Southern Ute Indian Tribe
Air Quality Program
Quality Assurance Project Plan
Fiscal Year 2022

Prepared for:
United States Environmental Protection Agency
Region VIII
1595 Wynkoop Street
Denver, Colorado 80202

Prepared by:
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Operating Period October 1, 2021 to September 30, 2022

FY22 CAA 105 QAPP has been approved through an expedited review and approval process. Only minor updates were made from FY21 QAPP. Most recently signed approval page has been inserted for reference. 09-01-2021

SOUTHERN UTE INDIAN TRIBE

AMBIENT AIR MONITORING PROGRAM

QUALITY ASSURANCE PROJECT PLAN APPROVAL FORM

October 1, 2019 to September 30, 2020

Document approved by:

Daniel Powers Air Quality Program Manager Southern Ute Indian Tribe	9/25/19 Date
Alexandra Ratcliff QA Manager Southern Ute Indian Tribe	9/25/19 Date
Monia Ben-Khaled Tribal Program Manager EPA Region VIII	9/26/2019 Date
Linda Himmelbauer Director, Quality Assurance Program EPA Region VIII	9/26/2019 Date

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Daniel Powers Date
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ACRONYMS AND ABBREVIATIONS

AIRS	Aerometric Information Retrieval System
AQP	Air Quality Program
AQS	Air Quality System
CAA	Clean Air Act
CFR	Code of Federal Regulations
CO	Carbon Monoxide
COC	Chain of Custody
DQA	Data Quality Assessment
DQOs	Data Quality Objectives
EPA	Environmental Protection Agency
ESC	Environmental Systems Corporation
FEM	Federal Equivalent Methods
FRM	Federal Reference Method
LPM	Liters per Minute
MFC	Mass Flow Controller
MQOs	Measurement Quality Objectives
NAAQS	National Ambient Air Quality Standards
NIST	National Institute of Standards and Technology
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
O_3	Ozone
OAQPS	Office of Air Quality Planning and Standards
$PM_{2.5}$	Particulate Matter less than or equal to 2.5 microns
Q_a	Sampler flow rate at ambient (actual) conditions of temperature and pressure
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
SLAMS	State and Local Air Monitoring Stations
SOP	Standard Operating Procedure
SRM	Standard Reference Method
SUIT	Southern Ute Indian Tribe
T_a	Temperature, at ambient or actual conditions
V_a	Air volume, at ambient or actual conditions
ZSP	Zero/Span/ Precision

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GROUP A PROJECT MANAGEMENT

A3 Distribution List

Key individuals and their organizations are listed on page ii, the signature page. These individuals will receive copies of the approved FY22 Southern Ute Indian Tribe (SUIT) Air Quality Program (AQP) Quality Assurance Project Plan (QAPP) and any subsequent revisions. Below is a general list of the organizations receiving a copy of this QAPP.

Southern Ute Indian Tribe:
Environmental Programs Division Head
Air Quality Program Manager
Air Quality Analyst
Air Quality Technician

EPA Region VIII:
Tribal Program Manager
Air Program Officer

A4 Project/Task Organization

Overall project responsibility for the SUITAQP rests with the Southern Ute Indian Tribe as represented by the Tribal Council and its designated representatives.

Program management and administration is the responsibility of the Air Quality Program Manager. The Program Manager reports directly to the Environmental Programs Division Head. The Division Head's responsibility is to review work performed and to provide program direction. The Division Head reports to the Director of the department of Justice and Regulatory, who reports to the Tribal Executive Officer, who then reports to the Tribal Chairman and Tribal Council.

The Air Quality Analyst duties include all network reviews/modifications, AQS ambient data submittals/certifications, QAPP revisions, maintenance, and distribution. Additionally, the Air Quality Analyst shall ensure that the QAPP is implemented as approved; and that all personnel involved in the work have direct access to a current version of the QAPP (electronically on the tribal network server) and all other necessary planning, implementation, and assessment documents. All personnel involved in ambient air monitoring will be appropriately trained in the requirements prior to the start of data generation activities. The Air Quality Analyst also reviews all the duties conducted by the Technician. The Analyst reports to the Air Quality Program Manager. Routine operation of the monitoring sites, including data collection and data reduction, is the responsibility of the Air Quality Technician who reports directly to the Analyst.

The Quality Assurance b Manager or their delegate, reviews the data and does not participate in the data gathering process. Consultants are retained by the AQP to conduct performance audits, data quality assurance reviews and provide general assistance and training as necessary for Air Quality Program personnel. Figure 1 illustrates the administrative organization of the Southern Ute Air Quality Program.

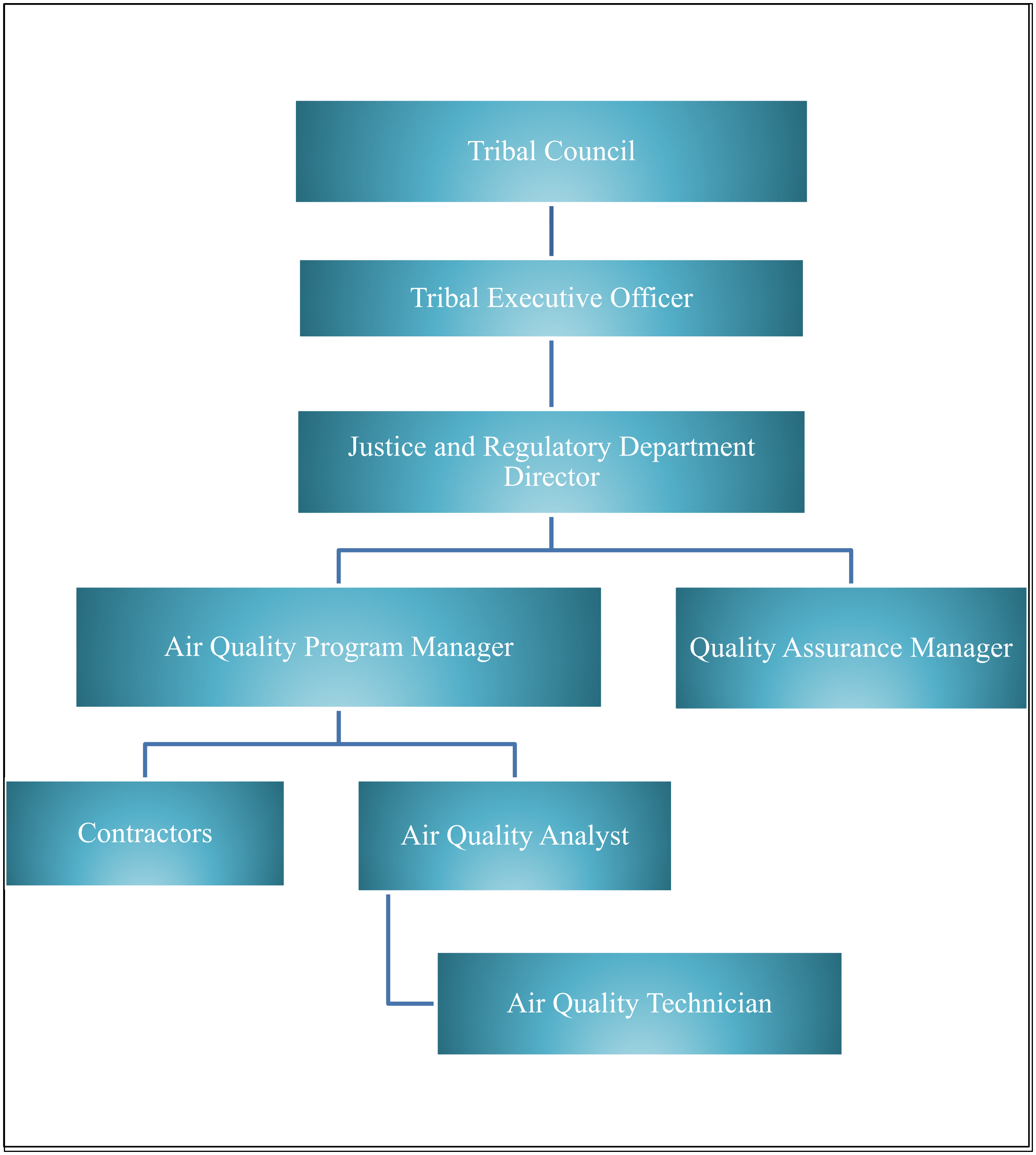

Figure 1. Administrative Organization of the SUIT Air Quality Monitoring Program

A5 Problem Definition - Background

The prime consideration of the AQP is the determination of the general background pollutant concentration levels on the Southern Ute Indian Reservation. Because of current and projected energy development in the region, the program is concerned with monitoring areas of the Reservation that could potentially be impacted by significant sources of air pollution.

It is the Southern Ute Ambient Air Quality Monitoring Program's goal to:

- Protect the health and welfare of all residents within the exterior boundaries of the Southern Ute Indian Reservation

- Determine if criteria pollutants of interest are in compliance with the National Ambient Air Quality Standards

- Maintain a reliable continuous ambient air monitoring network, and/or special studies that meet the requirements of the Code of Federal Regulations, particularly, but not limited, to appendix A in 40 CFR Part 58

If it is determined that criteria pollutants are not in compliance with the National Ambient Air Quality Standards, the Ambient Monitoring Program will work with the EPA and State of Colorado to determine if exceptional events contributed to or caused exceedances and will pursue the appropriate pathway for either (1) development of an exceptional event justification in accordance with the EPA Exceptional Events rule or (2) development and EPA approval of a Tribal Implementation Plan by the applicable deadlines to bring the air shed back in to compliance.

A6 Project/Task Description

This QAPP has been updated for fiscal year 2022. The program currently operates three monitoring stations: Ute 1, Ute 3, and MMS (Figure 2).

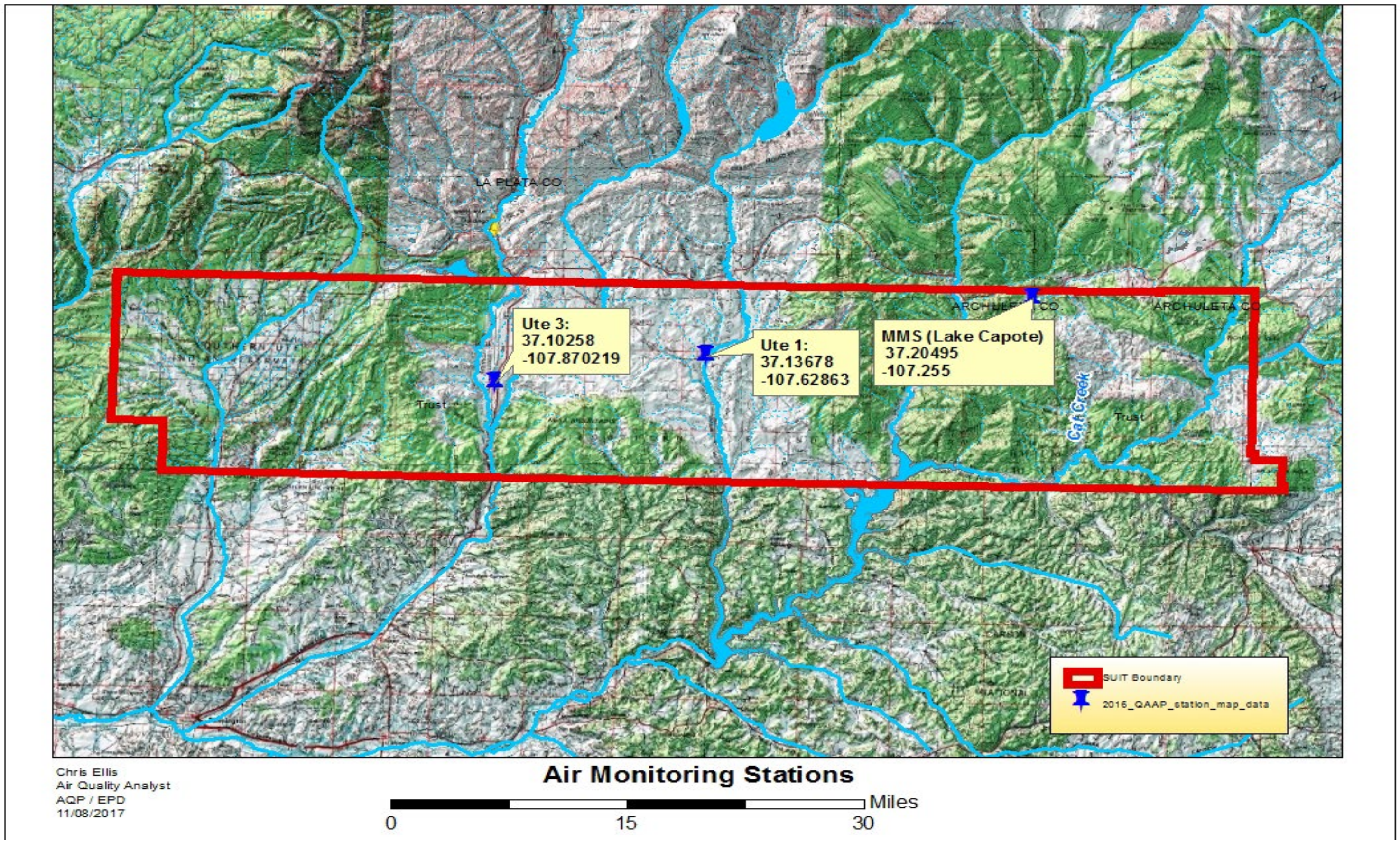

Figure 2. Sampling Site Locations

The Ute 1 monitoring station is located approximately one mile north of Ignacio, Colorado. The station is situated in the Pine River Valley, the most densely populated area of the Reservation. The Ute 1 station meets all siting criteria for an urban SLAMS. This station is in a secured area within the Southern Ute Indian Tribe Forestry complex and is thought to be representative of the air quality around the Ignacio community.

The Ute 3 station is located approximately twenty miles west of Ignacio, near Bondad, Colorado. The station is situated along the eastern rim of the Animas River Valley near Highway 550, a major roadway that connects southwestern Colorado with northwestern New Mexico. The area surrounding this monitoring site is comprised of dispersed homes, agricultural activities, and oil and gas production sites, so the site is influenced by both stationary and mobile sources of air pollution. The Ute 3 monitoring station is located on Tribal land within a locked perimeter fence, and the area is regularly patrolled by tribal rangers. The station meets all siting criteria for an urban SLAMS.

The Mobile Monitoring Station (MMS) is located on the eastern portion of the Reservation near Lake Capote. This location is further removed from the oil and gas development than the Ute 1 and Ute 3 stations on the western portion of the Reservation and is well suited to assess ambient background concentrations prior to proposed development of shale gas resources on the eastern portion of the Reservation. The MMS site is located within a locked perimeter fence and the area is regularly patrolled by tribal rangers, as well as and visited weekly by ambient air quality monitoring program staff. The current location of the MMS meets all siting criteria for an urban SLAMS.

In addition to the three air monitoring stations, the AQP has added two low-cost PurpleAir particulate matter sensors to the monitoring network. The sensors will be located at two different locations in the town of Ignacio, Colorado and used to help inform the public of health risks associated with fire smoke and seasonal dust storms. Data from the sensors will be polled in real-time to the PurpleAir map layer and linked to the AQP's ambient monitoring website to provide EPA Air Quality Index air quality health risk information to the public. The data will not be QA/QC reviewed, retained by AQP, or submitted to AQP. Because the PurpleAir sensors are not FRM, the AQP does not guarantee the validity of the data and only recommends the use of the data to help the public decide about actions they can take to protect themselves from particulate matter health-risks during regional fire smoke and dust storm events. PurpleAir sensor locations and associated information have not been added to Table 1 to allow the AQP flexibility in where instruments are located and how data is used.

The specific monitors in operation at each site within the AQP monitoring network will be determined by criteria listed in 40 CFR Part 58. Monitors in current possession of the program, their sampling schedules and their locations of operation are listed in Table 1.

Table 1. Ambient Air Quality and Meteorological Instrumentation

Parameter	Number of Instruments	Sampling Schedule	Location	Initial Start Date Ute 1 / Ute 3 / MMS
NO, NO_2, NO_X	3	Continuous	Ute 1 Ute 3 MMS	10/18/2005 01/01/2001 06/01/2017
CO	2	Continuous	Ute 1 Ute 3	01/01/2002 10/01/2021
SO_2	1	Continuous	MMS	06/01/2017
O_3	3	Continuous	Ute 1 Ute 3 MMS	06/01/1982 04/01/1997 06/01/2017
Wind Direction	3	Continuous	Ute 1 Ute 3 MMS	01/01/2001 01/01/2001 06/01/2017
Wind Speed	3	Continuous	Ute 1 Ute 3 MMS	01/01/2001 01/01/2001 06/01/2017
Temperature	3	Continuous	Ute 1 Ute 3 MMS	01/01/2000 01/01/2000 06/01/2017
Relative Humidity	3	Continuous	Ute 1 Ute 3	01/01/2000 01/01/2000

			MMS	06/01/2017
Solar Radiation	2	Continuous	Ute 1	01/01/2000
			Ute 3	09/13/2007
Precipitation	2	Continuous	Ute 1	01/01/2000
			Ute 3	02/26/2008
Visibility (nephelometer)	2	Continuous	Ute 3	07/01/2010
$PM_{2.5}$	2	Continuous	Ute 3	03/01/2013
			Ute 1	10/01/2022
PM_{10}	2	Continuous	Ute 3	03/01/2013 10/01/2022
			Ute 1	
CH_4/NMHCs	2	Continuous	Ute 3	06/01/2017
			MMS	06/01/2017

A7 Data Quality Objectives

The primary objective of the ambient air quality monitoring network is to measure criteria pollutants of interest within the Reservation's airshed. The AQP will utilize AQS certified data from the region to explore air quality issues connected to industry activities through spatial and temporal analysis of measured parameters.

All data generated from the AQP monitoring network will be subject to the quality assurance practices summarized in Table 2.

A7.1 Automated Span and Precision Checks for Gas Species

The precision and accuracy objectives during automated checks for instruments that measure gas phase species, using EPA designated methods, are summarized in Table 2. The measurement precision goal for automated ozone check events is defined by a coefficient of variation (CV) of less than or equal to 7% at the upper 90% confidence limit (CL). The measurement bias goal for automated ozone checks is defined as ≤7% of the CV at the upper 95% CL (see Appendix A, section 2.3.1.2 to 40 CFR Part 58).

Table 2. Gas Species Measurement Quality Objectives

Parameter	Reference Method	Conditions	Precision Level	Span level	Precision	Bias
NO	<u>Thermo</u> Model 42*i* RFNA-1289-074	Synthetic Atmosphere	50ppb	180ppb	90% CL CV≤10%	95% CL ≤ ±10%
NO_2			50ppb	100ppb		
NOx			50ppb	180ppb		
CO	<u>Thermo</u> Model 48i & 48iQTL RFCA-0981-054	Synthetic Atmosphere	1ppm	8ppm	90% CL CV≤10%	95% CL ≤ ±10%
O_3	<u>Thermo</u> Model 49*i* EQOA-0880-047	Synthetic Atmosphere	50ppb	180ppb	90% CL CV≤7%	95% CL ≤ ±7%

SO_2	Thermo Model 43*i* EQSA-0276-009	Synthetic Atmosphere	50ppb	180ppb	90% CL CV≤7%	95% CL ≤ ±7%
Methane and NMHC	Thermo Model 55i	Synthetic Atmosphere	2ppm	8ppm	90% CL CV≤7%	95% CL ≤ ±7%

A7.2 Direct Methane and Non-Methane Hydrocarbon Analyzer

Thermo Scientific 55i methane and non-methane hydrocarbon (NMHC) analyzers are operated at Ute 3 and the MMS. The AQP will use measurements from these instruments to explore the influence of oil and gas production activities on the airshed, near and far from point sources. The AQP will analyze the measurements from each site in terms of diurnal and seasonal trends. Analysis of longer time frames will also be performed to assess possible correlations between natural gas production volumes in the San Juan Basin and mole fractions of methane and total non-methane hydrocarbons. The manufacture-specified resolution of these GC-FID measurements are included in Table 3.

Table 3. Direct Methane and Non-Methane Hydrocarbon Analyzer

Parameter	Measurement Resolution	System Accuracy
Methane concentration	1.0ppb	±1% full scale
NMHC concentration	1.0ppb	±1% full scale
FID Temperature	2°C	±2% full scale
Column temperature	2°C	±2% full scale

A7.3 Continuous Light Scatter/Visibility Data

The AQP employs an Ecotech Aurora Single Wavelength Integrating Nephelometer to measure light scatter and to estimate visibility. Uncertainty in the measurement of the nephelometer light scatter and influential environmental parameters are summarized below in Table 4. Nephelometer and meteorological measurements are an important indicator of air quality during the increasing prevalence of smoke from fires across the western United States and regional emission reductions required by the State of New Mexico and State of Colorado State Implementation Plans for meeting Regional Haze Rule objectives.

Table 4. Aurora-1000 Environmental Sensors Precision and Accuracy Objectives

Parameter	Measurement Resolution	System Accuracy
Barometric Pressure	0.1 mmHg	±10 mmHg of observed
Temperature	0.1° C	±2° C
Relative Humidity	0.1%	±10% of observed
Measurement	< 0.25 – 2000 Mm^{-1}	< 0.3Mm^{-1}

A7.4 Meteorological Data

The measurement precision and accuracy objectives for meteorological parameters are summarized in Table 5. Meteorological data will be used to assist the AQP in better understanding atmospheric transport of pollution within the Reservation's airshed, by constraining models like NOAA Hybrid Single-Particle Lagrangian Integrated Trajectory model (HYSPLIT).

Table 5. Meteorological Data Precision and Accuracy Objectives

Parameter	Measurement Resolution	System Accuracy
Wind Speed	0.1 mph	±5% of observed
Wind Direction	1.0°	±5.0°
Temperature	0.1° C	±0.5° C
Precipitation	0.01inches	±10% of observed
Solar Radiation	0.01 L/M	±5% of observed
Relative Humidity	0.1%	±10% of observed

A7.5 Particulate Data

The continuous $PM_{2.5}$ sampler will be used to measure the variability of PM concentrations within the Reservation, to inform temporal trends. The continuous measurements for PM_{10} and $PM_{2.5}$ at the Ute 1 and Ute 3 stations will be used to help inform the relationships between PM concentrations, visibility, and atmospheric transport within the Reservation's airshed. The precision and bias objectives for continuous measurements of fine particulate ($PM_{2.5}$) are summarized in Table 6.

Table 6. PM10 & PM2.5 Continuous Measurement Quality Objectives

Parameter	Reference Method	Precision	Bias
PM_{10}	**Teledyne API T640 & T640x** (16.71 L/min) EQPM-0516-239	≤15% CV	±15%
$PM_{2.5}$	**Teledyne API T640 & T640x** (16.71L/min) EQPM-0516-238	≤10% CV	±10%

A8 Special Training Requirements

AQP personnel will attend courses offered by EPA's Air Pollution Training Institute, Northern Arizona University (NAU) American Indian Air Quality Training Institute, equipment manufacturers, and other environmental training providers that offer the necessary training to effectively implement the Southern Ute Air Quality Monitoring Program. Personnel who attend training will store a copy of their training report and certification in a training file on the internal server. Training reports will include training dates, topics covered, and certificate of completion. The Air Quality Program Manager will document all trainings in the annual report. Copies of training certifications will be maintained in personnel files. The semi-annual and annual reports will be submitted to the EPA Region VIII Tribal Program Manager as detailed in the AQP's workplan.

New employees will be given an overall air program orientation and evaluated after a 90-day probationary period. Employees will be evaluated annually thereafter to identify deficiencies that can be addressed through additional training. The Air Quality Program Manager will be responsible for the personnel performance evaluation and identification of areas in which training is necessary to support performance of appointed tasks.

The orientation and training of new employees will be conducted by AQP staff and the training institutions mentioned above. Employees will at minimum be required to have sufficient knowledge in areas detailed in Table 7 for each position, or attend trainings listed. These trainings will be completed in the first 12 months of employment or as course availability and scheduling allows. The Air Quality Program Manager and Analyst will be responsible for determining if an employee has sufficient knowledge or requires further training.

Table 7. Air Quality Monitoring Staff Minimum Training Requirements

Position	Minimum Trainings (or sufficient knowledge)
AQP Manager	Management of Tribal Air Programs and Grants Clean Air Act and Permitting Air Pollution Compliance & Enforcement Quality Assurance Project Plans (QAPP) Basic Budgets
Air Quality Analyst	Air Quality Computations Air Pollution Technology Air Quality System (AQS) Quality Assurance Project Plans (QAPP) ARC View/ GIS Quality Assurance/Control for Air Monitoring
Air Quality Technician	Air Quality Computations Air Pollution Technology Air Quality System (AQS) Meteorological Monitoring Gaseous Pollutant/$PM_{2.5}$ Monitoring

A9 Documentation and Records

Documentation and records maintained by the AQP are listed below in Table 8. Records will be documented either electronically, in bound notebooks, and/or in forms designated for specific applications. Air quality and meteorological data will be transmitted from Agilaire Dataloggers at each station to a central AirVision sever, where it will be backed-up and archived. All records will be stored at the air quality office and retained according to the Air Quality Program's filing protocol (Appendix G). All relevant air monitoring information will be documented and retained electronically on the tribal network server where it will be accessible to Air Quality Program staff for future use and reference. Examples of relevant information include, but are not limited to, instrument manuals, field data sheets, log books, calibration/verification records, NIST certifications, audit reports, as well as hourly and minute data.

Table 8. List of Documentation and Records

Record	Employee Responsibility	Brief Description
Approved QAPP	Analyst	Signed Project Plan
Raw Data	Technician	Raw Data
QA/QC Data	Technician	Data Precision and Accuracy records
Site Logs	Technician	All site activities
Calibrations	Technician	Calibration values and tolerances
QC Checks	Technician	Zero/Span/Precision values
Maintenance/Repair	Technician/Analyst	Maintenance/Repair records
Traceability	Technician	Chain of custody forms
Audits	Technician/Analyst	Schedule audits and review audit reports
Semi-annual/Annual Reports	Analyst	Percent data capture and air monitoring program highlights for the year
Network Review/ Modifications	Technician/Analyst	Network description and proposed monitoring changes (if any)
Data Submittals	Analyst	Submit QA/QC data to AQS
Data Certification	Analyst	Annual AQS Ambient Data Certification

GROUP B   MEASUREMENT/DATA ACQUISITION

B1 Sampling Process (Network) Design

Probe siting information for all monitoring stations is included in Appendix B of this QAPP. The site configurations of all stations are in accordance with Appendix E to 40 CFR Part 58.

The pollutants and meteorological parameters measured within the AQP network assist the program in developing accurate atmospheric representation of the air quality within the Reservation airshed. This representation allows for detailed interpretations of the potential impacts of stationary, area, and mobile sources operating in and around the Reservation area. The oil and natural gas exploration and production activities and the Ignacio community within the Reservation were key considerations in establishing air monitoring locations. Stations were sited to represent regional background air quality conditions as well as the air quality community members experience in Ignacio. Additionally, the location of each monitoring station was selected based on the AQP's best understanding of regional transport patterns for pollution throughout the Four Corners area and the resulting potential for exposure to air pollution on the Reservation.

The Ute 1 station is located directly northeast of the town of Ignacio, CO. This location is the best available site for an air quality monitoring station to inform exposure to air pollution in the town of Ignacio, while meeting the siting requirements in 40 CFR Part 58. The Ute 3 station is situated on the eastern ridge of the Animas River valley near Bondad, CO. This river valley is believed to be a main corridor for the transport for pollutants from the Farmington, New Mexico area into the Reservation. The MMS station is currently located at Lake Capote on the eastern portion of the Reservation in an area that is not influenced by nearby natural gas production activities. The specific site location is a quarter mile south of Highway 160, two miles east of Chimney Rock National Monument. The station is secured by a locked perimeter fence and within the main Lake Capote access gate.

Continuous measurements of all gaseous and meteorological parameters are reported to AQS in hourly averages.

The SUIT AQP will measure visibility as a proxy of light scatter, employing a nephelometer at the Ute 3 site. Visibility data is collected on a continuous basis and reported in hourly averages to AQS. This data will be used to inform trends in visibility on the Reservation.

The SUIT AQP will employ a continuous particulate mass monitors at the Ute 1 and Ute 3 sites. Data will be collected from these instrument on a continuous basis and hourly averages will be reported to AQS. All continuous PM data will be considered informational and will assist the AQP by informing visibility trends, in documentation of exceptional events, and to provide real-time PM data to the public, enabling informed action during dust storms or forest fires.

B2 Sampling Method Requirements

The SUIT AQP will maintain all three monitoring stations in accordance with 40 CFR Part 58 and all other associated guidance pertaining to instrument manufacture specifications/operations. Measured gaseous, particulate, meteorological, and visibility parameters will meet and/or exceed the 75% data completeness requirement. Data excluded from the annual data completeness will be a direct result of properly conducted QA/QC operations pertaining to routine field operations, power failures, and variations in meteorological conditions that introduce irregular atmospheric conditions. Examples of irregular atmospheric conditions that can occur, include but are not limited to, activities ranging from nearby construction and direct influences on the sampling system from nearby sources. Data subject to these conditions will be properly null coded and/or supplied with the correct qualifier code that adequately describes the conditions upon collection prior to AQS submittal. Additionally, the AQP will use EPA OAQPS Exceptional Events guidance documentation for further QA procedures.

B2.1 Continuous Gas Monitors

The sampling probe used for ambient air sample collection meets the requirements of Appendix E, section 9 to 40 CFR Part 58. Standard Operating Procedures for each instrument/monitor/sensor can be found in Appendix C of this QAPP. The instruments and calibration equipment that will be used to measure gas phase species by the network are summarized below.

Ozone will be measured using UV light absorption, EPA designated method EQOA-0880-047. The analyzer model used will be the Thermo Scientific 49*i*.

Nitrogen oxides will be measured using chemiluminescence, EPA reference method RFNA-1289-074. The analyzer model used will be the Thermo Scientific 42*i*.

Carbon monoxide will be measured using IR light absorption, augmented by Gas Filter Correlation, EPA reference method RFCA-0981-054. The analyzer models used will be a Thermo Scientific *48i* at the Ute 1 site and a Thermo Scientific 48*i*QTL at the Ute 3 site.

Sulfur Dioxide will be measured using pulsed UV fluorescence, EPA designated method EQSA-0276-009. The analyzer model used will be the Thermo Scientific *43i*.

Methane and Total Non-Methane Hydrocarbons will be measured using Gas Chromatography for separation and Flame Ionization for detection. The analyzer model used will be the Thermo Scientific *55i*.

Teledyne API T700 dynamic dilution calibrators with internal ozone generation capacity and ozone photometers will be used to perform zero/span/precision (ZSP) checks and calibrations of the ozone analyzers (EPA designated method EQOA-0992-87). The Ute 1 T700 will be verified on an annual basis against the EPA Region VIII's Standard Reference Photometer (SRP) using the operating procedures indicated in the technical assistance document "Transfer Standards for Calibration of Air Monitoring Analyzers for Ozone" November 2010.

Teledyne API T700 dynamic dilution calibrators will be used to perform ZSP checks and calibrations of the nitrogen oxides, sulfur dioxide, and carbon monoxide monitors using NIST-certified gas cylinders containing known concentrations of nitric oxide, sulfur dioxide, and carbon monoxide. Known concentrations of gas from the multi-blend gas cylinders will be diluted with zero air with mass flow controllers (MFCs) in the T700 calibrators. Zero air will be sourced by Teledyne API T701H Zero Air Generators. During normal operation, automated ZSP check events will be performed on a weekly basis or more frequently. Calibration and certification of MFCs will be performed every six months using NIST-traceable Bios 220H and 220L Standardized Mass Flow meters. Method, frequency, and equipment that will be used to certify the Bios 220H and 220L flow meters are detailed in Table 10 of this QAPP.

Calibration gas purchased through Praxair will possess documentation supplied by the manufacturer containing a description of contents and traceability to a NIST-SRM in accordance with EPA's QA Handbook Volume II (19). Calibration gas cylinders will be verified and inspected by the manufacturer on a bi-annual basis and/or before the cylinder pressure drops below 300PSI. All shipping performed by the AQP will be conducted in accordance with Department of Transportation regulations.

The digital voltage meter (DVM) used is a Fluke Multimeter, Model 117. The DVM shall be annually certified and verified against a NIST-traceable standard at the manufacturer.

B2.2 Continuous Visibility Monitor

Ute 3 will utilize the Ecotech Aurora-1000 single wavelength integrating nephelometer to measure visibility as a function of the scattering coefficient (resulting from the absorption and scattering of light due to particles and/or molecules in the atmosphere). A 520nm wavelength is used for nephelometer measurements. The nephelometer uses internal filters for generating particle free air while performing zero checks. Automated zero/span calibration checks will be conducted every 24 hours for the duration of 15 minutes, using a NIST-traceable gas cylinder containing pure CO_2 as a span gas. These calibrations values will not be applied to the nephelometer calibration curve unless a user set stability level (95%) is achieved for a duration of five minutes within the user set time limit (15min) for each calibration set point (zero, span).

The Ecotech Aurora nephelometer measures barometric pressure, sample temperature and relative humidity continuously. Calibration of the nephelometer's environmental sensors will be performed at least every three months using the following verification equipment:

1. Barometric pressure verifier: DPI 705S Barometer, Manufacturer: Druck, Model 705 Series.

2. Temperature verifier: Fluke Traceable Digital Thermometer Model 51 Series II.

3. Relative humidity verifier: Mannix Digital Sling Psychrometer, Model SAM 990D.

Certification and calibration of the verification equipment will be performed annually against NIST-traceable standards.

B2.3 Meteorological Instruments

Temperature, wind speed, wind direction, solar radiation, precipitation and relative humidity will be measured continuously.

1. **Temperature**: Fan aspirated radiation shield, Model 8152;
   Thermistor temperature sensor, Model 4481, Manufacturer: RM Young.

2. **Wind Speed and Direction**: Wind Monitor-AQ, Model 05305, Manufacturer: R.M. Young.

3. **Solar Radiation**: Silicon cell pyranometer, Model LI-200RSMV-15, Manufacturer: Li-Cor.

4. **Precipitation**: Tipping Bucket Rain Gauge, Model 52202, Manufacturer: R.M. Young.

5. **Relative Humidity**: Capacitive relative humidity sensor, Model
   HUMICAP 180, Manufacturer: Vaisala.

6. **Meteorological verification equipment:**
   a. Temperature verifier
      i. Fluke Traceable Digital Thermometer, Model 51 Series II
   b. Wind speed verifier
      i. Anemometer Drive, Model 18801
      ii. Torque Disc, Model 18310
   c. Wind direction verifier
      i. Vane Angle Fixture, Model 18212
      ii. Vane Torque Gauge, Model 18331
      iii. Vane Angle Bench Stand, Model 18112
      iv. Vane Alignment Rod, Model 18301
   d. Solar radiation verifier
      i. Solar radiation pyranometer verifier, Li-Cor Biosciences, Model LI-200SA
   e. Precipitation verifier
      i. Calibration bottle, Nova Lynx, Model 260-2595

f. Relative Humidity verifier
    i. Mannix Digital Sling Psychrometer, Model SAM 990D

Calibration and/or verification of the site's meteorological equipment will be performed at least every three months using the meteorological verification equipment listed above. Certification and calibration of the meteorological verification equipment will be performed annually against NIST-traceable standards. The Meteorological standard operating procedures are available in Appendix D.

B2.4 T60 & T640x PM Mass Monitor

The Teledyne API T640 & T640x PM Mass Monitors are specifically designed to comply with the FEM requirements of the NAAQS for Automated Particulate Matter (40 CFR Part 50) and to facilitate sampling as specified in that document. The AQP has selected the T640 & T640x instruments to measure particulate matter on a continuous basis in compliance with the EPA Class III $PM_{2.5}$ and PM_{10} FEM certifications. The T640 & T640x instruments monitor the operational parameters continually during the sampling cycle. The logged information is available to the field operator during and at the end of each sample cycle in electronic data format and stored on the master CPU. The TCP/IP Modbus (digital data output) port provides the capability for T640x instrument communication with the in-station Agilaire 8832 data logger.

The sample inlet of the T640x will operate at a total nominal flow rate (sample flow plus bypass flow) of 1.00m^3/hr (16.67L/min). The sampler will meet the following requirements listed in the operation's manual for EPA Class III FEM compliance for PM_{10} and $PM_{2.5}$ sampling. The T640 will operate with a single flow rate at 5.0 L/min.

- Sample line heaters on, and set to activate at 40% RH and deactivate at 30% RH

The T640 & T640x flow rate, thermocouples, RH sensors, and pressure sensors will be verified and/or calibrated every four weeks using these transfer standards:

a. Fluke Traceable Digital Thermometer Model 51 Series II. Manufacturer: Fluke Incorporated
b. DPI 705S Barometer, Manufacturer: Druck, Model 705 Series
c. Delta Cal D1 flow meter, Manufacturer: MesaLabs
d. Leak check filter assembly designed for the T640 & T640x inlet from Teledyne API

Additional guidance regarding the formal sampler specifications is available in Appendix K of 40 CFR Part 50. Additional guidance regarding operational aspects and quality assurance is available in US EPA QA Guidance Document Section 2.12 and the Operator's Manual for the T640 & T640x.

B2.5 Direct Methane and Non-Methane Hydrocarbon Analyzer.

The Thermo Scientific 55i Direct Methane and Non-methane Hydrocarbon analyzer (55i) operates a back-flush gas chromatography system designed for automated batch measurements that utilizes an eight -port rotary valve. This rotary valve regulates sample volume, carrier gas, and calibration gas volume through the packed polar proprietary column and increases the precision measurements associated with the flame ionization detector (FID). A minimum FID flow rate of 50 mL/min is required for adequate detection of methane and non-methane hydrocarbons at a pressure range of 40PSI to 65PSI. The FID fuel, carrier gas, and calibration gas will be supplied by gas cylinders equipped with a two-stage stainless steel regulator containing gas listed below.

- Carrier gas: Nitrogen
- FID fuel: Hydrogen
- NIST traceable calibration gas: Methane (3-8 ppm)/Propane (2 to 5ppm)

Note: The NMH calibration gas is subject to change from the recommended propane to include actual NMH measured. This will improve elution times, detailed separation represented in the chromatogram, and accurate concentration measured.

B3 Sample Handling and Custody Requirements

B3.1 Continuous Parameters

All parameters are measured on a continuous basis. These include all gas species, PM_{10} and $PM_{2.5}$, visibility, and metrological measurements. Hourly average data that are representative of ambient conditions will be reported to the EPA AQS database and will be subject to QC operations associated with section five of the Ambient Air Quality Assurance Handbook for pollution measurement systems volume II, detailed operations pertaining to the instrument operations manual, and the AQP SOP's. Minute averages of all continuous parameters are stored on the Agilaire 8832 datalogger locally for three months and on the central Air Vision server for two years. Hourly averages of gaseous, meteorological, particulate, and visibility are stored locally and on the central Air Vision server indefinitely. The AQP has initiated an automated routine in the Air Vision software to poll data from each site to the central server every few minutes to ensure maximum data capture during unexpected events that can contribute to significant data loss. Significant data loss can arise from shelter temperatures exceeding requirements, power failures, and electronic instrument communication failure. Measurements from continuous parameters are also shared on the AQP monitoring webpage each time the central server polls data from the three stations, in close to real time.

B4 Analytical Method Requirements

B4.1 Instrumentation quality control requirements

Gas analyzers and the T640 & T640x PM Mass Monitor must be operated in climate-controlled environments. The monitoring shelter temperatures must always remain between 20°-30°C. Air conditioners and heaters will be used to maintain this tight temperature range inside the monitoring shelters. The monitoring shelters will be maintained in such a way as to minimize dust contamination and external vibrations from the instruments. Each monitoring shelter will be visited at a minimum of one time per week During each site visit the operator will inspect the shelter temperature; check that the gas analyzers are operational and producing concentrations typical for the region. The operator will verify that data from each instrument and sensor are being recorded accurately by the data acquisition system. The operator will check the sample lines for any contamination, such as water or dust, and will ensure that the inlet to the sample line is positioned correctly to accomplish ambient monitoring.

B4.2 Nephelometer detection limits and operation

The nephelometer is operated inside the Ute 3 air quality monitoring station. During each site visit, the operator will verify that the light scattering coefficient on the nephelometer display is being recorded accurately by the data acquisition system. The operator will examine the nephelometer for any contamination and perform maintenance checks in accordance to the Nephelometer Maintenance SOP (Appendix F).

B4.3 Meteorological monitoring sensors

All meteorological monitoring equipment (with the exception of precipitation) will be mounted to a 10-meter tilt-over tower. Quarterly verification will be performed along with maintenance of meteorological equipment (including changing bearings and other parts as needed) every three months. The precipitation gauge will be cleaned monthly. All dust and debris will be removed from the funnel, screen, and bucket assembly.

B4.4 Direct methane and non-methane hydrocarbon analyzers

Direct methane and non-methane hydrocarbon analyzers (Thermo Scientific 55i) have been installed at the existing Ute 3 remote SLAMS and the Mobile Monitoring Station (MMS), consistent with sections 6 and 7 of the EPA quality assurance Handbook Volume II. The MMS was initially co-located with the Ute 3 station for a period of six months. During this time, a 55i analyzer was operating in each station. Subsequently, the MMS was relocated to a remote location to support a comparison of methane concentrations at the Ute 3 site relative to an undeveloped area of the Reservation. The six-month co-location period for the two 55i analyzers spanned two fiscal year quarters, allowing for proper sample cane configuration, residence time assessments, and an assessment of instrument detection limits, as well as to verify that the 55i analyzers responded with good agreement when co-located.

B5 Quality Control Requirements

B5.1 Continuous gas monitors

The dilution systems, reference photometers, zero air generators, and gas cylinders that will be used for gas analyzer calibration are detailed in section B2.1. Zero air delivered to gas analyzers will additionally pass through a filter in order to remove any PM which could potentially contaminate reflecting surfaces or react with measured gas species. Known concentrations of each measured gas species will pass through as much of the sampling line as is practical toward equivalent treatment of calibration mixtures and ambient air sampled. Furthermore, all QC requirements pertaining to continuous gas monitor accuracy and precision measurements will comply with section 3.2.2 part 58 of the 40 CFR. Zero/span and precision check descriptions herein are listed separately and are referred to as either zero/span, precision, or level 1 weekly checks.

B5.1.1 Zero and span checks

Continuous gas monitors will be subject to level 1 zero/span checks weekly. The upper range limit (URL) for 49*i*, 43*i*, 42*i* instruments is 200 ppb. The URL for 48i & 48iQTL instruments is 10 ppm.. These URLs are specified by the instrument manufacturer (Thermo Scientific). Level 1 span checks will be performed using an artificial test atmosphere at concentrations between eighty and ninety percent of the instrument URL, approximately 160–180 ppb for the 49*i*, 43*i*, 42*i* instruments and 7-9 ppm the *48i & 48iQTL* instruments. The exact concentration for each level 1 span check conducted at all three monitoring stations on a weekly basis are as follows: 180 ppb for the 49i, 43*i*, 42*i* instruments and 8 ppm for the *48i* and 48iQTL instruments. The frequency of zero/span checks will be based on instrument drift rates associated with interference occurring from the accumulation of particulates on inline filters and various chemical interference originating from the continuous operation of the sampling assembly at each station. Automated zero/span checks will be performed using calibration gas of a known concentration. For nitrogen dioxide measurement verification and converter efficiency assessment, gas phase titration using 200 ppb nitric oxide and set points between 30 and 170 ppb ozone will be used to establish percent converter efficiency on a monthly basis. Additionally, gas phase titration using 200 ppb nitric oxide and 50 ppb ozone will be used to and assess NO_2 GPT precision values and estimate converter efficiency on a weekly basis (Appendix C). Ozone zero/span checks will be conducted using automated events at concentration levels of 0ppb and180ppb. Methane and non-methane hydrocarbon analyzers (55*i*) will be subject to automated zero/span checks between 7 and 9 ppm once per week. All zero/span values will be documented.

B5.1.1.1 Zero and Span Check Procedure

1. Allow sufficient time for the calibration system and the analyzer (if applicable) to warm-up and stabilize.
2. Deliver zero air to instrument and allow sufficient time for analyzer stabilization, by reviewing the AV-Trend real time data trending time series. Record the observed zero reading (Z).
3. Deliver span gas test concentration and allow sufficient time for analyzer stabilization, by reviewing the AV-Trend real time data trending time series. Record the observed span reading (S_1).
4. Calculate zero deviation (D_z):
   D_z = (Z-b), b = intercept of recent multipoint calibration curve, ideally should be zero ppb. (Definition of zero drift is an adaptation of the definition given in Section 12 of the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II 1998.)
5. Calculate span drift (D_s):
   a. $Ds = ((S_1-S)/S) \times 100$ where: Ds = span drift (%)
   b. S_1 = unadjusted span reading S = actual span gas concentration

   (Definition of span drift is an adaptation of the definition given in Section 12 of the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II 1998.)
6. Calculate quarterly average percent zero drift.
7. Zero and span drift values as calculated above are to be plotted on quality control charts. If the following zero or span tolerances are exceeded for an analyzer, a calibration followed by a multi-point calibration check will be performed.

<u>$O_3/NO_X/SO_2$ Analyzers:</u>

zero drift ±2% of full scale (4 ppb)
span drift ±7%

<u>CO Analyzer:</u>

zero drift ±2% of full scale (0.2 ppm)
span drift ±7%

B5.1.2 Precision Checks

Continuous gas analyzers will be subject to a precision check at least once per week. The precision checks inform instrument linearity. The frequency of precision checks will be based on possible drift rates associated with interference occurring from the accumulation of particulates on inline filters and various chemical interference originating from continuous measurements. Precision checks will be accomplished through automated events and will use calibration gas of known concentration. For sulfur dioxide, ozone, and nitrogen oxide analyzers, precision checks will be performed at 50 ppb. For carbon monoxide precision checks will be performed at 1 ppm. All precision check values will be documented. Methane and non-methane hydrocarbon analyzers (55*i*) will be subject to automated precision checks between 1 and 3 ppm once per week. Precision checks, if performed in conjunction with zero/span adjustments, will be performed prior to any such adjustments.

B5.1.2.1 Precision Check Procedure

1. Allow sufficient time for the calibration system and analyzer (if applicable) to warm-up and stabilize.
2. Connect the calibration delivery system to the analyzer's sample inlet line. Be sure delivery system is properly vented and sufficient flow exists.
3. Deliver zero air and allow sufficient time for analyzer stabilization by reviewing the AV-Trend real time data trending time series. Record the observed zero reading.
4. Deliver a precision gas concentration (x_i) to analyzer and allow sufficient time for analyzer stabilization by reviewing the AV-Trend real time data trending time series. Record the observed precision reading (y_i).
5. Calculate percent precision (d_i): $d_i = ((y_i - x_i)/x_i) \times 100$.
6. Calculate quarterly average percent deviation (d_{avg}): $d_{avg} = (d_i)_x/n$
    a. n = number of percent precision (d_i) values which are valid.
    b. $(d_i)_x$ = sum of all valid percent precision values for the quarter
7. If quality control charts indicate an out-of-control situation, the percent precision value for that period will be considered invalid.
8. Calculate the standard deviation (s_j) of percent precision.
    a. (d_i): $s_j = [(\Sigma(d_i)^2 - (\Sigma d_i)^2/n)/(n-1)]^{1/2}$. The precision goal of ± 15% should be reflected in d_{avg} and s_j, both being ±15%.

B5.1.3 Performance Audits

Continuous gas monitors will be externally audited on a quarterly basis. Audits will be conducted by an outside contractor and in accordance with reference methods documented in the EPA Quality Assurance Handbook for Air Pollution Measurements, Volume II. Audit levels will be representative of typical atmospheric conditions measured at each monitoring station and consistent with section 3.2.2 to 40 CFR part 58. Audit equipment will be independently supplied by the contractor. The contractor will provide gas standards traceability documentation in the audit report and maintain a file of all calibration data in relation to the span gas test source used in an audit (Appendix I). The report will include accuracy probability intervals as described in 40 CFR Part 58 and in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II (19).

B5.2 Particulate Sampler

B5.2.1 T640 & T640x Particulate Continuous Sampler Precision and Accuracy

The precision of the T640 & T640x PM measurements Will be subject to four-week verification checks for each sensor (e.g., barometric pressure, temperature, relative humidity, and flow rate) in the sampler. The T640 & T640x will be challenged with span dust every four weeks. The accuracy of T640x will be estimated by routine verification checks, calibrations, and audits. Audit results should be within 10% as compared to the recent calibration and within 10% of the design flow rate of 16.7 l/m for the T640x and 5.0 l/m for the T640. If the sampler does not meet these requirements, then calibration, repair, and/or data invalidation will be performed as required after the issue for the deviation has been inspected by the external auditor, Air Quality Technician, and the Air Quality Analyst. If the final recommendation pertains to data validation, this will be determined by the QA Manager (AQ Program Manager or delegate) as noted in Section B10.5.

B5.2.2 T640 & T640x PM Mass Monitor Performance Audits

The T640 & T640x audits will be conducted by a third-party auditing contractor on a quarterly basis and will be performed using equipment other than that routinely used for station QC by the AQP. The third-party contractor will conduct audits on all auxiliary parameters and the flow rate on a quarterly basis.

B5.3 Meteorological Instruments

B5.3.1 Meteorological Instruments Precision and Accuracy

Routine maintenance checks and calibrations are specified in SOPs (Appendix D) and in instrument manuals to ensure good accuracy and precision. The calibration equipment, which will be used for meteorological instrument/sensor calibration and verification are listed in section B2.3 of this QAPP. Equipment used for all meteorological parameter verifications/calibrations are annually verified by the manufacturer and returned with a calibration certificate. Meteorological sensors in the AQP network are verified on a quarterly basis by the AQP. If any meteorological instrument or sensor is reporting outside of the accuracy and precision goals detailed in Table 4, or outside of manufacturer specifications, calibration will be performed by the AQP and/or the manufacturer.

B5.3.2 Performance Audits

Meteorological instruments and sensors will be externally audited every six months. Instruments and sensors will be verified by an artificial field or by the co-location with transfer standards. An outside contractor will conduct the audits. The audit report will include audit methods/procedures, equipment used to conduct the audit, and audit results (Appendix I).

B5.4 Continuous Visibility Monitor

The calibration equipment and gas standards, which will be used for nephelometer calibration and quality assurance, are listed in section B2.2 of this QAPP. Routine maintenance checks and calibrations procedures are specified in the SOPs (Appendix F) and in the nephelometer user manual.

B5.4.1 Aurora-1000 Environmental Sensors Precision and Accuracy

Verification equipment used for the Aurora-1000 environmental sensors are annually verified by the manufacturer and returned with a calibration certificate. Aurora-1000 environmental sensors' precision and accuracy objectives are presented in Table 4. The Aurora-1000 environmental sensors are verified every three months by the AQP. If any of the environmental sensors report outside of the guidelines specified Table 4, corrective action will be initiated. Calibration of these environmental sensors will be performed by the AQP and/or the manufacturer.

B5.4.2 Aurora-1000 Zero and Span Checks

A NIST-traceable gas cylinder containing CO_2 will be used for auto span calibration conducted once every 24 hours for the duration of 15 minutes. The zero air is generated in the instrument internally using a zero air pump and an internal fine particulate filter providing particle free air. The automated zero calibration will be conducted once every 24 hours for the duration of 15 minutes. Each zero/span auto calibration will have a stability setting of 95%. If this stability reading is not obtained within the 15-minute interval allotted by the programmed sequence the, the Aurora-1000 will not apply an updated calibration coefficient. Table 9 details the zero/span check procedure and action for the continuous visibility monitor.

Table 9. ***Zero and Span Checks for Continuous Visibility Monitor***

Daily check	Calibration Tolerance	Action required
Zero Check	±2 Mm^{-1}	Do zero adjust
	±4Mm^{-1}	Invalidate data Do zero adjust
Span Check	±5% of span point*	Do full calibration
	±10% of span point*	Invalidate data Do full calibration

B5.4.3 Aurora-1000 Precision Checks

The nephelometer will be subject to a precision check at least every 24 hours. Precision checks will be performed manually using NIST-traceable gas cylinder containing CO_2 (100% purity), which includes a zero and span checks detailed in section B5.4.2 of this QAPP.

B5.4.4 Aurora-1000 Performance Audits

The visibility monitor will be externally audited quarterly. Audits will be conducted in accordance with reference methods used for continuous gas monitors. Audit equipment will be independently supplied by the auditor. The auditor will provide gas standards traceability documentation in the audit report and maintain a file of all calibration data in relation to the span gas test source used in an audit (Appendix K).

B5.5 System Audits

The U.S. EPA Region VIII has performed a systems audit on the Southern Ute Indian Tribe's Air Monitoring Network and will conduct systems audits every three years. The Southern Ute Air Quality Program will conduct an internal systems audit every year that there is not a systems audit performed by the U.S. EPA.

B6 Instrument Maintenance Requirements/Configuration Control

B6.1 Preventative and Routine Maintenance

Preventative maintenance schedules recommended by all instrument manufacturers will be followed and are included on each instrument's maintenance log sheet, along with some additional procedures added by the AQP (Appendix A). All maintenance performed on air monitoring instruments that could affect the instrument's calibration will be followed by a multipoint calibration check. Maintenance performed on calibration equipment will be followed by a re-certification of the device if the manufacturer regards the maintenance as affecting the calibration. All preventative maintenances performed will be documented. Additionally, the following station checks (routine operating procedures) will be performed by the AQ Technician per station visit, ensuring that:

1. that the analyzers are drawing in ambient air at their appropriate flow rates;
2. sample lines are returned to the manifold after any lines are disconnected for flow checks or other purposes;
3. fittings are snug but not over-swaged;
4. analyzers, data acquisition systems, computers, calibrators, valves, and other equipment are in their normal operating modes;
5. air conditioning and heating systems are working properly;
6. power cords and adaptors are connected properly and the electrical power supply is stable;
7. the indicated time according to the data acquisition system or other system clocks is accurate, local standard time; and all other items in the Routine Operating Procedure SOP are carried out (Appendix C).

Any issues identified will be documented and resolved.

B6.2 Configuration Control for Logbooks

A standardized format will be utilized to ensure that all necessary information is obtained in the digital site logbook, located on the AirVision software. This information determines credibility of the data and should not be erased or altered. Recording of the data should be concise and include all relevant information. The format should clearly identify the effected parameters, the date and time, circumstance, purpose of any significant change in the configuration of the air monitoring station, and operating personnel. Log book entries will be made during any site maintenance including but not limited to::

1. If tubing is re-routed, or new fittings or other components are added or removed in any stream of sample air or calibration gas between analyzers, calibrators, or sampling ports on the station manifold
2. the relative positions of the analyzer sample ports on the manifold are changed,
3. a new blower is added,
4. the location of a sampler or sampling port is moved, or
5. any similar change in the air monitoring station's configuration.

B6.3 Instrument Repair

In the event of instrument malfunction or failure, a calibrated replacement shall be installed, if available, while the downed unit is repaired. Spare parts shall be kept in stock to cover predictable failures as determined by the instrument's maintenance and repair logs. Troubleshooting procedures provided in the instrument's operations manual will be followed to diagnose the problem. When a problem cannot be resolved by these methods, the manufacturer's technical personnel will be consulted for further guidance. Once the problem is isolated, corrective action will be taken immediately to minimize data loss. All resultant information from troubleshooting checks and technical personnel shall be recorded in the site logbook. The maintenance and repair logs will be used to signal the need for more frequent maintenance activities to reduce the occurrence of failure resulting in lost data.

B7 Instrument Calibration and Frequency

B7.1 Continuous Gas Monitors

All continuous gas monitors will be subject to a multi-point calibration at least quarterly. The calibration equipment and gas standards discussed in section B2.1 of this QAPP will be used. Requirements for continuous gas analyzer calibration standards are presented in Table 10.

Table 10. Requirements for Continuous Gas Monitor Standards

Equipment Used to Calibrate Monitoring Equipment	Acceptance Criteria	Frequency
Regional Standard Reference Photometer (Level One Ozone Transfer Standard)	Regression slope = 1.00 ± 0.01ppb Intercept ≤ 1.00ppb	1/yr
Level Two Ozone Transfer Standard (Ute 1 Teledyne API T700)	±4% or ±4ppb (whichever is greater)	1/yr
Level Three Ozone Transfer Standard (Ute 3 and MMS Teledyne API T700)	±4% or ±4ppb (whichever is greater)	1/yr
Cylinder of Compressed Gases Gas standard	NIST Traceable (e.g., EPA Protocol Gas)	EPA Protocol Gases have a 36-month certification period and must be recertified to extend the certification.
Standardized Mass Flow Calibrator BIOS Dry Cal220 H and 220 L	±2% of NIST-traceable standard	1/yr Bios International Corporation

*Acceptance criteria of standards: A certificate or laboratory results from the organization providing additional quality assurance information pertaining to the traceability of the AQP monitoring standards will provide documentation containing the following information: verification results, date, operator initials, and whether these requirements were met.

Zero air used for zero checks and dilution of the calibration gas cylinders will be of dry. The zero air will be free of contaminants that may cause a response from the monitor or which may react with the gases being monitored.

During calibration, span gas will pass through as much of the sampling train as is practical to ensure a high degree of similarity between treatment of ambient air and simulated atmosphere used for calibration and quality assurance purposes. For the nitrogen dioxide measurements, calibrations will be performed utilizing gas phase titrations and a cylinder containing a NIST gas standard that contains a known concentration of NO. The Ute 1 Teledyne API T700 calibrator will be used as the level two transfer standard for O_3 and will be used to calibrate the level three transfer standard (Teledyne API T700 calibrators) at the Ute 3 station and the MMS. The level two reference photometer will be annually calibrated/verified using EPA Region VIII's level one SRP and laboratory facilities. Each Teledyne API T700 calibrator contains an internal ozone generator and photometer which will be used to calibrate and verify the ozone analyzers at the corresponding stations. The appropriate gaseous calibration sheet (Appendix C) will be completed during the calibration of the monitor.

B7.1.1 Calibration Procedures and Multipoint Calibration Check Procedure

1. Allow sufficient time for the calibration system and analyzer (if applicable), to warm-up and stabilize.
2. Connect calibration gas delivery system to the monitor's sample inlet line. Be sure delivery system is properly vented and that sufficient flow exists.
3. Increase analyzer averaging time to 300 seconds
4. Deliver zero air to analyzer, allowing sufficient time for analyzer to stabilize by reviewing AV-trend real-time data trending time series. Record the unadjusted zero reading.
5. Adjust the monitor output to zero, if necessary (see Section B5.1.1.1). Allow sufficient time for monitor to stabilize as indicated on the AV-trend real-time data trending time series.
6. Ensure analyzer has a nice steady zero response, centered on zero.
7. Record the zero adjustment.
8. Deliver span gas test concentrations to analyzer, allowing sufficient time for the monitor to stabilize as indicated on the AV-trend real-time data trending time series. Record the observed span reading.
9. Adjust monitor span output to the span gas test concentration value, if necessary. Allow sufficient time for monitor to stabilize as indicated on the AV-trend real-time data trending time series.
10. Ensure the instrument has a steady response centered on the span value.
11. Record the adjusted span reading and the span adjustment (see Section B5.1.1.1).
12. Generate five targeted concentration points which cause a monitor response of twenty, thirty, forty, sixty, and eighty percent of the operating range, and record calibrator delivery and analyzer response for each.
13. Plot the calibrator delivery concentrations (y-axis) against the analyzer response values (x-axis) and apply a simple linear regression
14. The correlation coefficient(r) for the linear equation listed in step 8, r should be ≥0.998.
15. Return analyzer averaging time to 30 seconds.

A calibration and multi-point calibration check will be performed whenever any of the following conditions occur.

1. Quality control charts illustrate excessive drift and or instrumental noise exceeding or equal to zero and/or span drifts of the targeted QC concentration (see Section B5.1.1.1).

2. A monitor is initially installed or re-installed.

3. A monitor is relocated.

4. A monitor undergoes maintenance or repairs.

5. Monitor operation is interrupted for more than a few days.

6. Upon any indication of monitor malfunction or change in calibration.

B7.2 Continuous Visibility Monitor

The continuous visibility monitor will be subject to auto zero/span calibration every 24 hours for duration of 15 minutes. The calibration equipment and gas standards used will be as discussed in Section B2.2. Standards used to calibrate the visibility monitor require calibration against NIST-traceable standards and its calibration frequency are summarized in Section B2.2. NIST-traceable compressed CO_2 gas will be re-certified when the cylinder pressure drops below 200PSI. The zero-air used for setting the zero will be free of particulate matter as it passes through the instrument and measured as a reference. A full calibration procedure is accomplished through an automatic sequenced event and is accessed from the calibration menu. Refer to Appendix F, section 4.2.2 to this QAPP for the Aurora-1000 single wavelength integrating nephelometer user manual for further menu operations.

The Aurora-1000 environmental sensor calibrations will be conducted in the field using a co-location method, employing the Air Quality Program's NIST-traceable verification equipment listed in Section B2.2. A record of verification results will be maintained in the site logbook and documented on the appropriate instrument maintenance log sheet. If any of the environmental sensors fail the verification check, the sensor will be returned to the manufacturer to be recalibrated and certified. The Aurora-1000 environmental sensors will meet the following criteria:

1. Barometric Pressure: Accuracy of ±10% of observed.
2. Temperature: Accuracy of ±2°C.
3. Relative Humidity: Accuracy of ±10% of observed.

Certification and calibration of the verification equipment will be performed annually against NIST-traceable standards.

B7.3 Meteorological Instruments

All meteorological instruments at each monitoring site will be verified at least every three months using the AQP's meteorological verification equipment listed in Section B2.3 and/or equipment used during an external audit. All meteorological verification will be conducted in the field using a co-location method between the AQP's NIST-traceable verification equipment and the site's meteorological instruments/sensors. A record of verification results will be maintained in the site logbook and documented on the appropriate verification forms (Appendix D). If any of the site's meteorological instruments fail the verification check, the instrument will be returned to the manufacturer to be recalibrated and certified. Meteorological instruments at each site will meet the following criteria:

Wind Direction:

1. Ensure that wind direction monitor is properly aligned towards north.

Wind Speed:

1. Zero reading must be less than 0.5 mph.
2. Accuracy of ± [0.4 mph (0.2m/s) + 0.5% of observed].

Ambient Air Temperature:

1. Accuracy of ±0.5 °C.

Precipitation:
1. Resolution of 0.01 inches (0.3mm) at precipitation rates up to 7.6 cm/hr (3 in/hr).
2. Heating system to assure accurate measurement of frozen precipitation.
3. Suitable windscreen.

Solar Radiation:
1. Accuracy of ±5% of observed.

Relative Humidity:
1. Accuracy of ±2% between 0 and 90% RH.

Certification and calibration of the meteorological verification equipment will be performed annually against NIST-traceable standards.

B7.4 T640 & T640x Particulate Continuous Samplers

The sensors and pneumatics of the T640 & T640x will be verified every four weeks. Calibrations will be completed on an annual basis or after an unsatisfactory verification is conducted by the Air Quality Analyst or Air Quality Technician. Leak tests will be performed every four weeks as part of the verification process.

B7.5 Direct Methane and Non-Methane Hydrocarbon Analyzer

Thermo Scientific 55i GC-FID analyzers will be calibrated weekly to ensure optimal performance and in order to minimize deviations from known concentrations delivered in weekly precision and span checks less to less than ±5%. The calibration equipment and gas standards discussed in section B2.6 of this QAPP will be used. The 55i calibrations will be performed utilizing gas cylinders containing a NIST gas standard.

B8 Inspection and Acceptance of Supplies and Consumables

The Air Quality Analyst is responsible for ordering and maintaining supplies. Acceptance criteria must be consistent with overall project technical and quality criteria. Some of the acceptance criteria are specifically detailed in 40 CFR Part 50. Other acceptance criteria, such as observation of damage due to shipping, can only be performed once the equipment has arrived on site. Critical supplies will be purchased as needed from the specific instrument manufacturer or other acceptable suppliers. Table 11 shows the supplies that are considered critical and are associated with the AQP monitoring network, along with established vendors for these.

Table 11. Critical Supplies and Consumables

Point of Use	Item	Description	Vendor
Documentation	Site logbook	AirVision digital logbook	Agilaire
Analyzer/sampler	Fuses	In analyzers & PM2.5 samplers	Thermo Scientific, local electronic store
Data retrieval	Flash drive	USB	Electronics store
Analyzer/Calibrator	Replacement parts	In analyzer	Thermo Scientific, Teledyne API
Meteorological instruments	Replacement parts	In instrument	Campbell Scientific, RM Young, Vaisala, Weathertronics, Nova Lynx, LI-COR, Ecotech
Zero Air Supplies	Purafil or Charcoal columns	Refillable cartridges in the front of the machine	Teledyne API
Instrument Plumbing	Stainless Steel Fittings and tubing	For plumbing upstream of calibrator and downstream of instruments	Swagelok
Instrument Plumbing	Teflon tubing and fittings	For plumbing downstream of the calibrator and upstream of instruments	Savillex
Analyzer	Teflon particulate filters	Analyzer/sample line filters	Savillex
GAST Compressor	Replacement parts	In compressor	FIERO Fluid Power, Inc.
Field operation use	Low-lint wipes	Cleaning wipes	Local hardware store
T640 & T640x	Filters	47 mm Glass fiber whatman filter	Teledyne API
T640 & T640x	Vacuum pump kit	Rotary vane rebuild kit	Teledyne API
Calibration	Calibration Gas	NO/CO/SO2 CH4/C3H8 CO2	Praxair
55i GC-FID Instruments	Support Gases	Ultra-high purity N2 & H2	Four Corners Welding and Gas
Flow Verification	Flow Meters	BIOS Definers and DeltaCal	Mesa Labs
Temp/RH Verification	Temperature, Pressure, and RH Transfer Standards	Druck DPI 105 Barometer, SAM 990 DW RH	Chinook Engineering/Inter-Mountain Labs
H2 Generator	DI water filtration and separation	Parker H2 generator service kit	Webster Associates
Manifold	Teflon tubing manifold and supporting fittings and items	Teflon tubing, gaskets, , fittings	Savillex

B9 Data Acquisition Requirements

The data used, which are not obtained from direct measurement, will be obtained from reputable, quality assured sources such as the National Weather Service, National Oceanic and Atmospheric Administration, the National Institute of Standards and Technology, Colorado Department of Transportation or other similar sources. The data will consist of physical constants, weather data, housing information, and other such data.

B10 Data Management

Due to the potential use of all data collected for comparison to the NAAQS, extreme care in handling the raw data will be followed.

B10.1 Data Entry/Formatting

All data will be transferred to the EPA Air Quality System (AQS) database. Formatting data for submission to the AQS will performed promptly and carefully. All gaseous and meteorological data are automatically polled from each Agilaire 8872 datalogger to a central Air Vision server via a wireless router/ modem with serial numbers and IP address information controlled by the Air Quality Analyst and the Air Quality Technician.

Any data manually entered by the AQP staff will be subjected to additional quality assurance procedures. Manually entered data is defined as data that is manually polled for discrete parameters. Precision and accuracy data resulting from four-week verifications and quarterly audits are considered manually entered data and are submitted to AQS using the precision/accuracy setting in the transaction generator. All discrete data collected will be subjected to additional quality assurance practices ranging from double entry checks that calculate differences in values entered for the parameter values and third party "AQP Manager" review prior to AQS submittal. The AQP manager may choose to delegate the third party review to a qualified SUIT Environmental Programs Division staff member.

B10.2 Raw data

Raw data are worksheets, records, memoranda, notes, or exact copies and are the result of original observations and activities of a monitoring project. Raw data include data from automated routines, data entered into a system directly by keyboard or automatically.

B10.3 Data transfer

The gaseous, meteorological, particulate, and visibility instrument hourly average values are recorded by Agiliare dataloggers and stored locally and on the central Air Vision server indefinitely. Minute averages of all continuous parameters are stored on Agilaire datalogger locally for three months and on the central Air vision server for two years. The AQP has initiated an automated routine in the Air Vision software to poll data from each site to the central server every few minutes to ensure maximum data capture during unexpected events that can contribute to significant data loss. Significant data loss can arise from shelter temperatures exceeding requirements, power failures, and electronic instrument communication failure.

Precision and accuracy data will be entered manually into an appropriate transaction generator for formatting or exported directly from Air Vision for AQS submittal and will be subjected to all data validation requirements (Section B10). The AQP monitoring data is filed in chronological order and in accordance with the air quality filing protocol (Appendix G). All data generated at each monitoring station is quality assured and formatted for submission to the AQS by the Air Quality Analyst using Air Vision and/or transaction generators for all discrete parameters within the AQP monitoring network.

B10.4 Data Validation

Data validation encompasses correct data processing operations stemming from field procedures conducted in a manner consistent with the AQP SOPs by the Air Quality Technician and the Air Quality Analyst. Proper data validation can identify problems in field operations and issues with instrument performance. Once problems are identified, the data can be corrected or invalidated with the appropriate corrective actions determined by the responsible laboratory facility and/ or AQP monitoring staff. Data validation for the AQP field operations consist of internal audits conducted by the Air Quality Analyst on all field operations performed by the Air Quality Technician. The internal audit conducted will be held to the same quality assurance practices as external quarterly audits using the AQP internal transfer standards, SOPs, and instrumental operator manual performance procedures.

In the event of suspect data resulting from an internal audit, external audit and/or out of range instrumental response, the Air Quality Analyst will be responsible for reviewing field notebooks, previous modifications and general maintenance procedures conducted by the Air Quality Technician and possibly invalidating data that correlates to changes and previous modification indicated by or directly noted in the field notebook or by the Air Quality Technician. Data subject to possible invalidation will be reviewed up to or prior to, the most recent applicable precision and/or accuracy data that has been previously submitted to the EPA AQS database that meets minimal percent difference values indicated within the selected AMP reports and corresponds to the subjected data range in question. If the Air Quality Analyst deems it necessary that the data within the suspected range is indeed out of instrumental manufacturer performance specifications and/or falls below the EPA Quality Assurance guidelines, indicated in the validation tables of the EPA Quality Assurance Handbook for Ambient Air Monitoring, the data range under question will be invalidated in AQS, following additional AQP discussions with the Air Quality Program Manager, Air Quality Analyst and detailed review of the suspected data by a Region VIII quality assurance representative.

The Air Quality Program Manager will make the final decision on suspect data and corrective actions. Secondly, if data within the suspected range is not consistent with the validation criteria listed within the AQP QAPP based on instrumental communication error, data controller storage failure, shelter temperature requirements, or power failures caused by adverse weather conditions the suspect data will be reviewed by the respective parties listed above. All actions pertaining to relevant data invalidation documentation will be handled in accordance with the AQP filing protocol. The Air Quality Program Manager will be notified prior to the time data subject to invalidation is removed from or resubmitted to AQS. Additionally, station trend analyses will be conducted on the reported parameters in question to confirm if any significant differences among the Ute 1, Ute 3, and MMS stations are present.

B10.5 Data transmittal

Data transmittal occurs when data is transferred from one person or location to another or when data is copied from one form to another. Some examples of data transmittal are copying raw data from a notebook onto a data entry form for keying into a computer file and electronic transfer of data over a telephone or computer network. The AQPwill report all ambient air quality data and information in accordance with the AQS User Guide. The data will be coded in the AQS format. The AQP gaseous and metrological data will be validated as per section B10.4 of this QAPP and will be submitted directly to the AQS via electronic transmission, in the AQS format, and in accordance with the monthly schedule (Appendix E-AQS Data Submittal SOP).

B10.6 Data reduction

The data reduction process involves aggregating and summarizing results so that they can be understood and interpreted in different ways. Monitoring regulations require certain summary data to be computed and reported regularly to EPA.

B10.7 Data analysis

The AQP will implement the data summary and analysis requirements contained in appendix A to 40 CFR Part 58. Single analyzer accuracy (based on performance audits), single analyzer precision (precision check data) and data completeness will be tracked and reported for the monitoring network.

B10.8 Data flagging

The AQP will flag a data value that: (a) did not produce a numeric result, (b) produced a numeric result but is qualified in some respect related to the type or validity of the result, or (c) produced a numeric result but for administrative reasons is not to be reported. Qualifiers will be used in the free form notes area of field to signify samples that may be suspect due to contamination, special events, or failure of QC limits. Qualifiers can also be used to determine if reported gaseous, meteorological and/or visibility reported values are of suspect due to contamination, special/exceptional events, or failure of QA/QC limits. In all cases, the sample or reported data values will be thoroughly reviewed prior to any invalidation. The AQP will keep a record of the flags on the appropriate forms and/or logbooks that result in data invalidation. Null data codes will be generated for invalid data as they are entered into the AQS database.

B10.9 Data storage and retrieval

Duplicate data electronic copies are stored and backed up on the SUIT central server consistent with appendix G.

GROUP C ASSESSMENT/OVERSIGHT

C1 Assessments and Response Actions

A network review will be performed at least every year for each monitoring station. Based on the network review, adjustments to the monitoring network shall be made. Performance audits will be performed as outlined in Section B5. Audit results will be used to evaluate the performance of field staff in maintaining the monitoring network within the quality control goals of the program.

Listed below are the Tribe's expectations regarding the roles of the auditors, AQP staff, and the QA Manager (who is the Air Quality Program Manager or their delegate):

a. A performance audit should be conducted only if calibration data are available for the analyzers or samplers being audited.
b. A performance audit should be conducted only if the site or operator or representative is present, unless written permission is given to the auditor before the audit.
c. Before the audit, a general procedures protocol including the audit policy and special instructions from the auditor should be provided to the Southern Ute Indian Tribe Air Quality Program.
d. A signed acknowledgment that the audit has been completed should be obtained from the station operator.
e. The auditor should discuss the audit results with the site operator or representative at the conclusion of the audit. A form showing the audit concentrations, station responses, and other pertinent data recorded by the auditor should be given to the site operator or representative; the form must indicate that the results are not official until

the final report is issued. If the site operator or representative is not on-site at the conclusion of the audit, the auditor should contact the AQP before leaving the area or property when returning to the base of operations.

A corrective action request should be made whenever anyone in the reporting organization notes a problem that demands either immediate or long-term action to correct a safety defect, an operational problem, or a failure to comply with procedures. A separate audit finding response form should be used for each problem identified. The corrective action report form is designed as a closed-loop system.

First, it identifies the originator; the person who reports and identifies the problem states the problem and may suggest a solution/recommendation. The form then directs the request to a specific person (or persons) (i.e., the recipient in the AQP, who would be best qualified to "fix" the problem). Finally, the form closes the loop by requiring that the AQP state how the problem was resolved and the effectiveness of the solution. The form is signed, and a copy is returned to the originator and other copies are sent to the QA Manager and the applicable files for the record.

If the AQP has written comments or questions concerning the audit report, the auditor should review and incorporate them as appropriate, and subsequently prepare and resubmit a report in final form within thirty (30) days of receipt of the written comments. Copies of this report should be sent to the AQP for internal distribution. The transmittal letter for the amended report should indicate official distribution and again draw attention to the agreed-upon schedule for corrective action implementation.

The EPA Project Officer, Unit Chief, Air Permitting, Monitoring, and Modeling Unit may conduct an audit on the environmental data collection activities conducted by the AQP. All additional QA practices/activities associated with external auditing procedures and/or additional QA/QC procedures conducted by contractors or subcontractors will be the responsibility of the AQP.

As per requirements of 40 CFR Part 58.15, the program shall submit to the EPA Regional Administrator an annual air monitoring data certification letter to certify data each year that covers the previous calendar year. The certification letter shall be accompanied by three AQS summary reports (AMP450 and AMP255, and AMP450NC) and addressed to the EPA Regional Administrator. Then, the Regional Administrator must confirm completeness of certification package and send the package to EPA OAQPS Data Certification Contact for certification.

C2 Reports to Management

This section describes the quality-related reports and communications to management necessary to support network operations and the associated data acquisition, validation, assessment, and reporting. Periodic assessments of data quality are required to be reported to the EPA. This is done through semi-annual and annual reports. These reports will be submitted to the EPA Region VIII Tribal Program Manager as indicated in section A8 of this QAPP. The reports also provide for the review of the air quality surveillance system on an annual basis to determine if the system meets the monitoring objectives defined in appendix D to 40 CFR Part 58. Such review will identify needed modifications to the network such as termination or relocation of unnecessary stations or establishment of stations that are necessary.

The reports will include information for each ambient air pollutant in the Air Quality Program monitoring network.

GROUP D DATA VALIDATION AND USABILITY

D1 Data Review, Validation, and Verification Requirements

D1.1 Continuous Gas Monitors

Continuous gas monitors, the T640 and the T640x will be calibrated as outlined in section B7 of this QAPP. Calibrations followed by multi-point calibration checks, flow rate, auxiliary parameters and audit data will be used to provide an accuracy assessment of the pollutant gas data collected.

Precision and accuracy criteria given in appendix A to 40 CFR Part 58 will be followed. The application and definitions of the program criteria are given in section B5.1 of this QAPP. Data collected during periods when system response indicates precision and bias goals (Table 2 and Appendix H) have been achieved will be considered valid.

D1.2 Direct Methane and Non-Methane Hydrocarbon Analyzer

Thermos Scientific 55i monitors are calibrated as outlined in section B7 of this QAPP. Span and precision checks, regular calibration, auxiliary parameters, and audit data will be used to provide an accuracy assessment of the data collected. Precision and accuracy criteria given in appendix A to 40 CFR Part 58 will be followed. The application and definitions of the program criteria are given in section B5.1 of this QAPP. Data collected during periods when system response indicates precision and bias goals (Table 2 and Appendix H) have been achieved will be considered valid.

D1.3 Continuous Visibility Monitor

The visibility monitor will be calibrated as outlined in Section B7.2 of this document. Full calibration procedures and audit data will be used to provide an accuracy assessment of the visibility data collected. The data collected during periods when the system response indicates precision and accuracy goals (Table 3 and Section B5.4) have been achieved will be considered valid.

D1.4 Meteorological Instruments

All meteorological instruments will be calibrated as outlined in Section B7.3 of this document. The calibration procedures, parameters, and all associated information will be recorded in the site logbook and instrument maintenance log sheets shown in Appendix D to this QAPP. Meteorological data that is collected during periods when the system response indicates precision and accuracy goals (Table 4 and Section B5.3) have been achieved will be considered valid.

D2 Validation and Verification Methods

Data verification is conducted by checking that the SOPs were followed and that QC limits were met. One of the major objectives for the AQP is for comparison to the NAAQS and therefore, this is identified as the intended use. This section will describe the verification and validation activities that occur at a number of the important data collection phases. Earlier elements of this QAPP describe in detail how the activities in these data collection phases are implemented to meet the Data Quality Objectives

(DQOs) of the AQP. Review and approval of this QAPP by the personnel listed on the approval page provide initial agreement that the processes described in the QAPP, if implemented, will provide data of adequate quality. In order to verify and validate the phases of the data collection operation, the AQP uses qualitative assessments (e.g., technical systems audits, network reviews) to verify that this QAPP is being followed, and relies on the various quality control samples, inserted at various phases of the data collection operation, to validate that the data will meet the DQOs.

D2.1 Data Collection/Quality Control Procedures

The Air Quality Technician will be the first to validate and verify the data. Visual review of raw data will be performed to identify atypical or suspect data values that warrant further investigations and these values will be flagged. The review of QC data such as the precision/bias data, audits (accuracy data), and equipment verification checks that are described in Section B5 are used to verify that the data meet the objectives. The Air Quality Technician will also use the data validation templates provided in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II (Final Draft-August 2008). These data validation templates contain the list of criterion for criteria pollutants that must be met to ensure the quality of the data and are found in appendix H of this QAPP. Also, the Air Quality Analyst will review the appropriate logs/forms, AV-Trend, Air Vision, and quality control charts to determine the following:

- Is the suspect value due to instrument failure?
- Is the suspect value a result of atypical instrument response during QC checks, maintenance, or repair?
- Is the suspect value a result of improper data collection or handling?
- Is the suspect value a result of data transmittal error?
- Is the suspect value a result of an exceptional event?
- Does collected data meet precision, accuracy and bias goals?

The Air Quality Technician will document any evidence in support of or against the occurrence of any of the above using the station logbook, located in the AirVision software. The Air Quality Technician will make a recommendation based on the evidence and present data to the Air Quality Analyst for review.

The Air Quality Technician will review all data values. Non-flagged values will be reviewed for suspect values that may have been overlooked. The Air Quality Technician will flag these values for further investigation. Values passing the Air Quality Analyst's review will be deemed valid. Flagged values will be reviewed and either invalidated or validated based upon the supporting evidence or flagged by the Air Quality Technician for further investigation. The Air Quality Analyst will investigate and review any new supporting evidence and make a validity determination. If a value remains suspect, the Air Quality Analyst will present the data and evidence to the Air Quality Program Manager, who is the QA Manager, or their delegate, for review, recommendation, and final validity determination on the questionable data.

Data can be invalidated for the following reasons:

- Data value is due to instrument malfunction.
- Data value is due to Z/S/P or calibration procedures.

- Data value is lost or damaged during transmission from the Agilaire datalogger to the AQ laptop.
- Data value is due to maintenance/routine repairs.

Validation of QC procedures will also require a review of the documentation of the corrective actions that were taken when QC samples failed to meet the acceptance criteria, and the potential effect of the corrective actions on the validity of the routine data. Section B5 of this QAPP describes the techniques used to document QC review/corrective action activities.

D2.2 Data Reduction and Processing

As part of the quality assurance practices associated with data quality, discussed in section B.10 of this QAPP, all parameter will be investigated in a station trend analysis every month prior to data validation procedures and submittal to AQS using AirVision by the Air Quality Analyst. An example of an investigation would include review of verifications/calibration records, QC documentations for the parameter or parameters in question, and instrument specific auxiliary parameters such as sample flow rate, analog output, converter efficiency, UV lamp voltage, and reaction cell temperature. All raw data files associated with these records, including the following are reviewed:

- Sampling information
- Calibration - the calibration information that is relevant to that sampling period
- Sample handling/custody
- Corrective action
- Data reduction

All raw data that is manually entered on data sheets will be independently verified by the Air Quality Analyst and the Air Quality Program Manager as discussed in Section B10, prior to final submittal to the AQS database. The entries are compared to reduce the possibility of entry and transcription errors. Once the data is entered into AQS, the system will review the data for routine data outliers and data outside of acceptance criteria. These data are flagged appropriately. All flagged data are re-verified that the values are entered correctly. Details of these activities are discussed in Section B10 and the AQS Data Submittal SOP (Appendix E). The following QC functions are incorporated into the Agilaire datalogger and AQS Database to ensure quality of data entry and data processing operations:

- Range Checks - all monitored parameters have simple range checks programmed either in Agilaire datalogger or the analyzers. For example, valid times must be between 00:00 and 23:59, summer temperatures must be between 10°C and 50°C, etc. The data entry operator is responsible for noting when an entry is out of range. The operator has the option of correcting the entry or overriding the range limit. The specific values used for range checks may vary depending on season and other factors.
- Completeness Checks – during processing the Agilaire datalogger completeness certain criteria checks. For example, each data point must have a start time, an end time, an average flow rate, dates, and operator and technician names. The data entry operator is notified if an incomplete record has been entered before the record is considered valid and can be included in any report.

- Internal Consistency and Other Reasonableness Checks - Several other internal consistency checks are made by the Air Quality Technician and Air Quality Analyst reviewing the data. For example, the end time of a data set must be greater than the start time. Additional consistency and other checks are implemented as the result of problems encountered during data validation.
- Data Retention - Raw data sheets are retained on file in the AQP Office for a minimum of five years and are readily available for audits and data verification activities. After five years, the AQP staff will follow the filing protocol detailed in Appendix G of this QAPP.

Validated data surpassing all quality assurance criteria will be converted electronically into the AQS format. The data will then be submitted to the AQS database by the AQP.

D3 Reconciliation with Data Quality Objectives

The Measurement Quality Objectives (MQOs) are listed in Tables 2, 4, 5, and 6 of this QAPP.

Possible questions that can be considered during this "Reconciliation with Data Quality Objectives" process include:

- Were the NAAQS exceeded?
- Were all QA/QC check completed?
- Were all Quarterly audits conducted?

The AQP air monitoring program's purpose for ambient air data collection is to protect the health and welfare of all residents within the Reservation's airshed by collecting reliable ambient air monitoring data that is quality assured in accordance with this QAPP. The AQP will extend the quality assurance through the development of station trend reports. The annual station trend reports will compare current emissions inventory data with AQS certified ambient air monitoring data from the regional area.

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