

Status of Air Dispersion Modeling Today

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Discussion Topics

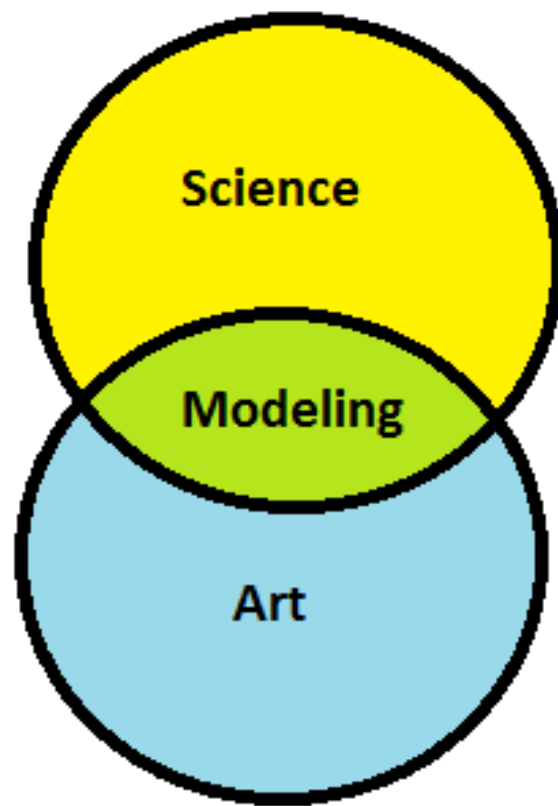
- ▶ Air Dispersion Modeling Overview
- ▶ Modeling Hurdles
- ▶ Modeling Solutions
- ▶ Appendix W Updates (guide for models)



Air Dispersion Modeling

► Types of Models

- SCREEN3 and AERSCREEN
- AERMOD
- CALPUFF

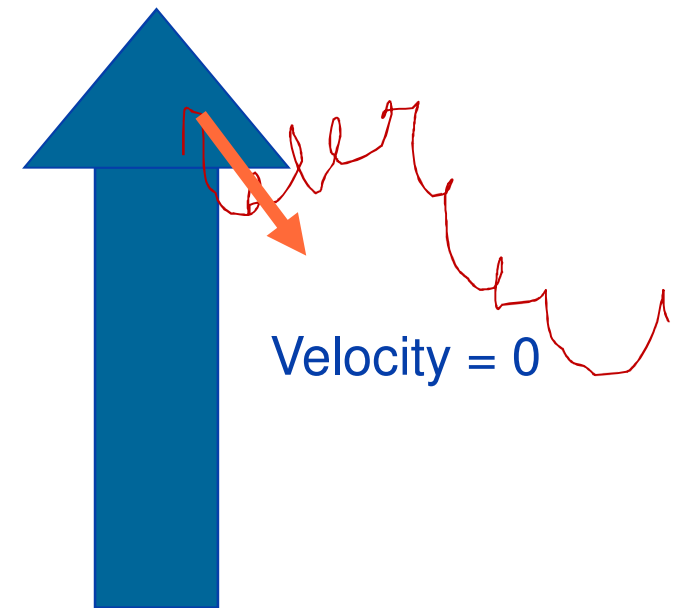


► Modeling Triggers

- Prevention of Significant Deterioration (PSD) Projects
- State Permits
- National Ambient Air Quality Standards (NAAQS) Compliance

Factors Influencing Modeling Results

- ▶ Emission rate
- ▶ Exhaust temperature and velocity
- ▶ Rain caps or horizontal discharges
- ▶ Terrain and dominant wind direction
- ▶ Existing background values
- ▶ Size of the facility's property/fence line
- ▶ Building downwash



Modeling Hurdles

- ▶ Likely to exceed significant impact level
- ▶ Small auxiliary equipment can cause exceedances
- ▶ Short-term high emissions can cause modeled exceedances
- ▶ Neighboring sources can be an issue
- ▶ High background values
- ▶ Small site = compliance headache
- ▶ No facility fence line



Modeling Hurdles – PM_{2.5}

- ▶ PM_{2.5} 24-hour and annual averaging periods
 - Low PM_{2.5} air dispersion modeling standards that trigger inclusion of nearby sources
 - High PM_{2.5} NAAQS background values
 - Increment standards can be the limiting factor for the stack height

NAAQS and Significance Levels and PSD Class II Increment

Pollutant	Averaging Period	NAAQS	Significance Level (triggers inclusion of nearby sources)	PSD Class II Increment
		micrograms per cubic meter (µg/m ³)		
PM _{2.5}	Annual	12	0.3 ^a	4
	24-hour	35	1.2 ^a	9

(a)United States Court of Appeals for the District of Columbia Circuit on January 22, 2013, vacated and remanded portions of the EPA rule establishing significant impact levels and vacated the rule establishing the significant monitoring concentration for PM_{2.5} however, the PM_{2.5} significant impact levels may still be used for Class II modeling analyses.

Modeling Hurdles – NO₂

- ▶ NO₂ 1-hour averaging period
 - Low NO₂ 1-hour air dispersion modeling standards that trigger inclusion of nearby sources
 - Likely to require advanced modeling methodologies to determine compliance

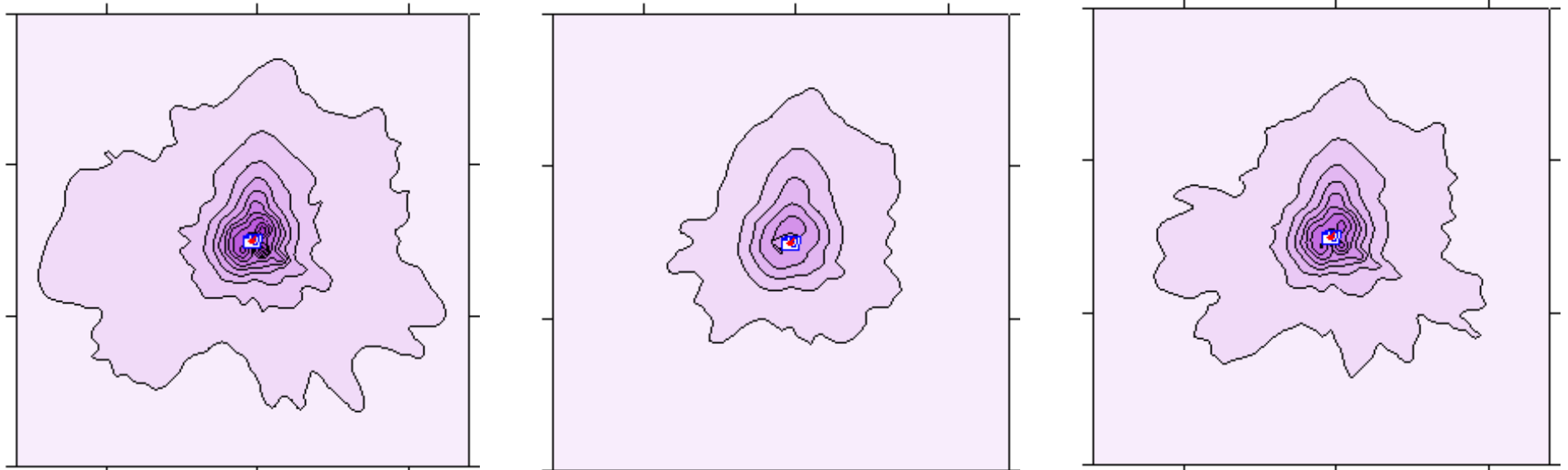
NAAQS and Significance Levels and PSD Class II Increment

Pollutant	Averaging Period	NAAQS	Significance Level (triggers inclusion of nearby sources)	PSD Class II Increment
			micrograms per cubic meter (µg/m ³)	
NO ₂	1-hour	188	7.5	NA

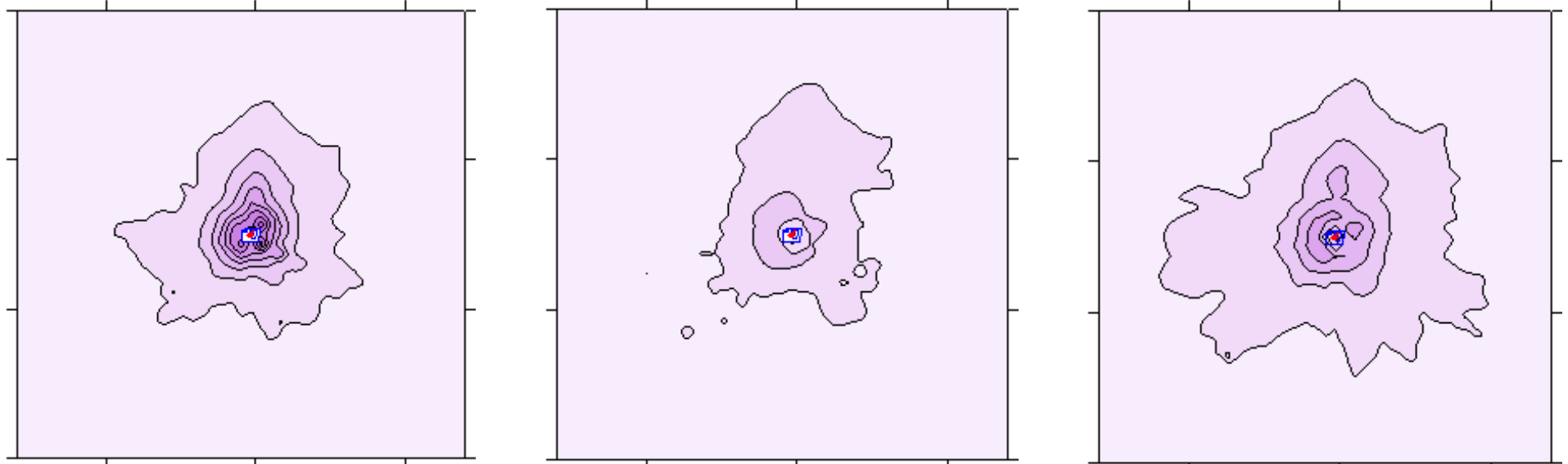
NO₂ - Modeling

- ▶ **Tier 1** – NO_x = NO₂
- ▶ **Tier 2** – Ambient Ratio Method (ARM)
- ▶ **Tier 3** – Detailed Analysis
 - Ozone Limiting Method (OLM) and Plume Volume Molar Ratio Method (PVMRM)
 - Case-by-case detailed methods that take ozone hourly, temporally varying or annual background values into account

NO₂ – Which Tier is Best?



(Exact same plant and emissions)



Modeling Hurdles – 1-hour SO₂ NAAQS

- ▶ Attainment areas can be set by modeling
- ▶ SO₂ Data Requirements Rule
 - Became final on August 21, 2015
 - Three options for facilities:
 - ▶ Option 1 - Remain less than 2,000 tpy of actual SO₂ emissions
 - ▶ Option 2 - Modeling
 - ▶ Option 3 - Monitoring

NAAQS and Significance Levels and PSD Class II Increment

Pollutant	Averaging Period	NAAQS	Significance Level (triggers inclusion of nearby sources)	PSD Class II Increment
		micrograms per cubic meter (µg/m ³)		
SO ₂	1-hour	196.5	7.8	NA

Modeling Solutions

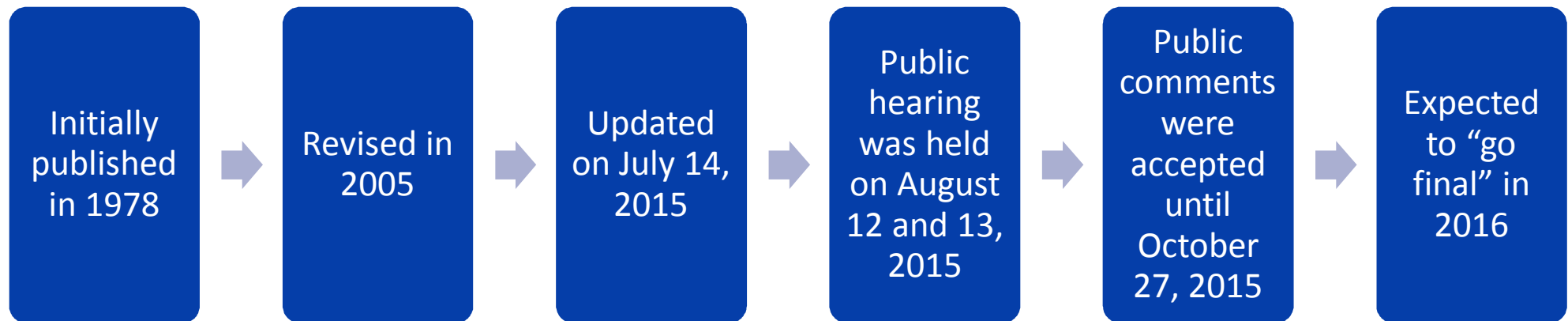
- ▶ Increase stack height
- ▶ Reduce emissions (control equipment)
- ▶ Move facility or stack location
- ▶ Expand/modify fence line
- ▶ Adjust hours of operation (for long term averages)
- ▶ Modify stack orientation
- ▶ Reevaluate surrounding buildings
- ▶ Reevaluate background



Modeling - Appendix W Updates

► Guideline on Air Quality Models

- Codified in Appendix W to 40 Code of Federal Regulations (CFR) part 51



Modeling - Appendix W Updates

Screening Model

- ▶ SCREEN3 is being replaced with AERSCREEN
 - Will affect states with air toxics modeling requirements
 - AERSCREEN requires meteorological data
 - Expected to provide more realistic concentration estimates



Modeling - Appendix W Updates

Secondary Formation of PM_{2.5} and Ozone

- ▶ Additional analyses is a Prevention of Significant Deterioration (PSD) Requirement
- ▶ No preferred model or technique
- ▶ Two tier Approach
 - Technical analysis demonstrating the relationship between precursor emissions and the source's impacts. (Use existing information.)
 - Case-specific chemical transport models
- ▶ Guidance proposes a separate rulemaking to establish thresholds for PM_{2.5} and ozone
 - MERP (Model Emission Rates for Precursors)

Modeling - Appendix W Updates

Class I PSD Increment

- ▶ Proposing to remove CALPUFF as the long-range transport model
- ▶ Proposed a screening approach that evaluates Class I SIL impacts at or about 50 kilometers with approved near-field models (i.e. AERMOD)
- ▶ No preferred model and applicant will have to select an alternative model on a case-by-case basis
- ▶ Does not affect Federal Land Manager (FLM) Air Quality Related Value (AQRV) analyses (Visibility and deposition impacts) or Best Available Retrofit Technology (BART) regional haze implementation plans

Modeling - Appendix W Updates

NO₂ Modeling

▶ Tier 2 – Ambient Ratio Method (ARM)

- ~~ARM – NO₂/NO_x ratio = 0.75 (annual) and 0.80 (1-hour)~~
- ARM2 – Variable NO₂/NO_x ambient ratio (regulatory default)

▶ Tier 3 – Detailed Analysis ~~(EPA approval)~~

- Proposing Ozone Limiting Method (OLM) and Plume Volume Molar Ratio Method (PVMRM) as regulatory default options
- Case-by-case detailed methods that take ozone hourly, temporally varying or annual background values into account

Modeling - Appendix W Updates

Model Clearinghouse Website (similar to Applicability Determination Index)

▶ <http://cfpub.epa.gov/oarweb/MCHISRS/>

***** DISCLAIMER *****

Appendix W Updates are NOT final and are subject to changes before the final rule.

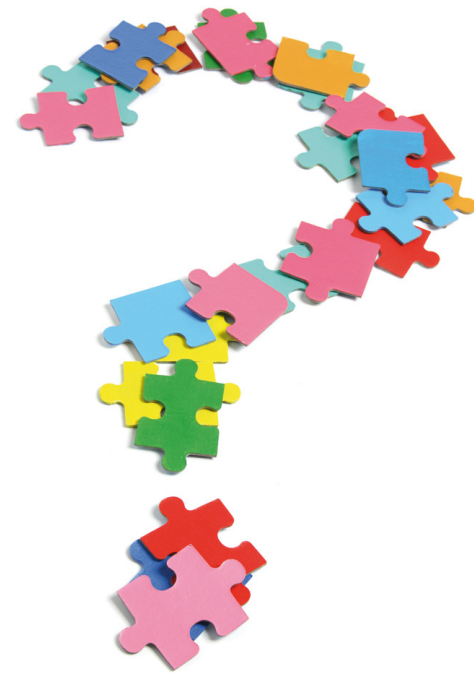
Summary

- ▶ NAAQS standards apply to all facilities
- ▶ Compliance is not a given
 - Model your facility
- ▶ When modeling issues arise there are solutions
- ▶ Compliance is a moving target
- ▶ Know how Appendix W updates will affect your facility



Questions?

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