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OFFICE OF AIR QUALITY PLANNING AND STANDARDS

Technical Note- Guidance on Identifying Annual PE Audit Levels Using Method Detection Limits and the 99th Percentile

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SUMMARY

Monitoring organizations can use Federal methods detection limits MDLs listed in AQS or alternate methods detection limits that monitoring organization have developed and reported to AQS to identify the low audit level they must select for the annual performance evaluation. The selection of the audit level can be performed at the site level or the network level. In addition, the memo provides information on the statistics that can be used to identify the appropriate concentration for 1-point QC checks and the second annual PE audit level (99th percentile).

BACKGROUND

The recent March 27 Federal Register provides the final rule for the quality assurance changes in both 40 CFR Part 58 Appendix A and Appendix B. A part of the revised rule was the selection of the audit levels for the Annual Performance Evaluation (PE). The revision can be found at section 3.1.2.1 and states:

One point must be within two to three times the method detection limit of the instruments within the PQAOs network, the second point will be less than or equal to the 99th percentile of the data at the site or the network of sites in the PQAQO or the next highest audit concentration level. The third point can be around the primary NAAQS or the highest 3-year concentration at the site or the network of sites in the PQAQO.

Based on this language, EPA has received questions on the method detection limit (MDL) and where this information can be found.

PROCEDURE

Two types of MDLs may be used to fulfill the requirements:

- **The Federal MDL**-For any FRM/FEM method the Federal MDL is reported to AQS when the method is approved. Attachment A contains all the Federal MDLs for the criteria pollutants.
- **Alternative MDL**- This is an MDL created by the monitoring organization if they have performed MDLs on their monitors. This alternate MDL must be reported to AQS if it is used. EPA has advocated for monitoring organization to perform MDLs¹ on their monitors and some

¹ See 40 CFR Part 136, App. B Guidelines Establishing Test Procedures for the Analysis of Pollutants

are reported to AQS. This will ensure that the instruments are challenged in accordance with how they are designed, and at the lower concentrations that they may regularly measure in the environment.

In either case, the monitoring organization will select the MDL (Federal or alternate) and multiply that value by 2 or 3. This “derived value” will be used to select the level (1-10) for the low concentration audit. Although it is suggested to choose a concentration in the audit level close to the derived value, the monitoring organization can choose any concentration within the audit level.

As an example (below), nitrogen dioxide method code 212 has a Federal MDL 0.04 ppb. Three times the MDL creates a derived value of 0.12 ppb. Therefore, one would have to perform a PE at level 1 but could choose a value between 0.3 to 2.9 ppb (level 1 concentration range of nitrogen dioxide).

NO2- FRM/FEM Method Codes				
Parameter	Method Code	Fed MDL (ppb)	Fed MDL * 3 (ppb)	Audit Level
42602	212	0.04	0.12	1

Attachment A provides the Federal MDL, the 3x concentration of the Federal MDL and the audit level that the 3x concentration would fall into for all FRM/FEM method codes currently in AQS. In addition, if the method code is not in Attachment A, MDLs can be found on the AQS Website at: <https://www.epa.gov/aqs/aqs-code-list>

Data Set to Establish Audit Levels.

There is some flexibility on how the audit levels are selected within a PQAQO. The following decisions can be determined by the PQAQO.

- Selecting low audit point on a monitor-by-monitor basis or across the network on monitors in the PQAQO. Although we feel it would be best to audit more sensitive instruments (trace gas NCore monitors) at lower levels, PQAQOs can select the low audit level based on all primary monitors within the network. For example, if there were some monitors that had derived values in audit level 1 and some monitors that had derived values in audit level 2, although not recommended, audit level 2 could be used for all primary monitors in the PQAQO. That said, it would be inappropriate to check all monitors at the same audit level if the monitors themselves have dramatically different detection limits, or serve very different monitoring objectives. (For example, a trace quality level monitor at a rural NCore site should probably be challenged at different “lowest level” concentrations than a sulfur dioxide monitor in the same PQAQO located downwind of a large SO₂ source which may show nonattainment with the NAAQS.)
- Selecting audit points 2 and 3 on a site-by-site basis or across the network on sites in the PQAQO; similar to the statement above.
- Since the rule discusses that the third audit point can use 3 years of data, 3 years of data can also be used to establish point two (*99th percentile of the data at the site or the network of sites in the PQAQO*) while point one is dictated by MDL. It is not a requirement to use three years of data so

In addition, MDL instructions are also included in the NCore Technical Assistance Document at <https://www3.epa.gov/ttn/amtic/ncoreguidance.html> and described in Issue 10 (page5) of the QA EYE <https://www3.epa.gov/ttn/amtic/qanews.html>

PQAOs may want to establish audit levels based on the previous year. However the data set should be large enough to justify the selection of audits points and be consistent in its implementation from year to year. EPA would expect this audit selection procedure to be documented in standard operating procedures (SOPs) and the PQAOs QAPP.

- Although there are number of different methods used to determine the NAAQS (i.e., rolling 8-hour averages etc.) hourly concentration data can be used to establish audit points 2 and 3 for all gaseous pollutants.

Data Evaluations Using the Annual PE Data

Some concerns expressed by PQAOs on going to lower PE audit levels relate to the possibility of failing the Annual PE which have an acceptance criteria listed in the validation templates as a percent difference (PD) of $\pm 15\%$. Audit point 1 and 2 also have a 1.5 ppb difference acceptance criteria for SO₂, NO₂ and O₃ and a 0.03 ppm difference for CO. As described in the rule, more than three PE points are encouraged which could alleviate concerns about exceeding the acceptance criteria at low level points, and may help better understand how to best troubleshoot any failed individual point. In addition, although the annual PE is a requirement to implement, it is in the operational section of the validation template and although an exceedance may indicate a monitor problem, an exceedance does not automatically invalidate the data.

Routine Concentration Statistics for 1-Point QC and 99th Percentile for Second Audit Level Point Statistics

The Appendix A requirements for the 1-Point QC check (section 3.1.1) states:

The QC check gas concentration selected within the prescribed range should be related to the monitoring objectives for the monitor. If monitoring at an NCore site or for trace level monitoring, the QC check concentration should be selected to represent the mean or median concentrations at the site.

In addition, as described above, the second Annual PE audit point *will be less than or equal to the 99th percentile of the data at the site or the network of sites in the PQAO or the next highest audit concentration level.*

Two Excel files can be found on AMTIC at: <https://www3.epa.gov/ttn/amtic/cpreldoc.html>

The files provide routine hourly concentration statistics for 2014 at the PQAO level and PQAOA/site level to help PQAOs identify the appropriate concentration for their QC checks. In the future, we hope to develop an automated report (AMP-like) that PQAOs can run at any time.

Attachment A

Federal Method Detection Limits Evaluation for Low Audit Level Selection

The following lists contain the Federal MDLs for each criteria pollutant for designated FRM/FEMs only. The forth column in each table is the derived concentration which is the federal MDL multiplied by 3. The forth column is the audit level the derived concentration would fall within. Not all method codes in these lists are federal reference or equivalent methods. These are left in the table since they are in AQS but are highlighted in red to distinguish them.

NOTE- If you are using a designated FRM/FEM and do not see it on the list please contact AQS.

Ozone-FRM/FEM Method Codes				
Parameter	Method Code	Fed MDL (ppb)	Fed MDL * 3 (ppb)	Audit Level
44201	199	0.6	1.8	1
44201	190	3	9	2
44201	003	5	15	2
44201	004	5	15	2
44201	007	5	15	2
44201	014	5	15	2
44201	015	5	15	2
44201	016	5	15	2
44201	017	5	15	2
44201	019	5	15	2
44201	020	5	15	2
44201	023	5	15	2
44201	036	5	15	2
44201	047	5	15	2
44201	053	5	15	2
44201	055	5	15	2
44201	056	5	15	2
44201	078	5	15	2
44201	087	5	15	2
44201	091	5	15	2
44201	103	5	15	2
44201	105	5	15	2
44201	112	5	15	2
44201	134	5	15	2
44201	160	5	15	2
44201	165	5	15	2
44201	187	5	15	2

SO ₂ -FRM/FEM Method Codes				
Parameter	Method Code	Fed MDL (ppb)	Fed MDL * 3 (ppb)	Audit Level
42401	600	0.2	0.6	1
42401	560	0.2	0.6	1
42401	592	0.2	0.6	1
42401	100	0.4	1.2	1
42401	005	2	6	3
42401	006	2	6	3
42401	009	2	6	3
42401	010	2	6	3
42401	013	2	6	3
42401	024	2	6	3
42401	029	2	6	3
42401	030	2	6	3
42401	032	2	6	3
42401	039	2	6	3
42401	046	2	6	3
42401	049	2	6	3
42401	060	2	6	3
42401	061	2	6	3
42401	075	2	6	3
42401	077	2	6	3
42401	092	2	6	3
42401	097	2	6	3
42401	101	2	6	3
42401	188	2	6	3
42401	513	2	6	3
42401	011	10	30	5

Blue indicates trace level methods

CO-FRM/FEM Method Codes				
Parameter	Method Code	Fed MDL (ppm)	Fed MDL * 3 (ppm)	Audit Level
42101	055	0.02	0.06	2
42101	554	0.02	0.06	2
42101	588	0.02	0.06	2
42101	593	0.02	0.06	2
42101	008	0.5	1.5	4
42101	012	0.5	1.5	4
42101	018	0.5	1.5	4
42101	021	0.5	1.5	4
42101	033	0.5	1.5	4
42101	041	0.5	1.5	4
42101	048	0.5	1.5	4
42101	050	0.5	1.5	4
42101	051	0.5	1.5	4
42101	054	0.5	1.5	4
42101	066	0.5	1.5	4
42101	067	0.5	1.5	4
42101	088	0.5	1.5	4
42101	093	0.5	1.5	4
42101	106	0.5	1.5	4
42101	158	0.5	1.5	4
42101	174	0.5	1.5	4
Blue indicates trace level methods				

NO2- FRM/FEM Method Codes				
Parameter	Method Code	Fed MDL (ppb)	Fed MDL * 3 (ppb)	Audit Level
42602	212	0.04	0.12	1
42602	574	0.05	0.15	1
42602	590	0.05	0.15	1
42602	591	0.05	0.15	1
42602	599	0.05	0.15	1
42602	200	0.1	0.3	1
42602	074	1	3	2
42602	102	1	3	2
42602	084	2.7	8.1	4
42602	099	2.7	8.1	4
42602	021	5	15	4
42602	022	5	15	4
42602	025	5	15	4
42602	031	5	15	4
42602	034	5	15	4
42602	035	5	15	4
42602	037	5	15	4
42602	038	5	15	4
42602	040	5	15	4
42602	042	5	15	4
42602	082	5	15	4
42602	083	5	15	4
42602	089	5	15	4
42602	090	5	15	4
42602	111	5	15	4
42602	157	5	15	4
42602	186	5	15	4
Blue indicates trace level methods				