QUALITY MANAGEMENT PLAN

Technical Services Program
Air Pollution Control Division
Colorado Department of Public Health and Environment

January 2023

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Approval Page

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Michael Ogletree, APCD Division Director — 2/14/2023 Date

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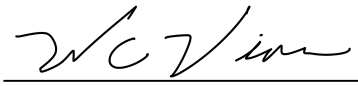

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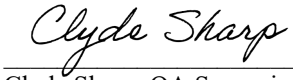

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Executive Summary

Quality systems that support environmental programs involving environmental data or technology, operated by organizations funded by the Environmental Protection Agency (EPA) are required to be covered by an EPA-approved Quality Management Plan (QMP). A Quality Management Plan is a tool that documents an organization's quality system for planning, implementing, documenting, and assessing the effectiveness of activities supporting environmental data operations and other environmental programs.

Personnel in the Colorado Department of Public Health and Environment (CDPHE) Air Pollution Control Division (APCD) Technical Services Program (TSP) use quality management processes during all operations that involve the collection, manipulation and utilization of environmental data. This QMP for the APCD TSP has been designed to define quality assurance goals, the methodology and criteria for attaining those goals, and to provide the operational mechanisms for maintaining those goals. It is the expressed purpose of the APCD to use only those analytical data that are both reliable and have a defined level of quality. The level of quality must be scientifically defensible and sufficient to support the APCD mission and individual project objectives.

The standards presented in this document apply to all APCD TSP efforts during which samples are taken for the purpose of generating environmental data that have been funded through EPA grants. The standards apply to activities that are conducted directly by APCD TSP personnel, activities performed under contracts, activities performed under EPA grants, and activities performed under any intergovernmental agreement when resulting environmental data are intended for use in EPA funded programs. These standards are intended to be applicable to the APCD TSP.

The APCD defines in this document the mandatory use of Quality Assurance Project Plans (QAPP) with minimum acceptable elements. APCD QAPPs must address all of the elements discussed in Section 2.1 of this document. Sampling plans for projects actively in place generating data should not be rewritten, but need to be examined to verify compliance with the standards and goals presented in this QMP.

This QMP recognizes there are times when sampling activities cannot be planned in advance. However, environmental data generated during these times must withstand review and meet the same quality requirements presented in this plan. After the fact QAPPs or Sampling and Analysis Plans will be prepared if review so indicates.

The APCD, as a primary tool in implementing this QMP, will utilize Standard Operating Procedures (SOP). This QMP is intended to be a flexible and dynamic tool, which evolves as the APCD mission and goals change. It will be open to revision at any time the plan is shown to be deficient.

This QMP for the CDPHE APCD was prepared in accordance with the EPA requirements documented in the "*Handbook for Developing Quality Management Plans*" (EPA, Draft December 2012) which encompasses all of the sections contained in EPA QA/R-2, entitled "*Requirements for Quality Management Plans."* Both of these documents are based on CIO 2105.0 (formerly EPA Order 5360.1 A2), entitled "*Policy and Program Requirements for the Mandatory Quality Assurance Program,"* and CIO2105-P-0) (formerly EPA Manual 5360 A1) entitled "*Quality Manual for Environmental Programs*." All APCD TSP documents comply with the EPA Quality Program Policy – CIO 2106.0 and the EPA Procedure – CIO 2106-P-01.0. The contents of these documents have not changed, only the document numbers have changed. Advice from the EPA Region VIII Quality Assurance Office was also utilized while developing this document.

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1.0 MANAGEMENT AND ORGANIZATION

1.1 Document Purpose and Organization

This Quality Management Plan (QMP) describes and documents the quality management process the Colorado Department of Public Health and Environment (CDPHE) Air Pollution Control Division (APCD) Technical Services Program (TSP) uses to maintain a Quality System consistent with U.S. Environmental Protection Agency (EPA) requirements, and APCD requirements. The QMP is used to demonstrate conformance to ANSI/ASQC E4-2004, entitled "*Quality Systems for Environmental Data and Technology Programs*." This QMP for the CDPHE APCD TSP was prepared in accordance with the EPA requirements documented in the "*Handbook for Developing Quality Management Plans*" (EPA, Draft December 2012), which encompasses all of the sections contained in EPA QA/R-2, entitled "*Requirements for Quality Management Plans."* Both of these documents are based on CIO 2105.0 (formerly EPA Order 5360.1 A2), entitled "*Policy and Program Requirements for the Mandatory Quality Assurance Program"*," and CIO2105-P-0) (formerly EPA Manual 5360 A1) entitled "*Quality Manual for Environmental Programs*." All APCD TSP documents comply with the EPA Quality Program Policy – CIO 2106.0 and the EPA Procedure – CIO 2106-P-01.0.

1.2 Statement of Quality Assurance Policy

The APCD will have a policy to implement, operate, and maintain a quality assurance and quality control (QA/QC) program to ensure that all environmental data collected, generated, and released are scientifically valid, defensible, and of known and acceptable precision and accuracy. This policy is to apply to all data whether it is for internal or external use. The APCD will adhere to the requirements of this QMP in order to assure that all projects undertaken meet QA/QC expectations. This quality assurance and quality control program will be implemented largely through: 1) mandatory QA/QC training for certain identified job functions, 2) mandatory use of program specific Quality Assurance Project Plans (QAPPs), and 3) implementation of Standard Operating Procedures (SOPs). No project that generates environmental data will be undertaken until an approved plan (QAPP or SOP) meeting all elements of this QMP are in place. Note exceptions to this statement in Section 1.5.

This QMP is to be evaluated annually and revised as necessary to ensure the continued production of quality data. See flow diagram entitled " Quality Management Plan Development and Review " in Attachment 5 to see how revisions of the QMP will be evaluated within APCD TSP. Conditions requiring revision and approval by the CDPHE Environmental Information Management Unit include the following:

- Expiration of the five-year life span of the QMP;
- Major changes in mission and responsibilities, such as changes in the delegation of a program;
- Re-organization of existing functions that affect programs covered by the QMP;
- Assessment findings requiring corrective actions and response.

1.2.1 Definition of QA/QC

Quality Assurance (QA) is an integrated system of management activities involving planning, implementation, assessment, reporting and quality improvement to ensure that a process, item, or service is of a type and quality needed and expected. With respect to this QMP, the production of reliable, accurate, and scientifically verifiable data will be expected.

Quality Control (QC) is the overall system of technical activities that measures and documents the attributes and performance of a process, item or service against defined standards to verify that the established requirements have been met. The QC system includes operational techniques and activities that are used to fulfill requirements for quality. The defined standards and requirements of this QMP will be the production of quality data.

1.2.2 Importance of QA/QC

The APCD is involved in collecting data, or overseeing data collection, in four broad categories: 1) to identify the presence of environmental contaminants in geographical areas of potential exposure to humans or the environment, 2) to determine impacts of environmental contaminants on human health and ecosystems, 3) to determine whether, how, and by whom such threats to human health and the environment should be remedied, 4) to monitor compliance with environmental regulations. QA and QC are crucial to the functions of the APCD and are critical to maintaining the scientific credibility of the data on which decisions are based.

QA and QC are integral to the functions of the APCD because quality data ensures the credibility of the data upon which decisions are based. Proper QA enhances proper planning, reducing the likelihood of duplicate or repetitive sampling, thereby reducing costs to the taxpayers.

1.2.3 QA/QC Objectives

- To assure that sampling activities are well planned and designed to address the needs and goals of the individual project.
- To assure the production of reliable, accurate data.
- To support decisions made on the basis of analytical data.
- To facilitate the timely identification of problems and implement corrective actions.
- To provide for continuous improvement in APCD operations.
- To provide a point of focus within the APCD for QA/QC activity.

1.3 Organization and Responsibilities

The APCD is divided into nine main Programs: the Climate Change Program, the Mobile Sources Program, the Indoor Environment Program, the Community, Partnership and Policy Program, the Planning and Policy Program, the Compliance and Enforcement Program, the Oil and Gas Program, the Permitting Program, and the Technical Services Program. There is also the Business Operations group which takes care of business operations including administrative services. The APCD also recently created the Air Toxics and Ozone Precursor Sector. This sector was created as a result of two state of Colorado House bills passed in the summer of 2021 and 2022. House Bills 21-1189 and 22-1244 were passed to greatly expand Air Toxics Monitoring in Colorado. The Air Toxics and Ozone Precursor Sector will have its own Quality Assurance Project Plan and Quality Assurance staff. This QMP document is primarily concerned with the Technical Services Program, since that is the program responsible for collection and validation of ambient environmental air data to show compliance with the National Ambient Air Quality Standards within Colorado. Within the TSP there are two main sectors and six units: the Criteria Monitoring Sector, under which exists the Particulate Monitoring Unit and the Gaseous and Meteorological Monitoring Unit. There is also the Quality Assurance, Data and Reports Sector, under which exists the Data and Reports Unit and the Quality Assurance Unit. The two other main units within TSP are the Regional Modeling and Emissions Inventory Unit and the Meteorology and Prescribed Fire Unit. It is the responsibility of each Unit to ensure that the requirements of this QMP plan are followed, and that data quality objectives are met for all projects. However, ultimate responsibility for implementation of this QMP, and review and approval authority of program QAPPs and SOPs will reside with the Quality Assurance, Data and Reports Sector and the Quality Assurance Officer (QAO). Unit specific quality control activities will be performed by authorized staff within each Unit, with QA oversight performed by the Quality Assurance, Data and Reports Sector and the QAO to ensure QMP objectives are being met.

The Criteria Monitoring Unit is broken down into two categories or units, the Gaseous and Meteorology Monitoring Unit (GMM) and the Particulate Monitoring Unit (PM). Both the PM and GMM units maintain databases for all the analytical data collected by all the samplers within their operational network.

The Particulate Monitoring (PM) Unit is responsible for all of the activities associated with particulate monitoring. This includes: Federal Reference Method (FRM) $PM_{2.5}$, Federal Equivalent Method (FEM) $PM_{2.5}$, High-Volume and Low-Volume PM_{10}, as well as particulate analyses for lead. This unit is also responsible for continuous PM_{10}, $PM_{2.5}$ and Speciation Trends Network (STN) sampling. This unit performs required quality control protocols for Colorado's Particulate Network including calibrations, maintenance, collocation precision testing, monthly verifications and other QC checks. They also maintain and validate the FRM/FEM $PM_{2.5}$, $PM_{2.5\ \&10}$ continuous databases and the High Volume PM_{10} and TSP database, and upload monitoring data to EPAs Air Quality System (AQS).

The Gaseous and Meteorological Monitoring (GMM) Unit is responsible for carbon monoxide (CO), ozone (O_3), sulfur dioxide (SO_2) and oxides of nitrogen (NO_x) sampling, as well as meteorological monitoring. This unit operates and maintains the NCore site, including trace level analyses of CO, SO_2 and NO_y. This unit is responsible for the two near-roadway monitoring sites. The unit also maintains the databases for the previously mentioned sampling and uploads monitoring data to EPAs AQS database. In addition this unit is responsible for the Ozone Precursor or Photochemical Assessment Monitoring (PAMs) at the Rocky Flats North site.

The Quality Assurance, Data and Reports Sector is broken down into two units: the Data and Reports Unit and the Quality Assurance Unit. The Quality Assurance Unit is responsible for QA oversight of both the PM and GMM networks, the QMP, the QAPP, all SOP's, the Annual Data Certification, field and laboratory audits, system performance audits, internal technical system audits, final data review and validation, and coordinating the 3-Year Technical Systems audit with EPA Region VIII.

The Data and Reports Unit is responsible for the production of the Annual Data Report / Data Quality Assessment, The Annual Network Plan, and the 5-Year Network Assessment, as well as the maintenance of all associated databases, software and data management tools. The unit collects, verifies, analyzes and writes reports from air quality data and distributes it to other governmental agencies and the public. The unit evaluates the ambient criteria pollutant monitoring network to determine if the network meets monitoring objectives, whether new sites are needed, whether existing sites are no longer needed and can be terminated, and whether new technologies are appropriate for incorporation into the ambient monitoring network. The unit is also responsible for responding to ad hoc data requests from the internal and external stakeholders and producing various data summaries and data visualizations as needed.

The Quality Assurance Officer (QAO) within the Quality Assurance, Data and Reports Sector will advise Unit Leaders and staff on technical issues associated with analytical methods, sampling, and QAPP design and implementation. Knowledge and familiarity with facilities, projects, and program mission are necessary for realistic implementation of this QMP. Through a review and approval process the Unit Leaders and staff are individually responsible for assuring that QAPPs are capable of producing reliable work of known quality, which meets stated project needs. The QAO will provide a final review and approval of QAPPs to ensure that all required quality assurance protocols are addressed. Staff functioning as project leaders are assigned projects by the appropriate Unit Leader and these projects must be consistent with the unit work plan. Project leaders are responsible for verifying that all QAPP and SOP requirements as outlined in this QMP, have been met. Project leaders will be required to report back to Unit Leaders, who will be required to report QMP activities to the QAO. The QAO is separated from monitoring activities by two levels of authority.

The Regional Modeling and Emissions Inventory (MEI) Unit performs and reviews air quality-related analyses for a variety of air programs to meet Federal and State regulatory requirements, including state implementation plans, mobile source control programs, and National Environmental Policy Act (NEPA) actions. The analyses include photochemical modeling, emission modeling, meteorological analysis, and emission inventory development. The spatial scales of analyses include near-field, far-field, and regional scale. Emission inventory work includes the compilation and development of comprehensive multi-pollutant inventories suitable for use in air quality modeling and conformity. Emission inventory development work includes on-road and non-road mobile sources, area sources, and small stationary

sources not included in the Division's Air Pollution Emission Notice program. Meteorological applications include evaluation of output from meteorological models for regional modeling purposes.

The Meteorology and Prescribed Fire Unit is responsible for two main tasks. The smoke management staff issue permits for the use of prescribed fire. The Meteorology group provides daily air quality forecasting, emergency response forecasting and meteorological analyses. There is no QA oversight affiliated with these activities.

Please see Attachment 2 for the CDPHE / TSP organizational chart. Please visit the following web address for the APCD organizational chart.

APCD Organizational Chart

1.4 General Data Generation Policy

Environmental sampling is conducted to accomplish the following goals: confirm the presence or absence of pollutants or contaminants, determine concentration levels of various sample components, evaluate rate and dispersion of transport, determine eventual fate of the identified pollutants, determine sources of contamination, establish time trends, delineate horizontal and vertical distribution, monitor change, evaluate progress, and evaluate compliance with environmental laws and regulations. Analytical data generated to comply with the Code of Federal Regulations (CFR) Sections 50, 53 and 58 require that the analytical methodology will be carried out in accordance with requirements as specified within the regulations.

For other activities where there is not a required analytical method, the program may utilize or allow the use of any applicable, appropriate, and verifiable analytical methodology that meets the data quality requirements of the project, provided that the method has been determined to be adequate. For those analytical problems undefined by guidance, the program may use or approve any analytical approach, which produces usable data with known performance characteristics.

All analytical data collection plans must be adequately addressed in a QAPP, which includes Data Quality Objectives (DQO). Each separate analytical data acquisition plan must have review and approval for the specific data collection activities to which it relates. The scope and required elements for the QAPP are discussed in Section 2.0 of this document.

1.5 Policy on Samples of Opportunity

Sampling events may not always be a planned activity. Some sampling events do not allow for a formal analytical data acquisition plan. These events may be driven by public health concerns, or bona fide emergencies in which case the collector has determined that an immediate threat to human health or the environment exists and/or the situation may not be apparent or accessible after time is taken for planning activities. Such samples are collectively referred to as samples of opportunity. In order to conserve resources, maximize information, account for the stated purpose of the sample in a reasonable time and allow for the safe gathering of these samples, the APCD reserves the right to employ expertise within the APCD to formulate such plans. Prior to collection of samples, field activities will be defined. If necessary, a QAPP will be developed within 30 days of the sampling, and reviewed for approval by the appropriate project manager or Unit Leader. All data will be examined relative to quality control criteria and corrective measures will be initiated where and when the quality control criteria are exceeded. The data quality objectives or reasons for the collection of data will be reconciled with data gathered.

1.6 Types of Activities Specifically Covered by QMP

- Data generated by field sampling and laboratory analysis.
- Data generated through modeling efforts.
- Data generated from sources outside of the APCD.

Data collection activities must be adequately addressed in a QAPP. Scope and required elements for the QAPP are discussed in Section 2.0.

Field activities that would be covered include not only the collection of samples, but observing and recording field observations, performing analyses in the field and in field laboratories. Physical measurements and observations in the field would include meteorological measurements, barometric pressure, temperature, etc. The QAPP must describe methods of collection, methods of analyses, methods of transportation, and methods of documentation for each of these activities.

2.0 QUALITY SYSTEM AND DESCRIPTION

2.1 Mandatory Use of Quality Assurance Project Plans

All data collection activities conducted by or on behalf of the APCD must be addressed in a QAPP as discussed in one of the following documents:

1) "*Handbook for Developing Quality Assurance Project Plans*" (Environmental Protection Agency, Draft, December 2012). This Handbook is designed to assist in the creation of QAPPs that address the specifications listed in Annex B of *Quality Standard For Environmental Data Collection, Production, and Use By EPA Organizations (EPA CIO 2106-S-01)* and *Quality Standard For Environmental Data Collection, Production, and Use By Non-EPA (External) Organizations (EPA CIO 2106-S-02.0)* (current versions). It is intended both for EPA organizations and for organizations conducting environmental data operations under external agreements with EPA.

2) *"Requirements for Quality Assurance Project Plans" (*Environmental Protection Agency, Final March 2001). The APCD, consistent with EPA Region VIII, requires that 16 elements defined in QA/R-5 be addressed adequately before a Quality Assurance Project Plan may be approved. A brief summary is provided here, but a full description of each element may be found in QA/R-5.

The APCD converted the format of their QAPP from the QA/R-5 elements to the Draft 2012 Handbook elements structure during the 2014 and 2015 rewrite of the QAPP and all associated SOPs, which was approved by APCD management on July 30, 2015.

In either case these four major elements are present (the contents within each major element is structured slightly differently within each guidance document):

- Project Management (*Plan*) - These elements, covering the basic areas of project management, project objectives, and the roles and responsibilities of the participants, document the development of progress towards the project's goal. The development of technical and quality project objectives, such as DQOs, are part of this step.
- Data Acquisition (*Do*) - These elements cover all aspects of data measurement, data acquisition designs, and their implementation. The development of performance and acceptance criteria for the collection of data by direct measurement, acquisition from existing sources, and by modeling are integral to this step. This ensures the intended measurements, data collection, or acquisition methods are appropriate for achieving project objectives.
- Assessments (*Check*) - These elements address the activities for assessing the effectiveness of the implementation of the project and associated QA and QC activities. The purpose of assessment is to ensure that the QAPP is implemented as prescribed and that project actions are implemented as expected.
- Review, Evaluation of Usability, and Reporting Requirements *(Act*) - These elements cover the QA activities that occur after the data collection (or use) phase of the project is completed. Implementation

of these elements will help in determining that the data conform to the specified criteria, and ensuring that data usability can be documented in a final project report. This step includes any limitations or restrictions on the use of the data, or contingencies for revising project objectives.

All QAPPs must be consistent with this QMP and QA policy of the APCD. See flow diagram in attachment #5 entitled "Quality Assurance Project Plan Review" to see how new QAPP development and current QAPP revisions will be evaluated.

It will be the policy of the APCD to encourage the "team approach" in developing QAPPs. The APCD employs technical experts in multiple disciplines. Each project leader is encouraged to involve as many of the professionals on his/her team as is relevant to site or project issues.

2.1.1 Standard Quality System for Control of Data

The standards presented in this QMP apply to all APCD activities during which physical samples are taken for the purpose of performing chemical or physical tests and generating environmental data. These standards apply to activities that are conducted directly by APCD personnel, activities performed for the APCD, activities performed under EPA grants, and activities performed under any intergovernmental agreement when resulting environmental data are intended for use in APCD or EPA funded programs.

QAPPs must be critically reviewed for technical adequacy and compliance with QA/R-5 and approved by the APCD TSP QAO prior to scheduling sampling or laboratory services. The QAO will have ultimate authority in administering this QMP. However, each program will have the responsibility of review and approval of program specific activities. Staff that will be considered "authorized" for QAPP review will be discussed in the following section.

QAPPs for long-term projects must be reviewed at least annually for continued relevancy and revised as needed. However, a QAPP may be revised at any time if necessary. Revisions to a previously approved QAPP must undergo the same review and approval process as the original version.

Each separate SOP must be individually reviewed and approved by staff, as identified in the QAPP, for the specific data collection activities to which it relates.

All field sampling must be conducted in accordance with an approved QAPP to ensure the DQOs will be met. SOPs for activities currently in place and preceding this QMP should not be rewritten, but need to be evaluated for compliance to the requirements of this QMP.

2.1.2 Qualification of Staff for Approval Authority

All staff that will approve QAPPs and SOPs are required to have adequate QA/QC training. This training starts with a review of the current CDPDE/APCD QAPP and associated SOPs. Additionally, it is a requirement to become familiarized with the EPA Quality Assurance Handbook for Air Pollution Measurement Systems Volume II Part I. Any coursework that is available on Quality Control activities is encouraged. Some generic QA/QC courses are available online through the *EPA Quality System, Training Courses on Quality Assurance and Quality Control Activities* located at the following web page. https://www.epa.gov/quality/training-courses-quality-assurance-and-quality-control-activities. QA courses are occasionally offered through EPA Region VIII headquarters. QA courses are offered during annual/biannual EPA QA conferences. Attendance at EPA QA conferences is recommended to stay current on Code of Federal Regulation or guidance changes and new methodologies. The QAO will determine if a staff member has enough knowledge and experience to review and approve QA documents. It is also recommended that staff with document approval authority keep current by reviewing the quarterly publication from the Office of Air Quality Planning Standards (OAQPS) called *The QA EYE*.

2.1.3 Use of Standard Operating Procedures (SOPs)

Program activities will incorporate the use of a SOP if a task is to be repeated frequently. The use of SOPs promotes reproducible work products and long-term consistency in Program operations. SOPs may be developed by a specific Program, but will be subject to review and approval by authorized staff within the Program. The EPA guidance document, EPA Document QA/G-6, "*Guidance for the Preparation of Standard Operation Procedures for Quality-Related Documents"* will be used as a guide in developing SOPs. SOPs will be referenced in QAPPs where appropriate.

SOPs are approved by the Unit Supervisors. SOPs may be developed to address elements of a QAPP. As such, SOPs must be stand-alone procedures that when assembled represent repetitive elements in QAPPs. SOPs will be evaluated by the following criteria:

a. Procedure is to be simple, so an individual with a basic technical education can employ them.
b. Procedure is to contain sufficient detail so that a user can follow the procedure.
c. Procedure is to be consistent with sound scientific principles and good laboratory practices.
d. Procedure is to be consistent with current regulatory agency requirements and guidelines.
e. Procedures must provide for a specific level of documentation.

Each separate SOP must be individually reviewed and approved by staff, as identified in the QAPP, for the specific data collection activities to which it relates. SOPs for activities currently in place and preceding this QMP should not be rewritten, but need to be evaluated for compliance to the requirements of this QMP.

2.2 Mandatory Control of Data Collection Activities

Certain practices are mandatory to control environmental data collection activities. These practices are described below:

- Development and Approval of a QAPP.

  The preparation, review and approval of a QAPP as described in previous sections is mandatory.

- Development of Data Quality Objectives (DQOs).

  The development of DQOs is mandatory under QA/R-5. DQOs may be a simple statement of why data are being collected and what data outputs will be considered significant. Others will require a complete statistical approach as described in EPA Guidance QA/G-4, "Guidance for the Data Quality Objectives Process." QAPP reviewers must assure that the QAPP specifically addresses the technical adequacy of DQOs.

  DQOs are intended to accomplish the following:

  - Clarify the objectives.
  - Define the most appropriate types of data to collect.
  - Determine the most appropriate conditions under which to collect the data.
  - Specify the level of uncertainty that is acceptable as the basis for establishing the quantity and quality of data needed.

- Production of a report documenting reconciliation with DQOs.

  Elements D1, D2 and D3 of QA/R-5 require that QAPPs identify data assessment procedures. These elements specifically include items on how data will be reviewed, validated and qualified. Element D3 requires reconciliation with stated DQOs. An assessment of the usability and limitation of the field and analytical data collected, with respect to the original DQOs, must be documented after completing

the data collection activities. A Data Report which includes a Data Quality Assessment of the annual precision and accuracy results is compiled annually.

- Satisfaction of Minimum Analytical QA and Deliverable Requirements.

  All analytical work performed must be as specified in a project QAPP, and must meet minimum standards as defined in the Standard Operating Procedures. Any additional QA/QC and deliverable requirements that are contained in the technical specifications in a project QAPP must also be performed, documented and provided. Failure to comply with these requirements may result in rejection of data.

2.3 Other Practices for Control of Data Collection Activities

Evaluations will be done in accordance with EPA Guidance Document QA/G-7 *"Guidance on Technical Audits and Related Assessments for Environmental Data Operations"*.

- Field Audits.

  These are observation, review and critical appraisal of field sampling activities. Field audits consist of an on-site visit to the sampling location, observation of sampling practices, performance evaluations of the sampling equipment, review of project records and sampling SOPs, and the documentation of findings. The primary intention of such audits is to determine if QAPP specified practices are being followed.

- Laboratory Audits.

  These are audits of laboratory operations while project samples are under analysis, or performed after analysis is completed.

- Data Inspection.

  When results of laboratory analyses are received, an inspection of analytical deliverables may be performed to determine whether the work performed is consistent with laboratory tasking instructions.

2.4 Quality System for Data Collected from Modeling, Electronic and Database Sources

- Modeling Data

  APCD staff often makes use of mathematical and computer based environmental models for the prediction of certain environmental events and effects. The reliability of the outputs of such modeling efforts are dependent upon the accuracy of the input data, on the suitability of the model, and on the accuracy of the modeling process.

  For regulatory modeling, APCD staff use models and procedures recommended and/or required by applicable state and federal rules, including 40 CFR Part 51 Appendix W – Guideline on Air Quality Models. In addition, for air quality permit modeling, Colorado Air Quality Control Commission Regulation No. 3 requires the use of U.S. EPA approved models. It states that "All estimates of ambient concentrations required under this Regulation No. 3 shall be based on the applicable air quality models, databases, and other requirements generally approved by U.S. EPA and specifically approved by the division. If a non-U.S. EPA approved model, such as a wind tunnel study, is proposed, the nature and requirements of such a model should be outlined to the division at a pre-application meeting. The application will be deemed incomplete until there has been an opportunity for a public hearing on the proposed model and written approval of the U.S. EPA has been received." The APCDs procedures may be found in the Colorado Modeling Guideline for Air Quality Permits, which is

available on the Internet at https://cdphe.colorado.gov/air-emissions/air-quality-modeling-guidance-for-permits.

In general, the APCD uses air quality models recommended by U.S. EPA. If a non-EPA approved air quality model is used, the APCD uses the procedures in 40 CFR Part 51 to gain approval from U.S. EPA. As such, the model code and documentation must be available for public review.

A wide variety of mathematical tools (i.e., models) are used by APCD staff. Some types of mathematical models require validation and some do not. In situations where a case-by-case performance evaluation is appropriate (e.g., when Eulerian grid models are used to simulate ozone or when mesoscale meteorological models are developed to simulate meteorology), the APCD documents the performance evaluation and makes it available to the public. For many other models used by the APCD such as plume and puff models, generic performance evaluations have already been performed and/or reviewed U.S. EPA prior to use. Thus, additional validation of the algorithms is not warranted.

- Environmental Database Systems

  All environmental data base systems are "beta" tested before they are first used, and any time programming changes are made. "Beta" testing consists of taking a set of "dummy" data and processing it through the new or modified version of a computational computer program before incorporating the changes into APCD's data storage, validation submittal processes. Periodically a beta test is performed to validate computations are being performed in the same manner as they were at the time of the last change. All changes and beta tests are documented in a logbook or electronic log. All environmental database system administrators will need to identify any major data quality weaknesses of their data system and establish a timetable and plan for improvement. This will require the development of a formal, written QA/QC plan for all APCD database systems.

- Data Obtained from Outside Sources (Secondary Data).

  When using secondary data, it is usually not possible for the APCD to validate or review all of the data. It is APCDs practice that project files and records indicate the source of the data and any efforts that may have been taken to review or validate the data. If multiple sources of the same or similar information are available, the project records must indicate why the source used was chosen.

3.0 PERSONNEL QUALIFICATIONS AND TRAINING

3.1 Staff

The State of Colorado has a civil service type personnel system which is detailed in the *"State Personnel Rules and Procedures"* and Colorado Statute C.R.S. 24-50 (https://www.colorado.gov/pacific/spb/rules-0). Job qualifications are established through the hiring process and determined by program and unit supervisors. These qualifications are documented within each employee's Position Description. Staff are encouraged to pursue professional development and project specific training through individual performance goals (IPGs) stated within an individual's annual job performance plan.

When establishing personnel needs for a specific project, it will be the Unit Leader's responsibility to review the personnel skills and expertise required to implement a project. Also, the Unit Leader must ensure that such personnel resources are available before a project will be approved and implemented.

The prerequisites for staff to perform the assigned duties include a technical education, training, and experience with the program/project goals. An understanding of atmospheric chemistry, statistics, field sampling, meteorology and quality control are developmental objectives for staff. Specifically with regards to approval authority for QAPPs and SOPs, staff will be encouraged to complete QA training classes as detailed in Section 2.1.2.

Unit Leaders are responsible for assuring that program personnel are appropriately trained.

3.2 Quality Assurance Officer

The Quality Assurance Officer (QAO) reports operational problems to the Unit Leaders, and reports any more serious issues requiring corrective actions to the TSP Program Manager. The TSP Program Manager reports to the APCD Division Director. The prerequisites for QAO are education, training, and experience in atmospheric chemistry, quality assurance and quality control, field sampling, meteorology and statistics.

4.0 PROCUREMENT OF ITEMS AND SERVICES

4.1 Selection of Contractors for Analytical and Other Services

Procurement of items and services must be done within the guidelines presented in the State of Colorado's documents entitled *"Procurement Code and Rules"* and *"Fiscal Rules*."

Contractors may be chosen by open competition or by their ability to provide a needed service as described in a project QAPP or SOP. QA and QC services conforming to EPA guidance and specified in a project QAPP or SOP will be required as part of the contract. For some types of laboratory testing, such as metals or organic compounds, annual laboratory certifications of accreditation based on audits performed by licensed accreditation auditors is sufficient for validating if a laboratory can adequately perform the testing to the standards required. Proof of these accreditation certifications from the contract laboratory will need to be provided to APCD. In the case of the gravimetric laboratories, there are no standardized accreditation service available. To assure EPA compliance within the contracted laboratory, an audit of the laboratory will be conducted by APCD prior to any samples being sent, and annually thereafter to insure quality data. These audits will focus on adherence of QA and QC activities as agreed to in the annual laboratory contract. If the QA/QC portion of the contract is not being followed corrective actions must be taken immediately by the contract laboratory to correct this or they will be in danger of losing the contract as soon as another laboratory provider can be established. Modifications to the contract can be made during renewal of the next contract if deficiencies are noted that were not addressed in the original contract.

Deliverables received from contractors are reviewed by the Unit Leader to ensure objectives of a QAPP or SOP are met. Unsatisfactory work is noted, and if the condition cannot be corrected, the Program Manager (or the QAO) is notified. Requirements addressing the QA and QC needs will be based on the applicable QAPP or SOP.

Laboratory services are generally provided by purchase agreement or contract with private laboratories and other governmental entity laboratories.

5.0 DOCUMENTATION AND RECORDS

It is the department's policy to adequately document its organization, functions, policies, decisions, procedures, and transactions. This policy is guided by Colorado's Uniform Records Retention policy and any applicable retention requirements of delegated Federal environmental laws.

All documents in the state, with limited exceptions, are covered by the Colorado Open Records Act (CORA) and are accessible to parties external to the department including the general public. Each division, program manager or project manager is responsible for records relevant to their division, programs, or projects.

All project records shall be kept in an official project file by the project manager. Project records shall be, at a minimum, retained by the department until they have met their approved retention or have been updated or made obsolete. They may then be disposed of or transferred to State Archives. Each division, program, or

project shall determine its own records retention and disposal schedule for each type of document. The approval of the State Archivist or the Attorney General may be sought, as appropriate.

The practices for handling, storing and archiving all electronic and hardcopy documents and records of both public and confidential nature are described in the *"Colorado State Archives Records Management Manual*," a document developed by the Division of Information Technologies within the Colorado State Government.

Hardcopy documents are kept for a minimum of three to five years before being archived in permanent files off-site. Sampled filters are also stored in the event that a repeat analyses needs to be performed. See specific SOPs for details on filter sample storage.

Technical and QA documents are prepared by staff responsible for project completion. Most documents are peer reviewed by other staff before final review by the Unit Leader or Program Managers.

5.1 QAPPs and SOPs

Each unit is responsible for maintaining files which contain all quality systems documents (QAPPs and SOPs) relating to their specific scope of work. In addition, the TSP will maintain a central file, which contains quality documents for all APCD TSP programs.

5.2 Reports

The following reports and reviews will be prepared at the specified intervals:

- Annual Monitoring Network Plan.
- Annual Air Quality Data Report, which includes the Annual Data Quality Assessment of all precision and accuracy events.
- Network Assessment, every five years.
- Annual Data Certification.
- Quarterly and Annual QA summaries for all Performance Evaluations and internal audits.
- Corrective action summaries.
- Exceptional Event reports.
- NPAP, PEP, TTP, NATTS PT testing performed by EPA or EPA contractors.
- Technical Systems Evaluations (TSA) done by EPA, every three years.
- TSA performed by APCD on sub-contracted work such as gravimetric laboratory.
- Explanation of any other problems encountered which could impact meeting QA/QC goals.

5.3 Field Documentation

Documentation of field activities validates completion of established procedures, identifies who performed the procedures, enhances and facilitates sample tracking, standardizes data entries, and identifies and establishes authenticity of the sample data collected. Proper documentation ensures that all essential and required information is consistently acquired and preserved. Timely, correct, and complete documentation establishes the chain-of-custody, a requirement for data intended to provide evidence for court proceedings.

Documentation of field activities, and chain-of-custody are done in accordance with EPAs *"Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II"* (OAQPS, May 2013).

All field records shall be generated and stored as specified in project specific QAPPs and SOPs.

5.4 Use of "Central" as a Central Database for APCD Continuous Monitoring Data

It is the policy of the APCD that all continuous monitoring data collected by or for the APCD will be stored in a SQL Server database managed by a central polling computer system. These data will be reviewed and

evaluated against QC and QA criteria, and validated as quality assured before being uploaded into the EPAs AQS database system. Reviewing of data to meet this goal is the responsibility of the Criteria Monitoring Unit (CMU). It will be the responsibility of the CMU Supervisor to verify all DQO requirements are met prior to uploading data to AQS. Additional continuous monitoring QC information from field data sheets will be reviewed before being uploaded to AQS. To assure the quality of the data, practices established in EPA Document QA/G-8 *"Guidance on Environmental Data Verification and Data Validation"* have been adopted. Hardcopies of these data records are filed on site and after two or more years are archived in permanent files.

5.5 Other Databases used by the APCD

Many Access™ and SQL-based databases used for particulate monitoring, gaseous monitoring and quality assurance are maintained by the TSP. The quality of these data is the responsibility of the unit within TSP which created and utilizes each of these databases. To assure the quality of the data, practices established in EPA Document QA/G-8 *"Guidance on Environmental Data Verification and Data Validation"* have been adopted. These databases are reviewed periodically by the QA Unit by hand calculating selected data sets to validate accuracy of data reporting. Any other databases in use by the APCD, which utilize environmental data generated by the APCD, will be subject to the standards outlined in this QMP.

Most APCD ambient air monitoring data are then uploaded to the EPAs AQS database system. APCD TSP is responsible for making sure these data have been validated and are of high quality. The EPA is responsible for maintaining the AQS database and all its levels of protection.

6.0 COMPUTER HARDWARE AND SOFTWARE

IT professionals employed by the Governor's Office of Information Technology (OIT) are responsible for maintaining information systems. OIT utilizes a PM Common Methodology. Documentation is available through the OIT website under OIT Policies and Standards (https://oit.colorado.gov/).

These documents outline the processes for developing, installing, testing, using, maintaining, controlling, and documenting computer hardware and software. The processes for assessing and documenting the impact of changes to user software and hardware are also found in this document.

The department uses a computer architecture including multiple systems, servers and digital storage, with Local Area and Wide Area Networks including Internet providing interconnectivity of Local, State, and Federal computing resources. Access onto the networks and systems require the use of user credentials, including (at least) user name and security password. OIT professionals maintain the systems, servers, storage, and the network. Technology professionals perform back-up functions on a pre-defined periodic schedule.

OIT establishes policies and standards for the purchase of network hardware and software. Development and adoption of policies regarding data management are conducted pursuant to a policy adoption SOP.

Computer hardware and software installation, support and maintenance are provided by OIT. Staff from OIT install new computers and software and provide performance checks and verification with test data. All computers are accessed through the Department's Local Area Network, which is password protected.

Computer software for completing basic office tasks is made available and maintained by OIT staff. This software provides word processing, database, geographic information system, and internal communication functions.

7.0 PLANNING

It is APCD policy to employ the Data Quality Objectives Process (See EPA Document QA/G-4, *"Guidance for the Data Quality Objectives Process"*), as discussed earlier in this QMP document and in greater detail in the QAPP, as its primary planning tool for data collection to ensure that environmental data will be adequate for their intended use. It will be the responsibility of the Unit Leaders to complete this process or delegate this task to an appropriate group staff member.

8.0 IMPLEMENTATION OF WORK PROCESSES

A primary goal of this QMP is to ensure that all data or information collected are of the needed and expected quality for its desired use. Section 2 of this QMP addresses implementation of work processes to ensure this goal is met. Randomly, or on an as needed basis, field audits or other checks will be used as tools to verify that project staff are following a QAPP and completing work as planned (see also Sec. 5.2).

9.0 ASSESSMENT AND RESPONSE

Assessment and response activity will be addressed within "Section C" of specific QAPPs for each individual program and all projects within a program, as discussed earlier in this document (Section 2.1 and 2.2). See "Quality Assurance Resolution Flow Diagram" in Attachment 5 to see the QA resolution process. The QMP itself will be assessed for effectiveness, and revised if needed, at least annually, but may be reviewed and revised whenever a problem is noted (see also Sec. 10 and flow diagrams in Attachment 5).

10.0 QUALITY IMPROVEMENT

Quality System Reviews of APCD QA and QC activities will be conducted in accordance with EPA Document QA/G-3 , *"Guidance on Assessing Quality Systems*." Several of the specific processes are described in Section 2.3 of this QMP document.

This QMP will be evaluated on a continual basis through the Technical Systems Audits performed by the EPA every three years and through the QA Reports submitted as described in Section 5.2. APCD management will assess the effectiveness of this QMP on an annual basis. The QMP will be revised as necessary when warranted by an annual review. However, changes to the plan may be made at any time a deficiency is noted. Any proposed significant change in the QMP will be submitted to appropriate personnel within EPA Region 8 for approval before becoming effective.

Attachment 1 - APCD Standard Operating Procedures

(Listed by order in which they appear as Appendices to APCD TSP QAPP)

QAPP APPENDICES LIST

Gaseous and Meteorological Monitoring SOPs

Appendix GM1 Standard Operating Procedure for Operation of Gaseous and Meteorological Monitoring Shelters
Appendix GM2 Standard Operating Procedure for Gas Analyzer Calibrations
Appendix GM3 Standard Operating Procedure for the Determination of Ozone in Ambient Air – 2B Tech Analyzers
Appendix GM4 Standard Operating Procedure for the Dynamic Dilution Calibrator and Zero Air Generator
Appendix GM5 Standard Operating Procedure for Meteorological Monitoring
Appendix GM5A Standard Operating Procedure for Meteorological Monitoring with a Mobile Tower
Appendix GM6 Standard Operating Procedures for Gas Cylinder Verification
Appendix GM7 Standard Operating Procedures for the OPTEC LPV-2 Transmissometer
Appendix GM8 Standard Operating Procedure for the OPTEC NGN-2 Nephelometer
Appendix GM9 Standard Operating Procedures for the Remote High-Resolution Digital Camera System (Currently Under Revision)
Appendix GM10 Standard Operating Procedures for the Determination of Toxic Organic Compounds in Ambient Air
Appendix GM11 Standard Operating Procedures for the Vaisala CL51 Ceilometer for Measuring Mixing Height (Reserved, currently under development)
Appendix GM12 Standard Operating Procedures for the Collection and Analysis of Carbonyls at Photochemical Assessment Monitoring Stations (PAMS) (Reserved, currently under development)
Appendix GM13 Standard Operating Procedures for the Analysis of Photochemical Assessment of Monitoring Station (PAMS) Volatile Organic Compounds (VOCs) in Ambient Air via the Markes Unity – XR Thermal Desorber with Agilent 7890B Auto-Gas Chromatograph with Flame Ionization Detection (Auto-GC-FID) (Reserved, currently under development)
Appendix GM14 Standard Operating Procedures for Solar Radiation Equipment (Reserved, currently under development)
Appendix GM15 Standard Operating Procedure for Method Detection Limit (MDL) Determination

Particulate Monitoring SOPs

Appendix PM1 Standard Operating Procedure for Monitoring PM_{10} in Ambient Air Using a High Volume (HV) Volumetric – Mass-Flow Controlled (MFC) Sampler
Appendix PM2 Standard Operating Procedure for Operation and Maintenance of the Low Volume Filter Based $PM_{2.5}$ and PM_{10} Particulate Samplers
Appendix PM3 Standard Operating Procedure for the Determination of Particulate Matter in Ambient Air Using a TEOM
Appendix PM4 Standard Operating Procedure for the Determination of PM_{10} and $PM_{2.5}$ in Ambient Air Using a GRIMM EDM 180
Appendix PM5 Standard Operating Procedure for the Chemical Speciation Network (CSN) – URG 3000 N
Appendix PM6 Standard Operating Procedure for the Chemical Speciation Network (CSN) – SASS & SUPER SASS
Appendix PM7 Standard Operating Procedure for the Operation of the TAPI Model 633 Aethalometer
Appendix PM8 Standard Operating Procedure for the Operation of the TAPI Model 640 Particulate Monitor

Data Handling SOPs

Appendix D1 Standard Operating Procedure for the Collection of Ambient Air Quality Data
Appendix D2 Standard Operating Procedure for the Processing and Verification of Gaseous and Meteorological Data
Appendix D3 Standard Operating Procedure for the Data Management Operations for Particulate Data
Appendix D4 Standard Operating Procedure for Precision & Accuracy Data Processing, Quarterly Data Validation, Verification, and Annual Data Certification
Appendix D5 Standard Operating Procedure for Generating QA Data Strings for AQS
Appendix D6 Standard Operating Procedure for Using the National Air Quality Systems Database
Appendix DQ Data Qualifiers

Quality Assurance SOPs

Appendix MQO Measurement Quality Objectives and Acceptance Criteria Validation Templates
Appendix QA1 Standard Operating Procedure for Performance Evaluations / Audits
Appendix QA2 Standards Verification and Calibration Standard Operating Procedures
Appendix QA3 Standard Operating Procedure for the Quality Assurance Review of Gaseous and Meteorological Data
Appendix QA4 Standard Operating Procedure for Zero Air Source Testing / Certification
Appendix QA5 Standard Operating Procedure for Training of new APCD TSP staff and Site Operators

QAPP specific SOPs

Appendix P1 Standard Operating Procedure for Amending QMPs, QAPPs, and SOPs
Appendix P2 Glossary, Acronyms and Abbreviations
Appendix P3 References

External Laboratory and Subcontractor SOPs

CDPHE Laboratory Services Division:

Appendix LSD1 PM_{10} High Volume Gravimetric Analysis
Appendix LSD2 $PM_{2.5}$/PM_{10} Low Volume Gravimetric Analysis
Appendix LSD3 Laboratory Services Division Quality Assurance Manual
Appendix LSD4 Laboratory Services Division Central Chain of Custody, Central Accessioning

Air Resource Specialists, Inc.:

App. ARS1 SOP for MAINTENANCE AND CALIBRATION SITE VISITS, 9/2022
App. ARS2 SOP for DATA COLLECTION, 03/2022
App. ARS3 SOP for DATA VALIDATION, 10/2022
App. ARS4 SOP for DATA REPORTING AND DISSEMINATION, 10/2022
App. ARS5 SOP for VERIFICATION, CALIBRATION AND MAINTENANCE OF OZONE ANALYSERS USING ROVER LEVEL 2 OZONE TRANSFER STANDARDS, 11/2022
App. ARS6 SOP for VERIFICATION, CALIBRATION AND MAINTENANCE OF OZONE ANALYZERS USING ROVER LEVEL 3 OZONE TRANSFER STANDARDS, 11/2022
App. ARS7 SOP for CERTIFICATION OF OZONE TRANSFER STANDARDS, 10/2022
App. ARS8 SOP for VERIFICATION AND MAINTENANCE OF WIND SPEED SENSORS, 10/2022
App. ARS9 SOP for VERIFICATION AND MAINTENANCE OF WIND DIRECTION SENSORS, 10/2022
App. ARS10 SOP for VERIFICATION AND MAINTENANCE OF BAROMETRIC PRESSURE SENSORS, 10/2022
App. ARS11 SOP for VERIFICATION AND MAINTENANCE OF IMMERSABLE TEMPERATURE SYSTEMS 10/2022

App. ARS12 SOP for VERIFICATION AND MAINTENANCE OF AMBIENT TEMPERATURE / RELATIVE HUMIDITY SENSORS, 10/2022
App. ARS13 SOP for VERIFICATION AND MAINTENANCE OF SOLAR RADIATION SENSORS, 10/2022
App. ARS14 SOP for AUDIT OF GAS ANALYZERS USING A DYNAMIC DILUTION CALIBRATOR, 07/2022
App. ARS15 SOP for PERFORMANCE AUDIT OF OZONE ANALYZERS USING A TRAVELING ARS OZONE AUDIT STANDARD, 07/2022
App. ARS16 SOP for PERFORMANCE AUDIT OF IMMERSABLE TEMPERATURE SENSORS, 07/2022
App. ARS17 SOP for AUDIT OF AMBIENT TEMPERATURE / RELATIVE HUMIDITY SENSORS BY COLLOCATED COMPARISON, 07/ 2022
App. ARS18 SOP for PERFORMANCE AUDIT OF BAROMETRIC PRESSURE SENSORS BY COLLOCATED COMPARISON, 07/ 2022
App. ARS19 SOP for PERFORMANCE AUDIT OF SOLAR RADIATION SESNSORS, 07/2022
App. ARS20 SOP for PERFORMANCE AUDIT OF WIND DIRECTION SENSORS, 07/ 2022
App. ARS21 SOP for PERFORMANCE AUDIT OF WIND SPEED SESNSORS, 07/2022
App. ARS22 SOP for VERIFICATION, CALIBRATION AND MAINTENANCE OF MET ONE BAM-1020 (Currently Under Revision)

Inter-Mountain Labs:

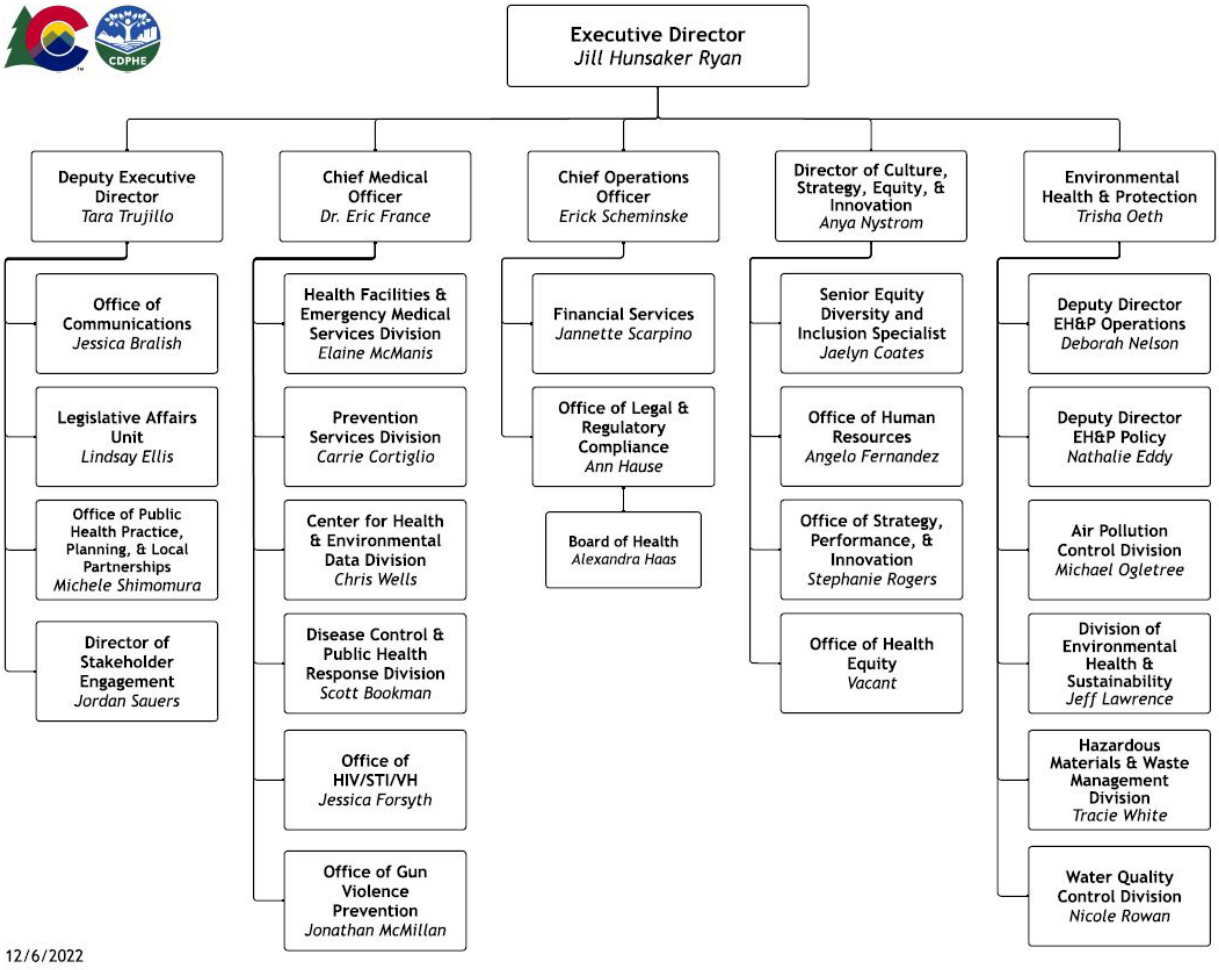
Appendix IML1 IML QAPP for Laboratory and Data Management Support of the Determination of Fine Particulate Matter as $PM_{2.5}$ and Coarse Particulate Matter as $PM_{10-2.5}$ in the Atmosphere, 05/2021

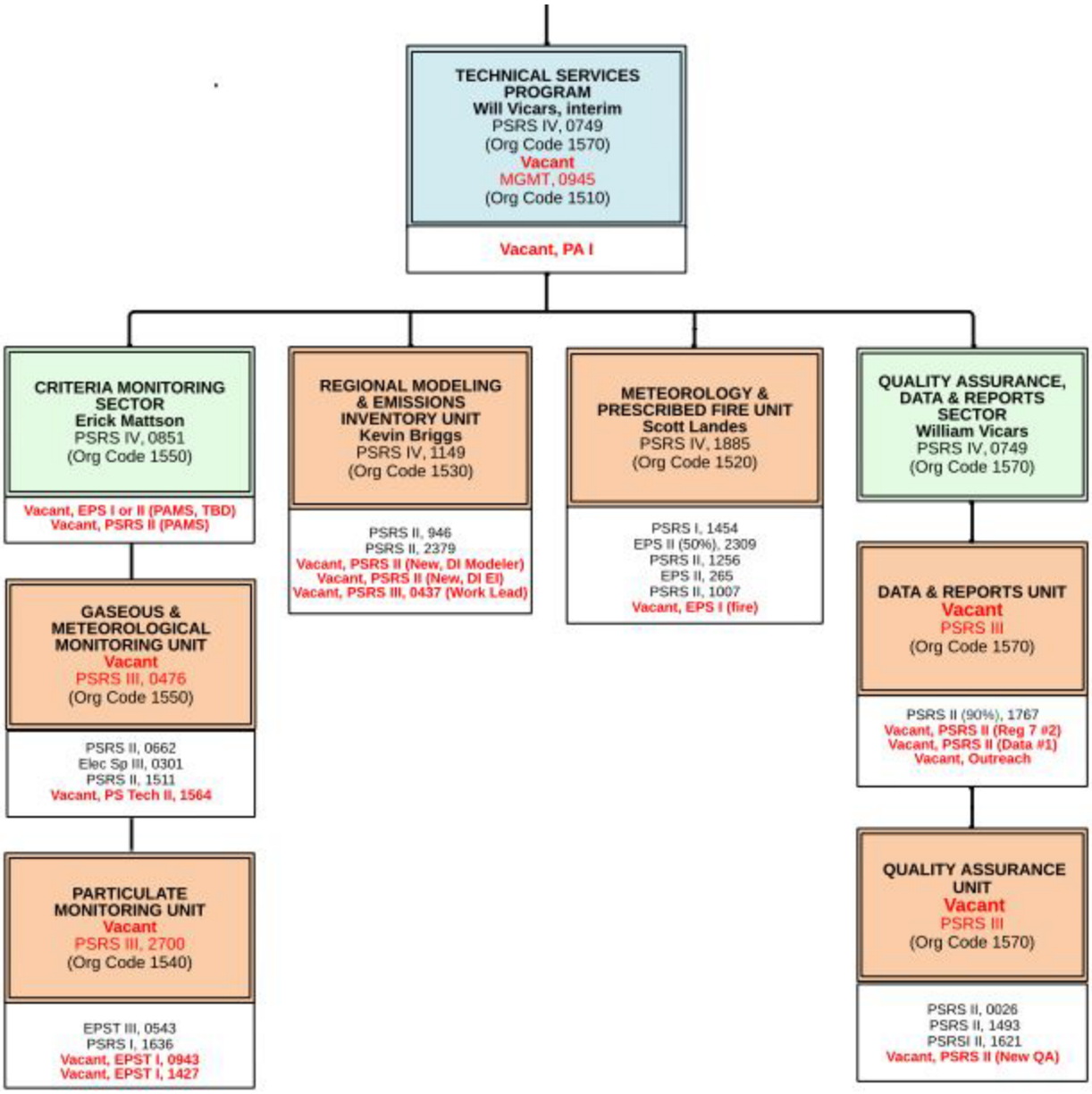
Other Associated Documents (not included as appendices):

Quality Assurance Project Plan for the National Air Toxics Trends Study (NATTS) in Grand Junction, by CDPHE/APCD/TSP, (January 2018)

Quality Assurance Guidance Document: Quality Assurance Project Plan: $PM_{2.5}$ Chemical Speciation Sampling at Trends, NCore, Supplemental and Tribal Sites (An Update to the $PM_{2.5}$ Speciation Trends Network Field Sampling QAPP, December 2000), June 2012, can be found at:
https://www3.epa.gov/ttnamti1/files/ambient/pm25/spec/qappsec1rev5-15-14.pdf

Attachment 2 – CDPHE/TSP Organizational Charts




TECHNICAL SERVICES PROGRAM
Will Vicars, interim
PSRS IV, 0749
(Org Code 1570)
Vacant
MGMT, 0945
(Org Code 1510)
Vacant, PA I
CRITERIA MONITORING SECTOR
Erick Mattson
PSRS IV, 0851
(Org Code 1550)
Vacant, EPS I or II (PAMS, TBD)
Vacant, PSRS II (PAMS)
GASEOUS & METEOROLOGICAL MONITORING UNIT
Vacant
PSRS III, 0476
(Org Code 1550)
PSRS II, 0662
Elec Sp III, 0301
PSRS II, 1511
Vacant, PS Tech II, 1564
PARTICULATE MONITORING UNIT
Vacant
PSRS III, 2700
(Org Code 1540)
EPST III, 0543
PSRS I, 1636
Vacant, EPST I, 0943
Vacant, EPST I, 1427
REGIONAL MODELING & EMISSIONS INVENTORY UNIT
Kevin Briggs
PSRS IV, 1149
(Org Code 1530)
PSRS II, 946
PSRS II, 2379
Vacant, PSRS II (New, DI Modeler)
Vacant, PSRS II (New, DI EI)
Vacant, PSRS III, 0437 (Work Lead)
METEOROLOGY & PRESCRIBED FIRE UNIT
Scott Landes
PSRS IV, 1885
(Org Code 1520)
PSRS I, 1454
EPS II (50%), 2309
PSRS II, 1256
EPS II, 265
PSRS II, 1007
Vacant, EPS I (fire)
QUALITY ASSURANCE, DATA & REPORTS SECTOR
William Vicars
PSRS IV, 0749
(Org Code 1570)
DATA & REPORTS UNIT
Vacant
PSRS III
(Org Code 1570)
PSRS II (90%), 1767
Vacant, PSRS II (Reg 7 #2)
Vacant, PSRS II (Data #1)
Vacant, Outreach
QUALITY ASSURANCE UNIT
Vacant
PSRS III
(Org Code 1570)
PSRS II, 0026
PSRS II, 1493
PSRSI II, 1621
Vacant, PSRS II (New QA)

Attachment 3 - Acronyms/Terms And Definitions

ANSI	American National Standards Institute
APCD	Air Pollution Control Division
ASQ	Air Quality System (EPA ambient air database)
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulartions
CIO	Chief Information Officer
CO	Carbon Monoxide
CSN	Chemical Speciation Network
DQA	Data Quality Audit
DQO	Data Quality Objectives
EAS	EPA Acquisition System
EPA	Environmental Protection Agency
FRM	Federal Reference Method
GIS	Geographic Information System
GMM/GMMU	Gaseous and Meteorology Unit
IA	Inter-agency Agreement
IGMS	Integrated Grants Management System
IQG	Information Quality Guidelines
ISO	International Organization for Standardization (*not an acronym*)
IT	Information Technology
NOx	Oxides of Nitrogen
O_3	Ozone
OEI	Office of Environmental Information
PDR	Pre-Dissemination Review
PE	Performance Evaluation
PM_{10}	Particulate Matter (inhalable, of less than 10 microns)
$PM_{2.5}$	Particulate Matter (respirable, of less than 2.5 microns)
PM/PMU	Particulate Monitoring Unit
QA	Quality Assurance
QAM	Quality Assurance Manual
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QARF	Quality Assurance Review Form
QAU	Quality Assurance Unit
QC	Quality Control

QMP	Quality Management Plan
QMS	Quality Management System
QSA	Quality System Audit
SIO	Senior Information Official
SO_2	Sulfur Dioxide
SOP	Standard Operating Procedure
STN	Speciation Trends Network
TSP	Technical Services Program
TSP	Total Suspended Particulate
TSA	Technical Systems Audit
UFP	Uniform Federal Policy

TERMS AND DEFINITIONS

Assessment: The evaluation process used to measure the performance or effectiveness of a system and its elements. As used here, assessment is an all-inclusive term used to denote any of the following: audit, performance evaluation, management systems review, peer review, inspection, or surveillance.

Audit: A systematic and independent examination to determine whether quality activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve objectives.

Competence: The ability to apply knowledge, skills, and experience to an activity to achieve intended results.

Conformity: The fulfillment of a requirement.

Corrective Action: An action to eliminate the cause of a nonconformity or undesirable situation and to prevent recurrence.

Data: Collection of facts and estimates from which conclusions may be drawn.

Data Usability: The process of determining and ensuring that the quality of the data produced meets the intended use of the data.

Data Quality Assessment: A statistical and scientific evaluation of the data set to determine the validity and performance of the data collection design and statistical test, and to determine the adequacy of the data set for its intended use.

Design: Specifications, drawings, design criteria, and performance requirements. Also the result of deliberate planning, analysis, mathematical manipulations, and design processes.

Dissemination: Process of distributing information to the public that represents an official EPA endorsed opinion or decision. [Examples of information not considered a dissemination are information intended only for government employees; EPA responses to requests for Agency records under the Freedom of Information Act (FOIA), the Privacy Act, The Federal Advisory Committee Act (FACA) or other similar laws; correspondence directed to individuals or persons; ephemeral information; and distribution of information in documents filed in or prepared specifically for a judicial case or an administrative adjudication.] (Source: Section 5.3 & 5.4, EPA Information Quality Guidelines)

Document: Recorded information regardless of physical form or characteristics including individual records or items of non-record materials.

Environmental Conditions: The description of a physical medium (e.g., air, water, soil, sediment) or biological system expressed in terms of its physical, chemical, radiological, or biological characteristics.

Environmental Data: Any data or information pertaining to the environment that describe measured outputs from processes, environmental conditions in a specific location; ecological effects and consequences; health effects and consequences; biological, chemical, and radiological conditions; or the performance of environmental technology. For EPA, environmental data include information collected directly from measurements, produced from models, and compiled from other sources such as databases, information systems, literature, or the Internet.

Environmental Data Collection: Process of acquiring or gathering environmental data through various means including (but not limited to) sampling and analysis activities, retrieval from information systems and the literature, and receipt from EPA partners and the regulated community.

Environmental Data Operations: Work performed to collect, produce, use, or report environmental data.

Environmental Data Production: Process of generating environmental data through various means including (but not limited to) the use of measurement instrumentation, information technology, computer models, and data analysis tools (e.g., statistics, risk assessment methods).

Environmental Programs: Activities involving the environment, including but not limited to: characterization of environmental processes and conditions; environmental monitoring; environmental research and development; the design, construction, and operation of environmental technologies; and laboratory operations on environmental samples.

Environmental Technology: An all-inclusive term used to describe pollution monitoring, measurement and control devices and systems, waste treatment processes and storage facilities, and site remediation technologies and their components that may be utilized to remove pollutants or contaminants from or prevent them from entering the environment.

Extramural Agreement: Legal agreement between EPA and a non-EPA organization for the acquisition of items or services by EPA or financial assistance to a non-EPA organization. Such agreements include acquisition agreements (e.g., contracts, work assignments, delivery orders, task orders), assistance agreements (e.g., cooperative agreements, research grants, state and local grants), and EPA-funded Interagency Agreements (IAs) with other governmental entities.

Graded Approach: the process of basing the level of application of managerial controls applied to an item or work according to the intended use of the results and the degree of confidence needed in the quality of the results.

Guidance: A non-mandatory compilation of advice, examples, best practices, or past experience. Guidance may supplement procedures.

Handbook: A non-mandatory compilation of advice, examples, best practices, or past experiences, may be revised according to the issuing Office's Peer Review Policy.

Independent Assessment: An assessment performed by a qualified individual, group, or organization that is not a part of the organization directly performing and accountable for the work being assessed.

Information: For purposes of this Standard, information means any communication or representation of knowledge such as facts or data, in any medium or form, including, but not limited to, textual, numerical, graphic, cartographic, narrative, or audiovisual forms (OMB Information Quality Guidelines).

Information Product: Any book, paper, map, machine-readable material, audiovisual production, or other documentary material, regardless of physical form or characteristic (OMB Circular A-130).

Information Quality Guidelines (IQG): An Agency document that defines a basic standard of quality (including objectivity, utility, and integrity) for information products disseminated by EPA. For influential information products, the basic standard of quality also includes reproducibility and transparency.

Information System: An organized collection, storage, and presentation system of data for decision making, progress reporting, and for planning and evaluation of programs. It can be either manual or computerized, or a combination of both.

Information Technology: The study, design, development, implementation, support, or management of computer-based information systems, particularly software applications and computer hardware.

Informative Annex: A part of a Standard that gives additional information as guidance which is intended to assist the understanding or use of the Standard. An informative annex is not considered to be part of the Standard when setting audit criteria.

Inspection: Examination or measurement of an item or activity to verify conformance to specific requirements.

Integrity (information): Assurance that the information is protected from unauthorized access or change and is not compromised through corruption or falsification.

Management: Those individuals directly responsible and accountable for planning, implementing, and assessing work.

Management Controls: A system of management functions to enable managers to (1) determine that the operations of a program or organization satisfy predetermined goals and objectives, and that performance is in line with standards and specifications; and (2) implement any remedial actions needed to ensure that human and other resources are being used in the most effective and efficient way possible in achieving the organization's mission.

Management System: A system to establish policy and objectives and to achieve those objectives (ISO 9001). A management system may describe the policies, objectives, principles, authority, responsibilities, accountability, and implementation plan of an organization for conducting work and producing environmental data. Management systems include ISO 9001 on quality management, ISO 14001 on environmental management, and OHSAS 18000 on occupational health and safety.

Normative Annex: A part of a Standard that gives provisions (requirements) additional to those requirements in the body of the Standard. A normative annex is considered to a part of the Standard when setting audit criteria.

Objective Evidence: Any documented statement of fact, other information or record, either quantitative or qualitative, pertaining to the quality of an item or activity, based on observations, measurements, or tests which can be verified.

Organization: Company, corporation, firm, enterprise, or institution, or part thereof, whether incorporated or not, public or private, that has its own functions and administration. In the context of this Standard, an EPA organization may be an Office, Region, National Research Center or Laboratory, or a sub-unit such as a division, branch, section, or team..

Peer Review: A documented critical review of work by qualified individuals (or organizations) who are independent of those who performed the work, but are collectively equivalent in technical expertise. A peer review is conducted to ensure that activities are technically adequate, competently performed, properly documented, and satisfy established technical and quality requirements. The peer review is an in-depth assessment of the assumptions, calculations, extrapolations, alternate interpretations, methodology, acceptance criteria, and conclusions.

Performance Evaluation: A type of audit in which the quantitative data generated in a measurement system are obtained independently and compared with routinely obtained data to evaluate the proficiency of an analyst or laboratory.

Policy: A high-level statement about an Agency requirement designed to influence and determine decisions, actions, and other matters. It is usually driven by statute, executive order, the mandate of an oversight agency or Congress, or the head of the organization.

Prime Recipient: Organization that directly receives funding, support, or authorization to implement a project or program.

Procedure (CIO Procedure): The required steps, course of action, or processes needed to accomplish or satisfy a policy.

Process: A set of interrelated resources and activities which transforms inputs into outputs. Examples of processes include analysis, design, data collection, operation, fabrication, and calculation.

Product: The intended result or final output of an activity or process that is disseminated or distributed among EPA organizations or outside of EPA.

Programmatic QMP: A management plan that defines the structure and framework for planning, implementing, and evaluating quality for a specific policy, or program.

Quality: The totality of features and characteristics of a product or service that bear on its ability to meet the stated or implied needs and expectations of the user.

Quality Assurance (QA): A management or oversight function that deals with setting policy and running an administrative system of management controls that cover planning, implementation, review and maintenance to ensure environmental data are meeting their intended use.

Quality Assurance Manager/Officer (QAM/QAO): The individual designated as the principal manager within the organization having management oversight and responsibilities for planning, documenting, coordinating, and assessing the effectiveness of the QMS for the organization. NOTE: Other personnel having QA or QC duties may be referred to as QA Officer and QA Coordinator.

Quality Assurance Project Plan (QAPP): A document describing in comprehensive detail the necessary QA, QC and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance objectives and criteria.

Quality Control (QC): The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality.

Quality Improvement: A management program for improving the quality of operations. Such management programs generally entail a formal mechanism for encouraging worker recommendations with timely management evaluation and feedback or implementation.

Quality Management: That aspect of the overall quality management system of the organization that determines and implements the quality policy. Quality management typically includes strategic planning, allocation of resources, and other systematic activities (e.g., planning, implementation, and assessment) pertaining to the application of quality practices to the organization's programs.

Quality Management Plan (QMP): A formal document or manual that describes the QMS in terms of the organizational structure, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing and assessing all activities conducted.

Quality Management System (QMS): A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality management system provides the framework for planning,

implementing, documenting, and assessing work performed by the organization and for carrying out required QA and QC activities.

Quality Program: The totality of management controls, processes, and documentation in EPAs planning, implementation, and assessment of applying quality to the creation of Agency environmental data.

Readiness Review: Systematic, documented review of the readiness for the start-up or continued use of a facility, process, or activity. Readiness reviews are typically conducted before proceeding beyond project milestones and prior to initiation of a major phase of work.

Record: A document stating results retrieved or providing evidence of activities (ISO 9000:2005). NOTE: A federal record is an information resource in any format that is needed to describe Agency activities (44 U.S.C. § 3301).

Requirement: An expression of the content of a Standard that conveys criteria to be fulfilled is compliance is to be claimed and from which no deviation is permitted.

Self-Assessment: Assessments of work conducted by individuals, groups, or organizations directly responsible for overseeing and/or performing the work.

Service: A discrete function that performs one or more operations and returns a set of results to an external requester.

Specification: A document stating requirements and which refers to or includes drawings or other relevant documents. Specifications should indicate the means and the criteria for determining conformance.

Standard: An accepted, consensus-based specification which defines systems, processes, methodologies, or practices. It provides a basis for assuring consistent and acceptable minimum levels quality, performance, safety, and reliability. Standards usually are included in or accompany procedures.

Standard Operating Procedure (SOP): A written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps, and that is officially approved as the method for performing certain routine or repetitive tasks.

Supplier: Any individual or organization furnishing items or services or performing work according to a procurement document or financial assistance agreement. This is an all-inclusive term used in place of any of the following: vendor, seller, contractor, subcontractor, fabricator, or consultant.

Surveillance: Continual or frequent monitoring and verification of the status of an entity and the analysis of records to ensure that specified requirements are being fulfilled.

Technical Review: A documented critical review of work that has been performed within the state of the art. The review is accomplished by one or more qualified reviewers who are independent of those who performed the work, but are collectively equivalent in technical expertise to those who performed the original work. The review is an in-depth analysis and evaluation of documents, activities, material, data, or items that require technical verification or validation for applicability, correctness, adequacy, completeness, and assurance that established requirements are satisfied.

Technical Systems Audit: A thorough, systematic, on-site, qualitative audit of facilities, equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of a system.

Transparency (Information): Assurance that information is supported by sufficient metadata when disseminated.

Usability Assessment: Evaluation of data based upon the results of data validation and verification for the decision(s) being made. Reviewers assess whether the process execution and resulting data meet quality objectives based on the criteria given in the QAPP.

User: An organization, group, or individual that utilizes the results or products from environmental programs or the customer for whom the results or products were collected or created.

Utility (Information): Assurance that information is useful for its intended purpose.

Validation (Information): Confirmation by examination and provision of objective evidence that the particular requirement for which the information is intended are fulfilled; the process of determining whether the specifications were appropriate and that the verified results will meet the data user's needs.

Verification (Information): Confirmation by examination and provision of objective evidence that validated information fulfills specified requirements; the process of checking whether the information met the project's specifications.

Attachment 4 – References

https://www.epa.gov/quality/agency-wide-quality-program-documents
https://www.epa.gov/sites/default/files/2015-09/documents/epa_order_cio_21060.pdf
https://www.epa.gov/quality/training-courses-quality-assurance-and-quality-control-activities

Internal EPA Directives

Title	Directive and Date	Description
The new EPA Quality Program Policy for Agency products and services issued in October 2008	EPA Quality Program Policy - CIO 2106.0	This Policy was issued in an October 21, 2008, CIO Transmittal Memorandum.
The new EPA Quality Program Procedure for Agency products and services issued in October 2008	EPA Procedure - CIO 2106-P-01.0	These Procedures were issued in an October 21, 2008, CIO Transmittal Memorandum.
Policy and Program Requirements for the Mandatory Agency-wide Quality System, May 2000	CIO 2105.0 (formerly EPA Order 5360.1 A2)	Quality specifications for EPA organizations that produce or use environmental data. For more information and resources, see Policies and Procedures for EPA Organizations.
EPA Quality Manual for Environmental Programs, May 2000	CIO 2105-P-01-0 (formerly EPA Manual 5360 A1)	Specifications for satisfying the mandatory Quality System defined in CIO 2105.0. For more information and resources, see Policies and Procedures for EPA Organizations.

EPA 2013a U.S. Environmental Protection Agency, *Quality Standard for Environmental Data Collection, Production, and Use by EPA Organizations.* (CIO Standard 2106-S-01).
http://www.epa.gov/quality

EPA 2013b U.S. Environmental Protection Agency, *Quality Standard for Environmental Data Collection, Production, and Use by Non-EPA (External) Organizations.*
(CIO Standard 2106-S-02).
http://www.epa.gov/quality

EPA 2013c U.S. Environmental Protection Agency, *Handbook on Quality Assurance Project Plans.* (CIO Handbook 2106-H-05 QAPP).
http://www.epa.gov/quality

EPA 2008a U.S. Environmental Protection Agency, EPA Order 1610, *Interagency Agreement Policies, Procedures, and Guidance Manual.*
http://www.epa.gov/oarm

Specifications for Non-EPA Organizations Invoked Through Individual Agreements or the Code of Federal Regulations

Title	Publication Number and Date	Description
https://www.epa.gov/quality/epa-qar-2-epa-requirements-quality-management-plans	EPA/240/B-01/002 March 2001 Quality Document Reissue Notice May 2006	Specifications for Quality Management Plans for organizations that receive funding from EPA. These specifications are equivalent to Chapter 3 of EPA Manual CIO 2105-P-01-0.
https://www.epa.gov/quality/epa-qar-5-epa-requirements-quality-assurance-project-plans	EPA/240/B-01/003 March 2001 Quality Document Reissue Notice May 2006	Specifications for QA Project Plans prepared for activities conducted by or funded by EPA. These specifications are equivalent to Chapter 5 of EPA Manual CIO 2105-P-01-0.

General Guidance

Title	Publication Number and Date	Description
https://www.epa.gov/sites/default/files/2015-08/documents/overview-final.pdf	EPA/240/R-02/003 November 2002	Information on existing Agency policies, responsibilities, and resources to use in implementing both the EPA Quality System and your organization's Quality System. For more information and resources, see Policies and Procedures for EPA Organizations and Quality Specifications for Non-EPA Organizations.
https://www.epa.gov/sites/default/files/2015-08/documents/g1-final.pdf	EPA/240/R-02/008 November 2002 Quality Document Reissue Notice January 2008	Guidance on developing and documenting the elements of a functional quality system in organizations that carry out environmental data operations within, or on behalf of, EPA.
https://www.epa.gov/quality/guidance-assessing-quality-systems-epa-gag-3	EPA/240/R-03/002 March 2003	Guidance on assessing the adequacy and effectiveness of an environmental quality system.
https://www.epa.gov/quality/guidance-data-quality-objectives-process-epa-qag-4-august-2000	EPA/240/B-06/001 February 2006	This document is an expanded version of the August 2000, *Guidance for*

Title	Publication Number and Date	Description
		the Data Quality Objectives Process and includes both decision making and estimation using the Data Quality Objectives (DQO) Process. It provides information on how to apply systematic planning to generate performance and acceptance criteria for collecting environmental data. The basic structure of the DQO Process is unchanged but there are some minor revisions in the names of the seven steps of the Process. For more information and resources, see EPAs Elements of Systematic Planning.
https://www.epa.gov/quality/systematic-planning-case-studies	EPA/240/B-06/004 February 2006	This document shows the use of systematic planning using the Data Quality Objectives (DQO) Process in the form of a case study.
https://www.epa.gov/quality/systematic-planning-case-studies	EPA/240/B-07/001 March 2007	This document shows the use of systematic planning using the Data Quality Objectives (DQO) Process. This case study shows how the DQO Process was applied to a particulate matter ambient air monitoring problem.
https://19january2017snapshot.epa.gov/sites/production/files/2015-08/documents/g4d-final.pdf	EPA/240/B-01/007 September 2001 User's Guide and DEFT Software (EXE)	PC-based software for determining the feasibility of data quality objectives defined using the Data Quality Objectives Process. Note: This version replaces the original software issued September 1994 (EPA/600/R-96/056). For more information and resources, see EPAs Elements of Systematic Planning.
https://www.epa.gov/quality/guidance-quality-assurance-project-plans-epa-qag-5	EPA/240/R-02/009 December 2002	Guidance on developing Quality Assurance Project Plans that meet EPA specifications. Note: This

Title	Publication Number and Date	Description
		version replaces the original document issued in February 1998 (EPA/600/R-98/018).
https://www.epa.gov/quality/guidance-geospatial-data-quality-assurance-project-plans-epa-qag-5g	EPA/240/R-03/003 March 2003	Guidance on developing Quality Assurance Project Plans for geospatial data projects.
https://www.epa.gov/sites/default/files/2015-06/documents/g5s-final.pdf	EPA/240/R-02/005 December 2002	Guidance on applying standard statistical sampling designs (such as simple random sampling) and more advanced sampling designs (such as ranked set sampling, adaptive cluster sampling) to environmental applications.
https://www.epa.gov/quality/guidance-quality-assurance-project-plans-modeling-epa-qag-5m	EPA/240/R-02/007 December 2002	Guidance on developing Quality Assurance Project Plans for modeling projects.
https://www.epa.gov/quality/guidance-preparing-standard-operating-procedures-epa-qag-6-march-2001	EPA/600/B-07/001 April 2007	Guidance on the development and documentation of Standard Operating Procedures. Note: This version replaces the previous document issued in March 2001 (EPA/240/B-01/004).
https://www.epa.gov/quality/guidance-technical-audits-and-related-assessments-environmental-data-operations-epa-qag-7	EPA/600/R-99/080 January 2000 Quality Document Reissue Notice May 2006	Guidance to help organizations plan, conduct, evaluate, and document technical assessments.
https://www.epa.gov/quality/guidance-environmental-data-verification-and-data-validation	EPA/240/R-02/004 November 2002 Quality Document Reissue Notice January 2008	Guidance to help organizations conduct data verification and data validation activities.
https://www.epa.gov/quality/guidance-data-quality-assessment	EPA/240/B-06/002 February 2006	General guidance to organizations on assessing data quality criteria and performance specifications for decision making. G-9R is non-technical document and shows a reviewer what constitutes an appropriate

Title	Publication Number and Date	Description
		Data Quality Assessment (DQA), and how to recognize situations or reports where a DQA has been conducted.
https://www.epa.gov/quality/guidance-data-quality-assessment	EPA/240/B-06/003 February 2006	This document can be considered the technical aspect of G-9R. The document is designed as a "tool-box" of useful techniques in assessing the quality of data. The overall structure of the document will enable the analyst to investigate many
https://www.epa.gov/quality/guidance-data-quality-assessment	No Longer Available. Removed March 2006	This document is replaced by Data Quality Assessment: A Reviewer's Guide (QA/G-9R), and the companion document Data Quality Assessment: Statistical Tools for Practitioners (QA/G-9S). A Cross-Walk between QA/G-9 and QA/G-9S is available.
https://www.epa.gov/sites/default/files/2015-06/documents/g9-final.pdf	No Longer Available.	The DataQUEST software is no longer available. EPA has a site license for SAS for EPA employees - for information, email: Quality Team.
https://www.epa.gov/quality/guidance-developing-training-program-quality-systems-epa-qag-10	EPA/240/B-00/004 December 2000 Quality Document Reissue Notice May 2006	Guidance on developing a program-specific quality systems training program for all levels of management and staff.
https://www.epa.gov/quality/guidance-quality-assurance-environmental-technology-design-construction-and-operation-epa	EPA/240/B-05/001 January 2005	Guidance on basic quality assurance and quality control procedures, and good engineering principles/practices, that may be used in the design, construction or operation of environmental technologies.

Quality Assurance Guidance Documents

- https://www.epa.gov/sites/default/files/2020-10/documents/r94-038a.pdf (54pp, 1.1 MB)
- https://www.epa.gov/amtic/ambient-air-monitoring-quality-assurance-guidance-documents (348pp, 3.4 MB)
- https://www.epa.gov/sites/default/files/2020-10/documents/app_d_validation_template_version_03_2017_for_amtic_rev_1.pdf (49pp, 407k) - July 2014
- https://www.epa.gov/scram/air-modeling-meteorological-guidance (191pp, 3.7 MB)
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https://www.colorado.gov/pacific/osc/fiscalrules

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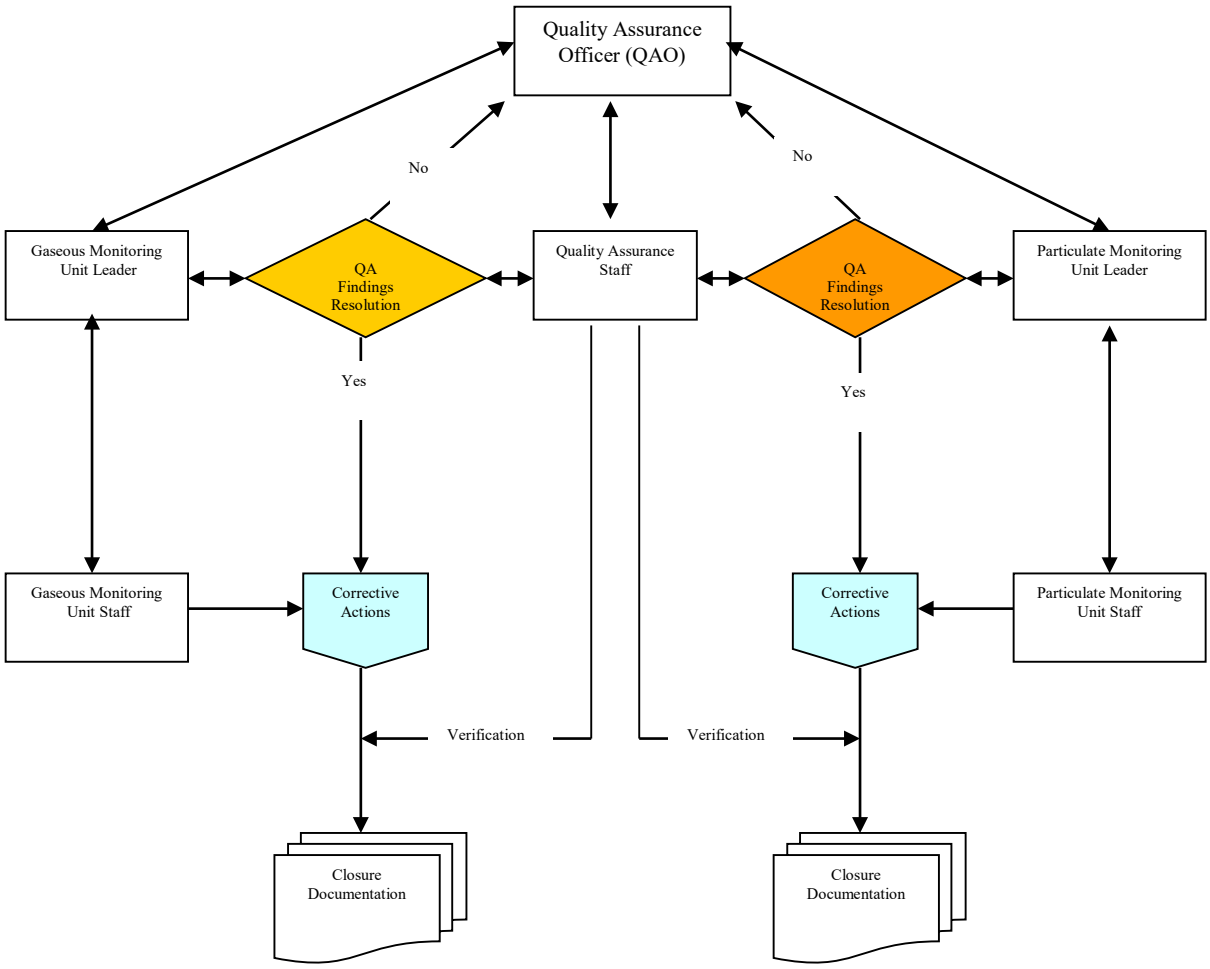
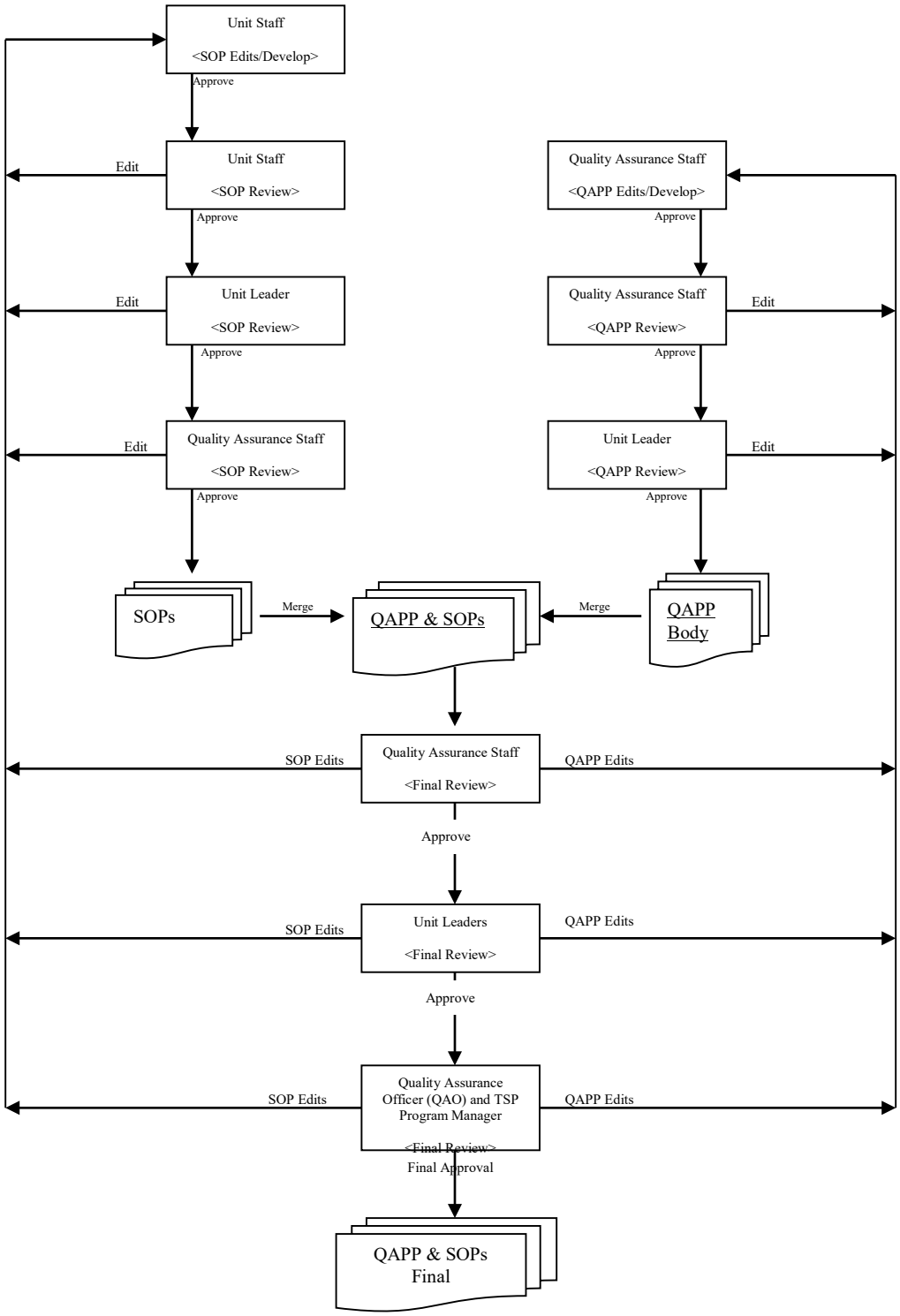
Attachment 5 - Flow Diagrams:

Quality Assurance Resolution Flow Diagram



Quality Assurance Project Plan Review Flow Diagram



Quality Management Plan Development and Review Flow Diagram