EPA OFFICE OF AIR QUALITY PLANNING AND STANDARDS

# The QA EYE

ISSUE 17

DECEMBER, 2014

**SPECIAL POINTS OF INTEREST:**

- August 2014 National Ambient Air Monitoring Conference
- RP transactions going away for collocated data in 2015
- RA and RP transaction going away March 2015

**INSIDE THIS ISSUE:**



## National Ambient Air Monitoring Conference Update

The National Ambient Air Monitoring Conference held August 11-14 in Atlanta had the largest attendance on record at 598 . This year we paired up with the AQS conference which was helpful since monitoring, quality assurance and data reporting cross lines in many areas and it was good to have AQS support in training sessions. The OAQPS quality assurance staff was quite busy throughout the week with a full day of QA training on Monday and a half-day presentation session on Wednesday. Presentations and training materials for the Conference are posted on AMTIC at http://www.epa.gov/ttnamti1/2014present.html .

Based on comments from the 2012 Conference in Denver, we expanded the QA Training course to a full day and even with that we could not get into too much detail. We had over 150 personnel attend the QA Training session and responses to the session were positive. The OAQPS QA Staff are contemplating more focused training on specific facets of the QA program for the next conference and really getting into the weeds. OAQPS tried something new for this conference by setting up an afternoon of round table questions and answers. Twelve table where set up with technical experts manning each table. Attendees floated among the tables to ask questions of the experts. It was quite a lively session and we answered a lot of questions but there was some comments on ways to improve this activity for the next conference. Many of the articles in this issue are derived from conversations at the conference or emails sent in since the last Issue. The conference would not have been a success without the help from the EPA Regions and State/Local /Tribal monitoring organization. For the QA Team we'd like to thank Melinda Ronca-Battista (Northern Arizona University representing the TAMS Center), and Stephanie McCarthy, EPA R4 who helped out on the training session and Yousaf Hameed (Clark County, NV) and Susan Kilmer (Michigan Dept of Environmental Quality) for their help facilitating the presentation sessions. In talking to many people I was amazed at how many individuals drove from as far away as Chicago and Michigan to cut down on travel expenses. With that kind of effort we know we need to keep up our own efforts to provide the best conference we can.

## Assessments- A Highlight During Air Monitoring Conference

During the Plenary Discussion provided by Janet McCabe, Chet Wayland, and Lew Weinstock there was some emphasis placed on the importance of our quality systems. Over the last year or so there have been a number of cases where significant amounts of data have been invalidated due to exceedances in the acceptance criteria describe in our QA regulations or methods. In some cases this has affected our ability to make NAAQS decisions. The initial costs for collecting this data and the additional costs of review and evaluation, not only on the monitoring agencies but on the EPA and regional and headquarters staff make it very clear that identifying quality issues as soon as possible and taking immediate correct action is highly beneficial. And cost effective

*Continued on Page 7*

# PM2.5 Bias Update at Atlanta Ambient Air Conference

The following are selected section from a report written by Mike McCarthy (Sonoma Technologies) and Shelley Eberly (Geometrics Tool). The full report will be posted on AMTIC in December. Since about 2007, EPA noticed an increased negative bias trend for many of the PM2.5 monitors. At the May 2012 Ambient Air Conference, Mike and Shelly presented findings of their evaluation of the bias issue which was published in Issue 13 of The QA EYE. EPA asked Sonoma to follow up on feedback received at the 2012 Denver meeting; specifically, to investigate if sampler cleaning, precision data, and chemical composition data could provide insight into bias trends. The results were presented at the 2014 Conference in Atlanta and are summarized below.

Bias and precision were calculated by and compared across method designations. For these analyses, PM2.5 federal reference method (FRM) and federal equivalent method (FEM) method designations were considered. These are listed in Table 1. For some analyses, only designations with sufficient sample size were included. These designations were typically 118, 120, 145, and 170.

Table 1 PM2.5 FRM and FEM method designations

| PM2.5 Sampler Manufacturer and Type of Sampler | Method Designation with WINS | Method Designatio n with VSCC |
|---|---|---|
| BGI PQ200/PQ200A Single Channel | 116 | 142 |
| R&P 2000 Single Channel | 117 | 143 |
| R&P 2025 Sequential Sampler | 118 | 145 |
| Andersen/Thermo RAAS2.5-100 Single Channel | 119 | 153 |
| Andersen/Thermo RAAS2.5-300 Sequential Sampler | 120 | 155 |
| BAM 1020 | 170 | |

Many of the calculations were performed at the seasonal level. Seasons were defined according to the months:

Spring: March-May
Summer: June-August
Fall: September-November
Winter : December-February

The bias database was developed for 2011-2013 by combining PEP data acquired directly from the U.S. EPA and SLT data acquired from the Air Quality System (AQS). The precision database is identical to the one developed for the 2011–2013 PM2.5 Quality Assurance Report and its development is documented in that report.

## What are Current Levels of Bias?

For 2011-2013, bias continues to be negative for most of the FRM methods, as shown in Figure 1. A negative bias means that the SLT concentrations are less than the PEP concentrations. It is noted that bias for WINS (wells impactor ninety-six) size selective inlet is more negative than bias for VSCC (Very Sharp Cut Cyclone) inlets.

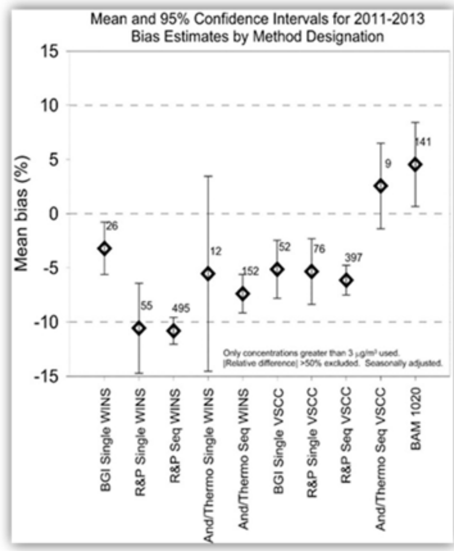


Figure 1 2011-13 bias estimates by method designation

## How Has Bias Been Changing Over Time?

Prior to 2006, annual bias of the most frequently used methods (118, 120, and 145) wiggled between -5% and +5% with no obvious trend, as shown in Figure 2. From 2006 to 2009, annual bias declined. Since 2009, bias for these methods dropped to a range between -15% and -5%, as shown in Figure 3. For these figures, bias is adjusted for PQAO and season, excludes pairs with concentrations less than or equal to 3 µg/m3, and excludes pairs with bias greater than 50% or more negative than -50%. *(Continued on page 3)*

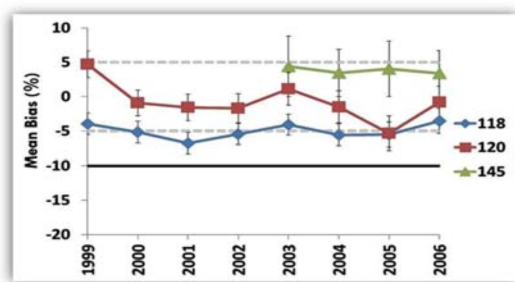


Fig 2.Annual bias for 1999-2006 for three major method designations

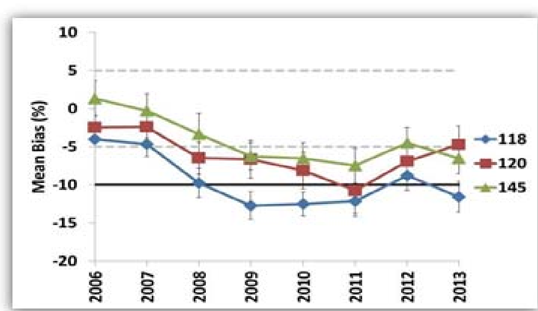


Fig 3.Annual bias for 2006-2013 for three major method designations

# PM2.5 Bias Assessment Update *(Continued from Page 2)*

*Does Sampler Cleaning Impact Bias*

Why is bias for WINS different than bias for VSCC for SLT but not for PEP? One idea is that bias varies by the elapsed time since the WINS was last cleaned. PEP cleans the WINS and VSCC each sampling event, whereas SLT cleans the WINS every five sampling events and the VSCC every month. The bias potentially became more negative as the WINS became dirtier because the cut point became smaller. Data for the elapsed time since the WINS was last cleaned was not readily available data, so a surrogate of sampling frequency was used. If we assume that sampling frequency is a proxy for sample cleaning frequency, then we can hypothesize that daily samplers would have dirtier WINS (i.e., more negative bias) than every third day samplers, which would have dirtier WINS than every sixth day samplers due to more frequent sampling. If this is true, then bias from daily samplers should be most negative, bias from every sixth day samplers least negative, and bias from every third day samplers in the middle.

However, this hypothesis was not consistent with the observed bias grouped by sampling frequency. No consistent relationship between bias and sampling frequency was found for the sampler types with sufficient data.

*Are Changes in PM2.5 Composition Contributing to Bias Trend?*

The trend in negative bias in PM2.5 concentrations was compared to trends in PM2.5 composition by analyzing SANDWICH (Sulfate, Adjusted Nitrate, Derived Water, Inferred Carbon Hybrid) data (Frank, 2006) from the Chemical Speciation Network (CSN). The PM2.5 components estimated through the SANDWICH technique include sulfate mass, nitrate mass, crustal mass, organic carbon mass, elemental carbon, and passive (filter contamination).

We hypothesized that changes in the relative contributions of PM components-specifically sulfate, nitrate, and organic carbon -may result in changes in PM volatility and may cause decreased retention of PM mass on filters. In this analysis, we selected CSN sites near PQAOs with large negative bias (more negative than -10%) and moderate bias (between 1 and -10%), and looked for differences in PM2.5 composition and trends.

To test this hypothesis, CSN data from 2006 to 2012 were acquired and precision and bias data of PQAOs from 2008 to 2010 were referenced to identify representative CSN sites. Twenty CSN sites were selected in or near PQAOs that also had acceptable precision (coefficient of variation less than 7%). Among these sites, 11 were associated with large negative bias, which exceeds the data quality objective (DQO), and 9 were associated with moderate bias, which meets the DQO.

The composition of PM2.5 SANDWICH data were analyzed for sites with large negative bias and sites with moderate bias. The trend of the mass and ratio to PM2.5 of the individual components were examined, and summary statistics calculated for the ratios of components to PM2.5 mass.

The results indicated that PM2.5 mass shows a declining trend from 2006 to 2012 in both groups of sites (Figure 4 top row). However, variations are seen in the relative contribution of different components of PM2.5 (Figure 4 bottom row) between bias groups.

The top three components of PM2.5 by ratio are sulfate, nitrate, and organic carbon mass. The average, median, 90th, and 10th percentiles as a fraction of PM2.5 mass are displayed in Figure 5. Both the large negative and moderate bias groups of sites show decreasing sulfate mass from an average of 40% of PM2.5 mass in 2006 to about 30% of PM2.5 mass in 2012. In contrast, the ratio of nitrate mass to PM2.5 is higher at sites with greater bias (~12% vs. 7%). *Continued on page 4*


Fig 4 Average mass (top) and fraction of PM2.5 mass (bottom) of the PM2.5 SANDWHICH components at CSN sites with large negative bias (left) and moderate bias (right)

## PM2.5 Bias Assessment Update *(continued from page 3)*

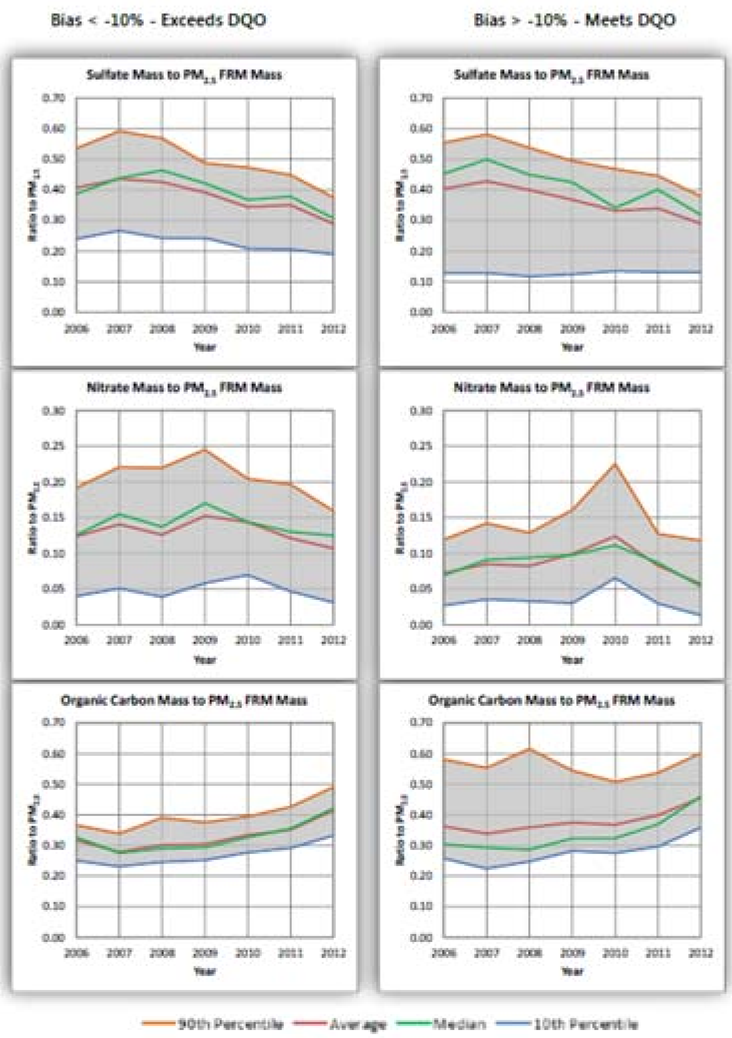


Figure 5. Fraction of PM2.5 mass of the sulfate (top), nitrate (middle), and organic carbon (bottom) mass components at CSN sites with large negative bias (left) and moderate bias (right).

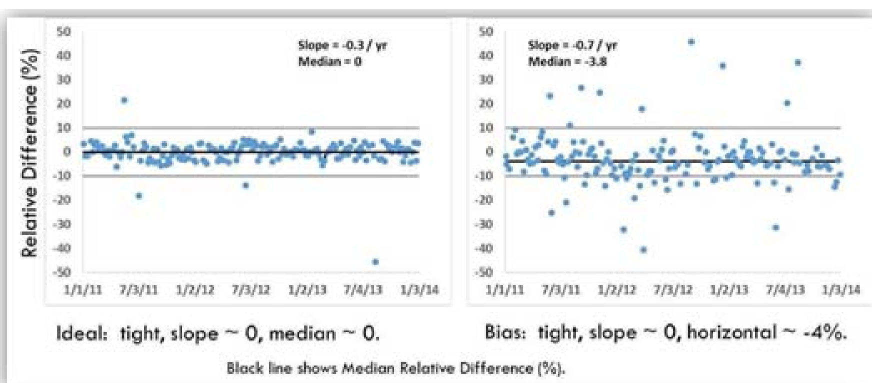


Fig. 6 Time-series graph showing relative precision differences; trends in precision can be indicative of bias

Note that the fraction of nitrate mass peaked in 2009 and 2010, which corresponds to the most negative bias in PM2.5. Finally, there is a large increase in organic carbon mass, from 30–35% in 2006 to 40–45% in 2012. The combined change in PM volatility from declining sulfate, increasing organic carbon, and inter-annual variability in nitrate has resulted in a more volatile PM2.5 mixture over the 2006 to 2012 time period. The peak in nitrate composition is associated with the most negative bias in PM2.5 concentrations. In addition, the differences in the relative contribution of nitrate and organic carbon mass between the groups of sites coincide with the PM2.5 bias trends. The findings from this analysis are consistent with the hypothesis that the trend in bias may be associated with changes in the volatile fraction of PM2.5 mass. Note that this does not prove that the trend in PM2.5 mass is associated with the changing composition of PM; additional study is needed to see if these compositional changes are consistent across other monitoring sites and over additional years.

### *Can Precision Data Give Insight into Bias Trends?*

PM2.5 precision data might give insight into bias and trends in bias. Data from collocated monitors that show a consistent relative difference indicate a bias is present in one or both samplers. The slope in the relative differences indicates trends in bias in one or both samplers.

Figure 6 shows relative differences from two sites. The site on the left shows the ideal precision data: relative differences are tightly clustered between -10% and +10%, the median relative difference is zero, which indicates both samplers have similar bias, and the slope of the regression line through the relative differences has a small slope of just -0.3 per year. The precision data for the site on the right shows more variability but, more importantly, it shows a median relative difference of -3.8% suggesting that one or both of the samplers are biased.

For each collocated site, the median relative difference was calculated for 2011-2013. The distribution of these median relative differences is summarized in Table 2. Calculations exclude pairs with low concentrations (less than or equal to 3 µg/m3) and include site-years with at least 30 pairs. The median was used to reduce impact of outliers.

*Continued on Page 5*

# PM2.5 Bias Assessment Update (*Continued from page 4*)

The median of all the site-level median percent relative differences is close to zero for Methods 117, 118, 120, and 145, and the 5th and 95th percentiles of the site-level medians are approximately -5% and 5%, respectively. Sites with medians larger than 5% or more negative than -5% should be investigated because the precision data are showing consistent differences between the two samplers. For method 170 (compared to other method 170 instruments), the precision data suggest large biases. This is based on a limited number of sites, but the data indicate strong biases (e.g., +33% or -20%).

Table 2. Distribution of site-level median relative percent differences.

| Method | Year | # Collo Pairs | # Collo Sites | 5th Ptile (% Rel Diff) | Median (% Rel Diff) | 95th Ptile (% Rel Diff) |
|---|---|---|---|---|---|---|
| 117 w/ 117 | 2011 | 184 | 4 | -5% | -2% | 1% |
| | 2012 | 255 | 6 | -3% | 0% | 3% |
| | 2013 | 92 | 2 | -5% | -1% | 2% |
| 118 w/ 118 | 2011 | 2929 | 51 | -4% | 0% | 6% |
| | 2012 | 3026 | 47 | -5% | -1% | 2% |
| | 2013 | 2903 | 49 | -4% | 0% | 5% |
| 120 w/ 120 | 2011 | 836 | 16 | -5% | 0% | 4% |
| | 2012 | 715 | 14 | -3% | 0% | 5% |
| | 2013 | 511 | 10 | -2% | 0% | 3% |
| 145 w/ 145 | 2011 | 2758 | 35 | -2% | 0% | 2% |
| | 2012 | 2885 | 36 | -4% | -1% | 4% |
| | 2013 | 2847 | 39 | -4% | 0% | 2% |
| 170 w/ 170 (small sample size) | 2011 | 622 | 2 | -19% | -9% | 0% |
| | 2012 | 754 | 3 | -8% | 2% | 6% |
| | 2013 | 1097 | 4 | -11% | 12% | 33% |

Graphing relative differences as time series may provide information not just related to precision or bias. Figure 7 is for a site with a continuous monitor and an FRM monitor collocated. This graph clearly shows the seasonal differences in PM2.5 collected by the two methods. The regression line suggests a large upward slope to the relative differences of 8 per year, meaning that the average relative difference is growing by 8 each year

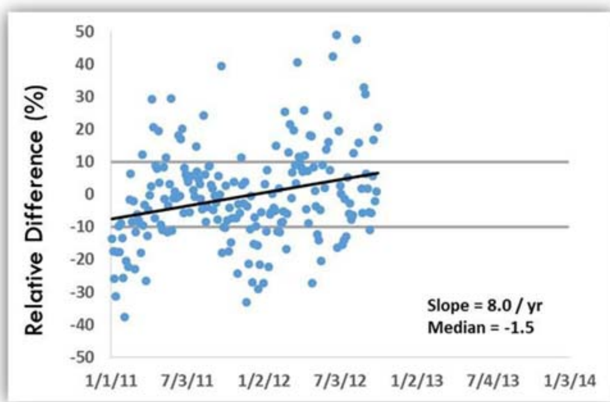


Figure 7. Relative differences from precision for a site with a continuous primary monitor collocated with a FRM collocation monitor

## Conclusions

Analyses to date have not found one clear cause for the downward trend in bias seen between 2007 and 2010. The decrease in PM2.5 concentrations and its impact on the bias statistic may contribute somewhat. Trends in PM2.5 speciation, namely nitrate, sulfate, and organic carbon, also may contribute. But these together do not seem sufficient to explain a drop of nearly 10% in bias. Several in attendance at the 2014 conference offered other suggestions for contributors to the trend. These suggestions are summarized in the next section

## Feedback at the 2014 National Ambient Air Monitor Conference

The first set of comments is directly related to bias and the second set to broader quality assurance issues.

**Does the method for cleaning filter cassettes impact bias?** One person described calling several labs and finding that there is no consistency in the cleaning of filter cassettes. Changes in cleaning protocols show up in trip blanks. If these blanks start to drift up, contact the lab to ask for better or different cleaning methods, then assess whether trip blanks drop after making this change.

**Are monitors properly maintained?** For example, are the PM10 heads properly maintained, especially the O-rings? When doing flow rate checks, is the PM2.5 head removed incorrectly? As a corollary, did cuts to staffing and operational budgets in the 2007-2010 recession result in improper maintenance? At first, even with cuts, monitor and lab personnel did what they had to do to maintain the instruments and process filters. As the cuts continued and deepened, the operators could not continue to cover all bases so things began to be maintained less thoroughly. Around 2010, a new norm for field maintenance and lab operation was found, at which time bias began to stabilize.

**Does filter retrieval time impact bias?** PEP filters are retrieved the morning after sampling. SLT filters are retrieved within a week. One suggestion was to collocate two PEP samplers with an SLT sampler; collect one of the PEP filters according to PEP protocol and collect the other PEP filter when the SLT filter is collected. Another suggestion was to collocate two PEP samplers with an SLT sampler; PEP collects one filter according to PEP protocol, and the SLT collects the other PEP filter when the SLT filter is collected, and the second PEP filter goes through the SLT lab. The first approach addresses filter retrieval time only. The second approach combines more possible causes for differences: filter retrieval time, laboratories, and filter transportation, to name a few. Some people suggested that it would be possible and reasonable to acquire dates of sampling, retrieval, and weighing for some PQAOs and/or states.

*Continued on page 6*

## PM2.5 Bias Assessment Update (*Continued from page 5*)

**Does filter equilibration time in the lab affect bias?** Regulations require filters to equilibrate in the analytical lab for at least 24 hours, but there is no upper limit on equilibration time. Do weights change as filters sit longer?

In addition, there were some comments not specifically related to bias but that likely impact bias:

**Regarding the use of primary monitors.** Comparing PEP or precision collocation for monitors identified as primary is too limited because another monitor's data may be used when the primary monitor does not record data. Maybe PEP should be used to evaluate all monitors at the site, possibly separating results for primary monitors and all others. Same is true for precision

**Regarding method codes.** There are cases of monitors running WINS in one season and VSCC in another, yet all data are reported under just one method code. There are other cases where the field changes the separator; however, the lab does not know this and reports the data to AQS under the incorrect method code. It is believed that the incorrect coding goes both ways: VSCC monitoring data are reported as WINS and WINS monitoring data are reported as VSCC.

**Regarding cassette changer.** Some have indicated that the new Thermo cassette changer is not rotating properly. This is impacting completeness, and data from other monitors are substituted more often than one might expect. Completeness less than 70% is not uncommon.

**Regarding mean-adjusted Coefficient of Variation (CV).** In the original PM2.5 ruling, CV was not mean-adjusted. Later, CFR was changed such that CV is now mean-adjusted so that it more accurately reflects variability only, not systematic differences. The mean adjustment is useful information. It was suggested that the mean adjustment be stated on AQS reports so that drifts in precision can be more easily identified. Showing the mean would also allow people to aggregate CV to other time intervals or other spatial areas. Without the mean, there is not enough information on the AQS reports to complete aggregations.

### References

Eberly S. and McCarthy M.C. (2012) Bias in PM2.5 filter-based methods. Presented at the *National Air Quality Conference: Ambient Monitoring, Denver, Colorado, May 14-17,* by Geometric Tools, LLC, WA, and Sonoma Technology, Inc., Petaluma, CA. STI-910320-5366.

Eberly S., McCarthy M., and Huang S. (2014) Bias in PM2.5 filter-based methods. Presented at the *National Ambient Air Monitoring Conference, Atlanta, Georgia, August,* by Geometric Tools and Sonoma Technology, Inc. STI-910515-6031.

Eberly S.I. and McCarthy M.C. (2013) 3-year quality assurance report: calendar years 2008, 2009, and 2010, PM2.5 ambient air monitoring program. Draft report prepared for the U.S. Environmental Protection Agency, Research Triangle Park, NC, by Sonoma Technology, Inc., Petaluma, CA, STI-910407-5712-DR, July.

Frank N.H. (2006) Retained nitrate, hydrated sulfates, and carbonaceous mass in federal reference method PM2.5 for six eastern U.S. cities. *J. Air Waste Manage.*, 56(4), 500-511, April.

# 2015 Guidance Documents for Development

Over a number of years EPA has been asked to pursue a number of guidance documents that we just have not gotten time to complete or pursue. The following are what he hope to have drafted by this time next year:

**QA Handbook Vol II.** The draft we completed in 2013 will be revised with the anticipation of a Jan 2016 publish date. We plan to have a Handbook Review Workgroup conference call in Jan. 2015.

**Flow Rate Transfer Standard Guidance –** Similar to the ozone transfer standard document we plan to develop guidance foe flow rates so that monitoring organization can certify a Level 2 primary standard in their labs that would be verified/certified annually and then use their Level 2 standard to verify transfer standards that are used in the field. The goal would be to have a draft completed by mid-year for review and a published version by the start of 2106. Some work has been done on this guidance .

**Electronic Notebooks-** EPA does not have a policy in place for electronic notebooks. Monitoring organization have asked about this and there are a few organizations that have developed procedures for there internal use. OAQPS planned to have a webinar in November 2014 to illustrate one potential technique but it was postponed till the new year. Organization who have been pursuing these techniques or are interested in the webinar should contact Mike Papp (back page)

# Data Quality Assessments *(continued from Page 1)*

Region 4 has taken a proactive role in the data quality arena by offering four three-day training sessions on ambient monitoring for the State/Local/Tribal monitoring agencies in the region. Although the training provides good coverage on many facets of air monitoring (grants, siting, network design etc.) they spend a good portion of the time on quality assurance activities including from QMP/QAPP/SOP development, quality control implementation, data reporting and assessment. See the article on page 9 for additional information about this training.

Technical systems audits have come up on the radar screen and OAQPS and the Regions will be working together this year to talk about the various ways the Regions perform the audits, identify some innovative ways to assess data quality and develop some consistency in auditing across the Regions. Greg Noah will be coordinating with the Regions on this activity.

In reviewing some of the data quality issues that have occurred over the last year it is also apparent that some QAPPs lack the detail necessary to defend the operations in place at some monitoring organizations. As one goes through an audit of data quality or is performing a technical system audit, issues related to data quality will be identified. As we review this information EPA steps through the following process is:

- What does CFR say?
- What does the QA Handbook say?
- What does the monitoring organization QAPP say?

CFR and the QA Handbook Vol II will always (should always) say the same thing when in regard to a regulation. The Handbook does add additional checks and acceptance criteria that represents the best guidance available at the time of publication. If a monitoring organizations QAPP is in conflict with a regulation this should be caught and corrected unless it is intentional and there is some documentation that EPA has accepted this alternative. Handbook guidance can be modified for a QAPP but changes to consensus established acceptance criteria in the Handbook should be identified to QAPP reviewers and some rationale for why this criteria has been changed. In most cases it's not the information in the QAPP that's a problem; it's the lack of information. In preparation for technical systems audits EPA reviews data form various AQS reports. When issues related to data quality in those reports are found the auditors will go back to monitoring organizations QAPPs/SOPs to find the process they use to validate data. In some cases there is not enough detail in these QAPPs/SOPs to determine what corrective action procedures are taken.

**Revisions to Our Handbook Guidance on QAPP Preparation.**

We are currently in the process of revising the 2013 QA Handbook. Over the last year or so we have found a few errors that need fixing. In addition, we will be incorporating validation templates for the NCore network. We are going to add language to the Handbook, as well as a technical memo to the EPA Air Directors that will require any monitoring agencies that plans to deviate from any CFR requirements (that does not have an EPA technical memo allowing for the deviation) to work with the EPA Regions prior to QAPP implementation on approval of this deviation. If this deviation is approved it will be formally documented in the EPA approval section of the QAPP. If QAPP approval has been delegated to the monitoring organization EPA expects a memo to the EPA Regions on any CFR deviations.

# Direct NO2… GPT… IPN… NPN… Help!!!

With the approval of the Teledyne Advanced Pollution Instrumentation, Model T500U CAPS (API CAPS) and the Environment S.A. Model AS32m CAPS Nitrogen Dioxide Analyzers as federal equivalent methods (FEMs), questions have come up in regards to the manner in which the instruments can be calibrated and checked. This instrument provides a direct reading of $NO_2$ and can be calibrated with an $NO_2$ standard rather than using gas phase titration which is what is called for in the Reference Method (40 CFR Part 50 Appendix F). With the calibration requirement in place for GPT, monitoring orgs on wondering what position EPA has on the newer direct reading technology. The API CAPS operations manual covers both $NO_2$ cylinder and GPT calibration techniques. However, it would certainly defeat the purchase of the monitor if one needed to purchase additional equipment for GPT. Russel Long, Research Chemist from ORDs National Exposure Research Laboratory is aware of these questions. ORD has a number of CAPS analyzers in addition to other direct measuring $NO_2$ instruments and will be evaluating calibration and challenge procedures involving $NO_2$ cylinders and GPT over the next few months. If the results from testing using both techniques are comparable, EPA could issue a technical memo allowing the use of $NO_2$ gas standards for these direct methods.

Similarly, ORD is also currently investigating calibration/challenge issues associated with NOy analyzers. Particularly, ORD is looking into the use of IPN and NPN gases during the required biweekly 1-point QC check for NOy vs using $NO_2$ via cylinder or GPT ( See QA EYE Issue 12 pg. 8).

# AQS Corner

## March 2015 No more RP and RA Transaction

For the past few years we have been advocating for the use of the QA transactions that have been developed and in use for a few years now. Starting in March, 2015 the QA transactions will be the only procedure available for reporting quality assurance data to AQS. The AQS team has had a number of training session in 2013 and 2014 to train AQS users on the use of the new transactions. In addition, we will be advertising for additional training sessions in Jan and February and posting those on AMTIC and the AQS Website.

## Data Certification Updates

We have been through two years with the annual data certification /concurrence process and each year the system gets more and more refined. We thank the monitoring agencies and EPA Regions for identifying issues. We do our best to resolve them as soon as possible. A few things that we have refined from last year include:

**M-Flag-** We had a request to have an M-flag, which identifies data that is modified, be placed on data that have been initially certified by the certifying agency but than has been changed before being evaluated by the EPA Regions. We recognize that if the monitoring organization recertifies the modified data prior to the EPA evaluation the M-Flag will be removed. In fact EPA encourages recertification of modified data.

**U-Flag-** The U-flag identifies data that should be certified that has not. Starting with the 2014 certification (May 1, 2015) AQS will apply a U-Flag for any data uncertified after July 1.

## QA Collocation data will be reported as raw data in 2015

Since 2006 (see QA EYE Issue 2 page 5) EPA has been advocating the use of primary monitors and the identification of the CFR required QA collocated monitor to be identified in the collocations table and requesting the collocated data to be submitted as raw data. This eliminates the need for monitoring organization submission of a precision transaction (RP) for this information. Since the new QA transactions are completed, use of the RP transaction for collocated data will be eliminated in December 2014.

In order to implement this reporting procedure, the primary monitor and the collocated monitor must be identified in the "Monitors Collocation Period" using the "MJ" transaction for the primary and collocated monitor. Contact the AQS helpline for further information and help setting this up.

## QMPs Now Posted and TSAs Open for Business

The National Air Data Group (they run AQS) has posted the quality management plan (QMP) dates from the last Excel report that was posted on AMTIC in 2011. The hard part of the initial posting is now completed so our expectation is the QMPs, like the QAPPs, can be kept up-to-date by either the monitoring organizations or the Regional QA Staff.

As mentioned in the last QA EYE, (Issue 16) technical systems audit data can be posted on AQS. This is optional for internal monitoring organization audits but we expect the Regional TSAs to be posted. We would hope to have 2014 TSAs posted but minimally this will start in 2015.

# A Review of Units and Decimal Places Reported for Criteria Pollutants

A review of units and decimal places for reporting of criteria pollutant and related parameters has been performed. This was done since different monitoring objectives (e.g., NAAQS, AQI, trends, modelling) may necessitate submitting more decimal places that might otherwise be expected for a pollutant. For example, CO calculations for the AQI use units of ppm truncated to one decimal place; however, for stations using CO trace gas analyzers, the method can provide statistically significant data down to the ppb level. Having CO data available to the ppb level allows for better use of the information in model evaluation and for other data uses. Therefore, we encourage monitoring agencies to submit data to the units and decimal place where the method can provide statistically significant data and allow the data systems (AQS and AIRNow) to perform the appropriate computations.

**Background**

Table 14.1 of the QA handbook Volume II provides a summary of the expected standard units and number of decimal places to report. We have replicated that table here with some additional notes to accommodate methods that may vary from what is normally expected.

**AQS Reporting Notes:**

Data may be reported in standard or other available units. For example, CO can be reported as raw data in units of ppm or ppb; however, all raw data are converted and saved as standard units (e.g., CO standard units are ppm).

- Data are saved as both raw data and again as standard units;
- Historically, up to 5 values to the right of the decimal place could be loaded and stored in AQS; however, recently AQS was modified to allow more values as necessary.
- Summary Scale. This AQS field provides for the number of decimal places available in standard units. For conventional CO methods the summary scale is one with standard units of ppm (e.g. a value of 0.6 ppm); while trace gas methods have a summary scale of 3 in units of ppm (e.g., 0.226 ppm). For all other parameters, the summary scale is the same whether it's a conventional or trace gas method (i.e., one for all SO2 and NO/NO2 methods in units of ppb).
- It's perfectly acceptable to report more decimal places than expected for a pollutant as AQS will appropriately handle all computations; however, never report less decimal places than what's expected.
- For NO/NOy, use the same units and decimal places as NO2. (i.e., ppb to one decimal place).

*Continued on page 10*

**Table 1. QA Handbook Table 14.1 with Additional Notes**

| Pollutant | Units | Decimal Places | Example | Minimum reporting requirement (as described in 40 CFR Part 50) | Notes (these notes provide additional information not described in table 14.1) |
|---|---|---|---|---|---|
| $PM_{2.5}$ | µg/m³ | 1 | 10.2 | Shall be reported to AQS in micrograms per cubic meter (µg/m³ ) to one decimal place, with additional digits to the right being truncated (App. N) | The Met One BAM1020 provides hourly data in whole numbers (i.e., there are no decimal places when using hourly µg/m³) Therefore, hourly concentration data should be reported as whole numbers. |
| $PM_{10}$ | µg/m³ | 1 | 26.2 | *No description found* | |
| Lead (Pb) | µg/m³ | 3 | 1.525 | Pb-TSP and Pb-PM10 measurement data are reported to AQS in units of micrograms per cubic meter (µg/m³) at local conditions (local temperature and pressure, LC) to three decimal places; any additional digits to the right of the third decimal place are truncated (App. R). | |
| $O_3$ | ppm | 3 | 0.108 | Hourly average concentrations shall be reported in parts per million (ppm) to the third decimal place, with additional digits to the right of the third decimal place truncated (App. P). | |
| $SO_2$ | ppb | 1 | 35.1 | Reported to AQS in units of parts per billion (ppb), to at most one place after the decimal, with additional digits to the right being truncated with no further rounding (App. T) | |
| $NO_2$ | ppb | 1 | 53.2 | Reported to AQS in units of parts per billion (ppb), to at most one place after the decimal, with additional digits to the right being truncated with no further rounding (App. S) | |
| CO | ppm | 1 | 2.5 | *No description found* | Recommend reporting trace gas CO analyzers to three decimal places (in ppm) to take advantage of the higher sensitivity of these methods. |
| $PM_{10-2.5}$ | µg/m³ | 1 | 10.2 | *No description found – follow PM2.5 requirements* | |

# Decimal Place Reporting for Criteria Pollutants *(continued from page 9)*

**For data submitted to AQS how many decimal places are being included?**

We reviewed reporting of criteria and related pollutants and in almost all cases we are seeing either the appropriate number or more decimal places than expected. However, for reporting of CO with trace gas methods, we see a number of sites with less decimal places than expected (i.e., 3). Figure 1 is a histogram of 2013 CO hourly data for values below 1ppm. Note: large spike at 0.25 is due to use of the ½ MDL policy for conventional trace gas methods. MDL of conventional CO FRMs is 0.5 ppm. MDL of trace gas methods is 0.020 ppm. The mean of all hourly data collected in 2013 is 0.321 ppm. The mean of hourly data with methods having an MDL of 0.020 ppm or better is 0.247 ppm.

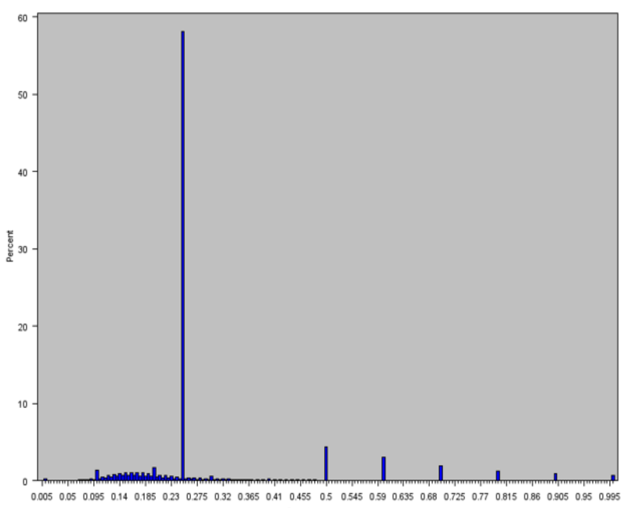


Fig.1

Figure 2 is a Histogram of hourly data with methods having an MDL of 0.020 (trace gas methods) or better and concentration of 1 ppm or less. The figure illustrates how values reported with less decimal places than expected (1 or 2 instead of 3), results in data being grouped at the tenths or hundreds of a ppm. If all trace gas data for CO were reported with 3 decimal places we would expect a smoother histogram than this.

**Data submitted for the CO trace gas monitor and number of decimal places**

This was generated by looking at CO monitors with an MDL of 0.020 or better. Monitoring data were organized by looking for at least a thousand hours of data reported in ppm to either 1 (tenths of a ppm), 2 (hundreds of a ppm), or 3 (thousands of a ppm) decimal places between -0.2 and 2.0 ppm. A total of 99 trace gas CO monitors were available in AQS to support this review. All of these monitors should report to 3 decimal places.

- Reporting to 1 decimal place – 9 monitors
- Reporting to 2 decimal places – 28 monitors
- Reporting to 3 decimal places (as is expected) – 62 monitors

Regions will be notified of the 37 trace gas CO monitors where we do not see ppm with the expected 3 decimal places.

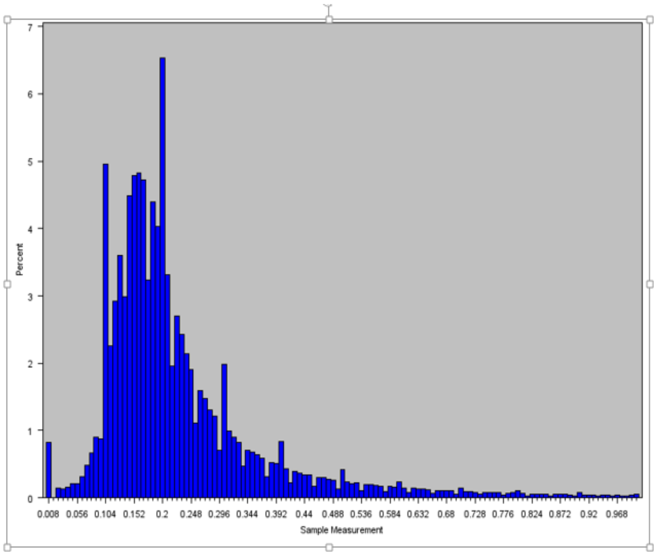


Fig 2

# Region 4 on the Training Trail

Over the last 7 months Region 4 monitoring staff in Atlanta and QA staff in Athens have teamed up to put on an impressive three-day air monitoring and QA training course that they have taken on the road. The first session kicked off in Nashville, TN (June 24-26) and has since been to Athens, GA (Oct 7-9) and Orlando (Nov 4-6), A future session is scheduled for Montgomery, AL (Feb 3-5). Florida has asked for a repeat engagement. The training is primarily focused on the technical monitoring staff with the goal to demonstrate how important their day-to-day work is in ensuring that data is acceptable for NAAQS attainment decisions. This training went through a lot of the facets of the monitoring program from grants, to network design, implementation of the monitoring networks, attainment demonstrations, our major regulations in 40 CFR parts 50, 53 and 58, to data quality and data quality assessment. Each phase was covered in enough detail to identify the important aspects and have interactive conversations on its importance to the ambient air program. The Team did a great job describing the technical systems audit process, how they prepare for a TSA and what they look for. The Team found many data quality related issues right in AQS reports. They went through these reports with the participants and asked them what they saw. Through dialogue at the training session, the participants were able to identify the data quality issues that should have been corrected prior to data submittal. Using this process they were able to train the participants on what to pay attention to in their day-to-day operations that can solve data quality issues before they become larger problems. A lot of effort has been put into this training program. Kudos to:

The Atlanta Staff: Todd Rinck, Darren Palmer, Dan Garver and Ryan Brown

The Athens Staff: Laura Ackerman, Richard Guillot, Doug Jager, Mike Crowe and Stephanie McCarthy.

# Data Quality Issues in PM 2.5 Labs

Over this last year serious data quality issues have been identified in a number of PM2.5 weighing laboratories that have been of concern to EPA. Some of these issues have resu l ted in the invalidation of enough data to defer NAAQS decisions. There seems to be a similar thread to many of these data quality issues and they derive from the laboratory conditioning requirements.

Temperature and Humidity Requirements

40 CFR part 50 Appendix L describes the PM2.5 field and laboratory methods. Requirements include:

Mean temperature: 20 - 23 °C

Temperature control: ±2 °C over 24 hours

Mean relative humidity: 30-40 %

Relative Humidity control: ±5 % over 24 hours

Filters must be conditioned at the same conditions (humidity within ±5 relative humidity percent) before both the pre- and post-sampling weighings.

Some exceedances of these requirements were identified while performing technical systems audits and reviewing laboratory data. Some labs did not have data recording devices to document adherence to mean conditions or to demonstrate control over 24 hour periods. The monitoring guidance called for the temperature (+ 2o C over 24 hours) and humidity (±5 % over 24 hours) control requirements to be based on a 24-hour standard deviation of the temperature or humidity values. In order to evaluate this data, data recording of these conditions (5 min values are suggested) are required in order to confirm the mean and a reasonable standard deviation over this time period. Some labs weighed and reported data within the required temperature and humidity conditions but could not document that conditions were in control. There were also cases where the labs could not document that the relative humidities at pre-weighing (prior to sampling) and post weighing (after sampling) were within + 5 percent.

EPA is aware that samples need to be weighed within 10– 30 days of the time they are sampled and this requirement puts considerable pressure on laboratories to weigh these filters quickly. However, our best guidance is to not weigh filters outside the requirements in 40 CFR Part 50 Appendix L. Weighing labs should consider alternate facilities when conditions cannot be achieved in the laboratories. EPA has a national weighing contract that can be quickly implemented to cover weighing activities when necessary. Contact your EPA Region for more information on this contract.

# NATTS Update

Dave Shelow and Greg Noah have instituted some changes to the NATTS proficiency test (PT) program which were discussed at the Atlanta Ambient Air Conference. The PT results will be presented to monitoring organization in three different comparisons:

- By the spiked value reported by the QA contract lab
- By the average of the concentrations reported by three referee laboratories, and
- By the average of the concentrations reported by the NATTs labs.
-

The labs seem to be on board with reporting the data by these three approaches. In the past we have had only one referee lab. We feel having three labs will provide more confidence in the PT values.
In addition, EPA will also continue to review the data by the Youden technique describe in QA EYE Issue 16 to determine within the population of NATTS laboratories whether there are any labs considered statistically different or consistently report lower or higher results then the other NATTS labs.

NATTS technical system audits will be scheduled for 2015. QA EYE issue 16 (page 9 ) provided some discussion on this. We are committed to work with the EPA Regions to schedule visits so the Regions can participate. In addition, we have made a change in how we plan to report the results of these TSAs. We will report; findings, observations and comments. We have replaced the term recommendations with the term comments. We will also be committed to following up on finding to ensure corrective action is addressed.
The NATTS 2011-2012 QA Annual Report (QAAR) has been posted to AMTIC at http://www.epa.gov/ttnamti1/airtoxqa.html. Recommendation for the QAAR include:

- Require the reporting of MDLs to AQS
- Include fields in AQS to specify the meaning of various POCs, and require the population of these fields
- Include fields in AQS to capture the results of ongoing flow audits performed by the monitoring agencies, and require the population of these fields
- Standardize the units of concentration used in AQS, and require that results be uploaded in these units only

# Final Thoughts

The National Ambient Air Meeting was a wonderful opportunity to discuss many QA related issues with monitoring organizations. We received a lot of questions and we are trying to pursue as many as we can get to.

We've had questions about the low level annual performance evaluations and whether the low level audits are meeting the acceptance criteria. Similarly our new Appendix A proposal has a lowering of the 1-point QC check and a requirement to select the 1-point QC concentration at the mean or median concentration of data within the PQAO. We will be doing a major assessment of both routine concentration data as well as how well monitoring organizations are achieving low level auditing for the agencies attempting these lower concentrations.

We had some questions about siting criteria and how far one takes the requirements about obstacles. The monitoring regulations require the distance from the obstacle to the probe inlet, or monitoring path must be at least twice the height that the obstacle protrudes above the probe, inlet, or monitoring path For example, if you monitor in a valley or base of a hill can a mountain range/ hill count as an obstacle? How far does one need to take the siting requirements? We plan to address these and other questions this year and include it in our next Handbook revision in 2016.

**EPA**

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**The Office of Air Quality Planning and Standards is dedicated to developing a quality system to ensure that the Nation's ambient air data is of appropriate quality for informed decision making. We realize that it is only through the efforts of our EPA partners and the monitoring organizations that this data quality goal will be met. This newsletter is intended to provide up-to-date communications on changes or improvements to our quality system. Please pass a copy of this along to your peers and e–mail us with any issues you'd like discussed.**

**Mike Papp**

# Key People and Websites

Since 1998, the OAQPS QA Team has been working with the Office of Radiation and Indoor Air in Montgomery and Las Vegas and ORD in order to accomplish it's QA mission. The following personnel are listed by the major programs they implement. Since all are EPA employees, their e-mail address is: last name.first name@epa.gov.

The **EPA Regions** are the primary contacts for the monitoring organizations and should always be informed of QA issues.

| Program | Person | | Affiliation |
|---|---|---|---|
| STN/IMPROVE Lab Performance Evaluations | Eric | Bozwell | ORIA- Montgomery |
| Tribal Air Monitoring | Emilio | Braganza | ORIA-LV |
| Speciation Trends Network QA Lead | Dennis | Crumpler | OAQPS |
| OAQPS QA Manager | Joe | Elkins | OAQPS |
| Standard Reference Photometer Lead | Scott | Moore | ORD-APPCD |
| National Air Toxics Trend Sites QA Lead | Greg | Noah | OAQPS |
| Criteria Pollutant QA Lead | Mike | Papp | OAQPS |
| NPAP Lead | Mark | Shanis | OAQPS |
| PM2.5 PEP Lead | Dennis | Crumpler | OAQPS |
| Pb PEP Lead | Greg | Noah | OAQPS |
| Ambient Air Protocol Gas Verification Program | Solomon | Ricks | OAQPS |
| STN/IMPROVE Lab PE/TSA/Special Studies | Jewell | Smiley | ORIA-Montgomery |
| STN/IMPROVE Lab PE/TSA/Special Studies | Steve | Taylor | ORIA-Montgomery |

## Websites

| Website | URL | Description |
|---|---|---|
| EPA Quality Staff | EPA Quality System | Overall EPA QA policy and guidance |
| AMTIC | http://www.epa.gov/ttn/amtic/ | Ambient air monitoring and QA |
| AMTIC QA Page | http://www.epa.gov/ttn/amtic/quality.html | Direct access to QA programs |