

BAQP Technical Services Branch
Policy Statement
for Evaluating PSD and Other Source Ambient Monitoring Gaseous Analyzer Data
November 2016

Background

The current EPA Part 58 ambient monitoring regulations took effect on April 27, 2016. This policy statement is about the new lowered mandatory gaseous audit level concentration ranges more suitable for trace gas monitors, which are not required to be used, than for the standard analyzers in widespread, if not exclusive, use in Nevada PSD and non-PSD source monitoring networks. Trace gas analyzers are not required to be used in source monitoring in Nevada, as any EPA-designated Federal Reference or Equivalent Method standard analyzer may be used.

Gaseous criteria pollutant standard analyzers traditionally have a range of 500 ppb for O₃, SO₂ and NO₂, and a range of 50 ppm for CO. For decades, the audit level concentration ranges required to be used by Part 58 regulations for O₃, SO₂ and NO₂ were 30-80 ppb, 150-200 ppb and 350-450 ppb; and for CO, 3-8 ppm, 15-20 ppm and 35-45 ppm. The 2006 version of the Part 58 regulations required three consecutive audit levels to be selected from five audit levels, the first two of which were suitable only for trace gas analyzers, with the exception of the O₃ audit levels, and the last three of which were suitable for standard analyzers. Again, trace gas analyzers are not required to be used for criteria pollutant monitoring in Nevada source monitoring networks.

Through WESTAR, the Bureau of Air Quality Planning (BAQP) pressed for and got clarification from EPA in the form of a question and answer sheet that using three consecutive audit levels which “*should* [emphasis added] represent or bracket 80 percent of ambient concentrations measured by the analyzer being evaluated” was a non-binding goal, and therefore sources could always audit at the three highest of the five specified audit level concentration ranges: “... if a SLAMS/SPM is audited and passes the audit in the upper ranges of the audit table in Section 3.2.2.1, then this will be used as its official annual assessment.” Only the highest three 2006 audit levels are suitable for standard SO₂, NO₂ and CO analyzers, while all five 2006 audit levels are suitable for standard O₃ analyzers. The EPA question and answer sheet is called Questions and Answers, Promulgated Gaseous Audit Levels in 40 CFR 58, Appendix A. This document also states, “Whether a PSD permit holder or applicant is required to do audits in the lower audit ranges or not, *should* [emphasis added] be at the discretion of the PSD permit issuing agency....”

Current Part 58 Audit Levels

The Part 58, Appendix B, Section 3.1.2.1 monitoring regulations effective April 27, 2016 stipulate,

The evaluation is made by challenging the monitor with audit gas standards of known concentration from at least three audit levels. One point must be within two to three times the method detection limit of the instruments within the

PQAOs network, the second point will be less than or equal to the 99th percentile of the data at the site or network of sites in the PQAO or the next highest audit concentration level. The third point can be around the primary NAAQS or the highest 3-year concentration at the site or the network of sites in the PQAO. An additional 4th level is encouraged for those PSD organizations that would like to confirm the monitor's linearity at the higher end of the operational range.

In the BAQP's jurisdiction, the middle required audit point can generally be expected to be in the next audit concentration range above the lowest audit concentration range for gaseous criteria pollutants other than ozone.

Related Consideration

The 2016 Part 58, Appendix B (PSD regulations), Section 1.2.3 states,

Failure to conduct or pass a required check or procedure, or a series of required checks or procedures, does not by itself invalidate data for regulatory decision making. Rather, PQAOs and the PSD reviewing authority shall use the checks and procedures required in this appendix in combination with other data quality information, reports, and similar documentation that demonstrate overall compliance with parts 51, 52 and 58 of this chapter. Accordingly, the PSD reviewing authority shall use a "weight of evidence" approach when determining the suitability of data for regulatory decisions. The PSD reviewing authority reserves the authority to use or not use monitoring data submitted by a PSD monitoring organization when making regulatory decisions based on the PSD reviewing authority's assessment of the quality of the data.

Audits

The BAQP Technical Services Branch is required to follow the Part 58 regulations, but not necessarily EPA guidance. As the EPA gaseous monitoring guidance (i.e., the Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. II, Appendix D audit tolerances) is geared toward urban pollution levels, toward average concentrations (as opposed to peak concentrations), which are meaningless in rural or remote locations, and toward the use of trace gas analyzers, which are not required, the BAQP Technical Services Branch does not use the EPA guidance accuracy tolerances of 15% per audit point for higher concentrations or in the case of very low audit concentrations, per point accuracy of 15% or a specified trace gas range concentration, whichever is higher. Instead, the BAQP Technical Services Branch relies on a linear regression analysis of the audit points as follows.

The BAQP Technical Services Branch's assessment of the quality of PSD and non-PSD source monitoring data includes the use of a linear regression analysis based on the tolerances discussed below, as presented in its 2016 *Nevada Bureau of Air Quality Planning Ambient Air Quality Monitoring Guidelines*:

For this agency, gaseous multipoint audit results shall be evaluated by a linear regression analysis between the audit concentrations (x-axis independent variable) and the analyzer response data logger concentrations (y-axis dependent variable). This approach provides a fairly robust way to evaluate the gas analyzer's performance because it uses an ensemble analysis of the audit points (i.e., a check on the intercept and slope, rather than single-point checks), while ensuring a strong linearity in the sensor response with the check on the correlation coefficient. These audit linear regression tolerances (obtained using the standard least squares method) are:

O₃

Slope: $0.90 \leq \text{slope} \leq 1.10$ = satisfactory

Intercept: $-10 \text{ ppb} \leq \text{intercept} \leq +10 \text{ ppb}$ = satisfactory

Correlation Coefficient: $\text{corr.} \geq 0.9950$ (to 1.0000) = satisfactory

NO₂, SO₂ and CO

Slope: $0.85 \leq \text{slope} \leq 1.15$ = satisfactory

Intercept: $-10 \text{ ppb} (-1.0 \text{ ppm CO}) \leq \text{intercept} \leq +10 \text{ ppb} (+1.0 \text{ ppm CO})$ = satisfactory

Correlation Coefficient: $\text{corr.} \geq 0.9950$ (to 1.0000) = satisfactory

These linear regression slope tolerances borrow from the 2008 EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. II, App. D, Operational Criteria, Federal Audits (NPAP) tolerances which use a mean absolute percent difference tolerance for the audit points of 10% for ozone and 15% for NO₂, SO₂ and CO. The linear regression intercept tolerances borrow from the 2008 EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. II, App. D, Critical Criteria, zero drift tolerances of 2% of full scale (10 ppb and 1.0 ppm for standard analyzers) for O₃ and CO, respectively, and tighten the 2008 zero drift tolerance of 3% of full scale for NO₂ and SO₂ to 2% of full scale (10 ppb). The Correlation Coefficient tolerance is taken from the EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. II: Part 1, Ambient Air Quality Monitoring Program Quality System Development (Aug., 1998), Appendix 15, Table A.11, Linear Regression Criteria.

Because a linear regression analysis is being used, the BAQP Technical Services Branch also recommends use of the optional fourth audit point: "An additional 4th level is encouraged for those PSD organizations that would like to confirm the monitor's linearity at the higher end of the operational range" (Part 58, Appendix B). Also recommended is the selection of required audit points at the high end of each audit level concentration range to make the audit points more suitable for standard gas analyzers as opposed to trace gas or lower range analyzers.

Quality Control Checks

The EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. II, Appendix D, Measurement Quality Objectives and Validation Templates (May of 2013) criteria pollutant monitoring guidance radically changed the tolerance for acceptable gaseous criteria pollutant zero drift checks every 14 days (biweekly checks) from the EPA 2008 Appendix D tolerances. For NO₂ and SO₂ the zero drift data validation tolerance was changed from 15 ppb to 1.5 ppb, for O₃ from 10 ppb to 1.5 ppb and for CO from 1 ppm to 0.03 ppm. The 0.03 ppm tolerance was later identified by EPA as a typographical error that should have been 0.3 ppm. These are all trace gas analyzer tolerances, where trace gas analyzers are not required and standard analyzers are in widespread, if not exclusive, use in Nevada.

The EPA subsequently acknowledged these 2013 zero drift tolerances for 14-day intervals were taken in error from the 12- and 24-hour zero drift tolerances for analyzer designation by EPA as a Federal Reference or Equivalent Method. Therefore, in July 2014 EPA revised the gaseous criteria pollutant biweekly zero check tolerances, based on a statistical analysis, from 1.5 ppb for O₃, NO₂ and SO₂ to 5.0 ppb and the CO zero check tolerance from 0.03 ppm to 0.6 ppm. The BAQP Technical Services Branch analyzed and rejected the statistical analysis on which these changes were made as not supporting these small increases in zero drift tolerances for biweekly quality control checks. As this is guidance, not regulation, the BAQP Technical Services Branch does not adopt these tolerances for 14-day zero drift, which must be suitable for standard analyzers. Therefore the BAQP Technical Services Branch adopts, with consideration of the EPA 2008 Appendix D zero drift tolerances, the following zero drift tolerances: for O₃, the EPA 2008 tolerance of 10 ppb; for CO, the EPA 2008 tolerance of 1.0 ppm; and for NO₂ and SO₂, the EPA 2008 tolerance of 15 ppb is reduced to 10 ppb.

The BAQP Technical Services Branch also does not adopt the EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. II, Appendix D, Measurement Quality Objectives and Validation Templates (2013/2014) criteria pollutant monitoring guidance tolerance for biweekly ozone precision (“one point QC check”) and span checks. With concurrence from the EPA Region 9 Quality Assurance Office in 2009 for use of a 10 percent precision and span check tolerance to achieve the 7 percent ozone data quality objectives, based on available monitoring data at that time, the BAQP Technical Services Branch uses a 10 percent tolerance for ozone precision and span checks, rather than a 7 percent tolerance. As the regulatory precision check concentration range has been lowered, the magnitude of this 10 percent tolerance has decreased. This 10% precision and span drift tolerance can also be compared to the 2014 EPA Appendix D per audit point tolerance of 15% for annual performance evaluations.

The BAQP Technical Services Branch supports the 2014 EPA Appendix D precision and span check tolerances of 15% and 10%, respectively, for NO₂ and 10% for SO₂.