

**Review of
Risk and Exposure Assessment to Support the
Review of the NO₂ Primary National Ambient
Air Quality Standard: Second Draft Chapter 8**

**Comments to CASAC on Behalf of the
American Petroleum Institute
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Outline of Presentation

- Review of September 10 concerns stated by API with modeling NO₂ accuracy in Philadelphia and Atlanta (slide 3)
- Roadway emission impacts dominate the Atlanta NO₂ exposure assessment (slide 4)
- AERMOD overpredictions for peak 1-hour and annual average NO₂ concentrations (slides 5 and 6)
- AERMOD limitations and recommendations for improvement (slide 7)
- Review and Conclusions on identified REA problems and recommendations (slide 8)

Concerns about Exposure Modeling

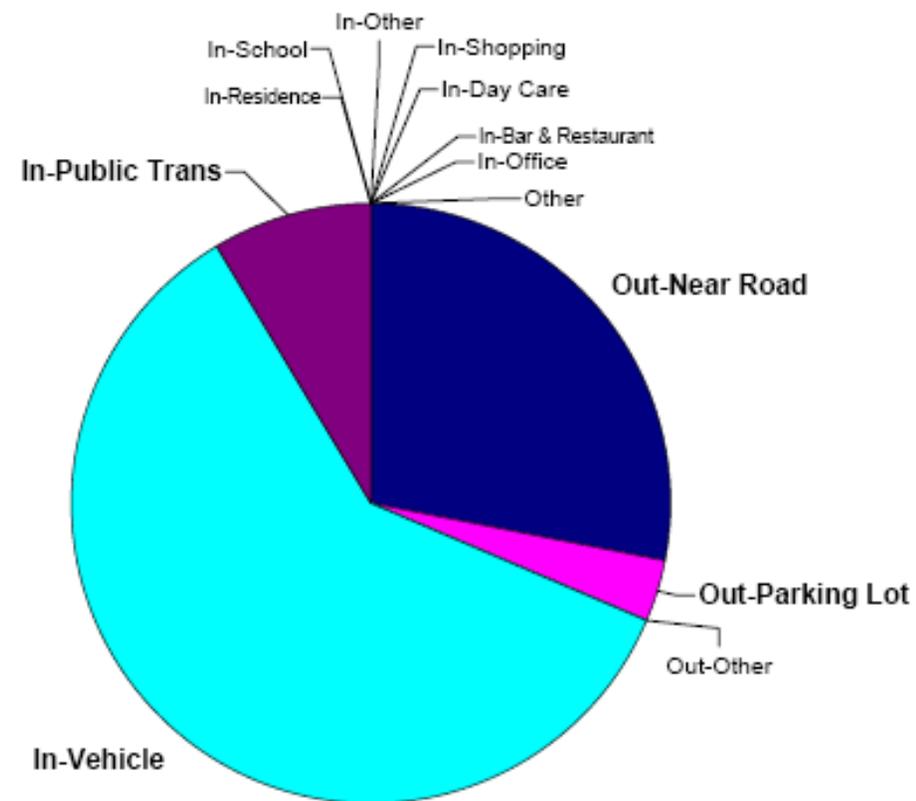
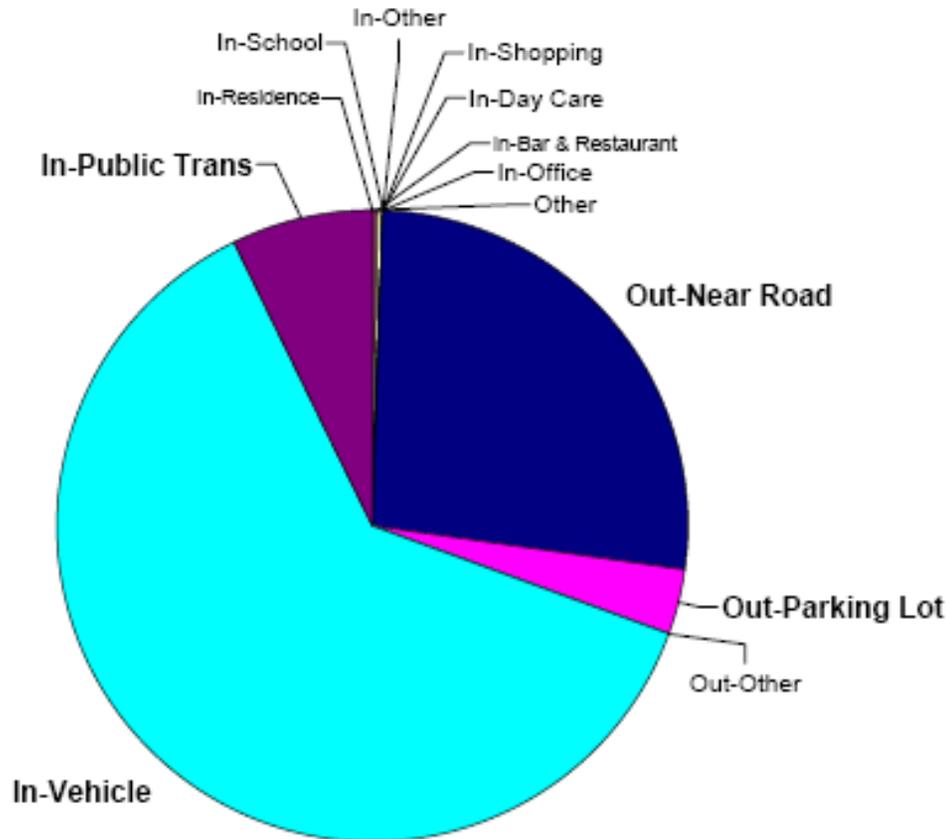
- General issue: roadway sources have peak NO₂ impacts, but modeled results do not accurately match observed concentrations
- Philadelphia issues not addressed
 - Unacceptable calibration was used to address large monitor-model differences
 - Outlier model results for 2003 need further investigation
- Atlanta issues
 - Initial peak NO₂ predictions (mostly due to roadway emissions) were too high by factor of 2 – EPA did revised modeling to try to address this
 - After revisions, AERMOD predictions still remain high by a wide margin
- API concurs with EPA’s presentation at 9th EPA Modeling Conference that
 - “...models used for risk and exposure assessments require skill at predicting concentration distributions paired in time and space.”
 - “Growing need for integrated exposure and risk-based approaches to health and environmental impact assessments places higher demands on dispersion model skill that will be difficult to meet.”

On-Roadway (In-Vehicle) and Near-Roadway Emissions Dominate the Atlanta REA Results for High 1-hr Exposures

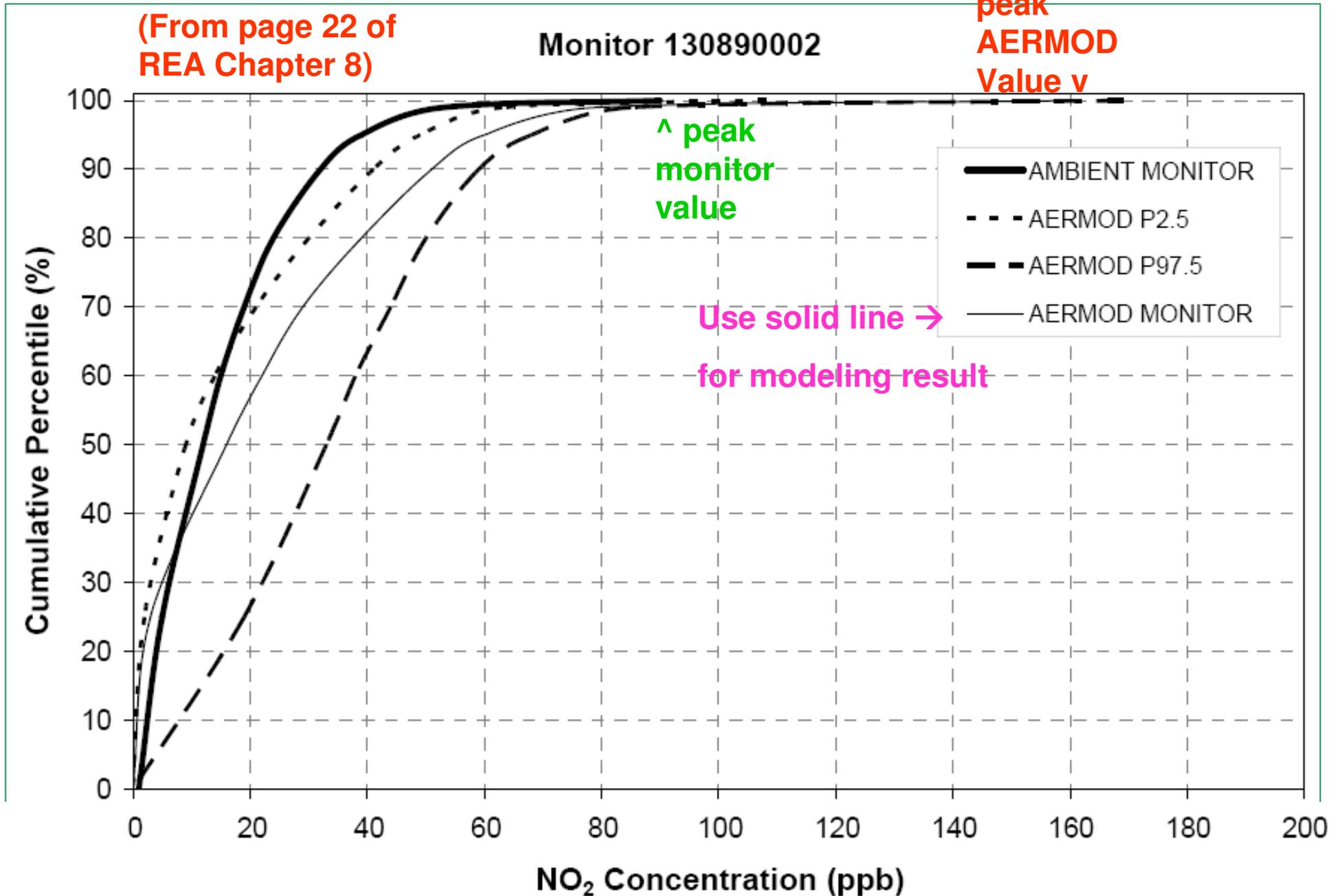
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(From page 54 of REA Chapter 8)

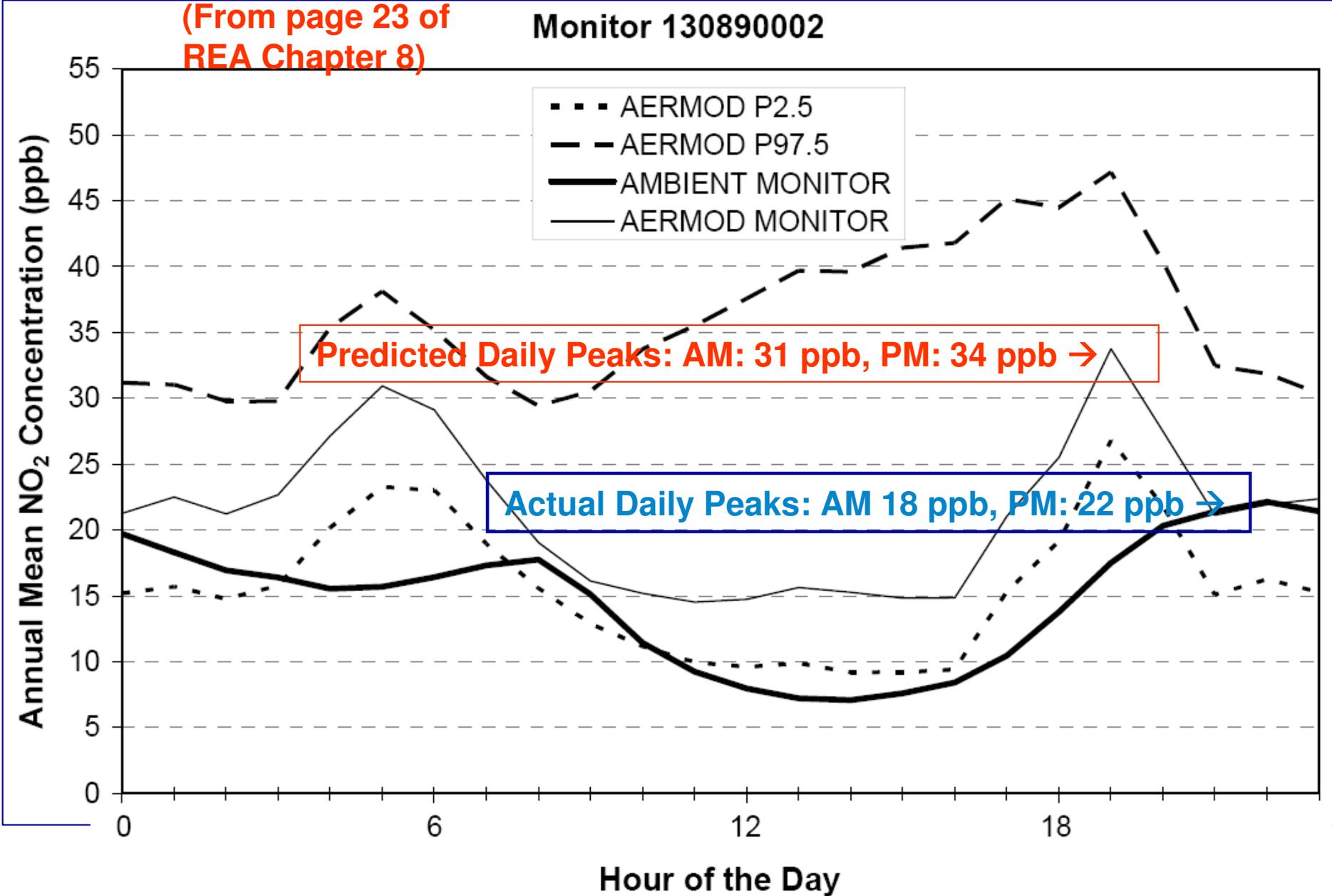
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Large AERMOD Overpredictions Occur at Ambient Monitors



Diurnal AERMOD Predicted Pattern Shows Significant Bias



AERMOD Limitations in Modeling Short-Term NO₂ from Roadways

Performance problem: AERMOD has significant overpredictions for short-term hourly concentrations; less significant for annual averages

- Field studies have found spatial ozone deficits (low ozone) over roadways – this is not accounted for in the AERMOD modeling and can lead to significant overpredictions for 1-hour averages of NO₂
- There are very limited AERMOD performance evaluations, especially in urban areas and within 100 m of roadways

Improvements needed: Better chemistry and roadway dynamics for NO₂ predictions from roadway emissions

- Two areas of uncertainty are turbulence characterization and conversion of NO to NO₂ with ozone limitation
- Geometry is critical – wind flow along or across roadway – significantly affects off-roadway concentration gradient

Overall Conclusions

- 1-hour NO₂ estimates by EPA using the simple roll-up technique are invalid; an adjusted roll-up procedure was provided by API in September 26, 2008 comments
- AERMOD shows significant overpredictions that substantially bias the results of the REA
- Roadway emissions (in-vehicle exposures) dominate the Risk Exposure Assessment for NO₂
- There are significant modeling challenges for roadway sources involving vehicle size, road geometry, and atmospheric chemistry for this critical source category
- The roll-up problems / technique and AERMOD limitations must be remedied for the REA to provide results useful for the Administrator's NAAQS review