

Summary of Revisions to Integrated Nitrogen Committee's Report in Response to Quality Review Comments from the Chartered Science Advisory Board

Minutes of the Chartered SAB meeting held on September 23, 2009 contain the following Chair's summary of actions needed to address quality review comments on the August 27, 2009 draft of the Integrated Nitrogen Committee's Report, *Reactive Nitrogen in the United States: An Analysis of Inputs, Flows, Consequences, and Management Options*. As summarized below, the draft report has been revised and restructured in response to the Board's comments.

SAB Chair's Summary of Actions to Needed to Address Quality Review Comments

1. *The report needs major revision and a second review by the Board*
2. *Three of the four Study Objectives are mostly met in the draft*
3. *The INC will revise the report so that it meets Study Objectives 2 (integrated Nr management), and 4 (research recommendations) more effectively*
4. *The structure of the report will be revisited to provide better mapping between objectives and chapters and objectives and findings/recommendations.*
5. *The executive summary is too long and it will be shortened*
6. *There is much dense science in the document and INC will consider whether moving significant portions to supplement the existing Technical Appendix would result in a more compact and thus more understandable report.*
7. *There are typos and repetition in the document and the staff office will provide editorial support for their correction and resolution (and possibly for an integrated framework for the report) at an appropriate point which still be decided between the SAB Director and the INC*
8. *In general, the report is logical, but there is a need for more work to support some of the conclusions and recommendations with more clarity.*
9. *The characterization of the 25% reductions as recognized opportunities in contrast to the currently implied prescriptive targets for nitrogen reduction is to be changed throughout.*
10. *Additional serious consideration and support is needed to justify the recommendation relating to using NO_y instead of NO₂ as the indicator for oxides of nitrogen for the NAAQS.*
11. *The issue of nitrogen in freshwater will be expanded and clarified.*

Summary of Changes in the Integrated Nitrogen Committee Report in Response to the SAB Chair's Action Items

- **A major revision of the report has been completed. The report has been restructured and revised to address the Board's consensus view that it be reorganized to provide clarification and better mapping between the study objectives and the findings/recommendations.**
- **The previous draft of the report contained three chapters. The revised report now contains six chapters. The introductory chapter provides an overview of**

problems caused by excess reactive nitrogen and describes the study objectives and approach. Chapter 2 addresses sources, transfer, and transformation of reactive nitrogen. Chapter 3 addresses the impacts of reactive nitrogen on aquatic, atmospheric, and terrestrial systems. Chapter 4 addresses metrics and current risk reduction strategies for reactive nitrogen. Chapter 5 addresses integrated risk reduction strategies for reactive nitrogen. Chapter 6 addresses recommendations for reactive nitrogen data collection, risk management, and research. Findings and recommendations corresponding to each of the four study objectives are discussed in Chapters 2-6 and consolidated in Chapter 6.

- Some material has been moved into technical appendices and changes have been incorporated to clarify and support recommendations.
- Definitions of chemical and other abbreviations and acronyms have been included at the beginning of the report.
- Numerous editorial changes and corrections have been made. Tables and Figures have been clarified and some have been removed.
- Goals for decreasing the amount of reactive nitrogen entering the environment have been characterized as recognized opportunities for reduced loading rather than prescriptive targets.
- Additional text has been incorporated to further discuss the use of NO_y instead of NO₂ as the indicator for oxides of nitrogen for the NAAQS.
- The executive summary and letter to the Administrator have been revised and made shorter.
- New sections have been included to address the issue of nitrogen in freshwater.
- Changes have been incorporated to address the many specific individual comments of chartered SAB members.

Changes in Response to the Consensus Comments from the Chartered SAB

The following “consensus comments” were provided in the minutes of the chartered SAB quality review meeting on September 23, 2009.

Consensus Comment 1. An overarching concern was identified with the report’s clarity. The existing structure of 3 chapters (introduction, reactive nitrogen behavior, and integrated risk reduction) does not provide a clear correspondence to the INC’s 4 objectives (problem analysis for Nr, integrated Nr management, additional risk reduction options, and research recommendations). Information relevant to each objective is scattered throughout the report. The result is that the coherence and integration of the report’s message, in relation to specific INC objectives, is obscured.

- **Action: The report has been reorganized in six chapters and revised to improve focus and clarity. Boxes highlighting findings and recommendations are provided in chapters 2-6. The findings and recommendations corresponding to each of the four study objectives are consolidated in Chapter 6.**

Consensus Comment 2. Comments received from several EPA offices and two members of the public should be addressed,

- **Action: Relevant information provided by EPA and the public has been incorporated into the report. An additional appendix has been included to describe actions taken by EPA to promulgate mobile source rules.**

Consensus Comment 3. Based on the volume of comments received it appears that clarification is needed to show support for some conclusions and recommendations, to communicate the Committee's level of confidence in different findings, and to present specific recommendations in some order of priority.

- **Action: Changes have been incorporated to clarify, regroup, reorder and, as necessary, eliminate some findings and recommendations. The discussion of goals for reduction of reactive nitrogen entering the environment was revised to indicate that the goals represented opportunities for reduced loading rather than prescriptive targets.**

Consensus Comment 4. There was little discussion of reactive nitrogen in freshwater systems. More is needed.

- **Action: Sections 3.1.1, 3.1.2, and 3.1.3 were added to discuss nitrogen contamination of groundwater, ammonia toxicity in freshwater systems, and impacts of reactive nitrogen on freshwater ecosystems.**

Consensus Comment 5. In section 2.4.7.2 (previous draft), the report seems to focus on grain crops. It does not acknowledge the possibility of changing N-fertilizer use by switching to alternative crops. It was suggested that including a list of interactions in this section should be considered as part of a tradeoff analysis.

- **Action: Section 5.3.4 and other parts of the report were revised to discuss matching land and land characteristics with crops and cropping practices.**

Consensus Comment 6. The report recommends a change in the NO_x NAAQS to NO_y. Members indicated that justification for this recommendation was needed.

- **Action: Additional text and numerous references were added to section 2.3.1 to further support the recommendation to consider using NO_y as a supplement or replacement for the current NO₂ standard.**

Consensus Comment 7. Research recommendations in the executive summary focus on existing technologies for risk reduction. The report should also focus on the need for additional research and development for new technologies.

- **Action: The need for additional research and development of new technologies is discussed throughout the report. Findings and recommendations that target research have been consolidated and clearly identified in section 6.4**

Consensus Comment 8. Text Box 6 is titled Water Quality Trading in the Illinois River Basin. There is no discussion of local effects from the wetlands restoration strategy. Load to the Gulf is the focus but there is still excess nitrogen in the streams and immediately downstream of the outfall there would be damage. The report should acknowledge this situation

- **Action: In the body of the report the importance of considering local effects has been acknowledged and it has been recommended that EPA develop a uniform assessment and management framework that considers the effect of reactive nitrogen loading over a range of scales reflecting ecosystem, watershed, and regional levels (recommendation 11 in Section 3.2).**

Consensus Comment 9. The report's overall 25% reduction is not clear as to whether this is a target to be applied to releases in a variety of programs or if it is the sum of the targeted low hanging fruit that INC identifies. If it is the former than then there seems to be a need to add justification for that percentage versus some alternative percentage (i.e., was it the result of some cost-benefit analysis?) If it is low hanging fruit then the report then the report should identify the criteria for choosing these relatively ease-to-attain reductions.

- **Action: In Section 6.3 and the Executive Summary, clarifications have been incorporated to characterize the overall 25% reduction as recognized opportunities for reduced loading rather than prescriptive targets. The rationale and recommended management options for achieving target goals to accomplish the reduction are discussed in section 6.3. The report discusses how the National Hypoxia Assessment addressed cost effectiveness and least cost alternatives. As stated in the executive summary and in chapter 1, assessment of the challenges and costs to the Agency of implementing the recommendations is beyond the scope of the report.**

Consensus Comment 10. The Clean Air Scientific Advisory Committee (CASAC) has discussed the issue of NO_y as an indicator of NO_x. Though other oxidation forms are important CASAC considered NO₂ for practical purposes, given the difficulties in monitoring for NO_y. A change to NO_y will require strong justification.

- **Action: Additional text and references were added to section 2.3.1 to further support the recommendation to consider using NO_y as a supplement or**

replacement for the current NO₂ standard. This section contains a detailed discussion of NO_y monitoring. Additional references are provided.

Consensus Comment 11. Reactive nitrogen cries out for a public education effort to show the complexities involved in managing a pollutant that is common to several environmental media and which has a multitude of impacts.

- **Action: The importance of a public education effort has been addressed in the report. The letter to the Administrator states that, "The most important task for EPA and allied agencies and departments will be to effectively inform the public of the costs and dangers of excess Nr. Without strong public support, the widespread efforts necessary to control Nr will not be possible."**

Consensus Comment 12. The clarity of the report's message is impeded by organizational issues. In some cases the report repeats materials and in other cases the issue, as applied to one section, seems to conflict with the way the issue is discussed in another section. For example, discussions about non-agricultural lands in Chapters 1 and 2 seem to have this problem. Also, the message that one section attempts to convey is not always clear, nor is it clear how one section links to other sections.

- **Action: The report has been restructured to clarify the discussion of the specific issues addressed in each chapter and section. The report has been edited to clarify the linkages between the sections.**

Consensus Comment 13. Table 1 (page 28) is not clear relative to the cited 25% target that is noted in the report. Perhaps a pie chart could be used to explain how the various sources contribute to the whole and how the 25% reduction can be attained. There also seems to be differential confidence in some numbers vs. others.

- **Action: The revised executive summary and Chapter 2 provide an explanation of sources transfer and transformation of reactive nitrogen.**

Consensus Comment 14. There is much redundancy in the document and it would be good to try to edit some of this out. Some of the numbers do not "jibe" across sections. It is difficult to answer the question of whether the INC objectives were achieved. Information is probably in the report but the message is fragmented (especially for Objective 2). The report is not organized by objectives, thus the information that addresses each objective is not clear. The commitment to organize recommendations by objective will help the SAB when it reviews the revised INC report.

- **Action: The report has been restructured and edited to address this comment. Some material has been moved into technical appendices. The findings and recommendations have been organized by study objective in Chapter 6.**

Consensus Comment 15. The report covers issues on reactive nitrogen from science to prescribing policy. The SAB does not usually go into policy and if we do such things we

should provide a strong justification. There is an example in the letter where the INC says EPA should “Use available technology to decrease by 25% the total amount of reactive nitrogen entering the U.S. Environment. On page 161, INC states that “These recommendations, if implemented, would reduce total Nr loadings to the environment in the United States by approximately 25% below current levels.” The two ways the comment is formed imply a prescriptive recommendation (letter) vs. a suggestion that the total reductions from implementing currently available technologies yields about a 25% reduction overall. The former is prescriptive policy in its tone and the latter is more a scientific conclusion.

- **Action: In Section 6.3 and the Executive Summary, clarifications have been incorporated to characterize the overall 25% reduction as recognized opportunities for reduced loading rather than prescriptive targets.**

Consensus Comment 16. The recommendation for a government-wide Task force may be inappropriate. Our report is to the EPA Administrator and could appropriately suggest cross-EPA task forces, but the EPA does not have the authority to direct other agencies to be parts of a task force to work on the issue.

- **Action: The report has been revised to address this comment. EPA does not direct other agencies to be part of a task force but the report recommends that EPA convene a reactive nitrogen inter-agency management task force.**

Consensus Comment 17. With regard to the recommended Task Force, the National Research Council has a continuing effort on water quality in the Mississippi River. They too recommend coordination efforts.

- **Action: The National Research Council effort is mentioned and referenced in the revised report.**

Consensus Comment 18. There can be unintended consequences associated with a focus on one pollutant, even an integrated focus on various forms of nitrogen. These consequences can be in regard to other pollutants that might change differently as a result of changed nitrogen management practices. The possibility of unintended consequences needs to be acknowledged and discussed more fully in the report. Relevant information may be included in the SAB report, [Hypoxia in the Northern Gulf of Mexico: An Update by the EPA Science Advisory Board.](#)

- **Action: Unintended consequences associated with a focus on one pollutant are more fully discussed in the revised executive summary and in sections 1.3, and 4.8. The SAB report on hypoxia in the Gulf of Mexico is discussed and referenced in Text Box 1 and other parts of the report.**

Consensus Comment 19. The notion of low hanging fruit and existing technologies yielding a 25% reduction in reactive nitrogen is useful. It is also necessary to consider if

these opportunities actually exist because of their cost-effectiveness. Some low hanging fruit may be too expensive to be feasible. Targeted grants also may be too prescriptive.

- **Action: Section 5.3.4 of the revised report contains a discussion of feasibility versus cost in the context of the National Hypoxia Assessment.**

Consensus Comment 20. Recommendations for research on best management practices to improve our understanding of what can be done is fine, but it might be more useful to also do research on the effectiveness of practices now available. This has been called for by the SAB in a number of its reports on the EPA research strategies and the research budget.

- **Action: The revised report calls for monitoring and research to understand the effectiveness of best management practices (recommendation 15d).**

Consensus Comment 21. The enhanced discussion of research should address the current disparity between available data on ecosystem response to reactive nitrogen, compared to data available on nitrogen usage. Data in comparable temporal and spatial scales are needed for analysis.

- **Action: Text addressing this comment has been included in sections 4.2, 4.5, and 4.6.**

Consensus Comment 22. The report should identify research priorities related to better understanding of the environmental impacts of existing conservation programs to address the adequacy of current voluntary nitrogen management approaches and to help identify alternatives.

- **Action: The revised report discusses existing conservation reserve programs. The report recommends an adaptive management approach to continuously improve the effectiveness and lower the cost of implementation.**

Consensus Comment 23. Table A in the executive summary has an entry for “Human Mortality” and the metric included is problematic. There is little discussion of the entries so the number is not explained and it could easily mislead readers. This is likely due to the fine particle risk reduction associated with the air quality program (NAAQS) and not solely to reduction in nitrogen.

- **Action: Row 14, column 4 of Table 1 has been revised to provide additional information addressing this comment.**

Consensus Comment 24: The letter identifies three key findings. Then there is a list of recommendations. These do not map well to the text of the report. There is an expectation that the findings and recommendations will easily link to the text so more can be learned about them.

- **Action: The letter has been revised.**

Consensus Comment 25: There is apparent disconnect in some of the TMDL efforts that take place in specific locations. It might be good to mention this disconnect. For example, on the Racoon River (Iowa) there are small communities directed to remove all nitrogen from their waste treatment effluents while just upstream there are major tile-based agricultural operations releasing a large amount of nitrogen into the same river with no restrictions. This has significant implications to the success of nitrogen management in specific watersheds. Another issue related to success of nitrogen management is that even in those cases where seed companies develop corn varieties that maintain yield levels with lower nitrogen levels, it is often the case that the same varieties do even better with increased nitrogen. Financial pressures will exist for farms using such varieties to increase nitrogen to increase yield.

- **Action: Text has been included in Section 4.3 to address this comment. The Racoon River (Iowa) is included as an example.**

Consensus Comment 26. It might be helpful to include a text box early in the report to clearly define reactive nitrogen.

- **Action: The revised report contains a box defining reactive nitrogen in the first paragraph of the introductory chapter. In addition, Nr is defined in the list of chemical abbreviations at the beginning of the report and in a footnote on the first page of the executive summary.**

Revisions in Response to Individual Comments from Board Members

Board members provided numerous individual comments on the previous draft of the report. The report has been revised to incorporate many technical and editorial corrections in response to those comments.