

SOUTHERN UTE INDIAN TRIBE AIR QUALITY PROGRAM ANNUAL NETWORK REVIEW CY2023



Prepared For:

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

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1.0 Introduction

The purpose of this document is to provide information concerning the operation of the ambient air monitoring network by the Southern Ute Indian Tribe's (SUIT) Air Quality Program (AQP) in calendar Year 2023.

In October 2006, US EPA issued final regulations concerning state and local agency ambient air monitoring networks. Under 40 CFR, Part 58, Subpart B, states and applicable tribes are required to submit an annual monitoring network review to the Environmental Protection Agency (EPA) regional office. This network review is required to provide the framework for establishment and maintenance of an air quality surveillance system. This network plan is required to list any changes that are proposed to take place to the current network during the following year. The annual monitoring network review must be made available for public inspection for at least 30 days prior to submission to EPA.

1.1 Overview

Located in southwestern Colorado, the SUIT AQP regulates air quality through implementation of Clean Air Act programs to protect public health and the environment on the Southern Ute Indian Reservation. Air monitoring data are used (1) to determine compliance with U.S. EPA's National Ambient Air Quality Standards (NAAQS) and (2) for generation of real-time EPA Air Quality Index (AQI) air quality forecasts and public health notifications, (3) identification of localized air quality related health risk concerns, and (4) tracking long-term trends in air quality.

1.2 Personnel

In 2022, all air quality monitoring activities were conducted by the Tribe's Environmental Programs Division – AQP staff. Mr. Danny Powers, the Air Quality Program Manager, directs and provides managerial direction to the program. The Air Quality Technical Manager, Dr. John Volkerding, provides technical direction and verifies data quality. Mr. Jacob Henry implements the day-to-day activities of the program as the Air Quality Technician.

1.3 Overview of Monitored Parameters – Criteria Pollutants

Nitrogen Dioxide (NO₂)

NO₂ is a reddish brown gas that is a respiratory irritant that causes eye and sinus irritation. It is created primarily from fuel combustion from industrial sources and vehicles. It can react in the atmosphere to form nitrate aerosols that block sunlight and reduce visibility. Of most interest to the AQP, NO₂ is a precursor pollutant in the photochemical reaction between nitrogen oxides and volatile organic compounds (VOCs)

and sunlight which is responsible for ground-level ozone formation. Monitoring of this pollutant could help the AQP estimate the influence of anthropogenic NO₂ emissions in the formation of ozone on the Reservation

Carbon Monoxide (CO)

CO is a colorless, odorless, and tasteless gas that is created primarily from incomplete fuel combustion and plays a small role in the formation of ground-level ozone. It is toxic to humans and animals as it readily attaches to hemoglobin in red blood cells that normally carry oxygen. Exposure to high levels of CO can be deadly. Exposure to low concentrations of CO can result in headaches, nausea, confusion, disorientation, syncope (fainting), and seizures.

Ozone (O₃)

Ground-level O₃, a constituent of photochemical smog, is not emitted into the atmosphere directly, but rather is formed by the reactions of other pollutants. The primary precursor pollutants involved in this reaction are VOCs and oxides of nitrogen. These precursors form O₃ in the presence of sunlight. O₃ is a strong irritant of the upper respiratory system and causes damage to crops. Ozone is a pollutant of concern on the Reservation, as historically, O₃ concentrations on the Reservation have been relatively near the 2015 ozone NAAQS of 70 parts per billion (ppb)

Sulfur Dioxide (SO₂)

SO₂ is a gaseous pollutant that is emitted primarily by industrial furnaces or power plants burning coal or oil containing sulfur. At high concentrations, breathing can be impaired. Damage to vegetation can also result.

Fine Particulate Matter (PM_{2.5})

Fine particulate matter with a diameter of 2.5 microns or less (PM 2.5) is created primarily from industrial processes and fuel combustion. These particles can travel deep into the lungs. Exposure to particle pollution is linked to a variety of significant health problems ranging from aggravated asthma to premature death in people with heart and lung disease. Particulate matter 2.5 is of particular concern and interest of the AQP, due to the frequent occurrence of high PM 2.5 concentrations during local and regional forest fire events and dust storms.

Particulate Matter (PM10)

Particulate matter with a diameter of 10 microns or less (PM 10) is emitted from mechanical processes in transportation and industrial sources. Dust storms and fires generate a significant number of particulates. Exposure PM₁₀ can induce tissue damage, and lung inflammation. Particulate matter 10 is also of great concern and interest of the AQP, due to the frequent occurrence of high PM 10 concentrations during local and regional forest fire events and dust storms.

Methane (CH4) and Non-Methane Hydrocarbons (NMHCs)

Although it is not an EPA NAAQS criteria pollutant, methane is of significant concern to the SUIT's air quality program. Due to the nature of the oil and gas industry within the region, elevated concentrations of methane have been observed within the tribal boundaries. The AQP therefore monitors CH4 and

NMHCs to establish trends and investigate the influence of the regional oil and gas production activities production. Non-methane hydrocarbons are also ozone precursors.

2.0 Monitoring Objectives

The monitoring program has been designed to respond to the needs of the Reservation, while adhering to strict EPA specifications and regulations. Monitoring is conducted to:

- Continuously collect ambient air pollutant and meteorological according to the quality assurance requirements of the Code of Federal Regulations, particularly, but not limited, to appendix A in 40 CFR Part 58.
- Submit all quality assurance reviewed data to the EPA Air Quality Systems database for use by the federal agencies, the State of Colorado, the Tribe or other outside agencies for air quality studies and air quality planning.
- Demonstrate compliance with the National Ambient Air Quality Standards (NAAQS).
- Help protect the health and welfare of all residents within the exterior boundaries of the Southern Ute Indian Reservation through population of real-time air pollution monitoring data and corresponding EPA Air Quality Index (AQI) health alerts on the Tribe's website.
- Identify localized health concerns and track long-term trends in air quality.

Although the reservation does not meet the requirement of a Metropolitan Statistical Area with a population greater than 350,000 in 40 CFR Part 58.50 AQI requirements, the AQP participates in AirNow. Data obtained from all 3 monitoring stations is uploaded and is viewable online for public access of the Air Quality Index on the reservation.

3.0 Air Monitoring Network

The SUIT has established three monitoring stations. Ute 1 is located in the town of Ignacio, Ute 3 is located on the central-western portion of the Reservation near Bondad, and the Mobile Monitoring Station (MMS) is currently located toward the northeastern corner of the Reservation, near Lake Capote. The SUIT AQP monitors five of the six NAAQS criteria pollutants: NO₂, O₃, particulate matter (PM₁₀ and PM_{2.5}), CO, and SO₂. (Table 1.) The tribe does not monitor Lead as the reservation currently does not meet the criteria for monitoring this pollutant. Meteorological (MET) parameters are obtained at all three of the monitoring stations.



Figure 1 - Map of Southern Ute Reservation with Location of Air Monitoring Stations

All three monitoring stations are fully equipped with an Agilaire 8872 data acquisition system connected to the gaseous analyzers, PM instruments, MET tower sensors, and other diagnostic sensors. Gas analyzers are challenged regularly during automated calibration events that make use of Teledyne T700 calibrators, T701 Zero Air Generators, and NIST traceable calibration gas cylinders with known concentrations of each species. Continuous data for all parameters is recorded locally at each individual station and centrally on

a main server located in Ignacio, CO. All historical data is stored on the central server and can be retrieved at will. This type of set-up has enabled the AQP to collect data with increased accuracy and precision and has reduced errors and system faults as they are now identified and corrected with minimal downtime.

The air monitoring data are used as a basis to improve environmental decision making and to further the understanding of the local air resources. These data also broaden awareness of air quality issues within the region.

The NetAssess2020 app, which was developed by the EPA's Office of Air Quality Planning and Standards (<u>https://sti-r-shiny.shinyapps.io/EPA_Network_Assessment/</u>), is used to determine the demographics and area served for each of the three SLAMS. This data is in each station's respective section and Appendix A.

SUIT Site Designa- tion	EPA- AQS Number	Street Address	Geographic Coordinates	Air Pollutants	Planned Additional Air Pollutants for CY2023
Ute 1	08-067- 7001	1 MI. NE of Ignacio, County RD. 517. Ignacio, CO 81137	37.13678, - 107.62863	NOx, O3 CO, PM2.5, PM10	N/A
Ute 3	08-067- 7003	7571 Hwy. 550. Ignacio, CO 81137	37.10258, - 107.870219	NOx, O3, CO, PM2.5, PM10, CH4/NMHC, Visibility	N/A
MMS	08-007- 7004	398 CO-151, Pagosa Springs, CO 81147	37.205717, - 107.254234	NOx, O3, SO2, CH4/NMHC	N/A

Table 1. SLAM Site Identification

3.1. Ute 1 (Ignacio) Air Monitoring Station

Ute 1 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 (Figure 1).

The Ute 1 station meets all siting criteria for an urban SLAMS. The Ute 1 station (Figure 2) is likely to be most affected by local activities such as vehicle traffic, on-going building and road construction, and winter residential wood and coal burning. Residential burning and traffic are the most influential local sources that directly impact the air quality around the Ignacio community.

Ute 1 serves a population of 5,575 and an area of 204 mi² (528km²) for NO₂. O₃, CO, and PM2.5. Demographics of this area are in Appendix A.

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. All criteria air pollutants currently measured at the monitoring station are listed in **Table 2** and have remained below the current NAAQS.



Figure 2 - Northeastern view of the Ute 1 station

Table 2. Ute 1 FY2022 measured ambient concentrations in comparison to the NAAQS

Instrument Type	Reference Method	Parameter	NAAQS	FY2022 Concentrations *
Thorres 42		NO	53 ppb (annual)	4 ppb
I nermo 421	EQUA-0880-047	NO ₂	100 ppb (1-hour)	19 ppb
The array of 40:	RFCA-0981-054	60	9 ppm (8-hour)	0.4 ppm
1 nermo 421		0	35 ppm (1-hour)	1 ppm
Thermo 49i	EQOA-0880-047	O ₃	0.070 ppm (8-hour)	0.067 ppm
Teledyne	EODM 0516 226	PM2.5	15 ug/m³ (Annual)	4.5 ug/m ³
T640	EQP1NI-0516-236		35 ug/m ³ (24-hour)	18.8 ug/m ³

*Calculated values for Fiscal Year 2022 (i.e. October 1 2021 to June 30, 2022)

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The Ute 1 monitoring station continues to collect meteorological data for the following parameters: solar radiation, wind speed, wind direction, ambient temperature, humidity, and precipitation. All the meteorological instruments, except for the precipitation gauge, are located on the 30-foot tilt-over aluminum met tower. The peripherals of the meteorological instruments are housed in a weather-resistant, surge protected enclosure box affixed to the base of the tower (**Figure 3**).



Figure 3 – Ute 1 Meteorological tower and weather resistant, surge protected enclosure box (left). The thirty-foot meteorological tower (right).

The monitoring station is adequately sited and has a long history of collecting monitoring data. With the Tribe's casino development and cultural museum that were completed in 2008 and 2011, respectively, the Ute 1 monitoring station has collected useful data representing traffic congestion and construction activities. The casino and cultural museum are located less than 1/2 mile west of the Ute 1 monitoring station. The AQP continues to use data from this monitoring station to analyze the air quality relative to the other two stations to understand differences in air quality that occur across the Reservation's airshed. PM pollution from wildfires across the Western United States and dust storms are becoming increasingly prevalent. In order to help inform residents of Ignacio (the most concentrated population within the SUIT Reservation) of dangerous air pollution during these events, the AQP has added a Teledyne T640 to the Ute 1 monitoring station. The AQP will make non-regulatory measurements of PM_{2.5} and PM₁₀ with this instrument to help inform individual decision making that will lead to reduced PM exposure in the region.

3.1.1 2023 Recommendations for Ute 1

The Teledyne T640 is a Federal Equivalent Method (FEM) for PM_{2.5} and while it does report PM10 readings it is not a FEM for PM10 and the AQP will evaluate whether changes should be made to bring the station to FEM for PM10.

3.2. Ute 3 (Bondad) Monitoring Station

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 (Figure 1.). 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.



Figure 4 - Northern view of Ute 3 monitoring station

Ute 3 serves a population of 46,774 and an area of 3,743 mi² (9,694 km²) for NO₂. Although Ute 3 does not serve Ignacio, CO, due to the scarcity of SLAMS in western Colorado, the EPA's NetAssess2020 app includes Durango and the area north of it as the area served (Appendix A).

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 (**Figure 4**).

A PM_{2.5}/PM₁₀ FEM monitor is located at Ute 3. The AQP continues to make non-regulatory measurements of PM_{2.5} and PM₁₀ with this instrument to help inform individual decision making that will lead to reduced PM exposure in the region from wildfires and dust storms.

Given the proximity to oil and gas operations, a Thermo Scientific 55i methane (CH4) and non-methane hydrocarbon (NMHC) monitor is operated at Ute 3. During CY 2022, the CH4/NMHC monitor had an approximately 30% data completeness rate which is less than the EPA's 75% rate goal.

All meteorological parameters and criteria air pollutants currently measured at this monitoring station are listed in **Table 3** and have remained below the current NAAQS.

Instrument Type	Reference Method	Parameter	NAAQS	FY 2022 Concentrations *
Thormo 42i	FOOA .0880.047	NO	53 ppb (annual)	4 ppb
11101110 421	EQOA-0000-047	1102	100 ppb (1-hour)	25 ppb
Thormo 42i	REC & 0981 054	CO	9 ppm (8-hour)	0.3 ppm
111011110 421	KI*CA-0901-004		35 ppm (1-hour)	0.5 ppm
Thermo 49i	EQOA-0880-047	O3	0.070 ppm (8-hour)	0.066 ppm
Thermo 55i		CH4/NMHC		6.7/0.6 ppm
Teledyne		PM2.5	15 μg/m³ (Annual)	4.9 μg/m ³
T640x	EQPM-0516-236		35 μg/m³ (24-Hour)	12.8 µg/m³
Teledyne EQPM-0516-239 PM10		150 μg/m ³ (24-Hour	93.5 μg/m³	
Ecotech Aurora Nephelometer		Visibility in Miles		97 miles

Table 3. Ute 3 FY2022 measured ambient concentrations in comparison to the NAAQS

*Calculated values for Fiscal Year 2022 (i.e. October 1 2021 to June 30, 2022)

3.2.2 2023 Recommendations for Ute 3

The equipment issues in the Thermo Scientific 55i instrument that affected the capture of CH4/NMHC data will be corrected to improve data capture percentage to meet the EPA's 75% requirement. In the short term this will be accomplished by re-locating the Thermo Scientific 55i from the Lake Capote (MMS) monitoring station while the monitor undergoes trouble shooting.

3.3. Lake Capote (MMS) Monitoring Station



Figure 5 - Mobile Monitoring Station

The Mobile Monitoring Station (MMS) is located on the northeastern portion of the Reservation near Lake Capote (Figure 1). It is further removed from the oil and gas development 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 (Figure 5) is located within a locked perimeter fence and the area is regularly patrolled by tribal rangers as well as visited weekly by ambient air quality monitoring program staff.

The current location of the MMS meets all siting criteria for an urban SLAMS. The MMS is located on the least populated area of the reservation yet serves a population of 78,080 and an area of 15,023 mi² (38,910 km²) for NO₂. Due to the scarcity of SLAMS in western Colorado, the EPA's NetAssess2020 app includes Pagosa Springs, Alamosa, and some parts of Northern New Mexico and the Jicarilla Apache Nation Reservation within the area served. A map containing the boundaries and demographics of this area are in Appendix A.

The purpose of the Mobile Monitoring Station (MMS) has been to assess pre-oil and gas development and ambient air quality conditions in the eastern portion of the Reservation. After completing a three-year back-ground monitoring campaign, the MMS has remained "stationed" at its current location at Lake Capote but may be periodically moved for special purpose monitoring projects or source surveillance.

The MMS includes a sulfur dioxide (SO₂) monitor; however, the three year background study has shown minimal SO2.

The Mobile Monitoring Station continues to collect meteorological data for the following parameters: wind speed, wind direction, ambient temperature, and humidity. All the meteorological sensors are located on an aluminum tower affixed to the station roof. All criteria air pollutants currently measured at the monitoring are listed in **Table 4** and have remained below the current NAAQS.

Instrument Type	Reference Method	Parameter	NAAQS	FY2 Concent	2022 rations *
Thermo 42i	EQQA 0880 047 NO		53 ppb (annual)	2	ppb
	LQOA-0000-047	1102	100 ppb (1-hour)	17	ppb
Thermo 43i	RFCA-0981-054	SO ₂	75 ppb (1-hour)	12.5	ppb
Thermo 49i	EQOA-0880-047	O ₃	0.070 ppm (8-hour)	0.067	ppm
Thermo 55i		CH4 / NMHC		2.7 / 0.1	ppm

Table 4.	MMS FY2022	? measured	ambient	concentrations	in com	varison t	to the	NAAOS.
10000 10						p	0 0000	

*Calculated values for Fiscal Year 2022 (i.e. October 1 2021 to June 30, 2022)

3.3.1 2023 Recommendations for MMS

After a successful 3-year monitoring campaign, Tribal leadership has suggested relocating the MMS to another site on the reservation. Because the MMS is a non-regulatory SLAM, relocation will not adversely affect the monitoring network and its commitments to the workplan. Viable sites are currently being surveyed and are expected to be finalized by the end of FY2023.

The Thermo Scientific 55i will need to be re-located to the Ute 3 monitoring station, at least in the short term, to improve the data completeness to meet EPA's 75% requirement at that location. The 3-year back-ground monitoring study has provided adequate data to evaluate the pre-oil and gas development ambient air quality conditions in the eastern area of the reservation. Continued real-time methane and NMHC monitoring is of greater importance in the area closer to oil and gas activity served by Ute 3.

The Thermo Scientific 43i has provided background SO2 data showing the ambient concentration is far below the ambient air standard of 75 ppb and the monitor should be retired from service to allow resources for any new and upcoming monitoring needs.

4.0 Quality Assurance

Continuous Monitors

The Air Quality staff regularly assesses gaseous analyzer automated performance checks including: Zero, Span, and Precision checks. Calibrations are performed as needed or once per quarter to maintain accuracy, precision, and bias goals defined in the AQP's Quality Assurance Project Plan. During these internal audits and checks, gas analyzers are challenged with NIST-certified gas cylinders containing known concentrations of the applicable pollutant gases, diluted with zero air using mass flow controllers. Every quarter, a third-party contractor performs system audits on all the gaseous analyzers and PM instruments.

The EPA's National Performance Audit Program (NPAP) is one of the major components in the quality assurance of the Nation's air monitoring program. Annually the EPA performs a NPAP audit at one the ambient air monitoring stations. The most recent was conducted at Ute 3 on September 20, 2022 with the facility passing.

Particulate Monitors

Verification checks of the continuous particulate monitors have occurred semi-annually by a 3rd party contractor and consist of calibrated flow rate checks, as well as temperature, pressure, leak rate and flow rate verification checks. The AQP has purchased new calibration equipment, specifically a Teledyne T701 Zero Air Generator and a Teledyne API 700 Dynamic Dilution Calibrator, which allow internally performed monthly checks starting in FY23.

Meteorological Monitors

Semi-annual calibrations and audit checks are performed by a 3rd party contractor on the meteorological equipment to determine proper alignment and operation of the sensors. The details and minimum standards for this program are set out in the Code of Federal Regulations (Part 58 Ambient Air Quality Surveillance).

The AQP always attempts to go above and beyond the minimum requirements. A complete description of these procedures is available in the SUIT AQP Quality Assurance Project Plan (QAPP) and the results are available from the AQP or through the national EPA AQS database. The QAPP is available on the AQP website at https://www.southernute-nsn.gov/justice-and-regulatory/epd/air-quality/ambient-monitoring/

EPA Technical System Audits

The U.S. EPA Region VIII performs a Technical Systems audit on the Southern Ute Indian Tribe's Air Monitoring Network every three years. The most recent was in September 2022. The Southern Ute Air Quality Program will conduct an internal systems audit every year that is not audited by the U.S. EPA. AQP staff conducts quality control checks at least once per week, and calibrations once every calendar quarter. The details and minimum standards for this program are set out in the Code of Federal Regulations (Part 58 Ambient Air Quality Surveillance).

5.0 Summary

The Southern Ute Reservation is located primarily within La Plata County with approximately 30% of the land located within Archuleta County. According to Colorado Oil and Gas Conservation Commission (COGCC), for calendar year 2021(CY21) the number of oil and gas wells located within Archuleta County was approximately 141 wells with an oil production totaling 805 barrels and 20.8 BCF of gas production. The number of oil and gas wells within La Plata County for CY21 was approximately 3,143 wells with an oil and gas production totaling 10,437 barrels and 199.35 BCF, respectively (COGCC).

Per the SUIT Air Quality Program data, of the combined 3,284 wells in both counties, approximately 78% (2,614 active production) are located within the Reservation boundaries. Considering the large quantity of oil and gas wells in production within the Reservation boundaries and the operation of the SUIT AQP's air permitting programs, the AQP plans to continue operating the three air monitoring stations. The Air Quality Program has also incorporated two non-regulatory Purple Air PM sensors in the network to aid in research and further community outreach.

6.0 Final Comments

The Tribe's AQP has reviewed the ambient air quality data within the AQP monitoring network and compared those findings to other ambient air quality data generated from other monitoring stations operated by other agencies within the Four Corners area (Appendix B). The gaseous pollutant data for ozone, carbon monoxide and nitrogen oxides as well as monitoring practices from both monitoring sites, Ute 1, Ute 3, and MMS were examined in detail. The AQP has determined that all data pertaining to the AQP monitoring network for the 2022 fiscal year meets all QA requirements for AQS, the AQP 2022 QAPP, and tribal standard operating procedures. All the data correlates well with other agencies' monitoring stations in southwestern Colorado and northeastern New Mexico that use similar sampling methodologies and have similar oil/gas operations.

A draft of this document was made available to the public in December of 2022, at <u>www.</u> <u>https://www.southernute-nsn.gov/justice-and-regulatory/epd/air-quality/ambient-monitoring/</u>. Any comments pertaining to this document should be sent to the following contacts:

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Appendix A: Demographics and Areas Served by the SUIT Network

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Area Served for sulfur dioxide:	
MMS Sulfur Dioxide Monitoring Demographics:	

Ozone

Areas Served for ozone:



Ute 1 Ozone Monitoring Demographics:



Ute 3 Ozone Monitoring Demographics:



Demographics for Area Served by AQS Site ID = Site 08-067-7001

MMS Ozone Monitoring Demographics:



Demographics for Area Served by AQS Site ID = Site 08-007-7004

Nitrogen Dioxide

Areas Served for nitrogen dioxide:



Ute 1 Nitrogen Dioxide Monitoring Demographics:



Ute 3 Nitrogen Dioxide Monitoring Demographics:



Demographics for Area Served by AQS Site ID = Site 08-067-7001

MMS Nitrogen Dioxide Monitoring Demographics:



Particulate Matter

Area Served for PM_{2.5}:







Demographics for Area Served by AQS Site ID = Site 08-067-7001





Demographics for Area Served by AQS Site ID = Site 08-067-7003

Carbon Monoxide

Area Served for carbon monoxide:







Demographics for Area Served by AQS Site ID = Site 08-067-7003

Sulfur Dioxide

Area Served for sulfur dioxide:





MMS Sulfur Dioxide Monitoring Demographics:

Appendix B FY2022 Air Monitoring Data and Regional NAAQS Comparison.













Appendix C 2022 Equipment List - Southern Ute Indian Tribe Air Monitoring Stations.

Parameter	Reference Method
NO NO ₂ NOx	<u>Thermo</u> Model 42 <i>i</i> RFNA-1289-074
со	<u>Thermo</u> Model 48C RFCA-0981-054
СО	<u>Thermo</u> Model 48C RFCA-0981-054
O ₃	<u>Thermo</u> Model 49 <i>i</i> EQOA-0880-047
SO ₂	<u>Thermo</u> Model 43 <i>i</i> EQSA-0276-009
Methane and NMHC	<u>Thermo</u> Model 55i

Gas Analyzers

PM Instruments

Parameter	Reference Method			
PM ₁₀	Teledyne API T640x			
	(16.71 L/min) EQPM-0516-239			
PM _{2.5}	Teledyne API T640x			
	(16.71L/min) EQPM-0516-238			
PM _{2.5 LC}	Teledyne API T640 (operational November 2021)			
	(5L/min) EQPM-0516-236			

Calibration Equipment

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

Meteorological Equipment:

Parameter	Sensor	Manufacturer
Temperature	Fan aspirated radiation shield,	RM Young
remperature	Model 8152	
Wind Speed and	Wind Monitor-AQ, Model 05305	RM Young
Direction		
Precipitation	Tipping Bucket Rain Gauge, Model 52202	RM Young
Solar Radiation	Silicon cell pyranometer	Li-Cor
	Model LI-200RSMV-15	
Relative Humidity	Capacitive sensor	Vaisala
	Model: HUMICAP 180	

Meteorological verification equipment:

Parameter	Sensor	Manufacturer
Temperature	Traceable Digital Thermometer	Fluke
remperature	Model 51 Series II	
Wind Speed and Direction	Anemometer Drive, Model 18801	RM Young
	Torque Disc, Model 18310	
	Vane Angle Fixture, Model 18212	
	Vane Torque Gauge, Model 18331	
	Vane Angle Bench Stand, Model 18112	
	Vane Alignment Rod, Model 18301	
Precipitation	Calibration bottle, Model 260-2595	Nova Lynx
Solar Radiation	Pyranometer verifier	Li-Cor
	Model LI-200SA	
Relative Humidity	Digital Sling Psychrometer	Mannix
	Model SAM 990D	

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