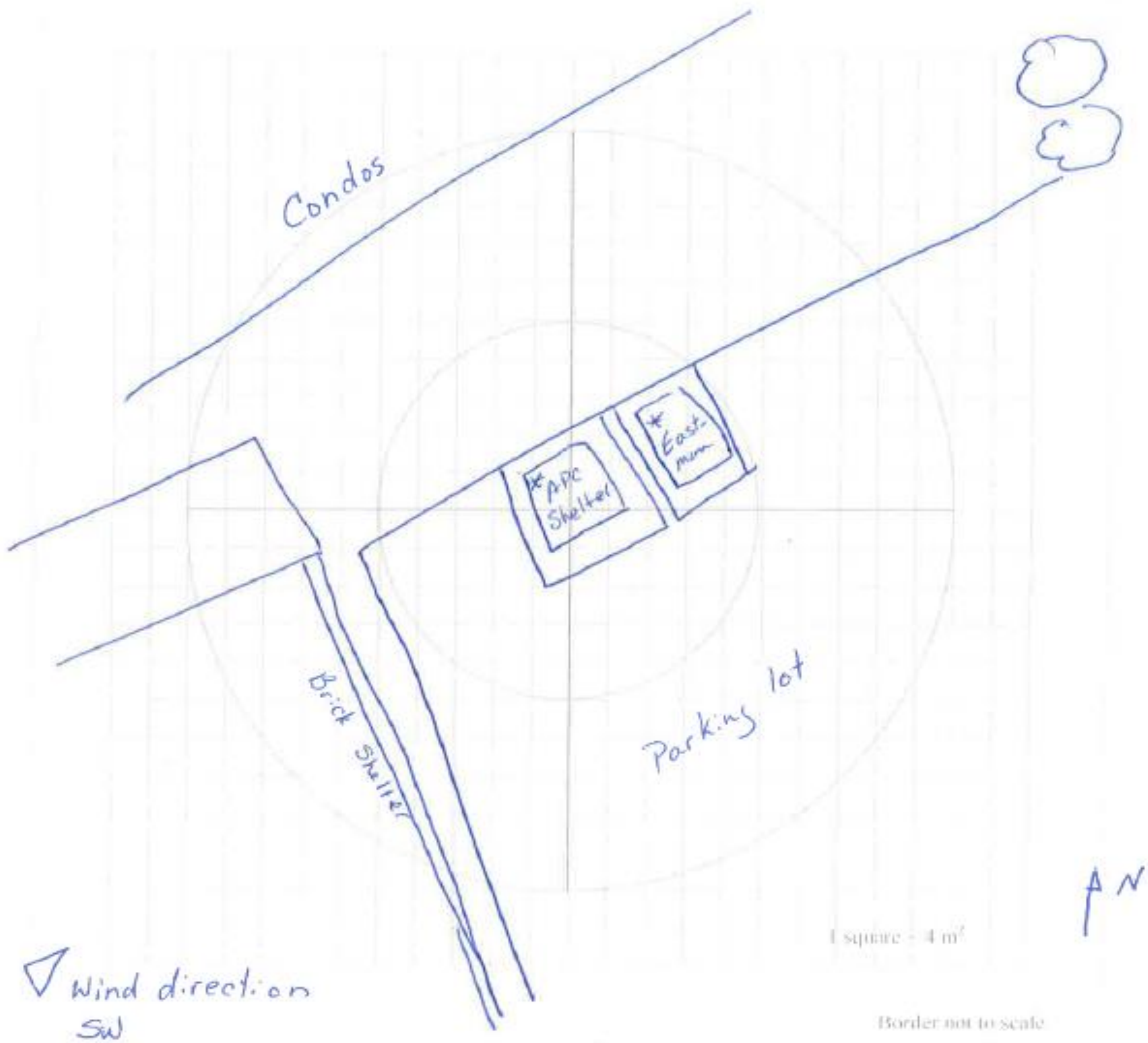
- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

**Issues:** ___Several chimneys are located SW of site and have not been active in over 20 plus years________________________

**MSEF (Page 5/5): Local Site Name:** _Eastman Robinson_______ **Initials:** EMH______ **Date:** __2/23/17________

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: _>270______° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

# Additional Information:

Distance between DAPC SO2 probe and nearest Eastman inlet is 5.5 meters

# Aerial Photo with Wind Rose

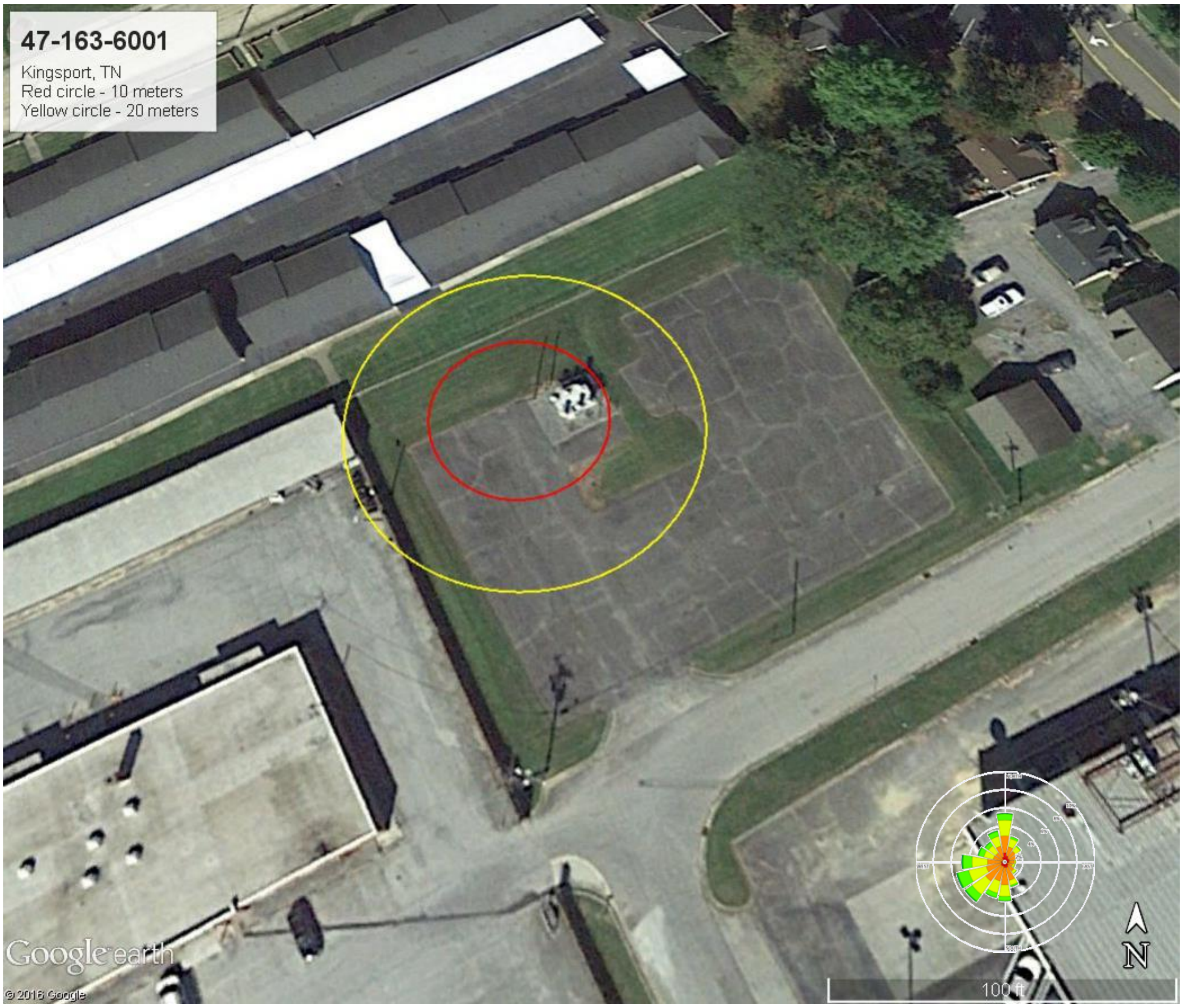


**PHOTO LOG: Local Site Name:** _Eastman Robinson_________ **Initials:** _EMH____ **Date**: 2/23/17________

**Camera [x APC / □ Personal – Owner: ________________] Make/Model:** Nikon Coolpix___________________

**Filename:** __01____________________ **Date:** __2/23/17______ **Time:** __2:31 _pm___ **Photographer:** ___EMH____________

**Description:** _Site view from south direction_____

**Filename:** ___02__________________ **Date:** __2/23/17______ **Time:** _2:31 _pm ____ **Photographer:** ___EMH____________

**Description:** _Site view from SE direction

**Filename:** __03____________________ **Date:** __2/23/17______ **Time:** __2:31 _pm __ **Photographer:** ___EMH____________

**Description:** __North side of site

**Filename:** __04____________________ **Date:** __2/23/17______ **Time:** __2:31 _pm ___ **Photographer:** ___EMH____________

**Description:** _View North of site (N directional)

**Filename:** __05____________________ **Date:** __2/23/17______ **Time:** __2:31 _pm ___ **Photographer:** ___EMH____________

**Description:** _South side of site

**Filename:** __06____________________ **Date:** __2/23/17______ **Time:** __2:31 _pm _____ **Photographer:** ___EMH____________

**Description:** __View South of site (S directional)

**Filename:** __07____________________ **Date:** __2/23/17______ **Time:** 2:31 _pm ______ **Photographer:** ___EMH____________

**Description:** __West side of site

**Filename:** __08____________________ **Date:** __2/23/17______ **Time:** 2:31 _pm _____ **Photographer:** ___EMH____________

**Description:** __View West of site (W directional)

**Filename:** __09____________________ **Date:** __2/23/17______ **Time:** 2:31 _pm ______ **Photographer:** ___EMH____________

**Description:** ___East side of site

**Filename:** __10____________________ **Date:** __2/23/17______ **Time:** 2:31 _pm ______ **Photographer:** ___EMH____________

**Description:** __View East of site (E directional)

001


002

003


004

005


006

007


008

009


010

# 40 CFR Part 58, Appendix E, Tables and Figures

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1,2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| **$O_3$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **$SO_2$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **PM, Pb** | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

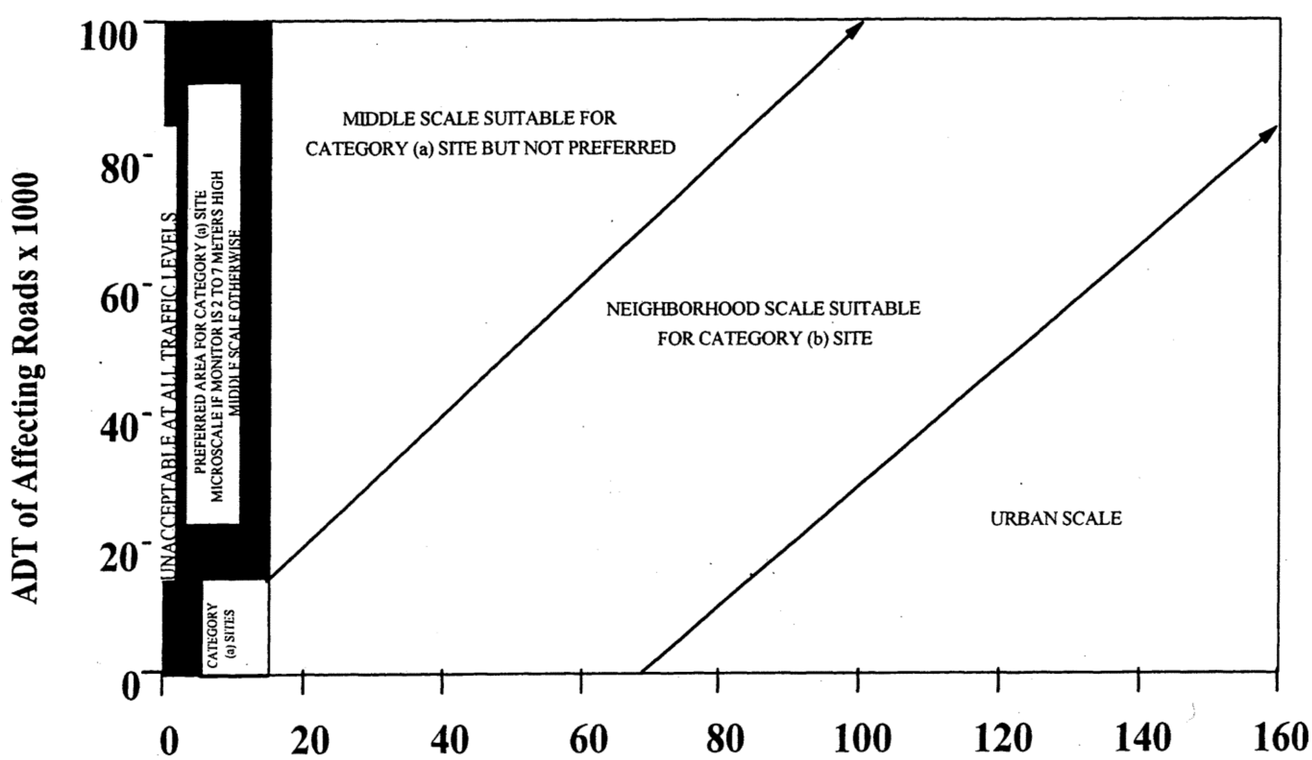



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| 1/4" Line OD / 20 Sec Residence Time | | | |
|---|---|---|---|
| **Flow Rate** | **1/8" ID** | **5/32" ID** | **3/16" ID** |
| **(liters/min)** | **feet** | **feet** | **feet** |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
| 0.6 | 82.9 | 53.0 | 36.8 |
| 0.7 | 96.7 | 61.9 | 43.0 |
| 0.8 | 110.5 | 70.7 | 49.1 |
| 0.9 | 124.3 | 79.6 | 55.3 |
| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
| 1.2 | 165.8 | 106.1 | 73.7 |
| 1.3 | 179.6 | 114.9 | 79.8 |
| 1.4 | 193.4 | 123.8 | 85.9 |
| 1.5 | 207.2 | 132.6 | 92.1 |
| 1.6 | 221.0 | 141.4 | 98.2 |
| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

**ADDITIONAL SUPPORTING INSTRUMENTATION**

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

The site uses an ESC 8832 and ESC 8872 data logger to collect data. Local internet company (Charter) provides internet communications to the data loggers at the site via a network switch.

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**

Is the shelter tied down – physically tied with hurricane straps?
Is the shelter grounded - look for rod in the ground and lead wire connection?

Type of Shelter(s) located on site:

1. **Enclosure: N**
2. **Trailer: Y**
3. **None: N**
4. **Other: N**

What are the shelter(s) made of?

1. ________________________________________
2. _Aluminum_________________________________
3. ________________________________________
4. ________________________________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **Y / N**
Write additional comments on the shelters below:

Shelter is new

# INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

**Initials:** Initials of auditor completing form.

**Date:** current date site is entered by auditor

**Reminder:** If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

**Arrival Time:** time auditors arrive at site

**Departure Time:** time auditors depart site

**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and is specified in TDEC DAPC's QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures. Teledyne analyzers are designated FEM for a range of 5-40 °C. Therefore, TDEC DAPC keeps shelters with these monitors within this range (still keeping in mind the 2 deg SD requirement). Shelters are generally kept about 25-26 °C in the warmest months to reduce condensation in sample lines and analyzer.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites? Ants? Wasps/Bees? / Larger wildlife causing problems (such as nesting in the undercarriage or walls or digging dens near the foundation/supports)?

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:** document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated. Some examples of items that can cause this problem are a leaking filter holder or fitting and an uncapped TTP system or sample line tee.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, SO2, NO, NO2, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control

**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**

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## Air Monitoring Site Evaluations
## TDEC APC

**Date: 2/23/17** **Location: Kingsport, TN**
**AQS Number: 47-163-6002**
**Site Name: Eastman Skyland** **Pollutants: $SO_2$**
**Project Leader:**

---

**Print Name / Signature / Initials / Duties**

**1:** (Team Lead) _Evelyn Haskin_____________________________EMH___Site Specialist_________________

**2:**_____________________________________________________________________________________

**3:**_____________________________________________________________________________________

# Air Monitoring Site Evaluation Summary

**Local Site Name:** Eastman Skyland **Initials:** EMH **Date:** 2/23/17

**Additional Comments:**

Partly Cloudy 47 °F

Electric Appalachian Electric Power Meter # 533 687 673

Distance to closest road (Bagwell St) – 22.1 meters (measured using Google Earth Pro)

**MONITORING SITE EVALUATION FORM (MSEF)**

**Local Site Name:** _Eastman Skyland________________ **Initials:** _EMH_______ **Date:** ___2/23/17__________

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present

**Arrival Time:** _10:45 am__ **Departure Time:** _11:50 am__ **Primary Operator:** _Ron Wilhoit____ ___________

**Observer(s):** ____________________________________________________________

**SITE**

[Y]-**Security Fence** [Y]-**Razor/Barb Wire** [Y] **Grass/Shrubs Cut** [NA ] **Bare Soil Area**

[N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** _______________________ [N] **Police Report Filed**

**Issues:** ______________________________________________________________________________

**SHELTER - Interior**

**Arrival Temperature:** 25.0_____**°C** (from data logger) **Operator Site Visits:** _1 - 2______ per [**week** | month | __________]

[N] **Leaking Roof** **[Damaged: □ Ceiling / □ Floor / □ Walls]** [ Y] **Clean / Neat** [ N] **Fire Extinguisher**

[Y ] **Insect / Wildlife Issues** [Y ] **Thermometer** (min/max) [N ] **Gasoline** (inside shelter)

**Issues:** ______________________________________________________________________________

**MONITOR(s):** **Location:** Exterior Samplers **[x Roof / □ Ground / □ Not Present]**

| Monitor(s) | Manufacturer | Model | Serial Number |
|---|---|---|---|
| $SO_2$ | Teledyne | 100E | 3460 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**CALIBRATOR(s):** □ **Not Present** [Y] **Are QA/QC Check Gases Vented Outside Shelter?**

| QA/QC | Make | Model | Serial Number | Certification Date | Expiration Date |
|---|---|---|---|---|---|
| QC | Teledyne | T700 | 488 | | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line?** **[N]** If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** _Eastman Skyland___________ **Initials:** _EMH____ **Date:** __2/23/17_______

**All Gas Standards Pass thru all Filters during:** [Y] **Calibrations** (Not Required) [Y] **Precision Checks** (Required) [Y] **Audits** (Required)

**Issues:** ________________________________________________________________

## CYLINDER GAS STANDARDS:

□ **Not Present**

**VENDOR:**

**(PSI Reading < 200, tank is empty and should not be in service)**

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| QC | | | 2-21-2020 | 30.2 +/- 0.3 | FBO3900 |
| | | | | | |
| | | | | | |

Issues: ________________________________________________________________

## SUPPORTING INSTRUMENTATION: Internal

[Y] **Temperature Sensor** [N] **Uninterruptable Power Supply**

**Zero Air System: Commercial System** (Make / Model): _Teledyne T701 SN 556________________________

**Cartridge System: [□Silica Gel □Pink / □Blue] / x Charcoal / □Purafil / □Hopcalite / Other:** _Dri- rite______**]**

[N] **Needs Service Last Service Date:** _______________ **Condition:** ____________________________

Issues: ________________________________________________________________

**Probe Line(s): [x Replaced / □Cleaned] – Frequency:** _yearly______ **Last Service Date:** _8/19/16_________

[Y ] **Clean** [Y ] **Heated** [ N] **Insulated** [Y ] **Moisture** [ N] **Retractable** [ N] **Old / Unused Lines** [ N] **Lo Flo**

**Manifold ->** [ N] **Any Open Ports? –> How many analyzers using manifold?** ________________

Issues: ________________________________________________________________

**MSEF (Page 3/5): Local Site Name:** __Eastman Skyland_________ **Initials:** _EMH_____ **Date:** _2/23/17_____

**SHELTER – Exterior** □ **Not Present**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other:** _Concrete Block______________________________**]**

[**N** ] **Needs Maintenance** (specify) [**N** ] **Tied Down** [**Y** ] **Electrically Grounded** [ **Y**] **Roof Railing**

**Roof Access: [**Stairs [Interior/**Exterior**] **/** Ladder [attached/removable] **/** □ **Not Present]** [ **N**] **Loose Decking** (Trip Hazard)

**Issues:** ________________________________________________________________________________

**Height of Roof:** ___________________**meters** **Roofing Material**: ________________________________________

**Issues:** ________________________________________________________________________________

**OUTDOOR SAMPLERS** **x Not Present**

[Y/N] **Locked** [Y/N] **Electrically Grounded** [Y/N] **Stabilized** [Y/N] **Clean Inside** [Y/N] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** _________________ **$PM_{10}$ Head Clean Schedule:** _________________

**Issue(s):** ________________________________________________________________________________

**COLLOCATED SAMPLERS:** **x Not Present** (39.4 inches = 1 meter)

| Pollutant | Flow (Hi / Lo) | *Separation Distance (meters) |
|---|---|---|
| | | |
| | | |

*Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s): External** □ **Not Present**

**Inlet Type:** [**x** Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [**x** Rain Shield / □Part of Probe] **Funnel Material**: [□Teflon® / **x** Glass / □ Stainless Steel / Other: _________]

**Probe Line(s)**: [**x** Teflon® / Other: _____________] **Probe Fitting(s)**: [**x** Teflon® / Other: ___________ / □ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

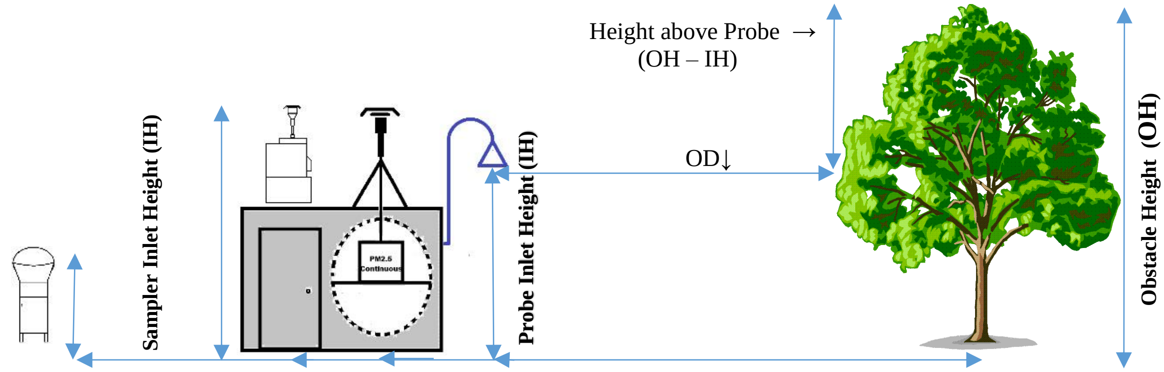
**Issue(s):** ________________________________________________________________________________

| Pollutant(s) | Inlet Height (meters) | Inlet Location (Side of Shelter, Ground, Roof) | *Horizontal Distance (meters) If Applicable | *Vertical Distance (meters) If Applicable | Monitoring SCALE | |
|---|---|---|---|---|---|---|
| | | | | | AQS | Annual Network Plan |
| $SO_2$ | 12.2 | Ground | | | Neighborhood | Neighborhood |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MSEF (Page 4/5): Local Site Name:** _Eastman Skyland________ **Initials:** _EMH______ **Date:** _2/23/17_____

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**Obstacle Distance(s) (OD)**

**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** ____________inches = _________**meters** (nearest inlet to dripline) □ **No Trees Present**

(39.4 inches = 1 meter) ____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ____No issues with driplines or obstacles______________________________

**Minor Sources:**

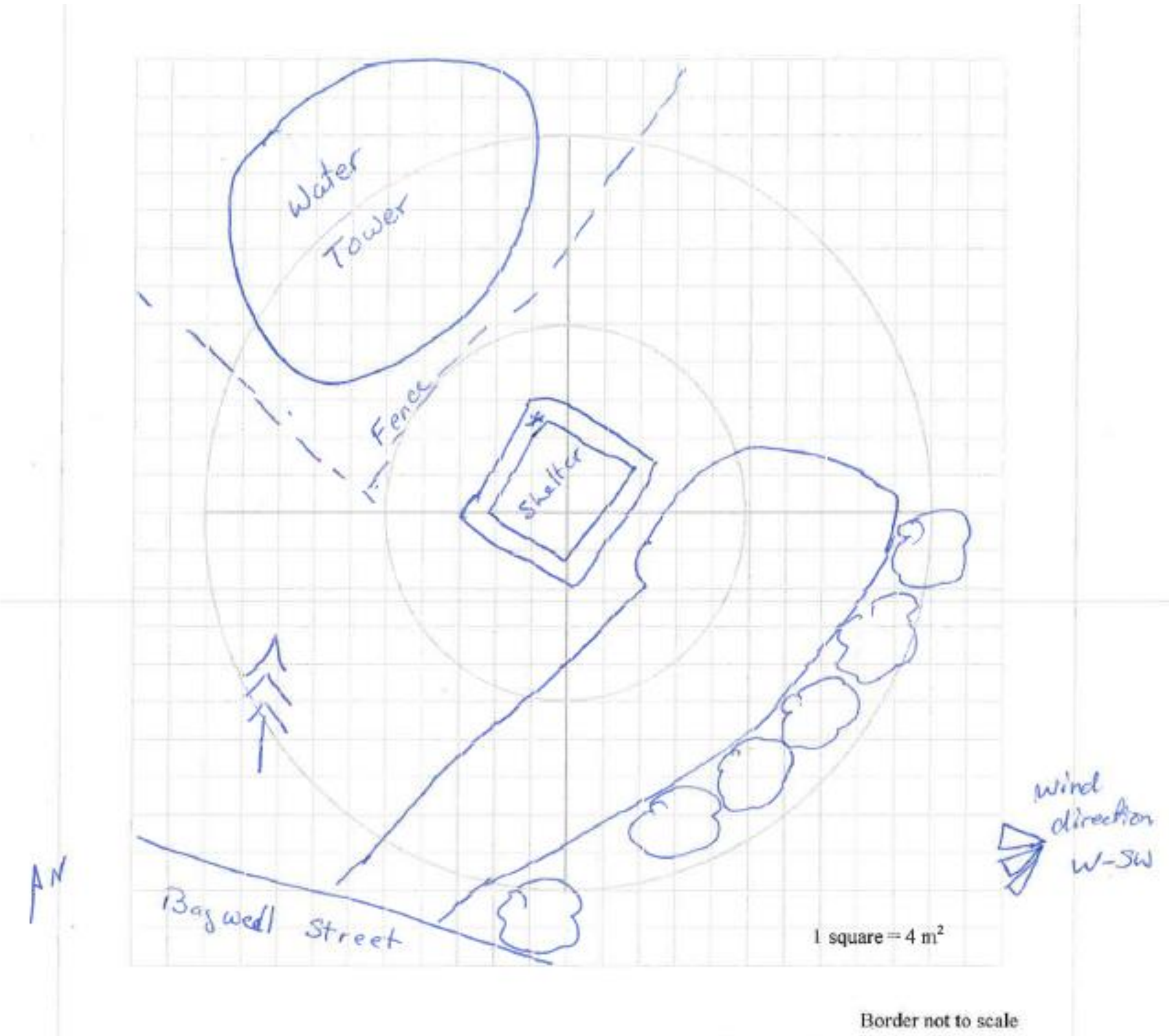
- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

**Issues:** _None_________________________________________________

**MSEF (Page 5/5): Local Site Name:** _Eastman Skyland`_______ **Initials:** EMH______ **Date:** __2/23/17________

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: _>270______° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

## Additional Information:

| | Height | [2* OH – IH (12.2)] | Distance |
|---|---|---|---|
| Water Tower | 18.0 | 11.6 | 12.4 |
| Tree (W) | 9.8 | ----- | 24.4 |
| Tree (S) | 11.4 | ----- | 23.6 |
| Trees (E) | 18.0 | 11.6 | 20.4 |

## Aerial Photo with Wind Rose

**PHOTO LOG: Local Site Name:** _Eastman Skyland_________ **Initials:** _EMH____ **Date**: 2/23/17________

**Camera [x APC / □ Personal – Owner:** _______________**] Make/Model:** Nikon Coolpix___________________

**Filename:** __01___________________ **Date:** __2/23/17______ **Time:** __11:20 _am___ **Photographer:** ___EMH____________

**Description:** _Site view from south direction_____________________________________________________________________

**Filename:** ___02__________________ **Date:** __2/23/17______ **Time:** _11:20 _am ____ **Photographer:** ___EMH____________

**Description:** _Site view from east direction_______________________________________________________________________

**Filename:** __03___________________ **Date:** __2/23/17______ **Time:** __11:20 _am __ **Photographer:** ___EMH____________

**Description:** __North side of site______________________________________________________________________________

**Filename:** __04___________________ **Date:** __2/23/17______ **Time:** __11:20 _am ___ **Photographer:** ___EMH____________

**Description:** _View North of site (N directional)________________________________________________________________

**Filename:** __05___________________ **Date:** __2/23/17______ **Time:** __11:20 _am ___ **Photographer:** ___EMH____________

**Description:** _South side of site_______________________________________________________________________________

**Filename:** __06___________________ **Date:** __2/23/17______ **Time:** __11:20 _am _____ **Photographer:** ___EMH____________

**Description:** __View South of site (S directional)_______________________________________________________________

**Filename:** __07___________________ **Date:** __2/23/17______ **Time:** 11:20 _am ______ **Photographer:** ___EMH____________

**Description:** __West side of site_______________________________________________________________________________

**Filename:** __08___________________ **Date:** __2/23/17______ **Time:** 11:20 _am _____ **Photographer:** ___EMH____________

**Description:** __View West of site (W directional)________________________________________________________________

**Filename:** __09___________________ **Date:** __2/23/17______ **Time:** 11:20 _am ______ **Photographer:** ___EMH____________

**Description:** ___East side of site_______________________________________________________________________________

**Filename:** __10___________________ **Date:** __2/23/17______ **Time:** 11:20 _am ______ **Photographer:** ___EMH____________

**Description:** __View East of site (E directional)__________________________________________________________________

Eastman Skyland: Photo Log (2017)

001

002

003


004

005

006

007


008

009


010

# 40 CFR Part 58, Appendix E, Tables and Figures

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| **$O_3$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **$SO_2$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **PM, Pb** | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

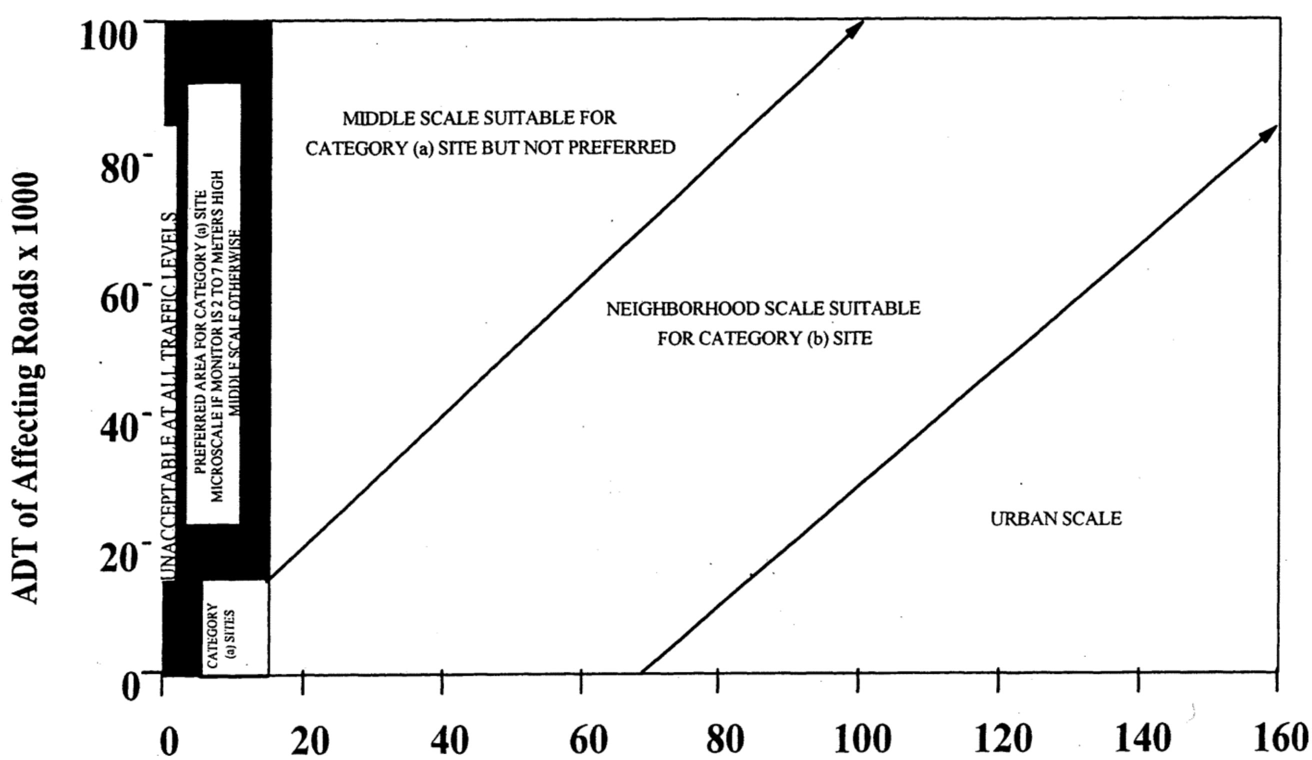



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼” OD tubing at given flow rate - using a 20 second residence time. The ID’s shown are for thick (1/8”), intermediate (5/32”) and thin (3/16”) wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| 1/4" Line OD / 20 Sec Residence Time | | | |
|---|---|---|---|
| **Flow Rate** | **1/8" ID** | **5/32" ID** | **3/16" ID** |
| **(liters/min)** | **feet** | **feet** | **feet** |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
| 0.6 | 82.9 | 53.0 | 36.8 |
| 0.7 | 96.7 | 61.9 | 43.0 |
| 0.8 | 110.5 | 70.7 | 49.1 |
| 0.9 | 124.3 | 79.6 | 55.3 |
| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
| 1.2 | 165.8 | 106.1 | 73.7 |
| 1.3 | 179.6 | 114.9 | 79.8 |
| 1.4 | 193.4 | 123.8 | 85.9 |
| 1.5 | 207.2 | 132.6 | 92.1 |
| 1.6 | 221.0 | 141.4 | 98.2 |
| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

**ADDITIONAL SUPPORTING INSTRUMENTATION**

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

The site uses an ESC 8832 and ESC 8872 data logger to collect data. Local internet company (Century Link) provides internet communications to the data loggers via a network switch.

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**

Is the shelter tied down – physically tied with hurricane straps?
Is the shelter grounded - look for rod in the ground and lead wire connection?

Type of Shelter(s) located on site:

1. **Enclosure: Y**
2. **Trailer: N**
3. **None: N**
4. **Other: N**

What are the shelter(s) made of?

1. ________________________________________
2. ________________________________________
3. ________________________________________
4. Concrete block

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **Y / N**
Write additional comments on the shelters below:
None

# INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

**Initials:** Initials of auditor completing form.

**Date:** current date site is entered by auditor

**Reminder:** If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

**Arrival Time:** time auditors arrive at site

**Departure Time:** time auditors depart site

**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and is specified in TDEC DAPC's QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures. Teledyne analyzers are designated FEM for a range of 5-40 °C. Therefore, TDEC DAPC keeps shelters with these monitors within this range (still keeping in mind the 2 deg SD requirement). Shelters are generally kept about 25-26 °C in the warmest months to reduce condensation in sample lines and analyzer.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites? Ants? Wasps/Bees? / Larger wildlife causing problems (such as nesting in the undercarriage or walls or digging dens near the foundation/supports)?

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:** document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated. Some examples of items that can cause this problem are a leaking filter holder or fitting and an uncapped TTP system or sample line tee.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, SO2, NO, NO2, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control

**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**

## Air Monitoring Site Evaluations
## TDEC APC

**Date: 2/23/17** **Location: Bristol, TN**
**AQS Number: 47-163-3004**
**Site Name: Exide** **Pollutants: Pb**
**Project Leader:**

**Print Name / Signature / Initials / Duties**

**1:** (Team Lead) _Evelyn Haskin____________________________EMH___Site Specialist_________________

**2:**______________________________________________________________________________

**3:**______________________________________________________________________________

# Air Monitoring Site Evaluation Summary

**Local Site Name:** _Exide_______________________________ **Initials:** _EMH_____ **Date:** __2/23/17____________

**Additional Comments:**

__Partly Cloudy   47$^{o}$ F

Electricity provided by the Exide platform on the other side of fence

Lead monitors are 5.8 meters (measured by measuring wheel) to the closest road (Edison Circle, which circles the plant, minimum traffic on this road)

**MONITORING SITE EVALUATION FORM (MSEF)**

**Local Site Name:** _Exide___ ___________________ **Initials:** _EMH_______ **Date:** ___2/23/17________

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present **[N] Completed**

**Arrival Time:** _9:15 am__ **Departure Time:** _10:00 am__ **Primary Operator:** _Candace Justice_______ ______

**Observer(s):** ________________________________________________

**SITE**

[N]-**Security Fence** [N]-**Razor/Barb Wire** [Y] **Grass/Shrubs Cut** [NA] **Bare Soil Area**

[N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** _______________________ [NA] **Police Report Filed**

**Issues:** _Site is located by road outside plant property___________________________________

**SHELTER - Interior**

**Arrival Temperature:** NA_____**°C** (from data logger) **Operator Site Visits:** _1 or 2_____ per [**week** ]

[NA] **Leaking Roof** **[Damaged: □ Ceiling / □Floor / □Walls]** [NA] **Clean / Neat** [NA] **Fire Extinguisher**

[NA] **Insect / Wildlife Issues** [NA] **Thermometer** (min/max) [NA] **Gasoline** (inside shelter)

**Issues:** __None_______________________________________ ______________________________

**MONITOR(s):** **Location:** Exterior Samplers **[□Roof / x Ground / □ Not Present]**

| Monitor(s) | Manufacturer | Model | Serial Number |
|---|---|---|---|
| Pb (Poc 1) | Tisch | TE-303 | 1110 |
| Pb (Poc 2) | Unknown | Unknown | Unknown |
| | | | |
| | | | |
| | | | |
| | | | |

**CALIBRATOR(s):** x **Not Present** [NA] **Are QA/QC Check Gases Vented Outside Shelter?**

| QA/QC | Make | Model | Serial Number | Certification Date | Expiration Date |
|---|---|---|---|---|---|
| NA | | | | | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line? [N]** If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** _Exide____________________ **Initials:** _EMH____ **Date:** __2/23/17_______

**All Gas Standards Pass thru all Filters during:** [NA] **Calibrations** (Not Required) [NA] **Precision Checks** (Required) [NA] **Audits** (Required)

**Issues:** ___NA_______________________________________________________________________________

**CYLINDER GAS STANDARDS:** **x Not Present**

**VENDOR:** **(PSI Reading < 200, tank is empty and should not be in service)**

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| NA | | | | | |
| | | | | | |
| | | | | | |

Issues: ____________________________________________________________________________________

**SUPPORTING INSTRUMENTATION: Internal**

[NA] **Temperature Sensor** [N] **Uninterruptable Power Supply**

**Zero Air System: Commercial System** (Make / Model): ___NA______________________________________________

**Cartridge System: [□Silica Gel □**Pink / □**Blue**] / □ **Charcoal** / □**Purafil** / □**Hopcalite** / **Other: __________]**

[NA] **Needs Service** **Last Service Date:** _______________ **Condition:** ____________________________

Issues: ____________________________________________________________________________________

**Probe Line(s): [□Replaced / □Cleaned] – Frequency: ___________ Last Service Date: __________________**

[NA] **Clean** [NA] **Heated** [NA] **Insulated** [NA] **Moisture** [NA] **Retractable** [NA] **Old / Unused Lines** [NA] **Lo Flo Manifold ->** [NA] **Any Open Ports?** **–> How many analyzers using manifold? _______________**

Issues: ______NA_____________________________________________________________________________

**MSEF (Page 3/5): Local Site Name:** __Exide____ ____________ **Initials:** _EMH_____ **Date:** _2/23/17________

**SHELTER – Exterior** **x Not Present**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other: __________ _________________________________]**

[**NA**] **Needs Maintenance** (specify) [**NA**] **Tied Down** [**NA**] **Electrically Grounded** [NA] **Roof Railing**

**Roof Access: [Stairs [Interior/Exterior] /** Ladder [attached/removable] **/ □ Not Present]** [NA] **Loose Decking** (Trip Hazard)

**Issues:** ______________________________________________________________________________________________

**Height of Roof:** __ _______________**meters** **Roofing Material**: ______________________________________

**Issues:** _________________ ____________________________________________________________________

**OUTDOOR SAMPLERS** **□ Not Present**

[**Y**] **Locked** [**Y**] **Electrically Grounded** [**Y**] **Stabilized** [**Y**] **Clean Inside** [**Y**] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** _________________ **$PM_{10}$ Head Clean Schedule:** ______________

**Issue(s):** ___**None**_____________________________________________________________________________

**COLLOCATED SAMPLERS:** **□ Not Present** (39.4 inches = 1 meter)

| Pollutant | Flow (Hi / Lo) | *Separation Distance (meters) |
|---|---|---|
| Pb | Hi | 2.3 |
| Pb | Hi | 2.3 |

*Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s): External** **x Not Present**

**Inlet Type:** [□ Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [□ Rank Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / □ Stainless Steel / Other: _________]

**Probe Line(s)**: [□ Teflon® / Other: _____________] **Probe Fitting(s)**: [□**x** Teflon® / Other: ___________ / □ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

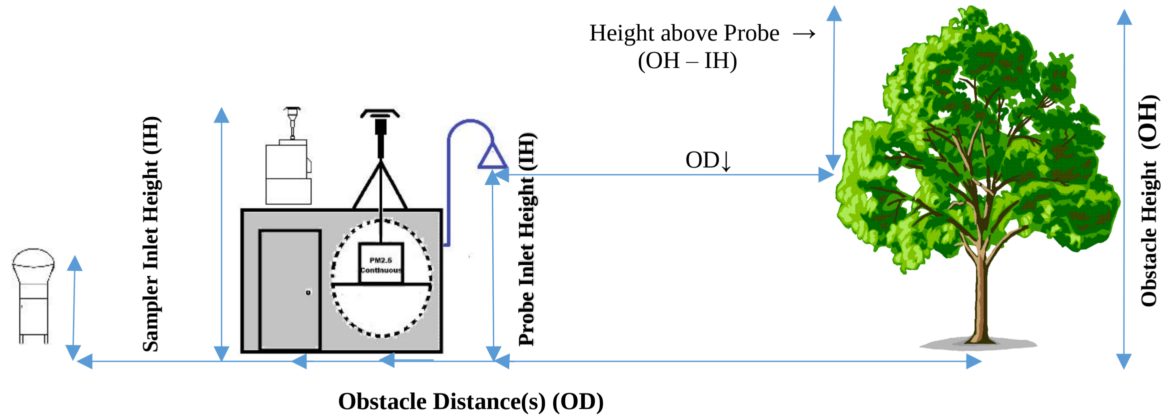
**Issue(s):** ______________________________________________________________________________________

| Pollutant(s) | Inlet Height (meters) | Inlet Location (Side of Shelter, Ground, Roof) | *Horizontal Distance (meters) If Applicable | *Vertical Distance (meters) If Applicable | Monitoring SCALE | |
|---|---|---|---|---|---|---|
| | | | | | AQS | Annual Network Plan |
| Pb | 2.1 | Ground | 2.3 | | Urban | Urban |
| Pb | 2.0 | Ground | 2.3 | | Urban | Urban |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MSEF (Page 4/5): Local Site Name:** _Exide__________ **Initials:** _EMH______ **Date:** _2/23/17______

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** ____________inches = _________**meters** (nearest inlet to dripline) □ **No Trees Present**

(39.4 inches = 1 meter) ____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ____No issues with driplines or obstacles________________________________________

**Minor Sources:**

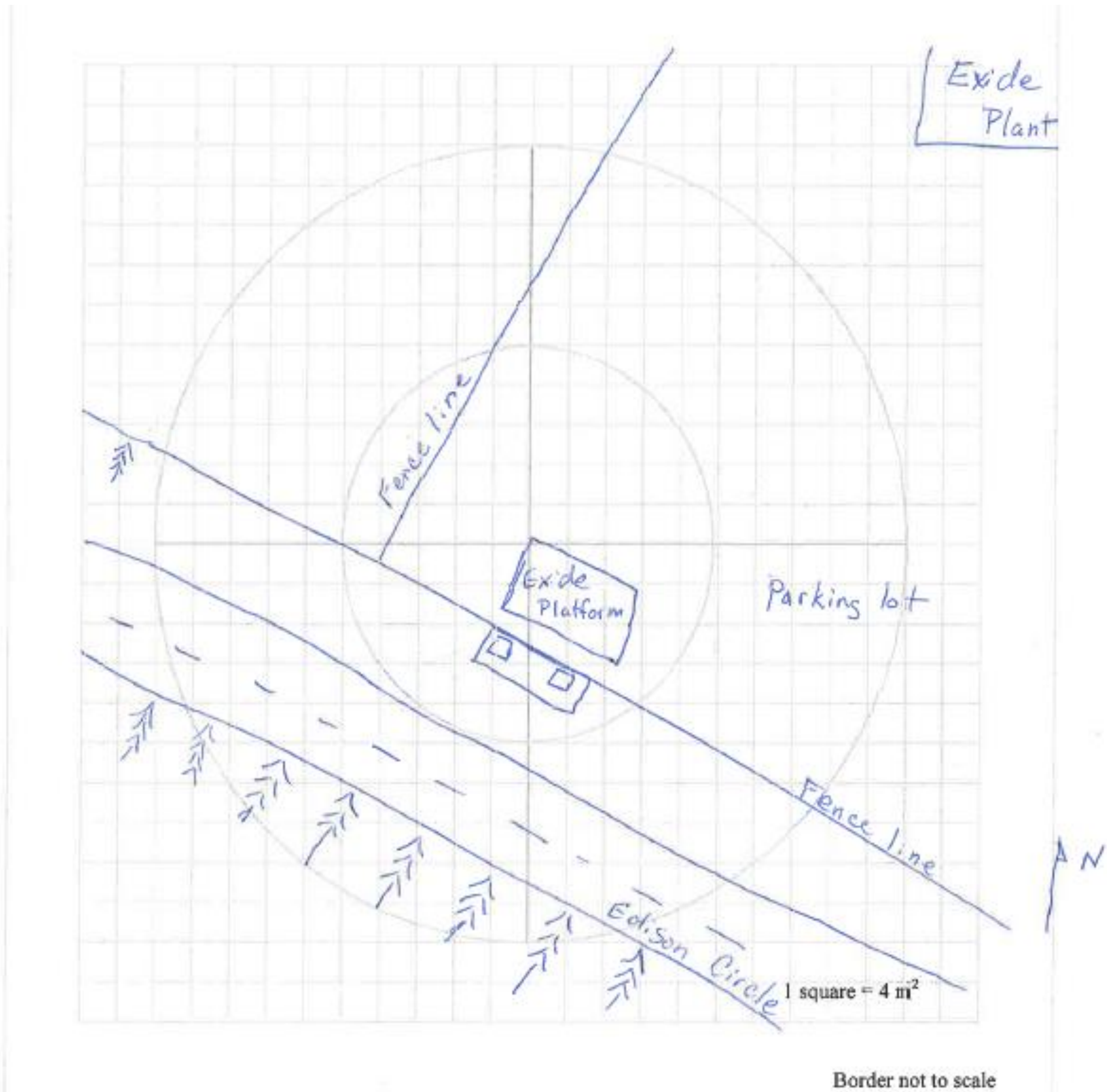
- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

**Issues:** ____No minor source issues________________________________________

**MSEF (Page 5/5): Local Site Name:** _Exide____________________ **Initials:** EMH______ **Date:** __2/23/17______

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: _270_____° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

# Additional Information:

Exide plant is 155 meters NE of the site

# Aerial Photo with Wind Rose

**PHOTO LOG: Local Site Name:** _Exide_____________________ **Initials:** _EMH____ **Date**: 2/23/17________

**Camera [x APC / □ Personal – Owner: ________________] Make/Model:** Nikon Coolpix___________________

**Filename:** __01___________________ **Date:** __2/23/17______ **Time:** 9:40 am____ **Photographer:** ___EMH____________

**Description:** _Site view from SW direction_____________________________________________

**Filename:** __02___________________ **Date:** __2/23/17______ **Time:** __9:40 am ___ **Photographer:** ___EMH____________

**Description:** __Site view from west direction_____________________________________________

**Filename:** __03___________________ **Date:** _2/23/17________ **Time:** __9:40 am ___ **Photographer:** _EMH_____________

**Description:** _View North of site (N directional)_____________________________________________

**Filename:** __04___________________ **Date:** __2/23/17______ **Time:** __9:40 _am____ **Photographer:** ___EMH____________

**Description:** __View South of site (S directional)_____________________________________________

**Filename:** __05___________________ **Date:** __2/23/17______ **Time:** __9:40 am _____ **Photographer:** ___EMH____________

**Description:** _View West of site (W directional)_____________________________________________

**Filename:** __06___________________ **Date:** __2/23/17______ **Time:** __9:40 am____ **Photographer:** ___EMH____________

**Description:** __View East of site (S directional)_____________________________________________

Exide:  Photo Log (2017)

001

002

003

004

005

006

# 40 CFR Part 58, Appendix E, Tables and Figures

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| $O_3$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| $SO_2$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| PM, Pb | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

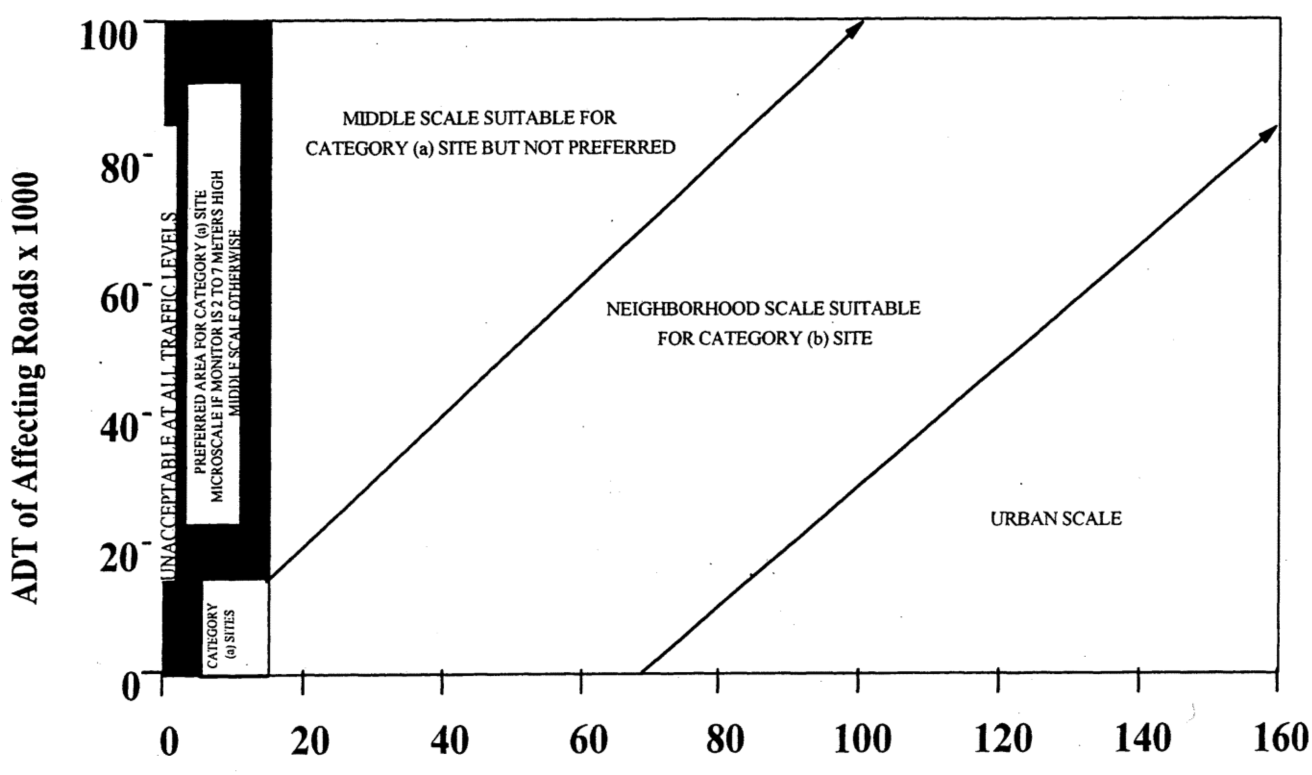



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| 1/4" Line OD / 20 Sec Residence Time | | | |
|---|---|---|---|
| **Flow Rate (liters/min)** | **1/8" ID feet** | **5/32" ID feet** | **3/16" ID feet** |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
| 0.6 | 82.9 | 53.0 | 36.8 |
| 0.7 | 96.7 | 61.9 | 43.0 |
| 0.8 | 110.5 | 70.7 | 49.1 |
| 0.9 | 124.3 | 79.6 | 55.3 |
| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
| 1.2 | 165.8 | 106.1 | 73.7 |
| 1.3 | 179.6 | 114.9 | 79.8 |
| 1.4 | 193.4 | 123.8 | 85.9 |
| 1.5 | 207.2 | 132.6 | 92.1 |
| 1.6 | 221.0 | 141.4 | 98.2 |
| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

**ADDITIONAL SUPPORTING INSTRUMENTATION**

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

None

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**
Is the shelter tied down – physically tied with hurricane straps?
Is the shelter grounded - look for rod in the ground and lead wire connection?

Type of Shelter(s) located on site:

1. **Enclosure: Y**
2. **Trailer: N**
3. **None: N**
4. **Other: N**

What are the shelter(s) made of?

1. ______________________________
2. ______________________________
3. ______________________________
4. __Platform - wood______________________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **N**
Write additional comments on the shelters below:
___Platform is in good condition. Breaker box, outlets, and plugs are in good condition.______________________________

# INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

**Initials:** Initials of auditor completing form.

**Date:** current date site is entered by auditor

**Reminder:** If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

**Arrival Time:** time auditors arrive at site

**Departure Time:** time auditors depart site

**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and is specified in TDEC DAPC's QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures. Teledyne analyzers are designated FEM for a range of 5-40 °C. Therefore, TDEC DAPC keeps shelters with these monitors within this range (still keeping in mind the 2 deg SD requirement). Shelters are generally kept about 25-26 °C in the warmest months to reduce condensation in sample lines and analyzer.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites? Ants? Wasps/Bees? / Larger wildlife causing problems (such as nesting in the undercarriage or walls or digging dens near the foundation/supports)?

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:** document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated. Some examples of items that can cause this problem are a leaking filter holder or fitting and an uncapped TTP system or sample line tee.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, SO2, NO, NO2, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control
## William R. Snodgrass Tennessee Tower
## 312 Rosa L. Parks Avenue, 15th Floor
## Nashville, Tennessee 37243

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**Air Monitoring Site Evaluations**

**TDEC APC**

**Date: 3/2/17** **Location: Fairview, TN**

**AQS Number: 47-187-0106**

**Site Name: Fairview** **Pollutants: O3**

**Project Leader:**

---

**Print Name / Signature / Initials / Duties**

**1:** (Team Lead) _Evelyn Haskin____________________________EMH___Site Specialist________________

**2:**_____________________________________________________________________________________

**3:**_____________________________________________________________________________________

# Air Monitoring Site Evaluation Summary

**Local Site Name:** _Fairview___________________________ **Initials:** _EMH_____ **Date:** __3/2/17______________

**Additional Comments:**

Shelter moved from previous location to new location because previous location was not meeting EPA siting criteria. Electricity needs to be installed and fence relocated

Waiting for inspection from MTEC to complete installation of electricity

Equipment will be installed and probe line changed out once electricity is on.

Distance from inlet to closest road- 15.8 meters

_Electricity was turned on 3/28/17 and site was set up for 2017 O3 season on 3/29/17

Data loggers ESC 8832 SN A4158K and Agilaire 8872 SN 494

**MONITORING SITE EVALUATION FORM (MSEF)**

**Local Site Name:** _Fairview___________________ **Initials:** _EMH_______ **Date:** ___3/2/17__________

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present

**Arrival Time:** _10:40 am__ **Departure Time:** _11:20 am__ **Primary Operator:** _Ken Cooper___ ___________

**Observer(s):** ______________________________________________________________________________

**SITE**

[N]-**Security Fence** [N]-**Razor/Barb Wire** [Y] **Grass/Shrubs Cut** [N] **Bare Soil Area**

[N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** _______________________ [NA] **Police Report Filed**

**Issues:** ______________________________________________________________________________________________

**SHELTER** - **Interior**

**Arrival Temperature:** NA ______**°C** (from data logger) **Operator Site Visits:** _1______ per [**week** ]

[N] **Leaking Roof** **[Damaged: □ Ceiling /□Floor / □Walls]** [N] **Clean / Neat** [N] **Fire Extinguisher**

[Y] **Insect / Wildlife Issues** [N] **Thermometer** (min/max) [N] **Gasoline** (inside shelter)

**Issues:** _See notes___________________________________________________________

**MONITOR(s):** **Location:** Exterior Samplers **[x Roof / □ Ground / □ Not Present]**

| Monitor(s) | Manufacturer | Model | Serial Number |
|---|---|---|---|
| Ozone | Thermo | 49C | 77489-386 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**CALIBRATOR(s):** x **Not Present** [Y/N] **Are QA/QC Check Gases Vented Outside Shelter?**

| QA/QC | Make | Model | Serial Number | Certification Date | Expiration Date |
|---|---|---|---|---|---|
| QC | Teledyne | T703 | 330 | | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line? [N]** If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** _Fairview____________________ **Initials:** _EMH____ **Date:** __3/2/17_______

**All Gas Standards Pass thru all Filters during:** [Y] **Calibrations** [Y] **Precision Checks** [Y] **Audits**
(Not Required) (Required) (Required)

**Issues:** ______________________________________________________________________________________

**CYLINDER GAS STANDARDS:** **x Not Present**

**VENDOR:** **(PSI Reading < 200, tank is empty and should not be in service)**

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| NA | | | | | |
| | | | | | |
| | | | | | |

Issues: ______________________________________________________________________________________

**SUPPORTING INSTRUMENTATION: Internal**

[Y] **Temperature Sensor** [N] **Uninterruptable Power Supply**

**Zero Air System: Commercial System** (Make / Model): Thomas pump, charcoal, and Drie-Rite will be installed before the site becomes operational.

**Cartridge System: [□Silica Gel □Pink / □Blue] / □ Charcoal / □Purafil / □Hopcalite / Other: _______]**

[NA] **Needs Service** **Last Service Date:** _______________ **Condition:** _____________________________

Issues: ______________________________________________________________________________________

**Probe Line(s): [x Replaced / □Cleaned] – Frequency:** __annually___ **Last Service Date:** _3/29/17_________

[Y] **Clean** [Y] **Heated** [N] **Insulated** [N] **Moisture** [N] **Retractable** [N] **Old / Unused Lines** [N] **Lo Flo**

**Manifold ->** [N] **Any Open Ports? –> How many analyzers using manifold?** ________________

Issues: ______________________________________________________________________________________

**MSEF (Page 3/5): Local Site Name:** __Fairview______________ **Initials:** _EMH_____ **Date:** _3/2/17________

**SHELTER – Exterior**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other:** _Aluminum______________________________**]**

[**Y**] **Needs Maintenance** (specify) [**Y**] **Tied Down** [**Y**] **Electrically Grounded** [**N**] **Roof Railing**

**Roof Access: [**Stairs [Interior/Exterior] **/** Ladder [attached/removable] **/ x Not Present]** [**N**] **Loose Decking** (Trip Hazard)

**Issues:** ____________________________________________________________________________________

**Height of Roof:** __3.1_____________**meters** **Roofing Material**: ___Aluminum ___________________________

**Issues:** ____________________________________________________________________________________

**OUTDOOR SAMPLERS** **x Not Present**

[NA] **Locked** [NA] **Electrically Grounded** [NA] **Stabilized** [NA] **Clean Inside** [NA] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** _________________ **$PM_{10}$ Head Clean Schedule:** ________ __________

**Issue(s):** ____________________________________ _____________________________________________

**COLLOCATED SAMPLERS: x Not Present** (39.4 inches = 1 meter)

| Pollutant | Flow (Hi / Lo) | *Separation Distance (meters) |
|---|---|---|
| | | |
| | | |

*Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s): External**

**Inlet Type:** [**x** Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [**x** Rain Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / **x** Stainless Steel / Other: _________]

**Probe Line(s)**: [**x** Teflon® / Other: _____________] **Probe Fitting(s)**: [**x** Teflon® / Other: ___________ / □ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

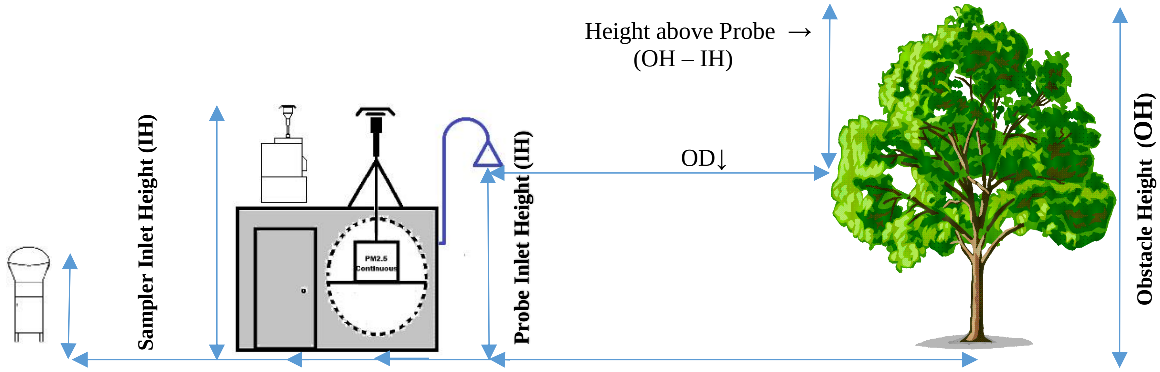
**Issue(s):** ____________________________________________________________________________________

| Pollutant(s) | Inlet Height (meters) | Inlet Location (Side of Shelter, Ground, Roof) | *Horizontal Distance (meters) If Applicable | *Vertical Distance (meters) If Applicable | Monitoring SCALE | |
|---|---|---|---|---|---|---|
| | | | | | AQS | Annual Network Plan |
| O3 | > 4.0 | Side of shelter | | | Urban | Urban |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

MSEF (Page 4/5): Local Site Name: _Fairview______________ Initials: _EMH______ Date: _3/2/17_________

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**Obstacle Distance(s) (OD)**

**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** ____________inches = __________**meters** (nearest inlet to dripline) □ **No Trees Present**

(39.4 inches = 1 meter) ____________inches = __________**meters** (nearest inlet to dripline) ☐ Not Present

____________inches = __________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ____No issues with driplines or obstacles______________________________

**Minor Sources:**

- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

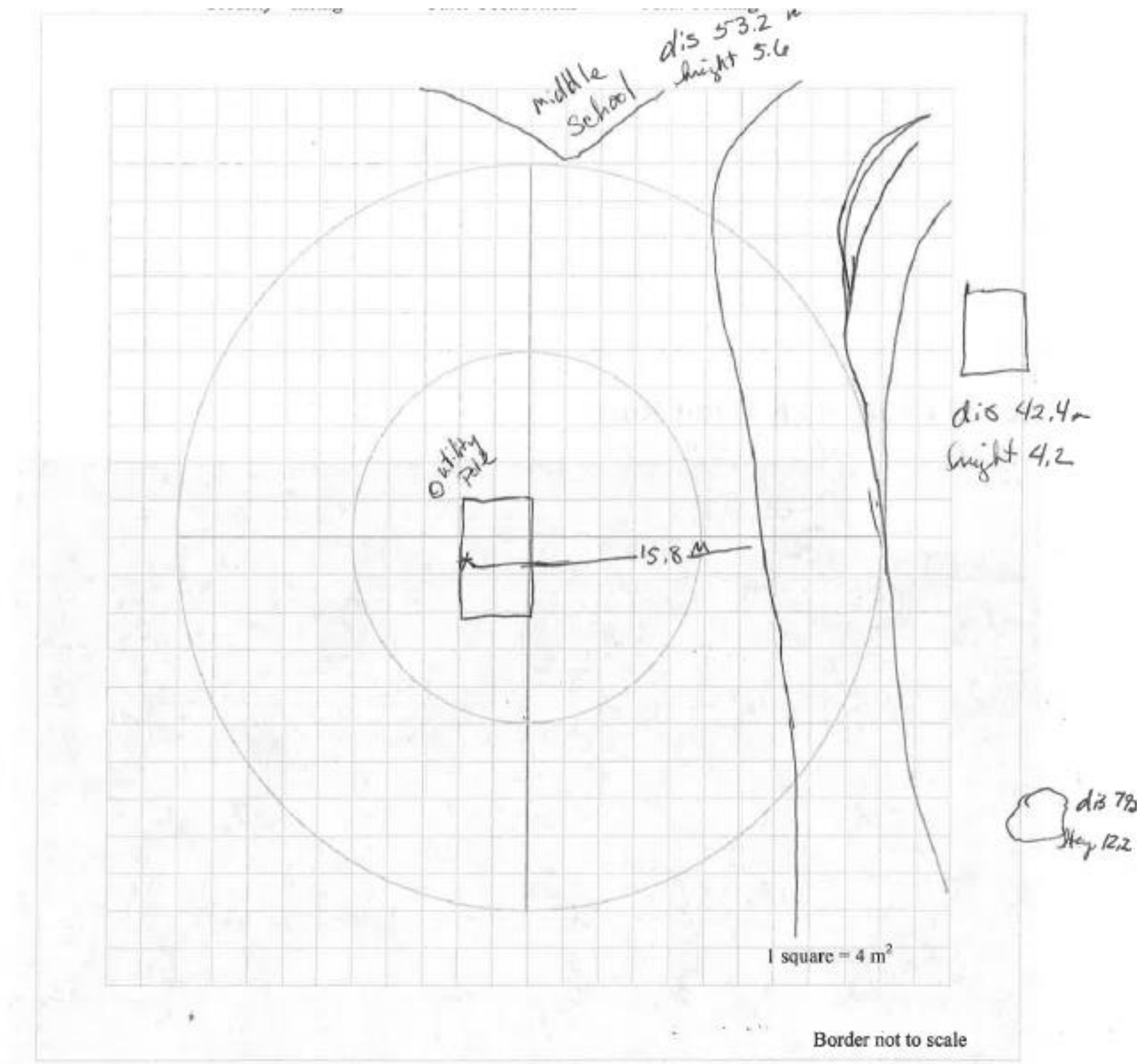
**Issues:** ___None__________________________________________________________

______________________________________________________________________

**MSEF (Page 5/5): Local Site Name:** Fairview ___________ **Initials:** EMH______ **Date:** 3/2/17________

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: >270______° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

## Additional Information:

Site drawing is the new site location.

Relocated site (Lat: 35.949729, Long: -87.138132)

## Aerial Photo with Wind Rose

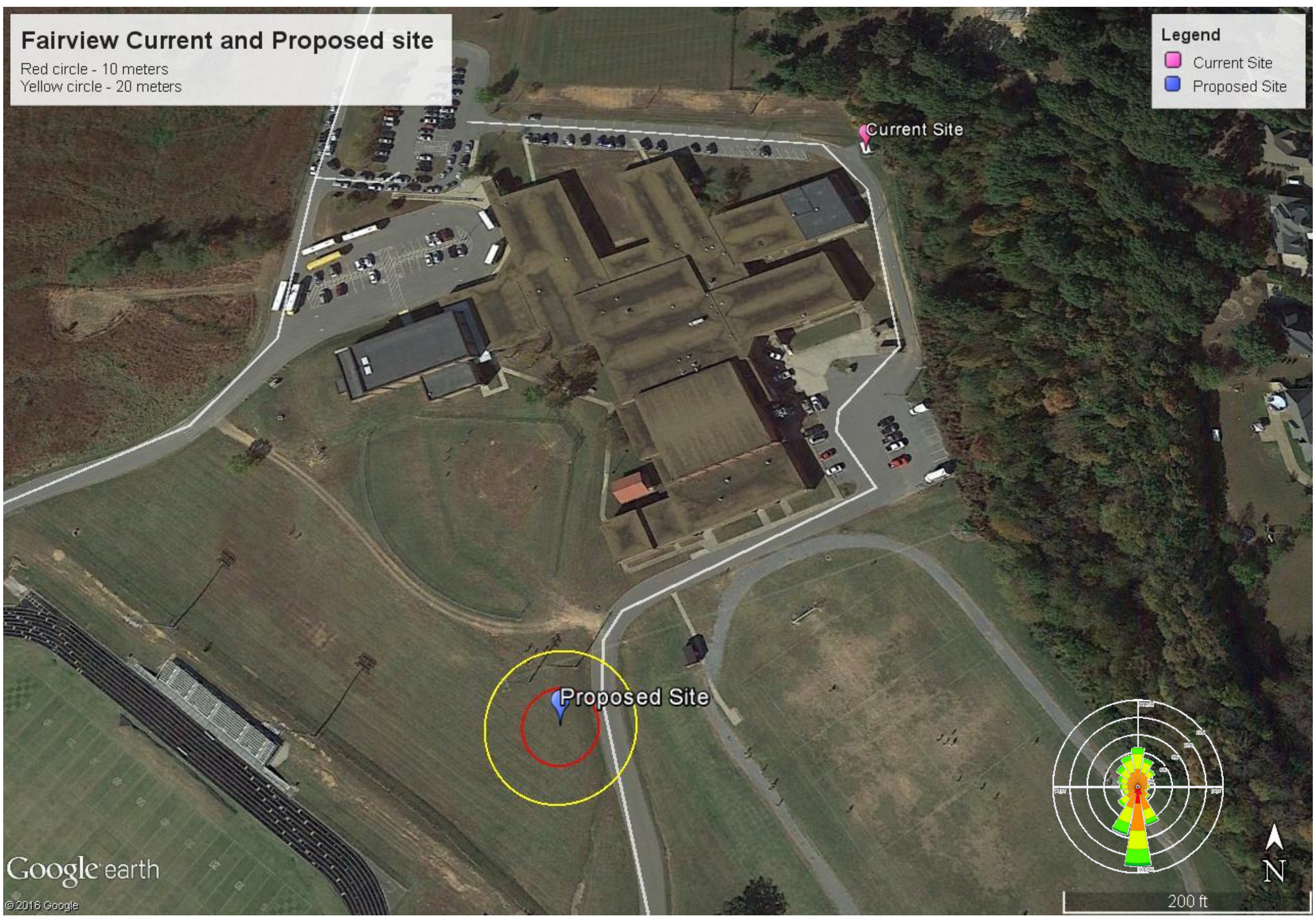


**PHOTO LOG: Local Site Name:** _Fairview___________ **Initials:** _EMH____ **Date**: 3/2/17________

**Camera [x APC / □ Personal – Owner: ________________] Make/Model:** Nikon Coolpix___________________

**Filename:** __01___________________ **Date:** __3/2/17______ **Time:** __11:10 _am___ **Photographer:** ___EMH____________

**Description:** _Site view from NE direction_____

**Filename:** __02___________________ **Date:** __3/2/17______ **Time:** __11:10 _am ___ **Photographer:** ___EMH____________

**Description:** _Site view from east direction

**Filename:** __03___________________ **Date:** __3/2/17______ **Time:** __11:10 _am __ **Photographer:** ___EMH____________

**Description:** __North side of site

**Filename:** __04___________________ **Date:** __3/2/17______ **Time:** __11:10 _am ___ **Photographer:** ___EMH____________

**Description:** _View North of site (N directional)

**Filename:** __05___________________ **Date:** __3/2/17______ **Time:** __11:10 _am ___ **Photographer:** ___EMH____________

**Description:** _South side of site

**Filename:** __06___________________ **Date:** __3/2/17______ **Time:** __11:10 _am _____ **Photographer:** ___EMH_________

**Description:** __View South of site (S directional)

**Filename:** __07___________________ **Date:** __3/2/17______ **Time:** 11:10 _am ______ **Photographer:** ___EMH____________

**Description:** __West side of site

**Filename:** __08___________________ **Date:** __3/2/17______ **Time:** 11:10 _am _____ **Photographer:** ___EMH____________

**Description:** __View West of site (W directional)

**Filename:** __09___________________ **Date:** __3/2/17______ **Time:** 11:10 _am ______ **Photographer:** ___EMH____________

**Description:** ___East side of site

**Filename:** __10___________________ **Date:** __3/2/17______ **Time:** 11:10 _am ______ **Photographer:** ___EMH____________

**Description:** __View East of site (E directional)

001

002

003


004

005

006

007


008

009

010

# 40 CFR Part 58, Appendix E, Tables and Figures

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| $O_3$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| $SO_2$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| PM, Pb | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

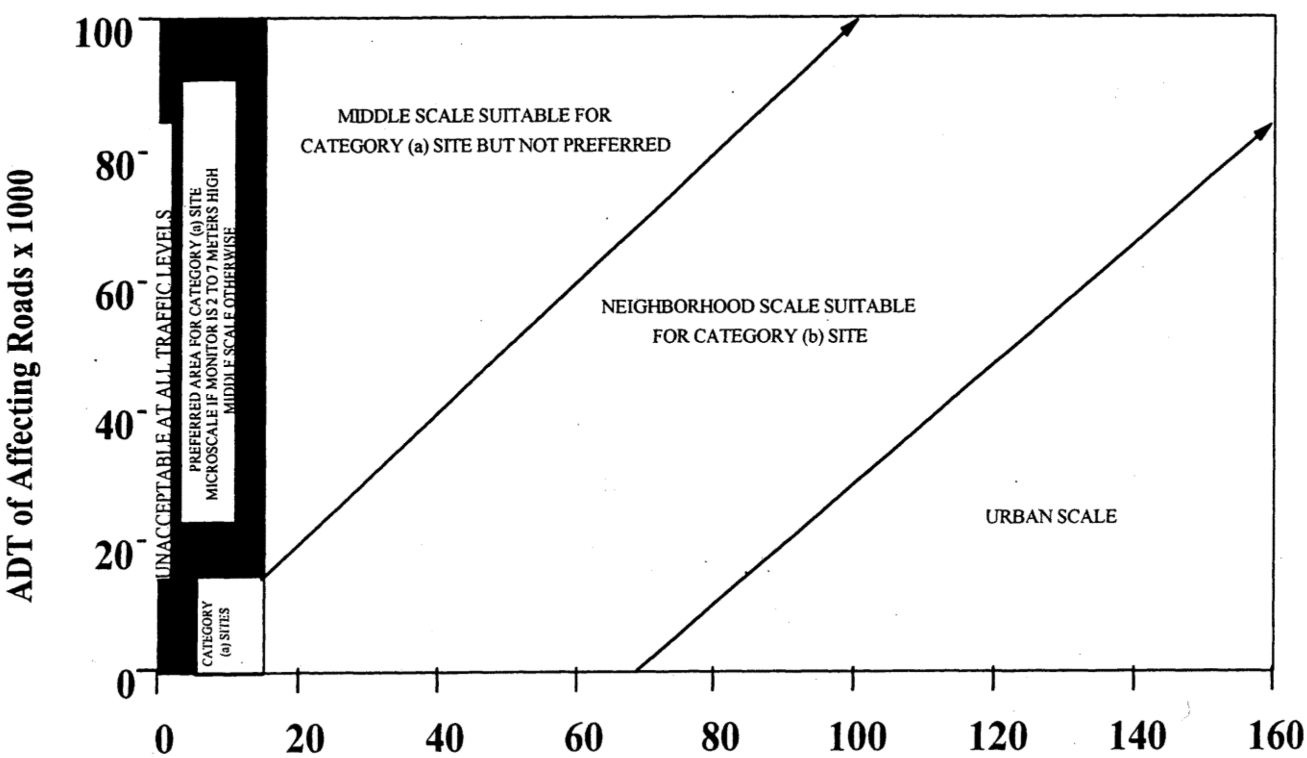



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| 1/4" Line OD / 20 Sec Residence Time | | | |
|---|---|---|---|
| **Flow Rate** | **1/8" ID** | **5/32" ID** | **3/16" ID** |
| **(liters/min)** | **feet** | **feet** | **feet** |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
| 0.6 | 82.9 | 53.0 | 36.8 |
| 0.7 | 96.7 | 61.9 | 43.0 |
| 0.8 | 110.5 | 70.7 | 49.1 |
| 0.9 | 124.3 | 79.6 | 55.3 |
| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
| 1.2 | 165.8 | 106.1 | 73.7 |
| 1.3 | 179.6 | 114.9 | 79.8 |
| 1.4 | 193.4 | 123.8 | 85.9 |
| 1.5 | 207.2 | 132.6 | 92.1 |
| 1.6 | 221.0 | 141.4 | 98.2 |
| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

**ADDITIONAL SUPPORTING INSTRUMENTATION**

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

The site uses an ESC 8832 data logger and an Agilaire 8872 PC/Data logger. The 8832 data logger serves as the primary logger and is directly connected via analog input to the analyzer at the site. The data will be polled from the 8832 to the central server via a 4G cellular modem (Sierra Wireless RV50). The 8872 serves as a secondary, backup logger, and is used by the site operator to retrieve the electronic strip chart in local standard time. The 8872 will poll data from the 8832 locally over the COM port or over the local tcp/ip network if the COM route is not working (via a network switch). This site was previously supplied internet connectivity via a cabled connection (Comcast Business).

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**

Type of Shelter(s) located on site:

1. **Enclosure: N**
2. **Trailer: Y**
3. **None: N**
4. **Other: N**

What are the shelter(s) made of?

1. ______________________________________________________________
2. _Aluminum____________________________________________________
3. ______________________________________________________________
4. ______________________________________________________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **Y**

Write additional comments on the shelters below:

__Shelter is in fair to good condition; some insulation is exposed underneath shelter, seams around roof need caulking___________

# INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

**Initials:** Initials of auditor completing form.

**Date:** current date site is entered by auditor

**Reminder:** If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

**Arrival Time:** time auditors arrive at site

**Departure Time:** time auditors depart site

**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and is specified in TDEC DAPC's QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures. Teledyne analyzers are designated FEM for a range of 5-40 °C. Therefore, TDEC DAPC keeps shelters with these monitors within this range (still keeping in mind the 2 deg SD requirement). Shelters are generally kept about 25-26 °C in the warmest months to reduce condensation in sample lines and analyzer.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites? Ants? Wasps/Bees? / Larger wildlife causing problems (such as nesting in the undercarriage or walls or digging dens near the foundation/supports)?

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:** document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated. Some examples of items that can cause this problem are a leaking filter holder or fitting and an uncapped TTP system or sample line tee.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, SO2, NO, NO2, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control

**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**

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## Air Monitoring Site Evaluations
## TDEC APC

**Date: February 17, 2017** **Location: Oak Ridge, TN**
**AQS Number: 47-001-0101**
**Site Name: Freel's Bend** **Pollutants: O3, SO2**
**Project Leader: EMH**

---

**Print Name / Signature / Initials / Duties**

**1:** Evelyn M. Haskin EMH Site evaluator

**2:** Justin E. Long JEL Site evaluator

**3:** Thomas E. Dalton TED Site evaluator

# Air Monitoring Site Evaluation Summary

**Local Site Name:** _Freel's Bend_______________________ **Initials:** _TED____ **Date:** February 17, 2017_____

**Additional Comments:**

__Sunny, no clouds, 52 F. _Electric service meter #115-623-3.5 with City of Oak Ridge. __Site behind locked gate with DOE holding permission for entry. __Distance to nearest traffic lane and measured by Google earth pro is 153 meters. Steps in need of being reseated or replaced.___________________________________________

**MONITORING SITE EVALUATION FORM (MSEF) (Page 1/5):**

**Local Site Name:** _Freel's Bend______________________ **Initials:** _TED____ **Date:** February 17, 2017___

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present

**Arrival Time:** _9:00 am____ **Departure Time:** _11:45 am__ **Primary Operator:** __Erin Sturgill____________

**Observer(s):** Tom Dalton (TED) Jarrett Rudd (JLR)_______________________________________________

**SITE**

[N]-**Security Fence** [N]-**Razor/Barb Wire** [Y ] **Grass/Shrubs Cut** [Y] **Bare Soil Area**

[N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** ______________________ [NA] **Police Report Filed**

**Issues:** ___**None**___________________________________________________________________________

**SHELTER - Interior**

**Arrival Temperature:** ___21.5____**°C** (from data logger) **Operator Site Visits:** __1_______ per [week]

[**Y**] **Leaking Roof** **[Damaged: □Ceiling / □Floor / □Walls]** [Y] **Clean / Neat** [N] **Fire Extinguisher**

[Y] **Insect / Wildlife Issues** [N] **Thermometer** (min/max) [N] **Gasoline** (inside shelter)

**Issues:** ________Mice might be in the walls causing problems___________________________________________

**MONITOR(s):** **Location:** Exterior Samplers **[X Roof / □Ground / □ Not Present]**

| Monitor(s) | Manufacturer | Model | Serial Number |
|---|---|---|---|
| SO2 | Teledyne | 100E | 3628 |
| O3 | Teledyne | T400 | 2285 |
| | | | |
| | | | |
| | | | |
| | | | |

**CALIBRATOR(s):** □ **Not Present** [Y] **Are QA/QC Check Gases Vented Outside Shelter?**

| QA/QC | Make | Model | Serial Number | Certification Date | Expiration Date |
|---|---|---|---|---|---|
| QC | Teledyne | 703E | 327 | 1-19-17 | |
| QC | Teledyne | T700 | 489 | 12-30-16 | 6-30-17 |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line? [N]** If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** _Freel's Bend____________ **Initials:** _TED____ **Date:** **February 17, 2017**

**All Gas Standards Pass thru all Filters during:** [Y] **Calibrations** (Not Required) [Y] **Precision Checks** (Required) [Y] **Audits** (Required)

**Issues:** __________Per Erin Strugill_ 2-24-17______________________________

**CYLINDER GAS STANDARDS:** □ **Not Present**

**VENDOR:** (PSI Reading < 200, tank is empty and should not be in service)

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| QC | SO2 | @ 2000 psig | 1-16-18 | 30.6+0.3 | FF17345 |
| | | | | | |
| | | | | | |

Issues: ____NA______________________________

**SUPPORTING INSTRUMENTATION: Internal**

[Y] **Temperature Sensor** [N] **Uninterruptable Power Supply**

**Zero Air System: Commercial System** (Make / Model): ___Dasbi 5011___________________________

**Cartridge System: [□Silica Gel □Pink / □Blue] / X Charcoal / □Purafil / □Hopcalite / Other:** __Dri-rite___**]**

[N] **Needs Service Last Service Date:** __2-16-17________ **Condition:** ______________________

Issues: ______________________________

**Probe Line(s): [ X Replaced / □Cleaned] – Frequency:** _once a year **Last Service Date:** __2/16/ 2017__

[Y] **Clean** [Y] **Heated** [N] **Insulated** [N] **Moisture** [N] **Retractable** [N] **Old / Unused Lines**

[NA] **Lo Flo Manifold ->** [N] **Any Open Ports? –> How many analyzers using manifold?** _1 per analyzer_

Issues: ______________________________

**SHELTER – Exterior** □ **Not Present**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other:** __Sheet metal siding-mobile home type________**]**

[Y] **Needs Maintenance** (specify) [Y] **Tied Down** [Y] **Electrically Grounded** [N] **Roof Railing**

**Roof Access: [Stairs [Interior/Exterior] / Ladder [attached/removable] / X Not Present]** [NA] **Loose Decking** (Trip Hazard)

**Issues:** ____Roof needs coating and area needs mice traps or other. Steps needs maintenance.___________

**Height of Roof:** ___3___________**meters** **Roofing Material**: __Sheet metal______________________

**Issues:** _______Roof needs coating______________________________

**MSEF (Page 3/5): Local Site Name:** _Freel's Bend___________ **Initials:** _TED____ **Date:** February 17, 2017

**OUTDOOR SAMPLERS** **X Not Present**

[NA] **Locked** [NA] **Electrically Grounded** [NA] **Stabilized** [NA] **Clean Inside** [NA] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** _________________ **$PM_{10}$ Head Clean Schedule:** _________________

**Issue(s):** ______________________________________________________________________________________________

**COLLOCATED SAMPLERS:** **x Not Present** (39.4 inches = 1 meter)

| Pollutant | Flow (Hi / Lo) | *Separation Distance (meters) |
|---|---|---|
| N/A | | |
| | | |

*Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s):** **External** **□ Not Present**

**Inlet Type:** [ **X** Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [ **X** Rain Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / **x** Stainless Steel / Other: _________]

**Probe Line(s)**: [ X Teflon® / Other: _____________] **Probe Fitting(s)**: [□Teflon® / **X** Other: Stainless Steel /□ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

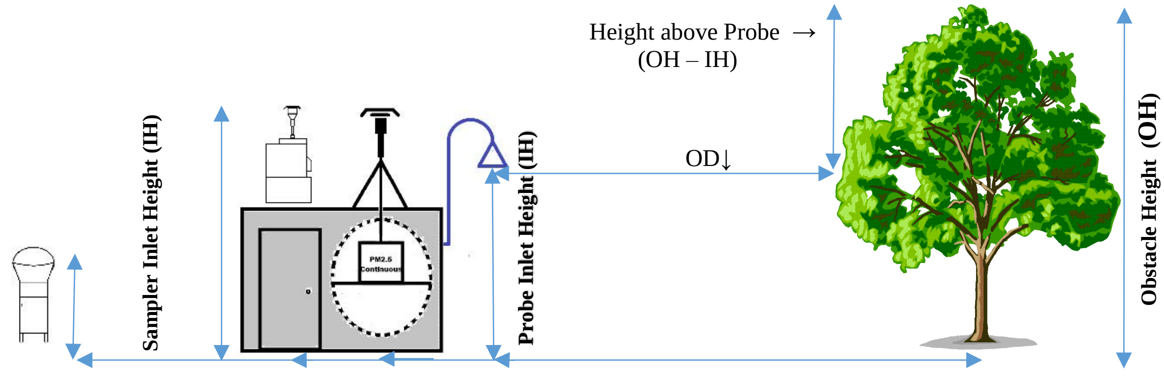
**Issue(s):** ______________________________________________________________________________________________

| Pollutant(s) | Inlet Height (meters) | Inlet Location (Side of Shelter, Ground, Roof) | *Horizontal Distance (meters) If Applicable | *Vertical Distance (meters) If Applicable | Monitoring SCALE | |
|---|---|---|---|---|---|---|
| | | | | | AQS | Annual Network Plan |
| $SO_2$ | 4.0 | Side of shelter | >1 | N/A | Urban | Urban |
| O3 | 4.0 | Side of shelter | >1 | N/A | Urban | Urban |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MSEF (Page 4/5): Local Site Name:** _Freel's Bend_________ **Initials:** _TED____ **Date:** February 17, 2017

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| N/A | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s)**: _____________inches = __________**meters** (nearest inlet to dripline) □ **No Trees Present**

(39.4 inches = 1 meter) _____________inches = __________**meters** (nearest inlet to dripline) ☐ Not Present

_____________inches = __________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ______None_______________________________________________

**Minor Sources:**

- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

**Issues:** None_______________________________________________

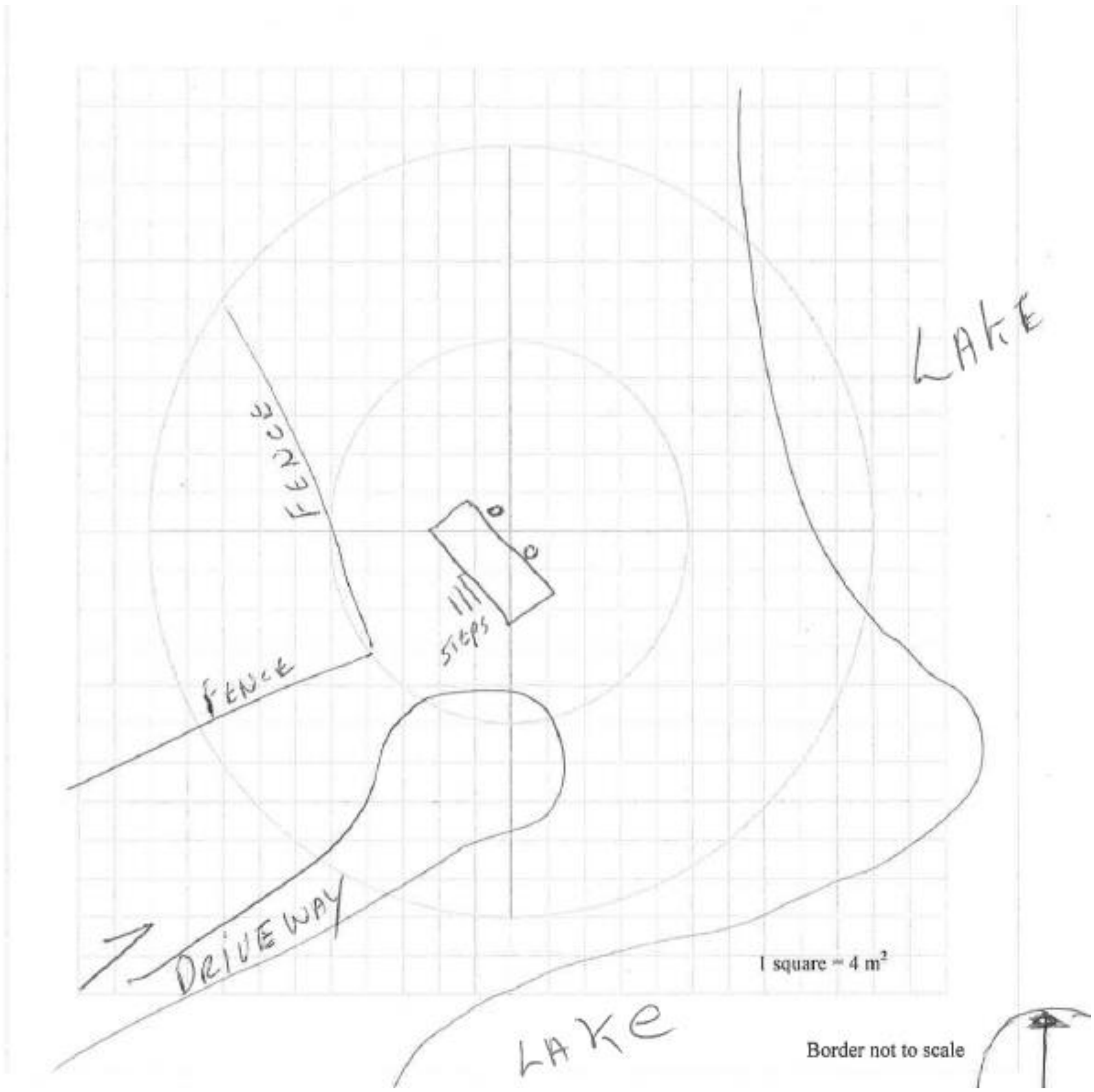
_______________________________________________________________

_______________________________________________________________

**MSEF (Page 5/5): Local Site Name:** Freel's Bend **Initials:** TED **Date:** February 17, 2017

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: >270 ° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

## Additional Information:

All trees and scrubs that posed a problem have been cut down.

No obstructions.

Closest tree to inlet math: [6.6 meter tall – 4.0 inlet height = 2.6 meter] * 2 = 5.2 meter distance of tree is 15.1 meter and 15.1 meter is greater than 5.2 so this tree is not an obstacle.

## Aerial Photo with Wind Rose

**PHOTO LOG:** **Local Site Name:** _Freel's Bend___ **Initials:** _TED__ **Date:** February 17, 2017_____

**Camera [□ APC / X Personal – Owner: __________] Make/Model: ________________________________**

**Filename:** __001 _ **Date:** ___2-17-17____________ **Time:** ___11:00 am_______ **Photographer:** ___TED______________

**Description:** __001 - North toward shelter____________________________________________________________

**Filename:** __002 _ **Date:** ___2-17-17____________ **Time:** ___11:00 am_______ **Photographer:** ___TED______________

**Description:** __002 - North away from shelter (north directional)____________________________________________

**Filename:** __003 _ **Date:** ___2-17-17____________ **Time:** ___11:00 am______ **Photographer:** ___TED_______________

**Description:** __003 - East toward shelter______________________________________________________________

**Filename:** __004 _ **Date:** ___2-17-17____________ **Time:** ___11:00 am_______ **Photographer:** ___TED_______________

**Description:** __004 - East away from shelter (east directional)_______________________________________________

**Filename:** __005 _ **Date:** ___2-17-17____________ **Time:** ___11:00_am______ **Photographer:** ___TED________________

**Description:** __005 - South toward shelter_____________________________________________________________

**Filename:** __006 _ **Date:** ___2-17-17____________ **Time:** ___11:00 am_______ **Photographer:** ___TED_______________

**Description:** __006 – South away from shelter (south directional)_____________________________________________

**Filename:** __007 _ **Date:** ___2-17-17____________ **Time:** ___11:00 am_______ **Photographer:** ___TED_______________

**Description:** __007 - West toward shelter_____________________________________________________________

**Filename:** __008 _ **Date:** ___2-17-17____________ **Time:** ___11:00 am_______ **Photographer:** ___TED_______________

**Description:** __West away from monitor (west directional)_______________________________________________

**Filename:** ______ **Date:** ______________________ **Time:** ________________ **Photographer:** _____________________

**Description:** ___________________________________________________________________________________

001 - North toward shelter

002 - North away from shelter (north directional)

003 - East toward shelter

004 - East away from shelter (east directional)

005 - South away from shelter (south directional)

006 - South toward shelter

007 - West toward shelter


008 - West away from monitor (west directional)

# 40 CFR Part 58, Appendix E, Tables and Figures

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| **$O_3$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **$SO_2$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **PM, Pb** | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

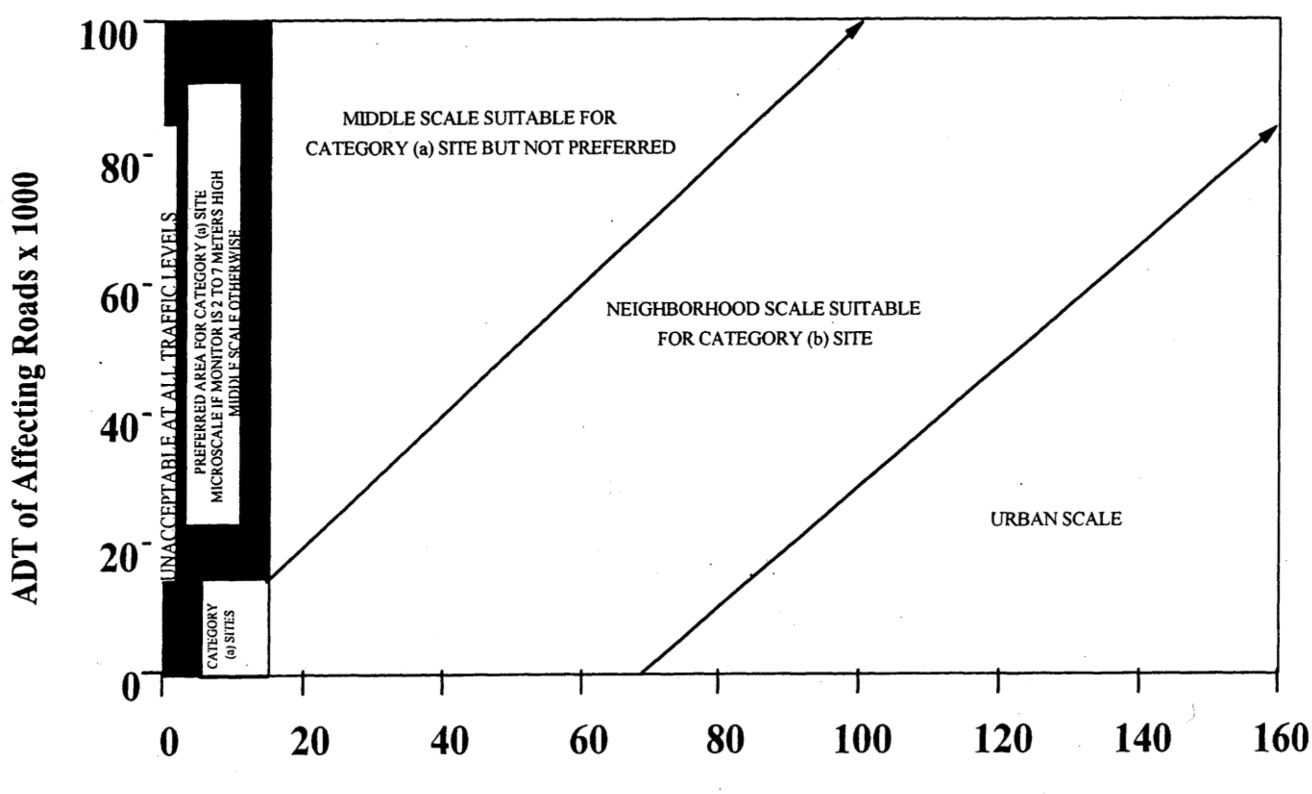



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| 1/4" Line OD / 20 Sec Residence Time | | | |
|---|---|---|---|
| **Flow Rate** | **1/8" ID** | **5/32" ID** | **3/16" ID** |
| **(liters/min)** | **feet** | **feet** | **feet** |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
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| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
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**ADDITIONAL SUPPORTING INSTRUMENTATION**

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

The site uses an ESC 8832 data logger and an Agilaire 8872 PC/Data logger. The 8832 data logger serves as the primary logger and is directly connected via analog input to the analyzers at the site. The data is polled from the 8832 logger to the central server via a 4G cellular modem (Sierra Wireless RV50). The 8872 serves as a secondary, backup logger, and is used by the site operator to retrieve the electronic strip chart in local standard time. The 8872 polls data from the 8832 locally over the COM port or over the local tcp/ip network if the COM route is not working (via a network switch).

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**

Type of Shelter(s) located on site:

1. **Enclosure: N**
2. **Trailer: Y**
3. **None: N**
4. **Other: N**

What are the shelter(s) made of?

1. ______________________________________________________________
2. _Aluminum sheet metal___________________________________________
3. ______________________________________________________________
4. ______________________________________________________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **Y**
With roof top samplers or inlets – is a roof railing present? **N** (May not be required in accordance with local ordinances)
Roof Access: Stairs or Ladder? **N**
Stairs can be inside or outside – Ladders are usually permanently attached or removable? **N**
Write additional comments on the shelters below:

Cleaning outside and paint roof, repair steps

__Mice inside walls, roof rusted and needs repainting, insulation exposed, steps need reseating or replacing______________________

_______________________________________________________________________________

_______________________________________________________________________________

# INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

**Initials:** Initials of auditor completing form.

**Date:** current date site is entered by auditor

**Reminder:** If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

**Arrival Time:** time auditors arrive at site

**Departure Time:** time auditors depart site

**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and is specified in TDEC DAPC's QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures. Teledyne analyzers are designated FEM for a range of 5-40 °C. Therefore, TDEC DAPC keeps shelters with these monitors within this range (still keeping in mind the 2 deg SD requirement). Shelters are generally kept about 25-26 °C in the warmest months to reduce condensation in sample lines and analyzer.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites? Ants? Wasps/Bees? / Larger wildlife causing problems (such as nesting in the undercarriage or walls or digging dens near the foundation/supports)?

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:** document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated. Some examples of items that can cause this problem are a leaking filter holder or fitting and an uncapped TTP system or sample line tee.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, $SO_2$, NO, $NO_2$, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control

**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**

## Air Monitoring Site Evaluations
## TDEC APC

**Date:** **March 9, 2017** **Location: Harriman, TN**
**AQS Number: 47-145-0004**
**Site Name: Harriman** **Pollutants: $PM_{2.5}$**
**Project Leader: EMH**

**Print Name / Signature / Initials / Duties**

**1:** Thomas E. Dalton ________________________________ TED Site Evaluator

**2:** Justin E. Long ________________________________ JEL Site Evaluator

**3:** Evelyn Haskin ________________________________ EMH Site Evaluator

# Air Monitoring Site Evaluation Summary

**Local Site Name:** _Harriman_____________________ **Initials:** _TED________ **Date:** __March 9, 2017__________

**Additional Comments:**

Closest road is Emory Dr. - 78 meters Northeast of site

**MONITORING SITE EVALUATION FORM (MSEF) (Page 1/5)**

**Local Site Name:** _Harriman________ **Initials:** _TED_______ **Date:** __March 9, 2017

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present

**Arrival Time:** __11:00 am___ **Departure Time:** __12:00 pm___ **Primary Operator:** ___Tom Dalton __

**Observer(s):** _Tom Dalton________________________________________________

**SITE**

[**Y**]-**Security Fence** [**N**]-**Razor/Barb Wire** [**Y**] **Grass/Shrubs Cut** [ **N** ] **Bare Soil Area**

[**N**] **Vandalism** – [□**Inside** / □**Outside**] **Date:** __N/A______________ [N] **Police Report Filed**

**Issues:** ___________________None___________________________________________________________

**SHELTER - Interior**

**Arrival Temperature:** ___N/A__**°C** (from data logger) **Operator Site Visits:** __**1-2**__ per [**week**]

[NA] **Leaking Roof** **[Damaged: □Ceiling / □Floor / □Walls]** [Y] **Clean / Neat** [N] **Fire Extinguisher**

[Y] **Insect / Wildlife Issues** [Y] **Thermometer** (min/max) [N] **Gasoline** (inside shelter)

**Issues:** _Wasps__________________________________________________________________

**MONITOR(s):** **Location:** Exterior Samplers **[□Roof / X Ground / □ Not Present]**

| **Monitor(s)** | **Manufacturer** | **Model** | **Serial Number** |
|---|---|---|---|
| PM 2.5 | Met One | BAM 1022 | T21583 |
| PM 2.5 | R & P | 2025 | 20980 |
| PM 2.5 TEOM | R & P | 1400a | 25085 |
| | | | |
| | | | |
| | | | |

**CALIBRATOR(s):** **X Not Present** [**NA**] **Are QA/QC Check Gases Vented Outside Shelter?**

| **QA/QC** | **Make** | **Model** | **Serial Number** | **Certification Date** | **Expiration Date** |
|---|---|---|---|---|---|
| **N/A** | | | | | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line? [N/A]** If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** _Harriman________________ **Initials:** _TED__ **Date:** __March 9, 2017

**All Gas Standards Pass thru all Filters during:** [N/A] **Calibrations** [N/A] **Precision Checks** [N/A] **Audits**

**Issues:** ________________________________None________________________________________________________

**CYLINDER GAS STANDARDS:** **X Not Present**

**VENDOR:** (PSI Reading < 200, tank is empty and should not be in service)

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| N/A | | | | | |
| | | | | | |
| | | | | | |

Issues: ________________________________________________________________________________________

**SUPPORTING INSTRUMENTATION: Internal**

[Y ] **Temperature Sensor** [ N] **Uninterruptable Power Supply**

**Zero Air System: Commercial System** (Make / Model): ______________________________________________

**Cartridge System: [□Silica Gel □Pink / □Blue] / □x Charcoal / □Purafil / □Hopcalite / Other: __________]**

[NA] **Needs Service Last Service Date:** _______________ **Condition:** ____________________________

Issues: ________NA________________________________________________________________________

**Probe Line(s): [□Replaced / □Cleaned] – Frequency: ___________ Last Service Date: __________________**

[NA] **Clean** [NA] **Heated** **[**NA] **Insulated** **[**NA] **Moisture** [NA] **Retractable** [NA] **Old / Unused Lines** **[**NA] **Lo Flo Manifold ->** [NA] **Any Open Ports? –> How many analyzers using manifold? _______________**

Issues: _____NA_____________________________________________________________________________

**MSEF (Page 3/5): Local Site Name:** Harriman________________ **Initials:** _TED__ **Date:** __March 9, 2017

**SHELTER – Exterior** **X Not Present**

**Type: [□ Freezer / □Wood Building / □Brick-Block / Other: ___________________________________]**

[NA] **Needs Maintenance** (specify) [NA] **Tied Down** [NA] **Electrically Grounded** [N/A] **Roof Railing**

**Roof Access: [Stairs [Interior/Exterior] / Ladder [attached/removable] / X Not Present]** [N] **Loose Decking** (Trip Hazard)

**Issues:** ___________________________None_________________________________________________________________

**Height of Roof:** ___ N/A _______________**meters** **Roofing Material**: _N/A ___________________________

**Issues:** ____________ N/A ___________________________________________________________________________________

**OUTDOOR SAMPLERS** **□ Not Present**

[**Y**] **Locked** [**Y**] **Electrically Grounded** [**Y**] **Stabilized** [**Y**] **Clean Inside** [**Y**] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** _Every 4-5 runs__ **$PM_{10}$ Head Clean Schedule:** __monthly___________

**Issue(s):** _______________________________________________N/A_______________________________________________

**COLLOCATED SAMPLERS:** **x Not Present** (39.4 inches = 1 meter)

| Pollutant | Flow (Hi / Lo) | Separation Distance (meters) |
|---|---|---|
| | | |
| | | |

Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s):** **External** **X Not Present**

**Inlet Type:** [□Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [□Rain Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / □Stainless Steel / Other: _________]

**Probe Line(s)**: [□Teflon® / Other: _____________] **Probe Fitting(s)**: [□Teflon® / Other: ___________ / □ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

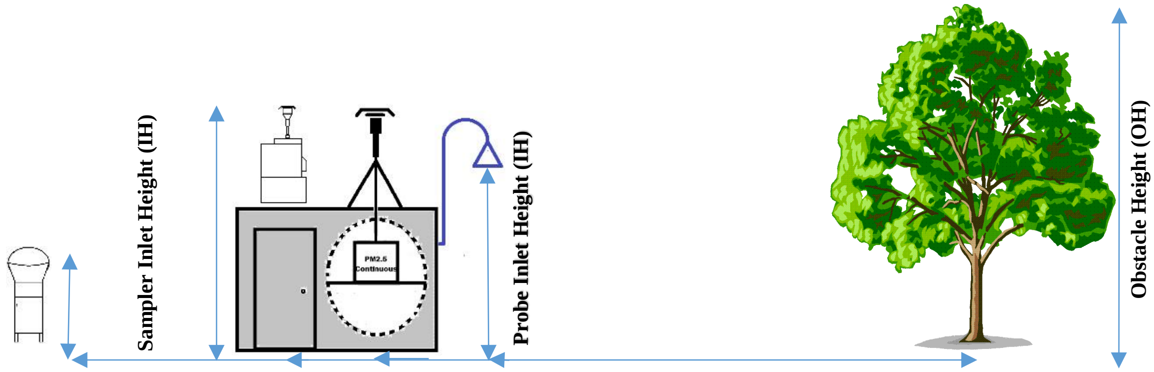
**Issue(s):** ______________________________________________________________________________________________

| Pollutant(s) | Inlet Height (meters) | Inlet Location (Side of Shelter, Ground, Roof) | Horizontal Distance (meters) If Applicable | Vertical Distance (meters) If Applicable | Monitoring SCALE | |
|---|---|---|---|---|---|---|
| | | | | | AQS | Annual Network Plan |
| PM | 2.5 | Ground | | | Urban | Unknown |
| PM | 2.5 | Ground | | | Urban | Unknown |
| PM | 2.5 | Ground | | | Urban | Unknown |
| | | | | | | |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MSEF (Page 4/5): Local Site Name:** Harriman **Initials:** TED **Date:** March 9, 2017

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| N/A | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** ____________inches = __________**meters** (nearest inlet to dripline) ☐ **No Trees Present**

(39.4 inches = 1 meter) ____________inches = __________**meters** (nearest inlet to dripline) ☐ Not Present

____________inches = __________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** None

**Minor Sources:**

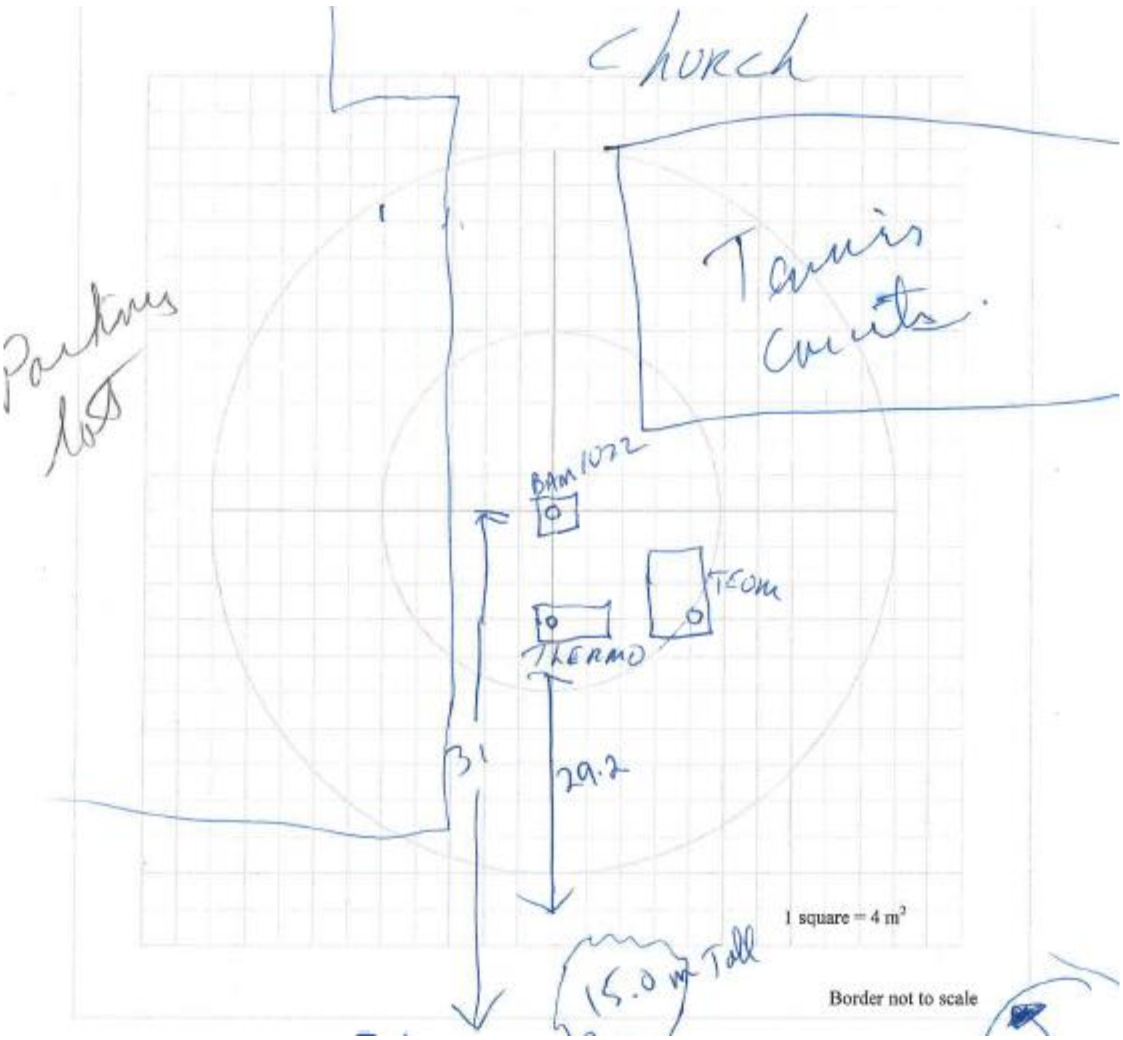
- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

**Issues:** None

**MSEF (Page 5/5): Local Site Name:** Harriman **Initials:** TED **Date:** March 9, 2017

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: 360 ° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

## Additional Information:

## Aerial Photo with Wind Rose

**PHOTO LOG:** **Local Site Name:** _Harriman________________ **Initials:** _TED_____ **Date:** _March 9, 2017_

**Camera [□ APC / □ Personal – Owner: _______________] Make/Model:** ________________________________

**Filename:** ___001_________ **Date:** _3-9-17_____________ **Time:** __11:00 am________ **Photographer:** ___TED___________

**Description:** _North from monitor (North directional)________________________________________________

**Filename:** ___002________ **Date:** _3-9-17_____________ **Time:** _11:00 am_________ **Photographer:** ___TED___________

**Description:** _North toward monitor__________________________________________________________

**Filename:** ___003_________ **Date:** _3-9-17_____________ **Time:** __11:00 am_________ **Photographer:** ___TED__________

**Description:** _South from monitor (South directional)________________________________________________

**Filename:** __004_________**Date:** _3-9-17_____________ **Time:** __11:00 am _________ **Photographer:** ___TED__________

**Description:** __South toward monitor_________________________________________________________

**Filename:** _005__________**Date:** __3-9-17_____________ **Time:** _11:00 am___________ **Photographer:** ___TED _________

**Description:** _East from monitor (East directional)____________________________________________________

**Filename:** __006________ **Date:** _3-9-17_____________ **Time:** __11:00 am __________ **Photographer:** __TED____________

**Description:** __East toward monitor__________________________________________________________

**Filename:** __007________**Date:** __3-9-17_____________ **Time:** _11:00 am____________ **Photographer:** ___TED__________

**Description:** __West from monitor (West directional)_________________________________________________

**Filename:** __008_______ **Date:** _3-9-17_____________ **Time:** __11:00 am___________ **Photographer:** __TED___________

**Description:** _West toward monitor__________________________________________________________

001 – North from monitor (North directional)


002 – North toward monitor

003 – South from monitor (South directional)


004 – South toward monitor

005 – East from monitor (East directional)


006 – East toward monitor

007 – West from monitor (West directional)


008 – West toward monitor

# CFR Part 58, Appendix E, Tables and Figures

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| $O_3$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| $SO_2$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| PM, Pb | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

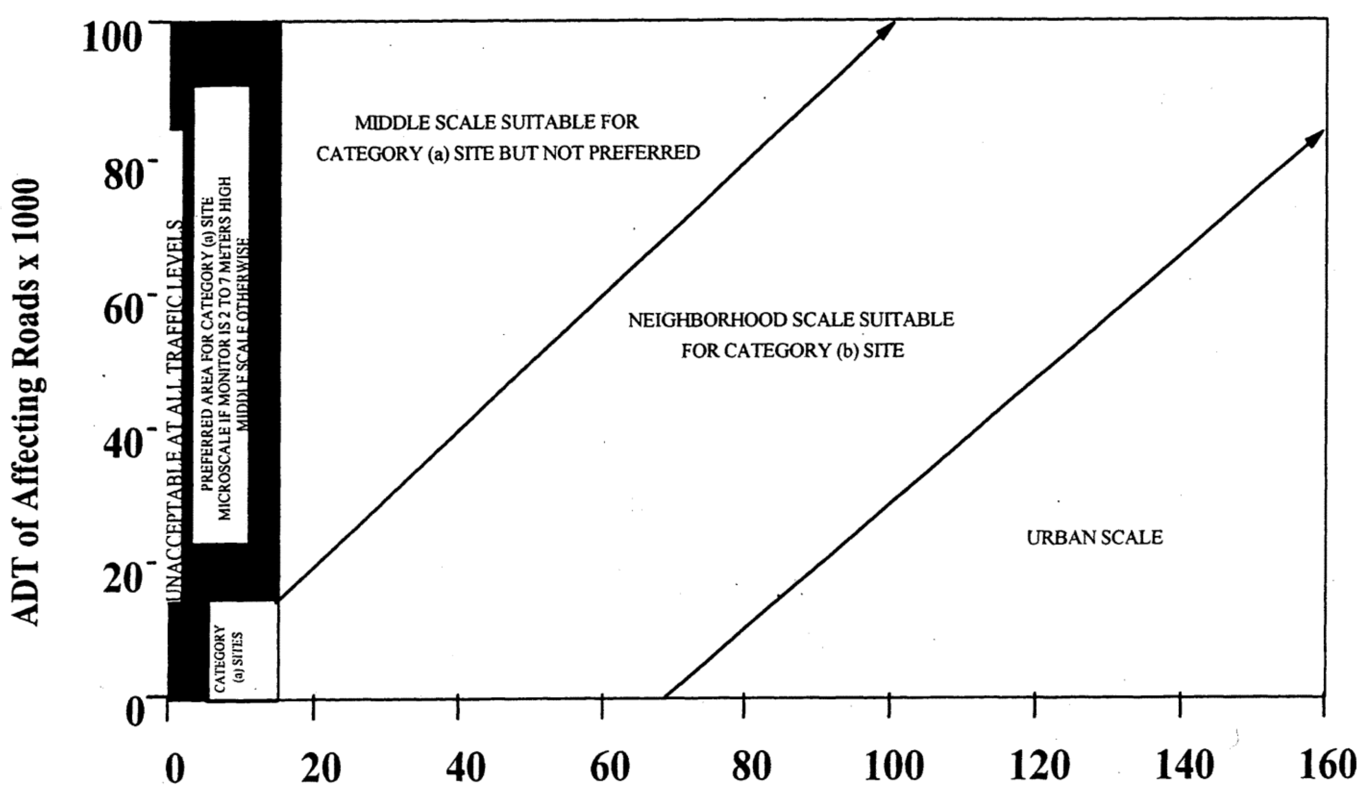



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| **1/4" Line OD / 20 Sec Residence Time** | | | |
|---|---|---|---|
| **Flow Rate** | **1/8" ID** | **5/32" ID** | **3/16" ID** |
| **(liters/min)** | **feet** | **feet** | **feet** |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
| 0.6 | 82.9 | 53.0 | 36.8 |
| 0.7 | 96.7 | 61.9 | 43.0 |
| 0.8 | 110.5 | 70.7 | 49.1 |
| 0.9 | 124.3 | 79.6 | 55.3 |
| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
| 1.2 | 165.8 | 106.1 | 73.7 |
| 1.3 | 179.6 | 114.9 | 79.8 |
| 1.4 | 193.4 | 123.8 | 85.9 |
| 1.5 | 207.2 | 132.6 | 92.1 |
| 1.6 | 221.0 | 141.4 | 98.2 |
| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

**ADDITIONAL SUPPORTING INSTRUMENTATION**

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

A 4G cellular modem (Sierra Wireless RV50) provides internet communications to the BAM 1022 and to the 8832 data logger via a network switch.

A US Robotics dial-up modem is used to send the ancillary data from the 2025 to the central office staff.

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**

Type of Shelter(s) located on site:

1. **Enclosure: N**
2. **Trailer: Y**
3. **None: N**
4. **Other: N**

What are the shelter(s) made of?

1. ______________________________
2. ______________________________
3. ______________________________
4. Platforms (wood)

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **N**
With roof top samplers or inlets – is a roof railing present? **N/A** (May not be required in accordance with local ordinances)
Roof Access: Stairs or Ladder? **N/A**
Stairs can be inside or outside – Ladders are usually permanently attached or removable? **N/A**
Write additional comments on the shelters below:

# INDEX

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**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and may be specified in agency QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites eating shelter? Ants eating operator? Wasps/Bees attacking auditor? / Larger wildlife making shelter its home

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**:  Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values.  Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:**  document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks.  Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met:  define the met instrumentation present or not.

**Calibrators:**  can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated.

**FILTERS:**  For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument.  Check the plumbing, interview the operator and qa auditor on this point.  Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration.  If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:**  complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, SO2, NO, NO2, the PSI reading -  a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading.  Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control

**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**

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## Air Monitoring Site Evaluations
## TDEC APC

**Date: 2/3/17** **Location: Hendersonville, TN**
**AQS Number: 47-165-0007**
**Site Name: Hendersonville** **Pollutants: O3/PM $_{2.5}$**
**Project Leader:**

---

**Print Name / Signature / Initials / Duties**

**1:** (Team Lead) _Evelyn Haskin______________________________EMH___Site Specialist__________________

**2:**_____________________________________________________________________________________

**3:**_____________________________________________________________________________________

# Air Monitoring Site Evaluation Summary

**Local Site Name:** _Hendersonville____________________ **Initials:** _EMH_____ **Date:** __2/3/17________________

**Additional Comments:**

__Sunny 39 $^{o}$__F

Site located inside Corp of Engineers fence

Ozone season starts March 1. Calibrator was taken back to field office for beginning of the year calibration.

Probe line will be replaced in Feb. prior to the beginning of ozone season.

Site was set up for 2017 O3 season on 2/14/17

**MONITORING SITE EVALUATION FORM (MSEF)**

**Local Site Name:** _Hendersonville___________________ **Initials:** _EMH_______ **Date:** ___2/3/17__________

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present **[Y/N] Completed**

**Arrival Time:** _2:00pm__ **Departure Time:** _3:20 pm__ **Primary Operator:** _Alysaa Ferraro_____________

**Observer(s):** ______________________________________________________________

**SITE**

[Y]-**Security Fence** [Y]-**Razor/Barb Wire** [Y] **Grass/Shrubs Cut** [NA] **Bare Soil Area**

[N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** _______________________ [Y/N] **Police Report Filed**

**Issues:** ______________________________________________________________________________________________

**SHELTER - Interior**

**Arrival Temperature:** 23.24_____**°C** (from data logger) **Operator Site Visits:** _1-2______ per [**week**]

[Y] **Leaking Roof** **[Damaged: x Ceiling / □Floor / □Walls]** [N] **Clean / Neat** [N] **Fire Extinguisher**

[Y] **Insect / Wildlife Issues** [Y] **Thermometer** (min/max) [Y] **Gasoline** (inside shelter)

**Issues:** _Evidence of past leaks , Damage of insulation underneath shelter______________________________

**MONITOR(s):** **Location:** Exterior Samplers **[□Roof / x Ground / □ Not Present]**

| Monitor(s) | Manufacturer | Model | Serial Number |
|---|---|---|---|
| PM $_{2.5}$ TEOM | R & P | 1400a | K58537 |
| Ozone | Thermo | 49c | 73470-373 |
| PM $_{2.5}$ (Poc 1) | Thermo | 2025 | 22516 |
| PM $_{2.5}$ (Poc 2) | Thermo | 2025 | 21906 |
| PM $_{2.5}$ BAM | Met one | BAM 1022 | T17005 |
| | | | |

**CALIBRATOR(s):** x **Not Present** [Y/N] **Are QA/QC Check Gases Vented Outside Shelter?**

| QA/QC | Make | Model | Serial Number | Certification Date | Expiration Date |
|---|---|---|---|---|---|
| QC | Teledyne | T703 | 332 | | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line? [N]** If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** _Hendersonville___________ **Initials:** _EMH____ **Date:** __2/3/17_______

**All Gas Standards Pass thru all Filters during:** [Y] **Calibrations** (Not Required) [Y] **Precision Checks** (Required) [Y] **Audits** (Required)

**Issues:** ______________________________________________________________________________________

## CYLINDER GAS STANDARDS: x Not Present

**VENDOR:** **(PSI Reading < 200, tank is empty and should not be in service)**

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

Issues: ______________________________________________________________________________________

## SUPPORTING INSTRUMENTATION: Internal

[Y/N] **Temperature Sensor** [Y/N] **Uninterruptable Power Supply**

**Zero Air System: Commercial System** (Make / Model): ________________________________________________

**Cartridge System: [□Silica Gel □Pink / □Blue] / x Charcoal / □Purafil / □Hopcalite / Other:** _Dri- rite______**]**

[Y/N] **Needs Service Last Service Date:** _______________ **Condition:** ____________________________

Issues: ______________________________________________________________________________________

**Probe Line(s): [x Replaced / □Cleaned] – Frequency:** _1 per year___ **Last Service Date:** _2/14/17___________

[Y/N] **Clean** [Y/] **Heated** [N] **Insulated** [Y/N] **Moisture** [N] **Retractable** [N] **Old / Unused Lines** [N] **Lo Flo**

**Manifold ->** [N] **Any Open Ports? –> How many analyzers using manifold?** _______________

Issues: __Probe line will be replaced prior to the beginning of 2017 ozone season____________________________________

**MSEF (Page 3/5): Local Site Name: __Hendersonville_________ Initials: _EMH_____ Date: _2/3/17________**

**SHELTER – Exterior** □ **Not Present**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other: _Aluminum________________________________]**

[**Y**/N] **Needs Maintenance** (specify) [**Y**/N] **Tied Down** [**Y**/N] **Electrically Grounded** [Y/**N**] **Roof Railing**

**Roof Access: [Stairs [Interior/Exterior] /** Ladder [attached/removable] **/ □ Not Present]** [Y/**N**] **Loose Decking** (Trip Hazard)

**Issues:** ____________________________________________________________________________________

**Height of Roof:** __3.2_____________**meters** **Roofing Material**: ___Aluminum ___________________________

**Issues:** Rust spots on roof ___________________________________________________________________

**OUTDOOR SAMPLERS** □ **Not Present**

**[Y ] Locked [Y ] Electrically Grounded [Y ] Stabilized [Y ] Clean Inside [Y/ ] Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule: __________________ $PM_{10}$ Head Clean Schedule:** _Monthly__________

**Issue(s):** WINS changed once every 5 runs : VSCC monthly____________________________________________

**COLLOCATED SAMPLERS:** **x Not Present** (39.4 inches = 1 meter)

| Pollutant | Flow (Hi / Lo) | *Separation Distance (meters) |
|---|---|---|
| $PM_{2.5}$ | Lo | 1.6 |
| $PM_{2.5}$ | Lo | 1.6 |

*Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s): External** □ **Not Present**

**Inlet Type:** [**x**Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [**x**Rain Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / **x**Stainless Steel / Other: _________]

**Probe Line(s)**: [**x**Teflon® / Other: _____________] **Probe Fitting(s)**: [**x**Teflon® / Other: ___________ / □ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

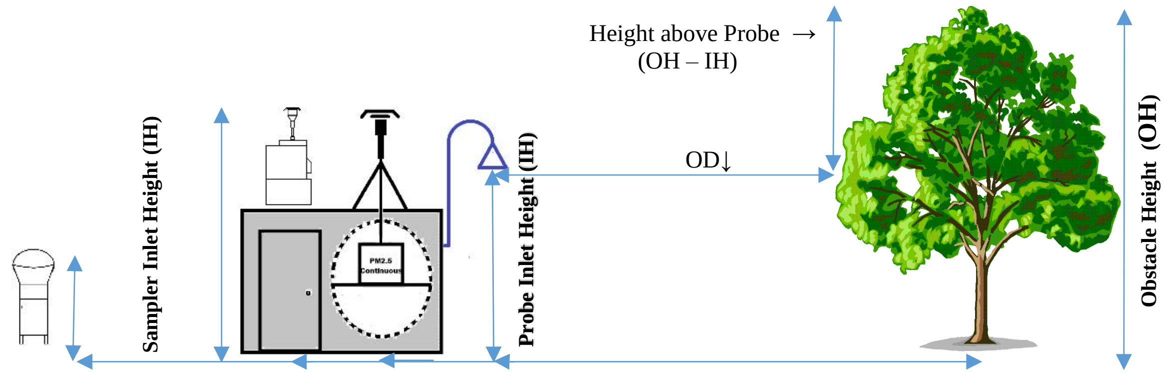
**Issue(s):** ______________________________________________________________________________

| Pollutant(s) | Inlet Height (meters) | Inlet Location (Side of Shelter, Ground, Roof) | *Horizontal Distance (meters) If Applicable | *Vertical Distance (meters) If Applicable | Monitoring SCALE | |
|---|---|---|---|---|---|---|
| | | | | | AQS | Annual Network Plan |
| O3 | 4.3 | Side of shelter | | 1.8 | Urban | Neighborhood |
| $PM_{2.5}$ TEOM | 5.0 | Roof | | 1.8 | | |
| $PM_{2.5}$ 2025 | 2 | Ground | | 1.6 | Urban | Neighborhood |
| $PM_{2.5}$ 2025 | 2 | Ground | | 1.6 | Urban | Neighborhood |
| $PM_{2.5}$ BAM | 2.3 | Ground | | 1.4 | Urban | Neighborhood |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MSEF (Page 4/5): Local Site Name:** _Hendersonville________ **Initials:** _EMH______ **Date:** _2/3/17_________

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** _____________inches = __________**meters** (nearest inlet to dripline) □ **No Trees Present**

(39.4 inches = 1 meter) _____________inches = __________**meters** (nearest inlet to dripline) ☐ Not Present

_____________inches = __________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ____No issues with driplines or obstacles_____________________________________________

**Minor Sources:**

- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

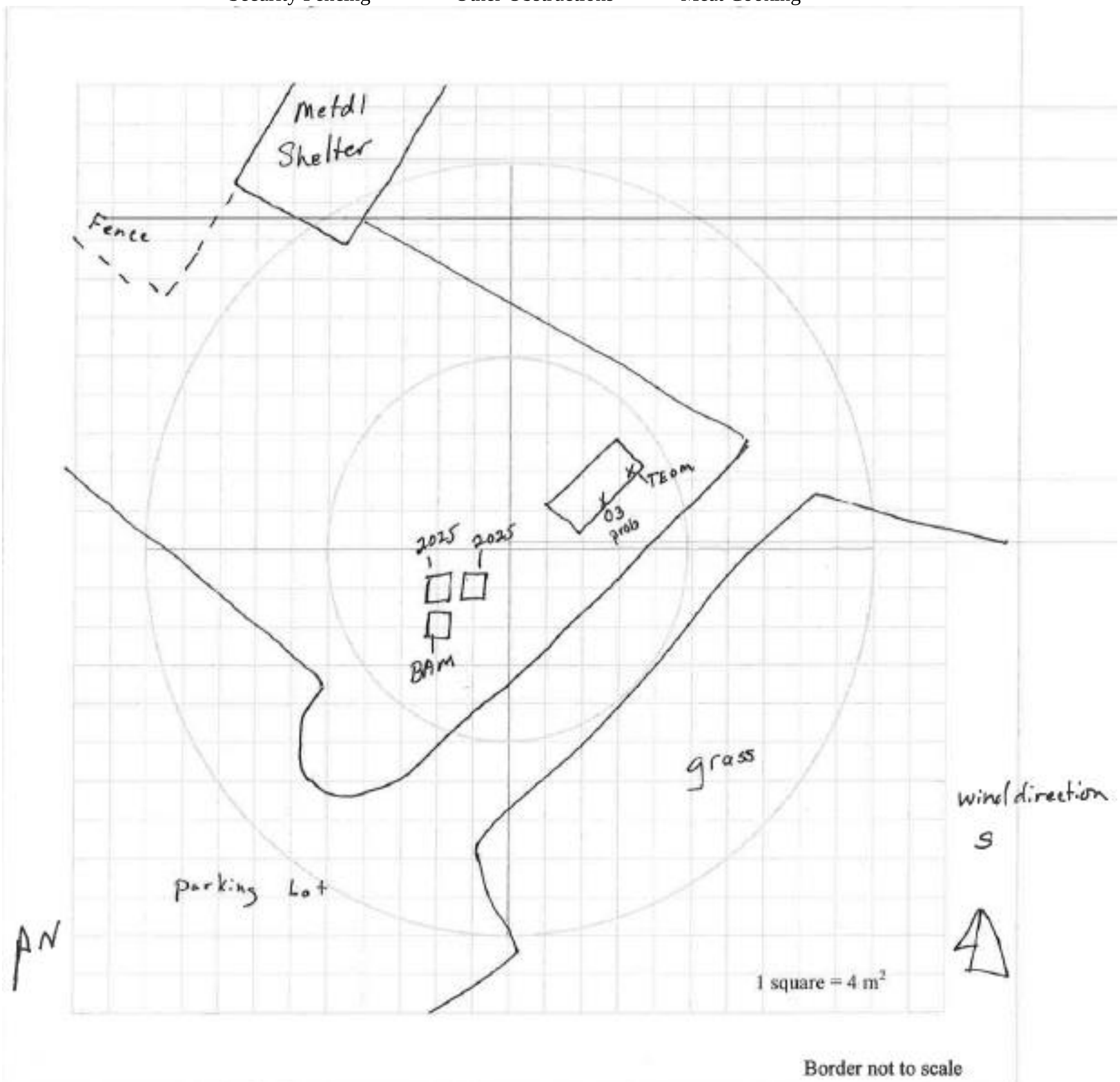
**Issues:** ___None_____________________________________________________________

_____________________________________________________________________________

**MSEF (Page 5/5): Local Site Name:** _Hendersonville__________ **Initials:** EMH______ **Date:** __2/3/17________

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: _>270______° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

## Additional Information:

Distance to closest road (Overlook Circle) – 67.9 m (Measured using Google Earth Pro)

## Aerial Photo with Wind Rose

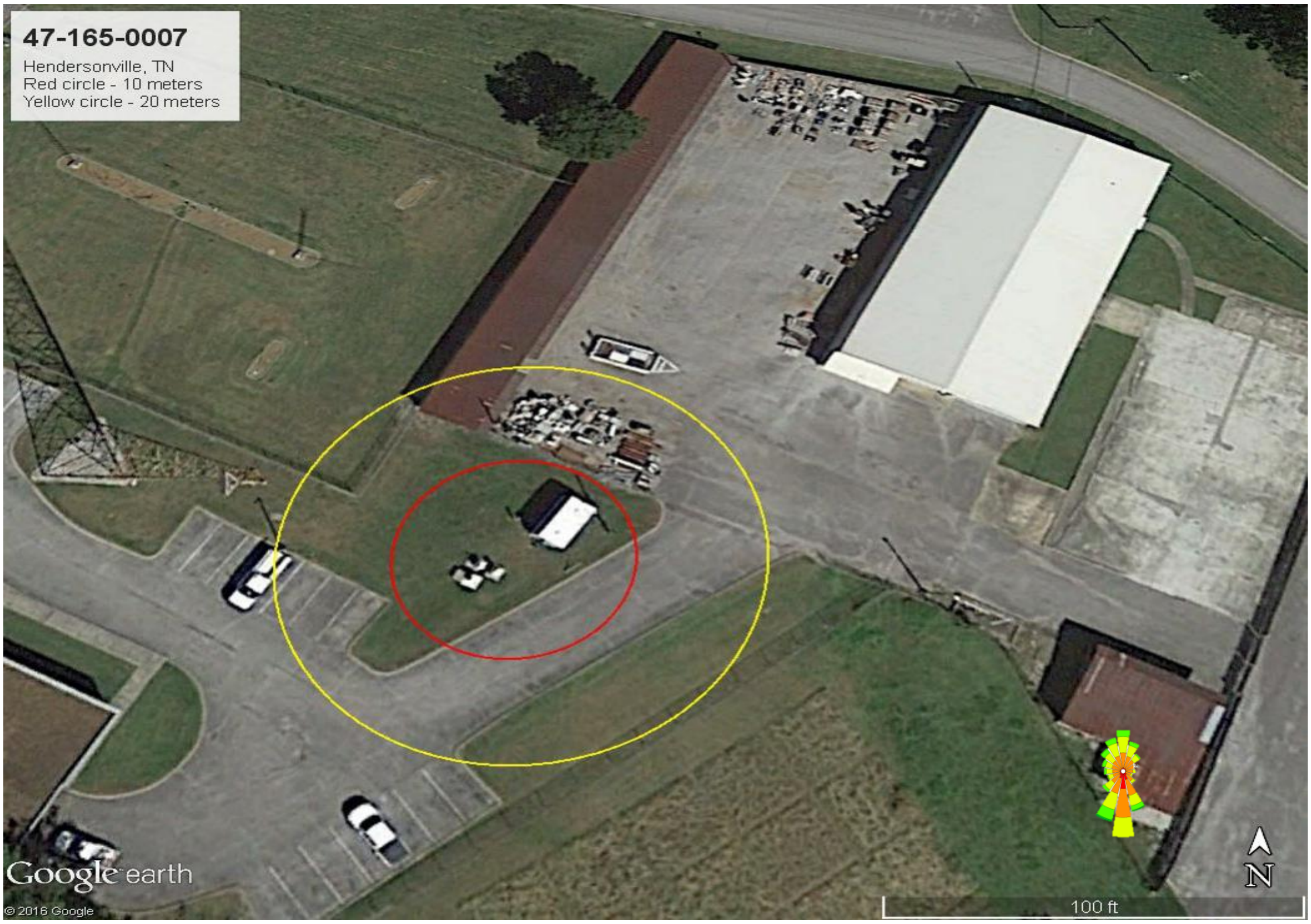


**PHOTO LOG: Local Site Name:** _Hendersonville__________ **Initials:** _EMH____ **Date**: 2/3/17________

**Camera [x APC / □ Personal – Owner: ________________] Make/Model:** Nikon Coolpix____________________

**Filename:** __01____________________ **Date:** __2/3/17______ **Time:** __3:00 _pm___ **Photographer:** ___EMH____________

**Description:** _Site view from west direction_____________________________________________________________

**Filename:** __02____________________ **Date:** __2/3/17______ **Time:** __3:00 pm____ **Photographer:** ___EMH____________

**Description:** __Site view from south direction__________________________________________________________

**Filename:** __03____________________ **Date:** __2/3/17______ **Time:** __3:00 _pm_____ **Photographer:** ___EMH____________

**Description:** __North side of site______________________________________________________________________

**Filename:** __04____________________ **Date:** __2/3/17______ **Time:** __3:00 pm______ **Photographer:** ___EMH____________

**Description:** _View North of site (N directional)__________________________________________________________

**Filename:** __05____________________ **Date:** __2/3/17______ **Time:** __3:00 pm_____ **Photographer:** ___EMH____________

**Description:** _South side of site_______________________________________________________________________

**Filename:** __06____________________ **Date:** __2/3/17______ **Time:** __3:00 pm______ **Photographer:** ___EMH____________

**Description:** __View South of site (S directional)_________________________________________________________

**Filename:** __07____________________ **Date:** __2/3/17______ **Time:** __3:00 _pm_____ **Photographer:** ___EMH____________

**Description:** __West side of site_______________________________________________________________________

**Filename:** __08____________________ **Date:** __2/3/17______ **Time:** __3:00 _pm_____ **Photographer:** ___EMH____________

**Description:** __View West of site (W directional)__________________________________________________________

**Filename:** __09____________________ **Date:** __2/3/17______ **Time:** __3:00 pm______ **Photographer:** ___EMH____________

**Description:** ___East side of site_______________________________________________________________________

**Filename:** __10____________________ **Date:** __2/3/17______ **Time:** __3:00 pm_____ **Photographer:** ___EMH____________

**Description:** __View East of site (E directional)__________________________________________________________

**Filename:** _11____________________ **Date:** __2/3/17______ **Time:** __3:00 pm______ **Photographer:** ___EMH____________

**Description:** __Steps to shelter are warped and split; need repair in near future_____________________________

**Filename:** __12____________________ **Date:** __2/3/17______ **Time:** __3:00 pm______ **Photographer:** ___EMH____________

**Description:** ___Insulation underneath shelter exposed_____________________________________________________

**PHOTO LOG: Local Site Name:** _Hendersonville__________ **Initials:** _EMH____ **Date**: 2/3/17________

**Camera [x APC / □ Personal – Owner: ________________] Make/Model:** Nikon Coolpix___________________

**Filename:** _13__________________ **Date:** __2/3/17______ **Time:** __3:00 pm_____ **Photographer:** ___EMH___________

**Description:** _Rust on roof_____________________________________________________________________

Hendersonville: Photo Log (2017)

001

002

003


004

005


006

007


008

009


010

# 40 CFR Part 58, Appendix E, Tables and Figures

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| $O_3$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| $SO_2$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| PM, Pb | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

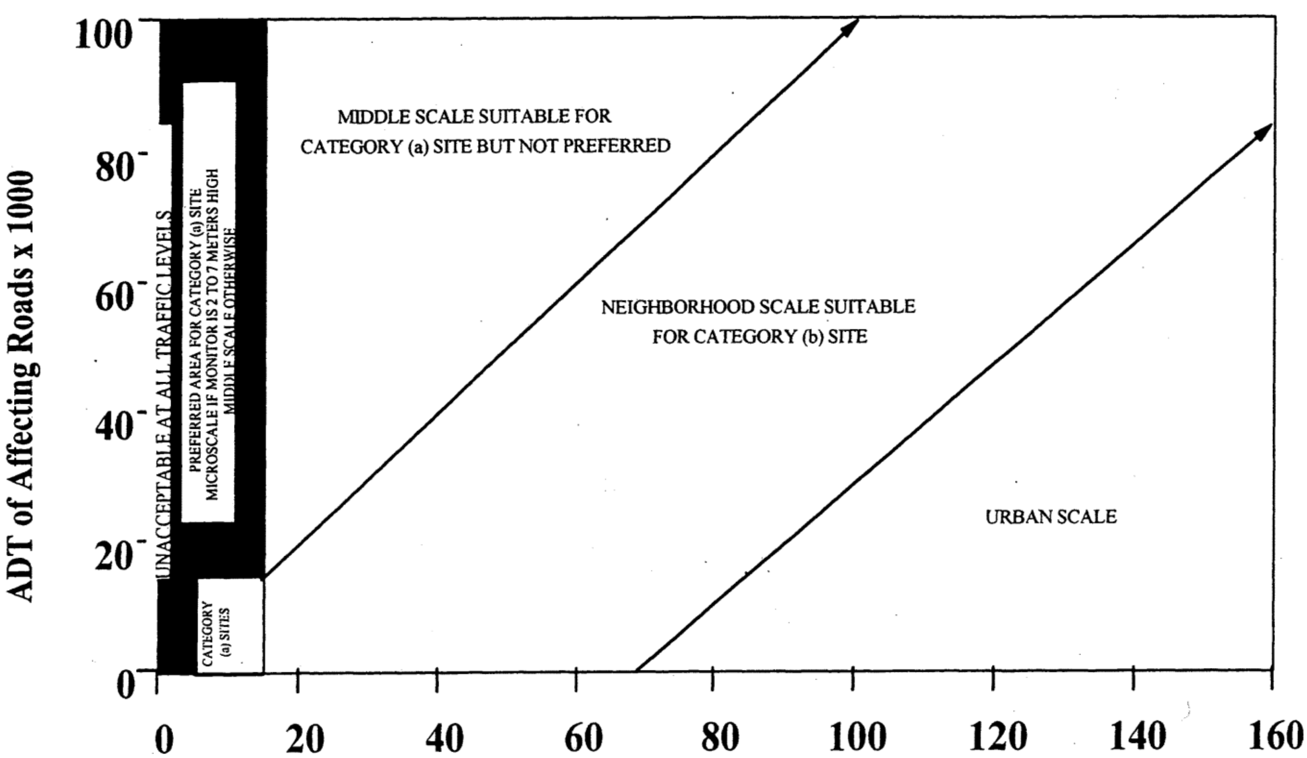



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| 1/4" Line OD / 20 Sec Residence Time | | | |
|---|---|---|---|
| Flow Rate | 1/8" ID | 5/32" ID | 3/16" ID |
| (liters/min) | feet | feet | feet |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
| 0.6 | 82.9 | 53.0 | 36.8 |
| 0.7 | 96.7 | 61.9 | 43.0 |
| 0.8 | 110.5 | 70.7 | 49.1 |
| 0.9 | 124.3 | 79.6 | 55.3 |
| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
| 1.2 | 165.8 | 106.1 | 73.7 |
| 1.3 | 179.6 | 114.9 | 79.8 |
| 1.4 | 193.4 | 123.8 | 85.9 |
| 1.5 | 207.2 | 132.6 | 92.1 |
| 1.6 | 221.0 | 141.4 | 98.2 |
| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

## SUPPORTING INSTRUMENTATION

**Temperature Sensor**: the shelter must have a temperature sensor inside connected to the data logger. The sensor is not directly required in the regulation, but is needed to demonstrate the operational conditions of the analyzer meet the FRM/FEM requirements.

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Zero Air System**:
For a Commercial System: give the make and model
For a home built Cartridge System: identify the cartridges present, if any need service, date of last service, and condition of system.
Identify any issues with either system.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

**Probe Lines**:
Frequency – how often are they cleaned or serviced, ask operator or check the logbook for the last service date.

Was any dirt and contamination observed in the probe lines, including condensation?  Y **/ N**
Are the probe lines heated and insulated? **Y / N**
Are the probe lines retractable – a retractable line is a single line system which can be "retracted" inside the shelter from its sampling position?  Y **/ N**
Comment and identify on any issues about the probe lines or attached additional sheets.

_Probe lines are heated but not insulated.________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

____SOP____________________________________________________________________

Are these electronic or hardcopy?

___Hardcopy________________________________________________________________

Are logbooks at the site?

___Yes  The logbooks are for each monitor located at site.______________________________

**Charts / Papers on Walls:** What do they Track, Up-to-date?

___No______________________________________________________________________

**SHELTER**

Is the shelter tied down – physically tied with hurricane straps?
Is the shelter grounded - look for rod in the ground and lead wire connection?

Type of Shelter(s) located on site:

1. **Enclosure: N**
2. **Trailer: Y**
3. **None: N**
4. **Other: Y**

What are the shelter(s) made of?

1. ____________________________________________________________
2. _Aluminum___________________________________________________
3. ____________________________________________________________
4. _Platforms - wood_____________________________________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **Y**
Write additional comments on the shelters below:
__Countertop in shelter needs to be cleaned; evidence of ceiling leaking in past, roof is has rust spots and seams around roof need caulking; steps outside shelter will need one or two of the boards replaced in near future, insulation underneath shelter is exposed__

## INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

**Initials:** Initials of auditor completing form.

**Date:** current date site is entered by auditor

**Reminder:** If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

**Arrival Time:** time auditors arrive at site

**Departure Time:** time auditors depart site

**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and is specified in TDEC DAPC's QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures. Teledyne analyzers are designated FEM for a range of 5-40 °C. Therefore, TDEC DAPC keeps shelters with these monitors within this range (still keeping in mind the 2 deg SD requirement). Shelters are generally kept about 25-26 °C in the warmest months to reduce condensation in sample lines and analyzer.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites? Ants? Wasps/Bees? / Larger wildlife causing problems (such as nesting in the undercarriage or walls or digging dens near the foundation/supports)?

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:** document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated. Some examples of items that can cause this problem are a leaking filter holder or fitting and an uncapped TTP system or sample line tee.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, $SO_2$, NO, $NO_2$, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control

**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**

## Air Monitoring Site Evaluations
## TDEC APC

**Date: 2/16/17** **Location: Jackson, TN**
**AQS Number: 47-113-0006**
**Site Name: Jackson** **Pollutants: PM $_{2.5}$**
**Project Leader:**

**Print Name / Signature / Initials / Duties**

**1:** (Team Lead) _Evelyn Haskin________________________________ EMH___Site Specialist_________

**2:**______________________________________________________________________

**3:**______________________________________________________________________

# Air Monitoring Site Evaluation Summary

**Local Site Name:** _Jackson___ _____________________ **Initials:** _EMH_____ **Date:** __2/16/17____________

**Additional Comments:**

Sunny, 48 $^{o}$ F

_Electric : Jackson Energy Authority Meter # 2114113

**MONITORING SITE EVALUATION FORM (MSEF)**

**Local Site Name:** _Jackson_________________________ **Initials:** _EMH_______ **Date:** ___2/16/17________

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present

**Arrival Time:** _11:30 am__ **Departure Time:** _12:40 pm__ **Primary Operator:** _David Norville_____________

**Observer(s):** ____________________________________________________________

**SITE**

[Y]-**Security Fence** [N]-**Razor/Barb Wire** [Y] **Grass/Shrubs Cut** [N] **Bare Soil Area**

[N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** ______________________ [NA] **Police Report Filed**

**Issues:** _Site is completely enclosed in by chain link fencing because area is due to vandalism problems_______

**SHELTER – Interior**

**Arrival Temperature:** NA_____**°C** (from data logger) **Operator Site Visits:** _1_________per [**week** ]

[N] **Leaking Roof** **[Damaged: NA]** [Y] **Clean / Neat** [N] **Fire Extinguisher**

[N] **Insect / Wildlife Issues** [N] **Thermometer** (min/max) [N] **Gasoline** (inside shelter)

**Issues:** __None____________________________________________________________

**MONITOR(s):** **Location:** Exterior Samplers **[□Roof / x Ground / □ Not Present]**

| Monitor(s) | Manufacturer | Model | Serial Number |
|---|---|---|---|
| PM $_{2.5}$ (Poc 1) | Thermo | 2025 | 22165 |
| PM $_{2.5}$ (Poc 2) | R & P | 2025 | 20786 |
| PM $_{2.5}$ TEOM | R & P | 1400a | 25175 |
| | | | |
| | | | |
| | | | |

**CALIBRATOR(s):** **x Not Present** [NA] **Are QA/QC Check Gases Vented Outside Shelter?**

| QA/QC | Make | Model | Serial Number | Certification Date | Expiration Date |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line?** [Y/N] If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** _Jackson_________________ **Initials:** _EMH____ **Date:** __2/16/17_______

**All Gas Standards Pass thru all Filters during:** [NA] **Calibrations** (Not Required) [NA] **Precision Checks** (Required) [NA] **Audits** (Required)

**Issues:** ____NA_______________________________________________

**CYLINDER GAS STANDARDS:** **x Not Present**

**VENDOR:** **(PSI Reading < 200, tank is empty and should not be in service)**

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

Issues: ______________________________________________________________

**SUPPORTING INSTRUMENTATION:** **Internal**

[NA] **Temperature Sensor** [NA] **Uninterruptable Power Supply**

**Zero Air System:** **Commercial System** (Make / Model): ___NA_______________________________

**Cartridge System: [□Silica Gel □Pink / □Blue] / □x Charcoal / □Purafil / □Hopcalite / Other: __________]**

[NA] **Needs Service** **Last Service Date:** _______________ **Condition:** ______________________________

Issues: ____________NA___________________________________________

**Probe Line(s): [□Replaced / □Cleaned] – Frequency: ___________ Last Service Date: __________________**

[NA] **Clean** [NA] **Heated** **[**NA] **Insulated** **[**NA] **Moisture** [NA] **Retractable** [NA] **Old / Unused Lines** **[**NA] **Lo Flo Manifold ->** [NA] **Any Open Ports?** **–> How many analyzers using manifold? _______________**

Issues: ______NA_________________________________________________

**MSEF (Page 3/5): Local Site Name:** __Jackson_ ____________ **Initials:** _EMH_____ **Date:** _2/16/17________

**SHELTER – Exterior** **x Not Present**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other:** _______ NA __________________________________**]**

[NA] **Needs Maintenance** (specify) **[**NA] **Tied Down** [NA] **Electrically Grounded** [NA] **Roof Railing**

**Roof Access: [Stairs [Interior/Exterior] /** Ladder [attached/removable] **/ □ Not Present]** [NA] **Loose Decking** (Trip Hazard)

**Issues:** ________________________________________________________________________________

**Height of Roof:** __ ___ _____________**meters** **Roofing Material**: ______________________________________

**Issues:** ________________________________________________________________________________

**OUTDOOR SAMPLERS**

[**Y**] **Locked** [**Y**] **Electrically Grounded** [**Y**] **Stabilized** [**Y**] **Clean Inside** [**Y**] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** _________________ **$PM_{10}$ Head Clean Schedule:** _Monthly__________

**Issue(s):** WINS changed once every 5 runs : VSCC cleaned monthly___________________________________

**COLLOCATED SAMPLERS:** **□ Not Present** (39.4 inches = 1 meter)

| Pollutant | Flow (Hi / Lo) | *Separation Distance (meters) |
|---|---|---|
| PM2.5 | Lo | 1.3 m |
| PM2.5 | Lo | 1.3 m |

*Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s):** **Not Present**

**Inlet Type:** [NA]

**Funnel(s):** NA **Funnel Material**: NA

**Probe Line(s)**: NA **Probe Fitting(s)**: NA

**Residence Time:** NA

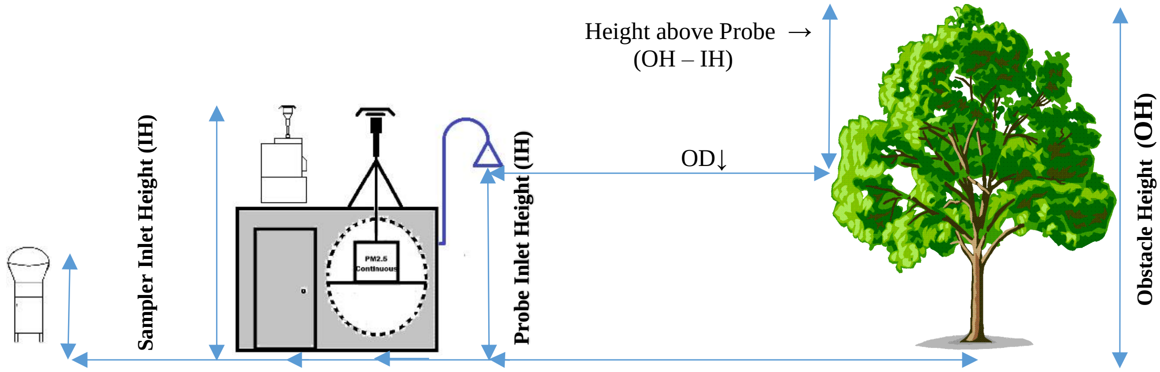
**Issue(s):** ________________________________________________________________________________

| Pollutant(s) | Inlet Height (meters) | Inlet Location (Side of Shelter, Ground, Roof) | *Horizontal Distance (meters) If Applicable | *Vertical Distance (meters) If Applicable | Monitoring SCALE | |
|---|---|---|---|---|---|---|
| | | | | | AQS | Annual Network Plan |
| $PM_{2.5}$ | 2.6 | Ground | 1.3 to 2.6 | | Neighborhood | Neighborhood |
| $PM_{2.5}$ | 2.5 | Ground | 1.3 to 2.6 | | Neighborhood | Neighborhood |
| $PM_{2.5}$ | 2.5 | Ground | 1.3 to 2.6 | | Neighborhood | Neighborhood |
| | | | | | | |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MSEF (Page 4/5): Local Site Name:** _Jackson_________ **Initials:** _EMH______ **Date:** _2/16/17______

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| Tree (1) | 18.6 | 2.5 | 32.2 | 24.6 |
| Tree (2) | 15.6 | 2.5 | 26.2 | 26.0 |
| Tree (7) | 17.6 | 2.6 | 30.0 | 29.4 |
| Tree (8) | 21.8 | 2.6 | 38.4 | 29.8 |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** ____________inches = _________**meters** (nearest inlet to dripline) ☐ **No Trees Present**

(39.4 inches = 1 meter) ____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ____A siting waiver was received for this site.______________________________

**Minor Sources:**

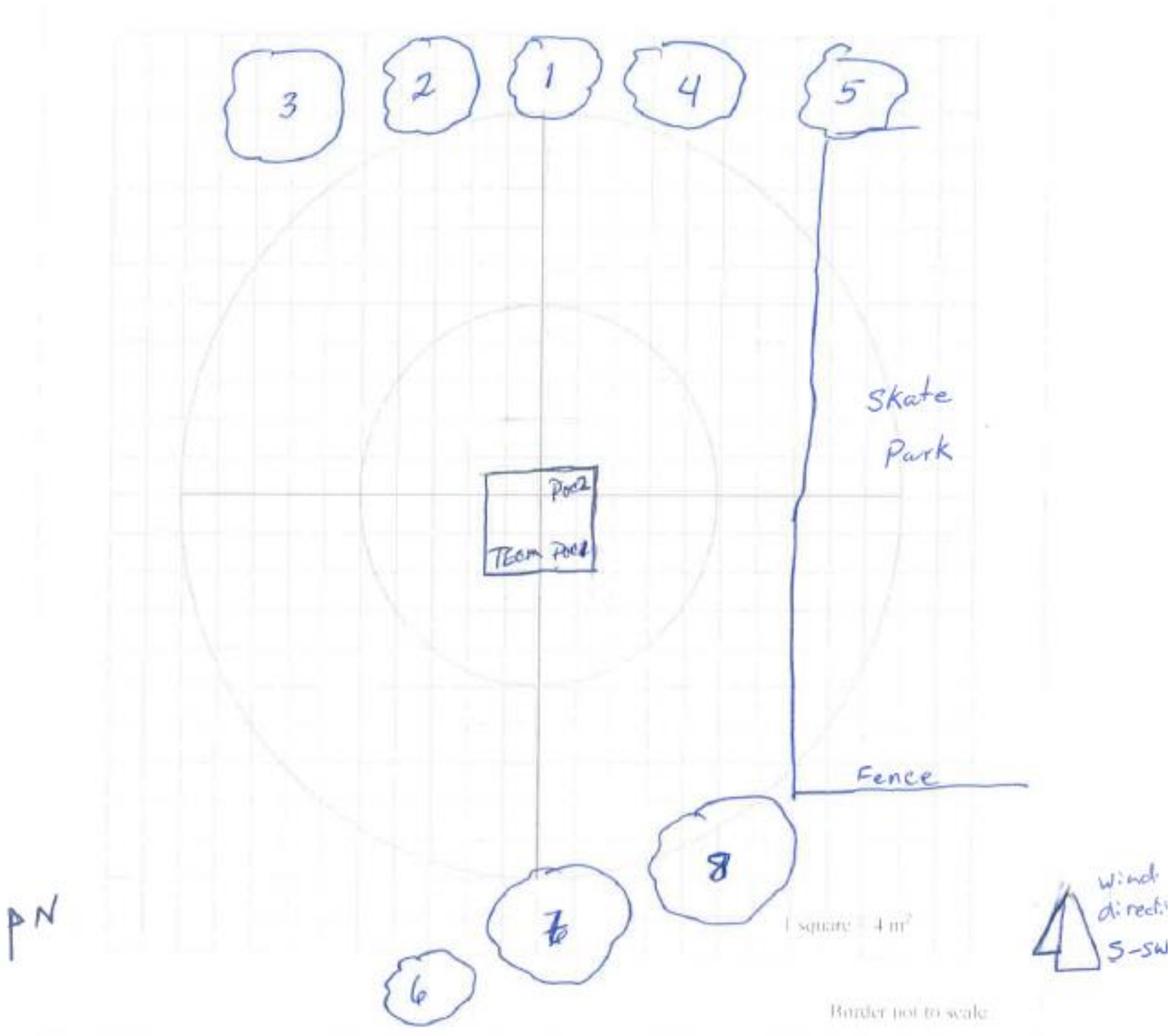
- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

**Issues:** ___None_______________________________________________

**MSEF (Page 5/5): Local Site Name:** _Jackson______________ **Initials:** EMH______ **Date:** __2/16/17________

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: 235______° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

## Additional Information:

Distance to closest road (North Parkway) – 225.8 meters

## Aerial Photo with Wind Rose

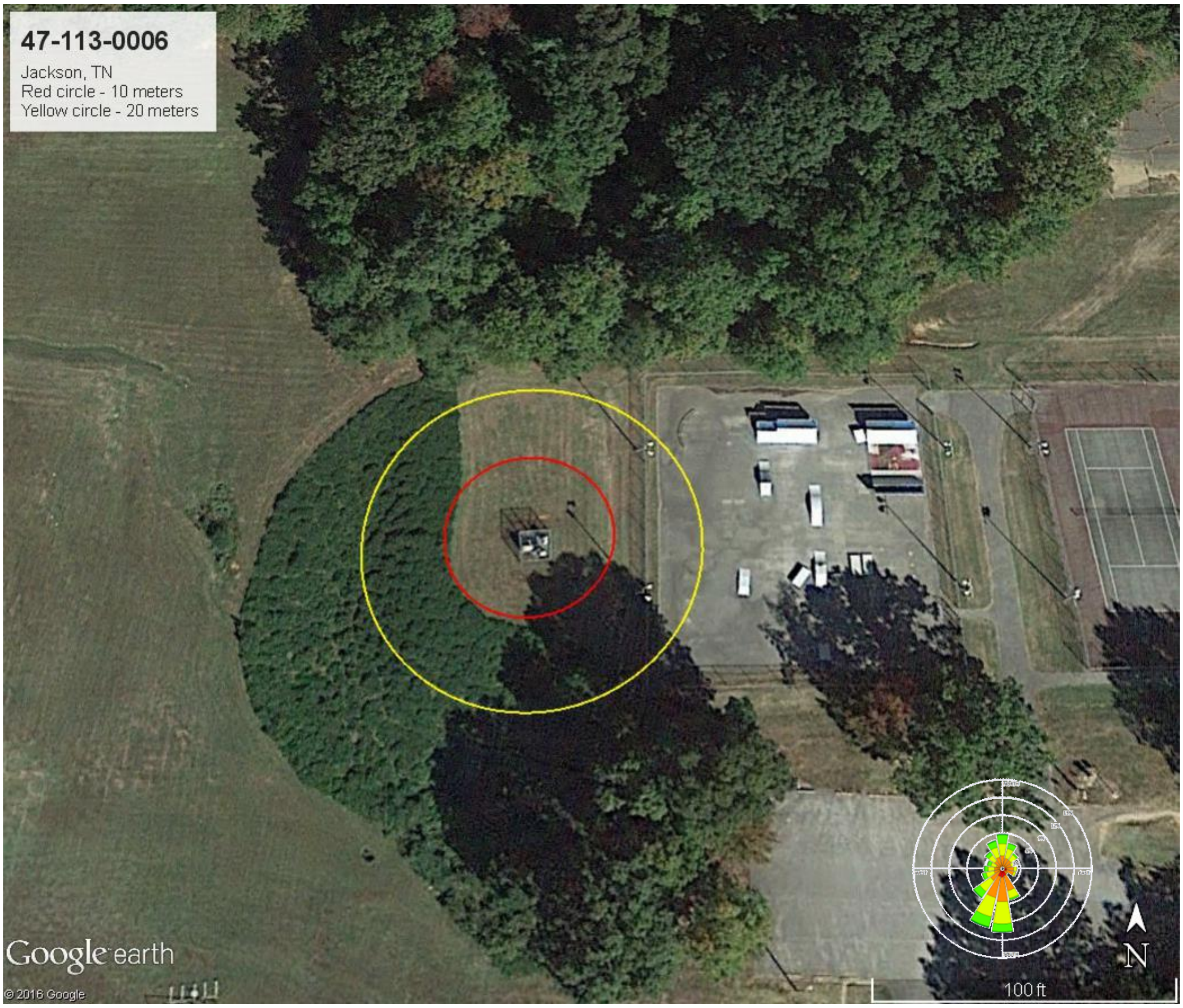


**PHOTO LOG: Local Site Name:** _Jackson ___________ **Initials:** _EMH_______ **Date**: 2/16/17________

**Camera [x APC / □ Personal – Owner:** ________________**] Make/Model:** _Nikon Coolpix__________________

**Filename:** __01___________________ **Date:** __2/16/17______ **Time:** 12:25 pm____ **Photographer:** ___EMH____________

**Description:** _View of site (taken from North)_____

**Filename:** __02___________________ **Date:** __2/6/17______ **Time:** __12:25 pm___ **Photographer:** ___EMH ____________

**Description:** __View of site (taken from NW)

**Filename:** __03___________________ **Date:** _2/6/17________ **Time:** __12:25 pm___ **Photographer:** _EMH _____________

**Description:** _North side of site

**Filename:** __04___________________ **Date:** __2/6/17______ **Time:** _12:25 pm____ **Photographer:** ___EMH ____________

**Description:** _View North of site ( N directional)

**Filename:** __05___________________ **Date:** __2/6/17______ **Time:** __12:25 pm_____ **Photographer:** ___EMH ____________

**Description:** _South side of site

**Filename:** __06___________________ **Date:** __216/17______ **Time:** __12:25 _pm____ **Photographer:** ___EMH ____________

**Description:** __ View South of site ( S directional)

**Filename:** __07___________________ **Date:** __2/16/17______ **Time:** __12:25 _pm____ **Photographer:** ___EMH ___________

**Description:** __West side of site

**Filename:** __08___________________ **Date:** __2/16/17______ **Time:** __12:25 pm________ **Photographer:** ___EMH ________

**Description:** __View West of site ( W directional )

**Filename:** __09_________________ **Date:** __2/16/17__ _______ **Time:** _12:25 pm________ **Photographer:** __EMH_________

**Description:** __East side of site

**Filename:** __10_________________ **Date:** _2/16/17_________ **Time:** __12:25 pm_______ **Photographer:** ___**EMH**_________

**Description:** __View East of site ( E directional)

Jackson:  Photo Log (2017)

001

002

003

004

005


006

007


008

009

010

# 40 CFR Part 58, Appendix E, Tables and Figures

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| $O_3$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| $SO_2$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| PM, Pb | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

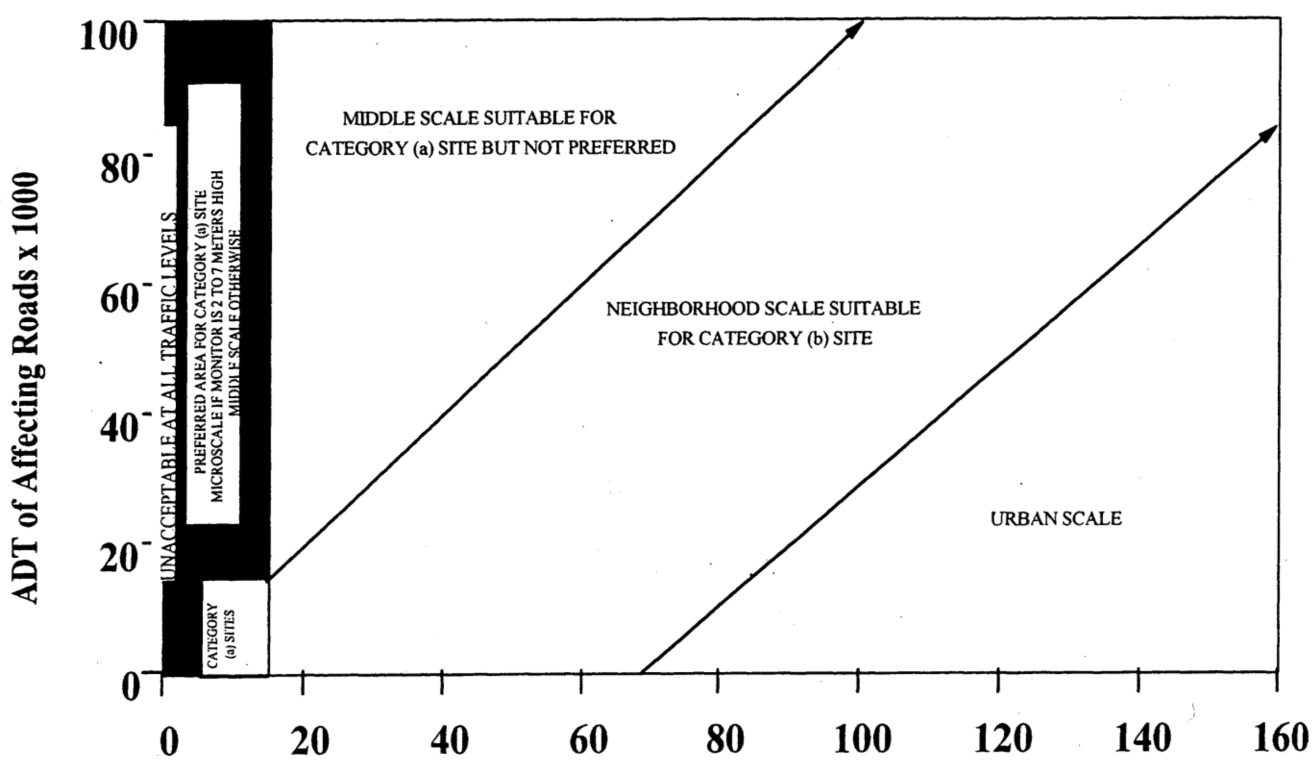



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| 1/4" Line OD / 20 Sec Residence Time | | | |
|---|---|---|---|
| **Flow Rate** | **1/8" ID** | **5/32" ID** | **3/16" ID** |
| **(liters/min)** | **feet** | **feet** | **feet** |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
| 0.6 | 82.9 | 53.0 | 36.8 |
| 0.7 | 96.7 | 61.9 | 43.0 |
| 0.8 | 110.5 | 70.7 | 49.1 |
| 0.9 | 124.3 | 79.6 | 55.3 |
| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
| 1.2 | 165.8 | 106.1 | 73.7 |
| 1.3 | 179.6 | 114.9 | 79.8 |
| 1.4 | 193.4 | 123.8 | 85.9 |
| 1.5 | 207.2 | 132.6 | 92.1 |
| 1.6 | 221.0 | 141.4 | 98.2 |
| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

**ADDITIONAL SUPPORTING INSTRUMENTATION**

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

An ESC 8832 data logger collects data from the TEOM only via an analog connection.

A 4G cellular modem (Sierra Wireless RV50) provides internet communications to the 8832 data logger.

Two US Robotics dial-up modems provide communications to each of the 2025s.

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**
Is the shelter tied down – physically tied with hurricane straps?
Is the shelter grounded - look for rod in the ground and lead wire connection?

Type of Shelter(s) located on site:

1. **Enclosure: Y**
2. **Trailer: N**
3. **None: N**
4. **Other: N**

What are the shelter(s) made of?

1. __TEOM enclosure______________________________________________
2. __________________________________________________________________
3. __________________________________________________________________
4. _Monitor platforms - wood________________________________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? Y **/ N**
Write additional comments on the shelters below:

___Platforms are in fair condition. Breaker box, outlets, and plugs are in good condition_____________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

# INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

**Initials:** Initials of auditor completing form.

**Date:** current date site is entered by auditor

**Reminder:** If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

**Arrival Time:** time auditors arrive at site

**Departure Time:** time auditors depart site

**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and is specified in TDEC DAPC’s QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures. Teledyne analyzers are designated FEM for a range of 5-40 °C. Therefore, TDEC DAPC keeps shelters with these monitors within this range (still keeping in mind the 2 deg SD requirement). Shelters are generally kept about 25-26 °C in the warmest months to reduce condensation in sample lines and analyzer.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites? Ants? Wasps/Bees? / Larger wildlife causing problems (such as nesting in the undercarriage or walls or digging dens near the foundation/supports)?

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:** document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated. Some examples of items that can cause this problem are a leaking filter holder or fitting and an uncapped TTP system or sample line tee.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, SO2, NO, NO2, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control
## William R. Snodgrass Tennessee Tower
## 312 Rosa L. Parks Avenue, 15th Floor
## Nashville, Tennessee 37243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## Air Monitoring Site Evaluations
## TDEC APC

**Date: February 21, 2017** **Location: Kingsport, TN**
**AQS Number: 47-163-2003**
**Site Name: Kingsport O3** **Pollutants: O3**
**Project Leader: EMH**

---

**Print Name / Signature / Initials / Duties**

**1:** Evelyn M. Haskin___________________________________EMH, Team 3 lead ______________

**2:** Thomas E. Dalton __________________ TED Site evaluator_____________

**3:** Justin E. Long __________________ JEL Site evaluator___________

# Air Monitoring Site Evaluation Summary

**Local Site Name:** Kingsport O3 **Initials:** TED **Date:** February 21, 2017

**Additional Comments:**

Electric meter:#190 087 204

The distance from the inlet to the nearest road is 40.9 meters with the road name being Ketron Dr. -

The property is owned by Sullivan County School Board with the property data being Map 014N 014N J 04900 000014N.

Photos are stored on the State computer Tag #M45936 at C: Local Disk C: Files: 2016-17: monitor audits: Kingsport O3.

Back up ozone analyzer: API 400A SN 546

## MONITORING SITE EVALUATION FORM (MSEF)

**Local Site Name:** Kingsport O3__________________________ **Initials:** TED______ **Date:** February 21, 2017

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present **[Y] Completed**

**Arrival Time:** _11:20 am_ **Departure Time:** _12:40 pm__ **Primary Operator:** _Preston K. Pierce____________

**Observer(s):** Preston Pierce____________________________________________________

### SITE

[N]-**Security Fence** [N]-**Razor/Barb Wire** [Y] **Grass/Shrubs Cut** [Y] **Bare Soil Area**

[N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** ___ N/A ____________________ [NA] **Police Report Filed**

**Issues:** ________________________________________ N/A ___________________________________________________________

### SHELTER - Interior

**Arrival Temperature:** _21.57_**°C** (from data logger) **Operator Site Visits:** _once__ per [**week** | month | _**four per month**]

[N] **Leaking Roof** **[Damaged: none]** [Y] **Clean / Neat** [N] **Fire Extinguisher**

[N] **Insect / Wildlife Issues** [Y] **Thermometer** (min/max) [N] **Gasoline**

**Issues:** **Steps are in need of being set back into the original spot.______________________________**

**MONITOR(s):** **Location:** Exterior Samplers **[□Roof / □Ground / □ Not Present]**

| **Monitor(s)** | **Manufacturer** | **Model** | **Serial Number** |
|---|---|---|---|
| O3 | Teledyne | T400 | 2278 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**CALIBRATOR(s):** **T703** ; **Are QA/QC Check Gases Vented Outside Shelter? Yes**

| **QA/QC** | **Make** | **Model** | **Serial Number** | **Certification Date** | **Expiration Date** |
|---|---|---|---|---|---|
| QC | Teledyne | 703 | 328 | 1-19-17 | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line? [N]** If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** Kingsport O3 **Initials:** TED______ **Date:** February 21, 2017

**All Gas Standards Pass thru all Filters during:** [Y] **Calibrations** (Not Required) [Y] **Precision Checks** (Required) [Y] **Audits** (Required)

**Issues: ____None______________________________________________________________________ ______________________**

**CYLINDER GAS STANDARDS:** **X Not Present**

**VENDOR:** **(PSI Reading < 200, tank is empty and should not be in service)**

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| N/A | | | | | |
| | | | | | |
| | | | | | |

Issues: _None_____________________________________________________________________________

**SUPPORTING INSTRUMENTATION: Internal**

[Y] **Temperature Sensor** [N] **Uninterruptable Power Supply**

**Zero Air System: Commercial System** (Make / Model): ______________________________________________

**Cartridge System: [□Silica Gel □Pink / □Blue] / X Charcoal / □Purafil / □Hopcalite / Other: _Dri-rite]**

[N] **Needs Service Last Service Date:** _2-15-17_________ **Condition:** _Good___________

Issues: __________________________________None__________________________________________

**Probe Line(s): [X Replaced / □Cleaned] – Frequency:** __1-year___ **Last Service Date:** _____02-15-17____

[Y] **Clean** [Y] **Heated** [N] **Insulated** [N] **Moisture** [N] **Retractable** [N] **Old / Unused Lines**

[N] **Lo Flo Manifold ->** [N] **Any Open Ports? –> How many analyzers using manifold?** ___one_________

Issues: _________None_______________________________________________________________

**MSEF (Page 3/5): Local Site Name:** Kingsport O3____ **Initials:** TED__ **Date:** February 21, 2017

**SHELTER – Exterior**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other:** Metal Sided]

[Y] **Needs Maintenance** (specify) [Y] **Tied Down** [Y] **Electrically Grounded** [N] **Roof Railing**

**Roof Access: [Stairs [Interior/Exterior] / Ladder [attached/removable] / X Not Present]** [N] **Loose Decking** (Trip Hazard)

**Issues:** Mold needs to be removed and entry steps reset.

**Height of Roof:** _3.2__**meters** **Roofing Material**: aluminum

**Issues:** ___None___________________________________________________________________

**OUTDOOR SAMPLERS** **X Not Present**

[NA] **Locked** [NA] **Electrically Grounded** [NA] **Stabilized** [NA] **Clean Inside** [NA] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** NA **$PM_{10}$ Head Clean Schedule:** NA

**Issue(s):** NA

**COLLOCATED SAMPLERS:** **□ Not Present** (39.4 inches = 1 meter)

| Pollutant | Flow (Hi / Lo) | *Separation Distance (meters) |
|---|---|---|
| N/A | | |
| | | |

*Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s): External** **□ Not Present**

**Inlet Type:** [ **X** Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [ **X** Rain Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / **X** Stainless Steel / Other: _________]

**Probe Line(s)**: [ **X** Teflon® / Other: _____________] **Probe Fitting(s)**: [□Teflon® / Other: Stainless Steel / □ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

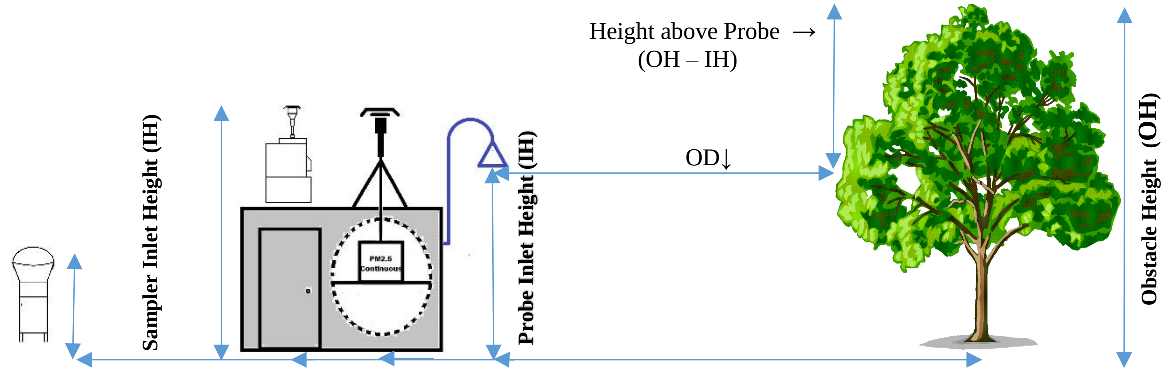
**Issue(s):** ____**None**_____________________________________________________________

| Pollutant(s) | Inlet Height (meters) | Inlet Location (Side of Shelter, Ground, Roof) | *Horizontal Distance (meters) If Applicable | *Vertical Distance (meters) If Applicable | Monitoring SCALE | |
|---|---|---|---|---|---|---|
| | | | | | AQS | Annual Network Plan |
| O3 | 4.2 | Side of shelter | N/A | >1 (1.2) | Neighborhood | Neighborhood |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MSEF (Page 4/5): Local Site Name:** Kingsport O3____ **Initials:** TED__ **Date:** February 21, 2017

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**Obstacle Distance(s) (OD)**

**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| | | | | |
|---|---|---|---|---|
| N/A | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s)**: _N/A _______inches = __________**meters** (nearest inlet to dripline) ☐ **No Trees Present**

(39.4 inches = 1 meter) _____________inches = __________**meters** (nearest inlet to dripline) ☐ Not Present

_____________inches = __________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ____None____________________________________________________

**Minor Sources:**

- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

**Issues:**
_None______________________________________________________________

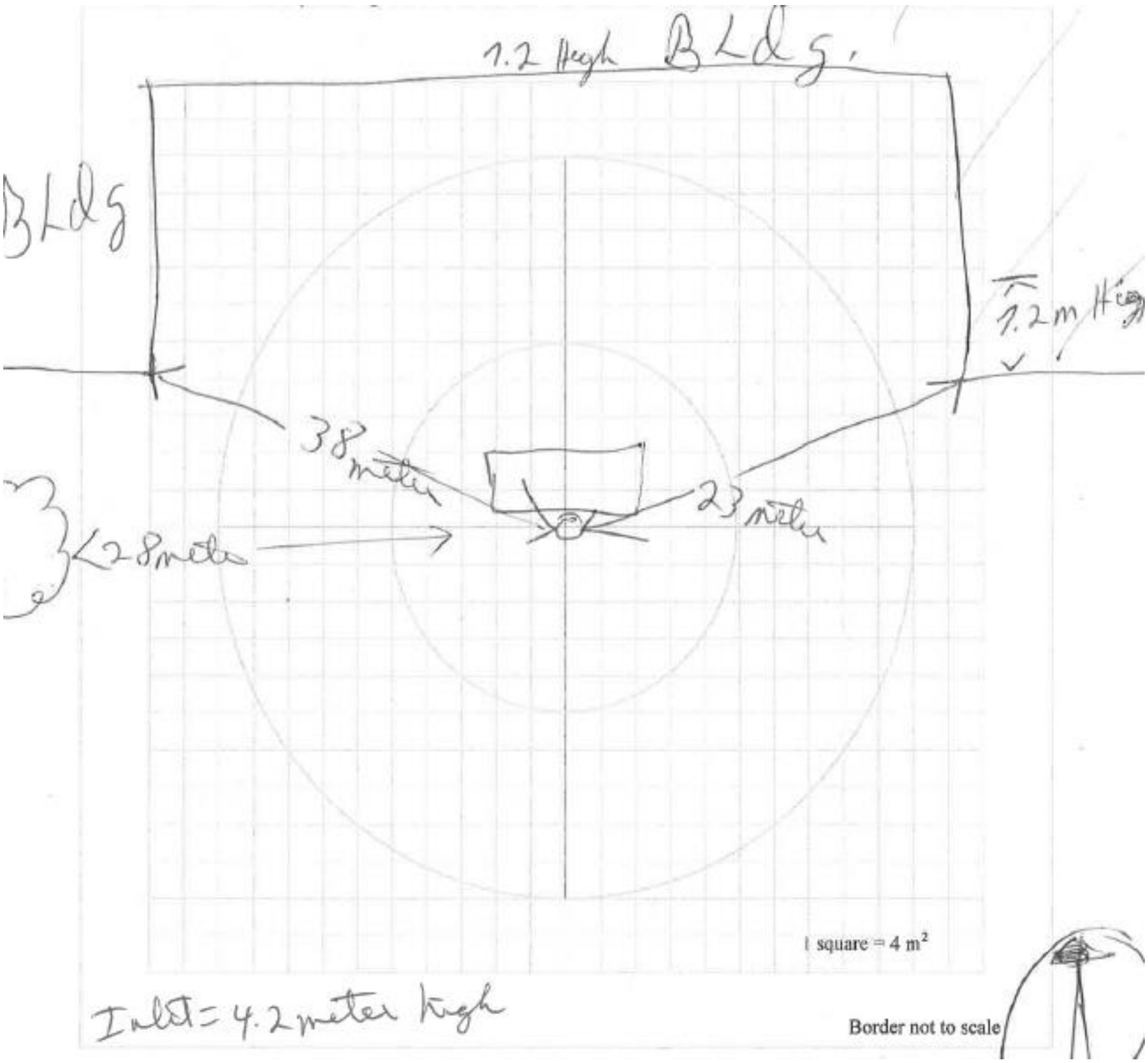
_______________________________________________________________

_______________________________________________________________

**MSEF (Page 5/5): Local Site Name:** Kingsport O3____ **Initials:** TED______ **Date:** February 21, 2017

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: __> 270____° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

# Additional Information:

Closest tree math- 28 meter distance with 11.6 meter height tree, inlet=4.2 meter high. [11.6- 4.2=7.4 meters]. (7.4 * 2=14.8) 28 meters distance is greater than 14.8 meters. Tree is not an obstacle.

# Aerial Photo with Wind Rose

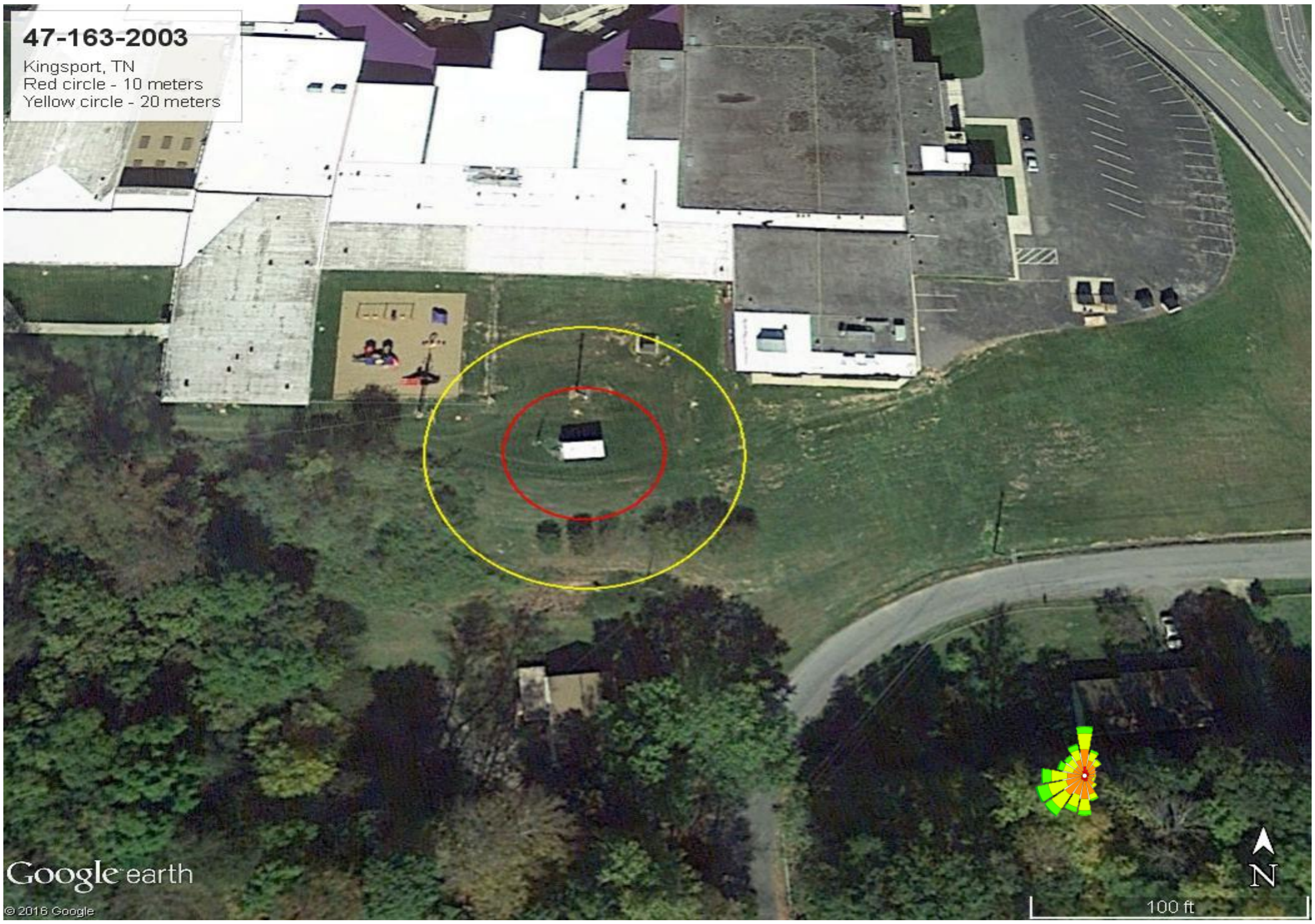


**PHOTO LOG:** Kingsport O3_______________ **Initials:** TED___ **Date:** February 21, 2017

**Camera [ X Personal – Owner: _TED____] Make/Model: _N/A____________________**

**Filename:** __001___ **Date:** _2-21-17 **Time:** _12:00pm **Photographer:** __TED ____________

**Description:** South away from monitor (south directional)__________________________________________

**Filename:** ___002___ **Date:** __02-21-17_____ **Time:** _12:00 pm____ **Photographer:** ___TED__________

**Description:** __South toward monitor__

**Filename:** ___003___**Date:** __02-21-17_____ **Time:** _12:00 pm____ **Photographer:** ___TED___________

**Description:** __East toward monitor______________________________________________________________

**Filename:** ____004__**Date:** ___02-21-17____ **Time:** ___12:00 pm__ **Photographer:** __TED_____________

**Description:** East away from monitor (east directional)_______________________________________________

**Filename:** ____005__ **Date:** ___02-21-17____ **Time:** __12:00 pm__ **Photographer:** ___TED_____________

**Description:** _North toward monitor______________________________________________________

**Filename:** ___006_**Date:** _02-21-17____ **Time:** __12:00 pm__ **Photographer:** ___TED________

**Description:** North away from monitor (north directional)________

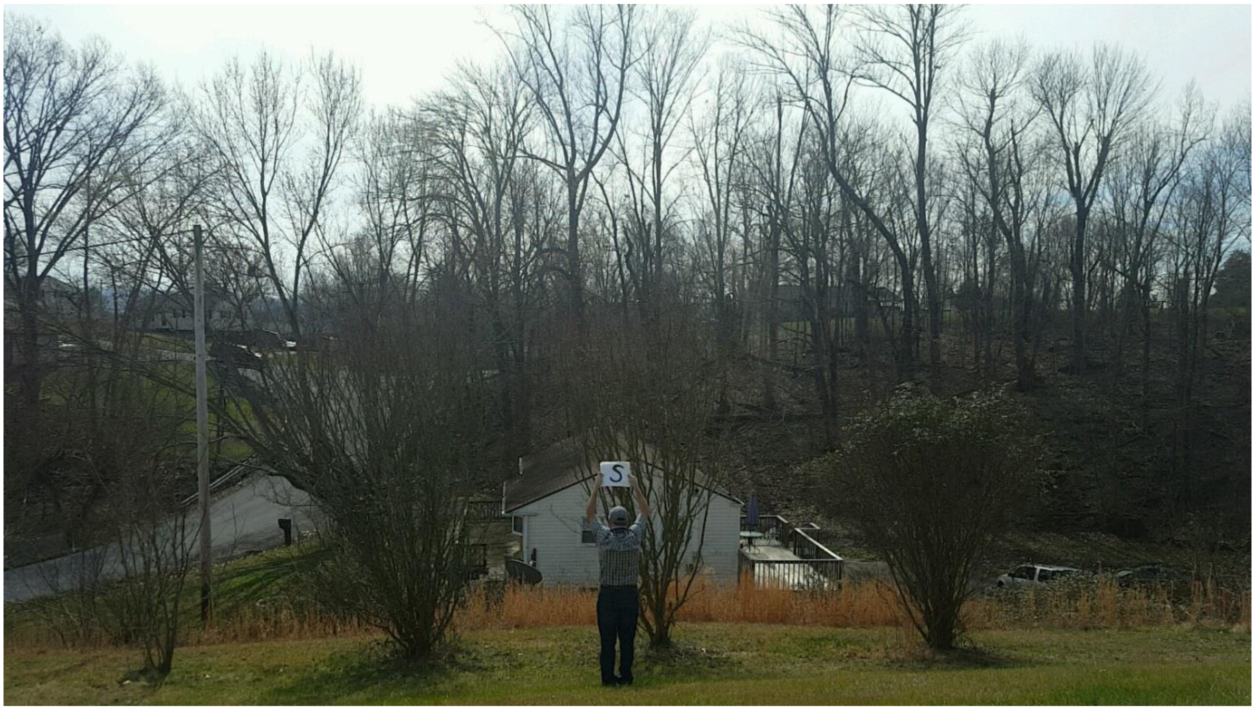
**Filename:** ____007 **Date:** _02-21-17___ **Time:** _12:00 pm_____ **Photographer:** __TED_________

**Description:** _West toward monitor______________________________________________________________

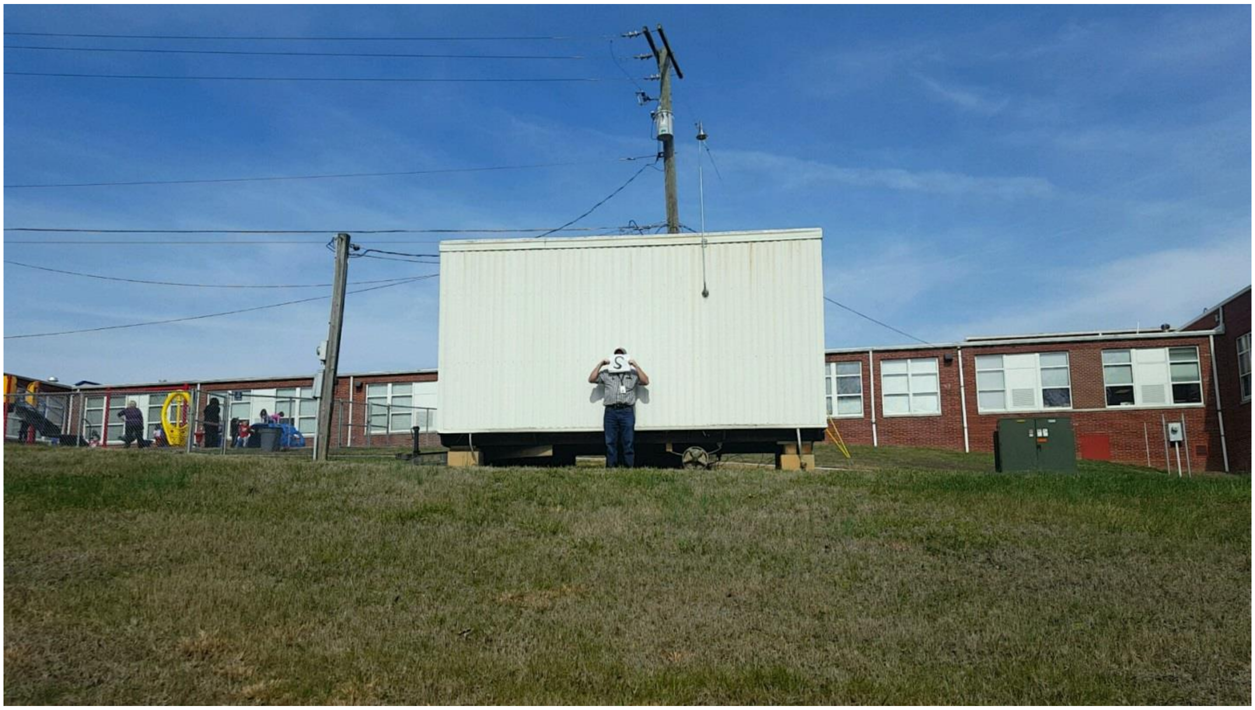
**Filename:** ___008_**Date:** 02-21-17____ **Time:** _12:00 pm____ **Photographer:** _TED___________

**Description:** West away from monitor (west directional)__________________________________________

001- South away from monitor (south directional)



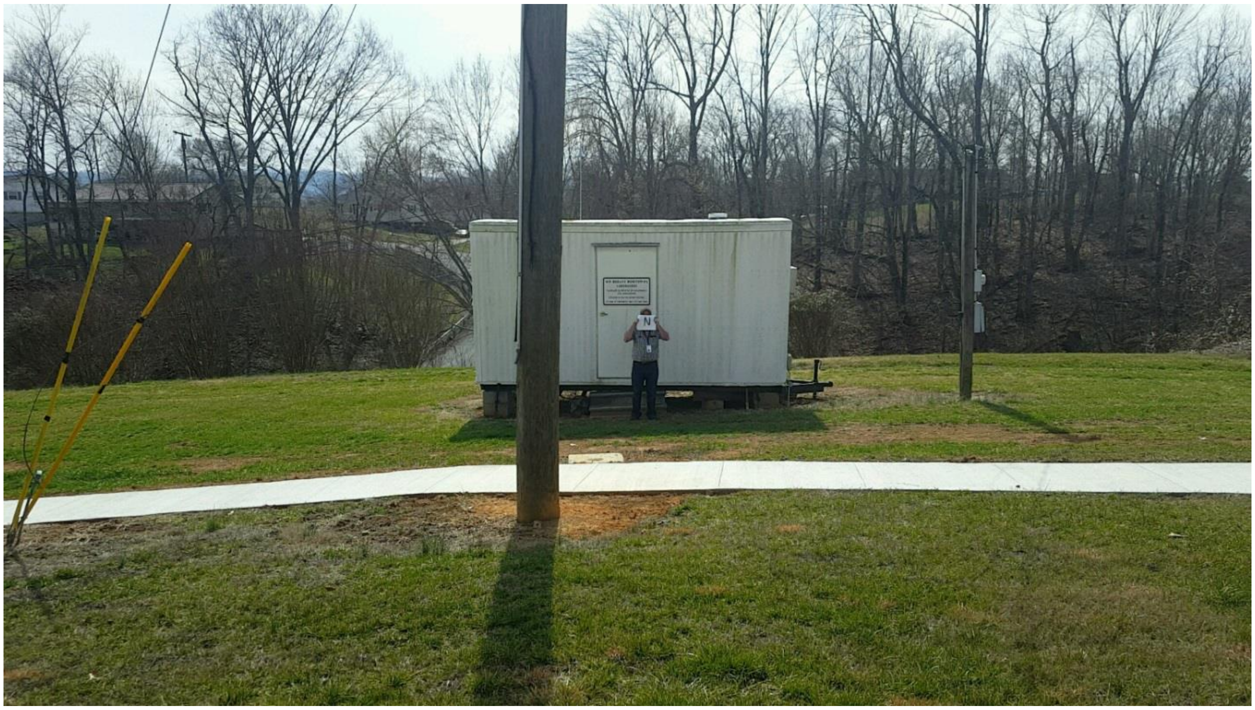

002-South toward monitor



003-East toward monitor

004-East away from monitor (east directional)

005-North toward monitor




006-North away from monitor (north directional)

007-West toward monitor

008-West away from monitor (west directional)

# 40 CFR Part 58, Appendix E, Tables and Figures

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

[1] Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2] Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| **$O_3$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **$SO_2$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **PM, Pb** | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

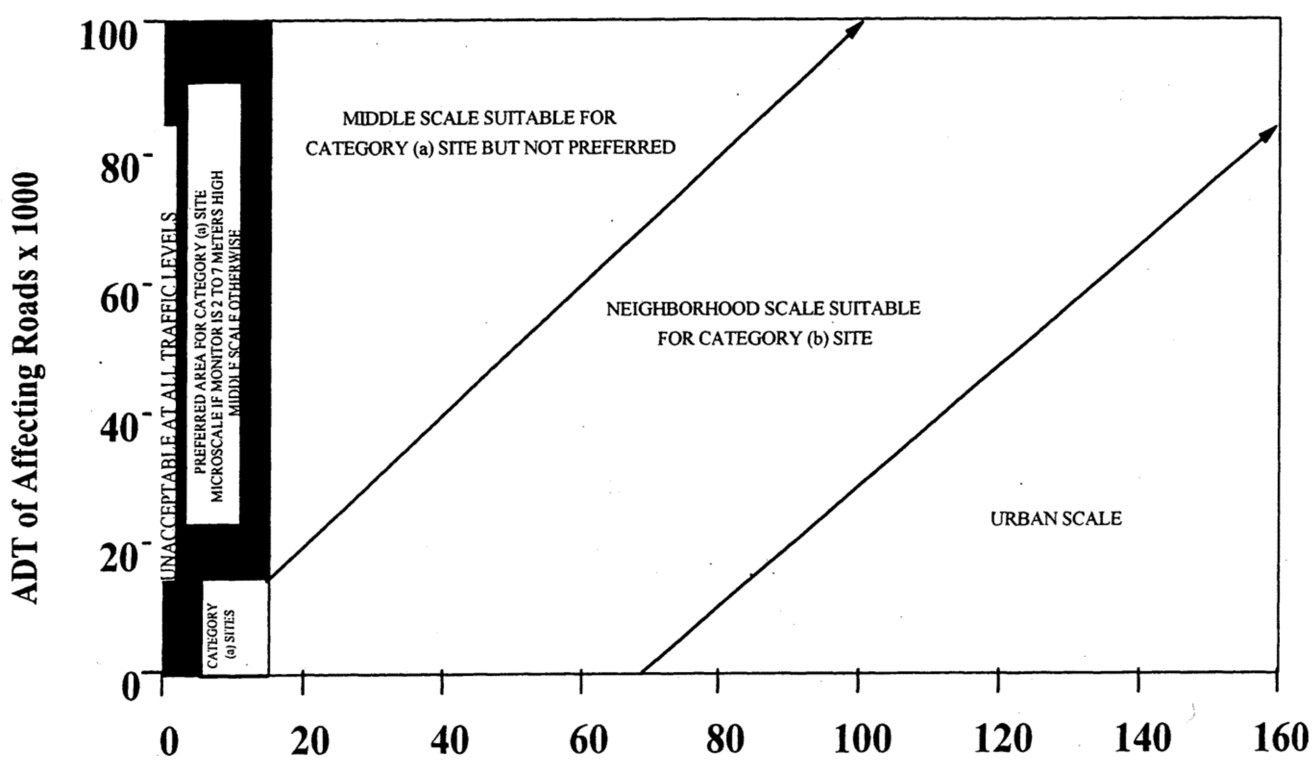



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| 1/4" Line OD / 20 Sec Residence Time | | | |
|---|---|---|---|
| **Flow Rate (liters/min)** | **1/8" ID feet** | **5/32" ID feet** | **3/16" ID feet** |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
| 0.6 | 82.9 | 53.0 | 36.8 |
| 0.7 | 96.7 | 61.9 | 43.0 |
| 0.8 | 110.5 | 70.7 | 49.1 |
| 0.9 | 124.3 | 79.6 | 55.3 |
| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
| 1.2 | 165.8 | 106.1 | 73.7 |
| 1.3 | 179.6 | 114.9 | 79.8 |
| 1.4 | 193.4 | 123.8 | 85.9 |
| 1.5 | 207.2 | 132.6 | 92.1 |
| 1.6 | 221.0 | 141.4 | 98.2 |
| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

**ADDITIONAL SUPPORTING INSTRUMENTATION**

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

The site uses an ESC 8832 data logger and an Agilaire 8872 PC/Data logger. The 8832 data logger serves as the primary logger and is directly connected via analog input to the analyzer at the site. The data is polled from the 8832 logger to the central server via a 4G cellular modem (Sierra Wireless RV50). The 8872 serves as a secondary, backup logger, and is used by the site operator to retrieve the electronic strip chart in local standard time. The 8872 polls data from the 8832 locally over the COM port or over the local tcp/ip network if the COM route is not working (via a network switch).

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**

Type of Shelter(s) located on site:

1. **Enclosure: N**
2. **Trailer: Y**
3. **None: N**
4. **Other: N**

What are the shelter(s) made of?

1. ____________________
2. sheet metal
3. ____________________
4. ____________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? Y

With roof top samplers or inlets – is a roof railing present? N

Roof Access: Stairs or Ladder? Y Ladder

Stairs can be inside or outside – Ladders are usually permanently attached or removable? Y removable

Write additional comments on the shelters below:

The outside of this shelter needs the mold removed (washed down or pressure washed)

Steps need reseated back to the original position

# INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

**Initials:** Initials of auditor completing form.

**Date:** current date site is entered by auditor

**Reminder:** If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

**Arrival Time:** time auditors arrive at site

**Departure Time:** time auditors depart site

**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and is specified in TDEC DAPC's QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures. Teledyne analyzers are designated FEM for a range of 5-40 °C. Therefore, TDEC DAPC keeps shelters with these monitors within this range (still keeping in mind the 2 deg SD requirement). Shelters are generally kept about 25-26 °C in the warmest months to reduce condensation in sample lines and analyzer.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites? Ants? Wasps/Bees? / Larger wildlife causing problems (such as nesting in the undercarriage or walls or digging dens near the foundation/supports)?

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:** document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated. Some examples of items that can cause this problem are a leaking filter holder or fitting and an uncapped TTP system or sample line tee.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, SO2, NO, NO2, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control

**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**

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## Air Monitoring Site Evaluations
## TDEC APC

**Date: 2/6/17** **Location: Kingsport, TN**
**AQS Number: 47-163-1007**
**Site Name: Kingsport PM** **Pollutants: PM $_{2.5}$**
**Project Leader:**

---

**Print Name / Signature / Initials / Duties**

**1:** (Team Lead) _Thomas E. Dalton______________________________TED___Site Evaluator________________

**2:**__Justin E. Long_________________________________________JEL___Site Evaluator__ ______________

**3:**____________________________________________________________________________________

# Air Monitoring Site Evaluation Summary

**Local Site Name:** _Kingsport PM___ _____________________ **Initials:** _TED_____ **Date:** __2/6/17____________

**Additional Comments:**

City of Kingsport is the property owner.  All trees and scrubs identified as problems during the initial site evaluation have been trimmed or cut back to the point that they are no longer an obstacle. Outdoor GFCI's need to be tested/operated regularly to ensure they work properly

## MONITORING SITE EVALUATION FORM (MSEF)

**Local Site Name:** _Kingsport PM____________________________ **Initials:** _TED_______ **Date:** ___2/6/17________

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present

**Arrival Time:** _9:00 am__ **Departure Time:** _1:00 pm__ **Primary Operator:** _Candace Justice______________

**Observer(s):** ____________________________________________________________________________

### SITE

[**Y**]-**Security Fence** [**N**]-**Razor/Barb Wire** [**Y**] **Grass/Shrubs Cut** [**N**] **Bare Soil Area**

[**N**] **Vandalism** – [□**Inside** / □**Outside**] **Date:** _______________________ [NA] **Police Report Filed**

**Issues:** ______________________________________________________________________________

### SHELTER - Interior

**Arrival Temperature:** NA_____**°C** (from data logger) **Operator Site Visits:** _1_________per [**week** ]

[NA] **Leaking Roof** **[Damaged: □ Ceiling / □Floor / □Walls]** [NA] **Clean / Neat** [NA] **Fire Extinguisher**

[NA] **Insect / Wildlife Issues** [NA] **Thermometer** (min/max) [NA] **Gasoline** (inside shelter)

**Issues:** __None_____________________________________________________________________________

### MONITOR(s):

**Location:** Exterior Samplers **[□Roof / x Ground / □ Not Present]**

| Monitor(s) | Manufacturer | Model | Serial Number |
|---|---|---|---|
| PM $_{2.5}$ | R & P | 2025 | 22127 |
| PM $_{2.5}$ BAM | Met One | BAM 1022 | T17015 |
| PM $_{2.5}$ TEOM | R & P | 1400a | 25209 |
| | | | |
| | | | |
| | | | |

### CALIBRATOR(s): x **Not Present**

[NA] **Are QA/QC Check Gases Vented Outside Shelter?**

| QA/QC | Make | Model | Serial Number | Certification Date | Expiration Date |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line?** [NA] If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** _Kingport PM________________ **Initials:** _TED____ **Date:** __2/6/17_______

**All Gas Standards Pass thru all Filters during:** [NA] **Calibrations** (Not Required) [NA] **Precision Checks** (Required) [NA] **Audits** (Required)

**Issues:** ____NA_______________________________________________________________________________

**CYLINDER GAS STANDARDS:** **x Not Present**

**VENDOR:** (PSI Reading < 200, tank is empty and should not be in service)

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

Issues: ____________________________________________________________________________________________

**SUPPORTING INSTRUMENTATION:** **Internal**

[Y] **Temperature Sensor** [N] **Uninterruptable Power Supply**

**Zero Air System:** **Commercial System** (Make / Model): ___NA_____________________________________________

**Cartridge System: [□Silica Gel □Pink / □Blue] / □x Charcoal / □Purafil / □Hopcalite / Other:** ___ NA ____**]**

[NA] **Needs Service** **Last Service Date:** _______________ **Condition:** ____________________________

Issues: ____________NA__________________________________________________________________________

**Probe Line(s): [□Replaced / □Cleaned] – Frequency:** ___________ **Last Service Date:** __________________

[NA] **Clean** [NA] **Heated** [NA] **Insulated** [NA] **Moisture** [NA] **Retractable** [NA] **Old / Unused Lines** [NA] **Lo Flo Manifold ->** [NA] **Any Open Ports?** **–> How many analyzers using manifold?** _______________

Issues: ______NA________________________________________________________________________________

**SHELTER – Exterior** **x Not Present**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other: __________ ________________________________]**

[NA] **Needs Maintenance** (specify) **[**NA] **Tied Down** [NA] **Electrically Grounded** [NA] **Roof Railing**

**Roof Access: [Stairs [Interior/Exterior] /** Ladder [attached/removable] **/ □ Not Present]** [NA] **Loose Decking** (Trip Hazard)

**Issues:** ________________________________________________________________________________

**Height of Roof:** ___________________**meters** **Roofing Material**: ______________________________________

**Issues: _____Used for storage only**________________________________________________________________

**OUTDOOR SAMPLERS**

[**Y**] **Locked** [**Y**] **Electrically Grounded** [**Y**] **Stabilized** [**NA**] **Clean Inside** [**Y**] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** _________________ **$PM_{10}$ Head Clean Schedule:** _Monthly__________

**Issue(s):** WINS changed once every 5 runs: VSCC cleaned monthly_______________________________________________

**COLLOCATED SAMPLERS:** **x Not Present** (39.4 inches = 1 meter)

| Pollutant | Flow (Hi / Lo) | *Separation Distance (meters) |
|---|---|---|
| | | |
| | | |

*Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s): External** **x Not Present**

**Inlet Type:** [□ Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [□ Rank Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / □ Stainless Steel / Other: _________]

**Probe Line(s)**: [□ Teflon® / Other: _____________] **Probe Fitting(s)**: [□**x** Teflon® / Other: ___________ / □ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

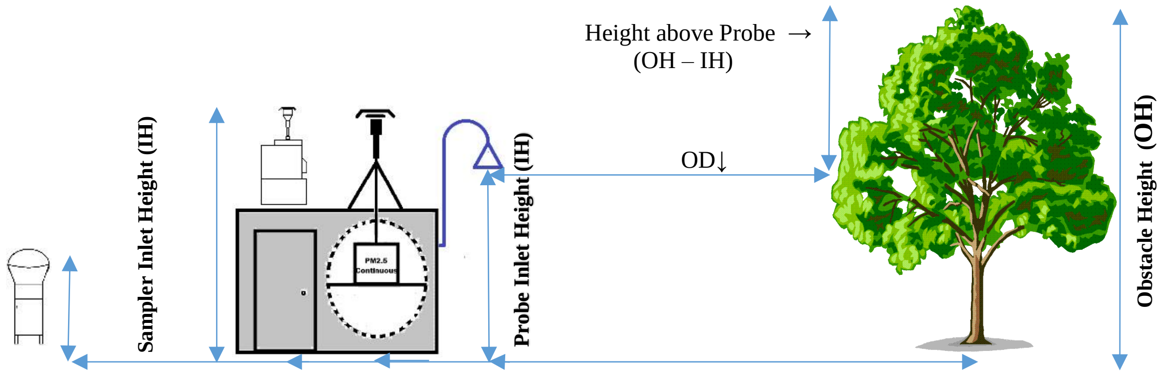
**Issue(s):** ________________________________________________________________________________

| Pollutant(s) | Inlet Height (meters) | Inlet Location (Side of Shelter, Ground, Roof) | *Horizontal Distance (meters) If Applicable | *Vertical Distance (meters) If Applicable | Monitoring SCALE | |
|---|---|---|---|---|---|---|
| | | | | | AQS | Annual Network Plan |
| $PM_{2.5}$ | 2.5 | Ground | 1.8 | | Urban | Urban |
| $PM_{2.5}$ | 2.5 | Ground | 1.8 | | Urban | Urban |
| $PM_{2.5}$ | 2.5 | Ground | 1.8 | | Urban | Urban |
| | | | | | | |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MSEF (Page 4/5): Local Site Name:** _Kingsport PM__________ **Initials:** _TED______ **Date:** _2/6/17______

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| NA | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** _____________inches = __________**meters** (nearest inlet to dripline) ☐ **No Trees Present**

(39.4 inches = 1 meter) _____________inches = __________**meters** (nearest inlet to dripline) ☐ Not Present

_____________inches = __________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ___No issues with driplines________________________________________

**Minor Sources:**

- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

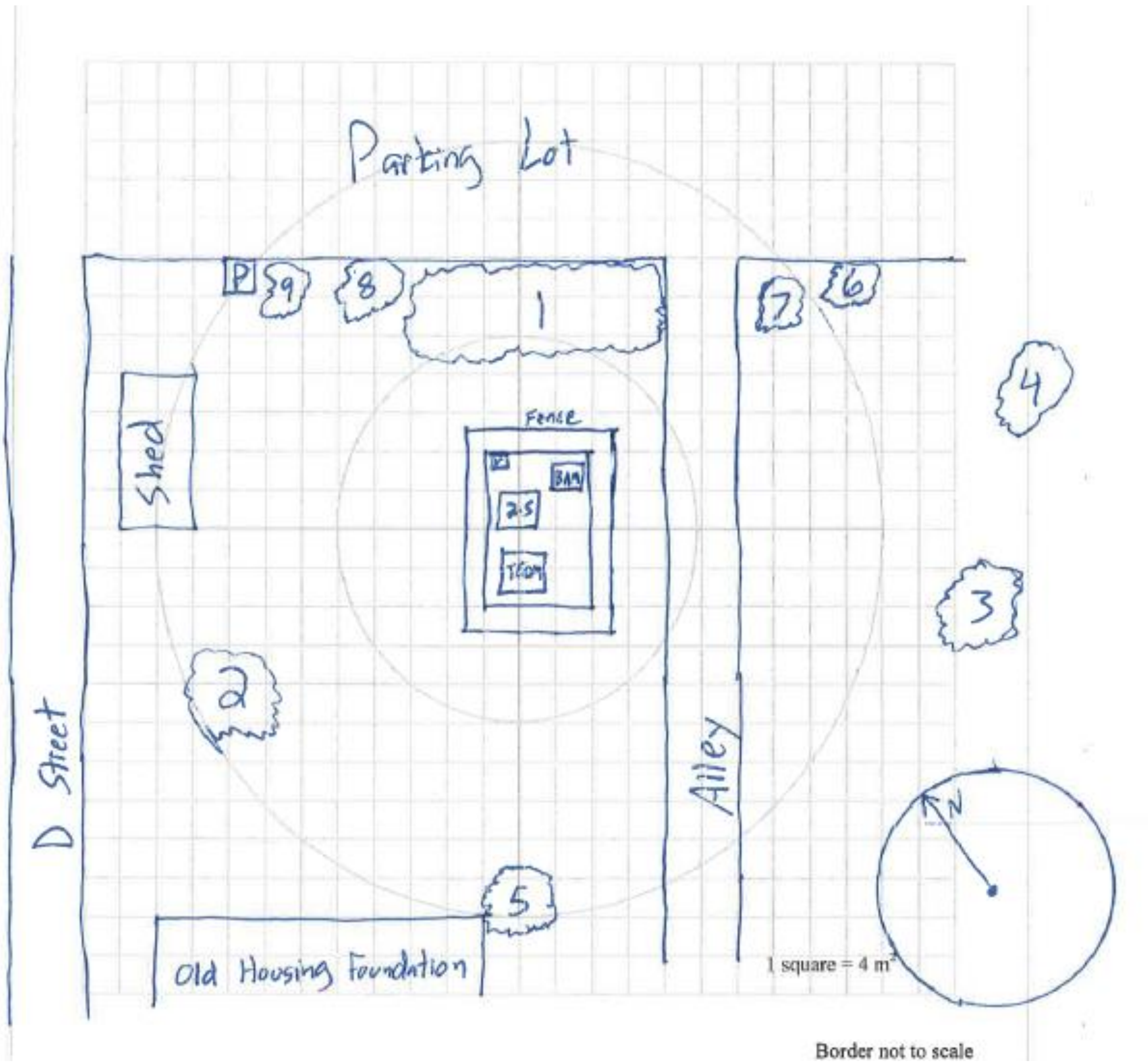
**Issues:** ___None___________________________________________

_____________________________________________________________

**MSEF (Page 5/5): Local Site Name:** Kingsport PM **Initials:** TED **Date:** 2/6/17

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: > 270 ° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

## Additional Information:

Currently there are 9 trees/bushes appearing on the site drawing on page 7. However, these trees are only shown to present the immediate surroundings of the monitor units. All tree listed either previously met the requirements for not being an obstacle or have been trimmed/cut back to where they no longer could be considered an obstacle.

## Aerial Photo with Wind Rose

**PHOTO LOG: Local Site Name:** _Kingsport PM__________ **Initials:** _TED____ **Date**: 2/6/17________

**Camera [x APC / □ Personal – Owner: ________________] Make/Model:** ________________________________

**Filename:** __01___________________ **Date:** __216/17______ **Time:** 12:00 pm____ **Photographer:** ___TED____________

**Description:** _East side away from monitor_____________________________________________________________

**Filename:** __02___________________ **Date:** __2/6/17______ **Time:** __12:00 pm___ **Photographer:** ___TED ____________

**Description:** __East side of monitor__________________________________________________________

**Filename:** __03___________________ **Date:** _2/6/17________ **Time:** __12:00 pm___ **Photographer:** _TED _____________

**Description:** _North side away from monitor____________________________________________________________

**Filename:** __04___________________ **Date:** __2/6/17______ **Time:** _12:00 pm____ **Photographer:** ___TED____________

**Description:** _North side of monitor__________________________________________________________

**Filename:** __05___________________ **Date:** __2/6/17______ **Time:** __12:00 pm_____ **Photographer:** ___TED___________

**Description:** _South away from monitor_____________________________________________________________

**Filename:** __06___________________ **Date:** __216/17______ **Time:** __12:00 _pm____ **Photographer:** ___TED ____________

**Description:** __South side of monitor_____________________________________________________________

**Filename:** __07___________________ **Date:** __2/16/17______ **Time:** __12:00 _pm____ **Photographer:** ___TED ____________

**Description:** __West side away from monitor____________________________________________________________

**Filename:** __08___________________ **Date:** __2/6/17______ **Time:** __12:00 pm________ **Photographer:** ___TED________

**Description:** __West side toward monitor__________________________________________________________

001-east from monitor

002 east side of monitor

003-North side away from monitor

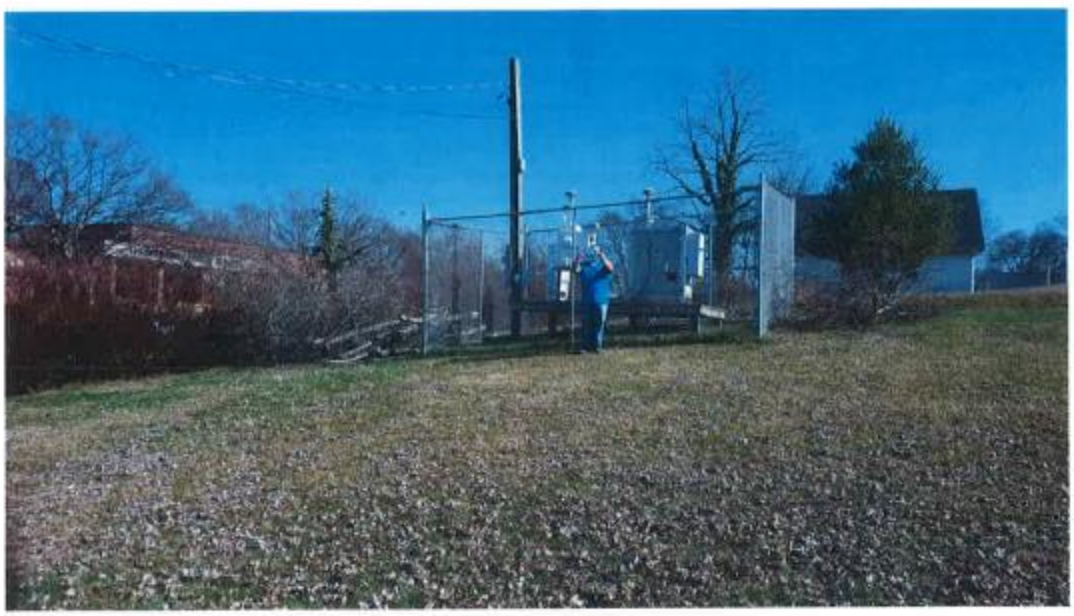

004-North side of monitor

005-south away from moniotor

006-South side toward monitor

007-west away from monitor

008-west side toward monitor



# 40 CFR Part 58, Appendix E, Tables and Figures

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| $O_3$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| $SO_2$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| PM, Pb | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

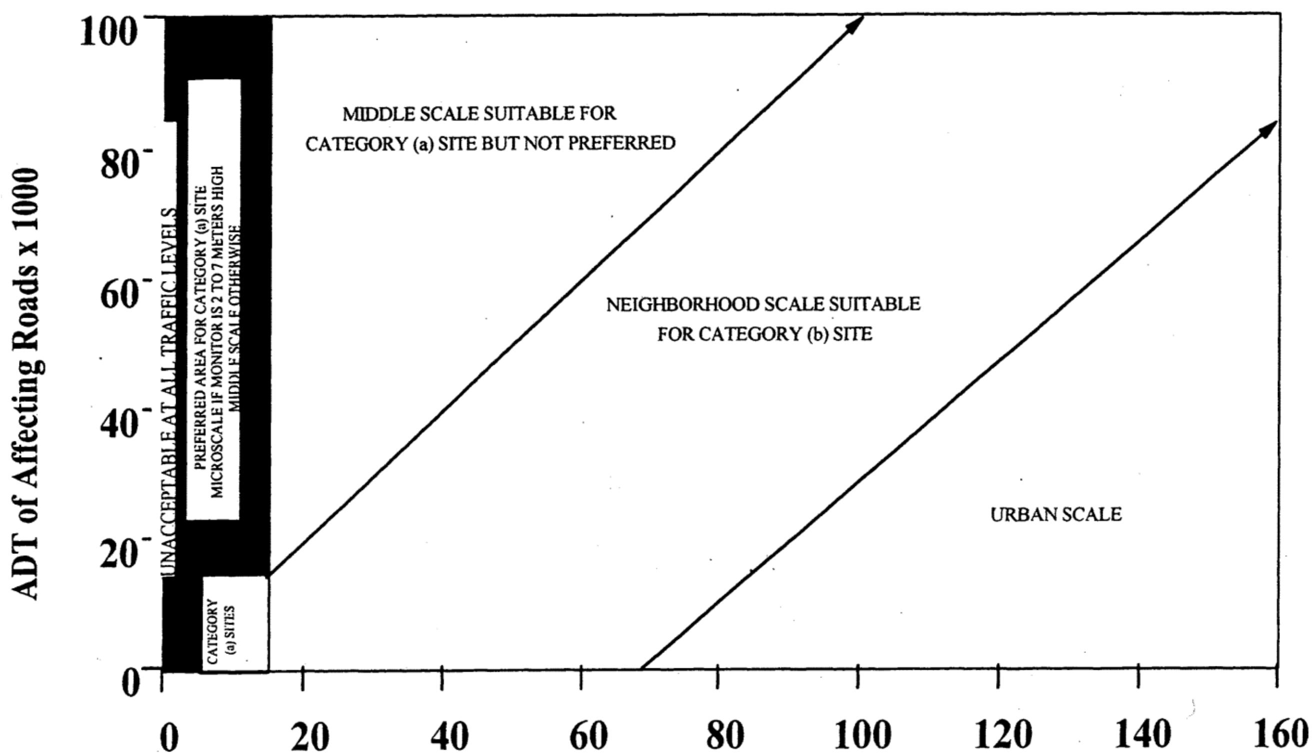



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| 1/4" Line OD / 20 Sec Residence Time | | | |
|---|---|---|---|
| **Flow Rate** | **1/8" ID** | **5/32" ID** | **3/16" ID** |
| **(liters/min)** | **feet** | **feet** | **feet** |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
| 0.6 | 82.9 | 53.0 | 36.8 |
| 0.7 | 96.7 | 61.9 | 43.0 |
| 0.8 | 110.5 | 70.7 | 49.1 |
| 0.9 | 124.3 | 79.6 | 55.3 |
| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
| 1.2 | 165.8 | 106.1 | 73.7 |
| 1.3 | 179.6 | 114.9 | 79.8 |
| 1.4 | 193.4 | 123.8 | 85.9 |
| 1.5 | 207.2 | 132.6 | 92.1 |
| 1.6 | 221.0 | 141.4 | 98.2 |
| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

**ADDITIONAL SUPPORTING INSTRUMENTATION**

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

A 4G cellular modem (Sierra Wireless RV50) provides internet communications to the BAM 1022 and to the 8832 data logger via a network switch.

A US Robotics dial-up modem is used to send the ancillary data from the 2025 to the central office staff.

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**
Is the shelter tied down – physically tied with hurricane straps?
Is the shelter grounded - look for rod in the ground and lead wire connection?

Type of Shelter(s) located on site:
1. **Enclosure: Y**
2. **Trailer: N**
3. **None: N**
4. **Other: N**

What are the shelter(s) made of?

1. __TEOM shelter (steel)__________________________________________

2. ______________________________________________________________

3. ______________________________________________________________

4. _Platform (wood)_________________________________________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? Y **N**
Write additional comments on the shelters below:

__Platform, Breaker box, outlets, and plugs are in good condition.   TEOM pump housing fan need replacing__________________

______________________________________________________________________________________

______________________________________________________________________________________

______________________________________________________________________________________

# INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

**Initials:** Initials of auditor completing form.

**Date:** current date site is entered by auditor

**Reminder:** If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

**Arrival Time:** time auditors arrive at site

**Departure Time:** time auditors depart site

**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and is specified in TDEC DAPC's QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures. Teledyne analyzers are designated FEM for a range of 5-40 °C. Therefore, TDEC DAPC keeps shelters with these monitors within this range (still keeping in mind the 2 deg SD requirement). Shelters are generally kept about 25-26 °C in the warmest months to reduce condensation in sample lines and analyzer.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites? Ants? Wasps/Bees? / Larger wildlife causing problems (such as nesting in the undercarriage or walls or digging dens near the foundation/supports)?

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:** document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated. Some examples of items that can cause this problem are a leaking filter holder or fitting and an uncapped TTP system or sample line tee.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, SO2, NO, NO2, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control

**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**

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**Air Monitoring Site Evaluations**

**TDEC APC**

**Date: 2/17/17** **Location: Loretto, TN**
**AQS Number: 47-099-0002**
**Site Name: Lawrence** **Pollutants: PM $_{2.5}$**
**Project Leader:**

---

**Print Name / Signature / Initials / Duties**

**1:** (Team Lead) _Evelyn Haskin____________________________EMH___Site Specialist_________________

**2:**______________________________________________________________________________

**3:**______________________________________________________________________________

# Air Monitoring Site Evaluation Summary

**Local Site Name:** Lawrence **Initials:** EMH **Date:** 2/17/17

**Additional Comments:**

Sunny 59 $^{o}$F

Electric meter: Lawrenceburg Power System Meter # 18282

Shelter is used for storage only; both BAM 1020 monitors are no longer in operation

TEOM and 2025 platforms have warped and split boards

**MONITORING SITE EVALUATION FORM (MSEF)**

**Local Site Name:** _Lawrence______________________ **Initials:** _EMH_______ **Date:** ___2/17/17________

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present **[Y] Completed**

**Arrival Time:** _10:40 am__ **Departure Time:** _11:50 am__ **Primary Operator:** _Larry Yocom_____________

**Observer(s):** ______________________________________________________________

**SITE**

[N]-**Security Fence** [N]-**Razor/Barb Wire** [Y] **Grass/Shrubs Cut** [NA] **Bare Soil Area**

[N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** ______________________ [NA] **Police Report Filed**

**Issues:** _None____________________________________________________________________

**SHELTER - Interior**

**Arrival Temperature:** NA_____**°C** (from data logger) **Operator Site Visits:** _1-2______ per [**week** ]

[NA] **Leaking Roof** **[Damaged: □ Ceiling / □Floor / □Walls]** [NA] **Clean / Neat** [NA] **Fire Extinguisher**

[NA] **Insect / Wildlife Issues** [NA] **Thermometer** (min/max) [NA] **Gasoline** (inside shelter)

**Issues:** __Shelter is used only for storage_______________________________________________

**MONITOR(s):** **Location:** Exterior Samplers **[□Roof / x Ground / □ Not Present]**

| **Monitor(s)** | **Manufacturer** | **Model** | **Serial Number** |
|---|---|---|---|
| PM $_{2.5}$ | Thermo | 2025 | 21908 |
| PM $_{2.5}$ TEOM | R & P | 1400a | 25205 |
| | | | |
| | | | |
| | | | |
| | | | |

**CALIBRATOR(s):** **x Not Present** [NA] **Are QA/QC Check Gases Vented Outside Shelter?**

| **QA/QC** | **Make** | **Model** | **Serial Number** | **Certification Date** | **Expiration Date** |
|---|---|---|---|---|---|
| **NA** | | | | | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line? [N]** If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** _Lawrence_______________ **Initials:** _EMH____ **Date:** __2/17/17_______

**All Gas Standards Pass thru all Filters during:** [NA] **Calibrations** (Not Required) [NA] **Precision Checks** (Required) [NA] **Audits** (Required)

**Issues:** ____NA_______________________________________________________________________________

## CYLINDER GAS STANDARDS: x Not Present

**VENDOR:** **(PSI Reading < 200, tank is empty and should not be in service)**

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| NA | | | | | |
| | | | | | |
| | | | | | |

Issues: ________________________________________________________________________________________

## SUPPORTING INSTRUMENTATION: Internal

[Y] **Temperature Sensor** [N] **Uninterruptable Power Supply**

**Zero Air System: Commercial System** (Make / Model): ___NA_____________________________________________

**Cartridge System: [□Silica Gel □Pink / □Blue] / □x Charcoal / □Purafil / □Hopcalite / Other: __________]**

[NA] **Needs Service Last Service Date:** _______________ **Condition:** _____________________________

Issues: ___________NA_______________________________________________________________________

**Probe Line(s): [□Replaced / □Cleaned] – Frequency:** ___________ **Last Service Date:** __________________

[NA] **Clean** [NA] **Heated** [NA] **Insulated** [NA] **Moisture** [NA] **Retractable** [NA] **Old / Unused Lines** [NA] **Lo Flo Manifold ->** [NA] **Any Open Ports? –> How many analyzers using manifold?** _______________

Issues: ______NA___________________________________________________________________________

**MSEF (Page 3/5): Local Site Name:** __Lawrence ____________ **Initials:** _EMH_____ **Date:** _2/17/17________

**SHELTER – Exterior** □ **Not Present**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other:** __Old shipping container____________________**]**

[**NA**] **Needs Maintenance** (specify) [**NA**] **Tied Down** [**NA**] **Electrically Grounded** [NA] **Roof Railing**

**Roof Access: [Stairs [Interior/Exterior] /** Ladder [attached/removable] **/ □ Not Present]** [NA] **Loose Decking** (Trip Hazard)

**Issues:** __Used for storage only__________________________________________________________________

**Height of Roof:** ___ ________________**meters** **Roofing Material**: ______________________________________

**Issues:** ____Used for storage only__________________________________________________________________

**OUTDOOR SAMPLERS**

[**Y**] **Locked** [**Y**] **Electrically Grounded** [**Y**] **Stabilized** [**Y** ] **Clean Inside** [**Y** ] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** _________________ **$PM_{10}$ Head Clean Schedule:** _Monthly__________

**Issue(s):** WINS changed once every 5 runs : VSCC cleaned monthly___________________________________

**COLLOCATED SAMPLERS:** **x Not Present** (39.4 inches = 1 meter)

| **Pollutant** | **Flow** (Hi / Lo) | ***Separation Distance** (meters) |
|---|---|---|
| | | |
| | | |

*Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s): External** **x Not Present**

**Inlet Type:** [□ Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [□ Rank Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / □ Stainless Steel / Other: _________]

**Probe Line(s)**: [□ Teflon® / Other: _____________] **Probe Fitting(s)**: [□**x** Teflon® / Other: ___________ / □ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

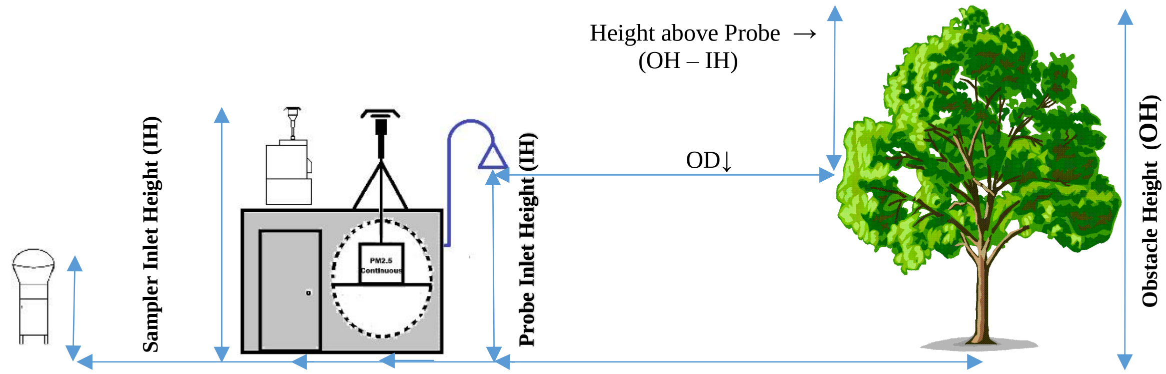
**Issue(s):** ________________________________________________________________________________

| **Pollutant(s)** | **Inlet Height** (meters) | **Inlet Location** (Side of Shelter, Ground, Roof) | ***Horizontal Distance** (meters) If Applicable | ***Vertical Distance** (meters) If Applicable | **Monitoring SCALE** | |
|---|---|---|---|---|---|---|
| | | | | | **AQS** | **Annual Network Plan** |
| $PM_{2.5}$ 2025 | 2.5 | Ground | 2.54 | | Regional | Regional |
| $PM_{2.5}$ TEOM | 2.5 | Ground | 2.54 | | Regional | Regional |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MSEF (Page 4/5): Local Site Name:** _Lawrence_________ **Initials:** _EMH______ **Date:** _2/17/17______

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**Obstacle Distance(s) (OD)**

**All distances in meters**

**OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| Tree (2) | 14.8 | 2.5 | 24.6 | 21.4 |
| Tree (5) | 15.4 | 2.5 | 25.8 | 18.8 |
| Tree (6) | 18.0 | 2.5 | 31.0 | 26.4 |
| Tree (7) | 18.0 | 2.5 | 31.0 | 19.4 |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** ____________inches = _________**meters** (nearest inlet to dripline) ☐ **No Trees Present**

(39.4 inches = 1 meter) ____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ____A siting waiver was received for this site ____________________________________________

**Minor Sources:**

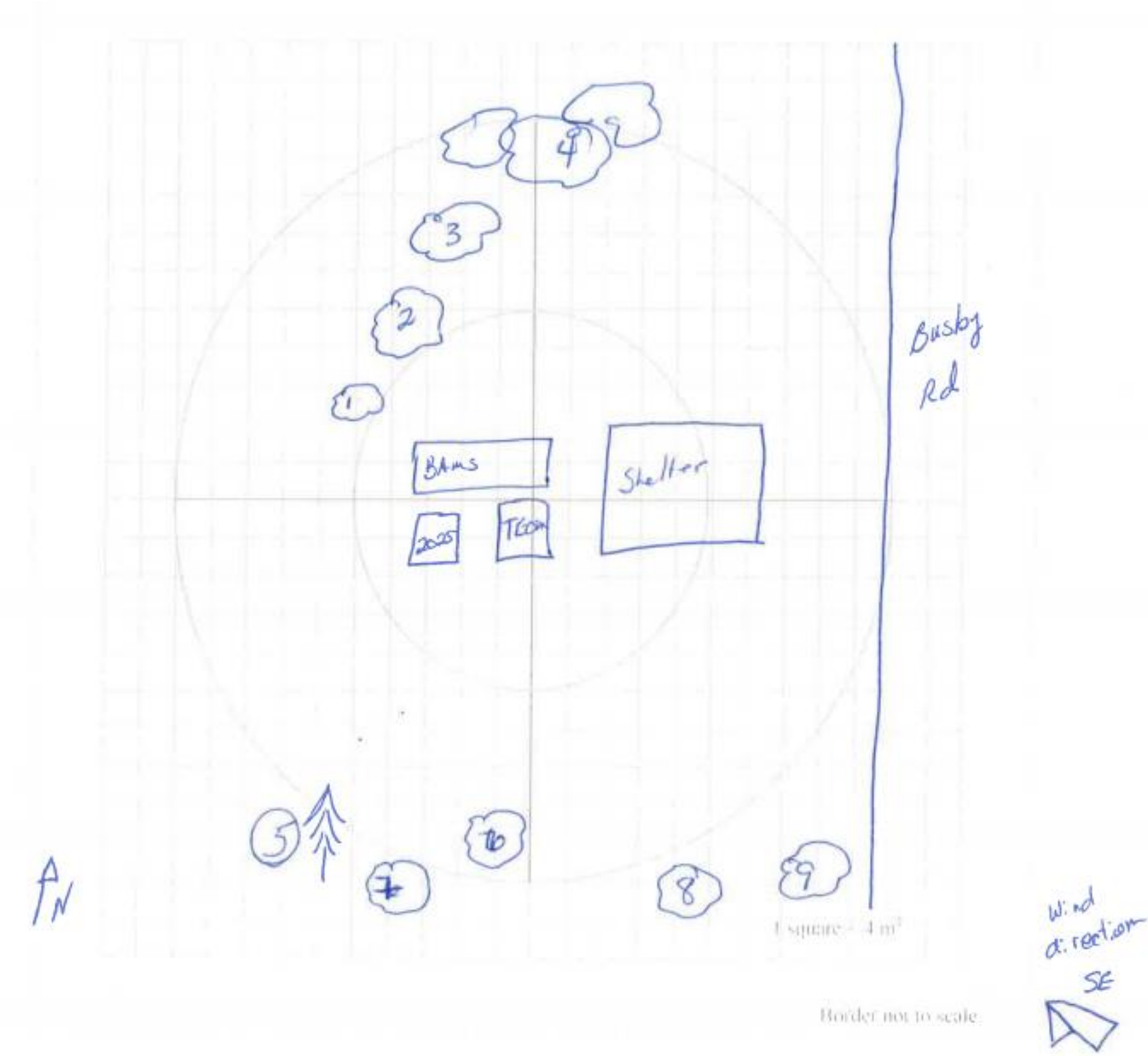
- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

**Issues:** ___None______________________________________________________________

**MSEF (Page 5/5): Local Site Name:** _Lawrence__________ **Initials:** EMH______ **Date:** __2/17/17________

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: _> 270______° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

# Additional Information:

Distance to closest road (Busby Road) – from TEOM is 17.6 meters and from 2025 monitor is 26.8 meters (used measuring wheel)

# Aerial Photo with Wind Rose

**PHOTO LOG: Local Site Name:** Lawrence **Initials:** EMH **Date:** 2/17/17

**Camera [x APC / □ Personal – Owner: ________________] Make/Model:** Nikon Coolpix

**Filename:** 01 **Date:** 2/17/17 **Time:** 11:40 am **Photographer:** EMH

**Description:** Site view from north direction

**Filename:** 02 **Date:** 2/17/17 **Time:** 11:40 am **Photographer:** EMH

**Description:** Site view from south direction

**Filename:** 03 **Date:** 2/17/17 **Time:** 11:40 am **Photographer:** EMH

**Description:** North side of site

**Filename:** 04 **Date:** 2/17/17 **Time:** 11:40 am **Photographer:** EMH

**Description:** View North of site (N directional)

**Filename:** 05 **Date:** 2/17/17 **Time:** 11:40 am **Photographer:** EMH

**Description:** South side of site

**Filename:** 06 **Date:** 2/17/17 **Time:** 11:40 am **Photographer:** EMH

**Description:** View South of site (S directional)

**Filename:** 07 **Date:** 2/17/17 **Time:** 11:40 am **Photographer:** EMH

**Description:** West side of site

**Filename:** 08 **Date:** 2/17/17 **Time:** 11:40 am **Photographer:** EMH

**Description:** View West of site (W directional)

**Filename:** 09 **Date:** 2/17/17 **Time:** 11:40 am **Photographer:** EMH

**Description:** East side of site

**Filename:** 10 **Date:** 2/17/17 **Time:** 11:40 am **Photographer:** EMH

**Description:** View East of site (E directional)

**Filename:** 11 **Date:** 2/17/17 **Time:** 11:40 am **Photographer:** EMH

**Description:** Board need replacing on 2025 platform

Lawrence: Photo Log (2017)

001

002

003

004

005

006

007


008

009


010

# 40 CFR Part 58, Appendix E, Tables and Figures

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| **$O_3$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **$SO_2$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **PM, Pb** | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

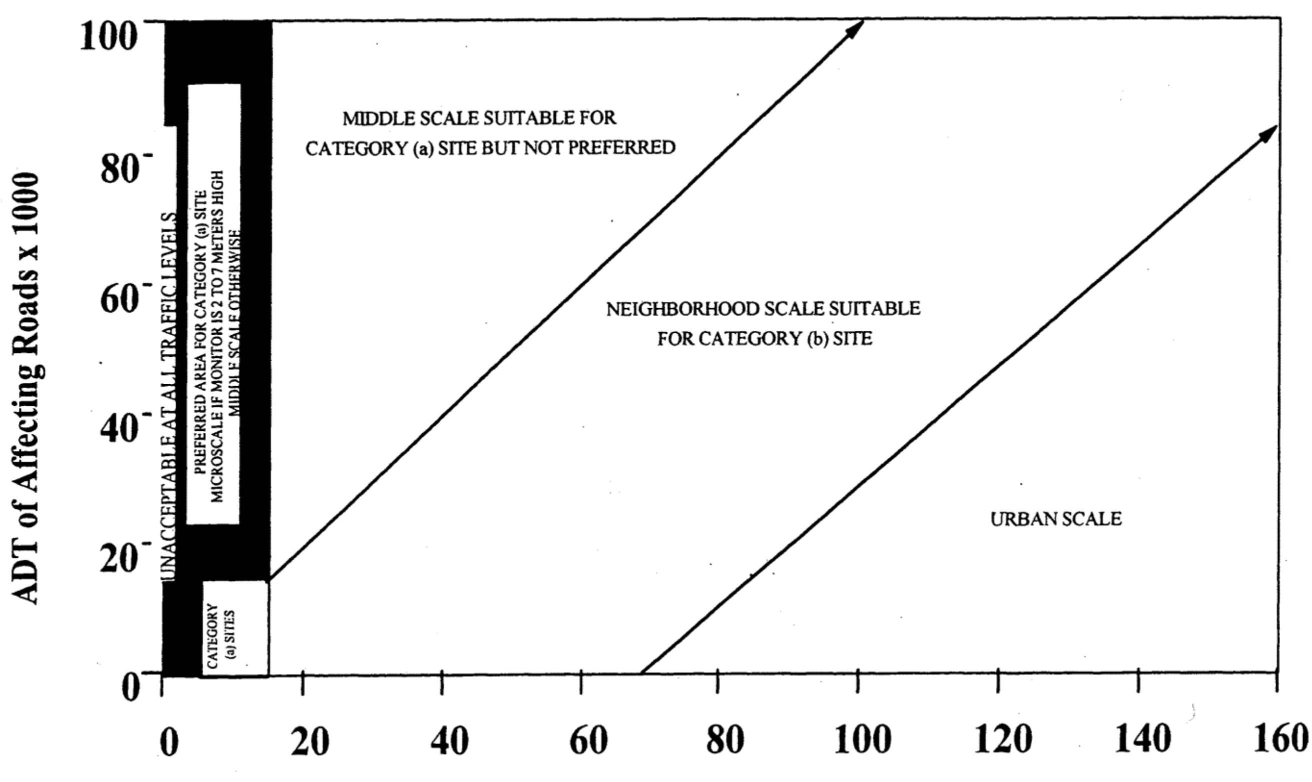



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| 1/4" Line OD / 20 Sec Residence Time | | | |
|---|---|---|---|
| **Flow Rate** | **1/8" ID** | **5/32" ID** | **3/16" ID** |
| **(liters/min)** | **feet** | **feet** | **feet** |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
| 0.6 | 82.9 | 53.0 | 36.8 |
| 0.7 | 96.7 | 61.9 | 43.0 |
| 0.8 | 110.5 | 70.7 | 49.1 |
| 0.9 | 124.3 | 79.6 | 55.3 |
| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
| 1.2 | 165.8 | 106.1 | 73.7 |
| 1.3 | 179.6 | 114.9 | 79.8 |
| 1.4 | 193.4 | 123.8 | 85.9 |
| 1.5 | 207.2 | 132.6 | 92.1 |
| 1.6 | 221.0 | 141.4 | 98.2 |
| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

**ADDITIONAL SUPPORTING INSTRUMENTATION**

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

A 4G cellular modem (Sierra Wireless RV50) provides internet communications to an ESC 8832 logger.

A US Robotics dial-up modem is used to send the ancillary data from the 2025 to the central office staff.

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**
Is the shelter tied down – physically tied with hurricane straps?
Is the shelter grounded - look for rod in the ground and lead wire connection?

Type of Shelter(s) located on site:

1. **Enclosure: Y**
2. **Trailer: N**
3. **None: N**
4. **Other: N**

What are the shelter(s) made of?

1. _TEOM and BAM enclosures - steel_______________________________
2. Shelter is old shipping container - steel_____________________________
3. ________________________________________________________________
4. _Platforms - wood_______________________________________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? Y
Write additional comments on the shelters below:

___Platforms are in fair condition. Breaker box, outlets, and plugs are in good condition.___________________________________

___Shelter has rodent problem.________________________________________________________________

# INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

**Initials:** Initials of auditor completing form.

**Date:** current date site is entered by auditor

**Reminder:** If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

**Arrival Time:** time auditors arrive at site

**Departure Time:** time auditors depart site

**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and is specified in TDEC DAPC's QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures. Teledyne analyzers are designated FEM for a range of 5-40 °C. Therefore, TDEC DAPC keeps shelters with these monitors within this range (still keeping in mind the 2 deg SD requirement). Shelters are generally kept about 25-26 °C in the warmest months to reduce condensation in sample lines and analyzer.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites? Ants? Wasps/Bees? / Larger wildlife causing problems (such as nesting in the undercarriage or walls or digging dens near the foundation/supports)?

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:** document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated. Some examples of items that can cause this problem are a leaking filter holder or fitting and an uncapped TTP system or sample line tee.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, SO2, NO, NO2, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control

**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**

## Air Monitoring Site Evaluations
## TDEC APC

**Date: February 28, 2017** **Location: Loudon, TN**

**AQS Number: 47-105-0109**
**Site Name: Loudon Elementary** **Pollutants: O3**
**Project Leader: Team 3**

**Print Name / Signature / Initials / Duties**

**1:** Evelyn Haskin________________________________________EMH__ Site Evaluator

**2:** Justin E. Long________________________________________JEL________ Site Evaluator

**3:** Thomas E. Dalton ____________________________________TED ____ Site Evaluator

# Air Monitoring Site Evaluation Summary

**Local Site Name:** Loudon Elementary________________ **Initials:** TED_________ **Date:** February 28, 2017

**Additional Comments:**

The ozone monitor has been moved from the Loudon – Pope site (130 Webb Dr., Loudon, TN) to the Loudon Elementary School (2175 Roberts Road, Loudon ,TN) at the beginning of the 2017 ozone season.____________

No obstructions were identified at the new location.________________________________________________

The exterior of the shelter is in need of cleaning.___________________________________________________

**MONITORING SITE EVALUATION FORM (MSEF) (Page 1/5):**

**Local Site Name:** Loudon Elementary______________ **Initials:** __TED______ **Date:** _February 28, 2017______

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present

**Arrival Time:** __10:30_am__ **Departure Time:** __1:00_pm_____ **Primary Operator:** _____Amelia Poe______

**Observer(s):** _____TED/JEL____________________________________________

**SITE**

[Y]-**Security Fence** [N]-**Razor/Barb Wire** [Y ] **Grass/Shrubs Cut** [Y] **Bare Soil Area**

[N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** ______________________ [NA] **Police Report Filed**

**Issues:** ___Area needs to be over-sowed with grass seed______________________________

**SHELTER - Interior**

**Arrival Temperature:** ___21.89_**°C** (from data logger) **Operator Site Visits:** ___1_____ per [**week**]

[**Y**] **Leaking Roof** **[Damaged: X Ceiling / X Floor / □Walls]** [**Y**] **Clean / Neat** [**N**] **Fire Extinguisher**

[**Y**] **Insect / Wildlife Issues** [**Y**] **Thermometer** (min/max) [**N**] **Gasoline** (inside shelter)

**Issues:** _Fire ants will need to be kept at bay to prevent shelter from having dirt removed from under supports.

**MONITOR(s):** **Location:** Exterior Samplers **[□Roof / □Ground / □ Not Present]**

| Monitor(s) | Manufacturer | Model | Serial Number |
|---|---|---|---|
| O3 Analyzer | Teledyne | T400 | 2282 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**CALIBRATOR(s):** □ **Not Present** [Y] **Are QA/QC Check Gases Vented Outside Shelter?**

| QA/QC | Make | Model | Serial Number | Certification Date | Expiration Date |
|---|---|---|---|---|---|
| QC | Teledyne | T703 | 331 | 1-18-17 | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line? [N]** If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** Loudon Elementary___ **Initials:** __TED___ **Date:** _February 28, 2017

**All Gas Standards Pass thru all Filters during:** [Y] **Calibrations** [Y] **Precision Checks** [Y] **Audits**

**Issues:** ________________________None____________________________________________________________

**CYLINDER GAS STANDARDS:** **[X] Not Present**

**VENDOR:** **(PSI Reading < 200, tank is empty and should not be in service)**

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| N/A | | | | | |
| | | | | | |
| | | | | | |

Issues: _________None______________________________________________________________________________

**SUPPORTING INSTRUMENTATION: Internal**

[Y] **Temperature Sensor** [N] **Uninterruptable Power Supply** [N] **On-Site Computer**

**Zero Air System: Commercial System** (Make / Model): ______________________________________________

**Cartridge System: [□Silica Gel [□Pink / □Blue] / X Charcoal / □Purafil / □Hopcalite / Other: __dri-rite__]**

[N] **Needs Service Last Service Date:** ___02-2017_____ **Condition:** ___OK_______________________

Issues: ___________________________________________________________________________________________

**Probe Line(s): [ X Replaced / □Cleaned] – Frequency:** _One a year__ **Last Service Date:** __2/27/17_______

[Y] **Clean** [Y] **Heated** [N] **Insulated** [N] **Moisture** [N] **Retractable** [N] **Old / Unused Lines** [Y] **Lo Flo**

**Manifold ->** [N] **Any Open Ports? –> How many analyzers using manifold?** ___1___________

Issues: ____None___________________________________________________________________________

**SHELTER – Exterior**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other:** ___Metal Sided________**]**

[N] **Needs Maintenance** (specify) [N] **Tied Down** [Y] **Electrically Grounded** [N/A] **Roof Railing**

**Roof Access: [Stairs [Interior/Exterior] / Ladder [attached/removable] /X Not Present]** [N] **Loose Decking** (Trip Hazard)

**Issues:** ____None______________________________________________________________________________

**Height of Roof:** ___3_________**meters** **Roofing Material**: aluminum

**Issues:** ____________________________None___________________________________________________

**MSEF (Page 3/5): Local Site Name:** __Loudon Elementary___ **Initials:** __TED___ **Date:** _February 28, 2017

## SHELTER – Exterior

**Type: [□Freezer / □Wood Building / □Brick-Block / Other:** ___Metal Sided________**]**

[N] **Needs Maintenance** (specify) [N] **Tied Down** [Y] **Electrically Grounded** [N/A] **Roof Railing**

**Roof Access: [Stairs [Interior/Exterior] / Ladder [attached/removable] /X Not Present]** [N] **Loose Decking** (Trip Hazard)

**Issues:** ____None____________________________________________________________________________________

**Height of Roof:** ___3_________**meters** **Roofing Material**: aluminum

**Issues:** ____________________________None_____________________________________________________________

## OUTDOOR SAMPLERS **X Not Present**

[Y/N] **Locked** [Y/N] **Electrically Grounded** [Y/N] **Stabilized** [Y/N] **Clean Inside** [Y/N] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** NA **$PM_{10}$ Head Clean Schedule:** NA

**Issue(s):** NA

## COLLOCATED SAMPLERS: **x Not Present**

(39.4 inches = 1 meter)

| Pollutant | Flow (Hi / Lo) | Separation Distance (meters) |
|---|---|---|
| N/A | | |
| | | |

Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

## PROBE SYSTEM(s): **External** **□ Not Present**

**Inlet Type:** [**x** Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [**x** Rain Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / **x** Stainless Steel / Other: _________]

**Probe Line(s)**: [**x** Teflon® / Other: _____________] **Probe Fitting(s)**: [**x** Teflon® / Other: ___________ / □ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

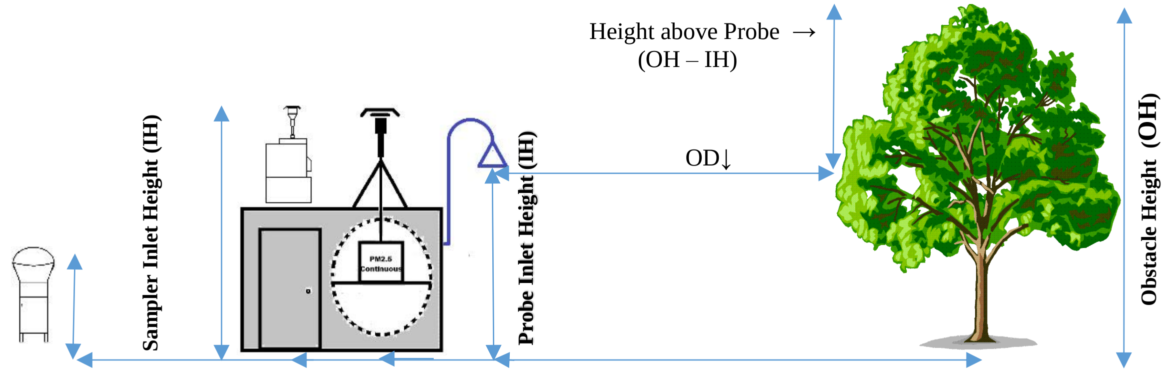
**Issue(s):** ______________________________________________________________________________________

| Pollutant(s) | Inlet Height (meters) | Inlet Location (Side of Shelter, Ground, Roof) | Horizontal Distance (meters) If Applicable | Vertical Distance (meters) If Applicable | Monitoring SCALE | |
|---|---|---|---|---|---|---|
| | | | | | AQS | Annual Network Plan |
| O3 | 4.8 | Side of shelter | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MSEF (Page 4/5): Local Site Name:** Loudon Elementary___**Initials:** __TED___ **Date:** _February 28, 2017

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**All distances in meters** **OD** **MUST** **be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| N/A | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** ____________inches = _________**meters** (nearest inlet to dripline) ☐ **No Trees Present**

(39.4 inches = 1 meter) ____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ____________________________________________

**Minor Sources:**

- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

**Issues:** _None____________________________________________

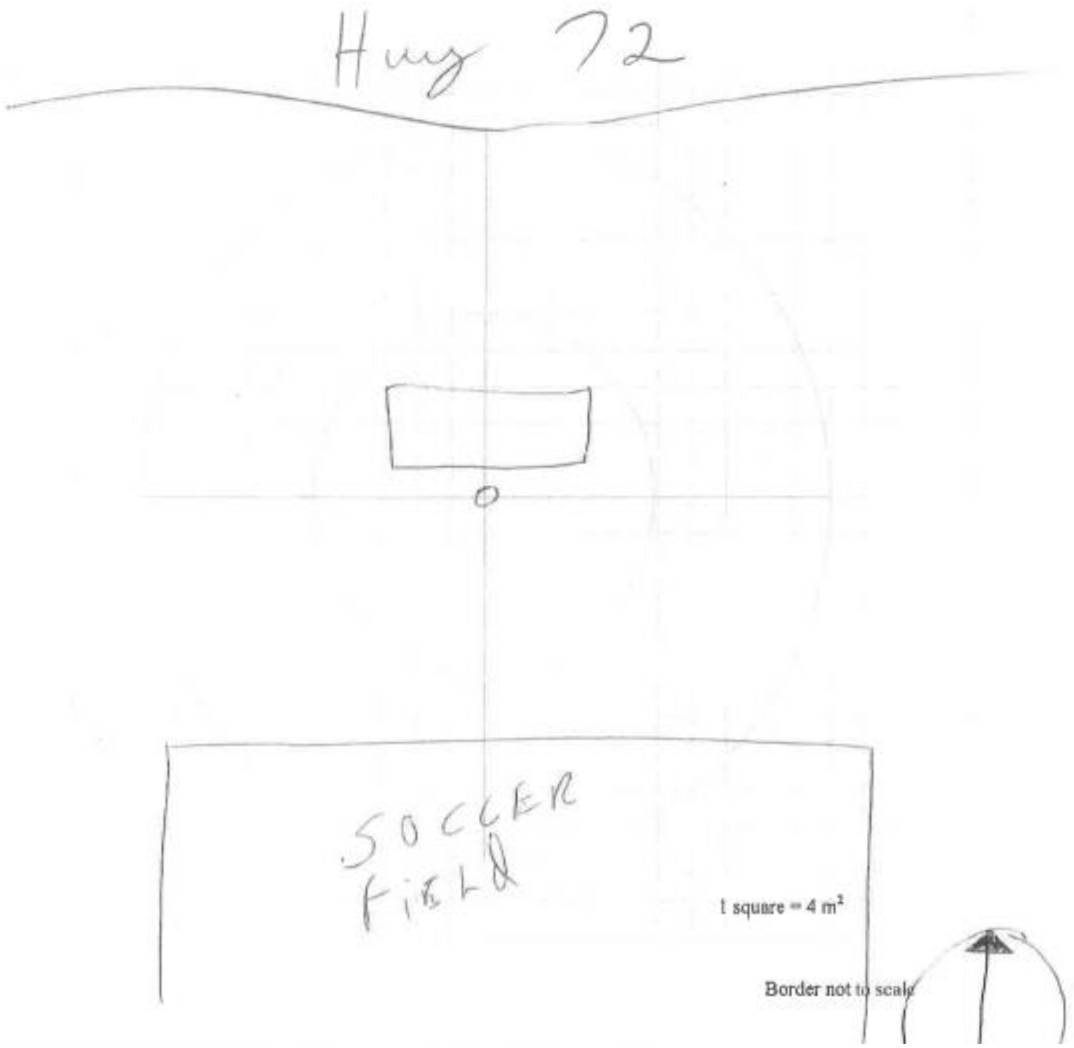
____________________________________________

____________________________________________

**MSEF (Page 5/5): Local Site Name:** Loudon Elementary_____________ **Initials:** TED__ **Date:** February 21, 2017

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: __360_______° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

# Additional Information:

New location is north of Loudon Elementary School's soccer field (Lat: 35.721004, Long: -84.343031)

As identified by yellow pin in aerial photo below

Distance to closest road: HWY 72 is 120.1 meters (measured by using Google Earth Pro)

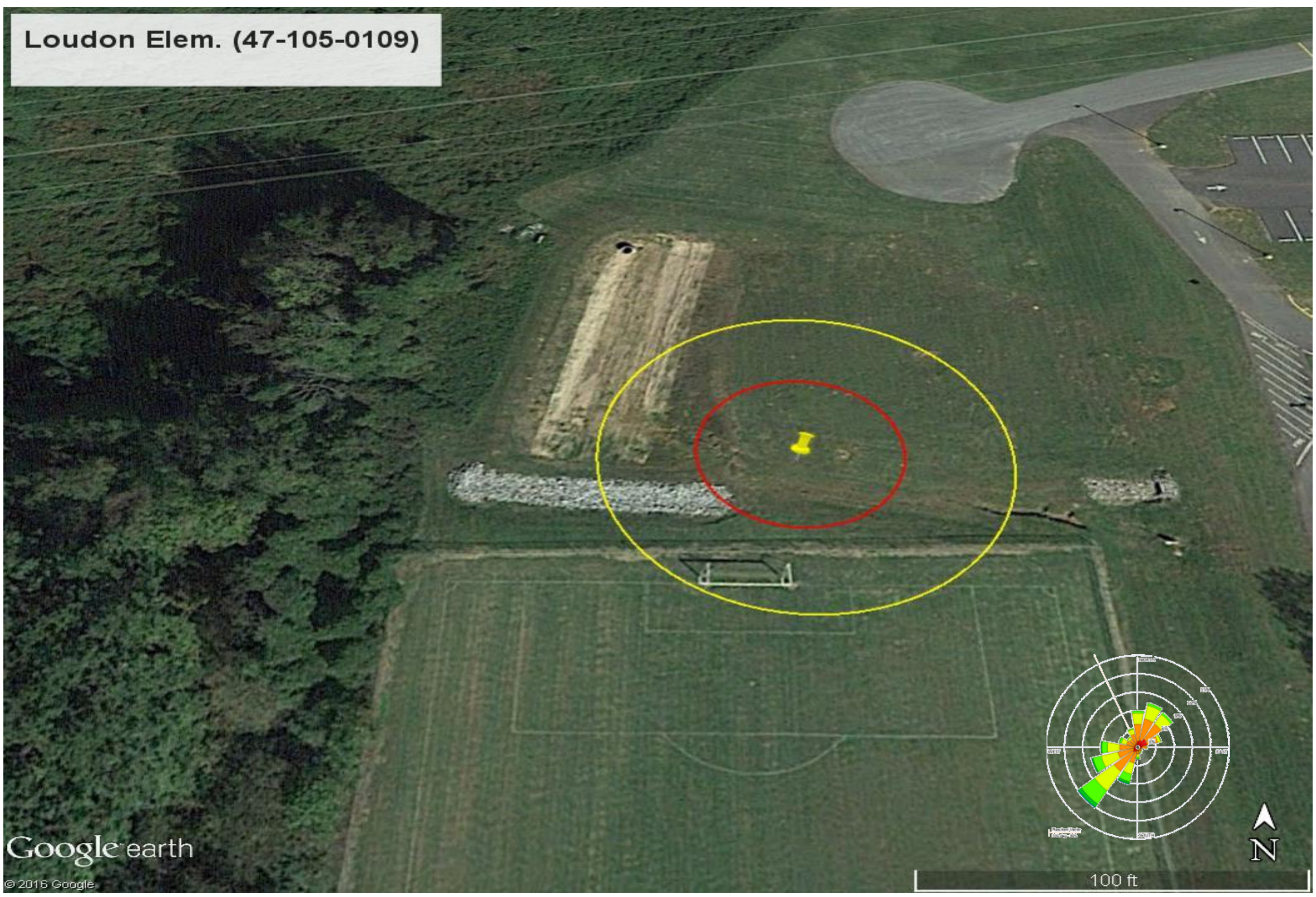


**PHOTO LOG:** **Local Site Name:** Loudon Elementary___________ **Initials:** TED__ **Date:** February 28, 2017

**Camera: X Personal – Owner: ____________ Make/Model: __N/A___**

**Filename:** ___001_______________ **Date:** _2-28-17______ **Time:** __10:30 am______ **Photographer:** ___TED___________

**Description:** _001-East toward monitor___________________________________________________________

**Filename:** 002_______________ **Date:** _2-28-17______ **Time:** __10:30 am______ **Photographer:** ___TED_____________

**Description:** _002-East away from monitor (east directional)_________________________________________

**Filename:** __003_______________ **Date:** _2-28-17______ **Time:** __10:30 am______ **Photographer:** ___TED_____________

**Description:** _003-South toward monitor_________________________________________________________

**Filename:** __004_______________ **Date:** _2-28-17______ **Time:** __10:30 am______ **Photographer:** ___TED_____________

**Description:** _South away from monitor (South directional)_________________________________________

**Filename:** ___005_______________ **Date:** _2-28-17______ **Time:** __10:30 am______ **Photographer:** ___TED_____________

**Description:** _West toward monitor_______________________________________________________________

**Filename:** __006_______________ **Date:** _2-28-17______ **Time:** __10:30 am______ **Photographer:** ___TED _____________

**Description:** _West away from monitor (West directional)__________________________________________

**Filename:** ___007_______________ **Date:** _2-28-17______ **Time:** __10:30 am_____ **Photographer:** ___TED ____________

**Description:** __North toward monitor_____________________________________________________________

**Filename:** __008________________ **Date:** _2-28-17_____ **Time:** __10:30 am_____ **Photographer:** ___TED____________

**Description:** _North away from monitor (north directional)_________________________________________

001-East toward monitor

002-East away from monitor (East directional)

003-South toward monitor

004-South away from monitor (South directional)

005-West toward monitor

006-West away from monitor (West directional)

007-North toward monitor

008-North away from monitor (North directional)

# 40 CFR Part 58, Appendix E, Tables and Figures

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

[1] Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2] Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| **$O_3$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **$SO_2$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **PM, Pb** | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

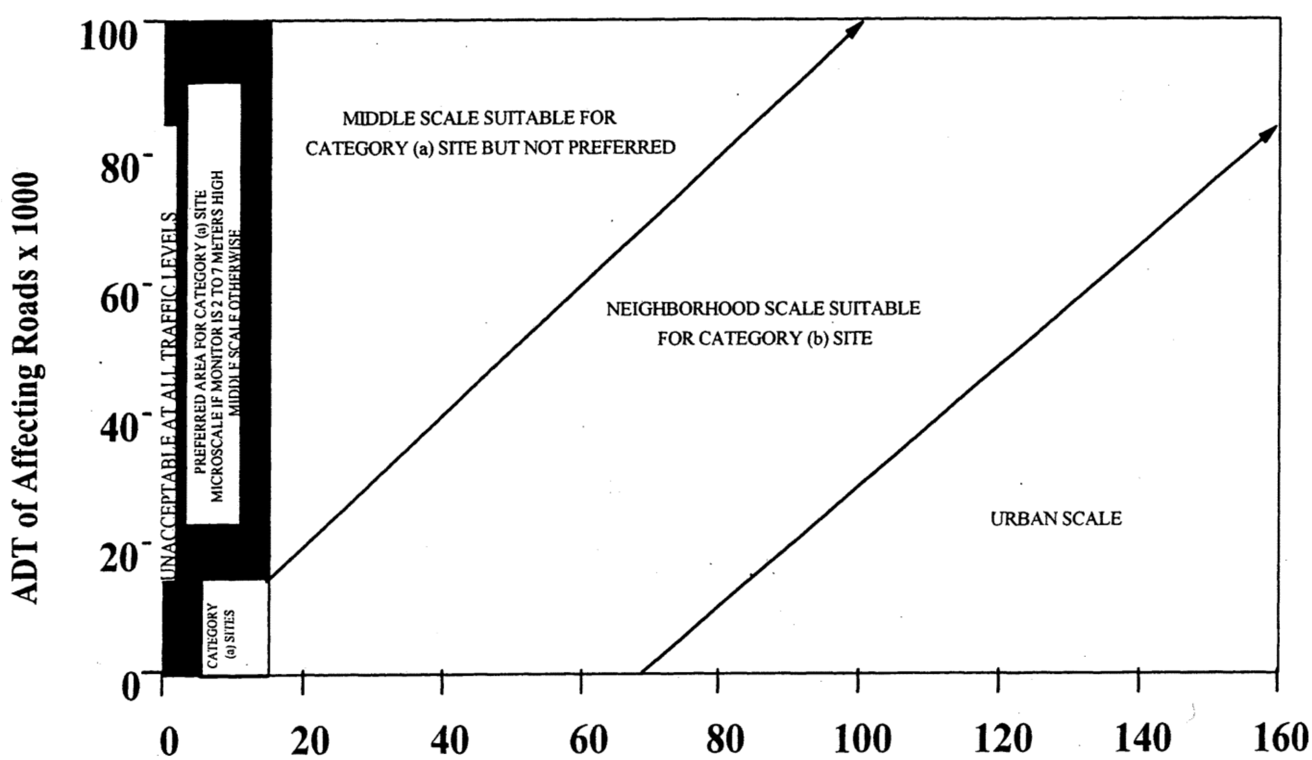



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| 1/4" Line OD / 20 Sec Residence Time | | | |
|---|---|---|---|
| **Flow Rate (liters/min)** | **1/8" ID feet** | **5/32" ID feet** | **3/16" ID feet** |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
| 0.6 | 82.9 | 53.0 | 36.8 |
| 0.7 | 96.7 | 61.9 | 43.0 |
| 0.8 | 110.5 | 70.7 | 49.1 |
| 0.9 | 124.3 | 79.6 | 55.3 |
| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
| 1.2 | 165.8 | 106.1 | 73.7 |
| 1.3 | 179.6 | 114.9 | 79.8 |
| 1.4 | 193.4 | 123.8 | 85.9 |
| 1.5 | 207.2 | 132.6 | 92.1 |
| 1.6 | 221.0 | 141.4 | 98.2 |
| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

**SUPPORTING INSTRUMENTATION**
**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

The site uses an ESC 8832 data logger and an Agilaire 8872 PC/Data logger. The 8832 data logger serves as the primary logger and is directly connected via analog input to the analyzer at the site. The data is polled from the 8832 logger to the central server via a 4G cellular modem (Sierra Wireless RV50). The 8872 serves as a secondary, backup logger, and is used by the site operator to retrieve the electronic strip chart in local standard time. The 8872 polls data from the 8832 locally over the COM port or over the local tcp/ip network if the COM route is not working (via a network switch).

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**

Type of Shelter(s) located on site:

1. **Enclosure: N**
2. **Trailer: Y**
3. **None: N**
4. **Other: N**

What are the shelter(s) made of?

1. ____________________ ___________________________________________
2. _Aluminum_____________________________________________________
3. ________________________________________________________________
4. _________________________________________________________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **Y**

Write additional comments on the shelters below:

Ladders are brought to the site as needed.

## INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

**Initials:** Initials of auditor completing form.

**Date:** current date site is entered by auditor

**Reminder:** If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

**Arrival Time:** time auditors arrive at site

**Departure Time:** time auditors depart site

**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and is specified in TDEC DAPC's QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures. Teledyne analyzers are designated FEM for a range of 5-40 °C. Therefore, TDEC DAPC keeps shelters with these monitors within this range (still keeping in mind the 2 deg SD requirement). Shelters are generally kept about 25-26 °C in the warmest months to reduce condensation in sample lines and analyzer.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites? Ants? Wasps/Bees? / Larger wildlife causing problems (such as nesting in the undercarriage or walls or digging dens near the foundation/supports)?

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:** document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated. Some examples of items that can cause this problem are a leaking filter holder or fitting and an uncapped TTP system or sample line tee.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, SO2, NO, NO2, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control

**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**

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## Air Monitoring Site Evaluations
## TDEC APC

**Date: February 28, 2017** **Location: Loudon, TN**

**AQS Number: 47-105-0108**
**Site Name: Loudon Pope** **Pollutants: PM $_{2.5}$**
**Project Leader: Team 3**

---

**Print Name / Signature / Initials / Duties**

**1:** Evelyn Haskin ____________________ EMH ____ Site Evaluator

**2:** Justin E. Long ____________________ JEL ____ Site Evaluator

**3:** Thomas E. Dalton ____________________ TED ____ Site Evaluator

# Air Monitoring Site Evaluation Summary

**Local Site Name:** Loudon Pope_____________________ **Initials:** TED/JEL________ **Date:** February 28, 2017

**Additional Comments:**

No license agreement for this site.________________________________________________________________

PM2.5 monitor will be moved to the Loudon Elementary School before or at the end of 2017._______________

_O3 monitor moved to Loudon Elementary School on 2/27/17 prior to the start of the 2017 O3 season. Shelter remains at Pope site. Shelter, met tower pole will need to be removed when PM2.5 monitor is relocated._____

Distance to closest road (Webb Dr) is 12.2 meter (measured using Google Earth Pro)______________________

_Landowner did not want anything cut down at site.______________________________________________

**MONITORING SITE EVALUATION FORM (MSEF) (Page 1/5):**

**Local Site Name:** Loudon Pope______________ **Initials:** __TED/JEL___ **Date:** _February 28, 2017__

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present
**Arrival Time:** __9:00_am__ **Departure Time:** __10:00_am_____ **Primary Operator:** _____Tom Dalton______

**Observer(s):** _____TED_________________________________________________________

**SITE**
[N]-**Security Fence** [N]-**Razor/Barb Wire** [Y ] **Grass/Shrubs Cut** [N] **Bare Soil Area**

[N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** ______________________ [Y/N] **Police Report Filed**

**Issues:** ___None__________________________________________________________________________

**SHELTER - Interior**
**Arrival Temperature:** ___NA_**°C** (from data logger) **Operator Site Visits:** ___1_-2_____ per [**week**]

[**N**] **Leaking Roof** **[Damaged: □ Ceiling / □ Floor / □Walls]** [**Y**] **Clean / Neat** [**N**] **Fire Extinguisher**

[**Y**] **Insect / Wildlife Issues** [**Y**] **Thermometer** (min/max) [**N**] **Gasoline** (inside shelter)

**Issues:** _Wasps tend to get in the fan shields_________________________________________________

**MONITOR(s):** **Location:** Exterior Samplers **[□Roof / x Ground / □ Not Present]**

| Monitor(s) | Manufacturer | Model | Serial Number |
|---|---|---|---|
| $PM_{2.5}$ | R & P | 2025 | 22134 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**CALIBRATOR(s):** **x Not Present** [Y] **Are QA/QC Check Gases Vented Outside Shelter?**

| QA/QC | Make | Model | Serial Number | Certification Date | Expiration Date |
|---|---|---|---|---|---|
| NA | | | | | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line? [N]** If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** Loudon POPE___ **Initials:** __TED/JEL___ **Date:** _February 28, 2017

**All Gas Standards Pass thru all Filters during:** [Y] **Calibrations** [Y] **Precision Checks** [Y] **Audits**

**Issues:** _______________________None_________________________________________________________

**CYLINDER GAS STANDARDS:** **x Not Present**

**VENDOR:** (PSI Reading < 200, tank is empty and should not be in service)

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| N/A | | | | | |
| | | | | | |
| | | | | | |

Issues: _________None_____________________________________________________________________

**SUPPORTING INSTRUMENTATION: Internal**

[Y] **Temperature Sensor** [N] **Uninterruptable Power Supply** [N] **On-Site Computer**

**Zero Air System: Commercial System** (Make / Model): _____________________________________________

**Cartridge System: [□ Silica Gel [□Pink / □Blue] / □ Charcoal / □Purafil / □Hopcalite / Other: _________]**

[N] **Needs Service** **Last Service Date:** ___ ________ _____ **Condition:** ___ ________________________

Issues: _None_________________________________________________________________________

**Probe Line(s): [□ Replaced / □Cleaned] – Frequency:** _____________ **Last Service Date:** __ _______

[Y/N] **Clean** [Y/N] **Heated** [Y/N] **Insulated** [Y/N] **Moisture** [Y/N] **Retractable** [Y/N] **Old / Unused Lines**

**[**Y/N] **Lo Flo Manifold ->** [N] **Any Open Ports?** **–> How many analyzers using manifold?** ___ ____________

Issues: ____None_________________________________________________________________________

**MSEF (Page 3/5): Local Site Name:** _ Loudon Pope___ **Initials:** __TED/JEL___ **Date:** _February 28, 2017

**SHELTER – Exterior** □ **Not Present**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other: ___Metal Sided________]**

[N] **Needs Maintenance** (specify) [Y] **Tied Down** [Y] **Electrically Grounded** [N/A] **Roof Railing**

**Roof Access: [Stairs [Interior/Exterior] / Ladder [attached/removable] /X Not Present]** [Y/N] **Loose Decking** (Trip Hazard)

**Issues:** _shelter no longer used_____________________________________________

**Height of Roof:** ___NA_________**meters** **Roofing Material**: ____Metal______________________________

**Issues:** ____________________________None____________________________________________

**OUTDOOR SAMPLERS** □ **Not Present**

[Y ] **Locked** [Y ] **Electrically Grounded** [Y ] **Stabilized** [Y ] **Clean Inside** [Y ] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** __________________ **$PM_{10}$ Head Clean Schedule:** _Monthly__________

**Issue(s):** _WINS cleaned every 5 runs; VSCC cleaned monthly_______________________________

**COLLOCATED SAMPLERS:** **X Not Present** (39.4 inches = 1 meter)

| Pollutant | Flow (Hi / Lo) | Separation Distance (meters) |
|---|---|---|
| N/A | | |
| | | |

Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s): External** **X Not Present**

**Inlet Type:** [□ Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [□ Rain Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / Stainless Steel / Other: _________]

**Probe Line(s)**: [□Teflon® / Other: _____________] **Probe Fitting(s)**: [□Teflon® / Other: ___________ / □ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

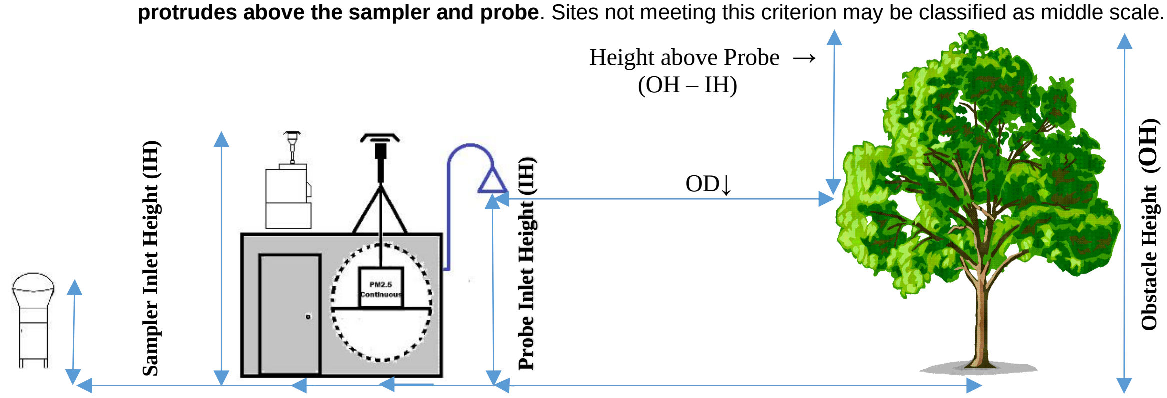
**Issue(s):** ____________________________________________________________________

| Pollutant(s) | Inlet Height (meters) | Inlet Location (Side of Shelter, Ground, Roof) | Horizontal Distance (meters) If Applicable | Vertical Distance (meters) If Applicable | Monitoring SCALE | |
|---|---|---|---|---|---|---|
| | | | | | AQS | Annual Network Plan |
| $PM_{2.5}$ | 2.5 | Ground | | | Neighborhood | Neighborhood |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MSEF (Page 4/5): Local Site Name:** Loudon Pope___**Initials:** __TED/JEL___ **Date:** _February 28, 2017

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**Obstacle Distance(s) (OD)**

**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) | Drip Line |
|---|---|---|---|---|---|
| 1 | 2.8 | 2.5 | 0.6 | 1.7 | 1.0 |
| 2 | 1.6 | 2.5 | 0 | 0 | 1.0 |
| 3 | 2.5 | 2.5 | 0 | 5.9 | 4.8 |
| 4 | 5.4 | 2.5 | 5.2 | 10.7 | 8.0 |
| 5 | 5.0 | 2.5 | 5.0 | 15.1 | 13.6 |
| 6 | 3.2 | 2.5 | 1.4 | 13.4 | 0 |
| 7 | 4.4 | 2.5 | 3.8 | 13.4 | 13.0 |
| 8 | 2.4 | 2.5 | 0 | 0 | 14.4 |
| 9 | 10.4 | 2.5 | 15.8 | 21.0 | 19.8 |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** ____________inches = _________**meters** (nearest inlet to dripline) □ **No Trees Present**

(39.4 inches = 1 meter) ____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ____________________________________________

**Minor Sources:**

- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

**Issues:** _None____________________________________________

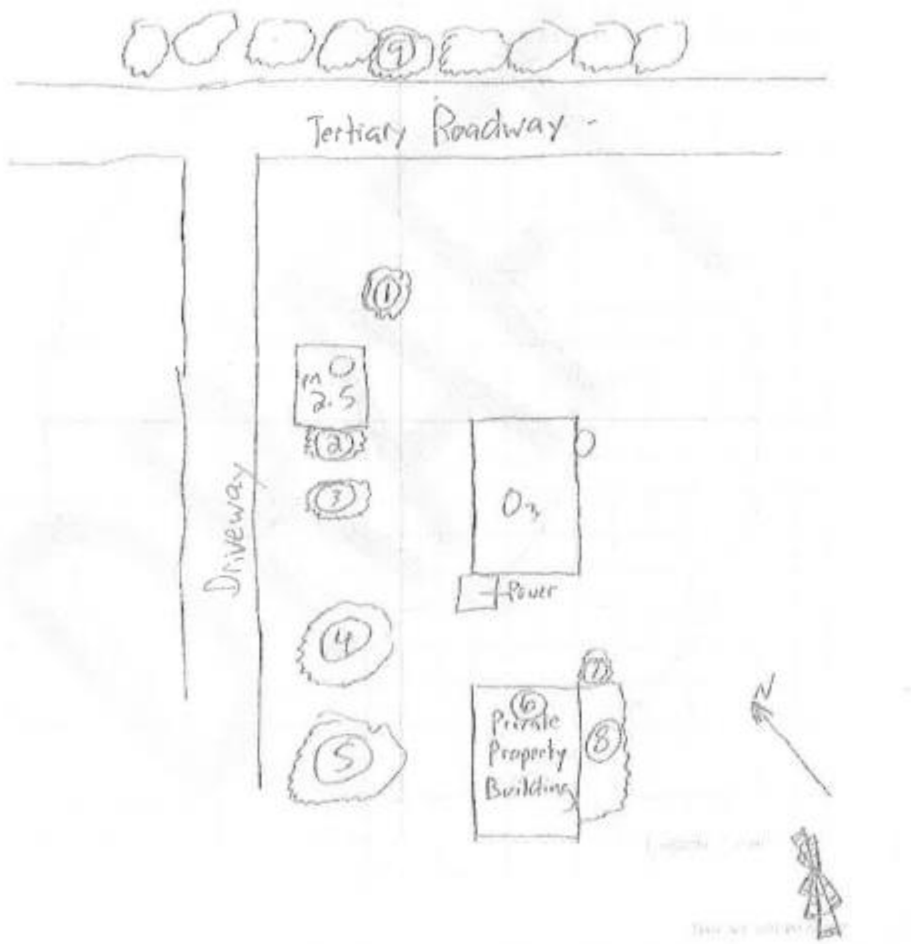
____________________________________________

**MSEF (Page 5/5): Local Site Name:** Loudon Pope____________ **Initials:** TED/JEL__ **Date:** February 21, 2017

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |

Relative Distances + Height can be found on pages 6 + 7 in the obstacle calculations boxes for both the PM2.5 + O3 monitors.




**UNRESTRICTED AIR FLOW**: __360_______° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

## Additional Information:

2025 monitor will be relocated to the Loudon Elementary School before or at the end of 2017

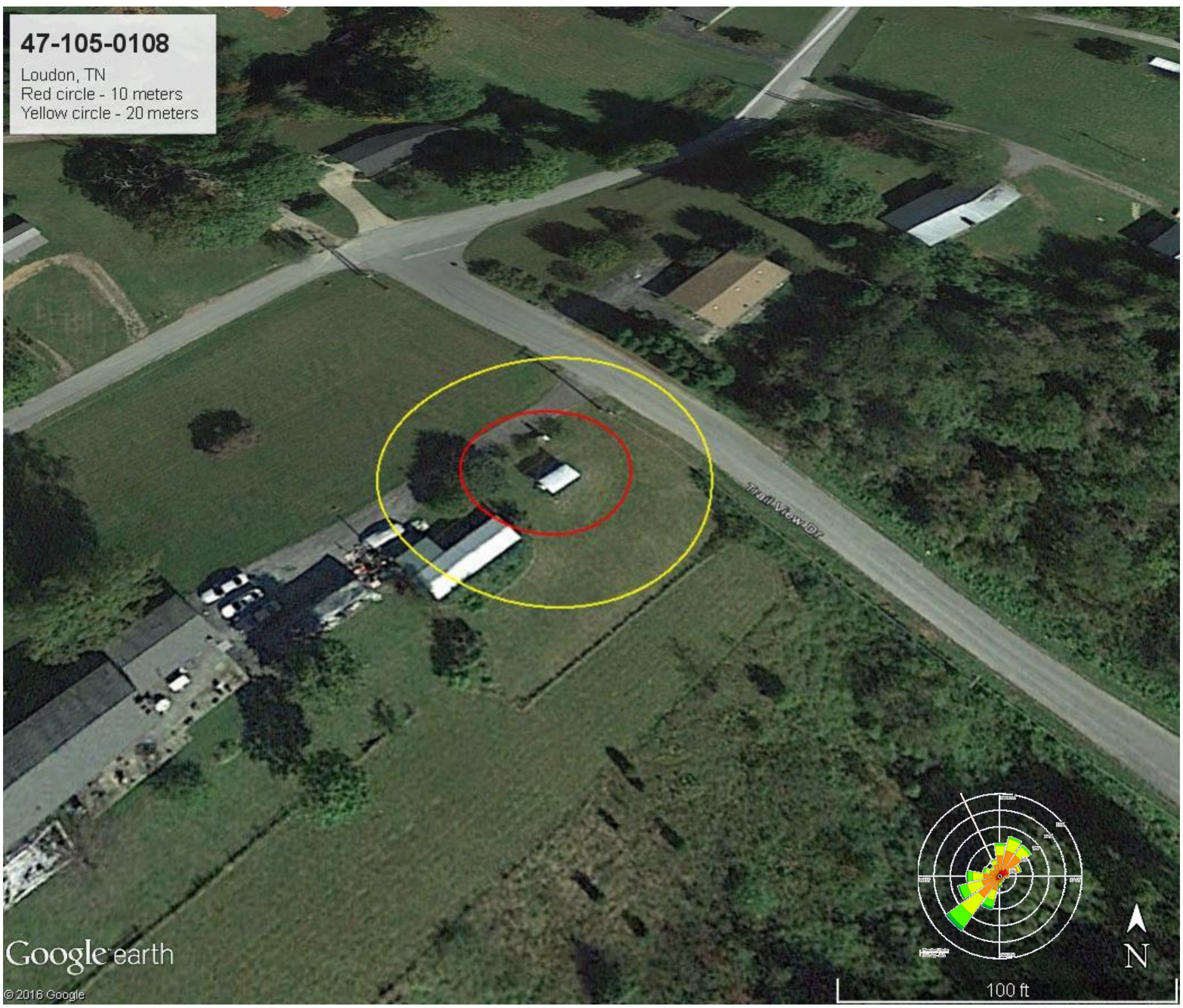


**PHOTO LOG:** **Local Site Name:** Loudon Pope___________ **Initials:** TED/JEL__ **Date:** February 28, 2017

**Camera: X Personal – Owner:** ____________ **Make/Model:** __N/A___

**Filename:** ___001_______________ **Date:** _11/18/16______ **Time:** _12:00 pm______ **Photographer:** ___TED____________

**Description:** _East away from monitor (East directional)_____________________________________________

**Filename:** 002_______________ **Date:** _11/18/16______ **Time:** __12:00 pm ______ **Photographer:** ___TED______________

**Description:** _East toward monitor _______________________________________________________________

**Filename:** __003_______________ **Date:** _11/18/16______ **Time:** __12:00 pm ______ **Photographer:** ___TED______________

**Description:** _West away from monitor (West directional)__________________________________________

**Filename:** __004_______________ **Date:** _11/18/16______ **Time:** __12:00 pm ______ **Photographer:** ___TED______________

**Description:** _West toward monitor_______________________________________________________________

**Filename:** ___005_______________ **Date:** _11/18/16______ **Time:** __12:00 pm ______ **Photographer:** ___TED______________

**Description:** _North toward monitor______________________________________________________________

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**Description:** _North away from monitor (North directional)___________________________________________

**Filename:** ___007_______________ **Date:** _11/18/16______ **Time:** __12:00 pm _____ **Photographer:** ___TED ____________

**Description:** __South toward monitor_____________________________________________________________

**Filename:** __008________________ **Date:** _11/18/16_____ **Time:** __12:00 pm _____ **Photographer:** ___TED____________

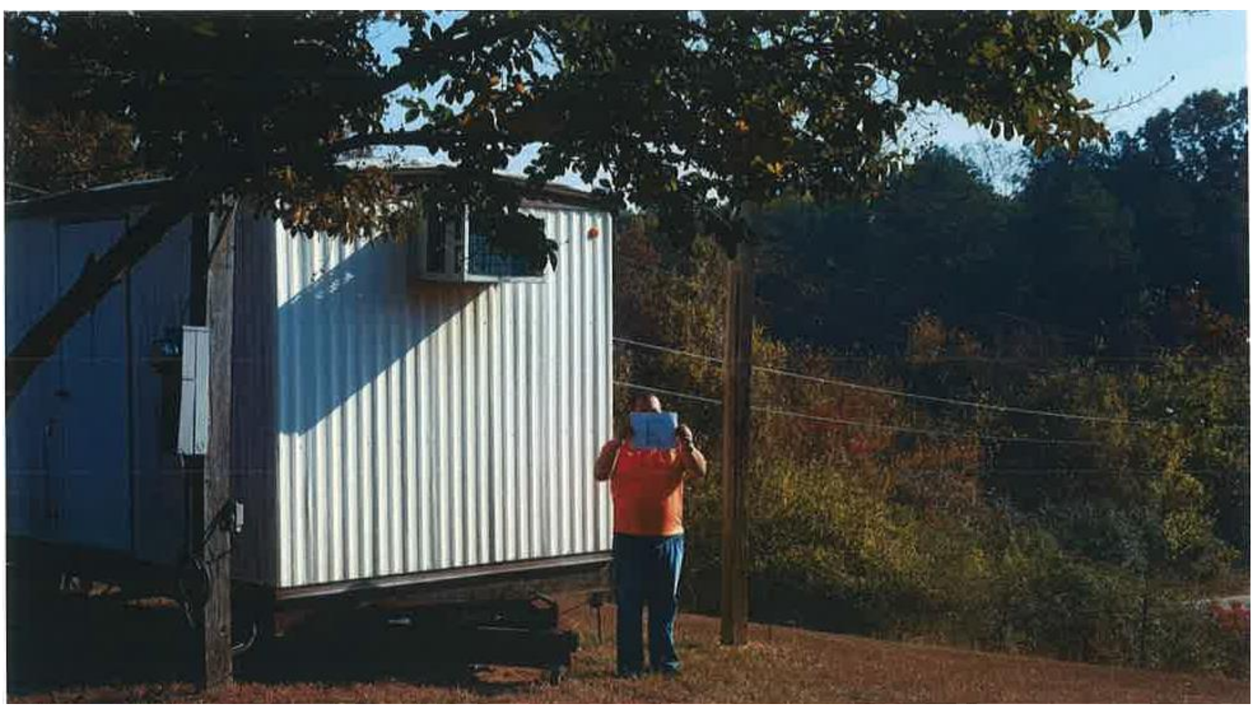
**Description:** _South away from monitor (South directional)___________________________________________

001-East away from monitor (East directional)

002-East towards monitor

003- West away from monitor (West directional)

004-West toward monitor

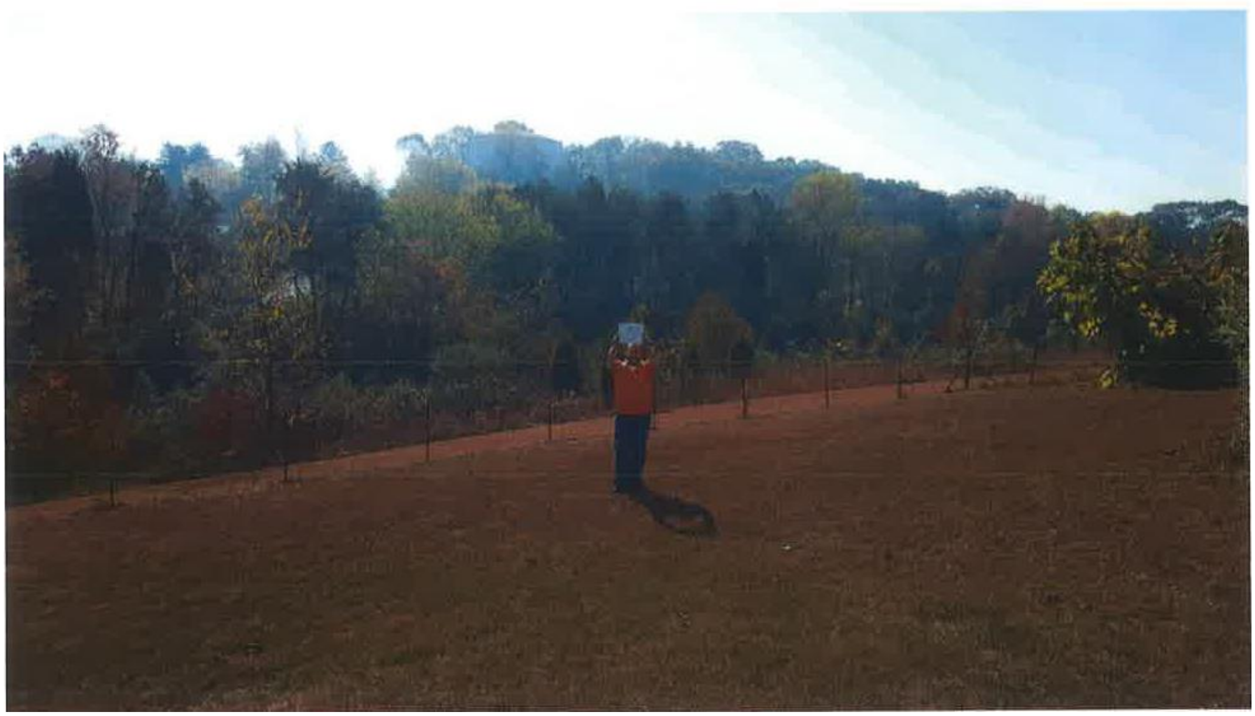


005- North toward monitor

006- North away from monitor (North directional)

007- South toward monitor

008- South away from monitor (South directional)



# 40 CFR Part 58, Appendix E, Tables and Figures

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| $O_3$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| $SO_2$ | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| PM, Pb | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

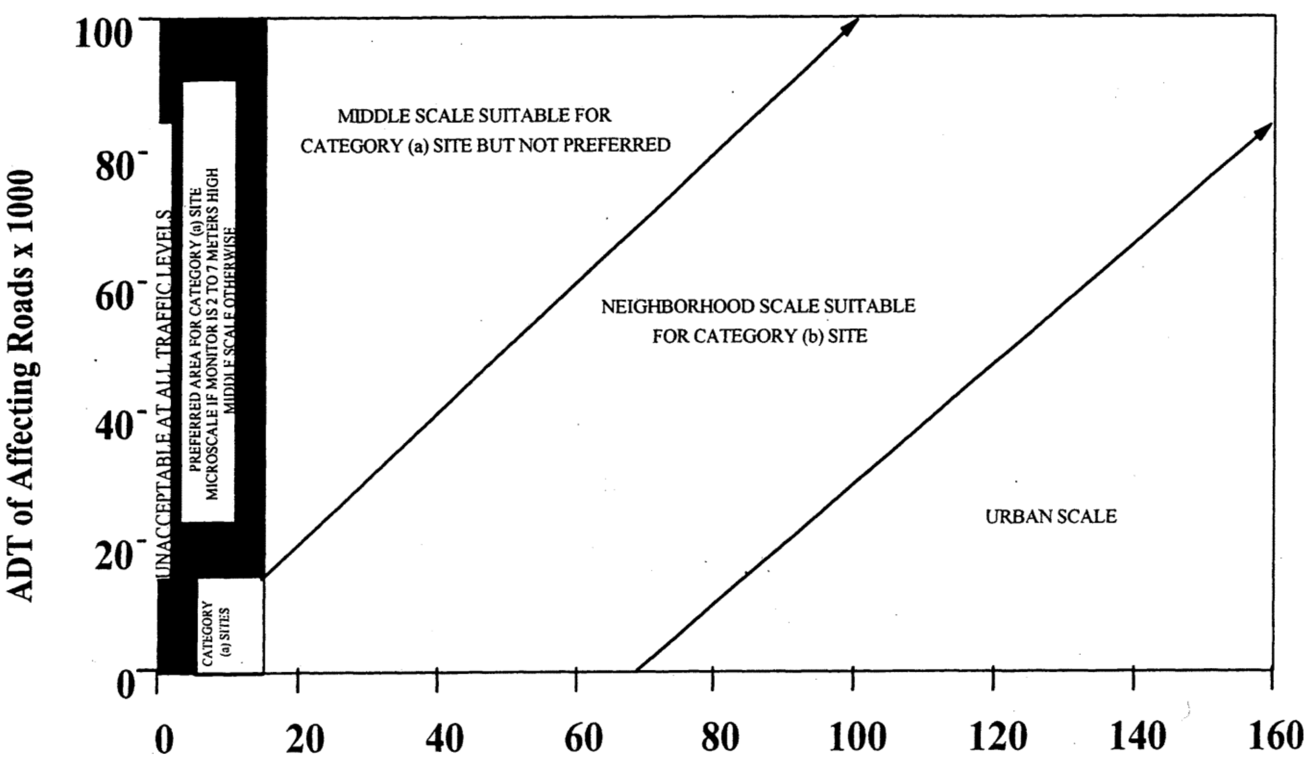



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| 1/4" Line OD / 20 Sec Residence Time | | | |
|---|---|---|---|
| Flow Rate | 1/8" ID | 5/32" ID | 3/16" ID |
| (liters/min) | feet | feet | feet |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
| 0.6 | 82.9 | 53.0 | 36.8 |
| 0.7 | 96.7 | 61.9 | 43.0 |
| 0.8 | 110.5 | 70.7 | 49.1 |
| 0.9 | 124.3 | 79.6 | 55.3 |
| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
| 1.2 | 165.8 | 106.1 | 73.7 |
| 1.3 | 179.6 | 114.9 | 79.8 |
| 1.4 | 193.4 | 123.8 | 85.9 |
| 1.5 | 207.2 | 132.6 | 92.1 |
| 1.6 | 221.0 | 141.4 | 98.2 |
| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

**ADDITIONAL SUPPORTING INSTRUMENTATION**

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

A US Robotics dial-up modem is used to send the ancillary data from the 2025 to the central office staff.

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**
Is the shelter tied down – physically tied with hurricane straps?
Is the shelter grounded - look for rod in the ground and lead wire connection?

Type of Shelter(s) located on site:
1. **Enclosure: Y**
2. **Trailer: N**
3. **None: N**
4. **Other: N**

What are the shelter(s) made of?

1. ____________________ __________________________________________
2. _Alunimum_Sheet Metal__________________________________________
3. _______________________________________________________________
4. __Wood________________________________________________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **Y**
With roof top samplers or inlets – is a roof railing present? **N** (May not be required in accordance with local ordinances)
Roof Access: Stairs or Ladder? **Y Ladder**
Stairs can be inside or outside – Ladders are usually permanently attached or removable? **Y removable**
Write additional comments on the shelters below:

_Shelter (trailer) is no longer in use; ozone equipment moved to Loudon Elementary School site 2025 monitor platform has boards that need replacing and equipment need cleaned of mold growing on them_______________
______________________________________________________________________________________________

______________________________________________________________________________________________

______________________________________________________________________________________________

# INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

**Initials:** Initials of auditor completing form.

**Date:** current date site is entered by auditor

**Reminder:** If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

**Arrival Time:** time auditors arrive at site

**Departure Time:** time auditors depart site

**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and is specified in TDEC DAPC’s QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures. Teledyne analyzers are designated FEM for a range of 5-40 °C. Therefore, TDEC DAPC keeps shelters with these monitors within this range (still keeping in mind the 2 deg SD requirement). Shelters are generally kept about 25-26 °C in the warmest months to reduce condensation in sample lines and analyzer.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites? Ants? Wasps/Bees? / Larger wildlife causing problems (such as nesting in the undercarriage or walls or digging dens near the foundation/supports)?

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:** document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated. Some examples of items that can cause this problem are a leaking filter holder or fitting and an uncapped TTP system or sample line tee.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, $SO_2$, NO, $NO_2$, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control

**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**

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## Air Monitoring Site Evaluations

## TDEC APC

**Date: February 15, 2017** **Location: Maryville, TN**
**AQS Number: 47-009-0011**
**Site Name: Maryville PM** **Pollutants: PM $_{2.5}$**
**Project Leader: EMH**

---

**Print Name / Signature / Initials / Duties**

**1:** Evelyn M. Haskin______________________________ EMH Team 3 Lead___________________

**2:** Justin E. Long____________________________________ JEL Team 3 member _________________

**3:** Thomas E. Dalton_______________________________ TED Team 3 member ________________

# Air Monitoring Site Evaluation Summary

**Local Site Name:** ___Maryville________________________________ **Initials:** _TED____ **Date:** ___2-15-17_____

**Additional Comments:**

Electrical meter #63109 with Maryville Electric Department. Platforms warped and split boards scheduled for replacement. Photos taken on 11-23-16 and 2-15-17. Distance to nearest traffic lane measured by Google Earth Pro which provided 89.6 meters or 294 feet. Landowner is the City of Maryville with the property location of 2001 Sequoyah Ave., Map 047K, Group B, Control map 047F, parcel 051.00.

## MONITORING SITE EVALUATION FORM (MSEF) (Page 1/5):

**Local Site Name:** __ Maryville__________________________ **Initials:** _TED____ **Date:** ___2-15-17____

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present

**Arrival Time:** _11:00 am_ **Departure Time:** _12:00 pm_ **Primary Operator:** __Justin Long (JEL)__________

**Observer(s):** _JEL for photos on 2-15-17________________________________________________

### SITE

[Y]-**Security Fence** [N]-**Razor/Barb Wire** [Y] **Grass/Shrubs Cut** [ N ] **Bare Soil Area**

[N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** _N/A______________________ [N/A] **Police Report Filed** ________

**Issues:** _**None**________________________________________________________________

### SHELTER - Interior

**Arrival Temperature:** _N/A____**°C** (from data logger) **Operator Site Visits:** _1-2__ per [**week** ]

[N/A] **Leaking Roof** **[Damaged:** □**Ceiling /** X **Floor /** □**Walls]** [Y] **Clean / Neat** [Y] **Fire Extinguisher** N]

[Y] **Insect / Wildlife Issues** [Y] **Thermometer** (min/max) [N] **Gasoline** (inside shelter)

**Issues:** _Wasps occasionally___________________________________________________

### MONITOR(s):

**Location:** Exterior Samplers **[□Roof / X Ground / □ Not Present]**

| **Monitor(s)** | **Manufacturer** | **Model** | **Serial Number** |
|---|---|---|---|
| PM $_{2.5}$ | R & P | 2025 | 21026 |
| PM $_{2.5}$ TEOM | R & P | 1400a | 25136 |
| | | | |
| | | | |
| | | | |
| | | | |

**CALIBRATOR(s):** x **Not Present** [Y/N] **Are QA/QC Check Gases Vented Outside Shelter?**

| **QA/QC** | **Make** | **Model** | **Serial Number** | **Certification Date** | **Expiration Date** |
|---|---|---|---|---|---|
| **N/A** | | | | | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line? [Y/N]** If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** ___Maryville______ **Initials:** _TED_____ **Date:** ___2-15-17__________

**All Gas Standards Pass thru all Filters during:** [Y/N] **Calibrations** [Y/**N**] **Precision Checks** [Y/**N**] **Audits**

**Issues:** N/A_______________________________________________________________________________

**CYLINDER GAS STANDARDS:** □ **Not Present**

**VENDOR:** (PSI Reading < 200, tank is empty and should not be in service)

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| N/A | | | | | |
| | | | | | |
| | | | | | |

Issues: _None_____________________________________________________________________________

**SUPPORTING INSTRUMENTATION: Internal N/A**

[Y/**N**] **Temperature Sensor** [Y/N] **Uninterruptable Power Supply** [Y/N] **On-Site Computer**

**Zero Air System: Commercial System** (Make / Model): ___________________________________________

**Cartridge System: [□Silica Gel [□Pink / □Blue] / □Charcoal / □Purafil / □Hopcalite / Other: ___________]**

[Y/N] **Needs Service Last Service Date:** _______________ **Condition:** _____________________________

Issues: __________N/A__________________________________________________________________________

**Probe Line(s): [□Replaced / □Cleaned] – Frequency: __________ Last Service Date: __________________**

[Y/**N**] **Clean** [Y/N] **Heated** **[**Y/N] **Insulated** [**Y**/N] **Moisture** [Y/N] **Retractable** [Y/N] **Old / Unused Lines**

**[**Y/N] **Lo Flo Manifold ->** [**Y**/N] **Any Open Ports? –> How many analyzers using manifold? _______________**

Issues: _____N/A__________________________________________________________________________________

**MSEF (Page 3/5): Local Site Name: ___Maryville___________________ Initials: _TED__ Date: ___2-15-17**

**SHELTER – Exterior** **X Not Present**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other: ___________________________________]**

[Y/N] **Needs Maintenance** (specify) [Y/N] **Tied Down** [Y/N] **Electrically Grounded** [Y/N] **Roof Railing**

**Roof Access: [Stairs [Interior/Exterior] / Ladder [attached/removable] / □ Not Present]** [Y/N] **Loose Decking** (Trip Hazard)

**Issues:**

________N/A________________________________________________________________________________

**Height of Roof: ___N/A _____________meters** **Roofing Material**: ____N/A _________________________________

**Issues:** __N/A______________________________________________________________________________

**OUTDOOR SAMPLERS** **□ Not Present**

[Y] **Locked** [Y] **Electrically Grounded** [Y] **Stabilized** [Y] **Clean Inside** [Y] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** _Every 5 runs or less_ **$PM_{10}$ Head Clean Schedule:** _Monthly________

**Issue(s):** _None__________________________________________________________________________

**COLLOCATED SAMPLERS: x Not Present** (39.4 inches = 1 meter)

| Pollutant | Flow (Hi / Lo) | Separation Distance (meters) |
|---|---|---|
| | | |
| | | |

Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s): External** **x Not Present**

**Inlet Type:** [□Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [□Rain Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / □Stainless Steel / Other: _________]

**Probe Line(s)**: [□Teflon® / Other: _____________] **Probe Fitting(s)**: [□Teflon® / Other: ___________ / □ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

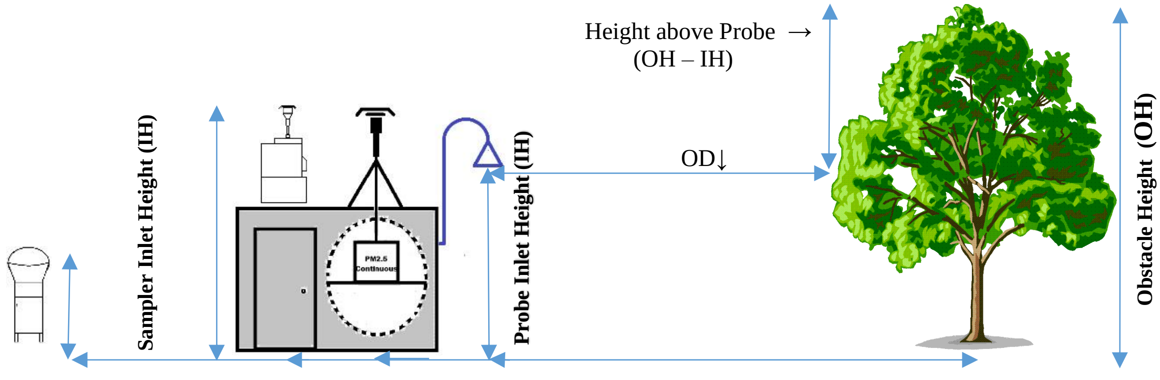
**Issue(s):** ___________________________________________________________________________

| Pollutant(s) | Inlet Height (meters) | Inlet Location (Side of Shelter, Ground, Roof) | Horizontal Distance (meters) If Applicable | Vertical Distance (meters) If Applicable | Monitoring SCALE | |
|---|---|---|---|---|---|---|
| | | | | | AQS | Annual Network Plan |
| $PM_{2.5}$ | 2.2 | Ground | >2m | | Neighborhood | Neighborhood |
| $PM_{2.5}$ TEOM | 2.2 | Ground | >2m | | Neighborhood | Neighborhood |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MEF (Page 4/5): Local Site Name:** ___Maryville__________________ **Initials:** _TED__ **Date:** ___2-15-17

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**Obstacle Distance(s) (OD)**

**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| Water Tower | 26.6 meter | 2.2 meter | 48.8 meter | 35.0 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** ____________inches = _________**meters** (nearest inlet to dripline) □ **No Trees Present**

(39.4 inches = 1 meter) ____________inches = _________**meters** (nearest inlet to dripline) □ Not Present

____________inches = _________**meters** (nearest inlet to dripline) □ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** _____None_______________________________________________

**Minor Sources:**

- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

**Issues:** _____None_______________________________________________

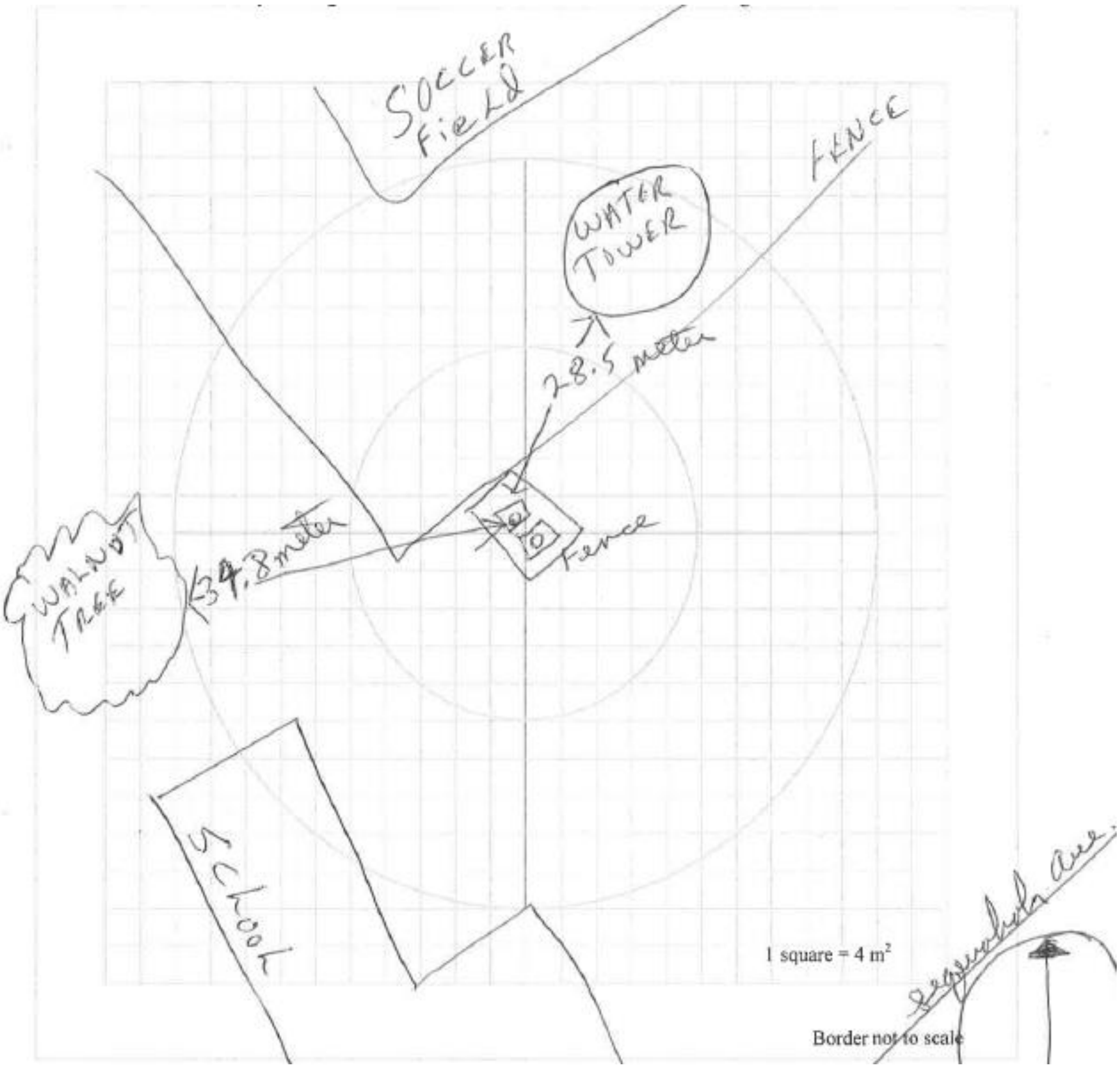
___________________________________________________________________

___________________________________________________________________

**MSEF (Page 5/5): Local Site Name:** Maryville **Initials:** TED **Date:** 2-15-17

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: >330˚ **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

# Additional Information:

Tree that was an obstacle during 11-23-16 site evaluation was removed.

## Aerial Photo with Wind Rose

**PHOTO LOG:** **Local Site Name:** Maryville ________________ **Initials:** TED_ **Date:** __2-15-17___

**Camera [ X APC – Owner: ________________] Make/Model:** ___Sony Cyber shot St. tag L33518__________

**Filename:** __001________________ **Date:** __2-15-17______ **Time:** ___1:00 PM _____ **Photographer:** ___ TED _____________

**Description:** _____East toward monitor ________________________________________________________________________

**Filename:** _002_________________ **Date:** 2-15-17________ **Time:** _1:00 PM _______ **Photographer:** __ TED _____________

**Description:** ____East away from monitor _____(East Directional)___________________________________________________

**Filename:** __003________________ **Date:** _2-15-17_______ **Time:** ____1:00 PM _____ **Photographer:** ____ TED ____________

**Description:** _____North toward monitor __________________________________________________________________________

**Filename:** _004_________________ **Date:** _2-15-17_________ **Time:** ___1:00 PM ___ **Photographer:** _____ TED __________

**Description:** _____North away from monitor (North Directional)________________________________________________

**Filename:** __005________________ **Date:** ___2-15-17______ **Time:** ____1:00 PM ___ **Photographer:** _______ TED ________

**Description:** _____South toward monitor ___________________________________________________________________

**Filename:** _006_________________ **Date:** __2-15-17_______ **Time:** ___1:00 PM _____ **Photographer:** _____ TED _________

**Description:** ____ South away from monitor (South Directional)_________________________________________________

**Filename:** __007________________ **Date:** __2-15-17______ **Time:** _____1:00 PM ___ **Photographer:** _______TED________

**Description:** ______West toward monitor ____________________________________________________________________

**Filename:** _008_________________ **Date:** _2-15-17________ **Time:** ___1:00 PM _____ **Photographer:** ____TED _________

**Description:** ______West away from monitor (West Directional)_________________________________________________

001-East toward monitor


002-East away from monitor

003-North toward monitor


004-North away from monitor

005-South toward monitor


006-South away from monitor

007-West toward monitor


008-West away from monitor

# 40 CFR Part 58, Appendix E, Tables and Figures

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

[1] Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2] Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| **$O_3$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **$SO_2$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **PM, Pb** | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

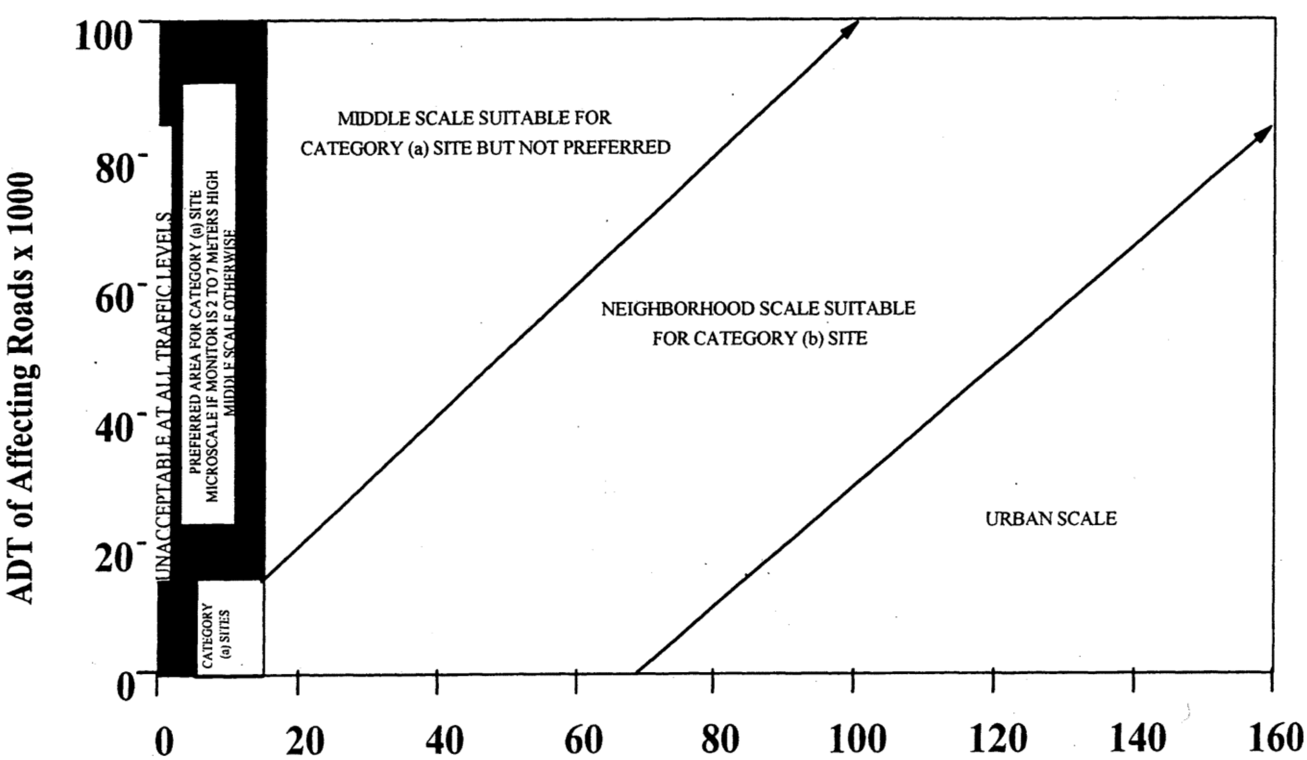



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| **1/4" Line OD / 20 Sec Residence Time** | | | |
|---|---|---|---|
| **Flow Rate (liters/min)** | **1/8" ID feet** | **5/32" ID feet** | **3/16" ID feet** |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
| 0.6 | 82.9 | 53.0 | 36.8 |
| 0.7 | 96.7 | 61.9 | 43.0 |
| 0.8 | 110.5 | 70.7 | 49.1 |
| 0.9 | 124.3 | 79.6 | 55.3 |
| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
| 1.2 | 165.8 | 106.1 | 73.7 |
| 1.3 | 179.6 | 114.9 | 79.8 |
| 1.4 | 193.4 | 123.8 | 85.9 |
| 1.5 | 207.2 | 132.6 | 92.1 |
| 1.6 | 221.0 | 141.4 | 98.2 |
| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

**ADDITIONAL SUPPORTING INSTRUMENTATION**

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

An ATT DSL modem (VersaLink B90) provides internet communications to the 8832 logger.

A US Robotics dial-up modem is used to send the ancillary data from the 2025 to the central office staff.

**RECORDS – at site**
Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**
Is the shelter tied down – physically tied with hurricane straps?
Is the shelter grounded - look for rod in the ground and lead wire connection?

Type of Shelter(s) located on site:

1. **Enclosure: Y**
2. **Trailer: N**
3. **None: N**
4. **Other: N**

What are the shelter(s) made of?

1. _Steel (TEOM enclosure)________________________________________
2. ____________________________________________________________
3. ____________________________________________________________
4. __Platforms - wood____________________________________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **Y**
With roof top samplers or inlets – is a roof railing present? **N** (May not be required in accordance with local ordinances)
Roof Access: Stairs or Ladder? **N**
Stairs can be inside or outside – Ladders are usually permanently attached or removable? **N**
Write additional comments on the shelters below:

Platforms need top boards replaced__________________________________________________________ ____________

______________________________________________________________________________________

______________________________________________________________________________________

______________________________________________________________________________________

## INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

**Initials:** Initials of auditor completing form.

**Date:** current date site is entered by auditor

**Reminder:** If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

**Arrival Time:** time auditors arrive at site

**Departure Time:** time auditors depart site

**Primary Operator:** the sites main operator, include parameters responsible for

**Observers:** person(s) at site, attending agency staff, site operators, other EPA, State auditors present

**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

**Arrival Temperature:** Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and is specified in TDEC DAPC's QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures. Teledyne analyzers are designated FEM for a range of 5-40 °C. Therefore, TDEC DAPC keeps shelters with these monitors within this range (still keeping in mind the 2 deg SD requirement). Shelters are generally kept about 25-26 °C in the warmest months to reduce condensation in sample lines and analyzer.

**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites? Ants? Wasps/Bees? / Larger wildlife causing problems (such as nesting in the undercarriage or walls or digging dens near the foundation/supports)?

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

**Monitors:** document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated. Some examples of items that can cause this problem are a leaking filter holder or fitting and an uncapped TTP system or sample line tee.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, SO2, NO, NO2, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

# Tennessee Environment and Conservation
# Division of Air Pollution Control

**William R. Snodgrass Tennessee Tower**
**312 Rosa L. Parks Avenue, 15th Floor**
**Nashville, Tennessee 37243**

## Air Monitoring Site Evaluations
## TDEC APC

**Date: March 3, 2017** **Location: New Market, TN**
**AQS Number: 47-089-0002**
**Site Name: New Market** **Pollutants: O3**
**Project Leader: EMH**

**Print Name / Signature / Initials / Duties**

**1:** Evelyn M. Haskin EMH Team 3 lead of site evaluation

**2:** Thomas E. Dalton TED Site evaluator

**3:** Justin E. Long JEL Site evaluator

# Air Monitoring Site Evaluation Summary

**Local Site Name:** _New Market O3___________________________ **Initials:** _TED____ **Date:** _March 3, 2017_____

**Additional Comments:**

__Site has been cleaned of the mold issue. Electric power provided by Appalachian Electric Power under meter number 67 377 701 or bar code *1NF104004600000* . Land owned by George A Miller III and Laura Shannon.

**MONITORING SITE EVALUATION FORM (MSEF) (Page 1/5)**

**Local Site Name:** _New Market O3_________________________ **Initials:** _TED____ **Date:** _March 3, 2017_

**APC auditor should document in the Site Logbook** – the time / date / purpose of visit / APC representatives present

**Arrival Time:** _6:40 am____ **Departure Time:** _7:45_am____ **Primary Operator:** _Sam Barnett____________

**Observer(s):** ____________________________________________________________

**SITE**

[N]-**Security Fence** [N]-**Razor/Barb Wire** [Y] **Grass/Shrubs Cut** [ N] **Bare Soil Area**

[N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** __N/A_________________ [N/A] **Police Report Filed**

**Issues:** ____None__________________________________________________________

**SHELTER - Interior**

**Arrival Temperature:** __23.02___**°C** (from data logger) **Operator Site Visits:** _Once__ per [**week**]

[**Y**] **Leaking Roof** **[Damaged: X Ceiling / □Floor / X Walls]** [Y] **Clean / Neat** [N] **Fire Extinguisher**

[Y] **Insect / Wildlife Issues** [N] **Thermometer** (min/max) [N] **Gasoline** (inside shelter)

**Issues:** ___Ceiling has mold issues (leaking roof)_____________________________________

**MONITOR(s):** **Location:** Exterior Samplers **[□Roof / □Ground / □ Not Present]**

| Monitor(s) | Manufacturer | Model | Serial Number |
|---|---|---|---|
| O3 | Teledyne | 400E | 2873 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**CALIBRATOR(s):** □ **Not Present** [Y] **Are QA/QC Check Gases Vented Outside Shelter?**

| QA/QC | Make | Model | Serial Number | Certification Date | Expiration Date |
|---|---|---|---|---|---|
| QC | Teledyne | T703 | 329 | 1-18-17 | |
| | | | | | |
| | | | | | |

**Is any analyzer sampling shelter air through its calibration line? [N]** If yes, photo, document and notify agency mgr.

**MSEF (Page 2/5): Local Site Name:** _New Market O3__________ **Initials:** _TED____ **Date:** _March 3, 2017_

**All Gas Standards Pass thru all Filters during:** [Y] **Calibrations** [Y] **Precision Checks** [Y] **Audits**

**Issues:** _________None______________________________________________________________________________

**CYLINDER GAS STANDARDS:** **x Not Present**

**VENDOR:** **(PSI Reading < 200, tank is empty and should not be in service)**

| QA /QC | Gas Standard | PSI Reading | Expiration Date | Standard Concentration | Serial Number |
|---|---|---|---|---|---|
| NA | | | | | |
| | | | | | |
| | | | | | |

Issues: ______None_____________________________________________________________________________

**SUPPORTING INSTRUMENTATION:** **Internal**

[Y] **Temperature Sensor** [N] **Uninterruptable Power Supply** [N] **On-Site Computer**

**Zero Air System:** **Commercial System** (Make / Model): __Dasbi 5011_______________________________________

**Cartridge System: [□Silica Gel [□Pink / □Blue] / X Charcoal / □Purafil / □Hopcalite / Other: ____________]**

[N] **Needs Service** **Last Service Date:** _______________ **Condition:** ____OK________________________

Issues: ______________None______________________________________________________________

**Probe Line(s): [ X Replaced / □Cleaned] – Frequency:** __Once a year_ **Last Service Date:** _2/16 2017_

[Y] **Clean** [Y] **Heated** [N] **Insulated** [N] **Moisture** [N] **Retractable** [N] **Old / Unused Lines** [Y] **Lo Flo**

**Manifold ->** [N] **Any Open Ports? –> How many analyzers using manifold?** ___One___________

Issues: ______________________________None______________________________________________________

**MSEF (Page 3/5): Local Site Name:** _New Market O3__________ **Initials:** _TED____ **Date:** _March 3, 2017_

**SHELTER – Exterior**

**Type: [□Freezer / □Wood Building / □Brick-Block / Other:** _____Mobile home type______________________**]**

[**Y**] **Needs Maintenance** (specify) [**Y**] **Tied Down** [Y] **Electrically Grounded** [**N**] **Roof Railing**

**Roof Access: [Stairs [Interior/Exterior] / Ladder [attached/removable] / X Not Present]** [N] **Loose Decking** (Trip Hazard)

**Issues:** Ladder has to be brought to the site. Maintenance of clean the interior/wash the roof and coat to exclude water from the inside.

**Height of Roof:** _______3__________**meters** **Roofing Material**: ___Metal__________________________

**Issues:** __Roof Leaks________________________________________________________________

**OUTDOOR SAMPLERS** **X Not Present**

[Y/N] **Locked** [Y/N] **Electrically Grounded** [Y/N] **Stabilized** [Y/N] **Clean Inside** [Y/N] **Head/Separator Clean**

**Operator / Log: VSCC/WINS Clean Schedule:** _________________ **$PM_{10}$ Head Clean Schedule:** _________________

**Issue(s):** __**None**__________________________________________________________________________

**COLLOCATED SAMPLERS: X Not Present** (39.4 inches = 1 meter)

| Pollutant | Flow (Hi / Lo) | Separation Distance (meters) |
|---|---|---|
| N/A | | |

Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

**PROBE SYSTEM(s): External** **□ Not Present**

**Inlet Type:** [ **x** Single Line / □Dual Line / □Bell Type (CAS design)]

**Funnel(s):** [ **x** Rain Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / **x** Stainless Steel / Other: ______]

**Probe Line(s)**: [ **x** Teflon® / Other: __________] **Probe Fitting(s)**: [ **x**Teflon® / Other: Stainless Steel □ Not Present]

**Residence Time:** (20 sec. max) (Refer to chart for maximum line lengths)

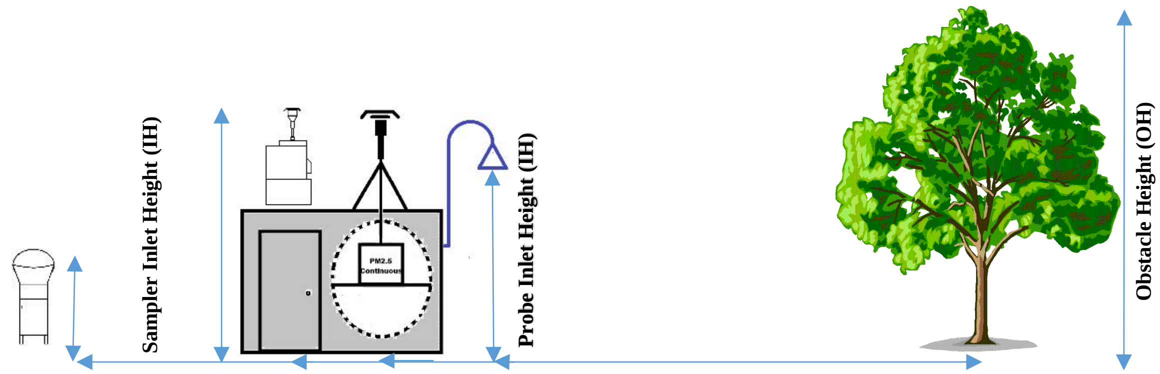
**Issue(s):** ______________________________________________________________________________

| Pollutant(s) | Inlet Height (meters) | Inlet Location (Side of Shelter, Ground, Roof) | Horizontal Distance (meters) If Applicable | Vertical Distance (meters) If Applicable | Monitoring SCALE | |
|---|---|---|---|---|---|---|
| | | | | | AQS | Annual Network Plan |
| O3 | 4.1 | Side of shelter | N/A | >1 | | |

**FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for $O_3$, $SO_2$,) & (2 meters for PM, Pb)**
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

**MSEF (Page 4/5): Local Site Name:** _New Market O3________ **Initials:** _TED____ **Date:** _March 3, 2017_

**OBSTRUCTION(s):** **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.




**Obstacle Distance(s) (OD)**

**All distances in meters** **OD MUST be ≥ [2*(OH-IH)]**

| Obstacle(s) | Obstacle Height (OH) | Sampler/Probe Inlet Height (IH) | [2*(OH-IH)] | Obstacle Distance (OD) |
|---|---|---|---|---|
| N/A | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Please identify each of these obstacles in the SITE DRAWING** (next page)

**TREE DRIPLINE(s):** ____________inches = _________**meters** (nearest inlet to dripline) □ **No Trees Present**
(39.4 inches = 1 meter) ____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present
____________inches = _________**meters** (nearest inlet to dripline) ☐ Not Present

**Should be** greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

**Issues:** ______________________________________________________________________________

**Minor Sources:**

- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near $NO_2$ or $SO_2$ analyzers

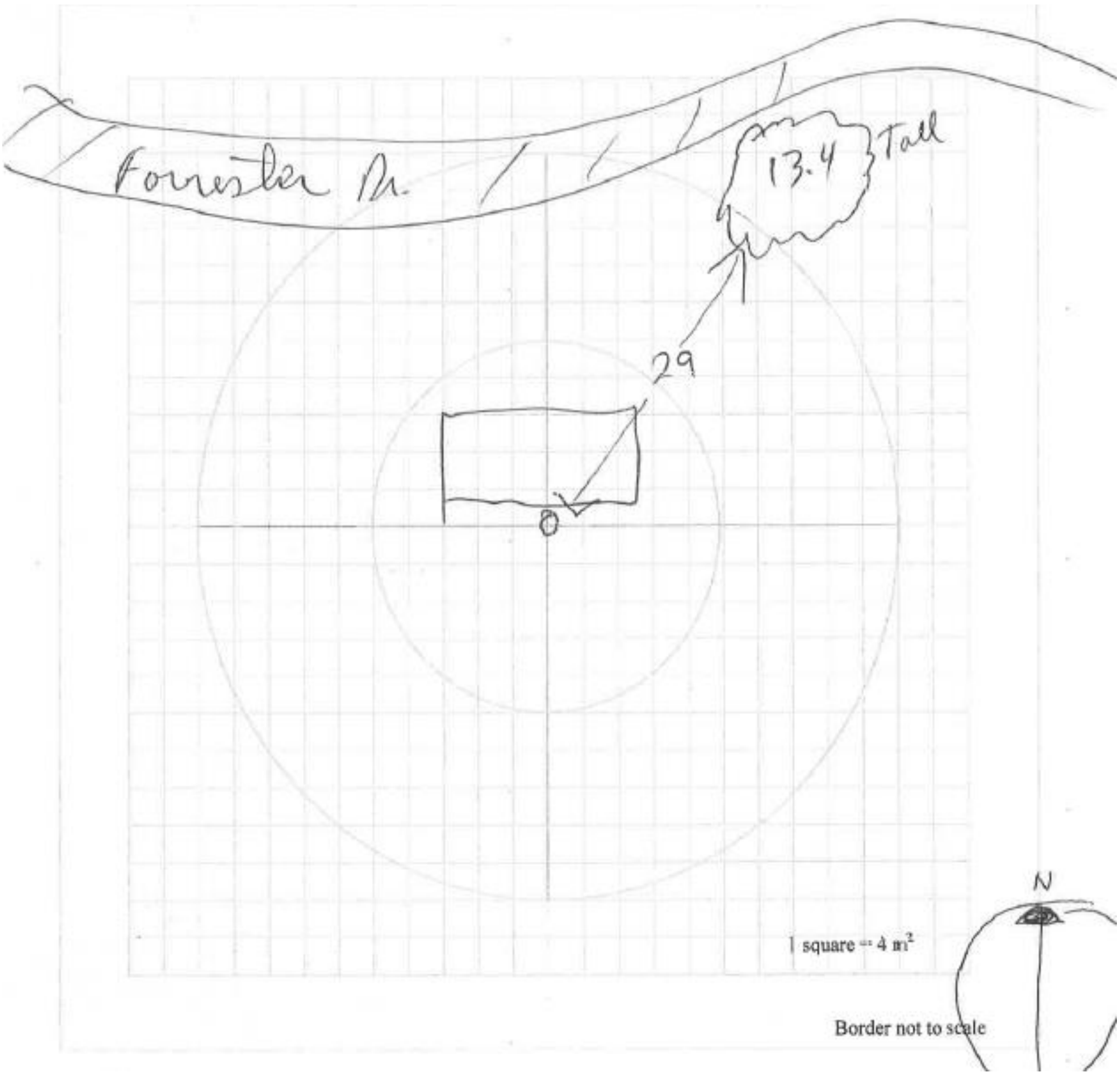
**Issues:** None______________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

**SITE DRAWING - Please Indicate:** (relevant distance / height measurements)

| | | | |
|---|---|---|---|
| Direction NORTH | Monitoring Shelter | Nearby Trees/Shrubs | Possible Sources |
| Primary Wind Dir | Probe Position(s) | Roadways | Paved / Unpaved Areas |
| Security Issues | Exterior Samplers | Buildings | Nearby Construction |
| Sloping Areas | Met Tower | Walls | Flues, Vents, Boilers |
| | Security Fencing | Other Obstructions | Meat Cooking |




**UNRESTRICTED AIR FLOW**: __> 270_____° **Estimated Degrees of Clearance**

**Must have** unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

## Additional Information:

Only tree in area is NE of monitor at 29 meters distance. Height is 13.4 meters and the distance is 29 meters with inlet being 4.2 meters. 13.4-4.2=*2=18.4. Distance being 29 meter and 18.4 meter (29 is greater than 18.4 making this not an obstacle.

The mold problem has been cleaned and painted (covered)

## Aerial Photo with Wind Rose

**PHOTO LOG:** **Local Site Name:** _New Market O3________ **Initials:** _TED____ **Date:** _March 3, 2017_

**Camera [□ APC / X Personal – Owner: ________________] Make/Model: ___personal phone_______________**

**Filename:** __001 _ **Date:** ___3-3-17____________ **Time:** ___7:30 am______ **Photographer:** ___TED________________

**Description:** __001 - West toward monitor____________________________________________________________________

**Filename:** __002 _ **Date:** ___3-3-17____________ **Time:** ___7:30am_______ **Photographer:** ___TED________________

**Description:** __002 - West away from monitor (west directional)______________________________________________

**Filename:** __003 _ **Date:** ___3-3-17____________ **Time:** ___7:30 am______ **Photographer:** ___TED________________

**Description:** __003 - South toward monitor___________________________________________________________________

**Filename:** __004 _ **Date:** ___3-3-17____________ **Time:** ___7:30 am______ **Photographer:** ___TED________________

**Description:** __004 - South away from monitor (south directional)____________________________________________

**Filename:** __005 _ **Date:** ___3-3-17____________ **Time:** ___7:30 am_____ **Photographer:** ___TED________________

**Description:** __005 - East toward monitor_____________________________________________________________________

**Filename:** __006 _ **Date:** ___3-3-17____________ **Time:** ___7:30 am______ **Photographer:** ___TED________________

**Description:** __006 – East away from monitor (east directional)______________________________________________

**Filename:** __007 _ **Date:** ___3-3-17____________ **Time:** ___7:30 am______ **Photographer:** ___TED________________

**Description:** __007 - North toward monitor___________________________________________________________________

**Filename:** __008 _ **Date:** ___3-3-17____________ **Time:** ___7:30 am______ **Photographer:** ___TED________________

**Description:** __ North away from monitor (north directional)___________________________________________________

001-West toward monitor

002- West away from monitor (west directional)

003-South toward monitor

004-South away from monitor (south directional)

005-East toward monitor

006-East away from monitor (east directional)

007-North toward monitor

008-North away from monitor (north directional)

# 40 CFR Part 58, Appendix E, Tables and Figures

**TABLE E-1 OF APPENDIX E TO PART 58**—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE ($O_3$)**

| Roadway average daily traffic, vehicles per day | Minimum distance[1] (meters) | Minimum distance[1 2] (meters) |
|---|---|---|
| ≤1,000 | 10 | 10 |
| 10,000 | 10 | 20 |
| 15,000 | 20 | 30 |
| 20,000 | 30 | 40 |
| 40,000 | 50 | 60 |
| 70,000 | 100 | 100 |
| ≥110,000 | 250 | 250 |

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

**Required Pollutant Probe Height (meters) vs Monitoring Scale:**

| Pollutant | Micro | Middle | Neighborhood | Urban | Regional |
|---|---|---|---|---|---|
| **$O_3$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **$SO_2$** | -- | 2-15 | 2-15 | 2-15 | 2-15 |
| **PM, Pb** | 2-7 | 2-7 | 2-15 | 2-15 | 2-15 |

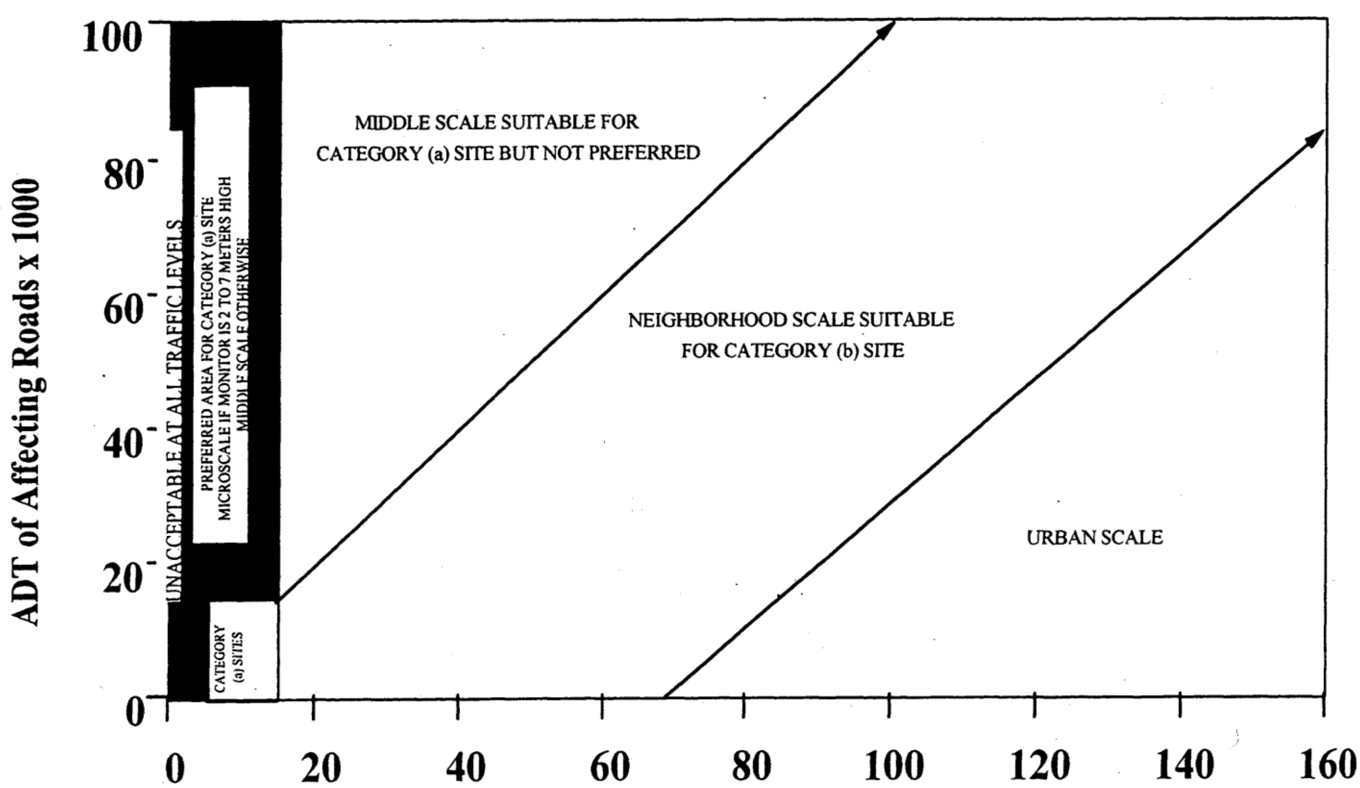



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

**Residence Time:** The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

| 1/4" Line OD / 20 Sec Residence Time | | | |
|---|---|---|---|
| **Flow Rate** | **1/8" ID** | **5/32" ID** | **3/16" ID** |
| **(liters/min)** | **feet** | **feet** | **feet** |
| 0.1 | 13.8 | 8.8 | 6.1 |
| 0.2 | 27.6 | 17.7 | 12.3 |
| 0.3 | 41.4 | 26.5 | 18.4 |
| 0.4 | 55.3 | 35.4 | 24.6 |
| 0.5 | 69.1 | 44.2 | 30.7 |
| 0.6 | 82.9 | 53.0 | 36.8 |
| 0.7 | 96.7 | 61.9 | 43.0 |
| 0.8 | 110.5 | 70.7 | 49.1 |
| 0.9 | 124.3 | 79.6 | 55.3 |
| **1** | 138.1 | 88.4 | 61.4 |
| 1.1 | 151.9 | 97.2 | 67.5 |
| 1.2 | 165.8 | 106.1 | 73.7 |
| 1.3 | 179.6 | 114.9 | 79.8 |
| 1.4 | 193.4 | 123.8 | 85.9 |
| 1.5 | 207.2 | 132.6 | 92.1 |
| 1.6 | 221.0 | 141.4 | 98.2 |
| 1.7 | 234.8 | 150.3 | 104.4 |
| 1.8 | 248.6 | 159.1 | 110.5 |
| 1.9 | 262.4 | 168.0 | 116.6 |
| 2 | 276.3 | 176.8 | 122.8 |

## ADDITIONAL SUPPORTING INSTRUMENTATION

**Uninterruptable Power Supply** – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

**On-Site Computer:** not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

**Data Logger**: Identify system at site
Identify how the analyzers are connected the data logger.

**Strip Chart**: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?

Enter additional information about supporting instrumentation below:

A 4G cellular modem (Sierra Wireless RV50) provides internet communications to the BAM 1022 and to the other instruments at the site via a network switch.

## RECORDS – at site

Documents available (QAPPs, SOPs)?

Yes

Are these electronic or hardcopy?

Hardcopy

Are logbooks at the site?

Yes

**Charts / Papers on Walls:** What do they Track, Up-to-date?

No

**SHELTER**
Is the shelter tied down – physically tied with hurricane straps?
Is the shelter grounded - look for rod in the ground and lead wire connection?

Type of Shelter(s) located on site:

1. **Enclosure: N**
2. **Trailer: Y**
3. **None: N**
4. **Other: N**

What are the shelter(s) made of?

1. ____________________
2. Sheet metal ____________________
3. ____________________
4. ____________________

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **Yes**
Write additional comments on the shelters below:

The outside of the shelter needs to be cleaned.

## INDEX

**Local Site Name:** prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

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**Networks:** check all that apply, indicates type / purpose of monitoring conducted at site

**SITE (Questions to ask yourself)**
**Security Fence:** present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

**Razor/Barb Wire** - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

**Grass/Shrubs Cut**: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

**Bare Soil**: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

**Vandalism** – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

**SHELTER – Interior** note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

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**Operator Site Visits**: how many times per week or month, what is the schedule? Does logbook confirm?

**Leaking Roof**: Does roof leak, evidence may be apparent, question operator?

**Damage: Ceiling, Wall, Floor**: document damage if present – how long did leak exist before repair?

**Clean / Neat**: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

**Fire Extinguisher**: not required by EPA, good idea.

**Insect/Wildlife Issues**: Termites eating shelter? Ants eating operator? Wasps/Bees attacking auditor? / Larger wildlife making shelter its home

**Thermometer (min/max)**: not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

**Gasoline**: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

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Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

**Calibrators:** can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

**QA/QC Vented**? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

**Is analyzer sampling Shelter Air?** - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated.

**FILTERS:** For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

**Cylinder Gas Standards:** complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, $SO_2$, NO, $NO_2$, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.