QUALITY ASSURANCE PROJECT PLAN

Ambient Air Monitoring Program for Measuring PM10

Using an Automated Tapered Element Oscillating Microbalance (TEOM 1405)

BISHOP PAIUTE TRIBE

ENVIRONMENTAL MANAGEMENT OFFICE

AIR QUALITY PROGRAM

2021 Revision

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ACKNOWLEDGEMENTS

This document is a revision of the 2017 Revision QAPP.

We would like to express our appreciation to a number of people who provided assistance with previous drafts of this QAPP. Dr. Toni Richards composed both the 2008 and 2013 versions of this QAPP and has provided invaluable training and advisory. The staff of the Great Basin Air Pollution Control District (GBUAPCD) helped with a number of aspects. Chris Lanane and Mike Horn carefully reviewed drafts and provided detailed comments and helpful suggestions. Scott Weaver (former GBUAPCD) has provided much assistance to improve and maintain the quality of monitor operation and data quality. They also provided many hours of technical support, answering detailed questions about calibration. We also want to thank Melinda Ronca-Battista from US EPA, the Institute for Tribal Environmental Professionals at Northern Arizona University and the Tribal Air Monitoring Support Center for providing us with a valuable template and for her helpful comments and her development of the QREST project. We also want to thank the staff at EPA Region 9 for their helpful comments and patience in reviewing recent revisions.

This revision was supported by the Clean Air Act (CAA) Grant # TX – 98T12501 – 0. This revision incorporates practices supported by the Bishop Tribe's Exchange Network Grant.

1.0 QA PROJECT PLAN IDENTIFICATION AND APPROVAL (Element A1)

Title: *Quality Assurance Project Plan for the Bishop Paiute Tribe Environmental Management Office Ambient Air Monitoring Program for Measuring PM10 Using an Automated Tapered Element Oscillating Microbalance (TEOM)* (QAPP). This QAPP commits the Bishop Tribe's Air Quality Program housed in the Environmental Management Office (EMO) to follow the procedures described and referenced in this plan. Plan development was supported by the General Assistance Program grant # GA-97962701-0 and CAA grant # XA-97967201-0 from the U.S. Environmental Protection Agency. The 2008 revision was supported by the CAA Grant # TX–97900001–0. The 2013 revision was supported by the Bishop Tribe's Exchange Network Grant TX-99T15001-0. The 2016 revision was supported by the Clean Air Act grant # TX-99T31301-0. The 2017 revision was supported by the CAA grant # TX-99T47201-0. This revision is supported by CAA grant # TX – 98T12501.

Environmental Management Office

Signature: _____ Date:_____
Brian Adkins, Environmental Manager

Signature: _____ Date:_____
Emma Ruppell, Air Quality & Meteorology Specialist

EPA Region 9

Signature: _____ Date:_____

Name

Title

Branch

2.0 TABLE OF CONTENTS (Element A2)

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3.0 DISTRIBUTION LIST (Element A3)

Paper or electronic copies of this QAPP have been distributed to the people listed in Table 1. As portions of this QAPP are revised, revised sections or the entire QAPP are sent to the people on this list.

Table 1. Distribution List

Name	Position	Address and email
Environmental Management Office		
Harry Williams	Chair, Tribal Environmental Protection Agency	50 Tu Su Lane Bishop, CA 93514
Brian Adkins	Environmental Director	Environmental Management Office Bishop Paiute Tribe 50 Tu Su Lane Bishop, CA 93514 brian.adkins@bishoppaiute.org
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4.0 PROJECT/TASK ORGANIZATION (Element A4)

4.1 The Role of the Environmental Management Office

This Tribal office incorporates quality assurance activities as an integral part of any program that gathers environmental data, from work in the field, from their own data analysis and reporting, and from any consulting and contractor laboratories which they may use.

The following sections list the responsibilities of each individual in the Bishop Paiute Tribe's Environmental Management Office involved in the Air Quality Program.

Environmental Director and QA Manager – Brian Adkins
The Environmental Director has overall responsibility for managing the Environmental Management Office's Air Quality Program. As the QA Manager, he does not maintain air monitoring equipment and is not responsible for any aspect of data collection, editing or transmission. Ultimately, the QA Manager is responsible for establishing QA policy and for resolving QA issues identified through the QA program. Major QA-related responsibilities of the Environmental Manager include:

- Reviewing acquisition packages (contracts, grants, cooperative agreements, inter-agency agreements) to determine the necessary QA requirements;

- Assuring that the Environmental Management Office develops and maintains this QAPP and ensuring adherence to the document by staff, and outside contractors and consultants as appropriate;
- Maintaining regular communication with the field, and other technical staff;
- Ensuring that all personnel involved in this program have access to any training or QA information needed to be knowledgeable in QA requirements, protocols, and technology of that activity;
- Reviewing and approving this QAPP;
- Ensuring that this program is covered by appropriate QA planning documentation (e.g., QA project plans and data quality objectives);
- Ensuring that reviews, assessments and audits are scheduled and completed, and at times, conducting or participating in these QA activities;
- Recommending required management-level corrective actions; and
- Serving as the program QA liaison with EPA regional QA Managers or QA Officers and the EPA regional Project Officer.

Air Quality & Meteorology Specialist – Emma Ruppell

The Air Quality & Meteorology Specialist **(referred to in this document as the Air Quality Specialist)** is responsible for carrying out the work in the field and ensuring that the data they gather meet the requirements of this QAPP. Responsibilities include:

- Developing and maintaining this QAPP;
- Developing QA documentation and providing answers to technical questions;
- Participating in training and certification activities;
- Writing and modifying standard operating procedures (SOPs);
- Verifying that all required QA activities are performed and that measurement quality standards are met as required in this QAPP;
- Following all manufacturer's specifications;
- Performing and documenting preventative maintenance and verifications;
- Documenting deviations from established procedures and methods;
- Reporting all problems and corrective actions to the supervisor;
- Assessing and reporting data quality;
- Preparing and delivering reports to the supervisor; and
- Flagging suspect data.

Outside Consultant – Scott Weaver

Scott Weaver was formerly staff of GBUAPCD for 18 years, and his assistance has been available via contract since 2015. This has ensured continuity in the Air Program by providing supplemental expert guidance, training, and technical assistance for the Air Quality Specialist. The primary activities can be summarized as:

- Training and observation of QA checks based on GBUAPCD practices.
- Advising on Air Monitoring procedures and equipment and regulatory specifications.
- Assistance with preventive maintenance scheduling and equipment troubleshooting.
- Providing guidance on data analysis and validation.
- Data review and analysis for select periods.
- Guidance on calibration procedures based on GBUAPCD practices.

Outside Auditor – Dave Yoho, T&B Systems

The auditor from T&B Systems conducts an annual instrument audit and reviews quality assurance, quality assessment, and quality control activities and ensures that ambient air quality data meet or exceed the data quality objectives of the Tribe. The auditor is responsible for certifying standards used in the field and generating audit reports. T&B Systems conducts audits for a number of air districts and at times has performed audits for GBUAPCD. They also perform audits for the California South Coast Air Quality Management District, for Santa Barbara, for the state of Wyoming, and for Clark County, Nevada to name a few examples. They have performed audits for a number of tribes in the region including, Lone Pine, Ft. Independence, Big Pine (in California), Walker River, and Pyramid Lake (in Nevada). T&B is a technically sophisticated firm that conducted the upper air monitoring for the Owens Dry Lake on behalf of GBUAPCD. The decision was made to use an outside contractor because GBUAPCD does not have sufficient personnel to conduct additional audits. Audits performed by GBUAPCD were done under contract just like those performed by T&B Systems. Should any questions or issues arise during audits or regarding audit reports, GBUAPCD will be contacted for technical assistance.

Toni Richards – Former Air Quality Specialist

Dr. Richards, the former Air Quality Specialist, was trained as an auditor by GBUAPCD and assisted the District by performing audits for them when they were short on personnel. Dr. Richards performed audits for other tribes, and enlisted the expertise of T&B Systems to carry out demonstration audits at 3 tribes in the Owens Valley and 3 tribes in Northern Nevada, some of whom have since adopted the audits. The tribe has contracted short-term assistance with Dr. Toni Richards since 2015. Dr. Richards' assistance provided the program with expert consultation regarding data collection methods, equipment history and maintenance planning, and program management considerations.

Data Reviewers

Data reviewers may include any of the above listed personnel. Data review is primarily conducted in the QREST software (Quality Review & Exchange System for Tribes, described in more detail below), or via direct analysis of raw data, or via data in the Vista Data Vision software (also described below). QREST data reviewers may also include personnel such as the BPT Water Quality Specialist, the Owens Valley Indian Water Commission Environmental Specialist, and any other neighboring tribal Air Quality staff such as the Big Pine Paiute or Lone Pine Paiute-Shoshone Air Quality Specialists, and ITEP staff.

Since the prior revision of this Plan, Air Quality staff from other Owens Valley Tribes and BPT have been able to collectively provide each other with assistance, which serves as independent oversight when provided, though the lead responsibility of QA oversight is as otherwise discussed. When QA issues arise that cannot be resolved internally or within the Owens Valley tribal staff base, the Air Program solicits assistance, provided within the limitation of available contract funding, by one of the outside contractors as described below. In addition, Great Basin Unified Air Pollution Control District (GBUAPCD) has historically made effort to be available for technical assistance or contract assistance to the Tribe; in particular, Chris Lanane, Air Monitoring Specialist, and Guy Davis. In 2016, the Tribe requested GBUAPCD to assess their availability and further define their role in Bishop Tribe's QA activities; however, past events have indicated the unlikelihood of their availability to contribute regular on-site activity to the Tribe's air program. T&B Systems conducts audits for a number of air districts and at times has performed audits for GBUAPCD. T&B is a technically sophisticated firm that conducted the upper air monitoring for the Owens Dry Lake on behalf of GBUAPCD, ozone study for Clark County, and PM10 study for Maricopa County. The decision was made to use an outside contractor because GBUAPCD does not have sufficient personnel to conduct additional audits. Audits performed by GBUAPCD were done under contract just like those performed by T&B Systems.

4.2 The Role of the EPA Region 9 Office

EPA Regional Offices have been developed to address environmental issues related to the Bishop Tribe's Air Programs within their region. EPA's Region 9 Office is responsible for the following activities in support of this program:

- Reviewing, providing assistance with, and approving this QAPP;
- Responding to requests for technical and policy information and interpretations;
- Evaluating quality system performance through technical systems audits, performance evaluations and network reviews, as appropriate for each grant and the Environmental Management Office; and
- Making available the technical and quality assurance information developed by EPA to the tribal agencies, and making the tribe aware of any unmet quality assurance needs of the tribal agencies.

5.0 PROBLEM DEFINITION/BACKGROUND (Element A5)

The principal pollutants, also called criteria pollutants, are particulate matter (PM2.5, PM10), sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, and lead. In 1970, the Clean Air Act (CAA) was signed into law. The CAA and its amendments provide the framework for all pertinent organizations to protect air quality. This framework provides for the monitoring of PM10 by the Bishop Tribe's Environmental Management Office (EMO). The EMO's sampling network functions for informational purposes, based on the Tribal air quality standards (adopted in April 2006).and to meet the following additional objectives:

- Determine the highest concentrations to occur in the area covered by the network (the Bishop Paiute Reservation)
- Determine the impact on ambient pollution levels of significant sources or source categories
- Determine general background concentration levels
- Determine the extent of regional pollutant transport
- Comparisons to the Tribal Air quality Standards (adopted in 2006) will be used for informational purposes only.

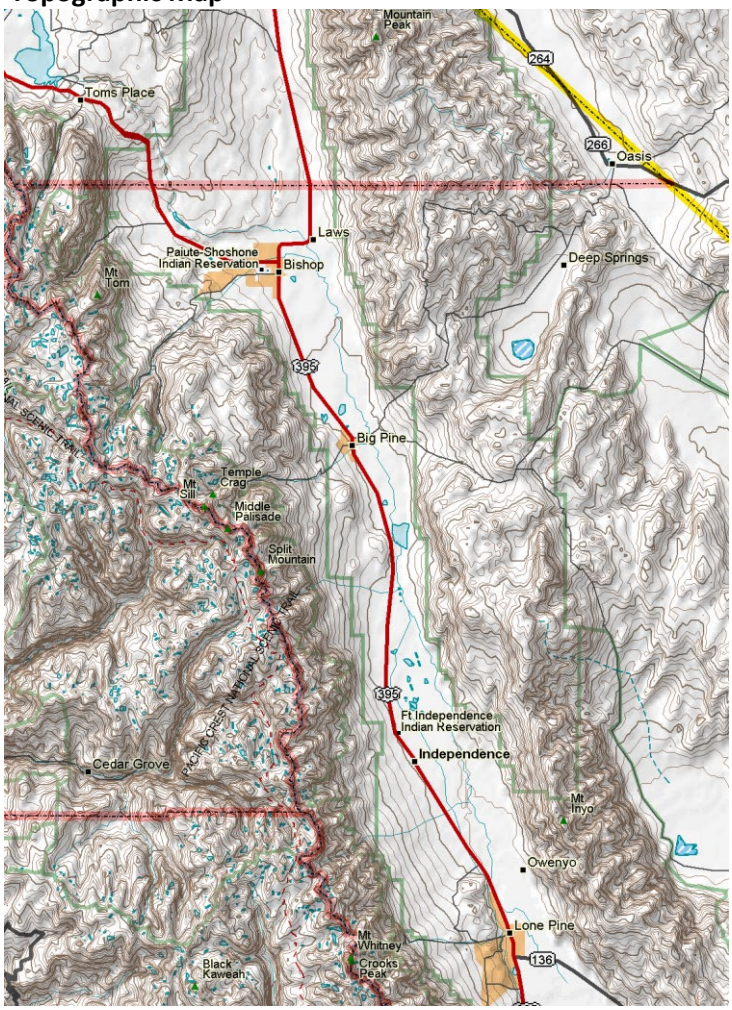
Until the Bishop Tribe initiated PM10 monitoring in April 2003 and PM2.5 monitoring in June 2004, there was no air quality monitoring in the Bishop area. Great Basin Unified Air Pollution Control District (GBUAPCD) had previously carried out PM10 monitoring in the nearby town of Bishop from 1987 to 1997, but had discontinued monitoring. At present GBUAPCD operates a large portable monitoring station at the White Mountain Research Station, to the East of Bishop. This is an NCore station and the monitors may be deployed to other locations as needed. The nearest particulate monitors operated by GBUAPCD are located in non-attainment areas, such as the Owens Dry Lake 60 miles to the south (the largest source of PM10 in the nation), the town of Mammoth Lakes 45 miles to the north, and Mono Lake 60 miles to the north. GBUAPCD frequently relies on data from the Bishop Tribe's monitoring station when they require information for the Bishop area. Other PM10 monitors in the area are operated by the Lone Pine Paiute Shoshone Reservation, located 60 miles to the south, and the Ft. Independence Reservation, located 45 miles to the south.

This QAPP describes how this program controls and evaluates data quality so that the objectives listed above are met. Currently, the primary objective is informational. Comparisons to Tribal Air Quality Standards are used for informational purposes, to evaluate air quality and to conduct air quality assessments. Therefore, the data quality objectives necessary for that determination are the most important. The derivation of these objectives is described in Section 7. The objective for the precision uncertainty of the flow rate of this automated equipment is a relative percent difference (RPD) between the external flow rate transfer standard and the actual instrument flow rate of 7% or less for every check. The objective for overall accuracy, which includes both bias and precision, is 10%.

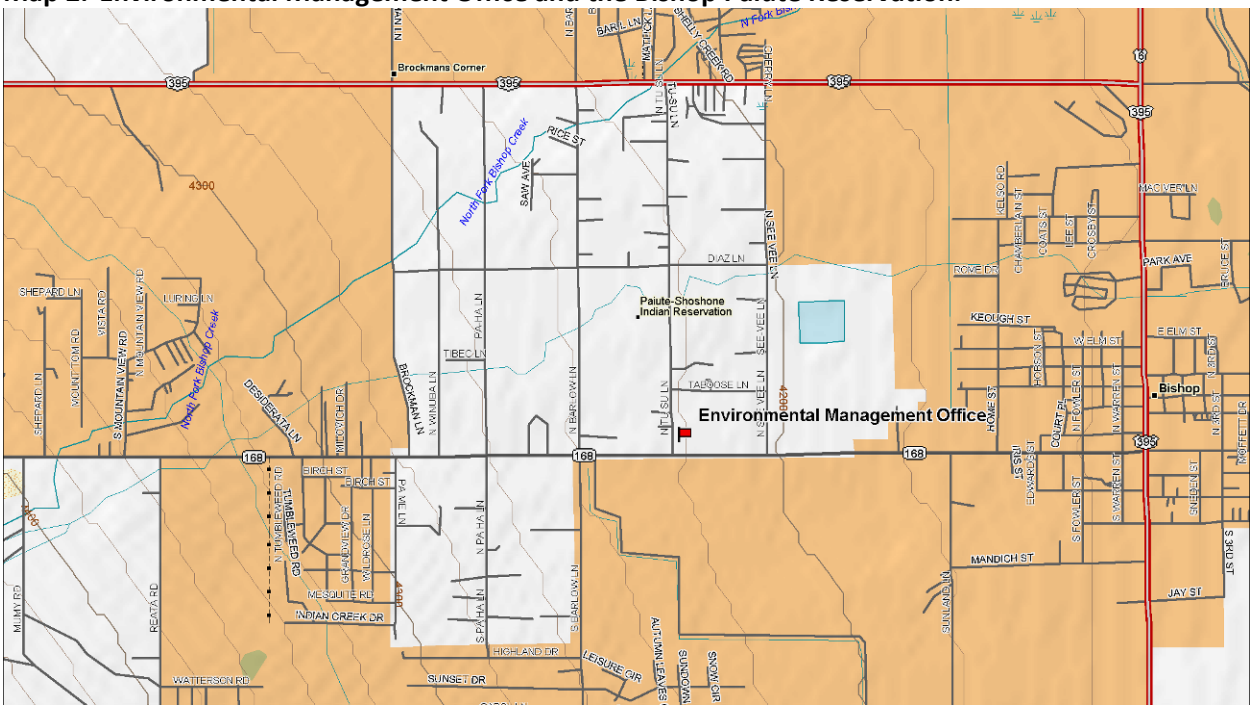
The accuracy and stability of the system is estimated using a National Institute of Standards (NIST) traceable flow, temperature and barometric pressure measurement device and a calibration verification kit available from the manufacturer. The specific measurement quality objectives (MQOs) are described in Section 7, and the methods for calculating their values are described in Sections 14 and 24. The MQOs are consistent with those used by the US EPA and the air quality community, as described in the US EPA Quality Assurance Manual, Vol. II Part 1, (EPA-454/B-13-003, May 2013) commonly termed the "QA Handbook" for general quality system and audit requirements, and 40 CFR 58 Appendix A for nomenclature, frequency and type of instrument checks, and data reporting.

The air monitoring equipment is located on the roof of the Environmental Management Office at 50 Tu Su Lane, on the Bishop Paiute Reservation (N37°22', W118°25' at an elevation of 4,226 ft.), shown in Maps 1 and 2 and in the photographs below. As shown in Map 1, the Bishop Paiute Reservation is located in the Owens Valley in eastern California, near the Nevada border. The reservation itself comprises 879 contiguous acres and is flanked by the City of Bishop to the East. It is surrounded by private lands and by lands owned by the Los Angeles Department of Water and Power. Approximately 1,796 people live on the Reservation. Map 2 shows the location of the Environmental Management Office on the Bishop Paiute Reservation. Photographs 1 and 2 show the equipment and location. Access is via external stairs to the roof.

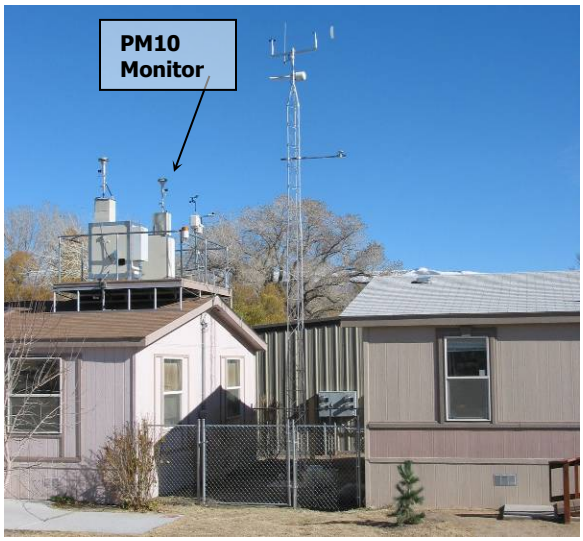
Map 1. Owens Valley Topographic Map



Map 2. Environmental Management Office and the Bishop Paiute Reservation.



Photographs 1 and 2. PM10 Air Monitoring Equipment Platform and Location



6.0 PROJECT DESCRIPTION (Element A6)

The Bishop Tribe's Air Program will use the Tapered Element Oscillating Microbalance 1405 v 1.71 automated (or continuous) monitor(s) for particulate monitoring. The PM10 monitor measures the mass of particulate 10 microns and smaller in aerodynamic diameter that accumulates on a filter and volumetric flow of air through the instrument. It uses this to calculate the concentration of particulate

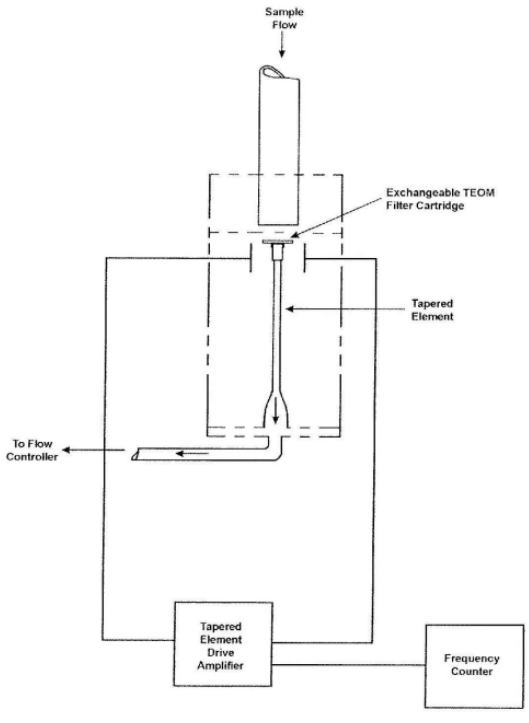
in micrograms per cubic meter of air volume as an internal component of the instrument. These automated instruments do not require the use of a laboratory or the analysis of a filter. This instrument is manufactured by Thermo Environmental Instruments, Inc. (Thermo, formerly, Rupprecht and Pataschnick, R&P). The instrument is operated in accordance with the manufacturer's instructions as contained in the operating manual, TEOM 1405 Ambient Particulate Monitor, Rev A.000, 15 Feb 2008.

The model 1405 Tapered Element Oscillating Microbalance (TEOM) system has been designated as an equivalent method for PM10 (24-h average concentration) by the EPA under Designation No. EQPM1090-079). This method has been shown to meet the requirements listed in 40 CFR 53 Subpart C (section 53.34) and D. The unit consists of the following components:

- Thermo PM10 Inlet (part number 57-00596)
- Flow Splitter (3 l/min sample flow);
- Temperature/humidity sensor
- TEOM Mass Transducer;
- TEOM Control Unit;
- Teflon-Coated Glass Fiber Filter Cartridges;
- Vacuum Pump

The instrument is operated for "instantaneous", 1-hour and 24-hour average mass concentration measurements, with the total mass averaging time set at 300 seconds, the mass rate/mass concentration averaging time set at 300 seconds, the gate time set at 2 seconds. It is housed in an Outdoor Enclosure supplied by R&P (now Thermo) and manufactured by EKTO.

Figure 1. Tapered Element Oscillating Microbalance (TEOM 1405)



Site field checks are conducted at least once every two weeks, in addition to more frequent checks, as the monitoring site is on the roof of the Air Program office. Maintenance and audits are conducted according to the schedule shown in Table 2 below. Both analog and digital data are collected. Analog data are the official data source, which are validated and submitted to AQS. They are transmitted from the instruments to a Sutron data logger which calculates 5-minute averages. The Sutron data logger is connected to the internet. Every 15 minutes the 5-minute averages are streamed to the cloud storage for the Quality Review and Exchange System for Tribes (QREST), and published to the QREST website. Data on the QREST website are updated every hour. These data are checked daily on the QREST Website. Automatic alarms, delivered to the Air Quality Specialist via email, are used to identify invalid data and to notify the operator (Air Quality Specialist) to check the instrument. Included is an alarm set for deviations from a set range of flow rate. Flow rate data is continuously collected and graphed alongside ambient data, available for viewing in a separate dedicated software via Vista Data Vision (VDV). Additionally, operators can also set codes on the data logger to indicate invalid data due to quality assurance or maintenance activities. Data are examined daily, analyzed and verified monthly with reports submitted to the Tribal Environmental Protection Agency board, and validated in QREST in monthly datasets. Validated data are transmitted to AQS on a quarterly basis. Automated alarms are verified as they arrive, which they do on a real-time, i.e., within daily, basis.

Digital data, i.e. the instrument's internal storage data, are transmitted directly to a computer located at the Air Quality Specialist's desk via an Ethernet connection and downloaded weekly or biweekly when necessary, and more often if a problem is suspected. This process can be either manual or automated, and currently is manual, as this data gets copied into a master spreadsheet for analysis manually. These datasets are used for troubleshooting because more parameters for each time stamp/record, including status codes and operating conditions, are saved in the instrument's internal storage than are transmitted via analog. Remote access to the instrument is available, but only at a dedicated computer located at the Air Quality Specialist's desk. The digital data are considered ancillary. Extensive analyses have been carried out to verify that the digital and analog data are delivering sufficiently matching data for the monitoring program's purposes, and are ongoing, annually. The Air Quality Specialist will make a representative selection of at least 5% of the data during each quarter, to check 24-hr average flow rates for precision. This check and the results will be documented in the records for data validation.

Data and instrument operating status are verified daily using all the tools available, including the tabular and graphical information on the QREST and VDV websites and direct access to the instruments via Ethernet connection as needed. The live web publishing makes it possible to check on data transmission, identify invalid data due to status codes, and verify plausibility from remote locations. It also makes it possible to view all the air quality and meteorological data simultaneously. Back-up of the official data pre-validation is ensured by the cloud services hosting the QREST data, and after validation, locally by the Air Quality Specialist. The Tribe's back up servers are in a separate location from the cloud server. Additionally, this data is stored in raw n-minute format on-site in the Tribe's data logger.

Table 2. Quality Assurance Schedule for Ambient Air Quality Monitoring

PARTICULATE MONITORING	Daily	Weekly	Bi-weekly	Monthly	Quarterly	Semi-annually	Annually
Check online real-time displays (VDV and QREST) for air quality and met data values, check VDV for codes, flows, and temperatures.	X	X	X	X	X	X	X

PARTICULATE MONITORING	Daily	Weekly	Bi-weekly	Monthly	Quarterly	Semi-annually	Annually
Verify any VDV or QREST email auto-alarms if they occur- for main flow, status codes, precip, and PM concs; check logger/instrument status for alarms	X	X	X	X	X	X	X
View data in plot; transfer data to summary file to plot if needed	X	X	X	X	X	X	X
Validate analog data and verify flags				X	X	X	X
Check all registers on instrument and verify that values are within specification.		X	X	X	X	X	X
Physically check flows (total and main), temperature and barometric pressure with calibration device.			X	X	X	X	X
Replace A/C filter and clean condenser coils. Clean A/C filter				X	X	X	X
Check mounting bolts on TEOM enclosure.				X	X	X	X
Clean pump cabinet				X	X	X	X
Replace TEOM filters.*				X	X	X	X
Exchange inlet with clean inlet. Clean inlet.				X	X	X	X
Measure auxiliary flow with calibration device.					X	X	X
Complete leak check.					X	X	X
Schedule audit with T&B and calibrate / repair / replace instrument as needed based on audit findings.							X
Check UPS battery levels.						X	X
Check pump (in line).			X	X	X	X	X
Replace in-line filters*					X	X	X
Flow calibration.						X	X
Analog calibration.							X
Ambient air temperature calibration.							X
Ambient pressure calibration.							X
Mass transducer calibration verification.							X
Replace pump and rebuild							X
Clean air inlet							X

**During wildfires TEOM filters are replaced more frequently, at total loading of no more than 2200 ug or 90%, as per operational observations*

7.0 QUALITY OBJECTIVES AND CRITERIA FOR MEASURING DATA (Element A7)

The current objectives of this PM10 monitoring project are informational, and are used to determine the ambient air quality within the boundaries of the Bishop Paiute Reservation. The data are used to determine whether or not the Tribal 24-hour ambient air quality standard (50 µg/m^3) and the Tribal annual standard (20 µg/m^3) have been exceeded. Note: the Tribal 24-hour standard is the same as that for California. These determinations are used for informational studies of Reservation air quality.

Until the Tribe started monitoring for PM10 in April 2003 and for PM2.5 in June 2004, there was no monitoring for air quality in the Bishop area. GBUAPCD monitoring activities for PM10 had been discontinued in 1997 and the nearest monitors were located in non-attainment areas 45 miles to the north (in the Town of Mammoth Lakes) and 60 miles to the south (at the Owens Dry Lake, largest source of PM10 in the nation). This meant that the largest population center in Inyo County had no air quality monitoring until the Bishop Tribe initiated monitoring efforts.

This QAPP describes how this program controls and evaluates data quality so that the objectives of the project are met. The highest priority objective is informational, specifically to determine if the Tribal air quality standards have been exceeded and for comparison to Tribal Air Quality Standards, to be used in

air quality studies and assessments. Therefore, the data quality objectives (DQOs) necessary for that determination are the most important. In addition to comparisons to Tribal standards, the data are used for a variety of analytical purposes including evaluating the impact of forest fires, the Owens Dry Lake, some impact from on-reservation sources as per the Emissions Inventory, and examining health impacts of high PM days for the Reservation population. To achieve these objectives, data must be available in near real time, and an archive of past information must be stored and accessible.

Measurement quality objectives (MQOs) are the translation of the DQOs into parameters that are directly measurable. The MQOs are set so that if they are met, the data user can assume that the DQOs have been met. MQOs are designed to evaluate and control various phases (sampling, preparation, and analysis) of the measurement process. Information regarding these objectives and their use can be found in the US EPA's Quality Assurance Handbook, Volumes I and II. MQOs can be defined in terms of the following data quality indicators:

- Precision
- Bias
- Representativeness
- Detection Limits
- Completeness
- Comparability
- Accuracy

Precision – a measure of mutual agreement among individual measurements of the same property usually under prescribed similar conditions, or agreement among side-by-side measurements. In the case of the flow rate of an instrument, precision can be estimated through repeated measurements, using the same or similar equipment. Precision represents the random component of uncertainty. It is intrinsic to the instrumentation and is not controllable. The TEOM instrument itself has a minimum precision of ±2.0 µg/m^3 per hour average. Precision is estimated using statistical techniques using the standard deviation or the percent difference.

Bias – the systematic or persistent distortion of a measurement process that causes error in one direction. These types of systematic errors may be caused by poor calibration, or repeated operating errors. Bias is estimated by evaluating your measurement results against some known standard. It can also be expressed as a percent difference.

Representativeness – a measure of the degree which data really represent some characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

Detection Limits – the lowest value a procedure or instrument can reliably discern. The TEOM mass transducer detection range is 0 – 1,000,000 µg/m^3

Completeness –the amount of valid data obtained from a measurement system compared to the amount expected under correct, normal conditions. Data completeness requirements are included in the reference methods (40 CFR 50). EPA has assumed levels of completeness of at least 75%.

Comparability – a measure of confidence with which one data set can be compared to another. Because of the strict requirements on the monitor types, analyses, and sampling procedures, EPA has helped to ensure adequate comparability for PM10 results.

Accuracy –a combination of precision and bias. This term has been used throughout the CFR. In general, we will follow the conventions of the NIST and, more recently, of EPA (ref. NIST Report 1297 and EPA G-9) and will not use the term accuracy, but will describe measurement uncertainties as precision, bias, and total uncertainty.

Various parts of the 40 CFR have identified acceptance criteria for some of these attributes as well as the EPA Quality Assurance Handbook, Vol. II, Part II. In theory, if these MQOs are met, measurement uncertainty should be controlled to the levels required by the DQO. Table 3 lists the MQOs for the PM10 measurements.

Table 3. PM10 Measurement Quality Objectives for Automated (Continuous) Monitor

MEASUREMENT QUALITY OBJECTIVES				
REQUIREMENT	**FREQUENCY**	**ACCEPTANCE CRITERIA**	**REFERENCE**	**INFORMATION / ACTION**
Reporting units	All data	µ/m^3 in volumetric units (standard conditions)	40 CFR 50.6	
Flow rate transfer standard (Streamline Pro MultiCal)	Annual calibration and re-certification	±2% accuracy (NIST traceable)	40 CFR 58, Appendix A, Section 2.3.3 QA Handbook, Volume II, Part 1, Appendix 3 40 CFR 50, Appendix K	Repair or replace if manufacturer is unable to calibrate within specifications.
Lower Detection Limit	Ongoing	Mass transducer minimum detection limit 0 µg/m^3	Verified with Thermo	
Completeness	Quarterly	75%	40 CFR 58 Appendix A	Data are not valid unless 75%complete
Mass transducer check using calibration verification kit (Thermo Part 59-002019)	Annually	±2.5% of the target value stated by the manufacturer	Operating Manual, TEOM 1405, pages 5-26 and 5-50; QA Handbook Appdx D p. 22	Repeat measurement for a K0 number if it fails. Check with manufacturer for repair / replacement in case of 2nd failure
Flow rate multi-point calibration	Annually	3 of 4 cal points within 10% of design.	QA Handbook Appdx D p.40	Flow calibration wizard for 6 cal points; use 5/6
Accuracy – external audit with flow transfer standard other than the one used to calibrate equipment; see section 14.1 and 14.3 of this QAPP)	Semi-annually	±10% difference between design flow rate (16.67 l/min) and auditor's transfer standard	QA Handbook Appdx D p. 40	Auditor's transfer standard is different than that used for calibrations. Recalibrate before additional sampling. Invalidate data to last acceptable flow check if the difference > 10% from design flow rate.
Precision – internal flow rate check	Bi-weekly	±7% difference between monitor's flow rate and transfer standard ±10% difference between monitor's flow rate and design rate (16.67 l/min)	QA Handbook Appdx D p.40	Conduct flow rate checks with an external flow rate meter every 2 weeks
Average flow rate	24-hr (test quarterly)	±5.1% of design	QA Handbook Appdx D p.40	Performed via data sample representative test
Precision – ambient temperature sensor	Verify bi-weekly Calibrate annually	Bi-weekly verification: ±2°C difference between monitor's temperature and transfer standard	Operating Manual, TEOM 1405, page 5-30	Repeat measurement to verify. Request audit if necessary. Complete any required maintenance.

MEASUREMENT QUALITY OBJECTIVES				
REQUIREMENT	**FREQUENCY**	**ACCEPTANCE CRITERIA**	**REFERENCE**	**INFORMATION / ACTION**
Precision – ambient pressure sensor	Verify bi-weekly Calibrate annually	Bi-weekly verification: ±0.013 atm)	Operating Manual, TEOM 1405 page 5-31	Repeat measurement to verify. Request audit if necessary. Complete any required maintenance.
Analog calibration	Annually	Tune potentiometers to 10% and 90% of full scale	Operating Manual, TEOM 1405 page5-44	Repeat measurement to verify. Repair or replace if unable to meet calibration standards.
Reference: QA Handbook refers to the QA Handbook for Air Pollution Measurement Systems Vol II, May 2013				

8.0 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION (Element A8)

Workshops and courses hosted by the Institute for Tribal Environmental Professionals (ITEP), the California Air Resources Board (CARB) and informal training with staff from GBUAPCD are available to project personnel. All personnel participate in this training. Records on personnel qualifications and training are maintained in the Environmental Management Office as a part of grant records and are accessible for review during audit activities. In addition, technical support is available from Thermo (formerly R&P), the equipment manufacturer and is used in to evaluate potential equipment problems.

Adequate education and training are integral to any monitoring program that strives for reliable and comparable data. Training is aimed at increasing the effectiveness of employees and the Environmental Management Office. All personnel directly involved with this project will have adequate time to read this document and relevant references (16 hours minimum). New personnel will work under the guidance of experienced personnel for a minimum of one month. If experienced Tribal staff are not available, mentoring is requested from GBUAPCD.

9.0 DOCUMENTATION AND RECORDS (Element A9)

The Bishop Tribe's air monitoring network is established for informational purposes. The Air Quality Program is committed to fully document all activities relating to data collection, analysis, validation, and reporting. The documentation requirements outlined below will ensure that the disposition and location of the data records are known, and that the data are legally defensible.

All field quality control (QC) procedures, instrument malfunctions, on-site repairs and maintenance, and out of control conditions are recorded on standard forms (See Appendix A, Standard Operating Procedures), site logbooks, and digital data file notes. Instrument malfunctions, repairs, and maintenance are also documented in instrument logbooks located at the Air Quality Specialist's desk. Site logbooks are labeled with applicable dates and site identification. Instrument checks and maintenance information is also recorded electronically using the Sutron data logger where operator notes can be recorded. These notes are saved in the logger internal storage for retrieval when validating data, and printing with the data records. Control charts are created automatically in VDV (multiple times per hour) as main flow is logged directly by the Sutron, and comparisons to instrument-generated drift factors are made with biweekly flow checks, using electronic field forms which also automatically generate the control charts of flows. The three most recent months (at least) of field forms are retained in a separate notebook so that field comparisons with recent data are possible. The remaining original forms are filed chronologically in binders at the Air Quality Specialist's desk, which include printouts of electronic field forms post-commencement of their use on a monthly schedule. Electronic field forms since incipience are stored on the field laptop computer, and transferred to the

dedicated Air computer inside after each check, then backed up again to the Tribe's servers. The Air Quality Specialist is responsible for the collection and maintenance of all field records. The Outside Auditor is responsible for annual spot checks during audits. The Tribe is working with Scott Weaver (see section 4) for more comprehensive reviews of record keeping practices, including creation of electronic field forms. GBUAPCD is also consulted if any QA questions arise.

Since the inception of particulate monitoring on the Bishop Reservation, automated data acquisition has been vastly expanded with data stored and backed up at a remote location on the former TrEx server at Northern Arizona University (NAU), and currently cloud service storage, in addition to local storage which is used as needed for instrument maintenance, data verification and data analyses.

There are 2 methods for data collection and thus 2 data types. The primary method uses a Sutron 9210 XLite data logger. These are analog data. A secondary method uses an 20Ethernet connection to the instrument. These are digital data. The data from the Sutron data logger are the official data. The data collected via ethernet are ancillary and are used for maintenance and troubleshooting. The Air Program has carried out extensive analyses to verify that all methods of data collection are consistent for the same parameters, including linearity and other statistical tests, clock tests, and time-series charts; hourly, 24-hourly and 5-min, performed annually.

The official data is publicly available through 3 websites. The Tribe's own website http://www.bishoptribeemo.com/index_air.htm, and the EPA funded QREST website both display the analog-sourced data, which are located on the cloud server for QREST (and for VDV). Data in QREST cloud server are updated as data are validated prior to submission to AQS. BPT participated in the former TrEx network since inception in 2004 and was one of the first 3 tribes to initiate the network by making our air quality and meteorological data available on the web in near-real time on the TrEx website http://trexwww55.ucc.nau.edu. TrEx was funded by an Exchange Network (EN) grant through the Walker River Tribe. TrEx was discontinued to Tribal users and replaced by QREST by EPA in January 2020. QREST is a cloud-based open source software. Both websites offer graphical and tabular data and are checked daily by the Air Quality Specialist. The Tribe's website displays the data in a "dashboard" fashion with simple graphing tools for the use of Tribal members, and the public, who are more likely to find the data as connected to the Tribe's Environmental Department. The 3rd website is AirNow. QREST feeds the data to AirNow, using the BPT agency credentials.

The Sutron data logger collects data from the instruments every second, and constructs 5-minute averages. The 5-minute data are then automatically polled and streamed to the remotely located, secure QREST cloud data storage computers. This is the official data storage site prior to AQS submittal. QREST has the responsibility for maintaining data security and back-up via its cloud services. These are the official data and are validated quarterly and used for AQS submission. The QREST software provides the interface for manual validation and data submission to AQS, Including assigning null values to records. The data logger is set up with 3 automatic alarms which notify the operator via email when an instrument parameter threshold is reached, timestamped for validation purposes. The Air Quality Specialist also retains a downloaded/non-edited version of the original, primary data for back-up, at both the 5-min and hourly level, as stored in the data logger.

The secondary data are obtained via an Ethernet connected to a designated computer, located next to the Air Quality Specialist's desk, and stored locally and secure at the Air Program office. They can also be downloaded via USB directly off the instrument. When the program was initiated, serial/RS232 transmission was the only method of data acquisition, and the Ethernet transmission is an upgrade of

the hardware and protocol of that system. It is subject to temporary internet connectivity outages if they occur, and thus frequently requires manual intervention. These data are comprised of parameters chosen by the user from the list available in the instrument. These include instrument operating conditions intended for troubleshooting, and PM10 concentration data derived from the instruments' multiple averaging processes. Several of these parameters are displayed in real-time on the instrument display. These secondary data are downloaded and examined weekly and prior to flow checks, and more frequently if a problem is suspected. They are intended to be used by the operator and can be used as back up data for the primary. Sometimes, the additional instrument parameters provide useful information for troubleshooting because they can show drift in operating parameters that may not trigger a status code. This makes it possible to carry out maintenance proactively or determine relationships between ambient conditions and instrument operation. These ancillary data are backed up on a second computer at the Air Quality Specialist's desk, which is backed up weekly. The dedicated computer and second computer at the Air Quality Specialist's desk are off or locked when unattended, and only the Air Quality Specialist has access to them.

We believe that the data are secure and well-protected because of redundancy via these multiple methods of data acquisition and storage all of which have been compared to verify that they contain the same information.

The Air Quality Specialist checks the instrument status and reviews the PM10 data daily using the sophisticated graphical tools available on the Tribe's online air "dashboard", and the QREST website. The dashboard delivers 15-minute old data with 5-minute updates. Manual validation of the analog data in QREST in monthly datasets is completed in preparation for quarterly submission to AQS. Data submission to AQS adds yet another secure remote storage location for the final verified data.

The Air Quality Specialist is responsible for the configuration, operation and management of the data acquisition system, and is also responsible for processing, analyzing and reporting the data collected. Data logger configuration and programming is carried out by the Air Quality Specialist, with assistance from T&B Systems, ITEP, and other Owens Valley tribal air programs.

Files are organized in a way that allows each data point to be tracked from the point of the beginning of the measurement through validation, analysis, and reporting. QREST data polling is automated, minimizing input error and ensuring that all information is timestamped. These include those records listed in Table 4 below. All records are organized and retrievable for audit purposes.

Table 4. Record Categories and Types

Category	Record/Document Types
Management and Organization	Tribal air grant application and associated records Personnel qualifications and training Training certifications Grant allocations, records of funds, expenditures Support contracts
Site Information	Network (site) description(s) Site maps Site pictures
Data Operations	QA Project Plans Standard operating procedures (SOPs) Field notebooks Inspection/maintenance/repair records Shipping/receiving records

Category	Record/Document Types
Raw Data	Any original data (routine and QC data)
Data Reporting	Air quality index report (reported automatically to AIRNOW) Daily, monthly and annual Tribal air quality information Data/summary reports Articles/papers/presentations
Data Management	Data algorithms Data management plans Equipment repair records Data validation notes and records
Quality Assurance	Network reviews Control charts Data quality assessments QA reports System audits Response/corrective action reports

All the information listed in table 4 is kept for a minimum of 5 complete calendar years after it was gathered in addition to the current year; however, typically data is kept regardless of age unless circumstances prevent this and at present, all data from the inception of the program are available in multiple electronic formats, in several locations.

All data transfers are electronic. Non-automated transfers involve only copying files. Edited files are maintained separately with documentation of all changes. The original raw data are automatically collected from the data logger, transferred to QREST and backed up in a separate location from BPT. Ancillary maintenance information is stored on 2 computers in the Air Program Office.

10.0 SAMPLING DESIGN (Element B1)

This section describes the rationale for the locations of the measurements, the frequency of sampling, the types of monitors used at each site and the location and frequency of the performance evaluations. The network design components comply with the recommendations in 40 CFR 58.13, Appendices A and D. Siting criteria comply with 40 CFR 58 Appendix E. Specific requirements are shown in Table 5 below.

Table 5. PM10 Monitor Siting Criteria

Scale	Vertical Height above ground (m)	Horizontal Height above ground (m)	Other spacing criteria
Micro	2 to 7	>2	• >20m from trees. • Distance from monitor to obstacle, such as buildings, must be twice the height that the obstacle protrudes above the monitor. • Must have unrestricted air flow 270 degrees around the monitor inlet. • No furnace or incineration flues should be nearby.[b] • Spacing from roads varies with traffic (see 40 CFR 58, Appendix E; if less than 10,000 vehicles per day the distance from the road needs to be at least 10m except for (a) micro-scale traffic corridors or street canyon stations it should be within 15 m of the road, or (24) for Pb and TSP it must be at least 50 m for neighborhood scale). • Monitor inlet is at least 2m but not >4m from any collocated PM monitor (see 40 CFR 58, Appendix A).
Middle, neighborhood, urban, and regional scale	2 to 15	>2	

[a] When inlet is located on rooftop, this separation distance is in reference to walls, parapets, or penthouses located on the roof.
[b] Distance depends on the height of furnace or incineration flues, type of fuel or waste burned, and quality of fuel (sulfur, ash, or lead content). If there is natural gas combustion the monitor should be at least 5 m away.

Prior to installation, the Air Quality Specialist together with staff from GBUAPCD verified that the site met the requirements in Table 5. The site is shown in Photographs 1 and 2. The monitor is located on the roof of the EMO building and is unobstructed. It is over 70m from both nearby roads, Highway 168 and from Tu Su Lane. Neither road has traffic in excess of 10,000 vehicles per day. The inlets for the two PM monitors are over 2m but less than 4m apart. There are no trees or obstacles comporomising the air flow and spacing around the monitors. These criteria continue to be met.

10.1 Project Schedule

This project involves measuring PM10 concentrations at the Environmental Management Office, on the Bishop Paiute Reservation. The monitor location is shown in Photographs 1 and 2. This location meets siting criteria and was selected with technical assistance from GBUAPCD. The project schedule is given in Table 6 below.

Table 6. Schedule of Sampling-Related Activities

Activity	Date	Comments
Order monitors	Ordered 1/23/02	From R&P, now Thermo
Receive monitors	Received 2/28/03	
Install monitor	Installed 4/8/03	
Begin routine sampling	4/9/03	
Replace monitor with upgraded model	Installed 9/29/15	Replaced original model

Activity	Date	Comments
Report routine data to AIRS-AQS	Ongoing – due within 90 days after end of quarterly reporting period	Initiated 2005
Execute maintenance schedule tasks	Tasks are due and performed weekly, biweekly (flow checks), monthly, quarterly, and annually; Table 2.	
Performance Evaluations	Audits including evaluation of program monitoring method occur annually	
Review internal and external QA reports	Ongoing	Needed to determine which, if any, monitors fail QC limits.
Primary network review	Annually	Evaluate reasonableness of siting, frequency, number of monitors.
Evaluate location of monitors	Annually	At time of network review.

10.2 Rationale for the Design

The procedure for siting the monitors to achieve the basic objectives is based on judgmental sampling, as is the case for most ambient air monitoring networks. Judgmental sampling uses data from existing monitoring networks, knowledge of source emissions and population distribution, and weather information to select the best monitor locations.

The network has been designed to meet the following basic monitoring objectives:

1. Supply monitoring data that is representative of concentrations on the Bishop Paiute Reservation.
2. Capture the highest concentrations affecting the Reservation population.
3. Measure the impact from significant sources of PM expected to impact the Reservation:
    a. Off Reservation: the Owens Dry Lake, largest source of PM10 in the nation, located 60 miles to the South.

On Reservation: smoke from wood burning for residential heating and dust from dirt roads and areas.
The TEOM is a continuous monitor that provides hourly and 24-hour concentrations.

11.0 SAMPLING METHODS (Element B2)

The Bishop Tribe's Air Program collects air quality data on the Bishop Paiute Reservation to be used for comparisons with future measurements and to determine compliance with Tribal air quality standards. This method provides for measurement of the mass concentration of particulate matter having an aerodynamic diameter less than or equal to a nominal 10 microns (µm) – PM10 – in ambient air over a 24-hour period for determining whether tribal standards for particulate matter (adopted in April 2006) are met and for comparison to the primary and secondary national ambient air quality standards for particulate matter specified in 40 CFR 50.7. The 1405 TEOM is Federal Equivalence Method (FEM) EQPM1090-079 for PM10 for comparison to the standard. The monitor was installed with adherence to procedures, guidance, and requirements detailed in 40 CFR 50, 53, and 58; U.S.EPA QA guidance documents, and the monitor manufacturers operation manual and manufacturer technical support, and with assistance from Air Program technical support individuals as listed in part 4.1.

11.1 Method Overview

The theory of operations for the TEOM is described in detail in Section 1 of the manufacturer's operating manual. It is shown schematically in Figure 1 of this document and is summarized below. The system is primarily made up of the following components:

1. The TEOM Series 1405 with control compartment and mass transducer compartment
2. PM10 specific inlet
3. Flow splitter
4. Vacuum pump

Initially the air stream passes through a size selective inlet and is split isokinetically into a 3 l/min main flow, used for PM measurement and a bypass flow of 13.67 l/min. The main flow is conditioned as it enters the mass transducer tapered element. The mass transducer continuously monitors the accumulated mass on the exchangeable TEOM filter. The system draws ambient air through a filter at a constant flow rate, necessary for cyclonic size selection, and continuously calculates and averages mass concentrations based on the oscillation frequency of the filter. The unit also houses the flow controller and analog boards that transmit instrument functions and display outputs.

11.2 PM10 Monitor Set-up

Set-up of the PM10 monitor was conducted according to the Operating Manuals for each monitor at time of installation. The previous monitor was a Thermo 1400a; the Thermo 1405 was installed with technical assistance as a direct replacement for the previous model. Both the monitor and pump are installed on a military-grade power supply system, designed to protect the equipment from power surges and minimize data loss.

11.3 Data Acquisition

Immediately after installation, only digital data were available from the PM10 monitor via an RS232 connection. Soon after installation, the PM10 monitor was added to the (former)TrEx network and analog data were collected using a ZENO data logger, eventually replaced with a Sutron 9210 XLite. For several years analog and digital data were collected and compared daily to verify accuracy of the system. Once the accuracy of the analog data available through the TrEx network was determined, the digital data became a secondary source of information used primarily for troubleshooting, and the analog data available via the web became the primary and official data source. The analog data are updated every hour on the QREST website (which replaced the QREST website in January 2020). The analog data can thus be viewed from remote locations. Within the QREST QC module, automatic flagging occurs on exceedances for ranges, record-to-record change threshold, and stuck values. Analog data are checked daily, as is instrument status. The digital data fall outside of the DAS for the official (AQS) data, and are checked biweekly. They are downloaded to a dedicated computer and backed-up to a second computer in the Air Quality Program (and then to BPT servers). The digital data can be downloaded more frequently if any problems are suspected or if the analog data are flagged by the LEADS software. Standard Operating Procedures describe daily checks.

The analog data collected from the Sutron data logger by the QREST network are the primary and official data source, because the data are downloaded continuously (every 15 minutes) and stored remotely via cloud hosting services.

QREST also automatically feeds the data to Air Now, creating another remote repository. The QREST software also has a graphical interface for manual validation and formatting needed for AQS submission, such as assigning null values. The QREST data collection system is therefore higher quality, more secure and offers more capability than simple local downloads and back-ups. It is fully automated with built-in cross checks.

11.4 Support Facilities for Sampling Methods

Table 7 lists the supplies that are available to PM10 field operators.

Table 7. Support Facility Supplies

Item	Minimum Quantity	Notes
Field logbook	1 per monitor	Available for field use, and kept at the Air Quality Specialist's desk
Monitor Operations Manual	1 per monitor	Available for field use, and kept at the Air Quality Specialist's desk
PM10 Monitor SOP	1 per monitor	Available for field use, and kept at the Air Quality Specialist's desk
Filter exchange tool	1 per monitor	Stored inside the transducer compartment
Spare filters for the TEOM	1 box per monitor	Stored inside the transducer compartment
In-line filters set	1	Kept in the Air Lab
Mass transducer test kit	1	Kept in the Air Lab
Teflon tweezers	2	Kept in the Air Lab
Hi-Vac lubricant for o-rings	1 tube	Available for field use, and kept in the Air Lab
In-line filters	4	Available for field use, and kept in the Air Lab
Miscellaneous tubing and fittings	Various diameters	Available for field use, and kept in the Air Lab
Miscellaneous cleaning supplies	1 box each lint free wipes (2 sizes) 1 gal distilled water 1 box each lint free swabs (2 sizes) 6 lab bottles	Kept in the Air Lab
Tools	1 box 1 case for field use	Screw drivers, wrenches, hammer, tape measures, etc.
USB stick	2	For manual downloads and for software installation as needed
Spare inlet	2	Replacement kept in the Air Lab
Spare pump and re-build kit, pump gauge	3 pumps/kits	Replacement kept in the Air Lab

11.5 Sampling/Measurement System Corrective Action

Corrective action measures with the PM10 monitor will be taken to ensure the data quality objectives are attained. Table 8 lists some of the expected problems and corrective actions.

Table 8. Field Corrective Actions

Item	Problem	Action	Notification
Power	Power interruptions	1. Check uninterruptible power supply 2. Verify settings 3. Restart if necessary 4. Check manual for additional diagnostics 5. Contact technical support and repair/replace as necessary	1. Document in Logbook 2. Notify Environmental Manager
Sample Flow Rate Verification	Out of Specification	1. Check and record system status codes and operating parameters in logbook 2. Repeat flow verification 3. Check pressure drop across filter and date of last replacement; replace filters if necessary 4. Perform leak check and check connections if leak check fails 5. Check air pump with vacuum gauge (in line), replace if needed following manufacturers' specifications 6. Check with manufacturer for additional diagnostics and repair/replace as needed	1. Document in Logbook and on forms 2. Notify Environmental Manager
Continuous analog data polling	Data transfer fails	1. Document key information in logbook 2. Verify cable connections and computer status; reconnect / restart as necessary 3. Check status of QREST network to see if other systems are on-line 4. Contact appropriate technical support	1. Document all storage attempts and failures 2. Notify Environmental Manager
Data on QREST website are flagged due to a status code or transmission failure	Flagged data	1. Set data flag to preventative maintenance 2. Check instrument for proper operation 3. Identify source of any status code by checking instrument directly and by downloading digital data 4. Repair instrument as needed 5. Check with manufacturer for additional diagnostics if needed	1. Document in logbook, on forms and in operator log 2. Notify Environmental Manager and any other key personnel, and if needed QREST staff.

Item	Problem	Action	Notification
Digital data downloading to EMO computer for trouble-shooting purposes	Data transfer fails	1. Document key information in logbook 2. Verify instrument, router, modem, cable connections and computer status; reconnect / restart as necessary 3. Contact appropriate technical support	1. Document all storage attempts and failures 2. Notify Environmental Manager
Enclosure AC unit	AC does not cool enclosure to < 50o C	4. Maintenance check per equipment manual 5. Contact qualified HVAC repair 6. Cool by other means during hours of operation over maximum temp	7. Notify Enviro Director 8. Record on log sheet 9. Flag data, if needed

12.0 SAMPLE HANDLING (Element B3)

For continuous monitors, PM10 measurements are stored electronically. All data transfers are automated. The QREST data are the official data. They are stored on host cloud servers and backed up regularly. QREST data can be downloaded via the web. Extraction via downloading does not affect the original raw data which remains fully recoverable. Separate files from the data which will be validated for AQS are maintained for analysis. Detailed file nomenclature is used to indicate the source and type of file. Documentation of any changes for analytical purposes in integral to the file structure and is described in Section 19, Data Management.

Definitions of parameters on the forms are explained in Table 9. All data are transferred and stored electronically.

Table 9. Parameter List for the Automated PM10 Monitor

Parameter	Frequency	Comment
ANALOG CHANNELS		
Mass Concentration	Every 5 mins	Collected via Sutron data logger and QREST software Also collected for use on Tribal website using Sutron polling software
Main Flow	Every 5 mins	Collected via Sutron data logger and QREST software
24 Hr Status Code	Every 5 mins	Collected via Sutron data logger and QREST software
AUTOMATIC ALARMS		
Mass Concentration	Timestamped	User specified
Status	Timestamped	User specified
Main Flow	Timestamped	User specified
DIGITAL DATA		
Timestamp	Every hour	Automatic field
Ambient pressure	Every hour	User specified
Ambient temperature	Every hour	User specified
Ambient relative humidity	Every hour	User specified
Ambient dew point	Every hour	User specified
Operating mode	Every hour	User specified
Status	Every hour	User specified
Main flow – volumetric	Every hour	User specified
Auxiliary flow – volumetric	Every hour	User specified

Parameter	Frequency	Comment
Case temp	Every hour	User specified
Air tube temp	Every hour	User specified
Cap temp	Every hour	User specified
1 Hr mass concentration	Every hour	User specified
Mass concentration	Every hour	User specified
24 Hr mass concentration	Every hour	User specified
Total mass	Every hour	User specified
Vacuum pressure	Every hour	User specified

12.1 Sample Custody Procedure

All data transfers are automated. The QREST data are the official data. The file names for the analog data are automatically generated by the QREST software or can be assigned nomenclature conforming to the on-site file storage. The file names for the digital data are automatically generated by the ePort (TEOM) software. The dates of file creation and modification constitute the chain of custody. All analog file modifications are documented in operator or manual validation logs and are contained in flags embedded in the data bases.

13.0 ANALYTICAL METHODS (Element B4)

The PM10 inlet is designed to allow only particulate matter less than 10 µm in diameter to remain suspended in the sample air stream as long as the flow rate of the system is maintained at 16.67 l/min. Other inlets allow for sampling other particle sizes. Flow is controlled with an isokinetic flow splitter in conjunction with automated flow controllers located in the control unit. A pump supplies the necessary vacuum. Mass accumulating on an exchangeable filter is measured every 2 seconds and compiled into averages that are recorded internally.

The TEOM is shown diagrammatically in Figure 1 in Section 6, above. The theory of operations is briefly described in Section 11.1 above. More details are available in the Operations Manual, supplied by the manufacturer.

14.0 QUALITY CONTROL REQUIREMENTS (Element B5)

Quality control (QC) is the overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements. In the case of this network, QC activities are used to ensure that measurement uncertainty can be estimated and is less than the measurement quality objectives so that the DQOs can be met.

The measurement quality objectives in Table 3 of Section 7 contain a list of these QC checks as well as other requirements for the PM10 Program. Various types of QC checks have been inserted at phases of the data operation to assess and control measurement uncertainties. Table 10 summarizes the field QC checks. The following information provides some additional descriptions of these QC activities, how they will be used in the evaluation process, and what corrective actions will be taken when they do not meet acceptance criteria.

Table 10. Field QC Checks

Requirement	Frequency	Acceptance	Reference
Status Codes	Daily during data checks and via automatic alarms. Weekly during routine checks. Bi-weekly during routine instrument flow checks.	Any status code other than "Normal" (digital code = blank) indicates invalid data and requires action.	Operating Manual, p 4-8
Noise < 0.10 after 30 minutes in operating mode 4.	Daily monitor and data check Weekly during routine checks. Bi-weekly following routine instrument flow checks.	< 0.10	Operating Manual, p. 4-3
Frequency of oscillating tapered element is stable after 30 minutes of operation.	Weekly during routine checks. Bi-weekly following routine instrument flow checks.	Ranges between 150 – 400 Hz Only last few digits change, over time with filter loading.	Operating Manual, p. 4-3
Flow rate verification	Bi-weekly	±7% of the transfer standard or ±10% of monitor flow rate and design rate and transfer standard that is accurate to ±1% at 3 and 16.67 l/min	QA Handbook, Appdx D p. 40 Operating Manual, p. 5-36
Instrument stability with mass filter supplied by the manufacturer	Annually, unless there is reason to suspect instrument instability	± 2.5 % of target value 2 consecutive successful internal computations of KO values	Operating Manual, p. 5-50

14.1 Flow Checks (Precision estimate for automated methods)

Because of the high cost of providing a collocated PM analyzer, flow checks are used to assess precision. A one-point check of the PM10 analyzer's normal operating flow rate is made at least once every two weeks. (If a precision check is made in conjunction with any other type of instrument adjustment, it must be made prior to the adjustment.) The percent difference between the actual and the indicated flow rates are used to assess the precision of the monitoring data and are graphed in control charts.

While it is acceptable to obtain the precision check flow rate data from the analyzer's internal flow meter, without the use of an external flow transfer standard, provided certain conditions are met as described in the memorandum issued by EPA regarding "Supplemental Interim Guidance for Quality Assessment of Continuous PM Analyzers," this approach is not used unless circumstances prevent regular bi-weekly precision checks.

The percentage difference (d_i) for a flow rate check (or audit) is calculated using Equation 1, where X_i represents the external transfer standard flow rate and Y_i represents the instrument's indicated flow rate.

Eq. 1 $d_i = [(Y_i - X_i) / X_i] \times 100$

If this value exceeds 7% corrective action is needed. Values of the percentage difference in sequential flow checks are monitored for trend and may be plotted over time to determine if the instrument is drifting. As least the two most recent prior flow checks are examined following each routine check to look for trends. The instrument main flow is automatically plotted in a time-series graph for analysis.

14.2 Instrument Stability Check using Calibration Verification Kit

The manufacturer provides a calibration verification kit that is separate from the analyzer unit and can be used to assess the unit's response to a "known" value that is stable over time. This stability check is completed annually, following the procedures described in the Operating Manual.

14.3 Flow Rate Audits Conducted by an External Auditor

External audits are conducted by T&B Systems, using their transfer standards. The procedures are the same as for routine flow verifications. Audit reports are available at the Air Quality Specialist's desk and are transmitted to EPA as part of regular quarterly reports to the project officer.

14.4 Corrective Action for External Flow Rate Audit

If the percentage difference between the audit transfer standard and the instrument's design flow rate exceeds 10% action must be taken to determine the source of the problem and correct the abnormal flow rate. This may include leak checks, pump checks and hardware flow calibration. The instrument will be re-audited at the first opportunity following the corrective action. Data back to the last acceptable audit will be verified and compared to the results of routine flow checks and flagged as necessary. The flow transfer standard will be recalibrated if necessary. All corrective action will be documented in the site notebook and on field forms and operator logs where relevant, as well as being reported to the QA Manager.

14.5 Control Charts

Control charts are used to document instrument performance. These are automatically generated by a dedicated software and by the digital biweekly field form, and consist primarily of time-series plots of flow rate, and of slope-intercept equation graphs. Routine monitoring of percent differences is used as an early warning device for potential problems requiring attention.

15.0 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE (Element B6)

This section discusses the procedures used to verify that all instruments and equipment are maintained in sound operating condition and can operate at acceptable performance levels. All instrument inspection and maintenance activities are documented in records kept at the Air Quality Specialist's desk and described in SOPs (Appendix A).

15.1 Initial testing

All PM monitors used in the Bishop Tribe's Air Quality Program are assembled according to the manufacturer's specifications and flow and leak tested prior to installation. Should the instrument appear to be operating out of specifications, the manufacturer is contacted for corrective action. An external audit is completed as soon as possible following instrument installation. Routine maintenance and audits begin immediately following installation following the schedule in Table 2, along with corresponding record-keeping as described in Section 9. Records are maintained at the Air Quality Specialist's desk and are available for inspection.

15.2 Preventive Maintenance

Table 2 in Section 6 describes the appropriate maintenance and calibration checks of the PM10 monitor and their frequency. The SOP's in Appendix A provide a detailed description of procedures. Table 11 below summarizes the maintenance procedures and frequency.

Table 11. Instrument Maintenance Frequencies

Instrument or Component	Frequency	Reference
Clean and inspect inlet	Monthly with filter exchange	Operating Manual p. 5-16
Replace in-line bypass filters	Quarterly	Operating Manual p. 5-20 (6 months); operational observation
Replace and rebuild pump	Annually or when instrument performance is out of specification	In rebuild kit
Clean transducer air inlet	Quarterly or when needed	Operating Manual p. 5-23

16.0 INSTRUMENT CALIBRATION AND FREQUENCY (Element B7)

16.1 Standards

The field equipment and calibration instruments follow the calibration and re-certification scheduled as listed in Table 12 and outlined in Table 2 of Section 6.

Table 12. Instruments and Calibration Frequencies

Instrument or Component	Frequency	Reference
Streamline Pro Multi Cal System, Chinook Engineering	Annually Specifications: • Flow rate range 0.8 to 19.0 l/min • Measurement uncertainty 0.6% at 22°C and ±1.2% over operating range • NIST traceable	Chinook Engineering, Streamline Pro Multical System Operating Manual, Revision 2.1a, January 2004 40 CFR 58, Appendix A, Section 2.3.3 QA Handbook, Volume II, Part I, Appendix 3
Flow controller adjustment	Semi-annually	Operating Manual, Section 5
Multipoint Flow Calibration	Annually	Operating Manual p.5-38 QA Handbook, Appdx D p. 40
Temperature and Pressure Sensor Calibration	Annually or when sensors are out of specification	Operating Manual p. 5-30 – 5-31
Analog Calibration	Annually or when instrument performance is out of specification	Operating Manual p.5-44
Mass Transducer Verification	Annually	Operating Manual p. 5-50

The transfer standard for flow rate verification has its own certification and is NIST-traceable. The Air Quality Specialist is responsible for ensuring that the transfer standard is re-certified annually by the manufacturer using NIST traceable reference standards to within 2% over the expected range of ambient temperatures and pressures at which the flow-rate standard is used. The flow rate standard is re-calibrated as necessary (may be annually). The calibration certificate shows the results of the calibration, summarizes how it was performed, and shows when it is next due. The certificate is filed with the instrument documents at the Air Quality Specialist's desk. During regular audits, results from the most recent flow verification are compared to the audit results to verify instrument accuracy.

All these events, as well as monitor and calibration equipment maintenance will be documented in field data records and notebooks. Logbooks will normally be located at the Air Quality Specialist's desk when not in use. Notes summarizing verifications and calibrations are also logged in the datalogger Operator Log.

17.0 SUPPLIES AND CONSUMABLES INSPECTION/ACCEPTANCE REQUIREMENTS (Element B8)

Table 13 describes critical supplies. Additional information is in Table 7.

Table 13. Critical Supplies and Consumables

Item	Description	Manufacturer	Supplier (if different)	Area
TEOM filters	boxes of 20	Thermo		Instrument and Air Lab
In-line filters	2 filters	Thermo		Air Lab
Hi Vac Grease	High grade silicone	Dow Corning	VWR	Air Lab
Low-lint wipes or similar	4.5x8.5" and 12x12" Cleaning Wipes	Kimberly Clark	VWR	Air Lab
Low lint swabs or similar	Micro swabs and bud-type swabs	Tex Wipe	VWR	Air Lab
O-rings for inlets	1 ¼" and 2 3/8"	Thermo		Air Lab
Cleaning solution & brush	Tapered brush, alcohol solution, rinse water	Thermo		Air Lab

17.1 Acceptance Criteria

Acceptance criteria must be consistent with overall project technical requirements. Some of the acceptance criteria are specifically detailed in 40 CFR 50. Other acceptance criteria such as observation of damage due to shipping can only be performed once the equipment has arrived on site.

17.2 Tracking and Quality Verification of Supplies and Consumables

Tracking and quality verification procedures are implemented to assure that the appropriate items are received, and that adequate documentation is supplied to the Tribal Fiscal Office to ensure appropriate and timely invoice payment.

1. Packages are inspected as they are received for obvious damage during transit. Freight packages are opened as soon as possible and inspected.
2. Packages are opened, contents inspected and compared to the packing slip and the list of items ordered.
3. Any discrepancies or damages identified are noted on the packing slip. The original is sent to the Fiscal Office. A copy of the packing slip is retained for records. The manufacturer is notified and supplied with necessary documentation to rectify any discrepancies.
4. Supplies are stored in the Air Lab, Office, or with the instrument, and dated with regard to receipt date and labeled if necessary

18.0 DATA ACQUISITION REQUIREMENTS (Element B9)

This section addresses data not obtained by direct measurements. This includes both outside data and historical monitoring data. The policies and procedures described in this section apply both to data acquired through the Tribal Air Quality Program's PM10 monitoring activities and to information previously acquired and from outside sources.

18.1 Chemical and Physical Properties Data

Chemical and physical properties data and conversion constants are often required in the processing of raw data into reporting units. This type of information that has not already been specified in the monitoring regulations will be obtained from nationally and internationally recognized sources. The following sources may be used in the PM10 program without prior approval:

- National Institute of Standards and Technology (NIST)
- ISO, IUPAC, ANSI, and other widely recognized national and international standards organizations
- US EPA
- The current edition of standard handbooks such as physical constants or conversions

18.2 Geographic Location

To identify the location of sampling sites maintained by the Bishop Tribe's Air Quality Program, conventional longitude and latitude coordinates and altitude are reported in AQS and Bishop Tribe's Air Program reports and with site information contained in on-line websites.

18.3 Historical Monitoring Information

Historical monitoring data and summary information derived from previous data may be used in conjunction with current monitoring results to calculate and report trends in pollutant concentrations. In calculating historical trends, it will be verified that historical data are fully comparable to current monitoring data. If different methodologies were used to gather the historical data, the biases and other inaccuracies will be described in trends reports based on that data. Direct comparison of PM10 with historical total suspended particulate data will not be reported or used to estimate trends.

18.4 External Monitoring Data Bases

It is the policy of this program that no data obtained from any other organization or agency shall be used in creating published reports or regulatory actions unless the data were collected under a QA program that meets the requirements of 40 CFR 58, and has been approved by the Environmental Manager in consultation with GBUAPCD.

Data from the U.S. EPA AQS database may be used in published reports with appropriate caution. Care will be taken in reviewing/using any data that contain flags or data qualifiers. If data is flagged, such data shall not be utilized unless it is clear that the data still meets critical QA/QC requirements. Users will review available QA/QC information to assure that the external data are comparable with Bishop Tribe's Air Quality Program measurements and that the original data generator had an acceptable QA program in place.

18.5 Meteorological Data from Other Sources

Meteorological data are gathered from other sources such as the U.S. Weather Service or GBUAPCD to provide information required when developing monitoring sites, computing corrections needed to convert form standard conditions to local conditions, and to support analysis and modeling efforts. These data are not reported to AQS and are clearly identified when used.

19.0 DATA MANAGEMENT (Element B10)

This section describes the data management operations pertaining to PM10 measurements by the Bishop Tribe's Air Quality Program. It provides the requirements data transfer from the monitor into the database and data reporting. The operations include recording, validations, calculations, transmittal, analysis, storage, and retrieval.

All sampling data will be entered into the Tribal air database through direct electronic transfer. Data are organized and filed as shown in Table 4. The official data are the analog data collected by the Sutron data logger and automatically transferred to the QREST cloud server. Data are organized and filed as shown in Table 4. The digital database is considered ancillary maintained on the office's desktop computers.

19.1 Data Transfers

Analog data are transmitted to a Sutron XLite data logger that polls the TEOM every second and compiles this information into 5-minute averages. The QREST system in turn polls the Sutron remotely via a web-based system, every 15 minutes and compiles this information into one-hour averages. This information is stored on the QREST cloud servers. Current PM10 concentrations are transmitted to the QREST website and can be viewed by the public. The data are protected by a firewall but are available for secure editing by the Air Quality Specialist. Analog data are archived as part of regular cloud server maintenance.

Digital data are downloaded to a dedicated computer at least every two week or more frequently if a problem is suspected. The downloaded data are then transferred to a second computer for analysis, where they are used for troubleshooting or when a status code is detected by the operator during a routine check.

19.2 Data Recording

All data downloading activities are automated and the corresponding file structure and file creation / modification dates create an electronic record. Separate files are maintained for analysis, using a standard nomenclature. Any changes to the files are documented electronically within each file.

19.3 Data Validation

Data validation involves checking that data processing operations have been carried out correctly and monitoring the quality of the field operations. The original raw data files are never edited, only copied. Data flags are added to second-generation files that are maintained in separate directories, using a distinct nomenclature. Analytic files are also maintained separately and any edits for analysis are

documented within those files. The original data can always be recovered because they are not changed.

The following validation functions are incorporated into the database to ensure quality of data entry and data processing operations. Data are examined daily using the QREST website information (and BPT dashboard and any email alerts). Any anomalies or status codes are noted. Data are validated for each month via manual editing for submission to AQS. Instrument storage data are examined weekly or more frequently if a problem is suspected. Storage data are used as a cross-check for any irregularities during validation of analog data for submission to AQS. Table 14 describes the checks that are routinely performed. Numeric values generated by the instrument cannot be edited in the instrument by the user.

Table 14. Data Validation Checks

Measurement	Range/Units	Completeness	Internal consistency	Comments
ANALOG CHANNELS/AUTOMATIC ALARMS				
Mass Concentration (PRC 240)	-100 to 900 µg/m^3	12 5-min readings of MC are averaged into one value for each hour. A day is complete when the data are 75% complete	TEOM data storage (digital), 5-min data	Large negative values may occur during routine maintenance and are not valid. Timestamped alarm wit thresholds at 9999, -100, 150, 300 µg/m^3
Status (PRC 008)	0 to 100 No units, default unit is V - raw voltage	12 5-min readings are averaged into one value for each hour.	TEOM data storage (digital), 5-min data Any value above .24 indicates a potential hardware problem that must be examined.	TEOM gives status codes in hexadecimal numbers for conversion; analog channel indicates presence of code with direct voltage over baseline value. Timestamped alarm wit thresholds at -1, -.05, .24, 1 V
Main Flow (PRC 217)	0-4.7 l/min	12 5-min readings are averaged into one value for each hour.	TEOM data storage (digital), 5-min data	Filter loading of 100% will drop main flow. Timestamped alarm wit thresholds at .2, 2.6, 3.4, 4 l/min
DIGITAL DATA				
Timestamp	Format: Month-day-year Day: 1 to 31 Month: 1 to 12 Year: 2015 to current year Format: 0:00 to 23:00	One value for each hour.		
Time (present when data is collected manually at TEOM via USB)	Format – hour:minute:second Hour 1-24 Minute and second 1-60	One value for each hour.		Separate column for date does not change.
Ambient pressure	3 decimal value in atm	One value for each hour.	Checked during flow checks	Diagnostic
Ambient RH	% Humidity	One value for each hour.	Compare to met data if problem suspected	± 2 d; Diagnostic

Measurement	Range/Units	Completeness	Internal consistency	Comments
Ambient temperature	Degrees Celsius	One value for each hour.	Checked during flow checks	± 2 d; Diagnostic
Dew point	Degrees Celsius	One value for each hour.	Calculated value	Diagnostic
Operating mode	1-4 No units	One value for each hour.	Value of 4 indicates proper function	
Status (PRC008)	0 to 1,073,741,824 No units	One value for each hour	Any value above 0 indicates a potential hardware problem that must be examined.	TEOM gives status codes in hexadecimal numbers for conversion
Main flow volumetric (PRC 217)	Up to 3.30 l/min	One value for each hour.	Sum of main and auxiliary flow = 16.67 l/min ± 10%	3.00 ± 10%, good correspondence to most recent flow check, no drift
Auxiliary flow volumetric	12.30 l/min to 15.04 l/min	One value for each hour.		13.67 ± 10%, good correspondence to most recent flow check, no drift
Case temperature	Degrees Celsius	One value for each hour.		Drift from 50.000 in 100ths' may indicate need for service
Air flow temperature	Degrees Celsius	One value for each hour.		Drift from 50.000 in 100ths' may indicate need for service
Transducer Cap temperature	Degrees Celsius	One value for each hour.		Drift from 50.000 in 100ths' may indicate need for service
1-Hour Mass Concentration	µg/m^3	One value for each hour. A day is complete when the data are 75% complete	Moving average w/ exponential smoothing	Large negative values may occur during routine maintenance and are not valid
Mass Concentration	-100 to 900 µg/m^3	One value for each hour		Large negative values may occur during routine maintenance and are not valid
24-Hour Mass Concentration	µg/m^3	One value for each hour	Moving average updated every hour	
Total Mass	µg	One value for each hour	Running total. Reset of Totaling indicates power interruption	Resets with filter change or reset
Vacuum pressure	Atm	One value for each hour	.33 - .50 is optimal range	Used to troubleshoot flows

19.4 AQS Submittal

The Bishop Tribe's Air Program reports all PM10 ambient air quality data and information specified by the AQS Users Guide (Volume II, Air Quality Data Coding, and Volume III, Air Quality Data Storage), coded in the AQS format. Such air quality data and information are fully screened and validated and are submitted directly to the AQS via electronic transmission, in the format of the AQS, and in accordance with the quarterly schedule. The specific quarterly reporting periods and due dates are shown in the Table 15. Data submissions to AQS were initiated in 2005 via TrEx. Data is coded into AQS format by the user (as well as some automated codes) in QREST, and can be retrieved only by credentialed log in on a

secure connection. This AQ- coded data file is submitted to AQS using either credentialed EN Services or directly from QREST using the tribal agency's credentials.

Table 15. Data Reporting Schedule

Reporting Period	Due Date
January 1 – March 31	June 30
April 1 – June 30	September 31
July 1 – September 20	December 31
October 1- December 31	March 31

19.5 Data Reduction

The analog data are the official data for the Bishop Tribe's Air Program and are the primary data used for analysis. Monthly and daily reports can be viewed on the QREST website, can be printed, or can be downloaded to a local computer in tabular or comma-delimited files. Generating a report on the QREST website does not change the underlying data. The original data collected from the instruments using the Sutron data logger and the QREST software remains intact. Changes to data made during validation can be transferred to the online portal, by using QREST flagging in addition to AQS null value coding, and are saved for retrieval using any QREST report.

An example of a report available is a monthly summary that includes the maximum hourly average for a given day, the minimum hourly average for a given day, the 24-hour average, and the capture rate based on the number of valid hourly averages for a given day or month (the last is available to credentialed agency users). These are available on both internal (secure) and external (public) webpages. Creating this monthly summary does not in any way alter the data stored on the QREST cloud server; it is simply an extraction process. Data can only be altered by the Air Quality Specialist while in the Data Review page, via secure connection and credentialed login, and the alterations are made via assigning null value codes to non-ambient records. The QREST cloud server containing the raw data is routinely backed up as described earlier.

The digital data are used for analysis when required for trouble shooting. The original data are stored on a dedicated computer and copies are transferred to a second computer for examination. Data are downloaded in comma-delimited format. These data are imported into Excel and saved under a separate name, indicating the last date of data downloaded. The original comma-delimited data remain unchanged. The individual Excel files are compiled into a larger spread sheet with monthly tabs. A new spreadsheet is created for each year.

Data Analysis

The Bishop Tribe's Air Program will implement the data summary and analysis requirements contained in 40 CFR 58, Appendix A. It is anticipated that as the program develops, additional data analysis procedures will be developed. The following specific summary statistics will be tracked and reported for the PM network:

- Single monitor bias (based on external performance audits and internal performance evaluations)
- Single monitor precision (based on flow rate checks)
- Network-wide bias and precision (based on flow rate performance audits and performance evaluations)

- Data completeness

19.6 Data Flagging – Monitor Qualifiers

A flagged, or null value coded record has a qualifier consists of 2 alphanumeric characters which act as an indicator that the data value (a) did not produce a numeric result, (b) produced a numeric result but it is qualified in some respect relating to the type or validity of the result, or (c) produced a numeric result but for administrative reasons is not to be reported. The Bishop Tribes' Air Program uses standard EPA AQS flags, and the corresponding verbal description of the problem identified. The null value codes included in electronic records (data to go to AQS). The verbal descriptions are included in logbooks, electronic operator logs, and validation logs. Note, formerly, with the TrEx system, which covered data up until January 2020, a color-coded set of 3- or 4-character coded flags was used in the validation software, which were converted into AQS codes. This is described in former versions of this plan.

Descriptive qualifiers will be used both in the field and in the office to signify data that may be suspect due to contamination, special events, or failure to meet QC limits. Operators may enter notes and set a non-ambient code to data applied during maintenance or quality assurance activities. Appendix A (SOPs) contains a complete list of the codes for non-ambient data including field activities.

19.7 Data Storage and Retrieval

Data archive policies are shown in Table 16.

Table 16. Data Archive Policies

Data Type	Medium	Location	Retention Time	Final Disposition
Field Notebooks	Hardcopy, digital	Site	5 years minimum Notebooks and forms are available from inception	N/A
PM10 Official Database	Electronic (web-based)	QREST cloud server The QREST data are the official database Data prior to Jan 2020 is in AQS at the EPA data mart, and also resides at BPT Air Office	5 years minimum Data are available from inception	N/A
PM10 Digital data base	Local computers	Air Program	5 years minimum Data are available from inception	N/A

The official PM10 data reside on the QREST cloud servers and in copy in the BPT Air Office. The analog data collected from the Sutron data logger by the QREST network are the primary and official data source because the data are downloaded continuously (every 15 minutes) The cloud storage is backed up to standard practices for major hosting companies, i.e. Amazon and Microsoft.

Data from the QREST cloud server are accessed via the internet. The software offers both secure and non-secure webpages for data acquisition, analysis and validation. The software has extensive flagging capability, including automatic flags if a status coded is encountered of if data are out of range.

Security of data in the PM10 database is ensured by the following controls: Only specifically identified operators using a password can validate and write to the data base files on the QREST cloud server during manual validation prior to AQS submission. Any changes are noted in the QREST data base. These data are the primary data base for reporting purposes.

Digital data are manually downloaded via an 40Ethernet connection using ePort software and are examined for validity, annotated, and used for troubleshooting when a problem is identified (for example data are flagged due to a status code). These data are stored on a dedicated computer in the Air Program office and are backed up to a second computer. Due to the communications configuration, these data are not accessible via the internet and are for local use only. Only the Air Quality Specialist has access to the two CPUs that store digitally collected data.

20.0 ASSESSMENTS AND RESPONSE ACTIONS (Element C1)

The results of assessments indicate whether the control efforts are adequate or need to be improved. Documentation of all quality assurance and quality control efforts implemented during the data collection, analysis, and reporting phases is important to data users, who can consider the impact of these control efforts on the data quality (see Section 21). Both qualitative and quantitative assessments of the effectiveness of these control efforts identify areas most likely to impact the data quality and the extent of the impact.

In order to ensure the adequate performance of the quality system, the Bishop Tribe's Air Program will perform the following assessments:

- Management Systems Reviews
- Network Reviews
- Systems Audits
- Field Performance Audits
- Data Quality Assessments

20.1 Management Systems Review

A Management Systems Review (MSR) is a qualitative assessment of a data collection operation or organization to establish whether the prevailing quality management structure, policies, practices, and procedures are adequate for ensuring that the type and quality of data needed is obtained. If an MSR is to be conducted, the auditor will carry out the activity. Otherwise, Bishop Tribe's Air Program's internal commitment to QA/QC, systems audits, performance audits, network reviews, pre-certification, data management and reporting, and corrective action activities will collectively serve as MSR. The quality control and assessment activities that collectively represent the MSR will use appropriate federal regulations and the Bishop Tribe's Air Program's QAPP to determine the adequate operation of the PM10 Program and its related quality system. The report will be filed and reported to the Environmental Manager and copies will be available at the Air Quality Specialist's desk (Section 9). Follow-up and progress on corrective actions will be determined by the Air Quality Specialist in consultation with the auditor and the Environmental Manager.

20.2 Network Reviews

The network review is used to determine how well the Bishop Tribe's air monitoring network is achieving its required air monitoring objective, and how it should be modified to continue to meet its objective. A PM network review will be completed annually, as needed. The Air Quality Specialist, in consultation with GBUAPCD will be responsible for conducting the network review.

The following criteria will be considered during the review:

- Date of last review
- Areas where attainment/non-attainment re-designations are taking place or are likely to take place
- Proposed site changes, as needed.

Prior to the implementation of the network review, significant data and information pertaining to the review will be compiled and evaluated. Such information may include:

- Network files (including updated site information and site photographs), available at the Air Quality Specialist's desk and an integral part of web-based information
- AQS reports
- Air quality summaries for the past five years for the monitors in the network
- Emission inventory information, including regional, local and on-reservation sources, and any relevant inventories conducted by neighboring tribes and GBUAPCD
- National Weather Service summaries for monitoring network area, as needed to supplement Tribal meteorological monitoring

Upon receiving the information, it will be checked to ensure it is current. Discrepancies will be noted on the checklist and resolved during the review. Files and/or photographs that need to be updated will be identified. The following categories will be emphasized during network reviews.

Number of Monitors – Adequacy of the network will be determined by using the following information:

- Historical monitoring data
- On and off reservation emissions
- Population density
- Best professional judgment

Location of Monitors – Maps, geographical overlays, and GIS-based information will be used as needed to assess the adequacy of monitor locations. Currently all monitors are located at the Bishop Tribe's Environmental Management Office. Network review will consider the adequacy of this monitoring location and will examine the need to expand to additional locations and/or monitoring for additional pollutants.

During network review, the stated objective for the current monitoring location will be 'reconfirmed' and the spatial scale 're-verified' and then compared to each location to determine whether these objectives can still be attained at the present location.

Prior to the site visit, the Air Quality Specialist will obtain and review the following:

- Most recent hard copy of site description (including any photographs)
- Data on the seasons with the greatest potential for high concentrations for specified pollutants

- Predominant wind direction by season
- Pollution roses if available

A checklist similar to the checklist used by the USEPA Regional offices during their scheduled network reviews will be used. (See *SLAMS/NAMS/PAMS Network Review Guidance*, Appendix E.) In addition to the items on the checklist, the reviewer will also perform the following tasks:

- Ensure that the inlet is clean
- Check equipment for missing parts, frayed cords, damage, etc.
- Record findings in field notebook and/or checklist
- Take photographs in 8 cardinal directions (at 45-degree intervals from North, clockwise)
- Document site conditions, with additional photographs as needed

Other Discussion Topics – In addition to the items included in the checklists, other subjects for discussion as part of the network review and overall adequacy of the monitoring program include:

- Siting criteria problems and suggested solutions
- Problems with data submittals and data completion
- Maintenance and replacement of existing monitors and related equipment
- Air quality assurance problems
- Air quality studies and special monitoring programs
- Proposed regulations
- Funding

A report of the network review will be written within two months of the review and filed.

20.3 System Audits

A system audit is a thorough and systematic onsite qualitative audit, where facilities, equipment, personnel, training, procedures, and record keeping are examined for conformance to the QAPP. T&B Systems will conduct the system audit. The auditor will perform three system audit activities that may be completed separately or combined:

- Field
- Data management – including information collection, flagging, data editing, and security
- Key personnel – including interviews with individuals responsible for planning, field operations, QA/QC, data management, and reporting.

To ensure uniformity of the system audit, an audit checklist will be used.

T&B Systems will send a copy of the final system audit report to the Bishop Tribes' Air Quality Program, who will forward the information to US EPA Region 9 as part of regular grant reporting activities. Any corrective action taken will be included in the report to US EPA Region 9.

Post-Audit Activities – The major post-audit activity is the preparation of the system audit report. The report will include:

- Audit team leaders, audit team participants and audited participants
- Background information about the project, purpose of the audit, dates of the audit, measurement phase or parameters that were audited, and a brief description of the audit process

- Summary and conclusions of the audit and corrective action required
- Attachments or appendices that include all audit evaluation and audit finding forms

To prepare the reports, the audit team will meet and compare observations with collected documents and results of interviews and discussions with key personnel. Expected QA Project Plan implementation will be compared with observed accomplishments and deficiencies and the audit findings will be reviewed in detail. The system audit report will be submitted to the Bishop Tribe's Environmental Management Office and Air Program for review and comment.

If the Environmental Management Office and/or Air Program have written comments or questions concerning the audit report, the audit team will review and incorporate them as appropriate, and subsequently prepare and resubmit a report in final form following receipt of the written comments. The report will include an agreed-upon schedule for corrective action implementation.

Follow-up and Corrective Action Requirements – The auditor and the Bishop Tribe's Air Program may work together to solve required corrective actions. The Bishop Tribe's Air Program has 30 days to respond to the follow-up and corrective action requirements in the system audit report. The audit team will review the Bishop Tribe's Air Program responses to the follow-up and corrective action and will work with the Bishop Tribe's Air Program to resolve any discrepancies.

20.4 Field Performance Evaluations

Field performance evaluations reveal how the data are handled, what judgments were made, and whether uncorrected mistakes were made. The audits will be performed every year and will be part of the system audit. The audits will have the same reporting/corrective action requirements as the system audit and will be conducted by T&B Systems.

20.5 Data Quality Assessment

Measurement statistics and summaries will be calculated and reviewed for each quarter and year, as well as other time periods deemed relevant to the Bishop Tribe's Air Program. For example, data summaries may be reviewed for each season, during periods of high winds, fires, traffic, or construction. In general, the data will be reviewed each month. The statistics described in Section 14 will be calculated as well as the average PM10 concentration during the time period, the range of valid concentrations measured, the times of the highest concentrations, times of the lowest concentrations, and the possible reason for changes in these parameters.

20.6 Documentation of Assessments

Table 17 lists each of the assessments.

Table 17. Assessment Summary

Assessment Activity	Frequency	Personnel Responsible	Schedule	Reporting/Resolution
MSR	As needed	Tribe, T&B Systems, US EPA Region 9	On-going	Tribe, T&B Systems, US EPA Region 9
Network Review 40 CFR 58 App E App F/G	Annually	Tribe, GBUAPCD, US EPA Region 9	Starting April 2003	Tribe, GBUAPCD, US EPA Region 9

Assessment Activity	Frequency	Personnel Responsible	Schedule	Reporting/Resolution
System Audits	Annually	Tribe, T&B Systems, US EPA Region 9	Starting in FY2005	Tribe, T&B Systems, US EPA Region 9
Data Quality Assessment	Annually	Tribe, T&B Systems, US EPA Region 9	Starting April 2003	Tribe, T&B Systems, US EPA Region 9

21.0 REPORTS TO MANAGEMENT (Element C2)

This section describes the quality-related reports and communications to management necessary to support PM network operations.

21.1 Network Reviews

Reporting to AQS started in 2005. The Bishop Tribe's Air Quality Specialist has provided a list of all monitoring sites, and their AQS site identification codes and submitted the list to the US EPA Office, with a copy to the Air Quality Subsystem (AQS). The AQS is US EPA's computerized system for storing and reporting of information relating to ambient air quality data. Whenever there is a change in this list of monitoring sites in a reporting organization, the Bishop Tribe's Air Quality Specialist will report this change to the US EPA Region 9 Office and to AQS. When there are changes in location of monitors or the network design is reviewed and found to be satisfactory, a revised QAPP will be issued and a revision copy will be submitted to the EPA Region 9.

21.2 Quarterly Reports

Each quarter, the Bishop Tribe's Air Program reports the results of all precision and accuracy tests it has carried out during the preceding quarter to AQS. The quarterly reports are submitted, consistent with the data reporting requirements specified for air quality data as set forth in 40 CFR 58, Appendix A, Section 4.

Required accuracy and precision data are to be reported on the same schedule as quarterly monitoring data submittals. The required reporting periods and due dates are listed in Table 18.

Table 18. Quarterly Reporting Schedule

Reporting Period	Due on or Before
January 1 – March 31	June 30
April 1 – June 30	September 30
July 1 – September 30	December 31
October – December 31	March 31 (following year)

Air quality data submittal for each reporting period are edited, validated, and entered into the AQS using the procedures described in the AQS Users Guide, Volume II, Air Quality Data Coding. The Bishop Tribe's Air Quality Specialist is responsible for preparing the data reports for transmission to USEPA. The QREST software has the capability of automatically generating AQS reports, following manual validation. The AQS files are transmitted via the EPA Environmental Exchange network. This automated electronic system avoids any transcription or data entry errors that might otherwise occur in the report generation process. AQS submissions started in 2005.

21.3 Technical System Audit Reports

The Bishop Tribe's Air Program performs regular Technical Systems Audits of the entire monitoring system (Section 20). These audits are conducted by T&B Systems. These reports are issued by T&B Systems and submitted to the Bishop Tribe's Air Quality Specialist for review and comment. The final reports are submitted to US EPA Region 9 and are available for review at the Air Quality Specialist's desk.

External technical system audits are conducted at least every three years by the US EPA Region 9 as required by 40 CFR 58, Appendix A, Section 2.5; provided staff are available.

21.4 Control Charts

Control charts are used as needed to supplement regular instrument performance information collected as part of weekly, bi-weekly precision checks, quarterly, semi-annual and annual maintenance. They are used to locate suspected trends in instrument performance. The charts and instrument performance data are available to auditors from T&B Systems and are available for review at the Air Quality Specialist's desk.

21.5 Responsible Organizations

The following paragraphs describe key personnel involved with QA reporting.

Air Quality Specialist – The ultimate responsibility for the quality of the data and the technical operation of the PM monitoring network rests with the Air Quality Specialist. In addition, the Air Quality Specialist is responsible for ensuring that formal and informal performance evaluations and internal and external audits are conducted on schedule, for reviewing results and for taking appropriate corrective action.

The Air Quality Specialist is also responsible for the data collected from all PM monitors in the Bishop Tribe's Air Program monitoring network, including identifying problems and taking appropriate corrective action, documented through instrument logs. The Air Quality Specialist is also responsible for reviewing QC data and for assuring that repairs and preventive maintenance are completed and that the maintenance is effective.

The Air Quality Specialist is responsible for compiling and publishing Bishop Tribe's Air Program data; reviewing the web-based data base; managing the local database and developing systems and processes for distributing these data in electronic form beyond those available through the combined BPT data acquisition system (DAS) and QREST if needed; identifying areas attaining and not attaining the Bishop Tribe's air quality standards; evaluating air quality trends and developing tools for determining and presenting these trends; and analyzing and interpreting air quality data in the context of meteorological and emission data to explain the causes and mechanisms responsible for the Bishop Tribe's air quality problems.

The Air Quality Specialist through the BPT DAS/QREST network manages, archives, and distributes the data, including resolving discrepancies in data, providing for the orderly and efficient transfer of data from data collection to the database, and distributing the data to meet program needs. Further specific duties include the development and implementation of enhancements to the data management systems in collaboration with vendors and ITEP and EPA staff, and improving the forms of data

distribution and access used to perform the above, and the evaluation of siting issues, including annual network reviews.

The Air Quality Specialist is responsible for assessing the acceptability of the air quality data prior to its use, purchasing NIST-traceable standards, assuring regular calibration of flow standards used in the field by an external entity, and generating QC reports.

Technical Assistance – The program retains contracted help from former GBUAPCD staff Scott Weaver to add redundancy and increased levels of quality assurance duties including data review, and additionally, may work with other Tribal Air Quality staff, other BPT Environmental staff for the same purposes, depending on the nature of the problem. If available, GBUAPCD may also be called upon for assistance.

Environmental Manager – The Environmental Manager is responsible for ensuring that the Air Quality Specialist has the appropriate skills, experience and resources necessary to carry out the job. In addition, the Environmental Manager is responsible for regular performance reviews of the Air Quality Specialist and may review any internal or external audit information.

Outside Auditor – The Outside Auditor conducts regular audits with the goal of ensuring quality assurance, quality assessment, and quality control activities and that ambient air quality data meet or exceed the data quality objectives of the Tribe.

22.0 DATA REVIEW, VALIDATION AND VERIFICATION REQUIREMENTS
(Element D1)

This section describes data verification and validation procedures. Verification can be defined as confirmation by examination and provision of objective evidence that specified *requirements* have been fulfilled. Validation can be defined as confirmation by examination and provision of objective evidence that the requirements *for a specified intended use* are fulfilled. Although there are a number of objectives of ambient air data, the major objective for the Bishop Tribe's Air Program PM network is informational, and for comparison to the Tribe's air quality standards and is the primary intended use.

22.1 Sampling Design

The objective of the sampling design is to represent the population of interest at adequate levels of spatial and temporal resolution.

Once a year, the Bishop Tribe's Air Program will perform a network review to determine whether the network objectives, as described in the Network Design Plan, are still being met, and that the sites are meeting the CFR siting criteria (see Section 20).

Every three years US EPA Region 9 will conduct a network review to determine whether the network objectives, are still being met, and that the sites are meeting the CFR siting criteria, provided staff are available.

The ambient air data derived from the site will be used to validate the sampling design. This information will be included in network review documentation and communicated to the US EPA Region 9 Office.

22.2 Data Collection Procedures

System audits will be used to verify that the data collection activity is being performed as described in this QAPP and the SOPs. Deviations from the data collection activity will be noted in audit finding forms and corrected and reported to management. The use of QC checks that have been placed throughout the measurement process help validate the activities occurring at each phase. The review of QC data such as the performance evaluation, and the sampling equipment verification checks that are described in Sections 14 can be used to validate the data collection activities. Any data that indicates unacceptable levels of bias or precision or a tendency will be flagged and investigated.

22.3 Quality Control

Section 14 of this QAPP specifies the QC checks that are to be performed during data collection. These include the use of flow rate transfer standards and instrument checks, which provide indications of the quality of data.

Validation of QC procedures includes a review of the documentation of the corrective actions that were taken when QC checks failed to meet the acceptance criteria, and the potential effect of the corrective actions on the validity of the routine data. This review is conducted on an ongoing basis by the Air Quality Specialist, contracted technical assistance, the QA Manager, and the Outside Auditor. Prior to and following the installation of a new PM10 monitor and change in personnel, the Air Program contracted technical assistance from former GBUAPCD staff (see section 4), who provided training and advises on QC scheduling and technical details.

22.4 Calibration

Routine instrument performance checks are performed to ensure stable performance. The calibration certificate of the flow rate transfer standard will be kept in the instrument file and available during an audit. The flow transfer standard is sent to the manufacturer annually for re-calibration.

The calibration of the monitor itself is recorded in the original paperwork received with the monitor, and calibration is verified through the regular sequence of flow checks, calibrations and regular maintenance. If degradation in instrument performance is observed during routine instrument performance checks, calibration or maintenance, it will indicate some change in the system. Any data that indicates unacceptable levels of bias or precision will be flagged and investigated. Corrective action will be taken as needed. Validation includes the review of the documentation to ensure corrective action was taken as prescribed in the QAPP.

23.0 VALIDATION AND VERIFICATION METHODS (Element D2)

Exceptional field events may occur, and field activities may negatively affect the integrity of data files. In addition, some of the QC checks will fail to meet the requirements. Information on problems that affect the integrity of data is identified in the form of data qualifiers or flags (Appendix A). It is important to determine how these failures affect the routine data. This section describes the methods that will be used to evaluate the data.

A thorough review of the data will be conducted for completeness and accuracy. Data will be reviewed for outliers and values outside of acceptance criteria. These data will be flagged. Details of these activities are discussed in Section 19.

Records of all invalid data files are filed electronically and can be retrieved for future re-verification. Information noted with the result includes a brief summary of the reasons for invalidation along with the associated flags. This record will be available on the database in the operator and validation logs.

23.1 Validation of Measurement Values

Information from the owner's manual, 40 CFR 58 Appendix A and the site operator's judgment are used to invalidate a data file or measurement. The record of flags used for validation prior to January 2020 is available as part of the MeteoStar LEADS documentation. Operator logs are used to inform validation. QREST, currently in use, has a comprehensive help section and documentation, and allows for additional data reviewers, as described in the Key Personnel section (and other sections).

All efforts will be made to take corrective actions, depending on the type of QC checks that were outside of acceptance criteria, to correct the problem. If the results remain outside the criteria, the results will be flagged until the problem is corrected.

24.0 RECONCILIATION WITH USER REQUIREMENTS (Element D3)

Reconciliation with the data quality objectives (DQOs) involves reviewing both routine and QA/QC data to determine whether the DQOs have been attained and that the data is adequate for its intended use. This process is termed data quality assessment (DQA).

The data used for information, for comparison to Tribal air quality standards and NAAQS are never error free and will always contain some level of uncertainty. Because of these uncertainties or errors, both false positives and false negatives may occur. There can be serious political, economic and health consequences of making such decision errors. Therefore, the Bishop Tribe's Air Program needs to understand and set limits on the probabilities of making incorrect decisions with these data. In order to set probability limits on decision errors, the Bishop Tribe's Air Program needs to understand and control uncertainty. Uncertainty is used as a generic term to describe the sum of all sources of error associated with a measurement result.

The measurement quality objectives (MQOs) listed in Table 3 are the goals for measurement uncertainty that, if met, will achieve the overall data quality objectives for this project. The following sections describe how the calculations will be made to determine if the MQOs have been met.

There are two components of measurement error. Systematic (or bias) errors cause results to be generally always high or always low. These errors are often caused by improper calibration or drift in an electronic or manual setting. Random (or precision) error causes results to be sometimes high and sometimes low, and these errors cannot be eliminated because they are intrinsic to the instrument variability. In the NAAQS, total error is termed accuracy. The quality control measurements made in this program with this automated monitor estimate precision error of the flow rate and the bias of the constants in the monitor software. Total error, or accuracy, is estimated with the external audits described in section 24.2.

24.1 Calculations for Precision

The Bishop Tribe's Air Program maintains one PM10 monitor and records the flow rate at least every two weeks. This flow rate is compared to the set-point flow rate, as shown in equation 1 of section 14. If at any time, this percent difference exceeds ±7%, an investigation into the cause of the difference is made. This procedure is described in Section 14.

24.2 Calculations for Accuracy

Accuracy is based on the results of quarterly audits. Each monitor is externally audited quarterly (see section 14.3 for the definition of an external audit) with a flow rate transfer standard. If the percent difference between the instrument specifications and the audit flow transfer standard exceeds ±10% then there will be an investigation and possible recalibration or repair.

The Bishop Tribe's Air Program will gather PM10 data for a minimum of 3 years adhering to the requirements in this QAPP. The data will ultimately be used to make long-term decisions on the conditions affecting air quality and the operations of the air sampling network.

ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
CAA	Clean Air Act
CV	coefficient of variation, or sample standard deviation divided by the mean
CFR	Code of Federal Regulations
COC	chain of custody
DQA	data quality assessment
DQOs	data quality objectives
EMO	Environmental Management Office
EPA	Environmental Protection Agency
FEM	Federal equivalent method
MQOs	measurement quality objectives
MSR	management system review
NAAQS	National Ambient Air Quality Standards
NIST	National Institute of Standards and Technology
OAQPS	Office of Air Quality Planning and Standards
PM10	particulate matter $\leq$ 10 microns
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
QREST	Quality Review and Exchange System for Tribes
RPD	relative percent difference
SOP	standard operating procedure
T_a	temperature, ambient or actual
TrEx	Tribal Environmental Exchange Network
TSA	technical system audit
TSP	total suspended particulate
V_a	air volume, at ambient or actual conditions

APPENDIX A
STANDARD OPERATING PROCEDURES

SOP 1. DATA VERIFICATIONS AND MANAGEMENT

Analog Data

The analog data that are automatically transferred from the data logger to the QREST cloud server are the official data. These are the data that are also manually validated for submission to AQS.

Data Transfer – The Sutron data logger collects analog data from the instruments every second, and constructs 5-minute averages. This data logger is connected to the internet. The 5-minute data are then automatically polled and downloaded to the remotely located, secure QREST. Hourly averages are calculated on the QREST cloud server and n-minute data are also available for viewing. Data are automatically transferred to the US EPA AirNow data base.

The parameters transferred are listed in Table A.2 below.

Table A.2. Analog and Automatic Alarm Data Parameters

Parameter	Frequency	Comment
ANALOG CHANNELS		
Mass Concentration (PRC 240)	12 5-min readings are averaged into one value for each hour.	Collected via Sutron data logger
Status (PRC 008)	12 5-min readings are averaged into one value for each hour.	Collected via Sutron data logger
Main Flow (PRC 217)	12 5-min readings are averaged into one value for each hour.	Collected via Sutron data logger
AUTOMATIC ALARMS		
Mass Concentration (PRC 240)	Timestamped	Collected via Sutron data logger
Status (PRC 008)	Timestamped	Collected via Sutron data logger
Main Flow (PRC 217)	Timestamped	Collected via Sutron data logger

Data Back-Up the QREST cloud service agreement has the responsibility for maintaining data security and back-up. The Air Quality Specialist performs periodic back-ups also. The QREST information is updated hourly. These are the official data and are validated quarterly and used for AQS submission. The data which streams to QREST is also stored in the Tribe's data logger on-site, in n-minute values, accessible via credentialed login.

Daily Data Checks – The Tribe's real-time online data dashboard, and QREST webpage www.QREST.net are viewed daily to verify proper data transmission. These checks are part of the Air Quality Specialist's automatic calendar. Any problems, such as the instrument operating out of specified limits, unexplained high or large negative values, or missing records cue the operator to further check the instrument for the cause of the status code and to take necessary maintenance or repair steps, or to download storage data for troubleshooting. The procedure for responding to these unscheduled non-ambient data is described under digital data. Timestamped automatic alarms will notify the operator of analog data exceeding or drifting lower and upper thresholds. The operator can also program a code into the data logger data during quality assurance activities or preventive maintenance activities. The list of codes contained in Table A.3. are used for data validation prior to submission to AQS.

Monthly Data Checks – Summary files are obtained in web (tabular) comma-delimited form from the QREST webpage These data are then transferred to a spread sheet with tabs for each pollutant and for each month. Graphs for each month containing the daily minimum, maximum and average are also created for presentation to the Tribal Environmental Protection Agency board, using this or dedicated ancillary software through Vista Data Vision.

Analysis – Analyses are carried out at a variety of intervals for different purposes. Any automatic alarms issued by the data logging system are compared to hourly data, or 5-minute data as needed. Alarms are timestamped for all threshold exceedances. Real-time analysis of data logger is conducted via 5-minute manual data collection tests and voltage tests. The web pages in QREST which can be used for analysis are the *Monthly Summary* and *Annual Summary*. Pollution roses that combine meteorological and air quality data from the Bishop Tribe's monitoring stations are also available using the VDV software. These may be combined with HySplit back trajectories to investigate unusual concentrations. Monthly summaries (included in monthly reports to TEPA in warm weather or months with elevated ozone levels), diurnal visualizations, and other manipulations are available in VDV.

Validation is completed for monthly datasets in QREST. Standard AQS validation codes are appended to selected records in batch or single records. Table A.3 below contains these codes. (Note: the AQS codes are the same as those generated by the former TrEx, minus the extra 3-character qualifiers used by TrEx, which are tabulated in prior versions of this Plan.). Though there are a multitude of AQS codes to accommodate many different types of monitors, only certain codes are regularly used by BPT Air Program. These codes are not to be confused with "QREST flags" which can also be appended to data rows, and will cause the data to display as flagged for online viewers, as this does not occur with only AQS coding. QREST flags may also be applied for this purpose. The selected codes most commonly used are as follows, in the order in which they appear in the (entire) list in the QREST Data Review page:

Table A.3. AQS Null Codes in QREST

Flag	Description
AI	Insufficient data (cannot calculate)
AL	Voided by operator
AS	Poor quality assurance results
AV	Power failure
AX	Precision check
AZ	QC audit
BA	Maintenance or routine repairs
BF	Precision/zero/span
BK	Site computer/data logger down
BR	Sample value below acceptable range
DA	Aberrant data/corrupt files

AQS Submission was initiated in 2005 using the former TrEx Manual Validation software. Since January 2020, QREST is used to generate the AQS files, and can be augmented with data imported from Vista Data Vision, following the procedures below.

1. SCHEDULE
   AQS submissions for each quarter are to be completed within 90 days of the end of that quarter

2. PREPARATION
   2.1. Access or open digital data workbook (TEOM internal storage)
   2.2. Access or open relevant graphical data from Vista Data Vision such as monthly time-series charts.
   2.3. Access or open downloaded operator notes from the data logger.
   2.4. Locate and open relevant maintenance logs and field forms

3. MANUAL VALIDATION IN QREST
   a) For details on using the manual validation software, a comprehensive user guide is available at https://www.qrest.net/Home/Help/#Quality-Control.
   b) Open in a web browser (Chrome) www.QREST.net. Log in to access the dashboard. (The above link is accessed by the "?" or Help button in the lower left of the screen).
   c) Using the left sidebar, choose Air Data, and in the dropdowns, Data Review. **NOTE:** ITEP has created comprehensive SOPs (pictorial step charts) instructing how to set up auto-validation, and perform first level validation. Currently the SOPs are available and are stored at https://www.dropbox.com/sh/zi76ar48gickf3m/AAAxWwrO_azXo_aSABw7Pg2Ba?dl=0
   And the first level validation SOP directory:
   https://www.dropbox.com/sh/zi76ar48gickf3m/AAAxWwrO_azXo_aSABw7Pg2Ba?dl=0&preview=8-Level+1+Data+Review.xlsx
   These may be revised further as of January 2021.
   d) If the monthly dataset does not show 100%, a button to "fill missing with LOST qualifier" should display, but if needed, import the missing data using the Manual Import page. This is used to configure templates and column mapping for imported data, and to enter data rows for import.
   e) Manual validation for all parameters is completed one pollutant at a time, in monthly sets. Select a month from the dropdowns, and all data parameters will display.
   f) Select one month's data for relevant pollutant. Note any differences in UTC and PST. Data will display in graph form and each 1-hour record. Validation is performed on 1-hour data; n-minute data is available for viewing and comparison.
   g) Review data, expanding graph scale and referring to maintenance records as needed. Find any records which aren't "AQS ready" or have QREST flags and assign null value codes to those first.
   h) Add null value codes (see Table A-1 above) to records where needed based on logbooks, forms etc., either individually or in manageable batches. Null value codes replace the numeric value and are for records where the numeric value doesn't represent reality. The qualifier codes in QREST are for exceptional events and are thus far not used for BPT station data.
   i) Validate corrected hourly data, adding short validator notes to log or to describe issues with the instruments, until all non-ambient values are removed by coding. (Note date of validation and any issues in instrument logbook.) When checking the data against the instrument QC Checks and logs, and for automatically assigned flags, threshold exceedances and stuck values, (for plausibility) select Level 1 complete. When checking the data against other systemic elements such as other datasets, other instrument logs, calendars, etc., (for consistency) select Level 2 complete (for example, as an outside data reviewer looking at the BPT data).
   j) Repeat previous steps for each remaining parameter. The data sets can be completed in modules of a parameter per month. Completion status are displayed for each dataset.
   k) Once completion status for AQS ready and Level checks show as 100%, select AQS Submission from the left sidebar.
   l) Select Add, then select as many months and parameters worth of data as QREST will generate a file for (try first 1 parameter at a time) and select Insert and Flat.

m) In the list of AQS files, including the one generated and any others not deleted yet, download to submit via EN Services (EPA CDX). Save the file in the QREST AQS files folder, adding the parameter name to the end of the original file name (which contains the date). Check it to compare what data was generated to what was selected, and to verify that no values are above the absolute maximum or below the absolute minimum for the parameter. Extreme values will stall the AQS submission.
n) Note the name of the file in the AQS logbook.
o) Repeat as necessary to complete the quarter's data.

4. AQS SUBMISSION
4.1. Data are submitted via the website https://enservices.epa.gov/login.aspx
4.2. Instructions are contained in the notebook labeled AQS Submission Tutorial.
4.3. Once at the website, log on using the default domain
4.4. Go to My Services and select NGNProd2
4.5. Browse for the file you want to submit, enter AQS user ID, select Bishop Paiute Tribe-EMO as the screening group, and select flat file type. If the data have been thoroughly reviewed during the manual validation process, it is appropriate to select post as the final step and do not stop on error. Send the data. Make a note in the AQS logbook.
4.6. Go to Activity Status to verify data processing. When complete, click on transaction ID to download and view reports. E-mail will automatically be sent to the user address provided.
4.7. Review and save reports in the AQS Reports directory, adding information on the date of submission in the format mm.dd.yy
4.8. Log off enservices.
4.9. Log on to AQS via the website https://aqs.epa.gov/aqs/
4.10. Retrieve the AMP350 raw data report, save, print and add to binder for the parameters just submitted.
4.11. Log off AQS.

Digital Data

Response to flagged data/automatic alarms in daily data checks – If the daily check reveals lost or missing data or that the monitor is operating out of specification, use ePort to connect to the monitor and to check current operating parameters on the instrument remote dashboard. In addition, follow the instructions below to download data from the last point and import into the specified Excel spreadsheet to try to identify the source of the problem and complete necessary maintenance or repairs. A list of status codes is contained in Operating Manual, Section 7.

Downloads take place weekly when possible or biweekly, using ePort Software. These files are automatically stored into a series of sequentially numbered files that contain the machine serial number. The downloaded files are stored in the file PM year, located on a dedicated machine. Each row of the file represents one hour's worth of data.

The parameters downloaded are listed in Table A.1 below.

Table A.1. Digital Data Parameters

Parameter	Frequency	Comment
Timestamp	Every hour	Automatic field

Parameter	Frequency	Comment
Ambient Pressure	Every hour	Diagnostic field (may vary)
Ambient Relative Humidity	Every hour	Diagnostic field (may vary)
Ambient Temperature	Every hour	Diagnostic field (may vary)
Dew point	Every hour	Calculated field
Operating Mode	Every hour	Operational field
Status	Every hour	Operational field
Main flow volumetric	Every hour	Operational field
Bypass flow volumetric	Every hour	Operational field
Case temperature	Every hour	Operational field
Air flow temperature	Every hour	Operational field
Cap temperature	Every hour	Operational field
1 Hour Mass Concentration	Every hour	Calculated field
Mass Concentration	Every hour	Calculated field
24 Hour Mass Concentration	Every Hour	Calculated field
Total Mass	Every hour	Calculated field
Vacuum Pressure	Every hour	Operational field

Analysis – Downloaded files are copied to a second machine for analysis, with no editing or changes in file names, which include the date. They are stored in a directory "TEOM raw data". Next the files are imported into an annual Excel spreadsheet with a separate tab for each month, called "TEOM *year*." This file is used for troubleshooting and comparison. Monthly graphs may be carried out in a second tab. All notes are transferred with the data and invalid values may be deleted (flagged in *light yellow*) for analyses. Outside data reviewers may request digital (internal storage) data for periods under review.

Monthly the files in "TEOM *year*" are examined to verify that flow rates and operating temperatures are within range and no additional status flags are present in the data. If there is more than one status code, the codes are presented in hexadecimal format and can be decoded to identify combinations of status codes present. Using the forms for maintenance and calibration (SOP 2) spread sheet rows are flagged in *light yellow* during the times where maintenance is carried out or other annotation is required. An annotation is added in the row containing 1-hour mass concentrations indicating the nature of the maintenance, ambient conditions during high or unusual concentrations, or other occurrences. Additional fields may be added containing internal consistency calculations, such as verifying that flows and temperature are within standards. Status codes or drift in parameters may lead to identifying the source of the problem.

SOP 2. INSTRUMENT MAINTENANCE AND CALIBRATION

Starting in FY21 (October 2020), values from TEOM regular checks are recorded in digitized versions of the field forms. The digital forms are excel forms, some of which allow charts of key operational indicators to be generated as the user inputs data. These are described as relevant for each field check below. The paper form can be used as back up in the event the digital form cannot be used; or in the case of the semi-annual and annual forms, in lieu of using the digital form and printing it later. In addition to the generation of control charts, the digital forms increase flexibility of accessing the monitors separately to accessing the office building, and provide a way to read the charts of the key operational data in the field.

Digital forms are treated with the same level of security and back up as paper forms, though they are backed up digitally more frequently (weekly) than paper forms are backed up by scanning. They are printed monthly to add to the printed field form records. Only the credentialed operator may access the digital forms. The order of access and back up ensures that only the working versions of the form will be used for original data entry (on a laptop) in the field, and backed up to the dedicated Air computer, which is then copied to computers on the tribe's main network for regular back up.

Printouts of the digital forms are appended after the regular (paper) version of the form in this Appendix, as a demonstration of the content of the digital forms, which are directly adapted from the original paper form. Current data is included for the weekly and bi-weekly forms as it's necessary in order to populate the charts.

Daily Data Checks, Weekly Checks, Bi-Weekly Precision Checks and Quarterly Maintenance

Daily Data Checks – The webpage www.QREST.net is checked daily to verify proper data flow. The data can also be downloaded from this web page. Any unusual values displayed, cue the operator to further check the instrument for the cause, and to take necessary maintenance or repair steps. The operator can also flag data during quality assurance activities or maintenance activities in the data logger. The operator notes unusual data or occurrences in the field logbook.

When flagged or suspicious data are encountered, the operator will access the monitor directly or remotely using ePort and follow the procedures outlined under Digital Data in SOP1 to download data from the last date and move the data to the appropriate spreadsheet for examination. A list of status codes is contained in Operating Manual, Section 7.

Weekly Checks involve a check of internal values measured by the instrument and available from the TEOM display screen. Values are recorded directly on the form labeled "TEOM/ Weekly Check and Bi-Weekly Precision Check," attached. A new form is started every calendar month. The digital form generates charts of *total mass* and *noise* as the user enters data. These parameters are useful in tracking filter loading.

Bi-Weekly Precision Checks involve

- Direct measurement of the main and total flows using an external transfer standard (Operating Manual, TEOM 1405, p. 5-32)
- Temperature and pressure verification using an external standard
- Cleaning the pump chamber

The results are recorded on the second page of the form labeled "Weekly Check and Bi-Weekly Precision Check," attached. The digital form (which includes monthly and quarterly checks) generates charts of *main flow, total flow, temperature difference, atmospheric pressure difference* and *pump vacuum,* as the user enters data.

Every 4 Weeks the following procedures are also undertaken

- Replacing the TEOM filter (Operating Manual, TEOM 1405, p. 5-4)
- Replacing the inlet (Operating Manual, TEOM 1405, p. 5-16)
- Cleaning the inlet (Operating Manual, TEOM 1405, p. 5-16)
- Cleaning the A/C filters
- Replacing the A/C filter and cleaning the condenser coils
- Leak check (Operating Manual, TEOM 1405, p.3-4; limits in wizard screens)

The results are recorded on the second page of the form labeled "Weekly Check and Bi-Weekly Precision Check," attached.

Every Quarter the following additional procedures are also undertaken

- Direct measurement of the auxiliary flow using an external transfer standard (attach the flow standard to the bypass flow immediately after the flow splitter)
- Clean the air down tube
- Replace in-line filters (Operating Manual, TEOM 1405, p. 5-20)

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ENVIRONMENTAL MANAGEMENT OFFICE
AIR QUALITY PROGRAM

TEOM 1405 WEEKLY CHECK AND BI-WEEKLY PRECISION CHECK – PM10 SN: 1405A231661508

WEEKLY CHECK
Check Main Screen and write down all entries exactly as they appear on the TEOM display.

Operator				
Date				
Current time (PST)				
Operating Mode				
Status/Codes				
Filter Loading %*				
Protection Level				
Mass Concentration				
01-Hr MC				
08-Hr MC				
12-Hr MC				
24-Hr MC				
Tot Mass				
Case Temp (°C)				
Air Temp (°C)				
Cap Temp (°C)				
Main Flow (lpm)				
Aux Flow (lpm)				
Vac Pressure (atm)				
Noise				
Frequency				

Notes: * Replace TEOM filters when filter loading reaches 90% or every 4 weeks whichever is sooner.

Comments

BI-WEEKLY PRECISION CHECK – PM10
SN: 1405A231661508

Set logger data to "q" mode. _____

Flow check

Operator					
Date		Start Time (PST)		End Time (PST)	

Flow check first then replace filters.

Verify that the Streamline Pro is using remote temperature to compute flows

	TEOM Design Values	TEOM Current Displayed Values	Percent Difference (design – display)	Limit Values	Calibration Device (1-minute collection)	Difference (display – audit)	Limit Values
Total Flow	**16.67**		n/a	n/a	Max Min Avg		**± 1 lpm or 7%**
Main Flow (lpm)	**3.00**			± 2 %	Max Min Avg		**± 0.2 lpm or 7% (2.8-3.2)**
Aux Flow (lpm) -- quarterly	**13.67**			± 2 %	Max Min Avg		**± 7% .96 lpm**
Amb. Temperature (°C)	n/a	Start End	n/a	n/a	Max Min Avg		**±2° C**
Amb. Pressure (mm Hg)	n/a		n/a	n/a	Max Min Avg		**±10 mm Hg or (.013 atm)**

2 weeks – Pump Vacuum and Fan

Pump Vacuum	in Hg	Pump fan		Clean Pump Chamber	

4 weeks – A/C Maintenance, filters and Inlet; check shelter attachment; clean pump chamber; leak check

Exchange A/C filter		Clean condenser coils	
Clean pump fan		Check Seal/Bolts	
Replace TEOM filter		Exchange Inlet	
Leak Check (use TEOM wizard screens & limits)	Main Flow (lpm)	Bypass Flow (lpm)	Limiting values (wizard)
			Less than 0.15

Quarterly

Clean air down tube		Clean mass transd. inlet	

Comments

Sutron – set data to "k" mode. _____
Filter noise & freq after change: _____, _____

TEOM 1405 Weekly Check - DIGITAL - PM10 SN1405A231661508

Check Main Screen and write down all entries exactly as they appear on the TEOM display.

Operator						
Date						
Current Time (PST)						
Operating Mode						
Status/Codes						
Filter Loading *						
Protection Level						
Mass Concentration						
1-Hour MC						
8-Hour MC						
12-Hour MC						
24 Hour MC						
Total Mass						
Case Temp (deg C)						
Air Temp (deg C)						
Cap Temp (deg C)						
Main Flow (lpm)						
Aux Flow (lpm)						
Vac Pressure (atm)						
Noise						
Frequency						

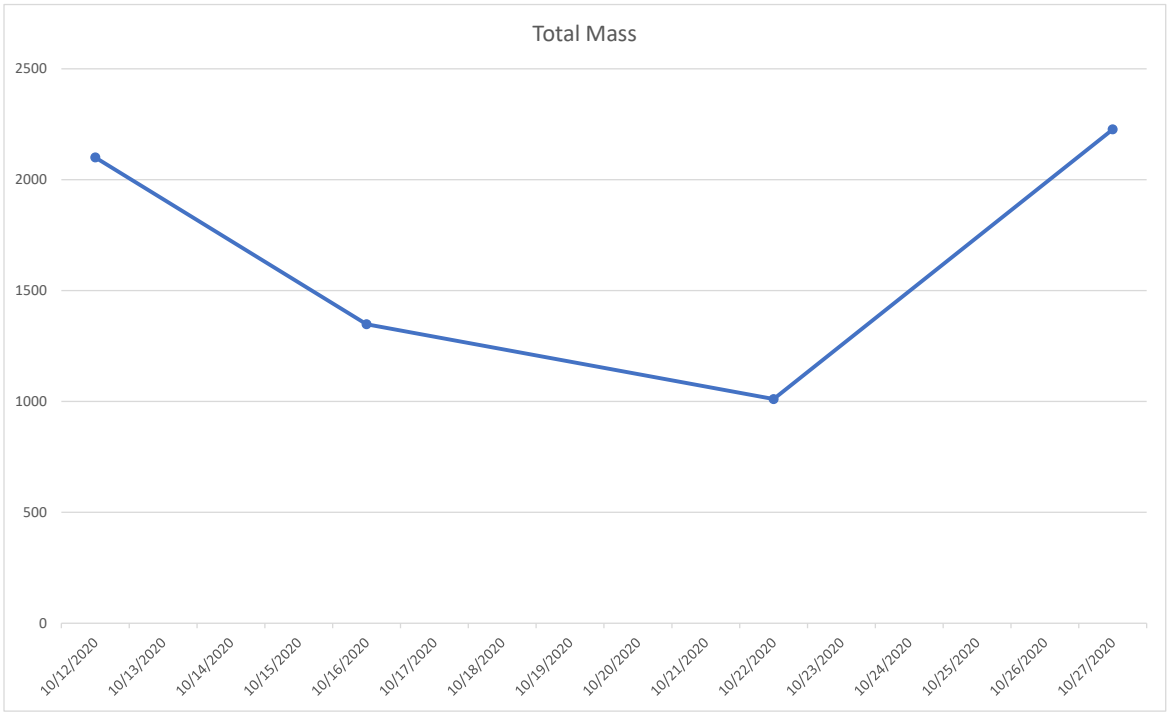
THIS IS NOT THE FORM
GO TO DATA tab
Put cursor in next row column A
Click data forms button
Click ok for any errors
make a new entry
use tab key (only) to enter data
click close or enter

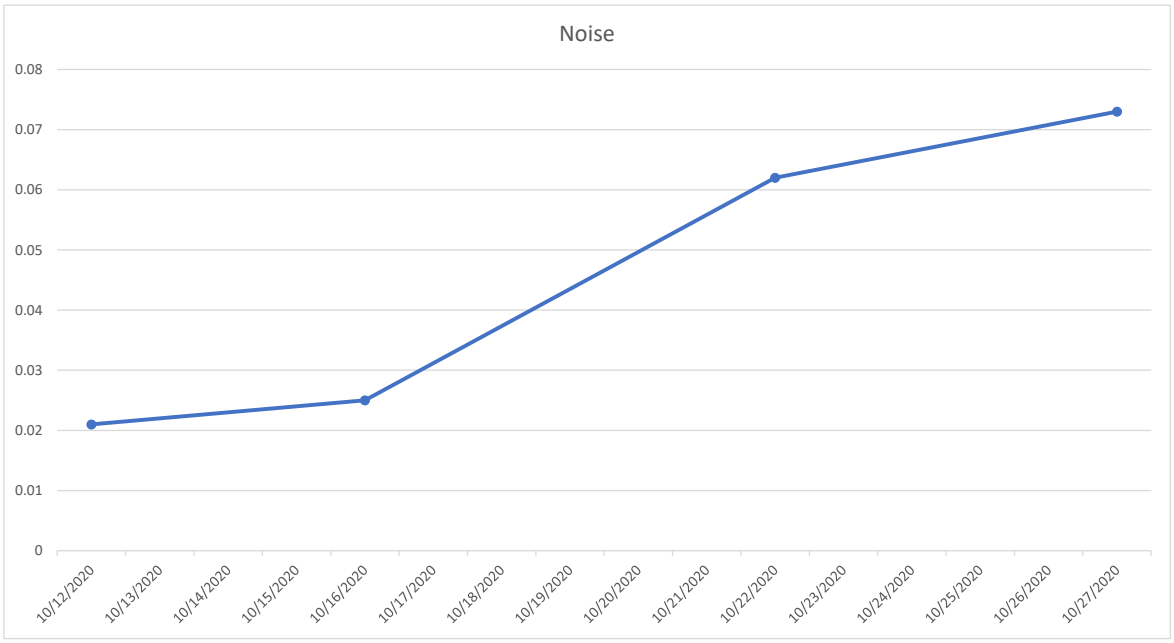
*Replace TEOM and FDMS filters when filter loading reaches 90% or every 4 weeks whichever is sooner.

Comments:

Operator	Date	Current Time (PST)	Operating Mode	Status/Codes	Filter Loading *	Protection Level	Mass Concentration	1-Hour MC	8-Hour MC	12-Hour MC	24 Hour MC	Total Mass	Case Temp (deg C)	Air Temp (deg C)	Cap Temp (deg C)	Main Flow (lpm)	Aux Flow (lpm)	Vac Pressure (atm)	Noise	Frequency
ER	10/16/2020	14:15	FO	normal	74.33	1	15.17	10.03	19.67	17.88	23.25	1348.38	50	50	50	2.99	13.66f	0.3	0.025	277.1051
ER	10/12/2020	1100	FO	Normal	30	1	80	100	75	60	25	2100	50	50	50	2.99	13.67	0.35	0.021	277.1781
ER	10/22/2020	10:48	FO	normal	77.19	1	224.77	131.96	133.79	125.42	103.33	1010.96	50	50	50	2.99	13.66	0.32	0.062	277.1287
ER	10/27/2020	8:10	FO	1	91.9	1	16.67	15.64	15.36	15.46	15.78	2226.72	50	50	50	3.01	13.68	0.35	0.073	276.3675

TEOM 1405 Weekly Check - CHARTS - PM10 SN1405A231661508





Bi-Weekly Precision Check – PM10 - DIGITAL
Serial # 1405A231661508

Flow Check

Operator	ER				
Date	10-19-2020	Start Time (PST)	14:32	End Time (PST)	15:06

	TEOM Design Values	TEOM Current Display Values	Percent Difference (design vs display)	Limit Values	Calibration Device (one minute collection)		Difference (display vs audit avg)		Limit Values
Total Flow (lpm)	16.67	16.67	n/a	n/a	max min avg	16.03 15.98 16.00	-0.67 -4.0	lpm %	+/- 1.0 lpm Or 7%
Main Flow (lpm)	3.00	3.01	0.33%	+/- 2%	max min avg	2.95 2.87 2.83	-0.18 -6.0	lpm %	+/- 0.2 lpm Or 7% (2.8 – 3.2)
Bypass Flow (lpm) quarterly	13.67	13.66	-0.07%	+/- 2%	max min avg			lpm %	+/- 0.96 lpm Or 7%
Ambient Temperature (deg C)	start avg finish	25.0 24.5 23.9	n/a	n/a	max min avg			deg C	+/- 2 deg C
Ambient Pressure (mmHg)		0.857	n/a	n/a	max min avg			mmHg	+/- 10 mmHg (0.13 atm)

2 Weeks – Pump Vacuum and Fan Checks

Pump Vacuum (inHg)		Pump Fan ok?		Clean Pump Chamber	

4-Weeks – A/C Maintenance, filters and inlet; check shelter attachment; leak check

Exchange A/C filter		Clean condenser coils		
Clean pump fan		Check seal/bolts		
Replace TEOM filter		Exchange Inlet		
Leak Check	Main Flow (lpm)	Bypass Flow (lpm)	Limit Values	
			0.15 lpm and 0.60 lpm	

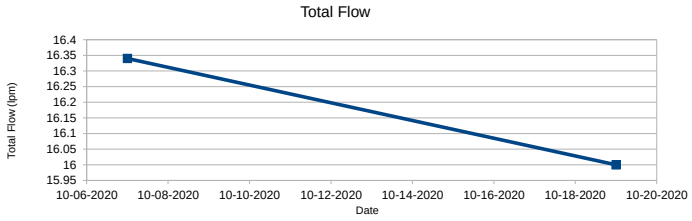
quarterly

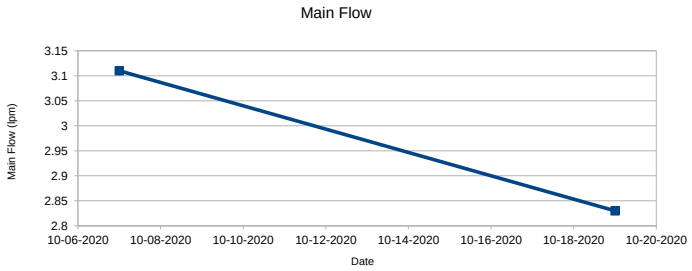
Clean sample down tube		Clean mass transducer inlet	

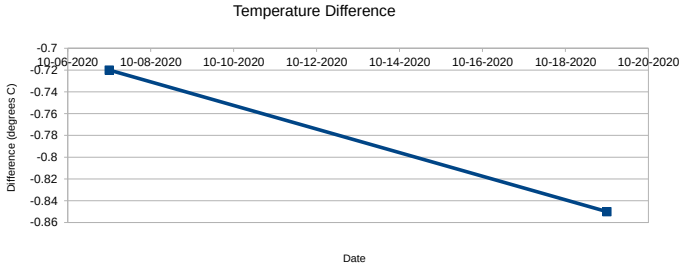
AFTER CHECK:

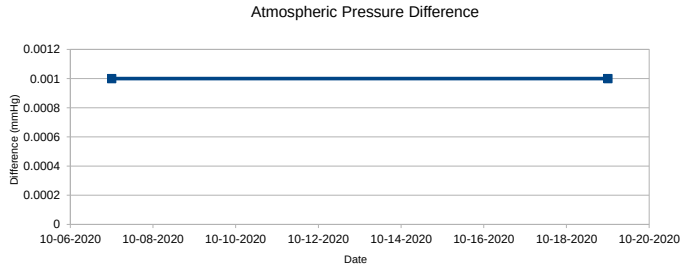
New filter noise		Logger mode Q or K/notes	

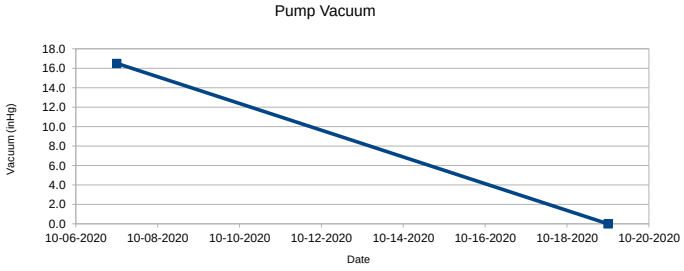
Date	Tot Flow	Main Flow	Temp diff	Press diff	Pump vac
10-07-2020	16.34	3.11	-0.72	0.001	16.5
10-19-2020	16	2.83	-0.85	0.001	0











Semi-Annual Maintenance

Semi Annual Maintenance involves all the components of weekly, bi-weekly and quarterly checks in addition to the following items: Values and activity is recorded in the field logbook, and the cpu and pump test field form. The digital version is a simple form with each date/entry saved on a separate tab.

- Battery CPU test (Service Manual, TEOM Series 1400a, Section 3.1.4)
- In-line pump verification (per R&P supplemental instructions or Service Manual TEOM Series 1400a, Section 3.1.5)
- Perform a leak check (quarterly). (Operating Manual, TEOM 1405, p. 5-26)
- Flow calibration (Operating Manual, TEOM 1405, p.5-38)
- Check UPS battery supply

Annual Maintenance

Annual Maintenance involves all of the components of weekly, bi-weekly, quarterly, and semi-annual checks in addition to the following items. Values are recorded directly in the field logbook and corresponding forms for the activity. The digital versions are simple forms with each date/entry saved on a separate tab.

- "Checklist for Annual Maintenance"
- Battery CPU test (Service Manual, TEOM Series 1400a, Section 3.1.4)
- In-line pump verification (per R&P supplemental instructions or Service Manual TEOM Series 1400a, Section 3.1.5)
- Pump replacement and rebuild if pump has been in operation for over 18 months or if necessary (pump rebuild kit instructions)
- "TEOM Analog Calibration" (Operating Manual, TEOM 1405, p.5-44)
- Temperature and Pressure Calibration (Operating Manual, p. 5-30, 5-31)
- Replace in-line filters (Operating Manual, TEOM 1405, p. 5-20)
- Perform a leak check (quarterly). (Operating Manual, TEOM 1405, p. 5-26)
- Flow calibration (Operating Manual, TEOM 1405, p.5-38)
- Mass Transducer Verification (Operating Manual, TEOM 1405, p. 5-50)

BISHOP PAIUTE TRIBE
ENVIRONMENTAL MANAGEMENT OFFICE
AIR QUALITY PROGRAM

CHECKLIST FOR ANNUAL MAINTENANCE – TEOM 1405 for FY _____

ANNUAL

1. Analog calibration — ***Due:_____ Date completed 1._____ Reviewed (initial) _____***
Notes:

2. Temperature and pressure calibration — ***Due:_____ Date completed 1._____ Reviewed (initial) _____***
Notes:

3. Mass transducer verification — ***Due:_____ Date completed 1._____ Reviewed (initial) _____***
Notes:

SEMI-ANNUAL

4. Pump test — ***Due:_____ Date completed 1._____ Reviewed (initial) _____***
Notes: ***2. _____ Reviewed (initial) _____***

5. Check CPU battery — ***Due:_____ Date completed 1._____ Reviewed (initial) _____***
Notes: ***2. _____ Reviewed (initial)_____***

6. Replace in-line filters — ***Due:_____ Date completed 1._____ Reviewed (initial) _____***
Notes: ***2. _____ Reviewed (initial)_____***

7. Flow controller calibration — ***Due:_____ Date completed 1._____ Reviewed (initial)_____***
Notes: ***2. _____ Reviewed (initial)_____***

QUARTERLY

8. Bypass flow check, clean air downtube — ***Date completed 1._____ Reviewed (initial)_____***
Notes: ***2. _____ Reviewed (initial)_____***
3. _____ Reviewed (initial)_____
4. _____ Reviewed (initial)_____

9. QA review of biweekly flow checks/monthly maint. — ***Date completed 1._____ Reviewed (initial)_____***
Notes: ***2. _____ Reviewed (initial)_____***
3. _____ Reviewed (initial)_____
4. _____ Reviewed (initial)_____

BISHOP PAIUTE TRIBE
ENVIRONMENTAL MANAGEMENT OFFICE
AIR QUALITY PROGRAM

1405 TEOM ANALOG CALIBRATION

Operator					
Date		Start Time (PST)		End Time (PST)	

ANALOG OUTPUT – USE MANUAL P. 5-44 CALIBRATION INSTRUCTIONS

Check Output Jumpers		Jumpers (*can be calibrated to either 0-1 or 1-5 VDC)*	
	Set param	Set value	Actual value
User out 1	MC	0-1 VDC	
User out 2	Status	0-1 VDC	
User out 3	Main flow	0-1 VDC	
User out 4	None selected	0-5 VDC	
User out 5	None selected	0-5 VDC	
User out 6	None selected	0-5 VDC	
User out 7	None selected	0-5 VDC	
User out 8	None selected	0-5 VDC	

Check Analog Output	Use Analog Output Calibration Wizard and enter numbers		
	Set value	Actual value (volt meter)	Final value (volt meter)
User out 1	.1		
User out 1	.9		
User out 2	.1		
User out 2	.9		
User out 3	.1		
User out 3	.9		
User out 4	.1		
User out 4	.9		
User out 5	.1		
User out 5	.9		
User out 6	.1		
User out 6	.9		
User out 7	.1		
User out 7	.9		
User out 8	.1		
User out 8	.9		

1405 TEOM ANALOG CALIBRATION - Bishop Paiute Tribe - PM10

Operator					
Date		Start Time (PST)		End Time (PST)	

Analog Output

Check Output Jumpers		Jumpers can be set to 0-1 VDC or 0-5 VDC	
	Set Parameter	Set Value	Actual Value
User Out 1	MC	0-1 VDC	
User Out 2	Status	0-1 VDC	
User Out 3	Main Flow	0-1 VDC	
User Out 4	none selected	0-5 VDC	
User Out 5	none selected	0-5 VDC	
User Out 6	none selected	0-5 VDC	
User Out 7	none selected	0-5 VDC	
User Out 8	none selected	0-5 VDC	

Check Analog Output		Use Analog Output Calibration Wizard and Input Numbers	
	Set Value	Actual Value (Volt Meter)	Final Value (Volt Meter)
User Out 1	0.1		
User Out 1	0.9		
User Out 2	0.1		
User Out 2	0.9		
User Out 3	0.1		
User Out 3	0.9		
User Out 4	0.1		
User Out 4	0.9		
User Out 5	0.1		
User Out 5	0.9		
User Out 6	0.1		
User Out 6	0.9		
User Out 7	0.1		
User Out 7	0.9		
User Out 8	0.1		
User Out 8	0.9		

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AIR QUALITY PROGRAM

1405 TEOM FLOW/TEMP/BARO CALIBRATION

Operator					
Date		Start Time (PST)		End Time (PST)	

TEMPERATURE*(acceptance criteria: +/-2dC; Continuous PM10 Validation Template 2017)*

Current TEOM display	FTS/external value - enter into wizard

BARO PRESSURE*(acceptance criteria: 10 mm Hg; Continuous PM10 Validation Template 2017)*

Current TEOM display	FTS/external value - enter into wizard

MAIN FLOW *(acceptance criteria: 10.1%; Continuous PM10 Validation Template 2017)*

Current TEOM display	FTS value - enter into wizard
LPM	LPM
Low	
Mid	
High	

BYPASS FLOW *(acceptance criteria: 10.1%; Continuous PM10 Validation Template 2017)*

Current TEOM display	FTS value - enter into wizard
LPM	LPM
Low	
Mid	
High	

UPS BATTERY SUPPLY LEVEL:

100% _____
80% _____
60% _____
40% _____
20% _____

Comments

1405 TEOM FLOW & AMBIENT CALIBRATION - Bishop Paiute Tribe - PM10

Operator					
Date		Start Time (PST)		End Time (PST)	

Temperature

Current TEOM Display	FTS/external device (enter into wizard)

Barometer

Current TEOM Display	FTS/external device (enter into wizard)

MAIN FLOW *(acceptance criteria: 10.1%; Continuous PM10 Validation Template 2017)*

Current TEOM Display		FTS (enter into wizard)	
	lpm		lpm
low			
mid			
high			

BYPASS FLOW *(acceptance criteria: 10.1%; Continuous PM10 Validation Template 2017)*

Current TEOM Display		FTS (enter into wizard)	
	lpm		lpm
low			
mid			
high			

UPS Battery Supply Level

100%
80%
60%
40%
20%

Comments

ENVIRONMENTAL MANAGEMENT OFFICE
AIR QUALITY PROGRAM

TEOM / CPU AND PUMP TEST PM10

Operator					
Date		Start Time (PST)		End Time (PST)	
Test CPU Battery	Observed voltage			Limiting value: Change battery if less than 2.75 V DC (*Service Manual for 1400 model TEOM Rev B.006*)	
Test Pump in-line				Limiting value: Vacuum gauge < 16 in Hg Replace / rebuild if < 16 in Hg (*GBUAPCD recommend*)	

Alternate pump test - OPTIONAL

Test Pump	Filter percentage where main and / or aux flow decreases			Limiting value: Replace / rebuild pump if filter percentage less than 90 %
	Filter Percentage	Main	Aux	

Replace in-line filters every 6 months.

Comments

TEOM CPU BATTERY AND PUMP TEST - Bishop Paiute Tribe - PM10

Operator					
Date		Start Time (PST)		End Time (PST)	
Test CPU Battery	Observed voltage V DC	Limiting Value: Change battery if voltage less than 2.75 V DC *(Service Manual for 1400 model TEOM Rev B.006)*			
Test Pump In line	inHg	Limiting Value: Vacuum gauge < 16 inHg Replace or rebuild if < 16 inHg			

Alternate Pump Test

Test Pump	Filter % where main and/or aux flow decreases			Limiting Value: Replace or rebuild if filter % <90%
	Filter %	Main	Aux	

Replace In-Line filters every six months

Comments:

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ENVIRONMENTAL MANAGEMENT OFFICE
AIR QUALITY PROGRAM

1405 TEOM MASS TRANSDUCER VERIFICATION

Use Ko Calibration Wizard. USE CALIBRATION FILTER EXCHANGE TOOL ONLY, AND ONLY FOR THIS

Operator					
Date		Start Time (PST)		End Time (PST)	

Weight of calibration filter	***Filt Wght***
1. Operate without a filter until oscillating frequency reaches a maximum	
Maximum oscillating frequency	f_0
2. Install calibration verification filter and wait until frequency reaches a maximum	
Maximum oscillating frequency	f_1
Audit K0	
Current K0	
Percentage difference (within 2.5% is pass; *Service Manual for 1400 model TEOM Rev B.006*)	
PASS	FAIL

Comments

1405 TEOM MASS TRANSDUCER TEST - Bishop Paiute Tribe - PM10

Operator					
Date		Start Time (PST)		End Time (PST)	

Weight of Calibration Filter			filter wt
1. Operate without filter until frequency reaches a maximum			
Maximum oscillating frequency			
2. Operate with Calibration Filter until frequency reaches a maximum			
Maximum oscillating frequency			
Audit Ko			
Current Ko			
Percent Difference < +/- 2.5 % is passing *Service Manual for 1400 model TEOM Rev B.006*)			