August 10, 2012
Addendum to the 2008 Lead NAAQS Implementation
Questions and Answers Signed on July 11, 2011, by Scott Mathias

(The following is a continuation of the Emissions Inventory Section, Question 10)

EMISSIONS INVENTORY

10a Q. What is the threshold for point sources for the 2011 base year inventory that will be used in the attainment demonstration SIP? Is it 0.5 tons per year (tpy)? Is this the same as in the Air Emissions Reporting Rule, 40 CFR Part 51 (AERR)? If it is different, is it mandatory for states to submit a more stringent threshold?

A: The threshold for point sources for the Pb SIP inventories is 0.5 tpy. This is in the Pb implementation rule and is not the same as the threshold in the AERR. That does not pose a particular problem because the AERR is a separate reporting requirement from the SIP inventory requirements in the CAA and implementation rules. Given that the 0.5 tpy threshold is in the Pb NAAQS implementation rule, it is mandatory for the SIP inventories.

10b Q. Are actual emissions required for the 2011 base year inventory for use in the Lead Attainment Demonstration SIPs?

A: Yes, for the base-year inventory, actual emissions are what should be provided. The inventory year is not necessarily 2011 (see Question 6 in the Pb Q&A memo, dated July 8, 2011). The EPA recommends using either 2010 or 2011 as the base year for the contingency measure calculations, but does provide flexibility for using other inventory years if states can show another year is more appropriate.

10c Q. Should 2011 base year point, area, nonroad, and on road mobile source emissions be submitted with this SIP?

A: Yes, the CAA requires for Pb SIPs that all sources of Pb emissions in the nonattainment area must be submitted with the base-year inventory. This is separate from the modeling requirements and the issue of which sources must be explicitly included in the modeling needed for Pb nonattainment SIPs.

10d Q. What is required for the attainment year inventory? Projected actual with controls or maximum allowable emissions? Are projection year point, area, nonroad, and on road mobile emissions required for the attainment year inventory?

A: Maximum allowable emissions should be included for the attainment year inventory, which includes only those sources within the modeling domain. The modeling guidance in *Guideline on Air Quality Models* (U.S. EPA, 2005) provides advice on which sources need to be included *explicitly* (i.e., as point sources) in the modeling and provides for including the impacts of smaller and diffuse sources through the use of background concentrations and other less specific techniques given the relatively lower significance of such sources to the SIP demonstration.

10e Q. Please provide an example of calculating Reasonable Further Progress (RFP) emissions reductions using the formula in 6 Q.

A: Annual average RFP = [Attainment level emissions (2015 or 2016, depending on the designations effective date) - Base year emissions (most likely 2010 or 2011)] ÷ 5 (or the number of years between the attainment year and the base year).
Assume that

Attainment level emissions = 0.4 tpy
Base year emissions = 1.0 tpy
Annual average RFP = [0.4 tpy - 1.0 tpy] ÷ 5 = - 0.60 tpy ÷ 5 = - 0.12 tpy.
The annual average RFP is - 0.12 tons per year.

(The following is a continuation of the modeling section, Questions 11 - 17)

MODELING

18 Q. How should model concentrations and background concentrations be properly accounted for in attainment demonstrations?

A: In order to properly account for cumulative effects, background concentrations should be added to modeled concentrations to calculate a design value. Background concentrations should reflect contributions from natural sources, nearby sources other than the one(s) being explicitly modeled, and unidentified sources. Beginning with version 11103, AERMOD can now include background concentrations in the model simulation. AERMOD can accept a variety of temporally varying background concentrations, from hourly background to an annual concentration. See Section 2.4 of the AERMOD User's Guide addendum (U.S. EPA, 2011a) for more details.

General guidance on background concentrations can be found in Section 8.2 of the *Guideline on Air Quality Models* (U.S. EPA, 2005). For isolated single sources, the *Guideline* discusses two options of determining background concentrations. The first, discussed in Section 8.2.2.b is the use of air quality data collected in the vicinity of the source to determine the background concentrations. Background concentrations are determined by excluding observations when the source being modeled is impacting the monitor. The guideline offers guidance that monitors inside a 90-degree sector downwind of the source may be used to determine the area of impact. Meteorological data used in the source contribution analysis should be representative of the monitored area. Because observed values often represent a 24-hour sample, it may be difficult to separate hours within a sample when modeled sources are impacting the monitor. In these cases, it may be necessary to exclude many 24-hour values entirely, such that the remaining observations are no longer robustly representative. This may necessitate the use of the second option, as discussed in Section 8.2.2.c. This option is to use a "regional site" when there are no monitors located in the vicinity of the source. As defined in the *Guideline*, a regional site is one that is located away from the area of interest but is impacted by similar natural and man-made sources.

For multi-source areas, section 8.2.3 of the *Guideline* offers guidance about two components of background, contributions of nearby sources and contributions of other sources. Nearby sources are those sources that are expected to cause a significant concentration gradient in the vicinity of the source(s) being modeled. These nearby sources should be explicitly modeled.

19 Q. How should fugitives be modeled in attainment demonstrations?

A: Fugitives can be characterized as volume sources or area type sources (rectangular, circular, or polygon). If the exact locations of fugitive emissions are unknown or are widespread over a particular area, such that their emissions can be combined into one representative source, the fugitives may be modeled as some type of area source. However, if the locations are known, it may be better to model them as volume sources, unless the placement of receptors would mean that receptors would be within the volume source exclusion zone (2.15 x Sigma Y + 1 meter). In those cases, smaller area sources may be used. Also, volume sources allow for meander under light wind conditions, whereas area sources do not. For details regarding source input parameters for volume or area type sources in AERMOD, see 3.3 of the AERMOD User's Guide (U.S. EPA, 2004a; U.S. EPA. 2011a).

If the reviewing authority has adequate technical data (i.e., soil samples) and additional information to support the inclusion of re-entrainment of lead from the soil, this can be simulated as an area of volume source type in the model.

20 Q. What is the level of capture efficiency that should be used in modeling of total enclosure emissions?

A: For modeling of secondary lead smelters, capture efficiency is needed for modeling of total enclosure emissions. At this time, 100% capture efficiency is not considered technically achievable in common practice. At this time, states that impose total enclosure controls in a manner consistent with the National Emission Standard for Hazardous Air Pollutants from Secondary Lead Smelting ,77 FR 555 (which includes requirements for enclosures and housekeeping), can assume a capture efficiency for total enclosures of no greater than 95%. A greater level of capture efficiency (up to 99%) may be demonstrated on a case-by-case basis taking into account site-specific factors and additional design or housekeeping provisions that go beyond what is assumed in the NESHAP. States should consult with their respective Regions for consideration of case-specific demonstrations claiming greater than 95% capture efficiency.

21 Q. What is the best way to model ambient air?

A: Ambient air is considered to be the air in those areas where the public generally has access. Non-ambient air generally includes property owned or controlled by the source to which access by the public is prohibited by a fence or other effective physical barrier.

Another issue with ambient air in modeling is the situation of multiple facilities in an area. As noted above, facility property is not ambient relative to its own emissions but is ambient relative to other sources' emissions. For example, there may be a situation with two sources, Source A and Source B. In this situation, the impacts of Source A on the air over Source A are not considered to be impacts on ambient air, but the impacts of Source A on the air over Source B are considered to be impacts on ambient air, and vice versa. This situation is discussed in the March 1985 memorandum "Applicability Determinations for Columbian Chemical Company[1]."

[1] http://www.epa.gov/region07/air/nsr/nsrmemos/ccc.pdf

In modeling these situations, there are two ways to handle ambient air over multiple facilities.

1. Divide the model runs into several modeling domains: A) a receptor network that is outside the property lines for all facilities for which all sources are modeled, and B) separate receptor networks and model runs over each facility for which that facility's emissions are not included. For this case, design values can be calculated for each receptor network using LEADPOST. LEADPOST results from all receptor networks can be concatenated together.

2. Create a receptor network that covers all ambient air and facilities. Include all emissions in the model runs and generate monthly POSTFILES by source group, with each source group representing a separate facility. After the model runs are finished, for receptors over a specific facility zero out the concentrations from that facility leaving the other facilities' contributions as they are. The new concentration files can be input into LEADPOST to calculate design values for cumulative concentrations.

22 Q. How should ASOS 1-minute data[2] be used in modeling?

A: In AERMOD, concentrations are not calculated for variable wind (i.e., missing wind direction) and calm conditions, resulting in zero concentrations for those hours. These light wind conditions may be the controlling meteorological circumstances in some cases because of the limited dilution that occurs under low wind speeds which can lead to higher concentrations. The exclusion of a greater number of instances of near-calm conditions from the modeled concentration distribution may therefore lead to underestimation of monthly average concentrations.

To address the issues of calm and variable winds associated with the use of NWS meteorological data, the EPA has developed a preprocessor to AERMET, called AERMINUTE (U.S. EPA, 2011b) that can read 2-minute ASOS winds and calculate an hourly average. Beginning with year 2000 data, NCDC has made the 2-minute average wind data, reported every minute from the ASOS network freely available. The AERMINUTE program reads these 1-minute winds and calculates an hourly average wind. In AERMET, these hourly averaged winds replace the standard observation time winds read from the archive of meteorological data. This results in a lower number of calm hours and missing wind direction hours and an increase in the number of hours used in averaging concentrations. For more details regarding the use of National Weather Service (NWS) data in regulatory applications see Section 8.3.2 of Appendix W (U.S. EPA, 2005) and for more information about the processing of NWS data in AERMET and AERMINUTE, see the AERMET (U.S. EPA, 2004b; U. S. EPA, 2011c) and AERMINUTE User's guides (U.S. EPA, 2011b).

Since the release of AERMINUTE in 2011, some permitting agencies have expressed concern that the inclusion of AERMINUTE output in AERMOD will lead to an increase in the conservatism of AERMOD output. This perceived increase in conservatism is due to an increase in hours with lower wind speeds input into AERMOD. The purpose of AERMINUTE is not to lead to more conservative concentration estimates, but to increase the data quality and representativeness of the meteorological inputs into AERMOD. Concentrations are not calculated for hours with reported calm winds or variable winds. These calm or variable winds are due to the METAR reporting code used to report ASOS

[2] The purpose of this section is to address the use of 1-minute data when using year 2000 and later ASOS airport data. This section does not address the use of pre-ASOS vs. post-ASOS data. The reviewing authority should use the meteorological data they consider most representative of the particular application.

observations. In the METAR coding used to report surface observations beginning July 1996, a calm wind is defined as a wind speed less than 3 knots and is assigned a value of 0 knots. The METAR code also introduced the variable wind observation that may include wind speeds up to 6 knots, but the wind direction is reported as missing, if the wind direction varies more than 60 degrees during the 2-minute averaging period for the observation. These are often hours of interest because these are light wind conditions and could lead to higher concentrations. With the use of AERMINUTE, hourly averages can be calculated for those hours with reported calm or missing winds, because the 2-minute average winds in the one-minute data files have not been subjected to the METAR coding. In effect, AERMINUTE is obtaining data that was unavailable because of METAR coding, making the meteorological data more representative of the area.

23 Q. What is the proper receptor spacing in modeling?

A: The model receptor grid is unique to the particular situation and depends on the size of the modeling domain, the number of modeled sources, and the complexity of the terrain. Emphasis should be placed on resolution and location, not the total number of receptors (Section 7.2.2 (U.S. EPA, 2005)). Receptors should be placed in areas that are considered ambient air (see ambient air discussion above) with respect to the source(s) being modeled and placed out to a distance such that all areas of violation can be detected from the model output. Receptor placement should be of sufficient density to provide resolution needed to detect significant gradients in the concentrations with receptors placed closer together near the source(s) to detect local gradients and placed farther apart away from the source(s). In addition, the user should place receptors at key locations such as around facility fence lines (which define the ambient air boundary for a particular source) or monitor locations (for comparison to monitored concentrations for model evaluation purposes). The receptor network should cover the modeling domain. If modeling indicates elevated levels of Pb (near the standard) near the edge of the receptor grid, consideration should be given to expanding the grid or conducting an additional modeling run centered on the area of concern. As noted above, terrain complexity should also be considered when setting up the receptor grid. If complex terrain is included in the model calculations, AERMOD requires that receptor elevations be included in the model inputs. In those cases, the AERMAP terrain processor (U.S. EPA, 2004c; U.S. EPA, 2011d) should be used to generate the receptor elevations and hill heights. The latest version of AERMAP (09040) can process either Digitized Elevation Model (DEM) or National Elevation Data (NED) data files. The AERMOD Implementation Guide recommends the use of NED data since it is more up to date than DEM data, which is no longer updated (Section 4.3 of the AERMOD Implementation Guide (U.S. EPA, 2009).

24 Q. How should haul roads for lead facilities be modeled?

A: Useful information regarding the modeling of haul roads in and around lead facilities can be found in the Final Report of the Haul Roads Workgroup, available on EPA's SCRAM website at Haul Road Workgroup Final Report Submission to EPA-OAQPS, March 12, 2012.

The report details the efforts of the Haul Roads Workgroup, which was a collaborative effort between the EPA and state/local modelers. The workgroup has recommended a methodology for modeling haul roads (pages 4-6 of the report). These recommendations are:

- Model all haul roads as adjacent volume sources, unless ambient air receptors are in the volume source exclusion zone (2.15 x Sigma Y + 1 meter)
- Top of plume height set to 1.7 x the vehicle height
- Release height of volume source set to half the plume height

- Width of the plume should be vehicle width + 6 m for single-lane roads or road width + 6 m for 2-lane roads
- The initial Sigma Z should be set to plume height/2.15
- Initial Sigma Y should be set to plume width/2.15
- Emission rate in grams/second

For cases where volume sources cannot be used due to ambient air receptors being located in the volume source exclusion zone, haul roads can be modeled as area sources with:

- Length set to length of link
- Top of plume, release height, plume width, and Sigma Z set to values listed above for volume sources.
- Emission rate in grams/second/m^2

For more details, users are strongly encouraged to review the Haul Road Workgroup Final Report Submission to EPA-OAQPS, March 12, 2012.

References

U.S. EPA, 2004a: User's Guide for the AMS/EPA Regulatory Model – AERMOD. EPA-454/B-03-001. U.S. Environmental Protection Agency, Research Triangle Park, NC 27711.

U.S. EPA, 2004b: User's Guide for the AERMOD Meteorological Preprocessor (AERMET). EPA-454/B-03-002. U.S. Environmental Protection Agency, Research Triangle Park, NC 27711.

U.S. EPA, 2004c: User's Guide for the AERMOD Terrain Preprocessor (AERMAP). EPA-454/B-03-003. U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711.

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