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Recent EPA Modeling Guidance and Model Development

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CIBO Quarterly EE Meeting

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Recent EPA Guidance Documents

- Use of ASOS Met Data in AERMET and AERMINUTE
- PSD Permit Modeling for $PM_{2.5}$ NAAQS
- 1-Hour SO_2 Area Designation Modeling (SO_2 TAD)

What is ASOS data?

- ASOS is the Automated Surface Observing System
- Joint effort of the National Weather Service, Federal Aviation Administration, and the Department of Defense
- Active at about 1000 sites including all major airports
- Designed to support aviation and forecasting
- Transition of NWS sites from human observer-based data collection to automated data collection in 1991
- Most sites today are ASOS-based

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Met Data Guidance

- Use of ASOS Meteorological Data in AERMOD Dispersion Modeling
  - March 8, 2013 memo from Tyler Fox to Regional modeling contacts
  - There were/are challenges imposed by switch to ASOS derived data
  - Justification for AERMINUTE preprocessor
- EPA recommends that AERMINUTE be routinely used to process wind data for AERMET
  - Recommended minimum wind speed threshold of 0.5 m/s

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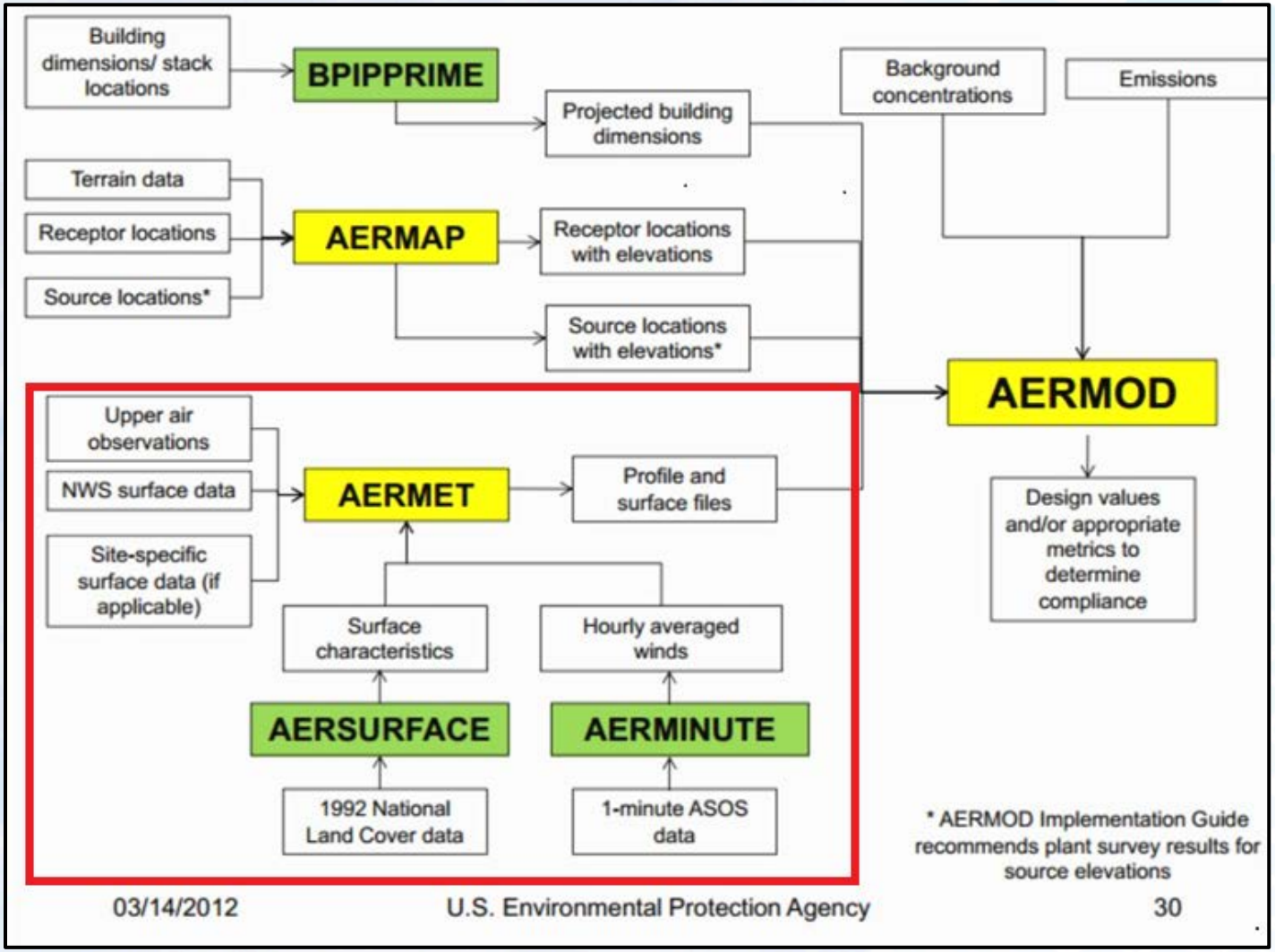
AERMOD – AERMET Flow Chart



Why use AERMINUTE? - Anemometers have improved

Sonic Anemometer

Propeller Anemometer

Cup Anemometer

Why do we need to process with AERMINUTE?

- To eliminate most “calm” observations
  - Since 1996 the NWS coding set a calm as any value < 3 knots (<1.5 m/s) in the standard hourly data available from NWS
  - This led to a high percentage of calms in meteorological data sets
  - AERMOD cannot model calm hours (or otherwise missing data)
- The use of the “one minute” wind data allows the use of all one minute data in an hour resulting in more valid observations. (A lower percentage of “calms.”)

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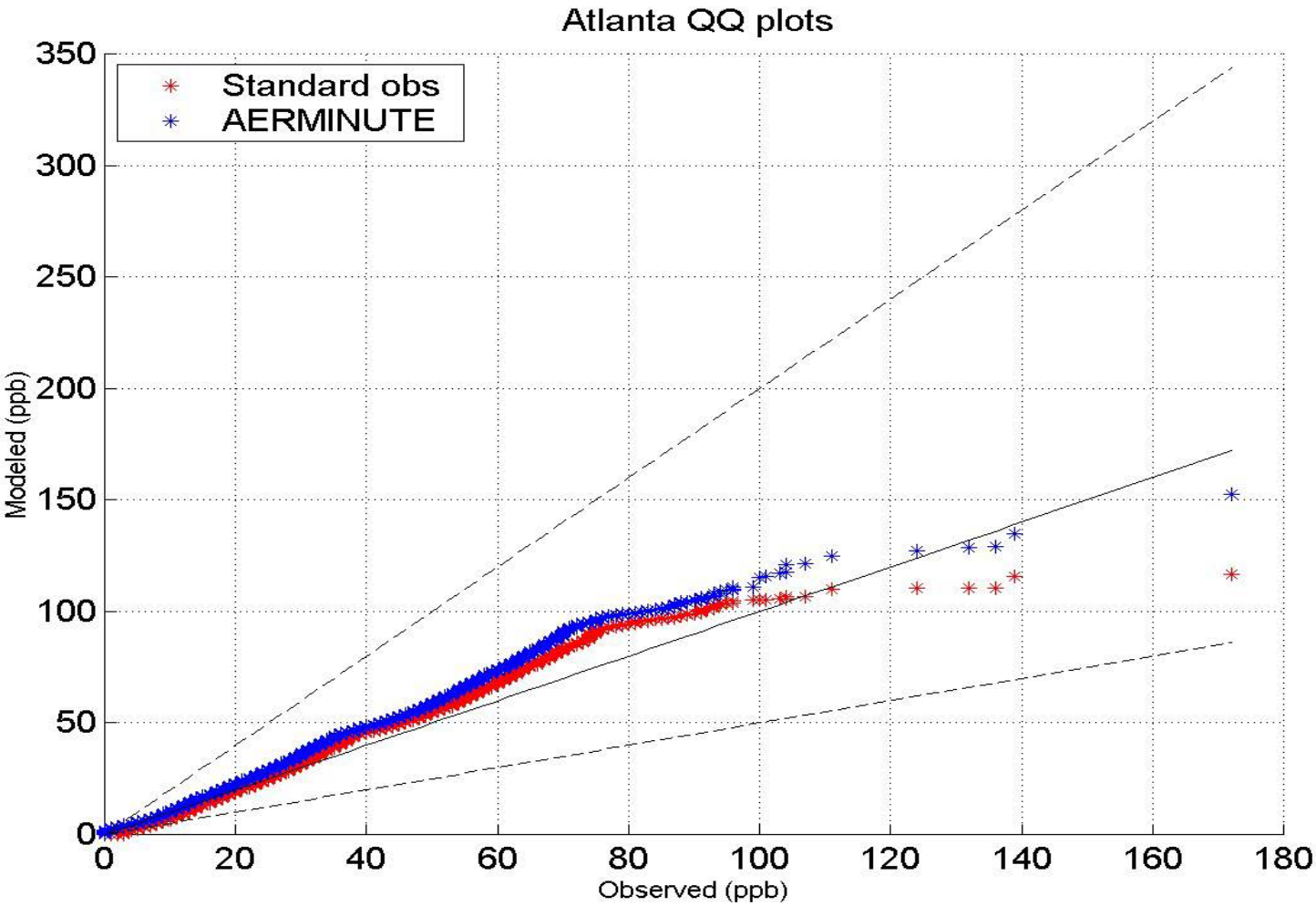
Comparison


Atlanta QQ plots
Standard obs
AERMINUTE
Modeled (ppb)
Observed (ppb)
0
50
100
150
200
250
300
350
0
20
40
60
80
100
120
140
160
180

$PM_{2.5}$ Permit Modeling

- January 22, 2013
  - SMC vacated
  - SIL vacated and remanded
  - EPA retained (for now) the SILs in 40 CFR 51.165(b)(2) - did not remove in December, 2013 rulemaking
  - Confusion at state levels
- March 4, 2013
  - Draft Guidance for $PM_{2.5}$ Permit Modeling
  - Q&A Document on Court Decision
  - Guidance not finalized

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40 CFR 51.165

- (b)(1) Each plan shall include a preconstruction review permit program or its equivalent to satisfy the requirements of section 110(a)(2)(D)(i) of the Act for any new major stationary source or major modification as defined in paragraphs (a)(1) (iv) and (v) of this section. Such a program shall apply to any such source or modification that would locate in any area designated as attainment or unclassifiable for any national ambient air quality standard pursuant to section 107 of the Act, when it would cause or contribute to a violation of any national ambient air quality standard.
- (b)(2) A major source or major modification will be considered to cause or contribute to a violation of a national ambient air quality standard when such source or modification would, at a minimum, exceed the following significance levels at any locality that does not or would not meet the applicable national standard:

Conduct "Significance Analysis" Class II (Near the facility)

- Compare modeled results to SILs – Guidance ONLY!

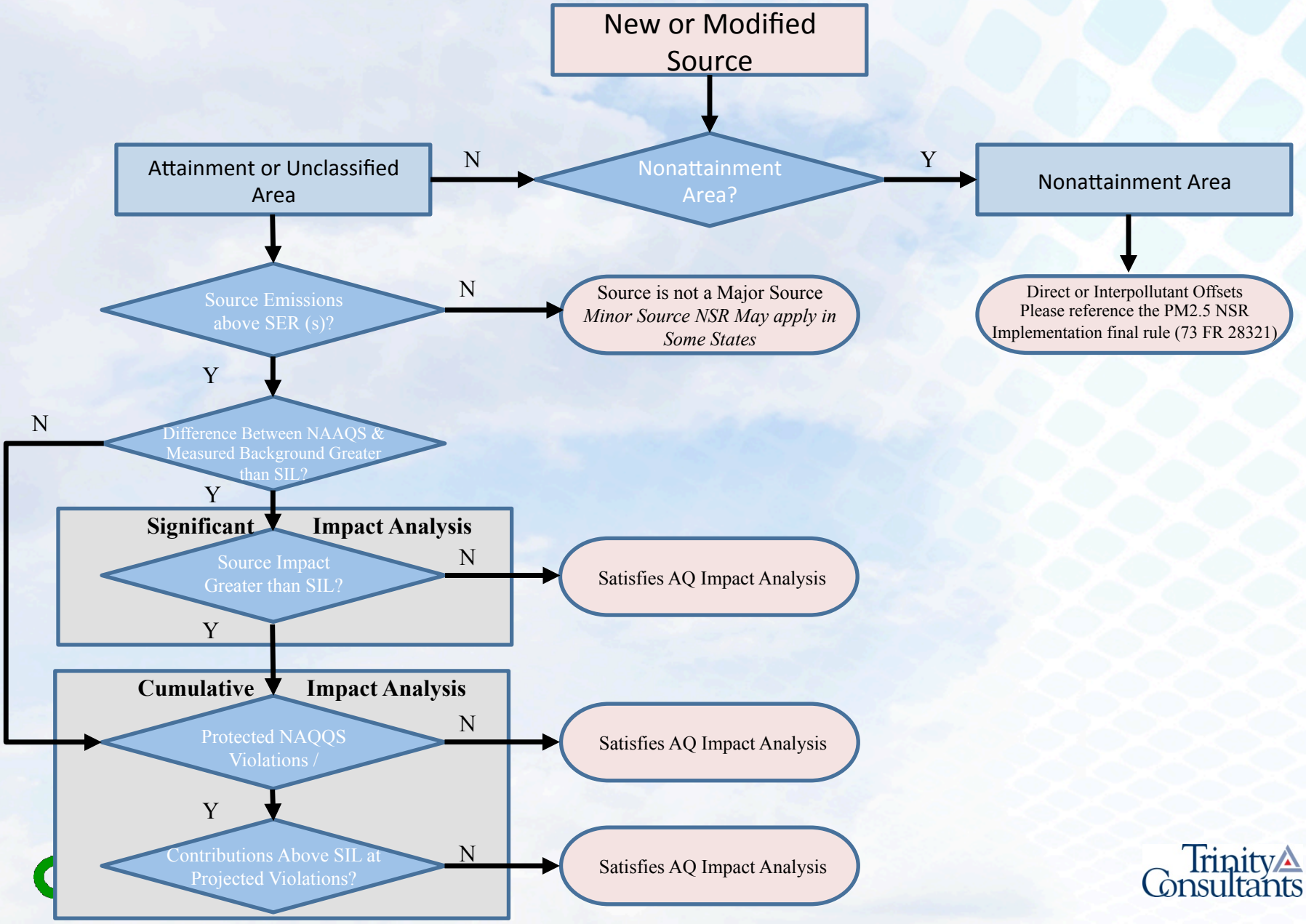
Pollutant	Annual SIL ($\mu g/m^3$)	24-hour SIL ($\mu g/m^3$)	8-hour SIL ($\mu g/m^3$)	3-hour SIL ($\mu g/m^3$)	1-hour SIL ($\mu g/m^3$)
$PM_{2.5}$	0.3	1.2	-----	-----	-----
PM_{10}	1	5	-----	-----	-----
SO_2	1	5	-----	25	7.8*
NO_2	1	-----	-----	-----	7.5*
CO	-----	-----	500	-----	2,000

* Interim values

$PM_{2.5}$ Permit Modeling

- Rulemaking to remove SMC and SILs from PSD regulations
  - Final rule published in Federal Register December 9, 2013
  - Rulemaking is ministerial in nature and exempt from notice-and-comment rulemaking
  - Removed SILs and set SMC = 0

Draft Guidance for $PM_{2.5}$ Permit Modeling



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Draft SO_2 Technical Assistance Document

- In December 2013, EPA reissued a draft document for SO_2 modeling - Modeling Technical Assistance Document
  - Purpose: to assist states with SO_2 NAAQS designation process beyond initial June 2013 nonattainment designations
  - "The primary purpose of this SO2 national ambient air quality standard (NAAQS) Designations Modeling Technical Assistance Document (TAD) is to provide recommendations on how an air agency might appropriately and sufficiently model ambient air in proximity to an SO2 emission source to establish air quality data for comparison to the SO2 NAAQS for the purposes of designations."

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Draft SO_2 Technical Assistance Document

- In the future rulemaking (2014), the EPA will establish requirements for characterizing SO2 air quality in priority areas, focusing on areas with sources that have emissions higher than a threshold amount:
  - The EPA expects to establish these thresholds taking population into account
  - States will have the flexibility to characterize air quality using modeling of actual emissions or using appropriately sited existing and new monitors
  - These data would be used in two future rounds of area designations in 2017 (based on modeling) and 2020 (based on new monitoring)

Modeling TAD – Similar to PSD Modeling, except:

- Use most recent 3 years of **actual emissions** instead of maximum allowable emissions
- Use **3 years of meteorological data**, instead of one (onsite) to five (offsite) years of data
- Use **actual stack heights**, instead of GEP stack height
- Modeling will be conducted consistent with State protocols
- The modeling TAD seems to indicate continued reliance on EPA's part on modeling because of the limit on the number of SO_2 monitors

Modeling TAD - Likely Sources to be Modeled

- "The determination of modeling domains and number of sources to consider for modeling should begin with analyzing the spatial distributions of sources that meet or exceed the emissions threshold established in the expected data requirements rule. The modeling domains could be centered over these sources."
- Sources that cause significant concentration gradient near the larger sources of interest (Smaller nearby SO_2 sources might be drawn into modeling study area.)
  - If there are sufficient numbers of these types of sources near the large sources, then these areas may wish to consider a monitoring strategy rather than conducting modeling that characterizes (either explicit modeling or background concentrations) all of the sources.
  - There may also be sources that are below the anticipated EPA thresholds within the potential modeling domains of the large sources.
- Reliance on modeling to periodically verify attainment

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SO_2 Area Designation Timeline

2014:	Future data requirements rule
2015:	Source/areas targeted for modeling/monitoring are identified
Jan 2016:	Modeling protocols are submitted
Jun 2016:	Monitoring protocols are submitted
Jan 2017:	Modeling submitted and propose designations
Dec 2017:	Finalize modeling-based designations
Aug 2019:	SIP attainment demonstration for modeling-based nonattainment area (2017 batch)
May 2020:	Proposed monitoring-based designations
Dec 2020:	Finalize monitoring-based designations
Aug 2022:	SIP attainment demonstration for monitoring-based nonattainment areas (2020 batch)

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EPA Model Updates

- AERMOD Model System
  - AERMET Version 13350 released on December 24, 2013; known to have bugs
  - January 14, 2014 webinar by EPA indicated a new 2014 version of AERMOD and AERMET would be released soon; as of February 28, no new version on SCRAM
  - Updates highlighted in http://www.epa.gov/ttn/scram/webinar/AERMOD_13350_Update/AERMOD_System_Update_Webinar_01-14-2014_FINAL.pdf

EPA Model Updates

- CALPUFF Model System
  - CALPUFF Version 5.8.4, level 130731 released on December 4, 2013; only includes bug fixes; does not incorporate latest enhancements of Version 6.42 for chemistry
  - CALMET Version 5.8.4, level 130731 released on December 4, 2013
  - CALPOST Version 6.221 remains the same
  - Updates highlighted at http://www.epa.gov/ttn/scram/models/calpuff/CALPUFF_Update_Memo_12032013.pdf

EPA Model Updates

- VISCREEN Model
  - VISCREEN Version 13190 released on August 15, 2013
  - Minor bug fixes; updated user's manual
- NO_2/NO_x In-Stack Ratio data base updated August 26, 2013

Other EPA Promised Model Updates

- AERSURFACE tool (to be updated in 2014)
  - Implementation issues – tower location, land cover class not ideal for surface roughness, better use of more recent land cover data (NLCD 2006)
  - EPA looking at alternate tool called the "Gust Factor Method" to be used with 1-min wind data
- AERPLOT Program (to be released in 2014)
  - Facilitate sending plot files to Google Earth kml files

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Possible Future Guidance

- Per Tyler Fox presentation at RSL Workshop (April 2013)
  - Monitoring in lieu of modeling under Section 10 of Appendix W
  - Further clarifications on Appendix W guidance regarding inventory of modeled sources and extent of modeling domain
  - GEP stack height changes in AERMOD