Appendix W-Section 5 Webinar Logistics

- Webinar audio is available via:
  - Your computer speakers (*preferred option*)
  - or by dialing 1-866-299-3188 and using the conference code 9195411850#.
  - If using the conference line option, please mute your line (your mute button or *6) and do not put your phone on hold… simply hang up and dial back when you want to rejoin.

- A copy of the webinar presentation is available via:
  - https://www3.epa.gov/ttn/scram/appendix_w/2016/Appendix_W-Section5-WebinarPresentation.pdf

- Questions will be accepted through the webinar chat window and answered later in the webinar or offline afterwards.

Tier 1 and 2 Demonstrations for Ozone and $PM_{2.5}$ under the PSD Permitting Program

US EPA
Office of Air Quality Planning & Standards

Webinar
July 25, 2017

Webinar Outline

- FRM and Overview of Section 5
- Applicable Guidance
- Two-Tiered Demonstration Approach
  - Tier 1 Assessments
  - Tier 2 Assessments
- Uses of Chemical Transport Models
- Model input/output availability
- Model support tools
- Question and Answer Session

Final Action: Single-Source Impacts on Ozone and Secondary $PM_{2.5}$

- The EPA believes photochemical grid models are generally most appropriate for addressing ozone and secondary $PM_{2.5}$, because they provide a spatially and temporally dynamic realistic chemical and physical environment for plume growth and chemical transformation.
- Lagrangian models (e.g. SCICHEM) applied with a realistic 3-dimensional field of chemical species could also be used for single source O_3 or $PM_{2.5}$ assessments.
- The EPA has finalized in Section 5 of revised *Guideline* a two-tiered demonstration approach for addressing single-source impacts on ozone and secondary $PM_{2.5}$.
  - Tier 1 demonstrations involve use of technically credible relationships between emissions and ambient impacts based on existing modeling results or studies deemed sufficient for evaluating a project source's impacts.
  - Tier 2 demonstrations would involve case-specific application of chemical transport modeling (e.g., with an Eulerian grid or Lagrangian model).

Section 5 of Appendix W: Overview

- Totally new section in 2017 Appendix W update
- Clear distinction between nonattainment planning for NAAQS (multi-source) vs. permit (single source) modeling recommendations
- Outlines a multi-tiered approach for single source permit assessments that reflects a screening approach with no preferred model
- Emphasizes the importance to develop modeling protocols and consult with the reviewing authority
- Emphasis on use of chemical transport models (e.g. photochemical & Lagrangian models) or techniques that reflect state of science atmospheric chemistry <u>for the less-anticipated situations</u> where a refined assessment is necessary
- <u>Section 5 does not provide a requirement for chemical transport modeling</u>

Section 5 of Appendix W: Outline

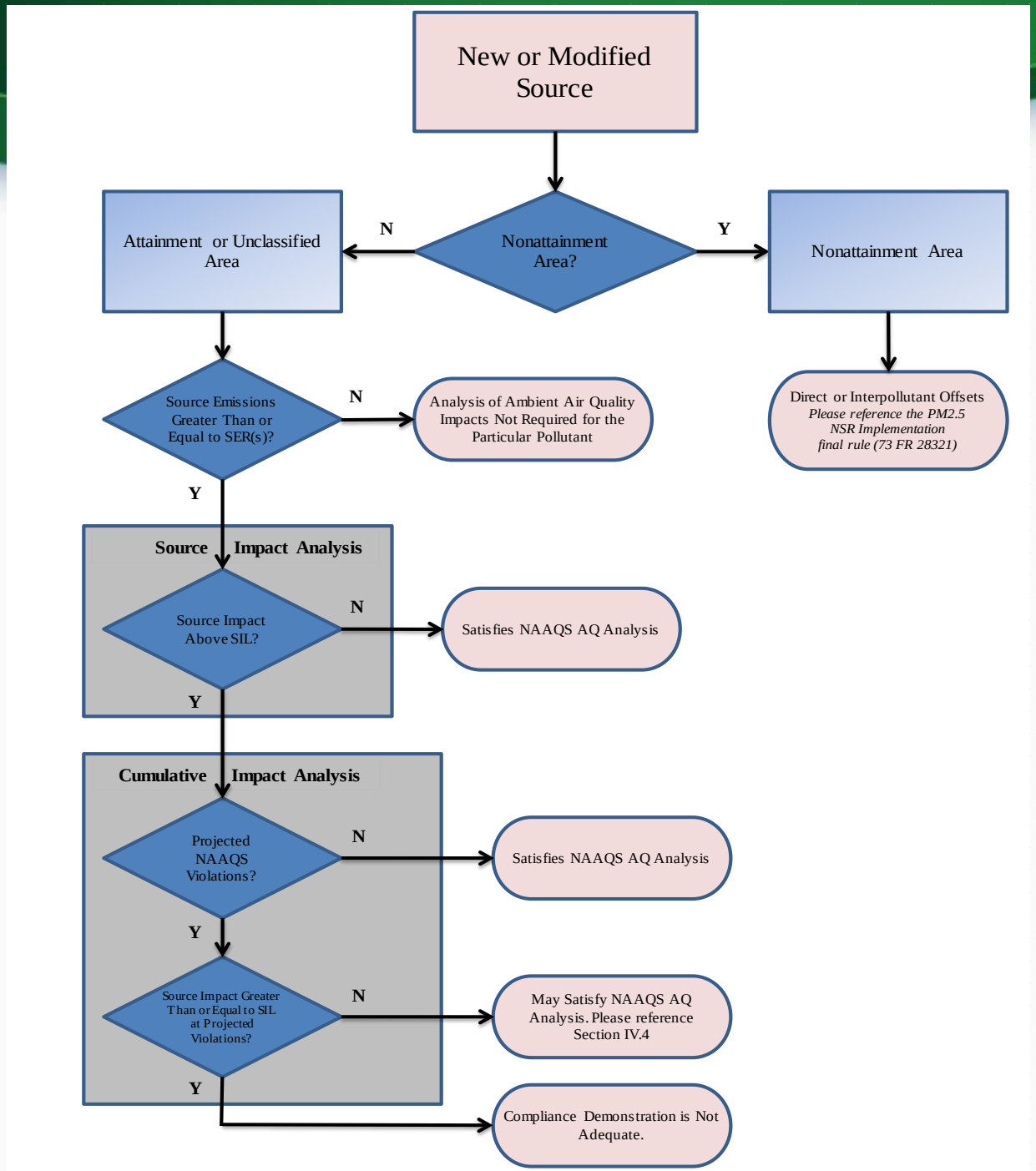
- Models for Ozone and Secondarily Formed Particulate Matter
  - 5.1 Discussion – Describe ground level ozone and secondary PM2.5
  - 5.2 Recommendations – What types of modeling systems would be appropriate for either single or multi-source assessments for secondary pollutants?
  - 5.3 Recommended Models 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

Applicable Guidance

- Guidance on the Use of Models for Assessing the Impacts of Emissions from Single Sources on the Secondarily Formed Pollutants: Ozone and PM2.5 (EPA-454/R-16-005 - December 2016)
- Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and PM2.5 under the PSD Permitting Program (EPA-454/R-16-006 - December 2016)
- Guidance for PM2.5 Permit Modeling (EPA–454/B–14–001 - May 2014)
- Guidance for Ozone and PM2.5 Permit Modeling (*Projected for Draft / Comment Release in Fall 2017*)
- Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program (*Currently being reviewed by Sr. management for OMB review*)

O3 and PM2.5 Permit Modeling Guidance

- Update to 2014 version of *Guidance for PM2.5 Permit Modeling* that includes O3 and reflects FRM revisions to *Guideline*
- Provides the framework by which to conduct PSD compliance demonstrations for NAAQS and PSD increment
  - Flow diagrams of process (similar to previous guidance)
  - Recommendations of conduct of Source Impact and Cumulative Impact Assessments under two-tiered demonstration approach for these pollutants
  - Leaves details to the other guidances, e.g., MERPs and single-source photochemical modeling
- Expect to release draft for public comment in Fall 2017



- O3/PM2.5 Permit Modeling Guidance frames the conduct of PSD compliance demonstrations.
- For NAAQS compliance demos under PSD, flow chart indicates the sequence of steps for source and cumulative impact analyses that use SILs and other demonstration tools (*separate diagram for PSD increment*).

Tier 1 Assessments

- For Tier 1 assessments, EPA generally expects that applicants would use existing empirical relationships between precursors and secondary impacts based on modeling systems appropriate for this purpose.
- The use of existing credible technical information that appropriately characterize the emissions to air quality relationships will need to be determined on a case-by-case basis.
- Examples of existing relevant technical information that may be used by a permit applicant, in consultation with the appropriate permitting authority, include air quality modeling conducted for the relevant geographic area reflecting emissions changes for similar source types as part of a State Implementation Plan (SIP) demonstration, other permit action, or similar policy assessment as well air quality modeling of hypothetical industrial sources with similar source characteristics and emission rates of precursors that are located in similar atmospheric environments and for time periods that are conducive to the formation of O_3 or secondary $PM_{2.5}$.

MERPs as a Tier 1 Demonstration Tool

- In the preamble of the Appendix W NPRM, EPA discussed plans to develop a PSD compliance demonstration tool for ozone and $PM_{2.5}$ precursors called Modeled Emission Rates for Precursors (MERPs).
- MERPs can be viewed as a type of Tier 1 demonstration tool under the PSD permitting program that provides a simple way to relate maximum downwind impacts with a critical air quality threshold.
- For PSD, separate MERPs could be developed to relate:
  - volatile organic compounds (VOCs) and/or nitrogen oxides (NO_x) to O_3
  - sulfur dioxide (SO_2) and/or NO_X to secondary $PM_{2.5}$

MERPs: O_3 and Secondary $PM_{2.5}$

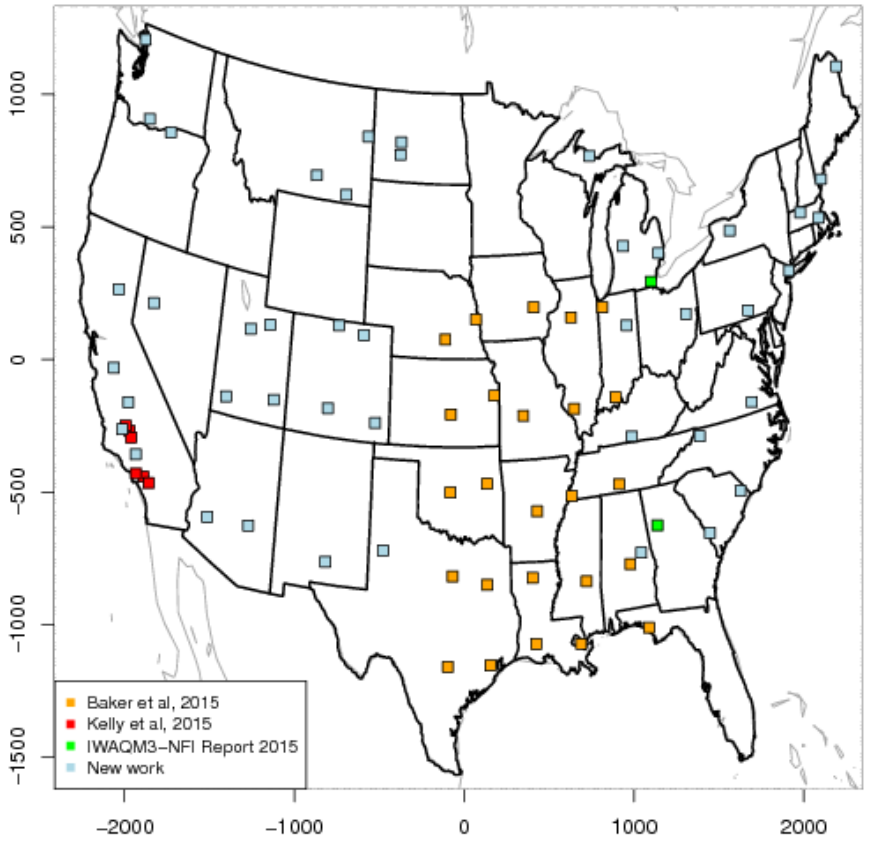
- EPA has provided technical guidance that will provide a framework for development of Tier 1 demonstration tools under Appendix W for PSD permitting.
  - Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and PM2.5 under the PSD Permitting Program (EPA-454/R-16-006 December 2016)
- The draft guidance provides a framework on how to arrive at values for MERPs based on existing relevant modeling or newly developed area specific modeling that source/states can utilize in their PSD compliance demonstrations.
  - The guidance does not endorse a specific MERP value for each precursor.
  - Public comments made available on SCRAM on May 26, 2017
- Currently reviewing comments and plan to provide a revised version of the guidance in late 2017 that addresses public comments with emphasis on:
  - More clarity on use of MERPs at national, regional and local level with more detail in the examples provided in the guidance

MERPs Guidance Overview

- Provides a detailed framework that permit applicants may choose to use, in consultation with the appropriate permitting authority, to estimate single source impacts on secondary pollutants under the first tier (or Tier 1) approach.
- Presents the EPA's modeling of hypothetical single source impacts on ozone and secondary $PM_{2.5}$ to illustrate how this framework can be implemented by stakeholders.
- Based on EPA modeling to inform illustrative MERPs, these values will vary across the nation reflecting different sensitivities of an area's air quality level to precursor emissions, thereby providing an appropriate basis for evaluating the impacts of these precursors to $PM_{2.5}$ and ozone formation because they reflect the regional or local atmospheric conditions for particular situations.

Single Source Impact Model Assessments

- Have documented and gotten peer-review for using photochemical grid models for single source secondary impacts
- We used single source modeling done to support Appendix W updates to examine the range of model estimated impacts for different sources in different areas
- Hypothetical source impact information generated with episodic and annual modeling
  - Episodic modeling for the central California the Los Angeles areas
  - Annual modeling for Detroit and Atlanta
  - Annual modeling for rural & suburban locations in the U.S. (see Figure at right)
- Important to continue this type of work to provide a robust estimate of single source secondary impacts



Note: The relationships provided in this guidance for these hypothetical sources are not intended to provide an exhaustive representation of all combinations of source type, chemical, and physical source environments but rather provide insightful information about secondary pollutant impacts from single sources in different parts of the U.S. that are appropriate for use in a Tier 1 demonstration

Definition of MERP value

- To derive a MERP value, the model predicted relationship between precursor emissions from hypothetical sources and their downwind maximum impacts can be combined with a critical air quality threshold using the following equation:

  MERP = Critical Air Quality Threshold * (Modeled emission rate from hypothetical source / Modeled air quality impact from hypothetical source)

- MERPs are expressed as an annual emissions rate in tons per year consistent with the modeled emissions rates that are input to the air quality model to predict a change in pollutant concentrations.
- The critical air quality threshold is separately defined (as discussed below) and expressed as a concentration for $PM_{2.5}$ (in $\mu g/m^3$) or O_3 (in ppb or ppm)

Developing Area Specific MERPs

- A modeling protocol should be developed and shared with the EPA Regional office that details the planned approach for developing MERPs based on photochemical modeling to ensure a sound technical basis for development of a suitable Tier 1 demonstration tool.
  - As part of the protocol, the permit applicant should include a narrative that provides a technical justification that the existing information is relevant for their project source scenario.
- There is no minimum number of hypothetical sources to include in developing a MERPs Tier 1 demonstration tool, but the benefit of including more hypothetical sources is that more information is available for future sources to use in predicting secondary pollutant impacts from their post-construction emissions.
- Permitting authorities or permit applicants should examine the existing recent (e.g., last 5 to 10 years) permit applications in that area to determine what types of emission rates and stack characteristics (e.g., surface and elevated release) should be reflected in the hypothetical project sources included in the model simulations.
- These model simulations should include a credible representation of current or post-construction conditions in the area of the project source and key receptors.
- Pre-existing modeling conducted for an area by a source, a governmental agency, or some other entity that is deemed sufficient may be adequate for air agencies to conduct local demonstrations leading to the development of area-specific MERPs.

Developing Area Specific MERPs

The general framework for such developmental efforts for O3 should include the following steps: (steps for PM2.5 similar)

1. Define the geographic area(s)
2. Conduct a series of source sensitivity simulations with appropriate air quality models to develop a database of modeled O3 impacts associated with emissions of O3 precursors (e.g., VOC and NOX) from typical industrial point sources within the area of interest.
3. Extract the appropriate NAAQS relevant modeled impact anywhere in the domain from the model simulation.
4. Calculate the MERP estimate(s) using the equation provided in the guidance document
5. Conduct quality assurance of the resulting MERP estimate(s) and evaluate the interpretation and appropriateness given the nature of O3 precursor emissions sources and chemical formation in the area of interest. This evaluation will likely require emissions inventory data and observed ambient data for O3 and precursors.

Hypothetical Examples

- The draft guidance provides 4 example scenarios using modeled hypothetical sources.
- These example scenarios are intended to illustrate how applicants could use existing information to support a demonstration.
- Further, these example scenarios are intended to help illustrate how to combine impacts from multiple precursors for a single demonstration
- Examples are also provided at the end of these slides for reference

Tier 2 Demonstrations

- A Tier 1 demonstration is not a requirement before performing a Tier 2 demonstration
- EPA anticipates few situations where a Tier 2 demonstration would be necessary, we expect most situations could be demonstrated under Tier 1
- Guidance on the Use of Models for Assessing the Impacts of Emissions from Single Sources on the Secondarily Formed Pollutants: Ozone and PM2.5 (EPA-454/R-16-005 December 2016)

Tier 2 Demonstrations

- For **second tier assessments** (Sections 5.3.2.c and 5.4.2.c), chemical transport models are recommended for estimating single source O3 and secondary PM2.5 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

Tier 2 Demonstrations: Guidance

- For **second tier assessments** 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 PM2.5 from single project sources
  - Guidance on the Use of Models for Assessing the Impacts of Emissions from Single Sources on the Secondarily Formed Pollutants: Ozone and PM2.5 (EPA-454/R-16-005 December 2016)
- Within the second tier described in Appendix W, the EPA's guidance provides applicants with flexibility in terms of the complexity of model application for comparison to both the SIL and NAAQS
- These sub-tiers 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's impact

Use of CTMs for Regulatory Modeling

- EPA is preparing a memorandum from the Model Clearinghouse that provides clearly indicates the appropriateness for use of the CMAQ and CAMx photochemical models for the purposes of permit related program demonstrations and NAAQS attainment demonstrations.
- Appendix W outlines elements needed for an alternative model demonstration where no preferred model exists for a particular situation so this memorandum documents that CMAQ and CAMx meet these criteria.
- This does not replace the need to provide project specific evaluations that focus on model performance near the project source and key receptors, but provides a “fit for purpose” basis so that all applicants do not need to provide such a demonstration for each project

Model Input/Output Data Availability

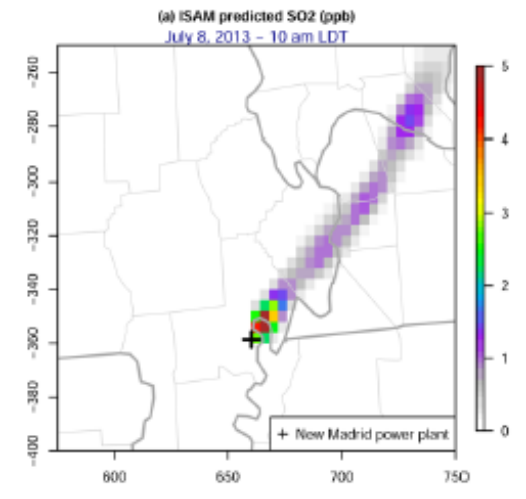
- The availability of model inputs and outputs of photochemical models (i.e., model platform data) allows for their application as a Tier 2 demonstration to be streamlined.
- EPA and other organizations have made such model platform data freely available to interested users. For instance, model-ready inputs for both CAMx and CMAQ for the entire year of 2011 are available at http://views.cira.colostate.edu/tsdw/.
- Further, multi-jurisdictional organizations typically either have existing photochemical grid model inputs or can direct those interested to other groups/organizations in the same region that may have suitable data.

Multi-Jurisdictional Organizations

Organization	Region of the country	Internet site
CENSARA	Central U.S.	http://www.censara.org/
LADCO	Upper Midwest	www.ladco.org
MARAMA	Mid-Atlantic	http://www.marama.org/
NESCAUM	Northeast U.S.	http://www.nescaum.org/
NW-AIRQUEST	Northwestern U.S.	http://lar.wsu.edu/airpact/
SESARM	Southeast U.S.	http://www.metro4-sesarm.org/content/metro-4sesarm-partnership
WRAP	Western U.S.	https://www.wrapair2.org/

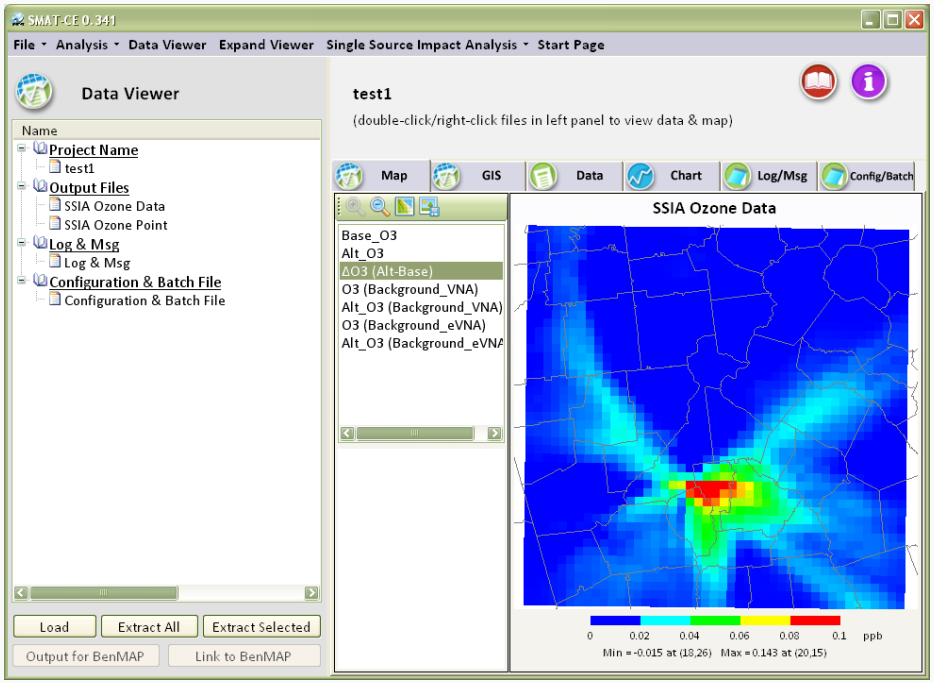
Photochemical modeling approaches: single-source impacts

- Multiple photochemical models
  - CMAQ
  - CAMx
- Source sensitivity approaches
  - Brute-force difference
  - HDDM
- Source apportionment approaches
  - ISAM
  - OSAT/APCA & PSAT



Modeling Support Tools

- EPA working toward making tools available that help add sources to existing model inputs and post-process outputs for demonstrations
- Also working on a new Windows based single source assessment tool



Question and Answer Session

- Please use the chat window within the webinar interface to submit questions. We will attempt to answer as many questions as possible and follow-up with others offline.

- For questions regarding the Appendix W final rule after the webinar, please contact:

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