UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4

Laboratory Services and Applied Science Division
980 College Station Road
Athens, Georgia 30605-2720

Mr. Brian Rivera, Director
Knox County Air Quality Management
1403 Davanna Street
Knoxville, Tennessee 37917

LSASD Project: #21-0090

Dear Mr. Rivera:

During June 2021 EPA Region 4 Laboratory Services & Applied Science Division (LSASD) personnel, Adam Zachary and Richard Guillot conducted a desk audit data review (DADR) of the Knox County Air Quality Management's (KCAQM) ambient air monitoring program. The data collection period covered by the DADR included calendar years 2019 through 2020. This letter accompanies a draft report detailing the audit results.

The attached draft report is provided to you for 14 days, during which time we ask that you review its contents for factual accuracy. If you observe an incorrect statement or datum, please submit written comments to LSASD to address the inaccuracy. If no comments are submitted to LSASD within 30 days, we will finalize the report.

LSASD will finalize and reissue the TSA report after the 30-day comment period expires. At that time, LSASD will request that your agency develop a corrective action plan to address the TSA findings and concerns. If you have any questions regarding this process, please contact Richard Guillot of my staff at (706) 355-8737.

Sincerely

BOBBI CARTER Digitally signed by BOBBI CARTER
Date: 2021.07.20 14:02:06 -04'00'

Bobbi Carter, Acting Chief
Quality & Support Branch

Enclosure

cc (via email), with attachments:
Todd Rinck, EPA Region 4, ARD

Project ID: 21-0090

2021 Desk Audit Data Review
Draft Report

Knox County Air Quality Management
Knoxville, Tennessee

Project Date: June 14-16, 2021
Report Date: July 13, 2021

Project Leader: Richard Guillot
Quality Assurance Section
Quality & Support Branch
Laboratory Services & Applied Science Division
U.S. EPA, Region 4
980 College Station Road
Athens, Georgia 30605-2720

Approvals:

EPA Project Leader:

Guillot, Richard Digitally signed by Guillot, Richard Date: 2021.07.20 08:41:48 -04'00'

Richard Guillot
Quality Assurance Section
Quality & Support Branch

Date

Approving Official:

BOBBI CARTER Digitally signed by BOBBI CARTER Date: 2021.07.20 14:02:50 -04'00'

Bobbi Carter, Acting Branch Chief
Quality & Support Branch

Date

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1.0 Executive Summary

U.S. Environmental Protection Agency (EPA) Region 4 Laboratory Services and Applied Science Division (LSASD) personnel conducted a Desk Audit Data Review (DADR) of the Knox County Air Quality Management's (KCAQM) ambient air monitoring program on June 14-16, 2021. A DADR serves as a cursory evaluation of the operation and performance of the ambient air monitoring program, in lieu of an on-site Technical Systems Audit (TSA) and was conducted due to travel restrictions imposed during the COVID-19 pandemic. The purpose of the DADR was to evaluate, remotely, the operation and performance of the ambient air monitoring program, pursuant to 40 CFR Part 58, Appendix A. Data from the 2019-2020 calendar years were reviewed as part of the DADR. KCAQM is an independent Primary Quality Assurance Organization (PQAO).

In general, the KCAQM air monitoring program is well-maintained and quality-controlled in accordance with its approved quality system. Data collected within KCAQM's air monitoring network is of sufficient quality for regulatory decision-making purposes. Summary statistics for data recovery and data quality meet and or exceed EPA requirements. This DADR discovered a validation error in the $PM_{2.5}$ dataset. This error will impact two 24-hour data points; these data points will need to be invalidated. EPA also recommends the KCAQM staff review or conduct a training on logbook procedures.

2.0 Introduction

On June 14-16, 2021, U.S. EPA Region 4 personnel initiated a DADR of the KCAQM ambient air monitoring program. The audit team included Adam Zachary and Richard Guillot (lead auditor) from the EPA Region 4 LSASD. Sara Waterson participated in the DADR as a representative from the U.S. EPA Region 4 Air and Radiation Division (ARD).

Pursuant to 40 CFR Part 58, Appendix A, § 2.5, Technical Systems Audits (TSAs) of each PQAO are required to be conducted every three years; monitoring organizations within a Primary Quality Assurance Organization (PQAO) should be audited within 6 years (2 TSA cycles). As a safety measure in response to the COVID-19 pandemic, EPA conducted a remote audit (DADR) in lieu of an on-site TSA. The DADR began via conference call hosted using Microsoft Teams. The DADR objective is to assess, remotely, KCAQM's compliance with established regulations governing the collection, analysis, validation, and reporting of ambient air quality data. KCAQM operates its ambient air monitoring program as an independent Primary Quality Assurance Organization (PQAO). Data reviewed for this DADR included that generated from State or Local Air Monitoring Stations (SLAMS) monitors operating during the 2019-2020 calendar years. Data was queried from EPA's Air Quality System (AQS) database prior to the virtual audit. EPA's Ambient Air Monitoring Technical Systems Audit Form was completed by KCAQM staff prior to the DADR and is included as Appendix B of this report.

Due to the nature of a DADR, this audit did not include on-site evaluations of any component of the KCAQM ambient air monitoring program. Instead, the auditors performed an Audit of Data Quality (ADQ), utilizing the records and data reviewed as part of the ADQ to gauge field operations and quality system performance. Audit interviews and information sharing were completed via Microsoft Teams and email. The DADR conference calls were held June 14-16, 2021; the exit briefing call was held on Friday, June 22, 2021.

During the audit, the following KCAQM personnel were interviewed.

- Brian Rivera, Division Director
- Rebecca Larocque, Environmental Specialist - Quality Assurance Officer
- Barron White, Environmental Specialist

Ms. Amber Talgo, the Air Monitoring Program Manager, was unavailable during this audit period.

The following AQS reports were reviewed in preparation for this DADR.

- AMP 220D: Monitor Network Report
- AMP 230: Frequency Distribution Report (2018-2020)
- AMP 260: Reduced Frequency Distribution Report (2018-2020)
- AMP 251: QA Raw Assessment Report (2018-2020)
- AMP 256: QA Data Quality Indicator Report (2018-2020)
- AMP 300: Violation Day Count (2018-2020)
- AMP 350: Raw Data Report (2018-2020)
- AMP 380: Site Description Report (2018-2020)
- AMP 390: Monitor Description Report (2018-2020)
- AMP 391: PEP Audit Summary Report
- AMP 393: PEP Audit History by PQAO
- AMP 410: AQI Report (2018-2020)
- AMP 410S: Air Quality Summary Report (2018-2020)
- AMP 430: Data Completeness (2018-2020)
- AMP 435: Daily Summary Report (2018-2020)
- AMP 440: Maximum Values Report (2018-2020)
- AMP 450: Quicklook Criteria Parameters (2018-2020)
- AMP 450NC: Quicklook All Parameters (2018-2020)
- AMP 480: Design Value Report (2020)
- AMP 504: Extract QA Data (2018-2020)
- AMP 600: Certification Evaluation and Concurrence (2018-2020)

Additionally, the following Knox County PQAO documents were reviewed.

- *Quality Management Plan, Knox County Health Department, Revision #3, September 17, 2018*
- *Quality Assurance Project Plan (QAPP) for Ambient Air Quality Monitoring of Criteria Air Pollutants, Monitoring QAPP Rev 1, July 29, 2020*
- *Thermo Model 2025 Sequential Sampler, Standard Operating Procedure, Revision 0, March 10, 2018*
- *Internal Auditing and Systems Review, Standard Operating Procedure, Revision #3, April 1, 2020*
- *Volumetric-Flow-Control (VFC), High Volume TSP/Pb Monitors, Standard Operating Procedures, Revision #0, June 19, 2019*
- *Ozone Monitoring with UV Spectrophotometry, Standard Operating Procedure, Revision #0, April 30, 2020.*
- *Teledyne T640x Model Continuous PM_{10} / $PM_{2.5}$, Standard Operating Procedure, Revision 0, November 13, 2019*

3.0 Commendations

LSASD would like to express its sincere gratitude and appreciation to the management and staff of the KCAQM air monitoring program for its assistance and cooperation during this DADR. LSASD would also like to recognize the KCAQM staff for all their efforts operating and maintaining the monitoring network during the COVID-19 pandemic. The efforts of working with these safety concerns and maintaining high quality data collection are recognized and deeply appreciated.

In addition, EPA would like to recognize the QA work of Ms. Rebecca Larocque. Ms. Larocque has developed a database to assist in the data verification / validation process and a separate database for tracking Certification of Standards for the monitoring program.

4.0 Findings and Recommendations

The issues from this DADR were compared to EPA regulations, technical policies, guidance, and the KCAQM PQAO's quality system documentation.

Quality system deviations found through this DADR are classified into three categories: **Findings**, **Concerns**, and **Observations**. These quality system deviations are defined as follows:

Finding:	Nonconformance of high importance which is unacceptable and must be remedied. Includes departures from or absences of specified requirements (e.g., regulatory, QMP, QAPP, SOP, etc) or a guidance deviation which could significantly impact data quality.

Concern:	Nonconformance of somewhat lesser importance as compared to a finding, but one that should be remedied. Includes departures from widely accepted best science / management practices, as well as practices which could have potential detrimental effect on the ambient air monitoring program's operational effectiveness, quality system, or sampling/measurement results.
Observation:	An infrequent deviation, error, or omission which does not impact the output of the quality of the work product but may impact the record for future reference.

For each of these categories, corrective action recommendations are provided. Corrective actions are required for all quality system deviations ranked as **Findings** or **Concerns**. Depending on the severity of the deviation, a specific data deliverable(s) may be requested to show that the corrective action recommendation has been successfully implemented. In these cases, the DADR report will specify the deliverable(s) that will be required for AQS and/or submittal to EPA. **Observations** do not require corrective actions. A summary table listing each finding, concern, and observation is provided as Appendix A of this report.

4.1 FIELD OPERATIONS

The DADR did not include evaluations of the KCAQM monitoring sites within the ambient monitoring network. Field records including logbooks, quality control forms, and maintenance records were reviewed in comparison to QAPP/SOP requirements.

4.1.1 Finding: Records indicated sample pick-up time was exceeded for four $PM_{2.5}$ data points. Please reference 40 CFR Part 50, Appendix L, §10.10.

Discussion: Four $PM_{2.5}$ data points, qualified in AQS as "HT" (Sample Pick-Up Hold Time Exceeded), were identified and reviewed. The data was collected at the Bearden Middle School monitoring site (AQS ID# 47-093-0028). The primary $PM_{2.5}$ monitor for the Bearden site is identified as parameter occurrence code (POC) 1, and the collocated monitor is identified as POC 2. The data impacted occurred on April 9, 2020, and July 2, 2020, for each of the POC 1 and POC 2 monitors, respectively.

40 CFR Part 50, Appendix L, §10.10 calls for the collection of the $PM_{2.5}$ filter within 177 hours (7 days, 9 hours) of the end of the sample period. The KCAQM QAPP, Table 7.2, Page 27, contains this requirement as well and identifies it as a critical criterion. As a critical criterion, any data not meeting this requirement must be invalidated.

Upon review of the documentation for the April 9, 2020 samples – these sample filters were retrieved in 179 hours 59 minutes, outside of the required 177-hour period. These data do not meet the CFR requirement and are invalid.

The documentation for July 2, 2020, indicates a retrieval time of 177 hours 15 minutes. In preparation for this DADR, the KCAQM staff reviewed the documentation for this data point and discovered an error in the time entered for these samples. The actual recovery time was 176 hours 15 minutes. KCAQM staff stated the error discovered was due to a failure to correct for Daylight Saving Time. These two data points meet the required sample recovery time.

Recommendation: KCAQM should review the critical pick-up time for the $PM_{2.5}$ filter with all operations staff. The four data points in the AQS database must be corrected. The two invalid data points collected on April 9, 2020, must be removed and properly null coded. The two data points collected on July 2, 2020, are valid; the current 'HT' data flags are unnecessary and can be removed. Please provide an AQS AMP501 report indicating the requested changes have been completed.

4.2 LABORATORY OPERATIONS

The KCAQM utilizes a private $PM_{2.5}$ gravimetric contract laboratory for its filter-based $PM_{2.5}$ monitoring program. This DADR did not include a review/inspection of the KCAQM $PM_{2.5}$ shipping and receiving area or the sample handling techniques. No issues were noted in the review of Chain of Custody (COC), operation, and maintenance records for these respective areas of the KCAQM program.

4.3 RECORDS MANAGEMENT

Certification records for standards were reviewed as part of the DADR. These standards included ozone photometers and $PM_{2.5}$ flow rate, temperature, and pressure instrumentation. No lapses or use of uncertified equipment were noted during the 2019-2020 DADR timeframe.

4.3.1 Concern: Logbook data fields were left blank for some entries. Please reference KCAQM Criteria QAPP, §9.1.1.

Discussion: The KCAQM utilize preprinted forms, known as "stickies", for use in their logbooks when conducting the various operations for the monitoring program. During review of the logbook records, the EPA auditor noted data fields that were left blank by the operations staff. The KCAQM Criteria QAPP, §9.1.1 requires completion of data forms for the associated routine environmental data operations.

Data fields deemed unnecessary at the time of record entry can be crossed out or a single line strike through may be used. Since blank data fields go against the QAPP procedures, this deviation could be used to cast doubt on the validity of the data, a QA check, and/or audit results. When data entry fields are left blank, this provides an opportunity for back-filling of the logbook to occur and the credibility of the site operator to be called into question.

Recommendations: EPA recommends one of the follow to address this concern: a review of logbook procedures by each operations staff; a staff meeting/training to review and discuss logbook procedures and requirements; or, a one-on-one review between operations staff personnel and the QA manager to discuss logbook procedures. Please inform EPA of how this review / training is accomplished, and specify the date and time.

4.4 DATA MANAGEMENT

No systemic issues with respect to data management were identified in the DADR review process.

4.5 QUALITY ASSURANCE

The KCAQM quality system documents (i.e., the QMP, QAPP and SOPs) were reviewed for this DADR. The review and approval of the QMP and QAPP were up-to-date.

4.5.1 Observation: A check of the percent difference calculation for ozone did not always match the recorded value.

Discussion: During a review of the ozone data documentation, a check of the percent difference calculation showed minor differences in the values indicated. When questioned, KCAQM staff noted that the difference was due to rounding of the significant digits during the calculation. KCAQM staff also identified that the issue was related to an older calibration unit, which is no longer in use by the agency.

Recommendation: EPA recommends carrying all digits through to the final calculation and then rounding to the appropriate significant digit. KCAQM QA staff identified this issue and made corrections to their procedures prior to the start of the DADR process. EPA auditors note the issue here for reference.

5.0 CONCLUSIONS

KCAQM operates and maintains a small, efficient ambient air monitoring program. KCAQM functions as a separate Primary Quality Assurance Organization within the State of Tennessee. Quality system documentation is up-to-date. Data recovery and data quality statistics are well above EPA required minimums.

The DADR discovered a few minor corrections that will be required to the AQS database with respect to the $PM_{2.5}$ dataset. Additionally, KCAQM should conduct a training for its operational staff with respect to good logbook techniques and procedures.

KCAQM must develop a corrective action plan and timeline to address the findings and concerns identified in Section 4 of this report and respond back to EPA within 30 days of receipt of the final DADR report. Please note that the corrective actions do not have to be completed by this

date, only a plan to address the findings and concerns. Observations do not require a corrective action, therefore, do not need to be addressed. If KCAQM anticipates that the development of the corrective action plan will not be completed within 30 days after the receipt of the final DADR report, please contact EPA to request an extension.

APPENDIX A

TSA Findings, Concerns and Observations Summary Table

Area	Section	Description
Findings		
Field Operations	4.1.1	Records indicated sample pick-up time was exceeded for four $PM_{2.5}$ data points. Please reference 40 CFR Part 50, Appendix L, §10.10.
Concerns		
Records Management	4.3.1	Logbook data fields were left blank for some entries. Please reference KCAQM Criteria QAPP, §9.1.1.
Observations		
Quality Assurance	4.5.1	A check of the of the percent difference calculation did not always match the recorded value.

APPENDIX B

APPENDIX B

United States

Environmental Protection Agency

Region 4

Laboratory Services & Applied Science Division

980 College Station Road

Athens, Georgia 30605

Ambient Air Monitoring

Desk Audit Data Review Form

Revision 1 | October 2020

Contents

1. General

Note: As you answer the questions throughout this questionnaire, please keep in mind that answers to some questions may be documented in your agency's QMP, QAPP(s), SOP(s), and/or annual monitoring network plan. As an alternative to providing language in the comment field for such questions, please consider listing an appropriate reference to the document(s) – including document name and section number – in which the relevant information has been documented. Such references should help reduce the amount of time and effort needed to complete this questionnaire through mitigating redundancy.

Name of your State, Local or Tribal Ambient Air Monitoring Organization:

Knox County Air Quality Management

Physical Address:

1403 Davanna St.

Knoxville, TN 37917

Mailing Address *(if different than physical address)***:**

140 Dameron Ave.

Knoxville, TN 37917

Date(s) of Desk Audit Data Review (DADR): Click or tap to enter a date.

This section of the questionnaire completed by: Amber Talgo

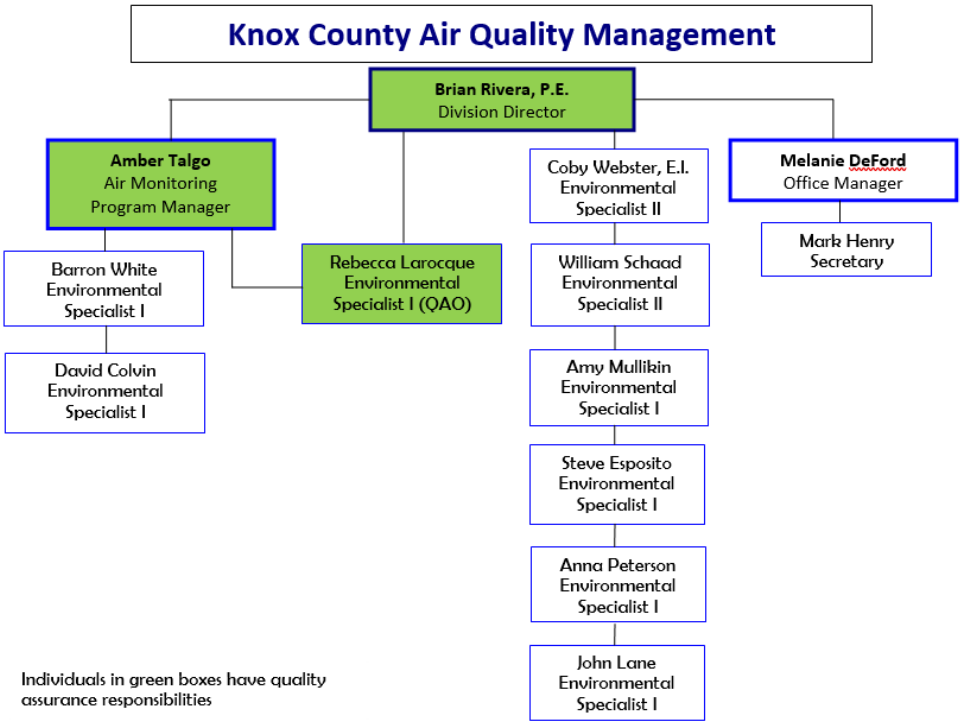
Key Individuals (e.g., Agency Director, Ambient Air Monitoring Network Manager, QA Manager, Technical Support/Instrument Repair Manager, Field Manager, Analytical Laboratory Manager, etc.):

Title/Position *(as presented in the organizational chart provided in Section 1.a.1)*	**Name**	**Phone Number and/or Email Address**
Division Director	Brian Rivera	865-215-5913
Air Monitoring Program Manager	Amber Talgo	865-215-5942
Environmental Specialist (QAO)	Rebecca Larocque	865-215-5941
Environmental Specialist	Barron White	865-215-5943
Environmental Specialist	David Colvin	865-215-5944

a. Program Organization

a.1 Organizational Chart

Upload an organizational chart, or attach to the form:



a.2 Key Position Staffing

Enter the number of personnel available to each of the following program areas, and any vacancies, if applicable.

Program Area	Number of People (Primary)	Number of People (Backup)	Number of Vacancies
Network Management (site setup, siting, ANP, etc.)	2	0	0
Field Operations (QC checks, site visits, site maintenance, etc.)	2	2	0
Quality Management (audits, QA documentation, certifications, etc.)	2	1	0
Data and Data Management (data review, validation and acquisition system, AQS, etc.)	2	1	0
Technical Support (equipment repair and maintenance)	2	1	0
Internal Analytical Laboratory (if applicable) ($PM_{2.5}$ gravimetric, high-volume PM_{10}/Pb, etc.)	N/A	N/A	N/A

Comment on the need for additional personnel, if applicable.

Click or tap here to enter text.

b. Facilities

*Identify the principal facilities where the agency conducts work related to air monitoring. **Do not include monitoring stations**, but do include facilities where work is performed by contractors or other organizations. "Air Lab" is office and lab space located at 1403 Davanna St.*

Ambient Air Monitoring Function	Facility Location	Comment on any significant changes to be implemented within the next one to two years.
Instrument repair	Air Lab	Click or tap here to enter text.
Certification of Standards (e.g., gases, flow transfers, MFCs)	Chinook Engineering, Mesa Labs, EPA Region 4 LSALD, Air Lab	Click or tap here to enter text.
PM filter weighing	Pace Analytical	Click or tap here to enter text.
Pb analysis	ERG	Click or tap here to enter text.
Data verification and processing	Air Lab	Click or tap here to enter text.
General office space	Air Lab	Click or tap here to enter text.
General lab/work space	Air Lab	Click or tap here to enter text.
Storage space (short and long term)	Air Lab	Click or tap here to enter text.

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

Click or tap here to enter text.

c. General Documentation Policies

Complete the following table. If relevant information is provided in a QMP, QAPP, and/or SOP, please provide an appropriate reference in the comment field in place of descriptive language.

Question	Yes	No	Comment
Does the agency have a documented records' management plan?	☒	☐	Click or tap here to enter text.
• If yes, does this include electronic records?	☒	☐	Click or tap here to enter text.
Does the agency have a schedule for retention and disposition of records? Are records kept for at least three years? Comment on how long records are retained.	☒	☐	Click or tap here to enter text.
Who is responsible for the storage and retrieval of records? If more than one person, please indicate those personnel responsible for storing/retrieving records, including what records each is responsible for.			Rebecca Larocque: QA, Logbooks, Field Forms, AV back up Talgo: RL's back up and employee records
What security measures are utilized to protect records?			**Thumb drive back-up of AV server and QA Database. Hardcopies of documents are stored at the AirLab. Logbooks are scanned periodically to the County server as well as all other electronic records which is backed-up by Knox County .**
Where/when does the agency rely on electronic files as primary records?			**Data files directly from continuous instruments and electronically delivered lab reports**
What is the system for storage, retrieval and backup of these files?			See Sec. 19.1, 19.2, 19.3 and 19.6 in QAPP

d. Training

Complete the following table.

Question	Yes	No	Comment
Does the agency have a training plan? If yes, where is it documented?	☒	☐	**See Section 8.0 of QAPP**
If yes, does the training plan include:			

• Training requirements by position?	☒	☐	**Knox County requires employees to do web-based safety training based on job description**
• Frequency of training?	☒	☐	Click or tap here to enter text.
• Training for contract personnel?	☐	☒	Click or tap here to enter text.
• A list of core QA-related courses? Please attach a list of required courses or cite where such information may be found.	☒	☐	**KCDAQM's SOP's, QAPP and quality bulletins**
• Does it make use of seminars, courses, EPA-sponsored college level courses, etc.?	☒	☐	Click or tap here to enter text.
Are personnel cross-trained for other ambient air monitoring duties?	☒	☐	Click or tap here to enter text.
Are training funds specifically designated in the annual budget?	☐	☒	Click or tap here to enter text.

e. Oversight of Contractors and Supplies

e.1 Contractors

Complete the following table. If your agency does not use contract personnel, proceed to section e.2 Supplies.

Contractors	Yes	No	Comment
Who is responsible for oversight of contract personnel?			**Contract facilities (Pace &ERG)**
Are contractors providing a service (e.g., independent performance audits, $PM_{2.5}$ lab) audited? How often?	☒	☐	**Analysis of PM 2.5 & Lead filters**
What steps are taken to ensure contract personnel meet training and experience criteria?			**Contract facilities are responsible for their own employee hiring and training. ERG and Pace have QAPPs, ERG is part of EPA's National Pb contract and Pace is subject to EPA regional Audits.**
Are contractor Quality Documents reviewed before procuring a service?	☐	☒	**IML/Pace Analytical has been working with KCAQM for many years. We have a copy of their QAPP and review the QA/QC data they send us. ERG is part of the**

			National Contract chosen by EPA and required not vetting by KCAQM. If a new service provider were to be contracted, KCAQM would review the quality documents and qualifications as part of the bidding process.
How often are contracts reviewed and/or renewed?			**Contracts are renewed Annually and Re-bid every 5 years.**

e.2 Supplies

Complete the following table. If relevant information is provided in a QMP, QAPP, and/or SOP, please provide an appropriate reference in the comment field in place of descriptive language.

Suppliers	Yes	No	Comment
Have specifications been established for consumable supplies and/or equipment?	☒	☐	See Section 17.0 of QAPP
What supplies and equipment have established specifications?			See Section 17.0 of QAPP
Is equipment from suppliers open for bid?	☐	☐	Bid must be obtained on items or services

2. Quality Management

This section of the questionnaire completed by: Rebecca Larocque

Key Individual(s) (e.g., Agency Director, Ambient Air Monitoring Network Manager, QA Manager, Field Manager, Analytical Laboratory Manager, etc.):

Title/Position	Name
Division Director	Brian Rivera
Air Monitoring Program Manager	Amber Talgo
Environmental Specialist I (Quality Assurance)	Rebecca Larocque
Environmental Specialist I Operator	Barron White
Environmental Specialist I Operator	David Colvin

a. Status of QA Program

a.1 QA and QC Activities

Complete the following table.

Question	Yes	No	Comment
Does the agency perform *all* quality assurance (QA) activities with internal personnel (i.e., developing QMPs/QAPPs/SOPs and DQOs/MQOs, performing systems audits, assessments and performance evaluations, corrective actions, validating data, QA reporting, etc.)? If not, please indicate in the comment field who is responsible and which QA activities are performed.	☒	☐	Click or tap here to enter text.
If the agency has contracts or similar agreements in place with either another agency or contractor to perform audits or calibrations, please name the organization and briefly describe the type of agreement.			US EPA – NPAP and PEP audit program. Lead Strips. State of Tennessee performs optional audits usually biannually
Does the agency perform *all* quality control (QC) activities with internal personnel (i.e., zero/span/one-point QC checks, calibrations, flowrate, temperature, pressure and humidity checks, certifying/recertifying standards, lab and field blanks, data collection, balance checks, leak checks, etc.)? If not, please indicate in the comment field who is responsible and which QC activities are performed.	☐	☒	All activities are performed with internal personnel except the following: Certifying/recertifying of standards are sent to qualified laboratories (IML, MESA, USEPA Region 4)

a.2 QC Acceptance Criteria

Complete the following tables.

Question	Yes/No	Location	Comment
Has the agency established and documented criteria to define agency-acceptable QC results?	Yes	Section 7.0 and 14.0 of QAPP	All QC acceptance criteria is iterated in the QAPP, & instrument specific SOP. Additionally, listed on most Forms for operators' quick access.

Pollutant	Does the agency adhere to the critical QC acceptance criteria for criteria pollutants[1] and meteorological measurements[2]?	QC Acceptance Criteria (if other than validation templates)	Action or Warning Limits	Corrective Action
Lead	Yes	Click or tap here to enter text.	See QAPP Table 14.4	See QAPP table 14.4
Ozone	Yes	Click or tap here to enter text.	See QAPP table 14.3	See QAPP Table 14.3
PM 2.5 Intermittent	Yes	Click or tap here to enter text.	See QAPP table 14.2	See QAPP table 14.2
PM 2.5 & 10 Continuous	Yes	Click or tap here to enter text.	See QAPP table 14.1	See QAPP table 14.1

QAPP tables provided at the end of this document.

b. Internal PE Audits

b.1 Internal Audit Questions

Complete the following table.

Question	Yes	No	Response
Does the agency maintain a laboratory to support QA activities?	☐	☒	Click or tap here to enter text.
Are the QA personnel organizationally independent from the personnel responsible for generating environmental data (40 CFR Part 58, Appendix A, § 2.2)? If no, please explain in the comment field.	☐	☒	**With a small local agency, the QA person is organized under the Air Monitoring Manager, however they have a direct communication line with the Director and are not responsible for regular generating of environmental data or QC checks.**
Are annual performance evaluation (PE) audits conducted by technician(s) other than the routine site operator(s) (40 CFR Part 58, Appendix A, § 3.1.2)? If no, please explain in the comment field.	☒	☐	

[1] Appendix D Validation Templates of the *QA Handbook for Air Pollution Measurement Systems Volume II (2017)*
[2] Appendix C Validation Templates of the *QA Handbook for Air Pollution Measurement Systems Volume IV (2008)*

Does the agency have identifiable auditing equipment and standards (specifically intended for sole use) for audits?	☒	☐	Click or tap here to enter text.
Are audit equipment and standards ever used to support routine calibration and QC checks required for monitoring network operations? If yes, please explain in the comment field.	☐	☒	Click or tap here to enter text.

b.2 Internal Audit Procedures

If the agency includes performance audit procedures in pollutant-specific monitoring SOPs, please provide an appropriate reference for each pollutant. Otherwise, if the agency does not have a performance audit SOP, please describe the performance audit procedure for each type of pollutant.

Pollutant	SOP/Performance Audit Procedure
Lead	Section 6.0, Lead Monitoring Audit " Internal Auditing and System Review SOP"
PM continuous	Section 5.0 PM Continuous Monitoring Audit " Internal Auditing and System Review SOP"
PM2.5 Intermittent	Section 4.0 PM2.5 Intermittent Sampling Audit " Internal Auditing and System Review SOP"
Ozone	Section 3.0 Ozone Monitoring Audit "Internal Auditing and System Review SOP"

b.3 Certification of Audit Standards

Attach a list or use the table below to provide information on the certification(s) and age of audit standards (e.g., flow standards, calibrators/photometers, gas standards, etc.) currently being used.

Vendor	Audit Standard	Age of Standard	Certification	Certification Frequency	Date of Last Certification
Streamline Pro	Multi cal – temperature/ Pressure/ Flow	2 years	Chinook Engineering	Annually	6/19/2020
BGI	Hi VolCAL lead flow audits	>8 years	Mesa Labs	annually	4/7/2020 * Lab closed temporarily standards removed from service till certified
VWR	Manometer	>8 years	Chinook Engineering	Annually	11/10/2020
Teledyne	Ozone	4 years	EPA region 4	annually	2/2/21
GMW	Adjustable Flow Orifice (Back up audit standard)	>10 years	Chinook Engineering	Annual	4/8/2021

Complete the following table.

Question	Yes	No	Comment
Does the agency have a separate source of zero air specifically for performance audits? Is it certified on any routine frequency? If so, how is it certified?	☒	☐	The agency utilizes a pump silica/ charcoal/ filter zero air system. The independent pump must be capable of specific output flow. The audit zero air charcoal canister and particulate filter is changed annually and only used for auditing. The silica canisters are refreshed with regenerated silica prior to each audit.
Does the agency have procedures for auditing and/or validating performance of meteorological monitoring?	☐	☒	We do not collect MET data other than ambient temperature and pressure collected as part of the PM2.5 methods. Those parameters are audited as part of the instrument audit with certified temperature and pressure standards.

b.4 Audit Acceptance Criteria

Complete the following tables.

Question	Yes/No	Location	Comment
Has the agency established and documented criteria to define agency acceptable audit results? If yes, comment where (page number, section, etc.)	Yes	QAPP Section 14 and tables 14.1,14.2,14.3,14.4 and 14.8	Additionally, some pollutants have additional marginal criteria that are passing but require action listed in the "Internal Auditing and System Review SOP"

Pollutant	Does the agency adhere to the audit acceptance criteria for criteria pollutants[3] and meteorological measurements[4]?	PE Audit Acceptance Criteria (if other than validation templates)	Do the audit levels (gaseous PE audits only) meet 40 CFR Part 58, Appendix A, § 3.1.2.1 criteria?	Corrective Action
Lead	Yes	n/a	n/a	See QAPP table 14.4
PM2.5	Yes	n/a	n/a	See QAPP table 14.2
PM10	Yes – per continuous method	n/a	n/a	See QAPP table 14.1

[3] Appendix D Validation Templates of the *QA Handbook for Air Pollution Measurement Systems Volume II (2017)*
[4] Appendix C Validation Templates of the *QA Handbook for Air Pollution Measurement Systems Volume IV (2008)*

Ozone	Yes	n/a	Yes See QAPP table 14.8	See QAPP table 14.3

c. Planning Documents Including QMP, QAPP, & SOP

c.1 QMP Questions

Complete the following table.

Question	Response
Does the agency have a quality management plan (QMP) that has been approved by EPA within the last five years? If "no", please explain why the agency does not have a QMP approved by EPA within the last five years.	Yes, QMP approved 2018

c.2 QAPP Questions

Provide a list of all QAPPs as an attachment or use the table below. If provided elsewhere, please provide a reference.

QAPP Title	EPA Approval Date	Most Recent QAPP Review Date	Pollutant(s)	Status
Quality Assurance Project Plan for Ambient Air Quality Monitoring of Criteria Air Pollutants	8/11/2020	7/1/2020	Ozone, Lead, PM	Approved, Active

Complete the following table.

Question	Response
How often does the air monitoring agency review QAPPs? Are these reviews documented? If so, please provide a location for where these documented reviews are retained.	All Quality Documents are reviewed annual – the review is notated in the Document control spreadsheet
Does the agency have any QAPP revisions still pending EPA approval?	No
• If yes, list the QAPP(s) that are pending approval.	Click or tap here to enter text.
How does the agency verify that the QAPP is fully implemented?	Employee competency checks performed by Air Monitoring Manager, And QA auditor reviews data, logbooks, and procedures for QAPP compliance
How are all air monitoring staff notified and trained when a QAPP is revised? Are the notifications/trainings documented? If so, please provide a location for where these records are retained.	Email from Manager
Does the agency have any missing QAPPs that need to be developed?	No

• If yes, list any missing QAPPs.	Click or tap here to enter text.

c.3 SOP Questions

Provide a list of all SOPs as an attachment or use the table below. If provided elsewhere, please provide a reference.

SOP Title	Agency Approval/Effective Date	Most Recent SOP Review Date	Pollutant(s)	Status
Volumetric-Flow Control High Colume TSP/ Pb	6/19/2019	10/9/2020	Lead	In Review
Internal Auditing and Systems Review	4/1/2020	5/11/2021	Lead, Ozone, PM, CSN	Approved
Teledyne T640/ T640 X Model Continuous PM 10/PM2.5	11/13/2019	6/1/2021	PM 10 and PM2.5	In Review
Thermo model 2025 Sequenital Sampler	3/10/2018	9/17/2020	Pm2.5	In Review
Ozone Monitoring with UV Spectrophotometry	5/1/2020	5/1/2020	ozone	Approved

Complete the following tables.

Question	Response
Are all standard operating procedures (SOPs) complete, or are some in development?	All complete
Does the agency have any missing SOPs that need to be developed?	Yes
• If yes, list the SOPs that need to be developed.	Chemical Speciation
Are SOPs available to all field operations personnel? How are SOPs accessed in the field (i.e., hard-copy or electronic)?	Hard copy or electronic – operator's choice
Does the agency have SOPs specific to data handling and validation?	No – this is included in each pollutant's SOPs and QAPP
Who develops/revises SOPs? Who approves SOPs?	QA person develops/ revises. Air Monitoring Program Manager and Division Director approves
Have all SOPs been internally approved?	No
• If no, list the SOPs that need to be approved.	Lead, 2025 and T640 SOP REVISIONS have been developed and are pending approval. Previously approved versions are still active.
How often are SOPs reviewed? Are these reviews documented? If so, please provide a location for where these documented reviews are retained. How often are SOPs updated?	SOPs are reviewed annually, and review is tracked in the document control

	spreadsheet. SOPs are updated when there is significant change in the process. Minor changes maybe be address with Quality Bulletins until full revision is scheduled
How are staff notified and trained when a SOP is revised?	Email by Air Monitoring Manager, with a small agency SOPs are developed with input from all staff so training is fluid with development.

d. Corrective Action

Complete the following table.

Question	Response
Does the agency have an operational, documented, and comprehensive corrective action program in place?	Yes
• As a part of the QAPP?	Yes
• As a separate document, or part of a SOP?	No
Are corrective action procedures based on results of the following that have exceeded established limits?	Yes, Action Points or marginal results are established in QAPP,SOPs and Corrective Action detailed
• 1-Point QC checks	Yes
• Calibrations and zero/span checks	Yes
• Flow rate verifications	Yes
• PEs (gaseous audits and semi-annual flow rate audits)	Yes
• Precision goals (collocated $PM_{2.5}$ and PM_{10})	Yes
• Bias goals	Yes
• NPAP audits	Yes
• PEP audits	No
• Completeness goals	Yes
• Data audits	Yes
• Technical Systems Audits/Desk Audit Data Reviews	Yes
How is responsibility for implementing corrective actions assigned?	Once a problem is recognized, either by site operator or management. It is discussed between Air Monitoring Program Manager and site operator and corrective action is taken.
How does the agency follow up on implemented corrective actions?	Corrective Action Report reviewed by QA person and Air Monitoring Program Manager

e. Quality Improvement

Complete the following table.

Question	Response
Have all deficiencies indicated in the previous TSA/DADR report been corrected? If no, please list and explain.	Yes
What actions were taken to improve the quality system since the last TSA/DADR?	Creation of the Document Control Spreadsheet, that tracks current forms, change/revision tracking, and links to older documents, Implementation of QA tracking sheets that documents multiple level review from operator, QA person, to Air Monitoring Program Manager
What was/were the cause(s) when goals for measurement uncertainty per 40 CFR Part 58, Appendix A were not met (if applicable)?	The Lead collocated precision is most often below comparable data. For PM2.5 the 2020 CV of continuous models was just outside the 10.1 % goal. With continuous vs intermittent a known bias of approved continuous methodology caused the issue.
What are your agency's plans for quality improvement?	Short Term: Pending approval of network plan the Lead network is changing to move the collocated monitor so that more comparable data is expected. We continue to work with other agencies (NYDEC) to improve our continuous instrument set up to reduce the bias and improve comparability of the continuous methods for PM2.5. Long term: Continue to build redundancy in equipment to reduce down time, continue to improve document review and management to reduce errors.

f. External Performance Audits

Complete the following table.

Question	Response	Comment
Does your agency participate in the following external performance audits? If not, please explain why.		We participate but due to COVID-19 were not audited in 2020. Staff contacted EPA to confirm these would not be completed.
• NPAP	Yes	Click or tap here to enter text.
• $PM_{2.5}$-PEP	Yes	Click or tap here to enter text.
• Pb-PEP	Yes	Click or tap here to enter text.

• Pb Strip Audit	Yes	These were completed in 2020
• Ambient Air Protocol Gas Verification Program (AA_PGVP)	N/A	Click or tap here to enter text.
List other performance audit participation.		Click or tap here to enter text.
Who performs NPAP and PEP audits?		US EPA Region 4 contractors

3. Network Management

This section of the questionnaire completed by: Rebecca Larocque

Key Individual(s) (e.g., Agency Director, Ambient Air Monitoring Network Manager, QA Manager, Field Manager, etc.):

Title/Position	Name
Division Director	Brian Rivera
Air Monitoring Program Manager	Amber Talgo
Environmental Specialist (QA)	Rebecca Larocque

a. Network Design

*For monitoring organizations and agencies that **do not submit the annual network plan (ANP)** required by 40 CFR 58.10, please complete the table below. For those monitoring organizations that **do submit an ANP**, proceed to section b. Siting.*

Site Name	AQS Site ID #	Pollutant(s) Monitored	Proposed Changes
Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.

b. Siting

b.1 Site Evaluations

Complete the following table.

Question	Yes	No	Comment
How often are site evaluations for 40 CFR Part 58, Appendix E criteria conducted?	Frequency:		**At least Annually, often bi annually**
	Date of last review:		**3/9/2021**
	Where is this documented?		**Sharepoint folder "Site evaluations" and included in quarterly audit report for corresponding quarter, and included in AMP**
Were any siting issues identified in the last three years? If so, have they been addressed?	☒	☐	**Found in 2019 TSA – trees were trimmed, documented in close out.**
How many sites have started-up, relocated, or shutdown within the past three years?	Site(s) Started-up:		**None**
	Site(s) Relocated:		**None**

Please list the names of these sites in the appropriate Comment section.	Site(s) Shutdown:		**Bearden (47-093-0028) as approved 2020 AMP per 5 year assessment evaluation**
Does the current level of monitoring effort (station placement, instrumentation, etc.) meet requirements imposed by current grant conditions?	☒	☐	**Meets or exceeds**

b.2 Site Non-Conformance

Please list any monitors with siting non-conformances, the AQS Site ID numbers for those monitors, the type of non-conformance and the reason(s) for the non-conformance. If none of your agency's monitors have siting non-conformances, proceed to section c. Waivers.

Monitor	AQS Site ID #	Type of Non-Conformance	Reason(s) for Non-Conformance
Choose an item.	Click or tap here to enter text.	Choose an item.	Click or tap here to enter text.

c. Waivers

c.1 Waiver Questions

Complete the following table.

Question	Yes	No	Comment
Does your agency plan to request any waivers?	☒	☐	**New Lead Site in development waiver requested in AMP 2021– no waivers for existing sites.**
Has your agency obtained necessary waiver provisions to operate equipment which does not meet the effective reference and equivalency requirements (if applicable)?			**n/a**
Do any sites vary from the required operating schedules in 40 CFR 58.12?	☐	☒	Click or tap here to enter text.
Does the number of collocated monitoring stations meet the requirements of 40 CFR Part 58, Appendix A? If no, please explain why, indicating which pollutant(s) does not meet the CFR collocation requirements.	☒	☐	Click or tap here to enter text.

c.2 Waiver Types

Indicate any waivers requested or granted by the EPA Regional Office, and provide waiver documentation. If your agency does not have any waivers, proceed to section d. Documentation.

Waiver Type	Reason	EPA Approval Date
Choose an item.	Click or tap here to enter text.	Click or tap to enter a date.

d. Documentation

Complete the following table.

Question	Yes	No	Comment
	☒	☐	

Are hard copy or electronic site information files retained by the agency for all air monitoring stations within the network? If so, please provide the location of these files in the comment field.			**Electronic Share point drive**
Who has custody of the current network documents?	**Name:** Amber Talgo **Title:** Air Monitoring Program Manager		Click or tap here to enter text.

4. Field Operations

This section of the questionnaire completed by: Amber Talgo & Rebecca Larocque

Key Individual(s) (e.g., Field Manager, Field Supervisor, Field QA Manager, etc.):

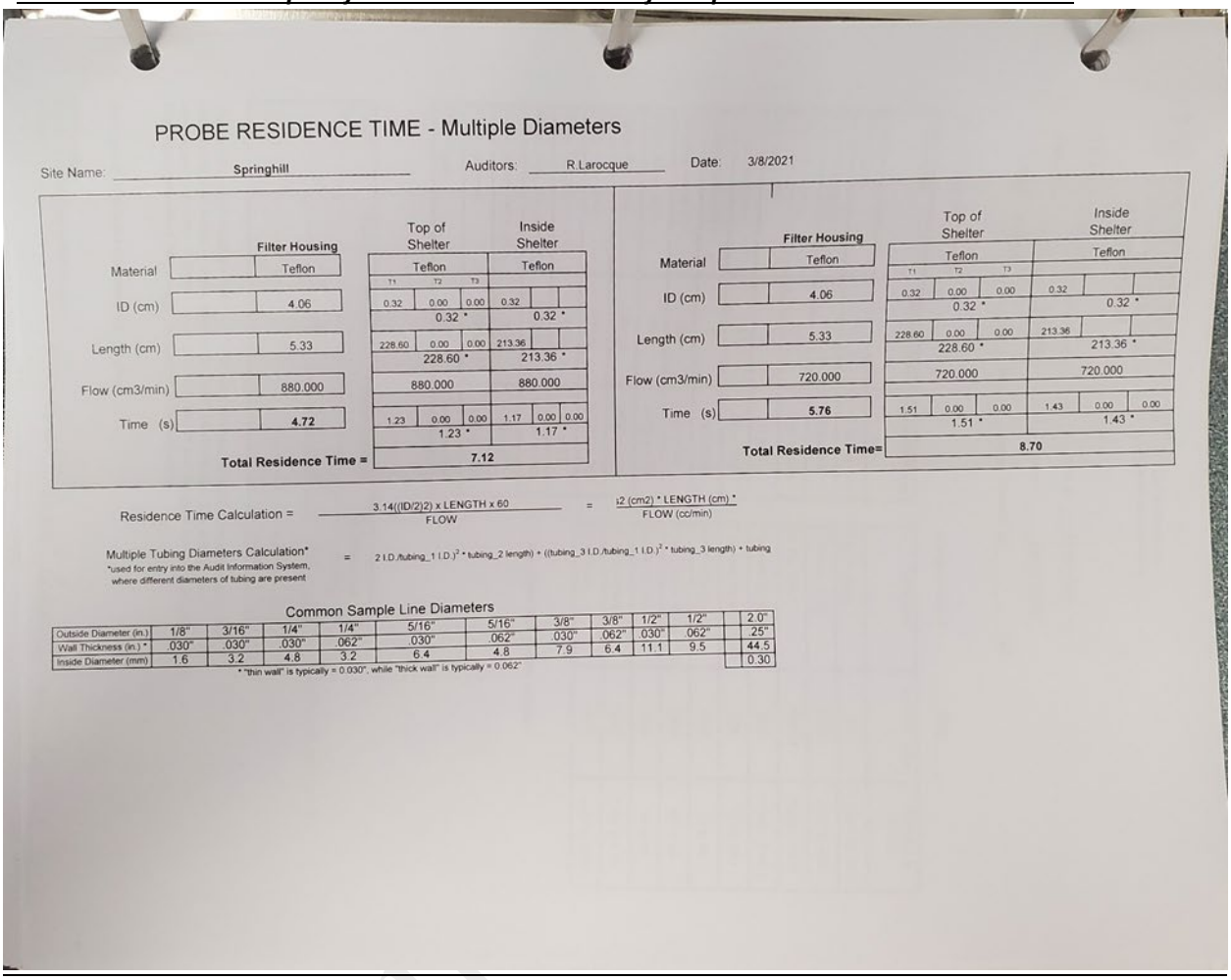
Title/Position	Name
Air Monitoring Program Manager	Amber Talgo
Environmental Specialist I (operator)	David Colvin
Environmental Specialist I (operator)	Barron White
Environmental Specialist I (QA)	Rebecca Larocque

a. Field Support

Complete the following table.

Question	Yes	No	Comment
On average, how often are most of your stations visited by a field operator?			Weekly
On average, how many stations does a single operator have responsibility for?			3
How many stations in your SLAMS network (including NCore and near-road NO_2, if applicable) are equipped with sampling manifolds?			0
Do the sample inlets and manifolds meet the requirements for through-the-probe audits?	☒	☐	Click or tap here to enter text.
• Briefly describe the most common manifold type and flow rate.			Click or tap here to enter text.
• How often are manifolds cleaned?			Click or tap here to enter text.
• What is used to perform the cleaning?			Click or tap here to enter text.
• Are manifolds equipped with a blower?			Click or tap here to enter text.
• How is the air flow through the manifold monitored?			Click or tap here to enter text.
• Is there a conditioning period for the manifold cleaning?			Click or tap here to enter text.
What is the longest calculated residence time of all reactive gas analyzers currently operating within the network?			8.70 secs
How often is the residence time calculated?			Annually
Sampling lines: 1) What material is used for instrument sampling lines?			Teflon
2) Are sample lines routinely cleaned or replaced? How often are sampling lines cleaned/replaced?			Yes, annually
3) Are sample line integrity checks (SLICs) routinely completed? If so, how often?			Yes, at the start of ozone season
Do you utilize uninterruptable power supplies or backup power sources at your sites?	☒	☐	Click or tap here to enter text.

Please attach an example of recent documentation of sample residence time calculation.



PROBE RESIDENCE TIME - Multiple Diameters

Site Name: Springhill Auditors: R.Larocque Date: 3/8/2021

	Filter Housing	Top of Shelter	Inside Shelter
Material	Teflon	Teflon	Teflon
ID (cm)	4.06	T1: 0.32, T2: 0.00, T3: 0.00 → 0.32 *	0.32 *
Length (cm)	5.33	228.60, 0.00, 0.00 → 228.60 *	213.36 *
Flow (cm3/min)	880.000	880.000	880.000
Time (s)	4.72	1.23, 0.00, 0.00 → 1.23 *	1.17, 0.00, 0.00 → 1.17 *
Total Residence Time =		7.12	

	Filter Housing	Top of Shelter	Inside Shelter
Material	Teflon	Teflon	Teflon
ID (cm)	4.06	T1: 0.32, T2: 0.00, T3: 0.00 → 0.32 *	0.32 *
Length (cm)	5.33	228.60, 0.00, 0.00 → 228.60 *	213.36 *
Flow (cm3/min)	720.000	720.000	720.000
Time (s)	5.76	1.51, 0.00, 0.00 → 1.51 *	1.43, 0.00, 0.00 → 1.43 *
Total Residence Time=		8.70	

Residence Time Calculation = $\frac{3.14((ID/2)2) \times LENGTH \times 60}{FLOW}$ = $\frac{i2\ (cm2) * LENGTH\ (cm) *}{FLOW\ (cc/min)}$

Multiple Tubing Diameters Calculation*
*used for entry into the Audit Information System, where different diameters of tubing are present

= 2 I.D./tubing_1 I.D.)^2 * tubing_2 length) + ((tubing_3 I.D./tubing_1 I.D.)^2 * tubing_3 length) + tubing

Common Sample Line Diameters

Outside Diameter (in.)	1/8"	3/16"	1/4"	1/4"	5/16"	5/16"	3/8"	3/8"	1/2"	1/2"		2.0"
Wall Thickness (in.) *	.030"	.030"	.030"	.062"	.030"	.062"	.030"	.062"	.030"	.062"		.25"
Inside Diameter (mm)	1.6	3.2	4.8	3.2	6.4	4.8	7.9	6.4	11.1	9.5		44.5
												0.30

* "thin wall" is typically = 0.030", while "thick wall" is typically = 0.062"

b. Instrument Needs

Please list your instrument needs in order of priority.

2025i, data logger, O3 Bench standard, O3 analyzer

c. Calibration

c.1 Calibration Frequency and Methods

Please indicate the frequency and method of multi-point calibrations of gaseous monitors.

Pollutant	Frequency	Calibration Method: Back of Instrument	Calibration Method: Through-the-Probe
Ozone	Pre, mid & end of season	☐	☒

c.2 Calibration Questions

Please complete the following table.

Question	Yes	No	Comment
How are field calibration procedures documented, and how are the results recorded?			Each pollutant has a calibration form (Cal. Verif for Pb as it can't be "calibrated")
Are calibration procedures consistent with the operational requirements of Appendices to 40 CFR Part 50 or to analyzer operation/instruction manuals?	☒	☐	**If no, why not?** Click or tap here to enter text.
Have changes been made to calibration methods based on manufacturer's suggestions for a particular instrument?	☐	☒	**If yes, what change(s)?** Click or tap here to enter text.
Do standards used for calibrations meet the requirements of appendices to 40 CFR Part 50 (EPA reference methods) and Appendix A to 40 CFR Part 58 (traceability of materials to NIST, SRMs or CRMs)?	☒	☐	**Comment on deviations.** Click or tap here to enter text.
Are all flow-measurement devices NIST-traceable?	☒	☐	Click or tap here to enter text.

d. QC Certifications

Please note: Sub-sections d.1-d.3 are intended for the QC standard equipment used for routine quality control of the monitoring network monitors. Audit/QA standard equipment information should be provided in Section 2.b of this questionnaire.

d.1 QC Flow Devices

Please list the authoritative QC standards used for each type of flow measurement. Indicate the certification frequency of these standards to maintain field material/device credibility. (Please note: Mass flow controllers (MFCs) used within dilution calibrators (if applicable) should be listed in sub-section d.2. However, the flow standards used to certify those MFCs should be listed here.)

QC Flow Device	Serial Number	Primary Standard	Certification Frequency	Use (calibration, audit, or spare)
Adjustable Orifice Plate	3614	No	Annually	Spare
Hi Vol Cal	95	No	Annually	Calibration/Verification
Streamline Pro	SM060505	No	Annually	Calibration/Verification-BW
Streamline Pro	SM060501	No	Annually	Spare
Streamline Pro	HL190707	No	Annually	Calibration/Verification-DC
Defender510	133398	No	Annually	Ozone flow calibration/verification

d.2 QC Calibrator Certifications

Please list the authoritative QC standards for each type of ozone (e.g., photometer), dilution (e.g., multi-gas blender) and permeation calibrator, and indicate the certification frequency of each.

QC Calibrator	Primary Standard	Frequency of Certification/Calibration
Teledyne 703e (Level II)	Yes Local Bench	Annually
Teledyne 703e (190)	No	Pre, Mid and Post Ozone Season
Teledyne 703e (188)	No	Pre, Mid and Post Ozone Season
Teledyne 703e (189)	No	Pre, Mid and Post Ozone Season
Teledyne T703U (316)	No	Pre, Mid and Post Ozone Season
Teledyne T703U (317)	No	Pre, Mid and Post Ozone Season

d.3 QC Certification Questions

Please complete the following table.

Question	Yes	No	Comment
How are certifications performed? (internally, by a vendor, or third party?)			Vendor
Where do field operations personnel obtain gas standards?			Level III Ozone transfer standard

How are the gas standards verified after receipt?			O3 transfer standards are certified to Level II bench according to O3 TAD and O3 SOP section 6.0
Is the date on which a standard was certified (as opposed to the standard's "placed in service" date) used to determine the standard's recertification due date?	☒	☐	Only exception is Span Dust – per Teledyne memo, following their new dating procedures.
What traceability is used?			Outside Vendors utilize primary standard or document their standards traceability to NIST primary standard. All of our standards are certified and traceable to a primary standard each year.
Is calibration equipment maintained at each station?	☒	☒	O3 (level III) Transfer Standards are at each station - Flow transfer standards are maintained at the office and transported for Flow calibrations
How is the functional integrity of this equipment documented?			As found/ as left documentation is provided on vender certifications, O3 standards are compared to the bench mid season, and control charts are used that can separate standards to look for deviations.
Who has responsibility for maintaining field calibration standards?			Operators are responsible for maintaining field calibration standards, including O3 bench comparisons. QA person tracks certifications and Air Monitoring Program Manager arranges recertifications by outside vendors.

****Please have copies of certifications of all standards currently in use from your master and/or satellite certification logbooks (i.e., chemical, gas, flow, and zero air standards) available for review during the DADR.***

Certifications have been provided in a joint TEAMS folder for review

Please attach an example of recent documentation of traceability.

Chinook Engineering — *innovative measurements*
a division of Pace Analytical Services, LLC — 555 Absaraka Street, Sheridan, WY 82801 USA

Certificate of Calibration

This Streamline Pro™ MultiCal™ System, serial number: **SM060501**
was calibrated against the following NIST-traceable Reference Standards:
Flow: Critical Flow Venturi S/Ns 10962, 10963, 18491 — on date: 11/09/20
Barometric Pressure: Precision Barometer S/N 913930-M1 — on date: 11/09/20
Temperature: NIST Traceable Hg-in-glass thermometers, S/Ns 2J3106, 2Y6027, 3L9452. — on date: 11/06/20

Quality Assurance:

Flow:

Reference Std. Q_{ref} (l/min)	Streamline Pro Q_{SLPro} (l/min)	Absolute difference (l/min)	% Diff. F.S.
2.00	2.00	0.00	0.02%
6.67	6.65	-0.02	-0.08%
10.00	10.02	0.02	0.08%
13.67	13.67	0.00	0.01%
16.67	16.66	-0.01	-0.05%
20.01	20.01	0.00	0.02%
25.00	25.00	0.00	0.00%

BP:

Reference Std. BP_{ref} (atm)	Streamline Pro BP_{SLPro} (atm)	Absolute difference (atm)	% Diff. F.S.
0.750	0.750	0.000	0.01%
0.900	0.900	0.000	0.01%
1.050	1.050	0.000	0.00%

Temp.:

Reference Std. T_{ref} (°C)	Streamline Pro T_{SLPro} (°C)	Absolute difference (°C)	% Diff. F.S.*
0.0	0.0	0.0	0.01%
20.5	20.5	0.0	0.01%
42.2	42.2	0.0	-0.01%

* based on absolute temp. scale (K)

Lab temp: 22.3 °C — Lab pressure: 0.865 atm

Certified By: Marty Kjorstad — Date: Nov 9, 2020

Chinook Engineering
555 Absaraka Street
Sheridan, Wyoming USA 82801
(307) 674-7506
www.chinookengineering.net

e. Repair

Complete the following table.

Question	Yes	No	Comment
Who is responsible for performing preventive maintenance?			Field Operators are responsible
What is the preventive maintenance schedule for each type of field instrumentation? If this information is provided in agency SOPs, please indicate that in the Comment section.			Each instrument has at minimum biannual and annual maintenance schedule. Some have quarterly. Ozone – SOP section 9.0 PM2.5 2025 – SOP section 6.0 Lead SOP Section – 5.0 T640 PM SOS – Section -5.0
Does the agency have service contracts or agreements in place with instrument manufacturers? Indicate in the Comment section or attach additional pages to show which instrumentation is covered.	☐	☒	Click or tap here to enter text.
Comment briefly on the adequacy and availability of the supply of spare parts, tools, and manuals available to the field operator to perform any necessary maintenance activities. Do you feel that this is adequate to prevent any significant data loss?	☒	☐	We purchase the manufacturer's suggested spare parts kits, have additional back up pumps and rebuild kits. Additionally, we have at least one back up instrument that can be swapped out for each type of monitor/ sampler to prevent any significant data loss.
Is the agency currently experiencing any recurring problem with equipment or manufacturer(s)? If so, please identify the equipment or manufacturer, and comment on steps taken to remedy the problem.	☐	☒	Click or tap here to enter text.

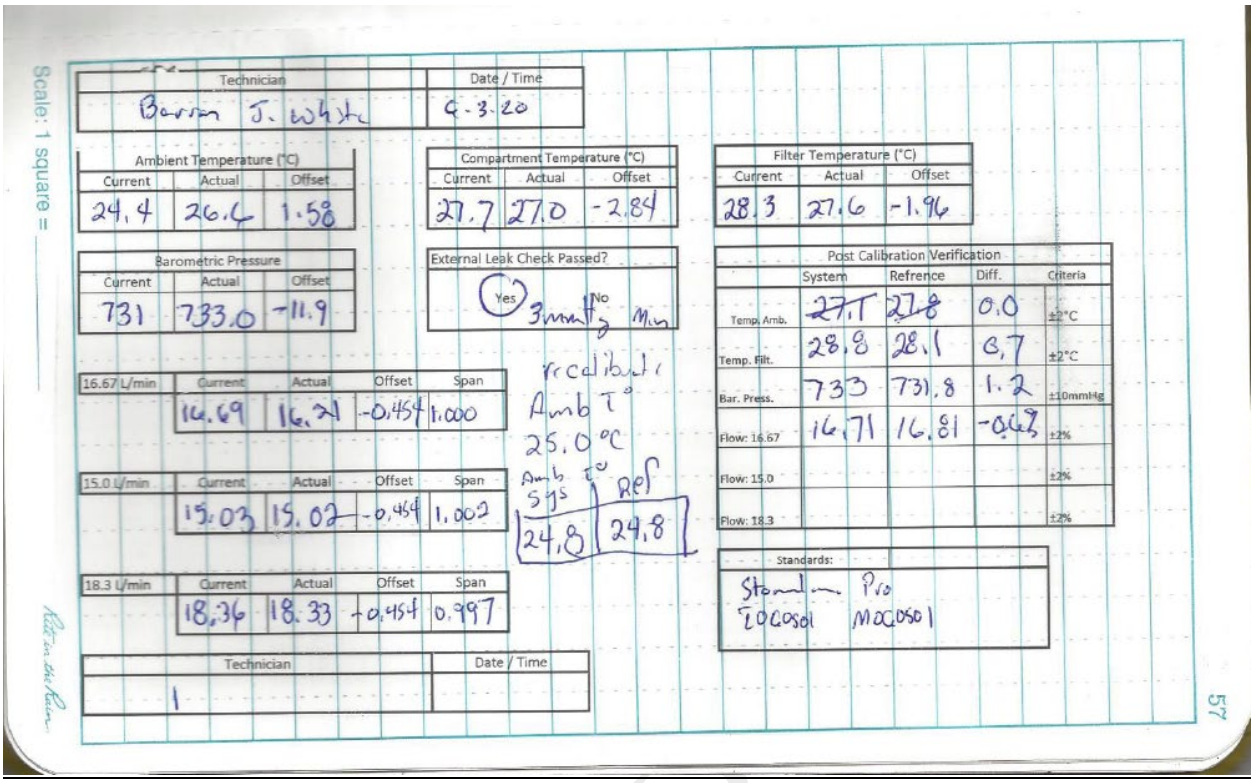
f. Record Keeping

Complete the following table.

Question	Yes	No	Comment
What type of station logbooks are maintained at each monitoring station? (e.g., maintenance logs, calibration logs, personal logs, etc.)			A site log is maintained at each station with multiple pollutants, and an instrument logbook is maintained for each monitor/ sampler/ O3 transfer standard. The instrument log includes maintenance, calibrations, QC and QA audits results. For the single pollutant sites the primary instrument logbook also serves as the site logbook,
• If hard-bound logbooks are used, are they electronically scanned on any	☒	☐	Instrument logs are scanned monthly, site logs are scanned quarterly.

routine frequency? If yes, at what frequency?			
Who reviews and verifies the logbooks for adequacy of station performance? Does the reviewer initial or sign the logbooks to document the review?			Logbooks are reviewed by the QA personnel and the Air Monitoring Program Manager. This is documented on the QA tracking Sheets, initial and dated. Additionally the internal Auditor reviews the logbooks and notates any deficiencies in the audit report.
How is control of logbooks maintained?			Sites are locked, QA personnel performs the scanning of the logbooks and reviews for discrepancies.
Where is the completed logbook archived?			Scanned logbooks are archived on the Shared drive, hardbound are archived with the data for the last year of logbooks use and maintained following records retention policy.
What other records are used? (Use drop-down menu below). Comment on the use and storage of these documents.			Click or tap here to enter text.
Log of precision checks			This is maintained in the QA database
Control Charts			Control charts are printed and maintained with QA tracking they correspond to, electronically stored on Shared drive
A record of audits			Audits are entered in the QA database, and physical copy of audits in the annual physical files, and electronic copy on the Shared drive
Other			QA database maintains a record, and scanned or jpg logbook copy of each QC check performed. This database is housed on a separate server.
Are calibration records (or calibration constants) available to field operators?	☒	☐	"Stickies" or forms printed on clear sticky paper are utilized to place calibrations / verification documentation directly in the instrument logbook.

Please attach an example field calibration record sheet.



5. Laboratory Operations

This section of the questionnaire completed by Rebeca Larocque

Laboratory Name: We utilize 2 contract laboratories for Criteria Pollutants. Both are listed below.

Eastern Research Group — Pace Analytical (IML Air Science)

Laboratory Address:

601 Keystone Park Drive #700, Morrisville, NC 27560 — 555 Absaraka St, Sheridan WY 82801

Key Individual(s) (e.g., Laboratory Manager, Laboratory Supervisor, Laboratory QA Manager, etc.):

Title/Position	Name
Air Monitoring Program Manager	Amber Talgo
Environmental Specialist (QA)	Rebecca Larocque

- Key individuals are listed for our agency that review contract laboratory data.

a. Routine Operation

a.1 Methods

In the table below, identify which of the following analyses are performed in the laboratory, and state the method used to conduct the analyses.

Pollutant	Method
Lead	ICP-MS Equivalent method EQL-0512-201, Based on EPA compendium Method IO3.5 and SW-846 method 6020A
PM2.5	Manual method according to 40 CFR 50 Appendix L " Reference Method for the Determination of Fine Particulate Matter as PM2.5 in the atmosphere"

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

Click or tap here to enter text.

a.2 Quality System

Complete the following table. – NOT Applicable no in House Laboratory

Question	Yes	No	Comment
Are procedures for the methods listed in Section a.1 included in the agency's QAPP and/or SOPs?	☒	☐	ERG and PACE/ IML QAPPs are incorporated in our Agency QAPP by appendix G & H
Have the laboratory SOPs been internally approved by agency staff?	☐	☐	Click or tap here to enter text.
Are SOPs easily and readily accessible for use and reference within the laboratory? If not, where are the documents stored?	☐	☐	Click or tap here to enter text.
Are separate facilities maintained for weighing the different sample types? (e.g., hi-volume vs low-volume), or is one weighing room utilized for all samples? Describe.	☐	☐	Click or tap here to enter text.
Does your laboratory hold certifications? (EPA, NIST, State, NLAC, or other)	☐	☐	Click or tap here to enter text.
Does your laboratory operate under a QA Manual or equivalent document? If so, what is the title of that document?	☐	☐	Click or tap here to enter text.
Does your laboratory participate in PE programs?	☐	☐	Click or tap here to enter text.
Does your laboratory have a corrective action process for non-conforming work?	☐	☐	Click or tap here to enter text.
Does your laboratory have a laboratory staff person assigned the role of QA Officer? If so, who is the lab QA Officer?	☐	☐	Click or tap here to enter text.

Please describe needs for laboratory instrumentation.

Click or tap here to enter text.

b. Laboratory QC -

b.1 Standards

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

Device	Pollutant	Brand (Make)	Model (Class)	Calibration/Certification Expiration Date
Choose an item.	Choose an item.	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap to enter a date.

Please have calibration/certification records for all laboratory standards available for review during the DADR.

b.2 Laboratory Temperature and RH

Complete the following table.

Question	Yes	No	Comment
What are the accuracy specifications and recording times (e.g., 5 min. averaging time) of the temperature and relative humidity (RH) sensors (loggers) used in the gravimetric laboratory?			Click or tap here to enter text.
What is the accuracy specification for any RH/temperature audit device used in the laboratory, if applicable?			Click or tap here to enter text.
Does the laboratory utilize an infrared (IR) gun to obtain sample shipment temperatures?	☐	☐	Click or tap here to enter text.
• If yes, is the IR gun NIST-traceable? Provide the certification expiration date.	☐	☐	Click or tap here to enter text.
• If no, what device is used to obtain shipment temperature? Please describe its traceability and provide a certification expiration date.			Click or tap here to enter text.

c. Laboratory Preventive Maintenance

Complete the following table.

Question	Yes	No	Comment
For laboratory equipment, who has the responsibility for performing preventive maintenance?			Click or tap here to enter text.
Is a maintenance log maintained for the balance?	☐	☐	Click or tap here to enter text.

Are service contracts in place for the balance?	☐	☐	Click or tap here to enter text.
If utilizing a weighing room, are service contracts in place for the climate control unit/HVAC?	☐	☐	Click or tap here to enter text.
Does the weighing room undergo routine cleaning activities? On what frequency?	☐	☐	Click or tap here to enter text.

d. Laboratory Record Keeping

Complete the following table.

Question	Yes	No	Comment
Are all samples that are received by the laboratory logged in?	☐	☐	Click or tap here to enter text.
Discuss sample routing (or reference the latest SOP which covers this). Attach a flow chart on the next page, if possible.			Click or tap here to enter text.
For the following four questions, select the medium used to document various activities enlisted. If the medium is not listed, select "Other" and list the medium. If the information is not recorded, select "N/A".			
• Environmental conditions, weighing session results, balance checks, and weight checks?			Choose an item.
• Serial numbers of filters prepared for the field?			Choose an item.
• Serial numbers of filters returning from the field for analysis?			Choose an item.
• General information about daily lab activities, preventive maintenance procedures, and/or other significant events in the laboratory that may impact data quality or the data record?			Choose an item.
How and where are data records from the laboratory archived? Who has this responsibility? (identify person/position)			Click or tap here to enter text.
How long are these records kept? Indicate the number of months/years.			Click or tap here to enter text.
Does the laboratory SOP contain procedures for sample chain-of-custody (COC)?	☐	☐	Click or tap here to enter text.
• If yes, indicate the title, date, and revision number, and where it can be found.			Click or tap here to enter text.
What type of COC record accompanies the samples?			Click or tap here to enter text.
Does the laboratory maintain original COCs or copies?	☐	☐	Click or tap here to enter text.
Where are COCs filed?			Click or tap here to enter text.

If possible, attach a sample routing flow chart:

e. Laboratory Data Acquisition and Handling

Complete the following table.

Question	Yes	No	Comment
Identify those laboratory instruments (e.g., balances, temperature/RH loggers, etc.) which make use of computer interfaces directly to record data.			Click or tap here to enter text.
Are QC data results readily available to the analyst during a weigh session?	☐	☐	Click or tap here to enter text.
Do RH/temperature loggers record values using paper chart records (chart wheels)? If yes, where are the paper charts maintained? Are they signed and dated?	☐	☐	Click or tap here to enter text.
What is the laboratory's capability with regards to data recovery? In case of problems, can the laboratory recapture data that may be lost in the event of computer failure? Discuss briefly.			Click or tap here to enter text.

Please attach a flow chart/diagram which illustrates the transcriptions, verifications, validations, and reporting processes the data goes through before being released by the laboratory.

f. Filter Questions

Complete the following table.

Question	Yes	No	Comment
Does the agency use filters supplied by EPA?	☐	☐	Click or tap here to enter text.
• If no, do the filters utilized meet the specifications in 40 CFR Part 50? Who is the vendor? Be prepared to provide documentation to demonstrate acceptance testing results.	☐	☐	Click or tap here to enter text.
Are unexposed filters equilibrated in a controlled conditioning environment which meets or exceeds the requirements of 40 CFR Part 50? Describe the conditioning room/chamber.	☐	☐	Click or tap here to enter text.
How long is the conditioning period?			Click or tap here to enter text.
On what frequency are lab blanks utilized?			Click or tap here to enter text.
Are chemical analyses performed on filters? If yes, which? Where are these additional analyses performed?	☐	☐	Click or tap here to enter text.

g. Metals & Other Analyses

If your laboratory completes lead (Pb) and/or other metals analyses, please complete the tables in this section.

g.1 Laboratory QA/QC

Question	Yes	No	Comment
Are at least one duplicate, one blank, and one standard or spike included with a given analytical batch?	☐	☐	Click or tap here to enter text.
Briefly describe the laboratory's use of data derived from blank analyses.			Click or tap here to enter text.
Are criteria established to determine whether blank data are acceptable?	☐	☐	Click or tap here to enter text.
How frequently and at what concentration ranges does the lab perform duplicate analyses? What constitutes an acceptable agreement?			Click or tap here to enter text.
Please describe how the lab uses data obtained from spiked samples, including the acceptance criteria (e.g., acceptable percent recovery).			Click or tap here to enter text.
Does the laboratory include samples of reference material within an analytical batch? If yes, indicate the frequency, level, and material used.	☐	☐	Click or tap here to enter text.

Are mid-range standards included in analytical batches? If yes, describe the frequency, level, and compound.	☐	☐	Click or tap here to enter text.
Are criteria for real-time QC established that are based on the results obtained for the mid-range standards discussed above? If yes, briefly discuss them below or indicate the document in which they can be found.	☐	☐	Click or tap here to enter text.
Are appropriate acceptance criteria for each type of analysis documented?	☐	☐	Click or tap here to enter text.

g.2 Chemicals

Question	Yes	No	Comment
Comment on the traceability of chemicals used in the preparation of calibration standards.			Click or tap here to enter text.

g.3 Pb

Question	Response	Comments
Is Pb analysis performed by a contract laboratory? If yes, provide the laboratory name in the comment section.	Yes	Eastern Research Group
What filter media is used for Pb analysis?	Glass	Click or tap here to enter text.
Are filters invalidated if defects (e.g., pinholes, tears and non-uniform deposit) are found upon visual inspection? If no, why not?	Yes	Operator inspects Filters before usage, with light box
What extraction method is used for filters?	Choose an item.	Click or tap here to enter text.
What reagents are used to clean glassware?		Click or tap here to enter text.
List standards used for analysis.		Click or tap here to enter text.
Are filter lot blanks analyzed for Pb content at a rate of 20 to 30 random filters per batch of 500 or greater? ***Only for filters not provided by EPA.***	Choose an item.	Click or tap here to enter text.
How often are MDLs determined?		Click or tap here to enter text.
How many replicates are used for MDLs?		Click or tap here to enter text.
Are MDLs calculated in accordance with 40 CFR Part 136, Appendix B? If not, why not?	Choose an item.	Click or tap here to enter text.

6. Data & Data Management

This section of the questionnaire completed by: Rebecca Larocque

Key Individual(s) (e.g., Ambient Air Monitoring Network Manager, QA Manager, Field Manager, etc.):

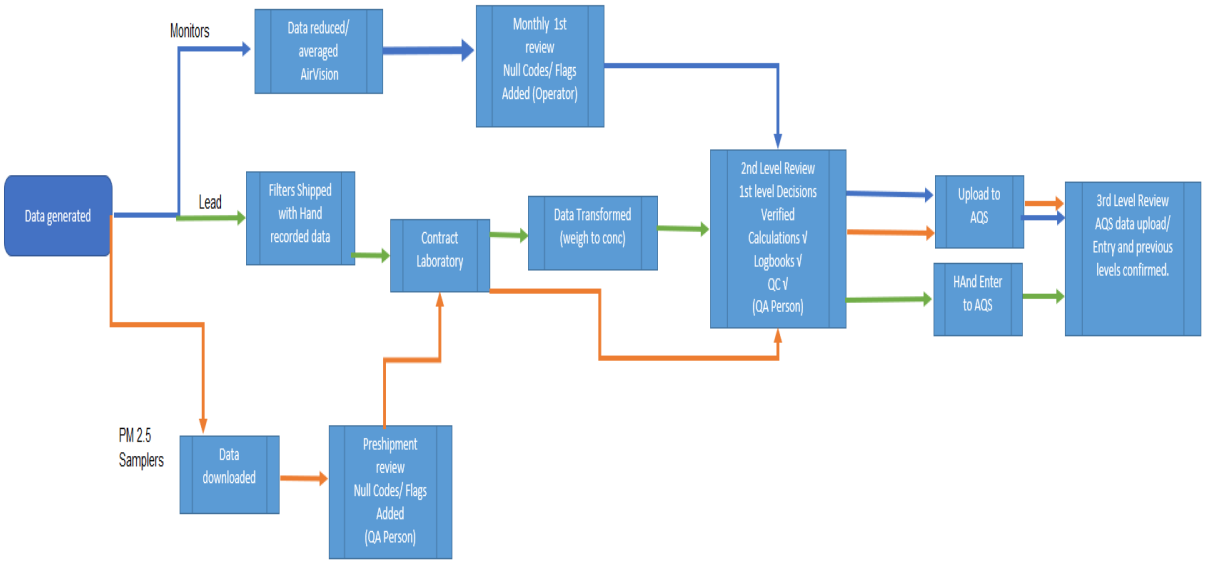
Title/Position	Name
Air Monitoring Program Manager	Amber Talgo
Environmental Specialist I - QA	Rebecca Larocque

a. Data Handling

Complete the following table.

Question	Yes	No	Comment
Is there a procedure, description, or a chart which shows a complete data sequence from point of acquisition to point of submission of data to EPA? If so, please include such information in the "Comment" field or on the next page.	☒	☐	Procedures are detailed in section 19.0 of the QAPP
Are procedures for data handling (e.g., data reduction, review, etc.) documented? If yes, comment on where.	☒	☐	Data Handling and any reduction/ transformation is found in the individual pollutant SOPs
In what media (e.g., flash drive, telemetry, wireless, etc.) and formats do data arrive at the data processing location?			For monitors (O3 + PM continuous) data is received via Internet protocol utilizing AirVision Software. This is collected either from data loggers or direct polling of instruments. Samplers data is received from flash drive download and email correspondence with contract laboratories
How often are data received at the processing location from the field sites and laboratory?			Monitors are polled hourly, sampler PM2.5 data is downloaded biweekly to correspond with filter shipments
Are there any activities being done before data is released to agency internal data processing?	☒	☐	AirVision has preset validation and rounding/ truncating protocols by pollutant. However raw data is also collected.
How are data entered into the computer system? (e.g., computerized transcription, manual entry, digitization of strip charts, or other)?			Automated computer system
For manual data, is a double-key entry system used? If so, please describe this system (e.g., who are the individuals involved, and is the same person required to enter the data twice?).	☐	☒	Data entry is checked with the QA tracking form, with upper level review verifying manual data entry is accurate.

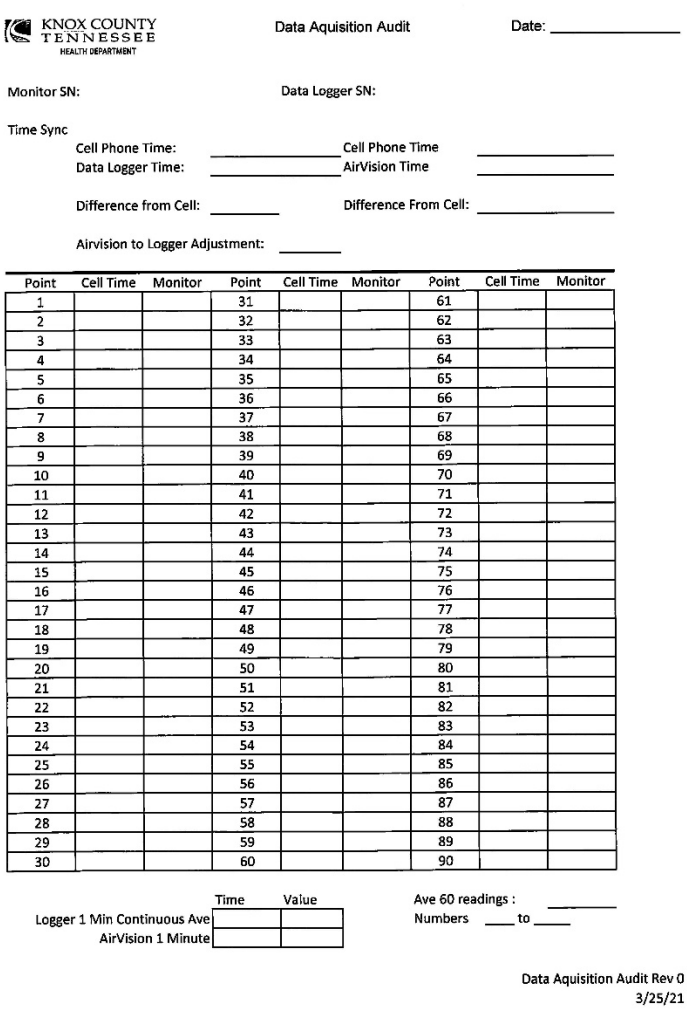
Please provide a data flow diagram indicating the data flow within the reporting organization.



b. Software Documentation

Complete the following table.

Question	Yes	No	Comment
What software is used to prepare air monitoring data for release into the AQS and AirNow databases? Include the names of the software packages, vendor or author, revision numbers, and the revision dates of the software.			AirVision by Agilaire
What is the recovery capability in the event of a significant computer problem (i.e., how much time and data would be lost)?			AirVision is automatically backed up to a hard drive nightly. That back up is transferred to a separate server at least monthly. Data loggers hold approximately 8 days of data. Instruments hold at least 2 weeks, and O3 has onsite back up AV Trend. Worst case 2 weeks of data loss.
Has your agency tested the data processing software to ensure its performance of the intended function are consistent with the *QA Handbook Volume II, Section 14.0*?	☐	☒	We have recently begun a Data Acquisition Audit. This process is in development and tracks data from monitor, to data logger (if applicable) to software. We also have hand calculated minute to hourly data averages.
Does your agency document software tests? **If yes, provide the documentation.**	☐	☒	These are in development and still working on process sample form below



KNOX COUNTY TENNESSEE HEALTH DEPARTMENT

Data Aquisition Audit Date: _____

Monitor SN: Data Logger SN:

Time Sync

Cell Phone Time: _____ Cell Phone Time _____

Data Logger Time: _____ AirVision Time _____

Difference from Cell: _____ Difference From Cell: _____

Airvision to Logger Adjustment: _____

Point	Cell Time	Monitor	Point	Cell Time	Monitor	Point	Cell Time	Monitor
1			31			61		
2			32			62		
3			33			63		
4			34			64		
5			35			65		
6			36			66		
7			37			67		
8			38			68		
9			39			69		
10			40			70		
11			41			71		
12			42			72		
13			43			73		
14			44			74		
15			45			75		
16			46			76		
17			47			77		
18			48			78		
19			49			79		
20			50			80		
21			51			81		
22			52			82		
23			53			83		
24			54			84		
25			55			85		
26			56			86		
27			57			87		
28			58			88		
29			59			89		
30			60			90		

	Time	Value
Logger 1 Min Continuous Ave		
AirVision 1 Minute		

Ave 60 readings : _____

Numbers ____ to ____

Data Aquisition Audit Rev 0
3/25/21

c. Data Validation and Correction

Complete the following table.

Question	Yes	No	Comment
Is there documentation in regards to data that has been identified as suspect and subsequently flagged?	☒	☐	QA decisions are documented within the monthly QA folders for each pollutant, null data is also notated in the void data log.
Please describe what action the data validator will take (e.g., flags, invalidate, etc.) if they find data with exceeded QC criteria.			Validators utilize the weight of evidence approach, typically exceeded QC criteria would result in invalidation of data back to the previous passing QC event.
Please describe how changes made to data that were submitted to AQS and AirNow are documented.			If the original data submitted to AQS is found suspect in the 3rd level review, or during the Quarterly QA report statistical analysis, then the change of data would be notated with the review (on the QA tracking sheet by Manager, or on the Quarterly QA report by the QA person)

Who has signature authority for approving corrections?			**Name:** Amber Talgo **Program Function:** Air Monitoring Program Manager
What criteria are used to determine a data point be deleted or invalidated?			See QAPP section 22.4 and 23.2
What criteria are used to determine if data need to be reprocessed?			If error is found in Reduction,Transmittal or transformation Section 19.0 of QAPP details the differences.
Are corrected data resubmitted to the issuing group/record generator for cross-checking prior to release?	☒	☐	This is a tiny agency, corrected data cross checked by a second level reviewer, whether that is operator to QA person, or QA person to Manager.

d. Data Processing

d.1 Reports

Complete the following table.

Question	Yes	No	Comment
Does the agency generate data summary reports?	☒	☐	See section 21.0 Of Agency QAPP
Please list at least three reports routinely generated, including the information requested below.			
Report Title	**Distribution**		**Period Covered**
Quarterly Quality Assurance Report	**Air Monitoring Program Manager, Division Director**		**Previous Quarter data, and Year to date.**
Internal Audit Report	**Air Monitoring Program Manager, Division Director**		**Previous Quarter**
Certification Evaluation	**EPA**		**Calendar Year**

d.2 Data Submission

Complete the following table.

Question	Yes	No	Comment
How often are data submitted to AQS?			At least quarterly, but most instances monthly
How often are data submitted to AirNow?			Air Now is sent hourly non validated data.
Briefly comment on difficulties the agency may have encountered in coding and submitting data following the AQS guidelines.			Hand entering Lead data is cumbersome, it doesn't take well to just typing and you must pull up previous event and copy and paste.
Does the agency retain a hard copy printout or an electronic copy of submitted data from AQS?	☒	☐	If uploaded via ENSC the upload file is maintained. For all data including hand entered a printout is maintained.

Are records kept by the agency for at least three years in an orderly, accessible form? If yes, does this include:	☒	☐	Yes records are kept according to the records retention policy QAPP appendix A.
• Raw data (including 1-minute concentration data)	☒	☐	Click or tap here to enter text.
• Calculations	☒	☐	Click or tap here to enter text.
• QC data	☒	☐	Click or tap here to enter text.
• Reports: list which reports are used	☒	☐	Click or tap here to enter text.
Are concentrations of PM_{10} corrected to EPA standard temperature and pressure conditions (i.e., 298 K, 760 mm Hg) before input to AQS?	☒	☐	Click or tap here to enter text.
Are concentrations of $PM_{2.5}$ and Pb reported to AQS under actual (volumetric) conditions?	☒	☐	Click or tap here to enter text.
Are audits on data reduction procedures performed on a routine basis? If yes, at what frequency?	☒	☐	Part of the monthly or quarterly QA tracking includes hand calculated checks on data reductions
Are precision and accuracy data checked each time they are calculated, recorded, or transcribed to ensure that incorrect values are not submitted to EPA? If so, who within the agency has this responsibility?	☒	☐	QC and QA is checked by secondary computerized calculation in the QA database, and again spot checked in the QA tracking with hand calculated check.

e. Internal Reporting

e.1 Reports

What internal reports are prepared and submitted as a result of the audits required under 40 CFR Part 58, Appendix A?

Report Title	Frequency
Internal Audit Report	Quarterly
Quality Assurance Report	Quarterly

What internal reports are prepared and submitted as a result of the precision checks required under 40 CFR Part 58, Appendix A?

Report Title	Frequency
Corrective Action Report	Upon failure of precision check

Question	Yes	No	Comment
Do either the audit or precision check reports indicated include a discussion of corrective actions initiated based on audit or precision check results?	☒	☐	A Corrective Action Report which can be initiated by an operator, QA person, or the Air Monitoring Program Manager. CARs maybe mentioned in audit reports but are not always.

e.2 Responsibilities

Who has the responsibility for the calculation and preparation of data summaries? To whom are such summaries delivered?

Name	Title	Type of Report	Recipient
Rebecca Larocque	**Environmental Specialist I (QAO)**	**Quality Assurance Report**	**Air Monitoring Program Manager, Division Director**

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

Name	Program Function
Amber Talgo	Air Monitoring Program Manager

Question	Yes	No	Comment
Does your agency report to the Air Quality Index (AQI)?	☒	☐	Click or tap here to enter text.
Is data certification signed by a senior officer of your agency?	☒	☐	Data is Certified by the Air Monitoring Program Manager

QAPP tables listed as reference

Table 14.1 Quality Control and Corrective Action PM_{10} and $PM_{2.5}$ continuous

Data Quality Indicator	Frequency	Action Point	Corrective Action
Parameter Check PM10	Weekly	Shelter Temp. 0-50 °C ±5% of design Flow	Investigate, Check warnings Document actions Perform maintenance/ verification
Flow Verification	Monthly	Main and total , ±3.5% of transfer standard	Investigate, check for damage to bypass line, recalibrate.
Temperature & Pressure Verification	Monthly	±2° C ±10mmHg	Check for leaks, Investigate, Advise Management Perform Cal Verification
Quarterly Internal Flow Audit	Quarterly	±3.5% Main, total Flow	Check for leaks, Investigate, Advise Management. Perform Cal Verification
Leak Check	Monthly	0.0-0.2 µg/m³	Check all connections, Investigate hoses. Repeat Test. Perform Maintenance

Table 14.2 Quality Control and Corrective Action $PM_{2.5}$

Data Quality Indicator	Frequency	Action Point	Corrective Action
Flow verification	Every 30 days separated by at least 14 days	±3.5% of transfer standard ±4.0% of design value	Leak Check, Document actions Perform multi point Calibration/ Verification
Temperature Verification	Every 30 days separated by at least 14 days	±2°C	Investigate, Check damage/ blockage of fan. Document actions, Recalibrate
Pressure verification	Every 30 days separated by at least 14 days	±10 mmHg	Investigate, Document actions, Recalibrate
Quarterly Internal Audit	Quarterly	±4% of transfer standard ±5 % of design value	Leak Check, Document actions Perform multi point Calibration/ Verification
Laboratory verification	At least Quarterly	Lab QC checks and filter handling verified	Contact Lab
Internal Leak check	Every 30 days separated by at least 14 days	Pass	Investigate, Check cassette ring, seals, O-rings. Replace or lubricate as necessary. Repeat test.
Multipoint Verification	Annually	Same as monthly Flow/ Temperature/ Pressure verifications	Re-calibrate
Collocated Samples	Every 6 days, aggregated quarterly, annually	CV ± 10% for samples > 3.0 µg/m3	Notify Lab Manager Review flow rates of collocated monitors
Calibration Temperature, pressure & Flow	At installation, post-major repair, after	See SOP & Operation Manual	Contact Equipment Manufacturer
Field Blank			nk filter, f contamination, notify air lab manager

Table 14.3 Quality Control and Corrective Action Ozone

Data Quality Indicator	Frequency	Action Point	Corrective Action
Automated Nightly Zero/Span	Daily	±5% span, ±3 ppb zero	Visit Site to investigate Check warnings Document actions Perform manual calibration verification
Operating Parameters	Weekly	Sample flow 740-860 cc/min, filter and zero air maintenance	Check for leaks, Investigate, Advise Management Perform Cal Verification
Manual Zero/Precision /Span	Bi-weekly	±5% precision &span, 3ppb zero	Check for leaks, repeat test Check parameters Recalibrate
Quarterly Internal Audit	4 times a season	±7% every point & ±3ppb zero	Check for leaks, Investigate, Advise Management Perform Cal Verification
Manual Calibration Verification	Start, mid and End Season	All points <± 2.1% or ≤±1.5 pp difference of best fit straight line whichever is greater and Slope 1 ±.05	Check for leaks, repeat test Check parameters Recalibrate

Table 14.4 Quality Control and Corrective Action Lead

Data Quality Indicator	Frequency	Action Point	Corrective Action
Flow Rate Verification	Monthly	±7%	Check for leaks, Investigate, Advise Management, Replace motor
Multi point Flow Verification	Annually	5 points (over range of 1.1 to 1.7m3/min) ±5% limit of linearity	Check for leaks, Investigate, Advise Management, Replace motor or orifice
Collocated Samples Precision	Every 6 days, aggregated quarterly, annually	CV ± 10% for samples > 0.02µg/m3	Notify Lab Manager, review flow rates of collocated monitors
Quarterly Internal Audit	4 times a season	Flow Rate ±7% audit standard	Check for leaks, Investigate, Advise Management, Replace motor
Flow Rate Bias	Aggregate monthly values, quarterly and annually, by monitor and by network	Absolute bias ± 7%, Signed bias ± 5%,	Notify Lab Manager, Review outliers
Analysis Audits	6 strips/quarter 3 at each concentration	< 10.1% difference (Done by contract laboratory, not conducted by Air Quality.)	Contact contract lab to see if multiple agencies or individual agency is affected