UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

July 27, 2005

THE ADMINISTRATOR

Dr. M. Granger Morgan
Chair, Science Advisory Board
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460

Dear Dr. Morgan:

Thank you very much for the Science Advisory Board's December 7, 2004, advisory on the Environmental Protection Agency's *Draft Report on the Environment 2003* (EPA-SAB-05-004).

The Office of Research and Development's National Center for Environmental Assessment has prepared a detailed response to your comments and suggestions, which is enclosed. I trust you will find this information helpful as we continue to work together to improve this important document.

Thank you for the opportunity to respond to this advisory. Should you have any questions or need additional information, please call Dr. Peter Preuss at (202) 564-3322.

Sincerely,

Stephen L. Johnson

Enclosures

cc: Dr. Virginia Dale

Enclosure 1

EPA appreciates the time, effort and expertise that the Science Advisory Board (SAB) Report on the Environment (ROE) review panel dedicated to its review and recommendations regarding future EPA Reports on the Environment. The ROE team has been working to implement many of the specific recommendations made by the panel, and it is already having a beneficial impact on development of the next ROE. We expect to see the proof of the value added as the indicators and the full reports go to peer review. EPA is sending this response to briefly address the overarching recommendations made in the Executive Summary of the panel's report.

• **Allocate funds and staff to ensure that the report is continued on a regular basis.** In order to sustain this important effort over the long term, the SAB recommends that the EPA dedicate resources and a permanent team of staff to synthesize appropriate indicators and data for the next report. The team should include statistical expertise, and should be assigned the ongoing tasks of pooling and analyzing data for the ROE and conducting more analysis and synthesis than was included in the draft ROE. The SAB emphasizes that, without allocation of funds and personnel needed to sustain development of the ROE on a continuing basis, most of the recommendations in the SAB report cannot be implemented.

> EPA recognizes the need to dedicate full time staff and appropriate resources to the ROE effort in order to develop the reports, assess indicators and supporting data, describe gaps, develop new indicators, and other activities essential for sustaining the development of ROEs into the future. I fully support the ROE effort as did my predecessors Michael Leavitt and Christine Todd-Whitman. To that end, ORD and OEI have dedicated FTE and identified resources in their respective FY2006 budget requests.

• **Keep the ROE free of conclusions about the impacts of specific policies or other government initiatives, except in cases where a policy or program is the obvious and undisputed explanation for a significant trend or status.** The ROE should be maintained as a Report on the Environment that reviews the status and trends of environmental conditions in the United States.

> EPA strongly agrees with the panel's recommendation on this issue and will do so. EPA recognizes that there are other reports that address and report management and EPA program and policy results.

• **Develop an expanded introduction to the ROE, defining the purposes of the document, describing the rationale behind the approach, and explaining the indicators and conceptual framework behind the structure**. The organizational focus of the draft ROE on questions and

indicators is basically sound. However, the draft ROE fails to communicate a consistent and clear purpose or to provide an overarching framework for the document. This deficiency has had wide ranging effects on the document, including varied and inconsistent approaches to indicator selection, and uneven treatment of indicator reliability. The expanded introduction should include a discussion of how the indices and data presented in the report relate and merge into the overarching themes of interest in the document: human health and ecological condition. The expanded introduction should provide a better explanation of the criteria for selecting the questions that are asked in the succeeding chapters, explain the concept of an indicator, explain what indicators were selected and why they were selected, and distinguish among different and expanded categories of data available for the selected indicators. The SAB suggests that reasonable criteria for selecting all indicators might include scientific defensibility, quantifiability, transparency and consistency.

EPA strongly agrees with the panel's recommendation. Revisions were made to the set of questions to make them consistent in form (as appropriate) across the chapters. The definition for environmental indicator for the ROE was revised and six criteria were developed specifically intended to ensure the scientific defensibility, quantifiability, transparency and consistency of indicators in future ROEs (see Attachment A).

As the panel suggested, together with the development of detailed QA/QC forms to support each indicator an on-line data management system has been developed and put in use. This capability already has had a significant impact on the review, development and recommendation of indicators proposed to be included in the next ROE and their underlying documentation. Although the introductory chapter for the next ROE has not yet been drafted, it will follow the panel's recommendation.

• **Reorganize the report to: provide greater consistency among the air, water, and land chapters; address linkages between exposure and human health in the human health chapter; and organize the ecological condition chapter around synthesis questions, with specific indicator data relocated to other chapters.** The chapter on human health impacts of pollution should devote greater attention to the linkages between exposure and health effects. Some environmentally linked health effects are well established and should be presented as such without equivocation. Other effects, which are suspected but less well established, can also be discussed. However, cataloging all causes of morbidity and mortality, most of which are not known or suspected of being related to the types of environmental exposures described in the air, water and land chapters, seems less useful. The SAB commends the use of vignettes or case studies focusing on specific pollutants (e.g., lead). The approach to assessing ecological health should be restructured to move away from reporting on isolated indicators such as the extent of forest land. The approach should integrate indicators from across different locations (e.g., air, water and land) to assess different essential ecological attributes (EEAs), and then integrate multiple EEAs to assess health with respect to key ecological conditions. The SAB notes that a framework for reporting on the condition of ecological resources has been developed by the SAB's Ecological Processes and Effects Committee

(U.S. EPA Science Advisory Board, 2002). This framework contains a set of EEAs and associated component categories and subcategories that can be used to guide the development of an approach for reporting information about ecosystem condition. Questions addressing ecological health such as the status of biodiversity, fisheries health and sustainability, and element cycling could also be used as organizing themes. Regional and local data should be used to convey an accurate picture of trends and knowledge gaps. In addition, the effect of ecologic changes on human disease (e.g., Lyme disease, West Nile viral encephalitis) should be discussed.

> EPA agrees with the panel's recommendation and has steps to implement it. The chapter on human health will expand the discussion of exposure and health effects, where they are well-established and can be presented as such without equivocation. Regarding the recommendation for vignettes or case studies, ROE staff is exploring the development of "threads": 2-3 page write-ups linking indicators across the report for lead, mercury, nitrogen and impervious surfaces. The questions in the ecological condition chapter have been revised to make them more integrative and will no longer break down by ecosystem type (e.g., forests, fresh waters, etc.) (Attachment B). The indicators in the ecological condition chapter of the Draft ROE that deal with single media (air, water, land) have been moved to the corresponding chapters.

• **Incorporate regional indicators into the report when they can provide insight on national conditions.** Much can be inferred from data available at local and regional scales. National indicators can be built from local and regional data and measures. Also, some environmental changes are best understood by considering regional impacts (e.g., air quality). Therefore, indicators in the next version of the ROE should not be limited to those for which data are available at the national level.

> EPA agrees with the panel's recommendation and has taken several steps to implement it. The next ROE will break down many national indicators to include all 10 EPA Regions. Also, as part of a Regional Pilot study, EPA's Regional Offices have submitted indicators that provide exemplars that could be extended to other Regions or to the Nation. Ultimately, EPA is working to develop fully scaleable indicators that could be tracked from the national to local scales in an electronic ROE (eROE).

• **Strengthen the report by adding certain key missing indicators and providing additional information about indicators that are currently included in the report.** Future versions of the ROE should distinguish between emitted (primary) pollutants and environmentally synthesized (secondary) pollutants and discuss the concept of secondary pollutant precursors. Water quantity information should be added to future versions of the ROE. Full coverage of the hydrologic cycle is needed to complete the assessment of status and trends in water quality and other water-related aspects of the environment. Information about groundwater, large scale water availability, and human water use and demands are missing from the draft ROE. The water and land chapters of future reports should contain indicators that address both the extent and quality of different land and

water ecosystem types. Contaminants in food and diet are also a critical component of environment as it relates to human health and should be included in future versions of the ROE. EPA should also rethink the indicator gap and limitations approach presented in the draft ROE. The indicator gap and limitations sections of the draft ROE contain An assortment of qualifiers that either inappropriately discourage the reader from believing the data presented, or leads the reader to correctly conclude that the indicator is unsuitable as it is configured. Some water indicators presented in the draft ROE, such as dissolved oxygen, chlorophyll, water clarity and index of biotic integrity, were not useful as developed in the report. The report appropriately discourages readers from believing the data presented on these indicators. As stated below, future versions of the ROE should include indicator data relevant to global climate change. Future versions of the ROE should also identify useful indicators of either human or ecological health for which only regional data, or no data, are currently available.

> EPA agrees with the panel's recommendations, and has taken steps to implement them. The relevant indicators in the next ROE will distinguish between secondary pollutant precursors and primary emitted pollutants. Additional water quality indicators have been proposed from NAWQA, EPA's newly available Wadeable Streams Survey, EPA's new lake fish tissue survey, and EPA's Coastal Condition Report. The report proposes to include groundwater quality indicators for nitrate and pesticides in predominantly agricultural watersheds and proposes to include contextual information on groundwater levels and withdrawals. EPA will work with the USGS to further expand groundwater coverage in future ROEs. The water and land chapters of future reports should contain indicators that address both the extent and quality of different land and water ecosystem types, as well as an indicator of contaminants in food.
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> EPA agrees that the treatment of gaps and limitations in the Draft ROE was uneven and needs to be improved. The revised indicator criteria will facilitate more consistent identification and treatment of gaps and limitations in a more consistent manner across the indicators. The next ROE will also make sure that the next ROE clearly explains what it means when it says that no indicator was available to contribute to or answer to a particular ROE question. Also, EPA is undertaking a more structured approach to identifying the most important gaps identified in the 2003 report.

• **Include analyses and presentations of much greater statistical rigor.** General lack of statistical analysis in the draft ROE seriously limits the presentation and interpretation of status and trend information. Future versions of the ROE should incorporate much more rigorous statistical analyses of human health and ecological condition indicator data in order to: develop informative syntheses and spatial displays, identify patterns, and depict trends. Greater statistical rigor is also needed in the description of pollution sources and post-emission transformations and transport. In future versions of the ROE, EPA should not aggregate data into national averages and trends when such aggregation leads to a loss of information. Rather than using the work summaries of others, EPA should conduct more in-depth data analyses and present summary data, ranges, measures

and trends. In addition, arbitrary measures of conditions such as "good" or "poor" should not be used in future versions of the ROE unless these measures are the established norms in the indices used and are valid conclusions that compare indicators on a national scale. Uncertainties in data and interpretation should also be discussed.

> EPA agrees with the panel's recommendation, and has taken some first steps to implement them, but others will take longer. As noted above, the next ROE is taking a first step to "break down" or scale patterns and trends in many of the national indicators. It also will avoid using normative terms such as "good" and "poor" unless these can be supported by objective reference points. The next ROE will use more custom-designed graphics, to aid in both the clarity and consistency of indicator presentations, rather than simply importing figures from elsewhere. While EPA agrees that future ROEs would benefit from greater statistical rigor and de novo data analyses, this issue presents significant policy and technical challenges that will take some time to address.

• **Include indicator data relevant to global climate change.** Omission of global climate change in relation to anthropogenic air pollution, and its health and ecologic implications, is a major defect in the draft ROE. Climate change is both a confounding and primary driver of the state of the environment. Therefore, lack of coverage of any aspect of climate change greatly hampers the presentation and interpretation of many indicators and topics in the draft ROE. Future versions of the ROE should recognize that global climate change will have first order impacts on a wide range of environmental indicators, and through them on human health and environmental conditions. Indicators related to global warming, such as changing air and water temperature patterns, changing ice formation and thawing patterns, trends in global concentrations of primary climate change gases, trends in U.S. emissions of these gases, and trends in scattering and absorbing aerosol particle concentrations are very important and should be included in future ROE documents.

> EPA agrees with the panel and recognizes the consternation caused by not including indicators related to global climate change in the Draft ROE. As noted in the ROE public listening sessions, this was the result of not being able to reach agreement among all of the cognizant government departments and agencies on the exact wording and content of these indicators in the very short time available to release the report under then-Administrator Whitman's term of office. Preliminary intergovernmental discussion already have occurred on this issue, and three indicators of global climate change (related to greenhouse gas emissions, greenhouse gas concentrations, and historical air, water, and sea surface temperatures) are proposed for inclusion in the next ROE.

• **Revise the draft ROE *Public Report* to include more graphics and make it user friendly.** The draft ROE *Public Report* is a long but largely abstracted presentation of the draft ROE *Technical Report*. The *Public Report* should be revised to present information and summarize findings in a format that can be easily understood by non-technical

audiences. The *Public Report* should be shorter, and it should contain clearer graphics as well as maps showing geographic trends.

EPA is striving to make the next ROE *Public Report* useful and appealing to non-technical audiences. Using existing research and feedback from various parties, the Agency is evaluating appropriate methods for selecting information from the *Technical Report* and presenting it in ways that are easy to understand. This will likely include additional graphics and maps as space permits.

Enclosure 2

Purpose: Inform about trends in the state of the environment.

Audience (Technical document): Environmental professionals (e.g., high-level decision makers, Congressional staff, NGOs), but not "specialists"

Audience (Public report): Based on the feedback EPA has received from various parties, the Agency is refining who the audience will be for the Public Report. At this point, the audience is civic-minded members of the public. The Agency will further determine the characteristics of this audience.

ROE Indicator definition:

For EPA's Report on the Environment, an indicator is a numerical value derived from actual measurements of a pressure, state or ambient condition, exposure, or human health or ecological condition over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.

ROE Indicator criteria:

- The indicator is useful. It answers (or makes an important contribution to answering) a question in the ROE.
- The indicator is objective. It is developed and presented in an accurate, clear, complete and unbiased manner.
- The underlying data are characterized by sound collection methodologies, data management systems to protect its integrity, and quality assurance procedures.
- Data are or will likely be available to describe changes or trends in future reports and the latest available data are timely.
- The data are comparable across time and space, and representative of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.
- The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

Enclosure 3

Proposed ROE06 Questions

AIR

Outdoor air quality
- What are the trends in outdoor air quality and effects on human health and ecological systems?

Indoor air quality
- What are the trends in indoor air quality and its effects on human health?

WATER

Water and watersheds
- What are the trends in extent and condition of *fresh surface waters*?
- What are the trends in extent and condition of *groundwater*?
- What are the trends in the extent and condition of *wetlands*?
- What are the trends in extent and condition of *coastal waters*?

Drinking water
- What are the trends in the quality of *drinking water*?

Recreation in and on the water
- What are the trends in the condition of *recreational waters*?

Consumption of fish and shellfish
- What are the trends in the contamination/quality/safety of *consumable fish and shellfish*?

LAND

Land cover
- What are the trends in land cover and their effects on human health and the environment?

Land use
- What are the trends in land use and their effects on human health and the environment?

Chemicals
- What are the trends in chemicals used on the land and their effects on human health and the environment?

Wastes
- What are the trends in wastes and their effects on human health and the environment?

Contaminated lands
- What are the trends in contaminated land and their effects on human health and the environment?

HEALTH

- What are the trends in health status in the U.S.?
- What are the trends in human disease and conditions for which environmental pollutants are thought to be to risk factors including across population subgroups and geographic regions?
- What are the trends in biomeasures of exposure to common environmental pollutants including across population subgroups and geographic regions?

ECOLOGICAL CONDITION

- What are the trends in the extent and distribution of the nation's ecological systems?
- What are the trends in the diversity and biological balance of the nation's ecological systems?
- What are the trends in the ecological processes that sustain the nation's ecological systems?
- What are the trends in the critical physical and chemical attributes of the nation's ecological systems?