

***Preliminary Comments from Dr. Donna Kenski on EPA's Integrated Science Assessment for Oxides of Nitrogen, Oxides of Sulfur, and Particulate Matter – Ecological Criteria (First External Review Draft)***

Preliminary comments on ISA for NO<sub>x</sub>/SO<sub>x</sub>/PM Ecological FX  
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**Preface**

This section is mostly fine as it is strictly historical, but it gives short shrift to the reasons behind the failure to set a new secondary standard after the last review. A more expansive explanation of the metric that was developed and why it was found inadequate would be useful background for this new review cycle. In particular, because the primary issue was uncertainty, it helps to set the stage for this review and highlights the need to clarify and quantify uncertainties wherever possible. The Integrated Review Plan contained such a summary in its section 4.1.1.7 that could form the basis of such a discussion.

Minor comments:

p. xlv: SRP is defined in the glossary as soluble reactive phosphorus but actually used in the text for sulfate-reducing prokaryotes

**Executive Summary**

Great job summarizing a huge amount of information. I appreciate the clear distinction between new data and findings and old data and findings that were covered in the previous ISA. The use of hyperlinks to jump to relevant sections of the document and references is a great help.

p. lxii, line 19: More current SO<sub>2</sub> emissions data is available and is given later in the report; please update these values to reflect the most recent data.

p. lxvi, first table entry, lateration -> alteration

p. lxvii, line 21, statement is misspelled

line 23, remove extra period

p. lxxii, line lxxii: existing is misspelled

**Chapter 1**

This more expansive summary of the document is also well done and generally has an appropriate level of detail. As in the Executive Summary, the use of hyperlinks is very helpful, although they are not always consistently applied. More frequent use of links to the summarized sections would be helpful.

Also, the use of boldface type for emphasis when confirming one of the causal determinations is a nice touch.

Section 1.2.2, Measurement and Modeling Techniques, refers to deposition rates that are ‘highly uncertain’. Every effort should be made to give quantitative uncertainties wherever possible. Similarly, Section 1.2.3, Spatial and Temporal Variability in Deposition, summarizes the TDEP estimation of annual dry and wet deposition of S and N, but characterizes fluxes as subject to ‘sizable uncertainty’. This summary chapter should have a more quantitative discussion of the uncertainties that are inherent in the estimation of deposition and deposition flux. These uncertainties are discussed at some length at various places in Chapter 2, with an important figure 2-33 that shows both N & S fluxes and uncertainties; either address them individually in the section summaries or add a section just for uncertainty sources and magnitudes.

p. 1-12, lines 7, 12, and 13: “or NH<sub>3</sub>” should be “and NH<sub>3</sub>”

line 31: remove comma after NO<sub>x</sub>

p. 1-19, line 12: thesame -> the same

p. 1-21, line 5: “is it” -> it is

p. 1-56, line 24: where -> were

p. 1-63, line 8: should be “...watersheds, estimates of...”

line 9: ANC -> ANCs

p. 1-78; lines 18-21: Should this causal statement be bold?

p. 1-81, line 3: SRP hasn’t been previously defined, should be sulfate-reducing prokaryotes

p. 1-81, line 4: Should this be Section 12.2.5?

p. 1-85, Section 1.12: this section just ends abruptly without a real summary or conclusion.

## **Chapter 2, Source to Deposition**

Chapter 2 is generally well written and thorough, but perhaps could benefit by being shortened and summarized. There’s a lot of detailed chemistry of the various nitrate and sulfate species, but it’s difficult to assess the relative importance of the various species and their reaction pathways. Of course it will vary by geography and weather and a host of other factors, but some attempt to summarize is warranted. Section 2.4, Atmospheric Transport, seemed out of place. Perhaps it would be better as part of a discussion of chemical transport models. Comparisons of various models are sprinkled throughout the document, but there isn’t any comprehensive discussion of model performance for concentration or deposition for the major contenders: CAMx, CMAQ, GEOS-CHEM, hybrid satellite/CTMs. Maybe this discussion is planned for a subsequent review document?

Section 2.5 is not very straightforward in its discussion of the various monitoring networks. I was taken aback at the realization that the FRM NO<sub>2</sub> network is not considered relevant for deposition. This

section never clearly states why, although the reasoning is given succinctly in the Chapter 2 summary on p. 2-88. This helpful discussion from the summary, Section 2.11, should first appear in Section 2.5.1.

Section 2.7.2 seemed excessively detailed and could be shortened if flux measurements were described conceptually without the math.

Section 2.8.4 presents important data on hybrid satellite/model estimates of deposition flux and uncertainty, but the accompanying Fig. 2-33 is barely legible. Higher resolution images of this data should be obtained if possible. Also, the uncertainties are given in mass units and the text summarizes uncertainty over the entire study area as 30%; more information on the spatial distribution of uncertainties is desirable. One question I still have, which I hoped the ISA would answer, is whether the hybrid satellite/CTM models are demonstrably better than CTMs alone in estimating deposition of the relevant species.

Section 2.9 on transference ratios is interesting and new since the last review. Is this mechanism for linking ambient concentrations to deposition a potential basis for a secondary standard? If so, more updated information will need to be provided. As the text notes, older versions of models were used and some errors in inputs were identified. The data presented don't provide a high degree of confidence, but the method seems promising.

Oddly, the summary section again brings up data that was not earlier discussed in the chapter (unless I missed it, always a possibility...). On p. 2-89, the middle paragraph compares, in very general terms, two micrometeorological models (MLM and BLM) but this comparison and the BLM were not mentioned previously.

p. 2-6, line 23: not clear. NH<sub>3</sub> is not an example of a fugitive source.

Line 28: oxidized is misspelled.

Line 31: entries is an odd word; estimates or data would be a better choice.

Line 35: chemical transport model, not chemistry transport model or chemistry-transport model. This error occurs multiple times throughout the chapter.

p. 2-23, line 21: delete 'for'; should be Community Multiscale Air Quality (CMAQ) modeling system. This error also occurs in several places.

p. 2-27, line 8: capitalize 'the'.

Line 28: Bonville -> Bondville

p. 2-32, Fig. 2-8: Add units to these plots (ppbv)

p. 2-38, Fig. 2-10: These plots aren't legible

pp. 2-39, 2-40, 2-45, 2-67, 2-68: The color scales for these plots lose too much detail; they should be redrawn to show more variation at low concentrations. Also, the captions incorrectly define CASTNET as Clear Air Status and Trends, rather than Clean Air Status and Trends. This is another error that occurs multiple times in figures and text. Please search and replace.

5/23/17 Preliminary draft comments from individual members of the CASAC Secondary NAAQS Review Panel for Oxides of Nitrogen and Sulfur. These comments do not represent consensus CASAC advice or EPA policy. DO NOT CITE OR QUOTE

p. 2-44, Fig. 2-15: CASTNET and CMAQ definitions are both wrong. Last sentence of caption has repeated phrase 'can be' . Delete close paren after billion

p. 2-48, line 27: delete 'to'. Also, rho in Eqn 2-12 is not defined. Should be density of air, same as Eqn 2-13

p.2-49, line 26: should be hyphens or dashes between NH<sub>3</sub>-HNO<sub>3</sub>-NH<sub>4</sub>NO<sub>3</sub>.

p. 2-64: Figs 2-22a and b are exact inverses of each other so only 1 is really necessary.

p. 2-87, line 2: need a comma after CONUS.

Line 16: pulse -> pulsed

Line 36: delete 'could', add comma after sources.

Lingering questions, thoughts:

Overwhelming evidence of significant fx at current levels of N & S deposition, exhaustively documented. What are we going to do with this? Where is EPA headed in terms of a standard? Not clear (again!) how we move from critical loads to a 2ary standard for atmospheric NO<sub>2</sub>/SO<sub>2</sub>/PM<sub>2.5</sub>. How does it get parsed, or does epa have a deposition or CL standard up its sleeve? Have we overcome the barrier of 'must be an atmospheric concentration standard' ?

Not directly relevant but still...Much of the data analysis presented in the ISA hinges on NADP, CASTNET, and IMPROVE data. These networks are partially funded by EPA, but each has a significant fraction of sites funded by non-EPA partners (some federal and some not). The continuity of each of these networks is constantly in peril due to funding uncertainty. Of course, assessing changes over time requires long term monitoring and stable networks. EPA must prioritize network funding, for these and the other networks that come under its umbrella.