QUALITY ASSURANCE PROJECT PLAN

In Use By

Polk County Air Quality
Ambient Air Monitoring Personnel

For Calendar Year 2014

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QUALITY ASSURANCE PROJECT PLAN (QAPP)
for
POLK COUNTY AMBIENT AIR MONITORING PROGRAM
5885 NE 14th Street
DES MOINES, IA, 50313

1.0 Signatures/Approvals

Robert Rice

3-11-2014

Robert Rice,
Polk County Public Works Director — ***Date***

3/11/2014

Jeremy Becker,
Polk County Air Quality Manager — ***Date***

Brent Blanchard

3/12/2014

Brent Blanchard,
Polk County Air Quality Assurance Manager — ***Date***

Catharine Fitzsimmons,
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IDNR Air Quality, Quality Assurance Coordinator — ***Date***

2.0 Table of Contents

Figures

3.0 Distribution List

A hardcopy of this QAPP will be distributed to the individuals in Table 3-1.

Table 3-1 Distribution List

Name	Position	Division/Branch
Polk County Air Quality		
Jeremy Becker	Air Quality Engineer	Polk County Air Quality
Brent Blanchard	Quality Assurance Officer	Polk County Air Quality
Jennifer Bradley	Air Monitoring Specialist	Polk County Air Quality
Rebecca Peltzer	Air Monitoring Specialist	Polk County Air Quality
Chad Hines	Air Monitoring Specialist	Polk County Air Quality
Iowa Department of Natural Resources		
Catherine Fitzsimmons	Iowa Department of Natural Resources, Bureau Chief	Iowa Department of Natural Resources/ Air Bureau
Sean Fitzsimmons	Iowa Department of Natural Resources, Air Monitoring Lead Worker	Iowa Department of Natural Resources/ Air Bureau
EPA Region 7		
Mike Davis	Chemist/Environmental Monitoring	Air/ Air Quality Monitoring
Emma Joe Mayberry	QA Officer	Grants Administration Office

4.0 Introduction

4.1 Purpose of QAPP

This document presents the quality assurance (QA) management plan for the Polk County, Iowa ambient air quality monitoring program. The purpose of the plan is to define and document the quality assurance (QA) and quality control (QC) activities of the program and ensure the validity of all data produced in the course of operations. Standard operating procedures (SOPs) and equipment associated with the operation and maintenance of field facilities are described in the appendices to the plan.

The provisions of this plan apply to ambient air monitoring conducted by Polk County at State and Local Air Monitoring Stations (SLAMS) and any other monitoring performed by the Air Quality Division.

The purpose of this document is to define and outline quality assurance management policies at the Division level as a part of an effort by the Polk County Air Quality Division to consolidate quality assurance management plans and standard operating procedures. This quality assurance management plan is intended to enhance the efforts of the Air Quality Division and assist the Division in achieving its mission.

4.2 Basic Concepts

Although Quality Assurance and Quality Control are related terms, they are not synonymous. Within the scope of this document, the following explanations apply.

Quality assurance refers to the collective efforts of administrative and senior staff to ensure that field and laboratory data meet the objectives of the organization, and are acquired in a scientifically defensible manner. Major QA functions include review and approval of program planning documents, and evaluation of effectiveness of implemented QC procedures.

Quality Control encompasses all measures taken by project managers and field and analytical staff to achieve a predetermined level of data reliability. It is applied from the design and planning stages of a monitoring effort, through the implementation phase, to handling and reporting of the accumulated data.

4.3 Quality Assurance Policies

It is Polk County's policy that there shall be sufficient QA/QC activities to ensure that all data generated are as accurate as possible and of acceptable completeness, comparability, and representativeness to support regulatory decisions based upon those data.

Completeness of data is an indicator of the quantity of valid data obtained from a measurement system compared to the quantity expected to be obtained under normal conditions. Completeness is related to the number of samples taken, and also to the care of instruments through calibration, maintenance or replacement and related activities.

Comparability expresses the confidence with which one data set can be compared to another. This encompasses data generated through measurements taken at various locations being reported in consistent

units and collected and analyzed by consistent methods to allow direct comparisons of measurement results.

Representativeness expresses the degree to which data represent reality. It is related to the nature of the condition being measured and includes consideration of probe siting criteria, spatial scales, monitoring objectives, and timing of sampling to represent peak pollutant levels.

Precision checks and performance audits are conducted on a regular basis in order to provide QC data for evaluation of monitoring data. Precision checks yield information on data precision and a measure of mutual agreement among individual measurements of the same type, usually collected under similar conditions. Performance audits yield data indicative of accuracy, which refers to the degree of agreement between a measurement and an accepted reference value.

In keeping with the above-stated policy, all data produced and utilized shall be of known quality. All air monitoring shall be done in accordance with the guidelines set forth in this program QA management plan utilizing reference or equivalent methodology (REM), provided that designated REMs exist for the analytical parameters of interest. Standard operating procedures shall be developed and followed for all activities. Quality Assurance Project Plans shall be prepared for special projects of limited scope or duration.

4.4 Plan Objectives

The primary objective of the Quality Assurance Management Plan is to ensure, to the greatest extent possible, that all data obtained by scientific measurement provide accurate, valid information for interpretation and use within the scope of the Polk County Ambient Air Quality Division's program. This is to be achieved through monitoring and assessment of precision and accuracy of measurement devices and systems, together with efforts to verify and maintain the integrity of archived data. These efforts require that all personnel involved in any function impacting upon data quality must have sufficient training in their appointed jobs to contribute to the reporting of complete data of high quality.

A major priority is effective management of a comprehensive air pollution control program, as authorized by Code of Iowa enabling legislation. Information gathered through ambient air monitoring provides a scientific and technical basis for many of the regulatory and administrative decisions made by Polk County. Maintenance of an ambient air monitoring program capable of providing accurate, valid data for measured pollutants is essential to achieving this goal.

The objectives of special and/or additional monitoring projects shall be determined prior to initiation of data collection activities. This determination shall be accomplished during the planning phase of each project to ensure inclusion of appropriate procedures for collection of relevant data. Quality Assurance Project Plans (QAPP) shall be developed for such projects. These QAPPs shall include descriptions of how project activities will achieve stated objectives.

5.0 Project/Task Organization

5.1 Office of Air Quality Planning and Standards (OAQPS)

OAQPS is the organization charged under the authority of the CAA to protect and enhance the quality of the nation's air resources. OAQPS sets standards for pollutants considered harmful to public health or welfare and, in cooperation with EPA's Regional Offices and the States, enforces compliance with the standards through state implementation plans (SIPs) and regulations controlling emissions from stationary sources. The office evaluates the need to regulate potential air pollutants and develops national standards; works with state and local agencies to develop plans for meeting these standards; monitors national air quality trends and maintains a database of information on air pollution and controls; provides technical guidance and training on air pollution control strategies; and monitors compliance with air pollution standards.

Within the OAQPS Emissions Monitoring and Analysis Division, the Monitoring and Quality Assurance Group (MQAG) is responsible for the oversight of the Ambient Air Quality Monitoring Network. MQAG has the following responsibilities:

- X ensure that the methods and procedures used in making air pollution measurements are adequate to meet the programs objectives and that the resulting data are of satisfactory quality.
- X operate the National Performance Audit Program (NPAP).
- X evaluate the performance of organizations making air pollution measurements of importance to the regulatory process.
- X implement satisfactory quality assurance programs over EPA's Ambient Air Quality Monitoring Network.
- X ensure that guidance pertaining to the quality assurance aspects of the Ambient Air Program is written and revised as necessary.
- X render technical assistance to the EPA Regional Offices and air pollution monitoring community.

5.2 EPA Regional Offices

EPA Regional Offices have been developed to address environmental issues related to the states within their jurisdiction and to administer and oversee regulatory and congressionally mandated programs.

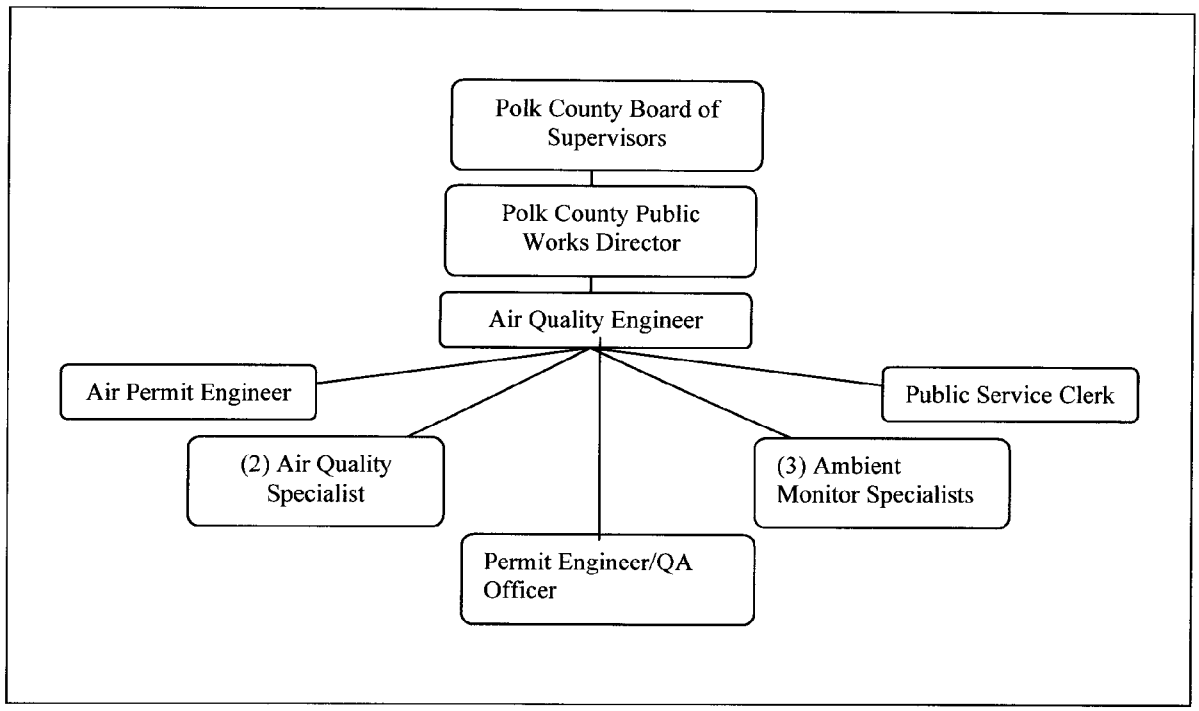
The major quality assurance responsibilities of EPA's Regional Offices regarding the Ambient Air Quality Program are the coordination of quality assurance matters between the various EPA offices and the State and local agencies. This is accomplished by the designation of EPA Regional Project Officers who are responsible for the technical aspects of the program including the review of QAPPs, and Regional QA Officers who are delegated the authority by the Regional Administrator to review and approve QAPPs for the Agency. The region acts as a liaison by making available the technical and quality assurance information developed by EPA headquarters to the State and local agencies and making EPA headquarters aware of the unmet quality assurance needs of the State and local agencies. The Regional Office also evaluates the capabilities of State and local agency laboratories to measure the criteria air pollutants. These reviews are accomplished through network reviews and technical systems audits whose frequency is addressed in the Code of Federal Regulations. To be effective in these roles, the Regional Offices must maintain their technical capabilities with respect to air pollution monitoring. 40 CFR Part 58 defines the Local Agency as "any local government agency, other than the state agency, which is charged with the responsibility for carrying out a portion of the plan (SIP).

5.3 Polk County Air Quality

5.3.1 Organization

Figure 5.1 represents the organizational structure for the Polk County Air Quality Division responsible for the activities of the Ambient Air Quality Monitoring Program. The following information lists the specific responsibilities of each individual and is grouped by functions of the Air Quality Engineer, and the divisions related to Quality Assurance and Program Support.

Figure 5-1 Organizational Structure of the Polk County Air Quality Division



5.3.2 Mission Statement

The mission of the Polk County Air Quality Division is to protect the public from the harmful effects of air pollution, and conserve natural resources by preventing damage to the environment from releases of air contaminants. The Air Quality Division has been established to assist in fulfilling this mission.

5.3.3 Goals and Objectives

As authorized by 455B Code of Iowa, Polk County maintains an ambient air quality monitoring network.

Information gathered through this network provides a scientific and technical basis for regulatory and administrative decisions made by the Air Quality Division. Continued maintenance of this program is a major priority for Polk County.

5.3.4 Responsibilities

The major responsibility of the Polk County Air Quality Ambient Air Monitoring program is the implementation of a satisfactory monitoring program, which would naturally include the implementation of an appropriate quality assurance program. It is also the responsibility of the Polk County Air Quality Ambient Air Monitoring program to implement quality assurance programs in all phases of the data collection process, including the field, laboratories, and in any consulting and contractor laboratories which they may use to obtain or analyze data.

5.3.4.1 Polk County Board of Supervisors

The Polk County Board of Supervisors has the ultimate responsibility for the day-to-day operations of all divisions of Polk County government.

5.3.4.2 Director of Polk County Public Works

The Director of Polk County Public Works Department is the delegated manager of the ambient air monitoring program that includes the QA/QC activities that are implemented as part of normal data collection activities. Responsibilities of the Director include:

X administrative oversight of the ambient air monitoring program
X approving the budget and planning processes
X assuring that the ambient air monitoring program develops and maintains a current and germane quality assurance/quality control system

The Director of Polk County Public Works Department delegates the responsibility for the development and implementation of individual monitoring programs, in accordance with Polk County policy, to the Air Quality Engineer.

5.3.4.4 Air Quality Engineer

The Air Quality Engineer has overall responsibility for establishing departmental policy and managing the Polk County Air Quality Ambient Air Monitoring program. The direct responsibility for assuring data quality rests with line personnel. Ultimately, the Air Quality Engineer is responsible for establishing QA policy and for resolving QA issues identified through the QA program. Major QA related responsibilities of the Air Quality Engineer include:

X approve the budget and planning processes
X assure that the ambient air monitoring program develops and maintains a current and germane quality assurance/quality control system
X assure that the ambient air monitoring program develops and maintains a current air monitoring QAPP and ensures adherence to the document by staff and, where appropriate, other extramural cooperators

- X establish policies to ensure that QA requirements are incorporated in all environmental data collection activities
- X maintain an active line of communication with the QAO and ambient air monitoring specialists
- X negotiate and approve any proposed acquisition packages (contracts, grants, cooperative agreements, inter-agency agreements)
- X approve QA budgets proposed by the QAO
- X ensure that all personnel involved in environmental data collection have access to any training or QA information needed to be knowledgeable in QA requirements, protocols, and technology
- X ensure that a management system review occurs every 2 years

The Air Quality Engineer delegates the responsibility of QA implementation in accordance with the Ambient Air Monitoring Policy to the Quality Assurance Officer. Oversight of the QA program is delegated to the QA officer.

5.3.4.5 Quality Assurance Officer (QAO)

The QA officer is the delegated manager of the Polk County Air Quality Ambient Air Monitoring QA program. He has direct access to the Air Quality Engineer on all matters pertaining to Quality Assurance. The main responsibility of the QAO is QA oversight; ensuring that all personnel understand the programs QA policy and all pertinent EPA QA policies and regulations specific to the Ambient Air Quality Monitoring Program. The QAO provides technical support and reviews, and approves QA products. Responsibilities include:

- X develop and interpret ambient air monitoring programs' QA policy, revising it as necessary
- X develop a QA Annual Quality Assurance Report, Annual Network Review and Work Plan (based on the Letter of Agreement Attachment A Section VI) for the Air Quality Engineer
- X review acquisition packages (contracts, grants, cooperative agreements, inter-agency agreements) to determine the necessary QA requirements
- X assist the Air Quality Engineer in developing QA budgets
- X assist staff in developing QA documentation and in providing answers to technical questions
- X ensure that environmental data collection activities are covered by appropriate QA planning documentation (e.g., QA project plans and data quality objectives)
- X track the QA/QC status of all programs
- X serve as the program's QA liaison with EPA Regional QA Managers or QA Officers and the Regional Project Officer
- X remain current on Department QA policy and general and specific EPA QA policies and regulations as it relates to the Ambient Air Quality Monitoring Program
- X review and approve the QAPP for the Ambient Air Quality Monitoring Program
- X schedule and implement technical systems audits
- X perform data quality assessments
- X review precision and bias data
- X ensure timely delivery of all required data to the AIRS system and ensure the development of data base guides (data base structures, user guidance documents)
- X ensure that technical systems audits occur within the appropriate schedules
- X ensure that a QAPP is in place for all environmental data collection activities associated with the Ambient Air Quality Monitoring Program and that it is up-to-date
- X verify that all required QA activities were performed and that measurement quality standards were met as required in the QAPP
- X develop data quality requirements with the appropriate QAO

X ensure that technical personnel follow the QAPP
X participate in training and certification activities

The QAO has the authority to carry out these responsibilities and to bring to the attention of the Air Quality Engineer any issues associated with these responsibilities. The QAO delegates the responsibility of QA development and implementation in accordance with the Ambient Air Monitoring Programs' policy to the Ambient Air Monitoring Specialist. Implementation of the QA program as it relates to daily field operations of the Ambient Air Monitoring Program is assigned to the Ambient Air Monitoring Specialist.

5.3.4.6 Ambient Air Monitoring Specialist

The Ambient Air Monitoring Specialists are responsible for overseeing the routine field/lab monitoring and QA activities of the Ambient Air Quality Monitoring Program. The Ambient Air Monitoring Specialists responsibilities include:

X give input to the Quality Assurance Annual Report and Work Plan (QAARWP) developed by the QAO
X assist in solving QA-related problems at the lowest possible organizational level
X ensure timely follow-up and corrective actions resulting from auditing and evaluation activities.
X facilitate management systems reviews implemented by the QAO
X participate in the development and implementation of the Ambient Air Quality Monitoring Program QAPP.
X participate in training and certification activities
X develop data quality requirements with the appropriate QAO
X write and modify standard operating procedures (SOPs)
X follow all manufacturer's specifications
X perform and document preventative maintenance
X document deviations from established procedures and method.
X report all problems and corrective actions to the QAO
X assess and report data quality
X prepare and deliver reports to the QAO
X flag suspect data
X prepare and deliver data for further review by the QAO
X develop local data management standard operating procedures
X ensure that information management activities are developed within reasonable time frames for review and approval
X follow good automated data processes
X ensure the development of data standards for data structure, entry, transfer, and archive
X ensure access to data for timely reporting and interpretation process
X ensure the development of data base guides (data base structures, user guidance documents)

5.3.4.7 Public Service Clerk

The Public Service Clerk has been designated to provide support for all shipping/receiving of all equipment and consumable supplies as well as document duplication for the Ambient Air Monitoring Program. Responsibilities include:

X assist in the development of standard operating procedures for shipping/receiving and following the procedures
X inform appropriate field /lab staff of arrival of consumables and equipment
X document, track, and archive shipping/receiving records

6.0 Problem Definition / Background

6.1 Background

Between the years 1900 and 1970, the emission of six principal pollutants increased significantly. The principal pollutants, also called criteria pollutants are: particulate matter, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, and lead. In 1970 the Clean Air Act (CAA) was signed into law. The CAA and its amendments provide the framework for all pertinent organizations to protect air quality. On May 10, 1979, EPA promulgated regulations in 40 CFR 58 that specified monitoring requirements for State Implementation Plans (SIPs outline the policies and procedures used by the State to assure CAA compliance with the National Ambient Air Quality Standards (NAAQS)).

These regulations also set forth requirements made in response to Section 319 of the Clean Air Act Amendments of 1977, which required EPA to establish monitoring criteria to be applied uniformly across the nation, and to establish a national monitoring network. One requirement of the regulations is that organizations responsible for ambient air pollution monitoring must establish and maintain a viable QA/QC program. Appendix A of 40 CFR 58 describes such requirements for organizations responsible for SLAMS. Appendix B of 40 CFR 58 describes requirements for organizations responsible for prevention of significant deterioration (PSD) air monitoring. These requirements include development and implementation of policies, procedures, specifications, standards, and documentation necessary to both provide data of adequate quality to meet monitoring objectives and to minimize loss of data due to malfunctions or out-of-control conditions.

The Air Quality Division quality assurance management plan has been developed from existing information and documentation present in budget narratives, internal policy memos, and other publications. The information and policies contained in this plan were previously available, but were not contained in a single document.

The Polk County Air Quality Division was initially authorized for implementation with the enactment of 455B.144 Code of Iowa, by the 1973 Iowa Legislature. The major provisions of this enabling statute were adopted to simultaneously comply with the requirements of the Federal Clean Air Act (42 U.S.C. 1857), which has been amended in 1967, 1970, 1977, and 1990. This Federal law establishes requirements for states to implement approved air pollution control programs within their respective jurisdictions. The initial series of air pollution control regulations were promulgated and codified in 567 Iowa Administrative Code and in Chapter V, Polk County Board of Health Rules and Regulations, Air Pollution. These original regulations have been amended and expanded since that time in order to comply with relevant modifications to the federal requirements and to respond to changing needs. The Air Quality Division has been assigned the responsibility for implementation of the air quality program.

Polk County has maintained an ambient air quality-monitoring program with an approved quality assurance plan and associated standard operating procedures in accordance with 40 CFR 58 since July 1, 1980.

Air quality samples are generally collected for one or more of the following objectives:

- < judge compliance with and/or progress toward meeting ambient air quality standards.
- < activate emergency control procedures that prevent or alleviate air pollution episodes as well as develop long term control strategies.
- < observe pollution trends throughout the state, including non-urban areas.

< provide a database for research and evaluation of effects.

With the end use of the air quality samples as a prime consideration, the network should be designed to determine:

1. highest concentrations expected to occur in the area covered by the network.
2. representative concentrations in areas of high population density.
3. impact on ambient pollution concentration by significant sources.
4. general background concentration levels.
5. extent of regional pollutant transport among populated areas, in support of secondary standards.
6. welfare-related impacts in more rural and remote areas (such as visibility impairment and effects on vegetation).

The Polk County Ambient Air Quality Monitoring Program consists of two major categories of monitoring stations or networks that measures pollutants. These stations are described below.

State and Local Air Monitoring Stations (SLAMS)

The SLAMS consist of a network of monitoring stations. The SIP provides for the implementation, maintenance, and enforcement of the national ambient air quality standards (NAAQS) in each air quality control region within the State.

Special Purpose Monitoring Stations (SPMS)

Special Purpose Monitoring Stations provide for special studies needed by the State to support SIPs and other air program activities. The SPMS are not permanently established and, thus, can be adjusted with relative ease to accommodate changing needs and priorities. The SPMS are used to supplement the fixed monitoring network as circumstances require and resources permit. If the data from SPMS are used for SIP purposes, they must meet all QA and methodology requirements for SLAMS monitoring.

6.2 Ambient Air Monitoring QA Program

6.2.1 Planning

Planning activities include:

The State Quality Management Plan (QMP) - This is a document that describes how the QA activities that are the responsibility of the State and Local agencies will be implemented.

Data Quality Objectives (DQOs) - DQOs are qualitative and quantitative statements derived from the outputs of the DQO Process that:

1. Clarify the study objective.
2. Define the most appropriate type of data to collect.
3. Determine the most appropriate conditions from which to collect the data.
4. Specify tolerable limits on decision errors which will be used as the basis for establishing the quantity and quality of data needed to support the decision. This process is discussed in Section 8.

Methods- Reference methods and standard operating procedures have been written for each pollutant monitor and meteorological instrument in use in the network.

Training - Training activities are discussed in Section 9.

Guidance - The State of Iowa Department of Natural Resources in accordance with EPA Region 7 offices shall provide guidance in the development of quality assurance/quality control procedures for the Polk County Ambient Air Quality Monitoring Program.

6.2.2 Implementation

Implementation activities include:

Precision and Accuracy (P & A) Checks - These checks are described in the Code of Federal Regulations as well as in each monitoring method specific SOP. These checks can be used to provide an overall assessment of measurement uncertainty.

State Internal Audits - These performance audits are used to provide an independent assessment on the measurement operations of each instrument by comparing performance samples of "known" concentrations or values to the values measured by the instrument.

EPA External Audits (PEP)- This audit is conducted by EPA Regional personnel and is intended as a management systems review to assess the quality system.

Annual Certifications - A certification is the process which ensures the traceability and viability of various QC standards. Standard traceability is the process of transferring the accuracy or authority of a primary standard to a field-usable standard. Traceability protocols are available for certifying a working standard by direct comparison to an NIST-SRM. Certification requirements are included in the individual monitoring SOPs.

Calibrations - Calibrations should be carried out at the field monitoring site by allowing the analyzer to sample test atmospheres containing known pollutant concentrations. Calibrations are discussed in Section 17.

6.2.3 Assessment

Scientific and statistical evaluations of data to determine if the data obtained from environmental data operations are of the right type, quality and quantity for their intended use. Assessments for the Ambient Air Quality Monitoring Program include:

P & A Reports - These reports are generated annually and evaluate the precision and accuracy data against the acceptance criteria.

QA Reports - A QA report provides an evaluation of QA/QC data for a given time period to determine whether the data quality objectives were met. Discussions of QA reports can be found in Section 21.

Network Reviews - The annual network review is used to determine how well the Air Monitoring Network is achieving its required air monitoring objective, and how it should be modified to continue to meet its objective. Network reviews are discussed in Section 21.

7.0 Project/Task Description

7.1 Description of Work to be Performed

In general, the measurement goal of the Polk County's Ambient Air Quality Monitoring Program is to estimate the concentrations of the certain primary pollutants described in 40 CFR Part 50. For the Polk County SLAMS/NAMS network, which is what this QAPP describes, the primary goal is to compare the concentrations of Ozone, Carbon Monoxide, NO_2, Sulfur Oxides, Particulate Matter <10 micrometers (PM10) and Particulate Matter <2.5 micrometers (PM2.5) to the National Ambient Air Quality Standard (NAAQS). The national primary and secondary ambient air quality standards for pollutants which Polk County Air Quality monitor are described in Table 7.1 below as well as 40 CFR Part 50, July 18, 1997 Federal Register Notice.

Table 7-1 National Ambient Air Quality Standards

Pollutant	Primary Stds.	Averaging Times	Secondary Stds.
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour[1]	None
	35 ppm (40 mg/m^3)	1-hour[1]	None
Lead	1.5 µg/m^3	Rolling 3 month average	Same as Primary
Nitrogen Dioxide	100 ppb	1-hour	Same as Primary
	0.053 ppm (100 µg/m^3)	Annual (Arithmetic Mean)	Same as Primary
Particulate Matter (PM_{10})	Revoked[2]	Annual[2] (Arith. Mean)	Revoked[2]
	150 µg/m^3	24-hour[3]	Same as Primary
Particulate Matter ($PM_{2.5}$)	12.0 µg/m^3	Annual[4][8] (Arith. Mean)	15 µg/m^3
	35 µg/m^3	24-hour[5][8]	Same as Primary
Ozone	0.075 ppm	8-hour[6]	Same as Primary
	0.120 ppm	1-hour[7]	Same as Primary
Sulfur Dioxide	0.03 ppm	Annual (Arith. Mean)	[see below]
	0.14 ppm	24-hour[1]	[see below]
	[see above]	3-hour[1]	0.5 ppm (1300 µg/m^3)

[1] Not to be exceeded more than once per year.

[2] Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, the agency revoked the annual PM_{10} standard in 2006 (effective December 17, 2006).

[3] Not to be exceeded more than once per year on average over 3 years.

[4] To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m^3.

[5] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 $\mu g/m^3$ (effective December 17, 2006).

[6] Reserved for promulgation of 40 CFR Part 50 and 40 CFR Part 58 [EPA-HQ-OAR-2005-0172; FRL-RIN 2060-AN24] National Ambient Air Quality Standards for Ozone signed March 12, 2008.

[7] Reserved for promulgation of 40 CFR Part 50 and 40 CFR Part 58 [EPA-HQ-OAR-2005-0172; FRL-RIN 2060-AN24] National Ambient Air Quality Standards for Ozone signed March 12, 2008.

(8) Standard remanded by United States Courts of Appeals for the District of Columbia February 24, 2009.

The following sections will describe the measurements required for the routine field and laboratory activities for the network. In addition to these measurements, an initial set of measurements will be required to fulfill the requirements of the AIRS database. These measurements are included in Section 19.

7.1.1 Field Activities

The performance requirements of the air samplers used by Polk County Air Quality is specified in 40 CFR Part 50 and the Federal Register Notice. Each corresponding appendix is shown below in Table 7.2. Each appendix of 40 CFR and the Federal Register summarizes some of the more critical performance requirements.

Table 7-2 References for Performance Requirements

Pollutant	Reference
Sulfur Dioxide	40 CFR Part 50, Appendix A
Carbon Monoxide (CO)	40 CFR Part 50, Appendix C
Ozone (O3)	40 CFR Part 50, Appendix D
Nitrogen Dioxide (NO_2)	40 CFR Part 50, Appendix F
Particulate Matter <10 micrometers (PM10)	40 CFR Part 50, Appendix J
Particulate Matter <2.5 micrometers (PM2.5)	40 CFR Part 50, July 18, 1997 Federal Register Notice.

7.1.2 Field Measurements

When operating any analyzer, certain diagnostic and conditional measurements must be recorded. Table 7-3 represents references for each pollutant that Polk County Air Quality monitors. References indicate what field measurements must be collected and are indicated in each pollutant's SOP. Measurements are made by the analyzer and are stored in the instrument for downloading/recording by the field operator during routine visits.

Table 7-3 Field Measurement Requirements References

Pollutant	Reference
Sulfur Dioxide	40 CFR Part 50, Appendix A
Carbon Monoxide (CO)	40 CFR Part 50, Appendix C
Ozone (O3)	40 CFR Part 50, Appendix D
Nitrogen Dioxide (NO2)	40 CFR Part 50, Appendix F
Particulate Matter <10 micrometers (PM10)	40 CFR Part 50, Appendix J
Particulate Matter <2.5 micrometers (PM2.5)	40 CFR Part 50, July 18, 1997 Federal Register Notice. Guidance Document 2.12

7.1.3 Laboratory Activities

Laboratory activities for the Polk County Air Quality Monitoring Program are included in the SOP of each pertinent pollutant and fall within the guidelines set forth in 40 CFR. The following activities are examples of general laboratory activities associated with the Polk County Air Quality Monitoring Program.

Shipping/Receiving

- < Receiving filters (PM2.5, PM10 and PM10 Metals)
- < Carrying filters to the field (if required)
- < Receiving filters from the field and logging these in
- < Storing filters
- < Shipping PM2.5 and PM10 and PM10 Metals filters to the State of Iowa Hygienic Laboratory
- < Shipping PM2.5 Speciation modules and filter cartridges to RTI
- < Receiving air toxics sampling canisters
- < Shipping air toxics sampling canister to the State of Iowa Hygienic Laboratory
- < Associated QA/QC activities

Post Sample Period

- < Data downloads from field data loggers
- < Data entry/upload to AIRS
- < Associated QA/QC activities

7.2 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: audit, performance evaluation (PE), management systems review (MSR), peer review, inspection, or surveillance. Section 21 will discuss the details of the Departments assessments. Table 7-4 will provide information on the parties implementing the assessment and their frequency.

Table 7-4 Assessment Schedule

Assessment Type	Assessment Agency	Frequency
Technical Systems Audit	EPA Regional Office	As Scheduled by EPA Region VII
Network Review	State	Yearly
FRM Performance Audit (PM2.5)	EPA Regional Office	25% of sites/year/4 times per year.
Quarterly Performance Audits	Department	Quarterly

7.3 Project Records

The Polk County Air Quality department will establish and maintain procedures for the timely preparation, review, approval, issuance, use, control, revision and maintenance of documents and records. Table 7-5 represents the categories and types of records and documents.

Table 7-5 Critical Documents and Records

Categories	Record/Document Types
Management and Organization	State Implementation Plan Reporting agency information Organizational structure Personnel qualifications and training Training Certification Quality management plan Document control plan EPA Directives Grant allocations Support Contract
Site Information	Network description Site characterization file Site maps Site Pictures
Environmental Data Operations	QA Project Plans Standard operating procedures (SOPs) Field and laboratory notebooks Sample handling/custody records Inspection/Maintenance records
Raw Data	Any original data (routine and QC data) including data entry forms
Data Reporting	Air quality index report Annual SLAMS air quality information Data/summary reports Journal articles/papers/presentations
Data Management	Data algorithms Data management plans/flowcharts PM2.5 Data Data Management Systems
Quality Assurance	Good Laboratory Practice Network reviews Control charts Data quality assessments QA reports System audits Response/Corrective action reports Site Audits

8.0 Quality Objectives and Criteria for Measurement Data

Data collected for the Polk County Ambient Air Quality Monitoring Program is used to make specific decisions that can have an economic impact on the area represented by the data. Data quality objectives (DQOs) are a full set of performance constraints needed to design an environmental data collection activity (EDCA) including a specification of the level of uncertainty that a decision maker (data user) is willing to accept in the data to which the decision will apply. Throughout this section, the term "decision maker" is used. This term represents individuals that are the ultimate users of ambient air data and therefore may be responsible for: setting the NAAQS, developing a quality system, evaluating the data, or declaring an area non-attainment. The DQO will be based on the data requirements of the decision maker. Decision makers need to feel confident that the data used to make environmental decisions are of adequate quality. The data used in these decisions are never error free and always contain some level of uncertainty. Because of these uncertainties or errors, there is a possibility that decision makers may declare an area "non-attainment" when the area is actually in "attainment" (false positive error) or "attainment" when actually the area is in "non-attainment" (false negative error). There are serious political, economic, and health consequences of making such decision errors. Therefore, decision makers need to understand and set limits on the probabilities of making incorrect decisions with the data. In order to set probability limits on decision errors, one needs to understand and control uncertainty. Uncertainty is used as a generic term to describe the sum of all sources of error associated with an EDCA.

The estimate of overall uncertainty is an important component in the DQO process. Both population and measurement uncertainties must be understood. Population uncertainties can be controlled by developing a proper statistical sampling design. Likewise, measurement uncertainties can be evaluated and controlled through appropriate quality assurance and quality control techniques (QA/QC).

Population uncertainties are the spatial and temporal components of error. These uncertainties can be controlled by selecting appropriate boundary conditions (the area and the time period) to which the decision will apply, and by developing a proper statistical sampling design. The key to controlling population uncertainties, and the most important attribute of any Ambient Air Monitoring Network, is representativeness. Representativeness refers to the degree in which data accurately and precisely represents a characteristic of a population, parameter variation at a sampling point, a process condition, or an environmental condition. It does not matter how precise or unbiased the measurement values are if a site is unrepresentative of the population it is presumed to represent. Assuring the collection of a representative air quality sample depends on the following factors:

- Selecting a network size that is consistent with the monitoring objectives and locating representative sampling sites.
- Determining and documenting restraints on the sampling sites that are imposed by meteorology, local topography, emission sources, and the physical constraints.
- Planning sampling schedules that are consistent with the monitoring objectives.

Measurement uncertainties are the errors associated with the EDCA, including errors associated with the measurement phases of field, preparation, and laboratory activities. At each measurement phase of this process, errors can occur that, in most cases, are additive. The goal of a QA program is to control measurement uncertainty to an acceptable level through the use of various quality control and evaluation techniques. In a resource constrained environment, it is most important to be able to calculate/evaluate the total measurement system uncertainty and compare this to the DQO. If resources are available, it may be possible to evaluate various phases of the measurement system.

Three data quality indicators are most important in determining total measurement uncertainty:

- Precision - a measure of mutual agreement among individual measurements of the same property usually under prescribed similar conditions. This is the random component of error. Precision is estimated by various statistical techniques using some derivation of the standard deviation.

- Bias - the systematic or persistent distortion of a measurement process which causes error in one direction. Bias will be determined by estimating the positive and negative deviation from the true value as a percentage of the true value.

- Detectability - The determination of the low range critical value of a characteristic that a method specific procedure can reliably discern.

Accuracy has been a term frequently used to represent closeness to "truth" and includes a combination of precision and bias error components. This term has been used throughout the CFR and in some of the sections of this document. If possible, it is recommended that an attempt be made to distinguish measurement uncertainties into precision and bias components.

The DQO process is used to facilitate the planning of data collection activities. It asks the data user to focus their EDCA efforts by specifying the use of data (the decision), decision criteria, and the probability they can accept of making an incorrect decision based on the data. The DQO process contains the following steps:

1. Identify the problem to be resolved
2. Decision
3. Inputs to the decision
4. Boundaries of the study
5. Decision rule
6. Limits of uncertainty
7. Study design optimization

8.1 Ambient Air Quality DQOs

As indicated above, the first step in the DQO process is to identify the problems that need to be resolved. The objectives of the Polk County Ambient Air Quality Monitoring Program as previously mentioned are:

1. Determine highest concentrations expected to occur in the area covered by the network.
2. Determine representative concentrations in areas of high population density.
3. Determine the impact on ambient pollution levels of significant sources.
4. Determine general background concentration levels.
5. Determine the extent of regional pollutant transport among populated areas, and in support of secondary standards.
6. Determine the welfare-related impacts in more rural and remote areas (such as visibility impairment and effects on vegetation).

Site-specific data quality objectives (DQOs) are defined for each monitoring station in operation in the State consistent with any one or more of the aforementioned monitoring objectives. Site-specific DQOs are defined in Section B.1, Sampling Process Design.

8.2 Measurement Quality Objectives

Once a DQO is established, the quality of the data needs to evaluated and controlled in order to ensure that it remains within the accepted range. Measurement quality objectives are designed to control various phases (sampling, preparation, and analysis) of the measurement process to ensure that total measurement uncertainty is within the ranges prescribed by the DQOs. MQOs can be defined in terms of the following measurement quality attributes:

Precision -A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar condition.

Accuracy - Degree of agreement between a measurement (or an average of measurements of the same thing), and the amount actually present.

Representativeness - a measure of the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition, assuring the collection of a representative air quality sample depends on the following factors:

1. Selecting a network size consistent with the monitoring objectives and properly locating the sampling site
2. Determining restraints on the sampling sites that are imposed by meteorology, local topography, emission sources, and physical constraints.
3. Planning sampling schedules consistent with the monitoring objectives.

Completeness - a measure of the amount of valid data obtained from a measurement system compared to the amount expected to be obtained under correct, normal conditions. Data completeness requirements are included in the reference methods (40 CFR Part 50).

Comparability - a measure of confidence with which one data set can be compared to another. Established by uniform application of siting criteria objectives for pollutant specific spatial scales of representativeness (see Section 11 Sampling Process Design).

Detectability - The determination of the low range critical value of a characteristic that a method specific procedure can reliably discern. It is identified on a pollutant monitoring method specific basis as established by the appropriate SOP.

An example of the requirements for MQOs for PM2.5 can be seen in Table 8.1. A full list of MQOs for the pollutants Polk County Air Quality monitors for is attached to this document as Appendix A.

Table 8-1 Measurement Quality Objectives – Parameter PM2.5

Requirement	Frequency	Acceptance Criteria	40 CFR Reference	QA Guidance Document 2.12 Reference
Filter Holding Times				
Pre-sampling	All filters	<30 days before sampling	Part 50, App. L Sec 8.3	Sec. 7.8
Post-sampling	"	<10 days at 25°C	"	Sec. 7.10
		<30 days at 4°C	"	
Reporting Units	All data	µg/m3	Part 50.3	Sec. 11.1
Detection Limit				
Lower DL	All data	2 µg/m3	Part 50, App. L Sec 3.1	
Upper Conc. Limit	All data	200 µg/m3	Part 50, App. L Sec 3.2	
Data Completeness	Quarterly	75%	Part 50, App N, Sec 2.1	
Calibration/Verification	See SOP's			
Flow Rate (FR) calibration		±2% of transfer standard	Part 50, App. L, Sec 9.2	Sec. 6.3 & 6.6
FR multi-point verification		±2% of transfer standard	Part 50, App. L, Sec 9.2.5	Sec. 8.3
One Point FR verification		± 4% of transfer standard	Part 50, App. L, Sec 9.2.5	Sec. 8.3
		± 5% of flow rate design	Part 50, App. L, Sec 9.2.5	Sec. 8.3
External leak check		value	And 7.4.3.1	Sec. 3.2.3 and 3.3.2
Internal leak check		80 mL/min	Part 50, App. L, Sec 7.4	Sec. 6.4
Temperature calibration		80 mL/min	"	Sec. 6.4 & 8.2
Temp multi-point verification		±2% of standard	Part 50, App. L, Sec 9.3	Sec. 6.4 & 8.2
One-point temp verification		±2C° of standard	"	Sec. 6.5
Pressure calibration		±4C° of standard	"	Sec. 8.2
Pressure verification		±10 mm Hg	"	Not described
Clock/timer verification		±10mm Hg	Part 50, App. L, Sect 7.4	
		1 min/mo		
Accuracy				
FRM performance evaluation	25% of sites (4/yr)	±10%	Part 58, App. A, Sec 3.5	Sec. 10.3
Flow rate audit	See SOP's	±4% of audit standard	"	Sec. 10.2
External leak check		<80 mL/min	Not described	"
Internal leak check		<80 mL/min	Not described	"
Temp audit		+2°C	Not described	"
Pressure audit		±10 mm Hg	Not described	"
Precision				
Collocated samples	Every 6 days for 25% of sites	CV ≤10%	Part 50, App. A, Sec 3.5 & 5.5	Sec. 10.3
Single analyzer	1/3 months	CV ≤10%	Not described	Not described
Single analyzer	1/year	CV ≤10%	Not described	Not described
Reporting Organization	1/3 months	CV ≤10%	Not described	Not described

Calibration & Check Standards				
Flow rate transfer std.	See SOP's	±2% of NIST traceable Std.	Part 50, App. L, Sec 9.1 & 9.2	Sec. 6.3
Field thermometer		±0.1° C resolution	Not described	Sec. 4.2 & 8.3
		±0.5° C accuracy	Not described	"
Field barometer		±1 mm Hg resolution	Not described	"
		±5 mm Hg accuracy	Not described	"

9.0 Special Training Requirements / Certifications

9.1 Personnel Qualifications

Personnel assigned to ambient air monitoring activities are expected to have met the educational, work experience, responsibility, personal attributes, and training requirements for their positions. In some cases, certain positions may require certification and/or recertification. These requirements are outlined in the air monitoring staff personal position descriptions. Records on personnel qualifications and training are maintained with the Polk County Air Quality Engineer and shall be accessible for review during audit activities. These records should be retained as described in Section 10.

9.2 Training

Adequate education and training are integral to the Polk County Ambient Air Quality Monitoring Program. Training is aimed at increasing the effectiveness of employees and their organization. Appropriate training shall be available to all employees supporting the Polk County Ambient Air Quality Monitoring Program, commensurate with their duties. Such training may consist of classroom lectures, workshops, teleconferences, and on-the-job training.

New employees of the Polk County Ambient Air Monitoring Program receive a thorough indoctrination into the quality assurance and quality control policies and procedures of ambient air quality monitoring. This document and its associated SOP are required reading for all new employees. All employees participating in ambient air quality monitoring activities are involved in review and revision of these documents annually. All new employees participate in orientation seminars offered by the Polk County Manager's Office. New supervisory staff is also expected to complete introductory management courses offered by the Polk County Manager's Office.

The Polk County Air Quality Division maintains a library of educational materials and has access to a satellite television receiver system, which may be utilized, for training and/or continuing educational purposes. Workshops, symposia, or continuing education courses offered by firms, colleges, or various government agencies are available to staff. In order for an employee to participate, the subject matter must be applicable to a program or project, funding must be available, and supervisory and administrative approval must be secured in advance.

9.2.1 Suggested Training

Over the years, a number of courses have been developed for personnel involved with ambient air monitoring and quality assurance aspects. Formal QA/QC training is offered through the following organizations:

- σ Air Pollution Training Institute (APTI)
- σ Air & Waste Management Association (AWMA)
- σ American Society for Quality Control (ASQC)
- σ EPA Institute
- σ EPA Quality Assurance Division (QAD)
- σ EPA Regional Offices

Table 9-1 provides a suggested sequence of core QA-related ambient air monitoring courses for ambient air monitoring staff, and QA Managers (marked by asterisk). The suggested course sequences assume little or no experience in QA/QC or air monitoring. Persons having experience in the subject matter described in the courses would select courses according to their appropriate experience level. Courses not included in the core sequence would be selected according to individual responsibilities, preferences, and available resources.

Table 9-1 Suggested Sequence of Core QA-related Ambient Air Training Courses for OAQPS QA or Ambient Air Monitoring Contacts and QA Managers

Sequence	Course Title (SI = self instructional)	Source
1*	Air Pollution Control Orientation Course (Revised), SI:422	APTI
2*	Principles and Practices of Air Pollution Control, 452	APTI
3*	Orientation to Quality Assurance Management	QAD
4*	Introduction to Ambient Air Monitoring (Under Revision), SI:434	APTI
5*	General Quality Assurance Considerations for Ambient Air Monitoring (Under Revision), SI:471	APTI
6*	Quality Assurance for Air Pollution Measurement Systems (Under Revision), 470	APTI
7*	Data Quality Objectives Workshop	QAD
8*	Quality Assurance Project Plan	QAD
9	Atmospheric Sampling (Under Revision), 435	APTI
10	Analytical Methods for Air Quality Standards, 464	APTI
11	Chain-of-Custody Procedures for Samples and Data, SI:443	APTI
*	Data Quality Assessment	QAD
*	Management Systems Review	QAD
*	Beginning Environmental Statistical Techniques (Revised), SI:473A	APTI
*	Introduction to Environmental Statistics, SI:473B	APTI
*	Quality Audits for Improved Performance	AWMA
*	Statistics for Effective Decision Making	ASQC

* Courses recommended for QA Managers

10.0 Documentation and Records

For the Polk County Air Quality monitoring program, there are a number of documents and records that need to be retained. A document, from a record management perspective, is a volume that contains information that describes, defines, specifies, reports, certifies, or provides data or results pertaining to environmental programs. As defined in the Federal Records Act of 1950 and the Paperwork Reduction Act of 1995 (now 44 U.S.C. 3101-3107), records are: "...books, papers, maps, photographs, machine readable materials, or other documentary materials, regardless of physical form or characteristics, made or received by an agency of the United States Government under Federal Law or in connection with the transaction of public business and preserved or appropriate for preservation by that agency or its legitimate successor as evidence of the organization, functions, policies, decisions, procedures, operations, or other activities of the Government or because of the informational value of data in them...." This section will provide guidance of documentation and records for the Polk County Ambient Air Quality Monitoring Program.

Table 10-1 Types of information that should be retained through document control

Categories	Record/Document Types
Management and Organization	State Implementation Plan Reporting agency information Organizational structure of monitoring program Personnel qualifications and training Quality management plan Document control plan Network reviews
Site Information	Network description Site characterization file Site maps Site audits
Environmental Data Operations	QA Project Plans Standard operating procedures (SOPs) Field and laboratory notebooks Sample handling/custody records
Raw Data	Any original data
Data Reporting	Air quality index report Annual SLAMS air quality information Data/summary reports Journal articles/papers/presentations
Data Management	Data algorithms Data management plans/flowcharts
Quality Assurance	Control charts Data quality assessments QA reports System audits

Table 10-1 represents the categories and types of records and documents which are applicable to document control. Information on key documents in each category follow. It should be noted that the list contains documents that may not be applicable to particular organizations and therefore is not meant to be a list of required documentation. This list should also not be construed as the definitive list of record and document types.

Statute of Limitations - As stated in 40 CFR 31.42, in general, all information considered as documentation and records should be retained for 3 years from the date the grantee submits its final expenditure report unless otherwise noted in the funding agreement. However, if any litigation, claim, negotiation, audit or other action involving the records has been started before the expiration of the 3-year period, the records must be retained until completion of the action and resolution of all issues which arise from it, or until the end of the regular 3-year period, whichever is later.

10.1 Management and Organization

Documentation for many of the document types listed in Table 10-1 for this category can be found in the Polk County Air Quality Management Plan.

10.2 Site Information

The Polk County Ambient Air Monitoring Network is composed of State and Local Air Monitoring Stations (SLAMS). This Network is provided for in the Iowa State Implementation Plan (SIP) as required by 40 CFR 58.20.

Monitoring requirements for such stations are outlined in the technical appendices to 40 CFR 58, as follows:

1. 40 CFR 58, Appendix A contains QA criteria for the operation of SLAMS
2. 40 CFR 58, Appendix B contains QA criteria for Prevention of Significant Deterioration (PSD) Air Monitoring
3. 40 CFR 58, Appendix C contains criteria for the selection of monitoring methods and instruments for SLAMS and NAMS;
4. 40 CFR 58, Appendix D contains criteria for SLAMS and NAMS network design; and
5. 40 CFR 58, Appendix E contains criteria for siting of instruments and/or instrument probes.

The Iowa Ambient air Monitoring Network is described in the State of Iowa Implementation Plan for the Attainment and Maintenance of National Air Quality Standards. All monitoring stations are assigned a specific identification number for the EPA Aerometric Information Retrieval System (AIRS) according to the format, SS-CCC-NNNN, where SS represents a two digit state code (19 for Iowa), CCC represents a three digit county code (153 for Polk County), and NNNN represents a specific site identifier. A Current list of monitoring stations is provided in Appendix C of this plan.

SPECIAL PURPOSE MONITORING/REGULATED ENTITIES

Special Purpose Monitors may be operated. Although Special Purpose Monitors are not SLAMS (and therefore not NAMS), they are subject to specific requirements in 40 CFR 58.14.

Regulated entities conducting their own ambient monitoring shall utilize reference or equivalent methods (as defined in 40 CFR 50.1), and conduct monitoring according to PSD monitoring requirements (contained in 40 CFR 58, Appendix B). Each regulated entity conducting such monitoring shall develop a monitoring plan that must include a QA plan.

This section references specific documentation of Polk County monitoring site characteristics for each monitoring station. This information will assist in providing objective inputs into the evaluation of data gathered at that site.

Carpenter-FRM $PM_{2.5}$

Address:	1901 Carpenter Ave
City:	Des Moines
State:	Iowa-19
County:	Polk-153
Site #:	0030
Parameter:	88101
Spatial Scale:	Neighborhood
Monitor Objective:	Population Exposure
Monitor Type:	SLAMS
Sample Frequency:	Daily
Analyzer:	Thermo Scientific 2025
Probe height:	30 feet
Distance from road:	>30 meters
Comments:	Located on building

Carpenter-BAMs $PM_{2.5}$

Address:	1901 Carpenter Ave.
City:	Des Moines
State:	Iowa-19
County:	Polk-153
Site #:	0030
Parameter:	88502
Spatial Scale:	Urban
Monitor Objective:	High Concentration
Monitor Type:	Special Purpose
Sample Frequency:	Continuous
Analyzer:	Met One Instruments, Model 1020
Probe height:	30 feet
Distance from road:	> 30 meters
Comments:	Located on Building

Slater- Met Station

Address:	105 Greene Street
City:	Slater
State:	Iowa-19
County:	Story-169
Site #:	0011
Parameter:	61101, 61102
Spatial Scale:	Regional
Monitor Objective:	Background
Monitor Type:	Special Purpose
Sample Frequency:	Continuous
Analyzer:	Met One 013A, 023A
Probe height:	20 feet
Distance from road:	40 feet
Comments:	Located on city property

Slater- Ozone

Address:	105 Greene Street
City:	Slater
State:	Iowa-19
County:	Story-169
Site #:	0011
Parameter:	44201
Spatial Scale:	Regional
Monitor Objective:	Downwind Exposure
Monitor Type:	SLAMS
Sample Frequency:	Continuous
Analyzer:	Thermo Scientific 49i, 49C
Probe height:	20 feet
Distance from road:	40 feet
Comments:	Located on city property

Indian Hills Jr. High-FRM $PM_{2.5}$

Address:	9401 Indian Hills Drive
City:	West Des Moines
State:	Iowa-19
County:	Polk-153
Site #:	2510
Parameter:	88101
Spatial Scale:	Neighborhood
Monitor Objective:	Population Exposure
Monitor Type:	SLAMS
Sample Frequency:	1 in 3 days
Analyzer:	Thermo Scientific 2025
Probe height:	25 feet
Distance from road:	>30 meters
Comments:	Located on school property

Indian Hills Jr. High-FRM PM_{10}

Address:	9401 Indian Hills Drive
City:	West Des Moines
State:	Iowa-19
County:	Polk-153
Site #:	2510
Parameter:	81102
Spatial Scale:	Regional
Monitor Objective:	Neighborhood
Monitor Type:	Special Purpose
Sample Frequency:	1 in 3 days
Analyzer:	Thermo Scientific 2025
Probe height:	25 feet
Distance from road:	>30 meters
Comments:	Located on school property

Carpenter-O_3

Address:	1901 Carpenter Ave
City:	Des Moines
State:	Iowa-19
County:	Polk-153
Site #:	0030
Parameter:	44201
Spatial Scale:	Neighborhood
Monitor Objective:	Population Exposure
Monitor Type:	SLAMS
Sample Frequency:	Continuous
Analyzer:	Thermo Scientific 49i, 49C
Probe height:	30 feet
Distance from road:	>30 meters
Comments:	Located in building

Carpenter-NO/NO_2/NOx

Address:	1901 Carpenter Ave
City:	Des Moines
State:	Iowa-19
County:	Polk-153
Site #:	0030
Parameter:	42601, 42602, 42603
Spatial Scale:	Neighborhood
Monitor Objective:	Population Exposure
Monitor Type:	Special Purpose
Sample Frequency:	Continuous
Analyzer:	Thermo Scientific TL-42i
Probe height:	30 feet
Distance from road:	>30 meters
Comments:	Located in building

Rollins-$TLNO_2$

Address:	6011 Rollins
City:	Des Moines
State:	Iowa-19
County:	Polk-153
Site #:	6011
Parameter:	42601, 42602, 42603
Spatial Scale:	Neighborhood
Monitor Objective:	Population Exposure
Monitor Type:	Special Purpose
Sample Frequency:	Continuous
Analyzer:	Thermo Scientific TL-42i
Probe height:	15 feet
Distance from road:	40 feet
Comments:	Near road side monitoring

Carpenter – TLCO

Address:	1901 Carpenter Ave
City:	Des Moines
State:	Iowa-19
County:	Polk-153
Site #:	0030
Parameter:	42101
Spatial Scale:	Neighborhood
Monitor Objective:	Population Exposure
Monitor Type:	Special Purpose
Sample Frequency:	Continuous
Analyzer:	Thermo Scientific 48CTLE
Probe height:	30 feet
Distance from road:	> 30 meters
Comments:	Located in building

Carpenter-$TLSO_2$

Address:	1901 Carpenter Ave
City:	Des Moines
State:	Iowa-19
County:	Polk-153
Site #:	0030
Parameter:	42401
Spatial Scale:	Neighborhood
Monitor Objective:	Population Exposure
Monitor Type:	Special Purpose
Sample Frequency:	Continuous
Analyzer:	Thermo Scientific 43CTLE
Probe height:	30 feet
Distance from road:	> 30 feet
Comments:	Located in building

Carpenter- Met Station

Address:	1901 Carpenter Ave
City:	Des Moines
State:	Iowa-19
County:	Polk-153
Site #:	0030
Parameter:	61101, 61102, 62201, 62101
Spatial Scale:	Neighborhood
Monitor Objective:	Population Exposure
Monitor Type:	Special Purpose
Sample Frequency:	Continuous
Analyzer:	Met-One 013A, 023A, 083D
Probe height:	30 feet
Distance from road:	> 30 feet
Comments:	Located on top of building

Carpenter – FRM PM_{10}

Address:	1901 Carpenter Ave
City:	Des Moines
State:	Iowa-19
County:	Polk-153
Site #:	0030
Parameter:	81102
Spatial Scale:	Neighborhood
Monitor Objective:	Population Exposure
Monitor Type:	Special Purpose
Sample Frequency:	1 in 3 days
Analyzer:	Thermo Scientific 2025
Probe height:	30 feet
Distance from road:	> 30 feet
Comments:	Located on top of building

Carpenter – Air Toxics

Address:	1901 Carpenter Ave
City:	Des Moines
State:	Iowa-19
County:	Polk-153
Site #:	0030
Parameter:	Several
Spatial Scale:	Neighborhood
Monitor Objective:	Population Exposure
Monitor Type:	Special Purpose
Sample Frequency:	1 in 12 days
Analyzer:	ATEC
Probe height:	30 feet
Distance from road:	> 30 meters
Comments:	Located in building

Carpenter – $PM_{2.5}$ Speciation

Address:	1901 Carpenter Ave
City:	Des Moines
State:	Iowa-19
County:	Polk-153
Site #:	0030
Parameter:	Several
Spatial Scale:	Neighborhood
Monitor Objective:	Population Exposure
Monitor Type:	SLAMS
Sample Frequency:	1 in 6 days
Analyzer:	Met One SuperSASS, URG-3000N
Probe height:	30 feet
Distance from road:	> 30 meters
Comments:	Located on top of building

10.3 Environmental Data Operations

A quality assurance program associated with the collection of ambient air monitoring data must include an effective procedure for preserving the integrity of the data. Ambient air test results and, in certain types of tests, the sample itself may be essential elements in proving the compliance status of a facility; that is, it may be necessary to introduce the sample or the test results as evidence in an enforcement proceeding. Therefore, each step in the testing and analysis procedure must be carefully monitored and documented. There are basically four elements in the evidentiary phase of an overall Quality Assurance Program:

1. Data collection - includes testing, preparation and identification of the sample, strip charts, or other data.
2. Sample handling - includes protection from contamination and tampering during transfer between individuals and from the sampling site to the evidence locker.
3. Analysis - includes storage of samples prior to and after analysis as well as data interpretation.
4. Preparation and filing of test report - includes evidentiary requirements and retention of records.

Failure to include any one of these elements in the collection and analysis of ambient air monitoring data may render the results of the program inadmissible as evidence, or may seriously undermine the credibility of any report based on these data.

Environmental data operations include all the operations required to successfully measure and report a value within the data quality objectives. Documentation for environmental data operations would include:

- σ *QA Project Plans* - Documents how environmental data operations are planned, implemented, and assessed during the life cycle of a program, project, or task. See below.
- σ *Standard operating procedures(SOPs)* -Written documents that detail the method for an operation, analysis, or action with thoroughly prescribed techniques and steps. See below.
- σ *Field and laboratory notebooks* - Any documentation that may provide additional information about the environmental data operation (i.e. calibration notebooks, temperature records, site notes, maintenance records etc.). See below.
- σ *Sample handling/custody records* - Records tracing sample handling from the site through analysis, including transportation to facilities, sample storage, and handling between individuals within facilities. Section B.3 provides more information on this activity.

10.3.1 Quality Assurance Project Plans

As mentioned in the assistance agreement sections of 40 CFR parts 30.54 (Non-State and Local Gov.) and 31.45 (State and Local Gov.) quality assurance programs must be established. In addition to the grant requirements, 40 CFR Part 58 Appendix A states that each quality assurance program must be described in detail in accordance with the *EPA Requirements for Quality assurance Project plans for Environmental Data Operations EPA QA/R-5*

10.3.2 Standard Operating Procedures (SOPs)

Standard operating procedures (SOPs) are written documents that detail the method for an operation, analysis, or action with thoroughly prescribed techniques and steps. It is officially approved as the method for all routine activities, especially those that are involved in the environmental data operations, which generally involve repetitious operations performed in a consistent manner. SOPs should be written by individuals performing the procedures that are being standardized. Individuals with appropriate

training and experience with the process need to review the SOPs. SOPs must be approved by the supervisor of the personnel responsible for writing the document. For documentation purposes the approving official should sign and date the title page of the SOP.

SOPs currently in use shall be electronically stored in pdf format on the agencies shared drive in the folder entitled "Current SOPs". These SOPs shall be used in field operations until a revised SOP receives approval from the Quality Assurance Officer. SOPs shall be maintained for historical purposes in the agencies shared drive in the folder entitled "Archived SOPs". Archived SOPs shall be stored in a file named with the year that the SOP was in use.

SOPs should ensure consistent conformance with organizational practices, serve as training aids, provide ready reference and documentation of proper procedures, reduce work effort, reduce error occurrences in data, and improve data comparability, credibility, and defensibility. They should be sufficiently clear and written in a step-by-step format to be readily understood by a person knowledgeable in the general concept of the procedure. Elements to include in SOP:

1. Scope and Applicability
2. Summary of Method
3. Cautions Indicating activities that would result in equipment damage, degradation of sample or possible invalidation of results.
4. Interference
5. Apparatus and Materials (list or specify; note also designated locations where found)
6. Instrument or Method Calibration
7. Sample Collection
8. Handling and Preservation Sample Preparation and Analysis
9. Troubleshooting
10. Data Acquisition, Calculations & Data Reduction

10.3.3 Field and Laboratory Notebooks

Manual recording of data is sometimes required for ambient air tests. Standardized forms should be utilized to ensure that all necessary information is obtained. These forms should be designed to clearly identify the process tested the date and time, location of test station, and operating personnel. These data may determine the credibility of the data and should not be erased or altered. Any errors should be crossed out with a single line, and the correct value recorded above the crossed-out number.

Site notebooks are located at each site as are copies of any test record manually at that site. These notebooks shall not be removed unless they are used completely and replaced with a new notebook of similar style. Copies of all field sheets used to manually record data of ambient air tests are also kept by the Polk County Air Quality Clerk and are available upon request.

Do not discard original field records; copies are not normally admissible as evidence. For neatness, the field data may be transcribed or copied for incorporation in a final report, but the originals should be kept on file. Since these records may be subpoenaed, it is important that all field notes be legible.

10.3.4 Sample Handling

Sample handling is covered in greater detail in Section 13.

10.3.5 Raw Data

Raw data includes any original factual information from a measurement activity or study recorded in laboratory work sheets, records, memoranda, notes, or exact copies thereof and that are necessary for the reconstruction and evaluation of the report of the activity or study. For automated information systems, raw data is considered the original observations recorded by the information system that are needed to verify, calculate, or derive data that are or may be reported.

10.3.6 Data Reporting

In addition to samples and field records, the report of the analysis itself serves as material evidence. Just as the procedures and data leading up to the final report are subject to the rules of evidence, so is the report itself.

To ensure compliance with legal rules, all test reports are filed in a safe place by Polk County Air Quality Monitoring Specialist. Although the field notes and calculations are not generally included in the summary report, these materials may be required at a future date to bolster the acceptability and credibility of the report as evidence in an enforcement proceeding. Therefore, the full report including all original notes and calculation sheets should be kept in the file. Signed receipts for all samples, strip charts, or other data, are also filed.

10.3.7 Data Management

Virtually all of the data collected for the Polk County Ambient Air Quality Monitoring Program will be collected through the use of automated systems. These systems are effectively managed and documented by using a set of guidelines and principles by which adherence will ensure data integrity. Discussion of data management activities and the requirements for documentation can be found in Section 20.

10.3.8 Quality Assurance

Quality assurance information is necessary to document the quality of data. This information should be retained in a manner that it can be associated with the routine data that it represents. QA Information include:

1. *Control charts*
2. *Data quality assessments (DQAs)* - These assessments are a statistical and scientific evaluation of the data set to determine the validity and performance of the data collection design and statistical test, and to determine the adequacy of the data set for its intended use.
3. *QA Reports* - Reports pertaining to the quality of data usually related to some aggregate (quarterly, yearly etc) and discuss the measurement quality attributes and data quality objectives discussed in Section 22.
4. *System Audits* - Assessments of various phases of the environmental data operation are discussed in Section 21.

11.0 Sampling Process Design

The purpose of this section is to describe all of the relevant components of the monitoring network to be operated by Polk County Air Quality Division, including the network design for evaluating the quality of data. This entails developing and understanding the monitoring objectives and appropriate data quality objectives; identifying the spatial scale most appropriate for the monitoring objective of the site; identifying the general locations where the monitoring site should be placed; and identifying specific monitoring sites. The network design components comply with the regulations set forth in 40 CFR Part 58 Section 58.13, Appendix A, and Appendix D.

Air quality samples are generally collected for one or more of the following purposes:

1. to judge compliance with and/or progress made towards meeting ambient air quality standards
2. to activate emergency control procedures that prevent or alleviate air pollution episodes
3. to observe pollution trends throughout the region, including nonurban areas
4. to provide a data base for research evaluation of effects: urban, land-use, and transportation planning; and development and validation of diffusion models

11.1 Monitoring Purposes

11.1.1 Compliance Monitoring

The information required for selecting the number of samplers and the sampler locations include isopleth maps, population density maps, source locations, and availability of appropriate location space. The following are suggested guidelines:

- the priority area is the zone of highest pollution concentration within Polk County; one or more stations should be located in this area
- close attention should be given to densely populated areas within Polk County
- the quality of air entering Polk County's region is to be assessed by stations situated on the periphery of the region (i.e. upwind and downwind locations)
- some information of air quality should be available to represent all portions of the region
- a major objective of surveillance is evaluation of progress made in attaining the desired air quality; for this purpose, sampling stations should be strategically situated to facilitate evaluation of the implemented control tactics

11.1.1 Emergency Episode Monitoring

In making determinations for the declaration of an air pollution episode condition, Polk County Air Quality will notify the Iowa Department of Resources immediately when any of the following levels is reached:

Fine particulate matter (PM10) – 150 micrograms per cubic meter for a 24 hour average
Fine particulate matter (PM2.5) – 35 micrograms per cubic meter for a 24 hour average
Carbon monoxide (CO) – 15 ppm for an 8 hour average
Ozone (O_3) – 0.12 ppm for a 1 hour average
Nitrogen dioxide (NO_2) – 0.6 ppm for a 1 hour average or 0.15 ppm for a 24 hour average

The Iowa Department of Natural Resources will have ultimate authority for determination of an air pollution alert. In the event that the Iowa Department of Natural Resources issues an air pollution alert, Polk County Air Quality will take action as described in the *Polk County Board of Health Chapter V, Article XV. Emergency Air Pollution Episodes.*

11.2 Rationale for the Design

11.2.1 Primary Samplers

The primary purpose of the ambient air monitoring program operated by Polk County Air Quality is to measure compliance with national standards for ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide and particulate matter less than or equal to 10 or 2.5 micrometers. These standards are detailed in 40 CFR Part 50 and are summarized as:

Table 11-1 National Ambient Air Quality Standards (NAAQS)

Pollutant	Primary Stds.	Averaging Times	Secondary Stds.
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour[1]	None
	35 ppm (40 mg/m^3)	1-hour[1]	None
Lead	0.15 $\mu g/m^3$	Rolling 3 month average	Same as Primary
Nitrogen Dioxide	0.1 ppm	1-hour[9]	Primary
	0.053 ppm (100 $\mu g/m^3$)	Annual (Arithmetic Mean)[10]	Same as Primary
Particulate Matter (PM_{10})	Revoked[2]	Annual[2] (Arith. Mean)	Revoked[2]
	150 $\mu g/m^3$	24-hour[3]	Same as Primary
Particulate Matter ($PM_{2.5}$)	12 $\mu g/m^3$	Annual[4][8] (Arith. Mean)	15 $\mu g/m^3$
	35 $\mu g/m^3$	24-hour[5][8]	Same as Primary
Ozone	0.075 ppm	8-hour[6]	Same as Primary
	0.075 ppm	8-hour[7]	Same as Primary
Sulfur Dioxide	0.075 ppm	1-hour[11]	Primary
	0.5 ppm	3-hour[1]	Secondary

[1] Not to be exceeded more than once per year.

[2] Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, the agency revoked the annual PM_{10} standard in 2006 (effective December 17, 2006).

[3] Not to be exceeded more than once per year on average over 3 years.

[4] To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 12.0 $\mu g/m^3$.

[5] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 $\mu g/m^3$ (effective December 17, 2006).

[6] Reserved for promulgation of 40 CFR Part 50 and 40 CFR Part 58 [EPA-HQ-OAR-2005-0172; FRL-RIN 2060-AN24] National Ambient Air Quality Standards for Ozone signed March 12, 2008.

[7] Reserved for promulgation of 40 CFR Part 50 and 40 CFR Part 58 [EPA-HQ-OAR-2005-0172; FRL-RIN 2060-AN24] National Ambient Air Quality Standards for Ozone signed March 12, 2008.

(8) Standard remanded by United States Courts of Appeals for the District of Columbia February 24, 2009.

(9) 98th Percentile averaged over 3 years

(10) Annual Mean

(11) 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years

To determine whether these characteristics are quantified with sufficient confidence, Polk County Air Quality must address sampler type, sampling frequency, and sampler siting. By employing FRM/FEM samplers, Polk County Air Quality is assured to be measuring the pollutant concentrations as well as possible with regard to evaluating compliance with the NAAQS. By complying with the sampling frequency requirements of 40 CFR Part 58 Section 58.13, Polk County Air Quality assumes that the sampling frequency is sufficient to attain the desired confidence in the annual 98th percentile and annual mean of concentrations in the vicinity of each monitor.

11.2.2 QA Samplers

The purpose of collocated samplers and the FRM performance evaluation is to estimate the precision and bias of the various samplers. The MQOs developed in Section 8.0 state what the concentrations measured by a sampler must be within (determined by percent difference) 10% of the true concentration as measured by an external, certified device. Bias and precision goals must be accomplished to insure that decisions concerning attainment and/or non-attainment of the NAAQS can be made with sufficient confidence. To estimate the level of bias and precision being achieved in the field, 25% of all pollutant sites will operate a collocated sampler and the remaining will be audited with an audit device. If a sampler is operating within the required bias and precision levels, then the decision maker can proceed knowing that the decisions will be supported by unambiguous data. If however, a sampler exceeds the bias limits, the precision limits, or both, then the decision maker cannot use the data to make decisions at the desired level of confidence and corrective action must be implemented to ensure that future data collected by the sampler does meet the bias and precision limits. Thus the key characteristics being measured with the QA samplers are bias and precision.

To determine whether these characteristics are measured with sufficient confidence, Polk County Air Quality must address sampler type, sampling frequency, and sampler siting for the QA network. As with the primary monitoring network, by using FRM/FEM samplers, maintaining the sampling frequency specified in 40 CFR Part 58 Appendix A, and collocating the number of samplers as specified in 40 CFR Part 58 Appendix A, Polk County Air Quality assumes its QA network will measure bias and precision with sufficient confidence.

11.3 Design Assumptions

The sampling design is based on the assumption that following the rules and guidance provided in the CFR and *Guidance for Network Design and Optimum Site Exposure for PM2.5 and PM10* will result in

data that can be used to measure compliance with the national standards. The only issue at Polk County Air Quality's discretion is the sampler siting, and to a degree, sampling frequency.

11.4 Procedures for Locating and Selecting Environmental Samples

11.4.1 Primary Samplers

The design of the NAMS/SLAMS network must achieve one of six basic monitoring objectives, as described in 40 CFR Part 58, Appendix D. They are:

1. To determine the highest concentrations expected to occur in the area covered by the network.
2. To determine representative concentrations in areas of high population density.
3. To determine the impact on ambient pollution levels of significant sources or source categories.
4. To determine general background concentration levels.
5. To determine the extent of regional pollution transport among populated areas.
6. In support of secondary standards, to determine the welfare-related impacts in more rural and remote areas.

The procedure for siting samplers to achieve the six basic objectives is based on judgmental sampling, as is the case for most ambient air monitoring networks. Judgmental sampling uses data from existing monitoring networks, knowledge of source emissions and population distribution, and inference from analyses of meteorology to select optimal sampler locations.

Table 11-2 Polk County Air Quality Monitoring Network

Pollutant	Monitor Type	AIRS ID	City	Location	Address	Operating Schedule	Monitoring Objective	Spatial Scale
PM2.5 FRM	SLAMS	19-153-0030	Des Moines	Carpenter	1901 Carpenter	Daily	Population Exposure	Neighborhood
PM2.5 FRM	Collocated	19-153-0030	Des Moines	Carpenter	1901 Carpenter	Daily	Precision	Neighborhood
PM2.5 BAM	SLAMS	19-153-0030	Des Moines	Carpenter	1901 Carpenter	Continuous	Population Exposure	Neighborhood
PM2.5 BAM	Collocated	19-153-0030	Des Moines	Carpenter	1901 Carpenter	Continuous	Population Exposure	Neighborhood
PM2.5 FRM	SLAMS	19-153-2510	West Des Moines	Indian Hills Jr. High	9401 Indian Hills Dr.	1 in 3	Population Exposure	Neighborhood
PM2.5 Speciation - SuperSASS	Supplemental Speciation	19-153-0030	Des Moines	Carpenter	1901 Carpenter	1 in 6	Population Exposure	Neighborhood
PM2.5 Speciation – URG-3000N	Supplemental Speciation	19-153-0030	Des Moines	Carpenter	1901 Carpenter	1 in 6	Population Exposure	Neighborhood
PM10 FRM	SLAMS	19-153-0030	Des Moines	Carpenter	1901 Carpenter	1 in 3	Population Exposure	Neighborhood
PM10 FRM	Collocated	19-153-0030	Des Moines	Carpenter	1901 Carpenter.	1 in 6	Precision	Neighborhood
Ozone	SLAMS	19-153-0030	Des Moines	Carpenter	1901 Carpenter	Continuous	Population Exposure	Urban
Ozone	Collocated	19-153-0030	Des Moines	Carpenter	1901 Carpenter	Continuous	Population Exposure	Urban
TLNO$_2$	Special Purpose	19-153-0030	Des Moines	Carpenter	1901 Carpenter	Continuous	Population Exposure	Neighborhood
Ozone	SLAMS	19-169-0011	Slater	City of Slater	105 Greene Street	Continuous	Max Ozone Concentration	Urban
Ozone	Collocated	19-169-0011	Slater	City of Slater	105 Greene Street	Continuous	Max Ozone Concentration	Urban
TLNO$_2$	Special Purpose	19-153-6011	Des Moines	Rollins	6011 Rollins	Continuous	Max NO$_2$ Exposure	Neighborhood
PM10 FRM	Special Purpose	19-153-2510	West Des Moines	Indian Hills Jr. High	9401 Indian Hills Dr.	1 in 3	Population Exposure	Neighborhood
TLSO$_2$	Special Purpose	19-153-0030	Des Moines	Carpenter	1901 Carpenter	Continuous	Population Exposure	Urban
TLCO	Special Purpose	19-153-0030	Des Moines	Carpenter	1901 Carpenter	Continuous	Population Exposure	Neighborhood
Air Toxics-VOCs	Special Purpose	19-153-0030	Des Moines	Carpenter	1901 Carpenter	Seasonal variations	Population Exposure	Neighborhood
Air Toxics-Aldehydes	Special Purpose	19-153-0030	Des Moines	Carpenter	1901 Carpenter	Seasonal variations	Population Exposure	Neighborhood
Met Station	Special Purpose	19-153-0030	Des Moines	Carpenter	1901 Carpenter	Continuous	Population Exposure	Neighborhood
Met Station	Special Purpose	19-169-0011	Slater	City of Slater	105 Greene Street	Continuous	Downwind Background	Urban

11.4.2 Primary Samplers – Defining Maps

At this time, no MPAs are defined. As data is gathered, MPAs may be defined.

11.4.3 Primary Samplers – Defining CMZs

Polk County Air Quality is defining no CMZs and no spatial averaging will be done.

11.4.4 Primary Samplers – Sampling Frequency

The sampling frequency is shown in Table 11.1 above.

11.4.5 Primary Samplers – Types of Samplers

All NAMS/SLAMS samplers will be FRM's, whereas the SPM will be a continuous FEM monitor.

11.4.6 QA Samplers

The collocated monitor will be the same type as the core sampler. The collocated sampler will run in accordance to Table 11.1 above, which will coincide with the sampling day of the core sampler at that site. According to 40 CFR Part 58, Appendix A, Section 3.5.2, for each method designation, at least 25% (minimum of one) of the samplers must be collocated. Polk County Air Quality has met this requirement by collocating the core sampler at Carpenter, Lake Ahquabi and Slater monitoring sites with a sampler of the same type and model.

A complementary method for estimating bias and precision for PM2.5 is the FRM Performance Evaluation. Even though U.S. EPA will be performing these evaluations, it is important to recognize that these evaluations be performed. First, Polk County Air Quality will provide access to the sites and offer other needed support after the EPA Region VII QA Coordinator contacts Polk County. Secondly, the performance evaluation data will be reviewed by Polk County Air Quality. According to 40 CFR Part 58, Appendix A, Section 3.5.3, each method designation and at least 25% of each method designation with a reporting organization must be audited each year.

11.5 Classifications of Measurements as Critical/Noncritical

11.5.1 Primary Samplers

The critical information collected at the primary samplers is that specified in Appendix A. that will be provided to AIRS. Also critical is the site information. This data is critical because they are necessary for determining compliance with the NAAQS standards. All NAMS/SLAMS monitoring data will be used in comparison with the NAAQS.

11.5.2 QA Samplers

The critical information collected at collocated samplers is the same as that presented in Appendix A. All of the measurements in Appendix A are considered critical because they form the basis for estimating bias and precision which are critical for evaluating the ability of the decision makers to make decisions at desired levels of confidence. The measurements described in Appendix A will also be collected for the collocated samplers.

12.0 Sampling Methods Requirements

12.1 Purpose/Background

This method provides for measurement pollutant concentrations for the purpose of determining whether the primary and secondary national ambient air quality standards for monitored pollutants are met.

12.2 Sample Collection and Preparation

FRM samplers will be used as the monitor for collection of concentrations/samples for comparison to the NAAQS. It is planned that sequential samplers will be used at all PM2.5 FRM, PM10 FRM, PM10 Metals and PM2.5 Speciation sites including collocated samplers. Continuous samplers will be used at all carbon monoxide, ozone, and NO_2, and SO_2 sites. Continuous FDMS TEOM and BAM-1020 will also be used at the Carpenter site as special purpose monitors for PM 2.5. Air Toxics will be used at the Carpenter site as a special purpose monitor. Each model sampler shall be installed with adherence to procedures, guidance, and requirements detailed in 40 CFR Parts 50[1], 53 and 58[2]: Section 2:12 of the QA Hand Book[3]: the sampler manufacturer's operation manual; Polk County's Air Quality SOP's[4] and the EPA's Quality Assurance Guidance Documents.

12.2.1 Sample Set-up

Sample set-up of any particulate matter sampler in the Polk County Air Quality's network takes place any day after the previous sample has been recovered. For the PM2.5 FRM samplers, which run on a 1 in 3 day sampling schedule, five samples and one sample blank are set up at once. The collocated PM2.5 FRM site is set up to sample daily. The primary sampler runs for 5 consecutive days, with the 5th sample running simultaneously with the collocated sampler. The collocated sampler will then continue sampling. The collocated PM2.5 FRM site is also set up with five samples and one sample blank. The PM10 FRM samplers, which run on a 1 in 6 day sampling schedule, five samples and one sample blank are set up at once. PM10 FRM filters will also be analyzed for Metals on a 1 in 12 day sampling schedule. The PM2.5 Speciation sampler runs on a 1 in 6 day sampling schedule, and is set up any day after the previous sample has been recovered. The Air Toxics sampler runs on a 1 in 12 day sampling schedule, with the exception on ozone season when the carbonyls run on a 1 in 6 day sampling schedule. Sample set-up on Air Toxics takes place any day after the previous sample has been recovered. Detailed set-up procedures are in Polk County Air Quality's PM2.5 FRM, PM10 FRM, PM10 Metals, PM2.5 Speciation and Air Toxics SOPs and the EPA's Quality Assurance Guidance Documents.

12.2.2 Sample Recovery

Sample recovery of any individual filter from the PM2.5 FRM, PM10 FRM and PM10 Metals Network must occur within 96 hours of the end of the sample period for that filter. For 1 in 3 day sampling on sequential samplers, this will normally be on the day after the second sample is taken. The next sample set-up for two samples may also take place on this day. At the collocated site the sample from the duplicate monitor will be recovered on the same day as the primary sampler. Sample recovery of any individual filter from the PM2.5 Speciation must occur within 48 hours of the end of the sample period for that filter. Sample recovery for Air toxics carbonyls and canisters must occur within 72 hours of the end of the sample period. Detailed Sample recovery procedures can be found in the Polk County Air Quality's PM2.5 FRM, PM10 FRM, PM10 Metals, PM2.5 Speciation and Air Toxics SOPs and the EPA's Quality Assurance Guidance Documents.

12.3 Support Facilities for Sampling Methods

Any equipment necessary for repairs, troubleshooting, downloads or other situations that may occur will be carried by the technician in his/her vehicle so they are available as necessary. Technicians may, at their discretion, leave pertinent equipment at sites where security is not an issue.

12.4 Sampling/Measurement System Corrective Action

Sample corrective actions will be in accordance with the appropriate Polk County Air Quality SOP.

12.5 Sampling Equipment, Preservation, and Holding Time Requirements

This section details the requirements needed to prevent sample contamination, the volume of air to be sampled, how to protect the sample from contamination, temperature preservation requirements, and the permissible holding times to ensure against degradation of sample integrity.

12.5.1 Sample Contamination Prevention

Sample contamination prevention actions will be in accordance with the appropriate Polk County Air Quality SOP.

12.5.2 Sample Volume

Sample volume procedures will be in accordance with the appropriate Polk County Air Quality SOP.

12.5.3 Temperature Preservation Requirements

Temperature preservation requirements will be in accordance with the appropriate Polk County Air Quality SOP.

12.5.4 Permissible Holding Times for PM 2.5 FRM, PM 10 FRM, and PM2.5 Speciation

The permissible holding times for the PM2.5 FRM and PM10 FRM samples are clearly detailed in both 40 CFR Part 50, Appendix L, and Section 2.12 of the U.S. EPA QA Handbook. Holding times are provided in Table 12.2. Permissible holding time for PM2.5 Speciation and Air Toxics samples are clearly detailed in the EPA's Quality Assurance Guidance Documents.

Table 12-1 Holding Times

Item	Holding Time	From:	To:	References
Pre-weighed filter	≤30 days	Date of pre-weigh	Date of sample	40 CFR Part 50, Appendix L, Section 8.3.5
Recovery of filter	≤177 hours	Completion of sample period	Time of sample recovery	40 CFR Part 50, Appendix L, Section 10.10
Transport of filter	<24 hours (ideally)	Time of recovery	Time placed in conditioning room	40 CFR Part 50, Appendix L, Section 10.13
Post sample filter stored at <4° C.	≤30 days	Sample end date/time	Date of post-weigh	40 CFR Part 50, Appendix L, Section 8.3.6
Post sample filter stored continuously stored at <25° C.	≤10 days	Sample end date/time	Date of post-weigh	40 CFR Part 50, Appendix L, Section 8.3.6

References

1. U.S. EPA (1997a) National Ambient Air Quality Standard for Particulate Matter – Final Rule. 40 CFR Part 50. *Federal Register*, 62(138):38651-38760. July 18, 1997.

2. U.S. EPA (1997b) Revised Requirements for Designation of Reference and Equivalent Methods for PM 2.5 and Ambient Air Quality Surveillance for Particulate Matter – Final Rule. 40 CFR Parts 53 and 58. *Federal Register*, 62(138):38763-38854. July 18, 1997.

3. U.S. EPA Quality Assurance Guidance Document 2.12: Monitoring PM 2.5 in Ambient Air Using Designated Reference or Class I Equivalent Methods. March, 1998. (http://www.epa.gov/ttn/amtic/pmqainf.html).

4.U.S. EPA Quality Assurance Guidance Document-Model Quality Assurance Project Plan for the National Air Toxics Trends Stations. December 3, 2002. (http://www.epa.gov/ttn/amtic/airtxfil.html).

5. U.S. EPA Quality Assurance Guidance Document, Final, Quality Assurance Project Plan: PM2.5 Speciation Trends Field Sampling. December, 2000. (http://www.epa.gov/ttn/amtic/pmspec.html).

6. Polk County Air Quality's Standard Operating Procedures. 2009

13.0 Handling & Custody Requirements for PM2.5 FRM, PM10 FRM, PM10 Metals, PM2.5 Speciation and Air Toxics

13.1 Sample Labeling and Identification

Upon reception of sample filters, cassettes, carbonyls and canisters, Polk County Air Quality will visually inspect these items to ensure that no damage has occurred during transport from the laboratory contractor assigned by the Iowa Department of Natural Resources. The Department of Natural Resources and/or its contracted/ appointed laboratory are responsible for providing documentation to label and identify each sample and its respective cassette. It is Polk County Air Quality's responsibility to ensure that all identifying documentation is filled out entirely, that it remains with its respective sample through the entire sampling process, and it is returned to the laboratory contracted/appointed by The Iowa Department of Natural Resources.

13.2 Transportation

Transportation of each sample filter, canister, carbonyl and its respective documentation shall be in accordance with 40 CFR Part 50, U.S. EPA Quality Assurance Guidance Document 2.12, Polk County Air Quality's PM2.5 FRM, PM10 FRM, PM10 Metals, PM2.5 Speciation and Air Toxics SOPs.

13.3 Chain-Of-Custody

Chain-of-Custody procedures will be in accordance with Polk County Air Quality's PM2.5 FRM, PM10 FRM, PM10 Metals, PM2.5 Speciation and Air Toxics SOPs. Furthermore, chain-of-custody documentation will be provided by The Iowa Department of Natural Resources and/or its contracted/appointed laboratory.

14.0 Analytical Methods Requirements

14.1 Purpose/Background

This method provides for procedures used to analyze concentrations of samples collected by the Polk County Air Quality monitoring network.

14.2 Preparation of Samples for PM2.5 FRM, PM10 FRM, PM10 Metals and PM2.5 Speciation

It will be the sole responsibility of the Iowa Department of Natural Resources and/or its appointed laboratory contractors to prepare and transport PM2.5 FRM, PM10 FRM, PM10 Metals and PM2.5 Speciation sample filters to Polk County Air Quality in accordance with by 40 CFR Part 50, U.S. EPA Quality Assurance Guidance Document 2.12 and PM2.5 Speciation Trends Network Field Sampling QAPP. Upon receiving sample filters, it will be the responsibility of Polk County Air Quality and its staff to maintain the integrity of these filters for sampling purposes. This will be performed in accordance with Polk County Air Quality's PM2.5 FRM, PM10 FRM, PM10 Metals and PM2.5 Speciation SOPs, 40 CFR Part 50, U.S. EPA Quality Assurance Guidance Document 2.12 and the EPA's Quality Assurance Guidance Documents.

14.3 Preparation of Samples for Air Toxics.

It will be the sole responsibility of the Iowa Department of Natural Resources and/or its appointed laboratory contractors to prepare and transport Air Toxics carbonyls and canisters to Polk County Air Quality in accordance with by 40 CFR Part 50 and the U.S. EPA Quality Assurance Guidance Document-Model Quality Assurance Project Plan for the National Air Toxics Trends Stations. Upon receiving sample canisters, it will be the responsibility of Polk County Air Quality and its staff to maintain the integrity of these carbonyls and canisters for sampling purposes. This will be performed in accordance with Polk County Air Quality's Air Toxics SOP, 40 CFR Part 50, and the U.S. EPA Quality Assurance Guidance Document-Model Quality Assurance Project Plan for the National Air Toxics Trends Stations.

14.4 Analysis Method

It will be the sole responsibility of The Iowa Department of Natural Resources and its appointed laboratory contractors to ensure that all PM2.5 FRM, PM10 FRM, PM10 Metals, PM 2.5 Speciation and Air Toxics laboratory analytical methods are within guidelines set forth by 40 CFR Part 50 and U.S. EPA Quality Assurance Guidance Documents. Polk County Air Quality will not be responsible for any laboratory analytical methods involved.

14.5 Internal QC and Corrective Action for Measurement

In regard to field internal QC and corrective action, Polk County will follow the appropriate SOP for a specific pollutant.

14.6 Sample Contamination Prevention, Preservation, and Holding Time Requirements

This section details the requirements needed to prevent and protect the filter sample from contamination, the volume of air to be sampled, temperature preservation requirements, and the permissible holding times to ensure against degradation of sample integrity.

14.6.1 Sample Contamination Prevention

In regard to sample contamination prevention, Polk County Air Quality will follow 40 CFR Part 50, U.S. EPA Quality Assurance Handbook for Measurement Systems Volume II: Ambient Air Specific Methods, and the U.S. EPA's Quality Assurance Guidance Documents in all of its activities.

14.6.2 Sample Volume

The volume of air to be sampled is specified in 40 CFR Part 50, U.S. EPA Quality Assurance Handbook for Measurement Systems Volume II: Ambient Air Specific Methods, and the U.S. EPA's Quality Assurance Guidance Documents.

14.6.3 Temperature Requirements

In regard to operational, laboratory and storage temperatures, Polk County Air Quality staff will refer to the appropriate SOP, the U.S. EPA Quality Assurance Handbook for Measurement Systems Volume II: Ambient Air Specific Methods and the U.S. EPA's Quality Assurance Guidance Documents.

14.6.4 Permissible Holding Times for PM2.5 FRM, PM10 FRM, PM10 Metals and PM2.5 Speciation

The permissible holding time requirements of the PM2.5 FRM, PM10 FRM, PM2.5 Speciation and Air Toxics Network are explicitly detailed in 40 CFR Part 50 and in PM2.5 Speciation Trends Network Field Sampling QAPP. In regard to permissible holding times, Polk County Air Quality will follow 40 CFR Part 50, the U.S. EPA's Quality Assurance Guidance Documents, and the Polk County Air Quality SOPs in all of its activities.

References

1. U.S. EPA (1997b) Revised Requirements for Designation of Reference and Equivalent Methods for PM2.5 and Ambient Air Quality Surveillance for Particulate Matter – Final Rule. 40 CFR Parts 53 and 58. *Federal Register*, **62**(138):38651-38760. July 18, 1997.

2. U.S. EPA Quality Assurance Guidance Document 2.12: Monitoring PM 2.5 in Ambient Air Using Designated Reference or Class I Equivalent Methods. March, 1998. (http://www.epa.gov/ttn/amtic/pmqainf.html).

3. U.S. EPA Quality Assurance Guidance Document-Model Quality Assurance Project Plan for the National Air Toxics Trends Stations. December 3, 2002. (http://www.epa.gov/ttn/amtic/airtxfil.html).

4. U.S. EPA Quality Assurance Guidance Document, Final, Quality Assurance Project Plan: PM2.5 Speciation Trends Field Sampling. December, 2000. (http://www.epa.gov/ttn/amtic/pmspec.html).

5. Polk County Air Quality's Standard Operating Procedures. 2009.

15.0 Quality Control Requirements

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 quality assurance activities, such as establishing policies and procedures, developing data quality objectives, assigning roles and responsibilities, conducting oversight and reviews, and implementing corrective actions. The other function is the control of the measurement process through the implementation of specific quality control procedures, such as audits, calibrations, checks, replicates, routine self-assessments, etc. In general, the greater the control of a given monitoring system, the better will be the resulting quality of the monitoring data.

Quality Control (QC) is the overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality. In the case of the Polk County Air Quality Monitoring Network, QC activities are used to ensure that measurement uncertainty is maintained within acceptance criteria for the attainment of the DQO

15.1 QC Procedures

Day-to-day quality control is implemented through the use of various check samples or instruments that are used for comparison. The measurement quality objective table (Appendix A) contains a complete listing of these QC samples as well as other requirements for the Polk County Air Monitoring Program. The procedures for implementing the QC samples are included in the field and analytical methods sections.

In regard to field quality control activities, Polk County Air Quality will follow 40 CFR Part 50, U.S. EPA Quality Assurance Handbook for Air Pollution Measurement Systems Volume II: Ambient Air Specific Methods and Polk County Air Quality's SOP.

15.1.1 Calibrations

Calibration is the comparison of a measurement standard or instrument with another standard or instrument to report, or eliminate by adjustment, any variation (deviation) in the accuracy of the item being compared[1]. The purpose of calibration is to minimize bias.

Calibration activities follow a two-step process:

1. Certifying the calibration standard and/or transfer standard against an authoritative standard, and
2. Comparing the calibration standard and or transfer standard against the routine sampling/analytical instruments.

In regard to field calibration activities, Polk County Air Quality will follow 40 CFR Part 50, *U.S. EPA* Quality Assurance Handbook for Air Pollution Measurement Systems Volume II: Ambient Air Specific Methods and Polk County Air Quality's SOP. All results shall be documented in accordance with the appropriate Polk County Air Quality SOP.

15.1.2 Precision Checks

Precision is the measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. In order to meet the data quality objectives for precision, the Polk County Air Quality Division must ensure the entire measurement process is within statistical control. Two types of precision measurements will be made in the monitoring program.

< Collocated monitoring
< Filter duplicates

Collocated Monitoring - In order to evaluate total measurement precision, collocated monitoring will be implemented, as referenced in 40 CFR Part 58. Therefore, every method designation will:

1. Have 25% of the monitors collocated (values of .5 and greater round up).
2. Have at least 1 collocated monitor (if total number is less than 4). The first collocated monitor must be the FRM.
2. Have 50% of the collocated monitors must be FRM monitors and 50% must be the same method designation. If there is an odd number of collocated monitors required, bias in favor of the FRM.

Evaluation of Collocated Data- Collocated measurement pairs are selected for use in the precision calculations only when both meet the criteria described in 40 CFR Part 50, U.S. EPA Quality Assurance Handbook For Air Pollution Measurement Systems Volume II: Ambient Air Specific Methods. However, all collocated data will be reported to AIRS.

The following algorithms will be used to evaluate collocated data. These algorithms are included in *40* CFR Part 58 Appendix A.

Percent Difference for a Single Check (d_i). The percentage difference, d_i, for each check is calculated by using Equation 19, where X_i represents the concentration produced from the primary sampler and Y_i represents the concentration reported for the duplicate sampler.

Equation 19

$$D_i = \frac{Y_i - X_i}{(Y_i + X_i)/2} \times 100$$

Coefficient of Variation (CV) for a Single Check (CV_i). The coefficient of variation, CV_i, for each check is calculated by dividing the absolute value of the percentage difference, d_i, by the square root of two as shown in Equation 20.

Equation 20

$$CV_i = \frac{|d_i|}{\{SQRT\ 2\}}$$

Precision of a Single Sampler - Quarterly Basis ($CV_{j,q}$). For particulate sampler, j, the individual coefficients of variation ($CV_{j,q}$) during the quarter are pooled using Equation 21, where $n_{j,q}$ is the number of pairs of measurements from collocated samplers during the quarter.

Equation 21
$$CV_{j,q} = \frac{\sum_{i=1}^{n_j} CV_i \text{ ^2}}{n_{j,q}}$$

The 90 percent confidence limits for the single sampler's CV are calculated using Equations 22 and 23, where $\chi^2_{0.05,df}$ and $\chi^2_{0.95,df}$ are the 0.05 and 0.95 quartiles of the chi-square (χ^2) distribution with $n_{j,q}$ degrees of freedom.

Equation 22 ***Lower Confidence Limit*** $= CV_{j,q} \quad {}^{n_{j,q}} \underline{\chi^2_{0.95,n_{j,q}}}$

Equation 23 Upper Confidence Limit $= CV_{j,q} \quad \frac{n_{j,q}}{\chi^2_{0.05,n_{j,q}}}$

Precision of a Single Sampler - Annual Basis. For particulate sampler, *j*, the individual coefficients of variation, CV_i, produced during the calendar year are pooled using Equation 21, where n_j is the number of checks made during the calendar year. The 90 percent confidence limits for the single sampler's CV are calculated using Equations 22 and 23, where $\chi^2_{0.05,df}$ and $\chi^2_{0.95,df}$ are the 0.05 and 0.95 quartiles of the chi-square (χ^2) distribution with n_j degrees of freedom.

Corrective Action: Single Monitor - The precision data quality objective of 10% coefficient of variation (CV) is based upon the evaluation of three years of collocated precision data. The goal is to ensure that precision is maintained at this level. Therefore, precision estimates for a single pair of collocated instruments, or even for a quarter, may be greater than 10% while the three year average is less than or equal to 10%.

15.1.4 Accuracy or Bias Checks

Accuracy is defined as the degree of agreement between an observed value and an accepted reference value and includes a combination of random error (precision) and systematic error (bias). Three accuracy checks will be implemented in the Polk County Air Quality monitoring program:

- Flow rate audits
- Collocated monitors
- FRM performance evaluations

Flow Rate Audits for PM2.5 FRM, PM10 FRM, and PM2.5 Speciation - Polk County Air Quality will perform a flow rate audit every quarter. The audit is done by measuring the analyzer's normal operating flow rate using a certified flow rate transfer standard. The flow rate standard used for auditing will not be the same flow rate standard used to calibrate the analyzer. However, both the calibration standard and the audit standard may be referenced to the same primary flow rate or volume standard. Report the audit (actual) flow rate and the corresponding flow rate indicated or assumed by the sampler.

Accuracy of a Single Sampler - Single Check (Quarterly) Basis (d_i). The percentage difference (d_i) for a single flow rate audit, *i,* is calculated using Equation 13, where X_i represents the audit standard flow rate (known) and Y_i represents the indicated flow rate.

Equation 13
$$d_i = \frac{Y_i - X_i}{X_i} \times 100$$

Bias of a Single Sampler - Annual Basis (D_j). For an individual particulate sampler, *j*, the average (D_j) of the individual percentage differences (d_i) during the calendar year is calculated using Equation 14, where n_j is the number of individual percentage differences produced for sampler *j* during the calendar year.

Equation 14
$$D_j = \frac{1}{n_j} \times \sum_{i=1}^{n_j} d_i$$

Bias for Each EPA Federal Reference and Equivalent Method Designation Employed by the Department - Quarterly Basis ($D_{k,q}$). For method designation *k* used by the reporting organization, quarter *q*'s single sampler percentage differences (d_i) are averaged using Equation 16, where $n_{k,q}$ is the number of individual percentage differences produced for method designation *k* in quarter *q*.

Equation 16
$$D_{k,q} = \frac{1}{n_{k,q}} \times \sum_{i=1}^{n_{k,q}} d_i$$

Corrective Action - The single sampler accuracy requirement is $\pm$ 4%. If the audit violates the acceptance criteria, the field technician shall refer to the appropriate Polk County Air Quality SOP, or the PM2.5 Speciation Trends Network Field Sampling QAPP relating to flow rate audits.

Collocated Monitors - Although the collocated monitors are primarily used for evaluating and controlling precision, they can be used to determine accuracy or bias. By determining percent difference, one can track trends or bias between the two instruments without knowing which instrument is producing the "true" value. Use of the FRM performance evaluation information (discussed below) in conjunction with collocation data should help improve the data quality.

FRM Performance Evaluation for PM2.5 and PM10– The Federal Reference Method (FRM) Performance Evaluation is a quality assurance activity, which will be used to evaluate measurement system bias of the PM2.5 and PM10 monitoring networks. The pertinent regulations for this performance evaluation are found in 40 CFR Part 58, Appendix A, Section 3.5.3[2]. The strategy is to collocate a portable PM2.5 FRM or PM10 air sampling instrument with an established routine air monitoring site, operate both monitors in exactly the same manner and then compare the results of this instrument against the routine sampler at the site. The EPA will be implementing this program and will inform Polk County Air Quality when an evaluation will be conducted. The evaluation will be conducted on a regularly scheduled sampling day and the filters from the evaluation instrument will be sent to a national laboratory for measurement. The comparison of data will be accomplished by EPA personnel using the Aerometric Information Retrieval System (AIRS) data base. Note that the performance evaluation is an estimate of the uncertainty of the measurement system and not necessarily of the instrument. Therefore, biases may be attributed to sample handling, transportation and laboratory activities as well as to the instrument.

Performance Evaluation for PM2.5 Speciation Network – The PM2.5 Speciation Network Performance Evaluation is a quality assurance activity, which will be used to evaluate measurement system bias of the PM2.5 Speciation Monitoring Network. The pertinent regulations for this performance evaluation are found in PM2.5 Speciation Trends Network Field Sampling QAPP.

Corrective Action – The U.S. EPA will notify Polk County Air Quality of the evaluation results within 10 days of sampling. The bias acceptance criteria for the data comparison is $\pm$10%. If a bias is apparent, corrective action will be initiated. The process will include an attempt to determine at what data collection phase(s) the majority of the measurement errors are occurring. This may require EPA to conduct additional performance evaluations to troubleshoot the process.

References

1. Taylor, J.K. 1987 Quality Assurance of Chemical Measurements. Lewis Publishers, Chelsea, Michigan. 328pp.

2. U.S. EPA (1997b) Revised Requirements for Designation of Reference and Equivalent Methods for PM2.5 and Ambient Air Quality Surveillance for Particulate Matter-Final Rule. 40 CFR Parts 53 and 58. *Federal Register*, **62**(138):38763-38854. July 18, 1997. (http://www.epa.gov/ttn/amtic/pmqainf.html).

16.0 Instrument/Equipment Testing, Inspection and Maintenance

16.1 Purpose/Background

The purpose of this section is to discuss the procedures used to verify that all instruments and equipment are maintained in sound operating condition and are capable of operating at acceptable performance levels. All instrument inspection and maintenance activities are documented with appropriate paperwork.

16.2 Testing

All samplers used in the Polk County Air Quality Ambient Air Monitoring Network will be designated Federal Reference or Equivalent Methods (FRM/FEM) that have been certified as such by EPA. Therefore, they are assumed to be of sufficient quality for the data collection operation. EPA tests this equipment through the procedures described in 40 CFR Part 50[1]. Prior to field installation, Polk County Air Quality will assemble and run the samplers in the office. If any checks are out of specification, the Polk County Air Quality Department will contact the vendor for initial corrective action. Once installed at the field site, the operators will run the tests in accordance with the manufacturer's manual and the appropriate Polk County Air Quality Division SOP. If the sampling instrument meets the acceptance criteria, it will be assumed to be operating properly. These tests will be properly documented with appropriate paperwork.

16.3 Inspection of Field Items

There are several items to inspect in the field before and after a sample have been taken. Please refer to the appropriate Polk County Air Quality SOP for details.

16.4 Field Maintenance Items

There are several items associated with appropriate preventive maintenance of a successful field program. Please refer to the appropriate Polk County Air Quality SOP for details.

References

1. U.S. EPA (1997a) National Ambient Air Quality Standards for Particulate Matter – Final Rule. 40 CFR Part 50. *Federal Register*, **62**(138):38651-38760. July 18, 1997. (http://www.epa.gov/ttn/amtic/pmqainf.html).

17.0 Instrument Calibration and Frequency

17.1 Instrumentation Requiring Calibration

17.1.1 Flow Rate

Monitoring Specialists will calibrate the flow of Air Toxics, PM2.5 FRM, PM10 FRM, and PM2.5 Speciation every 12 months at the sampler site. A one-point flow rate verification will be done every 4 weeks (except for Air Toxics which is done whenever needed as long as one year is not exceeded). Flow rate calibrations will be performed in accordance with the appropriate Polk County Air Quality SOP and PM2.5 Speciation Trends Network Field Sampling QAPP. PM2.5 FDMS TEOMs will be calibrated annually with a single point verification of the main flow and main+auxilliary flow being performed weekly. PM2.5 BAMs will be calibrated monthly with a single point verification being performed weekly.

17.1.2 Sampler Temperature and Pressure Sensors for PM2.5 FRM, PM10 FRM, PM10 Metals and PM2.5 Speciation

These instruments will be calibrated in accordance with the appropriate Polk County Air Quality SOP, and the U.S. EPA's Quality Assurance Guidance Documents.

17.1.3 Calibration of Concentrations for Ozone, Carbon Monoxide, Nitrogen Dioxide, and Sulfur Dioxide

Calibration of continuous pollutant concentrations will be performed semiannually and when precision checks result in a difference greater than $\pm 10\%$. Calibration of ozone analyzers will be performed prior to the beginning of ozone season and when precision checks result in a difference greater than $\pm$ 7%.

17.2 Calibration Methods

17.2.1 Flow Calibration Procedure

The sampler flow calibration will be performed in accordance with the appropriate Polk County Air Quality SOP.

17.2.2 Temperature Calibration Procedure for PM2.5 FRM, PM10 FRM, PM10 Metals and PM2.5 Speciation

The sampler ambient temperature calibration and filter temperature sensors calibration will be performed in accordance with the appropriate Polk County Air Quality SOP, and the U.S. EPA's Quality Assurance Guidance Documents.

17.2.3 Pressure Calibration Procedure for PM2.5 FRM, PM10 FRM, PM10 Metals and PM2.5 Speciation

The sampler pressure calibration will be performed in accordance with the appropriate Polk County Air Quality SOP, and the U.S. EPA's Quality Assurance Guidance Documents.

17.2.3 Concentration Calibrations for Continuous Samplers

Continuous sampler calibrations will be performed in accordance with the appropriate Polk County Air Quality SOP.

17.3 Calibration Standards

Flow Rate – The flow rate transfer standard will be calibrated in accordance with Polk County Air Quality's Air Toxic, PM2.5 FRM, PM10 FRM, and PM10 Metals, and PM2.5 Speciation SOPs, and the PM2.5 Speciation Trends Network Field Sampling QAPP. The flow rate standard will be recalibrated annually.

Temperature – The temperature transfer standard will be calibrated in accordance with Polk County Air Quality's PM2.5 FRM, PM10 FRM and PM10 Metals, and PM2.5 Speciation SOPs, and the PM2.5 Speciation Trends Network Field Sampling QAPP. The temperature transfer standard will be recalibrated annually.

Pressure – The pressure transfer standard will be calibrated in accordance with Polk County Air Quality's PM2.5 FRM, PM10 FRM and PM10 Metals, and Speciation SOPs, and the U.S. EPA's Quality Assurance Guidance Documents. The pressure transfer standard will be recalibrated annually.

Transfer Standards for Ozone - The ozone transfer standard will be calibrated in accordance with Polk County Air Quality's Ozone SOP. The transfer standard will be calibrated quarterly with a 6 x 6 calibration. Annually, the primary standard will be taken to EPA's regional office for re-certification.

Gaseous Transfer Standards for Carbon Monoxide, Sulfur Dioxide, and Nitrogen Dioxide - The gaseous transfer standards will be calibrated in accordance with Polk County Air Quality SOPs and the manufacturer's documentation of certification.

17.4 Document Calibration Frequency

Each pollutant SOP describes details for documentation of calibrations and their frequency.

References

1. ASTM. 1977. Standard test methods for measuring surface atmospheric pressure. American Society for Testing and Materials. Philadelphia, PA. Standard D 3631-84.

2. ASTM. 1977. Standard test methods for measuring surface atmospheric pressure. American Society for Testing and Materials. Philadelphia, PA. Standard D 3631-95.

3. ATEC Model No. 2200 Operations and Maintenance Manual. ATEC Atmospheric Technology, December 3, 2001.

4. EPA (1997a) National Ambient Air Quality Standards for Particulate Matter – Final Rule. 40 CFR Part 50. Federal Register, 62(138):38651-38760. July 18, 1997.

5. EPA 1997b Ambient air monitoring reference and equivalent methods. U.S. Environmental Protection Agency. 40 CFR Part 53, as amended July 18, 1997.

6. EPA. 1997. Reference method for the determination of fine particulate matter as $PM_{2.5}$ in the atmosphere. U.S. Environmental Protection Agency. 40 CFR Part 58, Appendix L, as amended July 18, 1997.

7. EPA. 1995. Quality Assurance Handbook for Air Pollution Measurement Systems Volume IV: Meteorological Measurements. U.S. Environmental Protection Agency. Document No. EPA/600/R-94/038d. Revised March.

8. NIST. 1976. Liquid-in-glass thermometer. National Institute of Standards and Technology. NBS Monograph 150. January.

9. NIST. 1986. Thermometer calibration: a model for state calibration laboratories. National Institute of Standards and Technology. NBS Monograph 174. January.

10. NIST. 1988. Liquid-in-glass calibration service. National Institute of Standards and Technology. Special publication 250-23. September.

11. NIST. 1989. The calibration of thermocouples and thermocouple materials. National Institute of Standards and Technology. Special Publication 250-35. April.

12. U.S. EPA Quality Assurance Guidance Document 2.12: Monitoring PM 2.5 in Ambient Air Using Designated Reference or Class I Equivalent Methods. March, 1998. (http://www.epa.gov/ttn/amtic/pmqainf.html).

13. U.S. EPA Quality Assurance Guidance Document-Model Quality Assurance Project Plan for the National Air Toxics Trends Stations. December 3, 2002. (http://www.epa.gov/ttn/amtic/airtxfil.html).

14. U.S. EPA Quality Assurance Guidance Document, Final, Quality Assurance Project Plan: PM2.5 Speciation Trends Field Sampling. December, 2000. (http://www.epa.gov/ttn/amtic/pmspec.html).

15. Polk County Air Quality's Standard Operating Procedures. 2009.

18.0 Inspection/Acceptance for Supplies and Consumables

Polk County Air Quality and its staff shall accept full responsibility for any supplies or consumables they receive and deem necessary for operation of the Polk County Air Quality monitoring network. When newly ordered or repaired sampling, analytical or computational equipment is delivered to the program office, the Air Quality Engineer or designated personnel compares the item to that requested on the original order, then inspects the equipment to ensure no breakage has occurred in transit and all components function properly. Once this inspection is completed, the Air Quality Engineer either accepts or rejects the shipment. Office and laboratory supplies receive a comparable level of scrutiny. Reference standard and equipment must be accompanied by a certificate from the vendor or manufacturer verifying the quality of these products. Specific requirements and procedures for inspecting ambient air monitors are found in the relevant SOP manual.

19.0 Data Acquisition Requirements

19.1 Acquisition of Non-Direct Measurement Data

This section addresses data not obtained by direct measurement from the Polk County Air Quality Ambient Air Monitoring Program. This includes both outside data and historical monitoring data. Non-monitoring data and historical monitoring data are used by the Program in a variety of ways. Use of information that fails to meet the necessary Data Quality Objectives (DQOs) for the Polk County Air Quality Ambient Air Monitoring Program can lead to erroneous trend reports and regulatory decision errors. The policies and procedures in this section apply both to data acquired through the Polk County Air Quality monitoring program and to information previously acquired and/or acquired from outside sources.

Chemical and Physical Properties Data - Physical and chemical properties data and conversion constants are often required in the processing of raw data into reporting units. This type of information that has not already been specified in the monitoring regulations will be obtained from nationally and internationally recognized sources. The following sources may be used in the Ambient Air Quality Monitoring Program.

- National Institute of Standards and Technology (NIST)
- ISO, IUPAC, ANSI and other widely recognized national and international standards organizations
- U.S. EPA
- *Handbook of Chemistry and Physics*
- *Lange's Handbook*

Sampler Operation and Manufacturers' Literature - Another important source of information needed for sampler operation is manufacturers' literature. Operations manuals and users' manuals frequently provide numerical information and equations pertaining to specific equipment.

Historical Monitoring Information - Polk County Air Quality has operated a network of ambient air monitoring stations since the mid 1970's. Historical data obtained from this network in conjunction with current monitoring results can be used to identify trends or relationships between different pollutant concentrations.

External Monitoring Data Bases - Polk County Air Quality will not use available air monitoring data from other organizations without first determining with utmost confidence that it is of high quality. Any data obtained from the EPA AIRS database will be scrutinized just as if it were obtained from another organization. Errors do, and have occurred when viewing, uploading or downloading files from the AIRS database. Flagged data will not be used unless it is proven that it has met all QA/QC requirements. The Polk County Air Quality QA officer shall determine if any outside data can or will be used by Polk County.

National Oceanic and Atmospheric Administration Data - Meteorological information is gathered by the Des Moines National Weather Service and supplied to Polk County Air Quality. Caution must be used when any of this data is used to determine pollutant concentrations. The Polk County Air Quality QA officer shall determine if any National Weather Service data can or will be used by Polk County.

19.2 Acquisition of Direct Measurement Data

Polk County Air Quality will be responsible for all downloads of data files related to individual samples or concentrations. It will be the policy of Polk County Air Quality to use communication software provided by the manufacturer of a given sampler or software designed for the sole purpose of data acquisition and storage. All data downloads will be in accordance with the Polk County Air Quality SOP and documented with appropriate paperwork.

Corrective Action – Should an error occur during any part of a data download, Polk County Air Quality's QA officer will be alerted and all attempts will be made to determine the source of the problem and to correct it. Visual verification will be performed on all data that may have been affected by errors incurred during a faulty download. All actions performed during the incident shall be documented with appropriate paperwork and kept on file.

Polk County Air Quality will not utilize any automatic data processing algorithms for PM2.5 FRM, PM10 FRM, PM10 Metals, PM2.5 Speciation or Air Toxics concentration calculations. These calculations are the responsibility of The Iowa Department of Natural Resources and its contracted/appointed laboratory.

19.3 Automatic Data Input

Polk County Air Quality will be responsible for all uploads or data inputs related to individual samples or concentrations with the exception of PM2.5 Speciation. RTI is responsible for all uploads or data inputs for PM2.5 Speciation following data validation by Polk County Air Quality Monitoring Specialist. Polk County Air Quality will perform all other data uploads in accordance with manufacturer specification and the Polk County Air Quality SOP and documented with appropriate paperwork.

Corrective Action – Should an error occur during any part of a data input or data upload, the Polk County Air Quality's QA officer will be alerted and all attempts will be made to determine the source of the problem and to correct it. Visual verification will be performed of all data that may have been affected by errors incurred during a faulty upload or input. All actions performed during the incident shall be documented with appropriate paperwork and kept on file.

20.0 Data Management

20.1 Background and Overview

This section describes the data management operations pertaining to measurements for the Polk County Air Quality network. Polk County will be responsible for operations including data recording, validation, transmittal, management, storage and retrieval. Data handling flowcharts for the pollutants Polk County Air Quality monitors are attached to this document as Appendix B.

For PM2.5 FRM, PM10 FRM, PM10 Metals, and PM2.5 Speciation, all field data will be transferred to The Iowa Department of Natural Resources and its contracted/appointed laboratory following all chain-of-custody requirements. Therefore, it will be the responsibility of The Iowa Department of Natural Resources and its contracted/appointed laboratory to perform any data transformation and tracking.

For Air Toxics, all data generated in the SHL laboratory are collected on electronic tape or disk drives and also paper copies. The printed copies of all reports are kept on file in the laboratory or in storage. Final data are entered into Excel and are printed for the monthly or quarterly reports. These reports are mailed to the EPA, State agencies and Polk County. SHL will prepare a final report containing all aspects of the program, including data summaries, QA, QC, and data analysis results for the EPA, and distribute site-specific summaries of the final data to designated State and Polk County[1].

20.2 Data Recording

Procedures for filling out documentation associated with field data, calibration/verification, QA/QC activities, shipping/receiving or any other activities involved with the Air Monitoring Network can be found in the appropriate Polk County Air Quality SOP. Field data documentation shall be copied and stored on file at Polk County Air Quality offices and will be available for public inspection upon request. The original field sheets for PM2.5 FRM, PM10 FRM, PM10 Metals, PM2.5 Speciation, and Air Toxics will accompany their appropriate samples to The Iowa Department of Natural Resources and/or its contracted/appointed laboratory. All other documentation shall be retained by Polk County Air Quality and is available upon request.

20.3 Data Validation

Data validation is a combination of checking that the data processing operations have been carried out correctly and to monitor the quality of field operations. Data validation can identify problems in either of these cases. If problems are identified, the data can then be validated or invalidated and corrective actions then taken.

The following validation checks will be performed:

- **Range Checks**
- **Completeness Checks** – Certain completeness checks must be met, i.e. start times, end times, average flow rate, dates weighed, operator/technician names.
- **Internal Consistency and Other Reasonableness Checks** – The end time of a filter must be greater than the start time. Computer filter volume (integrated flow) must be approximately equal to the exposure time multiplied by the nominal flow.
- **Data Retention** – Copies of raw data sheets are retained on file at Polk County Air Quality offices for a period of five years and are available upon request. Originals for PM2.5 FRM, PM10 FRM, PM10 Metals, PM2.5 Speciation, and Air Toxics will be sent to The Iowa Department of Natural Resources and/or its contracted/appointed laboratory. Any data (hardcopy or software) shall be archived on Polk County property after this time period.

- **Statistical Data Checks** – Any statistical outliers shall be considered suspect and an investigation into its validity will be performed.

Two key operational criteria for pollutant sampling are bias and precision. As defined in 40 CFR Part 58, Appendix A, these are based on differences between collocated sampler results and the primary sampler performance. Polk County Air Quality will inspect the results of collocated sampling. Acceptance criteria for collocated sampling can be found in the appropriate Polk County Air Quality SOP.

20.4 Data Transmittal

Data transmittal occurs when data is transferred from one person or location to another, or when data is copied from one form to another. Table 20-1 summarizes data transfer operations that will occur at Polk County Air Quality.

Table 20-1 Data Transfer Operations

Description of Data Transfer	Originator	Recipient	QA Measures Applied
Electronic data transfer	Between sampler and PC/laptop computer	NA	Parity checking: transmission protocols
Calibration, FRM/ FEM and audit data	Auditor or operator	database computer	Spot checked by Polk County Air Quality QA Officer
Field data transfer	Polk County Air Quality Technician	Iowa DNR laboratory	Chain-of custody protocol
AIRS data summaries	Polk County Air Quality Technician	AIRS (U.S. EPA)	Spot checked by Polk County Air Quality QA Officer

Polk County Air Quality will report all ambient air quality data and information specified by the AIRS Users Guide (Volume II, Air Quality Data Coding, and Volume III, Air Quality Data Storage), coded in the AIRS-AQS format. Such air quality data and information will be fully screened and validated and be submitted directly to the AIRS-AQS via electronic transmission on a monthly and quarterly basis.

20.5 Data Reduction

Data reduction processes involve aggregating and summarizing results so that they can be understood and interpreted in different ways. Air monitoring regulations require certain summary data be computed and reported regularly to EPA. Example of data summaries include:

- Average concentration for a station or set of stations for a specific time period
- Accuracy, bias and precision statistics based on accumulated FRM/FEM data
- Data completeness reports based on number of valid samples collected during a specific period

The Audit Trail is another important concept associated with data transformations and reductions. An audit trail is a data structure that provides documentation for changes made to a data set during processing. Typical reasons for data changes that would be recorded include the following:

- Corrections of data input due to human error
- Application of revised calibration factors
- Addition of new or supplementary data

20.6 Data Storage and Retrieval

Data archival policies applicable to Polk County Air Quality are shown on Table 20-2

Table 20-2 Data Archive Policies

Data Type	Medium	Location	Retention Time	Final Disposition
Field data forms (copies)*	Hard copy	Office	5 years	County archives
Calibration/ verification forms	Hard copy	Office	5 years	County archives
QA/QC documentation	Hard copy	Office	5 years	County archives
AIRS format files	Hard copy	Office	Indefinitely	PCAQ offices
Audit results	Hard copy	Office	Indefinitely	PCAQ offices

* The Iowa Department of Natural Resources and its contracted/appointed laboratory will maintain permanent possession of the original field data forms as they pertain to PM2.5 FRM, PM10 FRM, PM10 Metals, PM2.5 Speciation, and Air Toxics sample filters.

Any data or forms stored or generated by Polk County Air Quality will reside (but are not limited to) on a IBM-PC compatible computer. This computer has the following specifications:

- Manufacturer: HP Compaq
- Processor: Pentium 4
- Operating System: Windows 2000
- Memory: 64 MB
- Storage: 7.85 GB
- Backup: Intra-office share drive, Compact Disk

The laptop computer that will be used for field data file downloads will be IBM-PC compatible. This computer has the following specifications:

- Manufacturer: Compaq
- Processor: Pentium 4
- Operating System: Windows XP
- Memory: 96 MB
- Storage: 8.2 GB
- Backup: Intra-office share drive, Compact Disk
- Communication Software: AKComm

Reference:

1. ATEC Model No. 2200 Operations and Maintenance Manual. ATEC Atmospheric Technology, December 3, 2001.

21.0 Assessments and Response Actions

This section will describe and detail those efforts taken by Polk County Air Quality to measure the performance or effectiveness of its quality system, the establishment of its monitoring network and various measurement phases of the data operation.

21.1 State and Local Organization Performance Evaluations

In addition to NPAP, State and local organizations also conduct performance evaluations. The Iowa Department of Natural Resources shall conduct a performance evaluation of Polk County Air Quality every two years. This evaluation will assess the QA/QC activities performed in operating the Polk County Air Quality Network and make recommendations for any discrepancy that they make discover.

Corrective Actions – Should the Iowa Department of Natural Resources find any discrepancies in the Polk County Air Quality Monitoring Program, it will be the responsibility of Polk County Air Quality personal to rectify any problems discovered. Once action has been taken to correct the problem, Polk County Air Quality personal will contact The Iowa Department of Natural Resources via phone, mail, e-mail or another acceptable manner as to their actions.

21.2 Technical Systems Audits

Polk County Air Quality Monitoring Program shall participate in a Technical Systems Audit conducted by EPA Region VII as scheduled by EPA Region VII. This audit consist of an on-site review and inspection of a Polk County Air Quality's Ambient Air Monitoring Program to assess its compliance with established regulations governing the collection, analysis, validation, and reporting of ambient air quality data.

The scope of a systems audit is of major concern to both EPA Region VII and Polk County Air Quality. A Technical Systems Audit, as defined in the context of this document, includes an appraisal of the following program areas: network management, field operations, laboratory operations, data management, quality assurance and reporting. The Technical Systems Audit results present a clear, complete and accurate picture of the Polk County Air Quality's acquisition of ambient air monitoring data.

The Technical Systems Audit should include, but is not limited to the following information:

A. Network Design and Siting

1. **Network Size**--Provide an overview of the network size and the number of local agencies responsible to the state for network operation.
2. **Network Design and Siting**--Description of any deficiencies in network design or probe siting discovered during the audit. Indicate what corrective actions are planned to deal with these deficiencies.
3. **Network Audit**—Discussion of the conclusions of the last network annual audit and outline any planned network revision resulting from that audit.
4. **Non-criteria Pollutants**--Briefly discuss the agency's monitoring and quality assurance activities related to non-criteria pollutants.

B. Resources and Facilities

1. **Instruments and Methods**--Description of any instrument nonconformance with the requirements of 40 CFR 50, 51, 53, and 58. Briefly summarize agency needs for instrument replacement over and above nonconforming instruments.
2. **Staff and Facilities**--Comments on staff training, adequacy of facilities and availability of NBS-traceable standard materials and equipment necessary for the agency to properly conduct the bi-weekly precision checks and quarterly accuracy audits required under 40 CFR Part 58, Appendix A.
3. **Laboratory Facilities**—Discussions of any deficiencies of laboratory procedures, staffing and facilities to conduct the tests and analyses needed to implement the SLAMS/NAMS monitoring the Quality Assurance plans.

C. Data and Data Management

1. **Data Processing and Submittal**-- Comments on the adequacy of the agency's staff and facilities to process and submit Air Quality System (AQS) data as specified in 40 CFR 58.35 and the reporting requirements of 40 CFR 58, Appendices A and F. Include an indication of the timeliness of data submission by indicating the fraction of data which are submitted more than forty-five (45) days late.
2. **Data Review**--A brief discussion of the agency's performance in meeting the 75% criteria for data completeness. Additionally, discuss any remedial actions necessary to improve data reporting.
3. **Data Correction**—Discussion of the adequacy and documentation of corrections and/or deletions made to preliminary ambient air data, and their consistency with both the agency's QA Manual and Standard Operating Procedures, and any revised protocols.
4. **Annual Report**--Comments on the completeness, adequacy and timeliness of submission of the SLAMS Annual Report required under 40 CFR 58.26.

D. Quality Assurance/Quality Control

1. **Status of Quality Assurance Manual**—Discussion on the status of the Agency's Quality Assurance Plan. Include an indication of its approval status, the approval status of recent changes and a general discussion of the consistency, determined during the systems audit, between the Agency Standard Operating Procedures and the Quality Assurance Plan.
2. **Audit Participation**--Indicate frequency of participation in an audit program. Include as necessary, the agency's participation in the National Performance Audit Program (NPAP) as required by 40 CFR Part 58. Comment on audit results and any corrective actions taken.

Corrective Actions – Should EPA Region VII staff find discrepancies in the Polk County Air Quality monitoring program, it is the responsibility of Polk County Air Quality personal to rectify any problems discovered. Once action has been taken to correct the problem, Polk County Air Quality personal will contact EPA Region VII via phone, mail, e-mail or another acceptable manner as to their actions.

21.3 Data and Information Management Audits

With the implementation by many agencies of automated data acquisition systems, the data management function has, for the most part, become increasingly complex. Therefore, a complete systems audit must include a review of the data processing and reporting procedures starting at the acquisition stage and terminating at the point of data entry into the *AIRS* AQS computer system.

This audit will be performed as a part of the Technical Systems Audit performed by EPA Region VII and its staff at their discretion.

Corrective Actions – Should EPA Region VII staff find discrepancies in the Polk County Air Quality monitoring program, it will be the responsibility of Polk County Air Quality personal to rectify any problems discovered. Once action has been taken to correct the problem, Polk County Air Quality personal will contact EPA Region VII via phone, mail, e-mail or another acceptable manner as to their actions.

21.4 Network and Site Review

21.4.1 Network Review

Conformance with network requirements of the Polk County Ambient Air Monitoring Network are set forth in 40 CFR Part 58, Appendices D and E, are determined through an Annual Network Review of the Ambient Air Monitoring System. The network review is used to determine how well a particular air monitoring network is achieving its required air monitoring objective, and how it should be modified to continue to meet its objective. Polk County Air Quality will perform this review once per year in conjunction with EPA Region VII.

The following criteria will be considered during the review:

- Date of last review
- Areas where attainment/nonattainment redesignations are taking place or are likely to take place
- Results of special studies, saturation sampling, point-source oriented ambient monitoring
- Proposed network modifications

Other considerations that are emphasized during a review include:

Number of Monitors – For SLAMS, the number of monitors required for each pollutant monitored in the network is discussed in 40 CFR Part 58.

Location of Monitors – For SLAMS, the location of monitors is not specified in the regulations, but is determined by Polk County Air Quality personal in conjunction with The Iowa Department of Natural Resources. However, consideration of monitoring objectives must adhere to those specified in 40 CFR Part 58, Appendix D.

21.4.1 Site Review

The purpose of this review is to ensure that all sites adhere to siting criteria specified in 40 CFR Part 58, Appendix E. The site review will be performed by Polk County Air Quality once every three years. A site review will include, but is not limited to, the following:

- The most recent hard copy of site description including any available photographs
- Data on the seasons with the greatest potential for high concentrations for specified pollutants
- Predominant wind direction by season

Furthermore, while at the site review the following:

- Probe height above ground
- Distance from trees or roadways
- Check equipment for missing, damaged or worn-out parts

- Ensure notebook is present and is being utilized

Corrective Actions – Should any discrepancies in the monitoring network or site review occur, it is the responsibility of Polk County Air Quality personal to rectify any problems discovered. Once action has been taken to correct the problem, Polk County Air Quality personal will ensure that all activities are documented with the appropriate paperwork and filed.

22.0 Reports to Management

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

Important benefits of regular QA reports to management include the opportunity to alert the management of data quality problems, to propose viable solutions to problems, and to procure necessary additional resources. Quality assessment, including the evaluation of the technical systems, the measurement of performance, and the assessment of data, is conducted to help insure that measurement results meet program objectives and to insure that necessary corrective actions are taken early, when they will be most effective.

Effective communication among all personnel is an integral part of a quality system. Regular, planned quality reporting provides a means for tracking the following:

< adherence to scheduled delivery of data and reports,
< documentation of deviations from approved QA and test plans, and the impact of these deviations on data quality
< analysis of the potential uncertainties in decisions based on the data

22.1 Frequency, Content, and Distribution of Reports

Required reports to management for ambient air monitoring and the SLAMS program in general are discussed in various sections of 40 CFR Parts 50, 53, and 58. Guidance for management report format and content are provided in guidance developed by EPA's Quality Assurance Division (QAD) and the Office of Air Quality Planning and Standards (OAQPS). These reports are described in the following subsections.

22.1.1 QA Annual Report and Work Plan

Periodic assessments of SLAMS data quality are required to be reported to EPA (40 CFR 58 Appendix A, Section 1.4, revised July 18, 1997). Polk County Air Quality will perform the following quality control activities once per year and report the results to EPA AIRS.

- Flow rate audits
- Collocated Federal Reference Method Samplers (Section 3.5.2)
- Assessment of Bias Using the FRM Audit procedure (Section 3.5.3)

EPA will perform the calculations as prescribed in 40 CFR Part 58, Appendix A, Section 5. These calculations will use the QC results submitted to AIRS by Polk County Air Quality.

22.1.2 Network Review

As required by 40 CFR Part 58, Appendix A, Section 4(a), revised July 18, 1997, Polk County Air Quality will provide a list of all monitoring sites and their AIRS site identification codes to the EPA Region VII office and AIRS. This list is part of the Annual SLAMS report. The Network Review will be completed and copies submitted to EPA Region VII and Iowa DNR no later than March 15th of each year. Polk County Air Quality will notify EPA Region VII and AIRS of any changes to the list of monitoring sites.

22.1.3 Quarterly Reports

Each quarter, Polk County Air Quality will report to AIRS, the results of all precision, bias and accuracy tests it has carried out during the quarter. The quarterly reports will be submitted, consistent with the data reporting requirements specified for air quality data as set forth in 40 CFR Parts 58.26, 58.35 and 40 CFR Part 58 Appendix A, Section 4.

Air quality data submitted for each reporting period will be edited, validated and entered into AIRS using the procedures described in the AIRS Users Guide, Volume II, Air Quality Data Coding. Polk County Air Quality staff will prepare the report to be reviewed and submitted by the QA Officer.

Table 22-1 Identifies the reporting periods and the dates the report is due.

Table 22-1 Quarterly Report Schedule

Reporting Period	Due on or Before
January 1-March 31	June 30
April 1-June 30	September 30
July 1-September 30	December 31
October 1-December 31	March 31 (following year)

22.1.4 Technical System Audit Reports

The Polk County Air Quality Department performs Technical System Audits of the monitoring system. These reports are issued by the QA officer and are reviewed by the Air Quality Engineer. These reports will be filed and made available to EPA personnel during their technical systems audits.

22.2 Responsible Organizations

This section outlines the responsibilities of individuals within the monitoring organization for preparing quality reports, evaluating their impact, and implementing follow-up actions. Changes made in one area or procedure may affect another part of the project. Only by defining clear-cut lines of communication and responsibility can all the affected elements of the monitoring network remain current with such changes. The documentation for all changes should be maintained and included in the reports to management. The following paragraphs describe key personnel involved with QA reporting.

Polk County Air Quality Engineer - The ultimate responsibility for the quality of the data and the technical operation of the fine particulate monitoring network rests with the Polk County Air Quality Engineer. The engineer's responsibilities with respect to air quality reporting are delegated to the Polk County Air Quality Assurance Officer. These responsibilities include defining and implementing the document management and quality assurance systems for the monitoring network.

Polk County Air Quality Assurance Officer - The Quality Assurance Officer is responsible for operation of the Air Quality Network Quality Assurance/Quality Control Program. The Quality Assurance (QA) Officer is specifically responsible for assuring the timely submittal of quarterly and annual data summary reports. The QA officer works closely with the Air Quality Monitoring Specialist with QA procedures, arranging for audits, and reporting QA data. The QA Officer is appointed by the Air Quality Engineer to be responsible for data-to-day conduct of QA activities for the Ambient Air

Monitoring Program. The QA Officer's responsibilities for QA reports to management include the following:

- < Assist the Air Quality Engineer with data quality assessments and other internal audits
- < Calculate and/or review precision and bias data generated by the collocated monitors
- < Review control charts and other laboratory QC materials
- < Monitor Response/Corrective Action Reports

Polk County Air Quality Monitoring Specialist - The Air Monitoring Specialist is responsible for identifying problems and issuing appropriate Response/Corrective Action Reports related to laboratory activities. He/she is also responsible for reviewing laboratory QC data such as control charts and for assuring that repairs and preventive maintenance are completed and that the maintenance is effective. The Air Quality Monitoring Specialist is also responsible for maintaining any documentation files as defined in the relevant SOPs. The air quality specialist will assist the QA Officer in preparing QA reports and summaries and is responsible for disseminating information appearing in audit reports and other quality-related documents. The Air Quality Monitoring Specialist is responsible for coordinating the information management activities for SLAMS/NAMS data. Specific responsibilities related to management reports include:

- < Ensuring access to data for timely reporting and interpretation
- < Ensuring timely delivery of all required data to the AIRS system

23.0 Data Review, Validation, & Verification

Success of the Polk County Ambient Air Quality Program objectives relies on data and its interpretation. It is critical that data available to users are:

- < Reliable
- < Of known quality
- < Easily accessible to a variety of users
- < Aggregated in a manner consistent with it prime use.

This section describes how Polk County will verify and validate the data collection operations associated with the Ambient Air Monitoring Network. Verification can be defined as confirmation by examination and provision of objective evidence that specified requirements have been fulfilled. Validation can be defined as confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled. Although there are a number of objectives for ambient air data, the major objective, and intended use, for the Polk County Air Quality Network is comparison to the NAAQS.

Review by EPA and approval of this QAPP, provide initial agreement that the processes described in the QAPP, if implemented, will provide data of adequate quality. In order to verify and validate the phases of the data collection operation, Polk County Air Quality will use various qualitative assessments (i.e., technical systems audits, network reviews). To verify that the QAPP is being followed, they will rely on the various quality control samples to validate that the data will meet the DQOs.

23.1 Sampling Design

Section 11 describes the sampling design for the network established by Polk County Air Quality. It covers the number of sites required, their locations, and the frequency of data collection. The objective of the sampling design is to represent the population of interest at adequate levels of spatial and temporal resolution. Most of these requirements have been described in the CFR. However, it is the responsibility of Polk County Air Quality to ensure that the intent of the regulations are properly administered and carried out.

23.1.1 Sampling Design Verification

Verification of the sampling design will occur through three processes:

Network Design Plan Confirmation – The Network Design Plan that discusses the initial deployment of the network must be submitted, reviewed and approved by EPA prior to implementation. This process verifies the initial sampling design.

Internal Network Reviews – Once a year, Polk County Air Quality will perform a network review to determine whether the network objectives, as described in the Network Design Plan, are still being met, and that the sites are meeting the CFR siting criteria (see Section 21).

External Network Reviews – At their discretion the EPA Regional Office will conduct a network review to determine whether the network objectives, as described in the Network Design Plan, are still being met and that the sites are meeting the CFR siting criteria.

23.2 Sample Collection Procedures

23.2.1 Sample Collection Verification

Sample collection procedures, described in detail in Section 12, are developed to ensure proper sampling and to maintain sample integrity. The following processes will be used to verify the sampling collection activities:

External Technical Systems Audits – will be conducted by EPA Region VII.

The Technical Systems Audits will be used to verify that the sample collection activity is being performed as described in this QAPP and SOPs. Deviations from the sample collection activity will be noted in audit finding forms and corrected in accordance with activities described in Section 21.

23.2.2 Sample Collection Validation

The sample collection activity is just one phase of the measurement process. The use of QC samples that have been placed throughout the measurement process can help validate the activities occurring at each phase. The review of QC data such as the collocated sampling data, field blanks, the FRM performance evaluation and the sampling equipment verification checks that are described in Sections 15 and 17 can be used to validate the data collection activities. Any data that indicates unacceptable levels of bias or precision or a tendency will be flagged and investigated.

23.3 Handling of PM2.5 FRM, PM10 FRM, PM10 Metals, PM2.5 Speciation, and Air Toxics

Sections 12 and 13 detail the requirements for sample handling, including the types of sample containers and the preservation methods used to ensure that they are appropriate to the nature of the sample and the type of data generated from the sample. Due to the size of the filters and the nature of the collected particles, sample handling is on of the phases where inappropriate techniques can have a significant effect on sample integrity and data quality.

23.3.1 Verification of Sample Handling

As mentioned in the above section, External Systems Audits will be performed to ensure the specifications mentioned in this QAPP are being followed. The audits would include checks on the identity of the sample (i.e., proper labeling and chain-of-custody records), packaging in the field, and proper storage conditions (i.e., chain-of-custody and storage records) to ensure that the sample continues to be representative of the field sampler environment as it moves through the data collection operation.

23.3.2 Validation of Sample Handling

The review of data from collocated sampling, field blanks, and the FRM performance evaluations, described in Sections 15 and 17, can be used to validate the sample handling activities. Acceptable precision and bias in these samples would indicate that the sample handling activities are adequate. Any data that indicates unacceptable levels of bias or precision or a tendency will be flagged and investigated.

23.4 Analytical Procedures

Polk County Air Quality will perform no laboratory analyses of data collected from the PM2.5 FRM, PM10 FRM, PM10 Metals, PM2.5 Speciation, or Air Toxics networks. This responsibility will be given to The Iowa Department of Natural Resources and/or its contracted/appointed laboratory.

23.5 Quality Control

Sections 15 and 17 of this QAPP specify the QC checks that are to be during sample collection, handling and analysis.

23.5.1 Verification of Quality Control Procedures

As mentioned in the above sections, External Systems Audits and state Performance Evaluations will be performed to ensure the QC methods specified in this QAPP are being followed.

23.5.2 Validation of Quality Control Procedures

Validation activities of many of the other data collection phases mentioned in this subsection use the quality control data to validate the proper and adequate implementation of that phase. Therefore, validation of QC procedures will require a review of the documentation of the corrective actions that were taken when QC samples failed to meet the acceptance criteria, and the potential effect of the corrective actions on the validity of the routine data. Section 15 describes the techniques used to document QC review/corrective action activities.

23.6 Calibration

Section 17 details the calibration activities and requirements for the critical pieces of equipment in the Polk County Air Quality Monitoring Network.

23.6.1 Verification of Calibration Procedures

As mentioned in the above sections, External Systems Audits and State Performance Evaluations will be performed to calibration and corrective action specifications mentioned in this QAPP. Deviations from the calibration procedures will be documented and corrected using the procedures described in Section 21.

23.6.2 Validation of Calibration Procedures

The review of calibration data, described in Sections 15 and 17, can be used to validate calibration procedures. Calibration data within the acceptance requirements would indicate that the sample collection measurement devices are operating properly. Any data that indicates unacceptable levels of bias or precision or a tendency will be flagged and investigated as described in Sections 15 and 17. This investigation could lead to a discovery of inappropriate calibration procedures, or equipment problems requiring corrective action as detailed in this section. Validation would include the review of the documentation to ensure corrective action was taken as prescribed in the QAPP.

23.7 Data Reduction and Processing

23.7.1 Verification of Data Reduction and Processing Procedures

As mentioned in the above sections, External Systems Audits and State Performance Evaluations will be performed to ensure the data reduction and processing activities specified in this QAPP are being followed.

23.7.2 Validation of Data Reduction and Processing Procedures

As part of the audits of data quality (part of the External Technical System Audit), discussed in Section 21, a number of sample IDs, chosen at random will be identified. All raw data files, including the following will be selected:

- Sampling
- Calibration – the calibration information represented from that sampling period
- Sample handling/custody
- Corrective action
- Data reduction

This raw data will be reviewed and final concentrations will be recalculated manually by Polk County Air Quality to ensure that final values submitted to AIRS are valid. The data will also be reviewed by the Polk County Air Quality QA Officer to ensure that associated flags or any other data qualifiers have been appropriately associated with the data and that appropriate corrective actions were taken.

24.0 Validation & Verification Methods

Many of the processes for verifying and validating the measurement phases of the data collection operation have been discussed in Section 23. If these processes, as written in the QAPP, are followed, and the sites are representative of the boundary conditions for which they were selected, one would expect to achieve the appropriate DQOs. However, exceptional field events may occur and have an adverse effect on sample integrity. Similarly, it can be anticipated that some of the QC checks will fail to meet acceptance criteria. It is important to determine how these failures affect the routine data.

24.1 Data Validation and Verification Process

24.1.1 Verification of Data

Data verification is defined as the confirmation by examination and provision of objective evidence that specified requirements have been fulfilled. Polk County Air Quality will conduct a thorough review of all data involved to ensure completeness and data accuracy. All data will be reviewed for routine statistical outliers and data outside of acceptance criteria. This data will be flagged appropriately, "reverified" and entered correctly.

24.1.2 Validation of Data

Data validation is defined as examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled. The purpose of data validation is to detect and verify any data values that may not represent actual air quality conditions at the sampling station. For analytical work contracted to outside laboratories (i.e., PM2.5 FRM, PM10 FRM, PM10 Metals, PM2.5 Speciation, and Air Toxics), Polk County Air Quality's QA Officer will be responsible for validating or invalidating data. These validation decisions will be made primarily, but not exclusively, on the basis of field and/or transportation activities.

For manual methods, the first level of data validation that Polk County Air Quality will perform will be to accept or reject monitoring data based upon results from operational checks selected to monitor the critical parameters in the sampling and data reduction phases. In addition to using operational checks for data validation, Polk County will observe all limitations, acceptance limits, and warnings described in the reference and equivalent methods that may invalidate data.

Similarly, transportation activity requirements (i.e., maintenance of temperatures) will determine data validity and must be considered.

Polk County Air Quality will not use results from performance audits required in 40 CFR 58 Appendices A and B for data validation because these checks (performance audits) are intended only to assess the quality of the data.

Records of all invalid samples will be filed. Information will include a brief summary as to why the sample was invalidated along with the associated flag.

Corrective Action – Polk County will assume responsibility for identifying and correcting any problems that may arise in the field or during transportation that could affect the validity of data for a sampling period. This will be accomplished in accordance with the Polk County Air Quality SOP and documented with the appropriate paperwork.

25.0 Reconciling Results with DQOs

The DQOs for the Polk County Air Quality Ambient Air Monitoring Network were developed in Section 8. The resulting DQOs are for precision, as measure by a coefficient of variation, to be less than 10% and for relative bias to between –10% and +10%.

Polk County Air Quality will submit to AIRS the individual QC activities (precision, bias, and accuracy) as required by 40 CFR Part 58, Appendix A. EPA will perform the calculations as prescribed in 40 CFR Part 58, Appendix A. It is anticipated that EPA will perform the Data Quality Assessment.

Appendix A: Measurement Quality Objectives (MQO's)

A-1 Measurement Quality Objectives -OZONE

Requirement	Frequency	Acceptance Criteria	Information/Action
		CRITICAL CRITERIA	
One Point QC Check Single Analyzer	1/2 weeks	≤ ± 7% percent difference	0.01 – 0.10 ppm Relative to routine concentrations 40 CFR Part 58 App A Sec. 3.2
Zero/Span Check	1/2 weeks	Zero drift ≤ ± 1.5 ppb Span drift ≤ ± 7%	
		OPERATIONAL CRITERIA	
Shelter Temperature Temperature Range Temperature Control Temperature Device Check	 Daily Daily 2/year	 20 to 30°C. ± 2°C SD over 24-hours ± 2°C of standard	Generally the 20-30°C range will apply but the most restrictive operable range of the instruments in the shelter may also be used as guidance.
Precision Using 1-point QC Checks	Calculated annually and as appropriate for design value estimates	90% CL CV ≤7%	90% Confidence Limit of coefficient of variation 40 CFR Part 58 App A sec 4.1.2
Bias Using 1-point QC Checks	Calculated annually and as appropriate for design value estimates	95% CL ≤ ± 7%	95% Confidence limit of coefficient of absolute bias estimate 40 CFR Part 58 App A sec 4.1.3
Annual Performance Evaluation Single Analyzer Primary QA Organization (PQAO)	 Every site 1/year; 25% of sites quarterly Annually	 Percent difference of each audit level ≤ 15% 95% of audit % differences fall within the 1-point QC check 95% probability intervals at PQAO level of aggregation	 3 consecutive audit concentration not including zero 40 CFR Part 58 App A sec 3.2.2 40 CFR Part 58 App A sec 4.1.4
Federal Audits (NPAP) State audits	 1/year at 20% of sites audited 1/year	 Mean absolute difference ≤10% State requirements State Requirements	 40 CFR Part 58, Appendix A sec 2.4 Use information to inform reporting agency for corrective action and technical systems audits.
Verification/Calibration	Upon receipt/ adjustment/ repair 1/6 month if manual zero/span performed biweekly 1/year if continuous zero/span performed daily	All points within ± 2% of full scale of best-fit straight line Linearity error < 5%	Multi-point calibration (0 and 4 upscale points) 40 CFR part 50 App D Sec 5.2.3

Requirement	Frequency	Acceptance Criteria	Information/Action
Zero air		Concentrations below LDL	
Gaseous Standards		NIST Traceable	40 CFR Part 58 App A Sec 2.6.1.
Zero Air/Zero Air Check	1/year	Concentrations below LDL	
Ozone Local Primary Standard Certification/recertification to a Standard Reference Photometer	1/year	Single point difference ≤ ± 3%	Primary Standards usually transported to EPA Regions SRP for comparison
Ozone Transfer Standard			
Qualification	Upon receipt of TS	± 4% or ± 4 ppb (whichever greater)	Transfer Standard Doc EPA 600/4-79-056 Section 6.4
Certification	After qualification and upon receipt/ adjustment/ repair	RSD of six slopes ≤ 3.7% Std. Dev. Of 6 intercepts 1.5	Transfer Standard Doc EPA 600/4-79-056 Section 6.6 1 recertification test that then gets added to most recent 5 tests. If does not meet acceptability certification fails
Recertification to local primary standard	Beginning & end of O3 season	New Slope = ± 0.05 of previous RSD of six slopes ≤ 3.7% Std. Dev. Of 6 intercepts 1.5	
Lower detectible level	1/year	0.003 ppm	
SYSTEMATIC CRITERIA			
Standard Reporting Units	All data	ppm (final units in AQS)	
Completeness(seasonal)	Daily	75% of hourly averages for the 8-hour period	8-Hour Average
Sample Residence Times		< 20 seconds	
Sample Probe, Inlet, Sampling Train		Teflon	40 CFR part 58 App E
Siting		Un-obstructed probe inlet	40 CFR part 58 App E
EPA Standard Ozone Reference Photometer (SRP) Recertification	1/year	Regression Slope = 1.00 ± 0.01 And intercept < 3 ppb	This is usually at a Regional Office and is compared against the traveling SRP

A-2 Measurement Quality Objectives-Nitrogen Oxides (NOx)

Requirement	Frequency	Acceptance Criteria	Information/Action
CRITICAL CRITERIA			
One Point QC Check Single Analyzer	1/2 weeks	≤ ± 15% percent difference	0.02 – 0.10 ppm Relative to routine concentrations 40 CFR Part 58 App A Sec. 3.2
Zero/Span Check	1/2 weeks	Zero drift ≤ ± 1.5 ppb Span drift ≤ ± 10	
Converter Efficiency	During multi-point calibrations, span and audit 1/2 weeks	(≥96%) 96% – 104%	1) 40 CFR Part 50 App F Section 1.5.10 and 2.4.10 2) Recommendation 3) 40 CFR Part 50 App F Section 1.5.10 and 2.4.10 Regulation states > 96%, 96 – 104% is a recommendation.
OPERATIONAL CRITERIA			
Shelter Temperature Temperature Range Temperature Control Temperature Device Check	 Daily Daily 2/year	 20 to 30°C hourly avg. ± 2°C SD over 24-hours ± 2°C of standard	Generally the 20-30°C range will apply but the most restrictive operable range of the instruments in the shelter may also be used as guidance.
Precision Using 1-point QC Checks	Calculated annually and as appropriate for design value estimates	90% CL CV ≤10%	90% Confidence Limit of coefficient of variation 40 CFR Part 58 App A sec 4.1.2
Bias Using 1-point QC Checks	Calculated annually and as appropriate for design value estimates	95% CL ≤ ± 10%	95% Confidence limit of coefficient of absolute bias estimate 40 CFR Part 58 App A sec 4.1.3
Annual Performance Evaluation Single Analyzer Primary QA Organization (PQAO)	 Every site 1/year; 25% of sites quarterly Annually	 Percent difference of each audit level ≤ 15% 95% of audit % differences fall within the 1-point QC check 95% probability intervals at PQAO level of aggregation	 3 consecutive audit concentration not including zero 40 CFR Part 58 App A Sec 3.2.2 40 CFR Part 58 App A Sec 4.1.4
Federal Audits (NPAP) State audits	1/year at 20% sites audited 1/year	Mean absolute difference ≤15% State Requirements	40 CFR Part 58, Appendix A Sec 2.4 Use information to inform reporting agency for corrective action and technical systems audits.
Verification/Calibration	Upon receipt/ adjustment/ repair 1/6 month if manual zero/span performed biweekly 1/year if continuous zero/span performed daily	Instrument residence time ≤ 2 min Dynam. Parameter ≥ 2.75 ppm-min All points within ± 2% of full scale of best-fit straight line	Multi-point calibration (0 and 4 upscale points) 40 CFR Part 50 App F

Requirement	Frequency	Acceptance Criteria	Information/Action
Converter Efficiency	During multi- point cals., span and audit 1/2 weeks	96%	
Gaseous Standards		NIST Traceable	Vendor must participate in EPA Protocol Gas. Verification Program 40 CFR Part 58 App A Sec 2.6.1.
Zero Air/Zero Air Check	1/year	Concentrations below LDL	
Gas Dilution Systems	1/3 months	Accuracy ± 2%	
Detection Noise Lower Detectable Level	 NA 1/year	 0.005 ppm 0.01 ppm	 40 CFR Part 53.20
SYSTEMATIC CRITERIA			
Standard Reporting Units	All data	ppm (final units in AQS)	
Completeness(seasonal)	Quarterly	75%	Annual Standard (hourly data)
Sample Residence Times		< 20 seconds	
Sample Probe, Inlet, Sampling Train		Teflon	40 CFR part 58 App E
Siting		Unobstructed probe inlet	40 CFR Part 58 App E

A-3 Measurement Quality Objectives-TRACE LEVELCARBON MONOXIDE (TLCO)

Requirement	Frequency	Acceptance Criteria	Information/Action
CRITICAL CRITERIA			
Precision 250-500 ppb	1/2 weeks	± 10%	40 CFR Part 58 App A Sec. 3.2.1
Zero/Span Check-Level 1	Daily	Zero drift: 30 ppb Span drift: 10%	
OPERATIONAL CRITERIA			
Shelter Temperature Temperature Range Temperature Control	 Daily Daily	 20 to 30°C. ± 3°C over 24-hours	 40 CFR Part 53.20 Digital temperature recording recommended
Precision Using 1-point QC Checks	Calculated annually and as appropriate for design value estimates	90% CL CV ≤15%	
Bias Using 1-point QC Checks	Calculated annually and as appropriate for design value estimates	± 10%	
Annual Performance Evaluation Single Analyzer	Every site 1/year; 25% of sites quarterly	Mean absolute difference at each audit level ≤ 15%	
Federal Audits (NPAP) State audits	1/year at selected sites 1/year	Mean absolute difference at each audit level ≤15% State requirements State Requirements	Use information to inform reporting agency for corrective action and technical systems audits.
Verification/Calibration	Upon receipt/ adjustment/ repair 1/6 month	Slope 1.00 ± 0.02 Intercept ± 40 ppb $R^2 = 0.995$	Multipoint calibration- at least 4 points including zero
Zero air	Annual zero air purity check	< 40 ppb	Check zero air generator against an independent standard
Gaseous Standards	NIST Traceable 200-300ppm	1%	Vendor must participate in EPA Protocol Gas. Verification Program 40 CFR Part 58 App A Sec 2.6.1.

Requirement	Frequency	Acceptance Criteria	Information/Action
Gas Dilution Systems (MFC) 0-20 LPM air flow 0-100 cc/min gas flow Accuracy 1% (NIST Traceable)	1/6 months	Linearity: ± 1% Precision: ± 1%	Verify air and gas flows with a NIST traceable primary or secondary standard. If a secondary standard is used, it must be certified against a NIST primary standard annually.
Detection Noise Lower Detectable Level Method Detection Limit	 1/year 1/year 1/year	 20 ppb RMS 40 ppb 18 ppb	
SYSTEMATIC CRITERIA			
Standard Reporting Units	All data	ppb (final units in AQS)	Data reported hourly Data stored locally 5 minute values
Completeness(seasonal)	 Annually 24-hours 1-hours	 75% of daily values 75% of hourly values 75% of hour	Goal is 90%
Sample Residence Times		< 20 seconds	40 CFR part 58 Appendix E
Sample Probe, Inlet, Sampling Train	Continually	FEP & PTFE (Teflon)	40 CFR part 58 Appendix E
Siting	Continually	Un-obstructed probe inlet	40 CFR part 58 Appendix D & E

A-4 Measurement Quality Objectives-TRACE LEVEL SULFUR DIOXIDE-(Trace SO2)

Requirement	Frequency	Acceptance Criteria	Information/Action
CRITICAL CRITERIA			
Precision 5-20 ppb	1/2 weeks	± 10%	40 CFR Part 58 App A Sec. 3.2.1
Zero/Span Check-Level 1	Daily	Zero drift: 0.20 ppb Span drift: 10%	Criteria Pollutant MQO Table uses % full scale
OPERATIONAL CRITERIA			
Shelter Temperature Temperature Range Temperature Control	 Daily Daily	 20 to 30°C. ± 3°C over 24-hours	 40 CFR Part 53.20 Digital temperature recording recommended
Precision Using 1-point QC Checks	Calculated annually and as appropriate for design value estimates	90% CV ≤10%	
Bias Using 1-point QC Checks	Calculated annually and as appropriate for design value estimates	± 10%	
Annual Performance Evaluation Single Analyzer	Every site 1/year; 25% of sites quarterly	Mean absolute difference at each audit level ≤ 15%	
Federal Audits (NPAP) State audits	1/year at selected sites 1/year	Mean absolute difference at each audit level ≤15% State requirements State Requirements	Use information to inform reporting agency for corrective action and technical systems audits.
Verification/Calibration	Upon receipt/ adjustment/ repair 1/6 month	Slope 1.00 ± 0.02 Intercept ± 0.5 ppb $R^2 = 0.995$	Multipoint calibration- at least 4 points including zero
Zero air	Annual zero air purity check	< 0.1 ppb	Check zero air generator against an independent standard
Gaseous Standards	NIST Traceable 10-13 ppm	1%	Vendor must participate in EPA Protocol Gas. Verification Program 40 CFR Part 58 App A Sec 2.6.1.

Requirement	Frequency	Acceptance Criteria	Information/Action
Gas Dilution Systems (MFC) 0-20 LPM air flow 0-100 cc/min gas flow Accuracy 1% (NIST Traceable)	1/6 months	Linearity: ± 1% Precision: ± 1%	Verify air and gas flows with a NIST traceable primary or secondary standard. If a secondary standard is used, it must be certified against a NIST primary standard annually.
Detection Noise Lower Detectable Level Method Detection Limit	 1/year 1/year 1/year	 0.050 ppb RMS 0.100 ppb 0.055 ppb	
SYSTEMATIC CRITERIA			
Standard Reporting Units	All data	ppb (final units in AQS)	Data reported hourly Data stored locally 5 minute values
Completeness(seasonal)	 Annually 24-hours 1-hours	 75% of daily values 75% of hourly values 75% of hour	Goal is 90%
Sample Residence Times		< 20 seconds	40 CFR part 58 Appendix E
Sample Probe, Inlet, Sampling Train	Continually	FEP & PTFE (Teflon)	40 CFR part 58 Appendix E
Siting	Continually	Un-obstructed probe inlet	40 CFR part 58 Appendix D & E

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A-5 Measurement Quality Objectives – PARAMETER PM_{10} and $PM_{2.5}$					
Requirement	**Frequency**	**Acceptance Criteria**	**Information/Action**	**Acceptance Criteria Met Monthly, Quarterly or Yearly Objective**	**Comments**
Filter Holding Times Pre-sampling Post-sampling weighing	 All filters "	<30 days before sampling <10 days to 25 degrees C from sample end date <30 days at 4 degrees C from sample end date	 Sec. 7.9 Sec. 7.11 "		
Sampling Period	All data	1380-1500 minutes or value if <1380 and exceedance of NAAQS			
Reporting Units	All data	µg/m3	Sec. 11.1		
Detection Limit Lower DL Upper Conc. Limit	 All data All data	 2 µg/m3 200 µg/m3			
Sampling Instrument Flow Rate Filter temp sensor	 Every 24 hours of op	 <5% of 16.67 <2% CV measured <5% average for <5 min. <5 degrees C of ambient for <30 min.			
Data Completeness	quarterly	75%	Part 50, App. N, Sec. 2.1		

Measurement Quality Objectives – PARAMETER PM_{10} and $PM_{2.5}$					
Requirement	**Frequency**	**Acceptance Criteria**	**Information/Action**	**Acceptance Criteria Met Monthly, Quarterly or Yearly Objective**	**Comments**
Filter	All Filters	See reference	Sec. 7.5		
Visual Defect Check			Sec. 7.6		
Filter Conditioning					
Environment	All Filters	24 hours minimum	Sec. 7.6		
Equilibration	"	20-23degrees c	"		
Temp. Range	"	+_2 degrees C SD over 24	"		
Temp. Control	"	hr.	"		
Humidity Range	"	30% - 40% RH or +_5% sampling RH but	"		
Humidity Control	"	>20%RH			
Pre-post sampling RH	"	+_5% SS over 24 hr.			
Balance	"	+_5% RH			
	"	located in filter conditioning environment			
Filter Checks					
Lot Blanks	9 filters per lot	Less than 15 µg change between weighings	Sec. 7.7		
Exposure Lot Blanks	3 filters per lot	Less than 15 µg change between weighing	Sec. 7.7		
Lab QC checks	10% or 1 per weighing session				
Field filter blank		+_30 µg change between weighings	Sec. 7.7		
Lab filter blank	10% or 1 per weighing session	+_15 µg change between weighings	Sec. 7.7		
Balance Check	beginning every 10^{th} sample, end	<3 µg	Sec. 7.9		
Duplicate filter weighing session	1 per weighing session	+_15 µg change between weighings	Sec. 7.11		

Measurement Quality Objectives – PARAMETER PM_{10} and $PM_{2.5}$					
Requirement	**Frequency**	**Acceptance Criteria**	**Information/Action**	**Acceptance Criteria Met Monthly, Quarterly or Yearly Objective**	**Comments**
Calibration/Verification					
Flow rate(FR) Calibration	If multi-point failure	+_ 2% of transfer standard	Sec 6.3		
FR multi-point verification	1/yr	+_2% of transfer standard	Sec 6.3 & 8.4		
One point FR verification	¼ weeks	+_4% of transfer standard	Sec. 8.4		
		+_4% of transfer standard	Sec. 8.4		
External Leak Check	every 5 sampling events	80 mL/min	Sec. 6.6 & 8.4		
Internal Leak Check	every 5 sampling events	80 mL/min	Sec. 6.6 & 8.4		
Temperature Calibration	if multi-point failure	+_2% of standard	Sec. 6.4		
Temp M-point Verification	on installation, then 1/yr	+_2% of standard	Sec. 6.4 and 8.4		
One-point temp Verification	¼ weeks	+_4 C of standard	Sec. 6.4 and 8.4		
Pressure calibration	on installation, then 1/yr	+_10 mm Hg	Sec. 6.5		
Pressure verification	1/4 weeks	+_10 mm Hg	Sec. 8.2		
Clock-timer verification	1/4 weeks	1 min/mo	Not described		
Accuracy					
FRM Performance Evaluation	25% of sites 4/yr	+_10%	Sec. 10.2		
External Leak Check	4/yr	<80 mL/min	Sec. 10.2		
Internal Leak Check	4/yr	<80 mL/min	"		
Temperature Audit	4/yr	+_2 C	"		
Pressure Audit	4/yr(?)	+_10 mm Hg	"		
Balance Audit	1.yr	Manufacturers specs	"		
Accuracy	½ wk (automated)				
Flow Rate Audit	4/yr (manual)	+_4% of audit standard	Sec. 10.2		
Precision					
Collocated samples	Every 6 days for 25% of sites	CV<10%	Sec. 10.2		
Single analyzer	1/3 mo.	CV<10%	Not described		
Single analyzer	1/yr.	CV<10%	Not described		
Reporting Org.	1/3 mo.	CV<10%	Not described		
Calibration & Check Standards					
Flow rate transfer std.	1/yr	+_2% of NIST-traceable Std			
Field thermometer	1/yr	+_0.1 degrees C resolution +_0.5 degrees C accuracy			
Field barometer	1/yr	+_1 mm Hg resolution +_ mm Hg accuracy			
Working mass stds.	3-6 mo.	0.025 mg			

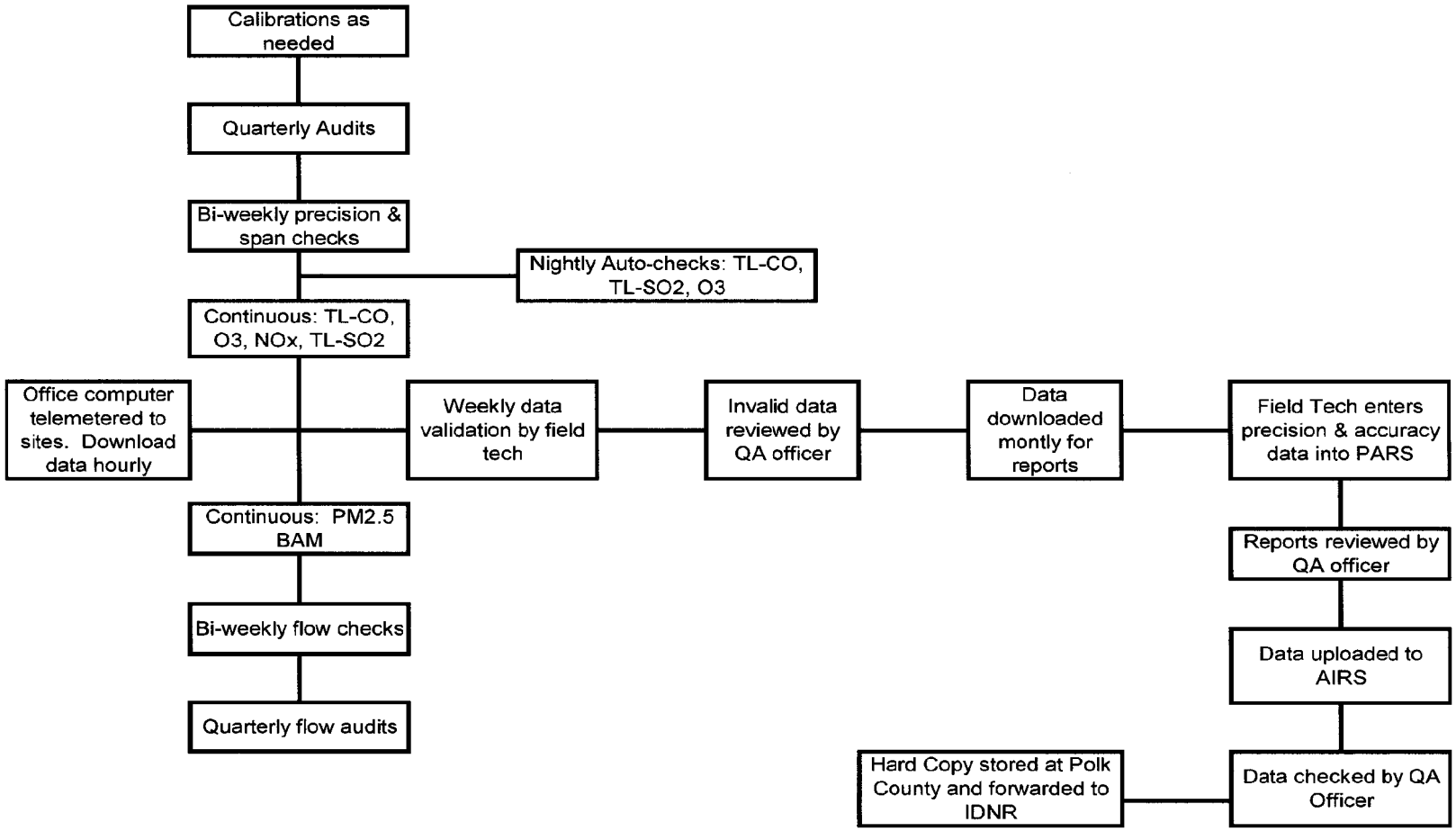
Primary mass stds.	1/yr	0.025 mg		

Measurement Quality Objectives – PARAMETER PM_{10} and $PM_{2.5}$

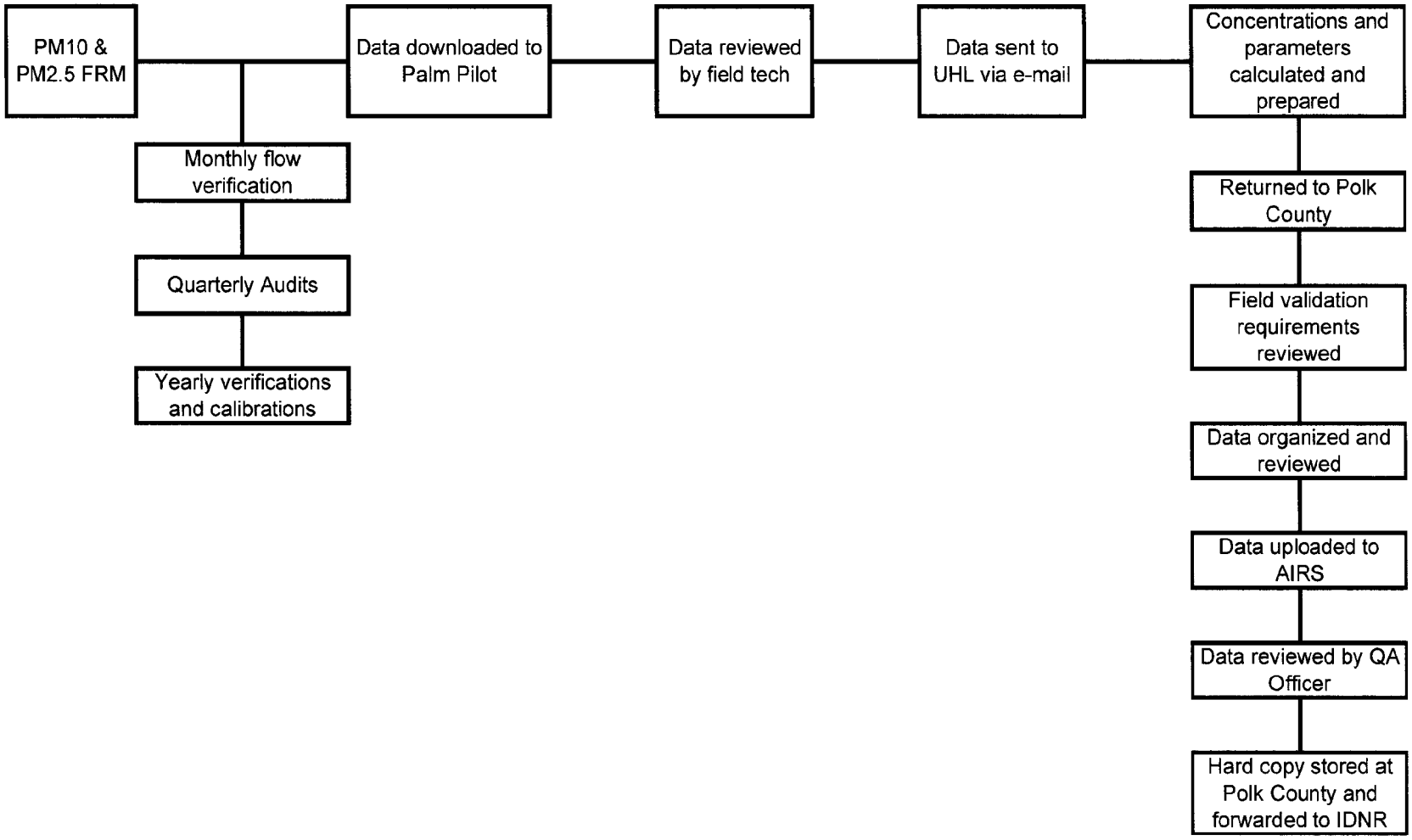
Requirement	Frequency	Acceptance Criteria	QA Guidance Document 2.12 Reference	Acceptance Criteria Met Monthly, Quarterly or Yearly Objective	Comments
Precision					
Collocated samples	Every 6 days for 25% of sites	CV<10%	Sec. 10.2		
Single analyzer	1/3 mo.	CV<10%	Not described		
Single analyzer	1/yr.	CV<10%	Not described		
Reporting Org.	1/3 mo.	CV<10%	Not described		
Calibration & Check Standards					
Flow rate transfer std.	1/yr	+_2% of NIST-traceable Std	Sec. 6.3		
Field thermometer	1/yr	+_0.1 degrees C resolution +_0.5 degrees C accuracy	Sec. 4.2 & 6.4 "		
Field barometer	1/yr	+_1 mm Hg resolution +_ mm Hg accuracy	" "		
Working mass stds.	3-6 mo.	0.025 mg	Sec. 4.3 and 7.3		
Primary mass stds.	1/yr	0.025 mg	"		

Appendix B: Data Handling Flowcharts

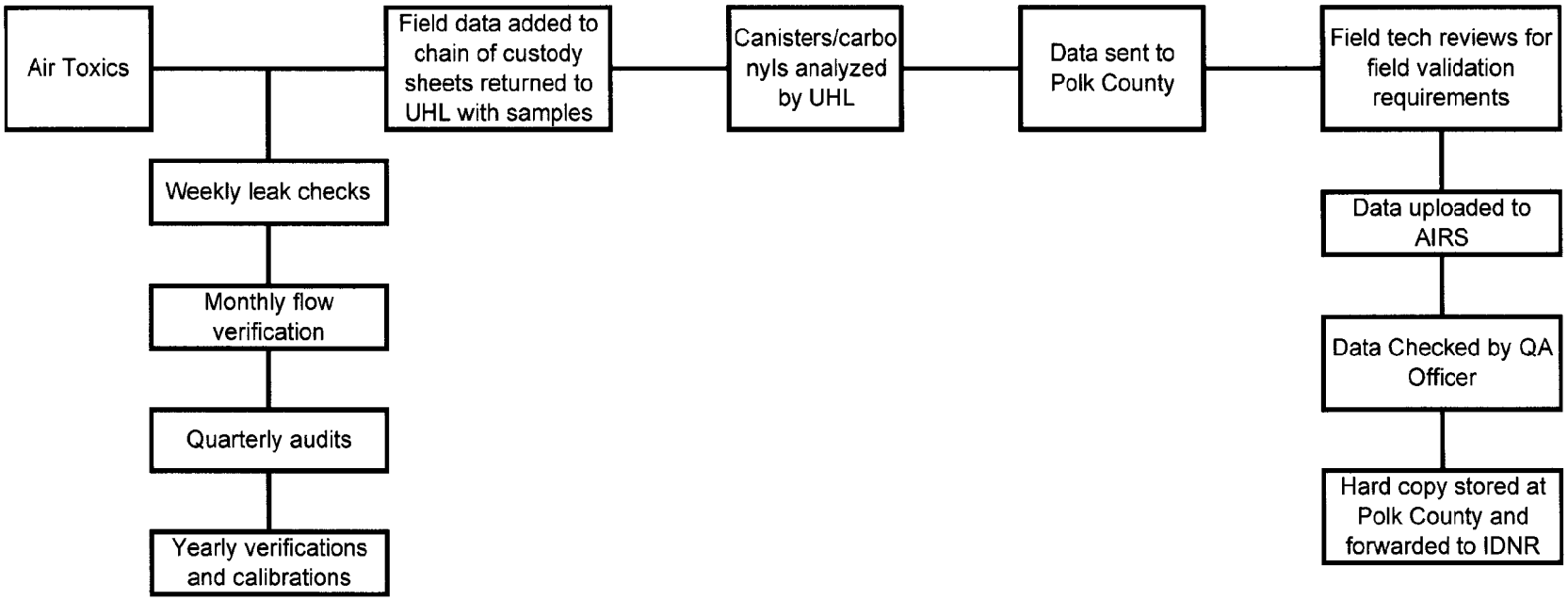
DATA HANDLING FLOW CHART: CONTINOUS DATA



DATA HANDLING FLOW CHART: PM10 FRM, PM2.5 FRM



DATA HANDLING FLOW CHART: AIR TOXICS



DATA HANDLING FLOW CHART: PM2.5 SPECIATION