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NAAQS Modeling Update

Jay Hofmann

CIBO ♦ March 6, 2013

AERMOD Update

- ❑ New versions of AERMET and AERMOD released on 12/17/12
- ❑ Miscellaneous bug fixes
- ❑ Added new LINE source type to AERMOD
 - ❖ Essentially AREA source with minimal width
- ❑ Updates to address low wind speeds
 - ❖ Minimum wind speed threshold - 0.5 m/s
 - ❖ Beta options to increase turbulence under low wind speed, stable conditions

AERMOD Update

- ❓ Minimum wind speed threshold
 - ❖ Set in AERMET
 - ❖ 0.5 m/s is threshold contained in guidance for collecting site specific wind data
 - ❖ Hours with wind speeds below this threshold are treated as “calm” (i.e., no concentration calculated in AERMOD)
- ❓ Low wind speed options
 - ❖ ADJ_U* in AERMET
 - ❖ LOWWIND1, LOWWIND2 in AERMOD

AERMOD Update

? Low wind speed options

- ❖ Increase turbulence during low wind speed, stable conditions
- ❖ Should lower concentrations for low level releases
- ❖ Could increase concentration for elevated releases

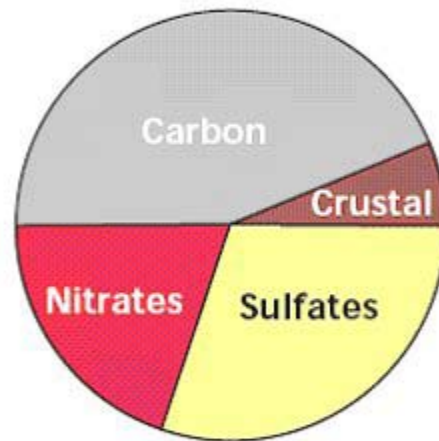
? Non-Regulatory Default

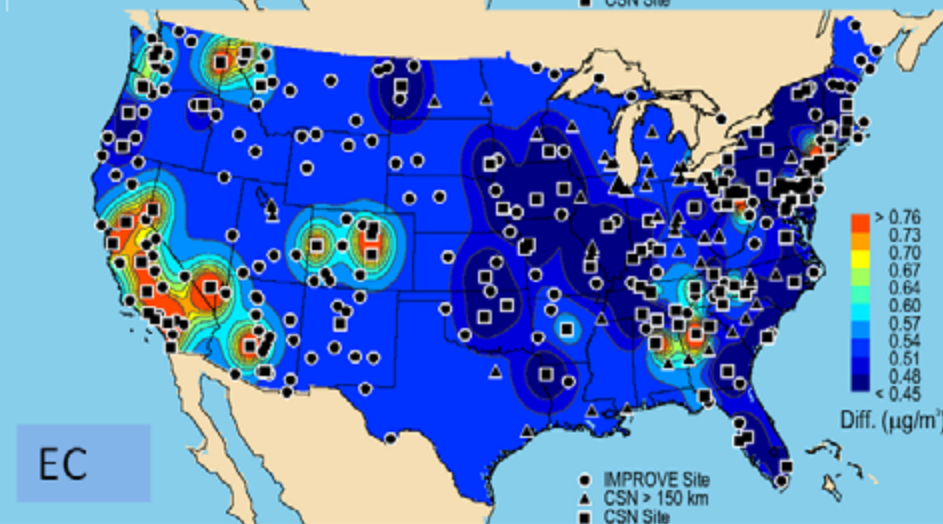
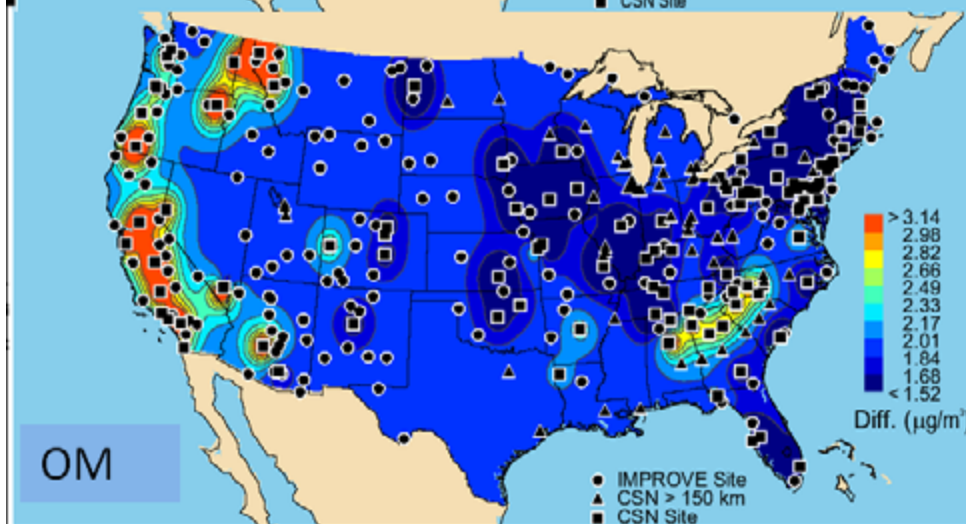
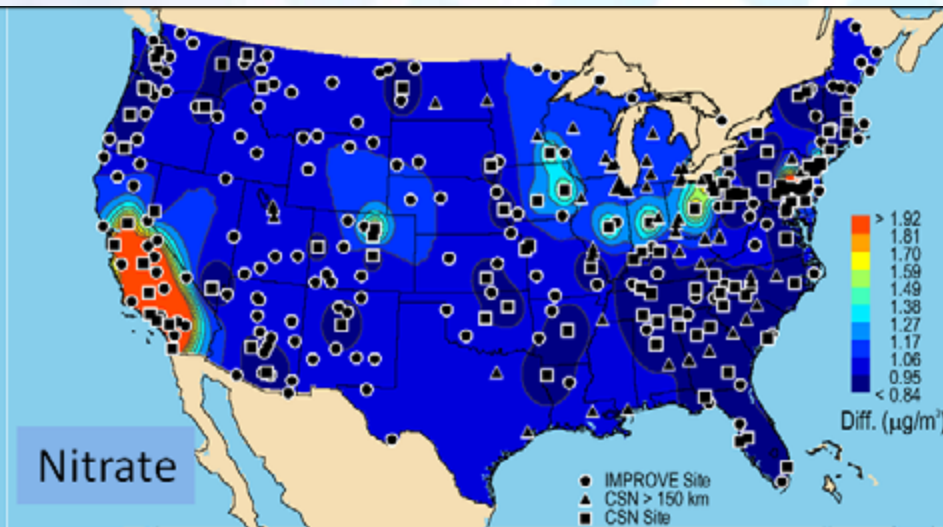
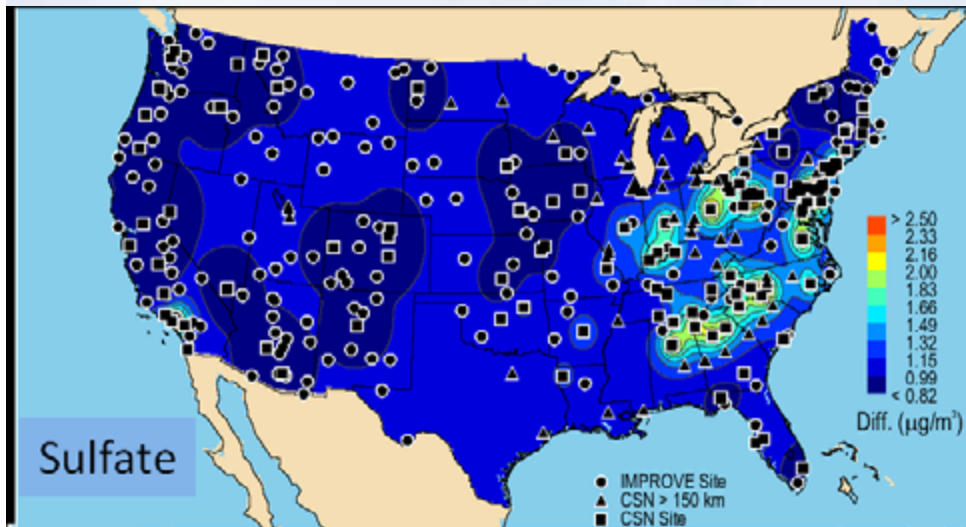
- ❖ Use is considered an “alternative model”
- ❖ Needs EPA Regional Office Approval
- ❖ Use App W Section 3.2 for justification

1-Hour SO₂ NAAQS Update

- ❑ EPA released new strategy paper on 2/6/13 concerning 1-hour SO₂ NAAQS attainment/nonattainment designations
- ❑ Monitoring is starting point, but current network is not sufficient
 - ❖ Add source oriented monitors or model
- ❑ Focus will be on larger sources
 - ❖ E.g., 2,000-3,000 tpy of SO₂ in populated areas
 - ❖ E.g., 5,000-10,000 tpy of SO₂ in rural areas
- ❑ EPA will conduct rulemaking to formalize process

Fine Particles Found in the Atmosphere - Constituents





Secondary PM2.5

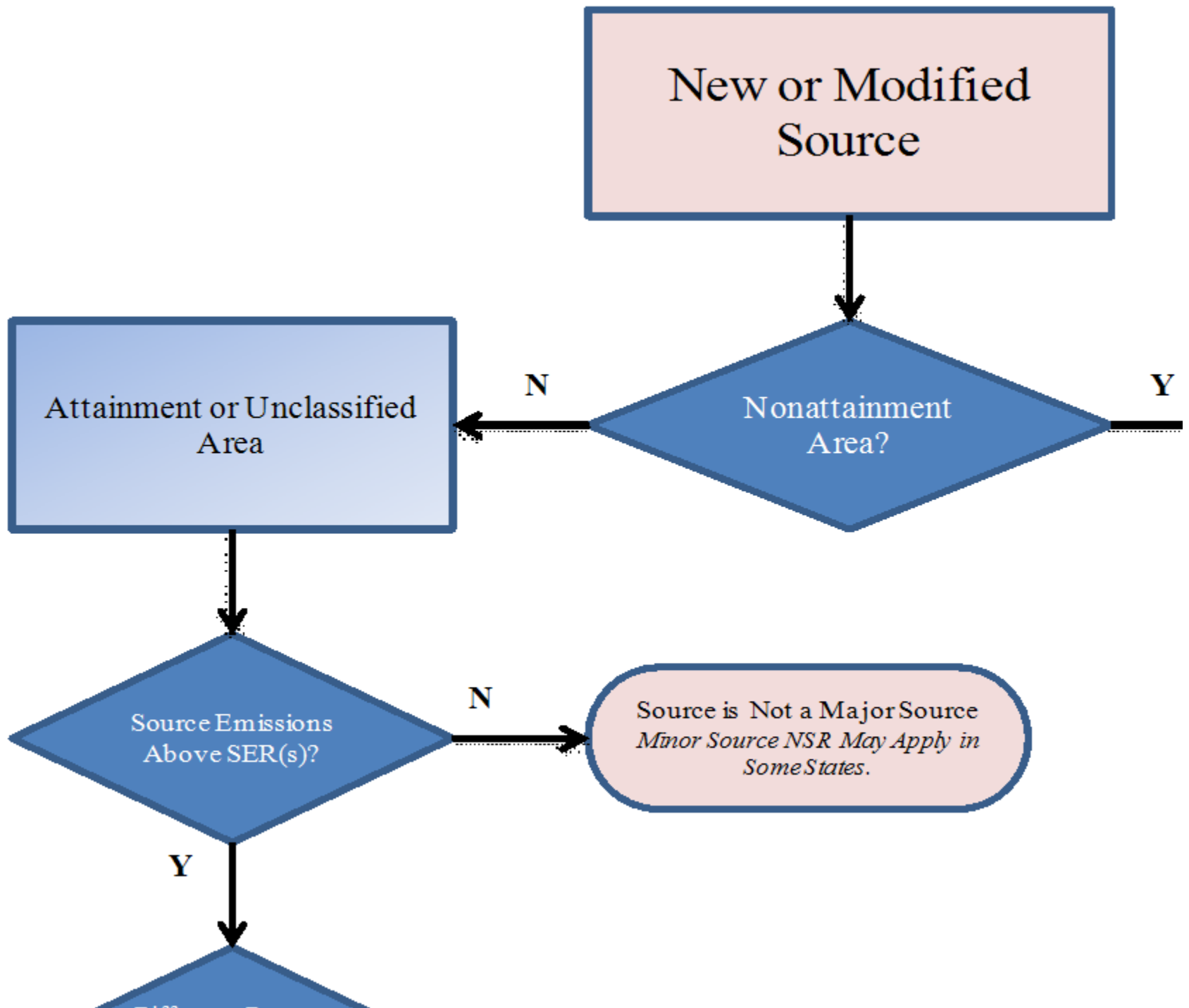
- ❑ “Secondary” PM2.5 formation
 - ❖ Sulfur, Nitrogen, and Carbon containing species (sulfates, nitrates, and “SOA”) are formed in the atmosphere as micron size and smaller particles
 - ❖ Precursors are SO₂, NO_x, VOC, NH₃

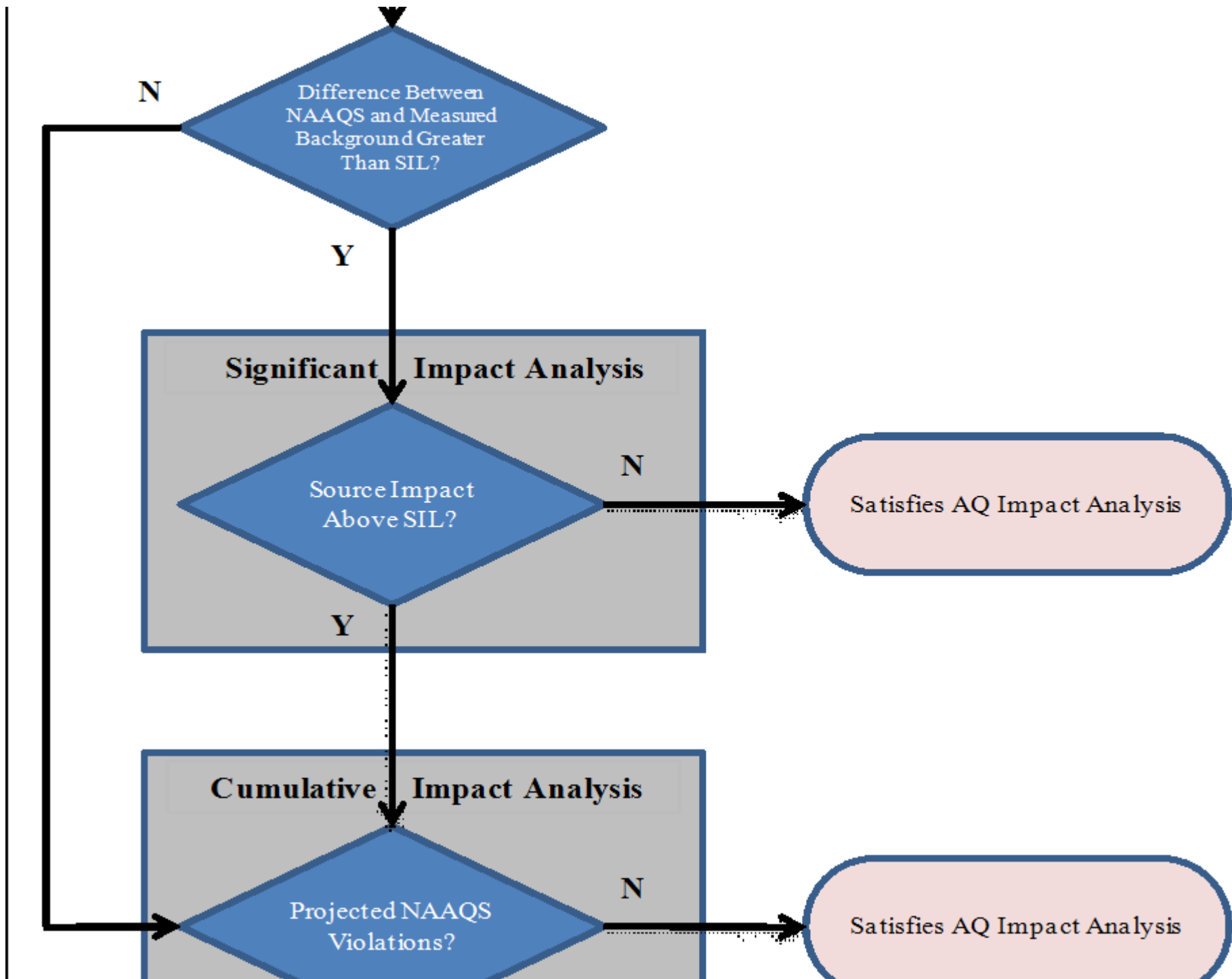
PM_{2.5} SIL/SMC Court Decision

- ❑ Decision by DC Circuit Court on 1/22/13 vacated and/or remanded sections of EPA's PM_{2.5} regulations
- ❑ Concept of significant monitoring concentrations (SMCs) vacated
 - ❖ Exceeded EPA's statutory authority
- ❑ PM_{2.5} significant impact levels (SILs) vacated and remanded in part
 - ❖ States should be able to require a full NAAQS analysis in PSD permitting even if project impacts are below SIL

PM_{2.5} SIL/SMC Court Decision

- ❑ How the SILs are supposed to work
 - ❖ “a source that demonstrates its impact does not exceed a SIL at the relevant location is not required to conduct more extensive air quality analysis or modeling to demonstrate that its emissions, in combination with the emissions of other sources in the vicinity, will not cause or contribute to a violation of the NAAQS at that location”
 - ❖ The more extensive analysis is what the EPA terms the cumulative impact analysis, or the cumulative air quality analysis.
- ❑ The legal basis for the SILs goes back to the 1979 Alabama Power case.





PM_{2.5} SIL/SMC Court Decision

- ❑ It's important to note cumulative impact exemption is only codified under the PSD rules (40 CFR 51.166 and 40 CFR 52.21)
- ❑ The SILs are also codified under EPA's NSR and permitting requirements (40 CFR 51.165) under a slightly different premise.
 - ❖ 51.165(b)(2) does not use the SILs to exempt a source from conducting a cumulative air quality analysis.
 - ❖ 51.165(b)(2) states that a proposed source or modification will be considered to cause a violation of a NAAQS when that source or modification would, at a minimum, exceed the SIL in any area that does not or would not meet the applicable NAAQS
- ❑ The DC Circuit Court did not vacate or remand the 51.165 rule - The judges made the fine distinction between the "automatic" exemption provided under 51.166/52.21 and 51.165
 - ❖ "the EPA acknowledges in its brief, "the regulatory text it adopted does not allow permitting authorities the discretion to require a cumulative impact analysis, notwithstanding that the source's impact is below the SIL, where there is information that shows the proposed source would lead to a violation of the NAAQS or increments."
 - ❖ "Because the EPA asserts that it did not intend to **automatically** exempt a proposed source from the requirements of the Act without affording the permitting authorities discretion in applying the SILs, it requests that we vacate and remand the regulatory text promulgated in the rule at 40 C.F.R. §§ 51.166(k)(2) and 52.21(k)(2). "

PM_{2.5} SIL/SMC Court Decision

- ❑ “Questions and Answers” document released by EPA on 3/4/13
 - ❖ “EPA has received questions from a number of stakeholders”
 - ❖ “This document is intended to communicate the Court’s decision and EPA’s preliminary answers to the most common questions.”
- ❑ SILs
 - ❖ Court’s decision does not preclude use of SILs for PM_{2.5} entirely
 - ❖ Additional care should be taken by permitting authorities in how they apply SILs

PM_{2.5} SIL/SMC Court Decision

❓ SIL Example

- ❖ If monitoring data show that the difference between NAAQS and monitored background is greater than PM_{2.5} SIL, it is sufficient in most cases to conclude impacts below SIL would not cause or contribute to NAAQS exceedance

❓ SMCs

- ❖ All applicants should submit PM_{2.5} monitoring data whenever either direct PM_{2.5} or any precursor is emitted in a significant amount
- ❖ Representative existing network data may be used in lieu of siting new monitors for each facility

Draft PM_{2.5} Modeling Guidance

- ❑ Draft guidance released by EPA on 3/4/13
- ❑ Internal draft of guidance presented at 10th Modeling Conference to March 2012
- ❑ EPA accepted comments on 10th Modeling Conference, including draft PM_{2.5} guidance presentation
 - ❖ Took comments, suggestions, and feedback into account in current draft guidance
- ❑ EPA is accepting comments until 4/17/13 on draft guidance
- ❑ Release of final guidance is expected by 7/31/13

Draft PM_{2.5} Modeling Guidance

☐ Four “Assessment Cases” identified

Assessment Case	Description of Assessment Case	Primary Impacts Approach	Secondary Impacts Approach
Case 1: No Air Quality Analysis	Direct PM _{2.5} emissions < 10 tpy SER NO _x and SO ₂ emissions < 40 tpy SER	N/A	N/A
Case 2: Primary Air Quality Impacts Only	Direct PM _{2.5} emissions ≥ 10 tpy SER NO _x and SO ₂ emissions < 40 tpy SER	Appendix W preferred or approved alternative dispersion model	N/A
Case 3: Primary and Secondary Air Quality Impacts	Direct PM _{2.5} emissions ≥ 10 tpy SER NO _x and/or SO ₂ emissions ≥ 40 tpy SER	Appendix W preferred or approved alternative dispersion model	<ul style="list-style-type: none"> • Qualitative • Hybrid qualitative / quantitative • Full quantitative photochemical grid modeling
Case 4: Secondary Air Quality Impacts Only	Direct PM _{2.5} emissions < 10 tpy SER NO _x and/or SO ₂ emissions ≥ 40 tpy SER	N/A	<ul style="list-style-type: none"> • Qualitative • Hybrid qualitative / quantitative • Full quantitative photochemical grid modeling

Direct PM_{2.5} Assessment Methods

- ❑ Use AERMOD
- ❑ To compare with SIL, use highest of 5-year average of maximum modeled 24-hour or annual PM_{2.5} concentrations - Consistent with prior guidance
- ❑ To compare with NAAQS (24-hour assessment), new “First Tier” approach includes the use of the design model concentration (98%-tile) and the design monitored concentration (98%-tile)
 - ❖ Less stringent than previous guidance, which required highest model concentration added to monitored design concentration
 - ❖ Secondary formation better addressed under new guidance

Regional Inventories for Modeling

- ❑ NAAQS regional inventory should focus on area within about 10 km of the project location in most cases
- ❑ Caution against literal and uncritical application of very prescriptive procedures to define regional inventory
 - ❖ E.g., Draft NSR Workshop Manual procedure of adding 50 km to Radius of Impact
 - ❖ Could increase likelihood of double counting modeled and monitored concentrations in many cases
- ❑ Recommendations for developing PM_{2.5} emission inventories for PSD applications will be addressed separately

Secondary PM_{2.5} Assessment Methods

- ❑ Completely qualitative
 - ❖ Develop “appropriate conceptual description of PM_{2.5}”
- ❑ The following may be important considerations:
 - ❖ Characterization of current 24-hour and annual design values
 - ❖ Seasonality and speciated composition of the current PM_{2.5} concentrations and any long term trends occurring
 - ❖ What are typical background concentrations of precursors and how will project affect concentrations?
 - ❖ Characterize meteorological conditions representative of region and associated with periods of higher and lower PM_{2.5} concentrations
 - ❖ Analysis of existing photochemical grid modeling for regional haze, ozone, and PM_{2.5} SIPs
- ❑ Example from Region 10 provided - Not a realistic case for many “urban” PSDs

Secondary PM_{2.5} Assessment Methods

❓ Hybrid qualitative/quantitative approach

- ❖ Add analysis of local/region specific “offset ratios” for precursor emissions (i.e. how readily the precursors form the fine particles in the modeled domain)
- ❖ This approach may include a modeled “overlay” of direct PM_{2.5} and a simplified approach for assessing the secondary formation
- ❖ States should adopt local/regional ratios using the approach outlined in Gina McCarthy’s July 21, 2011, memorandum

❓ Quantitative approach

- ❖ Photochemical Model (e.g., CAMx or CMAQ)
- ❖ Only expected to be needed in “rare” cases

❓ EPA recommends consultation with Regional Office including approval of modeling protocol

Combined PM_{2.5} Assessment Methods

- ❑ Projects triggering PSD for both direct PM_{2.5} and one or more precursors (Case 3)
 - ❖ It may be most appropriate to skip directly to NAAQS and Increment analysis unless full photochemical modeling is completed
 - ❖ “Basing the initial significant impact analysis on a qualitative assessment (or a hybrid of qualitative and quantitative assessments) of secondary PM_{2.5} ambient impacts may be difficult to justify in most cases”
- ❑ Same is true for projects triggering PSD for only precursors (Case 4)
 - ❖ Unless a demonstrably conservative estimate of the secondary PM_{2.5} contribution can be made that is below the applicable SIL

Combined PM_{2.5} Assessment Methods

- ❑ PM_{2.5} Increment assessments may be simplified (possibly model direct PM_{2.5} only) based on
 - ❖ A qualitative assessment of regional increases/decreases in precursor emissions
 - ❖ An overall assessment of the likely role the precursor emissions play in increment consumption/expansion in the area (i.e. seasonal meteorological factors and atmospheric chemistry)

Questions

