OFFICE OF AIR QUALITY PLANNING AND STANDARDS

The QA EYE

ISSUE 23

OCTOBER 2018

SPECIAL POINTS OF INTEREST:

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2018 National Ambient Air Monitoring Conference

On August 13 through 16 in Portland, Oregon, OAQPS hosted the 2018 National Ambient Air Monitoring Conference. Judging from the feedback, it was a great success! Quality Assurance had a large presence once again including the revamped QA 101 training session on Monday, the QAPPs and QC Discoveries technical session on Wednesday, to the TSA Training session on Thursday. A **big thanks** to all those involved in the planning and delivery of these sessions and to everyone who attended. A huge amount of planning and work goes into putting the conference together and the QA community stepped up to make it a success once again.

The QA 101 training session featured a new format using parts of the newly revised APTI 470 course as a template for the session. Mike Papp and Stephanie McCarthy have worked over the past year to update this course and the QA 101 training sessions were developed from these modules. It is our hope at OAQPS that the APTI 470 course can provide a solid QA foundation for new and veteran QA staff and that it builds consistency in QA throughout the regions. Modeling the QA 101 training course after the APTI 470 was a first step in this direction. The session began with the fundamentals of the EPA Quality System, then pollutant specific quality requirements, and ending with data verification/validation and certification. Wednesday was an afternoon of QAPPs and QC Discoveries featuring speakers from the regions and state and local monitoring organizations. QAPP writing guidance, experiences with QAPPs, and low-level auditing insight were the highlights. To end a long week, the TSA training session introduced the new TSA Quality Assurance Guidance Document, explored the details of a technical systems audit, and tested the audience with real-life TSA findings in pictures. As a credit to the presenters, all sessions were very well attended with good interaction throughout.

Three topics caught my interest during the conference that have or will have a big impact on the QA community. These three areas are PAMS, data visualization, and low-cost sensors. *Continued on page 2*

QAPP Session at the National Ambient Air Monitoring Conference

In recent months, many agencies have been focusing efforts towards updating their monitoring QAPPs, or developing new ones, which has sparked a lot of interest and questions from the monitoring community, especially for those agencies with new QA staff or QAPP writers. Common questions we have heard over the months include, "Why are QAPPs important?", "Why do I need a QAPP?", "Where do I start?" and most frequently, "Is there any new guidance available to help with this process?" The responsibility of writing a QAPP, especially for the first time, can be really overwhelming! So, to provide some assistance to QAPP writers, as well as to answer some of these important questions, a technical session was offered during the national monitoring conference in Portland. The technical session, *QAPPs and QC Discoveries*, was a packed house! It was exciting to see so many attendees – and there was a lot of good discussion and interaction during the session. Presenters discussed recent challenges and lessons learned during the QAPP writing process, offering perspectives on the value of these documents. New tools to assist the QAPP writer were also presented during the technical session. *Continued on page 2*

2018 National Ambient Air Monitoring Conference (continued from Page 1)

PAMS is a program that will involve everyone in the QA community in one form or another that we should all be preparing for in the very near future. At OAQPS we have been busy writing the quality documents for PAMS and providing resources for the PAMS QA program, but as I quickly learned, there is much more on the horizon. There may be new sites to visit, new QAPPs to review, and new technologies such as the auto-GCs and ceilometers to learn.

The rapid advancement of data visualization tools is exciting because of their ability to digest large datasets and create representations that are easily understandable and useful to users such as the QA community. The question is how do we make these tools available and relevant to the needs of different data users with different needs? We've only scratched the surface of the capabilities of data visualization, and I believe we will see much more advancement very quickly.

One of the biggest interests of the conference attendees was the explosion of the low-cost sensor world. With their ever-increasing numbers and their variability in data quality, low-cost sensors are devices that should be of interest to all in the QA community. OAQPS has taken a leadership role in helping to determine ways to assess these sensors and is also involved in their application in numerous studies. As QA professionals, these sensors will keep creeping into our everyday work and we will need to be knowledgeable in their appropriate use and necessary quality assurance. There is a buzz in the air regarding sensors and it's only going to get louder.

My final observation from the 2018 National Ambient Air Monitoring Conference is the sheer amount of work that the QA teams nationwide are responsible for. In every session, I would see a place for QA, and in every case, I would see a familiar face trying to build knowledge or asking a question. With that said, I say thanks to all of you for your dedication to QA. We at OAQPS recognize and appreciate your hard work in the ambient air monitoring programs. *– Greg Noah*

QAPP Session at National Ambient Air Monitoring Conference (continued from Page 1)

The first tool introduced was the newly published *Guide to Writing QAPPs for Ambient Air Monitoring Networks* (EPA-454/B-18-006, August 2018). This document is a plain language guide that concisely explains each of the required elements in a QAPP using common air monitoring terminology and examples. Additionally, the new guide offers specific monitoring questions to QAPP writers to help them brainstorm their air monitoring programs and quality systems, which in turn should help them craft language that best reflects their specific projects. A few excerpts from the QAPP guide were shown during the technical session, and a sneak peak was provided of a new QAPP review checklist that is also being developed to accompany the guide. Although the QAPP review checklist is geared towards the EPA QAPP reviewer, it can also be used as a tool to help the QAPP writer ensure that all the major elements of an air monitoring QAPP have been adequately addressed. The new guide, and its companion checklist, are the result of efforts by an EPA workgroup whose goal was to provide tools that would facilitate consistency across EPA Regions in both air monitoring QAPP content (for writers) and the approval process (for reviewers). Both the QAPP guide and the checklist can be found on the AMTIC website under the Quality Assurance Guidance Documents link (https://www3.epa.gov/ttn/amtic/qalist.html). Please check it out! Check out the article on page 3 for a first hand experience into using this guidance.

Another tool discussed during the QAPP technical session included an online QAPP-writing training course available through the Institute of Tribal Environmental Professionals (ITEP). ITEP's online training curriculum is available to any user – just sign up for an account! The online QAPP-writing training modules offer example text, provided element by element, along with videos and quizzes to help students think about the intended use of their data and the level of quality needed for the specific project. To find this online QAPP-writing course, visit ITEP's website at https://itep.scholarlms.com/courses/. Thanks to everyone who attended and presented at the *QAPPs and QC Discoveries* technical session! We hope you found it beneficial. And, we hope these new tools will help you more easily and quickly develop documents that reflect your unique air monitoring programs! Please reach out to your EPA Regional Office air monitoring QA contact with any questions or concerns you may have when writing QAPPs. We're happy to help! *-Stephanie McCarthy*

A QAPP Writing Journey

Being a person who loves the outdoors, hiking has naturally become a past-time I truly enjoy. As much as anything, it has become a great excuse to spend time in the woods, as you set a goal and enjoy the sense of accomplishment that comes along with pushing your limits. With that being said, I know my limitations and rarely tackle some 30-mile trail labeled as "strenuous". I like the shorter, easier trails that have some great reward at the end, like an incredible vista from a mountain peak or a beautiful waterfall tucked deep in the woods.

Five years ago I had a trail set in front of me that looked like it was 100 miles straight uphill in the Himalayas. Being a new air monitoring program manager, I learned my agency, like many other agencies, needed to update all of our QA documents, and in some cases, create them from scratch. This included SOPs, QAPPs, and a QMP. Our SOPs were old, outdated, and basically looked archaic. If you had questions about how to do something, you just asked your co-workers or supervisor. Well, everyone knows what that leads to: an unwritten and even worse, undocumented, way of doing things. All the years of doing the "right stuff," but not having documents detailing all of our current procedures made our data defensibility appear to be weak. And there it is, that 100-mile trail labeled as "very strenuous". I was not intimidated by figuring out our current process, because I knew that very well, but I never had any experience writing technical documents so how would I put my knowledge down on paper so it would satisfy EPA's expectation for proper QA documentation?

Looking at our old SOPs and QAPPs only made the trail look longer and added an altitude sickness component to it, which I was starting to literally feel. So, instead of looking ahead at the entire trail path, I thought about just putting one foot in front of the other to move forward. EPA Region 4 said they would help, and I knew other agencies that could help as well (not to mention the staff on-hand that also had a great deal of "current process" knowledge). We started with our Ozone SOP and tried our best to document our actual process. The goal was to write the SOP so that anyone with entry-level air monitoring experience could follow it. After a few revisions and a lot of bumps along the way, we got our first SOP approval letter from EPA. Now we could use this approved SOP as a guide for each specific pollutant and take one step at a time to get them all updated.

The QAPP was next. The QAPP is a document required to be agency / project-specific, which covers not just what you do, but why you do it. This is where the request sent to EPA Region 4 for guidance through the writing of the document reached a new level. EPA was also aware of so many agencies, who had been submitting QAPPs for approval, that were simply struggling with the concept of what a QAPP should be. So, the idea of developing a "QAPP guide" as a tool for agencies gained momentum. Region 4 EPA asked if I would be interested in helping in the development of a new air monitoring QAPP guide by designing our agency's QAPP to be a model to use in tandem with the guide. If it could help others improve their own agency's data defensibility then yes, of course, I would be interested.

Over the next few months, EPA and I worked over the phone 1-2 times a week and through email to develop, critique, fine tune, and finalize our QAPP, and at the same time, the QAPP guide. So many of the ideas and focus put into our QAPP started by just asking what do we do and why do we do it. How does *what* we do fit into the requirements for the QAPP? How does the QAPP reflect what *we* do? From site descriptions to assessment types, to documents and records management, each section states what we do -- and not only do we use it as a guide for staff, it serves as a resource for each of us to use when questions arise. The more I worked on the QAPP the more I realized how great a tool this could be, not just for my agency, but for the entire region as well. I have witnessed how many new faces are attending the EPA regional annual workshops in Region 4 and knew the need for this guidance tool would be greatly appreciated as agencies fall into knowledge turnover. It will also keep all processes more consistent and transparent for all levels.

The QA documentation developed by agencies is a tool for staff on so many levels. The new hire can use it as a resource for getting up to speed and improving their overall concept of the monitoring program's goal. Operator level staff can use it as a resource to make sure all procedures that they follow are backed up by fully adopted and managed documents. QA staff can use it as a true guidance and authority document to cite any practices that may be deemed harmful to the data's accuracy and defensibility. Management can also depend on the documents to be legally binding and present a clear process, objective, and basis for the monitoring program. Anyone can request and inspect the QA documents and get a clear understanding of how your monitoring program collects data. This could be the EPA, interested citizens, media, researchers, political groups, etc. No matter who reviews them, the documents should match the actual procedures in practice by your program and produce a high level of confidence in the data collected.

And there it is... the beautiful view from a mountaintop that you never thought you'd reach. All goals are reached by taking that first step, and then the next, and while EPA was pushing us to update everything and head up that strenuous trail, they did not push us to move and then disappear. They walked right alongside and helped answer questions along the way to make the journey easier. Here at the Forsyth County Environmental Assistance and Protection Office, we appreciate all the hours on the phone and questions answered over the last 5 years and would encourage everyone to extend a hand or ask for a hand as we continue on this journey.

— Jason Bodenhamer -Forsyth County Environmental Assistance and Protection Office

Fair Warning #1 1-Point QC Check Concentration Ranges

40 CFR Part 58 Appendix A requires the following ranges for the 1-point QC checks for the continuous gaseous monitors

- 0.005 and 0.08 parts per million (ppm) for SO2, NO2, and O3,
- 0.5 and 5 ppm for CO monitors.

A 1-point QC check that has the assessment value (not monitor value) concentration outside these ranges can be reported but will not be used in regulatory precision and bias statistics, and will also not be used to assess whether checks were conducted within the CFR required frequency, meaning the data will not show up on AMP reports. An assessment value that is within the range with the monitor value outside the range (since one can't determine what the monitor will measure) will be used.

To assess in AQS whether checks were conducted within the required range, values are rounded to the following number of digits after the decimal for the Assessment value, after it has been converted to the standard units for the parameter:

- CO: Std Units: PPM, Rounded to Number of digits after decimal: 1
- SO2: Std Units: PPB, Rounded to Number of digits after decimal: 0
- NO2: Std Units: PPB, Rounded to Number of digits after decimal: 0
- O3: Std Units: PPM, Rounded to Number of digits after decimal: 3

For Example: For SO2, the value 0.5 ppb will be rounded to 1 ppb (which is below the allowable range of 5 to 80 ppb), and the value 0.4999 ppb will be rounded to 0 ppb.

Another way of looking at it is:

- SO2 and NO2: 4.5 ppb - 80.4999 ppb is acceptable
- O3: 0.0045 ppm - 0.08049 ppm is acceptable
- CO: 0.45 ppm - 5.4999 ppm is acceptable

This rounding is only used to determine if the assessment value is within the correct range. For the statistical assessments, the values reported in the QA transaction will be used. For example, if an assessment value for SO2 was 4.55 ppb and the monitor value was 4.42 ppb the assessment value will round to 5 ppb and will be within the range for statistical assessment. However, when the statistical assessment is performed, AQS will use the 4.55 ppb assessment concentration and 4.42 ppb monitor concentration in the precision and bias calculation. As discussed in the QA Handbook (see section 14.3.1), AQS has been revised to allow monitoring organizations to report data up to 30 values to the right of the decimal and it is suggested that monitoring organization take advantage of reporting to more decimal places for both routine as well as the QC data.

When the assessment value data is reported to AQS outside of the range, a warning will be provided to the monitoring organization. As mentioned above, the data will be accepted in AQS but it will not be used in any assessment statistics. The National Air Data Group initially implemented this change around July 2018. OAQPS got a few complaints and we decided to wait until the calendar year 2019 for full implementation. It is important to note that beginning on Jan. 1, 2019, not only would implementation of this potentially affect regulatory precision and bias statistics, but it could also affect p-check completeness, resulting in the AMP600 recommending that certain monitors not pass "certification evaluation" criteria.

Fair Warning #2 QAPP Evaluation is Changing in the AMP600 Data

In order to address a finding in the last Inspector General audit (see QA EYE issue 22), OAQPS is revising the data certification and concurrence report (AMP600) to flag data with an "N" when a PQAOs QAPP is over five years old. Quality Assurance regulations require QAPPs be revised on a 5-year cycle and starting with the May 1, 2019 data certification for the 2018 data, OAQPS will be instituting this revision to the AMP600 report.

Last year Attachment 1 of the guidance document "Ambient Air Monitoring Data Certification Q&A for CY2017" posted on AMTIC alerted the PQAO of this revision as follows:

NOTE: *For the 2018 Data certification process (due date, May 1, 2019), any sites for PQAOs whose QAPP approval date is greater than 5 years old will be given a Red "N" flag. The tables below will be revised for the 2018 Guidance Document.*

First Results of CSN Mega-Performance Evaluation

As many of you are aware, the PM2.5 Mega performance evaluation (PE) program was suspended for approximately 3 years while the program was transitioned from NAREL to OAQPS. OAQPS resumed the program in late 2017 and completed the first study in early 2018. Most laboratories have submitted their results, which are presented here and are considered draft until the final data set are received and included in the calculations.

As in previous studies, each participating laboratory analyzed a set of blind PE filter samples. The PE samples were prepared by the Office of Air Quality Planning and Standards (OAQPS) at the Research Triangle Park (RTP), NC facility. For each analysis type, three sets of collocated filter samples were collected over varying time periods to ensure sufficient particulate were collected to span the PM2.5 Network average concentrations. The collocated sampling system was designed and fabricated at OAQPS in RTP, NC and is used for both the Mega PE and Gravimetric Round Robin PE events. The sampler can collect up to 32 collocated samples simultaneously and achieves 5% precision between samples (verified through gravimetric QC studies conducted prior to each PE event and flow checks at each cyclone prior to every sampling event).

Photos of the collocated sampling system and one of the four sampling manifolds containing eight cyclones are shown in Figures 1. and 2

Figure 1. One of four sampling manifolds on the 32-cyclone collocated PE sampler at OAQPS in RTP, NC

Figure 2. PE Sampling system consisting of 32 PM2.5 cyclones on four sampling manifolds and one dedicated pump (in fancy pump-box in the foreground)

Each laboratory received the following set of PE speciation samples:

- Anion and Cation Analysis by Ion Chromatography (IC)
  - –Five Nylon® filter samples (all labs)
  - –Six Teflon® filter samples (one lab)
- Carbon by Thermal Optical Analysis (TOA)
  - –Five quartz filter samples
  - –Four quartz filter samples (one lab)
- Elemental analysis by X-Ray Fluorescence (XRF)
  - –Five 47 mm Teflon® filter samples

OAQPS does not have its own laboratories and was unable to successfully qualify external referee labs, therefore it was not possible to obtain reference values for the PE samples. Since the lab results could not be evaluated against an assigned value (referee lab result), OAQPS evaluated each result against the results of the other laboratories participating in the study (interlaboratory comparison). To analyze the data, results that were reported as either "ND" or "<DL" were converted to zero. This was done because non-numerical values cannot be included in a statistical analysis. To avoid this in future studies, all laboratories will be asked to provide the actual numerical value of each result.

The interlaboratory comparison was performed by calculating the average and standard deviation of each set of analytical results from distinct sampling events, which were then used to calculate a z-score for each individual laboratory result. A z-score indicates how many standard deviations an analytical result is from the mean across all laboratory results for that target compound, and is calculated by:

$$z = \left|\frac{x - \mu}{\sigma}\right|$$

where z is the z-score, x is the value of the individual analytical result, μ is the population mean across all laboratories for that analyte, and σ is the standard deviation of that mean. The absolute value of z represents the distance between the raw score and the population mean in units of the standard deviation, as shown in the figure, below :

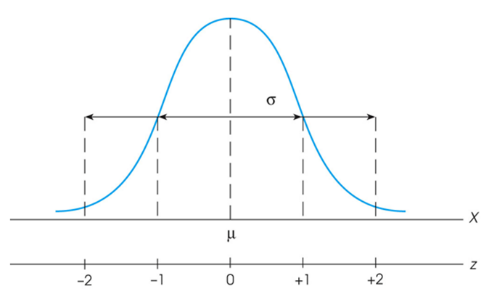

Figure 3. Relationship between z-score and standard deviation in a normal distribution

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CSN Mega PE Results (*Continued from page 5*)

For this study, when z < 2 the analytical result is satisfactory (95% of the z-scores are expected to fall in this range for normally distributed data); when 2 < z < 3 the analytical result is considered questionable (should be investigated by the laboratory); and when z > 3 the analytical result is unsatisfactory. Happily, none of the results had a z-score greater than 3 and only two results were greater than 2. See the tables below for a summary of all results. Note that these data may change when the remaining results come in from one laboratory.

For the elemental analysis by XRF, results from the top ten CSN wide average elemental concentrations from June 2016 through May 2018 were included in the interlaboratory comparison. In descending order by average concentration, these elements shown in Figure 2, below, and are sulfur (S), silicon (Si), iron (Fe), potassium (K), sodium (Ns), calcium (Ca), aluminum (Al), chlorine (Cl), magnesium (Mg), and zinc (Z).

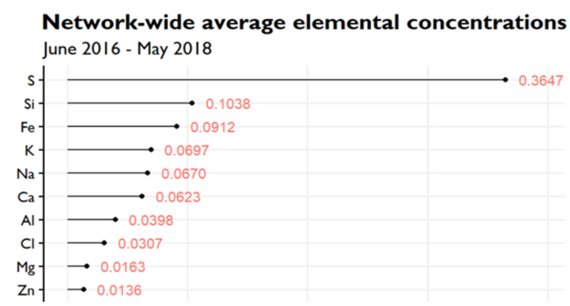


Figure 4. Top-ten CSN-wide average elemental concentrations

As shown in Table 1, below, all z-scores for the selected elements by XRF were below 2

Table 1. Selected Elements by XRF: Interlaboratory z-score Results

Lab	Event	S	Si	Fe	K	Na	Ca	Al	Cl	Mg	Zn
DRI	1	0.82	1.14	0.85	0.50	1.48	0.68	0.70	1.19	0.77	1.26
ODEQ		1.43	0.52	1.44	1.14	0.70	1.44	1.46	0.19	0.77	1.19
SCAQMD		0.10	1.02	0.37	1.06	0.48	0.67	0.59	1.23	1.33	0.04
UCD		0.51	0.63	0.22	0.58	0.30	0.08	0.16	0.15	0.22	0.04
DRI	2	0.71	1.28	0.39	0.17	1.50	0.30	0.81	1.12	0.85	0.62
ODEQ		1.47	0.31	1.47	1.44	0.59	1.49	1.23	0.97	0.85	1.49
SCAQMD		0.22	0.91	0.77	0.85	0.46	0.63	0.81	0.70	1.11	0.43
UCD		0.53	0.67	0.31	0.41	0.45	0.55	0.39	0.55	0.58	0.45
DRI	3	0.90	0.78	0.45	0.58	1.50	0.39	1.50	0.61	0.87	0.77
ODEQ		1.40	0.85	1.49	1.49	0.53	1.49	0.55	1.50	0.87	1.47
SCAQMD		0.01	1.23	0.65	0.32	0.47	0.61	0.52	0.44	0.87	0.35
UCD		0.49	0.40	0.40	0.59	0.50	0.49	0.43	0.45	0.86	0.34
DRI	B1	0.00	1.22	0.50	0.45	1.50	1.12	0.06	0.58	0.02	0.87
ODEQ		0.00	0.40	0.50	0.52	0.52	0.84	0.69	0.58	0.81	0.87
SCAQMD		0.00	0.90	0.50	0.52	0.52	0.84	0.69	1.49	1.40	0.88
UCD		0.00	0.73	1.50	1.50	0.46	0.57	1.43	0.33	0.61	0.85
DRI	B2	0.00	1.12	0.43	0.39	0.50	1.43	0.50	0.62	0.82	1.37
ODEQ		0.00	0.57	0.54	0.55	0.50	0.88	0.50	0.62	0.82	0.74
SCAQMD		0.00	0.83	0.54	0.55	0.50	0.42	0.50	1.48	1.21	0.74
UCD		0.00	0.86	1.50	1.50	1.50	0.13	1.50	0.24	0.43	0.12

For cation and anion analysis by IC, filters were extracted and analyzed for the cations sodium (Na), ammonium (NH_4^+), potassium (K), and anions chloride (Cl^-), nitrate (NO_3^-), and sulfate (SO_4^{2-}). Note that Cl^- was added to the analyte list several years ago because there was an interest in quantifying the impact of sea spray on $PM_{2.5}$. Desert Research Institute (DRI) has additional samples because they perform these analyses on both nylon and Teflon filters, so both filter types were included with their PE samples. Additionally, the DRI B2 Teflon PE sample was found to have two filters adhered together. DRI extracted these samples separately and reported both results, which were included in the data analysis. As shown in Table 2, below, most z-scores were below 2, with only one outlier at 2.04.

Table 2. Cations and Anions by IC: Interlaboratory z-score Results

Lab	Event	Na	NH_4^+	K	Cl^-	NO_3^-	SO_4^{2-}
DRI	1	0.86	1.45	0.86	0.70	0.25	0.38
DRI		1.16	0.13	1.21	0.95	1.76	1.49
ODEQ		0.63	1.36	0.30	NA	0.60	0.97
RTI		0.17	0.02	0.60	0.48	0.66	0.08
SCAQMD		1.22	0.20	1.16	1.17	0.25	0.83
DRI	2	0.25	0.45	0.87	0.37	0.16	0.89
DRI		1.63	1.79	1.18	1.49	1.73	1.38
ODEQ		0.22	0.39	0.45	NA	0.79	0.23
RTI		0.05	0.45	0.39	0.62	0.56	0.34
SCAQMD		1.11	0.50	1.22	0.50	0.21	1.06
DRI	3	0.36	0.38	0.72	0.03	0.04	0.01
DRI		1.73	1.41	1.29	1.34	1.73	1.41
ODEQ		0.04	1.31	0.19	NA	0.71	0.73
RTI		0.56	0.11	0.66	1.06	0.63	0.46
SCAQMD		0.76	0.38	1.16	0.25	0.35	1.12
DRI	B1	0.80	0.45	0.99	0.71	0.04	1.03
DRI		0.43	0.45	1.20	0.98	0.07	0.73
ODEQ		*0.90*	*0.45*	*0.73*	NA	*0.85*	*0.73*
RTI		0.86	*0.45*	*0.73*	0.59	*0.85*	*0.73*
SCAQMD		1.27	1.79	0.73	1.09	1.60	1.16
DRI	B2	0.05	0.00	0.40	0.28	0.19	0.41
DRI		0.84	0.00	1.50	0.50	0.66	0.41
DRI		1.56	0.00	0.65	0.50	0.56	0.41
ODEQ		*0.78*	*0.00*	*0.85*	NA	0.96	*0.41*
RTI		*0.78*	*0.00*	*0.85*	*0.50*	1.68	*0.41*
SCAQMD		0.78	0.00	0.85	1.78	0.70	2.04

NA: This laboratory does not routinely report Cl^-
Italicized results were reported as ND or < DL and converted to zero for statistical analysis

For organic carbon analysis, results for organic carbon (OC), elemental carbon (EC), and total carbon (TC) were analyzed and compared across laboratories. Note that one lab was not provided a filter for Event 1, so was not included in that comparison. As shown in Table 3, below, all z-scores were below 2.

Table 3. Carbon by TOA: Interlaboratory z-score Results

Lab	Event	OC	EC	TC
DRI	1	0.93	0.81	0.91
SCAQMD		1.06	1.12	1.07
UCD		0.13	0.31	0.16
DRI	2	1.44	1.25	1.33
ORD		0.59	0.23	0.77
SCAQMD		0.75	0.37	0.77
UCD		0.10	1.11	0.21
DRI	3	1.26	1.49	0.98
ORD		1.18	0.37	1.38
SCAQMD		0.04	0.65	0.34
UCD		0.12	0.46	0.06
DRI	B1	0.81	1.44	0.80
ORD		0.81	0.68	0.81
SCAQMD		0.37	0.68	0.37
UCD		1.25	0.09	1.25
DRI	B2	0.75	0.50	0.75
ORD		0.26	0.50	0.26
SCAQMD		1.47	0.50	1.47
UCD		0.46	1.50	0.46

These preliminary interlaboratory comparison results will be updated when the remaining laboratory submits their analytical results for this study.

–Jenia McBrian

Identifying the PM2.5 Primary Monitor (Sampler) for Routine Monitoring and Collocated For Regulatory QA Purposes

When it comes to QA Collocation requirements there is still a lot of confusion out there. Some of the confusion stems from the term "collocation" being used in the generic sense; meaning that sites exist where there is a primary PM2.5 monitor and there are other PM2.5 monitors "collocated" at the site for purposes other than meeting the "QA Collocation" requirements. In this article "QA collocation" refers to the NAAQS primary/QA collocated monitors that are paired to meet the 40 CFR Part 58 Appendix A Section 3.2.3 *Collocated Quality Control Sampling Procedures for PM2.5* QA requirements.

The collocated monitor must be paired with the NAAQS primary monitor. The AMP 256 reports and the AMP600 report will not recognize any collocation where the QA collocated monitor is not paired with the NAAQS primary. It will also not report where the method codes are not appropriately paired as required in CFR.

Many PM2.5 sites have more than one PM2.5 sampler/monitor at a site. When there is more than one monitor it may be for two reasons:

1. Additional monitors to cover additional days or to have a daily continuous monitor for AQI purposes while also having an intermittent primary monitor at the site, or
2. to achieve official regulatory QA collocation as described in 40 CFR part 58 Appendix A Section 3.2.3.

In either of the two scenarios, a primary monitor needs to be designated in AQS. It must also be the monitor that is listed as the primary monitor in the annual network plan as described below from 40 CFR 50, Appendix N, 1.0(c) (definitions):

> *Primary monitors*- are suitable monitors designated by a state or local agency in their annual network plan (and in AQS) as the default data source for creating a combined site record for purposes of NAAQS comparisons. If there is only one suitable monitor at a particular site location, then it is presumed to be a primary monitor.

By default, AQS will designate the first PM2.5 monitor created at a site as the primary monitor for NAAQS comparisons. By default, any other monitor created in AQS for the site will not be the NAAQS primary monitor.
This can lead to problems if a newer monitor is listed in the annual network plan as the primary, but the monitoring organization has not identified it as the primary monitor in AQS. The monitoring organization always has the option of setting the primary in AQS on the Maintain Site Form and EPA suggests that reviewing the primary monitor designation in AQS on the Maintain Site Form is the best practice to avoid misidentifying the primary monitor.

Checking the Primary Monitor in AQS

The following procedure is a way to check what AQS has currently defined as the primary monitor.

1. At the main menu select "Maintain" and then select "Site" this will bring you to a blank site form where you can enter the State, County and Site ID code (Fig 1). Hit "Execute the query"  for that site. It will provide the information shown in Figure 2. *Continued on Page 8*

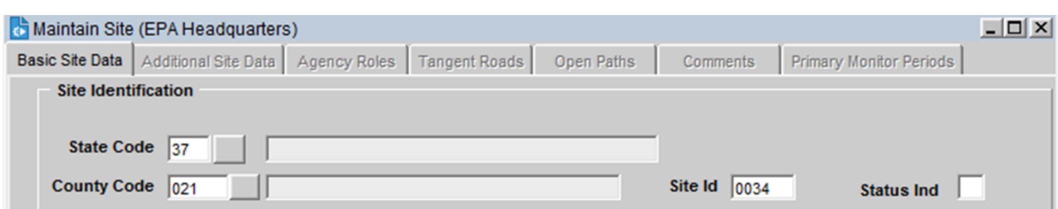


Figure 1. Partial view of maintain monitor form

Identifying the PM2.5 Primary Monitor for Routine Monitoring and Collocated For Regulatory QA Purposes *(continued from page 7)*

2. Click on "Primary Monitor Period" (see Fig 2)

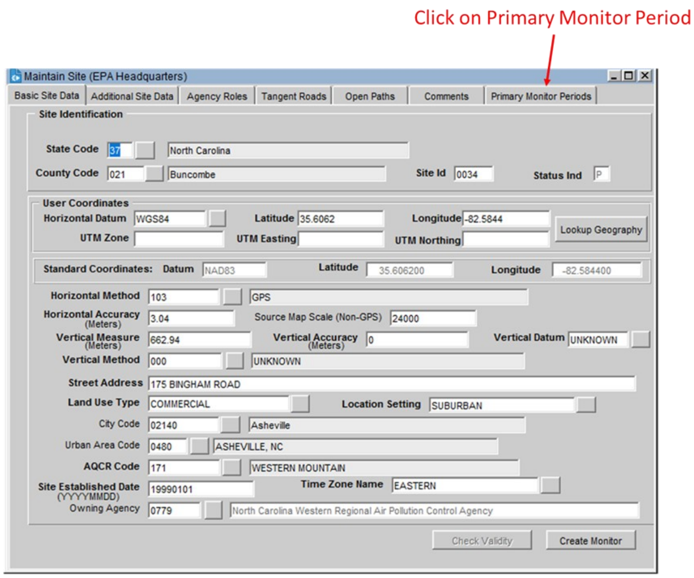


Figure 2. Maintain site record

3. For this site (see Fig 3), the primary monitor is the POC 1 monitor since there is no end date for this monitor

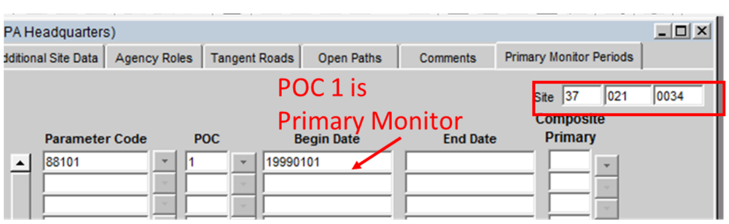


Figure 3 Primary monitor table

NOTE: If you wanted to change the current primary NAAQS monitor (in this case POC-1) to another monitor you would enter an end date for the POC-1 monitor and then start a new line with the parameter code, POC and begin date for the new primary monitor

Steps to Determine or Identify the QA Collocated Monitor That Will Be Paired with the Primary Monitor

The following steps will ensure that the QA collocated monitor is paired with the correct primary monitor at the site. In this scenario, the site has 4 PM2.5 monitors (POCS- 1,2 3 and 7) and as discovered above, the POC-1 is the NAAQS primary monitor. The POC-2 monitor has been identified as the collocated monitor to achieve the 40 CFR part 58 Appendix A Section 3.2.3 collocation.

1) Go to the main menu and select "Maintain" and select "Monitor". The Maintain Monitor Form (Fig. 4) will appear

2) Enter the state/county/site ID/Parameter Code (see Fig. 4) and click on the "execute query" icon.

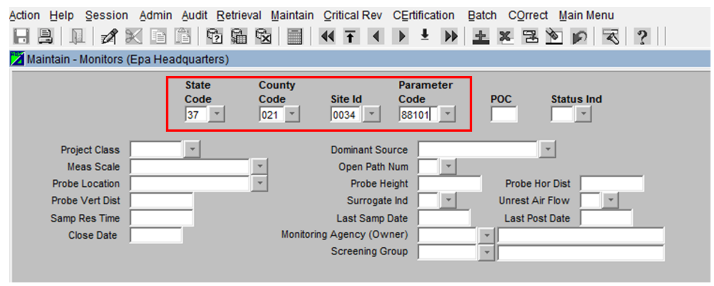


Figure 4 Maintain monitor form

3) This will retrieve all of the PM2.5 monitors at the site. Use the scroll icons (see Fig 5) to bring the primary monitor up on the form (POC-1 as determined in earlier section) . Then click on the "QA Collocation" button.

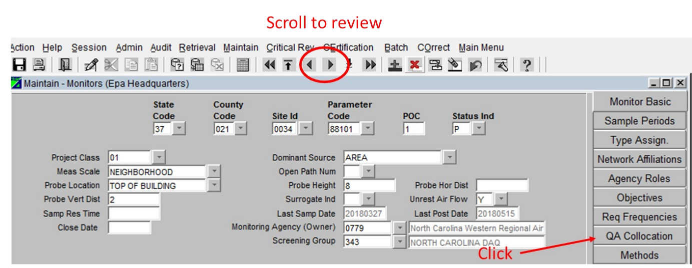


Figure 5 Maintain monitor form

4) The Monitor box in the upper right of the Form (red box in Fig 6) identifies the monitor that you are currently reviewing (POC-1 in this case as shown in Fig 5). The monitor ID high-lighted in blue is the current designated primary monitor. The Field "Primary Sampler" which in this case is designated as "Y" indicates that the POC-1 is the primary sampler (monitor).

Continued on page 9

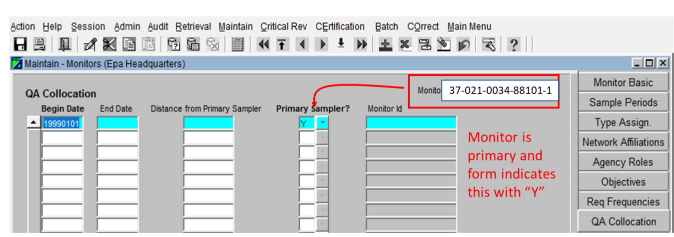


Figure 6 Maintain monitor form for the designated primary monitor

Identifying the PM2.5 Primary Monitor ... *(continued from page 8)*

5) Step 3 is repeated for the next PM2.5 monitor (POC-2) at the site. Figure 7 indicates that the POC-2 monitor is the QA collocated monitor since it is associated with the primary monitor and it also indicates that it is not (Primary sampler = "N") the primary sampler (monitor). The QA collocated monitor can not be the primary so the "N" is appropriate

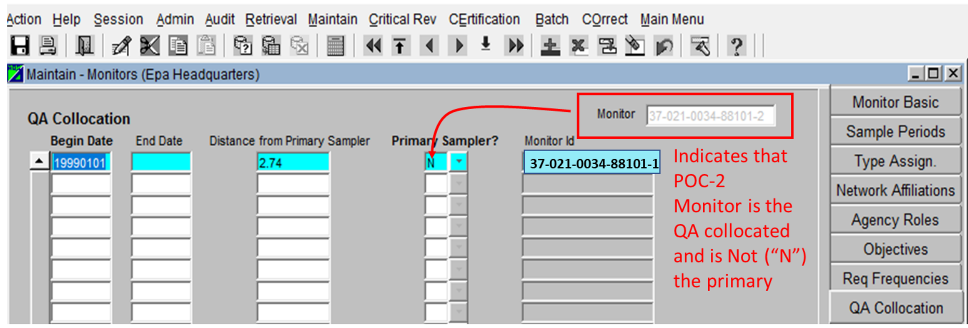


Figure 7 Maintain monitor form for the designated QA collocated monitor

6) The POC-3 and POC-7 monitors are then selected (see step 3) and because no monitor ID is associated with these monitors (rows are blank) it indicates they are not the QA collocated monitor.

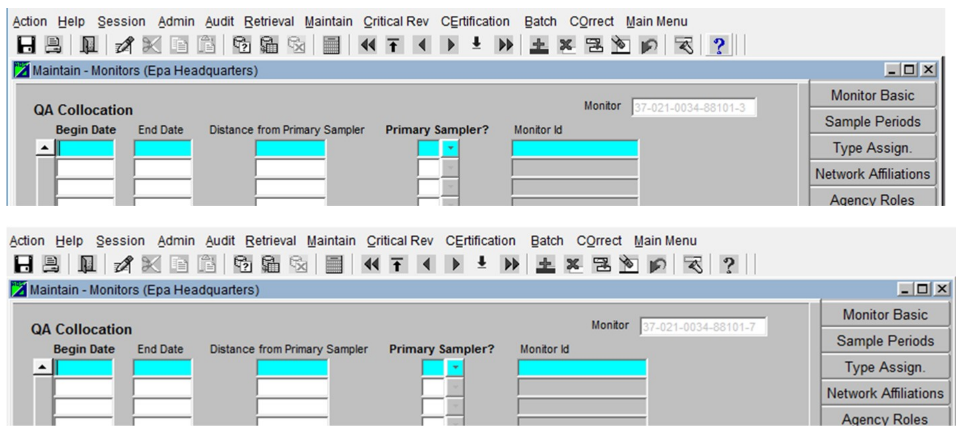


Figure 8 Maintain monitor form for POC-3 and POC 7

Additional Information About the System

AQS has specific procedures that must be followed to change primary monitors/samplers or change the QA collocated monitor/sampler.

To change a primary monitor at a non-QA collocated site

1. Go to Maintain Site Form (Fig 1)
2. Enter the Site ID and click on "Primary Monitor Periods" (see Fig 2 and 3)
3. Enter an end date for the current primary (POC-1)
4. Enter in new primary monitor POC (i.e., POC-3) and a begin date
5. Save the edit

To change a primary or QA collocated monitor at an official QA collocated site

If primary (currently POC-1) changes (i.e., to POC-3) but the POC-2 QA collocated monitor stays the same you first need to discontinue the QA collocated monitor from the current primary

1. Go into Maintain Monitor enter the QA collocated monitor POC (See Fig 3) and click QA Collocation
2. At the QA collocation table (Fig 4) enter an end date for this collocation POC,
3. Save the edit

Now change the primary

1. Go to Maintain Site Form
2. Enter the Site ID and click on "Primary Monitor Periods" (see Fig 2)
3. Enter an end date for the current primary (POC-1)
4. Save the edit
5. Enter in new primary monitor POC (i.e., POC-3
6. Save the edit

Now go back in and identify the collocated monitor for the primary

1. Go into Maintain Monitor (see Fig 3) and enter the QA collocated monitor POC that you want to identify as the QA collocated monitor (POC-2) and click QA Collocation
2. At the QA collocation table (Fig 4) enter a begin date, distance from primary monitor
3. Save the edit

Update on Things in the Pipeline

There are a number of projects that have yet to be completed that we plan to complete this year. The following are updates on progress:

National QAPP Level Activity

A Lean Kaizen event occurred in DC with a number of the EPA Regional QA Managers and Headquarters QA Managers. The E-Enterprise Leadership Council elevated the need to streamline and modernize the process for reviewing state and tribal QAPPs as an FY18 priority area. EPA held listening sessions with tribes and states to determine areas for improvement and the EELC supported a Lean Kaizen event focused on:

- Ensuring EPA's timely and consistent review and approval of QAPPs
- Streamlining QAPP requirements and simplify guidance
- Increasing the number of QAPPs that are completed and accurate when submitted.

The Lean event was held in DC September 11-13, 2018. The event produced an implementation plan and Workgroups were developed to work on action items identified in the plan.

Ozone Transfer Standard Guidance

This was discussed in QA EYE issue 22. An EPA Workgroup, including representatives for CA Air Resources Board, is making progress on this document. It is expected that an initial draft will be completed by spring 2019 that will then be out for review to the monitoring community. Scott Hamilton from EPA Region 5 and Greg Noah from OAQPS are coordinating this effort.

Flow Transfer Standard Guidance Document

Similar to the ozone transfer standard document , we are trying to develop guidance for flow rate transfer standards. This was also discussed in Issue 22 We hope to have a draft of this document in mid-2019.

Low Concentration Acceptance Criteria for PM2.5 precision and bias.

We have been evaluating the PM2.5 collocated QA data as well as the performance evaluation data and we think we may be able to develop a technical memo that would allow a 1 ug/m^3 difference acceptance criteria to be used in data verifications. See more detail in article on page 12

R-Shiny QC Tool.

Sonoma Technology Incorporated has been working on a automated report to evaluate the 1-point QC checks in AQS. We reported on this in QA EYE Issue 22 (Page 1). This report but it has been delayed due to revisions associated with moving AQS data to the Datamart. We hope have another version of the report ready for review in early 2019.

AQS Questions and Answers

These questions are related in the Technical memo posted on AMTIC on 1/30/2018 called 'Steps to Qualify or Validate Data after an Exceedance of Critical Criteria Checks'

Q-We have had a question relating to reporting and verifying the "1C" code in AQS for an invalid QC check. Should the code be reported in the QC null code field or in place of the assessment and monitor concentration values ?

A- The "1C" code will be reported in the QC null code field. AQS will nullify any values provided for monitor and assessment values; so the user does not need to manually remove these values.

Q-Will other QC checks (i.e., flow rate verifications) that exceed critical criteria be expected to follow the 1/30/2018 technical guidance?

A– Yes, EPA's focus has been on the gaseous pollutants to address the Inspector General's findings but will be programming the other QC checks considered critical criteria in 2019.

PEP and NPAP Training Update

On September 18th through 21st, OAQPS conducted a series of training webinars for all PEP/NPAP auditors and their EPA regional leads. These webinars included refresher training for auditors, discussions of issues encountered over the past year, analyses of audit data, and a summary of expectations for next year. The final day of the event was a discussion with the EPA PEP/NPAP national leads to address concerns from the year and to propose solutions going forward. Typically, this training event is an interactive face-to-face event; however, we opted for a webinar this year to save resources. In Spring 2019, we will implement new software and a new audit process for the PM2.5 and Pb PEP. This project was intended to be completed this past summer, but several delays forced the timeline for completion into 2019. So, we decided to have webinars for training this year and focus resources on training for the new process next year. The Spring 2019 training will involve hands-on with the new software and intensive instruction guiding the auditors through the new process. The new PEP process involves a field data collection and transfer application for the tablet computers that integrates with AQS. New weighing laboratory software will also be installed which integrates with AQS. Behind the scenes, AQS will combine the two data streams and calculate the final concentration. Finally, the data will be available for the regional PEP leads to validate before it moves into AQS. The hope is that this new process will be much more efficient and will standardize the PEP. Much of the new audit process will look familiar on the surface, but will be vastly different behind the scenes.

If you are a PEP auditor or a regional PEP coordinator, expect information about another training in Spring of next year. No location has been set yet, but we will have details in the next few months. We're looking forward to seeing everyone soon.
– Greg Noah

Jenia McBrian on Detail as OAQPS QA Manager

In October Jenia McBrian has begun a six-month developmental opportunity with the OAQPS Central Operations and Resources Office (CORE) as the OAQPS QA Manager.

Jenia is super excited about this opportunity which arose following the retirement of Joe Elkins, who had been with OAQPS since 1991. Jenia intends to maintain the established esteem Joe brought to the Office as an Agency leader in Quality Assurance.

In addition to learning about the work of CORE in supporting the mission of OAQPS, as the OAQPS QAM, Jenia will be working with the cross-office QA Team to:

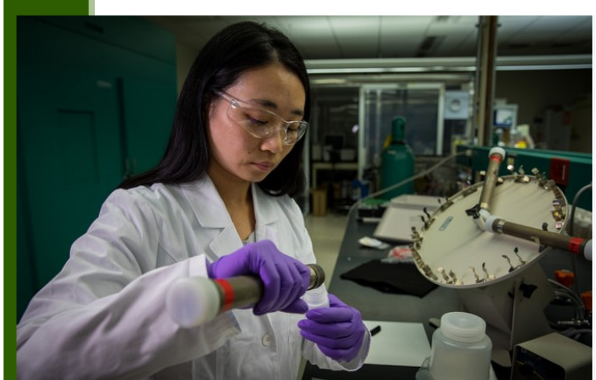
- Update the OAQPS Quality Management Plan (QMP);
- Develop the OAQPS Annual QA Report;
- Prepare for FY 2019 OEI OAQPS Quality Systems Audit) QSA;
- Provide QA training to staff;
- Respond to inquiries from the Office of the Inspector General (OIG); and
- Work with OAQPS divisions in development of relevant QAPPs that support the QMP.

In addition to OAQPS QA activities, Jenia will be involved in many Agency-wide QA initiatives to ensure OAQPS views are represented, including:

- CIO Policy 2105.0 and 2105-P-01-0 Revisions;
  - Revised Policy will feed into revisions of QA/R-2, QA/R-5 and other QA policy documents
- Regional QAPP LEAN Workgroup;
  - LEAN event focused on the efficient review of QAPPs across all Regions
  - Brought about by complaints of inconsistent QAPP reviews
  - Goal is to have more commonality in QAPP preparation and reviews across all Regions
- Other Agency-wide initiatives as they arise

While Jenia is on the detail, the Mega PE and Gravimetric Round Robin programs will be overseen by Nealson Watkins. QA questions regarding the CSN can still be directed to Jenia.

Xi Chen Joins Ambient Air Monitoring Group as NATTS Lead



With the retirement of Dave Shelow in September, the Ambient Air Monitoring Group has hired Xi Chen, who also goes by Doris, to lead the National Air Toxics Trends Program.

Doris received a B.E. in Civil and Environmental Engineering from the Harbin Institute of Technology, a M.S. in Atmospheric Environmental Science from the Hong Kong University of Science and Technology, and a Ph.D. in Environmental Science and Engineering from Clarkson University. She spent 3 years at Colorado State University working as a postdoc on characterizing and evaluating atmospheric ammonia/ammonium monitoring methods and applications.

She moved to RTP, NC and started working as an Oak Ridge Institute for Science and Education (ORISE) postdoc in the Office of Research and Developments National Risk Management Research Laboratory's Air and Energy Management Division (AEMD) in March of 2014. Since working with AEMD, she transitioned to Federal Postdoc. While at AEMD she primarily worked on atmospheric reactive nitrogen chemistry and deposition as well as improvement of methods for organic nitrogen speciation in PM.

With the move to the Ambient Air Monitoring Group Doris will be responsible for managing National Air Toxics Trends Monitoring Network, continue with ongoing methods development work, special field studies, and communications with the state, local, and tribal monitoring agencies. Welcome aboard Doris!

Low Concentration Data Quality Objective for PM2.5

We have been evaluating the PM2.5 performance evaluation data and we are confident that we can support the use of an absolute difference of ±1 ug/m3 for the acceptance criteria to be used in data certifications for sample pairs at low concentrations. Using this DQO, measured concentrations down to 2 ug/m3 may be used in data quality assessments. Due to the fact it would also need to be programmed into AQS, it is likely that it will be proposed in 2019 and implemented in AQS by 2020.

There are two important facets of this transition. The first is to establish that we can measure at low concentrations with acceptable accuracy and precision. To verify the lower concentration limit at which bias can be reliably measured, we summarized data for field blanks collected in the PEP over the past 10 years to characterize the programmatic detection limit for PM2.5. Figure 1 plots annual averages (± one standard deviation) of PM2.5 measurements in field blanks. (These concentrations assume a total volume commensurate with 24-hour sampling.) In August 2011 the PEP lab discovered than a subtle deterioration in the PEP's cassette cleaning compound had been contaminating our cassettes. This caused a gradual increase in annual average of measured field and travel blank mass over time. Upon resolving this issue, PEP field blank measurements dropped and have been stable, averaging 0.26 µg/m3. Two approaches can be used to characterize the method detection limit (MDL):

- Using the convention that an MDL corresponds to the field blank average plus 3 standard deviations (orange curve in Figure 1), the PEP's MDL since August 2011 is 0.77 µg/m3.
- Using the recently promulgated MDL Method Update Rule (MUR), the PEP's MDL (red curve in Figure 2) averages 0.83 µg/m3.

An investigation of the national PM2.5 field blanks reveals the average and apparent MDL is consistent with the PEP's or even a little lower.

We've seen that when bias is calculated exclusively using percent difference, average bias across the network becomes more negative as the concentrations get closer to 0 µg/m3, and the math forces the percent difference to disproportionately larger values even though the absolute difference is small. This is graphically represented in Figures 2 and 3, in which sample pairs collected from 2013 through 2017 are placed into one of ten bins by their PEP sample concentration (1 to <2 µg/m3, 2 to <3 µg/m3, …, 9 to <10 µg/m3, ≥10 µg/m3) and the distribution of percent difference values (Figure 2) and absolute difference values (Figure 3) in each bin is represented by a boxplot.

Ends of the boxes correspond to the 25th and 75th percentiles, and the red line within the box equals the median. The "whiskers" emanating from the boxes extend to the 10th and 90th percentiles. Blue circles represent averages (arithmetic means). Data include all PEP successfully paired w/ any SLT monitor (i.e., both primary and any collocated SLT monitor at a given site are compared against the PEP) between 2013-2017. The grey shaded region illustrates the bias DQO (±10%) for the percent difference plot and ±1 µg/m3 for the absolute difference plots. On the x-axis labelling, a parenthesis "("indicates the value is excluded from the bin, whereas a bracket "[" indicates the value is included. For example, the label [1 – 2) includes any value = 1 µg/m3 and excludes any = 2 µg/m3. *(Continued on page 13)*

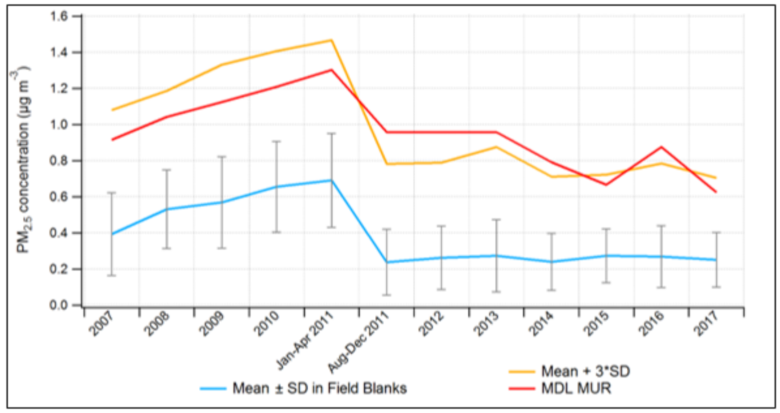


Figure 1. Annual mean air-equivalent $PM_{2.5}$ concentrations for field blanks (± 1 standard deviation), and lower programmatic detection limit calculations.

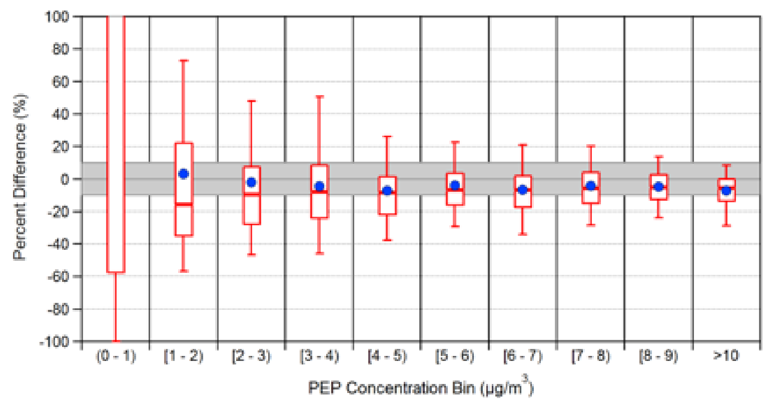


Figure 2. Percent Difference vs. PEP concentration for the years 2013-2017.

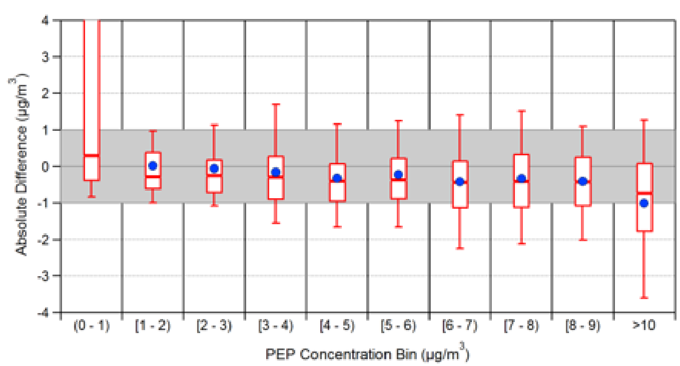


Figure 3. Absolute Difference (SLT – PEP) vs PEP concentration for the years 2013-2017.

Low Concentration Data Quality Objective for PM2.5 *(Continued from page 12)*

A closer look at the interquartile range (IQR) of the boxplots presented in Figures 2 and 3 give us a clue as to a logical transition point between percent difference and absolute difference as the metric for the DQO. For the percent differences (red curves in Figure 2), we pay special attention to how the IQRs compare to 20%, which is the range associated with the current bias DQO (±10% of 0% -- thus, the difference between the lower and upper values of this range is 10% - (-10%) = 20%; this value is portrayed by the black reference line in Figure 4). When the IQR exceeds 20%, this implies that some portion of the box will always fall outside of the DQO range, and thus, fewer than 50% of sample pairs will meet the DQO. Figure 4 shows that the size of the percent difference IQR decreases as the PEP sample concentration increases.

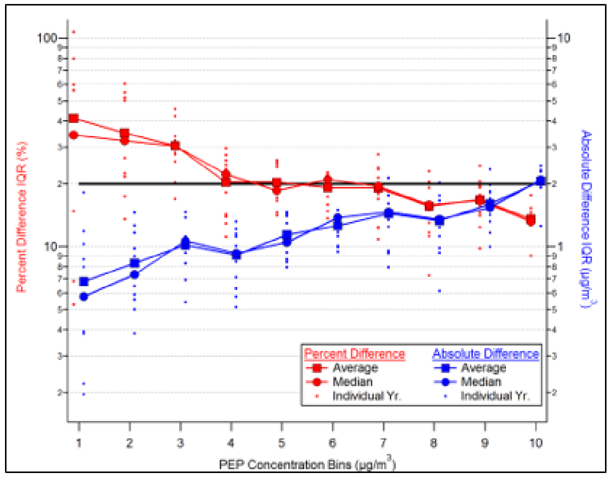


Figure 4.

Similarly, if a component of the revised DQO for bias states that the absolute difference in PM2.5 concentration between paired SLT and PEP samples must fall within ±1 µg/m3, the size of the range covered by the DQO is 1 – (-1) = 2 µg/m3. Thus, the right vertical axis in Figure 4 is positioned so that the horizontal reference line is at 2 µg/m3. The blue curves in Figure 4 show that the size of the absolute difference IQR increases with increasing concentration.

For PEP concentrations less than 5 µg/m3, both the mean and median percent difference IQRs are always above 20%. Thus, a cutoff concentration threshold of 5 µg/m3 may be appropriate in a revised bias DQO. In turn, the revised DQO could state that a PQAO use the percent difference calculation (±10%) when the PEP sampler's concentration is ≥ 5 µg/m3, and an absolute difference (±1 µg/m3) when the concentration is < 5 µg/m3.

Graphics and some of the prose for this article were supplied by Battelle Memorial Institute under contract to EPA. For further discussion send questions and comments to Dennis Crumpler; crumpler.dennis@epa.gov

QA BYE...A Fond Farwell From the Editor-in-Chief

It is with mixed emotions that I wrap up this Issue of the QA EYE as my last since I will be retiring from federal service at the end of December. Our first issue was September 2005 and it's been quite a journey, not just as editor of the Newsletter, but as a 30 year career in federal service.

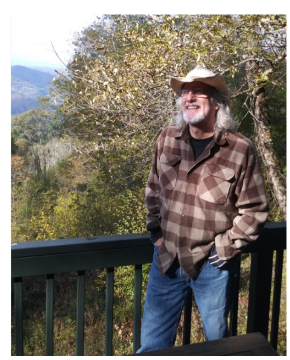
I started my career in 1981 right out of the University of Maine as a Forest Technician (pictured above), with the US Forest Service Research Station working for an "old school" Ukrainian soil scientist. He always went into the field with a suit and tie so you know who did all the work. He was a great mentor and I loved the work; spending many hours in the field in upstate Maine. I did all his field work, laboratory analysis, data reduction/ assessments. I learned a lot about quality assurance and quality control by doing and making mistakes. In about 1985, EPA started up Acid Deposition Research in New England and the Mid-Atlantic states and they needed soil scientists to characterize and sample soils. At the time, I was working for the Soil Conservation Service (SCS) and EPA and SCS cooperated on the work. That job eventually got me to EPA where I was asked to quality assure the data and laboratory analysis of the soil samples from the program. During that time, I also participated in a great program called the Environmental Monitoring and Assessment Program (EMAP) which kept my foot in the door with forestry work.

From there I went on the Great Lakes National Program Office (GLNPO) as QA Manager which solidified my career in QA. Much of my work in GLNPO had to do with water related projects.

In1995, after my parents made the move to retire to the coast of NC, I decided to look for work in RTP and found an opening in the Ambient Air Monitoring Program. For better or worse (you can decide) I took the job and the rest is history.

By the end of my career I had worked and performed QA is almost every media; from forest to soils to water and finally air. At every step along the way I have met so many inspirational people. I can't begin to thank you all without creating another QA EYE just for the folks that I've worked with, argued with, laughed with, golfed with, and hiked with. Ever notice at those award shows when someone wins they always seem to be forgetting someone they meant to thank. With that, I do not want to thank anyone **but everyone** that I've had the honor to meet and work with over my career.

You have helped guide the Ambient Air Monitoring QA Program to be one of the strongest programs in the country. Through your workgroup participation, questions and comments on our guidance you have kept our Air QA Program up-to-date and maintained our data quality so that we can make important environmental decisions with confidence.



Thanks again for you professionalism, expertise and friendship all these years. I'm back to the forests where I started and has always been my love. Happy Trails!
Mike Papp

EPA-OAQPS
C304-02
RTP, NC 27711

E-mail: papp.michael@epa.gov

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 Las Vegas, and ORD in Research Triangle Park in order to accomplish OAQPS'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
CSN/IMPROVE Lab PE and $PM_{2.5}$ Round Robin	Nealson	Watkins	OAQPS
Tribal Air Monitoring	Emilio	Braganza	ORIA-LV
CSN/IMPROVE Network QA Lead	Jenia	McBrian	OAQPS
OAQPS QA Manager (On Detail)	Jenia	McBrian	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	Greg	Noah	OAQPS
$PM_{2.5}$ PEP Lead	Dennis	Crumpler	OAQPS
Pb PEP Lead	Greg	Noah	OAQPS
Ambient Air Protocol Gas Verification Program	Solomon	Ricks	OAQPS

Websites

Website	URL	Description
EPA Quality Staff	EPA Quality System	Overall EPA QA policy and guidance
AMTIC	http://www3.epa.gov/ttn/amtic/	Ambient air monitoring and QA
AMTIC QA Page	http://www3.epa.gov/ttn/amtic/quality.html	Direct access to QA programs