Draft Guidance for $PM_{2.5}$ Permit Modeling

March 13, 2013 – Webinar

George Bridgers & Roger Brode
OAQPS-AQAD-Air Quality Modeling Group

Webinar Overview

- Brief introductions, acknowledgements, and disclaimers
- Background on the need for additional $PM_{2.5}$ permit modeling guidance
- Key elements and concepts found in the *Draft Guidance for $PM_{2.5}$ Permit Modeling*
- Logistics for providing comments regarding the *Draft Guidance for $PM_{2.5}$ Permit Modeling*
- Next steps
- Questions

Introductions, Acknowledgements, and Disclaimers

- George Bridgers
  Model Clearinghouse Director
  $PM_{2.5}$ Permit Modeling Point of Contact
  OAQPS – Air Quality Modeling Group

- Roger Brode
  AERMOD Model Developer
  NO_2 Permit Modeling Point of Contact
  OAQPS – Air Quality Modeling Group

Introductions, Acknowledgements, and Disclaimers

- A tremendous “thank you” is extended once again to NACAA and of the PM2.5 Modeling Implementation Workgroup!
- The Workgroup was formed in early 2010 with an objective of providing technical recommendations to the agency to aid in further development of $PM_{2.5}$ permit modeling guidance.
- Comprised of air dispersion modelers, permit engineers, and technical staff from federal state, local, and tribal agencies from throughout the country

Introductions, Acknowledgements, and Disclaimers

- The Workgroup focused its efforts on three specific issues:
  1) Emissions Inventories;
  2) Secondary Formation from Project Source; and
  3) Representative Background Concentrations.
- On January 7, 2011, a final report was shared with the EPA with a compilation of these efforts and recommendations.
- This report is available for review the EPA's SCRAM website:
  - http://www.epa.gov/ttn/scram/10thmodconf/review_material/01072011-NACAAPM2.5ModelingWorkgroupReport-FINAL.pdf

NACAA $PM_{2.5}$ Modeling Implementation Workgroup

- Emissions Inventories Sub-workgroup:
  - Chair Person: Jim Hodina, Linn County Public Health
  - Sub-workgroup Members:
    Joe Sims, Alabama Department of Environmental Management
    Leigh Bacon, Alabama Department of Environmental Management
    Bob Betterton, West Virginia Department of Environmental Protection
    Lynn Barnes, South Carolina Department of Health & Environmental Control
    Leland Villalvazo, South Joaquin Valley Unified Air Pollution Control District
    Tien Nguyen, Louisiana Department of Environmental Quality
    Regg Olson, Utah Division of Air Quality
    Frank Forsgren, Nevada Division of Environmental Protection
    Brenda Harpring, Nevada Division of Environmental Protection

NACAA $PM_{2.5}$ Modeling Implementation Workgroup

- Secondary Formation from Project Source Sub-workgroup:
  - Chair Person: Bob Hodanbosi, Ohio EPA Division of Air Quality
  - Sub-workgroup Members:

    Mike Koerber, Lake Michigan Air Directors Consortium
    Tim Martin, Alabama Department of Environmental Management
    Leigh Bacon, Alabama Department of Environmental Management
    Alan Dresser, New Jersey Department of Environmental Protection
    Margaret McCourtney, Minnesota Pollution Control Agency
    Clint Bowman, Washington Department of Ecology
    Glenn Reed, San Joaquin Valley Unified Air Pollution Control District
    James Sweet, San Joaquin Valley Unified Air Pollution Control District
    Jim Boylan, Georgia Environmental Protection Division
    Byeong Kim, Georgia Environmental Protection Division
    Gerri Garwood, Louisiana Department of Environmental Quality
    Sarah VanderWielen, Ohio EPA Division of Air Quality
    Mike Mosier, Indiana Department of Environmental Management
    Frank Forsgren, Nevada Division of Environmental Protection
    Tyler Fox, EPA OAQPS
    Annamaria Coulter, EPA OAQPS

NACAA $PM_{2.5}$ Modeling Implementation Workgroup

- Representative Background Concentrations Sub-workgroup:
  - Chair Person: Clint Bowman, Washington Dept of Ecology
  - Sub-workgroup Members:

    Bobby Lute, Virginia Department of Environmental Quality
    Dennis Becker, Minnesota Pollution Control Agency
    Gail Good, Wisconsin Department of Natural Resources
    Glenn Reed, San Joaquin Valley Unified Air Pollution Control District
    Jim Owen, Alabama Department of Environmental Management
    John Glass, South Carolina Department of Health and Environmental Control
    Jon McClung, West Virginia Department of Environmental Protection
    Josh Nall, Wyoming Department of Environmental Quality
    Leigh Bacon, Alabama Department of Environmental Management
    Lori Hanson, Iowa Department of Natural Resources
    Margaret McCourtney, Minnesota Pollution Control Agency
    Michael Kiss, Virginia Department of Environmental Quality
    Pete Courtney, Georgia Environmental Protection Division
    Yvette McGehee, Louisiana Department of Environmental Quality
    Roger Brode, EPA OAQPS
    Annamaria Coulter, EPA OAQPS
    Phil Lorang, EPA OAQPS

Introductions, Acknowledgements, and Disclaimers

- Disclaimer #1:

The *Draft Guidance for $PM_{2.5}$ Permit Modeling* is intended as a statement of the EPA's preliminary recommendations with respect to conducting $PM_{2.5}$ PSD compliance demonstrations that account for contributions from secondary $PM_{2.5}$. It is draft guidance for public review and comment and is not yet considered final EPA guidance. Since each permitting action will be considered on a case-by-case basis, the document does not limit or restrict any particular approach that applicants and permitting authorities may take to conduct the required compliance demonstrations. The draft guidance does not impose binding, enforceable requirements. This document does not substitute for statutory provisions or regulations, nor is it a regulation itself. Thus, the draft guidance document does not represent final agency action and cannot be relied upon to create any rights or obligations enforceable by any party.

Introductions, Acknowledgements, and Disclaimers

- Disclaimer #2:

  Given that the contributions of precursor pollutant emissions to the secondary formation of $PM_{2.5}$ are not explicitly accounted for by the currently preferred dispersion models and/or techniques, PSD compliance demonstrations that assess secondary $PM_{2.5}$ should be viewed as screening-level analyses analogous to the screening nature of Section 5.2.4 of Appendix W for NO_2 impacts.

Introductions, Acknowledgements, and Disclaimers

- Disclaimer #3:

  The release of the draft guidance package and associated comment period is not a rulemaking package and will therefore not have a response to comment document after the close of the comment period.

Draft Guidance for $PM_{2.5}$ Permit Modeling

- Background:
  - Daily and Annual $PM_{2.5}$ NAAQS originally established on July 18, 1997:
    - Daily or 24-hour $PM_{2.5}$ NAAQS was set at 65 $\mu g/m^3$
    - Annual $PM_{2.5}$ NAAQS was set at 15.0 $\mu g/m^3$
  - Citing significant technical difficulties with respect to $PM_{2.5}$ monitoring, emissions estimation, & modeling, the U.S. EPA established the PM_{10} Surrogate Policy on October 23, 1997.
    - Allowed permit applicants to use compliance with the applicable PM_{10} requirements as a surrogate approach for meeting $PM_{2.5}$ NSR requirements.

Draft Guidance for $PM_{2.5}$ Permit Modeling

- Background: *(Continued)*
  - The $PM_{2.5}$ NAAQS was revised on October 17, 2006:
    - 24-hour $PM_{2.5}$ NAAQS was reduced to 35 µg/m^3
    - Annual $PM_{2.5}$ NAAQS was retained at 15.0 µg/m^3
  - The final rules governing the implementation of the NSR program for $PM_{2.5}$ was promulgated on May 16, 2008.
    - Establishment of the Significant Emissions Rate (SER) for $PM_{2.5}$ and for the $PM_{2.5}$ Precursors which define the rates at which a net emissions increase will trigger major NSR permitting requirements. Any lower emissions increases are considered *de minimis*.
      - Direct $PM_{2.5}$ SER = 10 tpy
      - $PM_{2.5}$ Precursor – NO_x = 40 tpy and $PM_{2.5}$ Precursor – SO_2 = 40 tpy
    - This rule also included a "grandfathering provision" that allowed applicants for federal PSD permits to continue relying upon the PM_{10} Surrogate Policy.

Draft Guidance for $PM_{2.5}$ Permit Modeling

- Background: *(Continued)*
  - The EPA partially granted petitions filed by environmental organizations on August 12, 2009 with respect to PSD / Title V permits issued for Louisville Gas and Electric Company (LG&E) Trimble County Generating Station
    - EPA agreed that LG&E did not provide sufficient justification that it could meet its obligations for $PM_{2.5}$ under the PSD program by relying upon the PM_{10} Surrogate Policy.
  - On February 11, 2010, the U.S. EPA published a proposal to repeal the grandfathering provision and an early end to the PM_{10} Surrogate Policy

Draft Guidance for $PM_{2.5}$ Permit Modeling

- Background: *(Continued)*
  - To assist sources and permitting authorities in carrying out the required air quality analysis for $PM_{2.5}$ compliance demonstrations, a guidance memorandum entitled "Modeling Procedures for Demonstrating Compliance with $PM_{2.5}$ NAAQS" was released on March 23, 2010.
    - Often referred to as the "Page Memo."
    - Addressed interim procedures to address the probabilistic / statistical form of the NAAQS.
    - Acknowledged that there are technical complications associated with the ability of existing models to estimate the impacts of secondarily formed $PM_{2.5}$.
    - Recommended special attention be given to the evaluation of monitored background air quality data since this data readily accounts for the contribution of both primary and secondarily formed $PM_{2.5}$.

Draft Guidance for $PM_{2.5}$ Permit Modeling

- Background: *(Continued)*
  - On October 20, 2010, the final rule on $PM_{2.5}$ Increment, Significant Impact Levels (SILs), and Significant Monitoring Concentration (SMC) was promulgated.
    - Please note, aspects of this rule making with respect to SMC and SILs has changed per a January 22, 2013, decision from the U.S. Court of Appeals for the District of Columbia Circuit. More information on this decision will be provided in a subsequent slide.
  - The PM10 Surrogate Policy officially ended on May 16, 2011.
    - PSD compliance demonstrations must now be completed for PM2.5, include primary PM2.5 and, if applicable, secondarily formed PM2.5 from precursor emissions.

Draft Guidance for $PM_{2.5}$ Permit Modeling

- Background: *(Continued)*
  - On July 21, 2011, Gina McCarthy signed a memorandum entitled, "Revised Policy to Address Reconsideration of Interpollutant Trading Provisions for Fine Particulates ($PM_{2.5}$)."
    - This policy revision revoked our support of the presumptive interpollutant trading ratios provided in the preamble to the 2008 $PM_{2.5}$ NSR Implementation Rule.
    - This revised policy does not affect the U.S. EPA rule provisions that allow states to adopt as part of their $PM_{2.5}$ NSR programs appropriately supported interpollutant offset provisions involving $PM_{2.5}$ precursors.

Draft Guidance for $PM_{2.5}$ Permit Modeling

- Background: *(Continued)*
  - On January 4, 2012, the EPA granted a petition submitted on behalf of the Sierra Club on July 29, 2010.
    - In the petition grant, the EPA committed to engage in rulemaking to evaluate updates to the *Guideline on Air Quality Models* as published as Appendix W to 40 CFR 51, and, as appropriate, incorporate new analytical techniques or models for ozone and secondary $PM_{2.5}$.
    - As part of this commitment with the Sierra Club and in compliance with Section 320 of the Clean Air Act, the EPA conducted the 10th Conference on Air Quality Modeling (10th Modeling Conference) was held in March 2012.
      - http://www.epa.gov/ttn/scram/10thmodconf.htm
    - The release of the *Draft Guidance for $PM_{2.5}$ Permit Modeling* is consistent with the EPA's commitments in the January 4, 2012, administrative grant of the Sierra Club petition.

Draft Guidance for $PM_{2.5}$ Permit Modeling

- Background: *(Continued)*
  - The $PM_{2.5}$ NAAQS was revised again on December 14, 2012:
    - 24-hour $PM_{2.5}$ NAAQS was retained at 35 $\mu g/m^3$
    - Annual $PM_{2.5}$ NAAQS was reduced to 12.0 $\mu g/m^3$
  - On January 22, 2013, the U.S. Court of Appeals for the District of Columbia Circuit vacated the SMC for $PM_{2.5}$ and two provisions in EPA's PSD regulations containing SILs for $PM_{2.5}$.
    - SMCs for $PM_{2.5}$ should not be relied upon to exempt applicants from compiling preconstruction monitoring data for $PM_{2.5}$ in accordance with Sections 51.166(m) and 52.21(m) of the EPA's regulations.
    - The EPA believes PSD permit applicants may continue to meet the preconstruction monitoring requirements in these regs. by using data from existing monitors that are determined by the applicable permitting authority to be adequately representative of background conditions.

Draft Guidance for $PM_{2.5}$ Permit Modeling

- Background: *(Continued)*
  - On January 22, 2013, the U.S. Court of Appeals for the District of Columbia Circuit vacated the SMC for $PM_{2.5}$ and two provisions in EPA's PSD regulations containing SILs for $PM_{2.5}$. *(Continued)*
    - The Court's decision does not preclude the use of SILs for $PM_{2.5}$, but requires that EPA correct the error in the SIL regulations for $PM_{2.5}$ at 51.166(k)(2) and 52.21(k)(2).
    - EPA believes that permitting authorities may continue to apply SILs for $PM_{2.5}$ to support a PSD permitting decision, but they should take care to ensure that the SILs are not used in a manner that is inconsistent with the requirements of Section 165(a)(3) of the Clean Air Act.
    - Please reference the *$PM_{2.5}$ SILs/SMC Court Decision Question and Answer Document* for more information on the Court's decision.
      - http://www.epa.gov/nsr/guidance.html

Draft Guidance for $PM_{2.5}$ Permit Modeling

- The public release version of the *Draft Guidance for PM2.5 Permit Modeling* closely follows the presentation material from the 10th Modeling Conference:
  - http://www.epa.gov/ttn/scram/10thmodconf/presentations/2-2-Draft_PM25_Permit_Modeling_Guidance.pdf
- There are 4 notable differences:
  - The addition of a extra step to assess the appropriateness for the use of particular SIL values in a significant impact analysis.
  - Assessment Case 4 has changed to requiring some level of assessment of the impacts of secondarily formed $PM_{2.5}$.
  - In a cumulative impacts analysis, the revised First Tier approach recommends the combination of the modeled design value with the monitored design value from a representative monitor.
  - The inclusion of a discussion on $PM_{2.5}$ increment analyses.

PSD Modeling of $PM_{2.5}$: Screening Nature, Consultation, & Protocol

- Given that the contributions of precursor pollutant emissions to the secondary formation of $PM_{2.5}$ are not explicitly accounted for by the currently preferred dispersion models and/or techniques and the prominent role of background concentrations in cumulative impact analyses, certain aspects of standard modeling practices used for other criteria pollutants may not be appropriate.

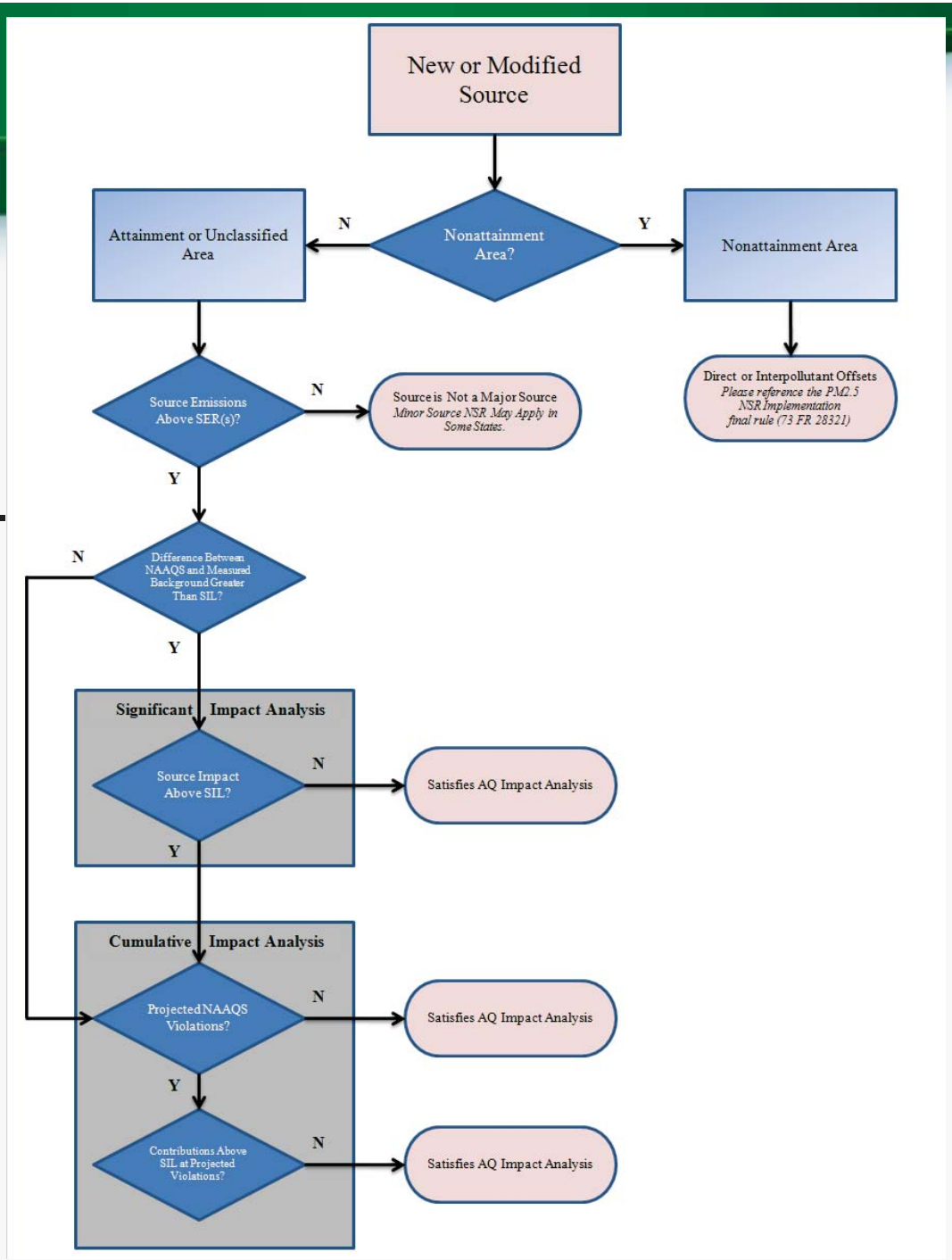
- As such, PSD compliance demonstrations that assess secondary $PM_{2.5}$ should be viewed as screening-level analyses analogous to the screening nature of Section 5.2.4 of Appendix W for NO_2 impacts.

PSD Modeling of $PM_{2.5}$: Screening Nature, Consultation, & Protocol

- As stated in Section 5.2.2.1.c of Appendix W, the "[c]hoice of methods used to assess the impact of an individual source depends upon the nature of the source and its emissions. Thus, model users should consult with Regional Office to determine the most suitable approach on a case-by-case basis."

- A modeling protocol should be developed and approved through a consultative process between the applicant and the appropriate permit reviewing authority to ensure that the analysis conducted will conform to the recommendations, requirements, and principles of Appendix W and any other regulatory guidance.

- Reference: Figure II-1.



Draft Guidance for $PM_{2.5}$ Permit Modeling

- Per the previously mentioned January 22, 2013 court decision, any permitting authority wishing to use a particular SIL value as a screening tool in a significant impact analysis should determine whether a substantial portion of the NAAQS has already been consumed.
  - Preconstruction monitoring data (or adequately representative monitoring data from an existing monitoring network) should be evaluated against the respective $PM_{2.5}$ NAAQS.
  - If the difference between the NAAQS and the measured $PM_{2.5}$ background in the area is greater than the applicable SIL value, then the EPA believes it would be sufficient in most cases for permitting authorities to conclude that a source with an impact below that SIL value will not cause a new NAAQS violation.
  - The EPA is continuing to evaluate the court decision and additional clarification and guidance may be needed.

$PM_{2.5}$ Compliance Demonstration: Assessment Cases

- We are proposing 4 different scenarios or assessment cases that will further define what air quality analyses, *if any*, that an applicant would following for compliance demonstration of the $PM_{2.5}$ NAAQS.

$PM_{2.5}$ Compliance Demonstration: Assessment Cases

- Case 1: If $PM_{2.5}$ emissions < 10 tpy and NO_x & SO_2 emissions < 40 tpy, then no $PM_{2.5}$ compliance demonstration is required.

- Case 2: If $PM_{2.5}$ emissions > 10 tpy and NO_x & SO_2 emissions < 40 tpy, then $PM_{2.5}$ compliance demonstration is required for direct $PM_{2.5}$ emission based on dispersion modeling, but no analysis of precursor emissions from the project source is necessary.

$PM_{2.5}$ Compliance Demonstration: Assessment Cases

- Case 3: If $PM_{2.5}$ emissions > 10 tpy and NO_x &/or SO_2 emissions > 40 tpy, then $PM_{2.5}$ compliance demonstration is required for direct $PM_{2.5}$ emission based on dispersion modeling, AND the applicant must account for impact of precursor emissions from the project source.
  - The assessment of the precursor emissions to the secondary formation of $PM_{2.5}$ could be completely qualitative in nature, could be a hybrid qualitative / quantitative approach, or may be a full photochemical grid modeling exercise.
  - We anticipate that only a handful of situations would require explicit photochemical grid modeling.

$PM_{2.5}$ Compliance Demonstration: Assessment Cases

- Case 4: If $PM_{2.5}$ emissions < 10 tpy and NO_x &/or SO_2 emissions > 40 tpy, then $PM_{2.5}$ compliance demonstration not required for direct $PM_{2.5}$ emissions, BUT the applicant must account for impact of precursor emissions from the project source.
  - The assessment of the precursor emissions to the secondary formation of $PM_{2.5}$ could be completely qualitative in nature, could be a hybrid qualitative / quantitative approach, or may be a full photochemical grid modeling exercise.
  - We anticipate that only a handful of situations would require explicit photochemical grid modeling.

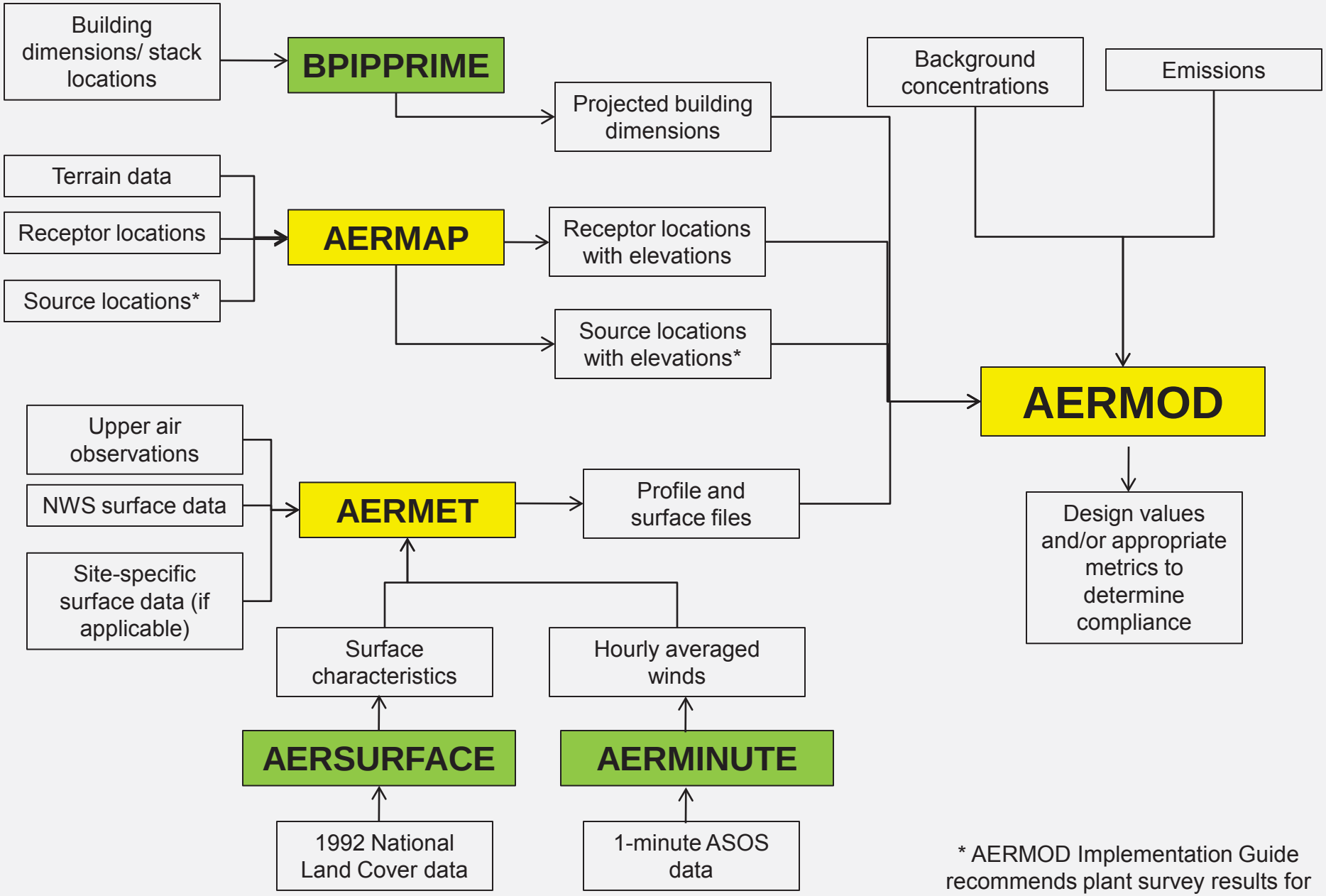
$PM_{2.5}$ Compliance Demonstration: Assessment Cases

- Reference: Table III-1.

Assessment Case	Description of Assessment Case	Primary Impacts Approach	Secondary Impacts Approach
Case 1: No Air Quality Analysis	Direct PM2.5 emissions < 10 tpy SER Both NOx and SO2 emissions < 40 tpy SER	N/A	N/A
Case 2: Primary Air Quality Impacts Only	Direct PM2.5 emissions ≥ 10 tpy SER Both NOx and SO2 emissions < 40 tpy SER	**Appendix W preferred or approved alternative dispersion model**	N/A
Case 3: Primary and Secondary Air Quality Impacts	Direct PM2.5 emissions ≥ 10 tpy SER Both NOx and/or SO2 emissions ≥ 40 tpy SER	**Appendix W preferred or approved alternative dispersion model**	• **Qualitative** • **Hybrid qualitative / quantitative** • **Full quantitative photochemical grid modeling**
Case 4: Secondary Air Quality Impacts Only	Direct PM2.5 emissions < 10 tpy SER Both NOx and/or SO2 emissions ≥ 40 tpy SER	N/A	• **Qualitative** • **Hybrid qualitative / quantitative** • **Full quantitative photochemical grid modeling**

Modeling of Directly Emitted $PM_{2.5}$

- Cases 2 & 3 both require compliance demonstration for the direct $PM_{2.5}$ through dispersion modeling.
- Typical significant impact and cumulative impact analysis approach.
- Model Selection:
  - AERMOD, *EPA's preferred near-field dispersion model.*
- Model Considerations:
  - Modeling domain.
  - Source inputs.
  - Meteorological inputs.
- Cumulative impact analyses would necessitate the inclusion of background (monitored and/or other sources explicitly modeled)



* AERMOD Implementation Guide recommends plant survey results for source elevations

Emissions and Source Characterization

- Maximum allowable emissions or federally enforceable limits should be basis of emissions used in modeling
  - Follow Section 8.1 of Appendix W
  - Emission input data can be calculated using Table 8-2
- Source characterization
  - Source release parameters should reflect modeled emissions levels
  - If modeling controlled emissions for demonstration, release parameters should reflect source “with controls in place”
  - Accurate locations
    - Sources and Buildings (if needed for downwash)
  - Urban vs. rural classification
    - Important in determining dispersion coefficients

Meteorology

- 5-years of representative National Weather Service data or at least one year of site-specific data (Appendix W)
  - 3-year standard does not pre-empt use of 5 years of NWS data
  - Calculate design values for modeled period , not 3-year averages
    - Example: Modeling 2005-2009, do not need to calculate 3-year averages for 2005-2007, 2006-2008, and 2007-2009
  - Recommend use of AERMINUTE hourly averaged winds to supplement standard NWS observations to reduce calms and missing data that will be important for modeling of a daily standard

Monitored Background *(Cumulative Impact)*

- Representative background monitored concentrations of $PM_{2.5}$ will entail different considerations from those for other criteria pollutants.
- Monitored background $PM_{2.5}$ concentrations:
  - Should account for the contribution of secondary $PM_{2.5}$ formation associated with existing sources represented in the modeling domain.
  - Consideration should be given to the potential for double-counting the impacts from modeled emissions that may be reflected in the background monitoring
    - Likely not as important for secondary contributions.
    - There could be some issues if the monitor is located relatively close to a nearby source of primary $PM_{2.5}$.

Monitored Background *(Cumulative Impact)*

- It may be appropriate to account for seasonal variation in background $PM_{2.5}$ levels which may not be correlated with seasonal patterns of the modeled primary $PM_{2.5}$ levels.
  - Primary $PM_{2.5}$ of fugitive or low-level emission sources likely occur during winter months due to longer periods of stable atmospheric conditions.
  - Maximum levels of secondary $PM_{2.5}$ (in the eastern U.S.) typically occur during the spring and summer months due to high levels of sulfates.
  - Relative composition of $PM_{2.5}$ and temporal patterns associated with the highest daily $PM_{2.5}$ levels may differ significantly from that associated with the annual average $PM_{2.5}$ levels, especially in western states.

Comparison to the $PM_{2.5}$ NAAQS

- Combining the modeled and monitored concentrations of $PM_{2.5}$ for comparison to the NAAQS also entails considerations different from those for other criteria pollutants.
- The probabilistic/statistical form of the $PM_{2.5}$ NAAQS requires additional careful considerations.
- The representative monitored $PM_{2.5}$ design value should be used as a component of the cumulative analysis rather than the overall maximum monitored background concentration.
  - Annual $PM_{2.5}$ design value is based on a 3-year average of the annual average $PM_{2.5}$ concentrations.
  - Daily $PM_{2.5}$ design value is based on the 3-year average of the 98th percentile 24-hour average $PM_{2.5}$ concentrations.
    - 8th highest based on 365 daily samples in a year.
    - Reference Appendix N to 40 CFR Part 50 for other ranks.

Comparison to the $PM_{2.5}$ NAAQS

- Annual $PM_{2.5}$ NAAQS Comparison: (*SIL*)
  - The highest average of the modeled annual averages across the 5-years (NWS) or the highest modeled annual average for one year (site-specific) should be compared to the respective and appropriately justified annual $PM_{2.5}$ SIL.
- Annual $PM_{2.5}$ NAAQS Comparison: (*Cumulative*)
  - The highest average of the modeled annual averages across the 5-years (NWS) or the highest modeled annual average for one year (site-specific) should be added to the monitored annual design value.
  - The resulting cumulative annual concentration would then be compared to the annual $PM_{2.5}$ NAAQS of 12.0 $\mu g/m^3$.
  - If a NAAQS violation is projected, then a source contribution analysis would be required to demonstrate compliance.

Comparison to the $PM_{2.5}$ NAAQS

- Daily $PM_{2.5}$ NAAQS Comparison: (*SIL*)
  - The highest average of the maximum modeled 24-hour values across 5-years (NWS) or the highest modeled 24-hour value for one year (site-specific) should be compared to the respective and appropriately justified daily $PM_{2.5}$ SIL.
- Daily $PM_{2.5}$ NAAQS Comparison: (*Cumulative*)
  - For a First Tier modeling analysis, the modeled design value based on the multi-year average of the 98^{th}-percentile of the 24-hour values across 5-years (NWS) or the 98^{th}-percentile of the 24-hour value for one year (site-specific) should be added to the monitored daily design value.
  - The resulting First Tier cumulative daily concentration would then be compared to the daily $PM_{2.5}$ NAAQS of 35 $\mu g/m^3$.
  - If a NAAQS violation is projected, then a source contribution analysis may be considered or possibly a Second Tier modeling analysis.

Comparison to the $PM_{2.5}$ NAAQS

- Daily $PM_{2.5}$ NAAQS Comparison: (*Cumulative*)
  - For applications where impacts from primary $PM_{2.5}$ emissions are not temporally correlated with background $PM_{2.5}$ levels, following the First Tier modeling analysis may be overly conservative.
  - In such cases, combining the monitored and modeled $PM_{2.5}$ concentrations on a seasonal or quarterly basis through a Second Tier modeling analysis might be more appropriate.
  - This is likely more of an issue for the daily $PM_{2.5}$ NAAQS, but it could be an important factor for both NAAQS in some cases.

Comparison to the $PM_{2.5}$ NAAQS

- Daily $PM_{2.5}$ NAAQS Comparison: (*Cumulative*)
  - For a Second Tier modeling analysis, four seasonal background values would be combined with the modeled concentrations on a seasonal basis.

    The recommended input for the Second Tier modeling analysis is the 98th percentile of monitored concentrations for each season, averaged across three years of monitoring.

  - The resulting Second Tier cumulative daily concentration would then be compared to the daily $PM_{2.5}$ NAAQS of 35 µg/m^3.
  - If a NAAQS violation is projected, then a source contribution analysis would be required to demonstrate compliance.
  - AERMOD has the capabilities to allow the user to track the contributions from background concentrations to the cumulative modeled design value.

Assessment of Secondarily Formed $PM_{2.5}$

- Case 3 and 4 requires some level of assessment of precursor pollutant emissions to the secondary formation of $PM_{2.5}$.
- As stated previously in the presentation, the assessment of the precursor pollutant emissions to the secondary formation of $PM_{2.5}$ could be completely qualitative in nature, could be a hybrid qualitative / quantitative approach, or may be a full photochemical grid modeling exercise.
- The combination of the modeled direct impacts of $PM_{2.5}$ with that of secondarily formed $PM_{2.5}$ will require additional thought and justification depending on assessment approach.
- Consultation with the appropriate permit reviewing authority is paramount, including the approval of a modeling protocol that includes a well constructed conceptual description of the $PM_{2.5}$ for the region surrounding the project source.

Assessment of Secondarily Formed $PM_{2.5}$

- Qualitative only approach:
  - Situations where precursor emissions levels are marginally higher than the level of the SERs, monitored background levels are very low, and the primary $PM_{2.5}$ impacts are also very low or not correlated in space and time with secondary formation such that the combination of the background and primary impacts are still well below the level of the NAAQS.
  - It is already a fair assessment that the primary $PM_{2.5}$ and the secondarily formed $PM_{2.5}$ concentrations will not be co-located in time and space.
  - Potentially augment with additional weight-of-evidence style discussion from recent SIP related photochemical modeling exercises in the region.
  - Recent Region 10 OCS drill ship permits are an example.

Assessment of Secondarily Formed $PM_{2.5}$

- Hybrid qualitative / quantitative approach:
  - In most situations, background concentrations in addition to the primary $PM_{2.5}$ impacts from the project source are already going to be relatively close to the NAAQS.
  - If a facility has sizable precursor emissions in such an environment, additional pseudo-quantitative analysis will be required beyond a weight-of-evidence style discussion.
  - The development of region specific offset ratios that can be applied to the precursor emissions to determine a related $PM_{2.5}$ concentration is one option.
  - Other techniques such as the development of a $PM_{2.5}$ Impacts Screening Tool based on region specific photochemical modeling could be explored.

Assessment of Secondarily Formed $PM_{2.5}$

- Chemical transport modeling:
  - As described in the NACAA $PM_{2.5}$ Implementation Workgroup recommendations for their Tier III and Tier IV cumulative impact assessments, the use of a Lagrangian or Eulerian model may be required for very large sources with a tremendous net increase of $PM_{2.5}$ precursor emissions.
  - We anticipate this being the rare case, especially in light of compliance requirements of the recently revised 1-hour NO_2 and SO_2 NAAQS.
  - The Lagrangian models (e.g. SCICHEM) are an emerging technical resource that could gain prominence with regards to the assessment of secondarily formed $PM_{2.5}$.

Assessment of Secondarily Formed $PM_{2.5}$

- Chemical transport modeling:
  - The Eulerian models (e.g. CAMx & CMAQ) are widely used for SIP attainment modeling purposed but have limited application thus far for single source impacts.
  - The next few slides provide a brief overview of several single source application techniques for the Eulerian photochemical models.

Use of Photochemical Grid Models for Single-Source Impact

- Brute Force "Zero-Out"
  - Simulate two sets of conditions, one with all emissions and one with the source of interest removed from the simulation. The difference between these simulations provides an estimate of the impact or contribution from the source.
- Source Apportionment Techniques
  - Some photochemical models have been instrumented with source apportionment, which tracks emissions from specific sources through chemical transformation, transport, and deposition processes to estimate a contribution to predicted air quality at downwind receptors.

Use of Photochemical Grid Models for Single-Source Impact

- Direct Decoupled Method (DDM)
  - Some photochemical models have been instrumented with DDM, which tracks the sensitivity of an emissions source through all chemical and physical processes in the modeling system. Sensitivity coefficients relating source emissions to air quality are estimated during the model simulation and output at the resolution of the host model.
- Sub-Grid Treatment
  - In situations of source-receptors within close proximity, a photochemical model instrumented with sub-grid plume treatment and sampling may better represent the contribution from the source.

$PM_{2.5}$ Increments

- PSD increments represent the "maximum allowable increase" of an air pollutant above the applicable "baseline concentration."
- EPA promulgated annual and 24-hr PSD increments for $PM_{2.5}$ in a final rule effective Oct. 20, 2011:
  - Annual $PM_{2.5}$ increment for Class II areas is 4 $\mu g/m^3$.
  - 24-hr $PM_{2.5}$ increment for Class II areas is 9 $\mu g/m^3$.
- CAA §163(a) stipulates that short-term increments "can be exceeded during one such period per year:"
  - Annual increment is based on highest annual value and 24-hr increment is based on highest, second-highest (H2H) value.

$PM_{2.5}$ Increments

- $PM_{2.5}$ increment analyses include many of the elements discussed above for NAAQS analyses, with some important differences:
  - Increment compliance is based on the increase in concentrations relative to baseline value due to proposed emissions from new or modified source, plus impacts due to increment-consuming emissions from other sources within the affected "baseline area."
  - Emission increases (or decreases) after the "minor source baseline date" may consume (or expand) increment.
  - Increment compliance is based on the net impact of actual emissions increases and decreases from new and nearby increment-affecting sources.

$PM_{2.5}$ Increments

- With these differences in mind, many of the recommendations for assessing secondary $PM_{2.5}$ impacts associated with precursor emissions on NAAQS analyses, based on the four assessment cases, are also applicable for increment analyses.
- Early coordination with the reviewing authority is encouraged to identify the appropriate baseline concentration and baseline area for the proposed new/modified source, and the inventory of increment-affecting sources.

Draft Guidance for $PM_{2.5}$ Permit Modeling

- Publically released on Monday, March 4, 2013.
- Draft guidance document package is available on the EPA's SCRAM website:
  - http://www.epa.gov/ttn/scram/guidance/guide/Draft_Guidance_for_PM25_Permit_Modeling.pdf
- There is an accompanying policy related $PM_{2.5}$ SILs/SMC Court Decision Question and Answer Document:
  - http://www.epa.gov/nsr/guidance.html
- *90* ~~45~~ day comment window that ends on *Friday, May 31, 2013* ~~Wednesday, April 17, 2013~~.

Draft Guidance for $PM_{2.5}$ Permit Modeling

- The release of the draft guidance package and associated comment period is not a rulemaking package and will therefore not have a response to comment document.
- All comments should be prepared and submitted to George Bridgers (bridgers.george@epa.gov) of OAQPS's Air Quality Modeling Group on or before *May 31, 2013* ~~April 17, 2013~~.
- Please contact George with any additional questions or needed clarifications regarding the draft guidance package or the submission of comments.

Draft Guidance for $PM_{2.5}$ Permit Modeling

- To the extent possible, the comments received by *May 31, 2013* ~~April 17, 2013~~ will be discussed during the 2013 Regional, State, and Local (RSL) Modelers' Workshop in Dallas, TX.
  - http://www.cleanairinfo.com/regionalstatelocalmodelingworkshop/index.htm
- There will be several opportunities for open discussion of the draft guidance package at the 2013 RSL Modelers' Workshop.
- The comments received and the conversation points from Workshop will be considered and incorporated, as appropriate, into the revised guidance document.

Draft Guidance for $PM_{2.5}$ Permit Modeling

- The *Draft Guidance on $PM_{2.5}$ Permit Modeling* will be revised based on:
  - Comments received;
  - Information exchanged and received from the permit modeling community at the A&WMA's Specialty Modeling Conference (March 2013 – Raleigh, NC) and the 2013 RSL Modelers' Workshop (April 2013 – Dallas, TX);
  - Additional clarity gleaned through ongoing permit applications;
  - Court decisions and consent decrees;
  - Additional agency rule makings with respect to $PM_{2.5}$ and/or compliance demonstration tools and techniques; and
  - Future developments with single source photochemical grid modeling and related techniques.

Draft Guidance for $PM_{2.5}$ Permit Modeling

- The current goal is to release the revised *Guidance for $PM_{2.5}$ Permit Modeling* on or about July 31, 2013.
- The revised guidance document will be released through the same pathways as the draft guidance document:
  - EPA's SCRAM website
    - http://www.epa.gov/ttn/scram/
    - http://www.epa.gov/ttn/scram/guidance_permit.htm
  - Regional Office Modeling Contacts
  - State/local permitting agency email distributions
  - Industrial/environmental organization email distributions

Questions?

- Further questions, needed clarifications, and the submission of comments regarding the *Draft Guidance for PM2.5 Permit Modeling* can be made to:

  George M. Bridgers
  OAQPS – Air Quality Modeling Group
  Bridgers.George@epa.gov