DIVISION OF ENVIRONMENT
QUALITY MANAGEMENT PLAN

PART III:

AMBIENT AIR MONITORING
QUALITY ASSURANCE PROGRAM PLAN

Revision 4

December 27, 2018

Kansas Department of Health and Environment
Division of Environment
Bureau of Air
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TABLE OF CONTENTS

SECTION 1

INTRODUCTION

1.1 Purpose

This document is the Quality Assurance Program Plan (QAPP) for Ambient Air Monitoring, administered by the Monitoring and Data Unit of the Air Monitoring and Planning Section, Bureau of Air (BOA), Division of Environment (DOE), Kansas Department of Health and Environment (KDHE). The purpose of the QAPP is to define and document the quality assurance (QA) and quality control (QC) activities of the program and ensure the validity of all data produced in the course of operations. Where applicable, this QAPP references the Air Monitoring and Planning Sections Ambient Air Monitoring Standard Operating Procedures (AAM SOP).

The provisions of this QAPP apply to ambient air monitoring conducted by the Air Monitoring and Planning Section. The QAPP also applies to ambient air monitoring performed by two local health/environment departments which submit data to the Monitoring and Data Unit for review and forwarding to the United States Environmental Protection Agency (EPA).

1.2 Developmental History of Plan

On May 10, 1979, EPA promulgated regulations in 40 CFR 58 that specified monitoring requirements for State Implementation Plans (SIPs). These regulations also set forth requirements made in response to Section 319 of the Clean Air Act Amendments of 1977 which required EPA to establish monitoring criteria to be applied uniformly across the nation, and to establish a national monitoring network. One of the requirements of the regulations is that organizations responsible for ambient air pollution monitoring must establish and maintain a viable QA/QC program. Appendix A of 40 CFR 58 describes such requirements for organizations responsible for SLAMS. Appendix B of 40 CFR 58 describes requirements for organizations responsible for prevention of significant deterioration (PSD) air monitoring. These requirements include development and implementation of policies, procedures, specifications, standards, and documentation necessary to (1) provide data of adequate quality to meet monitoring objectives and (2) minimize loss of air quality data due to malfunctions or out-of-control conditions.

The Air Monitoring and Planning Section has maintained an approved QA management plan and associated SOPs, in accordance with 40 CFR 58, since March 23, 1982. In 1995 revision and reformatting of the plan was carried out in compliance with an effort by the KDHE/DOE to consolidate program QA management plans and SOPs into a standard format. In 1999, a $PM_{2.5}$ QAPP was written and approved by EPA for the commencement of a new statewide $PM_{2.5}$ monitoring program. In 2000 this current Ambient Air Monitoring (AAM) QAPP was written to replace the 1995 plan and the 1999 $PM_{2.5}$ QAPP. EPA revised the Ambient Air Monitoring Regulations in 2006, and the AAM QAPP was revised following a comprehensive review. This AAM QAPP was updated again in 2011, and is subsequently being updated with the current

revision (revision 4) following another comprehensive review.

1.3 Historical Overview of Program

The Kansas ambient air quality monitoring program was initially authorized for implementation by KDHE (formerly the Kansas State Board of Health) with the enactment of K.S.A. 65-3001 *et seq*. by the 1967 Kansas legislature. The major provisions of these enabling statutes were adopted to simultaneously comply with the requirements of the federal Clean Air Act (42 U.S.C. 1857), which was subsequently amended in 1967, 1970, 1977 and 1990. This federal law establishes the requirements for states to implement approved air pollution control programs within their respective jurisdictions. The initial series of comprehensive air pollution control regulations implementing the Kansas Air Quality Act were promulgated in 1970 and codified in Article 19 of KDHE's administrative regulations (K.A.R. 28-19-1 *et seq.*). These original regulations have been amended and expanded since that time to comply with relevant modifications to the federal requirements and to respond to changing needs within the state.

1.4 Operational Overview

The ambient air criteria pollutant monitoring program conducted by the MPS generates a large quantity of data from hourly (continuous) and daily (intermittent) monitoring instruments located across the state. The Kansas Ambient Air Monitoring Network and associated air quality surveillance activities are described in the Kansas Ambient Air Monitoring Network Plan. Air monitoring data obtained from MPS activities are reported on a quarterly basis to the Air Quality System (AQS), a national database maintained by EPA.

SECTION 2

ORGANIZATIONAL DESCRIPTION

2.1 Organizational Charts

40 CFR Part 58 defines a State Agency as "the air pollution control agency primarily responsible for the development and implementation of a plan [State Implementation Plan (SIP)] under the Act [Clean Air Act]". The Kansas Department of Health and Environment (KDHE) is the State Agency for Kansas.

40 CFR Part 58 defines the Local Agency as "any local government agency, other than the State agency, which is charged by a State with the responsibility for carrying out a portion of the plan [SIP]". The following are the Local Agencies in Kansas:

Unified Government of Wyandotte County - Kansas City, Kansas Health Department

Figure 2.1 and 2.2 below represent the organizational structures of those portions of KDHE and the local agency that are responsible for the activities of the ambient air criteria pollutant monitoring program.

Kansas Department of Health and Environment
Division of Environment
Bureau of Air
Ambient Air Monitoring Organizational Structure

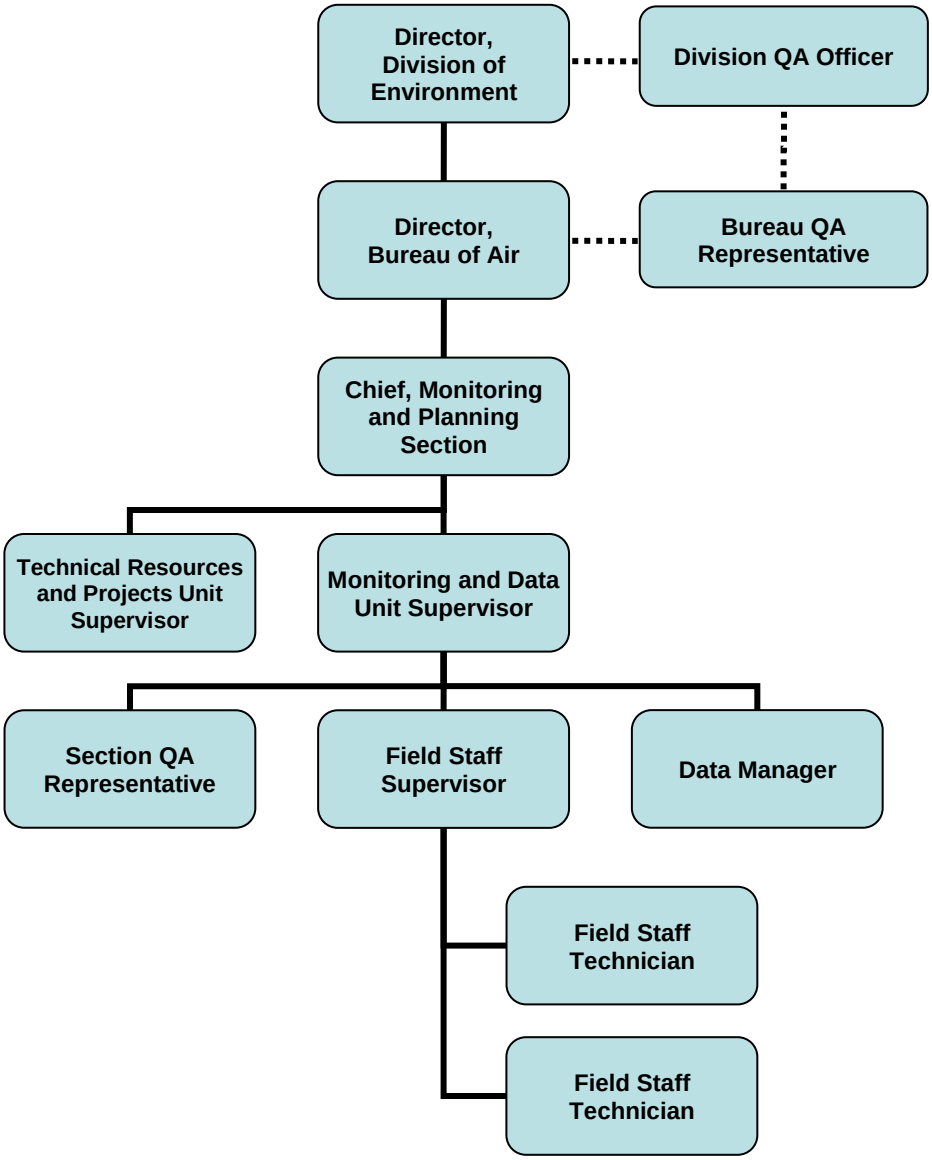

Figure 2.1

Unified Government of Wyandotte County – Kansas City, Kansas Health Department

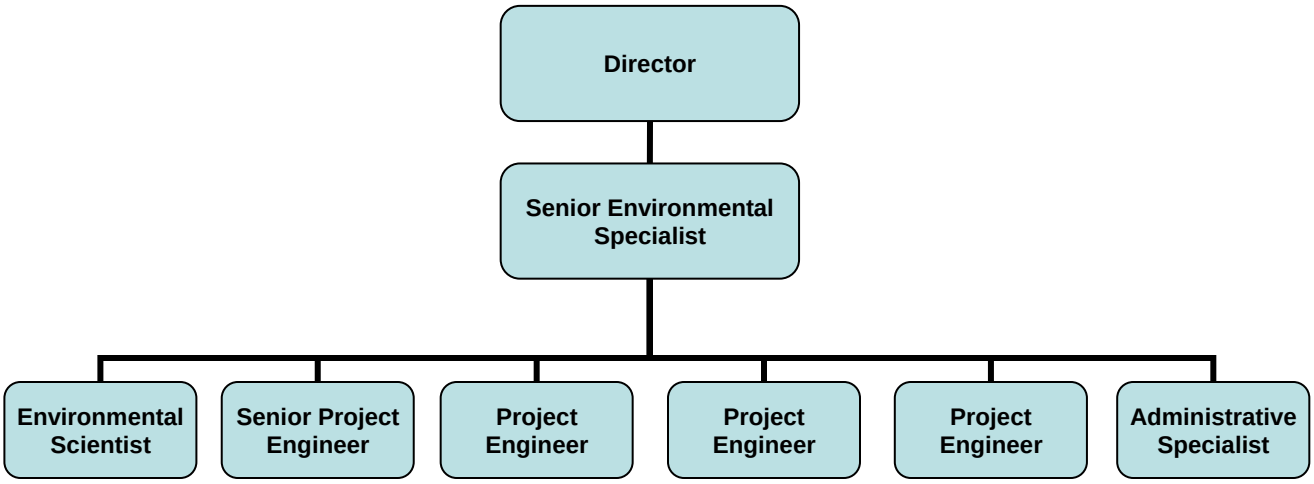

Figure 2.2

2.2 Individual Responsibilities of the Kansas Department of Health and Environment (KDHE)

The QA responsibilities of the **Division of Environment Director** and the **Division QA Officer** are described in the Division of Environment Quality Management Plan (QMP) Part I, Section 3.2.

The **Bureau Director** of the Bureau of Air has overall responsibility for managing the Bureau of Air (BOA) according to Division of Environment policy. The direct responsibility for assuring data quality rests with line management. Ultimately, the Bureau Director is responsible for establishing QA policy and for resolving QA issues identified through the QA program. Major QA related responsibilities of the Bureau Director include:

- maintaining an active line of communication with the KDHE QA personnel and employees within the Monitoring and Planning Section for BOA
- assuring that the BOA develops and maintains a current and germane quality system
- assuring that the BOA develops and maintains current QAPPs and ensures adherence to the documents by staff, and where appropriate, other extramural cooperators
- establishing policies to ensure that QA requirements are incorporated into all environmental monitoring operations
- approving the budget and planning processes

The Bureau Director delegates the responsibility of QA development and implementation in accordance with Division of Environment policy to the Section Chiefs.

The Bureau QA Representative (BQAR) of the Bureau of Air is the official staff QA contact appointed by the Bureau Director. The BQAR reviews and approves all QAPPs within the bureau. The BQAR's responsibilities include:

- maintaining an active line of communication with the KDHE QA personnel and employees within the Monitoring and Planning Section for BOA
- remaining current on KDHE/DOE QA policy and general and specific EPA QA policies and regulations as it relates to the Ambient Air Quality Monitoring Program
- providing QA guidance and training to scientific/technical staff of the section
- reviewing air monitoring standard operating procedures (SOPs).
- developing, reviewing and approving QAPPs for the Ambient Air Monitoring Program
- verifying that the measurement quality standards are met as stated in the QAPPs

The **Section Chief of the Monitoring and Planning Section** has overall responsibility for managing the Monitoring and Planning Section of the Bureau of Air (BOA). Ultimately, the Section Chief directs the evaluation of the quality assurance program and is responsible for establishing QA policy and for resolving QA issues identified through the QA program. Major QA related responsibilities include:

- maintaining an active line of communication with the KDHE QA personnel and employees within the Monitoring and Planning Section for BOA
- communicating with EPA Project Officers and EPA QA personnel on issues related to routine sampling and QA activities
- remaining current on KDHE/DOE QA policy and general and specific EPA QA policies and regulations as it relates to the Ambient Air Quality Monitoring Program
- ensuring that all personnel involved in environmental data collection have access to any training or QA information needed to be knowledgeable in QA requirements, protocols, and technology
- recommending required management-level corrective actions
- participating in the budget and planning processes
- assuring that the Section develops and maintains a current and germane quality system
- assuring that the Section develops and maintains current QAPPs and ensuring adherence to the document by staff, and where appropriate, other extramural cooperators
- implement policies to ensure that QA requirements are incorporated into all environmental monitoring operations
- understanding EPA monitoring and QA regulations and guidance, and ensuring subordinates understand and follow these regulations and guidance
- understanding KDHE QA policy and ensuring subordinates understand and follow the policy
- understanding and ensuring adherence to the QAPPs
- reviewing acquisition packages (contracts, grants, cooperative agreements, inter-agency

agreements) to determine the necessary QA requirements.
- reviewing and approving QAPPs for the Ambient Air Monitoring Program

The Section Chief delegates the responsibility of QA development and implementation in accordance with BOA policy to those in the Monitoring and Planning Section.

The **Monitoring and Data Unit Supervisor** (MDUS) directs the activities in this unit. The Monitoring and Data Unit duties include operations at air monitoring sites and ensuring the data quality results by adhering to guidance and protocol specified by the QAPPs and SOPs for field activities. Responsibilities of the MDUS include:

- maintaining an active line of communication with, BOA QA staff, Data Manager, Field Staff, Section Chief and Local Agency Partners listed in this QAPP
- remaining current on KDHE/DOE QA policy and general and specific EPA QA policies and regulations as it relates to the Ambient Air Quality Monitoring Program
- reporting all problems and corrective actions to the Section QA Representative (SQAR) via e-mail or in writing per the preference of the SQAR
- preparing and delivering field data to the SQAR per the preference of the SQAR
- reporting observed field/handling conditions which might influence data validity to the SQAR
- following all manufacturer's operating guidelines
- performing and documenting routine preventive and required maintenance
- documenting deviations from established procedures and methods
- participating in the development and implementation of QAPPs
- participating in training and certification activities
- participating in the development of data quality requirements (overall and field) with the Field Staff Supervisor, Data Manager, SQAR and Bureau QA Representative
- participating in the development of standard operating procedures (SOPs)
- responding to technical systems audits conducted by EPA
- ensuring timely follow-up and corrective actions resulting from auditing and evaluation activities

The **Section Quality Assurance Representative** (SQAR) of the Bureau of Air is the official staff QA contact in the Monitoring and Data Unit. The SQAR reads all QAPPs within the Monitoring and Data Unit and is responsible for the QA aspects of the Ambient Air Quality Monitoring Program. The SQAR's responsibilities include:

- maintaining an active line of communication with the EPA QA personnel, BQAR, Data Manager (DM), Field Staff, MDUS, Section Chief and Local Agencies Partners listed in this QAPP
- remaining current on KDHE/DOE QA policy and general and specific EPA QA policies and regulations as it relates to the Ambient Air Quality Monitoring Program
- participating in the development and implementation of QAPPs

- participating in the development of data quality requirements (overall and field) with the DM, MDUS and the BQAR
- participating in the development of standard operating procedures (SOPs)
- verifying that all required QA/QC activities are performed
- reporting problems and corrective actions to the Section Chief, DM, MDUS, Field Staff Supervisor and Field Staff Technicians

The **Field Staff Supervisor** (FSS) supervises the field staff who are responsible for carrying out air monitoring and ensuring the data quality results of the air monitoring by adhering to guidance and protocol specified by the QAPPs and SOPs for the field activities. Responsibilities include:

- maintaining an active line of communication with, BQAR, Data Manager, Field Staff, Section Chief, MDUS and Local Agency Partners listed in this QAPP
- reviewing and implementing the Air Monitoring QAPPs
- participating in training and certification activities
- participating in the development and modification of SOPs
- verifying that all required QA/QC activities are performed as required in the QAPPs
- following all manufacturer's operating guidelines
- performing and documenting routine preventive and required maintenance
- documenting deviations from established procedures and methods
- reporting all problems and corrective actions to the SQAR via e-mail or in writing per the preference of the SQAR
- reporting observed field/handling conditions which might influence data validity to the SQAR
- preparing and delivering field data to the SQAR per the preference of the SQAR
- shipping/receiving equipment and filters according to the QAPPs
- preparing purchase requests and approvals for new equipment, parts and repairs
- providing technical assistance to local agency partners for equipment/operational issues

The **Field Staff Technicians** are responsible for carrying out air monitoring and ensuring the data quality results of the air monitoring by adhering to guidance and protocol specified by the QAPPs and SOPs for the field activities. Responsibilities include:

- maintaining an active line of communication with, BOA QA staff, Data Manager, Field Staff Supervisor, Section Chief, MDUS and Local Agency Partners listed in this QAPP
- reviewing and implementing the Air Monitoring QAPPs
- participating in training and certification activities
- participating in the development and modification of SOPs
- performing all required QA/QC activities as required in the QAPPs
- following all manufacturer's operating guidelines
- performing and documenting routine preventive and required maintenance

- documenting deviations from established procedures and methods
- reporting all problems and corrective actions to the SQAR via e-mail or in writing per the preference of the SQAR
- preparing and delivering field data to the SQAR per the preference of the SQAR
- shipping/receiving equipment and filters according to the QAPPs
- providing operational training and technical assistance to local agencies

The **Data Manager** (DM) is responsible for ensuring that data and information collected for the air monitoring program are properly captured, stored, and transmitted for use by program participants. The DM also provides data reports, calculations, and charts as requested. Responsibilities include:

- participating in the development and implementation of QAPPs
- ensuring that information management activities are developed within reasonable time frames for review and approval
- coordinating the development of the information management system with data users
- ensuring the development of data standards for data structure, entry, transfer, and archive
- ensuring the adherence to the QAPPs where applicable
- ensuring access to data for timely reporting and interpretation processes
- ensuring the development of database guides (database structures, user guidance documents)
- ensuring timely delivery of all required data to the EPA-AQS system
- reporting observed field/handling conditions which might influence data validity to the SQAR

2.3 Individual Responsibilities of the Unified Government of Wyandotte County - Kansas City, Kansas

The **Director Department of Air Quality** (DDAQ) is the chief administrator of the Department of Air Quality of the Unified Government of Wyandotte County - Kansas City, Kansas.

The **Senior Environmental Scientist** (SES) manages the air pollution activities (including air monitoring). The ES reports any problems or corrective actions to KDHE (SQAR).

The **Environmental Scientist** and **Project Engineers** are responsible for carrying out air monitoring and ensuring the data quality results of the air monitoring by adhering to guidance and protocol specified by the QAPPs and SOPs for the field activities. Except for the Environmental Scientist, these people act in a backup role for air monitoring. Responsibilities include:

- reviewing and implementing the Air Monitoring QAPPs
- participating in training and certification activities
- participating in the development and modification of SOPs
- performing all required QA/QC activities as required in the QAPPs
- following all manufacturer's operating guidelines
- performing and documenting routine preventive and required maintenance
- documenting deviations from established procedures and methods
- reporting all problems and corrective actions to the SES, SQAR (per the preferences of the SQAR) and FSS
- reporting observed field/handling conditions which might influence data validity to the SQAR
- preparing and delivering field data to the SQAR per the preference of the SQAR
- shipping/receiving equipment and filters according to the QAPPs

2.4 Distribution

The Ambient Air Criteria Pollutant Monitoring QAPP and any revisions will be distributed to:

KDHE Division of Environment QA Officer
KDHE Bureau of Air (BOA) Director
KDHE Bureau of Air (BOA) QA Representative
KDHE BOA Monitoring and Planning Section (MPS) Staff
KDHE BOA MPS Section QA Representative
Unified Government of Wyandotte County - Kansas City, Kansas, Department of Air Quality
United States Environmental Protection Agency, Region VII

SECTION 3

DATA PERFORMANCE CRITERIA

This section provides a description of data performance criteria expressed in terms of data precision, accuracy, completeness, comparability and representativeness for each parameter of interest.

3.1 Precision

Precision is defined as the level of agreement among individual measurements of the same property, conducted under identical or similar conditions. The precision of each monitor is found in the following manner.

3.1.1 $PM_{2.5}$/PM_{10} Intermittent Monitoring

A description of procedures related to monitor collocation requirements and verifications to ensure the precision of monitoring equipment and sensors can be found in Sections 2 and 9 of the AAM SOP.

3.1.2 $PM_{2.5}$/PM_{10} Continuous Monitoring

A description of procedures related to monitor collocation requirements and verifications to ensure the precision of monitoring equipment and sensors can be found in Sections 14 and 15 of the AAM SOP.

3.1.3 Gaseous Monitors

A description of procedures related to monitor verifications to ensure the precision of monitoring equipment and sensors can be found in Section 2 of the AAM SOP.

3.1.4 Evaluation of precision

In the case of filter monitors, precision is evaluated by calculating the percent difference between the collocated readings. In the case of continuous monitors, precision is evaluated by calculating the percent difference between the known reading and the monitor reading. Detailed procedures for the evaluation of precision and steps necessary if a problem is detected can be found in Sections 1, 2, 9, 14 and 15 in the AAM SOP.

Precision results are reported to EPA AQS as described in Section 13 of the AAM SOP.

3.2 Accuracy

Accuracy is defined as the extent to which a measured value actually represents the condition being measured. Accuracy is influenced by the degree of random error (precision) and systematic error (bias) inherent in the measurement operation (e.g., environmental sampling and analytical operations). The accuracy of each monitor is found in the following manner.

3.2.1 $PM_{2.5}$/PM_{10} Intermittent Monitoring

A description of procedures related to monitor audits to ensure the accuracy of monitoring equipment and sensors can be found in Sections 2 and 9 of the AAM SOP.

3.2.2 $PM_{2.5}$/PM_{10} Continuous Monitors

A description of procedures related to monitor audits to ensure the accuracy of monitoring equipment and sensors can be found in Sections 14 and 15 of the AAM SOP.

3.2.3 Gaseous Monitors

A description of procedures related to monitor audits to ensure the accuracy of monitoring equipment and sensors can be found in Section 2 of the AAM SOP.

3.2.4 Evaluation of accuracy

Accuracy of the monitors is evaluated by calculating the absolute value of the percent difference (APD) between the known concentration or known flow and the monitor reading. Detailed procedures for the evaluation of accuracy and steps necessary if a problem is detected can be found in Sections 2, 3, and 4 in the AAM SOP.

Results from audits to evaluate accuracy are reported to EPA AQS as described in Section 13 of the AAM SOP.

3.3 Completeness

Completeness is defined as a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions.

Our minimum requirement is 75% valid data at each monitor per calendar quarter. Our goal is 100% valid data at each monitor per calendar quarter. The percentage valid is based on only those days which are planned to be monitored. In the case of particulate matter monitoring which is scheduled for less than every day sampling, monitoring on a non-scheduled day does not count as valid when calculating the percent valid.

3.4 Comparability

Comparability is defined as a measure of the confidence with which one item (e.g., data set) can be compared to another. We achieve comparability by using methodology which has been approved by EPA. Specifically, EPA has established certain monitoring equipment as Federal Reference Method (FRM) or Federal Equivalent Method (FEM). Unless the monitored parameter has no FRM or FEM method we will use an EPA FRM or FEM monitor.

3.5 Representativeness

Representativeness is defined as a measure of the degree to which data accurately and precisely represent a selected characteristic of a monitored system. Representativeness is achieved through the precision and accuracy procedures described above in Sections 3.1 and 3.2 respectively.

KDHE also achieves representativeness by following 40 CFR Part 58, Appendix D (Network Design Criteria for Ambient Air Quality Monitoring), and 40 CFR Part 58, Appendix E (Probe and Monitoring Path Siting Criteria for Ambient Air Quality Monitoring).

Each monitor operated by KDHE is assigned a scale of representativeness based on the definitions of 40 CFR Part 58, Appendix D.

Microscale defines the concentrations in air volumes associated with area dimensions ranging from several meters up to about 100 meters.

Middle Scale defines the concentration typical of areas up to several city blocks in size with dimensions of a few hundred meters.

Neighborhood Scale defines concentrations within some extended area of the city that has relatively uniform land use with dimensions of a few kilometers.

Urban Scale defines the overall, citywide conditions with dimensions on the order of 4 to 50 kilometers. This scale would usually require more than one site for definition.

Regional Scale defines usually a rural area of reasonably homogeneous geography and extends for tens to hundreds of kilometers.

SECTION 4

NETWORK DESCRIPTION

4.1 Purpose

The purpose of this section to provide a description of, and rationale for, intended sampling frequency, sampling network design and monitoring site selection criteria.

The primary purpose of the KDHE air monitoring program is to measure compliance with the National Ambient Air Quality Standards (NAAQS). Other purposes include determining trends over time, determining effects on air quality from adjustments to source emissions, developing algorithms based on historical air quality and other conditions which will forecast air quality, verifying air quality modeling programs, providing real-time ozone data to the public, and correlating health effects to air quality.

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

(1) 40 CFR 58, Appendix A contains QA criteria;

(2) 40 CFR 58, Appendix D contains criteria for network design; and

(3) 40 CFR 58, Appendix E contains criteria for siting of instruments and/or instrument probes.

4.2 Sampling Frequency

Minimum sampling frequencies are established by EPA and followed accordingly. The sampling frequency of the KDHE monitors is based on EPA's requirement. In the cases of every third and sixth day sampling, specific days must be sampled in order that the entire nation is sampling on the same day. This intermittent sampling is accomplished in accordance with a national sampling schedule published annually by EPA.

4.3 Site Selection

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

1) Developing and understanding the monitoring objective and appropriate data quality objectives;

2) Identifying the spatial scale most appropriate for the monitoring objective of the site;

3) Identifying general potential locations where the monitoring site could be placed; and

4) Identifying the specific monitoring site.

4.4 Monitoring Objectives and Spatial Scales

The criteria pollutant component of the Kansas Ambient Air Monitoring Network is designed to determine one of six monitoring objectives:

1) Highest concentrations expected to occur in the area covered by the network;

2) Representative concentrations in areas of high population density;

3) Impact on ambient air pollution of significant sources;

4) General background concentration levels;

5) Extent of regional pollutant transport among populated areas, and in support of secondary standards; and

6) welfare-related impacts in rural and relatively remote areas.

Each monitor within the Kansas Ambient Air Monitoring Network (see tables below) is assigned one of the following monitoring objective designations:

Population Exposure	The monitor located in an area associated with high population density.
Background	The monitor located where anthropogenic pollutant emissions are minimal.
Precision	This monitor is collocated for quality control purposes, i.e., to provide duplicate data for the evaluation of measurement precision.
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).
Comparison Study	The monitor is located adjacent to other instrumentation measuring the same pollutant to compare different sampling/monitoring methodologies.
AQI	The monitor provides data primarily for reporting the Air Quality Index (previously called the Pollutant Standards Index).

Data collected within the network must be representative of the spatial area under study. The goal in siting a monitoring station is to match the spatial scale represented by the samples obtained with the spatial scale most appropriate for the monitoring objective of the station. For a description of representative measurement scales, see section 3.5 above.

4.5 Site Location

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

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, geographical variability of ambient pollutant concentrations, meteorological conditions and population density. Selection of the number, geographic locations, and types of sampling stations is, therefore, a complex process.

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

Economics	The level of resources required for all data collection activity. This includes instrumentation, installation, maintenance, data retrieval, data analysis, quality assurance and data interpretation.

Security	In some cases, a particular site may have associated problems which 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 as possible to the preferred location 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, procurement of goods and services, communications, and inventory management.
Atmospheric Considerations	These 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 proper location of many monitoring sites (e.g., siting either to detect or avoid emissions from specific sources).

Diffusion and transport of air pollutants are affected by topographic features. Minor features may exert small influences, and major features (e.g., deep river valleys or mountain ranges) can affect large areas. A review of topography should be conducted prior to final site selection to ensure that data collection will not be adversely affected.

4.6 Monitor Placement

Final placement of a particular monitor at a selected site is dependent on physical obstructions and activities in the immediate area. The availability of utilities (i.e., electricity and telephone services) is critical. Monitors must be placed away from obstructions such as trees and fences in order to avoid their effects on air flow. To prevent sampling bias, air flow around the monitor sampling probe must be representative of the general air flow in the area.

The placement of each monitor is generally determined by the defined monitoring objective. Monitors are thus usually placed according to potential exposure to pollution. Due to the various factors discussed above, tradeoffs are often necessary to locate a site for collection of optimally representative data.

4.7 Network Information

Kansas Ambient Air Quality Monitoring Network site descriptions and other relevant site information are maintained at the offices of KDHE/BOA. The Kansas Ambient Air Network Plan is completed annually, and a Five Year Air Monitoring Assessment is completed every five years. Information on the ambient air monitoring network is available upon request or can be found on the KDHE/BOA website.

SECTION 5

DESCRIPTION OF SAMPLING EQUIPMENT

5.1 Description of Sampling Equipment

Descriptions of the sampling equipment and associated decontamination procedures are provided in the Ambient Air Monitoring SOPs. Monitors which are labeled as Federal Reference Method (FRM) or Federal Equivalent Method (FEM) by the U.S. Environmental Protection Agency used, when available, for all Kansas ambient air monitoring.

SECTION 6

DESCRIPTION OF FIELD PROCEDURES

6.1 Description of Field Procedures

A description of field procedures, including sample collection, analysis, preservation, transport and chain-of-custody procedures and accompanying safety protocols are in the AAM SOPs. General safety procedures for field staff are contained in AAM SOP Section 18.

SECTION 7

LABORATORY PARAMETERS AND PROTOCOLS

7.1 $PM_{2.5}$ Filter Analysis

$PM_{2.5}$ filters will be submitted to a contract laboratory to determine the resulting $PM_{2.5}$ concentrations (in units of micrograms per cubic meter) which are then provided to KDHE. The contract laboratory will provide a QAPP for their services and protocols, which will be reviewed and approved by the air monitoring unit of KDHE/BOA. Detailed laboratory protocols and other information on $PM_{2.5}$ filter analysis can be found in Section 4 of the AAM SOP.

7.2 PM_{10} Filter Analysis

PM_{10} and TSP filters will be submitted to the KDHE Division of Health and Environment Laboratory (DHEL) to determine resulting PM_{10} concentrations (in units of micrograms per cubic meter) which are then provided to KDHE. DHEL will provide a QAPP for their services and protocols, which will be reviewed and approved by the air monitoring unit of KDHE/BOA. Detailed laboratory protocols and other information on PM_{10} filter analysis can be found in Section 4 of the AAM SOP.

SECTION 8

DATA VALIDATION AND MANAGEMENT

This section provides a description of data validation, storage, transfer, reporting and backup requirements and special documentation requirements.

8.1 Data Validation

Data validation involves using procedures to check that field and data processing operations have been carried out correctly. The data validation process finds data that are suspect. Then the verification process determines whether the data are valid, invalid, or valid with a flag. A detailed description of data validation procedures, quality control of data, and submittal of data to EPA AQS can be found in Section 13 of the AAM SOP. Details on the submittal of data to the Ozone Mapping System (OMS) can be found in Section 14 of the AAM SOP.

8.2 Data Storage, Transfer, Reporting, Backup and Special Documentation

Procedures for data storage, transfer, reporting, backup, and other documentation regarding the management of ambient air monitoring data can be found in Section 13 of the AAM SOP.

SECTION 9

EQUIPMENT CALIBRATION AND AUDITING

This section describes equipment testing, auditing, calibration, and preventive maintenance procedures. All actions performed according to this section will be recorded and submitted to the Data Manager as described in the AAM SOP.

9.1 $PM_{2.5}$ Intermittent Monitoring

Monitor sensors will follow the schedule and procedures for calibration, verification, audits, and preventive maintenance as described in Section 4 of the AAM SOP. Transfer standards for monitoring equipment will follow the schedule and procedures as described in Section 11 of the AAM SOP. Results of aforementioned procedures will be submitted to EPA AQS as described in Section 13 of the AAM SOP.

9.2 PM_{10} Intermittent Monitoring

Monitor sensors will follow the schedule and procedures for calibration, verification, audits, and preventive maintenance as described in Section 4 of the AAM SOP. Transfer standards for monitoring equipment will follow the schedule and procedures as described in Section 11 of the AAM SOP. Results of aforementioned procedures will be submitted to EPA AQS as described in Section 13 of the AAM SOP.

9.3 Continuous Gaseous Monitoring

Monitor sensors will follow the schedule and procedures for calibration, verification, audits, precision checks, and preventive maintenance as described in Section 2 of the AAM SOP. Transfer standards for monitoring equipment, cylinders of known gas, and photometers will follow the schedule and procedures as described in Section 11 of the AAM SOP. Results of aforementioned procedures will be submitted to EPA AQS as described in Section 13 of the AAM SOP.

9.4 PM_{10}/$PM_{2.5}$ Continuous Monitoring

Monitor sensors will follow the schedule and procedures for calibration, verification, audits, precision checks, and preventive maintenance as described in Section 3 of the AAM SOP. Transfer standards for monitoring equipment, cylinders of known gas, and photometers will follow the schedule and procedures as described in Section 11 of the AAM SOP. Results of aforementioned procedures will be submitted to EPA AQS as described in Section 13 of the AAM SOP.

SECTION 10

PURCHASED EQUIPMENT

10.1 Purchased Equipment

The selection of monitoring equipment, specifically analyzer/instruments, their acceptance requirements, and installation procedures for purchased equipment and supplies can be found in Section 9 of the AAM SOP.

SECTION 11

EVALUATION PROCEDURES

This section contains a description of procedures (including statistical procedures) used to evaluate data precision, accuracy, completeness, representativeness and comparability, including a detailed characterization of internal QC procedures and external performance audit requirements.

11.1 Calculation Procedures

Section 3 above contains the data performance criteria used for evaluation of data. Those criteria use the percent difference (PD) quite often. For precision calculations on collocated data (monitors located at the same site), the PD is found by the following formula:

$$PD = \frac{Y - X}{(Y+X)/2} \times 100$$

Where Y is the duplicate sampler concentration and X is the regular sampler concentration.

For all other calculations in section 3 above, the PD is found by the following formula:

$$PD = \frac{Y - X}{X} \times 100$$

Where Y is the known concentration (or flow) and X is the monitor concentration (or flow).

Percent completeness (PC) (criteria are described in section 3 above) is found by using the following formula:

$$PC = \frac{NV}{NT} \times 100$$

Where NV is the number of valid samples and NT is the number of theoretical (scheduled) samples.

11.2 Evaluation of Internal QC Activities

For precision and accuracy, evaluate the results following the procedures in Section 3 above.

For zero/span checks, the procedures outlined in Section 13 of the AAM SOP will be followed.

In the cases of missing zero/span checks the validation rules provided in Section 3 of the AAM SOP will be followed.

11.3 Evaluation of External Audits

KDHE will participate in the National Performance Audit Program (NPAP) which is sponsored by EPA. $PM_{2.5}$ collocated Federal Reference Method (FRM) audits will be performed under NPAP; KDHE will cooperate with the auditors of this program. It is anticipated that EPA Region 7 will perform various monitor audits; KDHE will cooperate with these auditors, also. Any external audits with a percent difference greater than 15 percent (4 percent for $PM_{2.5}$ filter monitor flow audit and 10 percent for PM_{10} filter monitor flow audit) will be investigated to find the problem. Corrective action will be taken to solve the problem.

SECTION 12

SPECIAL TREATMENT OF DATA

12.1 Special Treatment of Data

This section describes procedures used to evaluate and enhance utility of environmental monitoring data including, but not necessarily limited to, procedures and assumptions applied in the identification and treatment of (a) outliers and other anomalous data, (b) nonlinear data requiring statistical transformation, and (c) values reported as "less than" or "greater than" established reporting limits**.**

In those cases where filter net weights are less than zero, these samples are considered invalid.

In those cases where continuous monitors record concentrations less than zero, these concentrations are reported as zero.

Except for the above, there will be no other special treatment of data.

SECTION 13

CORRECTIVE ACTIONS

13.1 Corrective Actions

Section 15 of the AAM SOP describes corrective actions that are taken due to problems with ambient air monitoring data including any quality control results which indicate problems as described in Sections 8, 9, and 11 above.

SECTION 14

QUALITY OF ACQUIRED DATA

14.1 Quality of Acquired Data

This section describes procedures for determining the quality of ancillary data acquired from external sources not subject to the provisions of the KDHE Division of Environment Quality Management Plan (e.g., meteorological, hydrological, geological, chemical and/or biological data obtained from other state and federal agencies).

The Monitoring and Planning Section acquires meteorological data from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC). The data acquired is typically quality controlled local climatological data**.**

The meteorological data are used to correlate air quality pollution data with source emission data. The meteorological data are also used to analyze long range transport of air pollution. The meteorological data are also used to convert PM_{10} or $PM_{2.5}$ concentrations reported in standard conditions of temperature and pressure to concentrations reported in local conditions of temperature and pressure. Details of this procedure are in Section 13 of AAM SOP.

SECTION 15

PARTNER PROGRAMS

15.1 Interagency Monitoring of Protected Visual Environments (IMPROVE)

The KDHE Bureau of Air is a participating organization in the IMRPOVE network to provide reasonably adequate spatial coverage of intermittent aerosol sampling sites across the United States. These sites and samplers are operated in accordance with the *IMPROVE Quality Assurance Project Plan* and the *IMPROVE Standard Operating Procedure for Sampler Maintenance by Site Operators* documents provided by the IMPROVE network.

15.2 National Atmospheric Deposition Program Mercury Deposition Network

The KDHE Bureau of Air is a participating organization in the National Atmospheric Deposition Program (NADP) Mercury Deposition Network (MDN) to provide data on the amounts, trends, and geographic distribution of mercury deposited by precipitation across the United States. These sites and samplers are operated in accordance with the National Atmospheric Deposition Program Quality Assurance and Quality Control procedures.

SECTION 16

REPORTS

16.1 Reports

This section contains a description of program/project deliverables (electronic databases, summary statistics, illustrative materials, interim and final reports, etc.) and schedule for completion.

Procedures and details on reports completed for the submission of hourly and daily concentration data, statistical evaluation, and precision and accuracy data can be found in Section 4 of the AAM SOP.

A SLAMS annual report is submitted to EPA Region VII and EPA Headquarters. This report covers the calendar year and is submitted by 1 May the following year. This report gives a summary of SLAMS, $PM_{2.5}$ and PM_{10} monitoring data.

An ambient air monitoring network report is submitted to EPA Region VII by 30 June of each year. This report provides the results of a network review and what changes are planned in the immediate future. In addition, a five-year air monitoring network assessment is completed every five years (i.e. 2010, 2015, 2020, etc.) and submitted to EPA Region VII by 30 June of the assessment year.

A quality assurance program evaluation of the air monitoring program is conducted covering the calendar year. This report is submitted to the Division of Environment QA Officer by 15 March of each year. The Monitoring and Planning Section Chief directs this evaluation.

During the ozone season, ozone monitoring data (i.e., "fast track" data, not completely quality assured) are submitted to EPA and other stakeholders. The data are submitted to EPA Region VII on a weekly basis.

As short term special projects are completed, a project report is prepared that summarizes the activities and results, including the air monitoring of the project.

For those ozone monitors that report real-time data to the ozone mapping system (OMS), data is automatically transmitted to OMS during the EPA designation NAAQS ozone. Polling times for OMS are hourly on Central Standard Time (CST). These data are not quality assured.

SECTION 17

TRAINING

17.1 Training

Personnel will meet the educational, work experience, responsibility, and training requirements for their positions. Records on personnel qualifications and training will be maintained in personnel files.

On-the-job training is an important part of the training program. For this, an employee reads and studies all relevant material (e.g., operator's manual, SOPs, federal regulations, and QA manuals) before performing an operation. Then the employee performs the operation while being observed by an experienced field staff member. When the experienced field staff member is satisfied that the employee is operating the equipment correctly, the employee may perform duties independently. An employee's work is reviewed every six months by the immediate supervisor. More detailed training procedures are given in Section 17 of AAM SOP.

Any conferences or workshops on air monitoring will be attended if funding can be arranged. Usually only one person attends these (he/she relays the information to applicable personnel after returning to the office) in order to conserve resources.

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

- Air Pollution Training Institute (APTI) *http://www.epa.gov/oar/oaq.apti.html*
- Air & Waste Management Association (AWMA) *http://awma.org/epr.htm*
- American Society for Quality Control (ASQC) *http://www.asqc.org/products/educat.html*
- EPA Institute
- EPA Quality Assurance Division (QAD) *http://es.inel.gov/ncerqa/qa/*
- EPA Regional Offices

Appendix A

AAM QAPP Revision History

Table A1. List of changes made during each revision.

Revision Number	Revision Date	Document Section	Revision Description
4.0	12/27/2018	Entire Document	Format change to header, table of contents, titles, and subtitles; addition of Appendix A to track changes; and updates to remove repetitive information that is provided in AAM SOP.
4.0	12/27/2018	Entire Document	Updated number references to AAM SOP sections due to changes in the updated AAM SOP.
4.0	12/27/2018	Section 15	Addition of a “Partner Programs” section to incorporate programs that KDHE BOA has collaborated with to perform monitoring activities.
4.0	12/27/2018	Section 2	Removal of Wichita Health Department as local agency handling responsibilities for ambient air monitoring.