THE STATE OF IDAHO AMBIENT AIR QUALITY MONITORING PROGRAM

Quality Assurance Project Plan

State of Idaho
Department of Environmental Quality

Air Quality Division

Version 5.5

January 5, 2021

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Version 5.5 Revision List	
Amended Section	**Reason for Amendment**
All	General edits, including redefine specific position related roles at DEQ, minor grammatical changes and updated figures and tables. Added acronym list.
Section 5.2	Clarified intended use for CRB monitors.
Section 10.2	Included the CRB Program description as an intended use.
Section 12.1	Included the use of electronic log book software, eSIMS.
Section 13.0	Updated the nephelometer description to accommodate the use of Met One E-Samplers.
Section 14	Added description of low level gas audit points at DEQ.
Section 19.2	Described the data transformation process applied to E-Sampler concentrations.
Table 3	Revised BOL TSA occurrence rate from annual to every three years.
Appendix A	Updated the list of SOPs.
Appendix B	Updated the list of BOL SOPs.

Title: DEQ Ambient Air Quality Monitoring Quality Assurance Project Plan (QAPP)

Region/Division: State of Idaho

Version Number: 5.5

Date: January 5, 2021

Approval Signatures

Note: This QAPP becomes effective on the date of the last approval signature.

AQ Monitoring Supervisor
Signature: _____ 01/06/2021
Name: ***Ben Seely*** ***Date***

AQ Data Bureau Chief
Signature: _____ 01/06/2021
Name: ***Steve Miller*** ***Date***

AQ Divisional Administrator
Signature: _____ 01/06/2021
Name: ***Tiffany Floyd*** ***Date***

EPA R10 Air Monitoring QA Coordinator
Signature: _____ 01/7/2021
Name: ***Chris Hall*** ***Date***

2. Table of Contents

List of Tables

List of Figures

Abbreviations, Acronyms, and Symbols

ADQ	data quality Audit
AQI	Air Quality Index
AQS	Air Quality System
BAM	Beta Attenuation Monitor
BOL	Idaho Bureau of Laboratories
CARB	California Air Resource Board
CFR	Code of Federal Regulation
CM	Content Manager
CRB	Crop Residue Burning
CSN	Chemical Speciation Network
CO	Carbon Monoxide
COC	Chain of Custody
DAS	Data Acquisition System
DEQ	Idaho Department of Environmental Quality
DQA	Data Quality Audit
DQI	Data Quality Indicators
DQO	Data Quality Objective
EPA	Environmental Protection Agency
EDMS	electronic document management system
FEM	Federal Equivalent Method
FRM	Federal Reference Method
IDHW	Idaho Department of Health and Welfare
INL	Idaho National Laboratory
IR	Infrared Radiation
MDL	Method Detection Limits
MSR	Management Systems Review
MOA	Memorandum of Agreement
MQO	Measurement Quality Objectives
NAAQS	National Ambient Air Quality Standards
NIST	National Institute of Standards and Technology
NO	Nitric oxide
NO2	Nitrogen Dioxide
NOx	Nitrogen oxides
NOy	Total Reactive Nitrogen
NPEP	National Performance Evaluation Program
OAQPS	Office of Air Quality Planning and Standards

O_3	Ozone
PQAO	Primary Quality Assurance Organization
PAMS	Photochemical Assessment Monitoring Stations
Pb	Lead
PEP	Performance Evaluation Program
$PM_{2.5}$	particulate matter with diameter less than or equal to 2.5 microns
PM_{10}	particulate matter with diameter less than or equal to 10 microns
PRR	Public Records Request
QA	Quality Assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
QMS	Quality Management System
SCC	Sharp Cut Cyclone
SLAMS	State and Local Air Monitoring Stations
SO_2	Sulfur Dioxide
SOP	Standard Operating Procedure
SPMS	Special Purpose Monitoring Stations
UV	Ultraviolet

3. Distribution List

A hard copy of this *Quality Assurance Project Plan for the State of Idaho Ambient Air Quality Monitoring Program* (QAPP) has been distributed to the individuals listed in Table 1. Those listed receive controlled copies and are responsible for ensuring that any staff associated with the project are using the most current version of the QAPP. The document can also be obtained from the Air Monitoring Supervisor. The master copy is stored in DEQ's electronic document management system (EDMS) known as HPE Content Manager (CM).

Table 1. Idaho Ambient Air Quality Monitoring Program QAPP Distribution List

Position	Project Affiliation	Location
Department of Environmental Quality		
Tiffany Floyd	AQ Divisional Administrator	DEQ State Office
Gerry Smith	Quality Assurance Manager	DEQ State Office
Steve Miller	AQ Data Bureau Chief	DEQ State Office
Ben Seely	AQ Monitoring Supervisor	DEQ State Office
Mary Walsh	AQ Monitoring Analyst	DEQ State Office
Shawn Sweetapple	AQ Regional Manager	Coeur d'Alene Regional Office
Phillip Hagihara	AQ Regional Manager	Lewiston Regional Office
David Luft	AQ Regional Manager	Boise Regional Office
Bobby Dye	AQ Regional Manager	Twin Falls Regional Office
Melissa Gibbs	AQ Regional Manager	Pocatello Regional Office
Rensay Owen	AQ Regional Manager	Idaho Falls Regional Office
Idaho Bureau of Laboratories		
Ernest Bader	Manager, Chemistry Section	Idaho Bureau of Laboratories, Boise
U.S. Environmental Protection Agency, Region 10		
Chris Hall	Air Monitoring QA Coordinator	Seattle, WA
Donald Brown	EPA R10 QA Manager	Seattle, WA

4. Project/Task Organization

DEQ is organized into eight main divisions: Administration, INL (Idaho National Laboratory) Oversight, Environmental Management and Information, Air Quality, Waste and Remediation, Water Quality, Regional Offices, and Technical Services. DEQ's Director has the overall responsibility for managing these divisions according to stated

DEQ policy. The Director delegates the responsibility and authority to develop, organize, and maintain quality programs to the DEQ Quality Manager. The DEQ Quality Assurance Manager also delegates the responsibility and authority to implement quality programs and procedures to the Administrators of each Division, in accordance with the *DEQ Quality Management Plan*. Responsibility for assuring data quality belongs to these Administrators and the managers that report to them.

A Memorandum of Agreement (MOA) has been established between DEQ and Idaho Bureau of Laboratories (BOL) to perform quality control audits, calibration device certification, and analysis of air samples. BOL is responsible for managing service agreements between the BOL and DEQ. The laboratory is responsible for preparation of all associated and necessary Quality Assurance (QA) documents in order to perform these tasks.

The MOA is reviewed and approved annually by the Directors of DEQ and Idaho Department of Health and Welfare (IDHW), AQ Divisional Manager and BOL's Chemistry Section Manager.

The organizational structure of DEQ for the implementation of the monitoring program is shown in Figure 1. The following information lists the specific responsibilities of each significant position within DEQ.

4.1 Air Quality Division

The Air Quality Division contains the Air Quality Data Bureau which is responsible for coordinating all aspects (quality assurance, data collection, and data processing) of DEQ's Ambient Air Quality Monitoring Program.

Administrator. The Air Quality Division Administrator has direct access to the Director on all matters relating to DEQ's operation. The Administrator's duties include, but are not limited to:

- providing program-wide consistent policy;
- submitting certified data to Environmental Protection Agency (EPA).

AQ Data Bureau Chief. The AQ Data Bureau Chief manages the Air Quality Data Bureau and reports to the Administrator of the Air Quality Division. The Bureau Chief's duties include:

- manage statewide monitoring budget;
- negotiate and report on work plans;
- oversight of procurement;
- securing funding for present and future network needs, and
- develop and administer contracts and special grants.

AQ Monitoring Supervisor. The Monitoring Supervisor reports to the AQ Data Bureau Chief and is responsible for coordinating the activities of the state monitoring program. The Monitoring Supervisor's duties include:

- Is the Quality Assurance Officer (QAO) for the Air Quality Monitoring Program;
- assuring timely and appropriate maintenance of all quality control (QC) and QA documents kept by regional office staff, such as site logs and QC charts;
- conducts final data validation and releases quarterly data for Air Quality Systems (AQS) submittal;
- liaison to EPA for monitoring program oversight;
- organize collection, verification, and reporting data;
- managing and assessing the effectiveness of the network system;
- ensuring/coordinating training availability and utilization;
- responding to public records requests (PRR);
- ensuring timely and appropriate standard operating procedure (SOP) and Quality Assurance Project Plan (QAPP) updates, and
- maintains the master copy of SOPs and QAPP. Communicates revisions to appropriate teams

Air Monitoring Analyst. The Monitoring Analyst reports to the Monitoring Supervisor and is responsible for coordinating the monitoring activities for the state. The Monitoring Analyst's duties include:

- maintaining data acquisition systems;
- submittal of air monitoring data to EPA's AQS database;
- complete data analysis and regression modeling;
- monthly and quarterly data submission;
- assist with exceptional events notification and documentation;
- responding to PRRs; and
- draft EPA data submittal certification letter;
- selecting and purchasing new monitoring instruments, consumables and audit standards.

4.2 Regional Offices

Regional Administrators. Regional Administrators report directly to the DEQ Director. Regional Administrators have the overall responsibility of ensuring the implementation of the DEQ QA Program at the regional level. They direct the activities of the Regional Air Quality Managers.

AQ Regional Managers. The Regional Managers report directly to the regional administrators and are directly responsible for the activities of the monitoring program staff at the regional offices. Their responsibilities include:

- coordinating and reviewing the collection of environmental data,
- acquiring resources and maintaining budgets pertinent to the collection of environmental data,
- implementing the DEQ's QA Program within the region,

- acting as conduits for information to regional monitoring staff,
- training staff in the requirements of an applicable QAPP, and
- ensuring that monitoring personnel follow the QAPP.

Regional Monitoring Staff. The Regional Monitoring Staff's duties include:

- ensuring that monitoring programs incorporate QA elements of SOPs and the QAPP;
- assisting in the acquisition of resources and maintenance of equipment and inventories;
- recertification and maintenance of audit standards;
- initiating corrective action;
- collecting, calculating, reviewing environmental data and flagging suspect values;
- submit notification to Air Monitoring Supervisor that preliminary data validation and editing is complete, on a quarterly basis;
- participating in training and certification activities;
- verifying that all required QC activities are performed and that measurement quality objectives are met as prescribed in the QAPP;
- documenting deviations from established procedures and methods;
- reporting nonconforming conditions and corrective actions to the Regional Air Manager, Monitoring Supervisor, and the Monitoring Analyst; and
- preparing reports for the Air Quality Monitoring Section.

4.3 Idaho Bureau of Laboratories (BOL)

Bureau Chief. The Bureau Chief of the Idaho Bureau of Laboratories is responsible for managing service agreements between the BOL and Department of Environmental Quality (DEQ). The Bureau Chief also ensures that the BOL performs laboratory and analytical services in compliance with the BOL Quality Plan and adheres to the guidance and protocols prescribed by DEQ QAPP and SOPs for laboratory activities.

Chemistry Section Manager. The Chemistry Section Manager at the BOL reports directly to the Bureau Chief. The Manager's duties include:

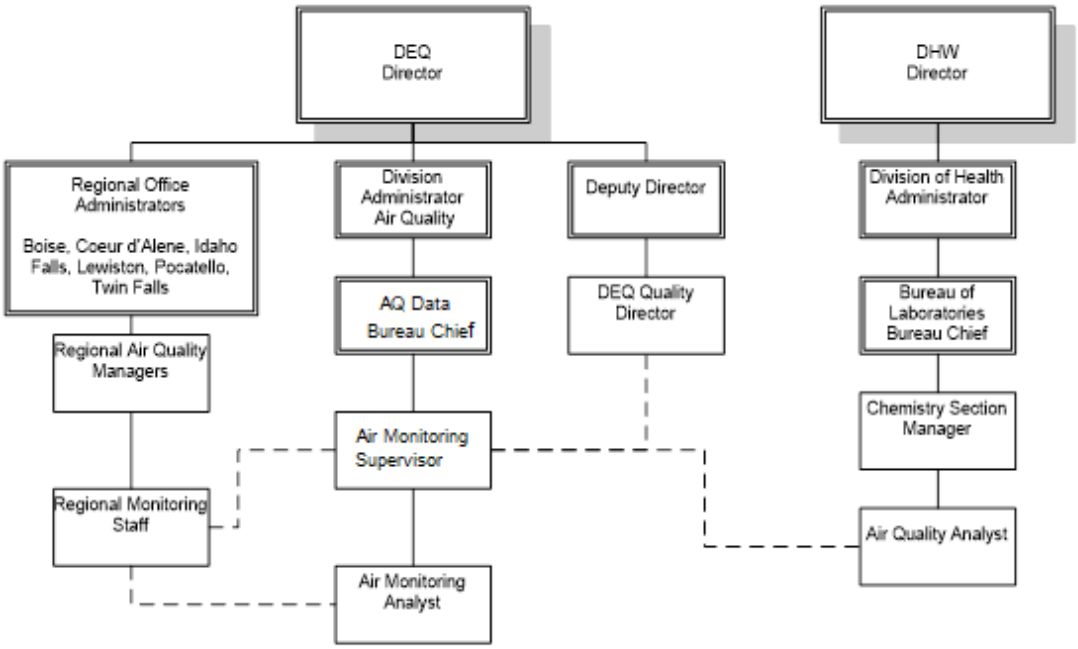
- directing the activities of laboratory personnel;
- ensuring the implementation of laboratory SOPs and sections of the DEQ QAPP as they pertain to filter processing;
- preparing and updating laboratory SOPs and good laboratory practices documents;
- verifying all required QA activities are performed and that measurement quality standards are met; and
- providing training and certification to laboratory personnel
- operating air filter laboratory according to approved SOPs;

- maintaining QA records, flagging suspect data, and assessing and reporting on laboratory data quality;
- performing and documenting all maintenance of laboratory equipment;

Air Quality Analyst. The Air Analyst at the BOL reports directly to the Chemistry Section Manager. The Air Analyst's duties include:

- preparing and delivering data to the Regional Offices and Air Quality Division in a timely manner;
- providing performance audit services to DEQ for its monitoring network;
- providing equipment acceptance testing and readiness certification of field equipment;
- certification of calibration standards used by regional office staff; and
- performs filter weighing services

Figure 1. Idaho Ambient Air Monitoring Organization Chart.



* Dashed lines indicate major program quality assurance interactions

5. Problem Definition/Background

5.1 Problem Statement

The Clean Air Act, which was last amended in 1990, requires EPA to set National Ambient Air Quality Standards (40 CFR part 50) for pollutants (called criteria pollutants) considered harmful to public health and the environment. The Clean Air Act established two types of national air quality standards. ***Primary standards*** set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. ***Secondary standards*** set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

The Clean Air Act and its amendments provide the framework for protecting air quality. In order to protect air quality, active environmental data collection operations must be established and operated in a manner that assures that the most applicable and highest quality data are collected.

Idaho's ambient air quality monitoring program measures air quality for a variety of reasons the most notable of which is for assessing compliance with National Ambient Air Quality Standards (NAAQS). The NAAQS establish numerical limits for a number of criteria pollutants. These include: particulate matter [particles with an average aerodynamic diameter of 10 micrometers or less (PM_{10}) or 2.5 micrometers or less ($PM_{2.5}$)]), sulfur dioxide [SO_2], carbon monoxide [CO], oxides of nitrogen [NO_x], ozone [O_3], and lead [Pb]. The current NAAQS standards are published on the EPA website and can be found at https://www.epa.gov/criteria-air-pollutants/naaqs-table.

Additionally, Idaho's ambient air quality monitoring program operates monitors for collection of information as part of the Chemical Speciation Network (CSN), for Idaho's smoke management program, and occasionally for special-purpose studies.

EPA policy requires that all projects involving the generation, acquisition, and use of environmental data be planned and documented and have an agency-approved QAPP. The QAPP is the critical planning document for any environmental data collection operation because it documents how QA and QC activities will be implemented during the project's life cycle.

The Idaho Ambient Air Quality Monitoring QAPP has undergone several revisions over the years dating back to 1987. This document is the latest revision which documents the principles and procedures DEQ adheres to for the ambient air quality monitoring program.

The purpose of this QAPP is to prescribe requirements, procedures, and guidelines for the Idaho Ambient Air Quality Monitoring Program. It is intended to serve as a reference document for implementing the DEQ QA/QC program and provides detailed operational procedures for the measurement processes used by DEQ.

The QAPP is a compilation of QA requirements, procedures, and guidelines that are applicable to air pollution and meteorological measurements systems. They are designed to achieve a high percentage of valid data samples (>95%) while maintaining integrity and accuracy within prescribed limits. This QAPP clearly and thoroughly establishes QA protocols and QC criteria required to successfully implement and maintain the state of Idaho's Ambient Air Quality Monitoring program. The monitoring program is administered by DEQ. It is the responsibility of DEQ to ensure that the QA/QC programs for the field, laboratory, and data processing phases of the monitoring program are implemented.

Quality assurance is a system of management activities designed to ensure that the data produced by the operation will be of the type and quality needed and expected by the data user. Quality control defines the procedures implemented to assure that acceptable precision, bias, completeness, representativeness, and comparability are obtained and maintained in the generated data set. Quality control procedures, when properly executed, provide data that meet or exceed the minimum acceptable quality criteria established to assist management in making confident decisions. It is the policy of DEQ to implement a QA program and QC procedures to assure that data of known and acceptable precision, bias, completeness, comparability, and representativeness are collected in all monitoring projects.

5.2 Intended Usage of Data

The data collected by the ambient air quality monitoring network is used by a wide audience, for a variety of purposes:

(a) **Provide air pollution data to the general public and air program managers in a timely manner**. Data can be presented to the public in a number of attractive ways including air quality maps, newspaper articles or advertisements, internet sites, and as part of weather forecasts and public advisories. Real-time data is used to publish the daily Air Quality Index (AQI), forecasting future air quality, assessing impacts from unplanned emergencies and assisting smoke managers in making burn decisions.

(b) **Provide support for determining compliance with ambient air quality standards and developing emissions control strategies**. Data from qualified monitors for criteria pollutants will be used for comparing an area's air pollution levels against the NAAQS. Monitoring data is used in the development of air quality improvement and maintenance plans. State and Local Air Monitoring Stations (SLAMS), and especially NCore station data, will be used to evaluate the regional air quality models used in developing emission strategies, and to track trends in air pollution abatement control measures' impact on improving air quality. In monitoring locations near major air pollution sources, source-oriented monitoring data can provide insight into how well industrial sources are controlling their pollutant emissions.

(c) **Provide support for air pollution research studies**. Air pollution data from the NCore multi-pollutant monitoring network can be used to supplement data collected by researchers working on health effects assessments and atmospheric processes, or for monitoring methods development work.

(d) **Provide support for CRB program.** DEQ uses seasonal monitors for the state's Crop Residue Burning (CRB) Program. This program oversees agricultural burning to limit smoke impacts, particularly to sensitive populations (i.e., schools and hospitals). The monitors are only active during the agricultural burning season and may only operate for about 2–5 months in any given year. As a result of these unique objectives and conditions, the data from these monitors is not submitted to EPA's AQS database.

6. Project / Task Description

6.1 General Overview of Project

This QAPP was developed to ensure that Idaho's air monitoring network collects ambient and meteorological data that meet or exceed DEQ and EPA quality assurance requirements. Upon final validation of data, it is entered into the EPA AQS database, and is available to a variety of data users for a number of purposes.

Figure 2 shows the distribution of ambient air quality monitoring sites throughout the state of Idaho. For more specific information on the DEQ monitoring network, please refer to the latest Annual Ambient Monitoring Network Plan, which can be found on DEQ's web site: http://www.deq.idaho.gov/air-quality/monitoring/monitoring-network/.

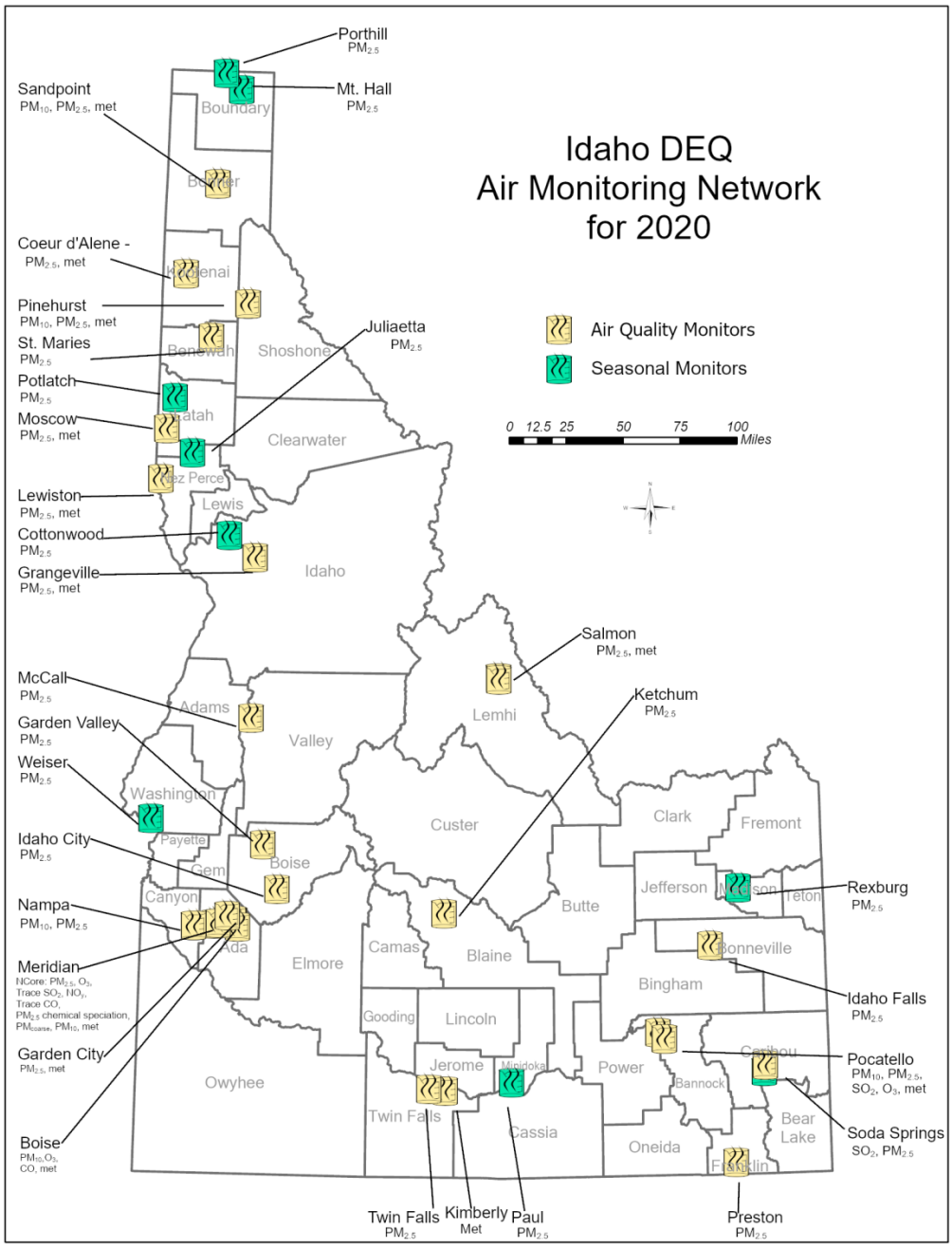
DEQ's ambient air monitoring network configuration hopes to achieve specific objectives, including:

- is of appropriate density, sampler location, and sampling frequency;
- addresses pollutants of concern for the airshed;
- provides associated surface meteorological data; and
- has accurate and reliable data recording equipment, procedures, and software.

To successfully support and interpret data collected by the ambient air monitoring network, it is essential the DEQ develop and provide encompassing documentation for:

- data collection and report format, content, and schedules;
- quality objectives, measurement criteria, and indicators for data quality;
- SOPs providing activities and schedules for equipment operation and preventative maintenance; and
- establishing assessment criteria and schedules.

Figure 2. Idaho Monitoring Network Map



6.2 Project Timetable

Personnel associated with the ambient air quality monitoring program perform all activities in a manner that supports continued successful operation of the statewide ambient air quality monitoring network. As such, SOP's exist that document the DEQ approved procedures and critical data validation criteria for all aspects of the monitoring

program. These SOP's cover the specific field activities of providing periodic preventative maintenance and service to equipment located at DEQ's State and Local Air Monitoring Stations (SLAMS), Special Purpose Monitoring Station (SPMS), Ncore, and seasonal monitoring sites operated by DEQ, as well as various data handling and laboratory processing procedures.

Specific responsibilities and procedures are documented in the appropriate standard operating procedures. Please refer to Appendix A for the current list of DEQ's Air Monitoring SOPs and Appendix B for a list of Laboratory SOPs.

DEQ operates most of the statewide ambient air monitoring network on a continuous schedule throughout the year. Some samplers don't run continuously and will operate for 24-hour periods (filter-based samplers) every day, every 3rd, 6th, or 12th day depending on the monitoring objectives. Most NAAQS have an annual average based on discrete calendar years and that is how DEQ's data is typically compiled and archived.

Various QA/QC activities are scheduled to occur throughout the year to ensure stability and continuity of data collected, with the goal of collecting enough valid data to make statistically sound decisions, see Table 3 in Section 20.6.

7. Quality Objectives and Criteria

DEQ, as a whole, operates under an EPA-approved Quality Management Plan (http://www.deq.idaho.gov/assistance-resources/quality-management/).
The QMP defines the Idaho Department of Environmental Quality's Quality Management System (QMS), in order to communicate and implement quality within DEQ.

This QAPP is specific to the ambient air quality monitoring program and represents the QA program for air pollution measurement systems. Some special projects may require different procedures depending on the purpose and scope of the project, and need its' own QAPP specific to that project.

The specific written procedures or methodologies for operating air monitoring equipment and managing resultant data contained in this QAPP must be adhered to by all individuals, weightors, firms, or agencies producing air quality data for enforcement purposes or under the terms of an air quality permit.

In general, the goal of the Ambient Air Quality Monitoring Program is to:

- determine the highest concentrations expected to occur in the area covered by the network;
- determine representative concentrations in areas of high population density;

- determine the impact on ambient pollution levels of significant sources or source categories;
- determine the general background concentration levels;
- determine the extent of regional pollutant transport among populated areas, and in support of secondary standards; and
- determine the welfare-related impacts in rural and remote areas (such as visibility impairment and effects on vegetation).

This data will be used to:

- establish a historical baseline concentration of natural and anthropogenic air pollutants,
- monitor the current dynamic concentrations of these air pollutants,
- evaluate compliance with the NAAQS,
- monitor progress made toward meeting ambient air quality standards,
- activate emergency control procedures that prevent or alleviate air pollution episodes,
- provide data upon which long term control strategies can be reliably developed,
- observe pollution trends throughout the region, and
- provide a database for researching and evaluating effects.

This section provides a description of the data quality objectives (DQO) for the ambient air quality monitoring program. Data quality objectives are qualitative and quantitative statements that:

- clarify the intended use of the data,
- define the type of data needed, and
- specify the tolerable limits on the probability of making a decision error due to uncertainty in the data.

As air pollution and meteorological measurement systems increase in both cost and complexity, it becomes essential that DEQ have a methodology that will, in a cost-effective manner, increase the completeness and precision and decrease the bias of the data produced by the DEQ's measurement systems.

Once a DQO is established, the quality of the data must be evaluated and controlled to ensure that it is maintained within the established acceptance criteria. Measurement Quality Objectives (MQOs) are designed to evaluate and control various phases (sampling, preparation, analysis) of the measurement process to ensure that total measurement uncertainty is within the range prescribed by the DQOs in Section 2.3 of Part 58 Appendix A of the Code of Federal Register (CFR). The MQOs for DEQ's Ambient Air Quality Monitoring Program will be defined in terms of the Data Quality Indicators (DQIs), listed below. For each of these DQIs, acceptance criteria have been developed using various parts of 40 CFR and EPA supplied guidance documents and are

described in more detail in the Quality Control and Quality Assurance sections of the individual SOPs.

7.1 Data Accuracy, Precision, Bias and Measurement Range

Accuracy - Accuracy is a combination of random error (precision), and systematic error (bias).

Precision - "Precision is a measure of agreement between two replicate measurements of the same property, under prescribed similar conditions. This agreement is calculated as either the range or as the standard deviation." (US EPA QA/G-5) This is the random component of error.

Bias - "Bias is the systematic or persistent distortion of a measurement process that causes errors in one direction." (US EPA QA/G-5) Bias is determined by estimating the positive and negative deviation from the true value as a percentage of the true value.

Sensitivity/Measurement Range – "Sensitivity is the capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest." (US EPA QA/G-5) Method, instrument, or quantitation limits of specific measurement procedures are known. The appropriate measurement range is determined by reviewing results and reconciling known ambient pollutant concentrations with reporting requirements. The specified/required measurement range will likely guide the selection for the monitor.

7.2 Data Representativeness

"Representativeness is a measure of the degree to which data accurately and precisely represent a characteristic of a population parameter at a sampling point or for a process condition or environmental condition. Representativeness is a qualitative term that is evaluated to determine whether in situ or other measurements are made and physical samples collected in such a manner that the resulting data appropriately reflect the media and phenomenon measured or studied." (US EPA QA/G-5)

7.3 Data Comparability

"Comparability is the qualitative term that expresses the confidence that two data sets can contribute to a common analysis and interpolation. Comparability must be carefully evaluated to establish whether two data sets can be considered equivalent in regard to the measurement of a specific variable or groups of variables." (US EPA QA/G-5)

7.4 Data Completeness

Completeness is a metric quantifying the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct, normal conditions. Completeness can be expressed as a ratio or a percentage. Data completeness requirements are included in the reference methods (40 CFR Part 50).

7.5 Measurement Quality Objectives

In June 1998, a workgroup was formed to develop a procedure that could be used by State and local air quality agencies that would provide for a consistent validation of PM2.5 mass concentrations across the US. The workgroup included personnel from several monitoring organizations, EPA Regional Offices, and Office of Air Quality Planning and Standards (OAQPS) who are involved with assuring the quality of PM2.5 mass and was headed by a State and local agency representative. The workgroup developed three tables of criteria where each table has a different degree of implication about the quality of the data.

The criteria included on the tables are from 40 CFR Part 50 Appendices L and N, 40 CFR Part 58 Appendix A, Method 2.12, and a few criteria that are neither in CFR nor Method 2.12. Upon completion and use of the table, it was decided that a "validation template" be developed for all the criteria pollutants. The completed "validation template" for all criteria pollutants was published in the 2008 *QA Handbook for Air Pollution Measurement Systems Volume II Ambient Air Quality Monitoring Program*.

The tables discriminate between criteria that *must* be met to ensure the quality of the data (Critical Criteria), criteria that indicate that there *might* be a problem with the quality of the data and further investigation is warranted before making a determination about the validity of the sample or samples (Operational Evaluations), and criteria that indicate a potentially systematic problem with the environmental data collection activity that may impact the ability to make decisions with the data (Systematic Issues).

For each criterion or MQO, the tables include (1) the operational range that is acceptable, (2) the frequency with which compliance is to be evaluated, (3) the number of samples that are impacted if violation of a criterion occurs (possible values include single filters, a batch of filters, or a group of filters from a specific instrument); (4) sections of 40 CFR and (5) Method 2.12 that describe the criterion. The table also indicates whether samples violating the criterion must be flagged before entering them into EPA's Air Quality System (AQS).

The full pollutant-specific validation template tables are included in Appendix D of *Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. II, Ambient Air Quality Monitoring Program*. The tables were updated in 2017 and can be found on EPA's web site:

https://www3.epa.gov/ttn/amtic/files/ambient/pm25/qa/APP_D%20validation%20template%20version%2003_2017_for%20AMTIC%20Rev_1.pdf

Meteorological measurement methods data validation criteria are included in Appendix C of *Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. IV: Meteorological Measurements, Version 2.0:*

https://www3.epa.gov/ttn/amtic/met.html

For the most part, DEQ incorporates the above referenced pollutant or parameter-specific MQO criteria for DEQ's Ambient Air Quality Monitoring Program. Each SOP contains a table of the applicable criteria and any applicable guidance on corrective actions. View the table in the Quality Control and Quality Assurance Validation Summary in each applicable SOP for more specifics.

When applicable, more detailed descriptions of these MQOs and how they will be used to control and assess measurement uncertainty are described in the SOP associated with the pollutant.

8. Special Training/Certifications

Adequate education and training are integral to any monitoring program that strives for reliable and comparable data. Training is aimed at increasing the effectiveness of employees and their organization. The DEQ training program includes information on:

- Personnel qualifications – general and position-specific
- Training requirements – by position
- Training frequency

In general, training for the ambient air monitoring program consists of a combination of required reading, formal training, self-guided study, mentoring, and performance assessment. The DEQ Air Monitoring Training Plan (TRIM document # 2013AAZ4) is largely based on EPA's Joint Training Committee's *National Training Action Plan*.

9. Documentation and Records

The vast majority of documentation and records produced by the ambient air monitoring program consist of data and supporting information. For data recording, transcribing, transformation, reduction, transmittal, storage and retrieval, refer to **Section 19: Data Management**.

DEQ uses an EDMS known as HPE Content Manager to assist with the storage, retrieval, and archiving of various types of documents. This system provides DEQ staff the ability to associate various meta-data characteristics to documents to make document retrieval

simpler. Document "Record Types" enable the assignment of specific retention schedules so that documents can be identified for archival or destruction.

All program-related documents are stored according to state of Idaho and DEQ record retention policy. All documentation is classified according to its intended use, future applicability, and regulatory requirement for retention. Specifics on the DEQ record retention policy and schedule for document types can be found in the document *"Program Policy Guidance for Filing AQ Monitoring Documents in TRIM"* (EDMS #2009ABD16).

In the case of any litigation, claim, negotiation, audit, or other action initiated before the scheduled expiration of any supporting record or document, the affected records or documents will be retained until completion of the action and resolution of all issues which arise from it.

Electronic records are stored on DEQ file servers, CM, Sonoma Technology (eSIMS), or the DEQ data acquisition system (DAS). All three areas are routinely backed up by DEQ IT staff using defined backup and recovery procedures.

DEQ uses a formal document control procedure for program policy, procedure, and guidance documentation. Documents in this category are published with date and revision information clearly noted on each document. When program policy, procedure, and guidance documentation is superseded by a newer version, the replacement document clearly states that it is a replacement. In CM, updated or revised documents are stored as "renditions". Always, the most recent rendition is the latest revision of the original document and will possess the "approval" signatures needed to make the document "official".

DEQ maintains a master list of controlled program policy, procedure and guidance documents, worksheets and templates on its' internal intranet:

http://deq.intranet/program-resources/air-monitoring-resources.aspx

Links and/or EDMS document numbers are included so that staff can go directly to CM to retrieve needed materials.

Documents in this category include:

- Quality Assurance Project Plans (QAPPs – this document);
- Standard Operating Procedures (SOP's);
- Worksheets for field activities, siting, calibration, maintenance; and
- Official DEQ policy interpretation or clarification.

Official, current versions of any program policy, procedure, and guidance documentation is distributed by, and additional copies can be obtained from the Air Monitoring Supervisor.

10. Sampling Process Design

The primary function of the DEQ Air Quality Monitoring Program is to determine compliance with the NAAQS. Other monitoring objectives include determining trends over time, assessing emission source impacts, support for smoke management and air quality forecasting, reconciling/verifying air quality models, providing real-time monitoring data to the public, and supporting public health studies.

The emphasis of Idaho's Ambient Air Quality Monitoring Network has been in areas where elevated pollutant concentrations are known or suspected coupled with areas of higher population. Often monitoring is expanded (i.e., number of sites and increased sampling frequency) in areas where NAAQS are exceeded.

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

- 40 CFR Part 58, Appendix A - Quality Assurance Requirements for State and Local Air Monitoring Stations (SLAMS)
- 40 CFR Part 58, Appendix D - Network Design for State and Local Air Monitoring Stations (SLAMS) and Photochemical Assessment Monitoring Stations (PAMS)
- 40 CFR Part 58, Appendix E - Probe and Monitoring Path Siting Criteria for Ambient Air Quality Monitoring

10.1 Rationale for Selection of Sampling Sites

40 CFR Part 58, Appendix D specifies criteria for SLAMS monitoring sites which vary by pollutant, by monitoring objectives and spatial scales. There are other underlying considerations that will be determinant in the final selection of an ambient air monitoring station. These are described below.

10.2 Monitoring Objectives and Spatial Scales

Each monitor within DEQ's Ambient Air Quality Monitoring Network is intended to address one of the following monitoring objectives:

- ***Population exposure*** **-** the monitor is located in an area associated with high population density and representative of average exposure.

- ***Background -*** the monitor is located where manmade (anthropogenic) contributions to ambient pollutant levels are minimal.

- ***Transport -*** the monitor is located to measure pollutants transported from other areas.

- ***Maximum concentration -*** the monitor is located where a high concentration of the pollutant is expected (often based on results of receptor models) or known emissions sources.

- ***Comparison study -*** the monitor is located adjacent to other instrumentation measuring the same pollutant to compare different sampling/monitoring methodologies.

- ***Air Quality Index -*** the monitor provides data primarily for reporting to the Air Quality Index (previously called the Pollutant Standards Index). The selected location is typically intended to represent average population exposure.

- ***CRB Program -*** Seasonal particulate monitors for smoke management may be included in this objective, as they are intended for early detection smoke impacts for nearby sensitive populations.

Data collected within the network must be representative of the spatial area under study. The goal in siting a monitoring station is to match the spatial scale represented by the samples obtained with the spatial scale most appropriate for the monitoring objective of the station. Spatial scales of representativeness are often determined by the distance from the monitor to sources of the pollutant being measured.

10.3 Site Selection

DEQ bases monitoring site selection on the criteria specified in 40 CFR Part 58, Appendix E. More details on site evaluation, selection, and deployment procedures can be found in the SOP: *SOP for Monitoring Site Evaluation, Selection, and Deployment (EDMS #*2010ABD42).

In all cases, the selection of a specific monitoring site includes the following actions:

- developing and understanding the monitoring objective and appropriate data quality objectives,
- identifying the spatial scale most appropriate for the monitoring objective of the site,
- identifying potential locations where the monitoring site could be placed, and
- identifying the specific monitoring site.

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

1. impacts of known pollutant emission categories on air quality,
2. population density relative to receptor-dose levels, both short- and long-term,
3. impacts of known pollutant emission sources (area and point) on air quality, and
4. representative air quality.

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

10.4 Other Factors for Consideration

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

- ***Economics*** **-** The quantity of resources required to accomplish all data collection activities, including instrumentation, installation, maintenance, data retrieval, data analysis, QA, and data interpretation, must be established.

- ***Security*** **-** In some cases, a preferred location may have associated problems that compromise the security of monitoring equipment (i.e., high risk of theft, vandalism, etc.). If such problems cannot be remedied through the use of standard measures such as additional lighting, fencing, etc., then an attempt to locate the site as near to the preferred location as possible shall be made.

- ***Logistics*** **-** This process includes procurement, maintenance, and transportation of material and personnel for the monitoring operation. The logistics process requires full knowledge of all aspects of the data collection operation: planning, reconnaissance, training, scheduling, safety, staffing, procuring goods and services, communications, and inventory management.

- ***Atmospheric Considerations*** **-** These considerations may include spatial and temporal variability of pollutants and their transport. Effects of buildings, terrain, and heat sources or sinks on air trajectories can produce localized anomalies of pollutant concentrations. Meteorology must be considered in determining the geographic location of a site as well as the height, direction, and extension of sampling probes. Evaluation of a local wind rose is essential to properly locate many monitoring sites (e.g., siting either to detect or avoid emissions from specific sources).

- ***Topography*** **-** Evaluation of the local topography based upon land use maps, U.S. Geological Survey topographic maps, and other available resources must be

completed. Minor and major topological features that impact both the transport and diffusion of air pollutants must be identified and evaluated. Minor features may consist of an adjacent tree-lined stream or tall structures either upwind or downwind of a point source, each of which may exert small influences on pollutant dispersion patterns. Major features include river canyons or deep valleys, mountain ranges, and large lakes. Major features significantly impact the prevailing wind patterns or create their own local weather such as katabatic or anabatic winds.

- ***Pollutant Considerations -*** The monitoring site location for a specific pollutant may or may not be appropriate for another pollutant. Evaluation of the changes that pollutants undergo temporally and spatially must be considered in order to determine the applicability of each particular site for a specific pollutant.

Interdependence exists between all of the factors listed above. Consequently, an iterative process is necessary to ensure proper site selection. In situations where the sites do not specifically meet the requirements necessary to obtain the project objectives, reevaluation of the project priorities may be necessary prior to the final monitoring site selection.

DEQ performs an annual air monitoring network review to address network modifications needed to continue to meet the monitoring objectives and priorities. Additionally, in 2020 DEQ completed its' third 5-year Ambient Air Monitoring Network Assessment, a very detailed document which details all of the considerations addressed above for each monitoring site in the network. Both documents are posted on the DEQ web page: http://www.deq.idaho.gov/air-quality/monitoring/monitoring-network.aspx.

11. Sampling Methods

Sampling methodology for ambient air monitoring is continually improving in ability to accurately, reliably, and efficiently identify and quantify various air pollutants. As such, there are frequent changes in how sampling is performed but variations can be categorized into two (2) distinct categories of sampling:

- Filter-based time integrated sample collection – A physical sample is collected using a monitoring device that passes ambient air through a filter. The filter is then removed and analyzed via an array of laboratory methods to determine particulate matter mass and/or composition. Examples of this type of sample collection include Federal Reference Method (FRM) particulate monitors such as the Thermo 2025 $PM_{2.5}$ sampler and Met One Instrument's E-SEQ-FRM sampler.

- Near, real-time continuous sample analysis – Physical samples are not collected using this type of collection mechanism. In situ analysis of the composition or mass of the sample is performed within the monitoring instrument.

For specifics on any particular sampling method, refer to the specific SOP in Appendix A.

11.1 Instrumentation

The analytical method employed for a specific criteria pollutant evaluation is dependent upon the monitoring technology utilized. For the gaseous criteria pollutants, SO_2, CO, NO_x, and O_3, the analyzers are designed as completely contained monitoring units that do not require additional analytical methods to establish the pollutants' environmental concentrations. The particulate matter criteria pollutants, PM_{10}, and $PM_{2.5}$, utilize methods that establish concentrations in a self-contained system as well as some that require analytical methods to evaluate the captured sample in order to establish the pollutant concentrations present in the environment.

DEQ uses only EPA-approved Federal Reference Method (FEM) or FRM methods for determining pollutant concentration for all NAAQS compliance determinations. For special purpose monitoring (such as smoke monitoring or community-specific AQI determination), DEQ may use SPMs which are not an FEM or FRM.
DEQ uses SPM monitors that are used widely for air monitoring and are acceptable alternatives. Typically SPMs are used for "real-time" monitoring of $PM_{2.5}$. EPA has approved numerous real time FEM technologies for $PM_{2.5.}$ DEQ continues to evaluate these monitors for applicability in its network, where the monitoring objective is for both NAAQS compliance and real-time AQI information.

More detailed description of analytical measurement principles for specific analytical methods can be found in each individual SOP.

In general, DEQ employs the following measurement methods:

- **Non-dispersive Infrared Photometry for Carbon Monoxide (CO)** - The detection and measurement of CO utilizes this chemical's propensity to absorb infrared radiation (IR) at wavelengths near 4.7 microns. Broadband IR radiation is generated using a high-energy heated element. The IR radiation is modulated using gas filter correlation technology. Gas filter correlation utilizes a rotating wheel containing two gas filled cells that selectively modulate the IR radiation. One cell contains nitrogen (the measure cell), while the other contains CO (the reference cell). Concentrations are proportional to the differences observed between the two cells.

- **Fluorescence for Sulfur Dioxide (SO_2)** - The physical principle used in SO_2 molecule measurement relies on exciting an electron shell, which occurs in the presence of a specific wavelength (214 nanometers [nm]) of ultraviolet (UV) radiation, and the subsequent relaxation which produces a photon of light. A photo multiplier tube allows the light emissions to be measured as the SO_2 molecule returns to the ground state. The intensity of this light is proportional to the quantity of SO_2 present in the sample.

- **Chemiluminescence for Oxides of Nitrogen (NO, NO_2, NO_x, NO_y) -** The principle of measurement is based upon the reaction of a nitrogen monoxide (NO) molecule with an internal source of O_3 in an evacuated reaction cell that results in the emission of light. The resulting light emitted by the reaction is monitored and correlated to the concentration of NO in the sample. Secondary measurement of other oxides of nitrogen (NO2, NOx, NOy) is accomplished by catalytic conversion of those species to NO during a separate measurement cycle.

- **Ultraviolet Photometry for Ozone -** The physical principle used to measure ozone relies on the absorption of UV radiation by the O_3 molecule at approximately 255 nm. The concentration of ozone present in the sample stream is proportional to the amount of light absorbed.

- **Time-integrated filter collection for Particulate Matter -** This methodology utilizes precisely weighed filters that are placed in a carefully controlled volumetric flow for a specified period of time. The combination of flow and duration identify a controlled volume that has passed through the clean filter. The mass added to the filter, determined by subsequent weighing, determines the particulate concentration of the air. Further speciation analysis is occasionally used to characterize the composition of the particulate matter. Intermittent filter-based methods require the use of an independent analytical testing laboratory. DEQ utilizes the Idaho Bureau of Labs for these services.

- **Continuous operation for Particulate Matter –** Multiple techniques are used for the near-real-time measurement of particulate matter.

    - **Beta-attenuation -** A small Carbon-14 element emits a constant source of high-energy electrons known as beta rays. An external pump pulls a measured amount of dust-laden air through a filter tape. The difference in the attenuation of the beta ray signal before and after particle accumulation is proportional to the particulate concentration in the air.

    - **Light Scatter** – Sample air is drawn into the monitor and through the laser optical module, where the particulate in the sample air stream scatters the laser light through reflective and refractive properties. This scattered light is collected onto a photodiode detector at a near-forward angle, and the resulting electronic signal is processed to determine a continuous, real-time measurement of airborne particulate mass concentrations.

12. Sample Handling and Custody

12.1 Sample Collection and Handling Records

Each field and laboratory analyst is responsible for maintaining appropriate field or lab notebooks. Beginning in 2017, DEQ began to transition to electronic logbooks. The

electronic logbook software is called eSIMS and was developed by Sonoma Technology. The software meets EPA's guidance provided in the April 2016 EPA Technical Note 'Use of Electronic Logbooks for Ambient Air Monitoring'. ESIMS software is maintained by the AQ Monitoring Supervisor.

The benefits and features of electronic log books include:

- Centralized, real-time log book access for review
- Conditional formatting of entry forms allow for real-time, pass or fail indications for critical fields
- Inventory management and tracking
- Electronic back up of log books
- Password protected entry
- Complete edit trails including original entries
- Log entries are date and time stamped

The challenges in adopting of electronic log books include:

- Internet access required at remote locations
- Significant staff training
- Electronic logbooks are relatively new for the air monitoring field
- Intensive form development process.

Logbooks serve as the formal, official record of sample collection activities because of their unalterable nature or ability to record edits. Controlled worksheets, such as gas MFC calibrations or gas multipoint verifications, are retained by the local, regional DEQ office directly responsible for the operation of monitoring equipment. Refer to Section 9 of this QAPP for additional information.

While not directly considered a collection and handling record, performance audits by external parties are categorized into this record type. Independent audits from the State of Idaho Bureau of Laboratories, EPA, or other entities are simply another form of routine inspection on monitoring equipment. Audit reports are retained at the state program office and are available from the Air Monitoring Supervisor.

The physical collection of particulate filter samples, sample transport, and sample preservation techniques adhere to the requirements of 40 CFR Part 50, Appendix J, and *Quality Assurance Handbook for Air Pollution Measurement Systems*, Volume II, Ambient Air Specific Methods. DEQ's Standard Operating Procedures address sample handling and preservation in detail, specific to the sample collection methodology in **Section 11.**

Specific sample handling and custody procedures include:

- Shelter design criteria such as significant environmental controls (temperature, humidity, rain, dust), electronic interference, or physical vibration;

- Sample size and characteristics such as minimum sample volumes and filter size and composition;
- Sample recovery, transport, and processing holding times;
- Sample integrity controls such as critical storage temperatures and contamination or loss prevention; and
- Sample disposal instructions.

In the event a regularly scheduled run is not performed, a make-up sample may be performed subject to 40 CFR, Part 50, Appendix N Section 1.0.c. Make up samples can be made using the primary or collocated monitor. They can be taken before the next sampling day or exactly one week after the missed (or voided) sampling day.

12.2 Chain of Custody Forms

Most ambient air monitoring data is collected via real-time or near real-time monitoring equipment. However, some monitoring involves the collection of a physical sample for analysis by a laboratory. Any samples collected for further analysis that are packaged and transported to another location are required to be accompanied with a Chain of Custody (COC) form that includes specific information regarding the sample. This form assists in tracking the integrity of the sample through the various stages of transportation and receipt.

While the forms themselves vary by laboratory and analyses required, the general content of forms includes:

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

Pollutant-specific procedures for maintaining COC forms are included in DEQ's SOPs.

The filter COCs originate and are finalized by BOL. Copies are sent to the state office and regional offices for reference and tracking purposes. Official, finalized COCs are retained by the BOL for a minimum of seven years.

13. Analytical Methods

FRM Teflon filters are purchased through EPA Region 10 annually. The complete filter weighing process is controlled and provided in BOL's SOP titled, *Idaho Bureau of Laboratories Standard Operating Procedure for Gravimetric Analysis of PM2.5 Filters*. BOL is responsible for the ordering, processing, storage and pre/post weighing of the $PM_{2.5}$ filters.

Teflon filters with a 46.2 mm diameter are conditioned and stabilized at a controlled temperature and relative humidity. After conditioning, filters are pre-weighed for a sampling event. Filters are then sent to the field for sample collection. After daily exposure to field conditions, filters are sent back to BOL for final weighing to determine the mass of particulates retained on the filters. Quality control procedures utilize laboratory and field blank filters as well as certified weight standards to check the accuracy of the analytical balances at BOL.

14. Quality Control

To assure the quality of data from air monitoring measurements, two distinct and important interrelated functions must be performed. One function is the control of the measurement process through broad QA activities, such as establishing policies and procedures, developing DQOs, assigning roles and responsibilities, conducting oversight and reviews, and implementing corrective actions. The other function is the control of the measurement process through the implementation of specific quality control procedures.

DEQ uses the following specific quality control procedures. The use and applicability of the various quality control procedures for any specific pollutant or measurement technique is addressed in the "Quality Control and Quality Assurance" portion of specific SOP:

- **Calibration** – The process employed to verify and rectify an instrument's measurements in order to minimize deviation from a known standard. This multiphase process begins with certifying a calibration or transfer standard against an authoritative standard. The sampling or analytical instrument's measurements are then compared to this calibration/transfer standard following established operating protocol. If significant deviations exist between the instrument's measurements and the calibration/transfer standard's measurements, corrective action is implemented to rectify the analytical instrument's measurements. Calibration requirements for the critical field and laboratory equipment are found in the calibration sections of each SOP and in the specific instruments' operations manuals.

- **Precision Checks** – The measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions.

In order to meet the DQOs for precision, DEQ will ensure the entire measurement process is within statistical control. Various tools are employed in evaluating and monitoring precision measurements.

Periodic challenging of instruments with zero and span checks and employing collocated monitoring will provide evidence of deviations from the required precision measurement. Fifteen percent (a minimum of one site for each method) of all network sites will be outfitted with collocated monitors to actively support precision checks.

- **Accuracy or Bias Checks** – The degree of agreement between an observed value and an accepted reference value. Accuracy is a combination of random error (precision), and systematic error (bias). Although collocated monitors are primarily used for evaluating and controlling precision, they can also be used to determine accuracy or bias. By tracking the percent difference calculations over time trends can be observed that indicate the bias occurring within the measurements. In addition to collocated monitors, daily zero and span checks can also provide data capable of identifying bias.

- **Low Level Gas Audits** – Revisions to 40 CFR Part 58 require states to challenge the gas analyzers at predetermined, low points. One point must be within two to three times the method detection limit of the instruments within the Primary Quality Assurance Organization (PQAO) network, the second point will be less than or equal to the 99th percentile of the data at the site or the network of sites in the PQAO or the next highest audit concentration level. The third point can be around the primary NAAQS or the highest 3-year concentration at the site or the network of sites in the PQAO.

  These audit points can be achieved using trace or low level monitoring at NCore or other background testing locations. Source monitoring or fence line monitors are configured to operate at concentration ranges one to two orders of magnitude higher than the new low level audits. As such, instrument noise or sensitivity and calibration equipment performance preclude testing at these levels. As a result, DEQ does not perform low level audits at all sites. For a complete record or list of sites where low levels are performed please refer to AQS.

  AQS contains the audit points (including low levels) DEQ uses to challenge the analyzers.

- **Performance Audits** – Audits are performed by measuring the analyzer's normal operating measurement (flow rate, temperature, barometric pressure, concentration, etc.) and comparing it to a certified traceable transfer standard. The standard used for auditing must not be the same standard used to calibrate the analyzer. However, both the calibration standard and the audit standard can be referenced to the same primary standard.

DEQ participates in performance audits from multiple organizations:

- Independent audit performed by the Idaho Bureau of Laboratories. Audit procedures are found in Appendix B – Laboratory Standard Operating Procedures and:
- EPA's National Performance Evaluation Program (NPEP). Information about these can be found at http://www.epa.gov/ttn/amtic/npepqa.html

- **Corrective Actions** – Corrective action measures in the Ambient Air Quality Monitoring Network will be taken to ensure the data quality objectives are attained.

  Given the number of monitors, the diversity of monitoring activities, and the complexity of many of the instruments, there is potential for many types of sampling and measurement system problems. A well-run monitoring network anticipates these problems in advance and prepares staff and procedures with corrective action measures for expected problems. The full pollutant and technique-specific checks, required frequency, acceptance criteria, and corrective action guidance are listed in the QA/QC section of each instrument-specific SOP.

  Table 2 lists some common sampling and measurement system problems and corrective actions needed.

Table 2. Typical Corrective Actions

Activity	Problem	Likely Actions
Performance Criteria Assessment	Out of specification check, sample handling or holding problem, or failed performance audit	1) Verify / reproduce performance check findings. If available, use an alternate transfer standard to confirm failures. 2) Perform alternate performance checks to determine cause (for example - leak tests to aid in flow rate issues). 3) Recalibrate monitor using standard operating procedures. 4) Identify any required procedural changes to prevent reoccurrence. 5) Document actions on audit worksheet, data sheet, or logbook as appropriate. 6) Notify air monitoring coordinator of performance audit failures as soon as practical.
Filter Inspection (Pre or Post sample)	Pinhole(s) or torn	1) Use of alternate filters 2) Void filter with pinhole or tear. 3) Obtain a new filter from lab. 4) Inspect sample stream and exchange mechanism to determine cause. 5) Document action taken on field chain of custody form, data sheets, or logbook as appropriate.
Run parameter check	Shortened sample run times	1) Verify proper monitor run-time programming. 2) Diagnose likely causes – low flow rates, low pressure, power disruption, others. 3) Document cause and any actions on field chain of custody form, data sheets, or logbook as appropriate.
Power	Power interruptions	1) Verify power supply integrity. 2) Verify circuit breaker and fuse integrity. 3) Document cause and actions taken on field chain of custody form, data sheets, or logbook as appropriate.
Data Review	Data missing from data acquisition system (DAS)	1) Verify DAS operation. 2) Ensure monitor polling is current. 3) Isolate telecommunications problem by connecting to the monitor using alternate processes. 4) Verify monitor operations remotely. 5) Notify DAS administrator or air quality manager as appropriate. 6) Perform site visit to resolve monitor or telecommunication issues.

15. Instrument/Equipment Testing, Inspection, and Maintenance

Preventative maintenance is a fundamental element to an effective Quality Assurance program. As such, DEQ uses established procedures to verify that all instruments and equipment are maintained in sound operating condition and are capable of operating at acceptable performance levels. Refer to QA/QC of the instrument-specific SOP for more details on the specific preventative maintenance activities.

New and replacement instruments are researched, selected and purchased through the state workshop. This equipment is inspected and tested according to DEQs Standard Operating Procedure for Equipment Acceptance.

In general, the following testing, inspection, and routine maintenance activities are used:

- Verification that instrument / equipment adheres to EPA equivalent or reference method requirements prior to use.
- DEQ relies on the manufacturer listed MDL level for FEM and FRM designated instruments.
- Current Transfer Standard certification by independent party. Ensure National Institute of Standards and Technology (NIST) traceability for any standards used to perform calibration or quality control checks on monitoring equipment

    - Flow standards (such as the BIOS, MultiCal, DeltaCal, or Streamline FTS) are certified annually by an accredited organization that provides a certificate of traceability to NIST standards.

    - Handheld temperature standards are certified annually by an accredited organization that provides a certificate of traceability to NIST standards.

    - Handheld Barometric Pressure standards are certified annually by an accredited organization that provides a certificate of traceability to NIST standards.

    - Wind speed simulation anemometer drivers are certified annually by an accredited organization that provides a certificate of traceability to NIST standards.

    - Gas dilution calibrator Mass Flow Controller’s are verified annually (by DEQ analysts) using NIST traceable flow standards and approved SOPs.

    - Ozone generators / calibrators are certified twice annually (beginning and end of ozone season) by the Idaho Bureau of Laboratories using a California Air Resources Board (CARB) NIST traceable/certified primary ozone standard.

- Compressed Gas Standards are purchased as certified canisters with concentrations traceable to NIST standards and are used only within the certification date range.

- Meteorological Sensors are purchased from the vendor with "as received" calibration certificates. Sensor performance over time is monitored using approved SOPs and certified transfer standards. Sensor performance failure generally indicates need for replacement or return to the vendor for repair and new certification.

- Monitoring shelters, sample inlets, and other enclosures are inspected twice annually during Idaho Bureau of Laboratories performance audits to ensure conditions do not adversely affect monitor operation or data integrity.

- All certification periods are monitored to ensure that equipment or certified materials are not used beyond the documented certification expiration dates.

16. Instrument/Equipment Calibration and Frequency

All instrument calibrations are performed using traceable standards to ensure that the ambient air quality and meteorological data meets DEQ and EPA quality objectives.

Traceability is ensured by:

- standards used for calibration are purchased and re-certified by vendors with accredited NIST-traceable calibration processes;

- primary and transfer standard calibration certificates are retained as part of the quality control documentation process;

- internally certified transfer standards are certified against NIST-traceable primary standards using approved SOP's;

- ASTM Class 1 weights are used by the Bureau of Laboratories to calibrate and check the filter-processing balances; and

- Calibration procedures and frequency requirements are documented in pollutant-specific or technique-specific SOPs.

Please refer to the operation and calibration section of individual SOPs for details on the calibration procedure and frequency requirements.

17. Inspection/Acceptance of Supplies and Consumables

Each Standard Operating Procedure itemizes the apparatus, equipment, materials, and supplies required for various monitoring equipment. In general, supplies and consumables are procured directly from the vendor manufacturing the equipment used by DEQ. Parts lists, including recommended replacement schedules, are itemized very clearly in most manufacturers' operating manuals. DEQ uses this information to determine the appropriate procurement schedule and volume of consumables required to support continuing operations.

Supplies and consumables are ordered and received directly by the state monitoring staff as needed or inventoried in the air monitoring workshop / laboratory for later distribution. In either case, received materials are inspected to ensure the proper part number was received as ordered. General inspection to identify any damaged products is also performed. Instruments and calibration equipment are entered and tracked through the eSIMS software.

Parts received are dated so that storage duration can easily be determined. A revolving inventory system (first in, first out) is used to ensure that storage times do not affect the material's integrity. If a manufacturer or EPA requirement indicates a specific expiration period for supplies, those supplies exceeding expiration dates are discarded if not used within the acceptable period.

Air filters are considered supplies and due to the nature of particulate monitoring methodology, filter integrity is of primary concern. Filters used to collect particulate samples ($PM_{2.5}$ and PM_{10}) are inspected at various times throughout the life of the sample.

The following describes the various stages of filter sample life inspection:

- EPA provides vendor lot certification of filters used to support the ambient air quality monitoring program prior to distribution to monitoring agencies;

- Idaho Bureau of Laboratories conditions and inspects air filters according to EPA requirements and approved SOPs during the initial weighing;

- DEQ monitoring staff inspect filters received from the lab for any possible shipping and handling damage;

- DEQ monitoring staff inspect filters upon retrieval from the monitoring equipment for possible instrument processing damage;

- Idaho Bureau of Laboratories conditions and inspects filters during the final tare process.

18. Non-direct Measurements

Some non-direct measurements and information are used to support the ambient air quality monitoring program. The data may be used only to validate/verify anomalous monitoring results. In no instance would original measurements be transformed or corrected. Information and data from outside sources may include:

- Geographic and terrain data;
- Localized emissions data generated by DEQ;
- Wildfire and prescribed fire information;
- Satellite data;
- Historical monitoring data measured by DEQ or other sources; and
- National Weather Service data.

Any use of outside data will be validated to the extent possible following protocol outlined in this document and in applicable EPA guidance documents.

19. Data Management

Formalized processes and procedures are required for the collection, recording, transformation, transmittal, reduction, storage, and retrieval of ambient air monitoring data.
Envidas is a suite of software used at DEQ to collect, review and archive the data. In addition, this DAS software is used to submit the data to the EPA. Instrument data is imported into the system using specific protocols within the Envidas software. This data is reviewed by DEQ staff to ensure accuracy and completeness. Each quarter the data is flagged using standard EPA codes within AQS. After the flags are verified, the data is formatted in a program called XML Reporter and submitted to AQS.

19.1 Data Recording

With the exception of the FRM monitors, the data collected in Idaho's network is recorded electronically. To accomplish this, each monitoring site is equipped with data loggers. A data logger records the monitor's output; it can perform specific data manipulations, and format the resulting data in preparation for downloading to a database or spreadsheet.

19.2 Data Transformation

The $PM_{2.5}$ filter-based samplers run data is downloaded either manually or remotely. This data is transferred to the $PM_{2.5}$ database and is joined with sample filter weights obtained from the BOL. The database then calculates ambient concentrations when combining all of the required information.

The inherent accuracy of an instrument is incorporated into the system accuracy when the instrument is calibrated. Each instrument is demonstrated to be linear within the range of 10% to 90% of full scale by manufacturers prior to gaining acceptance by EPA as suitable for ambient air monitoring (FRM/FEM designation).

The Beta Attenuation Monitor1020's (BAM) operated in DEQs network are configured and operated as SPMs. The BAMs in the network have been outfitted with Sharp Cut Cyclone (SCC) inlets and therefore are not FEM configured. This change does not impact data quality to the extent that a correction factor is needed.

DEQ uses Met One E-Samplers on a seasonal basis to support the CRB program. This includes producing an AQI value. The E-Sampler concentrations have a correction factor applied to help ensure the data is of a similar quality to the BAMs and FRMs data.

The E-Samplers were tested and shown to linearly compare to a Met One Instruments BAM 1020 and Thermo Scientific 2025 FRM using over 30 samples, covering the range of expected concentrations, while removing samples < $3\mu g/m^3$ or those identified as outliers through our data editing process. A linear regression was performed on the data. A minimum r^2 of 0.70 over the expected concentration ranges indicated the level of agreement was sufficient to warrant a correction factor could be developed and applied.

This linear regression was used to generate the correction factor applied to each E-Sampler's uncorrected concentration measurement.

Correction factors are most effective when developed near the field site. As such, corrections factors have been developed for the following regions within Idaho:

- North Idaho Panhandle covering the CDA and Lewiston regions
- Southwest Idaho covering the Boise Region
- South Central Idaho covering the Twin Falls region
- Eastern Idaho coving the Pocatello and Idaho Falls regions

The performance of the E-Samplers is reviewed on an annual basis. These results are shared with the regional offices and state office during the Annual Air Monitoring Conference.

19.3 Data Transmittal

Data transmittal from the monitor to the central DAS is accomplished via telephone, TCP/IP, or other remote access to connect to the site's data logger. Downloading of collected data does not delete the data from the data logger. Data are removed from the data logger continuously by overwriting data on a first-in, first-out basis. This configuration requires that the data be extracted from the data logger on a regular basis, thus preventing any loss of data.

Alternate data retrieval processes are defined that consist of direct on-site access to the data logger or retrieving the data remotely using an alternate communications process when standard communication processes are interrupted.

In the case of data transfer from the BOL to DEQ, an alternate transmittal process is used. Once independent laboratory analysis of particulate loaded filters is completed by the laboratory, the resulting data is transmitted to DEQ via the FTP website.

All transmitted raw data sets are stored electronically. Raw data sets are retained in unalterable form before any reduction or validation is performed. Data reduction and validation operations use replicate versions of the raw data to avoid violating the integrity of the original raw data set.

19.4 Data Reduction

Data reduction activities aggregate raw data into averages that are required to compare against the NAAQS criteria pollutant limits. The averaged data is used to establish whether or not the NAAQS have been exceeded for a particular pollutant.

Prior to compiling the averages, standard validation procedures are used to indicate the validity of the data for each data point. Air quality monitoring analysts review the data and consider quality assurance checks, external influences, and other characteristics to determine data validity. If the data are deemed invalid, they are disqualified from the data set, and consequently, not used in the calculation.

A minimum of 75% of any data collection interval is required for that interval to be considered complete. For example, at least 45 minutes of valid data is required for an hourly average concentration to be considered valid. If less than 75% of the interval data is valid, the entire interval is considered invalid and disqualified from the data set.

19.5 Data Storage and Retrieval

Once collected, data is stored in a variety of ways and for varying periods of time. Initially, data is stored in instrument or station-specific data loggers. Data loggers keep an un-alterable record of instrument measurements for a period of ten (10) days to 120 days depending on the complexity of the data logger and amount of information stored. Data stored in the data loggers is accessed automatically by the central data acquisition system. Procedures exist for alternate approaches to retrieving the data.

The central DAS "polls" or calls each monitor and monitoring station to collect "Raw data" from the data loggers. Interval data averages ranging from 1 minute averaged data to hourly averaged data is collected and stored by the DAS. The DAS stores this raw data in an archive database and creates a copy in an "edit" database for staff to perform data edits and validations. The DAS is designed to prevent alteration of the raw data file however data stored in the "edit" database can be changed or voided following DEQ policy and procedures. An edit history is recorded and available to track all changes made to the edit database data.

Written and electronic information such as logbooks, sample tracking chain of custody forms, and diagnostic information worksheets are kept in the regional office for a period of at least one (1) year. Written information is archived according to DEQ document retention policy (See **Section 9**).

Data is stored in electronic form in the DAS for a minimum period of three years to provide the ability to analyze trends and use system reporting features. Backup and recovery procedures exist to ensure that data can be recovered in the case of some sort of disaster. When storage space limits the amount of data that can be kept in the database, procedures exist for moving the data into an archive database. In addition, the electronic logbooks are backed up on a regular basis by Sonoma Tech.

All data is stored according to DEQ archive policy (See **Section 9**). After the storage period has passed, the storage media may be disposed of or recycled.

20. Assessment and Response Actions

Assessments or evaluations are designed to determine whether the ambient air quality monitoring program is being implemented in conformance with the approved QA Project Plan, to increase confidence in the information obtained, and ultimately to determine whether the information will be used for their intended purpose.

In order to ensure the adequate performance of the quality system, DEQ performs and/or participates in the following assessments to measure the performance or effectiveness of the quality system, the Ambient Air Quality Monitoring Network, and various measurement phases of the data operation:

- Management Systems Reviews
- Network Reviews and Assessments
- Technical Systems Audits
- Annual QAPP Self-audit
- Data Quality Audits
- Data Quality Assessments
- Assessment Activities and Project Planning

20.1 Management Systems Review

A Management Systems Review (MSR) is a qualitative assessment of a data collection operation or organization. A MSR is employed to establish whether the prevailing quality management structure, policies, practices, and procedures are adequate to ensure data obtained are of the necessary type and quality to support the decision process.

A MSR of the Ambient Air Quality Monitoring Program will be conducted every three years by EPA Region 10 quality assurance staff. The EPA will report its findings to DEQ senior management within 30 days of completion of the MSR. The report will be filed appropriately. The Air Quality Monitoring Supervisor or a duly appointed representative will regularly monitor progress on action(s) required as a result of MSR findings.

20.2 Network Reviews/Assessments

40 CFR Section 58.20(d) provides the requirements for annual network reviews and a more intensive five (5) year assessment, beginning in 2010. The goal of these reviews is to determine conformance with network requirements of the Ambient Air Quality Monitoring Network as set forth in 40 CFR Part 58, Appendices D and E.

Formal assessment is used to determine if the air monitoring network is collecting adequate, representative, and useful data in pursuit of its air monitoring objectives. Additionally, the network review may identify needed network modifications to enhance the system or correct deficiencies in attaining network objectives.

Prior to implementing a network review, significant data and information pertaining to the network will be compiled and evaluated. Such information includes network files (including updated site information and site photographs), AQS reports, air quality summaries, major metropolitan area emissions trends reports, emissions information and National Weather Service summaries for the monitoring network area.

Review and assessment findings are published for public comment and submitted to EPA for approval on any recommended changes to the monitoring network.

20.3 State Office Annual QAPP Self-Audit

Each calendar year the State Office (PQAO) will complete a checklist (Appendix C) to verify the required activities in the QAPP are complied with and documented. The State Office Air Monitoring Supervisor will have oversight that the checklist is completed, note any documented deficiencies, and stored in the appropriate TRIM container. The State Office Air Monitoring Supervisor will oversee corrective action for any deficiencies noted, along with the Regional Office Air Manger if appropriate.

20.4 Data Quality Audit

A data quality audit (ADQ) reveals how data are handled, what judgments were made, and whether uncorrected mistakes were made. The State Office Data Analyst performs this activity no less frequently than quarterly (it is inclusive of the final data verification/validation process).

20.5 Data Quality Assessments

A data quality assessment (DQA) is the statistical analysis of environmental data to determine whether the data meet the assumptions that the DQOs and data collection design were developed under and whether the total error in the data is tolerable. Calculations for DQA activities shall follow the requirements and equations identified in 40 CFR Part 58, Appendix A, Section 5. The DQA process is described in detail in the *Data Quality Assessment: A Reviewer's Guide*, EPA QA/G-9.

Measurement uncertainty will be estimated for both automated and manual data recording methods. Terminology associated with measurement uncertainty is found within 40 CFR Part 58, Appendix A.

Estimates of the data quality will be calculated on the basis of single monitors and aggregated to all monitors. The individual results of these tests for each method or analyzer shall be reported to EPA. In addition, the EPA's AQS database automatically calculates values for precision and bias for a number of pollutants. This information is retrieved, reviewed, analyzed for compliance and/or deficiencies and instrumental for DEQ's annual data certification process.

20.6 Assessment activities and project planning

Table 3 provides a summary of the relevant assessments performed for the Idaho ambient air quality monitoring network:

Table 3. Idaho Ambient Air Monitoring Assessment Types.

Assessment Type	Frequency (begin date)	Internal or External	Organization Performing Assessment	Person, Title, Affiliation Responsible for:			
				Assessment	Assessment Response	Implementing Corrective Action	Monitoring Effectiveness of Corrective Actions
Management Systems Review /Technical Systems Audit *	Every 3 years	External	EPA	EPA Quality Assurance Officer	DEQ QA Director	Regional Air Mgr, Air Monitoring Supervisor	Air Monitoring Supervisor
Annual QAPP Audit Checklists Completed	Annual	Internal	DEQ	Air Monitoring Supervisor and Regional Air Manager	Air Monitoring Supervisor	Air Monitoring Supervisor and Regional Air Manager	Air Monitoring Supervisor & AQ Data Bureau Chief
Performance Audit	Twice per year **	External	IBOL	BOL Auditor	Regional Air Mgr	Reg. Monitoring staff	Air Monitoring Supervisor
National Performance Audit Program (NPAP & PEP)	Annual ***	External	EPA / NPAP Contractor	EPA NPAP contractor	Regional Air Mgr	Reg. Monitoring staff	Air Monitoring Supervisor
BOL TSA	Every 3 years****	Internal	DEQ	Air Monitoring Supervisor	BOL Chemistry Mgr	BOL Chemistry Mgr	Air Monitoring Supervisor
Data Quality Audit	Annual	Internal	DEQ	Air Monitoring Analyst	Air Monitoring Supervisor	Air Monitoring Supervisor & Regional Manager	Air Monitoring Supervisor
Data Quality Assessment	Annual	Internal	DEQ	Air Monitoring Supervisor and Air Monitoring Analyst	Air Monitoring Supervisor	Air Monitoring Supervisor	Air Monitoring Supervisor
Monitoring Network Review	Annual	Internal	DEQ	Air Monitoring Supervisor	Actions described in Network Review Document Subject to EPA approval		

* TSA conducted by EPA is extended to also include Idaho Bureau of Laboratories filter weighing laboratory.
** Performance audits are scheduled to represent 6-month intervals as best as practical.
*** Select monitors are chosen for NPAP audits. Not all monitors receive NPAP audit in a given year.
****DEQ/BOL MOU is reviewed annually.

21. Reports to Management

Several quality-related reports and communications to management are necessary to support SLAMS/NCore network operations and the associated data acquisition, validation, assessment, and reporting. Unless otherwise indicated, all reports will contain monitoring data for criteria pollutants.

Reports to management required for 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 is provided in reports developed by EPA's Quality Assurance Division and Office of Air Quality Planning and Standards.

Table 4. Idaho Ambient Air Quality Monitoring Program Reports to Management.

Type of Report	Frequency	Projected Delivery Date	Report Preparation Responsibility	Recipients
Idaho Ambient Air Quality Network Assessment	Every 5 years	July 1, 2025	Air Monitoring Supervisor	EPA, Public access website
EPA QSR / TSA	Every 3 years	2020	EPA	AQ Divisional Administrator
Internal QAPP Audit	Annual	September	Air Monitoring Supervisor	AQ Data Bureau Chief
Annual Idaho Ambient Air Quality Network Review	Annual	July 1	Air Monitoring Supervisor	EPA, Public access website
Air Quality Monitoring Data Summary	Annual	September	Air Monitoring Supervisor	Public access website
Idaho Ambient Air Quality Data Certification	Annual	May 1	AQ Monitoring Analyst	EPA
Quarterly Data Submission	Quarterly	Quarterly	AQ Monitoring Analyst	EPA (Air Quality System)
Performance Evaluation Report	Quarterly	Quarterly	BOL Auditor	Air Monitoring Supervisor
EPA NPAP Report findings	Annual	Upon completion	EPA	Air Monitoring Supervisor, Regional Air Manager
Corrective Action Plans	As necessary	Within 30 days of audit findings	AQ Monitoring Staff	Air Monitoring Supervisor, Regional Air Manager

22. Data Review, Verification, and Validation

Each of the network's analytical instruments is employed to measure meteorological conditions or the ambient concentrations of specific pollutants. However, in order to be useful the data must undergo evaluation to determine the degree to which each datum has met its quality objectives and specifications. Evaluators estimate the potential effect that each deviation from the QAPP or SOP may have on the usability of the associated datum, its contribution to the quality of the reduced and analyzed data, and its effect on decisions.

Data review is the in-house examination to ensure that the data have been recorded, transmitted, and processed correctly. It includes completeness checks to determine if there are any deficiencies such as missing data or lost integrity.

Data verification is the process for evaluating the completeness, correctness, and conformance / compliance of the data set against method, procedural and contractual specifications.

Data validation is a pollutant- specific process to determine the quality of a specific data set relative to the end use. Data are examined routinely and in a timely manner to ensure data are within a specified range. Corrective action is taken if errors or anomalies are found.

Detailed information on data processing and validation is given in DEQ's Data Review, Verification and Validation SOP (TRIM Record # 2015ABD1).

Details on the data acceptance criteria for quality control procedures specific to each pollutant or measurement technique can be found in the SOP's Section ***Quality Control and Quality Assurance.***

23. Review, Verification and Validation Methods

The flow of data from the field environmental data operations to the storage in the database requires several distinct and separate steps:

- Initial selection of hardware and software for the acquisition, storage, retrieval and transmittal of data;
- Organization and the control of the data flow from the field sites and the analytical laboratory;
- Input and validation of the data;
- Manipulation, analysis and archival of the data, and
- Submittal of the data into the EPA's AQS database.

Both manual and computer-oriented systems require individual reviews of all data tabulations. As an individual scans tabulations, there is no way to determine that all values are valid. The purpose of manual inspection is to spot unusually high (or low) values (outliers) that might indicate a gross error in the data collection system.

Manual review of data tabulations also allows detection of uncorrected drift in the zero baseline of a continuous sensor. Zero drift may be indicated when the daily minimum concentration tends to increase or decrease from the norm over a period of several days. For example, at most sampling stations the early morning (3:00 a.m. to 4:00 a.m.) concentrations of carbon monoxide tend to reach a minimum (e.g., 2 to 4 ppm). If the minimum concentration differs significantly from this, a zero drift may be suspected. Zero drift could be confirmed by review of zero control chart information.

In an automated data processing system, procedures for data validation can easily be incorporated into the basic software. The computer can be programmed to scan data values for extreme values, outliers or ranges. These checks can be further refined to account for time of day, time of week, and other cyclic conditions. Questionable data values are then flagged to indicate a possible error.

Data verification can be defined as confirmation, through provision of objective evidence that *specified requirements* have been fulfilled. The data verification process involves the inspection, analysis, and acceptance of the field data or samples. These inspections can take the form of technical systems audits (internal or external). Questions that are to be asked during the verification process include but are not limited to:

- Were the environmental data operations performed according to the SOPs governing those operations?
- Were the environmental data operations performed on the correct time and date? Many environmental operations must be performed within a specific time frame; for example, the NAAQS samples for some particulates are collected once every six days from midnight to midnight. The monitor timing mechanisms must have operated correctly for the sample to be collected within the time frame specified.
- Did the sampler or monitor perform correctly? Individual checks such as leak checks, flow checks, meteorological influences, and all other assessments, audits, and performance checks must have been acceptably performed and documented. Checks also need to be completed within the prescribed time frame such as monthly, quarterly or yearly.
- Did the environmental sample pass an initial visual inspection? Many environmental samples can be flagged (qualified) during the initial visual inspection.

- Have manual calculations, manual data entry, or human adjustments to software settings been checked? Were automated calculations verified and accepted prior to use? at what frequencies were these calculations reviewed to ensure that they have not changed?

Data validation is a routine process designed to ensure that reported values meet the quality goals of the environmental data operations. Data validation is further defined as examination and provision of objective evidence that the particular requirements for a specific *intended use* are fulfilled. A progressive, systematic approach to data validation must be used to ensure and assess the quality of data. Effective data validation procedures usually are handled completely independently from the procedures of initial data collection. Final data validation for the air quality monitoring program will be under the direction of the Air Monitoring Supervisor at the State Program Office.

DEQ's SOP "*Standard Operating Procedure for Regional and State Office Data Review, Data Verification and Data Validation*" (TRIM record # 2015ABD1) ensures the entire data review, verification and final validation process is consistently followed within DEQ's organization.

24. Reconciliation with User Requirements

The purpose of Section 24 is to identify DEQ's process for evaluating the project results and assessing the usability of data for making environmental decisions and/or NAAQS compliance determinations.

Through the rulemaking process for the criteria pollutants and associated guidance documents, the USEPA establishes a number of criteria to ensure monitoring objectives are defined. EPA establishes data quality objectives (DQO's) and data quality indicators (DQI's) such as precision and accuracy, with acceptable limits designed to ensure DQO's are met. EPA also defines specific monitoring objectives (e.g. population oriented), scales of representation, and monitoring siting criteria. DEQ subscribes and implements these criteria for its ambient air monitoring program.

Throughout the data review, data verification and data validation process, DEQ's air quality monitoring staff continually assess data quality and data quality indicators to ensure data quality standards are met. Data that does not meet standards is typically applied a "null" code prior to submittal to the AQS system. Details of this process are described in the SOP "*Regional and State Office Data Review and Editing, Data Verification and Data Validation"* (TRIM Record # 2015ABD1).

Data quality performance is further measured through multiple methods at DEQ.

- Measurement Uncertainty for automated and manual $PM_{2.5}$ methods is reviewed during the annual data certification process. Each $PM_{2.5}$ monitor type is collocated in the network.

- DEQ participates in the EPA's National Performance Evaluation Program (NPAP) and $PM_{2.5}$ Performance Evaluation Program ($PM_{2.5}$-PEP).
- DEQ utilizes an independent audit of our gas, FRM, FEM, SPM monitoring network. These audits are performed by BOL twice annually.

In the event the aforementioned uncertainty measurements are not met or indicate a potential problem, i.e. a warning level result, then corrective action will be initiated to resolve the problem.

The AQS system produces reports for data quality assessment. DEQ is required to submit to EPA, on May 1 of each year, a letter to OAQPS in order to "certify" the previous year's annual data set. Then, EPA must agree with DEQ's request and apply a "concurrence flag" in order for the data to become official.

To complete this process, DEQ evaluates the AQS AMP 256 (Data Quality Indicator) and AMP600 (Data Certification) Reports. These reports automatically review the annual data for each SLAMS criteria pollutant monitor. The AMP 256 Report assesses the data for satisfying the QA/QC requirements of 40CFR Part 58, Appendix A. The AMP 600 Report will provide either a "Y" or "N" flag, recommending (or not) that the agency certify that data. If a "N" flag occurs the AMP 600 Report provides the reason, and DEQ can review the data and make corrections or submissions, if appropriate, and run the AMP 600 report again.

To complete the annual data certification process, following formal review of the data certification request by the EPA Regional Administrator, EPA will apply concurrence codes by monitor. This is the ultimate determination on the "usability" of the data.

If and when the data from at least one of the monitors or sites violates the DQI bias and/or precision limits, then DEQ must investigate the cause of the violation. If all of the monitors/samplers in the network of a similar type or pollutant violate the DQI, the cause may be at the agency level (e.g. operator training) or higher (e.g. laboratory QC, method selection). If only one monitor/sampler or site violates the DQI, the cause is more likely specific to the site (e.g. operator error, siting issue). Independent performance audits, QC records and site logs and precision/accuracy data from nearby states or national performance data are tools that are used to assess DQI deviations.

Specific monitor siting criteria are reconciled annually in the Ambient Air Monitoring Network Plan, and broader evaluations to determine whether site/pollutant monitoring objectives are being met are performed every 5 years as part of the Five Year Air Monitoring Network Assessment.

25. References

U.S. Environmental Protection Agency. 2002. *Guidance for Quality Assurance Project Plans (QA/G-5)* (EPA/240/R-02/009). Washington, D.C.

http://www.epa.gov/QUALITY/qs-docs/g5-final.pdf

U.S. Environmental Protection Agency. 2001a. *EPA Requirements for QA Project Plans (QA/R-5)* (EPA/600/R-98/018). Washington, D.C.

http://www.epa.gov/QUALITY/qs-docs/r5-final.pdf

U.S. Environmental Protection Agency. 2013. *QA Handbook for Air Pollution Measurement Systems Volume II Ambient Air Quality Monitoring Program* (EPA/454/B-13-003), May, 2013. RTP, North Carolina.

https://www3.epa.gov/ttn/amtic/qalist.html

U.S. Environmental Protection Agency. 2013. *QA Handbook for Air Pollution Measurement Systems Volume II Ambient Air Quality Monitoring Program, Appendix D* (EPA/454/B-13-003), May, 2013. RTP, North Carolina.

https://www3.epa.gov/ttn/amtic/qalist.html

U.S. Environmental Protection Agency. 2008. *QA Handbook for Air Pollution Measurement Systems Volume IV Meteorological Measurements Version 2.0* (EPA/454/B-08-002), March, 2008. RTP, North Carolina.

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U.S. Environmental Protection Agency. 2006. *Data Quality Assessment: A Reviewer's Guide (QA/G-9R)* (EPA/240/B-06/002). Washington, D.C.

https://www.epa.gov/quality/guidance-data-quality-assessment

U.S. Environmental Protection Agency. 2013. *List of Designated Reference and Equivalent Methods,* June, 2013. RTP, North Carolina.

https://www.epa.gov/amtic/air-monitoring-methods-criteria-pollutants

Appendices

Appendix A – IDEQ Air Monitoring Standard Operating Procedures

For DEQ Staff, the list of the current authorized Air Monitoring Standard Operating Procedures can be found on DEQ's intranet: http://deq.intranet/program-resources/air-monitoring-resources.aspx

The Air Monitoring Supervisor can be contacted as an alternate source to provide the documents.

Appendix B – Idaho Bureau of Laboratories Standard Operating Procedures

For a list of the current authorized IBL Standard Operating Procedures, contact the Air Monitoring Supervisor

Appendix C – QAPP Project QAO Annual Audit Checklist

Appendix A – IDEQ Air Quality Monitoring Standard Operating Procedures

DEQ maintains a master list of current versions/status of its' ambient air monitoring SOPs on the DEQ intranet (http://deq.intranet/program-resources/air-monitoring-resources.aspx)

This provides quick access for staff to the documents, all stored in TRIM. Below is the list as of September 9, 2020:

Final Documents

TRIM Record #	Rendition Name	Other Notes
2015ABD10	SOP – Teledyne API Model 400E and T400 Ozone Analyzers	Revision 2.1 - 9/24/2015
2015ABD12	SOP – Teledyne API Model 200E, 200EU (for use with Noy), and T200UP Nitrogen Oxides Analyzers	Revision 2.0 -10/23/2015
2009ABD22	SOP - API 300 CO Analyzer	Revision 2.0 - 6/22/2010
2010ABD9	SOP - API 300EU CO Analyzer	Revision 2.0 - 6/29/2010
2019ABD2	SOP – Met One's E-SEQ-FRM Sampler	Revision 1.0 – 8/19/2020
2009ABD52	SOP - FRM 2025 Sequential Sampler	Revision 2.0 - 10/29/2010
2015ABD4	SOP – Teledyne API Model T100 and 100EU SO2 Analyzers	Revision 2.1 – 9/30/2015
2009ABD50	SOP - Standard Operating Procedure for E-BAM	Revision 2.1 - 8/6/2018
2011ABC5	SOP - Meteorological Tower	Revision 2.0 – 6/27/2013
2010ABD26	SOP - BAM 1020	Revision 3.0 - 11/14/2013
2009ABD5	SOP - Air Monitoring Station Site Visits	Revision 2.0 - 1/22/2010
2009ABD25	SOP - Equipment and Supply Acceptance	Revision 1.1 - 1/22/2010
2010ABD42	SOP - Monitoring Site Evaluation, Selection, and Deployment	Revision 1.0 - 9/30/2010
2010ABD25	SOP - Communications Software and Tools	Revision 1.0 - 11/20/2010
2010ABD13	SOP - Method Detection Limit (MDL) Determinations	Revision 1.0 - 7/8/2010
2013ABD5	SOP - Statistical Evaluation of SPMs for the Purpose of Determining the AQI	Revision 2.0 3/24/2014
2013ABD18	SOP - Submission of Air Quality (AQI) Forecasts to AirNow and DEQ Web	Revision 3.1- 6/2/2020
2014ABD7	SOP – Met One Instruments SASS Speciation Monitor	Revision 1.0 – 2/27/2014

TRIM Record Number: 2015ABD2

2010ABD16	SOP – Maintenance of Gas Calibrators and Zero Air Generators	Revision 3.0 – 3/17/2014
2014ABD9	SOP – URG 300N	Revision 1.0 – 3/19/2014
2013ABD7	Policy Guidance - Flagging and Documenting Exceptional Events	Revision 3.1 - 6/1/2016
2013ABD8	Program Policy Guidance for Emergency Monitor Deployment	Revision 4.2 – 8/6/2018
2009ABD16	Program Policy Guidance for Filing AQ Monitoring Documents in TRIM	Revision 3.0 - 9/30/2013
2014AAZ1	Air Quality Monitoring Training Plan	Revision 2.0 - 1/21/2014
2015ABD1	SOP for Regional and State Office Data Review and Editing, Data Verification and Data Validation	Revision 1.0 - 9/1/2015
2013AEC1	DEQ Procedure for Preparing Standard Operating Procedures (Note: This SOP is governed by DEQ QA Manager)	Revision 1 - 3/30/2016
2015ABD3	SOP – Met One Instrument's E-Sampler	Revision 1.0 - 5/27/2015

Archived SOPs

These SOPs are no longer being actively revised but, remain available for reference. They often cover instruments which are being phased out of use or obsolete. The instruments may remain in service for use during emergency situations or for study purposes but, are not part of the active monitoring network.

TRIM Record #	Rendition Name	Other Notes
2009ABD19	SOP – TEOM Particulate Monitors (PM_{10} and $PM_{2.5}$)	Revision 2.1 - 6/29/2010
2010ABD44	SOP - FRM 2000 Manual Sampler	Revision 2.0 - 10/29/2010
2013ABD9	SOP - Radiance Research M903 Nephelometer	Revision 2.0 - 7/15/2013
2013ABD4	Cd'A Reg Office SOP - Bench Testing 1400AB TEOM Control and Sensor Units	Revision 1.0 - 4/22/2013
2012ABD2	PM2.5 – Thermo 1405 FDMS	EPA Version – 12/14/2012
2010ABD27	SOP - Digital Modem Setup and Provisioning	Revision 1.0 - 7/12/2010
2010ABD20	SOP - Documenting and Charting Quality Control Checks	Revision 1.0 - 9/20/2010

Appendix B – BOL Standard Operating Procedures

Current List of BOL Air Monitoring Standard Operating Procedures:

SOP Title (note: no renditions In TRIM)	**Revision Date**
Audit of Air Quality Monitors	10/11/2017
Air Audit Appendix K – Ozone Reverification	06/18/2019
Air Audit Appendix A – Hi Vol	06/18/2019
IBOL SOP Gravimetric Analysis PM2.5 Filters	09/17/2018
Operation and Control if Air Filter Laboratory	06/20/2018

Appendix C - State Office QAO QAPP Annual Audit Checklist

This audit is required to be performed by the state office QAO on statewide generic QAPPs that control project activities approaching or extending beyond one year from the date of QAPP approval. The QAO assigned in the statewide generic QAPP *shall complete this checklist as part of the audit process and file the completed form in the appropriate project TRIM system files.* Project QAOs are encouraged to expand this standard list as project conditions warrant.

Printed Name of Staff Performing the QAPP Audit	Date Completed
QAPP Title	QAPP TRIM Record #

Check the following review boxes following completion of each listed task.

Check *yes* if the task was completed without any noted discrepancies. Otherwise, check *no* and include a description of the discrepancy in the space provided. Use additional sheets as necessary.

Yes	No	
☐	☐	Verify that the approved current Ambient Air Monitoring QAPP, including a copy of the signed approval signature page, is currently filed in TRIM. Also, verify the project information has been entered into the QAO project tracker found at TRIM record 2012AEB8. If the QAPP is not filed in TRIM, or the QAO tracker is not current, immediately inform the DEQ QA manager.
☐	☐	Verify that the approved and current project documents, such as the Ambient Air Monitoring QAPP and associated SOPs, etc., are available to project staff and are in use per project requirements.
☐	☐	Determine through review and observation if the project has performed and documented project activities as described and required by the Ambient Air Monitoring QAPP, such that the needs of the data users are satisfied.
☐	☐	Determine if the Ambient Air Monitoring QAPP and associated SOPs, etc. adequately document and describe the actual project requirements such that the needs of the data user are satisfied. If necessary, in coordination with the Ambient Air Monitoring QAPP and Regional Office Air Managers, initiate document revision, review, and approval efforts in accordance with the DEQ QMP.
☐	☐	Determine if the project analytical requirements are adequately met by the laboratories selected for use in the project, including use of proper analytical methods and sufficient analytical data support documentation.

Yes	No	
☐	☐	Determine if project sample handling activities are in compliance with the requirements of the Ambient Air Monitoring QAPP and the SOPs.
☐	☐	Determine if project field activities are in compliance with the requirements of the Ambient Air Monitoring QAPP and the SOPs.
☐	☐	Determine if all nondirect data acquisition associated with the project has been addressed and properly documented in accordance with the Ambient Air Monitoring QAPP and the SOPs.
☐	☐	Compare actual project documents available in the DEQ TRIM record system against the document filing requirements contained in the Ambient Air Monitoring QAPP and the SOPs. Identify existing deficiencies in the project TRIM system files, such as missing field note pages and missing chain-of-custody forms, and provide this information to the Ambient Air Monitoring QAPP and Regional Office Air Managers for immediate resolution.
☐	☐	Ensure that all deficiencies and/or conditions adverse to quality determined during the state office QAPP QAO audit are listed on this checklist or attached for inclusion in the TRIM record system.
☐	☐	Verify that a copy of this audit report has been provided to Ambient Air Monitoring QAPP project manager for deficiency resolution and placed in the project TRIM file system. Note that additional audit administrative actions may be required based on audit findings, such as a corrective action plan/reports, etc. The state office QAPP QAO shall consult the DEQ QMP and proceed accordingly.

Please list any additional comments below. Attach additional sheets as necessary.

_____
_____
_____
_____