

**Preliminary Comments from Members of the Chartered SAB on the report,
*Advisory on EPA's Draft Report on Aquatic Ecosystem Effects of Mountaintop
 Mining and Valley Fills***

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Comments from lead reviewers

Comments from Dr. Claudia Benitez-Nelson

Comments on the SAB's Aquatic Ecosystem Effects Review of Agency's draft report on "The Effects of Mountaintop Mines and Valley Fills on Aquatic Ecosystems of the Central Appalachian Coalfields."

The Science Advisory Board had provided a number of detailed and constructive recommendations for improvement of the EPA's draft report on, "The Effects of Mountaintop Mines and Valley Fills on Aquatic Ecosystems of the Central Appalachian Coalfields." While I would like to commend the SAB committee for the extensive review of the report, I found the presentation style to be awkward and hard to follow. While repetition is unavoidable, the review was unnecessarily wordy and confusingly written. In a number of sections, I found it difficult to decipher between when the SAB review was requesting: 1) the addition of missing references and data, 2) reinterpretation of available data, or 3) unavailable data that should be requested for future analysis. This was confounded by inconsistent literature referencing within the main text of the document. A careful re-editing of the SAB review would therefore greatly increase its helpfulness as a guide for revising the Draft EPA Report.

In response to specific Quality review questions:

1. Are the original charge questions to SAB Standing or Ad Hoc Committees adequately addressed?

Yes, the SAB Review Committee has provided a number of detailed and constructive comments in addressing each of the six charge questions. These comments include, but are not limited to: reorganization of the EPA Report around a modified and broader conceptual model of the issues regarding mountaintop mining, the inclusion of over 100 missing references, a more in depth discussion of the impact of headwater stream loss on freshwater habitat diversity over spatial and temporal scales, and a substantially wider perspective on potential cumulative impacts.

2. Are there any technical errors or omissions in the report or issues that are inadequately dealt with in the Committee's report?

Yes. Major issues:

- a) I found it very surprising that there was no attempt in the SAB review to draft a revised conceptual diagram that more clearly indicates the requested revisions. Given that the SAB Review further requests that the EPA Report be restructured around this revised conceptual model, an attempt at a revised figure(s) would have been invaluable (as opposed to a 4 page listing of specific comments, pages 11-14). Indeed, this revised conceptual model or diagram sets the stage for the remaining EPA Report revision. Thus, extreme clarity on this point is fundamental for success.
- b) One of the main charges to the SAB Review is to ensure that the most-relevant peer-reviewed and published literature is included (Question 2). Towards that end, simply listing over 100

missing references in Appendix I is only partially helpful. I was extremely dismayed to see the poor referencing of the missing literature (listed in Appendix I) within the *main* body of the SAB Review. Indeed, entire sections were missing references. As such, suggested recommendations for the EPA Report revision will be incredibly difficult to conduct in an efficient and appropriate manner. For example, Page 15 lists more than 12 bulleted items that require increased referencing, but does rarely includes specifically what those citations should be!

3. Is the Committee's report clear and logical?

No. Again, I commend the SAB Review for their extensive critique of the EPA Report. However, I found a number of the recommendations to be so wordy that the main message was vague. In a number of instances, I simply could not differentiate between when: 1) data was missing from the report, 2) data was missing from report AND needed to be reinterpreted, or 3) data was simply unavailable, but should be obtained in future research efforts. Distinguishing these main points is critical for successful revision of the EPA Draft Report.

4. Are the conclusions drawn or recommendations provided supported by the body of the Committee's report?

No. The SAB Review provides a number of important examples as to why more in depth or broader discussions should be provided when appropriate. Nonetheless, given the poor referencing throughout the body of the SAB review and the lack of clarity in suggested revisions, many of the SAB review recommendations are not well supported. See responses to Quality Review Questions #2, and #3 above.

Comments from Dr. John Giesy

Response to quality review questions:

1. *Were the original charge questions to SAB Standing or Ad Hoc Committees adequately addressed?*

Yes. The US EPA requested the SAB to review the report and in that request directed the SAB to comment on specific aspects of the report. The SAB committee has considered and opined on those sections and aspects of the report requested by the US EPA. The report prepared by the SAB committee is very comprehensive in its guidance. The report is well organized and concise. The guidance will help EPA develop comprehensive guidance for evaluating the potential of MTM to cause adverse effects on streams and to develop remediation plans. This is a very well done review of the EPA report. The report captures the frustration demonstrated in the original EPA report on the lack of research and data in the area of MTM. The SAB critique makes a number of sound recommendations on ways to reduce uncertainty by filling specific data needs.

2. *Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the Committee's report?*

No. I found no errors or omissions in the SAB report.

3. *Is the Committee's report clear and logical?*

Yes, in general the report is well organized and very well written. The grammar and syntax are excellent and the report is easy to read and interpret. Some areas of the report could be more clear. Please see specific suggestions below.

4. *Are the conclusions drawn or recommendations provided supported by the body of the Committee's report?*

Yes, the conclusions drawn and the recommendations made are well founded and give excellent guidance in EPA as to how to improve the state of the science relative to monitoring for and remediating effects of MTM on streams.

Additional comments:

In the entire document change "may" to "might" or "could"

The section on page 2 line 11 is unclear. Please review it and consider breaking it into several more simple statements: "Additional suggestions for improving the model include for example: clarifying directionality of impacts indicated in the diagram; review whether directionality of impact or a change " Δ " in the model is warranted; clarifying use of stressor and response variables; and connection of the many hydrological variables in the model."

Page 3 line 18. The ions measured in TDS and conductivity affect more than toxicity. It is also a matter of nutrition and ion balance. So I am not sure if toxicity is the right word in this context.

Page 5 line 21. I would avoid parenthetical sentence structure. This is confusing to follow. While this comment applies to the entire report, this is a particularly good example of the confusion.

Page 7 line 33. This section is curious. It is unclear what it means and it is somewhat awkwardly written. I suggest a more direct or active voice statement would be more clear. The following passage reads as if it were a critique of the critique.

“In this Advisory Report there often appears to be repetitive responses to Charge Questions. In some cases, similar topics are discussed under more than one Charge Question. This results from both the integrated nature of the draft EPA Report and an overlap in interpretation of the Charge Questions. The Panel’s responses to the Charge Questions vary in length and detail. This is a consequence of both the importance of the response and the amount of necessary material required to respond comprehensively.”

Page 11 line 1 Move the clause “within the diagram itself” from the beginning of the sentence. Start the sentence with “EPA is...”,

Page 16 line 5 This seems like it should be a new bullet. There are two thoughts in this bullet.

Page 24 the discussion of conductivity is very good

Page 25 the discussion of toxicity testing and extrapolation is excellent

Comments from Dr. Amanda Rodewald

Draft Report on Aquatic Ecosystem Effects of Mountaintop Mining and Valley Fills

1. Were the original charge questions to SAB Standing or Ad Hoc Committees adequately addressed?

Yes. The committee did an excellent job responding to the charge questions.

2. Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the Committee's report?

No, I found no errors or omissions. However, I ask the committee to consider the following suggestions to the authors of the report:

- a. Further emphasize the importance of explicitly considering how impacts to terrestrial systems can profoundly affect the aquatic ecosystems. Regional forest cover and fragmentation can profoundly affect watersheds, including hydrology of headwater streams. While this terrestrial-aquatic link was acknowledged throughout the report, it could have been strengthened with examples and additional references to the literature.
- b. Add upland forests to the conceptual model OR remove "riparian" from the modifier in the forest-box. Impacts to aquatic ecosystems also can result directly from regional changes in land cover type, particularly forest loss and fragmentation.
- c. Be more explicit about the reliance of many salamanders and other aquatic organisms on upland, not only riparian and aquatic, habitats during certain stages of the life cycle. This was mentioned on page 47, but the recommendation could be stronger. The loss of required upland habitat to support certain stages of the life cycle might also be added to the list of forest clearing impacts on p. 13 (lines 31-36).
- d. Further discuss recent advances in mine reclamation processes that allow for reforestation (e.g., the Forestry Reclamation Approach). This discussion should better highlight the Appalachian Regional Reforestation Initiative, a cooperative effort of Office of Surface Mining and Appalachian states.
- e. Better emphasize that reclamation efforts using non-native grasses will result, in all likelihood, in *permanent loss of forest habitat*, which will alter levels of regional forest cover and fragmentation. For this reason, the impacts of MTM-VF are not akin to those from timber harvests, which when allowed to regenerate, only temporarily results in forest loss. Moreover, ecological studies of wildlife (especially birds) show that early-successional forest is required by certain disturbance-dependent animals as well as heavily used by a wide variety of interior/mature-forest specialists during juvenile, post-breeding, or migratory periods. Although non-native grasses may provide habitat for certain grassland and openland species, the change in community composition is profound (a point that was acknowledged in the report).

- f. Elaborate on the importance and diversity of taxa other than salamanders, which were the only group really highlighted (i.e., 10% of global diversity was mentioned multiple times). Are there other examples of endemism or unusually high diversity or sensitivity of taxa in the geographic area that will be impacted by MTM-VF?
- g. Given the agency-wide interest in ecosystem services, the report might also suggest that the authors place the expected impacts from MTM-VF into the context of ecosystem services.

3. Is the Committee's report is clear and logical?

Yes, the report is very well written.

One editorial suggestion is to consider reframing the bolded subsection comments as actual recommendations. For example, on page 17, line 19, point 4.3.2.1 reads "lack of estimate of ultimate area to be affected over different timeframes". The wording here and in the preceding paragraph made me unclear if there was simply an issue with the lack of estimates or if the committee wanted the revised report to include estimates. Clarity would be improved throughout by writing comments as succinct recommendations.

Minor point - Page 21, line 34-35. The committee commented on the limited usefulness of Figure 6, but can they be more specific on how the committee should respond (i.e., simply remove the figure or modify it in some way)?

Typo – page 32, line 15 – “associate” should be “associated”

4. Are the conclusions drawn or recommendations provided supported by the body of the Committee's report?

Yes.

General comment about the charge questions:

While I recognize that the EPA report and SAB committee focused squarely on the impacts of MTM-VF to aquatic ecosystems, I want emphasize that understanding the consequences to terrestrial ecosystems, including certain sensitive and globally-declining species, is equally critical. For example, the Cerulean Warbler is a steeply-declining migratory songbird that is thought to have lost 70% of the global population since the 1960s and has twice been petitioned for Federal protection. Not only does the heart of the breeding distribution of Ceruleans co-occur with areas most strongly impacted by MTM-VF, but the bird shows a strong affinity for breeding on steep slopes and ridgetops. A recent study projected that up to 23% of breeding Cerulean Warblers in the Cumberland Mountains of Tennessee, a region that supports an estimated 20% of the global population, could be displaced from MTM-VF activities (Buehler et al. 2006. *Journal of Wildlife Management* 70(6):1763-1769). Other impacts to terrestrial

ecosystems, such as fragmentation, habitat loss, regional loss of forest cover, are important consequences in their own right, not only as they can directly or indirectly influence aquatic systems.

Comments from Dr. James Sanders

1. Were the original charge questions to SAB Ad Hoc Committees adequately addressed?

Yes. The panel was asked to address six questions concerning the draft report, and all six were addressed to a considerable extent. The review was thoughtful and constructive.

2. Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the Committee's report?

I did not find errors or omissions. I do have some comments about the response to Charge question 1. That question referred to the conceptual model that had been developed for problem formulation. The Panel recommended that while the model was appropriate, there were a number of modifications necessary to improve its use. I concur with their recommendations, but was not able to reach that conclusion from the Panel's report. Instead, I needed to go to the EPA report, and view the figure in its context. By doing so, I was able to understand the Panel's concerns and suggestions. Therefore, I strongly recommend that the Panel place this figure Figure 12 in its review, so that readers can get a feel for the complexity of the figure, but also for its great potential utility, should the Panel's recommendations be adopted. I understand that the figure is large and complex, but believe that its inclusion is worthwhile.

3. Is the Committee's report clear and logical?

Yes.

4. Are the conclusions drawn or recommendations provided supported by the body of the Committee's report?

Yes. The Panel is to be commended for preparing a concise, readable review. In addition, the letter to Administrator Jackson and the Executive Summary are both excellent summaries of the review and its findings.

Comments from other SAB Members

Comments from Dr. Ingrid Burke

1. Were the original charge questions to SAB Standing or Ad Hoc Committees adequately addressed?

I believe so. The original charge questions do not appear to be specific; rather, the report is to review the ecological impacts of mountain top mining and valley fill.

The report is very well organized, assessing terrestrial and (primarily) aquatic impacts of MTM-VF. The report cites peer-reviewed literature and does an excellent job summarizing the literature and describing the studies it cites.

2. Are there are any technical errors or omissions in the report or issues that are not adequately dealt with in the Committee's report?

The section on terrestrial impacts (pages 16-17) seemed to be less detailed and well-cited than the aquatic sections. Perhaps there is less information available. However, the language about "lost" forest, for instance, did leave me wondering more about whether reclamation always results in conversion to grassland, or whether reforestation ever occurs, and if so, at what rates.
I

3. Is the Committee's report is clear and logical?

The conceptual model would be well-placed at the beginning, rather than the end of the document. Other than that, the document seems to be very clear and logical, with excellent overview at the beginning that provides a good roadmap, although the conceptual model would do a bit better job.

4. Are the conclusions drawn or recommendations provided supported by the body of the Committee's report?

Citations seem to support the committees conclusions.

Comments from Dr. Terry Daniel

General comments

The SAB panel review was very thorough and seemed authoritative (to a non-ecologist). There were several sections of the review that had a very tutorial tone. In several cases the critique and recommendations of the state-of-science assessment seemed to push beyond the charge questions to focus on issues that could only be addressed by extrapolations from indirectly relevant literatures and/or by substantial new research. The review could be improved by editing and reorganization that more effectively indicates which recommendations can be accomplished by revisions of the current draft of the EPA assessment, which are more substantive changes that will require significant additional analysis of existing indirectly related literature and data, and which will require new research and data collection. In this context, it would be helpful if the panel could “prioritize” the suggested changes, especially noting those that should be required prior to Agency acceptance of the MTM-VF effects assessment report, and which should be targeted for later improved methods.

Quality Review Questions

1. YES: The original 6 charge questions to the SAB Panel reviewing the EPA MTM-VF effects assessment report were adequately addressed;
2. NO: There do not appear to be any technical errors or omissions in the report or issues that are inadequately dealt with in the panel’s report;
3. YES: the panel’s report is clear and logical;
4. YES: The conclusions drawn and the recommendations provided are supported by the body of the panel’s report.

Some specific/editorial comments

Letter to Administrator

“The Panel reviewed the literature used as the foundation of the draft EPA report and found it to be **fairly** thorough and comprehensive ...”

[Is this to be taken as a critique or as faint praise?]

Executive Summary

P 1

While a more detailed description of the technical recommendations is described in the **draft EPA report**, the key points and recommendations are highlighted below.

[Should this be the SAB panel report?]

P3

EPA should consider developing a more robust characterization of MTM-VF effluents with respect to ionic composition, including **an analysis that exploring the role** of the matrix ions as well as trace constituents, since it would improve the

[Analysis that explores the role or analysis exploring the role?]

Review

P 11

The conceptual model also should suggest the relative importance of different issues or impacts and how the risks differ (e.g., the risks due to exposure to nickel (Ni) are not the same as those related to Se exposure). Further, near-field and far-field effects could be quite different depending on the flows and their interactions with the hyporheic and riparian zones.

The Panel believes the conceptual diagram is so complex that its utility is somewhat limiting.

In addition to the above comments, **the causal diagram should depict levels of uncertainty.**

[These, plus later suggestions to show spatial/temporal dynamics, restoration options and effects, etc leave the EPA authors “Damned if they don’t, damned if they do.” The panel is correct about the model being too complex, but then offers a number of suggestions for making it even more so. Following one panel suggestion, a relatively simple/general “pictorial model” (e.g., similar to those effectively used in the Millennium Assessment reports) might be used up front to show the most important/basic ecologically relevant features of a MTM-VF operation, while more detailed “flow diagram” models (similar to, but only showing relevant subsets of Figure 12, perhaps with direction, uncertainty, etc represented) could be presented where specific issues are addressed later in the report.]

The model is presented in two parts, one for mountaintop removal and one for valley fill, which the Panel believes is an acceptable approach.

[Are interactions addressed—are they important? Alternatively, assuming that the materials removed in a given MTM will essentially always be deposited in an adjacent valley (VF) these two components would seem to be completely confounded—so the unit of analysis might better be specified in terms of relevant combinations of MT and V conditions, and their respective perturbations by a given mining operation and restoration program.]

P 17

A clear definition of what a headwater stream is **and how much of that literature and supporting data** are related to ephemeral, intermittent vs. perennial streams (and related literature)

[What literature/data?]

P 24

waters with respect to ionic composition, **including an analysis that exploring the role** of the matrix ions as well as trace constituents, since such an analysis would improve the mechanistic [explores the role of ?]

P 27

environment in question. There should also be citation of the preliminary data **that** from recent “grey literature” reports prepared by the West Virginia Department of Environmental Protection

geology, some understanding of underlying geological processes could improve the ability to predict **in** the degree of Se contamination among watersheds

P 28-29 (and several other places in the review)

[The list of suggested additional studies, measures, etc is growing as the report proceeds. It seems important to prioritize these for EPA, and to clearly distinguish those that suggest/require new research and data collection, etc from those that can be filled by additional discussion and extrapolation of literature cited, or the addition of new cites.]

P 29

Further, **the sediment sections on sediments** in the draft EPA report seems to focus exclusively on the **surficial**

P 36

[This is a very interesting tutorial on the cumulative effects of forest fragmentation, penetration etc that suggests some extrapolations to MTM-VF impacts—but it is not supported by any specific citations and determining and justifying any specific appropriate extrapolations is left for the EPA to do. How does this help the EPA with their current task? Is the EPA expected to be able to assemble the appropriate literature and make and justify the extrapolations to MTM-VF in a revision of the current EPA report? How far should EPA be expected to go in extrapolating from “related literatures,” given that their reports are in support of regulation activities that typically occur in a highly contentious atmosphere?]

P 42

Once the **forested** is progressively established the terrestrial-related functions

P 43+

[Interesting ideas for restoration are discussed, but only a PhD dissertation and an unpublished manuscript are cited. Is the EPA expected to suggest restoration criteria based on this work, or is the suggestion that the EPA initiate new research to refine and confirm the methods suggested? This should be made clear.]

P 47

3. Development and implementation of best management practices for surface mine reclamation that are designed to minimize conductivity, minimize sulfide oxidation, maximize sulfate reduction, and maximize ecosystem functions of reconstructed stream channels on reclaimed mines; and

4. Use of off-site mitigation as a way to target dominant limiting factors in a region and maximize recovery of aquatic ecosystem functions at a watershed scale.

[So, which is the preferred approach—on site restoration (stream reconstruction) or off-site mitigation (e.g., improved water treatment systems)? Should both be required? Does EPA have the authority to require off site mitigation? Do the mining companies have the authority/desire to pay for off-site mitigation? Does the public see these as equivalent approaches for protecting the environment in MTM-VF operations?]

Should there be a short “summary/conclusion” section at the end of the SAB panel review? All of the charge questions are addressed (individually) but there are many cross references between and overlaps among the responses to separate questions, and there are suggestions for

conditional actions (e.g., when on-site stream reconstruction is better (or not) than off site mitigation) that are likely to be lost without some attempt to review and tie them all together. A similar problem occurs with the executive summary, which just ends on a particular point regarding the last charge question.

Appendix 1

This is a very long list of references that could take the authors of the EPA report considerable time to review and digest. Could this be organized by the relevant charge questions and/or issues raised in the review?

Comments from Dr. George Daston

1. Were the original charge questions adequately addressed?

I believe that the charge questions have been adequately addressed. I found the Committee's recommendations on how to proceed in understanding cumulative impacts to be particularly valuable. In addition to the perspectives listed, the Committee should consider adding the question of whether the density of MTM-VF in a particular area provides an additional burden that is unaccounted for by other metrics.

2. Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the Committee's report?

I did not note any technical errors or omissions. I found the Committee's report to be thorough.

3. Is the Committee's report logical and clear?

I found the report to be logically presented and easy to follow. There was good consistency between the body of the text, the Executive Summary and the cover letter.

4. Are the conclusions drawn or recommendations provided supported by the body of the Committee's report?

I believe that the Committee's conclusions and recommendations are supported by the text.

Comments from Dr. Costel Denson

Were the original charge questions to the SAB committee adequately addressed?

Six charge questions were presented to the SAB committee for its review. The committee addressed each of these questions adequately and in considerable detail, providing useful insight and recommendations in every case.

Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the committee's report?

None that was obvious to this reviewer. However, much of what is discussed is outside this reviewer's area of expertise.

Is the committee's report clear and logical?

The committee's report is laid out in a clear and logical way. Each charge question is presented and discussed, and the associated recommendations are presented with that particular question.

Are the conclusions drawn or recommendations provided supported by the body of the committee's report?

The conclusions that are drawn and the recommendations that are provided are judged to be supported by the body of the report.

Comments from Dr. David Dzombak

Comments of David Dzombak on SAB Advisory on EPA's "Draft Report on Aquatic Ecosystem Effects of Mountaintop Mining and Valley Fills"

1. Comment on whether the original charge questions to SAB Standing or Ad Hoc Committees were adequately addressed.

The charge questions were adequately and comprehensively addressed. The committee generally went beyond what was needed to answer the charge question, providing additional advice and information. With respect to Charge Question 6, the additional advice and information obscures somewhat the response to the charge question, as discussed below, and I recommend that this be remedied through revision.

2. Comment on whether there are any technical errors or omissions in the report or issues that are inadequately dealt with in the Committee's report.

I found no technical errors or omissions in the report, or issues that were inadequately addressed.

3. Comment on whether the Committee's report is clear and logical.

The report is very detailed and it is clear that the Committee put a great deal of thought into their responses to the charge questions. It is also clear that the Committee desired to provide detailed constructive advice for each charge question that went beyond the specific focus of the charge question. For most charge questions this works well. In the case of Charge Question 6, I believe that the additional advice somewhat obscures the direct response to the charge question, and that this should be remedied as outlined below.

Specific suggestions to improve the clarity of the body of the report are given below. Comments on and recommendations pertaining to the letter to the Administrator and the Executive Summary are given in my comments under (4).

- (a) Page 13, line 16: "Reclamation in the context of re-mining should also be included." It is not clear what this has to do with MTM-VF. I suggest that this statement be deleted.
- (b) Page 15, lines 37-38, last bullet: The absence of stream recovery literature would seem to be a more important gap than some of the other areas listed. Perhaps the list provided should be organized to indicate level of priority in some way.
- (c) Page 15, lines 12 and 15: The bullets that begin on these lines are not in the form of complete sentences; they should be revised to make them complete sentences.
- (d) Page 23, line 8: The paragraph begins "With a few important caveats," but important caveats are not mentioned in the discussion which follows. I suggest deleting the cited phrase.
- (e) Page 24, line 17: the word "influence" is more appropriate than "shape" here

- (f) Page 25, Sec. 4.2.2.2: The logic flow is somewhat difficult to follow here. The section is titled “Limitations of laboratory toxicity tests” and the first two paragraphs focus on that topic, pointing out that the laboratory toxicity data are not very useful. Paragraph 3 then abruptly shifts to the topic of field data, beginning with the statement that “the field data provided strong support for a causal relationship between MTM-VF and impaired aquatic communities.” The relationship of paragraph 3 to the previous two paragraphs is not clear. It is only in the fourth paragraph that the relationship is explained. The last paragraph should be revised a bit and put before paragraph 3, and the current paragraph 3 should be revised to be clear that it is providing further explanation of the relationship described in the current paragraph 4.
- (g) Pages 38-39: Charge Question 6 asks “Does the review appropriately characterize the effectiveness of currently employed restoration methods?” The response under General Comments does not provide a clear answer to the question, and the details in Section 4.6.2.1 of Specific Comments do not respond to the question directly either. Most of the text here is devoted to providing guidance as to how restoration should be defined and planned. The response implies that currently employed restoration methods are neither well defined nor well implemented. If this is the case, the response should state this directly and support the statement rather than providing a tutorial about restoration. Also, the response can probably be more concise. The lengthy discussion obscures the main message of the response to the charge question.
- (h) Pages 40-43: The details in Section 4.6.2.2 of Specific Comments provide more information about one of the main points that the Committee seems to want to make in response to Charge Question 6, i.e., that the review of restoration effectiveness would be improved by reorganization. The first part of the section (first bullet and first part of the second bullet) stay on this topic, but then the section drifts into a somewhat rambling discussion of recent studies and research findings, and research needs on restoration. The Committee is attempting to go beyond the specific focus of the charge question to provide more advice and information helpful to the effort, but the lengthy discussion obscures the response to the charge question and the messages intended are somewhat hard to find. I suggest that the section be shortened and that the first part of the section be focused on providing a clear response to the charge question.
4. Comment on whether the conclusions drawn or recommendations provided are supported by the body of the Committee’s report.

The main conclusions drawn and recommendations made as presented in the letter to the Administrator and the Executive Summary are supported by the body of the Committee’s report.

The letter to the Administrator, while a little long, is well organized and easy to follow. The letter does not explicitly list the specific charge questions, but summarizes them concisely and moves from charge question to charge question in summarizing main conclusions.

The Executive Summary is a longer summary and also does not explicitly list the specific charge questions. I recommend that the Executive Summary be revised to reflect more

explicitly the organization of the main body of the report, which is organized by charge question. An Executive Summary should read like a mini-version of the entire report (this is what distinguishes an ES from an Abstract). Thus, the charge questions should be listed explicitly. Further, a reader knowledgeable about SAB processes and role who reads only the Executive Summary of an SAB report wants to know what charge questions are being addressed. The charge questions are not clear in the Executive Summary as currently written.

I also have the following comments on some specifics of the Executive Summary.

- (a) Pages 1-2: The bullet points listed under the section labeled “Conceptual Diagram” do not all describe “additional components to be added to the diagram.”
- (b) Page 3, lines 26-28 and rest of paragraph: This paragraph relates to the response to Charge Question 4 and the issue of limitation of laboratory toxicity tests (see Comment 3f above). The relationship between the two topics discussed in the first sentence of the paragraph is not clear. The logic flow leading up to the relationship of these topics needs to be improved in the paragraph. When the text in the body of the report is revised to address Comment 3f above, it will be clear how this topic sentence and paragraph should be revised.
- (c) Page 5: The section “Effectiveness of Restoration Methods” relates to Charge Question 6 and is not well focused, reflecting the problems in the response to Charge Question 6 in the main body of the report as discussed in Comments 3g and 3h above. After the main body of the report is revised to address those comments, this section of the Executive Summary should be revised.

Comments from Dr. James Johnson

1. Were the original charge questions to SAB Standing or Ad Hoc Committees adequately addressed?

Yes.

2. Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the Committee's report?

Yes.

3. Is the Committee's report clear and logical?

Yes.

4. Are the conclusions drawn or recommendations provided supported by the body of the Committee's report?

Yes.

Comments:

- the length of the Panel's review comments is of concern
- page2, line 6, The Panel recommends a-the conceptual model...

Comments from Dr. Bernd Kahn

Both reports are well written, and my responses to the quality review questions for both are yes, no, yes, and yes, respectively.

Minor comments for the Aquatic Ecosystem Effects report are:

Letter, p. I, l. 29: Insert 'SAB' before 'Panel' to introduce the Panel, and replace 'SAB' in the following sentence by 'Panel'.

l.39: Delete 'However'.

p.1, l.17: Insert 'SAB' before 'Panel'.

p.4, l.34: Replace 'effects' with 'affects' behind 'VF'.

p.5, l.22: Delete first question mark.

l.41: Insert comma behind 'report'.

p.7, l.34: Delete 's' in 'appears'.

p.15, l.15: Replace 'include' with 'are' at end of sentence.

p.28, l.25: Replace parenthesis with comma behind 'cultures'.

p.32, l.16: Replace 'conducted' with 'performed'.

p.33, l.21: What does 'telescoping' mean here?

p.36, l.20: Begin new paragraph with 'It is difficult'.

p.39, l.32: Replace 'considering how to assess' by 'assessing'.

p.42, l.31: Write these 5 points in parallel sentence or phrase form.

General: Do the 6 charge questions have to be repeated in Section 1, in each of the following applicable Section, and in Appendix 2?

Comments from Dr. Agnes Kane

Mountaintop Mining: Aquatic Ecosystem Effects Report

The SAB panel provided a thorough, comprehensive review of the Agency's draft report. No errors or technical omissions are identified and the recommendations are appropriate. These suggested recommendations will improve the clarity and scientific rigor of the draft report. Overall, this is a very comprehensive review of the draft report.

Comments from Dr. Madhu Khanna

EPA's Draft Report on Aquatic Ecosystem Effects of Mountaintop Mining and Valley Fills

1. Were the original charge questions to SAB Standing or Ad Hoc Committees adequately addressed?

The charge questions have been addressed adequately

2. Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the Committee's report?

I am unable to comment on this since this is outside my area of expertise

3. Is the Committee's report clear and logical?

Yes

4. Are the conclusions drawn or recommendations provided supported by the body of the Committee's report?

Yes

Comments from Dr. Nancy Kim

Comments on the Draft Report on Aquatic ecosystem effects of Mountaintop Mining and Valley Fills.

1. Were the original charge questions adequately addressed?

Yes. However, the report does contain a number of sentences that say EPA should consider... or the Panel encourages EPA to... or the review could benefit from... Does the Panel want to make these recommendations?

2. Are there any technical errors or omissions in the report or issues that are not adequately dealt with? No, not that I found, but this is not my area of expertise.

- a. On page 15, line 10, the report recommends including “some local grey literature to help scope some of the issues that are under-represented.” The scientific value of grey literature can be uncertain. However, in some areas, I recognize that little information may be available and that grey literature may be useful. Perhaps the recommendation could be modified by stating something such as EPA should have criteria for what grey literature should be added or that the grey literature should be appropriately qualified, etc.?

3. Is the report clear and logical? For the most part, yes. The following comments identify some possible areas that may need clarifying. Since I am not familiar with this area, they may be misunderstandings on my part, but may also suggest that some clarification is needed.

- a. Letter to the administrator, page ii, line 11. I am not clear what the word depth is trying to convey in the phrase “lack of depth regarding the loss of biodiversity”. Does it mean the scientific discussion is not sufficiently detailed, the loss needs to cover more organisms, etc.? Others could have other interpretations.

- b. Page 7, line 22. To what does the following sentence refer? Using the best available science and applying existing legal requirements, EPA issued comprehensive guidance on April 1, 2010 that sets benchmarks for preventing significant and irreversible damage to Appalachian watersheds at risk from mining activities? After I read the report on the Review of Field-Based Aquatic Life benchmark for Conductivity in Central Appalachian Streams I realized what it was. This latter report has a good paragraph explaining what the guidance is. It is in the Background section of the report (page 5), the second paragraph. Perhaps some of that language could be used in this document.

- c. Charge question 1. The Panel recommends that the conceptual diagram be placed near the beginning of the draft EPA report. It also has a number of recommendations to add information/detail to the diagram. On page 11, line 10, the Panel states that the diagram is so complex that its utility is somewhat limiting. It also suggests breaking

- the complete diagram into sections for different sections of the report and having the complete diagram in an Appendix. The panel may want to modify its recommendation to something like place a simplified conceptual diagram near the beginning of the report and add additional detail to the diagram in appropriate sections.
- d. Page 16, line 6, sentence starting “with Reclamation technology.” How does this differ from the reference to Forest Reclamation Approach that is mentioned in the next to the last bullet on page 15? Should they be referenced in the same way?
 - e. Page 18, line 25 through 28. The implications of this sentence seem to be that limiting the report to freshwater habitats is problematic and that would be an important conclusion. What recommendation might arise from it or can additional clarification be added?
 - f. The paragraph beginning on page 33, line 6-13 is not clear. The first sentence provides details on what information is needed and the second sentence says it isn’t totally necessary. Could the paragraph provide additional clarification on the two sentences? Could additional clarification be added to the sentence that states “Comparison with separate unmined watersheds is not always appropriate”. For example, when would it be appropriate ?
4. Are the conclusions drawn or recommendations provided supported by the body of the report? Yes, for the most part.
- a. Page 24, lines 18 through 22. It isn’t clear how a more robust characterization of MTM-VF effluents would improve the mechanistic understanding of toxicological effects of MTM-VF activities. It might help explain what substance in the effluent is responsible, but maybe not the mechanism of how it happens.
 - b. Page 28, sentences on lines 23-29. What does the phrase “EPA moderately hard water mean? Is it a standard type of water used in lab experiments? Also, it isn’t clear how “These data” (line 27) demonstrate that the tests did not include an adequate array of species. Is it because *Hyalella azteca* is unusually sensitive to low levels of chloride?
 - c. How does the SAB want to deal with the recommendations of including new literature in the EPA report?

Minor editorial suggestions

Letter to the Administrator and report

1. Page i, line 31. Delete “associated” between occur and with.
line 33. Change “improvement of” to improving.
line 41. Delete “in order”.
2. Page ii, line 12. Change “in the assessment of” to in assessing.

3. Page iii, line 4. Change “improvement of” to improving.
- Executive Summary and report.
1. Page 3, line 22. Change “exploring” to explores.
 2. Page 4, line 43. Change “effects” to affects.
 3. Page 11, line 36. Change “.” to ,.
 4. Page 16, line 3. Remove “that” (before indicates).
 5. Page 18, line 5. Should the phrase “that could be” be added between “length” and “affected”?
 6. Page 18, line 15. Change are to is.
 7. Page 18, line 21 to 23. The sentence beginning “The degree to which...” doesn’t seem to fit with the rest of the paragraph. Could it be placed somewhere else or additional information added to form a new paragraph?
 8. Page 19, line 34. Sentence states, “Since headwater streams represent the vast majority.... Could a phrase be added to specify the vast majority of what, e.g. headwater streams, streams, stream miles?
 9. Page 20, line 19. Change “be focused on regarding” to focus on.
 10. Page 21, line 30. There is an extra “)” after waters?.
 11. Page 21, line 34-35. The statement beginning with “Of particular concern” may be more useful if after the words “the more complex system” a phrase beginning with “because ...” would explain the reason for the limitations of Figure 6.
 12. Page 22, line 13. Typo MTM/VF.
 13. Page 22, line 30. Should “for example,” be added at the beginning of the sentence starting with “Organic matter”?
 14. Page 24, line 20. Change exploring to explores.
 15. Page 24, line 25. Should the sentence beginning with “To enhance the causal” start a new paragraph?
 16. Page 26, line 34. Should uS/cm be written out?
 17. Page 27, line 3. Should EPT be written out? It is defined later in the report.
 18. Page 27, line 32. Remove “in” after predict.
 19. Page 29, lines 21- 22. Remove “on sediments” in line 22 and remove the s from seems.
 20. Page 32, lines 9 -11. The sentence beginning “EPA should consider conducting or reviewing” uses a form of the word conduct a number of times and its meaning could probably be made clearer.
 21. Page 33, line 29. Should forest be forests?
 22. Page 34, line 10. Although it says examples, what follows seems to be one example. Should examples be changed to an example?
 23. Page 37, line 19. It should be they.
 24. Page 41, lines 13-19. The information in these sentences seems to be related to the next bullet, rather than the bullet it is in. Should these sentences be included in the next bullet?
 25. Page 42, line 32. Change “have been” to were.
 26. Page 42, line 40. Change forested to forest and insert a comma after established.
 27. Page 43, line 6. Should the word connections (between ecosystem and to) be removed?
 28. Page 43, line 12. Remove s from receives.
 29. Page 43, line 18. Should WVU be written out?
 30. Page 45, line 23. Remove as between been and a means.

31. Page 47, lines 1 – 11. The sentences before these 4 items states: “Lastly, restoration is a critical element of a holistic process of managing impacts from MTM-VF. Recent research indicates that a successful management program will include:...” Does the Panel have a specific recommendation about how EPA should use this information?

Comments from Dr. Kai Lee

I have reviewed the SAB panel reviews of the Mountaintop Mining and Aquatic Life Benchmark studies. I believe the panel has answered the charge questions. Accordingly, I would support approval of the panel reviews, unless serious concerns are raised by public commentators or in the SAB discussion in January 19. My opinions should be weighed against the fact that I have no significant expertise in the subjects discussed.

Comments from Dr. Cecil Lue-Hing

Review of SAB Mountaintop Mining Panel Draft Report on **Aquatic Ecosystem Effects of Mountaintop Mining and Valley Fills**

In its charge to the SAB, the EPA on Behalf of ORD requested that the SAB review the draft report with attention directed to **six specific** charge questions. To conduct this review, the SAB assembled a Panel on the Ecological Aspects of Mountaintop Mining and Valley Fills.

General Comments

The SAB found the overall approach and scope of the draft EPA report to be appropriate and comprehensive. The SAB also found that while the report was well done, there were areas in which the report was deficient. The SAB identified these areas of deficiencies, developed recommendations to improve them, and passed them on to the EPA. One such area of deficiency was the Literature Review. The SAB was mildly critical of the use of total dissolved solids, and conductivity as indicators of water quality, referring to them as coarse indicators of water quality. However, the EPA made a strong case for their use and effectiveness in the circumstances for which they were developed, namely the limited geographic region for which the available database was appropriate.

.Quality Review Questions

1-Were the original charge questions adequately addressed?

The charge questions were adequately addressed. Recommendations and suggestions were offered to improve the context where they were requested or otherwise felt to be appropriate.

2-Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the Panel's report?

From my reading of the Panel's report, there does not appear to be any.

3-Is the Panel's report clear and logical?

Yes, with minor exceptions as noted in the Transmittal Letter and Executive Summary.

4-Are the conclusions drawn and recommendations provided supported by the body of the Panel's report.

Yes.

Specific Comments

Transmittal Letter – page para. 2 speaks of a conceptual diagram, and para. 3 speaks of a conceptual model.

This interchange has occurred in other places, e.g., Executive Summary page 1, and Executive Summary page 2, where diagram and model are used in the same paragraphs – (2 and 3).

Question- Is this acceptable? Or should the reader be informed that the terms are being used interchangeably?

Comments from Dr. James Mihelcic

Advisory on EPA's Draft Report on Aquatic Ecosystem Effects of Mountaintop Mining and Valley Fills,

1. Were the original charge questions to SAB Standing or Ad Hoc Committees adequately addressed?

I felt all 6 charge questions were addressed very well. Was glad to see the issue of invasive species addressed in two locations by the Committee. However, I wonder if this issue should also be addressed in Charge Question 6, specifically, what impact do **currently employed restoration methods have in introducing invasive species?** The Committee left it out. It has been documented in many studies the impact that use of heavy equipment such as employed in mountain top removal and restoration have on introduction of invasive species. I would think also that the "use phase" of the land after mountain top restoration and valley fill may change which could result in introduction of invasive species (e.g., perhaps change in land use results in changes with off road vehicle use).

2. Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the Committee's report?

I did not observe any technical errors. I did think that after reading Section 4.4.2.5. (Sensitivity of mussels and other organisms) (pg 27-28) whether the report should provide information on impact of species found higher up in terrestrial foodwebs.

3. Is the Committee's report clear and logical?

Yes

4. Are the conclusions drawn or recommendations provided supported by the body of the Committee's report?

Yes

Comments from Dr. Horace Moo-Young

Advisory on EPA's Draft Report on Aquatic Ecosystem Effects of Mountaintop Mining and Valley Fills

1. Were the original charge questions to SAB Standing or Ad Hoc Committees adequately addressed?

Yes, the charge questions were adequately addressed.

2. Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the Committee's report?

No technical errors were seen.

3. Is the Committee's report clear and logical?

Yes. The report is clear and logical.

4. Are the conclusions drawn or recommendations provided supported by the body of the Committee's report?

Yes.

As I review the report, the conceptual model indicates that processes such as mountain top preparation, deforestation, access road building, and explosives were not taken into account in the review. It is the humble opinion of this reviewer that these impacts and the fate and transport of these impacts should be studied or recommended for future research. Dust and airborne toxins fate and transport resulting from these impacts are a potential source of human health exposure and risk through the airborne exposure pathway. Since the process of Mountain Top Mining is a continuous process

Comments from Dr. Eileen Murphy

Advisory on EPA's Draft Report on Aquatic Ecosystem Effects of Mountaintop Mining and Valley Fills

1. Were the original charge questions to SAB Standing or Ad Hoc Committees adequately addressed?

Yes

2. Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the Committee's report?

No

3. Is the Committee's report clear and logical?

Yes

4. Are the conclusions drawn or recommendations provided supported by the body of the Committee's report?

Yes

Comments from Dr. Stephen Roberts

Review of Effects of Mountaintop Mines and Valley Fills on Aquatic Ecosystems of the Central Appalachian Coalfields.

1. Were the original charge questions to the SAB adequately addressed?

Yes. The report provides detailed responses to each of the charge questions.

2. Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the Committee's report?

Although this is not my field, it appears to me that all of the technical issues were addressed.

3. Is the Committee's report clear and logical?

Yes. The report is very well written. The points are clear and logical.

4. Are the conclusions drawn or recommendations provided supported by the body of the Committee's report?

The basis for the conclusions and recommendations are explained in the body of the report.

Comments from Dr. John Vena

Advisory on EPA's Draft Report on Aquatic Ecosystem Effects of Mountaintop Mining and Valley Fills

1. Were the original charge questions to SAB Standing or Ad Hoc Committees adequately addressed?

The Mountaintop Mining Panel did a superb job in responding to each of the charge questions.

The background on page 7 lines 34 -- 39 provides the rationale for the content and format responses to each of the charge questions.

The panel provided a very comprehensive response to charge question one with superb recommendations including identification of missing model components. In response to charge question two the panel gave suggestions for very specific additions to the scientific literature. The panel identified issues for charge question three and need further discussion and these were noted in four areas. For charge question four the panel provided general comments in specific comments on six topics and other considerations. The response to charge question five is clear and comprehensive panel proposes and gives details for evaluation of cumulative impacts in at least five perspectives. In response to charge question six the panel recommends reorganization of the report under two major headings and provides suggestions for research needs and additional references.

2. Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the Committee's report?

To my knowledge there are no major technical errors or omissions.

3. Is the Committee's report clear and logical?

The cover letter is well written and the bulleted text very effectively highlights the major recommendations. The letter captures the sentiments of the full review report.

The executive summary provides an excellent overview of responses to each of the charge questions with suggestions for changes in recommendations.

In the executive summary it would be helpful to the reader to state how each section relates to the response of each of the charge questions.

4. Are the conclusions drawn or recommendations provided supported by the body of the Committee's report?

In my opinion the review is well written, comprehensive in responses to the charge questions and is well referenced.

Comments from Dr. Thomas Zoeller

The following comments are provided in response to the 12/28/2010 memo by DFO Dr. Tom Armitage concerning the Quality Review of the SAB workgroup's document of 11/8/2010 entitled, "*Advisory on EPA's Draft Report on Aquatic Ecosystem Effects of Mountaintop Mining and Valley Fills*". This memo asked contributing SAB members to specifically address the four quality review questions from the vantage point of our own expertise. These questions are:

1. whether the original charge questions to SAB Standing or Ad Hoc Committees were adequately addressed;
2. whether there are any technical errors or omissions in the report or issues that are inadequately dealt with in the Committee's report;
3. whether the Committee's report is clear and logical; and
4. whether the conclusions drawn or recommendations provided are supported by the body of the Committee's report.

Overall, the SAB review of EPA's draft report is thorough and well organized. The draft letter to the Administrator does is effective at conveying the scope of EPA's draft report and of the six charge questions presented to the SAB workgroup to specifically address the report. The summary information in this letter focuses very clearly on the strengths and weakness in the EPA draft document with emphasis on the six charge questions. These charge questions are:

Charge Question 1: The Mountaintop Mining Assessment uses a conceptual model (Figure 12 of the draft document) to formulate the problem consistent with EPA's Ecological Risk Assessment Guidelines. Does the conceptual diagram include the key direct and indirect ecological effects of MTM-VF? If not, please indicate the effects or pathways that are missing or need additional elucidation.

Charge Question 2: This report relied solely on peer-reviewed, published literature and the 2005 Final Programmatic Environmental Impact Assessment on Mountaintop Mining/Valley Fills. Does this assessment report include the most relevant peer-reviewed, published literature on this topic? If not, please indicate which references are missing.

Charge Question 3: Valley fills result in the direct loss of headwater streams. Has the review appropriately characterized the ecological effects of the loss of headwater streams?

Charge Question 4: In addition to impacts on headwater streams, mining and valley fills affect downstream water quality and stream biota. Does the report effectively characterize

Charge Question 5: The published literature is sparse regarding the cumulative ecological impacts of filling headwater streams with mining waste (spoil). Does the review accurately describe the state of knowledge on cumulative ecological impacts of MTM-VF? If not, how can it be improved?

Charge Question 6: The Surface Mining Control and Reclamation Act and its implementing regulations set requirements for ensuring the restoration of lands disturbed by mining through

restoring topography, providing for post-mining land use, requiring re-vegetation, and ensuring compliance with the Clean Water Act. Does the review appropriately characterize the effectiveness of currently employed restoration methods?

Quality Charge Question # - whether the original charge questions to SAB Standing or Ad Hoc Committees were adequately addressed:

This is not my area of expertise, so I reviewed the SAB document with the purpose of ensuring clarity of organization and of content and that the document was focused on answering these charge questions. From this perspective, the document is extremely well written. It is organized around the specific charge questions and clearly addresses each of questions in a manner that appears to be both clear and comprehensive. The inclusion of appendices with ancillary information (e.g., the original charge memo as well as additional references) is an example of the transparency with which the SAB analysis of EPA's draft document was reviewed. Overall, this appears to be a thorough, well-organized and scholarly analysis of the EPA draft report.

Quality Charge Question #2 - whether there are any technical errors or omissions in the report or issues that are inadequately dealt with in the Committee's report:

This reviewer did not detect any overt technical errors or issues that were incompletely or inadequately addressed. It is not possible to determine fully whether omissions were made, but there were certainly no omissions relative to the original charge questions themselves.

Quality Charge Question #3 - whether the Committee's report is clear and logical:

As stated above, the SAB review of EPA's draft document appears clear and logical. I cannot add to this.

Quality Charge Question #4 - whether the conclusions drawn or recommendations provided are supported by the body of the Committee's report:

The SAB review document presents very clear conclusions both in the cover letter to the Administrator and in the Executive Summary of the document. These conclusions are very well documented in the body of the review.