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OFFICE OF AIR QUALITY PLANNING AND STANDARDS

DRAFT
Technical Note –Pb Monitoring Implementation Strategy
Quality Assurance Issues

Background: On November 12, 2008 EPA substantially strengthened the national ambient air quality standards (NAAQS) for lead (see 73 FR 66934). EPA revised the level of the primary (health-based) standard from 1.5 micrograms per cubic meter ($\mu g/m^3$) to 0.15 $\mu g/m^3$, measured as total suspended particles (TSP) and revised the secondary (welfare-based) standard to be identical in all respects to the primary standard. In conjunction with strengthening the lead (Pb) NAAQS, EPA identified the need for states to improve existing lead monitoring networks by requiring monitors to be placed in areas with sources that emit one ton per year (tpy) or more of lead and in urban areas with more than 500,000 people. Depending on specific circumstances, States may have the option of using monitoring for either lead in TSP (Pb-TSP) or lead in PM_{10} (Pb-PM_{10}) using approved Federal Reference Methods (FRM's) or Federal Equivalent Methods (FEM's) to demonstrate compliance. This document provides guidance in the form of questions and answers (Q&As) related to quality assurance activities for Pb-TSP and Pb-PM_{10}.

What Changes have been made to the Pb QA Requirements in 40 CFR Part 58 Appendix A?
The following are the highlights of the changes that occurred in Appendix A:

- **DQO Goals -**EPA utilized the DQO process to determine appropriate precision and bias measurement quality objectives. Measurement quality objectives for precision will be 20% for a 90% confidence limit coefficient of variation and an overall absolute bias upper bound goal of 15%. Goals will be assessed on 3 years of data at the PQAO level of aggregation.

- **Flow Rates-**No changes occurred to flow rate. Flow rate verification will be implemented monthly (PM_{10} Lo-Vol) or quarterly (TSP Hi-Vol) and flow rate performance evaluations will be implemented every six months.

- **Collocated Monitoring-**No changes occurred to the collocation requirements. Collocation will continue to be required at 15% of each method designation within a primary quality assurance organization at a 1-in-12 day sampling frequency. EPA added language encouraging monitoring organizations to site the first collocated sampler in each network at the highest concentration site. This will allow the site to operate over the longest time period and since it may be the site that affects the NAAQS and it is allowable to substitute collocated data for missing data from the primary monitor, this siting would be advantageous for improving data completeness at a very important site. Routine/collocated data pairs will be used when Pb concentrations of both samples are greater than or equal to 0.02 $\mu g/m^3$. Prior to 2008, this cutoff value was 0.15 $\mu g/m^3$.

- **Pb Strip Audits-**The requirement for the analysis of 6 Pb audit strips per quarter (3 strips at 2 concentration ranges) has not changed. However, the audit concentrations ranges have changed. The lower concentration range is 30-100% of the NAAQS and the higher concentration range is 200-300% of the NAAQS.

- **Pb-Performance Evaluation Program (Pb-PEP)-**The implementation of an audit similar to the $PM_{2.5}$ Performance Evaluation program (PEP) is a new requirement and it provides some assessment of overall bias but will be a mix of one or two Pb-PEP audits with additional collocated sampling. The program will require the same number of audit samples as required for $PM_{2.5}$ meaning:

    - PQAOs with $\leq$ 5 sites require 5 audits (1 PEP, 4 collocated)
    - PQAOs with > 5 sites require 8 audits (2 PEP, 6 collocated)

Pb Collocated Monitoring Questions

With Pb concentrations being so low, we may get poor collocated precision just due to comparisons of data at low concentrations. What do we do when the precision is over our measurement quality objectives?

A measurement quality objective (MQO) is a goal set by EPA guidance that represents a reasonable expectation of what one should be able to achieve for a specific data quality indicator in order to maintain acceptable levels of uncertainty. EPA reviewed precision data from various sources including routine Pb data from the SLAMS, National Air Toxics Trends Sites and Chemical Speciation Network Sites; this Pb data was collected by various sampling and analytical methods. Table 1 provides a comparison of this data. The data represent eight precision assessments due to use of either a different sampling method or a different analysis method. Based on the 0.02 $\mu g/m^3$ cutoff value and reviewing the historical data in Table 1 at or above the cutoff value, EPA set a measurement quality objective of 20% for a 90% confidence limit coefficient of variation, aggregated over a 3-year period at the primary quality assurance organization level. The data appears to indicate that monitoring organizations should be able to meet the precision MQO. However, as stated above, the MQO is a goal. As routine Pb collocated data are reported to AQS, EPA will review this information and determine the monitoring organizations success at achieving this goal. If it is found that the majority of the monitoring organizations are having difficulty and/or that the difficulty is related to precision samples at low concentrations, EPA may either need to develop more realistic MQOs (possibly a different precision statistic for lower concentration) or raise the cutoff value if the evaluation provides a justification for a change.

Table 1. Pb Collocated Precision 90% Coefficient of Variation Summary

Data Values	1	2	3	4	5	6	7	8
Pb > 0.002 ug/m3	19.4	13.0	16.9	9.4	36.6	37.0	23.5	15.5
Pb > 0.006 ug/m3	20.7	11.8	16.8	8.8	29.1	36.1	14.9	15.4
Pb > 0.01 ug/m3	11.2	11.7	16.5	8.1	24.1	18.3		15.4
Pb > 0.02 ug/m3	12.0	6.7	15.0	9.0		14.0		16.4

1. PM10 NATTS Pb High-volume sampling (~113 LPM) Analysis ICP-MS
2. TSP Pb High-volume sampling (~113 LPM) Analysis ICP-MS
3. TSP Pb High-volume sampling (~113 LPM) Analysis Atomic Absorption
4.TSP Pb High volume NY Data Analysis Graphite Furnace AA
5. TSP Pb Low-volume sampling Analysis XRF
6. PM2.5 CSN Very-low-volume sampling (~6 & 7 LPM) Analysis XRF
7. PM2.5 CSN Texas Low-volume sampling (16.7 LPM) Analysis XRF
8. TSP Pb High-volume sampling (~113 LPM) Analysis ICAP

If a PQAO has only one site, does it need a collocated sampler?

Yes. EPA evaluates data quality indicators by PQAO so it would need to accumulate collocated data in order to assess precision. Therefore, collocation is needed.

If a PQAO is sampling Pb-TSP and Pb-PM10 does it need a collocated monitor for both?

Yes. Similar to $PM_{2.5}$, even though the cut point for all FRM/FEMs were the same, the samplers had

different operational attributes that had an affect on precision and bias. Since there will be more potential for operational differences between the PM10 and TSP samplers, EPA needs to be able to quantify the precision of both types of methods at the PQAO level of aggregation

Pb Audit Strip Questions

Who is required to develop the Pb audit strips?
The monitoring organizations are required to ensure that the Pb analytical laboratories fulfill the quarterly Pb audit strip requirement. However, since EPA will need Pb strips for the PEP program, it is looking into the development of audit samples for both the Teflon and glass fiber filters. It will utilize similar techniques currently used for the metals proficiency test samples in the National Air Toxics Trends (NATTS) program. From a data quality standpoint, implementation of a national audit strip program would provide a mechanism to assess data quality and comparability across all labs performing Pb analysis.

Can audit "strips" be developed for XRF analysis?
Currently the technique to create filter strips on glass fiber TSP filters is to pipette a "known" concentration of Pb on a filter strip. Since the entire strip is digested in the preparation procedure, this technique has been successful. Due to the fact that only a portion of the 46mm Teflon filter is scanned during XRF analysis, the pipette procedure will not be appropriate for the creation of lab audit filters. EPA will be testing a process by which Pb is aerosolized on to either the Teflon (PM_{10} Lo-Vol) or the TSP (glass fiber) filters for use with the XRF analysis. This technique is currently employed in the National Air Toxics Trends (NATTS) Program. NATTS PE samples consist of 46.2-mm quartz fiber filters that are produced by the nebulization and deposition of a Pb-salt solution onto each filter.

What would it take for EPA to develop the audit strips for the Pb Program?
Two things are initially required; interest and funds. If there was enough interest and monitoring organizations are willing to redirect STAG funds for the development of these filters, EPA is willing to implement the program. Similar to the PEP and NPAP Program, each year monitoring organizations would need to determine whether it would like EPA to implement the program.

What would be the costs for an EPA implemented audit strip program?
EPA is currently looking into costs for both Teflon and glass fiber filters. Since the concentration levels have changed as well as the need to provide audits for two media, EPA does not currently have a reliable estimate. Costs for implementation will include:

- preparation costs
- referee lab analysis
- 1st year capital costs
- consumables (e.g., standards, filters, shipping supplies)
- shipping costs

EPA will have reasonably accurate estimates of the costs of the audit strips by the end of April, 2009. Since costs can be affected by the size of an order, EPA needs to ascertain the number of analytical labs that will be analyzing Pb samples as soon as possible.

If EPA implemented the Pb audit strip program would it run it as a single- blind performance evaluation meaning the labs would know it was an audit sample but its concentration would remain unknown?
No. EPA anticipates distributing the audit strips as QC samples where it would provide the labs with the audit strip's theoretical "actual" concentration. Monitoring organizations would then submit both actual and indicated concentrations to AQS. However, if monitoring organizations would rather the audit be

single-blind, EPA would be willing to work out the implementation details of this process.

If a Pb analytical lab is analyzing both Teflon (PM10) and glass fiber filters (TSP), does it need Pb strip audits for both types of filters each quarter?
Yes. In addition, if a lab is implementing multiple methods (i.e., ICP-MS and XRF) it needs to analyze a set of audit strips for each method. However, if the methods are non-destructive, it is possible that one set of strips could be used for more than one method.

Does an analytical laboratory serving multiple monitoring organizations need to have a independent set of audit strips analyzed for each monitoring organization it services?
No. Pb analytical labs servicing multiple monitoring organizations will be required to perform one set (three strips, at two concentration levels) of Pb strips per analysis method each quarter. The laboratory would provide each monitoring organization with the same filter strip concentration information each quarter, Monitoring organizations will be responsible for reporting the Pb strip data to AQS. So, if the analytical laboratory was servicing 5 monitoring organizations, those 5 organizations would be submitting the same filter strip concentration data for its PQAO.

Pb-Performance Evaluation Program (PEP) Questions

Who is responsible for the implementation of the Pb-PEP?
Similar to the $PM_{2.5}$ PEP and NPAP programs, monitoring organizations are responsible for the implementation of this Pb-PEP. In order to self-implement the Pb-PEP, monitoring organizations would need to meet adequacy and independence requirements very similar to the $PM_{2.5}$ PEP. The $PM_{2.5}$ PEP adequacy and independence criteria can be found at the following site: http://www.epa.gov/ttn/amtic/pmpep.html. EPA will modify these requirements as necessary for the Pb-PEP by July, 2009 and include them in the Pb-PEP Implementation Plan

Will EPA develop a federally implemented Pb PEP?
Yes. EPA will provide for federal implementation of the Pb-PEP using the current $PM_{2.5}$ PEP auditors. An implementation plan, quality assurance project plan and standard operating procedures for the federal program will be developed by July, 2009.

How do monitoring organizations identify whether or not they will participate in the federally implemented Pb-PEP?
Similar to the $PM_{2.5}$ PEP, implementation decisions are made by the monitoring organizations on an annual basis. EPA will draft a memo to the monitoring organizations to determine whether they plan to self implement the Pb-PEP or utilize the federally implemented program. The memo will be distributed in July, 2009 and take the form of previous $PM_{2.5}$ PEP decision memos. An example of one of these memos can be found at: http://www.epa.gov/ttn/amtic/npepqa.html. The EPA Regions will collect this information from the monitoring organizations and provide the information to OAQPS in time to redirect the appropriate STAG funds for the federally implemented program.

There are two parts to the PEP; a Pb-PEP sample and collocated samples. How does this work?
As explained earlier in the Q&A the Pb-PEP is a mix of two samples

1. A PEP sample where an independent field auditor sets up a second audit sampler, collects a 24-hour sample and sends the sample to an independent lab for analysis.
2. A collocated sample where each quarter the monitoring organization field operator will take one additional collocated sample and send this sample to the independent laboratory (same lab as PEP sample) for analysis.

Since the collocated sampling frequency is 1-in-12 days and the routine sampling frequency is 1-in-6

days, an extra collocated sample can be acquired without an affect on routine operations.

Will the Pb-PEP program use one sampling and analysis technique?
Yes. The Pb-PEP program will sample Pb-PEP with a portable TSP Hi-Vol and analyze all samples by ICP-MS. Similar to the $PM_{2.5}$ PEP which uses the BGI portable audit sampler almost exclusively (in some rare circumstances others are used) and utilizes one national PEP lab, the Pb-PEP will utilize one sampler and one analysis technique which will improve data comparability. This process does not suggest that the Pb-PEP sampler or lab technique is superior to those used by the monitoring organization; it simply allows for a better comparison of differences, should they exist. EPA is presently testing out a portable TSP sampler for use in the Pb-PEP program.

Why do monitoring organizations need to sample 4 additional collocated samples for the Pb-PEP program? Since only a portion of the routine collocated sample is used during normal analysis, why not send a strip of the routine collocated sample to the Pb-PEP Lab?
There are a number of reasons for the additional sample. It is important to reduce any potential issues that can affect sample integrity. Handling and preparation of the routine collocated samples for routine analysis prior to shipping a portion of the collocated filter to the Pb-PEP lab could provide an avenue for contamination. Also, there will be sampling on 46.2mm Teflon filters that, due to complete filter digestion, will not lend itself to sending a portion to the Pb-PEP Lab. However, from a QA standpoint there are some advantages to either having the Pb-Lab send a portion of the PEP collocated sample to the routine lab for analysis or for the routine lab to send a portion of a routine collocated sample to the Pb-PEP lab for analysis. This intercomparison is not a requirement but is something that could be explored if monitoring organization were interested.

AQS Related QA Questions

What PARS fields will the QA data be reported?
The precision transaction fields will be used for reporting:

- Flow rate verifications (optional for submission but suggested)
- Pb-PEP (PEP sample and collocated)
- Collocated precision

The accuracy transaction field will be used for reporting:

- Lead strip audits
- Semi-annual flow rate audits

Will the AMP255 handle the new Pb requirements?
Yes. The AMP255 is being revised and is anticipated to be completed by July, 2009. In addition, the Data Analysis Statistical Calculator (DASC) will be revised to conform to the new Pb data assessment statistics. This software, found on AMTIC http://www.epa.gov/ttn/amtic/parslist.html will be revised by July, 2009

Miscellaneous QA Questions

Will EPA develop a Model Pb QAPP?
EPA does not plan to develop a model QAPP for Pb**.** For new monitoring programs like $PM_{2.5}$, PM Speciation or the National Air Toxics Trends Sites (NATTS), EPA developed generic or model QAPPs to assist monitoring organization in its QAPP development. However, Pb monitoring has been an ongoing monitoring program that should already be supported by QAPPs. Monitoring organizations may need to

revise its current QAPP to address the new requirements. EPA Regions may be able to assist those monitoring organizations that have never developed a Pb QAPP by providing copies of approved QAPPs to them as examples. It is EPA policy that QAPPs be developed and approved before the start of data collection.

There will be cases where a number of states may use one analytical laboratory. Is there a possibility that multiple states could consolidate to one PQAO for purposes of Pb monitoring?
Yes. One of the common factors of the PQAO is "*support by a common management, laboratory or headquarters*". However there are also other important factors in the PQAO definition; of most importance is "*use of a common QAPP or standard operating procedure*". If monitoring organizations can commit to adhere to the same QAPP and SOPs and create the necessary paper work for approval, consolidation to one PQAO is possible. The advantage from a QA standpoint in PQAO consolidation for Pb monitoring would be the reduction of the Pb-PEP program which has been developed at a reduced cost compared to the $PM_{2.5}$ PEP. Since collocation is based on a percentage of sites in a PQAO, there is not a substantial cost savings in consolidation. It must be realized that once consolidated, the precision and bias results apply to all monitoring organizations in the consolidated PQAO. The consolidation may complicate the analysis of results and the actions needed for corrective action if DQO goals are not met.

For Further Information

This document and other documents intended to assist monitoring agencies implement the Pb monitoring requirements can be found at - http://www.epa.gov/ttn/amtic/pb-monitoring.html

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