AERMOD Modeling for the NJDEP Section 126 Rule

Roger W. Brode
U.S. EPA/OAQPS
Air Quality Modeling Group

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Overview

- EPA granted NJ DEP's CAA Section 126 petition asserting that the Portland Generating Station (PGS) located on the Delaware River in PA contributes significantly to nonattainment and interferes with maintenance of the 1-hour SO_2 NAAQS in New Jersey
- AERMOD dispersion modeling played a significant role in support EPA's final rule

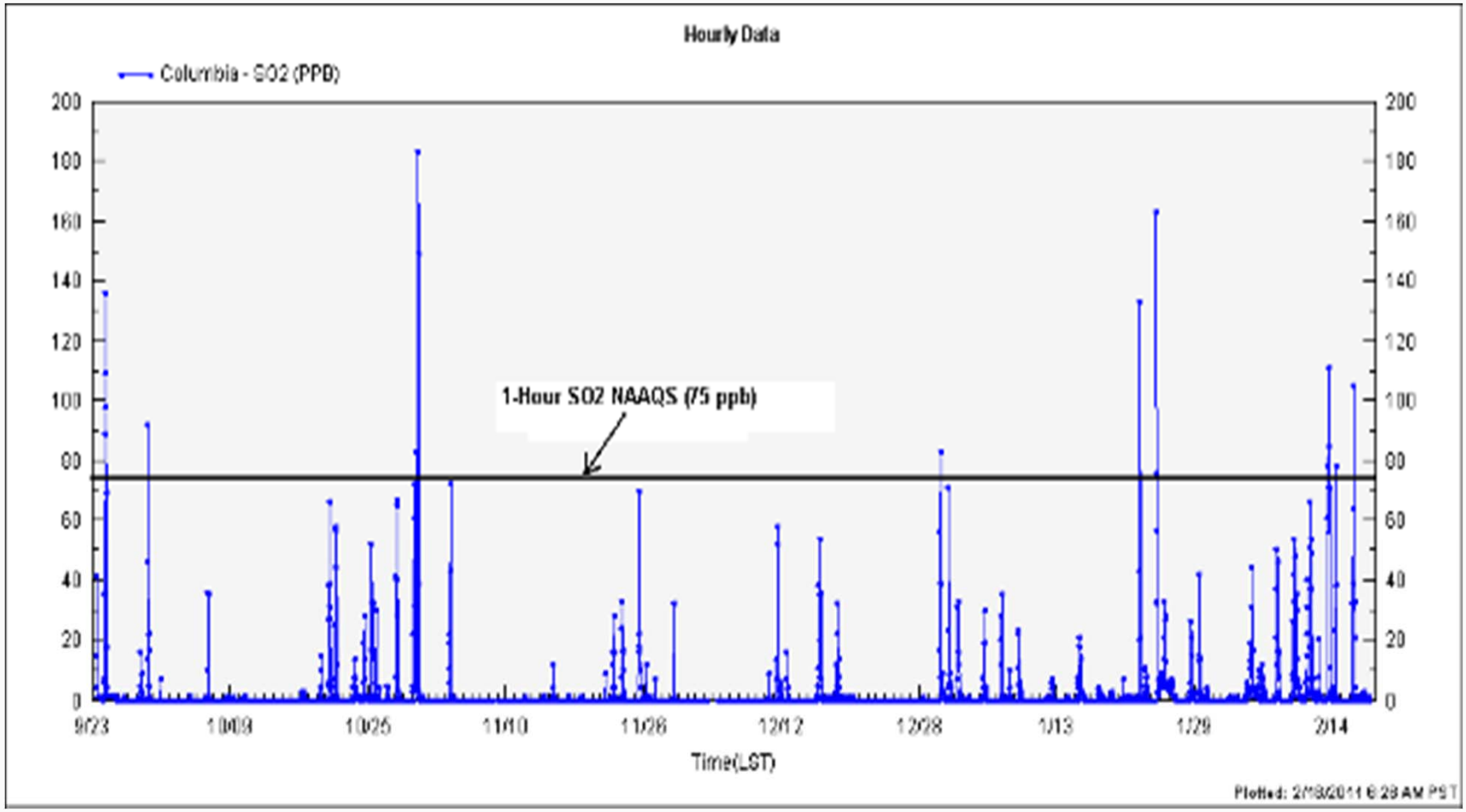
NJDEP Section 126 Petition Against 400 MW Portland Power Plant

Power Plant Description

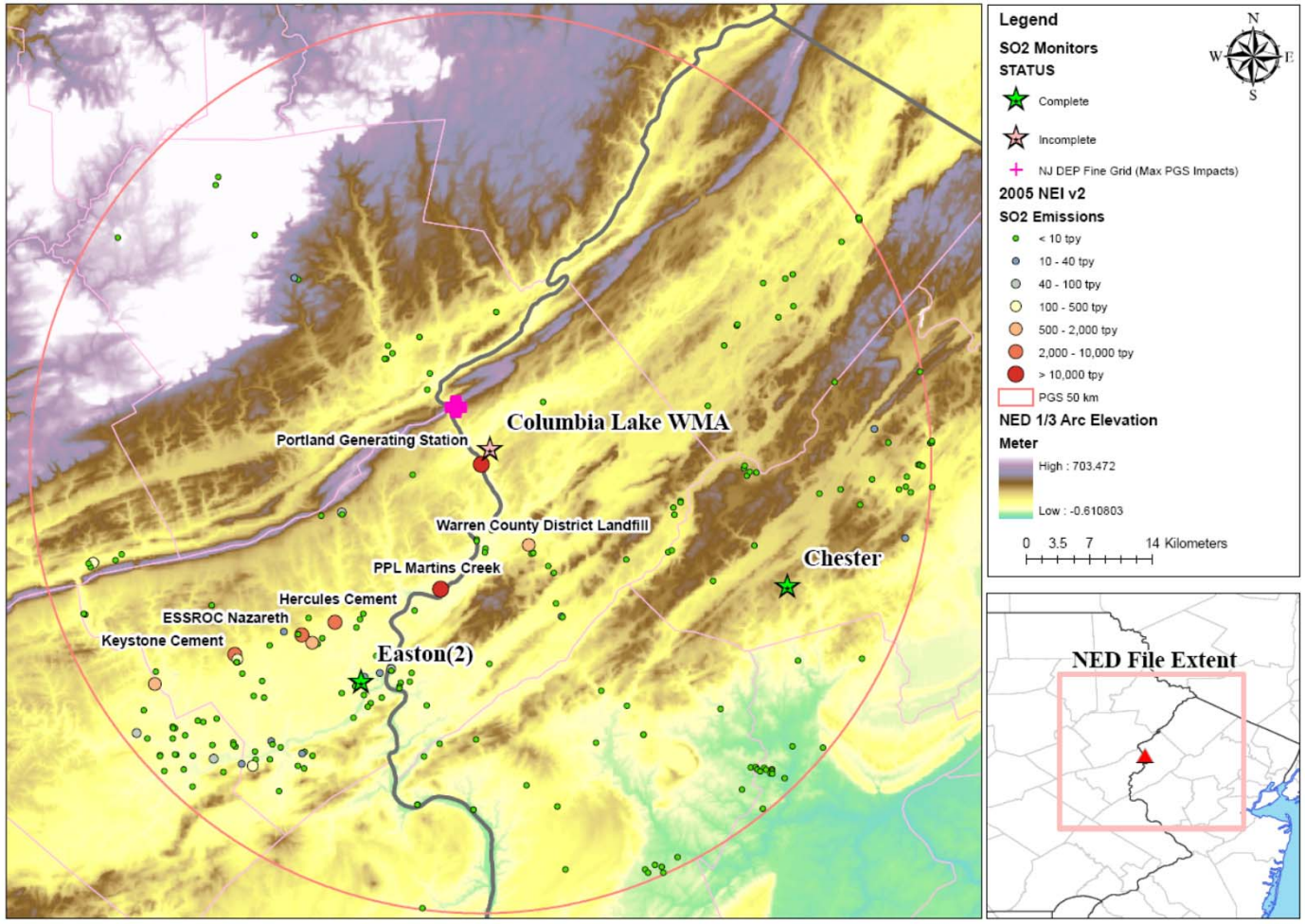
- Size/Age
  - Unit 1 – 160 MW / 1958
  - Unit 2 – 240 MW / 1962
- No existing emission controls for SO_2
- 2007 – 2010 annual average SO_2 emissions of 29,067 tons
- NJDEP sited the Columbia SO_2 monitor about 2km downwind of the Portland Plant in Sept. 2010
- The Columbia monitor data shows numerous exceedances of the 1-hr SO_2 NAAQS, but observed concentrations are near zero most of the time, indicative of very source-oriented impacts and lack of other significant “background” sources

Location of the Portland Facility and recently sited Columbia, NJ monitor

Columbia Lake - Sept. 23, 2010 to Feb. 17, 2011



AERMOD Analysis - Background Analysis (Monitoring)



Portland Section 126 Remedy

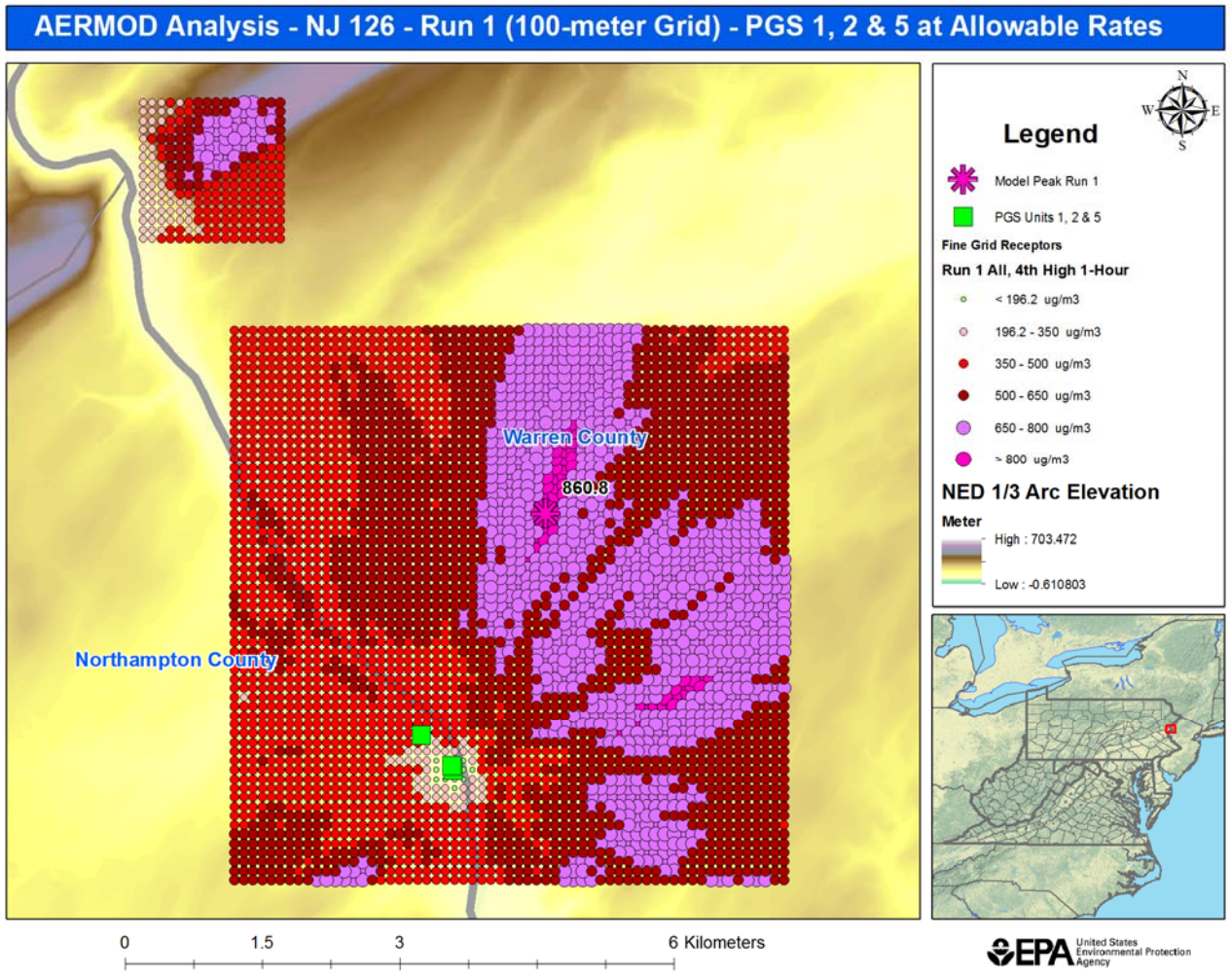
- AERMOD dispersion modeling to determine the remedy under the Section 126 petition to eliminate Portland's significant contribution to nonattainment and interference with maintenance of the 1-hour SO_2 NAAQS in NJ
- Modeling to address significant contribution to nonattainment was similar to modeling for PSD permitting to demonstrate compliance with the NAAQS, addressing issues of met data representativeness, identification of nearby sources to include in modeling, and accounting for monitored background concentrations:
  - One year of site-specific meteorological data for July 1993 – June 1994 from a 100m tower and SODAR about 1km west of Portland was used
  - Ambient data from Columbia Lake, NJ, ambient monitor and review of nearby SO_2 sources suggests ambient impacts from background sources is small
  - Large coal burning units at Martin's Creek, about 14km southwest of Portland shut down in 2007

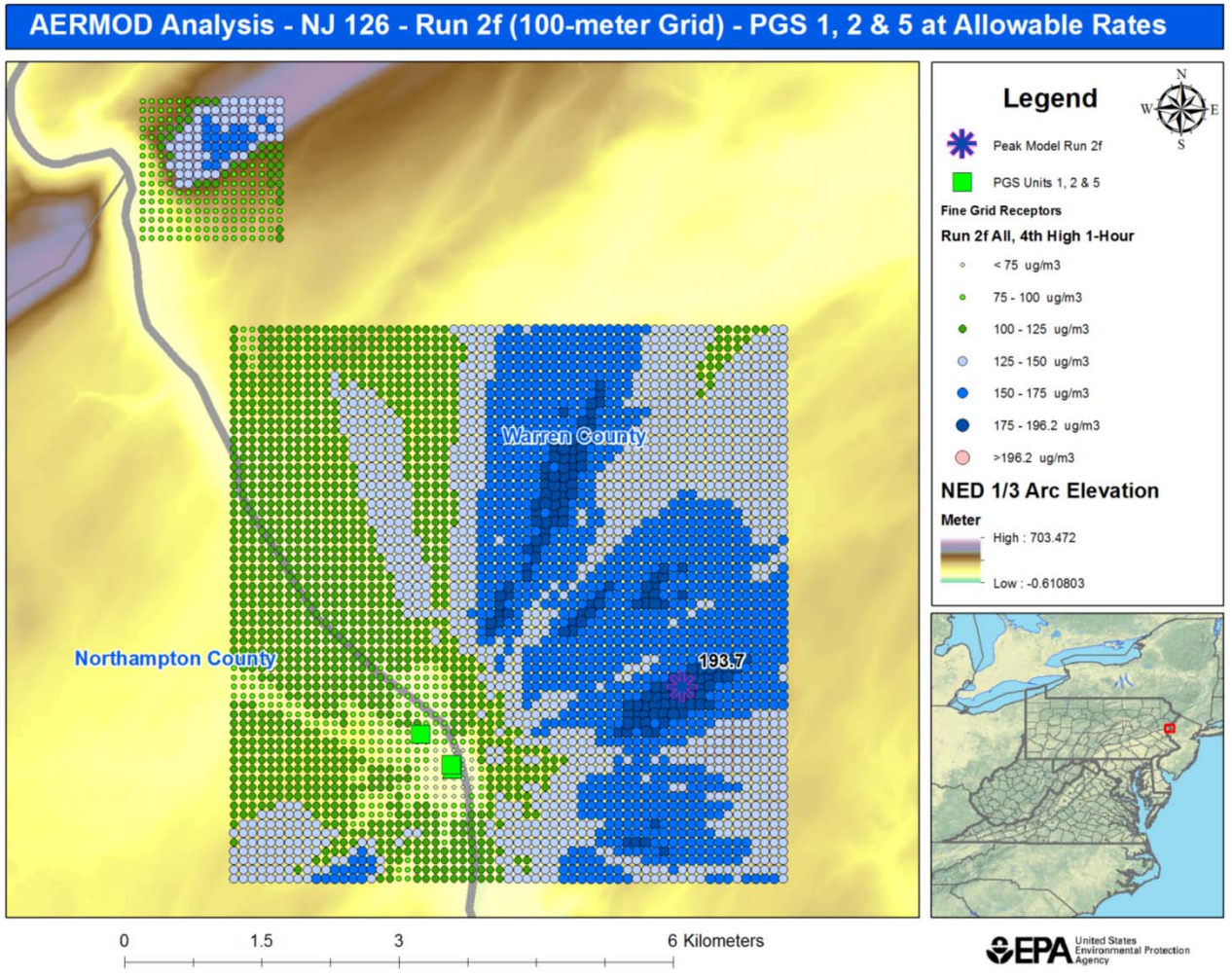
Portland Section 126 Remedy

- Additional element of interference with maintenance under Section 126 introduces issue of variability, including variability of emissions and meteorology
  - Variability of emissions addressed by modeling at allowable emissions and accounting for load analysis
  - Issue of variability of meteorology was further highlighted due to the fact that only one year of site-specific meteorology was used
  - Meteorology variability analysis was conducted based on 5 years of data from ABE ASOS station shows less variability due to the form the 1-hour SO_2 NAAQS as compared to deterministic standards
  - Monitored background concentrations from Chester, NJ ambient monitor based on 99th-percentile by season and hour-of-day (ranging from about 5 to 20 ppb); some conservatism in monitored background also addresses issue of variability

Portland Section 126 Remedy

- Based on the maximum modeled design value of 861 µg/m^3 using current allowable emissions for Portland, plus monitored background concentrations from Chester, NJ ambient monitor based on 99th-percentile by season and hour-of-day (ranging from about 5 to 20 ppb), an 81 percent reduction from allowable emissions was established as the remedy to comply with the 1-hr SO_2 NAAQS
- The following two slides shows the modeled impacts from the Portland Plant at allowable emissions and then with the 81 percent remedy applied based on the same 100m-spaced receptor grid


AERMOD Analysis - NJ 126 - Run 1 (100-meter Grid) - PGS 1, 2 & 5 at Allowable Rates
Warren County
860.8
Northampton County
Legend
Model Peak Run 1
PGS Units 1, 2 & 5
Fine Grid Receptors
Run 1 All, 4th High 1-Hour
< 196.2 ug/m3
196.2 - 350 ug/m3
350 - 500 ug/m3
500 - 650 ug/m3
650 - 800 ug/m3
> 800 ug/m3
NED 1/3 Arc Elevation
Meter
High : 703.472
Low : -0.610803
0
1.5
3
6 Kilometers
EPA United States Environmental Protection Agency


AERMOD Analysis - NJ 126 - Run 2f (100-meter Grid) - PGS 1, 2 & 5 at Allowable Rates
Warren County
Northampton County
193.7
Legend
Peak Model Run 2f
PGS Units 1, 2 & 5
Fine Grid Receptors
Run 2f All, 4th High 1-Hour
< 75 ug/m3
75 - 100 ug/m3
100 - 125 ug/m3
125 - 150 ug/m3
150 - 175 ug/m3
175 - 196.2 ug/m3
>196.2 ug/m3
NED 1/3 Arc Elevation
Meter
High : 703.472
Low : -0.610803
N
W
E
S
0
1.5
3
6 Kilometers
EPA United States Environmental Protection Agency

Form of Emission Limit for the Final Remedy

- Reducing load as a compliance strategy can be problematic in terms of air quality
  - Reduced loads reduce plume rise; ambient impacts are not reduced in proportion to emissions under reduced load
  - When modeled at reduced loads, final remedy as proposed is not protective of the NAAQS (Standard is 196 µg/m^3)

	Unit 1 (lb/hr)	Unit 2 (lb/hr)	Total (lb/hr)	Firing rate (mmBTU/hr)	AERMOD Result (µg/m3) – max. 4th high
Current Permit - Allowable	5,820	8,900	14,720	Unit 1 – 1,657 Unit 2 – 2,112	861
Proposed final remedy (81% emission reduction at full load)	1,106	1,691	2,797	Unit 1 – 1,657 Unit 2 – 2,112	194
Hypothetical, dirtier coal example -81% reduction, 50% load	1,106	1,691	2,797	Unit 1 829 Unit 2 – 1,056	264

Form of Emission Limit for the Final Remedy

- Setting a limit of 0.67 lb/mmBtu for each unit in addition to 1,106 lb/hr (Unit 1) and 1,691 lb/hr (Unit 2) limits (i.e., 81% reduction in current allowables at full load)
  - 0.67 lb/mmBtu is the equivalent reduction from allowable emissions at full load
    - Calculation for Unit 1 – [1,106 lb SO2/hr] X [hr/ 1657 mmBtu] = 0.67 lb/mmBtu
    - Calculation for Unit 2 – [1,691 lb SO2/hr] X [hr/ 2512 mmBtu] = 0.67 lb/mmBtu
  - Effectively makes the limit more stringent at reduced loads (i.e., >81% reduction at loads less than 100%)
  - Keep lb/hr as upper limit to restrict operating above stated capacity
  - It's common to write permits with lb/hr and lb/mmBtu limits