

Treatment of PM_{2.5} and Ozone in PSD Compliance Demonstrations

11th Modeling Conference
Research Triangle Park, NC
August 12, 2015



Updates for Secondary Pollutants

- EPA granted Sierra Club petition (Jan 4, 2012) with commitment to update the Guideline on Air Quality Models (Appendix W) to address O₃ and secondary PM_{2.5} impacts
- Current final version provides little information about assessing single source secondary impacts (O₃ and secondary PM_{2.5})
- Proposed revision includes an entire chapter (5) on secondarily formed pollutants (O₃ and secondary PM_{2.5}) and a chapter (6) focused on visibility, deposition (AQRVs)
- Intent for the proposed Appendix W revision is to develop appropriate detail that will be relevant over the long term
- Increasing technical detail and reflections of the current practice of model application in guidance documents which are more dynamic



Process of updating Appendix W for single source secondary pollutant impacts

- Interagency Workgroup on Air Quality Modeling (IWAQM) has been a process historically used for collaborative work to update regulatory air quality modeling approaches
- IWAQM (phase 3) initiated in July 2013 to provide a mechanism for updating Appendix W and related guidance documents in partnership with the EPA Regional Offices and other federal agencies
- Goal is to understand and identify credible modeling techniques for single source secondary impacts for O₃ and secondary PM_{2.5}
- IWAQM3 consists of 2 working groups
 - near-field impacts
 - long-range transport (most similar to past IWAQM phases)
- Technical reports and guidance were developed to support the proposed revisions to the Guideline on Air Quality Models



Appendix W

Chapters 5, 6, & preamble

PM Modeling Guidance

Guidance on the use of models for assessing the impacts of emissions from single sources on the secondarily formed pollutants ozone and PM_{2.5}

IWAQM Phase 3 Summary Report: Near-Field Single Source Secondary Impacts

Increasingly dynamic

Federal Land Managers' Air Quality Related Values Work Group (FLAG) Phase I Report - Revised 2010

IWAQM Phase 3 Summary Report: Long Range Transport and Air Quality Related Values

Other relevant internal and external technical reports, technical presentations, and literature

**blue color indicates development and/or revisions as part of current IWAQM3 process, other colors show documents outside of this process*



Appendix W Chapter 5: Outline

- 5.0 **Models for Ozone and Secondarily Formed Particulate Matter**
- 5.1 Discussion
 - Describe ground level ozone and secondary PM2.5
- 5.2 Recommendations
 - What types of modeling systems would be appropriate for either single or multi-source assessments for secondary pollutants?
- 5.3 Recommended Models and Approaches for Ozone
 - Background relevant to both permit and non-permit assessments
- 5.3.1 Models for NAAQS Attainment Demonstrations and Multi-Source Air Quality Assessments
 - Projected future year O3 NAAQS attainment
- 5.3.2 Models for Single-Source Air Quality Assessments
 - Current year O3 SIL or NAAQS comparison for permit related assessments
- 5.4 Recommended Models and Approaches for Secondarily Formed PM2.5
 - Background relevant to both permit and non-permit assessments
- 5.4.1 Models for NAAQS Attainment Demonstrations and Multi-Source Air Quality Assessments
 - Projected future year PM2.5 NAAQS attainment
- 5.4.2 Models for Single-Source Air Quality Assessments
 - Current year PM2.5 SIL or NAAQS comparison for permit related assessments



Appendix W Chapter 5: Summary

- Totally new chapter in Appendix W
- Clear distinction between nonattainment planning for NAAQS (multi-source) vs. permit (single source) modeling requirements
- Emphasizes the importance to develop modeling protocols and consult with the reviewing authority
- Includes a screening approach with no preferred model
- Outlines a multi-tiered approach for single source permit assessments
- Emphasis on use of chemical transport models (e.g. photochemical & Lagrangian models) or techniques that reflect state of science atmospheric chemistry for the less-anticipated situations where a refined assessment is necessary



Broader Considerations for O₃ and secondary PM_{2.5} Permit Modeling

- Model Emissions Rates for Precursors (MERPs) will be included as part of future rulemaking/guidance
- A MERP would neither replace the existing Significant Emissions Rates (SERs) for these pollutants nor serve as the basis for the applicability of PSD requirements to sources with emissions above the SER
- However, a MERP would represent a level of emissions of precursors that is not expected to contribute significantly to concentrations of secondarily-formed PM_{2.5} or ozone
 - A source emitting above the SER but below the MERP would still need to follow administrative PSD requirements but may not need to do further technical demonstration to show impacts are below the appropriate SIL
- Our present understanding of the atmospheric science of ozone and secondary PM_{2.5} formation indicates that MERP values will likely be higher than the SERs and more appropriate for evaluating the impacts of these criteria pollutants as precursors to PM_{2.5} and ozone formation
- Separate memorandum have been submitted to the docket illustrating how permit assessments will work when MERPs are in place



Guidance on the use of models for assessing the impacts of emissions from single sources on the secondarily formed pollutants ozone and PM_{2.5}

- It is expected project source post-construction emissions will initially be compared with the level of the MERP (once available); if emissions are above the MERP then a first and possibly second tier assessment may be necessary
- For **first tier assessments**, it is generally expected that applicants would use existing empirical relationships between precursors and secondary impacts based on modeling systems appropriate for this purpose as detailed in this guidance
- It is also possible screening approaches based on full science chemical transport modeling systems (e.g. reduced form models) could provide information to satisfy the first tier in some situations
- The use of pre-existing credible technical information or a screening model for the purposes of estimating single source secondary impacts will be considered on a case-by-case basis and should be done in consultation with the appropriate permitting authority



Guidance on the use of models for assessing the impacts of emissions from single sources on the secondarily formed pollutants ozone and PM_{2.5}

- For **second tier assessments** (Sections 5.3.2.c and 5.4.2.c) when necessary, guidance is provided on the air quality models, inputs, run time options, receptor placement, and application approach for the purposes of estimating the impacts on ozone and secondarily formed PM_{2.5} from single project sources
- Within the second tier described in Appendix W, applicants are provided flexibility in terms of the complexity of model application for comparison to both the SIL and NAAQS
- These sub-tiers of the Appendix W second tier allow for simpler approaches to be compared conservatively to the SIL and NAAQS and more sophisticated approaches could be applied to provide a more representative impact for a source



Guidance on the use of models for assessing the impacts of emissions from single sources on the secondarily formed pollutants ozone and PM_{2.5}

- For **second tier assessments**, chemical transport models are recommended for estimating single source O₃ and secondary PM_{2.5} impacts
- Chemical transport models include Lagrangian puff models and Eulerian grid (e.g. photochemical transport) models
- Lagrangian puff models need as input a realistic chemical environment
- Photochemical transport models typically estimate a realistic chemical environment
- Even though single source emissions are injected into a grid volume, comparisons with in-plume measurements indicate these types of models can capture downwind secondary pollutant impacts when applied appropriately for this purpose
- Further testing is needed for both types of chemical transport modeling systems (Lagrangian and Eulerian) to best understand the configurations appropriate for permit related assessments



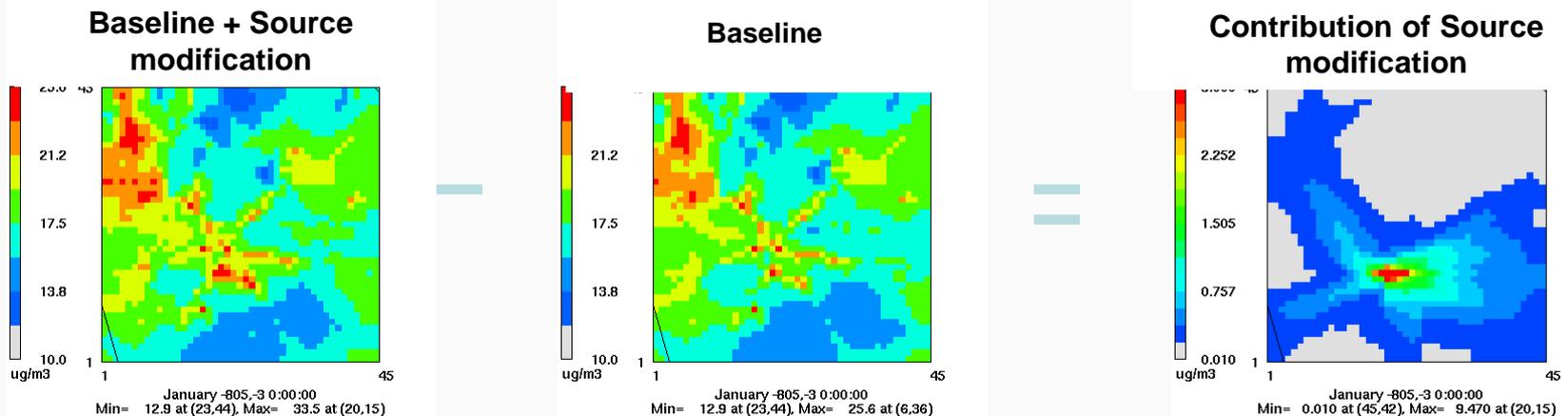
IWAQM3: Near-Field Impacts Workgroup

- Updates to preamble & Chapter 5: Ozone and Secondary PM_{2.5}
- New guidance document: Guidance on the use of models for assessing the impacts of emissions from single sources on the secondarily formed pollutants ozone and PM_{2.5} (available in docket)
- IWAQM Phase 3 Summary Report: Near-Field Single Source Secondary Impacts (available in docket)
 - What do we know about the relationships between single source precursors and secondary impacts?
 - Overview of published emissions and secondary impacts from single sources to provide context for expected impacts
 - Recommended models, approaches, screening tools, etc.



Estimating Source Contribution with Chemical Transport Models

- Lagrangian puff models output single source impacts
- Single source impacts estimated by photochemical grid models can be done by comparing a 1) model simulation with all sources and the project source at pre-construction levels and 2) model simulation with all sources and the project source at post-construction levels
- Alternatively, post-construction emissions could be tracked with photochemical grid model source apportionment or source sensitivity model extensions





Appendix W Chapter 6: Outline

- **6.0 Modeling for Air Quality Related Values and Other Governmental Programs**
- 6.1 Discussion
 - Brief description of scope of this section and the need to consult the appropriate guidance and reviewing Agencies
- 6.2 Air Quality Related Values
 - Describes what AQRVs entail, the regulatory authority, the reviewing authority, and FLAG guidance
- 6.2.1 Visibility
 - Describes the nature of visibility impairment and appropriate guidance
- 6.2.1.1 Models for Estimating Near-Field Visibility Impairment
 - Describes the types of modeling systems appropriate for this purpose and directs to appropriate guidance
- 6.2.1.2 Models for Estimating Visibility Impairment for Long-Range Transport
 - Describes the types of modeling systems appropriate for this purpose and directs to appropriate guidance
- 6.2.2 Models for Estimating Deposition Impacts
 - Describes the types of modeling systems appropriate for this purpose and directs to appropriate guidance
- 6.3 Modeling Guidance for Other Governmental Programs
 - Directs to guidance for outer continental shelf where BOEM is the authority and airports (FAA)



Appendix W Chapter 6: Summary

- Previous version of Appendix W chapter 6 contained a variety of incongruous information
- New chapter 6 focuses only on air quality related values (visibility and deposition) with small notes for other governmental programs
- Section describes visibility and deposition and the types of models that are appropriate for estimating these endpoints
- Emphasis on use of chemical transport models (e.g. photochemical models) or techniques that reflect state of science atmospheric chemistry
- Specific guidance for model selection and model application for visibility and deposition at Class I areas available from Federal Land Managers
 - Federal Land Managers' Air Quality Related Values Work Group (FLAG) Phase I Report - Revised 2010
- Specific guidance for models and model application available from FAA for airports and BOEM for offshore sources within their jurisdiction
- Screening approach for primary pollutant impacts on PSD/NAAQS increment at Class I areas described in Chapter 4 of the proposed Appendix W revision



IWAQM3: Long Range Transport Workgroup

- Updates to preamble & Chapter 6: Modeling for Air Quality Related Values and Other Governmental Programs
- IWAQM Phase 3 Summary Report: Long Range Transport and Air Quality Related Values (in docket)
 - Recommended models, approaches, screening tools, etc. for long range transport assessments of secondary pollutants and deposition