



BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

TECHNICAL SERVICES DIVISION
QUALITY ASSURANCE PROJECT PLAN
STANDARD OPERATING PROCEDURE

DATA MGT SOP 604
BAM 1020

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STANDARD OPERATING PROCEDURE
BAAQMD Technical Services Division

BAM 1020 PM_{2.5} Data Management

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Purpose

The purpose of this Data Management Standard Operating Procedure (SOP) is to document data validation procedures for Met One BAM-1020 Beta Attenuation Mass Monitors (BAM) used by BAAQMD to measure continuous hourly PM_{2.5} mass concentrations. The goal is to define the staff persons responsible for the review, a review timeline, and the specific steps and objectives of the review process.

Background

The District has installed Met One BAM-1020 monitors to measure continuous ambient PM_{2.5} mass concentrations. There are two versions of the BAM-1020 operated by the BAAQMD. The newer unit has been certified by the EPA as a Federal Equivalent Method (FEM) and may be used for PM_{2.5} regulatory monitoring. The older BAM-1020 (non-FEM) has not been certified by EPA for PM_{2.5} regulatory monitoring, but is allowed for monitoring in support of the AIRNow forecasting and mapping programs, for data submission to the Air Quality System (AQS), and to provide real-time PM_{2.5} particulate concentrations to the general public. The BAM is approved by the California Air Resources Board (CARB) to evaluate compliance with the State Ambient Air Quality Standards as noted in 17 CCR Section 70100.1b(2)(B). These data Quality Check/Quality Assurance procedures follow guidelines established in the reference documents listed in the last section of this document.

Procedure Summary

Data review begins with the Air Monitoring (AM) Section staff that installs and maintains BAM instruments. AM is responsible for following approved BAM instrument SOPs and is the final authority in determining whether the BAM is operating correctly and providing valid data. BAM instrument performance parameters (sample volume,

warning and error flags) shall be utilized by AM to assist in the data validation process. AM shall invalidate data collected when BAM environmental conditions were outside of temperature limits specified by the manufacturer or EPA/CARB certification (if applicable).

The second data review is conducted by the Meteorology and Quality Assurance Section (MQA). In general, MQA is responsible for all data review not specifically related to BAM instrument operation. As part of the Quality Assurance function, MQA may recommend changes concerning AM data handling and validation procedures. These changes would require agreement by the Technical Services Director and, depending on the scope, may require Quality Assurance Program Plan approval by CARB and EPA.

Air Monitoring Data Review

BAM data reviewers include the Air Monitoring Station Operator, Field Supervisor, and Data Assessment Air Quality Instrument Specialist (AQIS). Station Operators and Field Supervisors have the authority to edit data values and modify data validation codes.

Station Operator

The Station Operator shall:

- Reviews BAM operational data on a daily basis to confirm normal instrument operation
- Invalidate all data recorded during periods of equipment malfunction, maintenance, or interference from other activities at the station as needed, based on BAAQMD Continuous PM_{2.5} MQO's and Control Limits
- Investigate any data containing a warning or error flag
- Invalidate data with sample volumes outside the 0.800 to 0.867 m³ limits for a non-FEM BAM and 0.673 to 0.729 m³ limits for a FEM BAM
- Invalidate data in accordance with BAAQMD Continuous PM_{2.5} MQOs after a failed leak test, flow rate verification, pressure verification, or temperature verification.
- Investigate data recorded when the BAM shelter temperature was operating outside the manufacturer temperature specifications of 0-50°C
- If analog data telemetry is employed, confirm that telemetry system and raw BAM concentrations reported through the serial interface match to less than 1 µg/m³. Also confirm that a 1-hour time shift exists between the telemetry database ("early reporting") and the downloaded BAM serial data. These items should be reconfirmed whenever BAM instruments are changed, analog signals are adjusted, or changes are made to the BAM data telemetry system
- Notify MQA immediately of any changes in BAM equipment or associated datalogger/telemetry changes or adjustments
- Complete all BAM data review no later than 7 days after the end of the month.

Field Supervisor

A Supervisor shall:

- Provide for uniform Station Operator reviews throughout the District
- Ensure that all first level BAM data review is completed no later than 1 week after data is collected.

MQA Data Review

A member of the MQA staff conducts the final review of District BAM data before uploading data into the EPA Air Quality System (AQS) database. The MQA reviewer shall:

- Review Operations Data Action Monitoring Notifications (ODAMNs) issued by the QA group against BAM instruments indicating a failed Quality Assurance audit and resulting in data invalidation. ODAMN documents are stored in the P:\Techdata\MQA\QA\ directory.
- Review data invalidation resulting from failed AM leak and flow checks.
- Examine BAM PM_{2.5} concentrations spatially across the network to determine if the values appear reasonable for the meteorological conditions. Investigate any sites that appear to be abnormally high or low compared to the rest of the network
- Investigate anomalies such as repeating values or patterns, and high rates of change. Successive hourly concentrations differing by more than 30 µg/m³, or two-hour concentrations differing by more than 50 µg/m³ should trigger a manual investigation.
- Hourly BAM data will show variability due to individual instruments and measurement locations. If the data variability appears uncharacteristically high for a particular instrument, request that the Air Monitoring Manager direct field staff to conduct a zero filter test to evaluate a possible instrument problem.
- Report any problems to the Air Monitoring and QA Officer.
- MQA review and posting of hourly BAM data to AQS should be completed no later than 75 days after the end of the month.

Authors, Revisions, and Approvals

April 2005 (original version)

August 2005 (temperature revision by MS)

January 2011 (Revision to AM validation procedures by SR)

July 2012 (revision: Removed MQA reviewer changing negative BAM values to zero, removed calculation percentage of PM_{2.5} to PM₁₀, and removed comparing to FRM filters since they are never available at time of review and done during FRM review by KM).

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Approved: Eric Stevenson, Air Monitoring Manager

Approved: Dick Duker, Meteorology and Quality Assurance Manager

Approved: Glen Colwell, Air Monitoring Manager (March 2011)

References

State Ambient Air Quality Standards California Approved Samplers, 17 CCR Section 70100.1b(2)(B)

Met One BAM 1020 Particulate Monitor Operation Manual (BAM-1020-9800 Rev E)

Met One BAM 1020 Audit Procedure

CARB QA Procedures Volume V page 10 on BAM Audit Limits, Audit Procedures for Air Quality Monitoring

EPA QA Handbook Vol. II, Quality Assurance Handbook for Air Pollution Measurement Systems

State and National Air Quality Standards, [Table of Pollutant Standards](#)

EPA Air Quality Standards, 40 CFR Part 50.7