QUALITY ASSURANCE PROJECT PLAN FOR THE STATE OF FLORIDA PARTICULATE MATTER ($PM_{2.5}$ & PM_{10}) AMBIENT AIR QUALITY MONITORING PROGRAM

Prepared for:

U.S. EPA

REGION 4

December 2022

Florida Department of Environmental Protection
Division of Air Resource Management
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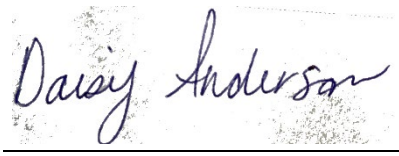
QUALITY ASSURANCE PROJECT PLAN IDENTIFICATION AND APPROVAL

Title: *Quality Assurance Project Plan for the State of Florida Particulate Matter ($PM_{2.5}$ and PM_{10}) Ambient Air Quality Monitoring Program*

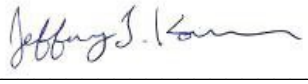
The attached *Quality Assurance Project Plan for the State of Florida Particulate Matter ($PM_{2.5}$ and PM_{10}) Ambient Air Quality Monitoring Program* is hereby recommended for approval and commits the State of Florida Department of Environmental Protection to follow the elements described within.

Florida Department of Environmental Protection (PQAO)

1) Signature:  Date: December 29, 2022
Quality Assurance Manager, Office of Air Monitoring

2) Signature:  Date: December 29, 2022
Environmental Administrator, Office of Air Monitoring

3) Signature:  Date: December 29, 2022
Program Administrator, Office of Air Monitoring

4) Signature:  Date: December 29, 2022
Director, Division of Air Resource Management

U.S. Environmental Protection Agency

5) Signature: KEITH HARRIS Digitally signed by KEITH HARRIS Date: 2023.01.25 14:47:13 -05'00' Date _____
EPA Region 4 Quality Assurance Officer

Document History

Revision No.	Date	Responsible Person	Description of Change
1	September 2020	Cadedra Hodge	• **Cover Page**-Updated DEP logo to reflect current version. • Updated/removed references to high-volume filter based PM_{10} and PM_{10} lab analysts throughout the document. • Updated references to FAMAS (changed to AirMVP) throughout the document. • **Section 1.0 Distribution List** - Updated the EPA division names to reflect their recent reorganization. • **Section 4.0 Project and Task Description** - Updated references to Annual Network Plan; updated Particulate Matter Site Locations map. • **Section 5.0 Data and Measurement Quality Objectives and Criteria** – Removed data validation template for high-volume, filter-based PM_{10}. • **Section 8.0 Network Description** - Added Woodlawn siting waiver information. • **Section 12.0 Quality Control Requirements** – Updated language regarding performance evaluations. Field technicians now conduct these audits instead of the QA auditors due to the pandemic.
2	December 2022	Cadedra Hodge	• **Section 1.0 Distribution List** – Updated addresses and names based on recent Gaseous QAPP revision. • **Section 2.0 Project and Task Organization** – Updated organization charts; moved AQS Coordinator position under Quality Assurance Manager. • **Section 3.0 Problem Definition and Background** – Added background on ultrafine. • **Section 4.0 Project and Task Description** – Updated language regard Palm Beach Met One BAM1020; updated map (locations for PM sites); updated to include $PM_{0.1}$. • **Section 5.0 Data and Measurement Quality Objectives and Criteria** – Added Teledyne T640 and T640X validation templates; added footnotes to T640 and T640X validation templates; updated Annual Network Plan link. • **Section 6.0 Training Requirements –** Updated language regarding the documentation of review of SOPs and QAPPs; updated PM2.5 lab training based on recent SOP revision.

Revision No.	Date	Responsible Person	Description of Change
			• **Section 8 Network Description** – Updated language regarding Site Review Protocol (referenced Site Review SOP instead). • **Section 9.0 Sampling Method Requirements** – Updated language regarding the use of the BAM1020 (and associated waiver) in the Florida PQAO network; updated to include $PM_{0.1}$. • **Section 12.0 Quality Control Requirements** – Added language regarding external audits. • **Section 13.0 Instrument/Equipment Testing, Inspection, and Maintenance Requirements** – Updated language regarding check-in/check-out procedures. • **Section 18.0 Assessments and Oversight –** Updated language regarding performance evaluations. • **Section 20.0 Data Validation and Usability** – Updated null code and QA qualifier tables. • **Appendix A** – Updated QA Systems Audit Protocol. • **Appendix B** – Updated QA Systems Audit questionnaires; added laboratory questionnaire. • **Appendix C** – Updated SOP list. • **Appendix D** – Added statement that the Site Review Protocol is replaced by the Site Review SOP (DEP 18-28). • **Appendix E** – Moved Glossary to Appendix F and add EPA OAQPS memo regarding shelter temperatures.

TABLE OF CONTENTS

List of Tables

List of Figures

1.0 DISTRIBUTION LIST

Table 1-1 Distribution List for Particulate Matter QAPP

U.S. EPA Region 4 Air and Radiation Division 61 Forsyth Street, SW Atlanta, GA 30303-3104	U.S. EPA Region 4 Laboratory Services and Applied Science Division 980 College Station Road Athens, GA 30605-2720
City of Jacksonville Environmental Quality Division 214 N. Hogan Street Jacksonville, FL 32202	Broward County Natural Resources Division Air Program 115 South Andrews Avenue Room 329H Fort Lauderdale, FL 33301
Hillsborough County Environmental Protection Commission 3629 Queen Palm Drive Tampa, FL 33619	Orange County Environmental Protection Division Air Quality Management 3165 McCrory Place, Suite 200 Orlando, FL 32803
Miami-Dade Regulatory and Economic Resources Environmental Resources Management Division Overtown Transit Village 701 NW 1st Court Miami, FL 33136	Pinellas County Air Quality Division 509 East Avenue, South Clearwater, FL 33756-5338
Florida Department of Health Palm Beach County Division of Environmental Public Health 800 Clematis Street West Palm Beach, FL 33401	Sarasota County Planning and Development Services Air and Water Quality 1001 Sarasota Center Boulevard Sarasota, FL 34240
Florida Department of Environmental Protection Division of Air Resource Management Office of Air Monitoring 2600 Blair Stone Road, Tallahassee, FL 32399	
Note: This document will be distributed electronically to all personnel within the Primary Quality Assurance Organization (PQAO) involved in the particulate matter ambient air monitoring project (see Section 2 of this QAPP for these personnel positions). The PQAO includes all Florida ambient air monitoring programs listed in Table 1-1. *Additionally, this QAPP will be available and document controlled within the Florida Air Monitoring Validation Program (AirMVP) database.*	

2.0 PROJECT AND TASK ORGANIZATION

The Florida Department of Environmental Protection's (FDEP) Division of Air Resource Management (DARM) is organized into four offices: the Office of Business Planning; the Office of Permitting & Compliance; the Office of Air Monitoring; and the Siting Coordination Office. The Division director has the overall responsibility for managing these offices per stated policy. The director delegates the responsibility and authority to develop, organize, and maintain quality programs to the administrators of the offices. The director also delegates the responsibility and authority to implement quality programs and procedures to the administrators of each section, in accordance with the Quality Management Plan. The direct responsibility for assuring data quality rests with these administrators and the line managers beneath them.

There are many specialized groups that support others across the agency, such as the information technology and administration staff (for personnel and purchasing support). While these groups do not conduct monitoring, they support the Office of Air Monitoring in accomplishing their mission. An overall organizational chart for DEP is presented in Figure 2-1. The organizational structure for the implementation of the monitoring program is shown in Figure 2-2 and the structure of the Office of Air Monitoring is shown in Figure 2-3. (Specific information about the structure and support groups in the local programs is presented at length in the FDEP Air Quality Management Plan, 2021). The charts are followed by information listing the specific responsibilities of each significant position and area within the Office of Air Monitoring.

Figure 2-1 Florida Department of Environmental Protection Organizational Chart

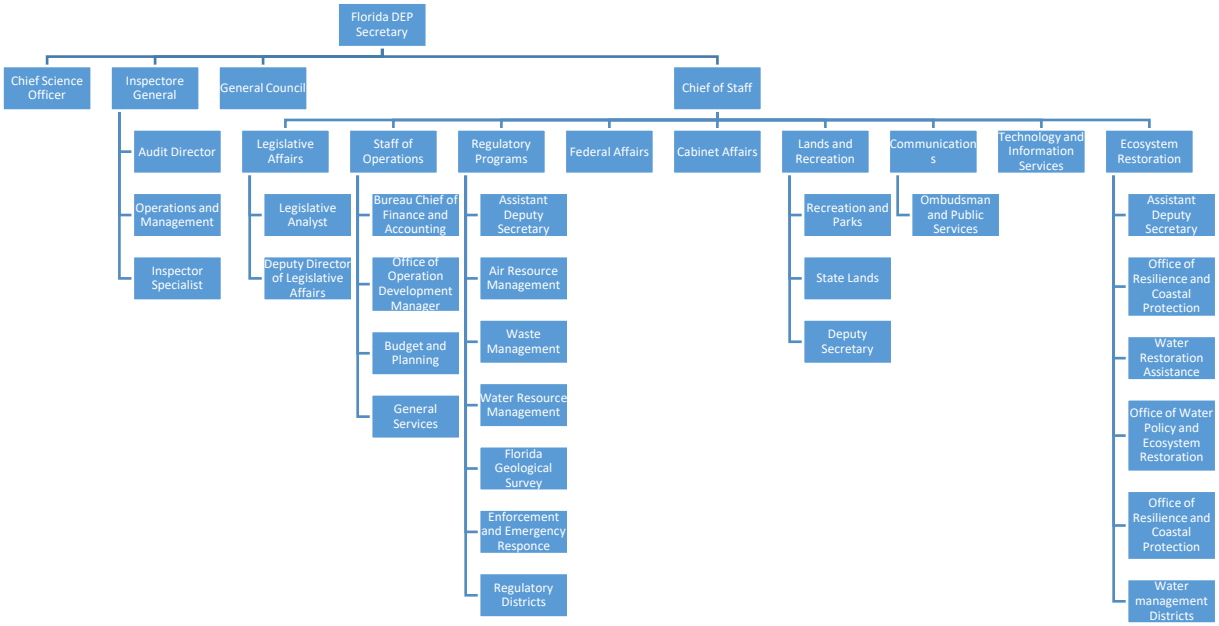


Figure 2-2 Division of Air Resource Management Organizational Chart

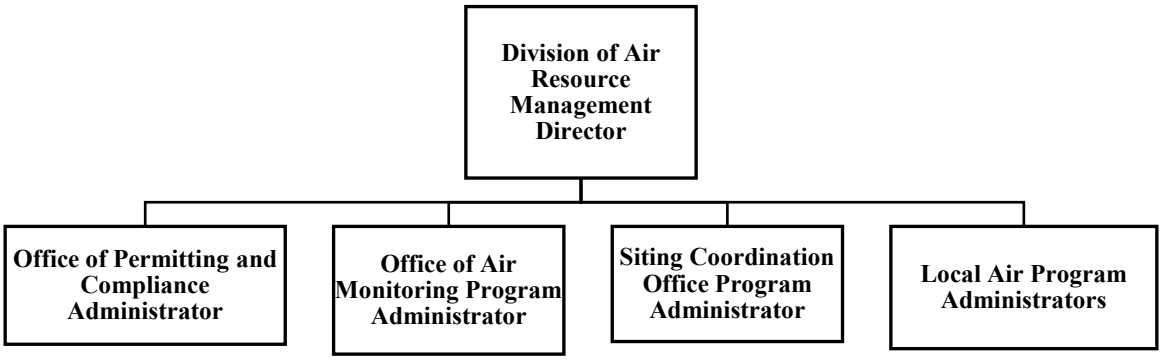
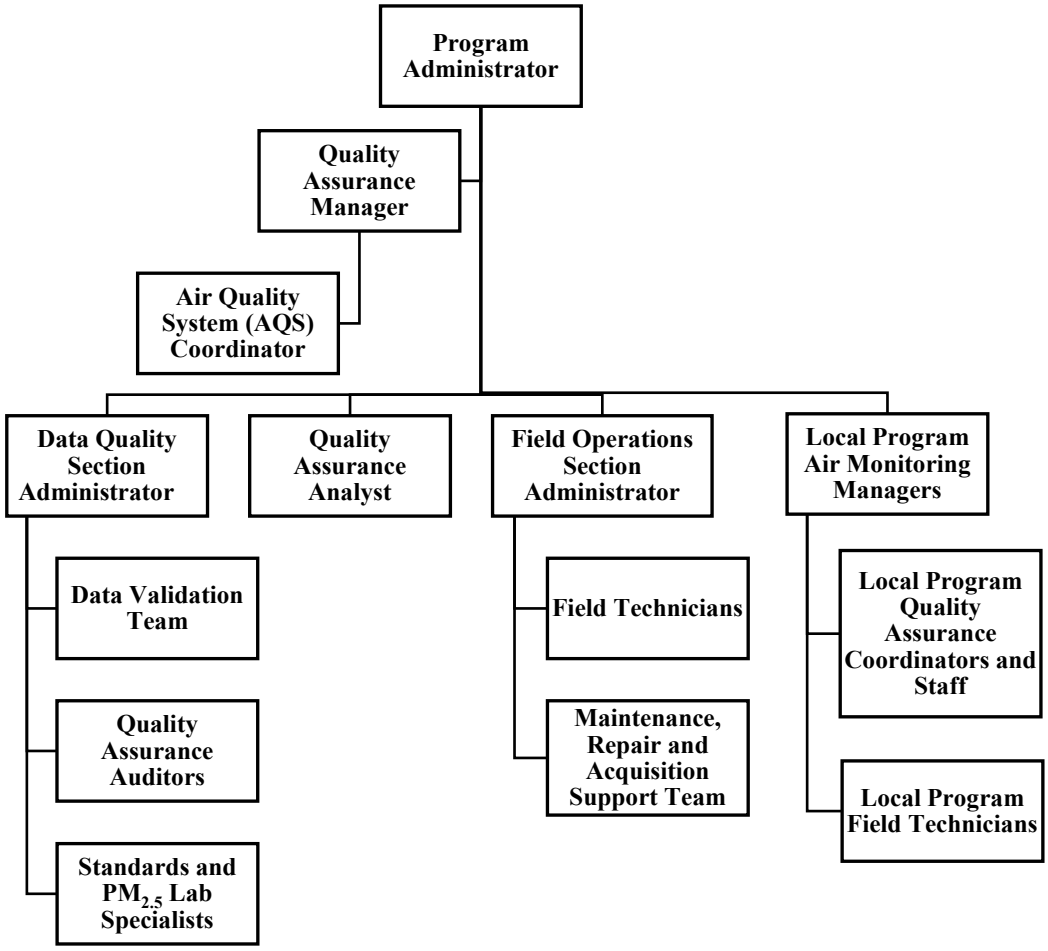


Figure 2-3 Office of Air Monitoring Organizational Chart



2.1 Office of Air Monitoring

The Florida Department of Environmental Protection's (FDEP) Office of Air Monitoring (OAM) contains the functions of Ambient Monitoring Quality Assurance, Data Quality Management, and Field Operations. It is responsible for coordinating all aspects (quality assurance, data collection, and data processing) of Florida's Ambient Air Quality Monitoring Program.

OAM is the coordinating agency to oversee the single Primary Quality Assurance Organization (PQAO) in Florida.

2.2 Florida DEP and Local Air Programs

Division Director. The Division of Air Resource Management (DARM) Director has the overall responsibility of managing all matters related to air pollution programs within the state of Florida, including the ambient air monitoring statewide program. The Director has "stop work authority" and will make final decisions regarding monitoring issues. The Division Director's responsibilities include:

- Directing each office within DARM,
- Managing and reviewing budgets, contracts, grants and proposals,
- Reviewing, overseeing, and evaluating overall air monitoring activities,
- Assuring that the Office of Air Monitoring develops and maintains a current and germane quality system,
- Acquiring resources and maintaining budgets pertinent to the collection of environmental data,
- Maintaining an active line of communication with the Program Administrators,
- Delegating the responsibility and authority to implement quality programs and procedures to the Program Administrator, Quality Assurance Manager, Data Quality Section Administrator, Field Operations Section Administrator and Quality Assurance Analyst, and
- Reviewing and approving Quality Management Plans, Quality Assurance Project Plans, and Annual Data Certification packages for the ambient air monitoring program.

Program Administrator. The Program Administrator of Florida DEP's Office of Air Monitoring has direct access to the director on all matters relating to the air monitoring program's operation and serves as the monitoring liaison to EPA Region 4. The Program Administrator's responsibilities include:

- Maintaining oversight of all monitoring activities related to the statewide ambient air monitoring program,
- Specifying funding for present and future network needs,
- Reviewing budgets, contracts, grants and proposals,
- Overseeing the responses to public inquiries and public records requests relating to ambient air monitoring, and

- Authorizes operational activities with approval from the Division Director.

Quality Assurance Manager. The Quality Assurance Manager (QAM) reports to the Program Administrator of Florida DEP's Office of Air Monitoring and is responsible for the management of quality control and quality assurance activities for the program. The QAM's responsibilities include:

- Interpreting EPA QA policy especially for the purposes of developing, with the direction from management, the policy for the statewide monitoring organization,
- Reviewing QA documentation to ensure the latest federal and state requirements, policies and procedures are met,
- Reviewing the statewide monitoring network design to ensure compliance and preparing the Annual Air Monitoring Network Plan,
- Performing Annual Primary Quality Assurance Organization (PQAO) Data Certification and preparing Exceptional Events packages,
- Ensuring statewide air monitoring Quality Management Plan (QMP), Standard Operating Procedures (SOPs) and Quality Assurance Project Plans (QAPPs) are created and/or revised timely and appropriately,
- Identifying quality problems and initiating action which results in solutions,
- Providing technical advice and assistance to monitoring staff regarding data quality issues arising during routine operations,
- Providing QA-related training support to statewide air monitoring staff,
- Tiebreaker for all QA-related impasses, in consultation with the Program Administrator,
- Managing the agency databases and data reporting through the Air Quality System (AQS) database, and
- Chairing the Florida Air Monitoring Advisory Committee (FAMAC), which is made up of voting members from Florida DEP and the local air monitoring programs.

AQS Coordinator. The AQS coordinator reports to the Quality Assurance Manager and is responsible for coordinating and performing the statewide ambient air data submittal to the EPA AQS. The AQS coordinator's responsibilities include the following:

- Performing Level 3 data review activities, in accordance with the PQAO Data Handling and Validation SOP,
- Verifying accuracy and completeness of data entry into the AQS database,
- Assisting the QAM with the Annual PQAO Data Certification,
- Providing data management and data upload support to statewide databases and data reporting through the Air Quality System (AQS) database, and
- Assisting the QAM with data quality assessments and conducting investigations, when needed, to determine root causes if DQOs/DQIs are not met.

Quality Assurance Analyst. The Quality Assurance Analyst reports to the Program Administrator of Florida DEP's Office of Air Monitoring and provides support to quality control and quality assurance activities for the program. The analyst's responsibilities include:

- Conducting quality assurance systems audits relating to the collection and analysis of ambient air monitoring data,
- Interpreting EPA QA policy especially for the purposes of developing, with the direction from management, the audit policy for the statewide monitoring organization,
- Reviewing QA documentation to ensure the latest federal and state requirements, policies and procedures are met,
- Identifying quality problems and initiating action which results in solutions,
- Providing technical advice and assistance to monitoring staff regarding data quality issues arising during routine operations, and
- Providing QA-related training support to statewide air monitoring staff.

Data Quality Section Administrator. The section administrator reports to the Program Administrator of Florida DEP's Office of Air Monitoring and is responsible for coordinating the activities of the data validation team, the Air Quality System (AQS) coordinator, and the audit, $PM_{2.5}$ gravimetric laboratory, and standards laboratory staff. The Section Administrator's responsibilities include:

- Supervising section staff and their activities,
- Identifying data quality problems and initiating action which results in solutions
- Providing technical advice and assistance to monitoring staff regarding data quality issues arising during routine operations,
- Providing data quality-related training support to statewide air monitoring staff,
- Coordinating performance and quality assurance systems audits for the statewide ambient monitoring network,
- Coordinating the collection, verification, validation and reporting of ambient air quality monitoring and quality assurance data to the EPA's Air Quality System (AQS), which includes performing Level 3 data review activities in accordance with the PQAO Data Handling and Validation SOP,
- Reviewing and approving corrective action reports for Florida DEP,
- Assuring procurement of needed supplies and equipment for audit and standard laboratory activities,
- Assuring data handling, audit and standards laboratory SOPs are maintained and up to date, and
- Ensuring staff training availability and utilization as it relates to the section's functions.

Data Validation Team. The data validation team reports to the Data Quality Section Administrator and is responsible for coordinating and/or performing data validation and data

verification functions on Florida DEP's air monitoring data. The data validation team's responsibilities include the following:

- Performing Level 2 data validation activities in accordance with the PQAO's Data Handling and Validation SOP, in order to ensure reported data is complete and accurate,
- Evaluating data for non-representative (irregular) data points that may be the result of monitoring system malfunctions, and
- Maintaining calibration and certification documentation according to the Florida PQAO's record retention policy.

Quality Assurance (QA) Auditor(s). The QA auditors reports to the Data Quality Section Administrator and are responsible for coordinating and performing audit functions related to the statewide ambient monitoring program. The auditors' responsibilities include the following:

- Conducting performance audits on ambient air monitoring equipment in accordance with established procedures, guidelines and schedules,
- Conducting quality assurance review of performance audits conducted by field technicians.
- Conducting annual siting evaluations,
- Conducting quality assurance systems audits of monitoring programs every 3 to 5 years,
- Conducting data quality audits of local program agencies and Florida DEP,
- Preparing audit finding reports and tracking progress on corrective actions,
- Ensuring audits are entered into AirMVP,
- Participating and/or assisting in EPA-conducted systems and technical audits, and
- Maintaining audit SOPs.

Standards and $PM_{2.5}$ Gravimetric Laboratory Specialists. The standards and $PM_{2.5}$ gravimetric laboratory specialists report to the Data Quality Section Administrator and are responsible for coordinating and performing laboratory functions related to the statewide ambient air monitoring program.

The Standards Laboratory specialist's responsibilities include the following:

- Scheduling and performing laboratory calibration, certification and verification services,
- Reviewing laboratory QC data supporting all certifications of standards,
- Assuring that laboratory repairs and preventive maintenance are completed and that the maintenance is effective,
- Maintaining laboratory standard operating procedures (SOPs),
- Assuring documentation files are as defined in the relevant SOPs, and

- Tracking certifications to ensure that all equipment and gaseous standards used by monitoring and QA staff meet minimum requirements and are traceable to National Institute of Standards and Technology (NIST) standards, and that certifications are current.

The $PM_{2.5}$ Gravimetric Laboratory specialist's responsibilities include the following:

- Receiving, inspecting, conditioning, weighing, shipping, and archiving filters for $PM_{2.5}$ gravimetric analysis,
- Collecting, reviewing, and reporting gravimetric data for the statewide $PM_{2.5}$ network,
- Monitoring and maintaining regulatory laboratory conditions,
- Maintaining laboratory equipment, supplies, and certifications,
- Reporting nonconforming conditions and corrective actions to management.

Field Operations Section Administrator. The section administrator reports to the Program Administrator of Florida DEP's Office of Air Monitoring and is responsible for the activities of the field and repair technicians. The supervisor's responsibilities include:

- Supervising section staff and their activities,
- Coordinating and reviewing the collection of environmental data,
- Ensuring timely and appropriate statewide ambient air monitoring updates and revisions to the air monitoring SOPs,
- Ensuring field technicians adherence to QAPP/SOPs,
- Ensuring field technicians correctly and timely complete monitoring operations and monitoring records,
- Reviewing corrective action activities and reports for Florida DEP,
- Training statewide field staff,
- Providing acquisition support to ensure Florida DEP's air monitoring network operational readiness,
- Providing site maintenance and repairs support, and
- Ensuring staff training availability and utilization as it relates to the section's functions.

Field Technicians. The field technicians report to the Field Operations Section Administrator and are responsible for day-to-day operation and maintenance of the air monitoring sites and equipment. The field technician's responsibilities include:

- Collecting, reviewing, reporting and documenting environmental data,
- Collecting, storing, shipping, and receiving manual $PM_{2.5}$ samples,
- Verifying that QC activities, such as precision checks, verifications, calibrations, and other scheduled checks and maintenance are performed and documented, and that measurement quality objectives (MQOs) are met as prescribed in the QAPP/SOPs,
- Reporting nonconforming conditions and corrective actions to management,

- Performing data verification activities (Level 1 review), which includes flagging and commenting on suspect data and troubleshooting, as needed, and
- Participating in training and certification activities.

Maintenance, Repair and Acquisition Support Team. This team reports to the Field Operations Section Administrator and are responsible for Florida DEP's equipment repair and maintenance, new site installation, operational infrastructure, consumables supply and instructional support to field technicians. The team's duties include the following:

- Coordinating and supporting the installation of new monitoring sites, and the installation/integration of new hardware/software required by the DARM air monitoring program,
- Coordinating and/or providing the repair and/or replacement of field instrumentation required for the Florida DEP's air monitoring program,
- Providing acquisition support to ensure the operational readiness of Florida DEP's air monitoring network,
- Maintaining Florida DEP's air monitoring inventory system of equipment and parts,
- Providing technical support to the statewide air monitoring program,
- Providing training support for the statewide air monitoring program, and
- Maintaining SOPs related to maintenance and repair activities.

Local Agency Air Program Administrators. The Local Program Administrators have direct access to the Division Director and OAM Program Administrator on all matters relating to the operation of the ambient air monitoring program within the PQAO. The Local Program Administrator's duties include:

- Ensuring that PQAO policies and procedures are maintained by the local program office to ensure data quality excellence,
- Ensuring that budgets and staff are maintained by the local program office to ensure network operational excellence and ongoing data collection activities,
- Ensuring that sufficient inventory supplies of tools, equipment, and materials are available and usable to ensure impacts to data collection activities are minimized, and
- Providing input to the Division Director and OAM Program Administrator on problems which may be occurring within their jurisdiction/program that may require monitoring program support.

Local Agency Air Program Managers. The local program managers report directly to their Local Program Administrators; however, they have direct access to the OAM Program Administrator, Quality Assurance Manager, Data Quality Section Administrator, Field Operations Section Administrator and Quality Assurance Analyst. The Local Program manager's duties include:

- Ensuring that monitoring staff are properly trained to perform their job functions to ensure data quality objectives are maintained,
- Ensuring that monitoring programs incorporate QA elements of SOPs and QAPPs,
- Implementing day-to-day QA/QC activities for the ambient air quality monitoring program,
- Reviewing environmental data and reports prior to submittal,
- Assisting with data quality assessments and systems audits,
- Assisting in the acquisition of resources and maintenance of equipment and inventories to ensure network operational readiness and avoidance of disruptions to data collection activities,
- Assigning response/corrective actions to specific personnel,
- Reviewing and approving corrective action activities and reports, and
- Assisting in network decisions and modifications.

Local Program Quality Assurance Coordinators/Staff. Local Program Quality Assurance Coordinators/Staff are responsible for data handling, data validation and data verification. They serve as members of FAMAC to guide policy for data quality in Florida. Local Program Quality Assurance Coordinators/Staff responsibilities include:

- Ensuring necessary performance evaluations are completed,
- Ensuring completeness and efficacy of the work,
- Ensuring field and data processing personnel maintain their documentation,
- Preparing internal reports for their management,
- Completing additional narratives on data quality, such as comments in AirMVP and exceedance reports,
- Assessing systems audit findings and issuing appropriate response/corrective actions,
- Overseeing investigations into assessment results in conjunction with the QAM,
- Maintaining calibration and certification documentation according to the Florida PQAO's record retention policy,
- Overseeing PM_{10} gravimetric laboratory specialists and laboratory operations, where applicable, (the laboratory specialist may be an employee of the air monitoring group or may be an employee of another program within the agency),
- Disseminating information appearing in audit reports and other quality-related documents to field technicians, and
- Verifying that all submitted data are correct and complete by performing Level 2 data review activities, as described within the PQAO's Data Handling and Validation SOP.

Local Agency Air Program Monitoring Staff. The local program monitoring staff's duties include:

- Verifying that QC activities such as precision checks, verifications, calibrations, and other scheduled checks and maintenance are performed and documented, and that measurement quality objectives (MQOs) are met as prescribed in the QAPP/SOPs,

- Collecting, calculating, reporting and reviewing environmental data,
- Calculating and/or reviewing precision and bias data
- Performing data verification activities (Level 1 review), which includes flagging and commenting on suspect data and troubleshooting, as needed,
- Documenting deviations from established procedures and methods,
- Reporting nonconforming conditions and corrective actions to their Local Program Managers and Quality Assurance Coordinators/staff,
- Conducting and documenting appropriate corrective actions, and
- Participating in training, calibration and certification activities.

2.3 Office of Technology and Information Services

The Office of Technology and Information Services (OTIS) is responsible for the management and security of the systems that provide the agency with information technology (IT) solutions to promote mission success. OTIS responsibilities include:

- Providing support for the department's databases, including AirMVP, PMTS (Particulate Matter 2.5 Tracking System), and LIMS (Laboratory Information Management System) and data reporting to the Air Quality System (AQS) database, and
- Identifying quality problems as they relate to database systems and initiating actions which result in solutions.

3.0 PROBLEM DEFINITION AND BACKGROUND

In 1970 the Clean Air Act (CAA) was signed into law, and its amendments provide the framework for protecting air quality. To protect air quality, active environmental data collection operations must be established and operated in a manner that assures the most applicable and highest quality data are collected. Ambient air quality monitoring programs monitor criteria pollutants (particulate matter [particles with an average aerodynamic diameter of 10 micrometers (PM_{10}) or less ($PM_{2.5}$)], sulfur dioxide [SO_2], carbon monoxide [CO], nitrogen dioxide [NO_2], ozone [O_3], and lead [Pb]). Gaseous criteria pollutants and lead are discussed in their respective QAPPs.

Table 3-1 below shows particulate matter and their designated National Ambient Air Quality Standards (NAAQS).

Table 3-1 National Ambient Air Quality Standards for Particulate Matter

Pollutant	Averaging Time	Standard Value [a]	Standard Type	Description
Particulate Matter (PM_{10}) [a]	24-hour	150 µg/m^3	Primary and Secondary	Not to be exceeded more than once per year on average over 3 years
Particulate Matter ($PM_{2.5}$) [b]	Annual	12.0 µg/m^3	Primary	Annual mean averaged over 3 years
	Annual	15.0 µg/m^3	Secondary	Annual mean averaged over 3 years
	24-hour	35 µg/m^3	Primary and Secondary	98th percentile, averaged over 3 years

[a] Particulate with diameters of 10 micrometers or less
[b] Particulate with diameters of 2.5 micrometers or less

Particulate matter (PM), also known as particle pollution, is a complex mixture of extremely small particles and liquid droplets that get into the air. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. National Ambient Air Quality Standards (NAAQS) for PM pollution specify a maximum amount of PM to be present in outdoor air. Limiting PM pollution in the air protects human health and the environment. These particles come in many sizes and shapes and can be made up of hundreds of different chemicals. Some are emitted directly from a source, such as construction sites, unpaved roads, fields, smokestacks or fires. However, most particles form in the atmosphere as a result of complex reactions of chemicals such as sulfur dioxide and nitrogen oxides, which are pollutants emitted from power plants, industries and automobiles. The primary and secondary PM_{10} standards are also meant to protect against the effects associated with exposures to thoracic coarse particles (i.e., $PM_{10-2.5}$). EPA groups particle pollution into two categories:

- "Inhalable coarse particles," such as those found near roadways and dusty industries, are larger than 2.5 micrometers and smaller than 10 micrometers in diameter.
- "Fine particles," such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller. These particles can be directly emitted from sources such as forest fires, or

they can form when gases emitted from power plants, industries and automobiles react in the air.

The first regulatory decision for particulate matter occurred in 1971 for total suspended particles (TSP). TSP is the measure of the mass concentration of particulate matter (PM) in community air. It was defined by the (unintended) size-selectivity of the inlet to the filter that collected the particles. Unfortunately, the size cut varied with wind speed and direction and was from 20 to 50 μm (microns) in aerodynamic diameter. Particulate matter was found to have adverse effects on public health and welfare, evading the respiratory tract and transferring to other areas of the body (i.e. lymph, blood, or gastrointestinal tract). The NAAQS, at the time, was 260 micrograms per cubic meter ($\mu g/m^3$) for the 24-hour averaging time and 75 ($\mu g/m^3$) for the annual averaging time for the primary standard; and, 150 $\mu g/m^3$ for the 24-hour averaging time and 60 $\mu g/m_3$ for the annual averaging time for the secondary standard.

In 1987, these standards (NAAQS) were revised to an indicator of particulate matter 10 (instead of TSP). PM of these sizes can enter the thorax and cause or exacerbate lower respiratory tract diseases, such as chronic bronchitis, asthma, pneumonia, lung cancer, and emphysema. This switch to a more health-related index stimulated studies of the associations between ambient air PM and mortality, morbidity, and cardiopulmonary function indices. In 1990, the first size-selective PM monitoring network occurred with the establishment of a PM_{10} network consisting of mainly high-volume samplers.

In 1997, the EPA supplemented its regulations (NAAQS) on PM_{10} with new regulations on $PM_{2.5}$. Some of the studies utilized by EPA used measures of the fine PM concentrations in the air, as indexed by $PM_{2.5}$ and/or sulfate and were able to show that annual mortality rates were more closely associated with fine ($PM_{2.5}$) particles than with the larger PM_{10}. Major sources of these fine particles are fossil fuel combustion by electric utilities, industry, and motor vehicles; vegetation burning; and the smelting or other processing of metals.

In the 2006 PM NAAQS review, the EPA promulgated a new federal reference method (FRM) for the measurement of $PM_{10\text{-}2.5}$ (coarse) mass in ambient air. Major components of coarse particles are aluminosilicates and other oxides of crustal elements (e.g., Fe, Ca, etc.) in soil dust; fugitive dust from roads, industry, agriculture, construction and demolition; fly ash from combustion of oil and coal; and additional contributions from plant and animal material. Coarse particles can irritate a person's eyes, nose, and throat. Thoracic coarse particles use a low-volume PM_{10} indicator. The $PM_{10\text{-}2.5}$ FRM (or approved FEMs, where available) was implemented at required NCore stations by January 1, 2011. The method employed is either a $PM_{10\text{-}2.5}$ FRM, which is performed using a low-volume PM_{10} FRM collocated with a low volume $PM_{2.5}$ FRM of the same make and model, or FEMs for $PM_{10\text{-}2.5}$, including filter-based dichotomous methods and continuous methods of which several makes and models are approved. In Florida, PM coarse monitoring is implemented at the Broward County and Hillsborough County NCore monitoring sites.

As part of the 2010 NO_2 NAAQS review, the near-road monitoring network was initiated and has become a multi-pollutant monitoring network. A recommended secondary priority for multipollutant monitoring at near-road sites includes ultrafine particle size distribution or ultrafine particle number concentration. PM emitted through the combustion process occurs initially in the ultrafine size range (i.e. less than 0.1 µm in diameter). These particles are far smaller than the regulated PM_{10} and $PM_{2.5}$ particle classes. Research has shown that particle number concentration measurements often provide a good indication of primary PM exhaust emissions from motor vehicles. Several health studies suggest that ultrafine particles may lead to adverse health effects. Ultrafine particles (diameters less than 0.1 µm) are primarily deposited in the small peripheral airways and the alveoli (the pulmonary region). A large proportion of ultrafine particles that reach the small airways and alveoli remain suspended in the airways and are subsequently exhaled. In Florida, an ultrafine particulate matter ($PM_{0.1}$) monitor is currently implemented at the near-road monitoring area in Tampa. At the time of this QAPP revision, the City of Jacksonville had intentions to implement the $PM_{0.1}$ monitoring at its environmental justice site during calendar year 2023.

On December 14, 2012, the most recent NAAQS update, the EPA strengthened the annual health-based standard for fine particles to a level of 12.0 $\mu g/m^3$ and retained the other particulate matter (PM) standards. These standards (PM_{10}), set at a level of 150 $\mu g/m^3$, have been in place since 1987.

Florida's Ambient Air Quality Monitoring Program monitors for PM_{10}, $PM_{2.5}$, $PM_{10-2.5}$, and $PM_{0.1}$.

Note: The high-volume, filter-based PM_{10} network was totally phased out and replaced with PM_{10} continuous FEM monitors by March 1, 2019. High-volume, filter-based PM_{10} was removed from the Florida Particulate QAPP effective with Revision 1. However, the high-volume PM_{10} samplers are still utilized with quartz filters for metal collection for the National Air Toxics Trend Stations (NATTS) reporting; this is covered in the Florida NATTS QAPP.

Primary standards are set at a level adequate to protect public health within an acceptable margin of safety, while secondary standards are set a level that is requisite to protect public welfare. The CAA and its amendments provide the framework for the monitoring of these criteria pollutants by state, local, and tribal air monitoring organizations. Under the area designations process, data from ambient air monitors are typically used to characterize air concentrations for identification of areas that are either meeting or violating a particulate pollutant standard. Monitors used for comparisons against a NAAQS are typically designated as State and Local Air Monitoring Stations (SLAMS) monitors and must meet the requirements stipulated in 40 CFR Parts 50, 53, and 58. For particulate matter, three years of valid, quality-assured data are needed for comparison against the NAAQS.

The objective of Florida's Ambient Air Quality Monitoring Program is to protect the health and sustainability of the state by identifying any violations of the NAAQS, locating the highest ambient pollution concentrations across the area, and determining the general background concentration. The ambient air monitoring networks in Florida have been continuously operated, maintained, and updated for over 50 years, in accordance with county, state, and federal monitoring requirements.

The ambient air monitoring data collected are used to support the local, state, regional, and federal air monitoring programs, County organizations, and the general population. Additional goals for Florida's environmental protection are to encourage the wise and beneficial use of the natural environment, to minimize the adverse impact of environmental contaminants on human health and welfare, to assess the air quality, to identify air quality trends, to develop air models and emission inventories, and to foster public awareness of environmental considerations.

On January 1, 2015, the U.S. Environmental Protection Agency (US EPA) designated the State of Florida as one Primary Quality Assurance Organization (PQAO) responsible for monitoring air pollution. 40 CFR Part 58, Appendix A defines each PQAO such that measurement uncertainty among all stations in the organization can be expected to be reasonably homogeneous as a result of common factors. These factors include:

(a) Operation by a common team of field operators according to a common set of procedures;
(b) Use of a common quality assurance project plan (QAPP) and standard operating procedures;
(c) Common calibration facilities and standards;
(d) Oversight by a common quality assurance organization; and
(e) Support by a common management organization (i.e., state agency) or laboratory.

Florida's PQAO consists of Florida DEP as the lead agency, and nine (9) local air monitoring organizations throughout the state. This statewide program includes the operation of the ambient air monitoring network (including the particulate matter monitors discussed within this QAPP), laboratory analysis, data reporting, and quality assurance activities to ensure the quality of the data generated by the PQAO. Florida also developed the Florida Air Monitoring Advisory Committee (FAMAC), which is an internal committee consisting of Florida DEP and local program representatives to aid in coordinating quality assurance (QA) and quality control (QC) policies and guidance. This committee identifies practices that strengthen data quality objectives, promote innovative and efficient operations, and sets the minimum QA and QC requirements by which all agencies within the PQAO shall operate their air monitoring quality assurance programs. FAMAC communicates on a routine basis, including bi-monthly calls and semi-annual face-to-face or virtual meetings, in order to ensure a continuous flow of information, team building, and problem solving within the PQAO.

The Quality Assurance Project Plan (QAPP) is a compilation of QA/QC requirements, procedures, and guidelines that are designed to achieve a high percentage of valid data samples, while maintaining integrity and accuracy. The US EPA regulations require that all projects involving the generation, acquisition, and use of environmental data are planned, documented, and have an approved QAPP. Adherence to the requirements set forth in this QAPP will ensure consistent, repeatable results, and improve the reliability and comparability of all data collected. This QAPP will be used by all of Florida's monitoring staff within the PQAO as a reference document, providing the framework for the monitoring network's QA program. Additional details and

technical specifications are set forth in individual SOPs utilized by the air monitoring staff for each aspect of the monitoring program, such as instrument operations, data handling and certification, and will be referenced in later sections of this QAPP. It is the responsibility of all air monitoring staff to ensure that all procedures and guidelines in this QAPP are properly implemented.

This version of the QAPP is the second full revision to the original document, approved by EPA in May 2019. The original QAPP is retained in an archived subfolder on the Florida DEP network. The PQAO will adhere to the principles and procedures herein, unless a special project requires more stringent requirements. If any special project requires more stringent requirements, the QAPP will be revised or, depending on the purpose and scope of the project, a separate QAPP will be developed to address the requirements of the special project. This QAPP and its associated SOPs (see Appendix C of this QAPP) will be reviewed annually and revised as necessary, at least every 5 years, per grant commitments. QAPP revisions are subject to the approval of the EPA's Region 4 QA staff.

This QAPP ***only*** covers particulate matter (PM_{10}, $PM_{2.5,}$ and $PM_{0.1}$) monitors at State and Local Air Monitoring Stations (SLAMS) and Special Purpose Monitors (SPM) within Florida's ambient air monitoring network. Lead, gaseous, National Core (NCore), and National Air Toxics Trends Stations (NATTS) and Air Toxics monitors are addressed in separate QAPPs.

4.0 PROJECT AND TASK DESCRIPTION

4.1 Description of Work to be Performed

This QAPP was developed to ensure that Florida's particulate matter air monitoring network collects ambient data that meet or exceed EPA quality assurance requirements. Particulate matter data collected by Florida is used for regulatory decision-making purposes – i.e., determination of compliance with the NAAQS – and will be submitted to EPA via the EPA's national database, AQS. Other purposes of the data include determining trends over time, determining effects on air quality from adjustments to source emissions, developing algorithms based on historical air quality and other conditions which will forecast air quality, verifying air quality modeling programs, and providing real-time monitoring data to the public.

In accordance with 40 CFR Part 58, Appendix D, Section 1.1, SLAMS monitoring networks must be designed to meet three basic monitoring objectives: provide air pollution data to the public in a timely manner; support compliance with ambient air quality standards and emissions strategy development; and support for air pollution research studies. Florida's particulate matter monitoring network is designed to support these objectives. Additional specific goals of Florida's Ambient Air Quality Monitoring Program include:

- Determining the highest particulate matter concentrations expected to occur in the area covered by the network.
- Determining representative particulate matter concentrations in areas with high population density and\or heavily congested areas.
- Determining the impact on ambient pollution levels of significant sources emitting particulate matter in the area.
- Determining the general background particulate matter concentration levels.
- Determining the extent of regional particulate matter transport among populated areas and in support of secondary standards.
- Determining the welfare-related impacts of particulate matter in rural and remote areas (such as visibility impairment and effects on vegetation).
- Determining PM coarse components (as part of NCore) to support long-term health studies. PM coarse data is not used for regulatory purposes, but the primary and secondary PM_{10} standards are meant to protect against the effects associated with exposures to thoracic coarse particles.
- Understanding the chemical composition and sources of $PM_{2.5}$, PM_{10}, $PM_{10\text{-}2.5,}$ and $PM_{0.1}$.

Data will be reported to AQS in accordance with the requirements stated in 40 CFR 58.16. Florida's particulate matter (PM) monitoring network will operate and collect data in accordance with the schedules codified in 40 CFR 58.12. The ambient air monitoring concentration data will be collected by monitors that have been designated as Federal Reference Method (FRM) or Federal Equivalent Method (FEM), in accordance with 40 CFR

Part 58, Appendix C, Section 2.1. The types of data collected by Florida's PM monitoring network, overall, will include:

- Continuous (near real-time) hourly-averaged pollutant concentration data collected by continuous particulate samplers;
- 24-hour particulate matter samples collected by intermittent samplers in the field, and subsequently analyzed at the laboratory using the appropriate analytical method;
- Continuous (near real-time) hourly-averaged $PM_{2.5}$ concentration data collected by non-FEMs to report data to the Air Quality Index (AQI);
- Continuous shelter temperature measurements for ensuring conformity to environmental requirements of the air monitoring equipment (this is applicable to some samplers however others can be placed outdoors);
- $PM_{2.5}$ mass concentrations and low-volume PM_{10} mass concentrations for the calculation of PM coarse are reported at local conditions;
- PM_{10} mass concentrations are reported at standard temperature and pressure (STP) (298 K and 760 mmHg);
- Precision measurements;
- Bias measurements; and,
- Geographic measurements (e.g. locational, demographic, topographical).

Appendix C in Florida's Annual Network Plan provides details of the sampling schedules for both primary and collocated particulate monitors in Florida's monitoring network. Additionally, Appendix C of Florida's Annual Network Plan describes the monitor type, monitoring objective, purpose, and spatial scale of particulate monitors at each site. Florida's PQAO currently operates both FRM and FEM $PM_{2.5}$ monitors. Table 4.2 in the 2022 Florida Annual Network Plan provides specifics (i.e. operating schedule, method, etc.) on Florida's $PM_{2.5}$ network.

- Florida's PQAO operates only FEM PM_{10} monitors. Table 4.12 in the 2021 Florida Annual Network Plan provides specifics (i.e. operating schedule, method, etc.) on Florida's PM_{10} network.
- Florida's PQAO operates FEM $PM_{10-2.5}$ monitors at the urban NCore monitoring sites located at Broward County NCore and Hillsborough County NCore monitoring sites.
- Florida's PQAO operates an ultrafine or $PM_{0.1}$ monitor at the near-road monitoring area in Tampa. At the time of this QAPP revision, the City of Jacksonville had intentions to implement the $PM_{0.1}$ monitoring at its near-road monitoring area during calendar year 2023.

The work required to collect, document, and report this data includes, but is not limited to, the following:

- Establishing a monitoring network that has:
  - Appropriate density, location, and sampling frequency;
  - Accurate and reliable monitors, data recording equipment, and software;

- Developing encompassing documentation for:
  - Data and report format, content, and schedules;
  - Quality objectives and criteria;
- Establishing standard operating procedures, which provide activities and schedules for:
  - Equipment operation and preventative maintenance;
  - Instrument calibrations, precision checks, and accuracy evaluations;
  - Lab operations and sample custody procedures;
- Establishing assessment criteria and schedules; and,
- Verifying and validating the data produced by network monitors in accordance with the criteria and schedules established herein.

Towards this end, Florida's work products also include a series of assessments and reports to ensure the network and resulting data continuously meet or exceed regulatory requirements. Similarly, the Florida PQAO maintains this QAPP and its associated SOPs, reviewing and revising them as needed, to ensure they continuously reflect the requirements of the PQAO and EPA.

4.2 Field Activities

All monitoring personnel will perform those activities that support the continued successful operation and expansion of the particulate matter monitoring network. Personnel will perform field activities that include, but are not necessarily limited to, the following:

- Conducting periodic preventative maintenance and servicing equipment at SLAMS and SPM monitors/samplers;
- Conducting calibrations and routine QC checks on SLAMS and SPM monitors/samplers;
- Performing building/grounds maintenance activities to assure dry and appropriate climate conditions within the monitoring stations (the sampler may be located inside a building or located outdoors);
- Performing routine site operations and servicing activities that include, but are not limited to:
  - Verifying sampler status and diagnostics to ensure continuous data collection;
  - Recording pertinent field data and measurements in logbooks and on required PQAO forms;
  - Restocking consumables;
- Locating suitable monitoring sites for relocation of existing monitoring equipment or the location of new monitoring stations, when needed; and,
- Collecting $PM_{2.5}$ FRM samples and shipping them to the laboratory for subsequent analysis.

Also, the QA Auditor performs bi-annual instrument performance audits, equipment certifications, and internal systems audits, which may include visiting and accessing monitoring stations in the field.

4.3 Standards Laboratory Activities

For the particulate matter, the laboratory specialist will assure completion of those activities that support continued successful operation of the statewide ambient air quality monitoring network through instrument certification activities. These include, but are not limited to, comparing equipment to standards for certification, maintaining consumable inventories, and shipping and receiving activities.

4.4 Gravimetric Laboratory Activities

At the time of this QAPP revision, the Florida PQAO has one $PM_{2.5}$ gravimetric laboratory (operated by Florida DEP) and no PM_{10} gravimetric laboratories (the last of the high-volume, filter-based PM_{10} samplers in the Florida PQAO was removed from operation by March 1, 2019 and replaced with continuous samplers). Formerly, there were PM_{10} laboratory operations in Broward County, Hillsborough County, Miami-Dade County, and Pinellas County. The laboratory specialists will assure completion of those activities that support continued successful weighing of the filter based particulate matter network. These activities include, but are not limited to, monitoring laboratory conditions, processing incoming/outgoing filters, maintaining consumable inventories, ensuring standards are within certification, and weighing filters.

4.5 Project Assessment Techniques

An assessment is an evaluation process used to measure the performance or effectiveness of a system and its elements. As used here "assessment" is an all-inclusive term used to denote any of the following: technical systems audit, performance evaluation, peer review, inspection, or surveillance. Section 18 will discuss the details of assessments. Information on the parties implementing assessments and assessment frequency is provided in Table 4-1.

Table 4-1 Assessment Schedule

Assessment Type	Assessment Agency	Frequency
Technical / Quality Assurance System Audits	EPA Region 4 and/or State	Every 3 to 5 Years
Network Plan/Review	EPA Region 4 and State	Annually
Network Assessment	State	Every 5 years
Performance Evaluations	State and Local Air Programs	Semi-annually
Standard Operating Procedures Review	State	Annually
QAPP Review	State	Annually
Data Quality Audits	State	Periodically, per State schedule
Data Quality Assessment	State	Quarterly
$PM_{2.5}$ Performance Evaluation Program	State/EPA	As Scheduled

Assessment Type	Assessment Agency	Frequency
Data Certification	EPA Region 4 & State	Annually

4.6 Project Records

Each program within the PQAO, including Florida DEP, has its own internal procedures for the timely preparation, review, approval, issuance, use, control, revision, and maintenance of documents and records. However, for the particulate matter monitoring network described by this QAPP, these records are compiled and stored annually in Florida's data management system, as well as the department's local area network servers, in accordance with the Data Handling and Data Validation SOP. Please note that these records are also stored within the local program servers, to ensure backup copies are available, if needed. The categories and types of records and documents are presented in Table 4-2 below.

Table 4-2 Critical Documents and Records

Categories	Record/Document Type
Site Information	▪ Network Descriptions ▪ Site Files ▪ Site Maps ▪ Site Pictures
Environmental Data Operations	▪ Quality Assurance Project Plans ▪ Standard Operating Procedures ▪ Field and Laboratory Notebooks ▪ Sample Handling/Custody Records ▪ Inspection/Maintenance Records
Raw Data	▪ Any Original Data (routine and quality control) including Data Entry Forms and control charts.
Data Reporting	▪ Air Quality Index Reports ▪ Data/Summary Reports
Data Management	▪ Data Algorithms ▪ Data Management Plans/Flowcharts ▪ Data Management Systems ▪ Pollutant Data ▪ Meteorological Data
Quality Assurance	▪ Network Reviews ▪ Data Quality Assessments ▪ Quality Assurance Reports ▪ Technical /Quality Assurance Systems Audits ▪ Response/Corrective Action Reports ▪ Performance Evaluations

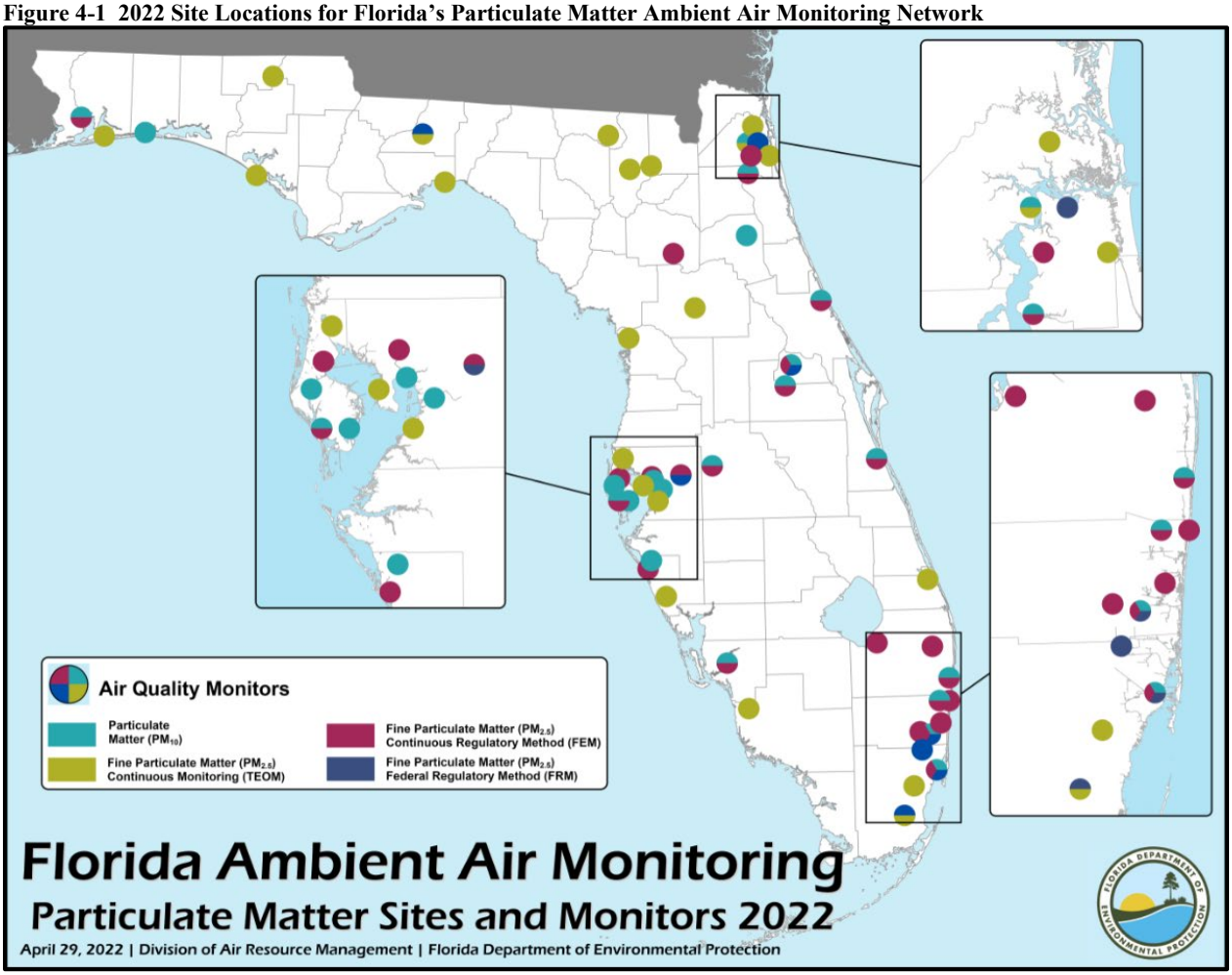
4.7 Site Locations

Figure 4-1, below, shows the 2022 site locations for Florida's Particulate Matter Ambient Air Monitoring Network. Florida's air monitoring network description is provided on Florida DEP's website in the 2022 Annual Network Plan: 2022 Ambient Air Monitoring Network Plan | Florida Department of Environmental Protection.

Table 4.2 details Florida's $PM_{2.5}$ network, and Table 4.12 details Florida's PM_{10} network.

Figure 4-1, below, shows the 2022 site locations for Florida's Particulate Matter Ambient Air Monitoring Network.

Figure 4-1 2022 Site Locations for Florida's Particulate Matter Ambient Air Monitoring Network



5.0 DATA AND MEASUREMENT QUALITY OBJECTIVES AND CRITERIA

Florida operates under an EPA-approved Quality Management Plan (QMP) that describes the system for communicating and implementing quality within the PQAO.

A quality system is a structured and documented set of management activities in which an organization applies sufficient quality control practices to ensure that the data produced by an operation will be of the type and quality needed and expected by the data user. Quality control defines the procedures implemented to assure that acceptability is obtained and maintained in the generated dataset. Quality control procedures, when properly executed, provide data that meet or exceed the minimally acceptable quality criteria established to assist management in making confident decisions. Florida's policy is to implement a QA program to assure that data of known and acceptable precision, bias, completeness, comparability, representativeness, and sensitivity are collected within its Ambient Air Quality Monitoring Program.

Precision, bias, completeness, comparability, representativeness, and sensitivity are the principle Data Quality Indicators (DQI) that provide qualitative and quantitative descriptions used in interpreting the degree of acceptability of data. Establishing acceptance criteria for these DQIs sets quantitative goals for the quality of data generated in the measurement process. Of the six principal DQIs, precision, bias, and sensitivity are the quantitative measures, representativeness and comparability are qualitative measures; and, completeness is a combination of both qualitative and quantitative measures. The specific requirements of these six DQIs are established before data collection commences. The goal is to locate and eliminate (or minimize) bias, so the data collected show the true conditions of the area being sampled. This includes consideration of siting criteria, spatial scales, monitoring objectives, climatic change, source configurations, and the duration of the study.

The written procedures and methodologies in this QAPP for operating air monitoring instrumentation and handling data must be adhered to by all individuals to ensure quality data for purposes of Florida's air quality designations regarding attainment of the NAAQS. EPA-approved Federal Reference Methods (FRMs) or Federal Equivalent Methods (FEMs) are the designated methodologies and basis for operating particulate matter monitoring equipment within the network.

5.1 Data Quality Objectives

This section provides a description of the data quality objectives (DQO) for the particulate matter network for the State of Florida PQAO. Data quality objectives are qualitative and quantitative statements that:

- Clarify the intended use of the data,
- Define the type of data needed, and

- Specify the acceptable probability limits for making a decision error due to uncertainty in the data

5.2 Intended Use of Data

Data collected in Florida's monitoring network will be used to:

- Evaluate compliance with the NAAQS,
- Establish a historical baseline concentration of natural and anthropogenic air pollutants,
- Monitor the current dynamic concentrations of these air pollutants,
- Monitor progress made toward meeting ambient air quality standards,
- Provide data upon which long term control strategies can be reliably developed,
- Observe pollution trends throughout the region, and
- Provide a database for researching and evaluating effects.

5.3 Type of Data Needed

The type of data needed is determined by its intended use. Because the primary use of Florida's monitoring data is for comparison to the NAAQS, data must be collected in accordance with 40 CFR Parts 50, 53, and 58 requirements, and be of such quality that decision makers can make comparisons to the NAAQS with confidence and certainty. The particulate matter monitoring data compiled by PQAO will include particles of 10 micrometers or less [PM_{10}] or 2.5 micrometers or less [$PM_{2.5}$]. 40 CFR 58.16 specifies the data reporting requirements that the Florida PQAO will follow, and the appendices to 40 CFR Part 50 explain the data handling conventions and computations necessary for determining whether the NAAQS are met for each pollutant.

Continuous particulate matter data will be collected for comparison to the NAAQS using hourly continuous concentration data and a 24-hour period calculated if 18 or more hours are reported for a day. For intermittent samplers, a sampling period is complete if it has 1380-1500 minutes, midnight to midnight local standard time; or, if value is less than 1380 minutes and exceedance of NAAQS. For each of these pollutants, quarterly data capture will need to be ≥75% completeness and the collection of precision and bias data are also required. In addition to these requirements, the data needed will meet the following principle quality objectives:

- All data should be traceable to a National Institute of Science and Technology (NIST) primary standard.
- All data shall be of a known and documented quality. As noted above, two key quantitative indicators for assessing data quality are precision and bias. Precision and bias requirements are established herein.
- All data shall be comparable. This means all data shall be produced in a similar and scientific manner. The use of the standard methodologies for sampling, calibration, auditing, etc. found in the QAPP and SOPs should achieve this goal.

- All data shall be representative of the parameters being measured with respect to time, location, and the conditions from which the data are obtained. The use of the standard methodologies contained in the QAPP should ensure that the data generated are representative.
- The QAPP and its associated SOPs must be dynamic to continue to achieve its stated goals as techniques, systems, concepts, and technology change.

The following subsections provides more detail regarding the specifications on the types of data needed to compare Florida's design values to the NAAQS.

5.3.1 Particulate Matter – PM_{10} –

- Calculate a 24-hour average concentration from midnight to midnight (local time).
- Each continuous instrument must calculate an hourly data point.
- An exceedance means a daily value that is above the level of the 24-hour standard after rounding to the nearest 10 $\mu g/m^3$ (i.e., values ending in 5 or greater are to be rounded up).
- The comparison with the allowable expected exceedance rate of one per year is made in terms of a number rounded to the nearest tenth (fractional values equal to or greater than 0.05 are to be rounded up; e.g., an exceedance rate of 1.05 would be rounded to 1.1, which is the lowest rate for nonattainment).
- A minimum of 75 percent of the scheduled PM_{10} samples per quarter are required
- In all cases, 3 years of representative monitoring data meeting the 75 percent criterion should be utilized, if available.
- More than 3 years may be considered, if all additional representative years of data meeting the 75 percent criterion are utilized.

Specific information on PM_{10} NAAQS calculations is found in 40 CFR 50 Appendix K. This CFR appendix explains the computations necessary for analyzing PM_{10} data to determine attainment of the 24-hour standard specified in 40 CFR 50.6, using the reference method based on 40 CFR Part 50, Appendix J, or a designated equivalent method per 40 CFR Part 53.

5.3.2 Particulate Matter – $PM_{2.5}$ –

- Keep each data point (hourly and 24-hour filter-based) with at least one decimal place in units of $\mu g/m^3$, with additional digits to the right being truncated with no further rounding.
- Each continuous instrument must calculate an hourly data point.
- Calculate a 24-hour period in a day from midnight to midnight for the daily average.
- A 24-hour average concentration shall be considered valid if at least 75 percent of the hourly averages (i.e., 18 hourly values) for the 24-hour period are available.

- Twenty-four-hour periods with seven or more missing hours shall also be considered valid if, after substituting zero for all missing hourly concentrations, the resulting 24-hour average daily value is greater than the level of the 24-hour $PM_{2.5}$ NAAQS.
- For 24-hour filter-based samples, the sampler must have operated for 23-25 hours or the day will not be valid (unless a sample with less than 23 hours run time has a concentration that exceeds the NAAQS).
- The 3-year average of $PM_{2.5}$ annual mean mass concentrations for each eligible monitoring site is referred to as the "annual $PM_{2.5}$ NAAQS DV" and compared to the annual standard.
- The 3-year average of annual 98th percentile 24-hour average $PM_{2.5}$ mass concentration values recorded at each eligible monitoring site is referred to as the "24-hour (or daily) $PM_{2.5}$ NAAQS DV" and compared to the daily standard.

Specific information on $PM_{2.5}$ NAAQS calculations is found in 40 CFR 50 Appendix N.

5.4 Tolerable Error Limits

The Data Quality Objective (DQO) process defines tolerable limits on the probability of making a decision error due to uncertainty in the data, that is, limits on the probability of measuring a false positive or false negative error. Regarding air quality data, a false positive error occurs when data indicates that the NAAQS has been exceeded when in fact, due to random deviations in the data, it has not been exceeded. Alternatively, a false negative error occurs when data indicate that no NAAQS have been exceeded when in fact, due to random deviations in the data, it has been exceeded.

Utilizing the formal DQO process, EPA established the tolerable error limits for ambient air monitoring precision and bias data in order to reduce the probability of decision errors. 40 CFR 58, Appendix A Section 2.3.1.1, defines the acceptable measurement uncertainty for the $PM_{2.5}$ pollutant. EPA has not developed a formal 7-step DQO process for PM_{10} at this time; however, EPA has provided DQOs for PM_{10} in the Quality Assurance Handbook for Air Pollution Measurements Systems, Volume II. Florida formally adopts EPA's DQOs for the PM_{10} and $PM_{2.5}$ pollutant network and these are summarized in Table 5-1 below.

Table 5-1. Acceptable Precision and Bias as Measured by Coefficient of Variation (CV) for $PM_{2.5}$ and PM_{10}

Pollutant	Acceptable Precision	Acceptable Bias
$PM_{2.5}$	Upper 90 % confidence limit for the CV of ≤10%	Upper 90 % confidence limit for the absolute bias of ≤±10%
PM_{10}	Upper 90 % confidence limit for the CV of ≤10%	Upper 90 % confidence limit for the absolute bias of ≤10%

5.5 Measurement Quality Objectives

The DQO process functions to identify the allowable measurement uncertainty for a given objective. Once a DQO is established, the quality of the data must be evaluated and controlled to ensure that it is maintained within the established acceptance criteria. Measurement quality objectives (MQOs) are designed to evaluate and control various phases (sampling, preparation, analysis) of the measurement process to ensure that total measurement uncertainty is within the range prescribed by the DQOs. MQOs are derived from the DQOs, and can be established to evaluate overall measurement uncertainty, as well as be established for an individual phase of a measurement process.

The MQOs for Florida's Ambient Air Monitoring Network are defined in terms of the following data quality indicators (DQI):

- ***Precision*** - Precision is a measure of agreement between two replicate measurements of the same property, under prescribed similar conditions. This agreement is calculated as the percent difference and the standard deviation. This calculation represents the random component of error (e.g. Flow Rate Verifications).
- ***Bias*** - Bias is the systematic or persistent distortion of a measurement process that causes errors in one direction. Bias is determined by estimating the positive and negative deviation from the true value as a percentage of the true value (e.g. Performance Evaluations).
- ***Comparability*** - Comparability is the qualitative term that expresses the confidence that two data sets can contribute to a common analysis and interpolation. Comparability must be carefully evaluated to establish whether two data sets can be considered equivalent with respect to the measurement of a specific variable or groups of variables.
- ***Representativeness*** - Representativeness is a measure of the degree to which data accurately and precisely represent a characteristic of a population parameter at a sampling point or for a process condition or environmental condition. Representativeness is a qualitative term that should be evaluated to determine whether in situ or other measurements are made and physical samples collected in such a manner that the resulting data appropriately reflect the media and phenomenon measured or studied.
- ***Completeness*** - Completeness is a metric quantifying the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct, normal conditions. Completeness can be expressed as a ratio or a percentage. Data completeness requirements are included in the appendices of 40 CFR Part 50.
- ***Sensitivity -*** Sensitivity is a measure of the capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest. Methodology to establish sensitivity for a given analytical method or instrument includes examination of standardized blanks, instrument

detection limit studies, and calibration of the QL (quantitation limit). Method sensitivity is typically evaluated in terms of the method detection limit (MDL). The instrument detection limit (IDL) is the lowest concentration that can be detected for a given analyte on a specific instrument independent of matrix and sample preparation. Appendices of 40 CFR Part 50 describe sensitivity requirements for particulates. Additionally, EPA Quality Assurance Guidance Document 2.12 describes sensitivity requirements for $PM_{2.5}$.

Acceptance criteria have been developed for these DQIs using various parts of 40 CFR Parts 50, 53, and 58 and EPA guidance documents. Specifically, the MQOs for the criteria pollutants have been compiled into "validation templates" found in the EPA Quality Assurance Handbook for Air Pollution Measurements Systems, Volume II (i.e., QA Handbook). The validation templates for $PM_{2.5}$ and PM_{10} monitors used in Florida's PQAO have been reproduced here and are included as Tables 5-4 to 5-9. Florida has adopted these tables and established them as the MQOs for the State-wide Ambient Air Monitoring Program.

As described in the QA Handbook and implemented here, for each criteria pollutant listed in the tables that follow, three validation criteria are listed: critical, operational, and systematic. The tables discriminate between criteria that must be met to ensure the quality of the data (i.e., critical criteria), criteria that indicate that there may be issues with the quality of the data and further investigation is warranted before making a determination about the validity of the sample or samples (i.e., operational criteria), and criteria that indicate a potentially systematic problem with the environmental data collection activity, that may impact the ability to make decisions with the data (i.e., systematic criteria). For each criterion, the tables include: (1) the requirement, (2) the frequency with which compliance is to be evaluated, (3) the acceptance criteria, and (4) information where the requirement can be found or additional guidance on the requirement.

In addition to adopting the MQOs, Florida has created and implemented warning limits. Warning limits are defined as the level of allowable imprecision before an analyzer/sampler calibration or other corrective action is warranted. These limits will be set lower than the MQOs (i.e., control limits) to reduce imprecision and bias and enhance data recovery.

Control limits are defined as the level of allowable imprecision before data invalidation and corrective actions are required. The control limits cannot be set higher than the MQOs and these limits are to be used when validating ambient air measurements against single point precision checks. This will strengthen the precision of these measurements and improve the data validation practices to meet regulatory requirements. The warning and control limits for precision checks used by the Florida PQAO are listed in Table 5-2, below.

Table 5-2 Data Quality Action Levels

Parameter	Control Limit (MQO)	Warning Limit
	Precision Checks (% Difference)	
*$PM_{2.5}$	< ± 4.1%	≥ 3%
**PM_{10}	< ± 7.1%	≥ 5%

*These limits are also used for filter-based low-volume PM_{10} which is used to calculate PM_{coarse} (i.e., PM_{10} minus $PM_{2.5}$).

** **Starting** January 1, 2023 Florida PQAO implemented the T640X Validation template to require method code 239 and a control limit of < ± 4.1% and a warning limit of ≥ 3%

By the same token, action limits were adopted and implemented for performance audits (semi-annual flow rate audits). These limits require investigations and corrective actions be performed by Field Technicians if the MQO for the specific pollutant is exceeded during the audit of the instrument. These levels are described in Table 5-3 below.

Table 5-3 Semi-annual Flow Rate Audit Action Levels

Parameter	Audit Action Levels	Action Required
*$PM_{2.5}$	<±3%	N/A
	≥±3% - <±4.1%	Investigation and documentation in logbooks required.
	>±4.1%	Corrective action required.
**PM_{10}	<±5%	N/A
	≥±5% - <±7.1%	Investigation and documentation in logbooks required.
	>±7.1%	Corrective action required.

*These limits are used for filter-based low-volume PM_{10} which is used to calculate PM_{coarse} (i.e., PM_{10} minus $PM_{2.5}$).

** **Starting** January 1, 2023 Florida PQAO implemented the T640X Validation template to require method code 239 and new action levels

Florida's implementation of EPA's validation tables as well as the warning limits/levels – how they will be used to validate data and drive data quality decision-making – will be described in more detail in Section 20 of this QAPP, and in the Data Handling and Data Validation SOP (DEP 18-27).

Table 5-4 $PM_{2.5}$ Filter-based Local Conditions Validation Template

1) Criteria (PM2.5 LC)	2) Frequency	3) Acceptable Range	Information /Action
CRITICAL CRITERIA- $PM_{2.5}$ Filter Based Local Conditions			
Field Activities			
Sampler/Monitor	NA	*Meets requirements listed in FRM/FEM/ARM designation*	1) 40 CFR Part 58 App C Sec. 2.1 2) NA 3) 40 CFR Part 53 & FRM/FEM method list
Filter Holding Times			
Pre-sampling	*all filters*	*≤ 30 days before sampling*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.3.5
Sample Recovery	*all filters*	*≤ 7 days 9 hours from sample end date*	1, 2 and 3) 40 CFR Part 50, App. L 10.10
Sampling Period (including multiple power failures)	*all filters*	*1380-1500 minutes, or if value < 1380 and exceedance of NAAQS 1/ midnight to midnight local standard time*	1, 2 and 3) 40 CFR Part 50 App L Sec. 3.3 and 40 CFR Part 50 App N Sec. 1 for the midnight to midnight local standard time requirement See details if less than 1380 min sampled
Sampling Instrument			
Average Flow Rate	*every 24 hours of op*	*average within 5% of 16.67 liters/minute*	1, 2 and 3) Part 50 App L Sec. 7.4.3.1
Variability in Flow Rate	*every 24 hours of op*	*CV ≤ 2%*	1, 2 and 3) 40 CFR Part 50, App L Sec. 7.4.3.2
One-point Flow Rate Verification	*every 30 days each seperated by 14 days*	*< ± 4.1% of transfer standard* < ± 5.1% of flow rate design value	1, 2 and 3) 40 CFR Part 50, App L, Sec. 9.2.5 and 7.4.3.1 and 40 CFR Part 58, Appendix A Sec. 3.2.1
Design Flow Rate Adjustment	*After multi-point calibration or verification*	*< ± 2.1% of design flow rate*	1, 2 and 3) 40 CFR Part 50, App. L, Sec. 9.2.6
Individual Flow Rates	*every 24 hours of op*	*no flow rate excursions > ±5% for > 5 min. 1/*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 7.4.3.1
Filter Temp Sensor	*every 24 hours of op*	*no excursions of > 5° C lasting longer than 30 min 1/*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 7.4.11.4
External Leak Check	*Before each flow rate verification/calibration* and before and after $PM_{2.5}$ separator maintenance	*< 80.1 mL/min* (see comment #1)	1) 40 CFR Part 50 App L, Sec. 7.4.6.1 2) 40 CFR Part 50 App L Sec. 9.2.3 and Method 2-12 Sec. 7.4.3 3) 40 CFR Part 50, App. L, Sec. 7.4.6.1
Internal Leak Check	If failure of external leak check	*< 80.1 mL/min*	1) 40 CFR Part 50, App. L, Sec. 7.4.6.2 2) Method 2-12, Sec. 7.4.4 3) 40 CFR Part 50, App. L, Sec. 7.4.6.2
Laboratory Activities			

1) Criteria (PM2.5 LC)	2) Frequency	3) Acceptable Range	Information /Action
Post-sampling Weighing	*all filters*	*Protected from exposure to temperatures above 25C from sample retrieval to conditioning* *≤10 days from sample end date if shipped at ambient temp, or* *≤ 30 days if shipped below avg ambient (or 4° C or below for avg sampling temps < 4° C) from sample end date*	1, 2 and 3) 40 CFR Part 50 App L Sec. 8.3.6 and L Sec. 10.13. See technical note on holding time requirements at : https://www3.epa.gov/ttn/amtic/pmpolgud.html
Filter Visual Defect Check (unexposed)	*all filters*	*Correct type & size and for pinholes, particles or imperfections*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 10.2
Filter Conditioning Environment			
Equilibration	*all filters*	*24 hours minimum*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.5
Temp. Range	*all filters*	*24-hr mean 20.0-23.0° C*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.1
Temp. Control	*all filters*	*< 2.1° C SD* over 24 hr.*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.2 SD use is a recommendation
Humidity Range	*all filters*	*24-hr mean 30.0% - 40.0% RH or Within ±5.0 % sampling RH but ≥ 20.0%RH*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.3
Humidity Control	*all filters*	*< 5.1 % SD* over 24 hr.*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.4 SD use is recommendation
Pre/post Sampling RH	*all filters*	*difference in 24-hr means < ± 5.1% RH*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.3.3
Balance	*all filters*	*located in filter conditioning environment*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.3.2
Microbalance Auto-Calibration	*Prior to each weighing session*	Manufacturer's specification	1) 40 CFR Part 50, App. L, Sec. 8.1 2) 40 CFR Part 50, App. L, Sec. 8.1 and Method 2.12 Sec. 10.6 3) NA
OPERATIONAL EVALUATIONS TABLE $PM_{2.5}$ Filter Based Local Conditions			
Field Activities			
One-point Temp Verification	every 30 days	< ± 2.1°C	1) 40 CFR Part 50, App. L, Sec. 9.3 2) Method 2.12 Sec. 7.4.5 and Table 6-1 3) Recommendation
Pressure Verification	every 30 days	< ± 10.1 mm Hg	1) 40 CFR Part 50, App. L, Sec. 9.3 2) Method 2.12 Sec. 7.4.6 and Table 6-1 3) Recommendation
Annual Multi-point Verifications/Calibrations			
Temperature multi-point Verification/Calibration	on installation, then every 365 days and once a calendar year	< ± 2.1°C	1) 40 CFR Part 50, App. L, Sec. 9.3 2 and 3) Method 2.12 Sec. 6.4.4 Table 6-1

1) Criteria (PM2.5 LC)	2) Frequency	3) Acceptable Range	Information /Action
Pressure Verification/Calibration	on installation, and on one-point verification failure	< ± 10.1 mm Hg	1) 40 CFR Part 50, App. L, Sec. 9.3 2 and 3) Method 2.12 Sec. 6.5 Sampler BP verified against independent standard verified against a lab primary standard that is certified as NIST traceable 1/year
Flow Rate Multi-point Verification/ Calibration	***Electromechanical maintenance or transport*** or every 365 days and once a calendar year	< ± 2.1% of transfer standard	1) 40 CFR Part 50, App. L, Sec. 9.2. 2) 40 CFR Part 50, App. L, Sec. 9.1.3, Method 2.12 Sec. 6.3 & Table 6-1 3) Recommendation
Other Monitor Calibrations	per manufacturers' op manual	per manufacturers' operating manual	1, 2 and 3) Recommendation
Precision			
Collocated Samples	***every 12 days for 15% of sites by method designation***	CV < 10.1% of samples ≥ 3.0 µg/m^3	1) and 2) Part 58 App A Sec. 3.2.3 3 Recommendation based on DQO in 40 CFR Part 58 App A Sec. 2.3.1.1
Accuracy			
Temperature Audit	every 180 days and at time of flow rate audit	< ± 2.1°C	1, 2 and 3) Method 2.12 Sec. 11.2.2
Pressure Audit	every 180 days and at time of flow rate audit	< ±10.1 mm Hg	1, 2 and 3) Method 2.12 Sec. 11.2.3
Semi Annual Flow Rate Audit	***Twice a calendar year and between 5-7 months apart***	< ± 4.1% of audit standard < ± 5.1% of design flow rate	1 and 2) Part 58, App A, Sec. 3.2.2 3) Method 2.12 Sec. 11.2.1
Monitor Maintenance			
$PM_{2.5}$ Separator (WINs)	every 5 sampling events	cleaned/changed	1, 2, and 3) Method 2.12 Sec. 8.2.2
$PM_{2.5}$ Separator (VSCC)	every 30 days	cleaned/changed	1, 2 and 3) Method 2.12 Sec. 8.3.3
Inlet Cleaning	every 30 days	cleaned	1, 2 and 3) Method 2.12 Sec. 8.3
Downtube Cleaning	every 90 days	cleaned	1, 2 and 3) Method 2.12 Sec. 8.4
Filter Housing Assembly Cleaning	every 30 days	cleaned	1, 2 and 3) Method 2.12 Sec. 8.3
Circulating Fan Filter Cleaning	every 30 days	cleaned/changed	1, 2 and 3) Method 2.12 Sec. 8.3
Manufacturer-Recommended Maintenance	per manufacturers' SOP	per manufacturers' SOP	
Laboratory Activities			
Filter Checks			
Lot Blanks	9 filters per lot	< ±15.1 µg change between weighings	1, 2, 3) Recommendation and used to determine filter stability of the lot of filters received from EPA or vendor. Method 2.12 Sec. 10.5
Exposure Lot Blanks	3 filters per lot	< ±15.1 µg change between weighings	1, 2 and 3) Method 2.12 Sec. 10.5 Used for preparing a subset of filters for equilibration
Filter Integrity (exposed)	each filter	no visual defects	1, 2 and 3) Method 2.12 Sec. 10.7 and 10.3
Lab QC Checks			

1) Criteria (PM2.5 LC)	2) Frequency	3) Acceptable Range	Information /Action
Field Filter Blank	10% or 1 per weighing session	<± 30.1 µg change between weighings	1) 40 CFR Part 50, App. L Sec. 8.3.7.1 2 and 3) Method 2.12 Table 7-1 & Sec.10.5
Lab Filter Blank	10% or 1 per weighing session	<± 15.1 µg change between weighings	1) 40 CFR Part 50, App. L Sec. 8.3.7.2 2 and 3) Method 2.12 Sec. 10.5
Balance Check (working standards)	beginning, 10th sample, end	< ±3.1 µg from certified value	1, 2 and 3) Method 2.12 Sec. 10.6 Standards used should meet specifications in Method 2.12, Sec. 4.3.7
Routine Filter re-weighing	1 per weighing session	<± 15.1 µg change between weighings	1, 2 and 3) Method 2.12 Sec. 10.8
Microbalance Audit	every 365 days and once a calendar year	<± 0.003 mg or manufacturers specs, whichever is tighter	1, 2 and 3) Method 2.12 Sec. 11.2.7
Lab Temp Check	Every 90 days	< ± 2.1ºC	1, 2 and 3) Method 2.12 Sec. 10.10
Lab Humidity Check	Every 90 days	< ± 2.1%	1, 2 and 3) Method 2.12 Sec. 10.10
Verification/Calibration			
Microbalance Calibration	***At installation*** every 365 days and once a calendar year	Manufacturer's specification	1) 40 CFR Part 50, App. L, Sec. 8.1 2) 40 CFR Part 50, App. L, Sec. 8.1 and Method 2.12 Sec. 10.11 3) NA
Lab Temperature Certification	every 365 days and once a year	< ± 2.1ºC	1, 2 and 3) Method 2.12 Sec. 4.3.8 and 9.4
Lab Humidity Certification	every 365 days and once a year	< ± 2.1%	1, 2 and 3) Method 2.12 Sec. 4.3.8 and 9.4
Calibration & Check Standards -			
Working Mass Stds. Verification Compared to primary standards	Every 90 days	< ±2.1 ug	1, 2 and 3) Method 2.12 Sec. 9.7
Primary standards certification	every 365 days and once a calendar year	0.025 mg tolerance (Class 2)	1, 2 and 3) Method 2.12 Sec. 4.3.7
SYSTEMATIC CRITERIA -$PM_{2.5}$ Filter Based Local Conditions			
Siting	every 365 days and once a calendar year	***Meets siting criteria or waiver documented***	1) 40 CFR Part 58 App E, Sec. 2-5 2) Recommendation 3) 40 CFR Part 58 App E, Sec. 2-5
Data Completeness	***Annual Standard***	***≥ 75% scheduled sampling days in each quarter***	1, 2 and 3) 40 CFR Part 50, App. N, Sec. 4.1 (b) 4.2 (a)
	24- Hour Standard	***≥ 75% scheduled sampling days in each quarter***	1, 2 and 3) 40 CFR Part 50, App. N, Sec. 4.1 (b) 4.2 (a)
Reporting Units	***all filters***	***µg/m^3 at ambient temp/pressure ($PM_{2.5}$)***	1, 2 and 3) 40 CFR Part 50 App N Sec. 3.0 (b)
Rounding convention for design value calculation	***all filters***	***to one decimal place, with additional digits to the right being truncated***	1, 2 and 3) 40 CFR Part 50 App N Sec. 3.0 (b) The rounding convention is for averaging values for comparison to NAAQS not for reporting individual values.

1) Criteria (PM2.5 LC)	2) Frequency	3) Acceptable Range	Information /Action
Annual 3-yr average	*all concentrations*	*nearest 0.1 µg/m^3* (≥ 0.05 round up)	1, 2 and 3) 40 CFR Part 50, App. N Sec. 3 and 4 Rounding convention for data reported to AQS is a recommendation
24-hour, 3-year average	*all concentrations*	*nearest 1 µg/m^3* (≥ 0.5 round up)	1, 2 and 3) 40 CFR Part 50, App. N Sec. 3 and 4 Rounding convention for data reported to AQS is a recommendation
Detection Limit			
Lower DL	*all filters*	*≤ 2 µg/m^3*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 3.1
Upper Conc. Limit	*all filters*	*≥ 200 µg/m^3*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 3.2
Precision			
Single analyzer (collocated monitors)	every 90 days	Coefficient of variation (CV) < 10.1% for values ≥ 3.0 µg/m^3	1, 2 and 3) Recommendation in order to provide early (quarterly) evaluation of achievement of DQOs.
Primary Quality Assurance Org.	*Annual and 3 year estimates*	*90% CL of CV < 10.1 % for values ≥ 3.0 µg/m^3*	1, 2 and 3) 40 CFR Part 58, App A, Sec. 4.2.1 and 2.3.1.1
Bias			
Performance Evaluation Program (PEP)	*5 audits for PQAOs with ≤ 5 sites* *8 audits for PQAOs with > 5 sites*	*< ± 10.1% for values ≥ 3.0 µg/m^3*	1, 2 and 3) 40 CFR Part 58, App A, Sec. 3.2.4, 4.2.5 and 2.3.1.1
Field Activities			
Verification/Calibration Standards Recertifications – All standards should have multi-point certifications against NIST Traceable standards			
Flow Rate Transfer Std.	every 365 days and once a calendar year	*< ± 2.1% of NIST Traceable Std.*	1) 40 CFR Part 50, App. L Sec. 9.1 & 9.2 2) Method 2-12 Sec. 4.2.2 & 6.4.3 3) 40 CFR Part 50, App. L Sec. 9.1 & 9.2
Field Thermometer	every 365 days and once a calendar year	± 0.1° C resolution, ± 0.5° C accuracy	1, 2 and 3) Method 2.12 Sec. 4.2.2
Field Barometer	every 365 days and once a calendar year	± 1 mm Hg resolution, ± 5 mm Hg accuracy	1, 2 and 3) Method 2.12 Sec. 4.2.2
Clock/timer Verification	Every 30 days	*1 min/mo*	1 and 2) Method 2.12 Sec. 4.2.1 3) 40 CFR Part 50, App. L Sec. 7.4.12
Laboratory Activities			
Microbalance Readability	*At purchase*	*1 µg*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.1
Microbalance Repeatability	At purchase	1 µg	1) Method 2.12 Sec. 4.3.6 2) Recommendation 3) Method 2.12 Sec. 4.3.6
Primary Mass/Working mass Verification/Calibration Standards	At purchase	0.025 mg tolerance (Class 2)	1, 2 and 3) Method 2.12 Sec. 4.3.7

1) Criteria (PM2.5 LC)	2) Frequency	3) Acceptable Range	Information /Action
Comment #1 The associated leak test procedure shall require that for successful passage of this test, the difference between the two pressure measurements shall not be greater than the number of mm of Hg specified for the sampler by the manufacturer, based on the actual internal volume of the sampler, that indicates a leak of less than 80 mL/min.			

Table 5-5 Continuous $PM_{2.5}$ Local Conditions Validation Template[1]

1) Criteria (PM2.5 Cont)	2) Frequency	3) Acceptable Range	Information /Action
CRITICAL CRITERIA- $PM_{2.5}$ Continuous, Local Conditions			
Sampler/Monitor Designation	NA	***Meets requirements listed in FRM/FEM/ARM designation*** Confirm method designation on front panel or just inside instrument.	1) 40 CFR Part 58 App C Sec. 2.1 2) NA 3) 40 CFR Part 53 & FRM/FEM method list
Firmware of monitor	At setup	1. Must be the firmware (or later version) as identified in the published method designation summary. 2. ***Firmware settings must be set for flowrate to operate and report at "local conditions" (i.e., not STP).***	40 CFR Part 50 App N. sec. 1 (c)
Data Reporting Period	Report every hour	1. The calculation of an hour of data is dependent on the design of the method. 2. ***A 24-hour period is calculated in AQS if 18 or more valid hours are reported for a day*** [1/].	See operator's manual. Hourly data are always reported as the start of the hour on local standard time 40 CFR Part 50 App N. Sec 3 (c)

1) Criteria (PM2.5 Cont)	2) Frequency	3) Acceptable Range	Information /Action
Sampling Instrument			
PM10 Inlet (if applicable to method designated)	At Setup	Must be a Louvered PM10 size selective inlet as specified in 40 CFR 50 appendix L, Figures L-2 through L-19	
PM2.5 second stage separator (if applicable to method designated)	At Setup	Must be a BGI Inc. Very Sharp Cut Cyclone (VSCC™) or equivalent second stage separator approved for the method.	The other approved second stage separator option for select FEMs is the Dichot. Only the GRIMM 180 and Teledyne T640 and T640X are known to not have a second stage seperator as part of the method.
Average Flow Rate	*every 24 hours of operation; alternatively, each hour can be checked*	*average within 5% of 16.67 liters/minute at local conditions*	1, 2 and 3) Part 50 App L Sec. 7.4.3.1
Variability in Flow Rate	*every 24 hours of op*	*CV ≤ 2%*	1, 2 and 3) 40 CFR Part 50, App L Sec. 7.4.3.2
One-point Flow Rate Verification	*every 30 days each seperated by 14 days*	*< ± 4.1% of transfer standard* < ± 5.1% of flow rate design value	1, 2 and 3) 40 CFR Part 50, App.L, Sec. 9.2.5, 40 CFR Part 58, Appendix A Sec. 3.2.3 & 3.3.2
Design Flow Rate Adjustment	*After multi-point calibration or verification*	*< ± 2.1% of design flow rate*	1,2 and 3) 40 CFR Part 50, App. L, Sec. 9.2.6
External Leak Check	*Before each flow rate verification/calibration* and before and after $PM_{2.5}$ separator maintenance	Method specific. See operator's manual.	1) 40 CFR Part 50 App L, Sec. 7.4.6.1 2) 40 CFR Part 50 App L Sec.t 9.2.3 and Method 2-12 Sec. 7.4.3 3) 40 CFR Part 50, App. L, Sec. 7.4.6.1
Internal Leak Check	If failure of external leak check	Method specific. See operators manual.	1) 40 CFR Part 50, App. L, Sec. 7.4.6.2 2) Method 2-12 7.4.4 3) 40 CFR Part 50, App. L, Sec. 7.4.6.2
Annual Multi-point Verifications/Calibrations			
Leak Check	every 30 days	< 1.0 lpm BAM (Not Thermo BAMS) ± 0.15 lpm TEOM	1) 40 CFR Part 50 App L, Sec. 7.4.6.1 2) Recommendation 3) BAM SOP Sec. 10.1.2 TEOM SOP Sec. 10.1.6 Thermo BAM leak check should not be attempted. Foils could be ruptured.
Temperature multi-point Verification/Calibration	on installation, then Every 365 days and 1/ calendar year	< ± 2.1°C	1) 40 CFR Part 50, App.L, Sec. 9.3 2 and 3) Method 2.12 Sec. 6.4.4
One-point Temp Verification	every 30 days	< ± 2.1°C	1) 40 CFR Part 50, App.L, Sec. 9.3 2) Method 2.12 Sec. 7.4.5 and Table 6-1 3) Recommendation
Pressure Verification/Calibration	on installation, then Every 365 days and 1/ calendar year	< ± 10.1 mm Hg	1) 40 CFR Part 50, App.L, Sec. 9.3 2 and 3) Method 2.12 Sec. 6.5 BP verified against independent standard verified against a lab primary standard that is certified NIST traceable 1/year

1) Criteria (PM2.5 Cont)	2) Frequency	3) Acceptable Range	Information /Action
Flow Rate Multi-point Verification/ Calibration	***Electromechanical maintenance or transport or*** Every 365 days and 1/ calendar year	< ± 2.1% of transfer standard	1) 40 CFR Part 50, App.L, Sec. 9.2. 2) 40 CFR Part 50, App.L, Sec. 9.1.3, Method 2.12 Sec. 6.3 & Table 6-1 3) Recommendation
Other Monitor Calibrations/checks	per manufacturers' op manual	Annual zero test on Met One BAM 1020 and BAM 1022	per manufacturers' operating manual. Note: more frequent zero tests may be appropriate in areas with seasonal changes in dew-points.
Precision			
Collocated Samples	***every 12 days for 15% of sites by method designation***	CV < 10.1% of samples ≥ 3 µg/m^3	1) and 2) Part 58 App A Sec. 3.2.3 3 Recommendation based on DQO in 40 CFR Part 58 App A Sec. 2.3.1.1
Accuracy			
Temperature Audit	every 180 days and at time of flow rate audit	< ± 2.1°C	1, 2 and 3) Method 2.12 Sec. 11.2.2
Pressure Audit	every 180 days and at time of flow rate audit	< ±10.1 mm Hg	1, 2 and 3) Method 2.12 Sec. 11.2.3
Semi Annual Flow Rate Audit	***Twice a calendar year and 5-7 months apart***	< ± 4.1% of audit standard < ± 5.1% of design flow rate	1 and 2) Part 58, App A, Sec. 3.3.3 3) Method 2.12 Sec. 11.2.1
Shelter Temperature			
Temperature range	At setup	per operator manual	
Temperature Control	Daily (hourly values)	< 2.1° C SD over 24 hours	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2
Temperature Device Check	every 180 days and twice a calendar year	< ± 2.1° C	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2
Monitor Maintenance			
$PM_{2.5}$ Separator (WINS)	every 5 sampling events	cleaned/changed	1, 2,and 3) Method 2.12 Sec. 8.2.2
$PM_{2.5}$ Separator (VSCC)	every 30 days	cleaned/changed	1,2 and 3) Method 2.12 Sec. 8.3.3
Inlet Cleaning	every 30 days	cleaned	1,2 and 3) Method 2.12 Sec. 8.3
Downtube Cleaning	every 90 days	cleaned	1,2 and 3) Method 2.12 Sec. 8.4
Filter Housing Assembly Cleaning	every 30 days	cleaned	1, 2 and 3) Method 2.12 Sec. 8.3
Circulating Fan Filter Cleaning	every 30 days	cleaned/changed	1, 2 and 3) Method 2.12 Sec. 8.3
Manufacturer-Recommended Maintenance	per manufacturers' SOP	per manufacturers' SOP	
TEOM-FDMS Specific Operational Criteria			
Total Flow Verification	every 30 days	Sum of flow rates from 3 paths equal design flow rate < ± 5.1%	1,2 and 3) TEOM SOP Sec. 10.1.2
Bypass leak check (TEOM)	every 30 days	± 0.60 lpm	1,2 and 3) TEOM SOP Sec. 10.1.6 or TEOM Operating Manual Sec. 5-4
Replace TEOM filters	as needed	Change TEOM filter as filter loading approaches 90%, but must be changed before reaching 100%.	1,2 and 3) TEOM SOP Sec. 10.1.8
Replace the 47-mm FDMS (Purge) filters	every 30 days or any time TEOM filters are replaced	replaced	1,2 and 3) TEOM SOP Sec. 10.1.10

1) Criteria (PM2.5 Cont)	2) Frequency	3) Acceptable Range	Information /Action
Internal/External Data Logger Data	Every 30 days 10 randomly selected values	agree exactly (digital) and ± 1 µg/m^3 (analog). Note: digital is expected and should be used unless there is no capacity to utilize digital in the monitoring agencies' data system.	1, 2 and 3) TEOM SOP Sec. 10.1.24
Replace In-line filters	every 180 days and twice a calendar year	replaced	1, 2 and 3) TEOM SOP Sec. 10.2
Clean cooler assembly	every 365 days and once a calendar year	cleaned	1, 2 and 3) TEOM SOP Sec. 10.3.1
Clean/Maintain switching valve	every 365 days and once a calendar year	cleaned	1, 2 and 3) TEOM SOP Sec. 10.3.2
Clean air inlet system of mass transducer enclosure	every 365 days and once a calendar year	cleaned	1, 2 and 3) TEOM SOP Sec. 10.3.3
Replace the dryers	1/yr or due to poor performance	Review dryer dew point data to determine acceptable performance of dryer	1, 2 and 3) TEOM SOP Sec. 10.3.4
Calibration (KO) constant verification	every 365 days and once a calendar year	Pass or Fail (≤ 2.5%)	1, 2 TEOM SOP Sec. 10.3.6 3) 1405-DF operating guide. Verification software either passes or fails the verification. Acceptance criteria is ≤ 2.5 %
Rebuild sampling pump	18 months	< 66% of local pressure	1, 2 and 3) TEOM SOP Sec. 10.4
GRIMM Specific Operational Criteria			
Internal rinsing air filter	After a few years	Changed	1, 2 and 3) GRIMM SOP Sec. 12.4 May require a trained service staff to change. May only require changing if a message reads "check nozzle and air inlet"
Change Dust Filter	Every 365 days and 1/ calendar year	Changed	1, 2 and 3) GRIMM SOP Sec. 12.3
Relative Humidity Setting	At Setup	Per Operators manual (55%) unless otherwise directed and approved to use at a different value	
Calibration of spectrometer	Yearly	+/- 5% for mass	Operators' Manual section 5.2
Cleaning or changing of the Nafion in inlet	As needed	We are seeking clarification from GRIMM on this	Operators' Manual section 11.4.2
Thermo BAM Specific Operational Criteria			
Cleaning Nozzle and Vane (BAM)	Minimally every 30 days	cleaned	1, 2 and 3) BAM SOP Sec. 10.1.3
Leak Check	every 30 days	≤ 0.42 L/min	1) BAM 5014i Instruction Manual 2) 3) BAM 5014i Instruction Manual
Replace or clean pump muffler	every 180 days and twice a calendar year	Cleaned or changed	

1) Criteria (PM2.5 Cont)	2) Frequency	3) Acceptable Range	Information /Action
Internal/External Data Logger Data (BAM)	Every 30 days 10 randomly selected values	agree exactly (digital) and ± 1 µg/m^3 (analog). Note: digital is expected and should be used unless there is no capacity to utilize digital in the monitoring agencies' data system.	1, 2 and 3) BAM SOP Sec. 10.1.9
Clean/replace internal debris filter	Every 365 days and 1/ calendar year		
MetOne BAM Specific Operational Criteria			
BAM check of membrane span foil	Daily	Avg. < ± 5.1% of ABS	1, 2 and 3) BAM SOP Sec. 10.4.3. Applies on the BAM 1020
BAM electrical grounding	At setup	1. Is the chassis of the BAM grounded? Is the downtube grounded to the chassis at the collar (i.e., with setscrews)	Per operator manual
Nozzle cleaning	Every 30 days, or more often as needed	cleaned	Per operator manual
Zero test	Yearly	Standard deviation of the data from a 72-hour zero test < 2.4 µg/m^3	Per operator manual
SYSTEMATIC CRITERIA- $PM_{2.5}$ Continuous, Local Conditions			
Siting	every 365 days and once a calendar year	*Meets siting criteria or waiver documented*	1) 40 CFR Part 58 App E, Sec. 2-5 2) Recommendation 3) 40 CFR Part 58 App E, Sec. 2-5
Data Completeness	*Annual Standard*	*≥ 75% scheduled sampling days in each quarter*	1, 2 and 3) 40 CFR Part 50, App. N, Sec. 4.1 (b) 4.2 (a)
	24- Hour Standard	*≥ 75% scheduled sampling days in each quarter*	1, 2 and 3) 40 CFR Part 50, App. N, Sec. 4.1 (b) 4.2 (a)
Reporting Units	*all filters*	*µg/m^3 at ambient temp/pressure ($PM_{2.5}$)*	1. 2 and 3) 40 CFR Part 50 App N Sec. 3.0 (b)
Rounding convention for data reported to AQS	*all filters*	*to one decimal place or as reported by instrument*	1. 2 and 3) 40 CFR Part 50 App N Sec. 3.0 (b)
Annual 3-yr average	*all concentrations*	*nearest 0.1 µg/m^3* (≥ 0.05 round up)	1,2 and 3) 40 CFR Part 50, App. N Sec. 3 and 4 Rounding convention for data reported to AQS is a recommendation
24-hour, 3-year average	*all concentrations*	*nearest 1 µg/m^3* (≥ 0.5 round up)	1,2 and 3) 40 CFR Part 50, App. N Sec. 3 and 4 Rounding convention for data reported to AQS is a recommendation
Verification/Calibration Standards Recertifications - All standards should have multi-point certifications against NIST Traceable standards			
Flow Rate Transfer Std.	every 365 days and once a calendar year	*< ± 2.1% of NIST Traceable Std.*	1) 40 CFR Part 50, App.L Sec. 9.1 & 9.2 2) Method 2-12 Sec. 4.2.2 & 6.4.3 3) 40 CFR Part 50, App.L Sec. 9.1 & 9.2
Field Thermometer	every 365 days and once a calendar year	± 0.1° C resolution, ± 0.5° C accuracy	1, 2 and 3) Method 2.12 Sec. 4.2.2

1) Criteria (PM2.5 Cont)	2) Frequency	3) Acceptable Range	Information /Action
Field Barometer	every 365 days and once a calendar year	± 1 mm Hg resolution, ± 5 mm Hg accuracy	1, 2 and 3) Method 2.12 Sec. 4.2.2
Clock/timer Verification	Every 30 days	*1 min/mo***	1 and 2) Method 2.12 Sec. 4.2.1 3) 40 CFR Part 50, App.L Sec. 7.4.12
Precision			
Single analyzer (collocated monitors)	every 90 days	Coefficient of variation (CV) < 10.1% for values ≥ 3.0 µg/m^3	1,2 and 3) Recommendation in order to provide early (quarterly) evaluation of achievement of DQOs.
Primary Quality Assurance Org.	*Annual and 3 year estimates*	*90% CL of CV < 10.1 % for values ≥ 3.0 µg/m^3*	1,2 and 3) 40 CFR Part 58, App A, Sec. 4.2.1 and 2.3.1.1
Bias			
Performance Evaluation Program (PEP)	*5 audits for PQAOs with ≤ 5 sites* *8 audits for PQAOs with > 5 sites*	*< ±10.1% for value > 3 µg/m^3*	1,2 and 3) 40 CFR Part 58, App A, Sec. 3.2.7, 4.3.2 and 2.3.1.1

[1]This validation template is used to validate the $PM_{2.5}$ TEOM data, however all $PM_{2.5}$ TEOMs within Florida's PQAO are not configured as FEMs and thus are only used for AQI purposes. Additionally, this template was used for the BAM1020, which had an EPA approved NAAQS comparison waiver (see Section 4.1), hence the data is only used for AQI reporting.

Table 5-6. Teledyne T640 Continuous $PM_{2.5}$ Local Conditions Validation Template
NOTE: The Florida PQAO will implement this template effective January 1, 2023.

1) Criteria (T640)	2) Frequency	3) Acceptable Range	Information /Action
CRITICAL CRITERIA- T640 $PM_{2.5}$ Continuous, Local Conditions			
Sampler/Monitor Designation	NA	*Meets requirements listed in FEM designation* Confirm method designation on front panel or just inside instrument.	1) 40 CFR Part 58 App C Sec. 2.1 2) NA 3) 40 CFR Part 53 & FRM/FEM method list
Firmware of monitor	*At setup and as updated*	1. *Must be the firmware (or later version) as identified in the published method designation summary.* 2. *Firmware settings must be set for flowrate to operate and report at "local conditions" (i.e., not STP).*	1) FEM: EQPM-0516-236 2) EPA T640 SOP 3) 1. FEM: EQPM-0516-236 2. 40 CFR Part 50 App N. sec. 1 (c)
Data Reporting Period	Report every hour	1. The calculation of an hour of data is dependent on the design of the method. 2. *A 24-hour period is calculated in AQS if 18 or more valid hours are reported for a day* [1].	See operator's manual. Hourly data are always reported as the start of the hour on local standard time 40 CFR Part 50 App N. Sec 3 (c)
Sampling Instrument			

1) Criteria (T640)	2) Frequency	3) Acceptable Range	Information /Action
TSP Sampling Inlet	*At Setup*	*TAPI 5-Lpm sample inlet (P/N: 081050000)*	1) FEM: EQPM-0516-236 2) EPA T640 SOP 3) 1. FEM: EQPM-0516-236
One-point Flow Rate Verification	*every 30 days each separated by 14 days*	< ± 4.1% of ±5.0 LPM design flowrate	1, 2 and 3) 40 CFR Part 50, App.L, Sec. 9.2.5, 40 CFR Part 58, Appendix A Sec. 3.2.1
PMT verification	every 90 days	≤ ± 1.5 of SpanDust™ value stated on bottle	1) Teledyne T640 manual 2) EPA T640 SOP 3) To meet DQO set forth in 40 CFR Part 58, Appendix A Sec. 2.3.1.1
OPERATIONAL CRITERIA- T640 $PM_{2.5}$ Continuous, Local Conditions			
One-point Temp Verification	every 30 days	*< ± 2.1°C*	1) Teledyne T640 manual 2) EPA T640 SOP 3) Teledyne T640 manual
Pressure Verification	every 30 days	*< ± 10.1 mm Hg*	1) Teledyne T640 manual 2) EPA T640 SOP 3) Teledyne T640 manual
Leak Check (Zero Test)	every 30 days	*≤ 0.2 µg/m³*	1) Teledyne T640 manual 2) EPA T640 SOP 3) Teledyne T640 manual
Span Deviation Tracker	Daily	If flagged	1, 2 and 3) Recommended. Teledyne representatives suggest monitoring this metric as a leading indicator of potential instrument malfunction.
Signal Length	Daily	Logged	1, 2 and 3) Recommended. Teledyne representatives suggest monitoring this metric because it is useful when diagnosing instrument malfunction (e.g., deviation from design flow rate).
Annual Multi-point Verifications/Calibrations			
Pressure Verification/Calibration	on installation, then every 365 days and 1/calendar year	*< ± 10.1 mm Hg*	1) Teledyne T640 manual 2) Method 2.12 Sec. 6.5 3) Teledyne T640 manual
Flow Rate single-point Verification/ Calibration	*Electromechanical maintenance or transport or* Every 365 days and 1/ calendar year	< ± 2.1% of transfer standard	1) 40 CFR Part 50, App.L, Sec. 9.2. 2) 40 CFR Part 50, App.L, Sec. 9.1.3, Method 2.12 Sec. 6.3 & Table 6-1 3) Recommendation
Precision			

1) Criteria (T640)	2) Frequency	3) Acceptable Range	Information /Action
Collocated Samples	*every 12 days for 15% of sites by method designation*	CV < 10.1% of samples ≥ 3 µg/m^3	1) and 2) 40 CFR Part 58 App A Sec. 3.2.3 3 Recommendation based on DQO in 40 CFR Part 58 App A Sec. 2.3.1.1
Accuracy			
Temperature Audit	every 180 days and at time of flow rate audit	< ± 2.1°C	1, 2 and 3) Method 2.12 Sec. 11.2.2
Pressure Audit	every 180 days and at time of flow rate audit	< ±10.1 mm Hg	1, 2 and 3) Method 2.12 Sec. 11.2.3
Semi Annual Flow Rate Audit	*Twice a calendar year and 5-7 months apart*	< ± 4.1% of 5.0 LPM design flowrate	1 and 2) 40 CFR Part 58, App A, Sec. 3.2.2 3) Method 2.12 Sec. 11.2.1
Shelter Temperature			
Temperature range	during operation	**0 - 50°C**	1) Teledyne T640 manual 2) Recommendation 3) Teledyne T640 manual
Temperature Control [2]	Daily (hourly values)	< 2.1° C SD over 24 hours	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2
Temperature Device Check	every 180 days and twice a calendar year	< ± 2.1° C	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2
Monitor Maintenance			
Inlet Cleaning	*every 30 days*	*cleaned*	1,2 and 3) Teledyne T640 manual
Downtube Cleaning	every 90 days	cleaned	1) Teledyne T640 manual 2 and 3) Method 2.12 Sec. 8.4
Inspect and clean optical chamber and relative humidity/temperature (RH/T) sensors	every 180 days and twice a calendar year. More frequently with high loading	cleaned	1) Teledyne T640 manual 2) EPA T640 SOP 3) EPA T640 SOP
Change Disposable Filter Unit	Annually or when Pump PWM value approaches 80%.	cleaned/changed	1) Teledyne T640 manual 2) EPA T640 SOP 3) EPA T640 SOP
Inspect Downtube and ASC to ensure vertically plumbed	every 90 days	*Plumb (90° from instrument horizontal axis)*	1) Teledyne T640 manual 2) Recommendation 3) Teledyne T640 manual
Check Pump Performance	every 30 days	*PWM value 30 < 80%*	1) Teledyne T640 manual 2) EPA T640 SOP 3) Teledyne T640 manual
Inspect inner and outer sample tubes	*every 30 days*	*Inspected* *Cleaned as needed*	1,2 and 3) Teledyne T640 manual
Manufacturer-Recommended Maintenance	per manufacturers' manual	per manufacturers' manual	
SYSTEMATIC CRITERIA- T640 $PM_{2.5}$ Continuous, Local Conditions			

1) Criteria (T640)	2) Frequency	3) Acceptable Range	Information /Action
Siting	every 365 days and once a calendar year	*Meets siting criteria or waiver documented*	1) 40 CFR Part 58 App E, Sec. 2-6 2) Recommendation 3) 40 CFR Part 58 App E, Sec. 2-6
Data Completeness	*Annual Standard*	*≥ 75% scheduled sampling days in each quarter*	1, 2 and 3) 40 CFR Part 50, App. N, Sec. 4.1 (a)(b)
	24- Hour Standard	*≥ 75% scheduled sampling days in each quarter*	1, 2 and 3) 40 CFR Part 50, App. N, Sec. 4.2 (a)(b)
Reporting Units	*all data*	*µg/m^3 at ambient temp/pressure ($PM_{2.5}$)*	1. 2 and 3) 40 CFR Part 50 App N Sec. 3.0 (b)
Rounding convention for data reported to AQS	*all concentrations*	*to one decimal place or as reported by instrument*	1. 2 and 3) 40 CFR Part 50 App N Sec. 3.0 (b)
Annual 3-yr average	*all concentrations*	*nearest 0.1 µg/m^3* (≥ 0.05 round up)	1,2 and 3) 40 CFR Part 50, App. N Sec. 3 and 4 Rounding convention for data reported to AQS is a recommendation
24-hour, 3-year average	*all concentrations*	*nearest 1 µg/m^3* (≥ 0.5 round up)	1,2 and 3) 40 CFR Part 50, App. N Sec. 3 and 4 Rounding convention for data reported to AQS is a recommendation
Verification/Calibration Standards Recertifications - All standards should have multi-point certifications against NIST Traceable standards			
Flow Rate Transfer Std.	every 365 days and once a calendar year	*< ± 2.1% of NIST Traceable Std.*	1) 40 CFR Part 50, App.L Sec. 9.1 & 9.2 2) Method 2.12 Sec. 4.2.3 & 6.3.3 3) 40 CFR Part 50, App.L Sec. 9.1 & 9.2
Field Thermometer	every 365 days and once a calendar year	± 0.1° C resolution, ± 0.5° C accuracy	1, 2 and 3) Method 2.12 Sec. 4.2.2
Field Barometer	every 365 days and once a calendar year	± 1 mm Hg resolution, ± 5 mm Hg accuracy	1, 2 and 3) Method 2.12 Sec. 4.2.2
Clock/timer Verification	Every 30 days	±5 min/mo**	1 and 2) Method 2.12 Sec. 4.2.1 3) Recommendation
Precision			
Single analyzer (collocated monitors)	every 90 days	Coefficient of variation (CV) < 10.1% for values ≥ 3.0 µg/m^3	1,2 and 3) Recommendation in order to provide early (quarterly) evaluation of achievement of DQOs.
Primary Quality Assurance Org.	*Annual and 3-year estimates*	*90% CL of CV < 10.1 % for values ≥ 3.0 µg/m^3*	1,2 and 3) 40 CFR Part 58, App A, Sec. 4.2.1 and 2.3.1.1
Bias			
Performance Evaluation Program (PEP)	*5 audits for PQAOs with ≤ 5 sites* *8 audits for PQAOs with > 5 sites*	*< ±10.1% for values ≥ 3 µg/m^3*	1,2 and 3) 40 CFR Part 58, App A, Sec. 3.2.4, 4.2.5 and 2.3.1.1

SD= standard deviation , CV= coefficient of variation

**** = need to ensure data system stamps appropriate time period with reported sample value**

[2] Temperature Control. The Florida PQAO will operate the T640 in accordance with the associated Teledyne T640/T640X manual per the EPA Federal Designation Number EQPM-0516-236 (5.0 LPM Model T640 monitor ($PM_{2.5}$)). In accordance with the EPA OAQPS Technical Note – Clarifications and Guidance on Shelter Temperature Guidance for Ambient Air Pollutant Methods (dated March 8, 2018) (see Appendix E of this document) and the associated Teledyne T640/T640X

manual, the approved federal equivalent method (FEM) designation allows these monitors to be operated at a temperature range of 0-50^{o}C, with no regard to the standard deviation (SD). Though Section 7.2.2 of EPA's QA Handbook Volume II (dated January 2017) suggests that shelters be maintained within a standard deviation of $\leq +2^{o}$C over a 24-hour period, based on a review of actual data, this is not reasonable for those T640/T640X instruments being housed in the "doghouse shelters" within the Florida PQAO.

Table 5-7. Teledyne T640X Continuous $PM_{2.5}$ Local Conditions and PM_{10} Standard Temperature and Pressure (STP) Validation Template
NOTE: The Florida PQAO will implement this template effective January 1, 2023.

1) Criteria (T640x)	2) Frequency	3) Acceptable Range	Information /Action
CRITICAL CRITERIA- T640x Continuous, Local Conditions ($PM_{2.5}$) and STP (PM_{10})			
Sampler/Monitor Designation	NA	*Meets requirements listed in FEM designation* Confirm method designation on front panel or just inside instrument.	1) 40 CFR Part 58 App C Sec. 2.1 2) NA 3) 40 CFR Part 53 & FRM/FEM method list
Firmware of monitor	*At setup and as updated*	1. *Must be the firmware (or later version) as identified in the published method designation summary.* 2. *Firmware settings must be set for flowrate to operate and report at (1) "local conditions" for $PM_{2.5}$ and (2) STP for PM_{10}.*	1) FEM: EQPM-0516-238/239 2) EPA T640x SOP 3) 1. FEM: EQPM-0516-238/239 2. 40 CFR Part 50 App N. sec. 1 (c)
Data Reporting Period	Report every hour	1. The calculation of an hour of data is dependent on the design of the method. 2. *A 24-hour period is calculated in AQS if 18 or more valid hours are reported for a day* [1/].	See operator's manual. Hourly data are always reported as the start of the hour on local standard time 40 CFR Part 50 App N. Sec 3 (c)
Sampling Instrument			

1) Criteria (T640x)	2) Frequency	3) Acceptable Range	Information /Action
PM10 Inlet	At Setup	**Must be a Louvered PM10 size selective inlet as specified in 40 CFR 50 appendix L, Figures L-2 through L-19**	1) FEM: EQPM-0516-238/239 2) EPA T640x SOP 3) FEM: EQPM-0516-238/239
Average Flow Rate	*every 24 hours of operation; alternatively, each hour can be checked*	*average within ±5% of 16.67 liters/minute at local conditions*	1, 2 and 3) 40 CFR Part 50 App L Sec. 7.4.3.1
Variability in Flow Rate	*every 24 hours of op*	*CV ≤ 2%*	1, 2 and 3) 40 CFR Part 50, App L Sec. 7.4.3.2
One-point Flow Rate Verification (Total Flow)	*every 30 days each separated by 14 days*	*< ± 4.1% of transfer standard* < ± 5.1% of flow rate design value	1, 2 and 3) 40 CFR Part 50, App.L, Sec. 9.2.5, 40 CFR Part 58, Appendix A Sec. 3.2.1
One-point Flow Rate Verification (Sample Flow)	*every 30 days each separated by 14 days*	*< ± 4.1% of transfer standard*	1, 2 and 3) 40 CFR Part 50, App.L, Sec. 9.2.5, 40 CFR Part 58, Appendix A Sec. 3.2.1
PMT verification	every 90 days	≤ ± 1.5 of SpanDust™ value stated on bottle	1) Teledyne T640 manual 2) EPA T640x SOP 3) To meet DQO set forth in 40 CFR Part 58, Appendix A Sec. 2.3.1.1
OPERATIONAL CRITERIA- T640x Continuous, Local Conditions ($PM_{2.5}$) and STP (PM_{10})			
One-point Temp Verification	every 30 days	*< ± 2.1°C*	1) Teledyne T640 manual 2) EPA T640x SOP 3) Teledyne T640 manual
Pressure Verification	every 30 days	*< ± 10.1 mm Hg*	1) Teledyne T640 manual 2) EPA T640x SOP 3) Teledyne T640 manual
Leak Check (Zero Test)	every 30 days	*≤ 0.2 µg/m³*	1) Teledyne T640 manual 2) EPA T640x SOP 3) Teledyne T640 manual
Span Deviation Tracker	Daily	If flagged	1, 2 and 3) Recommended. Teledyne representatives suggest monitoring this metric as a leading indicator of potential instrument malfunction.
Signal Length	Daily	Logged	1, 2 and 3) Recommended. Teledyne representatives suggest monitoring this metric because it is useful when diagnosing instrument malfunction.
Annual Multi-point Verifications/Calibrations			
Pressure Verification/Calibration	on installation, then every 365 days and 1/ calendar year	*< ± 10.1 mm Hg*	1) Teledyne T640 manual 2) Method 2.12 Sec. 6.5 3) Teledyne T640 manual

1) Criteria (T640x)	2) Frequency	3) Acceptable Range	Information /Action
Flow Rate single-point Verification/ Calibration	*Electromechanical maintenance or transport or* every 365 days and 1/calendar year	< ± 2.1% of transfer standard	1) 40 CFR Part 50, App.L, Sec. 9.2. 2) 40 CFR Part 50, App.L, Sec. 9.1.3, Method 2.12 Sec. 6.3 & Table 6-1 3) Recommendation
Precision			
Collocated Samples	*every 12 days for 15% of sites by method designation*	CV < 10.1% of samples ≥ 3 µg/m^3	1) and 2) 40 CFR Part 58 App A Sec. 3.2.3 3 Recommendation based on DQO in 40 CFR Part 58 App A Sec. 2.3.1.1
Accuracy			
Temperature Audit	every 180 days and at time of flow rate audit	< ± 2.1°C	1, 2 and 3) Method 2.12 Sec. 11.2.2
Pressure Audit	every 180 days and at time of flow rate audit	< ±10.1 mm Hg	1, 2 and 3) Method 2.12 Sec. 11.2.3
Semi Annual Flow Rate Audit (Total Flow)	*Twice a calendar year and 5-7 months apart*	< ± 4.1% of audit standard < ± 5.1% of design flow rate	1 and 2) 40 CFR Part 58, App A, Sec. 3.2.2 3) Method 2.12 Sec. 11.2.1
Semi Annual Flow Rate Audit (Sample Flow)	*Twice a calendar year and 5-7 months apart*	< ± 4.1% of audit standard	1 and 2) 40 CFR Part 58, App A, Sec. 3.2.2 3) Method 2.12 Sec. 11.2.1
Shelter Temperature			
Temperature range	during operation	**0 - 50°C**	1) Teledyne T640 manual 2) Recommendation 3) Teledyne T640 manual
Temperature Control [3]	Daily (hourly values)	< 2.1° C SD over 24 hours	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2
Temperature Device Check	every 180 days and twice a calendar year	< ± 2.1° C	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2
Monitor Maintenance			
Inlet Cleaning	*every 30 days*	*cleaned*	1,2 and 3) Teledyne T640 manual
Downtube Cleaning	every 90 days	cleaned	1) Teledyne T640 manual 2 and 3) Method 2.12 Sec. 8.4
Inspect and clean optical chamber and relative humidity/temperature (RH/T) sensors	every 180 days and twice a calendar year. More frequently with high loading	cleaned	1) Teledyne T640 manual 2) EPA T640x SOP 3) EPA T640x SOP
Change Disposable Filter Unit	Annually or when Pump PWM value approaches 80%.	cleaned/changed	1) Teledyne T640 manual 2) EPA T640x SOP 3) EPA T640x SOP
Inspect Downtube and ASC to ensure vertically plumbed	every 90 days	*Plumb (90° from instrument horizontal axis)*	1) Teledyne T640 manual 2) Recommendation 3) Teledyne T640 manual
Check Pump Performance (Pump)	every 30 days	*PWM value 30 < 80%*	1) Teledyne T640 manual 2) EPA T640x SOP 3) Teledyne T640 manual

1) Criteria (T640x)	2) Frequency	3) Acceptable Range	Information /Action
Check Pump Performance (Valve)	every 30 days	*PWM value 50 < 85%*	1) Teledyne T640 manual 2) EPA T640x SOP 3) Teledyne T640 manual
Inspect inner and outer sample tubes	*every 30 days*	*Inspected* *Cleaned as needed*	1,2 and 3) Teledyne T640 manual
Manufacturer-Recommended Maintenance	per manufacturers' manual	per manufacturers' manual	
SYSTEMATIC CRITERIA- T640x Continuous, Local Conditions ($PM_{2.5}$) and STP (PM_{10})			
Siting	every 365 days and once a calendar year	*Meets siting criteria or waiver documented*	1) 40 CFR Part 58 App E, Sec. 2-6 2) Recommendation 3) 40 CFR Part 58 App E, Sec. 2-6
Data Completeness	*Annual Standard*	*≥ 75% scheduled sampling days in each quarter*	1, 2 and 3) 40 CFR Part 50, App. N, Sec. 4.1 (a)(b)
	24- Hour Standard	*≥ 75% scheduled sampling days in each quarter*	1, 2 and 3) 40 CFR Part 50, App. N, Sec. 4.2 (a)(b)
Reporting Units	*all data*	*µg/m³ at ambient temp/pressure ($PM_{2.5}$)* *µg/m3 at STP (PM_{10})*	1. 2 and 3) 40 CFR Part 50 App N Sec. 3.0 (b), 40 CFR Part 50 App K
Rounding convention for data reported to AQS	*all concentrations*	*to one decimal place or as reported by instrument*	1. 2 and 3) 40 CFR Part 50 App N Sec. 3.0 (b)
Annual 3-yr average	*all concentrations*	*nearest 0.1 µg/m³* (≥ 0.05 round up)	1,2 and 3) 40 CFR Part 50, App. N Sec. 3 and 4 Rounding convention for data reported to AQS is a recommendation
24-hour, 3-year average	*all concentrations ($PM_{2.5}$)* *quarterly (PM_{10})*	*nearest 1 µg/m³* (≥ 0.5 round up) *($PM_{2.5}$)* *nearest 10 µg/m3 (> 5 round up) (PM_{10})*	1,2 and 3) 40 CFR Part 50, App. N Sec. 3 and 4 Rounding convention for data reported to AQS is a recommendation, 40 CFR Part 50 App K Sec. 1 The rounding convention for comparison to NAAQS not for reporting individual values.
Verification/Calibration Standards Recertifications - All standards should have multi-point certifications against NIST Traceable standards			
Flow Rate Transfer Std.	every 365 days and once a calendar year	*< ± 2.1% of NIST Traceable Std.*	1) 40 CFR Part 50, App.L Sec. 9.1 & 9.2 2) Method 2.12 Sec. 4.2.3 & 6.3.3 3) 40 CFR Part 50, App.L Sec. 9.1 & 9.2
Field Thermometer	every 365 days and once a calendar year	± 0.1° C resolution, ± 0.5° C accuracy	1, 2 and 3) Method 2.12 Sec. 4.2.2
Field Barometer	every 365 days and once a calendar year	± 1 mm Hg resolution, ± 5 mm Hg accuracy	1, 2 and 3) Method 2.12 Sec. 4.2.2
Clock/timer Verification	Every 30 days	±5 min/mo**	1 and 2) Method 2.12 Sec. 4.2.1 3) Recommendation
Precision($PM_{2.5}$)			
Single analyzer (collocated monitors)	every 90 days	Coefficient of variation (CV) < 10.1% for values ≥ 3.0 µg/m³	1,2 and 3) Recommendation in order to provide early (quarterly) evaluation of achievement of DQOs.
Primary Quality Assurance Org.	*Annual and 3-year estimates*	*90% CL of CV < 10.1 % for values ≥ 3.0 µg/m³*	1,2 and 3) 40 CFR Part 58, App A, Sec. 4.2.1 and 2.3.1.1

1) Criteria (T640x)	2) Frequency	3) Acceptable Range	Information /Action
Bias			
Performance Evaluation Program (PEP)	*5 audits for PQAOs with < 5 sites* *8 audits for PQAOs with > 5 sites*	*< ±10.1% for values ≥ 3 µg/m³*	1,2 and 3) 40 CFR Part 58, App A, Sec. 3.2.4, 4.2.5 and 2.3.1.1

SD= standard deviation , CV= coefficient of variation

** = need to ensure data system stamps appropriate time period with reported sample value

[3]Temperature Control. The Florida PQAO will operate the T640X in accordance with the associated Teledyne T640/T640X manual per the EPA Federal Designation Numbers EQPM-0516-238 (16.7 LPM Model T640 with 640X option monitor ($PM_{2.5}$)) and EQPM-0516-239 (16.7 LPM Model T640 with 640X option monitor (PM_{10})). In accordance with the EPA OAQPS Technical Note – Clarifications and Guidance on Shelter Temperature Guidance for Ambient Air Pollutant Methods (dated March 8, 2018) (see Appendix E of this document) and the associated Teledyne T640/T640X manual, the approved federal equivalent method (FEM) designation allows these monitors to be operated at a temperature range of 0-50ºC, with no regard to the standard deviation (SD). Though Section 7.2.2 of EPA's QA Handbook Volume II (dated January 2017) suggests that shelters be maintained within a standard deviation of ≤ +2ºC over a 24-hour period, based on a review of actual data, this is not reasonable for those T640/T640X instruments being housed in the "doghouse shelters" within the Florida PQAO.

Table 5-8 Continuous PM_{10} STP Conditions Validation Template

1) Criteria (PM_{10} Cont)	2) Frequency	3) Acceptable Range	Information /Action
CRITICAL CRITERIA- PM_{10} Continuous			
Sampler/Monitor	NA	*Meets requirements listed in FRM/FEM/ARM designation*	1) 40 CFR Part 58 App C Sec. 2.1 2) NA 3) 40 CFR Part 53 & FRM/FEM method list
Sampling Period	**all filters**	**1440 minutes ± 60 minutes midnight to midnight local standard time**	1, 2 and 3) 40 CFR Part 50 App J Sec. 7.1.5
Average Flow Rate	every 24 hours of op	Average within < ± 5.1% of design	recommendation
Verification/Calibration			
One-point Flow Rate Verification	*every 30 days each seperated by 14 days*	< ± 7.1% of transfer standard	1 and 2) 40 CFR Part 58, App A, Sec. 3.3 3) Method 2.10 Table 3-1
OPERATIONAL EVALUATIONS TABLE PM_{10} Continuous			
Verification/Calibration			
System Leak Check	During precalibration check	Auditory inspection with faceplate blocked	1, 2 and 3) Method 2.11 Sec. 2.3.2
FR Multi-point Verification/Calibration	every 365 days and once a calendar year	3 of 4 cal points within < ± 10.1% of design	1) 40 CFR Part 50 App J Sec. 8.0 2 and 3) Method 2.10 Sec. 2.2.4
Audits			
Semi Annual Flow Rate Audit	*Twice a calendar year and 5-7 months apart*	< ± 10.1% of audit standard	1, 2) Part 58, App A, Sec. 3.3.3 3) Method 2.10 Sec. 7.1.5
Monitor Maintenance			
Inlet/downtube Cleaning	every 90 days and 4 times a calendar year	cleaned	1, 2 and 3) Method 2.10 Sec. 6.1.2
Manufacturer-Recommended Maintenance	per manufacturers' SOP	per manufacturers' SOP	
SYSTEMATIC CRITERIA - PM_{10} Continuous			
Siting	Every 365 days and 1/ calendar year	*Meets siting criteria or waiver documented*	1) 40 CFR Part 58 App E, Sections 2-5 2) Recommendation 3) 40 CFR Part 58 App E, Sections 2-5
Data Completeness	24-hour quarterly	≥ 75%	1, 2 and 3) 40 CFR Part 50 App. K, Sec. 2.3b & c

1) Criteria (PM_{10} Cont)	2) Frequency	3) Acceptable Range	Information /Action
Reporting Units	all filters	$\mu g/m^3$ at standard temperature and pressure (STP)	40 CFR Part 50 App K
Rounding convention for design value calculation			
24-hour, 3-year average	*quarterly*	*nearest 10 $\mu g/m^3$ ($\geq$ 5 round up)*	1, 2 and 3) 40 CFR Part 50 App K Sec. 1 The rounding convention is for averaging values for comparison to NAAQS not for reporting individual values.
Verification/Calibration Standards and Recertifications - All standards should have multi-point certifications against NIST Traceable standards			
Flow Rate Transfer Std.	every 365 days and once a calendar year	*< $\pm$ 2.1% of NIST-traceable Std.*	1) 40 CFR Part 50, App.J Sec. 7.3 2) Method 2.11 Sec. 1.1.3 3) 40 CFR Part 50, App.J Sec. 7.3
Field Thermometer	every 365 days and once a calendar year	$\pm$ 0.1° C resolution, $\pm$ 0.1° C accuracy	1, 2 and 3) Method 2.10 Sec. 1.1.2
Field Barometer	every 365 days and once a calendar year	$\pm$ 1 mm Hg resolution, $\pm$ 5 mm Hg accuracy	1, 2 and 3) Method 2.10 Sec. 1.1.2
Clock/timer Verification	every 180 days and twice a calendar year	*15 min/day*	1) 40 CFR Part 50, App.J Sec. 7.1.5 2) Recommendation 3) 40 CFR Part 50, App.J Sec. 7.1.5

Table 5-9. PM_{10c} for $PM_{10-2.5}$ Low-Volume, Filter-based Local Conditions Validation Template

NOTE: The following validation template was constructed for use of PM_{10} at local conditions where PM_{10c} is used in the calculation of the $PM_{10-2.5}$ measurement or for objectives other than comparison to the PM_{10} NAAQS. Although the $PM_{10-2.5}$ method is found in 40 CFR Part 50 Appendix O, Appendix O references Appendix L (the $PM_{2.5}$ Method) for the QC requirements listed below. Therefore, the information action column, in most cases, will reference 40 CFR Part 50 App L. Monitoring organizations using PM_{10} data for a NAAQS comparison purposes should refer to the PM_{10} validation template for STP (standard temperature and pressure correction). In addition, since the samplers are very similar to the $PM_{2.5}$ samplers, Guidance Document 2.12 Monitoring $PM_{2.5}$ in Ambient Air Using Designated Reference or Class 1 Equivalent Methods is referred to where appropriate.

1) Criteria (PM10c)	2) Frequency	3) Acceptable Range	Information /Action
CRITICAL CRITERIA- PM10c Filter Based Local Conditions			
Field Activities			
Sampler/Monitor	NA	*Meets requirements listed in FRM/FEM/ARM designation*	1) 40 CFR Part 58 App C Sec. 2.1 2) NA 3) 40 CFR Part 53 & FRM/FEM method list
Filter Holding Times			
Pre-sampling	*all filters*	*≤ 30 days before sampling*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.3.5
Sample Recovery	*all filters*	*≤7 days 9 hours from sample end date*	1, 2 and 3) 40 CFR Part 50 App L Sec. 10.10
Sampling Period (including multiple power failures) **Sampling Instrument**	*all filters*	*1380-1500 minutes, or value if < 1380 and exceedance of NAAQS 1/ midnight to midnight local standard time*	1, 2 and 3) 40 CFR Part 50 App L Sec. 3.3 See details if less than 1380 min sampled
Average Flow Rate	*every 24 hours of op*	*average within 5% of 16.67 liters/minute*	1, 2 and 3) Part 50 App L Sec. 7.4.3.1
Variability in Flow Rate	*every 24 hours of op*	*CV ≤ 2%*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 7.4.3.2
One-point Flow Rate Verification	*every 30 days each seperated by 14 days*	*± 4% of transfer standard* ± 5% of flow rate design value	1, 2 and 3) 40 CFR Part 50, App. L, Sec. 9.2.5, 40 CFR Part 58 App A Sec. 3.3.1
Design Flow Rate Adjustment	*After multi-point calibration or verification*	*< ± 2.1% of design flow rate*	1, 2 and 3) 40 CFR Part 50, App. L, Sec. 9.2.6
Individual Flow Rates	*every 24 hours of op*	*no flow rate excursions > ±5% for > 5 min. 1/*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 7.4.3.1
Filter Temp Sensor	*every 24 hours of op*	*no excursions of > 5° C lasting longer than 30 min 1/*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 7.4.11.4
External Leak Check	*Before each flow rate verification/calibration* and before and after $PM_{2.5}$ separator maintenance	*< 80.1 mL/min* (see comment #1)	1) 40 CFR Part 50 App L, Sec. 7.4.6.1 2) 40 CFR Part 50 App L Sec.t 9.2.3 and Method 2-12 Sec. 7.4.3 3) 40 CFR Part 50, App. L, Sec. 7.4.6.1

1) Criteria (PM10c)	2) Frequency	3) Acceptable Range	Information /Action
Internal Leak Check	If failure of external leak check	*< 80.1 mL/min*	1) 40 CFR Part 50, App. L, Sec. 7.4.6.2 2) Method 2-12, Sec. 7.4.4 3) 40 CFR Part 50, App. L, Sec. 7.4.6.2
Laboratory Activities			
Post-sampling Weighing	*all filters*	*Protected from exposure to temperatures above 25C from sample retrieval to conditioning* *≤10 days from sample end date if shipped at ambient temp, or* *≤30 days if shipped below avg ambient (or 4° C or below for avg sampling temps < 4° C) from sample end date*	1, 2 and 3) 40 CFR Part 50 App L Sec. 8.3.6
Filter Visual Defect Check (unexposed)	*all filters*	*Correct type & size and for pinholes, particles or imperfections*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 10.2
Filter Conditioning Environment *Equilibration*	*all filters*	*24 hours minimum*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.5
Temp. Range	*all filters*	*24-hr mean 20.0-23.0° C*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.1
Temp.Control	*all filters*	*< 2.1° C SD* over 24 hr*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.2 SD use is a recommendation
Humidity Range	*all filters*	*24-hr mean 30.0% - 40.0% RH or within ±5.0% sampling RH but > 20.0%RH*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.3
Humidity Control	*all filters*	*< 5.1% SD* over 24 hr.*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.4 SD use is recommendation
Pre/post Sampling RH	*all filters*	*difference in 24-hr means ≤ ± 5.1% RH*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.3.3
Balance	*all filters*	*located in filter conditioning environment*	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.3.2
OPERATIONAL EVALUATIONS TABLE- PM10c Filter Based Local Conditions			
Field Activities			
Sampling Instrument			
Routine Verifications *One-point Temp Verification*	every 30 days	≤ ± 2.1°C	1) 40 CFR Part 50, App. L, Sec. 9.3 2) Method 2.12 Sec. 7.4.5 and Table 6-1 3) Recommendation
Pressure Verification	every 30 days	≤ ± 10.1 mm Hg	1) 40 CFR Part 50, App. L, Sec. 9.3 2) Method 2.12 Sec. 7.4.6 and Table 6-1 3) Recommendation
Annual Multi-point Verifications/Calibrations *Temperature multi-point Verification/Calibration*	on installation, then every 365 days and once a calendar year	≤ ± 2.1°C	1) 40 CFR Part 50, App. L, Sec. 9.3 2 and 3) Method 2.12 Sec. 6.4.4 Table 6-1

1) Criteria (PM10c)	2) Frequency	3) Acceptable Range	Information /Action
Pressure Verification/Calibration	on installation, then every 365 days and once a calendar year	≤± 10.1 mm Hg	1) 40 CFR Part 50, App. L, Sec. 9.3 2 and 3) Method 2.12 Sec. 6.5 Sampler BP verified against independent standard verified against a lab primary standard that is certified as NIST traceable 1/year
Flow Rate Multi-point Verification/ Calibration	*Electromechanical maintenance or transport or* every 365 days and once a calendar year	≤± 2.1% of transfer standard	1) 40 CFR Part 50, App. L, Sec. 9.2. 2) 40 CFR Part 50, App. L, Sec. 9.1.3, Method 2.12 Sec. 6.3 & Table 6-1 3) Recommendation
Other Monitor Calibrations	per manufacturers' op manual	per manufacturers' operating manual	1, 2 and 3) Recommendation
Precision			
Collocated Samples	*every 12 days for 15% of sites by method designation*	CV < 10.1% of samples ≥ 3.0 µg/m^3	1) and 2) Part 58 App A Sec. 3.2.3 3 Recommendation based on DQO in 40 CFR Part 58 App A Sec. 2.3.1.1
Accuracy Temperature Audit	every 180 days and at time of flow rate audit	≤± 2.1°C	1, 2 and 3) Method 2.12 Sec. 11.2.2
Pressure Audit	every 180 days and at time of flow rate audit	≤±10.1 mm Hg	1, 2 and 3) Method 2.12 Sec. 11.2.3
Semi Annual Flow Rate Audit	*Twice a calendar year and 5-7 months apart*	≤± 4.1% of audit standard ≤± 5.1% of design flow rate	1 and 2) Part 58, App A, Sec. 3.2.2 3) Method 2.12 Sec. 11.2.1
Monitor Maintenance $PM_{2.5}$ Separator (WINs)	every 5 sampling events	cleaned/changed	1, 2 and 3) Method 2.12 Sec. 8.2.2
$PM_{2.5}$ Separator (VSCC)	every 30 days	cleaned/changed	1, 2 and 3) Method 2.12 Sec. 8.3.3
Inlet Cleaning Downtube Cleaning	every 30 days every 90 days	cleaned cleaned	1, 2 and 3) Method 2.12 Sec. 8.3 1, 2 and 3) Method 2.12 Sec. 8.4
Filter Housing Assembly Cleaning	every 30 days	cleaned	1, 2 and 3) Method 2.12 Sec. 8.3
Circulating Fan Filter Cleaning Manufacturer-Recommended Maintenance	every 30 days per manufacturers' SOP	cleaned/changed per manufacturers' SOP	1, 2 and 3) Method 2.12 Sec. 8.3
Laboratory Activities			
Filter Checks			
Lot Blanks	9 filters per lot	≤±15.1 µg change between weighings	1, 2, 3) Recommendation and used to determine filter stability of the lot of filters received from EPA or vendor. Method 2.12 Sec. 10.5
Exposure Lot Blanks	3 filters per lot	≤±15.1 µg change between weighings	1, 2 and 3) Method 2.12 Sec. 10.5 Used for preparing a subset of filters for equilibration
Filter Integrity (exposed)	each filter	no visual defects	1, 2 and 3) Method 2.12 Sec. 10.7 and 10.3
Lab QC Checks			

1) Criteria (PM10c)	2) Frequency	3) Acceptable Range	Information /Action
Field Filter Blank	10% or 1 per weighing session	<± 30.1 µg change between weighings	1) 40 CFR Part 50, App. L Sec. 8.3.7.1 2 and 3) Method 2.12 Table 7-1 & Sec.10.5
Lab Filter Blank	10% or 1 per weighing session	<± 15.1 µg change between weighings	1) 40 CFR Part 50, App. L Sec. 8.3.7.2 2 and 3) Method 2.12 Sec. 10.5
Balance Check (working standards)	beginning, 10th sample, end	<±3.1 µg from certified value	1, 2 and 3) Method 2.12 Sec. 10.6 Standards used should meet specifications in Method 2.12, Sec. 4.3.7
Routine Filter re-weighing	1 per weighing session	<± 15.1 µg change between weighings	1, 2 and 3) Method 2.12 Sec. 10.8
Microbalance Audit	every 365 days and once a calendar year	<± 0.003 mg or manufacturers specs, whichever is tighter	1, 2 and 3) Method 2.12 Sec. 11.2.7
Lab Temp Check Lab Humidity Check	Every 90 days Every 90 days	<± 2.1°C <± 2.1%	1, 2 and 3) Method 2.12 Sec. 10.10 1, 2 and 3) Method 2.12 Sec. 10.10
Verification/Calibration			
Microbalance Calibration	*At installation* every 365 days and once a calendar year	Manufacturer's specification	1) 40 CFR Part 50, App. L, Sec. 8.1 2) 40 CFR Part 50, App. L, Sec. 8.1 and Method 2.12 Sec. 10.11 3) NA
Lab Temperature Certification	every 365 days and once a year	<± 2.1°C	1, 2 and 3) Method 2.12 Sec. 4.3.8 and 9.4
Lab Humidity Certification	every 365 days and once a year	<± 2.1%	1, 2 and 3) Method 2.12 Sec. 4.3.8 and 9.4
Calibration & Check Standards - Working Mass Stds. Verification Compared to primary standards	Every 90 days	<± 2.1 ug	1, 2 and 3) Method 2.12 Sec. 9.7
Primary standards certification	every 365 days and once a calendar year	0.025 mg tolerance (Class 2)	1, 2 and 3) Method 2.12 Sec. 4.3.7
SYSTEMATIC CRITERIA - PM10c Filter Based Local Conditions			
Siting	Every 365 days and 1/ calendar year	*Meets siting criteria or waiver documented*	1) 40 CFR Part 58 App E, Sec. 2-5 2) Recommendation 3) 40 CFR Part 58 App E, Sec. 2-5
Data Completeness	NA	≥ 75% scheduled sampling days in each quarter	1, 2 and 3) Recommendation based on PM2.5 requirements in 40 CFR Part 50, App. N, Sec. 4.1 (b) 4.2 (a)
Reporting Units	*all filters*	*µg/m^3 at ambient temp/pressure ($PM_{2.5}$)*	1, 2 and 3) 40 CFR Part 50 App N
Rounding convention for design value calculation	*all filters*	*to one decimal place, with additional digits to the right being truncated*	1, 2 and 3) 40 CFR Part 50 App N Sec. 3.0 (b) The rounding convention is for averaging values for comparison to NAAQS not for reporting individual values.
Lower DL	*all filters*	*≤ 3 µg/m^3*	1, 2 and 3) 40 CFR Part 50, App O Sec. 3.1
Upper Conc. Limit	*all filters*	*≥200 µg/m^3*	1, 2 and 3) 40 CFR Part 50, App O Sec. 3.2

1) Criteria (PM10c)	2) Frequency	3) Acceptable Range	Information /Action
Precision			
Single analyzer (collocated monitors)	every 90 days and 4 times a calendar year.	Coefficient of variation (CV) < 10.1% for values ≥ 3 µg/m^3	1, 2 and 3) Recommendation in order to provide early evaluation of achievement of DQOs.
Primary Quality Assurance Org.	*Annual and 3 year estimates*	*90% CL of CV < 10.1% for values ≥ 3 µg/m^3*	1, 2 and 3) Recommendation in order to provide early evaluation of achievement of DQOs.
Bias Performance Evaluation Program (PEP)	Once every 6-7 years	*< ±10.1% for values ≥ 3 µg/m^3*	1, 2 and 3) Recommendation based on pending guidance.
Field Activities			
Verification/Calibration Standards Recertifications – All standards should have multi-point certifications against NIST Traceable standards			
Flow Rate Transfer Std.	every 365 days and once a calendar year	*< ± 2.1% of NIST-traceable Std.*	1) 40 CFR Part 50, App. L Sec. 9.1 & 9.2 2) Method 2-12 Sec. 6.3.3 and Table 3-1 3) 40 CFR Part 50, App. L Sec. 9.1 & 9.2
Field Thermometer	every 365 days and once a calendar year	± 0.1° C resolution, ± 0.5° C accuracy	1, 2 and 3) Method 2.12 Sec. 4.2.2
Field Barometer	every 365 days and once a calendar year	± 1 mm Hg resolution, ± 5 mm Hg accuracy	1, 2 and 3) Method 2.12 Sec. 4.2.2
Verification/Calibration Clock/timer Verification	every 30 days	*1 min/mo*	1 and 2) Method 2.12 Sec 4.2.1 3) 40 CFR Part 50, App. L, Sec. 7.4.12
Laboratory Activities			
Microbalance Readability	*at purchase*	*1 µg*	1, 2 and 3) 40 CFR Part 50, App. L, Sec. 8.1
Microbalance Repeatability	at purchase	1 µg	1) Method 2.12 Sec. 4.3.6 2) Recommendation 3) Method 2.12 Sec. 4.3.6
Primary Mass. Verification/Calibration Standards	at purchase	0.025 mg tolerance (class 2)	1, 2 and 3) Method 2.12 Sec. 4.3.7
Comment #1 The associated leak test procedure shall require that for successful passage of this test, the difference between the two pressure measurements shall not be greater than the number of mm of Hg specified for the sampler by the manufacturer, based on the actual internal volume of the sampler, that indicates a leak of less than 80 mL/min.			

1/ value must be flagged, SD= standard deviation, CV= coefficient of variation

5.6 Network Scale

Representativeness is defined as a measure of the degree to which data accurately and precisely represent a selected characteristic of a monitored system. Support in achieving representativeness is provided through adhering to the requirements provided in:

- 40 CFR Part 58, Appendix D (Network Design for State and Local Air Monitoring Stations [SLAMS], National Core Monitoring Stations [N-Core]; and
- 40 CFR Part 58, Appendix E (Probe and Monitoring Path Siting Criteria for Ambient Air Quality Monitoring).

Each monitor operated is assigned a scale of representativeness based on the definitions of 40 CFR Part 58, Appendix D. See the State of Florida Ambient Air Monitoring Annual Network Plan located on Florida DEP's website: 2022 Ambient Air Monitoring Network Plan | Florida Department of Environmental Protection. Florida's particulate matter ambient monitoring network utilizes the following spatial scales:

- ***Microscale*** - describes the concentrations in air volumes associated with area dimensions ranging from several meters up to about 100 meters (m).
- ***Middle Scale*** - describes the concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 to 500 meters.
- ***Neighborhood Scale*** - describes concentrations within some extended area of the city that has relatively uniform land use with dimensions in the range of 500 to 4000 meters.
- ***Urban Scale*** - describes concentrations within an area of city-like dimensions, on the order of 4000 to 50,000 meters. This scale will usually require more than one site to represent air quality on an urban scale.

6.0 TRAINING REQUIREMENTS

Adequate education and training are essential to any monitoring program that strives for reliable and comparable data. Personnel within the PQAO will meet the educational requirements, accountability standards, and training requirements for their positions. All staff are required to take specific, mandatory governmental training courses, such as safety training, operation of government vehicles, and EEO courses, among others. Records on personnel qualifications and training may be maintained in several locations, dependent upon the applicability of the information. For example, staff may maintain copies of certificates received from classes or workshops, whereas the Florida DEP and Local Program Administrators/Managers will keep records of personnel qualifications and in-house training. Other personnel training and qualification records are maintained by each programs' human resources departments.

Ambient air monitoring training is aimed at increasing the effectiveness of employees as well as the effectiveness of the PQAO as a whole. In general, training for the ambient air monitoring program consists of a combination of required reading, monthly air monitoring meetings, active cross-training amongst staff, completion of EPA-lead training classes (when available), and attendance at Florida DEP and/or EPA workshops and conferences. Observations made during internal systems audits may result in the need for specific refresher training to be provided to PQAO staff. Completion of additional training – such as self-instructional air monitoring courses (e.g., online APTI) and EPA-provided webinars (e.g., AQS) – is encouraged by all staff.

A large component of Florida's air monitoring training program is centered around equipment and quality assurance cross-training, to build and ensure staff redundancy. Training occurs when back-up roles are needed to maintain coverage for a site or QA procedure. With that in mind, individuals within each program are assigned as "back-ups" for various roles. For example, within Florida DEP, the Quality Assurance Analyst is the back-up for the QAM, and members of the Maintenance, Repair and Acquisition Support Team sometimes act as back-up field technicians. Within the local programs, similar back-up roles are also assigned to monitoring personnel in order to ensure redundancy in staff and to prevent downtime or significant data loss associated with absence or turnover.

The following describes the base-training that is required for Florida's air monitoring staff.

Quality Assurance - The foundation of the ambient air monitoring program is an understanding of basic quality assurance and the overall ambient air monitoring program goals. To achieve this understanding, the following activities are required:

- Reading and understanding the monitoring-specific SOPs associated with the equipment for which the trainee is responsible for validating ambient data. Staff will sign and date their training plans, upon completion.
- Reading and understanding the PQAO QAPPs for Ambient Air Quality Monitoring of Criteria Air Pollutants.

- All staff are required to read this QAPP and sign and date their training plans upon revision/completion.
- Reading and understanding the EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II (QA Handbook).
- All staff are required to read the sections of the QA Handbook that clearly address duties they perform for the PQAO. These sections will be identified by the Florida DEP and Local Program Managers. Additionally, staff will sign and date their training plans, upon completion.
- Participation in monthly air monitoring meetings to stay current with PQAO policies, procedures, and guidance.
- The monthly PQAO air monitoring meetings are typically held via teleconferencing on the first Tuesday of each month. These meetings serve as a knowledge-sharing tool to expose staff to new policies and regulations; to modifications within the PQAO; and to provide clarification/explanation of an existing policy or procedure. The agendas vary each meeting but may include any of the following topics: quality assurance, instrument maintenance and troubleshooting, operational procedures, and SOP form revisions.

Equipment / Monitor-Specific Procedural Training - The vast majority of work in the ambient air quality monitoring program involves operation, maintenance, and troubleshooting of equipment. Staff need to be trained on the procedures involved for proper installation of equipment, daily operation, required QA/QC check procedures, preventative maintenance, and troubleshooting. Proper understanding and implementation of this QAPP requires the following specific training regimen for field technicians:

- Reading and understanding the monitoring-specific SOPs associated with the equipment for which the trainee is responsible for operating. Staff will sign and date their training plans, upon completion.
- General and background knowledge of installation, operation, and maintenance of specific equipment.
- Reading and understanding the manufacturer's operating manuals and guides and attending vendor-offered formal training sessions, when available.
- Completion of "on-the-job training," which includes learning an instrument hands-on through collaboration with a senior air monitoring staff member.
- The trainee will operate the instrument until deemed proficient by the training staff member and the Field Operations Administrator/Local Program Manager. Close attention is paid to the typical operation of the equipment and the understanding of data flow from the analyzer to PQAO data management system. If any abnormalities occur, the trainees are always to notify the Field Operations Administrator/Local Program Manager.
- It is recommended that the trainee attends Florida DEP's annual Field Technician Hands-On training.
- The trainee will also be required to complete a Field Proficiency test, which covers "big picture" air monitoring items as well as instrument specific questions related to equipment.

- Applicable health and safety training conducted within the Florida DEP and Local Programs for operating new equipment.

Data Review and Validation - Data can be considered the true work product of the ambient air quality monitoring program. Accordingly, thorough attention must be given to review, verification, and validation to ensure data is accurate and reliable. Staff must completely understand the importance of following defensible procedures by reading and understanding this QAPP and the PQAO Data Handling and Data Validation SOP. Like with equipment training, on-the-job training is the primary means by which staff members learn to review and validate data in accordance with PQAO procedures. The QA training and required reading described above also assists in ensuring staff understand the fundamentals of data review. Supplemental training such as the Florida DEP's Quality Assurance Hands-On training (which focuses primarily on data review), is offered annually or on an as needed basis; for example, the QAM provides hands-on QA/data review training to staff upon request from a Program Administrator or Manager. Additionally, results from quality assurance systems audits or data quality audits (as discussed in Section 18 of this QAPP, performed by Florida DEP) may highlight a need for additional field or QA training, which would be provided for a designated period of time.

$PM_{2.5}$ Laboratory Training – The work in the $PM_{2.5}$ gravimetric laboratory requires that staff are knowledgeable of not only the method, but the operational aspects of the method and the quality assurance procedures and guidance to ensure that the DQOs are reliably achieved for the $PM_{2.5}$ monitoring. Staff must first successfully perform an Initial Demonstration of Competency (IDOC) and then an Annual Proficiency Evaluation thereafter. It is imperative that the staff be part of a continuing education and training program to ensure that their skills and knowledge stay up-to-date. As indicated, some of the training items listed below are required, while some are recommended. Training documentation is archived in the Florida DEP network folder.

- Method IDOC (required for $PM_{2.5}$ Gravimetric Laboratory Specialists) - Demonstrate the ability to operate the microbalances and anti-static devices. This involves taking multiple measurements of standard weights and filters. The acceptance criteria for the measurements are established by the method. The IDOC also includes demonstration of the ability to handle sample filters within the laboratory workflow, to perform calibration and verification procedures, to assess and document lab activities and environmental conditions, and to maintain a clean working environment.
- The Annual Proficiency Evaluation (required for $PM_{2.5}$ Gravimetric Laboratory Specialists) - Demonstration of a $PM_{2.5}$ Gravimetric Laboratory Specialist's ongoing capability. If the specialist has participated in regular lab activities including weigh sessions at least once per quarter, they are considered proficient; otherwise, the specialist should complete another IDOC before returning to regular lab activities.
- QAPP/SOP Training
    - $PM_{2.5}$ Laboratory SOP (required)
    - DEP 03-14, Cooler Shipping (required)
    - DEP 03-8 (2025) and DEP 03-15 (2025i) Field Sampler SOPs (recommended)

  - DEP 18-27 Data Handling and Data Validation SOP (recommended)
  - This QAPP (recommended)
- Laboratory Training (required)
  - Quality Assurance Guidance Document 2.12 Monitoring $PM_{2.5}$ in Ambient Air Using Designated Reference or Class I Equivalent Methods, January 2016
- Regulatory Training
  - 40 CFR Part 50 Appendix L (required)
  - 40 CFR Parts 53 & 58 (recommended)
  - Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II: Ambient Air Quality Monitoring Program, EPA-454/B-17-001, January 2017 (required)
- Air Division Training (recommended)
  - Quality Management Plan for the Florida Department of Environmental Protection's Division of Air Resource Management
  - APTI SI-434 Introduction to Air Monitoring
  - APTI SI-434 Quality Assurance for Air Pollution Measurements

7.0 DOCUMENTATION AND RECORDS

This section includes information concerning the management of documentation and records, including this Quality Assurance Project Plan (QAPP). As one PQAO, QAPP and SOP revisions, including changes to forms, must be submitted to Florida DEP for approval prior to use and be sufficiently document controlled. Additionally, SOPs must not conflict with any part of this QAPP or with any other relevant local, state, or federal regulation.

The majority of documentation and records produced by Florida's ambient air monitoring program consist of data and information gathered to support the data collection activities. Documentation and records include:

- Quality Assurance Project Plans (i.e., this QAPP and others supporting the PQAO's ambient monitoring program)
- Standard Operating Procedures (SOPs)
- Logbooks and data collection records in electronic and written format
- Instrument and equipment calibration information
- Quality assurance documentation in electronic and written format
- Documentation that supports data review, validation, and certification activities.

Section 17 of this QAPP contains more detailed information regarding how data will be managed from Florida's monitoring network, including information on data recording, transmittal, storage, and retrieval.

7.1 Statewide Policy and Procedure Documentation

Florida's PQAO maintains records of program policy and procedure documentation. Documents in this category are published with the date and revision information clearly noted, generally in a document header. Documents in this category include:

- Quality Assurance Project Plans (QAPPs – i.e., this document)
- Standard Operating Procedures (SOPs), which contain the electronic QA/QC data forms that must be documented
- Quality Assurance and Technical Notes, which provide air monitoring policy interpretations or best practices.

All of these records/documents are distributed electronically to the PQAO by Florida DEP Administrators and the QAM, and are posted to the statewide air monitoring database, AirMVP. When a document is superseded by a newer version, the replacement document clearly states the effective date of the document. All individuals within the PQAO receive notification that a new version is available and has been posted to AirMVP.

Copies of current program policy and procedure documents are retained in electronic file format (i.e., pdf) in a secured folder on the Florida DEP network, where access is limited to a read-only status to personnel other than the Florida DEP Administrators and the QAM.

When replaced by a newer version, the previous (older) version is moved to a subfolder on the network that is marked for archived documents. In this manner, older versions of the policy/procedure documents are always available, in case procedures from a specific period in the past ever need to be revisited.

7.2 Data Collection Records and Logbooks

Dependent upon whether the sampler is continuous or intermittent/filter-based, data collection and logbooks are captured and recorded in various ways for particulate matter data.

7.2.1 Data Acquisition

Continuous Samplers

The continuous particulate samplers, coupled with the data acquisition system, provide an automated means for collecting information that would otherwise be recorded on data entry forms. However, forms (Excel/PDF/Access format or hardcopy) are also utilized to record and document other pertinent information relative to data collection (i.e. maintenance activities, QA/QC activities documented in Section 7.4, etc.). Field technicians/QA staff verify the continuous particulate matter data collected when reviewing and documenting their electronic strip charts throughout the data collection process. Electronic strip charts are accessed in AirVision/AirMVP and are a graphical representation of the minute data. Field technicians/QA staff also verify and/or update the flags applied to continuous particulate data by the site dataloggers to ensure that they are appropriate. Comments are added as appropriate on the site record and forms and in AirVision/AirMVP.

Intermittent Samplers

For intermittent particulate samplers (i.e., filter-based), field technicians are required to retrieve the filters from the sampler. For $PM_{2.5}$, they also download the associated meta data from the sampler (i.e. a .TXT file format). Forms (Excel/PDF/Access format or hardcopy) are also utilized to record and document other pertinent information relative to data collection (i.e. sampler flags, maintenance activities, QA/QC activities documented in Section 7.4, etc.)

Laboratory data is acquired by the laboratory technicians. These data include environmental conditions (i.e. relative humidity and temperature), weigh data, chain-of-custody documentation, etc. The $PM_{2.5}$ gravimetric laboratory uses WinWedge Balance Command, Microsoft Excel, and a customized Laboratory Information Management System (LIMS)for data acquisition and reporting. The software programs Balance Command and Excel are used for automated data collection from the microbalances. The $PM_{2.5}$ gravimetric laboratory also uses Vaisala Veriteq software to monitor and record the room temperature and humidity. The Vaisala Veriteq data is maintained on a local server, backed up weekly and archived on the network drive and can be reviewed at any time. The digital sensors perform several

functions in the lab environment, including interface with the air condition (AC) system and recording and transmitting temperature/humidity data in the conditioning/weighing lab. The Siemens sensor interface is used to interface with the AC system to regulate the temperature and humidity in the weighing room. The Vaisala sensors interface to the Vaisala Veriteq software. The lab is equipped with multiple Vaisala sensors for backup and verification. Additionally, LIMS automatically flags the data for temperature/humidity control failures. Chain-of-custody records are Excel/PDF format documents. Ultimately, the final $PM_{2.5}$ concentration is a combination of both field data (the downloaded electronic files with associated volumes from the sampler that are uploaded into PMTS) and laboratory data (mass data associated with the filter weigh is uploaded into LIMS) in which the two are joined, so that a final concentration value is calculated and stored in PMTS. And, subsequently uploaded to AirMVP by the Data Validation Team/Local Program QA Coordinators/Staff. Additionally, a $PM_{2.5}$ gravimetric analysis report is released by the $PM_{2.5}$ gravimetric laboratory to each of the agencies within the PQAO with filter mass data.

7.2.2 Logbooks

Each field technician and laboratory specialist will be responsible for obtaining, maintaining and documenting the appropriate field and lab logbooks and associated QA/QC data forms. Logbooks will be used to record information about the site and laboratory operations, as well as document routine operations. QA/QC forms will be used to document the QA/QC activities described in Section 7.4 below. The field logbooks will be made for each sampling site or particulate pollutant. Laboratory logbooks will retain all records pertaining to equipment certifications, performance acceptance testing, calibrations, materials tracking, general comments and notations as well as other pertinent information required for support of the ambient air quality network data integrity activities.

The Florida's Laboratory Information Management System (LIMS) and Particulate Matter Tracking System (PMTS) applications are used as tools to streamline the numerous aspects of the filter-based $PM_{2.5}$ program. These databases are used to store information from when a filter is pre-weighed in the Florida DEP $PM_{2.5}$ Gravimetric Lab, sent to the field technician or local program agency, is taken to the site for sampling, and is shipped back to the lab for post-sampling weighs. All lab and field data associated with a filter are stored in these applications. Additionally, most of the data validation procedures for $PM_{2.5}$ filters are performed within the PMTS application, which are then transferred into the AirMVP database.

Logbooks and QA/QC forms can be either electronic or hardcopy records. Electronic logbooks/forms must contain locked cells, so that formulas cannot be overwritten; be filled out clearly and completely; and dated and signed. Hardcopy logbooks must be legible; filled out completely in ink; and dated and signed. Corrections to these records shall be made either electronically or manually. For electronic logbooks or QA/QC forms, corrections will be made through PDF editor by inserting a single line through the incorrect entry, initialing and

dating with the date the correction was made. The correct information should then be added, via a text box, nearby with the corrected information. For hardcopy logbooks, corrections will be made by crossing out the incorrect entry with a single line, initialing and dating with the date the correction was made. The correct information should then be written beside the incorrect entry, if there is space to legibly do so, or should be written in a space nearby. Hardcopy records are then scanned and stored on the network drive.

7.2.3 Record Retention

The electronic and scanned hardcopy field records are compiled into data packets for each site within the PQAO, which are stored annually on the department's local area network servers, in accordance with the Statewide Data Handling and Data Validation SOP. The electronic laboratory records are stored on the department's local area network servers as well, however, bound logbooks are stored in cabinets within the laboratory. Please refer to Appendix J of the QA Handbook (2017) for further information on the use and document control of electronic logbooks, guidance to which Florida strives to adhere.

Additional information on data collection is detailed in Section 17 of this QAPP. To reduce the potential for data entry errors, automated systems will be used where appropriate and will record the same information that would be recorded on data entry forms. Electronic backup copies of automated data collection information will be stored on the servers, within the local program offices and in Florida DEP's central office.

7.3 Chain-of-Custody Forms

Most continuous ambient air monitoring data is collected via real-time or near real-time monitoring equipment. However, some monitoring – specifically, FRM $PM_{2.5}$ and PM_{10} – involve the collection of a physical sample for analysis by a laboratory. Any samples collected for analysis that are packaged and transported to another location are required to be accompanied with a Chain-of-Custody (COC) Form that includes specific information regarding the sample. This form assists in tracking the integrity of the sample through the various stages of transportation and receipt. While COC forms themselves may vary by laboratory and analyses required, the general content of forms includes:

- Submitter – Individual submitting samples to the laboratory.
- Submission Date(s) – Date(s) the sample transferred into the possession of the new entity.
- Delivery Method – The method that was used to transfer possession of the sample.
- Tracking information on relevant sample conditions, such as minimum or maximum temperatures in the shipping container, or condition of any integrity seals.
- Sample specific information, such as the date the sample was collected and other sample/site identifiers.

Section 10 of this QAPP will provide more information about COC forms. In the Florida's ambient network, COCs are used for $PM_{2.5}$ FRM sampling. The Florida PQAO does not

operate PM_{10} FRM samplers for the purpose of PM_{10} sampling; however, the high-volume PM_{10} samplers are still utilized with quartz filters for metal collection for the National Air Toxics Trend Stations (NATTS) reporting; this is covered in the Florida NATTS QAPP. Refer to the specific PQAO Standard Operating Procedures for further details on COC application and usage. Completed Chain of Custody forms are retained as part of the official analytical record.

7.4 QA/QC Records

Quality assurance and quality control are achieved through the performance of periodic activities such as:

- Technical systems audits (TSAs)
- Quality assurance systems audits
- Verification/calibration procedures
- Maintenance activities
- One-point flow rate verifications
- Semi-annual flow rate audits
- EPA performance audits (i.e. PEP)
- Collocated sampling
- Traceability certifications/calibrations
- Corrective actions

With the exception of the TSAs and systems audits (which are documented in the form of a written report), the QA/QC activities listed above are typically documented and maintained using a variety of methods which include: Excel spreadsheets (as data forms), fillable PDF data forms, worksheets, and data management systems (AirMVP/AirVision – e.g., electronic logbooks which are included with these software). Use of these methods to create the air monitoring QA/QC records is described in the associated PQAO SOPs. These records are retained and archived according to the procedures identified in Section 7.6 below. If the entire QA/QC record needs to be corrected, then a new form should be created and appended to the incorrect form, to ensure traceability.

However, for some of the QA/QC activities described above – such as the traceability certifications – many of those records are retained in the Florida DEP office on the network server and by the local programs. For example, the certificates of calibrations from many of the vendors where the standards are sent annually for testing are typically provided in paper format but are scanned and maintained on the network server, along with the other electronic air monitoring records.

7.5 Reference Materials

Because of the technical nature of ambient air monitoring, numerous reference materials are required to effectively administer the program. Publications such as instrument operation manuals, troubleshooting guides, EPA guidance documentation, EPA technical memoranda,

and various other reports are included in this category. Florida's PQAO maintains access to applicable reference materials as long as they are administratively valuable. These documents are maintained in the Local Program and Florida DEP office's and/or on the department's network drive.

7.6 Archiving and Retrieval

Documentation is classified according to its intended use, future applicability, and regulatory requirement for retention. Information listed in Table 7-1 will be retained for a minimum of ten (10) complete calendar years from the date of collection in accordance with the Florida Administrative Code and Florida Administrative Register, Chapter 1B-26.003 – Records Management: Standards and Requirements, as well as Florida's Quality Management Plan. Additionally, if any litigation, claim, designation, audit, or other action involving the records has been started before the expiration of the ten-year period, the records will be retained until completion of the action and resolution of all issues which arise from it, or until the end of the regular (ten-year) period, whichever is later.

Electronic records are stored within the data management systems of each local agency within the PQAO, and on the FL DEP network server for the FDEP-portion of the network. Data stored in the statewide data management system (AirMVP) as well as records on the network server are backed up nightly by the OTIS Department and stored off-site. The Florida DEP central polling computer writes the data to network drive daily, and therefore, the data it contains is automatically backed up by OTIS staff nightly as well.

Table 7-1. Documentation and Records Information

Categories	Record/Document Type	Location
Management and Organization	▪ State Implementation Plan ▪ Reporting Agency Information ▪ Quality Management Plan ▪ Personnel Qualifications and Training ▪ Training Certification ▪ Organizational Structure ▪ Document Control Plan ▪ EPA Directives ▪ Grant Allocations ▪ Support Contracts	Tallahassee, FL – Florida DEP's Central Office & Local Program Offices
Site Information	▪ Network Descriptions ▪ Site Files ▪ Site Maps ▪ Site Pictures	Tallahassee, FL – Florida DEP's Central Office
Environmental Data Operations	▪ Quality Assurance Project Plans ▪ Standard Operating Procedures ▪ Field and Laboratory Notebooks ▪ Sample Handling/Custody Records ▪ Inspection/Maintenance Records	Tallahassee, FL – Florida DEP's Central Office & Local Program Offices
Raw Data	▪ Any Original Data (routine and quality control)	Tallahassee, FL –

Categories	Record/Document Type	Location
		Florida DEP's Central Office & Local Program Offices
Data Management	▪ Data Algorithms ▪ Data Management Plans/Flowcharts ▪ Data Management Systems ▪ Pollutant Data ▪ Meteorological Data	Tallahassee, FL – Florida DEP's Central Office & Local Program Offices
Data Reporting	▪ Air Quality Index Reports ▪ Data/Summary Reports ▪ Data Certification Reports	Tallahassee, FL – Florida DEP's Central Office
Quality Assurance	▪ Network Reviews ▪ Data Quality Assessments ▪ Quality Assurance Documents and Reports ▪ Technical System Audits ▪ Response/Corrective Action Reports ▪ Site Audits (Performance Evaluations)	Tallahassee, FL – Florida DEP's Central Office & Local Program Offices

8.0 NETWORK DESCRIPTION

The primary function of the air monitoring program is to verify compliance with the NAAQS. Other purposes include determining trends over time, determining effects on air quality from adjustments to source emissions, developing algorithms based on historical air quality and other conditions which will allow the verifying air quality modeling programs, providing real-¬time pollutant data to the public, and correlating health effects to air quality levels.

Sampling network design and monitoring site selection comply with the following appendices of 40 CFR Part 58:

- 40 CFR Part 58, Appendix A – Quality Assurance Requirements for Monitors used in Evaluations of National Ambient Air Quality Standards
- 40 CFR Part 58, Appendix D – Network Design for Ambient Air Quality Monitoring
- 40 CFR Part 58, Appendix E – Probe and Monitoring Path Siting Criteria for Ambient Air Quality Monitoring

8.1 Network Objectives

The ambient air quality monitoring network is designed to meet a minimum of six basic monitoring objectives. These basic monitoring objectives are to:

- Determine the highest concentrations expected to occur in the area covered by the network,
- Determine representative concentrations in areas of high population density,
- Determine the impact of significant sources or source categories on ambient pollution levels,
- Determine general background concentration levels,
- Determine the extent of regional pollutant transport among populated areas and in support of secondary standards, and
- Determine the welfare-related impacts in rural and remote areas (such as visibility impairment and effects on vegetation).
- Produce ambient monitoring data that are legally defensible.

The department utilizes the network design criteria specified in 40 CFR Part 58, Appendix D, to establish the appropriate network configuration necessary to meet these objectives. This appendix describes the monitoring objectives and general criteria for establishing ambient air quality monitoring stations as well as the specific requirements for the number and location of FRM and FEM sites for specific pollutants based on the Core-Based Statistical Areas (CBSAs) and Metropolitan Statistical Areas (MSAs). As mentioned in Section 4.6, Florida's ambient air monitoring network description is provided in the annual Network Plan located on Florida DEP's website.

8.1.1. Monitoring Objectives and Spatial Scales

Each monitor within Florida's ambient air quality monitoring network is assigned the appropriate monitoring objective designation(s) from the list below:

- ***Population Exposure*** – the monitor is located within an area associated with high population density,
- ***General Background*** – the monitor is located where man-made pollutant emissions are minimal,
- ***Highest Concentration*** – the monitor is located where a high concentration of the pollutant is expected,
- ***Other*** – the monitor objective is not well described by any other objective.

Data collected within the network must be representative of the spatial area under study. The goal in siting a monitoring station is to match the spatial scale represented by the samples obtained with the spatial scale most appropriate for the monitoring objective of the station. For a description of representative measurement scales, see Section 5.6.

8.2 Site Selection

The selection of a specific monitoring site includes the following activities:

- Developing and understanding the monitoring objective and appropriate data quality objectives,
- Identifying the spatial scale most appropriate for the monitoring objective of the site,
- Identifying potential locations where the monitoring site could be placed,
- Identifying the specific monitoring site, and
- Following the site selection criteria specified in 40 CFR Part 58, Appendix E.

Site Location

Four criteria should be considered when evaluating potential sites. Monitoring sites should be oriented to measure the following (singly or in combination as appropriate for the sampling objective):

- Impacts of known pollutant emission categories on air quality,
- Population density relative to receptor-dose levels, both short- and long-term,
- Impacts of known pollutant emission sources (area and point) on air quality, and
- Representative air quality.

Selection consistent with these criteria requires detailed information concerning the location of sources, geographic variability of ambient pollutant concentrations, meteorological conditions, and population density. Selection of the number, geographic locations, and types of sampling stations is, therefore, a complex process.

The sampling site selection process also involves consideration of the following factors:

- ***Economics*** – The quantity of resources required to accomplish all data collection activities, operations, including instrumentation, installation, maintenance, data retrieval, data analysis, QA, and data interpretation, must be established
- ***Security*** – In some cases, a preferred location may have associated problems that compromise the security of monitoring equipment (i.e., high risk of theft, vandalism, etc.). If such problems cannot be remedied using standard measures such as additional lighting, fencing, etc., then an attempt to locate the site as near to the preferred location as possible shall be made.
- ***Logistics*** – This process includes procurement, maintenance, and transportation of material and personnel for the monitoring operation. The logistics process requires full knowledge of all aspects of the data collection operation: planning, reconnaissance, training, scheduling, safety, staffing, procuring of goods and services, communications, and inventory management.
- ***Atmospheric Considerations*** – These considerations may include spatial and temporal variability of pollutants and their transport. Effects of buildings, terrain, and heat sources or sinks on air trajectories can produce localized anomalies of pollutant concentrations. Meteorology must be considered in determining the geographic location of a site as well as the height, direction, and extension of sampling probes. Evaluation of winds is essential to properly locate many monitoring sites (e.g., siting either to detect or avoid emissions from specific sources).
- ***Topography*** – Evaluation of the local topography based upon land use maps, U.S. Geological Survey topographic maps, and other available resources must be completed. Minor and major topological features that impact both the transport and diffusion of air pollutants must be identified and evaluated. Minor features may consist of an adjacent tree lined stream or tall structures either upwind or downwind of a point source, each of which may exert small influences on pollutant dispersion patterns. Major features in Florida include large lakes and bays.
- ***Pollutant Considerations*** – The monitoring site location for a specific pollutant may or may not be appropriate for another pollutant. Evaluation of the changes that pollutants undergo temporally and spatially must be considered to determine the applicability of each site for a specific pollutant.

An interdependence exists between all the factors listed above. Consequently, an iterative procedure must be employed to successfully select appropriate sites that can provide the data necessary to accomplish the project's stated objectives. In situations where the sites do not specifically meet the requirements necessary to obtain the project objectives, reevaluation of the site location may be necessary. Staff familiar with the operation of air quality measurement systems; estimates of air quality concentrations, and air modeling; and considerations of atmospheric chemistry and air pollution effects work collaboratively to select the optimum sampling site in order to fulfill the monitoring objectives.

Monitor Placement

The placement of each monitor is generally determined by the defined monitoring objectives. Therefore, monitors are usually placed in accordance with the potential exposure to pollution. Due to the various factors discussed above, tradeoffs are often necessary to locate a site for collection of optimally representative data. Final placement of a monitor at a selected site is dependent on physical obstructions and activities in the immediate area. Particulate monitors must be placed away from obstructions such as trees and buildings so that their effects on airflow can be avoided. To prevent sampling bias, airflow around the monitor's sampling probes must be representative of the general airflow in the area. In addition, the availability of utilities (i.e., electricity and communications services) is critical.

8.3 Probe Siting Criteria for Pollutant Sampler/Analyzer

General probe and monitoring path siting criteria for particulate matter shall adhere to the requirements listed in 40 CFR Part 58, Appendix E, and outlined below in Table 8-1. Florida's Site Review SOP (DEP 18-28) provides further details on how these criteria are interpreted and implemented.

Table 8-1 Probe and Monitoring Path Siting Criteria

Pollutant	Scale[1]	Height from ground to probe or inlet	Horizontal and vertical distance from supporting structures[2] to probe or inlet	Distance from trees to probe or inlet	Distance from roadways to probe or inlet
PM[3 4 5 6]	Micro	2-7 meters	>2 meters (all scales, horizontal distance only)	>10 meters (all scales)	2-10 meters
	Middle	2-7 meters			See Figure 8-1 below for all other scales.
	All other scales	2-15 meters			

[1] Maximum monitoring path length, meters

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

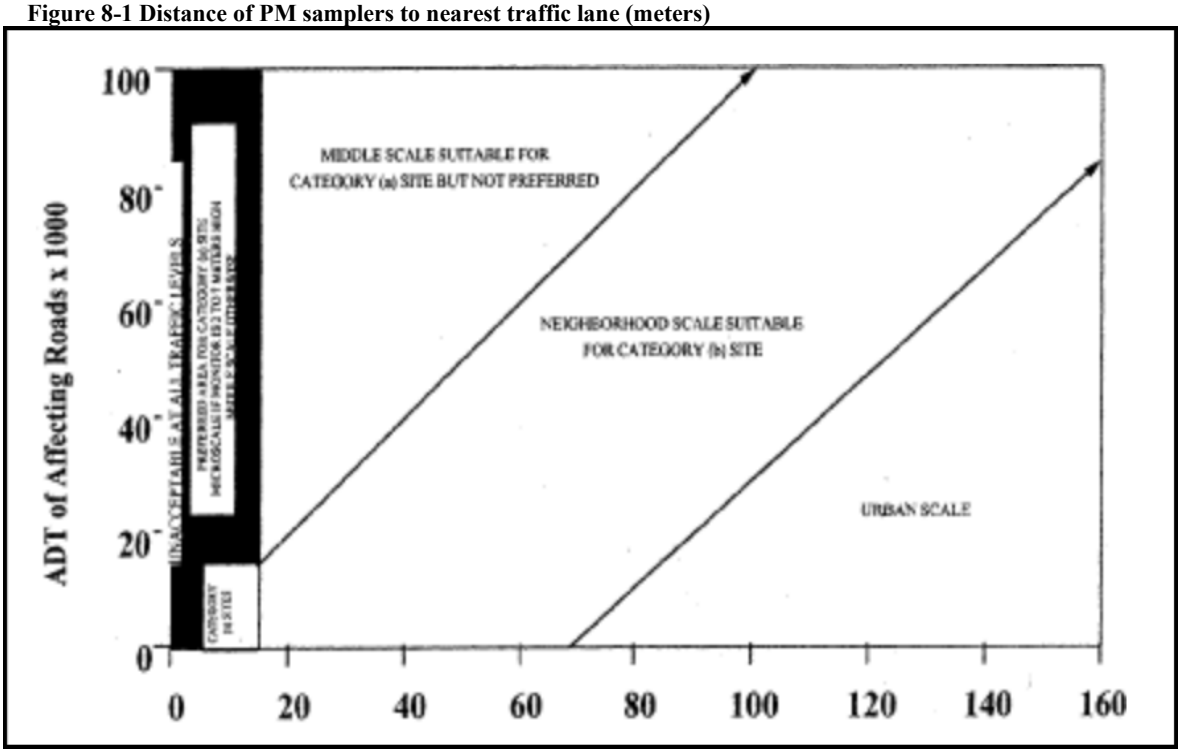
[3]Should be greater than 20 meters from the dripline of tree(s) and must be 10 meters from the dripline when the tree(s) act as an obstruction.

[4]Distance from sampler, probe, or 90 percent of monitoring path to obstacle, such as a building, must be at least twice the height the obstacle protrudes above the sampler, probe, or monitoring path. Sites not meeting this criterion may be classified as middle scale (see text).

[5]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.

[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.

Figure 8-1 Distance of PM samplers to nearest traffic lane (meters)



At the time of this QAPP revision, there is an approved siting criteria waiver for the source oriented (PM_{10}) Woodlawn site (AQS# 12-103-0012) in Pinellas County.

8.4 Rationale for Florida's Ambient Air Quality Monitoring Network

Florida's particulate network stations have been placed to provide information on how particulates are transported to and within the state, to identify the parts of the state with the highest concentrations of particles, and to determine where the particle concentrations do and do not exceed the NAAQS. Most of the monitoring done in Florida is attributable to the population requirements in the federal requirements.

9.0 SAMPLING METHODS REQUIREMENTS

In accordance with 40 CFR 58, Appendix C, Section 2.1, a criteria pollutant monitoring method used for making NAAQS decisions at a SLAMS site must be a reference or equivalent method (i.e., FRM or FEM, respectively). Towards that end, the Florida PQAO uses only EPA-approved FRM or FEM instrumentation at SLAMS sites within the particulate matter monitoring network. Particulate matter sampling methods that have received FRM or FEM status have been rigorously tested, in accordance with 40 CFR Part 53 requirements, and found to meet (or be comparable to) the EPA reference methods (codified in 40 CFR Part 50 – see Section 11 of this QAPP). For the detailed specifications upon which a specific monitoring method (i.e., sampler type) has received its FRM/FEM status, see the List of Designated Reference and Equivalent Methods, issued by the EPA Office of Research and Development, which can be found on the AMTIC website (https://www3.epa.gov/ttn/amtic/criteria.html as of the date of this QAPP). The Florida PQAO will operate each sampler in accordance with these designation specifications. Table 9-1 contains the EPA method designation reference or equivalence number for each sampler-type operated within the PQAO.

Note: According to the EPA Near-road NO_2 Monitoring Technical Assistance Document, a number of devices exist to measure particle number concentrations, ranging from inexpensive industrial hygiene monitors to research-grade ambient air monitors (e.g., condensation particle counter, differential mobility analyzer). Most of these devices can provide number concentration measurements in near real-time, while some devices are capable of providing particle number concentrations within specific size bins. When comparing measurements from different devices, any differences in particle size ranges detected must be noted. Measurements show that as the distance or transit time from emission to sampling increases, the size distribution shifts to larger particle diameters. Table 9-1 includes the particle counter (ultrafine monitor) currently in use by the Florida PQAO although there is no designated EPA reference or equivalent.

9.1 PM_{10} Monitoring Technology/Methodology

Manual PM_{10c} Filter-based Local Conditions – Federal Reference Method – (Intermittent Operation; R&P 2025, TEI 2025i)

A low-volume PM_{10c} sampler draws a known volume of ambient air at a constant flow rate through a size-selective inlet and traps particles on a 47-mm Teflon filter. Particles in the PM_{10c} size range are then collected on the filter during the specified 24-hour sampling period. Each sample filter is weighed before and after sampling to determine the net weight (mass) gain of the collected PM_{10c} sample. The total volume of air sampled is determined from the measured volumetric flow rate and barometric pressure and the sampling time. The concentration of PM_{10c} in the ambient air is computed as the total mass of collected particles in the PM_{10c} size range divided by the volume of air sampled. The PM_{10c} measurement is expressed as micrograms per actual cubic meter (µg/m3). 47-mm Teflon filters are used for PM_{10c} sample collection. This methodology is utilized in order to perform the PM coarse

calculations. The $PM_{10-2.5}$ FRM (or approved FEMs, where available) was implemented at required NCore stations by January 1, 2011. PM coarse is calculated as the difference between concentrations of low-volume PM_{10} and $PM_{2.5}$ at collocated monitoring sites. The method employed is either a $PM_{10-2.5}$ FRM, which is performed using a low-volume PM_{10} FRM collocated with a low volume $PM_{2.5}$ FRM of the same make and model, or FEMs for $PM_{10-2.5}$, including filter-based dichotomous methods and continuous methods of which several makes and models are approved. At the time this QAPP was written, Florida employed low-volume PM_{10} FRM collocated with a low volume $PM_{2.5}$ FRM of the same make and model at one of its NCore monitoring sites, Hillsborough County, to calculate $PM_{10-2.5}$ FRM (or PM coarse). One sampler is configured as a $PM_{2.5}$ sampler (RFPS-0498-118) and the other is configured as a PM_{10c} sampler with the $PM_{2.5}$ separator replace with a Thermo Scientific Partisol 2025 downtube (RFPS-1298-127).

Continuous PM_{10} Standard Conditions, Beta Attenuation – (Met One Instruments Beta Attenuation Monitor (BAM) – 1020)

The Met One Instruments model BAM-1020 automatically measures and records airborne particulate concentration levels using the principle of beta ray attenuation. This method provides a simple determination of concentration in units of micrograms of particulate per cubic meter of air. A small C-14 (Carbon 14) element emits a constant source of high-energy electrons called beta particles. These beta particles are detected and counted by a sensitive scintillation detector. An external pump pulls a measured amount of dust-laden air through a filter tape. After the filter tape is loaded with ambient dust, it is automatically placed between the source and the detector thereby causing an attenuation of the beta particle signal. The degree of attenuation of the beta particle signal is used to determine the mass concentration of particulate matter on the filter tape, and hence the volumetric concentration of particulate matter in ambient air. The BAM methodology does not collect 45 minutes of data. Instead, it collects 42 minutes of data that are reported as an hourly concentration. Each minute of that hour will reflect the same hourly concentration. This is a part of the approved EPA-approved methodology.

Note: The BAM 1020, if operated according to EPA requirements, is an FEM. However, the Florida PQAO had not been operating this instrument as such. The BAM 1020 in the Florida network was being utilized for AQI purposes only and was granted an approved EPA waiver. According to the 2021 Florida Annual Network Plan, BAM 1020s are expected to be replaced with alternative FEM monitors (i.e. T640/T640X) no later than the end of calendar year 2021.

Continuous PM_{10} Standard Conditions, Light Scattering – Federal Equivalent Method – (Teledyne Advanced Pollution Instrumentation (API) – Model T640X PM Mass Monitor)

The Model T640X PM Mass Monitor is an optical aerosol spectrometer that converts optical measurements to mass measurements by determining sampled particle size via scattered light at the single particle level according to Lorenz-Mie Theory.

Briefly, the sampling head draws in ambient air with different-sized particles, which are dried with the Aerosol Sample Conditioner (ASC) and moved into the optical particle sensor where scattered light intensity is measured to determine particle size diameter. The particles move separately into the T-aperture through an optically differentiated measurement volume that is homogeneously illuminated with polychromatic light. The polychromatic light source, an LED, combined with a 90° scattered light detection achieves a precise and unambiguous calibration curve in the Mie range, resulting in a large size resolution.

Each particle generates a scattered light impulse that is detected at an 85° to 95° angle where amplitude and signal length are measured; the amplitude (height) of the scattered light impulse is directly related to the particle size diameter.

The T-aperture and simultaneous signal length measurements eliminate border zone error, which is characterized by the partial illumination of particles at the border of the measurement range.

Broward County also employs the T640X at its NCore monitoring site to determine PM coarse values. The T640X reports PM_{10} (at standard temperature and pressure), PM_{10} (at ambient temperature), $PM_{2.5}$ and $PM_{10\text{-}2.5.}$ $PM_{10\text{-}2.5}$ is calculated by the T640X by subtracting the PM_{10} (at ambient temperature) from the $PM_{2.5}$ (at ambient temperature).

Continuous PM_{10}, Beta Attenuation – Federal Equivalent Method (Thermo Scientific Model 5014i)

The Model 5014i Continuous Ambient Particulate Monitor continuously measures the mass concentration of suspended and refined particulates (e.g., TSP, PM_{10}, $PM_{2.5}$, and PM_{1}) by the use of beta attenuation. In addition, the influence of natural Radon (Rn-222) gas is corrected for as a mass refinement step allowing better sensitivity at lower ambient particulate concentrations. In contrast to other beta attenuation monitors using Carbon-14 (C-14) as a source of the beta rays, the Model 5014i particulate sample collection area is located between both the C-14 source and the proportional counter. While ambient particulate is being deposited onto a filter tape sample spot, the dynamic filter loading is measured simultaneously by the attenuation of the C-14 source beta rays. As a result of this configuration, a continuous real-time measurement of airborne particulate is provided. It is not necessary to move the filter spot from the sample position to a separate detector position for zero and mass determinations (old stepwise method of beta attenuation monitors). Therefore, uncertainties associated with stepwise filter transport are eliminated by the use of this continuous ambient particulate monitoring method.

Continuous PM_{10}, Beta Attenuation – Federal Equivalent Method (Met One Instruments Model Environmental Beta Attenuation Monitor (E-BAM) PLUS)

The Met One Instruments, Inc Model E-BAM PLUS automatically measures and records airborne PM_{10} or $PM_{2.5}$ particulate concentration levels using the principle of beta ray attenuation. This method provides a simple determination of concentration in units of

milligrams of particulate per cubic meter of air. A small C-14 (Carbon 14) element emits a constant source of high-energy electrons known as beta rays. Beta rays are detected and counted by a sensitive scintillation detector. A vacuum pump pulls a measured amount of ambient air through the filter tape, which is positioned between the source and the detector thereby causing an attenuation of the beta ray signal. The degree of attenuation of the beta ray signal is used to determine the mass concentration of particulate matter on the filter tape and the volumetric concentration of particulate matter in ambient air. The BAM methodology does not collect 45 minutes of data. Instead, it collects 42 minutes of data that are reported as an hourly concentration. Each minute of that hour will reflect the same hourly concentration. This is a part of the EPA-approved methodology.

Continuous PM_{10} Standard Conditions, TEOM – Federal Equivalent Method (TEI 1400 ab, TEI 1405)

The TEOM is a true "gravimetric" instrument that draws (then heats) ambient air through a filter at constant flow rate, continuously weighing the filter and calculating near real-time mass concentrations of particulate matter. In addition, the instrument computes the 1-hour, 8-hour, 12-hour and 24-hour averages of the mass concentration of particulate. The weighing principle used in the tapered element oscillating microbalance (TEOM) mass transducer is similar to that of a laboratory microbalance in that the mass change detected by the sensor is the result of the measurement of a change in a parameter (in this case, frequency) that is directly coupled via a physical law (or from first principles). The tapered element at the heart of the mass detection system is a hollow tube, clamped on one end and free to oscillate at the other. An exchangeable TEOM filter cartridge is placed over the tip of the free end. The sample stream is drawn through this filter, and then down the tapered element. This flow is maintained at a constant volume by a mass flow controller that is corrected for local temperature and barometric pressure. The tapered element oscillates precisely at its natural frequency, much like the tine of a tuning fork. An electronic control circuit senses this oscillation and, through positive feedback, adds sufficient energy to the system to overcome losses. An automatic gain control circuit maintains the oscillation at a constant amplitude. A precision electronic counter measures the oscillation frequency with a 10-second sampling period. The tapered element is, in essence, a hollow cantilever beam with an associated spring rate and mass. As in any spring-mass system, if additional mass is added, the frequency of the oscillation decreases.

9.2 $PM_{2.5}$ Monitoring Technology/Methodology

Manual $PM_{2.5}$ Filter-based Local Conditions – Federal Reference Method (Intermittent Operation; R&P 2025, TEI 2025i)

This methodology utilizes precisely weighed filters that are placed in a carefully controlled volumetric flow for a specified period of time. The combination of flow and duration identify a controlled volume that has passed through the clean filter. The mass added to the filter has been applied during the period when the flow was present. Determining the amount of mass

added, and dividing by the volume of air filtered, yields a particulate concentration that is an average during the time the flow occurred.

The 2025/2025i samplers can be configured to operate for use with either very-sharp cyclone (VSCC) or WINS Impactor inlet. The $PM_{2.5}$ sampler inlet is designed to representatively extract ambient aerosols from the surrounding airstream, remove particles with aerodynamic diameters greater than nominally 10 µm, and send the remaining smaller particles to the next stage. The impactor and filter holder assembly first remove those particles nominally less than 10 µm but greater than nominally 2.5 µm in diameter but allows particles of nominally 2.5 µm in diameter (and smaller) to pass and collect on a Teflon® filter surface. This separator has been called the "Well Impactor 96" or WINS impactor. Downstream of the inlet, particles less than 10 µm but greater than 2.5 µm are removed by a $PM_{2.5}$ separator. The well of the impactor assembly contains a 37-mm-diameter glass fiber filter immersed in 1 mL of low volatility, low-viscosity diffusion oil. The oiled glass fiber filter removes particles between 10 and 2.5 µm in diameter by preventing bouncing of the incoming particles. An alternative to the WINS, is the VSCC that has been approved by EPA through the FRM/FEM designation process.

For the purposes of the particulate matter network in the Florida PQAO, this intermittent sampler is used to collect manual $PM_{2.5;}$ the samplers are configured with the VSCCs instead of the WINS inlet-based reference method. These samplers are also used in the collection of the $PM_{2.5}$ component of the PMcoarse at the NCore monitoring site in Hillsborough County.

These intermittent operating filter monitors require that the filters be changed between each sampling period, which usually occurs once every three days, but can be scheduled more or less frequently. The filters are precisely weighed in a lab prior to field installation. They are once again precisely weighed, under the same controlled laboratory conditions, after the filtering operation. The resulting difference yields the mass added during filtering.

Continuous $PM_{2.5}$ Local Conditions, TEOM (TEI 1400ab, TEI 1405)

The tapered element oscillating microbalance (TEOM) is a true gravimetric digital instrument that measures near real-time mass concentrations by drawing ambient air through a Teflon®-coated borosilicate glass filter at a constant flow rate and continuously weighing the filter. The instrument then calculates the 1-hour, 8-hour, 12-hour, and 24-hour averages and the total mass accumulation on the filter from the raw data. Utilizing hydrophobic filter material and collecting the sample at above ambient temperatures (50°C) minimizes humidity effects. The control unit employs an industrial microprocessor system, flow control hardware, transformers and power supplies, and a gauge to determine filter lifetime.

Initially, the air stream is filtered through an inertial separator. An inertial separator is specifically designed to eliminate particles with aerodynamic diameters greater than 10 micrometers. A second inertial separator (VSCC) is then used to further eliminate particles with aerodynamic diameters of greater than 2.5 micrometers. This equipment draws in 16.7

liters/minute (L/min) (1.0 m3/hour) of air. After the air stream exits the inertial separators the stream is split respectively into a sample that is sent to the mass transducer and an exhaust stream.

NOTE: Monitoring of $PM_{2.5}$ using the TEOM collection system methodology in Florida is solely used for the air quality index (AQI).

Continuous $PM_{2.5}$ Local Conditions, Beta Attenuation (MetOne BAM 1020)

A Beta-Attenuation Mass (BAM) Monitor utilizes beta ray attenuation to determine the volumetric concentration of $PM_{2.5}$ in ambient air on semi-continuous basis. This federal equivalent method collects and reports samples on an hourly basis using a roll of filter tape. The BAM 1020 only collects hourly values; hence its consideration as a semi-continuous monitor.

Each hour, a clean spot of tape is passed in front of a small carbon-14 element, which constantly emits a source of high-energy electrons (i.e. beta rays). These electrons pass through the clean spot on the filter tape to a scintillation detector, which detects these rays. The instrument then calculates a zero reading. After the zero reading is obtained the clean spot of tape is advanced to an area below a sample nozzle.

Ambient air is sampled in much the same way as the TEOM. Ambient air is initially pulled through an inertial separator at 16.7 L/min. The inertial separator eliminates particles with aerodynamic diameters greater than 10 micrometers. A second inertial separator is then used to further eliminate particles with aerodynamic diameters of greater than 2.5 micrometers. The remaining ambient air then passes through the sample nozzle onto the clean spot of filter tape.

At the end of an hour, the sampled filter spot is passed back between the carbon-14 element and the scintillating detector. Another reading is taken by the same method as the zero reading. The sample on the tape causes an attenuation of the beta rays. This attenuation is used by the instrument to calculate the collected mass and volumetric concentration of $PM_{2.5}$ in the ambient air. The BAM methodology does not collect 45 minutes of data. Instead, it collects 42 minutes of data that are reported as an hourly concentration. Each minute of that hour will reflect the same hourly concentration. This is a part of the approved EPA-approved methodology.

Note: The BAM 1020 is only considered a federal equivalent method if a very sharp-cut cyclone (VSCC, the second inertial separator) is used as part of the sample inlet (inertial separator). If a VSCC is not used, the BAM 1020 is neither a federal reference nor equivalent method. According to the 2021 Florida Annual Network Plan, BAM 1020s within the Florida PQAO were replaced with alternative FEM monitors (i.e. T640/T640X) no later by the end of calendar year 2021.

Continuous $PM_{2.5}$ Local Conditions, Beta Attenuation – Federal Equivalent Method (TEI 5014i)

The TEI 5014i continuously measures the mass concentration of suspended particulates using the radiometric principle of beta attenuation through a known area on a fibrous filter tape. To correct for known interferences from radon gas, the monitor measures alpha particle emissions directly from the ambient aerosol being sampled and excludes negative mass artifacts from the daughter nuclides of radon gas decay to achieve a refined mass measurement. Simultaneous refined mass measurements of sampled particulate on the filter tape and sample volume measurement provide a continuous concentration measurement of ambient particulate concentration.

A clean filter spot is introduced by an automatic filter change to the combined sampling and detection chamber. Immediately after a filter change, a new measurement cycle is initiated with an automatic zero adjustment of the mass signal. The TEI 5014i only collects hourly values; hence its consideration as a semi-continuous monitor.

Continuous $PM_{2.5}$ Local Conditions, Light Scattering – Federal Equivalent Method - (T-API Model T640)

The Model T640 PM Mass Monitor is an optical aerosol spectrometer that converts optical measurements to mass measurements by determining sampled particle size via scattered light according to Lorenz-Mie theory. The sampling head draws in ambient air which are dried below 35% relative humidity and moved into the optical particle sensor where scattered light intensity is measured. The polychromatic light source, an LED, is combined with a 90° scattered light detection where amplitude and signal length are measured. The amplitude of the scattered light impulse is directly related to the particle size.

The T640 operates at 5.0 LPM with an aerosol sample conditioner (ASC) assembly, no inertial separators are required. This configuration is approved as an FEM for $PM_{2.5}$; however, it also provides data (not approved as an FEM) for PM_{10} and $PM_{10\text{-}2.5}$.

Continuous $PM_{2.5}$ Local Conditions, Light Scattering – Federal Equivalent Method - (T-API Model T640X)

The Model T640X PM Mass Monitor is an optical aerosol spectrometer that converts optical measurements to mass measurements by determining sampled particle size via scattered light according to Lorenz-Mie theory. The sampling head draws in ambient air which are dried below 35% relative humidity and moved into the optical particle sensor where scattered light intensity is measured. The polychromatic light source, an LED, is combined with a 90° scattered light detection where amplitude and signal length are measured. The amplitude of the scattered light impulse is directly related to the particle size.

Manual $PM_{10-2.5}$ (PM Coarse) Local Conditions – Federal Equivalent Method (R&P 2025, TEI 2025i)

The $PM_{10-2.5}$ FRM (or approved FEMs, where available) was implemented at required NCore stations by January 1, 2011. PM coarse is calculated as the difference between concentrations of low-volume PM_{10} and $PM_{2.5}$ at collocated monitoring sites. The method employed is either a $PM_{10-2.5}$ FRM, which is performed using a low-volume PM_{10} FRM collocated with a low volume $PM_{2.5}$ FRM of the same make and model, or FEMs for $PM_{10-2.5}$, including filter-based dichotomous methods and continuous methods of which several makes and models are approved. At the time this QAPP was written, Florida employed low-volume PM_{10} FRM collocated with a low volume $PM_{2.5}$ FRM of the same make and model at one of its NCore monitoring sites, Hillsborough County, to calculate $PM_{10-2.5}$ FRM (or PM coarse). One sampler is configured as a $PM_{2.5}$ sampler (RFPS-0498-118) and the other is configured as a PM_{10c} sampler with the $PM_{2.5}$ separator replace with a Thermo Scientific Partisol 2025 downtube (RFPS-1298-127).

9.3 Electronic Data Collection

Continuous particulate samplers can provide an automated means for collecting information that would otherwise be recorded on data entry forms. The data logging function may be internal to the monitoring instrument (e.g., $PM_{2.5}$ 2025i intermittent samplers) or an external device (i.e. – Agilaire 8832 data logger) connected to the instrument (e.g., continuous analyzer). The data logger records the monitoring instrument outputs, generating concentration data that is transmitted to AirVision/AirMVP in continuous particulate samplers. The data logger may also perform specific data reduction and/or format data in preparation for downloading/uploading to a database or spreadsheet which is the case of intermittent/filter-based $PM_{2.5}$ samplers in which electronic filter data files are uploaded into PMTS. Information on these systems is detailed in Section 17. To reduce the potential for data entry errors, automated systems will be used where appropriate. Continuous particulate samplers' electronic data collection is possible through the network's data loggers and modems. This equipment is located within the shelters where the data loggers record the data history and the modems provide a path to download the data for analysis. FDEP's Data Acquisition System (DAS) is configured to automatically poll sites or download data from specific folders on Florida's FTP server periodically. Monitoring personnel can remotely access the sites to retrieve data or determine the status of the systems. Additional information is discussed in Section 17 of this QAPP.

9.4 Support Facilities

Monitoring Station Design

The monitoring station design must encompass the operational needs of the equipment, provide an environment that supports sample integrity, and allow the operator to safely and easily service and maintain the equipment. Within the PQAO modular shelters such as construction trailers or modified shipping containers are often used (e.g., Wells Cargo

trailers); however, for some sites, equipment may be located in small outdoor or rooftop single-monitor enclosures or inside existing buildings.

Shelter Criteria

All particulate matter samplers are not maintained inside a shelter. Some samplers are kept in an outdoor enclosure. However, those samplers housed in a shelter must be housed in a shelter capable of fulfilling the following requirements:

- The shelter temperature must be maintained between 20° and 30°C (unless otherwise specified by the EPA equipment designation).
- The power supply should not vary more than ±10% from 120 Alternating Current Voltage (VAC). It is recommended to provide some type of voltage regulation.
- The shelter must protect the instrumentation from precipitation and excessive dust and dirt, provide third wire grounding as required in modern electrical codes, meet federal Occupational Safety and Health Administration regulations, and be cleaned regularly to prevent a buildup of dust.
- The shelter must protect the instrumentation from any environmental stress such as vibration, corrosive chemicals, intense light, or radiation.
- The shelter may also provide structure and connectivity for communications equipment, lightning suppression systems, or other support equipment.

The inlet system must also prevent rainwater from entering the samplers. No condensate of liquid phase of any kind can be present in the system since it will absorb pollutants, impacting the particulate concentration by removing pollutants from the sample, and consequently, yielding inaccurate environmental data.

9.5 State of Florida's Ambient Air Monitoring Network Analyzers

The particulate matter analyzers used in the statewide ambient air monitoring network are listed in Table 9-1. See Appendix C of this QAPP for the list of instrument SOPs as they relate to the table below.

Table 9-1. Florida's Ambient Air Monitoring Network Particulate Matter Samplers

Pollutant	Sampler	EPA Reference/Equivalence
Continuous PM_{10}	MetOne Instruments E-BAM PLUS Teledyne API T640X Thermo Scientific Model 5014i Thermo Scientific TEOM 1400AB Thermo Scientific TEOM 1405	EQPM-1215-226 EQPM-0516-239 EQPM-1102-150 EQPM-1090-079 EQPM-1090-079
Manual PM_{10c}[1] (Low-Volume)	Thermo Scientific Partisol Plus 2025 Thermo Fisher Scientific Partisol 2025i	RFPS-1298-127 RFPS-1298-127
Manual $PM_{2.5}$[1]	TEI Partisol-Plus 2025/2025i	RFPS-0498-118

Pollutant	**Sampler**	**EPA Reference/Equivalence**
(Low-Volume)		
Continuous $PM_{2.5}$	TEI 1400 AB TEI 1405 Met One BAM-1020[2] TEI 5014i T-API T640 T-API T640X	Not an FRM, FEM, or ARM Not an FRM, FEM, or ARM EQPM-0308-170 EQPM-0609-183 EQPM-0516-236 EQPM-0516-238
Continuous $PM_{0.1}$	TSI EPC3783	N/A

Notes

[1]The low-volume manual PM_{10c} coupled with the low-volume manual $PM_{2.5}$ are utilized to calculate and report PM_{10} coarse (Method Code 176) at the Hillsborough County NCore Monitoring sites. Low-volume manual $PM_{2.5}$ is also reported at other monitoring sites as an individual pollutant (see Section 4.7). However, low-volume manual PM_{10c} is operated solely for the calculation of PM coarse.

[2]The BAM 1020, if operated according to EPA requirements, is an FEM. However, the Florida PQAO had not been operating this instrument as such. The BAM 1020 in the Florida network was being utilized for AQI purposes only and was granted an approved EPA waiver. According to the 2021 Florida Annual Network Plan, BAM 1020s were replaced with alternative FEM monitors (i.e. T640/T640X) by the end of calendar year 2021.

10.0 SAMPLE CUSTODY PROCEDURE

A critical activity within any data collection phase involving physical samples is the handling of sample media prior to sampling, during preparation, handling/transporting sample media to the field, handling samples in the field at the time of collection, storage of samples (in the field or other locations), transport of samples from the field site, and the analysis of the samples. Documentation ensuring that proper handling has occurred throughout these activities is part of the custody record. This documentation initially comes in the form of a written sample handling and custody procedure and then in the development, use, and archiving of field and laboratory notebooks and chain of custody forms.

Due to the potential use of data for comparison to the NAAQS and the requirement for extreme care in sample collection, sample custody procedures must be followed. Florida utilizes forms that document the chain of custody (COC) or the various sample handling steps associated with each sample in the collection of filter-based particulate matter data. The following details the sample custody procedure for the intermittent $PM_{2.5}$ samplers in Florida's network.

The Teflon filters used for $PM_{2.5}$ sampling are ordered annually from EPA. Accordingly, each lot of filters is evaluated utilizing EPA's acceptance testing protocol prior to shipping to the laboratory. The results of the EPA acceptance testing results are provided to the agency along with the boxes of filters that were ordered for the calendar year. The acceptance protocol includes, but is not limited to:

- Visual inspection;
- Assessment of the physical characteristics;
- Filter thickness and tensile strength;
- Flow rate and retention acceptance criteria; and
- Background lead content.

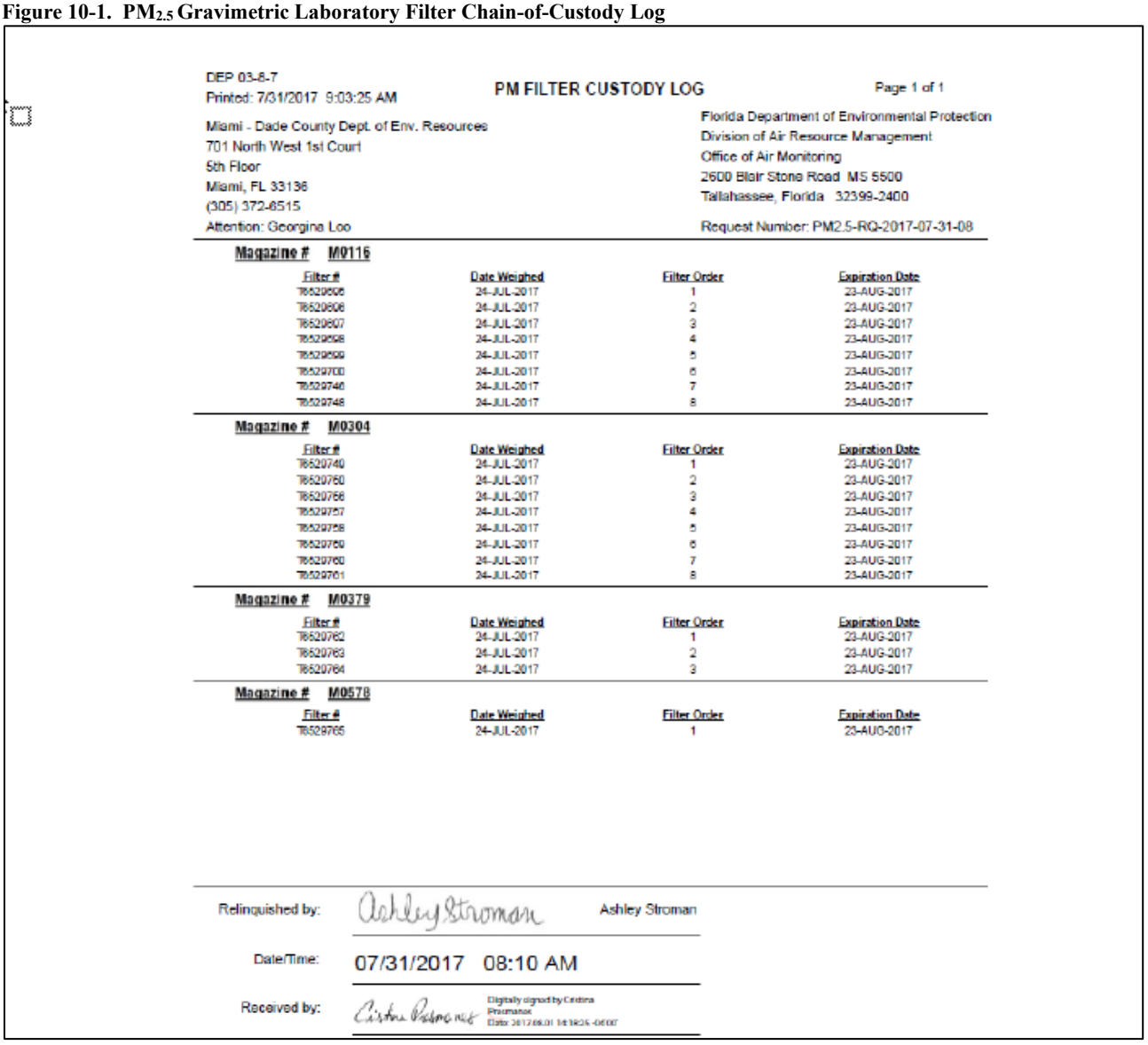
In general, once the filters are received by the agency's laboratory, the Gravimetric Laboratory Specialist conducts additional visual inspections, analyzes batch blanks, and other quality control procedures identified in the Statewide Standard Operating Procedure (SOP) for the Determination of Particulate Matter ($PM_{2.5}$) in Ambient Air by Gravimetric Analysis (DEP 16-23). The Gravimetric Laboratory Specialist provides the initial COC to the field operators, listing each individual filter. The field operators complete their entries as they prepare the filters for sampling by the instrument. Once the filters have been sampled, the field operators collect the filters noting any damage or unusual appearance on the sample record, returning the sampled filter and associated records to the Gravimetric Laboratory Specialist. Upon receipt, the Gravimetric Laboratory Specialist documents the COC of the exposed filters and performs analysis. The exposed and analyzed filters are archived and stored in a protective media or cases (i.e. petri dishes, envelopes, etc.). Detailed custody procedures are detailed in the individual instrument SOPs and laboratory SOPs.

10.1 $PM_{2.5}$ Pre-Sample Custody

Filters used for $PM_{2.5}$ sampling are initially equilibrated and weighed in the gravimetric laboratory maintained by Florida DEP. Due to the small size of mass to be measured, extreme care is taken to prevent contamination of the samples. Filters used in the $PM_{2.5}$ program are provided by EPA. Upon receipt of the new filter lot each year, the laboratory specialist will inspect and test the filters, and then store them until they are needed for sampling. At that time, the filters will be conditioned and subsequently weighed. The laboratory specialist is responsible for documenting the laboratory conditions during the weigh sessions. Filter conditioning data (e.g. weigh date, initial temperature mean, temperature control (i.e., standard deviation (SD), initial RH mean, RH control (SD), etc.) are documented.

After the initial (tare) weighing, the analyst will prepare the $PM_{2.5}$ filters for field use, including any blanks. The filters are placed in cassettes, sequentially stacked in magazines, and packaged in soft-side coolers within the large Igloo coolers, along with sufficient blue ice (room temperature for pre-filter shipments). A COC (Figure 10.1) is provided with the shipment that contains the identification numbers for all filters in the magazine(s). The COC is signed and dated by the site operator upon receipt.

Figure 10-1. $PM_{2.5}$ Gravimetric Laboratory Filter Chain-of-Custody Log



DEP 03-8-7
Printed: 7/31/2017 9:03:25 AM

PM FILTER CUSTODY LOG

Page 1 of 1

Miami - Dade County Dept. of Env. Resources
701 North West 1st Court
5th Floor
Miami, FL 33136
(305) 372-6515
Attention: Georgina Loo

Florida Department of Environmental Protection
Division of Air Resource Management
Office of Air Monitoring
2600 Blair Stone Road MS 5500
Tallahassee, Florida 32399-2400

Request Number: PM2.5-RQ-2017-07-31-08

Magazine # M0116

Filter #	Date Weighed	Filter Order	Expiration Date
T8529606	24-JUL-2017	1	23-AUG-2017
T8529608	24-JUL-2017	2	23-AUG-2017
T8529607	24-JUL-2017	3	23-AUG-2017
T8529698	24-JUL-2017	4	23-AUG-2017
T8529699	24-JUL-2017	5	23-AUG-2017
T8529700	24-JUL-2017	6	23-AUG-2017
T8529746	24-JUL-2017	7	23-AUG-2017
T8529748	24-JUL-2017	8	23-AUG-2017

Magazine # M0304

Filter #	Date Weighed	Filter Order	Expiration Date
T8529749	24-JUL-2017	1	23-AUG-2017
T8529750	24-JUL-2017	2	23-AUG-2017
T8529756	24-JUL-2017	3	23-AUG-2017
T8529757	24-JUL-2017	4	23-AUG-2017
T8529758	24-JUL-2017	5	23-AUG-2017
T8529759	24-JUL-2017	6	23-AUG-2017
T8529760	24-JUL-2017	7	23-AUG-2017
T8529761	24-JUL-2017	8	23-AUG-2017

Magazine # M0379

Filter #	Date Weighed	Filter Order	Expiration Date
T8529762	24-JUL-2017	1	23-AUG-2017
T8529763	24-JUL-2017	2	23-AUG-2017
T8529764	24-JUL-2017	3	23-AUG-2017

Magazine # M0578

Filter #	Date Weighed	Filter Order	Expiration Date
T8529765	24-JUL-2017	1	23-AUG-2017

Relinquished by: Ashley Stroman — Ashley Stroman

Date/Time: 07/31/2017 08:10 AM

Received by: Digitally signed by Cristina Pisaranos

Compromised or damaged filters are not sampled in the field. Compromised or damaged filters may be evidenced by visible damage noted on the filter substrate (e.g. – pinholes, rips, etc.), damage to the filter screen, or damage to the filter cassette. Compromised or damaged filters are returned to the Florida DEP $PM_{2.5}$ Gravimetric Laboratory.

10.2 $PM_{2.5}$ Post-Sample Custody

Field technicians collect $PM_{2.5}$ samples using procedures outlined in the DEP 3-8 and DEP 3-15 $PM_{2.5}$ SOPs. In general, field technicians collect exposed $PM_{2.5}$ samples from the FRM samplers in the field within 177 hours of sample collection. The samples are removed from the samplers in the protective magazines and then transferred into a cooler containing frozen blue ice packs (or equivalent). From there, the samples are taken to the respective office

within the Florida PQAO (Florida DEP or Local Program). Field technicians observe the exposed filters for possible instrument processing or sample handling damage. Compromised or damaged filters are noted on the associated filter data sheet. If it is determined that damage to the filter is significant, such as a breach in the filter substrate, the sample is considered to be invalid.

Filter Logs (see Figure 10-2) are prepared for the filters to be returned to the laboratory, along with the completed/signed COC. However, if the filters are not going to be shipped back immediately, then the filters are stored in a designated refrigerator in the respective office within the Florida PQAO (Florida DEP or Local Program), along with the paperwork, until it is time to ship them. Filter holding requirements for the samples can be found in Table 5-4 of this QAPP.

When preparing the exposed samples for shipment, the field technician places the sample magazines, surrounded by frozen ice packs, into the shipment cooler. The cooler is then sealed with duct tape and addressed to the Florida DEP $PM_{2.5}$ Gravimetric Laboratory. The coolers are shipped commercial carrier, currently Greyhound GPX. FedEx may be utilized for unscheduled shipments.

Upon receipt, the laboratory specialist documents the date the samples are received and records the cooler shipment temperature utilizing the Cooler Receiving Log (Figure 10-3). Analytical holding time is dependent upon the shipment temperature and will be determined as outlined in SOP DEP 16-23. Filters are subsequently conditioned and prepared for weighing. Filter conditioning data (e.g. weigh date, final temperature mean, temperature control (SD), final RH mean, RH control (SD), etc.) are documented during the final weigh session. During this process, samples are also inspected for damage. The laboratory specialist notes compromised or damaged filters. Any filter damage is noted on the post-sampling filter layout sheet (see Figure 10-4). Filter Logs are emailed to the lab in excel format from the customer and saved in text/tab delimited format on the server. These logs are uploaded into LIMS. Once the filters have been weighed and have gone through all of the pertinent QA/QC procedures implemented by the laboratory (see SOP DEP 16-23 for details), the customer (Florida DEP or the Local Program) will receive the final $PM_{2.5}$ Analysis Report from the laboratory in a PDF format that includes the recipient contact information, data qualifier codes and definitions, received temperature of the filters, magazine ID, filter ID, pre- and post-weight results and dates, calculated delta, and any qualifiers and comments applied to the data. See Figure 10-5.

Figure 10-2. $PM_{2.5}$ FRM Field Filter Log

DEP 03-8 REV. 3: 08-2015
Effective Date: April 20, 2016

INCOMING				FILTER RUN DATA				FILTER STORAGE DATA				OUTGOING		
REC. DATE	MAG #	FILT. #	OPER IN	START DATE	START TIME	STOP DATE	STOP TIME	SAMPLER REMOVAL DATE	SAMPLER REMOVAL TIME	Frozen Blue Ice Yes/No	OPER IN	SHIP DATE	MAG #	LAB FILTER COMMENTS
04/26/16	M0236	T5562025	AH	05/10/16	00:00	05/11/16	00:00	05/17/16	10:55	Yes	AH	05/17/16	M0236	VOID
05/03/16	M0058	T5562184	AH	05/11/16	00:00	05/11/16	00:00	05/17/16	10:55	Yes	AH	05/17/16	M0236	BLANK
05/03/16	M0058	T5562185	AH	05/11/16	00:00	05/12/16	00:00	05/17/16	10:55	Yes	AH	05/17/16	M0236	
05/03/16	M0058	T5562186	AH	05/12/16	00:00	05/13/16	00:00	05/17/16	10:55	Yes	AH	05/17/16	M0236	
05/03/16	M0058	T5562187	AH	05/13/16	00:00	05/14/16	00:00	05/17/16	10:55	Yes	AH	05/17/16	M0236	
05/03/16	M0058	T5562188	AH	05/14/16	00:00	05/15/16	00:00	05/17/16	10:55	Yes	AH	05/17/16	M0236	
05/03/16	M0058	T5562189	AH	05/15/16	00:00	05/16/16	00:00	05/17/16	10:55	Yes	AH	05/17/16	M0236	
05/03/16	M0058	T5562190	AH	05/16/16	00:00	05/17/16	00:00	05/17/16	10:55	Yes	AH	05/17/16	M0236	
04/26/16	M0284	T5562033	AH	05/10/16	00:00	05/11/16	00:00	05/17/16	12:50	Yes	AH	05/17/16	M0284	
05/03/16	M0287	T5562193	AH	05/11/16	00:00	05/11/16	00:00	05/17/16	12:50	Yes	AH	05/17/16	M0284	BLANK
05/03/16	M0287	T5562194	AH	05/11/16	00:00	05/12/16	00:00	05/17/16	12:50	Yes	AH	05/17/16	M0284	
05/03/16	M0287	T5562195	AH	05/12/16	00:00	05/13/16	00:00	05/17/16	12:50	Yes	AH	05/17/16	M0284	
05/03/16	M0287	T5562196	AH	05/13/16	00:00	05/14/16	00:00	05/17/16	12:50	Yes	AH	05/17/16	M0284	
05/03/16	M0287	T5562197	AH	05/14/16	00:00	05/15/16	00:00	05/17/16	12:50	Yes	AH	05/17/16	M0284	
05/03/16	M0287	T5562198	AH	05/15/16	00:00	05/16/16	00:00	05/17/16	12:50	Yes	AH	05/17/16	M0284	
05/03/16	M0287	T5562199	AH	05/16/16	00:00	05/17/16	00:00	05/17/16	12:50	Yes	AH	05/17/16	M0284	
04/26/16	M0425	T5562041	AH	05/10/16	00:00	05/11/16	00:00	05/17/16	9:40	Yes	AH	05/17/16	M0425	
05/03/16	M0314	T5562202	AH	05/11/16	00:00	05/11/16	00:00	05/17/16	9:40	Yes	AH	05/17/16	M0425	BLANK
05/03/16	M0314	T5562203	AH	05/11/16	00:00	05/12/16	00:00	05/17/16	9:40	Yes	AH	05/17/16	M0425	
05/03/16	M0314	T5562204	AH	05/12/16	00:00	05/13/16	00:00	05/17/16	9:40	Yes	AH	05/17/16	M0425	
05/03/16	M0314	T5562205	AH	05/13/16	00:00	05/14/16	00:00	05/17/16	9:40	Yes	AH	05/17/16	M0425	
05/03/16	M0314	T5562206	AH	05/14/16	00:00	05/15/16	00:00	05/17/16	9:40	Yes	AH	05/17/16	M0425	
05/03/16	M0314	T5562207	AH	05/15/16	00:00	05/16/16	00:00	05/17/16	9:40	Yes	AH	05/17/16	M0425	
05/03/16	M0314	T5562208	AH	05/16/16	00:00	05/17/16	00:00	05/17/16	9:40	Yes	AH	05/17/16	M0425	
04/26/16	M0457	T5562042	AH	05/12/16	00:00	05/13/16	00:00	05/17/16	12:40	Yes	AH	05/17/16	M0438	

ENTER FIELD FILTER COMMENTS BELOW

T5562025	Filter exchange failed during sampler audit and leak check. Void sample.
T5562184	Designated Blank Filter
T5562193	Designated Blank Filter
T5562202	Designated Blank Filter

Completed By: A. Humphrey Date: 5/17/2016
QA/QC By: N. Rabanal Date: 5/17/2016

Operator's and a supervisor's initials with their respective dates, are required before filing away Form DEP 03-8-2A in PDF

Figure 10-3. $PM_{2.5}$ Gravimetric Laboratory Cooler Receiving Log

Effective Date: 08/22/2022
Revision Date: 08/18/2022
Revision Author(s): C. Armour

PM-RECEIVINGLOG-2.0

DEP PM2.5 Cooler Receiving Log

Infrared Thermometer SN: | Certification Exp:

Agency	Incoming Y/N	Received Y/N	Date/Time Received	Received By	Shipment Integrity OK?	Received Temp °C	Unpacked By Initials	Comments
Broward								
Central								
Miami-Dade								
Duval								
Hillsborough								
Tallahassee								

Shipment Integrity: Tape intact on hard cooler and lid closed. Softside inner cooler closed. No damage to magazines.

Coolers Unpacked By Signature:

Lab Staff Signature #1: _____ Date/Time: _____

Lab Staff Signature #2: _____ Date/Time: _____

Equilibrium Time ≥ 2.5Hrs: _____ or Equalized Temperature in Degrees Celsius: _____

Additional Comments:

PM-RECEIVINGLOG-2.0.xlsx

Figure 10-4. $PM_{2.5}$ Gravimetric Laboratory Post-Sampling Filter Layout Sheet

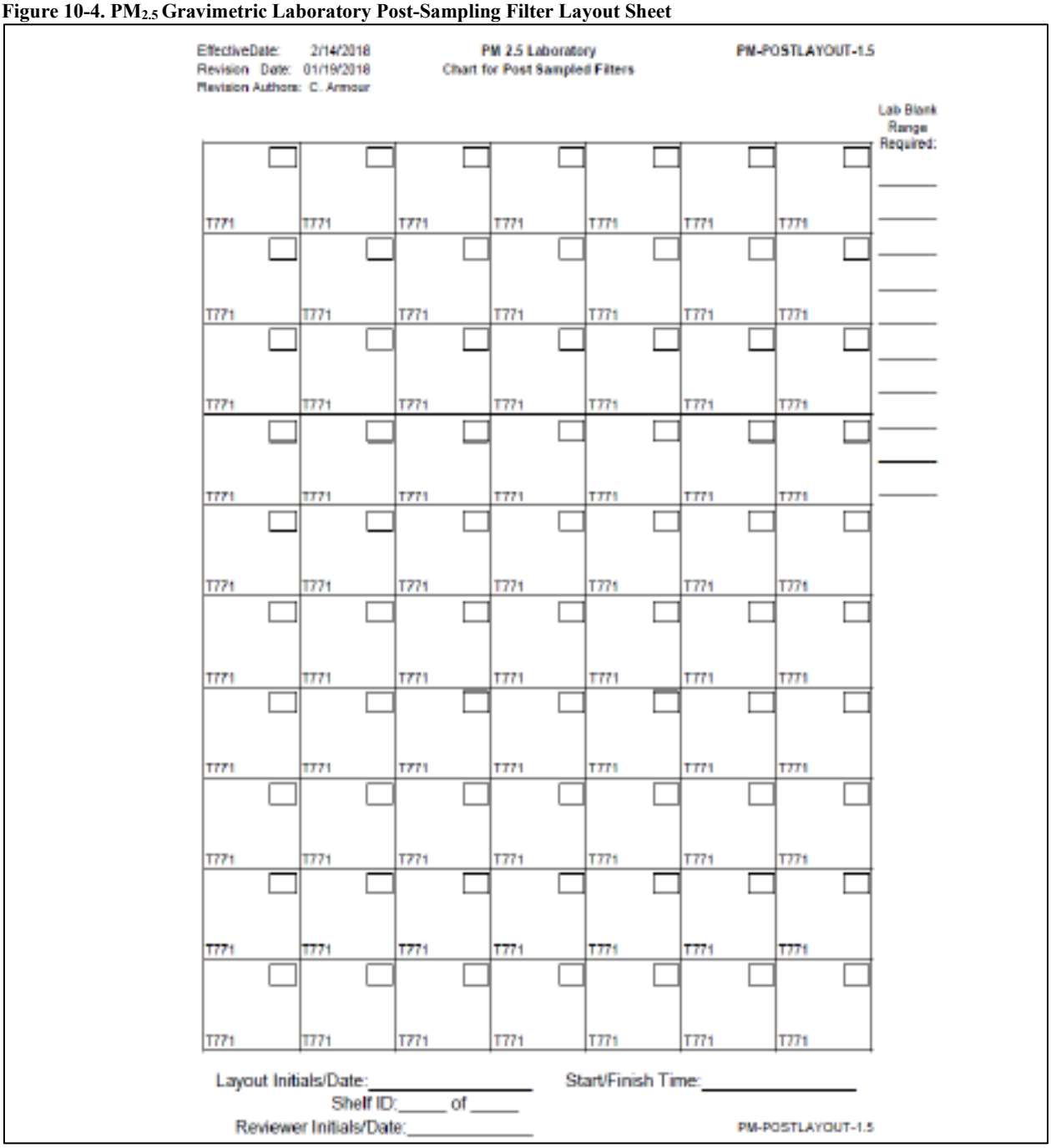
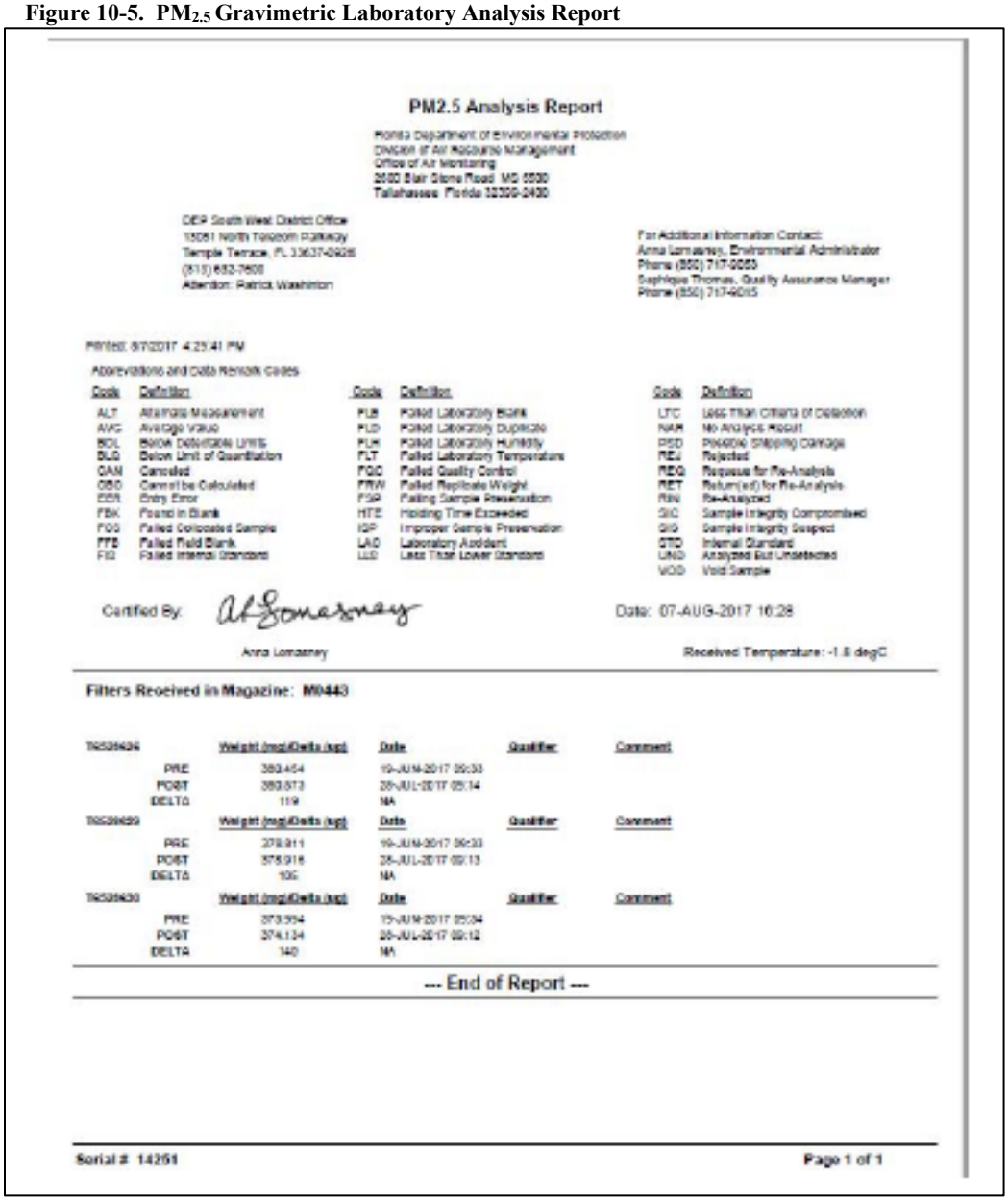


Figure 10-5. $PM_{2.5}$ Gravimetric Laboratory Analysis Report



PM2.5 Analysis Report

Florida Department of Environmental Protection
Division of Air Resource Management
Office of Air Monitoring
2600 Blair Stone Road MS 5530
Tallahassee Florida 32399-2400

DEP South West District Office
13051 North Telecom Parkway
Temple Terrace, FL 33637-0926
(813) 632-7600
Attention: Patrick Washinton

For Additional Information Contact:
Anna Lomasney, Environmental Administrator
Phone (850) 717-0053
Sephigue Thomas, Quality Assurance Manager
Phone (850) 717-4015

Printed: 8/7/2017 4:25:41 PM

Abbreviations and Data Remark Codes

Code	Definition	Code	Definition	Code	Definition
ALT	Alternate Measurement	FLB	Failed Laboratory Blank	LTC	Less Than Criteria of Detection
AVG	Average Value	FLD	Failed Laboratory Duplicate	NAR	No Analysis Result
BDL	Below Detection Limit	FLH	Failed Laboratory Humidity	PSD	Possible Shipping Damage
BLD	Below Limit of Quantitation	FLT	Failed Laboratory Temperature	REJ	Rejected
CAN	Canceled	FQC	Failed Quality Control	REQ	Requeue for Re-Analysis
CBD	Cannot be Calculated	FRW	Failed Replicate Weight	RET	Return(ed) for Re-Analysis
EER	Entry Error	FSP	Failing Sample Preservation	RIN	Re-Analyzed
FBK	Found in Blank	HTE	Holding Time Exceeded	SIC	Sample Integrity Compromised
FDS	Failed Collocated Sample	ISP	Improper Sample Preservation	SIG	Sample Integrity Suspect
FFB	Failed Field Blank	LAC	Laboratory Accident	STD	Internal Standard
FIS	Failed Internal Standard	LLD	Less Than Lower Standard	UND	Analyzed But Undetected
				VOID	Void Sample

Certified By: Anna Lomasney Date: 07-AUG-2017 16:28

Received Temperature: -1.6 degC

Filters Received in Magazine: M0443

TAS30626	Weight (mg)/Delta (ug)	Date	Qualifier	Comment
PRE	380.464	19-JUN-2017 09:33		
POST	380.573	26-JUL-2017 09:14		
DELTA	119	NA		
TAS30629	**Weight (mg)/Delta (ug)**	**Date**	**Qualifier**	**Comment**
PRE	278.911	19-JUN-2017 09:33		
POST	278.916	26-JUL-2017 09:13		
DELTA	105	NA		
TAS30630	**Weight (mg)/Delta (ug)**	**Date**	**Qualifier**	**Comment**
PRE	373.994	19-JUN-2017 09:34		
POST	374.134	26-JUL-2017 09:12		
DELTA	140	NA		

--- End of Report ---

Serial # 14251 Page 1 of 1

10.3 Make-Up Samples

The Florida PQAO collects $PM_{2.5}$ samples in accordance with the scheduled specified in 40 CFR 50 Appendix N. The national sampling scheduled is set each year by EPA. A "make-up" sample becomes a replacement for a scheduled day. The number of make-up samples permitted by EPA in any calendar quarter is limited to 5 samples. When make-up samples are necessary, field technicians will document the reason why the original sample was invalidated.

The following is the approach Florida PQAO field technicians will take when selecting the make-up sampling day. In all cases, the make-up sampling day must be no later than 1 week from the missed sampling day. Florida's strategy in making up samples is in accordance with EPA's "Use of Make-up PM Samples to Replace Scheduled PM Samples) guidance memorandum dated February 3, 1999: https://www3.epa.gov/ttnamti1/files/ambient/pm25/replacem.pdf.

Preferred choice for make-up sampling day: Before the next scheduled sampling day.

- For monitoring sites sampling every sixth day (in a network with other sites sampling every third day), the preferred replacement day is the next scheduled every third day sample. This provides the benefit of additional spatial resolution of network measurements and is likely to be most convenient for site operators. Otherwise, a day closest to the missed sampling day is suggested.
- For monitoring sites sampling every third day, the earliest possible day before the next scheduled sample at the monitoring site is suggested. Although there are only two possible make-up days with 1-in-3 day sampling, selection of a replacement day as close as possible to the missing day increases the chances of a replacement day with similar meteorological conditions.

Alternative approach: Sample one week later, on the same calendar day. This provides a replacement day on the same day of the week, thereby helping with temporal balance for the quarterly data set to reduce any potential day of the week effect of emissions.

11.0 ANALYTICAL METHODS REQUIREMENT

Particulate matter requires analytical methods to evaluate the captured sample and to establish the pollutant concentration present in the environment. The intermittent, filter-based $PM_{2.5}$ particulate samplers employed for particulate matter monitoring require gravimetric analyses. A filter's net weight gain identifies the sample characteristic of interest, captured particulate mass. The net gain is obtained by subtracting the initial filter weight from the final weight of the exposed filter. Once calculated, the net weight gain can be used with the total volumetric flow to calculate the concentration for comparison to the NAAQS. Since the method is non-destructive, and due to possible interest in sample composition (e.g., subsequent chemical analyses), the filters will be archived after final gravimetric analyses has occurred.

The particulate sample filters are analyzed by agency-specific weighing labs. For $PM_{2.5}$, the conditioning environment is the weighing facility within the laboratory. The laboratory conducts pre-exposure weighing and post-exposure weighing of each filter sample. The laboratory is an environmentally controlled room. The temperature and relative humidity are measured and documented prior to the weighing process. The balance is located on a marble slab and is protected from drafts. The filters are conditioned before both the pre-exposure and post-exposure weighing activities. Specific requirements for $PM_{2.5}$ are in SOP DEP 16-23 and summarized in Table 5-4. These requirements are adopted from EPA's QA Handbook (derived from the 40 CFR Part 50, Appendix L and EPA Quality Assurance Guidance Document 2.12).

For intermittent particulate matter sampling, sample collection occurs in the field using a sampler that has been designated as an FRM, but the final sample analysis of the collected filter occurs in the laboratory. The gravimetric analysis of the particulate filters must also be completed in accordance with the federal reference method. These method requirements for $PM_{2.5}$ sampling, which includes both the field and laboratory (analytical) components, are detailed in 40 CFR Part 50, Appendix L and Method 2.12. The analytical instrument that will be used for the gravimetric analysis of the FRM $PM_{2.5}$ sample is the microbalance. The required filter media is a 46.2-millimeter polytetrafluoroethylene (PTFE Teflon) filter.

More details about the analytical method and laboratory QC are found in Sections 10 and 12 of this QAPP.

11.1 Filter Storage and Archival

The following details the filter storage and archival process for $PM_{2.5}$ filters:

- Upon completion of filter sampling, post-weighing and reporting, the filters are stored in Millipore Petri-slides.
- Filters are stored in numerical order in Petri-slide trays.
- When all the filters have been post-weighed from a box of 50 filters, the associated lab blanks must be placed in the Petri-slide tray, along with any filters in the sequence that were cancelled. Label the series of filters contained in each tray, seal the tray in a clear plastic bag, and store in the lab refrigerator at 1-4 °C.

- Archived filters will be stored for five years. The filters are stored in refrigeration for the first year and then at room temperature for four additional years, free from excessive heat, humidity, and contamination.
- Archived filters may be made available upon request.

11.2 Analytical Method Validation

A method validation exercise must initially be performed on every instrument used to collect data and must be repeated any time there is a major change to the analytical method or instrumentation. The validation procedure is the repeated measurement of standard weights, demonstrating that the instrumentation and personnel can meet all the method criteria. Method validation should be documented.

12.0 QUALITY CONTROL REQUIREMENTS

Quality control is the overall system of technical activities that measure the attributes and performance of a process against established standards to verify that performance meets the stated requirements. This section contains QA/QC information regarding the specifications and performance criteria for the particulate matter samplers utilized in Florida's network. Information on QA data validation and verification can be found in Section 20.

To assure the quality of data from air monitoring measurements, two distinct and important interrelated functions must be performed. One function is the control of the measurement process through broad QA activities, such as establishing policies and procedures, developing DQOs, assigning roles and responsibilities, conducting oversight and reviews, and implementing corrective actions. The second function is to control measurement error by implementing specific QC checks at established frequencies to ensure the monitoring instrumentation operates within specified criteria.

QC procedures for each sampler type are addressed (and discussed in more detail) in the specific SOPs (see Appendix C of this QAPP). Calculations and formulas related to the QC checks are defined in the individual SOPs. Associated forms utilized by the PQAO contain these formulas embedded in cells and generate values for the field technicians immediately. Similarly, EPA's AQS provides statistical software that evaluates the DQIs of precision, bias, and completeness, once the data is uploaded into the AQS database.

The following summarizes the QC procedures performed by Florida's air monitoring staff.

12.1 Calibration

The process employed to verify and rectify an instrument's measurements in order to minimize deviation from a known standard. This multi-phase process begins with certifying a calibration/transfer standard against an authoritative, NIST-traceable standard. The sampler's measurements are then compared to that of the calibration/transfer standard. If deviations exist between the instrument's measurements and the calibration/transfer standard's measurements that are beyond the acceptance specification, corrective action is implemented to rectify the instrument's measurements. This corrective action is in the form of an instrument adjustment. Henceforth, the term calibration will be used to mean adjustment.

Calibration requirements for the critical field and laboratory equipment are found in the SOPs and in the specific instruments' operations manuals. The requirements are specified in Tables 5-4 thru 5-9 as well as the SOPs.

The flow rate calibration for the low-volume samplers is made within the instrument. It is electronic and performed by the flow controller inside the instrument. The sampler automatically adjusts the offset and span values to perform measurements. The detailed calibration procedure is located in SOP DEP 3-15. This is also true for other particulate

samplers in the Florida network --- see SOPs DEP 3-8, 3-12, 3-15, 3-16, 3-20, 3-21, 3-23, and 3-24.

12.2 Verifications

The particulate matter network employs verifications to confirm that the sampler is in good working order. Verifications do not make any adjustments to the sampler or data, but rather supports the defensibility of the data collected. The frequency of these checks varies by instrument type. However, there are minimum requirements that the PQAO employs. These are detailed below.

Precision (or QC) Checks

Precision is defined as the measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. To meet the DQOs for precision, the PQAO will ensure the entire measurement process is within statistical control and various tools will be employed in evaluating and monitoring precision measurements. To evaluate precision, the following checks will be performed.

- **Flow Checks** – Pursuant to 40 CFR Part 58, Appendix A, Section 3.2.1, one-point flow rate verification check must be performed at least once every month (each verification minimally separated by 14 days) on each monitor used to measure $PM_{2.5}$. The verification is made by checking the operational flow rate of the monitor. If the verification is made in conjunction with a flow rate adjustment, it must be made prior to such flow rate adjustment. For the standard procedure, use a flow rate transfer standard certified in accordance with section 2.6 of 40 CFR 58 Appendix A to check the monitor's normal flow rate. Care should be used in selecting and using the flow rate measurement device such that it does not alter the normal operating flow rate of the monitor. Report the flow rate of the transfer standard and the corresponding flow rate measured by the monitor to AQS. The percent differences between the audit and measured flow rates are used to assess the bias of the monitoring data as described in section 4.2.2 of Appendix A (using flow rates in lieu of concentrations).

  Pursuant to 40 CFR Part 58, Appendix A, Section 3.3.1, for low-volume samplers (less than 200 liters/minute), a one-point flow verification check must be performed at least once every month (each verification minimally separated by 14 days) on each monitor used to measure PM_{10}. The verification is made by checking the operational flow rate of the monitor. A certified flow rate transfer standard certified must be used to check the monitor's normal flow rate. The percent differences between the audit and measured flow rates are reported to AQS and used to assess the bias of the monitoring data. The acceptance criteria are identified in Tables 5-4 thru 5-9 and as specified in the SOPs.

  Additionally, a multi-point verification is conducted once a year on all samplers. An adjustment (calibration) must be performed if the verification fails (i.e., exceeds

acceptance criteria) and the sampler itself is determined to be in good working order. See Tables 5-4 thru 5-9 for acceptance criteria. Before the recalibration is performed, all typical troubleshooting techniques should be applied to verify the complete system is in good working order (which, in turn, verifies the failed verification is valid).

- **Collocated Monitoring** – Pursuant to 40 CFR Part 58, Appendix A, Section 3.2.3, collocated monitoring for $PM_{2.5}$ sampling will be utilized in the Florida network. This collocated monitoring will be used to assess precision. For $PM_{2.5}$, collocated monitoring applies to both continuous and intermittent samplers. For PM_{10}, collocated monitoring only applies to manual/intermittent samplers. The Florida PQAO only employs continuous samplers for PM_{10}. This collocated monitoring will be used to assess precision for particulate monitoring. Precision (or QC checks) verify (confirm) the sampler is in good working order, and, therefore, support the defensibility of the data.

Note: Florida's PQAO does not perform post-process procedures on the monitoring data to "correct" for a failing QC check. Based upon calibration data and validation criteria, the monitoring data is either reported as collected, appropriately qualified, or the data is invalidated.

Accuracy or Bias Checks

Accuracy is defined as the degree of agreement between an observed value and an accepted reference value. Accuracy is a combination of random error (precision), and systematic error (bias). The collocated monitors are primarily used for evaluating and controlling precision; however, they can also be used to determine accuracy or bias. By employing percent difference calculations and plotting the results on control charts, trends can be observed that indicate bias occurring within the measurements. Particulate matter control charts plot the monthly flow rate verifications to ascertain the accuracy or an indication of any bias between the monitor or sampler and the flow rate transfer standard. Accuracy or bias requirements for various types of instrumentation are found in the SOPs and in the specific instruments' operations manuals.

These evaluations will be included in the calculations for determination of an agency's accuracy. While these evaluations will not be used to invalidate or adjust concentration data, if an evaluation for a monitor indicates a problem, an investigation into the root cause must be performed and subsequent corrective actions must be performed to ensure overall quality of the data. Corrective actions must be completed in accordance with the Corrective Action SOP (DEP 01-4). See Sections 20 and 21 of this QAPP and the Data Handling and Data Validation SOP (DEP 18-27) for further details on assessing data quality when a problem is noted during such an evaluation.

Weigh Laboratory

The laboratories participating in filter-based gravimetric analyses must also perform QC procedures to ensure the validity of the sample data. For the $PM_{2.5}$ gravimetric laboratory, these checks include:

- **Conditioning Environment** – The conditioning room 24-hour average temperature must be 20.0-23.0 °C and the relative humidity (RH) in the range of 30.0-40.0 %.
    - Verify and record the preceding 24-hour average temperature (20.0-23.0°C) with the standard deviation not to exceed 2.0 °C.
    - Verify and record the preceding 24-hour average relative humidity (30.0-40.0 % RH) with the standard deviation not to exceed 5.0% RH.
    - Verify that the difference in the pre- and post- relative humidity does not exceed ±5.0 %.
- **Filter Holding Times**
    - Filters must be sampled within 30 days of pre-weighing.
    - Filters must be collected from the sampler within 177 hours of sampling.
    - Filters received into the lab at temperatures below the average ambient sampling temperature must be post-weighed within 30 days of sampling. Agencies must compare relevant temperatures and dates and verify the holding time requirement.
    - Filters received into the lab at temperatures above the average ambient sampling temperature must be post-weighed within 10 days of sampling.
    - Filters received at temperatures higher than 4 °C will be reported to the agency with a qualifier. Agencies must compare relevant temperatures and dates and verify the holding time requirement.
    - Filters received into the lab at temperatures above 25 °C do not meet method criteria and are invalid; however, they will be weighed and reported to the agency with a qualifier.
- **Working Standards** – Mass reference standards of 300 mg and 500 mg are weighed at the beginning and end of each batch (weigh sheet) and after every 10th filter on a weigh sheet and must not exceed +3 µg compared to their conventional mass values.
- **Batch Duplicate Filter Weighing** – A duplicate filter is weighed with each batch of filters. The first filter on any weigh sheet is denoted the batch duplicate (BD). The difference of the duplicate filter weights must not exceed ± 15µg.
- **Lab Filter Blanks** – Lab blanks are weighed with every batch of filters and must meet the delta criteria of ± 15 µg compared to the original mass measurement made when the blank filter was first weighed.

These procedures are covered in detailed in the SOP (DEP 16-23).

Quality Control Samples

For the intermittent $PM_{2.5}$ samplers, collecting field blanks for the intermittent $PM_{2.5}$ sampler is required under 40 CFR Part 50, Appendix L, Section 8.3.7.1. As such, the Florida PQAO will collect field blanks samples as a QC check. A field blank is a filter that is pre-weighed with routine samples, installed in the field sampler without any flow passing over the filter, re-weighed with routine samples, and then initial/final weights compared. The purpose of field blanks is to provide an estimate of total measurement system contamination, including laboratory and field activities. Through a comparison of laboratory blanks against field blanks, contamination from field activities can be assessed. The acceptance criterion for field blanks is ±30 µg between weighings. Field blanks are to be collected in the Florida PQAO network at a frequency of ~10% of the sampling runs scheduled per site. The Florida PQAO filter-based $PM_{2.5}$ field blank policy is to run a blank with any Wednesday sample on the calendar. For example, for a sampler operating on a 1-in-3-day operating schedule, about 17 field blanks would be collected over the course of a year. Field blanks are taken throughout the duration of the sampling schedule (spaced evenly across the year) and not concentrated in a short period of time.

12.3 Performance Evaluation (PE) Audits

For instruments that monitor flow, a flow rate audit will be performed. The audit is made by measuring the sampler's normal operating flow rate using a certified flow rate transfer standard. The flow rate standard used for auditing must not be the same standard used to calibrate the sampler. In Florida's air monitoring network, the quality assurance (QA) auditor is independent from routine field operations and normally conducts performance audits on network equipment using dedicated QA equipment. This was the case prior to the second quarter of calendar year 2020. However, due to the pandemic (COVID-19) and related restrictions (i.e. travel, interactions, etc.), the field technicians, both local program agencies and Florida DEP, within the Florida PQAO began conducting performance evaluations (semi-annual flow rate audits) for the particulate matter monitors utilizing independent certified equipment, not normally used to calibrate and operate the sampler. This took effect beginning the second quarter of calendar year 2020. The field SOP forms were used in lieu of the audit SOP forms to record these performance evaluations. However, a newly created, PQAO-approved forms were implemented during the second quarter of calendar year 2022 to document these semi-annual flow rate audits. Florida DEP OAM QA staff conduct quality assurance reviews of these documented performance evaluations, both Florida DEP and local program agencies, before they are finalized and entered into AirMVP. The final, QA'd performance evaluation is provided to the agency or Florida DEP territory and saved on Florida DEP's network drive. See OAM Quality Assurance Note 006 – Semi-Annual Flow Rate Audits for Particulate Matter and Lead (formerly Calendar Year 2020 Performance Audit Activities) posted on AirMVP; this quality assurance note details the original actions taken. These audits are conducted using the methodology specified in audit and field SOPs for the particulate being measured (see Appendix C of this QAPP). Details for implementing

flow audits may be found in the applicable instruments' operations manuals, and in the appropriate SOPs.

The requirements and frequency for flow rate audits are specified in 40 CFR Part 58, Appendix A. In general, for the particulate matter 2.5 sampler, the audits are required bi-annually (between 5 and 7 months apart) per Section 3.2.2 ($PM_{2.5}$) and 3.3.3 (PM_{10}) of Appendix A, to which Florida adheres.

Florida's PQAO also participates in the EPA National $PM_{2.5}$ Performance Evaluation Program (NPEP). For each NPEP audit, a percent difference is calculated, and the results are compared to the acceptance criteria established in Tables 5-4 to 5-7 and 5-9.

12.4 Corrective Actions

Corrective action measures within the PQAO are taken as necessary to ensure the MQOs are attained. Given the number of monitors, the diversity of monitoring activities, and the complexity of the instruments, there is a potential that issues may arise with the air monitoring measurement systems. In a properly functioning monitoring network, issues may be anticipated in advance and staff should be prepared and equipped to address issues as they arise.

Corrective actions may also be implemented on an "as-needed" basis when unexpected or unforeseen circumstances are encountered, such as a failed QA/QC check. The Corrective Action SOP (DEP 01-4) as well as instrument SOPs contain examples of corrective actions that may need to be completed under certain circumstances. Field technicians should consult the appropriate particulate matter-specific SOP for technique-specific checks, required frequency of checks, acceptance criteria, and additional corrective action guidance (i.e., Corrective Action SOP). Please refer to the Corrective Action and Data Handling and Data Validation SOPs for further information on completing corrective actions and appropriate data handling procedures. Additionally, laboratory-related corrective action procedures are documented in SOP 16-23 for the $PM_{2.5}$ gravimetric weigh laboratory. Laboratory specialists should consult these SOPs for corrective action guidance.

12.5 Documentation

All events, including routine site visits, calibrations, precision checks, PEs, sampler maintenance, and calibration equipment maintenance will be documented in the appropriate laboratory data records and logbooks and/or field data records and logbooks, as specified in the particulate matter-specific SOPs. Corrective actions will be documented in accordance with the Corrective Action SOP. Additionally, laboratory-related corrective action procedures are documented in SOP 16-23 for the $PM_{2.5}$ gravimetric weigh laboratory.

13.0 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE REQUIREMENTS

Preventative maintenance is a foundational element to an effective QA program. Florida DEP maintains a maintenance/repair shop at the Tallahassee, FL main office building for off-site repair, maintenance, and field readiness certification of equipment. This work is performed by the Maintenance, Repair and Acquisition Support (MRAS) team. There are also a few maintenance/repair shops amongst the local programs, however, all local programs within the PQAO do not have a maintenance/repair shop due to facility and resource constraints. Maintenance of the $PM_{2.5}$ weighing laboratory and equipment is handled by (i.e. performed directly, serviced out, or coordinated with the appropriate staff within Florida DEP) the $PM_{2.5}$ Gravimetric Laboratory Specialists. When possible, new monitoring equipment is inspected and certified for the field by the DARM Standards Laboratory. Alternatively, some local programs perform equipment testing "live" in the field at the monitoring site, but the data is not reported to EPA's AQS database until it is deemed acceptable for NAAQS comparisons. Furthermore, the sampling start date in AQS for these newly deployed instruments will reflect the date NAAQS comparable data collection commenced, which will be following the completion of acceptance testing activities.

Instrument/equipment as-found and as-left status and/or conditions are documented using an equipment tracking log (for example, Equipment Status Reports or Check-in Check-out forms) to verify that all instruments and equipment are in sound operating condition and are capable of operating at acceptable performance levels before beginning or resuming ambient data collection. PQAO monitoring staff are strongly encouraged to share knowledge and equipment experience. Refer to the instrument specific SOPs (listed in Appendix C of this QAPP) for more details on the specific preventative maintenance activities.

In general, the following acceptance/testing activities are performed upon receipt of new samplers, and/or after a sampler has undergone significant repair. If the equipment is new and fails to meet the field readiness certification described below, the vendor will be contacted.

- Verify that instrument contains its EPA equivalent or reference method decal and meets the specifications of the purchase request.
- Verify that all expected parts arrived with the instrument and that nothing is physically broken. Contact the vendor if there are issues.
- Perform field readiness "certification" testing, summarized as follows. Although the designation of the FRM/FEM status ensures the make/model of the instrument meets EPA requirements for use in a SLAMS network, PQAO staff must still ensure that individual instruments perform as expected before deploying to the field and/or prior to the beginning of (NAAQS comparable) data collection.
    - Check and document the diagnostics of the sampler, looking for any fault lights or warnings. Ensure that parameters such as sample flow rate, lamp intensity,

temperatures, and so forth are within specifications (see user manuals). Perform a leak check(s) on the sampler.

- Perform verification check(s). Perform a leak check. Verify the flows, the temperature sensor, the pressure sensor, and the particle sensor PMT check (with span dust) for the T640/T640X (see corresponding SOPs, DEP 03-21 and 03-23). Additionally, conduct a multi-point verification of the actual volumetric flow measured by the transfer flow standard.
- Allow the sampler to run in its normal sampling mode in the shop (or the field) for several days before deployment (or commencing NAAQS comparable data collection). Verify that all instrument settings and data generated meet the FRM/FEM method requirements.

If an instrument has undergone significant troubleshooting or repair and fails to meet the field readiness certification (testing), the vendor will be contacted. If after working with the vendor, the instrument cannot be repaired such that it passes performance testing, then the instrument will be returned (if under warranty) or shelved (i.e., discontinued from service, if warranty has expired). With regard to the latter, the instrument is tagged as inoperable and will be used for spare parts. If the instrument that was shelved and tagged was a back-up instrument, then the Field Operations Section Administrator or Local Agency Air Program Manager will begin the process to purchase a new instrument to replace that back-up, such that a spare is once again available for use.

In general, the following inspection activities are used:

- Monitoring shelters, downtubing, and other enclosures are inspected routinely to ensure conditions do not adversely affect monitor operation or data integrity.
- Data collection and data quality is reviewed each business day and trends are inspected for signs of problems. Data trends that signal inspection would include issues such as frozen numbers for multiple hours in a row, or erratic spikes or valleys in the concentrations obtained.
- Inspections on equipment also occur during site visits to verify the entire system is in good working order. Site visit checklists are available to the field technicians and equipment operating parameters are also documented on the calibration, and maintenance tracking forms (within electronic logbooks), as well as on performance evaluation audit forms.
- The sites and monitors are reviewed annually to ensure continuing compliance with 40 CFR Part 58, Appendix E. These are documented by QA Auditors on the PQAO Site Review forms.

Regarding routine maintenance, the following are general protocols:

- A limited supply of critical spare parts is maintained within the PQAO by each respective program to aid in rapid response to issues. For example, pump rebuild kits, spare pumps, and filters.

- Preventive maintenance is scheduled ahead of time, so all parts/tools can be easily available to complete the tasks and data loss is kept at a minimum.
- Preventive maintenance activities are typically performed in the field, although some activities are completed in the shop, if available.

The routine preventive activities and schedules are detailed in the specific equipment SOPs and supplemented by the equipment user manuals. For example, for the manual, filter-based instruments, the particle trap filter is changed, the air screens are cleaned, and the VSCC is changed or cleaned routinely. While, for the continuous instruments, the optical chamber and relative humidity/temperature sensor is routinely cleaned, for example. All particulate instruments undergo a comprehensive preventive maintenance regimen (also detailed in the SOPs) which includes tasks such as cleaning the inlets, checking pump performance, and performing leak checks.

Regarding $PM_{2.5}$ gravimetric laboratory equipment routine maintenance, the following are performed:

- The analytical balances are routinely certified to maintain NIST-traceability and inspected to ensure that the are grounded and operating with the leveling bubble at the level position.
- Mass reference standards are routinely certified to maintain NIST-traceability and are inspected for scratches, bends, and corrosion.
- Computers and associated software are routinely checked to ensure that they are performing as they should and to ensure that the calculations and automated practices are correct and up-to-date.
- Balance weighing tables are routinely cleaned and remain clutter free.
- Conditioning shelves are routinely cleaned and checked to make sure they remain stable.
- Anti-static devices are routinely cleaned and/or replaced to ensure they are working appropriately.
- Air conditioning equipment is routinely inspected and monitored. Filters must be changed. Dehumidifier desiccant requires routine replacement. Fan speed has to be adjusted seasonally to ensure that the humidity levels are maintained. AC fan belt tension and condition has to be inspected to ensure that it is not frayed or cracked and to ensure that it hasn't slipped during operation.
- The temperature of the refrigerator for filter storage is routinely monitored and recorded to ensure that the required temperature is maintained.
- The digital sensors associated with the hygrometer and temperature controller probes are routinely recalibrated by the manufacturer to maintain NIST certification and are verified regularly to ensure performance and functionality.
- The weighing room is routinely cleaned to ensure no introduction of outside interferences and maintain cleanliness.

The routine maintenance and system calibration schedule is detailed in the PQAO $PM_{2.5}$ Gravimetric Laboratory SOP.

14.0 INSTRUMENT STANDARDS, CERTIFICATIONS, AND FREQUENCY

40 CFR Part 58, Appendix A, §2.6 requires that gaseous standards (i.e., gas cylinders), photometers, and flow rate standards used in the ambient air monitoring network be traceable to National Institute of Standards and Technology (NIST). As such, instrument calibrations performed in Florida's network are conducted using traceable standards to ensure that the ambient air quality data meets the Florida PQAO and EPA quality objectives.

Traceable is defined in 40 CFR Parts 50 and 58 as meaning that a local standard (i.e., one maintained by a monitoring organization) has been compared and certified, either directly or via not more than one intermediate standard, to a primary standard such as a NIST Standard Reference Material (NIST SRM) or an EPA/NIST-approved Certified Reference Material (CRM). Similarly, traceability is the property of a measurement result whereby the result can be related to a stated reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty. Standard traceability, therefore, is the process of transferring the accuracy or authority of a primary standard to a field-usable standard, resulting in a documented unbroken chain of calibrations/certifications.

Calibration is defined as the comparison of a measurement standard, instrument, or item with a standard or instrument of higher accuracy to detect and quantify inaccuracies and to report or eliminate those inaccuracies by adjustment. Use of the term "calibration" indicates that an adjustment either in the instrument or the software occurred. EPA recommends that adjustments be minimized to prevent introducing measurement uncertainty and that verifications, "i.e., checks without correction (adjustment)," be used to confirm whether or not an instrument is operating within its acceptance range. Thus, the purpose of calibration is to minimize bias. Calibrations are discussed in more detail in Section 12 of this QAPP. Calibration procedures for each specific sampler are described in the applicable SOP.

The term "certification" refers to the actions or processes that attest the status, operational capacity, and/or functionality of an instrument. An overview of the certification procedures will be discussed in this section; however, the specific verification, calibration, and certification procedures for the laboratory and field equipment can be found in the applicable SOPs or operation manuals. See Appendix C of this QAPP for the applicable SOPs.

14.1 Flow Rate Standards

The field technicians within the PQAO are responsible for ensuring that all flow rate standards used in the ambient air monitoring network are properly certified and/or calibrated. The QA staff, i.e. the Data Validation Team and Local Program QA Coordinators/Staff, confirms these records during the data validation process. The QA staff are responsible for maintaining calibration and certification documentation according to the Florida PQAO's record retention policy.

Flow devices used by the field technicians (e.g., Mesa Labs TetraCals, Chinook FTSs, etc.) are returned to the vendor by the Standards Laboratory for annual certification. Mass flow devices which operate under microprocessor control (and flow controllers in electronically flow-controlled instruments) must be verified annually with a properly certified flow standard and documented, in lieu of a formal calibration.

Specific certification and calibration procedures for field equipment can be found in the applicable instrument and laboratory SOPs and/or operation manuals.

14.2 Temperature Standards

The DARM Standards Laboratory maintains Brooklyn Thermometer Company mercury-in-glass thermometers as NIST primary standards, which are used to recertify field NIST-traceable digital thermometers (e.g., max/min thermometers) used to perform routine checks (e.g., pressure verification, pressure sensor calibration). The mercury-in-glass thermometers should be checked routinely for column separation and the field temperature devices shall be recalibrated and recertified at least annually, to within 2°C of the expected range of ambient temperatures at which the temperature standard is to be used. Additionally, all non-liquid-in-glass thermometers, including max/min, thermographs, and electronic sensors must be certified or calibrated at a minimum of three (3) points which encompass the primary area (temperature range) of interest.

Specific certification and calibration procedures for field equipment can be found in the applicable instrument and laboratory SOPs and/or operation manuals.

14.3 Humidity and Temperature Standards – Gravimetric Laboratory

The gravimetric laboratories utilize hygrometers to measure relative humidity, and thermometers or temperature controller/probes to measure temperature.

The digital hygrometer and temperature sensors within the $PM_{2.5}$ gravimetric laboratory are NIST certified and the certification is maintained by sending units to Vaisala for recalibration annually. Verification of the sensors is performed on a quarterly basis by comparing the working and back-up sensor readings to the primary sensor reading. The Siemens sensor functionality is verified on a quarterly basis, also, by comparing the 5-minute data archived in the division's monitoring system against the Vaisala primary unit (see SOP DEP 16-23 for specifics). All verifications and certifications are documented in the laboratory's logbook.

14.4 Pressure Standards

The DARM Standards Laboratory maintains a stationary Princo Fortin mercury barometer, which is used to certify pressure transfer standards used at the air monitoring sites to complete routine checks (e.g., pressure verification, pressure sensor calibration). These field pressure transfer standards will be handheld aneroid (e.g., Taylor) or digital barometers (e.g.,

Nova Link) that will be recertified at least annually against the Standards Laboratory primary standard.

14.5 Time Standards

Florida's PQAO may use the WWV NIST atomic clock in Boulder, CO (telephone number: 1-303-499-7111) as a primary time standard. A local program agency can establish a time transfer standard (computer clock, watch, etc.) however the device must be reliable and certified against the WWV NIST atomic clock. A time transfer standard is considered reliable when it has proven to be consistently accurate to +5 minutes over a six-month period (+50 seconds per month) and is not adversely affected by an electrical power failure. A newly designated time transfer standard should be checked monthly, to establish its compliance, for the first six months of operation and semi-annually thereafter. Please note that the number of time transfer standards should be kept to a minimum. Time standards are used in the gaseous network to ensure datalogging systems and analyzers report data at local standard time.

14.6 ASTM Class I Weights

The ASTM class I weights (primary standard) used to calibrate the laboratory working weights will be recertified, at a minimum, within 365 days and once a calendar year against NIST traceable standards. This is applicable in the $PM_{2.5}$ gravimetric weigh laboratories. The primary standards and certifications may be acquired through Troemner, Rice Lake Weighing Systems, or equivalent vendor. The standard will also be replaced or recertified against a NIST primary standard when there is an observed physical deformity or shift in performance. For the $PM_{2.5}$ weights, the working weights are verified quarterly against the primary standards. The laboratory specialists perform and document theses verifications.

The weights used by the Standards Laboratory are required to be recertified every three years. Through proper handling and care of weights, the certified value should not deviate during those three years. Currently, it is more cost efficient to replace the old weights with new certified weights every three years. Documentation of these certifications are maintained by the Standards Laboratory.

14.7 Analytical Balances

The analytical balance in the Standards Laboratory is recertified by a Mettler Toledo technician (or other qualified service provider) on an annual basis. This balance is utilized to determine and certify filter weights for filters used in the continuous PM_{10} and $PM_{2.5}$ TEOMs. These filters are provided to both the field technicians and QA auditors in the Florida PQAO, upon request. These filters are utilized for the mass transducer audits (or K_o value calibration constant verification). See DEP SOP 03-07 and 03-12 for specifics.

The analytical microbalances used to weight intermittent particulate matter sampler filters in the $PM_{2.5}$ gravimetric laboratories are serviced by a Mettler–Toledo technician (or other

qualified service provider) once a year. Additional service technician visits may be required if a balance is not operating within the acceptance limits of the method or is otherwise malfunctioning. Documentation of instrument service is kept on file by the laboratory.

14.8 Elapsed Timer Verification

The field time transfer standard will be certified against a primary standard. The standard will be verified every 180 days.

14.9 Documentation

All certification, verification, and calibration records for the PQAO are compiled and stored annually in Florida's data management system, as well as the department's local area network servers, in accordance with the Data Handling and Data Validation SOP. Please note that these records are also stored within the local program servers, to ensure backup copies are available, if needed.

15.0 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Florida's PQAO SOPs itemize the apparatus, equipment, materials, and supplies required for various monitoring equipment. In general, supplies and consumables are procured directly from the vendor manufacturing the samplers used within the PQAO. Parts lists, including recommended replacement schedules, are itemized in most manufacturers' operating manuals as well. Florida uses this information to determine the appropriate procurement schedule and volume of consumables required to support continuing operations.

Supplies and consumables are tracked by the field technicians, MRAS team, gravimetric laboratory specialists and Local Program Managers and/or staff. Instrument-related supplies or consumables are maintained; however, when replacements are needed, the Florida DEP or Local Program Administrators are notified, and hence responsible for purchasing. Supplies are inventoried by each program for later distribution. Received materials are inspected to ensure the proper part number was received as ordered. General inspection to identify any damaged products is also performed. A revolving inventory system (first in, first out) is used to ensure that storage times do not affect the material's integrity. If a manufacturer or EPA requirement indicates a specific expiration period for supplies, those supplies exceeding expiration dates are discarded if not used within the acceptable period.

Supplies and Consumables – $PM_{2.5}$ Gravimetric Laboratory

- Magazines – These are cleaned after each use. These are inspected routinely. O-rings or caps are replaced if worn.
- Cassettes and Screens – These are cleaned after each use. The "fit" of the top and bottom components are inspected. Worn or damaged cassettes and screens are discarded.
- Insulated Shipping Containers – All shipping containers are inspected after every use for cleanliness and damage. Handles, latches, and hinges must be intact and functional. When possible, broken components are replaced with spare parts.
- Ice-substitute Gel Pack – These are kept in sealed plastic bags but are discarded if leaking.
- Texwipes and alcohol – These are used to clean magazines and cassettes.
- Staticide Antistatic Solution
- Tyvek Lab Coats, Hair Covers, and Shoe Covers
- Powder-Free Vinyl Gloves
- Staticmaster Polonium Strips
- 47-mm Teflon Filters
- Nylon Forceps

16.0 NON-DIRECT MEASUREMENTS

Some data not obtained by direct measurement from Florida's Ambient Air Quality Monitoring Program are used to support the monitoring program. This includes data from outside sources and historical monitoring data. Possible databases and types of data and information that might be used include:

- Chemical and Physical Properties Data
- Sampler Manufacturers' Operational Literature
- Geographic Location Data
- Traffic Count Data
- Census Data
- Dispersion modeling
- Historical monitoring data measured by other sources
- National Weather Service Data

Any use of outside data will be quality controlled to the extent possible following QA procedures outlined in this document and in applicable EPA guidance documents.

17.0 DATA MANAGEMENT

The primary work product of Florida's Ambient Air Quality Monitoring Program is data. Accordingly, formalized procedures are required to ensure successful data management. Data management describes an inter-related set of standardized processes used to acquire, transmit, transform, reduce, analyze, store, and retrieve data. When documented and followed, a data management system helps maintain the integrity and validity of the data throughout its entire life cycle. Florida's air monitoring data follows a documented flow path. The data life cycle starts before data collection actually begins and ends with use of the data. The major components of Florida's data management process are summarized here, and further detailed in the PQAO Data Handling and Data Validation SOP.

17.1 Data Collection and Recording

Ambient air monitoring samplers which have been designated by EPA as reference or equivalent methods (FRMs or FEMs) will be used to collect the criteria particulate pollutant data used for NAAQS compliance within the Florida PQAO. Upon installation and at regular intervals as specified, ambient air monitoring instrumentation is calibrated in accordance with the instrument-specific SOPs, see Appendix C of this QAPP.

Continuous monitoring sites and intermittent, filter-based samplers are equipped with data recording capabilities. The data logging function may be internal to the monitoring instrument (e.g., $PM_{2.5}$ 2025i samplers) or an external device (i.e. – Agilaire 8832 data logger) connected to the instrument (e.g., continuous analyzer). The data logger records the monitoring instrument outputs, generating concentration data that is transmitted to AirVision/AirMVP. The data logger may also perform specific data reduction and/or format data in preparation for downloading to a database or spreadsheet.

Manual data collection is limited in the Florida PQAO. Filter-based particulate data are manually sampled in the field and weighed in the laboratory.

It mainly consists of transferring filter-based $PM_{2.5}$ sampler data from the field (F files containing sample volume, sample time, average temperature, error codes, etc.) into PMTS to be combined with laboratory $PM_{2.5}$ mass data (which the laboratory has uploaded into LIMS) resulting in a mass concentration for filter-based $PM_{2.5}$. The $PM_{2.5}$ gravimetric laboratory uses WinWedge Balance Command, Microsoft Excel, and a customized Laboratory Information Management System (LIMS)for data acquisition and reporting. The software programs Balance Command and Excel are used for automated data collection from the microbalances. The $PM_{2.5}$ gravimetric laboratory also uses Vaisala Veriteq software to monitor and record the room temperature and humidity. The Vaisala Veriteq data is maintained on a local server, backed up weekly and archived on the network drive and can be reviewed at any time. The digital sensors perform several functions in the lab environment, including interface with the air condition (AC) system and recording and transmitting temperature/humidity data in the conditioning/weighing lab. The Siemens

sensor interface is used to interface with the AC system to regulate the temperature and humidity in the weighing room. The Vaisala sensors interface to the Vaisala Veriteq software. The lab is equipped with multiple Vaisala sensors for backup and verification. Additionally, LIMS automatically flags the data for temperature/humidity control failures (see Table 20-5).

The results of the internal QA performance evaluations (semi-annual flow rate audits) for all $PM_{2.5}$ and PM_{10} must also be manually entered into AirMVP. For the performance audits, the audit flow rate of the transfer standard and the corresponding flow rate measured by the monitor is recorded in the audit logbooks or appropriate field forms (Excel forms). The percent differences between these flow rates are used to evaluate monitor performance are recorded manually by the QA Auditor during the audit. These data must then be transferred from the audit logbooks or field forms (Excel forms) to AirMVP. Care must be taken in order to ensure all data that is recorded manually into logbooks (Excel forms) is accurate and complete.

17.2 Data Transmittal

For continuous particulate monitoring, data transmittal is accomplished using wireless access to the site's modem, which is linked to the data logger and the site computer. Alternate access may be used if normal communications are interrupted, including downloading directly to storage media at the site or accessing data directly from the instrument if the data logger is malfunctioning. Downloading of collected data to AirMVP/AirVision does not delete the data from the data logger. Data are removed from the data logger continuously by overwriting data on a first-in, first-out basis, but are also recorded on the site computer in an on-going manner.

The laboratory data is handled differently. For filter-based $PM_{2.5}$, the laboratory uses WinWedge Balance Command, Microsoft Excel, and a customized Laboratory Information Management System (LIMS) for data acquisition and reporting. The software programs Balance Command and Excel are used for automated data collection from the microbalances. The laboratory specialists weigh the filters, performing preliminary QA/QC, while the Data Quality Section Administrator (or designee) performs final QA review and reporting of the weigh data to PMTS. Field data is uploaded from an F file into PMTS by the field technicians, joined with the LIMS data resulting in a $PM_{2.5}$ FRM concentration. These data are then transmitted from PMTS to AirMVP by Local Program Quality Assurance Coordinators/Staff and the Data Validation Team.

All transmitted raw datasets are stored electronically. For continuous particulate data, AirVision/AirMVP is designed to prevent alteration of the raw data file. For intermittent samplers, the field technicians are to download the data from the sampler every time they go to the site to insert new filters. Otherwise data may not be available for download due to a limited timeframe that data are stored on the sampler. As such, raw datasets are retained in unalterable form before any reduction or validation is performed. Data validation operations

(e.g., AirMVP/AirVision database) use replicate versions of the raw data to avoid violating the integrity of the original raw dataset. Data stored in the "edit" database can be added, changed, flagged, or voided following the procedures described within the PQAO Data Handling and Data Validation SOP. An edit history is recorded and available to track changes made to the editable database.

17.3 Data Verification and Validation

Each of the network's instruments employed to measure the ambient concentrations of the particulate pollutants undergo periodic audits, precision checks and calibrations. These procedures are outlined in the appropriate SOPs. Performance audits and precision checks ascertain the accuracy, precision, and repeatability of each instrument in performing its required function.

The continuous instrument generated particulate data are stored onsite in the datalogger and downloaded to the data management system (AirMVP and/or AirVision) where they will undergo verification, analysis, and validation. The first data verification step is performed automatically by searching the data download for status flags and comparing reported values to acceptable range criteria. Additionally, field technicians verify the data collected when reviewing their minute data and electronic strip charts throughout the sample collection process.

The intermittent/manual samplers' data are stored on the sampler itself; there are no dataloggers involved. For intermittent/filter-based $PM_{2.5}$, the field technician must download the data file from the samplers for upload into PMTS. Field technicians also record pertinent information from the sampler onto associated forms. Data verification is performed when the field technicians visit the site and verify that the samplers are operating properly and there are no bad status flags generated on the samplers.

The laboratory specialists also perform data verification by reviewing laboratory data and documents to verify proper filter preparation, shipping/receiving, weighing and reporting. Furthermore, $PM_{2.5}$ Gravimetric Laboratory Specialists utilize LIMS coupled with other associated records to perform data verification and validation of the laboratory data relative to filter-based $PM_{2.5}$ data before releasing the data to be available to PMTS and associated $PM_{2.5}$ Analysis Reports (PDF format).

Data validation is an important routine process that involves several steps to ensure that field and data processing operations have been carried out correctly. Similarly, a validation process is utilized in the gravimetric laboratories. The validation process will identify data with errors, biases, and physically unrealistic values before they are used for the identification of exceedances, further analyses, or modeling. Once these problems have been identified, the data can be corrected or invalidated. If necessary, corrective actions can be taken by laboratory or field personnel.

Local Program QA Coordinators/Staff and Data Validation Team evaluate the flagged data to identify underlying causes and decide whether the data are valid. If the data are invalid, they are not used in calculations. If the data are valid, but flagged due to some extenuating circumstance, then the data will be used in calculations and properly documented, per the PQAO Data Handling and Data Validation SOP (DEP 18-27). Further details on the data verification and validation processes are also provided in this SOP.

17.4 Data Reduction and Analysis

Data reduction occurs throughout the data management process. For continuous particulate data, the datalogger reads instantaneous particulate values from the monitor and averages them to create 1-hour averages. The data acquisition system stores minute averages, and this acts as the base unit for all measurements taken by monitors within the continuous particulate monitoring network.

These stored minute averages in continuous samplers are then averaged to form averaged hourly values, which are the blocks of continuous ambient particulate measured concentrations that are submitted to the EPA. These values are transmitted to the data management system (i.e., AirMVP/AirVision) for retention. Similarly, intermittent particulate data undergoes a data reduction process. Field data (i.e. volume) are collected and downloaded from the intermittent samplers by the field technicians to be uploaded into PMTS while the laboratory specialists collect and upload mass data into LIMS and subsequently into PMTS resulting in a concentration value. This resulting concentration value is transferred into AirMVP and subsequently submitted to EPA for comparison against the NAAQS.

Criteria for the quantity of valid data points required within a data set are defined in 40 CFR Part 50; for particulates, a minimum data completeness of 75% of the required quarterly interval must be captured for the interval to be considered valid and used in NAAQS comparisons. Furthermore, for $PM_{2.5}$, data substitution may be utilized, as prescribed in 40 CFR Part 50, Appendix N, Section 4(c), if:

- An annual $PM_{2.5}$ NAAQS design value that is above the level of the NAAQS can be validated if it passes the minimum quarterly value data substitution test. This type of data substitution is permitted only if there are at least 30 days across the three quarters of the three years under consideration (e.g., collectively, quarter 1 of year 1, quarter 1 of year 2 and quarter 1 of year 3) from which to select the quarter-specific low value. Data substitution will be performed in all quarter periods that have less than 11 creditable samples.
- An annual $PM_{2.5}$ NAAQS design value that is equal to or below the level of the NAAQS can be validated if it passes the maximum quarterly value data substitution test. This type of data substitution is permitted only if there is at least 50 percent data capture in each quarter that is deficient of 75 percent data capture in each of the three years under consideration. Data substitution will be performed in all quarter periods

that have less than 75 percent data capture but at least 50 percent data capture. If any quarter has less than 50 percent data capture, then this substitution test cannot be used.

These criteria are adhered to when performing the data reduction and NAAQS-comparison operations. Section 5 of this QAPP contains more information regarding data reduction to produce pollutant design values for NAAQS-comparison.

Data is analyzed periodically throughout the data collection and validation process. It is ultimately the responsibility of the Quality Assurance Manager, in coordination with the Local Program QA Coordinators/Staff, to certify all hourly daily averaged particulate data collected within a calendar year as usable for NAAQS comparisons. The Quality Assurance Manager primarily relies upon AQS calculated metrics of precision, bias, and completeness, via several AQS-generated reports, to complete assessments of the data. AQS will also estimate the design values for each of the particulate pollutants, based upon the concentrations entered for each monitor in the network.

17.5 Data Storage and Retrieval

Once collected, data is stored in a variety of ways and for varying periods of time. Initially, data is stored in the instrument and/or the site-specific datalogger. Dataloggers keep an un-alterable record of instrument measurements for a period of five (5) to sixty (60) days, depending on the complexity of the data logger and the amount of information stored. Data stored in the dataloggers are accessed automatically by the data management system (DMS). The timeframe of the data stored on the intermittent samplers are not clear; however, field technicians are required to download the data from these samplers every time they are loading filters.

All transmitted raw datasets stored in electronic form in the DMS (e.g., AirMVP/AirVision) are retained intact by permanently archiving the data. A copy of the raw data is also maintained, upon which, data reduction operations can be performed repeatedly without violating the integrity of the original raw dataset (as described above). Retaining copies of all datasets electronically recorded provides a data audit trail. These datasets are archived on backup-systems (e.g., PQAO LAN servers, as well as off-site, as discussed in Section 7 of this QAPP).

$PM_{2.5}$ laboratory data and records are maintained accordingly:

- The $PM_{2.5}$ electronic documentation is stored in MS Excel, MS Word, Adobe pdf, and/or Text Tab Delimited files, organized by year, month, and/or agency.
- The Excel spreadsheets containing the Pre- and Post-Weight data are saved as Text Tab Delimited files. The Text Tab Delimited file is used to upload the data into LIMS. Excel spreadsheets for both pre- and post- weights are electronically stored in the $PM_{2.5}$ directory on a network server.

The data shall be stored for a period of ten (10) years, unless any litigation, claim, negotiation, audit, or other action involving the data and its supporting records has been started before the expiration of the ten-year period. If this happens, the data and records will be retained until completion of the action and resolution of all issues that arise from it, or until the end of the regular ten-year period, whichever is later.

After the storage period has passed, the storage media may be disposed of or recycled. However, the validated dataset, including quality assurance data, is uploaded to the EPA Air Quality System (AQS) for long-term storage.

18.0 ASSESSMENTS AND OVERSIGHT

Assessments or evaluations are designed to determine whether the ambient air quality monitoring program is being implemented in conformance with its approved QA Project Plan. These activities are conducted to increase confidence in the information obtained, and ultimately to determine whether the information may be used for their intended purpose. Table 4-1 provides a summary of the relevant assessments performed in Florida's ambient air quality monitoring network.

18.1 Assessments and Response Actions

To ensure the adequate performance of the quality system, the Florida PQAO performs and/or participates in the following assessments. These assessments are used to measure the performance and effectiveness of the quality system, the ambient air quality monitoring network design and operation, and various measurement phases of the data operation.

- Network Plans and Assessments
- External Performance Audits
- Internal Performance Audits
- Technical Systems Audits
- Internal Systems Audits
- Data Quality Assessments
- Data Quality Audits
- Data Certification

18.2 Network Plans and Assessments

40 CFR §58.10 provides the requirements for annual network plans and the more intensive 5-year assessment. These assessments are completed primarily by the Quality Assurance Manager in conjunction with other air monitoring staff, when necessary.

In summary, the annual monitoring network plan provides documentation of the establishment and maintenance of Florida's air monitoring network, which consists of SLAMS and SPM monitoring stations. The goal of the network plan is to determine conformance with network requirements as set forth in 40 CFR Part 58, Appendices A, C, D, and E. Any proposed changes to the monitoring network are detailed in the annual plan; proposed additions and discontinuations of SLAMS monitors are subject to EPA approval in accordance with 40 CFR §58.14. Specifically, for the particulate network, the plan would ensure compliance with 40 CFR Part 58, Appendix D, Sections 2, 4.6 and 4.7, and assess any possible or required monitor or site changes to the network. The annual monitoring network plan is made available for public inspection and comment for at least 30 days prior to submission to EPA Region 4 and the submitted plan addresses, as appropriate, any received comments. Annual network plans, in accordance with 40 CFR §58.10, began July 1, 2007. Annual network plans are due to EPA Region 4 on July 1 of each year.

The 5-year network assessment is a more extensive evaluation of the particulate air monitoring network. The assessment determines, at a minimum, if the particulate network meets the monitoring objectives defined in 40 CFR Part 58, Appendix D, 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 particulate monitoring network. During the network assessment, 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), as well as the potential impact any sites proposed for discontinuance may have on other data users is considered. Florida DEP submits a copy of the 5-year assessment, along with a revised annual network plan, to the EPA Region 4. These assessments began in 2010 and are due to EPA every five years on July 1.

For more information about the monitoring locations in the Florida's network please see the Annual Network Plan at this link: https://floridadep.gov/air/air-monitoring/documents/2022-ambient-air-monitoring-network-plan.

18.3 External Performance Audits

The Florida PQAO participates in the EPA $PM_{2.5}$ Performance Evaluation Program (PEP) for performance audits of FRM $PM_{2.5}$ samplers. Information about these audits, which are part of the EPA Performance Evaluation Program, are detailed in 40 CFR Part 58, Appendix A, Section 2.4.

In general, the $PM_{2.5}$-PEP is a performance evaluation where quantitative data are collected independently to evaluate the accuracy of the monitoring equipment. In Region 4, EPA staff (or contracted personnel) arrive at a Florida monitoring site, and the strategy is to collocate a portable FRM $PM_{2.5}$ air sampling audit instrument with an established primary sampler at a routine air monitoring site, operate both samplers in the same manner, and then compare the results. Each year, eight audits are required for the Florida PQAO since there are greater than five sites. These audits are not required for PM_{10}. The results of the comparison are immediately available to site operators and the QA staff. More information about $PM_{2.5}$-PEP can be found in 40 CFR Part 58, Appendix A, §3.2.4.

18.4 Performance Evaluations

Performance evaluations (PEs) are a type of audit in which the quantitative data generated in a measurement system are obtained independently and compared with routinely obtained data to evaluate the proficiency of the instruments. As stated in Section 2.2 of this QAPP, the Florida DEP QA auditors normally conduct performance audits of the PQAO monitoring equipment. However, due to the COVID-19 pandemic, this process was modified.

The particulate monitors (both $PM_{2.5}$ and PM_{10}) will be audited to ensure that at least two flow rate audits, ideally spaced between 5 and 7 months apart, are performed each calendar year. The flow rate standard used for auditing must not be the same flow rate standard used for verifications or to calibrate the monitor. See Section 12.0 of this QAPP for additional

information. Specifications for performance audits are detailed in the PQAO audit SOPs. Performance evaluation audits shall be performed in accordance with the schedule established by Florida DEP.

Performance Audit Results

The performance audit results for particulates will be reported to the same number of significant digits as the ambient data for the pollutant. The audit report will contain additional decimals for information only.

18.5 Technical Systems Audits

A Technical Systems Audit (TSA) is a thorough, independent, and systematic on-site qualitative assessment, where facilities, equipment, personnel, training procedures, protocols, and recordkeeping are examined for conformance with regulatory requirements and this QAPP. EPA Region 4 QA staff conducts a TSA of Florida's PQAO every 3 years, in accordance with 40 CFR Part 58, Appendix A, §2.5. The EPA reports its findings to Florida DEP and Local Program senior management such as the Director and Program Administrators (Florida DEP and Local Program). The Program Administrators (or delegate) regularly monitors progress on corrective action(s) required as a result of TSA findings, and communicates progress to the Director and EPA Region 4.

EPA TSA auditors may segregate the TSA activities into multiple categories, which may include field, laboratory, and data management activities. The categories may be audited independently, or they may be combined. Key personnel with responsibilities for planning, field operations, laboratory operations, QA/QC, data management, and reporting are included in TSA audit activities and are often interviewed during the process.

Upon completion of the audit, EPA verbally alerts PQAO senior management of any deficiencies or findings during an on-site TSA exit briefing. This briefing allows Florida PQAO staff to begin formulating or implementing corrective actions. A draft TSA Report is typically distributed within 30 days of the completion of the audit. EPA Region 4 allows a brief comment period of the draft report for factual accuracy; after comments are received (if necessary), the TSA report will be finalized and resubmitted to Program Administrator(s). A formal response to address the TSA findings must be completed and resubmitted to EPA Region 4 within 30 days. The Program Administrator(s) will communicate with EPA routinely after the Corrective Action Plan has been submitted and provide progress updates on a periodic basis until the corrective actions have been completed.

TSAs conducted by EPA shall be performed once during every three-year period that the Florida particulate air monitoring program is compliant with established regulations governing the collection, analysis, validation, and reporting of ambient air quality data. In the case of Florida, a PQAO made up of more than one monitoring organization, with the exception of one, operating particulate samplers, should be audited within 6 years (two TSA cycles of the PQAO).

18.6 Internal (Florida DEP Quality Assurance) Systems Audit

Florida DEP performs a quality assurance (QA) systems audit, which is similar to a technical systems audit (TSA). It is a thorough and systematic qualitative audit, where facilities, equipment, personnel, training procedures, protocols, and record keeping are examined for conformance with established regulations and statewide policies governing the collection, analysis, validation, and reporting of ambient air quality data. Additional information on the QA systems audit is provided in Appendices A and B of this QAPP.

Post-Audit Activities

The auditors will provide the OAM Data Quality Section Administrator with a summation of their notes and possible findings following the audit. The draft report will be completed within ten (10) calendar days after the audit is completed and submitted to the OAM Data Quality Section Administrator. The auditors' draft report will be submitted in a standard format, to include:

- A summary page which addresses the parties involved in the audit from both the Florida DEP and the audited agency,
- The audited agency's network description,
- The audited agency's data completeness (including a table summarizing the data completeness for each year of the audited time period),
- The audited agency's compliance with the EPA's precision and accuracy goals,
- The audited agency's participation in the National Performance Audit Program,
- The audited agency's site reviews (indicate whether all recent issues have been addressed or identify issues that require the agency's attention), and
- Findings and recommendations/direction (which will have been discussed with the agency's staff and OAM's management before inclusion in the report) along with citations (i.e. CFR, QAPP, SOP, QA Handbook, etc.).

Audit findings will be categorized as detailed in Table 1 below:

Table 28-6: QA Systems Audit Findings Categorization

Finding	Nonconformance with or absence of a specified requirement (regulatory, QMP, QAPP, SOP, etc.) or guidance deviation which could significantly impact data quality.
Concern	Practices with the potential detrimental effect on the ambient air monitoring program's operational effectiveness or the quality of sampling or measurement results.
Observation	An infrequent deviation, error, or omission which does not impact the output of the quality of the work product but may impact the record for future reference.

The draft report will be approved by both the OAM Data Quality Section Administrator and the OAM Program Administrator. The draft report will be provided to the agency's air

program Director/Administrator no later than thirty (30) days after completion of the systems audit interview with the agency.

Once the agency receives the draft report from Florida DEP, the agency will be provided a 15-day review period to "fact check" the written information. If the agency identifies an incorrect statement or datum within the draft, then the agency should provide corrections and/or edits to Florida DEP within the 15-day timeframe. Helpful edits the monitoring organization can provide include factual corrections such as staff names/titles, spellings, site names, and other typographical/minor errors made by the audit team. If the agency fails to respond to Florida DEP within the 15-day timeframe, Florida DEP will consider this as no corrections are warranted and issue the final report.

The final QA systems audit report should be issued to the agency no later than thirty (30) days following the receipt of the draft comments or the expiration of the 15-day review period), whichever comes first.

Follow-up and Corrective Action Requirements

As part of corrective action and follow-up, an audit finding response will be generated by the audited organization for each finding in the QA systems audit report with a corrective action report where appropriate. The audit finding response is signed by the Local Program Administrators and/or Managers and sent to the Florida DEP Program Administrator, who reviews, and accepts or rejects the corrective action. The audit response will be completed within 30 days of receipt of the audit report.

The audit report will remain open until all issues have been satisfactory resolved (or proposed resolutions have been made). It is at the discretion of the OAM Data Quality Section Administrator to recommend to the OAM Program Administrator that the audit be closed.

Audit Schedule

Florida DEP shall conduct QA systems audits once during every three to five-years that the monitoring organization operates the network which collects data verifying compliance with the NAAQS.

18.7 Data Quality Assessments

A data quality assessment (DQA) is the statistical analysis of environmental data to determine whether the data meet the assumptions that the DQOs and data collection design were developed under, and whether the total error in the data is tolerable. Calculations of measurement uncertainty are carried out by the EPA according to the procedures and equations identified in 40 CFR Part 58, Appendix A, §4. The DQIs are used to assess how well the monitoring data compare to the established DQOs and MQOs. AQS provides statistical software that evaluates the DQIs of precision, bias, and completeness for the monitoring organizations. With that in mind, the PQAOs (including Florida's) must report

the data for QA/QC checks (per Section 12 of this QAPP) to AQS. Measurement uncertainty will be estimated for both continuous and intermittent/filter-based sampling methods.

The statistical estimates of the data quality will be calculated in AQS based on single monitors, as well as aggregated for monitors within the PQAO for a specific pollutant. The collocated quality control sampler precision estimate (calculation) used to assess the precision checks for particulate samplers is found in 40 CFR Part 58, Appendix A, §4.2.1. The bias estimate for one-point flow rate verification is found in the §4.2.2. The bias estimate for semi-annual flow rate audit is found in §4.2.3. And, the performance evaluation programs bias estimate (calculation) is found in §4.2.5.

To complete the DQAs, the Quality Assurance Manager (QAM) and/or AQS Coordinator will generate a series of standard AMP reports from AQS to review and assess the PQAO data quality quarterly. For this quarterly assessment, the AMP 256 (Data Quality Indicator) reports are generated, evaluated, and then kept as a record to document the review. These reports provide the results of the statistical analyses, which is compared to the DQOs in Section 5 of this QAPP. If the monitoring data are found to meet the DQOs, the data are considered to be "in control" and no further action is needed. However, if issues are observed in the data during these assessments such that DQOs are not met, the issues will be investigated to determine root cause and then corrective actions implemented.

Also, during these quarterly data assessments, the Data Validation Team and Local Program QA Coordinators/Staff will generate AMP 430 (Data Completeness), AMP 504 (Extract QA data), and AMP 501 (Extract Raw Data) reports. The results of these reports are compared to the MQOs in Section 5 of this QAPP, documented in Tables 5-4 through 5-9. If issues are observed in the data, the QAM will discuss these issues with the QA staff and determine the necessary course of action. If data completeness requirements have not been met, Florida DEP's Program and Data Quality Section Administrators will communicate this issue to EPA Region 4, in accordance with grant commitments.

18.8 Data Quality Audits

An audit of data quality (ADQ) reveals how data are handled, what judgments were made, and whether unresolved errors persist. An ADQ can often identify the means to correct systematic data reduction errors. Sufficient time and effort will be devoted to this activity, so that the data reviewers and QA staff within the PQAO have a clear understanding and complete documentation of data flow.

The Florida DEP's Office of Air Monitoring conducts a Data Quality Audit of agencies within the PQAO, its version of an ADQ. A Data Quality Audit is an independent and periodic review of a select dataset. It is essentially a small-scale QA systems audit, to ensure that agencies are handling data correctly and performing processes and procedures in accordance with QAPPs, SOPs, and other formalized QA documentation.

The Data Quality Audit will serve as an effective framework for organizing the extensive amount of information gathered during the audit of laboratory, field monitoring, and support functions within the agency. Additionally, these audits help to alleviate the loss of large datasets, if agencies have systemic issues, and will have the same reporting/corrective action requirements as the QA systems audit (discussed in Section 18.6 above).

Florida DEP performs these Data Quality Audits within the PQAO as necessary; therefore, all agencies are not reviewed each year. However, over a 3-year period each agency will receive at least one Data Quality Audit and the schedule will be determined based on whether the agency has had recent staff turnover, new processes have been implemented, and/or the agency has had significant data loss due to operator error. This audit process involves the following:

- Pre-Data Review Activities
  - The Florida DEP contacts the agency to coordinate a review of the records that support the selected dataset.
- Data Audit Activities
  - Florida DEP conducts the records review (includes review of records, AirMVP, QA documents, etc.), in conjunction with the review of the selected dataset.
- Post-Data Audit Activities
  - The agency is provided a summary report identifying the list of concerns/issues cited during the audit, the data audit period, the parameters that were reviewed, etc.
  - The agency proceeds with corrective action and/or follow-up, if any.
  - Florida DEP ensures that the all corrective action and/or follow-up is completed.

The schedule for the Data Quality Audits is at the discretion of the Florida DEP Program Administrator and Data Quality Section Administrator. Agencies that display potential issues or deficiencies (i.e. constant staff turnover, known problems with a particular parameter, etc.) are more likely to undergo a Data Quality Audit.

18.9 Data Certification

In accordance with 40 CFR 58.15, an annual air monitoring data certification letter is required to certify that the data collected by the FRM and FEM monitors at SLAMS (and SPM sites, if applicable) within the Florida PQAO network meet criteria in 40 CFR Part 58, Appendix A from January 1 to December 31 of the previous year. Along with the certification letter, Florida DEP must submit to EPA an annual summary report of all the ambient air quality data collected by the monitors, as well as a summary of the precision and accuracy data, for the previous year.

Data Certification is the final process of assessing the PQAO's data for the previous calendar year. Data is verified and validated monthly, as discussed in Section 21 of this QAPP. Additionally, data is assessed on a quarterly basis when specific AQS reports are generated to assess the DQIs (as described in Section 18.7 above). With these assessments ongoing throughout the year, annual data certification, then, serves as the last assessment of the data – looking at it from an all-inclusive, annual perspective – to see if any unidentified anomalies or trends exist in the data that were not previously identified. The annual data certification process starts with running and reviewing AMP reports contained in AQS. The reports typically queried include the following:

- AMP350 Raw Data
- AMP251 QA Data
- AMP430 Data Completeness
- AMP600 Certification Evaluation
- AMP256 Data Quality Indicator
- AMP504 Extract QA Data
- AMP450 Quicklook Criteria Parameters
- AMP450NC Quicklook All Parameters

The QAM and AQS Coordinator review these reports and confirm everything is complete and accurate. The reports are also reviewed to ensure the statistical results indicate that the monitoring data were "in control" over the course of the entire year and met the DQOs. If problems are identified, they are investigated in accordance with Section 22 of this QAPP.

Ultimately, this process verifies that the PQAO monitoring data submitted to AQS is correct and complete. Once any necessary corrections/additions/deletions have been completed in AQS and the dataset is finalized, the Florida DEP Program Administrator and QAM officially recommend the data for certification to EPA Region 4. The data certification package provided to EPA includes a signed copy of the AMP 600 report, along with a letter signed by the Division Director, certifying that the ambient concentration and quality assurance data in AQS are complete and accurate, taking into consideration the quality assurance findings, to the best of his/her knowledge.

The annual data certification package is due to EPA Region 4 by May 1 of each year.

18.10 Reporting and Resolution of Issues

An important function of a quality system is a communication structure that ensures corrective actions, when needed, are implemented in a timely manner and their effectiveness is confirmed. To address the findings from the assessments described above and noted in Table 4-1, the following structure and associated protocols shall be employed to identify and implement corrective actions.

All PQAO staff members involved in particulate sampling are responsible for identifying the need for corrective actions. Identifying the need for corrective actions can occur during site visits, audits, data review activities, or other monitoring activities. This shared responsibility, coupled with diligent attention to detail and accuracy, will assure that Florida's ambient air monitoring network consistently collects quality data, and that the data is reduced, analyzed, and presented in an accurate and representative manner. Any air monitoring staff member who perceives a need for corrective action(s) shall present the situation/concern to the QAM and/or Local Program Manager.

In most cases, the QAM will assess the need for corrective action, although occasions may arise where other Florida DEP Administrators and/or senior management personnel are delegated this responsibility. If one is deemed necessary, a suitable corrective action will be selected and disseminated to the field technician(s) or air monitoring staff member, generally within the week. If the issue is of major significance, the situation will be communicated by the Florida DEP Program Administrator to the Director, who may determine that the issue is of such import that work must stop until corrective action(s) can be implemented, and the situation completely resolved. For example, although it is not a reactive corrective action measure, a proactive corrective measure that may involve the Director stopping work would be the circumstance of emergency weather conditions. The State of Florida is sometimes impacted by hurricanes and other significant weather events. During times such as these when a hurricane is approaching, the Program Administrator may communicate concern to the Director about the security and safety of the monitoring stations and equipment, as well as the air monitoring staff themselves. The Director may initiate emergency shutdown procedures at this time, as a safety measure.

Field technicians are primarily responsible for implementing corrective actions, however, any personnel within the air monitoring network may initiate the corrective action process. in accordance with the PQAO Corrective Action SOP (DEP 01-4). The Corrective Action SOP (DEP 01-4) describes the corrective action process and this process must be used whenever a failure or deviation from accepted standards arises and action is taken to rectify the problem. Laboratory specialists are also responsible for implementing corrective actions for incidents that occur in the laboratories; however, these corrective actions are documented in the respective laboratory logbook instead of forms found in the PQAO Corrective Action SOP (DEP 01-4).

The two common forms of corrective action within Florida's monitoring network are immediate and long-term corrective actions. Immediate corrective actions are typically performed by the field technicians and only require notations in the site logbooks, forms, and null codes/qualifiers (if applicable) in the data management system along with comments (e.g., AirMVP/AirVision). Some examples of immediate corrective actions include:

- Resetting the GFI circuit breaker,

- Time synchronizations, and
- Thermostat adjustments.

Long-term corrective actions identify and eliminate causes for systemic or systematic failures. It consists of a thorough assessment and identification of the cause of the problem as well as objectively developing preventative methods to avoid recurrence. Some examples of long-term corrective actions include:

- The update of PQAO quality assurance documents as a result of an external audit (e.g., EPA TSA),
- Supplemental training of air monitoring personnel as a result of a QA systems audit, and
- Resolution of siting criteria issues (e.g., site relocations, siting criteria waiver requests and demonstrations).

Following the implementation of a corrective action, the air monitoring Administrators and/or Managers may, at their discretion, require a QA systems audit or Data Quality Audit to verify the efficacy of the corrective action. Both the action of implementing the corrective action and the influence of the corrective action on the operations of the ambient air quality monitoring network must be evaluated. Any deficiencies in the correction must be noted and the procedure should be updated to completely correct the discrepancy. Any disputed or unresolved corrective actions are elevated to DEP's Program Administrator and the applicable Local Program Administrator(s) for resolution by either the QAM, Data Quality or Field Operations Administrators.

19.0 REPORTS TO MANAGEMENT

This section describes the quality-related reports and communications to management necessary to support ambient air monitoring network operations and the associated data acquisition, validation, assessment, and reporting.

19.1 Frequency, Content, and Distribution of Reports

Reports to management required for the SLAMS program in general are discussed in various sections of 40 CFR. Guidance for management report formats and content are provided in reports developed by EPA's Air Quality Assessment Division within the Office of Air Quality Planning and Standards (OAQPS). These reports are described in the following subsections. Additionally, Florida DEP generates other internal reports within its PQAO, which are also described below.

19.2 EPA Exceedance Reports

The Quality Assurance (QA) Manager is responsible for notifying EPA Region 4 personnel in writing of any observed exceedance of a NAAQS within 30 days of the known exceedance event. The notification will include a summary of statistics from AQS generated reports, such as design values. A notification is not generated if there are no exceedances during the month.

AUTHOR →	RECIPIENT(S)
QA Manager	Program Administrator → EPA Region 4

19.3 Quarterly Data Submittal Reports

Each quarter, concentration data submitted for each reporting period will be edited, validated, and entered into AQS using the procedures described in the EPA's AQS User Guide, EPA's AQS Data Coding Manual, and Florida's Data Handling and Data Validation SOP (DEP 18-27). The Data Validation Team and Local Program QA staff will be responsible for reviewing and validating the concentration data and submitting all applicable reports (e.g., AirMVP Data Completeness, Data Validation Checklist, etc.). Additionally, these reports should be accompanied by a memo from the Local Program QA Coordinators/Staff or the Field Technicians (for the Florida DEP) for data captures below 75% for the quarter for particulates[1], which will be reviewed by the Data Quality Section Administrator before the data is transmitted to AQS.

AUTHOR →	RECIPIENT(S)
Data Validation Team/Field Technicians	Data Quality Section Administrator
Local Program QA Coordinators	

[1]Completeness requirements for ozone are more stringent and are covered in the Gaseous QAPP and the NCore QAPP.

Florida PQAO will report to AQS the results of all valid precision and bias checks and quarterly performance audits performed during the previous quarter. The quarterly reports will be submitted consistent with the data reporting requirements specified for air quality data as set forth in 40 CFR 58, Appendix A. The data reporting requirements of 40 CFR 58.16 apply to those stations designated as SLAMS. Required quality assurance data are to be reported on the same schedule as quarterly monitoring data submittals. It is the responsibility of the Data Quality Section Administrator and QA Manager to ensure that the results of quality assurance data are used to validate concentration data.

In accordance with 40 CFR 58.16, data is to be submitted to the AQS database no later than 90 days following the end of the quarter in which the data was collected. While not required, Florida makes every effort to upload each quarter's concentration and quality assurance data within 60 days following the end of the quarter that it was collected.

QUARTER	REPORTING PERIOD	AQS UPLOAD DEADLINE
Q1	January 1- March 31	June 29
Q2	April 1- June 30	September 28
Q3	July 1- September 30	December 29
Q4	October 1- December 31	March 31 (following year)

19.4 Quarterly EPA Data Completeness Deficiency Reports

The Data Quality Section Administrator is responsible for notifying EPA Region 4 personnel if any criteria pollutant monitor does not achieve at least 75% data completeness for particulates[1] in any quarter. Notification is provided via a letter, which is written with the cooperation of the Program Administrator and QA Manager. The letter outlines the causes of data completeness deficiencies and the corrective actions taken to resolve the observed issues. The letter includes an AQS-generated summary of network-wide data completeness.

The Data Quality Section Administrator will notify EPA Region 4 within 90 days following a complete quarterly AQS data submittal, including the applicable quality assurance data, by the AQS Coordinator. A notification is not generated if each criteria pollutant monitor achieves acceptable data recovery.

AUTHOR →	RECIPIENT(S)
Data Quality Section Administrator	Program Administrator → EPA Region 4

[1]Completeness requirements for ozone are more stringent and are covered in the Gaseous QAPP and the NCore QAPP.

19.5 Annual Performance Evaluations

Field staff across the PQAO conduct performance evaluations (audits) of each instrument in the particulate matter network twice each calendar year (approximately 5-7 months apart), using specially designated audit or independent equipment. See Section 12.0 of this document for additional information. All transfer standards used in the air monitoring network must be traceable to a primary standard such as a NIST Standard Reference Material (NIST SRM) or an EPA/NIST-approved Certified Reference Material (CRM).

The results of each performance evaluation are documented on designated forms and are communicated via a written report. The report is issued by the QA auditors and is routed to the Data Quality Section Administrator for review and approval. After approval, the reports are then distributed to the Field Operations Section Administrator, QA Manager, Local Program QA Coordinators/Staff, and Field Technicians.

AUTHOR →	RECIPIENT(S)
Florida PQAO Field Staff	Data Quality Section Administrator → QA Manager → Field Operations Section Administrator → Local Program QA Coordinator → Field Technician(s)

19.6 Siting Criteria Evaluation Reports

Florida DEP QA auditors conduct siting criteria evaluations annually for each site in the network. The results are detailed in the Site Review form, which is distributed to the Data Quality Section Administrator, Field Operations Section Administrator, QA Manager, Local Agency Air Program Administrators, and any other applicable air monitoring staff. The reports outline an evaluation of the siting criteria, consistent with 40 CFR Part 58 Appendix E and Florida DEP's Site Review Protocol, identifying deficiencies in siting criteria, if any, and the necessary corrective actions. These reports will be filed and made available to EPA personnel during their TSAs.

AUTHOR →	RECIPIENT(S)
QA Auditor	Data Quality Section Administrator → Florida Air Monitoring Staff

19.7 Annual Data Certification

The QA Manager will prepare a data certification package for signature by the Division Director by May 1 of each year. The report will consist of a letter, for signature, along with AQS generated summaries of gaseous concentration data collected during the previous year, and all applicable quality assurance data. The exact AQS reports that are required each year are specified by OAQPS and EPA Region 4.

AUTHOR →	RECIPIENT(S)
QA Manager	Program Administrator → Division Director → EPA Region 4

19.8 Annual Network Plan

Florida DEP conducts a network review in accordance with the requirements in 40 CFR 58.10. The purpose of the network reviews is to determine if a system meets the monitoring objectives defined in 40 CFR 58, Appendix D. The review identifies needed modifications to the network including termination or relocation of unnecessary stations or establishment of new stations.

As part of the review, Florida DEP submits an Annual Monitoring Network Plan to the EPA for approval by July 1 of each year. The document undergoes a 30-day public comment period prior to submission to the EPA. The Annual Network Plan provides a detailed description of all air monitoring sites.

AUTHOR →	RECIPIENT(S)
QA Manager	Program Administrator → Division Director → Public Comment → EPA Region 4

19.9 Quality Assurance Systems and Data Quality Audit Reports

Florida DEP performs internal Quality Assurance (QA) Systems Audits and Data Quality Audits (see Sections 18.6 and 18.8, respectively). The QA audits are performed by assigned QA Systems auditor(s) on a 3 to 5-year basis, while Data Quality Audits are performed periodically over a 3-year timeframe. Written reports on the findings of these audits are issued to the Data Quality Section Administrator for review and approval. After approval, the reports are then distributed and reviewed by the Program Administrator. These reports will be filed and made available to EPA personnel during their TSAs.

External systems audits are conducted at least every three years by EPA Region 4 as required by 40 CFR Part 58, Appendix A, Section 2.5.

AUTHOR →	RECIPIENT(S)
QA Systems auditor(s)	Data Quality Section Administrator → Program Administrator → Local Agency Air Program Administrators

19.10 Five-Year Network Assessment

In accordance with 40 CFR 58.10, Florida DEP conducts a Network Assessment every five years. A Network Assessment is a thorough analysis of the ambient air monitoring network to determine if the network meets the criteria set forth by 40 CFR 58.10(d). The Network Assessment is used as an internal planning document to guide potential improvements to the ambient air monitoring network. It is the responsibility of the QA Manager, with the assistance of assigned Florida air monitoring staff, to complete and submit a Network Assessment to the EPA by July 1 of each five-year interval (e.g. 2020, 2025, etc.).

AUTHOR →	RECIPIENT(S)
QA Manager	Program Administrator → Division Director → EPA Region 4

19.11 Response/Corrective Action Reports

The Corrective Action report is used to document corrective measures taken whenever a problem is found such as a safety defect, an operational problem, or a failure to comply with procedures. These four steps below will be documented per the procedures detailed in the Corrective Action SOP (DEP 01-4) with its associated forms from the date of the original problem or infraction.

- Identify the problem
- Identify why the problem occurred
- Identify a process in which it can be prevented from recurring
- Follow up after the process has been put into place

The corrective action reports are primarily designed to document any issues that can detrimentally impact data validity and a separate report will be required for each problem identified. This report is one of the most important ongoing reports to management because it documents primary QA activities and provides valuable records of QA activities that can be used in preparing other summary reports. Copies of corrective action reports will be distributed twice: first when the problem has been identified and the action has been scheduled, and second when the correction has been completed.

The field technician, data processing staff, and/or QA Coordinator assigned will generate the corrective action reports. The report will be distributed to the appropriate air monitoring supervisor(s)/manager(s) for review and approval and then ultimately to Florida DEP.

AUTHOR →	RECIPIENT(S)
Field Technician/QA Staff/QA Coordinator	Air Monitoring Supervisor/Manager → Local Program Administrator → Florida DEP

20.0 DATA VALIDATION AND USABILITY

20.1 Data Review, Verification, and Validation

Each of the network's analytical instruments are employed to measure ambient concentrations of specific pollutants. To be useful, the data must undergo evaluation to determine the degree to which each data point has met its quality specifications. Florida's QA staff, particularly the Data Validation Team and QA Coordinators/Staff, evaluate the data to establish that data collection is consistent with QAPP and SOP requirements. The Data Quality Section Administrator and Quality Assurance Manager, in collaboration with the Data Validation Team and QA Coordinators/Staff, estimate the potential effect any deviation from the QAPP or SOP requirements may have on the usability of the associated data item, its contribution to the quality of the reduced and analyzed data, and its effect on decisions as needed.

Data Review

Data review is the in-house examination to ensure that the data has been recorded, transmitted, and processed correctly. It includes completeness checks to determine if there are any deficiencies such as missing data or lost integrity. The data under evaluation should be compared to actual events, as per guidance (Guidance on Environmental Verification and Validation (EPA QA/G-8)). In addition, it is expected that some of the QC checks will indicate that the data fail to meet the acceptance criteria. Data identified as suspect, or does not meet the acceptance criteria, shall be flagged with AQS codes prior to upload into AQS. The review of the routine data and the associated QC data will be verified and validated on a monthly basis.

- Continuous particulate matter data are downloaded to the data acquisition system (i.e. AirMVP and/or AirVision) daily and examined to ensure the data is acquired according to requirements. Electronic strip charts of the one-minute data in AirMVP/AirVision are utilized by field technicians/QA staff daily to ensure there are no anomalies in the data.
- Filter-based, manual particulate matter 2.5 data are reviewed by the laboratory specialists (laboratory data) and field technicians/QA staff (laboratory and field data).
    - Laboratory specialists review laboratory environmental conditions, weigh data, chain-of-custody records, and other associated data and documents to ensure that filter-based $PM_{2.5}$ data are acquired in accordance to requirements. The weigh data is ultimately uploaded to LIMS and subsequently joined to field data in PMTS. The $PM_{2.5}$ gravimetric laboratory also provides the field technicians/QA staff with laboratory gravimetric analysis reports detailing weigh data associated with each filter as well as any laboratory qualifiers or null codes (and comments) (see Tables 20-5 and 20-6).
    - Field technicians/QA staff review data retrieved from the samplers by the field technicians to ensure that data are within requirements. The data retrieved from

the samplers is a combination of downloaded files and forms (see SOP DEP 03-8 and 03-15) completed by the technician. They also upload these data (downloaded files from the particulate sampler) to PMTS and subsequently to AirVision/AirMVP on a monthly basis and examine it to ensure the data is acquired according to requirements. QA staff are also provided monthly $PM_{2.5}$ lab environmental condition reports by OAM staff.

Continuous and filter-based $PM_{2.5}$ data are later reviewed in batches in AirMVP during the data validation process. Corrective action is taken if errors or anomalies are found. In cases when data does not meet quality goals, it may be flagged or invalidated.

Data Verification

Data verification is the process for evaluating the completeness, correctness, and conformance/compliance of the dataset against method, procedural and contractual specifications. Verification can be further defined as a confirmation, through provision of objective evidence, that specified requirements have been fulfilled.

- Field Technicians/QA staff verify the continuous particulate matter data collected when reviewing and documenting their electronic strip charts (daily one-minute data) throughout the data collection process, as well as by verifying or updating the flags applied to data by the site dataloggers.
- $PM_{2.5}$ laboratory specialists verify the filter-based $PM_{2.5}$ data when performing analysis and uploads into LIMS. Field Technicians/QA staff verify these data when reviewing PMTS and laboratory gravimetric analysis reports.

Any missing data (gaps) are reviewed and accounted for, and unacceptable or questionable data will be flagged by the Field Technicians/QA staff during the daily and/or monthly data review process. At that time, all flagged data will be re-verified by the Data Validation Team and QA Coordinators/Staff. The procedures for verifying data are detailed in Florida's Data Handling and Data Validation SOP (DEP 18-27).

Data Validation

Data validation is a routine process designed to ensure that reported values meet the quality goals of the environmental data operations. Data validation is further defined as examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled. The primary intended use for Florida's particulate matter dataset is NAAQS compliance (with the exception of continuous $PM_{2.5}$ TEOM data that is used for AQI purposes only). A progressive, systematic approach to data validation must be used to ensure and assess the quality of data. Data validation includes the review of the PQAO datasets against the individual pollutant MQOs (see Section 5 of this QAPP), which is completed by the Data Validation Team and QA Coordinators/Staff. It also includes the review of data

against the QA/QC results, strip charts, as well as the comparison of the data against basic statistics (such as completeness). Reviewing data long-term (over a monthly or quarterly timeframe) provides information about the structure of the data and may identify patterns, relationships, or potential anomalies. Invalidated data are replaced with AQS Null Data codes prior to upload to AQS. Deviations from operational procedures or quality assurance requirements that do not result in data invalidation may require that data be qualified with QA qualifier flags prior to upload to AQS. The Data Quality Section Administrator and/or AQS Coordinator spot-checks these data after validation by the Data Validation Team and QA Coordinators/Staff is completed, prior to AQS upload. The procedures for validating data are detailed in Florida's Data Handling and Data Validation SOP (DEP 18-27).

20.2 Sampling Design

Sampling network design and monitoring site selection must comply with:

- 40 CFR Part 58, Appendix A – Quality Assurance Requirements for Monitors Used in Evaluations of National Ambient Air Quality Standards
- 40 CFR Part 58, Appendix D – Network Design Criteria for Ambient Air Monitoring
- 40 CFR Part 58, Appendix E – Probe and Monitoring Path Siting Criteria for Ambient Air Quality Monitoring.

Additional guidance is provided in Guidance for Choosing a Sampling Design for Environmental Data Collection, (EPA QA/G-5S).

Any deviations from the minimum siting criteria (e.g., shelter location, probe placement, and/or monitor sight path requirements) shall be thoroughly documented in the Site Review report. Examples of deviations include, but are not limited to, insufficient distance from roadways (i.e. marginal terrain criteria) and insufficient distance from influencing objects (e.g. drip line of an adjacent tree or a cell phone tower that was installed after the monitoring site was established). Sites that do not meeting siting requirements are to be flagged with the "SX - Does Not Meet Siting Criteria" qualifier code until siting issues are resolved or EPA grants a siting criteria waiver.

20.3 Sample Collection Procedures

Potentially unacceptable data points are routinely identified in the database through electronic application of error flags. Each instrument-specific flag is associated with a unique error. These error flags are routinely reviewed as part of the data validation process. This activity assists in identifying suspect (potentially bad) data points that could invalidate the resulting averaging periods.

The impact of any sample collection deviations shall be evaluated during data validation by the QA staff prior to upload of the data to AQS. Additionally, any deviation from the

established sample collection procedures must be documented in the appropriate logbook or data sheet. Accurate and complete documentation of any data collection deviations will assist in any subsequent investigations or evaluations. Investigations and evaluations may be necessary to determine whether the data obtained from a site may qualify as a baseline or indicator for other sites.

The data may also require qualifier flags, null codes and text comments within the data management system (i.e., AirMVP/AirVision), which are typically applied to the data by field technicians and/or QA staff. The qualifier flags and null codes are transmitted to AQS and provide the principal means of communicating data quality characteristics to the EPA. A compilation of the EPA null codes and quality assurance flags and the particulate gravimetric laboratory null codes and quality assurance flags is presented in Tables 20-1 through 20-6. The PQAO Data Handling and Data Validation SOP provides a list of the commonly used null codes and quality assurance flags as well as sample scenarios for their use.

Table 20-1. Qualifier Code Description and Type

Qualifier Code	Qualifier Description	Purpose
1	Deviation from a CFR/Critical Criteria Requirement	Flag is applied to valid data to provide additional information.
1V	Data reviewed and validated	
2	Operational Deviation	
3	Field Issue	
4	Lab Issue	
5	Outlier	
6	QAPP Issue	
7	Below Lowest Calibration Level	
9	Negative value detected - zero reported	
CB	Values have been Blank Corrected	
CC	Clean Canister Residue	
CL	Surrogate Recoveries Outside Control Limits	
DI	Sample was diluted for analysis	
DN	DNPH peak less than NATTS TAD requirement, reported value should be considered an estimate	
EH	Estimated; Exceeds Upper Range	
FB	Field Blank Value Above Acceptable Limit	
FX	Filter Integrity Issue	
HT	Sample pick-up hold time exceeded	
LB	Lab blank value above acceptable limit	
LJ	Identification of Analyte Is Acceptable; Reported Value Is an Estimate	
LK	Analyte Identified; Reported Value May Be Biased High	

Qualifier Code	Qualifier Description	Purpose
LL	Analyte Identified; Reported Value May Be Biased Low	
MD	Value less than MDL	
MS	Value reported is 1/2 MDL substituted.	
MX	Matrix Effect	
ND	No Value Detected, Zero Reported	
NS	Influenced by nearby source	
QP	Pressure Sensor Questionable	
QX	Does not meet QC criteria	
QT	Temperature Sensor Questionable	
SQ	Values Between SQL and MDL	
SS	Value substituted from secondary monitor	
SX	Does Not Meet Siting Criteria	
TB	Trip Blank Value Above Acceptable Limit	
TT	Transport Temperature is Out of Specs.	
V	Validated Value	
VB	Value below normal; no reason to invalidate	
W	Flow Rate Average out of Spec.	
X	Filter Temperature Difference or Average out of Spec.	
Y	Elapsed Sample Time out of Spec.	

Table 20-2. Null Code Description and Type

Null Data Code	Code Description	Purpose
1C	A 1-Point QC check exceeds acceptance criteria but there is compelling evidence that the analyzer data is valid	Code is applied to invalid data, where the code replaces the data value.
1F	No 1 Point QC but need to count for completeness	
AA	Sample Pressure out of Limits	
AB	Technician Unavailable	
AC	Construction/Repairs in Area	
AD	Shelter Storm Damage	
AE	Shelter Temperature Outside Limits	
AF	Scheduled but not Collected	
AG	Sample Time out of Limits	
AH	Sample Flow Rate out of Limits	
AI	Insufficient Data (cannot calculate)	
AJ	Filter Damage	
AK	Filter Leak	
AL	Voided by Operator	
AM	Miscellaneous Void	

Null Data Code	Code Description	Purpose
AN	Machine Malfunction	
AO	Bad Weather	
AP	Vandalism	
AQ	Collection Error	
AR	Lab Error	
AS	Poor Quality Assurance Results	
AT	Calibration	
AU	Monitoring Waived	
AV	Power Failure	
AW	Wildlife Damage	
AX	Precision Check	
AY	Q C Control Points (zero/span)	
AZ	Q C Audit	
BA	Maintenance/Routine Repairs	
BB	Unable to Reach Site	
BC	Multi-point Calibration	
BD	Auto Calibration	
BE	Building/Site Repair	
BF	Precision/Zero/Span.	
BG	Missing ozone data not likely to exceed level of standard.	
BH	Interference/co-elution/misidentification.	
BI	Lost or damaged in transit.	
BJ	Operator Error.	
BK	Site computer/data logger down.	
BL	QA Audit.	
BM	Accuracy check.	
BN	Sample Value Exceeds Media Limit.	
BR	Sample Value Below Acceptable Range.	
CS	Laboratory Calibration Standard.	
DA	Aberrant Data (Corrupt Files, Aberrant Chromatography, Spikes, Shifts).	
DL	Detection Limit Analyses.	
EC	Exceeds Critical Criteria.	
FI	Filter Inspection Flag.	
MB	Method Blank (Analytical).	
MC	Module End Cap Missing.	
QV	Quality Control Multi-Point Verification.	
SA	Storm Approaching.	
SC	Sampler Contamination.	
ST	Calibration Verification Standard.	

Null Data Code	Code Description	Purpose
SV	Sample Volume out of limits.	
TC	Component Check & Retention Time Standard.	
TS	Holding Time or Transport Temperature Is Out of Specs.	
XX	Experimental Data.	

Table 20-3. Informational Flag Description and Type

Informational Flag	Flag Description	Purpose
IA	African Dust	Flag is applied to provide additional information on events that may have influenced the data
IB	Asian Dust	
IC	Chem. Spills & Indust Accidents	
ID	Cleanup After a Major Disaster	
IE	Demolition	
IF	Fire - Canadian	
IG	Fire - Mexico/Central America	
IH	Fireworks	
II	High Pollen Count	
IJ	High Winds	
IK	Infrequent Large Gatherings	
IL	Other	
IM	Prescribed Fire	
IN	Seismic Activity	
IO	Stratospheric Ozone Intrusion	
IP	Structural Fire	
IQ	Terrorist Act	
IR	Unique Traffic Disruption	
IS	Volcanic Eruptions	
IT	Wildfire-U. S.	
J	Construction	

Table 20-4. Exclusion Flag Description and Type

Exclusion Flag	Flag Description	Purpose
RA	African Dust	Flags data influenced by an exceptional event that will be excluded.
RB	Asian Dust	
RC	Chem. Spills & Indust. Accidents	
RD	Cleanup After a Major Disaster	
RE	Demolition	
RF	Fire - Canadian	

Exclusion Flag	Flag Description	Purpose
RG	Fire - Mexico/Central America	
RH	Fireworks	
RI	High Pollen Count	
RJ	High Winds	
RK	Infrequent Large Gatherings	
RL	Other	
RM	Prescribed Fire	
RN	Seismic Activity	
RO	Stratospheric Ozone Intrusion	
RP	Structural Fire	
RQ	Terrorist Act	
RR	Unique Traffic Disruption	
RS	Volcanic Eruptions	
RT	Wildfire-U. S.	

Table 20-5. $PM_{2.5}$ Gravimetric Laboratory Automated LIMS Flags and Comments for Holding Time and Temperature/Humidity Control

Specification	Qualifier	Failure Comment
Filter holding time from pre-weight ≤ 30 days	HTE	Sampled more than 30 days after pre-Weighing
Filter holding time from sampling ≤ 30 days	HTE	Weighed more than 30 days after sampling
Filter collection ≤177 hours after sampling	HTE	Filter collected more than 177 hours after date sampled
Lab conditioning average Temperature 20.0-23.0 ºC	FLT	Lab average temperature criterion exceeded
Lab temperature control 24-hour standard deviation ≤ 2.0 ºC	FLT	Lab temperature 24-hour standard deviation criterion exceeded
Lab conditioning humidity average 30.0-40.0 % RH	FLH	Lab average humidity criterion exceeded
Lab conditioning humidity 24-hour standard deviation ≤ 5.0%	FLH	Lab humidity 24-hour standard deviation criterion exceeded
Pre/post-sample conditioning humidity difference does not exceed ± 5.0% RH	FLH	Pre-/post-sample humidity average difference of ± 5.0 % RH exceeded
Received temperature 4.1 - 25 °C	ISP	Received at [X] degrees C. Verify average ambient sampling temperature and holding time
Received temperature ≥ 25.1 °C	FSP	Filter magazine received above 25°C

Table 20-6. PM2.5 Gravimetric Laboratory Recommended Data Qualifiers and Comments for LIMS

Data Qualifier	Code	Recommended Comments
Sample Integrity Suspect	SIS	Filter damage observed upon receipt (ex: scuff, pinhole). Foreign object on filter surface (ex: particle, spot).
Sample Integrity Compromised	SIC	Destructive filter damage observed upon receipt (ex: hole, tear)
Lab Accident	LAC	Laboratory accident or damage
Holding Time Exceedance	HTE	Post-weighed more than 30 days after sampling. Holding time in field exceeded 177 hours. Sampled more than 30 days after pre-weight.
Voided Filter	VOD	Filter voided by customer.
Lab Temperature criteria exceeded	FLT	Lab Temperature criteria exceeded.
Lab Humidity criteria exceeded	FLH	Lab Humidity criteria exceeded.
Improper Sample Preservation	ISP	Filter Magazine received above 4 ºC.
Failing Sample Preservation	FSP	Filter Magazine received above 25 ºC.

20.4 Quality Control

Quality control activities are outlined in Section 12 of this QAPP. Prior to upload of data to AQS, the impact of any deviations shall be evaluated by the Data Validation Team and Local Program QA Coordinators/Staff during the data validation process. While not exhaustive, the list below contains some examples of data loss/invalidation and the associated methods of data handling.

- All periods of missing concentration data (e.g. during QC activities, maintenance, and power failures) will be replaced with the appropriate AQS Null Data codes.
- All filters for manual particulate matter analysis will be composed of 1380 – 1500 minutes. Filters with a sampling period that exceeds these limits will require invalidation of that filter. The affected filter concentration will be replaced with AQS Null Data codes.
- The filter conditioning environment (i.e. temperature, humidity, etc.) for particulate matter filter analysis must be maintained within certain ranges.
- Analysis performed outside of these ranges will result in the invalidation of data and data will be replaced with AQS Null Data codes.
- The one-point flow verifications must be within the acceptance criteria limits specified in Tables 5-4 to 5-9.
- The calculated difference for the precision point conducted during precision checks (i.e., one-point flow verification) must be within the acceptance criteria control limits (i.e. meet the MQOs) specified in Tables 5-4 to 5-9. If the 1-pt QC exceeds the percent difference limits, all hourly averaged data or filters sampled during that time period will be invalidated back to the last passing Precision Check or known point of sampler malfunction. Invalidated data will be replaced with AQS Null Data codes.

- Precision Check data uploaded to AQS as QA data must actually quality assure the applicable concentration data within AQS. Examples are below:
  - All valid, both passing and failing, precision check (i.e. precision point greater than control limit), will be uploaded to AQS.
  - Refer to the Data Handling and Data Validation SOP (DEP 18-27) for more examples of handling concentration and QA data in AirMVP and AQS.

- The calculated percent difference for Semi-Annual Flow Rate Audits conducted during a QA Performance Evaluation must be within the acceptable operational criteria control limits (i.e. meet the MQOs) noted in Tables 5-4 to 5-9.
  - If the performance evaluation results exceed these criteria limits, the validity of the failed audit must be verified by a flow rate audit conducted with an independent transfer standard (i.e. the transfer standard routinely located at the site should not be used).
  - Florida does not invalidate data solely based on performance evaluation audit results. However, if the failed audit results are verified, then data will be invalidated back to the point of the last acceptable precision check or a known point of sampler malfunction. The affected data will be replaced with AQS Null Data codes.
  - All performance evaluation should be entered into AirMVP. However, only passing semi-annual flow rate audits are uploaded into AQS.

It is the responsibility of the Data Validation Team and QA Coordinators/Staff to ensure that all invalidated concentration data is coded appropriately, and then correctly uploaded to AQS.

20.5 Calibration

Sections 12 and 14 addresses the calibration of instruments and equipment and the information that should be presented to ensure that the calibrations are performed correctly, and the results are acceptable. When calibration problems are identified, any data produced between the suspect calibration event and any subsequent recalibration should be flagged or invalidated to alert data users.

20.6 Data Reduction and Processing

As mentioned in the above sections, both internal and external TSAs will be performed to ensure the data reduction and processing activities mentioned in the QAPP are being followed. Data will be reviewed on a monthly basis to ensure that associated flags or any other data qualifiers have been appropriately associated with the data and that appropriate corrective actions were taken.

20.7 Exceptional Events

40 CFR 50.14 allows the EPA Administrator to exclude certain data from being used for determinations of exceedances and violations of a NAAQS, so long as a State demonstrates to the Administrator's satisfaction that exceedance or violation was caused by an "exceptional event." 40 CFR 50.1 defines an "Exceptional Event" as an event or events, in which:

- The resulting emissions affect air quality in such a way that there exists a clear causal relationship between the specific event(s) and the monitored exceedance(s) or violation(s)
- The event(s) is not reasonably controllable or preventable
- The event(s) is caused by a human activity that is unlikely to recur at a particular location or is a natural event(s).

An Exceptional Event does not include:

- Air pollution relating to source noncompliance
- Stagnation of air masses or meteorological inversions
- Meteorological events involving high temperatures or lack of precipitation

However, conditions involving high temperatures, or a lack of precipitation may promote occurrences of particular types of exceptional events, such as wildfires or high wind events, which do directly cause emissions.

Data impacted by an Exceptional Event is not considered "representative" of air quality for NAAQS comparison purposes, or calculation of certain summary statistics. All concentration data impacted by an Exceptional Event must be flagged with an AQS Request Exclusion code and must be linked within AQS to an event description. Exceptional Event codes and descriptions are typically due by July 1 of the following year, but alternative schedules may be established during Federal rulemaking. It is the responsibility of the Quality Assurance Manager to analyze data for potential Exceptional Events and to add the necessary flags and descriptions into AQS by July 1 of the following year (or by applicable regulatory deadlines).

A State seeking concurrence must notify and cooperate with the appropriate EPA Regional Office (i.e. EPA Region 4) to prepare a demonstration package for the Administrator. Exceptional Event data in AQS must receive concurrence from the EPA Administrator. Data that does not receive a concurrence is still eligible for NAAQS comparisons, regardless of the application of Request Exclusion flags. See Table 20-4 above for the applicable exceptional events AQS codes.

21.0 DATA VERIFICATION AND VALIDATION METHODS

40 CFR Part 58, Appendix A, states the following in Section 1.2.3:

Each PQAO is required to implement a quality system that provides sufficient information to assess the quality of the monitoring data…Failure to conduct or pass a required check or procedure, or a series of required checks or procedures, does not by itself invalidate data for regulatory decision making. Rather, PQAOs and the EPA shall use the checks and procedures required in [Part 58, Appendix A] in combination with other data quality information, reports, and similar documentation that demonstrate overall compliance with Part 58. Accordingly, the EPA and PQAOs shall use a "weight of evidence" approach when determining the suitability of data for regulatory decisions…Consensus built validation templates or validation criteria already approved in QAPPs should be used as the basis for the weight of evidence approach.

As stated in Section 5.5 of this QAPP, Florida has adopted the consensus-built data validation templates in the EPA QA Handbook. The templates are included in this QAPP in Section 5.5 and will be used for the weight of evidence approach afforded to PQAOs within the regulation. The QA Handbook provides the following guidance regarding the use of the templates, which the Florida PQAO will follow when validating data.

- Critical Criteria- Deemed critical to maintaining the integrity of a sample (or ambient air concentration value) or group of samples. Observations that do not meet each and every criterion on the critical table should be invalidated unless there are compelling reason and justification for not doing so. Basically, the sample or group of samples for which one or more of these criteria are not met is invalid until proven otherwise. In most cases the requirement, the implementation frequency of the criteria, and the acceptance criteria are found in CFR and are therefore regulatory in nature.
- Operational Criteria - Violation of a criterion or a number of criteria may be cause for invalidation. The data validator should consider other quality control information that may or may not indicate the data are acceptable for the parameter being controlled. Therefore, the sample or group of samples for which one or more of these criteria are not met is suspect unless other quality control information demonstrates otherwise and is documented. The reason for not meeting the criteria should be investigated, mitigated or justified.
- Systematic Criteria - include those criteria which are important for the correct interpretation of the data, but do not usually impact the validity of a sample or group of samples. An example criterion is that at least 75% of the scheduled samples for each quarter should be successfully collected and validated. The DQOs are also included in this table. If the data quality objectives are not met, this does not invalidate any of the samples, but it may impact the confidence in the attainment/non-attainment decision.
- The designation of QC checks or QC samples as Operational or Systematic do not imply that these quality control checks need not be performed. Not performing an operational or systematic QC check that is required by regulation can be a basis for invalidation of all associated data. The validation templates are meant to be applied to small datasets (single

values or a few weeks of information) and should not be construed to allow a criterion to be in non-conformance simply because it is operational or systematic.

The following levels of data review describe the overall data verification and validation process, including the individuals responsible for the stated activities.

RAW - Level 0 (All Staff): In the case of continuous samplers, these data are obtained directly from the dataloggers that acquire the data in the field. Averaging times represent the minimum intervals recorded by the datalogger. In the case of intermittent sampling, field data are obtained directly from the samplers. For filter-based $PM_{2.5}$, laboratory data are obtained from LIMS; and, ultimately, the data that is a combination of both field and laboratory data is stored in PMTS. Raw data may have been reduced, but are unedited, not reviewed, and are not adjusted. Raw data has not been edited for instrument downtime, but may be flagged with pre-programmed, user-defined status flags that the data logger, LIMS, PMTS, or AirMVP/AirVision will apply to data points when excursions occurs. Raw data are consulted on a regular basis to ascertain instrument functionality and environmental conditions and to identify potential episodes prior to the monthly (or in the case of the $PM_{2.5}$ gravimetric laboratory weekly) data validation process.

REVIEW (Verification) - Level 1 (Field Technician/Assigned QA Staff/Laboratory Specialists): This is the next step in the verification process, that occurs after the Level 0 data review. Data are revised (in the edited database only; original data remains intact in the unedited database). Verification and associated data edits include the following:

- Removal of values when monitoring instruments or laboratory conditions fail specified validation criteria.
- Verifying computer file entries against data sheets/logbooks, where appropriate.
- Verifying manual data entry against data sheets/logbooks, where appropriate.
- Replacement of data from a backup data acquisition system in the event of failure of the primary system.
- Identification and flagging of data that are beyond reasonable bounds, significantly deviate from measurement assumptions, or that may be deemed unrepresentative.
- Identification of data collected during periods of maintenance or malfunction.

This process occurs in LIMS (filter-based $PM_{2.5}$), PMTS (filter-based $PM_{2.5}$), and AirMVP/AirVision (both continuous and filter-based/intermittent $PM_{2.5}$ and PM_{10}).

QA REVIEW (Validation) - Level 2 (Data Validation Team and QA Coordinators/Staff): QA validation is the next step in data analysis. In addition to a Level 1 review of the data, the Data Validation Team and QA Coordinators/Staff verify the field technician's logbooks and data forms for completeness and accuracy and ensure the data results meet the MQOs found in Tables 5-4 to 5-9. Data that do not meet the requirements of the critical criteria elements will be invalidated, unless compelling evidence and justification exists for not doing so. In case of the latter, the reason(s) for not invalidating the data will be documented. Qualifier flags may be applied to data that are found to not meet operational or systematic criteria. If multiple operational criteria flags

are applied to the data, the Data Validation Team and QA Coordinators/Staff, in collaboration with the Data Quality Section Administrator and Quality Assurance Manager, may deem that the data should be invalidated instead of qualified.

These steps are applicable to all particulate matter sampling (filter-based/intermittent and continuous).

AQS READY - Level 3 (Data Quality Section Administrator and AQS Coordinator): Data is prepared for AQS submission and text files are created (see Data Handling and Data Validation SOP - DEP18-27). The Data Quality Section Administrator and AQS Coordinator will perform a cursory review of statewide data prior to upload to AQS. If there are any issues or concerns, they will alert the QA Coordinator/Staff or the Data Validation Team. Once submitted successfully, AQS AMP reports will be reviewed by the Data Validation Team and QA Coordinators/Staff to verify data upload (transfer) was successful. The data will also be spot-checked for accuracy by Data Quality Section Administrator.

Tables 20-1 to 20-6 list the AQS null value codes, QA qualifier flags, and informational flags that may be applied to Florida's dataset during verification/validation processes.

These steps are applicable to all particulate matter sampling (filter-based/intermittent and continuous).

22.0 RECONCILIATION WITH DATA QUALITY OBJECTIVES

Florida follows procedures that verify data collected by the PQAO complies with the particulate matter pollutant DQOs. Actions will be taken based upon assessment of the DQOs to maintain compliance.

To reiterate, the data collected by the Florida PQAO will be used to:

- Monitor the ambient concentrations of criteria pollutants within the state;
- Evaluate compliance with the NAAQS;
- Observe pollution trends; and,
- Alert the public when unhealthy pollution levels are detected or predicted.

The quantitative DQOs are established in 40 CFR Part 58, Appendix A, and stated in Section 5.1 of this QAPP. To review the results of required statistical analyses (codified in Section 4 of 40 CFR Part 58, Appendix A), the AMP256 and AMP600 AQS reports will be generated. Since Florida implements EPA's critical criteria for precision checks – FDEP should not have to directly calculate confidence intervals annually because all data should, statistically, meet the DQOs.

While DQOs will be assessed quarterly throughout the year, Florida DEP will evaluate whether these objectives are achieved on an annual basis as well. Evaluation of measurement uncertainty will occur in conjunction with Annual Data Certification, which is to be completed by May 1 of each year. The evaluation will be conducted by the AQS Coordinator under the supervision of the Quality Assurance Manager. The data used to calculate measurement uncertainty will be obtained from AQS, which will have been previously quality assured, coded, qualified, and evaluated based upon applicable MQOs.

If and when the data from at least one of the monitors violates the DQI bias and/or precision limits, then the AQS Coordinator will conduct an investigation to uncover the cause of the violation. If all the monitors in the network of a similar type or pollutant violate the DQI, the cause may be at the agency level (operator training) or higher (problems with method designation). If only one monitor or site violates the DQI, the cause is more likely specific to the site (particular field technician, problem with the site or equipment). Tools for determining the cause include reviewing:

- Data from a collocated network (e.g., state, another local program, national),
- Data from performance audits (e.g., other agency or PEP), and,
- QC trends.

Once the cause(s) of non-conformance has been determined, Florida DEP will institute and document corrective actions to correct quality system deficiencies. Corrective actions may include revising the following:

- Pollutant MQOs (e.g., to make them more stringent),
- This QAPP, and

- Specific SOPs.

While multiple staff members will be involved in any such investigation, the Quality Assurance Manager and QA Coordinators/Staff will be responsible for oversight of the investigation. Modification of the MQOs, QAPP, and related SOPs will be the responsibility of the Quality Assurance Manager, with revisions subsequently approved by EPA Region 4. The Quality Assurance Manager will contact EPA Region 4 for guidance during this process, when/if necessary. Ultimately, specifying tolerable error limits reduces the probability of making a decision error due to uncertainty in the data. Decision-makers, such as EPA, need to determine if the data collected within Florida's monitoring network will be less than, equal to, or greater than the level of the NAAQS for each specific criteria pollutant. The annual data certification process, and reports generated as part of the certification, provide a quantitative assessment of the measurement uncertainty within the PQAO criteria pollutant dataset. By controlling uncertainty in the data to the extent prescribed by the DQOs, decision makers can use Florida's ambient air monitoring data with confidence.

23.0 REFERENCES

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Environmental Protection Agency. 2012. *Near-road NO_2 Monitoring Technical Assistance Document*. Washington, D.C.

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APPENDIX A – QUALITY ASSURANCE SYSTEMS AUDIT PROTOCOL

Florida Department of Environmental Protection
Division of Air Resource Management
Office of Air Monitoring

Quality Assurance Systems Audit Protocol
Revised July 2021

This document provides the auditors, as well as those being audited, with a protocol of how quality assurance (QA) systems audit conducted by the Florida Department of Environmental Protection (Florida DEP) Division of Air Resource Management (DARM) Office of Air Monitoring (OAM) will be conducted. This protocol does not specify all of the individual records, procedures, etc., that will be reviewed, but rather, denotes a broad specification of the process that will be used for managing the systems audit.

1.0 Introduction

The authority to perform systems audits is derived from the Code of Federal Regulations (Title 40); specifically, 40 CFR Part 58, which deals specifically with the installation, operation and quality assurance of the SLAMS networks. The regulations in 40 CFR Part 58, mandate the performance of the systems audits of agency air monitoring programs.

It is a review and inspection of the agency's ambient air monitoring program, performed to verify that applicable elements of the air quality monitoring quality control system are suitable and have been developed, documented, and effectively implemented in accordance with specified requirements. The specific elements of the State of Florida's QA systems audit are to:

- Evaluate the management performance related to the quality control of the ambient air monitoring program;
- Evaluate the quality control performance for elimination of systematic errors;
- Identify areas of significant concern requiring corrective action;
- Assist in the positive development of the agency's ambient air monitoring activities; and
- Provide a forum for the dissemination and discussion of ideas and procedures which enhance data quality between agencies.

The scope of the systems audit is of major concern to both Florida DEP and the agency being evaluated. A systems audit, as defined in the context of this document, includes an appraisal of the following program management areas: network, field and laboratory operations, data handling and reporting, and quality assurance activities. The depth of coverage within these areas may be increased or decreased based on the past or current agency activities and results. The intent of the

audit is to define areas in which the supervisory/management staff needs to improve their overview and direction of the program.

Guidance for conducting systems audits are contained in the EPA's *Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II: Ambient Air Quality Monitoring Program*, Section 15.3 and Appendix H (EPA-454/B-17-001, dated January 2017) and EPA's *Quality Assurance Guidance Document Conducting Technical Systems Audits of Ambient Air Monitoring Programs* (EPA-454/B-17-004, dated November 2017).

2.0 QA Systems Audit Procedures

2.1 Audit Schedules

The systems audits should be conducted within a three to five-year cycle unless an agency has one or more major findings, in which case a follow-up systems audit will be conducted during the next audit cycle. A master audit schedule for the current year will be published in early January of that year. Each agency being audited will be contacted at least six weeks prior to the start of the audit to establish a schedule and to identify the agency personnel who will represent the agency during the audit. It is requested that the agency's Monitoring Manager and the QA Coordinator/Staff be present to answer questions throughout the audit. Pertinent files, logs, and other documents which may be subject to review will be requested by the auditor at least six weeks prior to the audit.

Each agency will be audited during the dates specified to minimize scheduling conflicts and ensure timely completion of the systems auditing process. When possible, an attempt will be made by the auditors to accommodate unexpected conflicts such as leave taken due to illness or other emergencies. The agency's Air Program Director/Administrator shall notify OAM’s Data Quality Section Administrator as soon as possible when a scheduling conflict becomes apparent. However, if the auditors are unable to adjust the audit schedule, available staff shall be provided by the agency to assist the auditors as necessary to complete the audit as previously scheduled.

2.2 Audit Questionnaire

The questionnaire will be emailed to the agencies scheduled to be audited along with a copy of this protocol at least six weeks prior to the start date of the audit. The receiving agency should review, address all applicable issues, and submit the electronic version of the completed questionnaire to OAM’s Data Quality Section Administrator at least two weeks prior to the audit. The questionnaire will be utilized by the auditors during the audit in accordance with Section 2.3 below and during the preparation of the audit report.

2.3 Audit Guidelines

The audit will be performed using the OAM prepared audit questionnaire. While this document is not all-inclusive, it is meant to be used as a tool by the agency and the auditor to ensure an

adequate review of all aspects of the agency's ambient air monitoring and quality assurance programs. The auditors will adhere to the audit questionnaire, including the order in which the items are arranged, but may deviate as necessary if questions arise during the systems audit process that need further examination.

2.4 Auditor Documentation Review

Prior to auditing an agency, the auditors will conduct a review of the audited agency's documentation. This request of records to the agency from OAM will be made well in advance of the actual audit date to allow audit staff ample time to review the records. It is imperative that agency staff work closely with audit staff to provide requested records in a timely manner. Documents could include, but are not limited to, Quality Management Plans (QMPs), Quality Assurance Project Plans (QAPPs), Standard Operating Procedures (SOPs), control charts, raw data, Quality Assurance/Quality Control (QA/QC) data, laboratory and field records, etc. An "approved" status does not preclude the auditors from finding omissions or discrepancies between the document and any applicable regulation, policy document, QA Plan, or other proper operational practice. A missing document is an issue of concern which may be noted in the audit report. Omissions or discrepancies in currently approved agency documentation which conflict with rules or regulations shall also be noted. Issues found during the review process that may still be impacting data quality should immediately be brought to the attention of the OAM Data Quality Section Administrator.
Note: Florida is a single Primary Quality Assurance Organization (PQAO), so SOPs, QAPPs, and QMPs, are statewide documents.

2.5 Audit Briefings

The entire interview process is expected to be conducted within a single day; however, if warranted additional interviews may be scheduled. At the onset of the interview, the auditor will explain the purpose and scope of the systems audit. Then, the interview will transition into the questionnaire followed by specific questions or possible findings relative to issues or concerns resulting from the auditors' review of the agency's records. A formal exit interview with the agency's Air Program Administrator/Manager will be held, if requested, the day of or the day after the completion of the interview process. Prior to the interview, the auditors will discuss their findings with the OAM Data Quality Section Administrator. The OAM Administrators will give the auditors specific guidance for issues to be included in the interview. See Section 2.6

Agency staff are encouraged to take notes during the audit so that corrective actions may be initiated for each area of concern before the draft systems audit report is submitted to the agency.

Issues noted by the auditors with which the audited agency disagrees should be brought to the attention of the OAM Data Quality Section Administrator. The auditors will note in their draft report those issues with which they and the agency did not agree. In addition, it is

recommended that the audited agency summarize its disagreements in detail and submit them to the OAM Data Quality Section Administrator for inclusion in the systems audit file. These comments, along with the auditors' notes, will be reviewed by the OAM Data Quality Section Administrator and discussed further with the OAM Quality Assurance Manager, if warranted, to determine the validity of the issue for inclusion in the draft systems audit report. The auditors or the agency staff should call the OAM Data Quality Section Administrator when problems arise which require an immediate solution.

Issues which, while outside the purview of the routine systems audit structure, may be considered of concern by the auditor, will be discussed with the OAM Data Quality Section Administrator who will decide whether he/she or the auditor should discuss the issue with the audited agency's program management. For example, the audit period may cover calendar years 2018 thru 2019; however, the audit staff notes an issue that appears in late calendar year 2019 but spill over into calendar year 2020 during their reviews. The OAM Program Administrator will also be kept apprised of these issues in addition to the normal preview of the audit reports. These issues may be considered as part of the formal written audit report and/or may be included in the cover letter for the audit report.

2.6 Audit Draft Report

The auditors will provide the OAM Data Quality Section Administrator with a summation of their notes and possible findings at least four weeks prior to the audit (see Table 1 for categorization of audit findings). The OAM Data Quality Section Administrator will discuss these notes and possible findings with the auditors prior to the audit interview to ensure that these are valid possible findings. However, if there is any concern for a finding that may still be impacting data quality, the OAM Data Quality Section Administrator should be immediately informed by the audit staff. The auditors will utilize these notes during the interview process with the audited agency. The final draft of the agency's audit report will be prepared by the auditors after the interview process and will include only those issues and areas of concern noted during the audit interview and discussed with the OAM Data Quality Section Administrator.

The audit staff should consider the following when conducting the review and preparing the draft report:

- Findings from the previous OAM's systems audit of the agency. Be aware of past mistakes. Are they recurring? Have they been addressed, and appropriate actions been taken to correct them? Determine if a repeat of the finding is warranted.
- Findings from the most recent Environmental Protection Agency's (EPA) systems audit of the agency. Were there findings in the EPA systems audit that have since been addressed by the agency?
- The fact that Florida is a single PQAO (i.e. consider whether and how much of the agency's time/efforts need to be placed in addressing certain issues associated with documentation that is currently undergoing statewide revision).

- Recent changes to the agency's network (i.e. new equipment, updates, etc.) and/or the agency's staff (i.e. new employees, retired staff, etc.). New equipment could account for improved data completeness (or decreased data completeness if equipment had malfunctions or inherent issues). Staff turnover could indicate a need for training or more intimate direction and guidance.
- The OAM is to provide guidance and assistance to the audited agency. If there are equipment or training needs, the OAM could possibly meet these types of provisions.

The draft report will be completed within ten (10) calendar days after the audit and submitted to the OAM Data Quality Section Administrator. The auditors' draft report will be submitted in a standard format, to include:

- A summary page which addresses the parties involved in the audit from both the Florida DEP and the audited agency,
- The audited agency's network description,
- The audited agency's data completeness (including a table summarizing the data completeness for each year of the audited time period),
- The audited agency's compliance with the EPA's precision and accuracy goals,
- The audited agency's participation in the National Performance Audit Program,
- The audited agency's site reviews (indicate whether all recent issues have been addressed or identify issues that require the agency's attention), and
- Findings and recommendations/direction (which will have been discussed with the agency's staff and OAM's management before inclusion in the report) along with citations (i.e. CFR, QAPP, SOP, QA Handbook, etc.).

Audit findings will be categorized as detailed in Table 1 below:

Table 1. QA Systems Audit Findings Categorization

Finding	Nonconformance with or absence of a specified requirement (regulatory, QMP, QAPP, SOP, etc.) or guidance deviation which could significantly impact data quality.
Concern	Practices with the potential detrimental effect on the ambient air monitoring program's operational effectiveness or the quality of sampling or measurement results.
Observation	An infrequent deviation, error, or omission which does not impact the output of the quality of the work product but may impact the record for future reference.

The draft report will be approved by both the OAM Data Quality Section Administrator and the OAM Program Administrator. The draft report will be provided to the agency's air program Director/Administrator no later than thirty (30) days after completion of the systems audit interview with the agency.

Once the agency receives the draft report from Florida DEP, the agency will be provided a 15-day review period to "fact check" the written information. If the agency identifies an incorrect statement or datum within the draft, then the agency should provide corrections and/or edits to Florida DEP within the 15-day timeframe. Helpful edits the monitoring organization can provide include factual corrections such as staff names/titles, spellings, site names, and other typographical/minor errors made by the audit team. If the agency fails to respond to Florida DEP within the 15-day timeframe, Florida DEP will consider this as no corrections are warranted and issue the final report.

2.7 Audit Final Report

The final QA systems audit report should be issued to the agency no later than thirty (30) days following the receipt of the draft comments or the expiration of the 15-day review period), whichever comes first.

2.8 Agency Response Review

No later than thirty (30) days after receipt of the systems audit report, the audited agency is required to respond in writing addressing the management activities proposed or implemented to rectify or prevent the occurrence of findings identified in the final report. Agency responses should be detailed enough to allow the OAM Data Quality Section Administrator to decide the viability of the resolution of each issue. Agency responses to the issues should include such items as copies of revised forms, copies of missing data forms, or any other documentation which demonstrates the action taken (or to be taken) to completely respond to each specific issue. For each issue which is not able to be resolved expeditiously, a proposed completion date must be included in the agency's response. For example, a response to an audit finding which requires the agency to order a replacement instrument or part should include documentation that the order has been placed.

The audit report will remain open until all issues have been satisfactory resolved (or proposed resolutions have been made). It is at the discretion of the OAM Data Quality Section Administrator to recommend to the OAM Program Administrator that the audit be closed. Depending on the severity of the findings, additional action may be taken to ensure that the agency's air monitoring program has resolved issues satisfactorily before citing audit closure. For example, Florida DEP may have to continue to work closely with the agency by implementing recurring meetings (i.e. weekly, bi-weekly, monthly, etc.) with the agency. These meetings provide an opportunity for Florida DEP to remain abreast of the status of field and QA tasks, for example, that were cited in the report and to provide intimate training or guidance to the agency. This is also an opportunity for the agency to ask questions and address their concerns.

2.9 Audit Close-Out

When the audit report issues have been satisfactorily addressed, a letter closing out that year's report will be submitted to the agency by the OAM Program Administrator. The letter must be filed with the systems audit report, to document all actions as having been completed or

otherwise satisfied. When all agency audit reports have been finalized, the OAM Data Quality Section Administrator will compile the reports and pertinent correspondence from the Department and local air programs into a comprehensive systems audit report package. The audit report will indicate the issues noted during the audited period. Copies of the package are then forwarded to the appropriate EPA offices for review and subsequent filing. The cover letter to the EPA will indicate that all issues noted in the audit reports have been satisfactorily resolved as of the date of the DEP submission.

3.0 Summary

The process outlined above is dynamic and may be subject to future revision. The "QA Systems Audit Protocol" is designed to assist state and local air program quality assurance and management staff in satisfying the systems audit reporting requirements in the most effective and efficient manner possible.

APPENDIX B – QUALITY ASSURANCE SYSTEMS AUDIT QUESTIONNAIRES

I. General QA Systems Audit Questionnaire

Florida Department of Environmental Protection
Division of Air Resource Management
Office of Air Monitoring

Quality Assurance (QA) Systems Audit Questionnaire

A. GENERAL INFORMATION
A1. BASIC PROGRAM INFORMATION AND ORGANIZATION
Agency:
Agency Mailing Address:
City:
Zip:
Date of QA Systems Audit:
Agency's Air Program Administrator:
Ambient Air Monitoring Network Manager:
QA Manager:
Attach a program organizational chart.
A2. KEY POSITION STAFFING
Enter the number of personnel available to each of the following program areas and any vacancies, if applicable.

Program Area	Number of People (Primary)	Number of People (Backup)	Vacancies
Network Management (i.e. site setup, siting, etc.)			

Field Operations (i.e. QC checks, site visits, site maintenance, etc.)			
Quality Management (i.e. audits, QA documentation, certifications, etc.)			
Data and Data Management (i.e. data review, validation and acquisition system, etc.)			
Technical Support (i.e. equipment repair and maintenance)			
Comment on the need for additional personnel, if applicable:			

A3. FACILITIES

Ambient Air Monitoring Function	**Facility Location**	**Comment on any significant changes to be implemented within the next one to two years.**
Instrument Repair		
Certification of Standards (i.e. gases, flow transfers, MFCs, etc.)		
Pb Analysis		
Data Verification and Processing		
General Office Space		
General Lab/Workspace		
Storage Space – Short-Term and Long-Term		
Air Toxics		

Indicate below any facilities that should be upgraded or any needs for additional physical space (laboratory, office, storage, etc.).

A4. GENERAL DOCUMENTATION POLICIES

Question	Yes	No	Response
Does the agency have a documented records management plan?	☐	☐	
If yes to previous question, does this include electronic records?	☐	☐	
Does the agency have a schedule for retention and disposition of records?	☐	☐	
Are records kept for at least ten years?	☐	☐	
Who is responsible for the storage and retrieval of records?			
What security measures are utilized to protect records?			
Where/when does the agency rely on electronic files as primary records?			

What is the system for storage, retrieval and backup of the electronic files?			
Does the agency have a training plan?	☐	☐	
Where is it documented?			
Does it make use of seminars, course, EPA-sponsored college-level courses, etc.?	☐	☐	
Are personnel cross-trained for other ambient air monitoring duties?	☐	☐	
Are training funds specifically designated in the annual budget?	☐	☐	
Does the training plan include the following:	☐	☐	
• Training requirements by position?	☐	☐	
• Frequency of training?	☐	☐	
• Training for contract personnel?	☐	☐	
• A list of core QA-related courses?	☐	☐	

Indicate below the most recent training events attended since the last QA audit and identify the personnel who participated in them.

Event	Dates	Participant(s)

B. QUALITY MANAGEMENT			
B1. STAFF			
Identify key individuals (i.e. QA Manager, Internal Auditor, etc.)			
Position Title			**Name**
B2. QA ACTIVITIES			
Question	**Yes**	**No**	**Response**
Does the agency perform all QA activities with internal personnel (i.e. developing QMPs, QAPPs, SOPs and DQOs; performing system audits, assessments and performance evaluations, corrective actions, validating data, QA reporting, etc.)? If no, in the response field indicate who is responsible and which QA activities are performed.	☐	☐	
If the agency has contracts or similar agreements in place with either another agency or contractor to perform audits or calibrations, please name the organization and briefly describe the type of agreement.			
Does the agency perform all QC activities with internal personnel (i.e. zero, span, one-point QC checks, calibrations, flowrate, temperature, pressure	☐	☐	

and humidity checks, certifying standards, lab and field blanks, data collection, balance checks, leak checks, etc.)?	☐	☐	

B3. QC ACCEPTANCE CRITERIA

Question	Yes	No	Response
Has the agency established and documented criteria to define agency acceptable QC results?	☐	☐	

Complete the following table.

Pollutant	Does the agency adhere to the critical QC acceptance criteria for criteria pollutants[1] and meteorological measurements[1]?	QC Acceptance Criteria (if other than validation templates[1])	Action or Warning Limits	Corrective Action

[1]QA Handbook Volume II, Appendix D Validation Templates; Handbook for Air Pollution Measurement Systems, Appendix C Validation Templates; Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV: Meteorological Measurements Version 2.0

B4. QAPPs			
Note: QMPs, QAPPs, and SOPs are created, updated, and maintained by the entire Florida PQAO under the leadership of Florida DEP.			
Question	**Response**		
How often does the air monitoring agency review QAPPs?			
How does the agency verify that the QAPP is fully implemented?			
How are staff notified and trained when a QAPP is revised?			
What personnel regularly receive updates?			
B5. SOPs			
Question	**Yes**	**No**	**Response**
Are SOPs available to all field operations personnel?	☐	☐	
How are staff notified and trained when a SOP is revised?			
B6. CORRECTIVE ACTION			
Complete the following table.			
Question	**Response**		
How is responsibility for implementing corrective actions assigned?			
How does the agency follow-up corrective actions are implemented?			

Briefly describe recent examples of the ways in which the above corrective action system was employed to remove the problems.	
B7. QUALITY IMPROVEMENT	
Question	**Response**
What actions were taken to improve the quality system since the last QA systems audit (Florida DEP) or technical systems audit (EPA)?	
Have there be any criteria pollutants with a completeness of less than 75% (90% for ozone) in the past 3 years? If so, list the pollutant and the corresponding year/quarter.	
Have all deficiencies indicated on the previous QA systems audit (Florida DEP) or technical systems audit (EPA) been corrected? If no, please list and explain.	

What are your agency's plans for quality improvement?	

B8. EXTERNAL PERFORMANCE AUDITS			
Question	**Yes**	**No**	**Response**
Does your agency participate in the following external performance audits? If the agency does not participate, please explain why.			
• NPAP	☐	☐	
• $PM_{2.5}$	☐	☐	
• PEP	☐	☐	
• Pb-PEP	☐	☐	
• Pb Strip Audit	☐	☐	
• Ambient Air Protocol Gas Verification Program (AA_PGVP)	☐	☐	
• Round Robin Metal PT	☐	☐	
List other performance audit participation (aside from Florida DEP)?			
Who performs NPAP and PEP audits?			

B9. INTERNAL PERFORMANCE AUDITS

Note: Florida DEP auditors usually conduct performance audits for the Florida PQAO. However, due to the COVID19 pandemic, the Florida DEP auditors began conducting only gaseous performances audits beginning late March 2020. Performance audits are conducted in accordance with 40 CFR Part 58 Appendix A. Complete the following sections (B9 thru B13) **only if** your agency conducts additional performance audits aside from those conducted by Florida DEP. Otherwise, enter "N/A". Performance audits include gaseous, particulate, and lead parameters.
Question

Question	Yes	No	Response
Does the agency maintain a laboratory to support quality assurance activities?	☐	☐	
Has the agency documented and implemented specific audit SOPs separate from monitoring SOPs?	☐	☐	
Are the QA personnel organizationally independent from the personnel responsible for generating environmental data (40 CFR Part 58 Appendix A Section 2.2)?	☐	☐	
Are performance audits conducted by technician(s) other than the routine site operator(s)? If no, please explain in the response field.	☐	☐	
Does the agency have identifiable auditing equipment and standards (specifically intended for sole use) for audits? If no, please explain in the response field.	☐	☐	
Are audit equipment and standards ever used to support routine calibrations and QC checks required for monitoring network operations? If yes, please explain in the response field.	☐	☐	

B10. INTERNAL PERFORMANCE AUDIT PROCEDURES

If the agency does not have a performance audit SOP (included as an attachment), describe the performance audit procedure for each type of pollutant.

Pollutant	Performance Audit Procedure

B11. CERTIFICATION OF AUDIT STANDARDS

Use the table below to provide information on certification of audit standards (i.e. flowmeters, gas standards, etc.).

Vendor	Audit Standard	Last Certification Date	Certification Frequency

Question	Yes	No	Response
Does the agency have a separate certified source of zero air for performance audits?	☐	☐	
Does the agency have procedures for auditing and/or validating performance of meteorological monitoring?	☐	☐	

B12. AUDIT EQUIPMENT

Manufacturer	Make and Model Number	Purchase Year or Year Acquired

B13. AUDIT ACCEPTANCE CRITERIA			
Question	**Yes**	**No**	**Response**
Has the agency established and documented criteria to define agency acceptable audit results? If yes, comment where (i.e. page number, section, etc.).	☐	☐	

C. NETWORK MANAGEMENT

C1. STAFF	
Identify key individuals.	
Position Title	**Name**

C2. NETWORK DESIGN			
Florida DEP submits an Annual Network Plan for the entire Florida PQAO. If there are any additional proposed changes that have not been provided to or discussed with Florida DEP already, please list below.			
Site Name	**AQS Site ID#**	**Pollutants Monitored**	**Proposed Changes**

C3. SITING
Florida DEP performs siting evaluation for the entire Florida PQAO in accordance with 40 CFR Part 58.

Question	Yes	No	Response
Are there any issues?	☐	☐	
If yes, please identify site, issue, and briefly describe plans to resolve the issue(s).			

C4. WAIVERS

Question	Yes	No	Response
Does your agency have any waivers? If yes, identify waivers in the response section.	☐	☐	
Does your agency plan to request any waivers? If yes, identify waivers in the response section.	☐	☐	

D. FIELD OPERATIONS

D1. STAFF

Identify key individuals (i.e. Field Manager, Field Supervisor, Field QA Manager, Operator, etc.).

Position Title	Name

D2. FIELD SUPPORT			
Question	**Yes**	**No**	**Response**
On average, how often are most of your stations visited by a field operator?			
On average, how many stations is a single operator held responsible?			
What material is used for instrument sampling lines?			
How often are sampling lines changed?			
Do you utilize uninterruptable power supplies or backup power sources at your sites?			

D3. INSTRUMENTATION

List the instruments in your inventory.

Pollutant	**Number of Instruments**	**Make and Models**	**Reference or Equivalent Number**

List instrument needs in order of priority.

D4. VERIFICATION/CALIBRATION

Indicate the frequency of multipoint verifications/calibrations.

Pollutant	**Frequency**

Question	Yes	No	Response
How are field calibration procedures documented and how are the results recorded?			
Do standards used for calibrations meet the requirements of appendices to 40 CFR Part 50 (EPA reference methods) and Appendix A to 40 CFR Part 58 (traceability of materials to NIST, SRMs, or CRMSs)?	☐	☐	
Are all flow-measurement devices NIST traceable?	☐	☐	

D5. CERTIFICATION

List the authoritative standards used for each type of flow measurement and indicate the certification frequency of standards to maintain field material/device credibility.

Flow Device	Serial Number	Primary Standard	Certification Frequency	Use (i.e. Calibration, Audit, Spare, etc.)

Question	Yes	No	Response
How are certifications performed (i.e. internally, vendor, third party, etc.)?			
Where do field operations personnel obtain gas standards?			
How are the gas standards verified after receipt?	☐	☐	
What equipment is used to perform calibrations (i.e. dilution devices, etc.)?			
Do the dilution air flow control and measurement devices conform to CFR requirements?	☐	☐	
Is calibration equipment maintained at each site?	☐	☐	
How is the functional integrity of this equipment documented?			
Who has responsibility for maintain field calibration standards?			

Please list the authoritative standards and certification frequency.

Calibrator/Primary Standard	Frequency of Certification/Calibration

D6. REPAIR			
Question	**Yes**	**No**	**Response**
Who is responsible for performing preventive maintenance?	☐	☐	
Is special training provided to them for performing preventive maintenance? Briefly comment on background or courses.	☐	☐	
What is the preventive maintenance schedule for each type of field instrumentation?	☐	☐	
How is control of logbook maintained?	☐	☐	
If preventive maintenance is MINOR, it is performed at:			
• Field Station?	☐	☐	
• Headquarters Facilities?	☐	☐	
• Manufacturer?	☐	☐	
• PQAO?	☐	☐	
If preventive maintenance is MAJOR, it is performed at:			
• Field Station?	☐	☐	
• Headquarters Facilities?	☐	☐	
• Manufacturer?	☐	☐	
• PQAO?	☐	☐	
Does the agency have service contracts or agreements in place with instrument			

manufacturers? Indicate in the response section or attach additional pages to show which instrumentation is covered.	☐	☐	
Comment briefly on the adequacy and availability of the supply of spare parts, tools, and manuals available to the field operator to perform any necessary maintenance activities. Do you feel that this is adequate to prevent any significant data loss/	☐	☐	
Is the agency currently experiencing any recurring problem with equipment or manufacturer(s)? If so, please identify the equipment or manufacturer, and comment on steps taken to remedy the problem.	☐	☐	
D7. RECORDKEEPING			
Question	**Yes**	**No**	**Response**
What type of station logbooks are maintained at each monitoring station (i.e. maintenance logs, calibration logs, personal logs, etc.)?			
What information is included in the station logbooks?			
Who reviews and verifies the logbooks for adequacy of station performance?			
How is control of logbook maintained?			
Where is the completed logbook archived?			
What other records are used? Comment on the use and storage of these documents?			
Are calibration records (or calibration constants) available to field operators?	☐	☐	
E. DATA MANAGEMENT			
Identify key individuals.			

Position Title	**Name**

E2. DATA HANDLING			
Question	**Yes**	**No**	**Response**
Is there a procedure, description, or chart which shows a complete data sequence from point of acquisition to point of submission of data to EPA?	☐	☐	
Are procedures for data handling (i.e. data reduction, review, etc.) documented? If yes, comment where.	☐	☐	
In what media (i.e. flash drive, telemetry, wireless, etc.) and formats do data arrive at the data processing location?			
How often are data received at the processing location from the field sites and laboratory?			
Are there any activities being done before data is released to agency internal data processing?	☐	☐	
How are data entered into the computer system (i.e. computerized transcription, manual entry, digitization of strip charts, etc.)?			
For manual data, is a double-key entry system used?	☐	☐	
Attach a flow diagram indicating the data flow within the reporting organization.			

E3. SOFTWARE DOCUMENTATION			
Question	**Yes**	**No**	**Response**
Does your agency use an AQS manual?	☐	☐	

Does the agency have information on the reporting of precision and accuracy data available?	☐	☐	
What software is used to prepare monitoring data for release into AQS and AirNow databases? Include the names of the software packages, vendor or author, revision numbers, and the revision dates of the software.			
What is the recovery capability in the event of a significant computer problem (i.e. how much time and data would be lost)?			
Has your agency tested the data processing software to ensure its performance of the intended function are consistent with the QA Handbook Volume II, Section 14.0?	☐	☐	
How are data entered into the computer system (i.e. computerized transcription, manual entry, digitization of strip charts, etc.)?			
Does your agency document software tests? If yes, provide the documentation.	☐	☐	
E4. DATA VALIDATION AND CORRECTION			
Question	**Yes**	**No**	**Response**
Is there documentation regarding data that has been identified as suspect and subsequently flagged?	☐	☐	
Please describe what action the data validator will take (i.e. flags, null code, etc.) if they find data with exceeded QC criteria.			
Please describe how changes made to data that were submitted to AQS and AirNow are documented.			
What criteria are used to determine a data point to be deleted or invalidated?			

What criteria are used to determine if data needs to be reprocessed?			
Are corrected data resubmitted to the issuing group/record generator for crosschecking prior to release?	☐	☐	

E5. DATA PROCESSING			
Question	**Yes**	**No**	**Response**
Does the agency generate data summary reports?	☐	☐	
Please list at least three reports routinely generated, including the information requested below.			

Report Title	**Distribution**	**Period Covered**

Question	**Yes**	**No**	**Response**
Please describe how changes made to data that were submitted to AQS and AirNow are documented.	☐	☐	
Who has signature authority for approving corrections?	☐	☐	
What criteria are used to determine a data point be deleted or invalidated?			

What criteria are used to determine if data needs to be reprocessed?			
Are concentrations of PM_{10} corrected to EPA standard temperature and pressure conditions (i.e. 298K, 760mmHG, etc.) before input to AQS?	☐	☐	
Are concentrations of $PM_{2.5}$ and Pb reported to AQS under actual (volumetric) conditions?	☐	☐	
Are data precision and accuracy checked each time they are calculated, recorded, or transcribed to ensure incorrect values are not submitted to EPA?	☐	☐	
Are audits on data reduction procedures performed on a routine basis? If yes, at what frequency?	☐	☐	
E6. DATA SUBMISSION			
Florida DEP currently submits data to AQS for the entire state of Florida. Data are submitted in accordance with 40 CFR Part 58.			
Question	**Yes**	**No**	**Response**
Are records kept by the agency for at least 10 years in an orderly, accessible form? If yes, does this include:			
• Raw Data?	☐	☐	
• Calculations?	☐	☐	
• QC Data?	☐	☐	
• Reports (list them)?	☐	☐	
E7. INTERNAL REPORTING			
Question	**Yes**	**No**	**Response**

Do either the audit or precision check reports include a discussion of corrective actions initiated based on audit or precision check results?	☐	☐	

E8. RESPONSIBILITIES

Identify the individuals within the agency responsible for the calculation and preparation of data summaries. To whom are such summaries delivered?

Name	Title	Type of Report	Recipient

Identify the individuals within the agency responsible for reviewing and releasing the data?

Name	Program Function

II. Laboratory Operations Systems Audit Questionnaire

Florida Department of Environmental Protection
Division of Air Resource Management
Office of Air Monitoring

LABORTORY OPERATIONS QUESTIONNAIRE

A. GENERAL INFORMATION	
Organization Name:	
Organization Address:	
Date:	

Identify laboratory personnel and their respective roles (i.e. Laboratory Manager, Laboratory Supervisor, Laboratory QA Manager, etc.)

Title/Position	Name

B. ROUTINE OPERATION

B1. Methods
Identify which of the following analyses are performed in the laboratory and state the method used to conduct the analyses.

Pollutant	Method

Please describe areas where there have been difficulties meeting the regulatory requirements for any of the above methods.

B2. Quality System			
Question	**Yes**	**No**	**Comment**
Are procedures for the methods listed in Section B1 included in the agency's QA Project Plan?			
Have the laboratory SOPs been reviewed and approved? If yes, in the comment section, indicate by who (i.e. EPA, PQAO, etc.)?			
Are SOPs easily and readily accessible for use and reference within the laboratory? If not, where are the documents stored?			
Does the lab have sufficient instrumentation to conduct the analyses?			
Are separate facilities maintained for weighing the different sample types (i.e. high-volume vs. low-volume), or is one weighing room utilized for all samples? Describe.			
Does your laboratory hold certifications (i.e. EPA, NIST, State, NELAC, or other)?			
Does your laboratory operate under a Quality Assurance Manual or equivalent document?			
Does your laboratory participate in performance evaluation programs?			
Does your laboratory have a corrective action process for non-conforming work?			
Does your laboratory have a laboratory staff person assigned the role of Quality Assurance Officer?			
Please describe needs for laboratory instrumentation.			

C. LABORATORY QUALITY CONTROL

C1. Standards

Please identify the equipment and standards used in support of the gravimetric laboratory, including any quality assurance standards (such as additional weight sets or portable RH/temperature probes).

Device	Pollutant	Brand (Make)	Model (Class)	Calibration/ Certification Expiration Date

C2. Laboratory Temperature and Relative Humidity

Question	Yes	No	Comment
What is the accuracy specification and recording time (i.e. 5 min. averaging time) of the temperature sensor (logger) used in the gravimetric laboratory?			
What is the accuracy specification and recording time (i.e. 5 min. averaging time) of the RH sensor (logger) used in the gravimetric laboratory?			
What is the accuracy specification for any RH/temp audit device used in the laboratory, if applicable?			
Does the laboratory utilize an IR gun to obtain sample shipment temperatures?	☐	☐	
If yes, is the IR gun NIST traceable? Provide the certification expiration date.	☐	☐	

Question	Yes	No	Comment
If the laboratory does not utilize an IR gun, what device is used to obtain shipment temperature? Please describe its traceability and provide a certification expiration date.			
C3. Laboratory Preventative Maintenance			
Question	**Yes**	**No**	**Comment**
Is preventive maintenance performed on laboratory equipment? If so, who has the responsibility for performing preventive maintenance?			
If equipment maintenance is performed by laboratory staff, does the SOP detail the procedures to be followed? Provide the SOP title, date, and revision number where the procedures are found.			
Is a maintenance log maintained for the balance?			
Are service contracts in place for the balance?			
If utilizing a weighing room, are service contracts in place for the climate control unit/HVAC?			
Describe static control equipment utilized in the weighing room, if applicable.			
Does the weighing room undergo routine cleaning activities? On what frequency?			
Briefly describe the weighing room cleaning procedure.			
D. LABORATORY RECORDKEEPING			
Question	**Yes**	**No**	**Comment**
Are all samples that are received by the laboratory logged in?			

Question	Yes	No	Comment
Discuss sample routing (or attach a copy of the latest SOP which covers this). Attach a flow chart.			
For the following 4 questions, describe how each of the various activities are documented. If the information is not recorded, enter "N/A".			
Environmental conditions, weighing session results, balance checks, and weight checks?			
Serial numbers of filters prepared for the field?			
Serial number of filters returning from the field for analysis?			
General information about daily lab activities, preventive maintenance procedures, and/or other significant events in the laboratory that may impact data quality or the data record?			
Question	**Yes**	**No**	**Comment**
How are data records from the laboratory archived?	☐	☐	
Where are they archived (see previous question)?	☐	☐	
Who has the responsibility (see previous questions)? Identify a key person/position.	☐	☐	
How long are records kept? Indicate the number of months/years.			
Does the laboratory SOP contain procedures for sample chain-of-custody (COC)?	☐	☐	
If yes to the previous question, indicate the title, date, and revision number, and where it can be found.			
What type of COC record accompanies the samples?			
Does the laboratory maintain original COCs or copies?	☐	☐	
Where are COCs filed?			
Attach a sample routing flow chart.			

E. LABORATORY DATA ACQUISITION AND HANDLING			
Question	**Yes**	**No**	**Comment**
Identify those laboratory instruments (i.e. balances, temperature/RH loggers, etc.) which make use of computer interfaces directly to record data.			
Are QC data results readily available to the analyst during a weigh session?			
Do RH/temperature loggers record values using paper chart records (chart wheels)? If yes, where are the paper charts maintained? Are they signed and dated?			
What is the laboratory's capability with regards to data recovery? In case of problems, can the laboratory recapture data that may be lost in the event of computer failure? Discuss briefly.			
Does the laboratory maintain an SOP that discusses how to use the laboratory's data acquisition instrumentation? If yes, please provide the SOP title, date, and revision number.			
Attach a flow chart/diagram which illustrates the transcriptions, verifications, validations, and reporting processes the data goes through before being released by the laboratory.			
F. FILTER QUESTIONS			
Question	**Yes**	**No**	**Comment**
Does the agency use filters supplied by EPA?			
If the answer to the above question is No, do the filters utilized meet the specifications in 40 CFR Part 50? Who is the vendor? Be prepared to provide documentation to demonstrate acceptance testing results.			
Are unexposed filters visually inspected via strong light from a view box for pinholes and other imperfections?			
Are unexposed filters equilibrated in a controlled conditioning environment which meets or exceeds the requirements of 40 CFR Part 50? Describe the conditioning room/chamber.			
How long is the conditioning period?			
Briefly describe how exposed filters are prepared for conditioning.			

Question	Yes	No	Comment
Are exposed filters reconditioned in the same conditioning environment as the unexposed filters?			
Are the temperature and relative humidity of the conditioning environment (i.e., weigh room or conditioning chamber) monitored? What is the resolution of the data collected (e.g., 1-minute, 5-minute, 1-hour, etc.)?			
How often are balance checks performed?			
Do the weights (mass reference standards) bracket the weights of the filters being utilized? What are the masses of the weight standards used?			
To what sensitivity are filter weights recorded?			
Are filters packaged for protection to and from the laboratory?			
On average, what is the elapsed time in hours between the end of sampling and laboratory receipt?			
In what medium are field measurements recorded (e.g., in a logbook, on a filter form, or on standard forms)?			
Briefly describe how and where exposed filters are stored after being weighed.			
On what frequency are lab blanks utilized?			
Are chemical analyses performed on filters? If yes, which? Where are these additional analyses performed?			
F. METALS & OTHER ANALYSES **If your laboratory completes lead (Pb) and/or other metals analyses, please complete the tables in this section.**			
F1. Laboratory QA/QC			
Question	**Yes**	**No**	**Comment**
Are at least one duplicate, one blank, and one standard or spike included with a given analytical batch?			
Briefly describe the laboratory's use of data derived from blank analyses.			

Question	Yes	No	Comment
Are criteria established to determine whether blank data are acceptable?	☐	☐	
How frequently and at what concentration ranges does the lab perform duplicate analyses? What constitutes an acceptable agreement?			
Please describe how the lab uses data obtained from spiked samples, including the acceptance criteria (e.g., acceptable percent recovery).			
Does the laboratory include samples of reference material within an analytical batch? If yes, indicate frequency, level, and material used.	☐	☐	
Are mid-range standards included in analytical batches? If yes, describe the frequency, level, and compound.	☐	☐	
Are criteria for real time quality control established that are based on the results obtained for the mid-range standards discussed above? If yes, briefly discuss them below or indicate the document in which they can be found.	☐	☐	
Are appropriate acceptance criteria for each type of analysis documented?	☐	☐	
F2. Chemicals **Complete the following.**			
Question	**Yes**	**No**	**Comment**
Are all chemicals and solutions clearly marked with an indication of shelf life?	☐	☐	
Are chemicals removed and properly disposed of when the shelf life expires?	☐	☐	
Does the laboratory purchase standard solutions such as those for use with lead or other metals analyses?	☐	☐	
Are only ACS grade chemicals used by the laboratory?	☐	☐	
Comment on the traceability of chemicals used in the preparation of calibration standards.	☐	☐	
F3. Lead (Pb)			
Question	**Yes**	**No**	**Comment**
Is Pb analysis performed by a contract laboratory? If yes, provide the laboratory name in the comment section.	☐	☐	

Question	Yes	No	Comment
What filter media is used for Pb analysis?			
Are filter samples visually inspected for defects (e.g., pinholes, tears and non-uniform deposit)?			
Are filters invalidated if defects are found? If no, why not?			
Are tweezers used to handle filters? If yes, what material are the tweezers made of (ex. Teflon, plastic, metal, etc.)?			
What extraction method is used for filters?			
What reagents are used to clean glassware?			
List standards used for analysis.			
Are filter lot blanks analyzed for Pb content at a rate of 20 to 30 random filters per batch of 500 or greater? Only for filters not provided by EPA.			
How often are MDLs determined?			
How many replicates used for MDLs?			
Are MDLs calculated in accordance with 40 CFR Part 136, Appendix B? If not, why not?			
Are waste HNO_3, HCL, and solutions containing these reagents and/or Pb placed in labeled bottles and delivered to a commercial firm that specializes in removal of hazardous waste?			

APPENDIX C – FLORIDA STANDARD OPERATING PROCEDURES

Statewide Particulate Matter and Ancillary SOPs

Statewide				
Document Control No.	**Document Name**	**Revision No.**	**Effective Date**	**Author/Contact**
DEP 01-4	Corrective Action	2	04/2021	Florida PQAO
DEP 3-8	Thermo Scientific Partisol Plus 2025	4	02/2019	Florida PQAO
DEP 3-12	Thermo TEOM 1405	2	04/2021	Florida PQAO
DEP 3-15	TEI 2025i	3	05/2022	Florida PQAO
DEP 3-16	Thermo 5014i $PM_{2.5}$/PM_{10} Sampler	0	08/2016	Florida PQAO
DEP 3-20	Met One BAM 1020	0	01/2017	Florida PQAO
DEP 3-21	Teledyne API T640	2	05/2022	Florida PQAO
DEP 3-22	TSI 3031 UFP	3	05/2022	Florida PQAO
DEP 3-23	Teledyne API T640X	2	05/2022	Florida PQAO
DEP 3-24	MetOne Instruments E-BAM Plus	2	05/2022	Florida PQAO
DEP 16-23	$PM_{2.5}$ Laboratory	2	09/2022	Florida PQAO
DEP 17-11	Agilaire 8872	1	07/2021	Florida PQAO
DEP 18-27	Statewide Data Handling and Data Validation	2	02/2022	Florida PQAO
DEP 18-28	Site Review	0	1/2022	Florida PQAO

Active DEP and Local Program Particulate & Ancillary SOPs

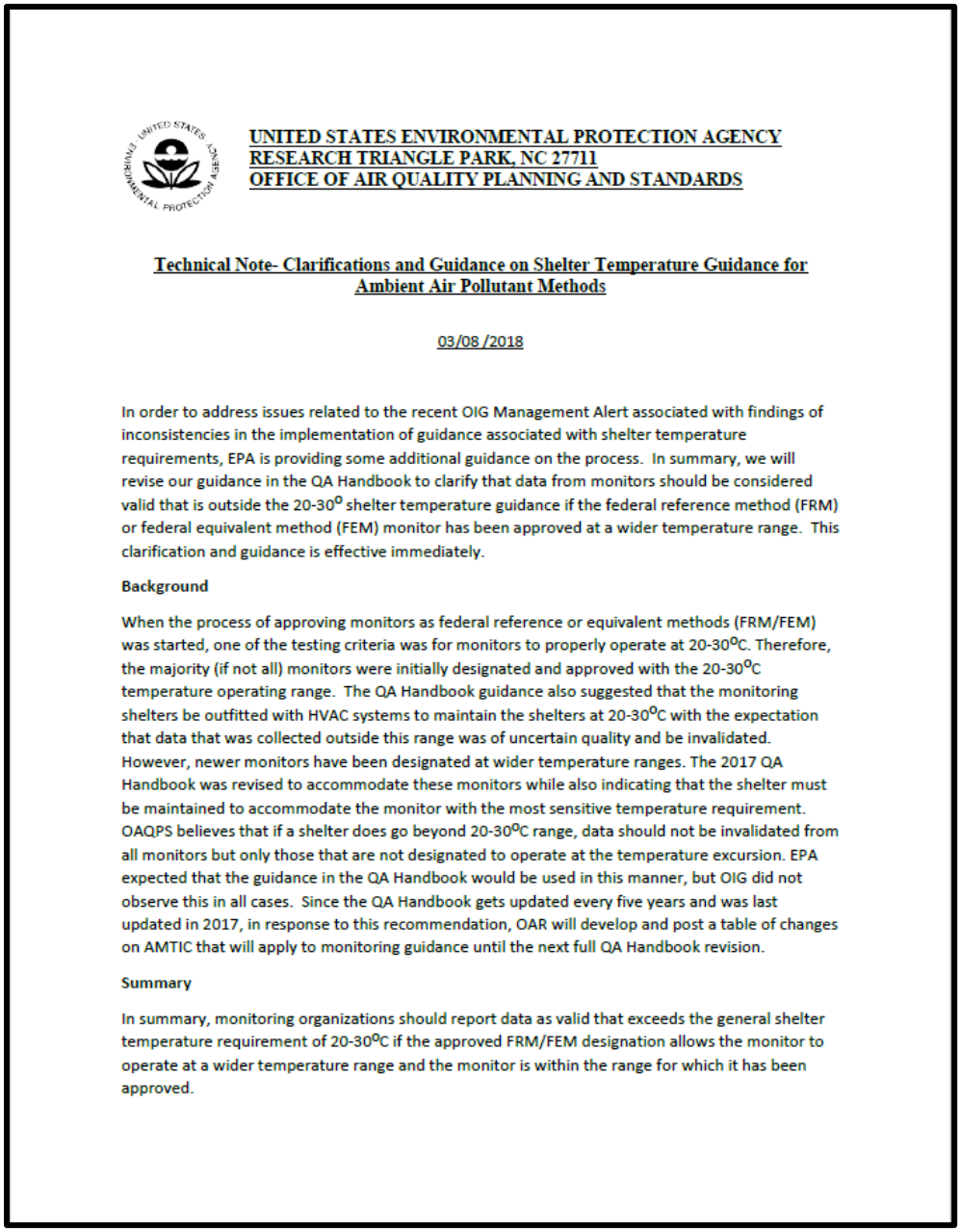
Miami-Dade County				
Document Control No.	**Document Name**	**Revision No.**	**Effective Date**	**Author/Contact**
DERM 56	Rupprecht & Patashnick TEOM Series 1400AB $PM_{2.5}$ Continuous Monitor	4	03/2019	Miami-Dade County

APPENDIX D – FLORIDA SITE REVIEW PROTOCOL

The Florida Site Review Protocol was replaced by the Site Review SOP (DEP 18-28) January 2022. This statement is here for informational purposes. In future revisions of this QAPP, there will not be an appendix will be removed.

APPENDIX E – EPA OAQPS TECHNICAL NOTE – CLARIFICATIONS AND GUIDANCE ON SHELTER TEMPERATURE GUIDANCE FOR AMBIENT AIR POLLUTANT METHODS

The document is located here: https://www.epa.gov/sites/default/files/2018-03/documents/clarifications_on_shelter_temperature_for_gaseous_pollutant_methods_03_2018_0.pdf.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711
OFFICE OF AIR QUALITY PLANNING AND STANDARDS

Technical Note- Clarifications and Guidance on Shelter Temperature Guidance for Ambient Air Pollutant Methods

03/08 /2018

In order to address issues related to the recent OIG Management Alert associated with findings of inconsistencies in the implementation of guidance associated with shelter temperature requirements, EPA is providing some additional guidance on the process. In summary, we will revise our guidance in the QA Handbook to clarify that data from monitors should be considered valid that is outside the 20-30^{o} shelter temperature guidance if the federal reference method (FRM) or federal equivalent method (FEM) monitor has been approved at a wider temperature range. This clarification and guidance is effective immediately.

Background

When the process of approving monitors as federal reference or equivalent methods (FRM/FEM) was started, one of the testing criteria was for monitors to properly operate at 20-30^{o}C. Therefore, the majority (if not all) monitors were initially designated and approved with the 20-30^{o}C temperature operating range. The QA Handbook guidance also suggested that the monitoring shelters be outfitted with HVAC systems to maintain the shelters at 20-30^{o}C with the expectation that data that was collected outside this range was of uncertain quality and be invalidated. However, newer monitors have been designated at wider temperature ranges. The 2017 QA Handbook was revised to accommodate these monitors while also indicating that the shelter must be maintained to accommodate the monitor with the most sensitive temperature requirement. OAQPS believes that if a shelter does go beyond 20-30^{o}C range, data should not be invalidated from all monitors but only those that are not designated to operate at the temperature excursion. EPA expected that the guidance in the QA Handbook would be used in this manner, but OIG did not observe this in all cases. Since the QA Handbook gets updated every five years and was last updated in 2017, in response to this recommendation, OAR will develop and post a table of changes on AMTIC that will apply to monitoring guidance until the next full QA Handbook revision.

Summary

In summary, monitoring organizations should report data as valid that exceeds the general shelter temperature requirement of 20-30^{o}C if the approved FRM/FEM designation allows the monitor to operate at a wider temperature range and the monitor is within the range for which it has been approved.

APPENDIX F - GLOSSARY OF AIR MONITORING TERMS

AirMVP	Air Monitoring Validation Program – FDEP's repository of ambient air quality data
AQS	Air Quality System – EPA's repository of ambient air quality data.
CFR	Code of Federal Regulations
CO	Carbon monoxide – an odorless, colorless gaseous; one of the "Six Common Air Pollutants," also known as "Criteria Pollutants," regulated by EPA.
FEM	Federal Equivalence Method – method approved for comparison to NAAQS.
FRM	Federal Reference Method – method approved for comparison to NAAQS.
MRAS	Maintenance, Repair and Acquisitions Support team
NAAQS	National Ambient Air Quality Standards – maximum threshold concentrations above which adverse health effects may occur. EPA established NAAQS for Criteria Pollutants based on the 1970 Clean Air Act.
NCore	National Core multi-pollutant monitoring stations – a collection of monitors that integrates several advanced measurement systems for particles, pollutant gases and meteorology.
NO	Nitrogen oxide
NO_2	Nitrogen dioxide – a by-product of incomplete combustion that is intimately involved in photochemistry and ozone formation, as well as acid rain formation.
NO_x	A measure of total oxides of nitrogen, consisting primarily of nitrogen dioxide (NO_2) and nitric oxide (NO).
NO_y	Total reactive nitrogen – a collective name for oxidized forms of nitrogen in the atmosphere, such as nitric oxide (NO), nitrogen dioxide (NO_2), nitric acid (HNO_3) and organic nitrates.
O_3	Ozone – a gaseous pollutant and a component of smog at ground level; one of the "Six Common Air Pollutants," also known as "Criteria Pollutants," regulated by EPA.
PAMS	Photochemical Assessment Monitoring Station
PM	Particulate Matter – also known as particle pollution.
$PM_{0.1}$	Particulate Matter 0.1 micrometer in diameter and smaller – also known as ultrafine particles.
$PM_{2.5}$	Particulate Matter 2.5 micrometers in diameter and smaller.
PM_{10}	Particulate Matter 10 micrometers in diameter and smaller.
$PM_{10-2.5}$	Particle size between 10 and 2.5 micrometers.
PQAO	Primary Quality Assurance Organization
PSD	Prevention of Significant Deterioration
SLAMS	State and Local Air Monitor Stations
SO_2	Sulfur dioxide
SPM	Special Purpose Monitors
TSA	Technical Systems Audit