



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

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OFFICE OF  
RESEARCH AND DEVELOPMENT

Gary S. Sayler, Ph.D.  
Chair, Board of Scientific Counselors  
Center for Environmental Biotechnology  
The University of Tennessee  
676 Dabney Hall  
Knoxville, TN 37996

Dear Dr. Sayler:

On May 23, 2007, the Board of Scientific Counselors (BOSC) Mid-Cycle Subcommittee on Drinking Water Research met in Newport, Rhode Island, to evaluate the Office of Research and Development's (ORD) Drinking Water Research Program. Following this review, the Subcommittee presented a report of its findings and recommendations to the Executive Committee of the BOSC. The final report, dated August 20, 2007, provided several recommendations. Enclosed with this letter, I am pleased to provide the Drinking Water Research Program (DWRP) response to the BOSC Mid-Cycle Review report.

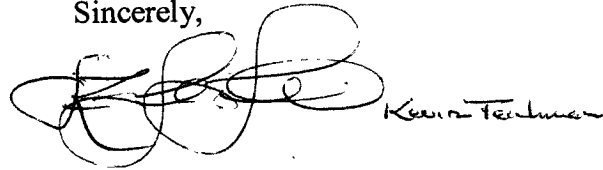
ORD appreciates the insight, advice, and recommendations offered by the Subcommittee. The enclosed narrative identifies specific recommendations made by the Mid-Cycle Subcommittee and provides a brief response. A table summarizing each recommendation, the action to be taken, and a schedule for completion of the action is also attached.

As you know, ORD conducts periodic evaluations of its research programs' progress at intervals of 4–5 years. These reviews evaluate progress with regard to relevance, quality, performance, and scientific leadership. The reviews also focus on identifying how the scientific community and programmatic clients utilize ORD's scientific outputs. In addition to these formal reviews, ORD evaluates program progress midway through the review cycle. These mid-cycle reviews provide critical feedback to help track the progress of the program since its the last review, as well as examine the status of

recommendations from that review.

The date for the next full review of the Drinking Water Research Program has tentatively been set for the fall of 2009 in anticipation of a 2010 Program Assessment Rating Tool (PART) review. In this context, we look forward to working with the BOSC again.

Sincerely,

A handwritten signature in black ink, appearing to read "Kevin Y. Teichman", with a stylized, cursive script.

Kevin Y. Teichman, Ph.D.  
Acting Deputy Assistant Administrator for Science

Enclosure

cc: Dr. John Giesy  
Dr. Sue Thompson  
Dr. Robert Eugene Turner



**Drinking Water Research Program  
Response to the Board of Scientific Counselors  
Mid-Cycle Review  
May 23, 2007**

Submitted by:

Audrey D. Levine, Ph.D., P.E.

National Program Director

Drinking Water Research Program

Office of Research and Development

January 2008

Response to Recommendations from the BOSC Mid-Cycle Review  
of the Drinking Water Research Program  
January 15, 2008

The U.S. Environmental Protection Agency's (EPA) Office of Research and Development (ORD) relies on its Board of Scientific Counselors (BOSC) to conduct independent expert reviews of its environmental research programs every four to five years. Mid-cycle reviews are scheduled half way through the cycle to provide feedback concerning progress since the last review and offer advice concerning future directions and performance.

The BOSC Mid-Cycle Subcommittee for the Drinking Water Research Program (DWRP) met by teleconference on April 26, 2007. This session was followed by a public meeting held on May 23, 2007. The mid-cycle review focused on ORD's response to the 2005 BOSC recommendations for the DWRP. A set of specific questions was used to guide the Subcommittee through the review, and ORD sought feedback on several key topics including: restructuring of the long-term goals and thematic areas, metrics of performance, the extramural drinking water research effort, inter-relationships between the DWRP and other ORD research programs, and other programmatic changes.

The timing of the mid-cycle review provided an opportunity for the DWRP to receive feedback from the BOSC subcommittee that could be directly incorporated into the revisions of the DWRP Multi-Year-Plan. The BOSC subcommittee provided thirteen recommendations to ORD that were detailed in the *Final Report of the Mid-Cycle Review of the Office of Research and Development's Drinking Water Research Program at the US Environmental Protection Agency*, dated August 20, 2007. ORD's responses to each recommendation are presented below and summarized in Table 1.

**Recommendation 1** (page 5, paragraph 2 and page 6): The BOSC subcommittee suggested that a resource analysis matrix be developed to facilitate prioritization and funding for the thematic research agenda. It was suggested that this analysis include intramural funding, extramural Science to Achieve Results (STAR) grant solicitations, collaborative partnerships, and the possibility of reinvesting ORD-derived royalties.

**Response:** Research prioritization is an on-going challenge that requires frequent iteration in light of regulatory drivers, program office needs, research progress, and available resources. Alternative approaches for developing strategic directions are being explored including: setting up a drinking water research steering committee, developing a process for weighting research priorities, and exploring opportunities for leveraging resources across other ORD programs (Water Quality, Global Change, Homeland Security, Human Health) and other research efforts.

**Recommendation 2** (page 6): The BOSC subcommittee emphasized the importance of timely completion of the Drinking Water (DW) Multi-Year Plan (MYP).

**Response:** The DW MYP (2008-2014) was completely revised to correspond to the new long-term goals and thematic areas. The draft MYP is undergoing internal review, and it is hoped that it will be finalized by March 2008.

**Recommendation 3** (page 6): The BOSC subcommittee recommended that strategic planning be pursued at several levels:

- a. Research prioritization
- b. Resource procurement and allocation in an era of declining budgets
- c. Maintaining and promoting a leadership agenda
- d. Integration of emerging environmental concerns such as climate change, sequestration, nanotechnology, and water reuse.

**Response:** Efforts are underway across ORD to develop more effective approaches for strategic planning. Through this process, the national program directors (NPDs) have an annual opportunity to discuss strategic directions with the Science Advisory Board (SAB) and ORD's Executive Committee. These annual strategic directions discussions provide an opportunity to both evaluate research progress and reassess research needs and priorities consistent with available resources. The restructuring of the DW MYP has enabled the development of a more integrated research program to address waterborne contaminants and fostered the inclusion of some emerging issues including water infrastructure, geologic sequestration of carbon, sustainable water systems, and other topics.

The challenges of research prioritization are being addressed through the MYP process and other related activities. As a tool for improving the research prioritization process, ORD and the Office of Water (OW) plan to hold a "Senior Management Retreat" in the spring of 2008. This ORD-OW senior management meeting will provide an opportunity for OW office directors and ORD NPDs and lab and center directors to develop strategies to define and address high priority water-related issues. These strategies will help ORD and OW develop mechanisms for improving cross-agency coordination, partnering, and collaboration. These discussions will incorporate common themes across ORD programs (drinking water, water quality, homeland security, global climate change, human health, ecosystem services, sustainability, endocrine disrupting compounds, safe pesticides-safe products, etc.) and OW offices (OGWDW, OWM, OWOW, OST). It is hoped that regular cross-agency coordination will serve to evolve towards developing an agency-wide corporate perspective on water-related research issues and priorities.

Cross-ORD discussions are also in progress to assess the efficacy of consolidating the Drinking Water and Water Quality MYPs into a single MYP. Other cross-program research efforts include developing a research program to address geologic sequestration of carbon in collaboration with the Global Change Research Program and identifying drinking water issues in conjunction with the National Biofuels Research Strategy.

**Recommendation 4** (page 6): The BOSC subcommittee recommended further investigation, refinement, and application of the bibliometric and partner document analysis and surveys. The subcommittee suggested that the DWRP consider:

- a. Discriminating between the contributions of extramural research (STAR) and intramural research,
- b. Determining whether indices of high publication citation rates or impact factors are equivalent among disciplines and organizations, and
- c. Enhancing partner diversity beyond EPA program offices.

**Response:** Development and refinement of program metrics is an ongoing process within ORD. We are currently exploring the application of data mining tools to provide a more comprehensive evaluation of the degree to which ORD research products are used in achieving environmental outcomes (decision-making, risk assessment, risk management, rule development and implementation, health risk reduction, etc.). One of our major challenges is the development of metrics that can accommodate different and variable timelines associated with research planning, execution, and publication and the timeframes and drivers for regulatory activities (decision-making, rule-implementation, etc.). Responses to the subcommittee's specific suggestions are given below:

- a. *Discriminating between the contributions of extramural research (STAR) and intramural research:* To develop meaningful ORD research programs, we believe it is important to ensure that high priority and emerging research issues are being addressed both intramurally and extramurally. A variety of approaches is used to integrate extra- and intramural research activities throughout the lifecycle (planning, execution, dissemination, evaluation) of each research program emphasis. Coordination and communication among STAR and EPA researchers is encouraged through workshops, seminars, and other activities that are designed to advance the scientific knowledge base and promote the development of complementary research. It is believed that information about the productivity of the entire DWRP provides greater insight regarding the impact of the program and its overall applicability and utility than could be achieved through separately evaluating research outputs by source.
- b. *Determining whether indices of high publication citation rates or impact factors are equivalent among disciplines and organizations.* It is unclear how this information could facilitate review of the DWRP. As data mining tools advance and on-line publishing opportunities increase, it is likely that citation rates and impact factors will also change over time. It is believed that reviews of individual program performance can provide baseline information and trends that are more relevant to assessing research relevance, quality, and impact than trying to develop a universal bench-mark for research programs that vary in urgency, maturity, and applicability.
- c. *Enhancing client diversity beyond EPA program offices.* We agree that it is important to expand our partner diversity beyond program offices. In addition to program office priorities, our current program also targets addressing research needs of regional offices (including input from states and tribes). Other program partners include members of the water industry such as utilities, agencies, and various associations and research groups. In some cases, interactions between the DWRP and stakeholders have been somewhat *ad hoc* in response to specific needs or issues (e.g., lead in water distribution systems, treatment issues). In other cases, our partners' involvement has been more directed (e.g. arsenic demonstration program). We are

exploring approaches for a more systematic evaluation of the outcomes of DWRP research products among a broader audience (beyond program offices).

**Recommendation 5** (page 6): The BOSC subcommittee recommended that there is a need for more consistency in intra-Agency communication and evaluation procedures.

**Response:** We recognize the difficulty in trying to evaluate intra-agency communication and evaluation procedures. Efforts will be made to provide better documentation of these communication and evaluation processes, and their impact, in future DWRP reviews.

**Recommendation 6** (page 8–9): The BOSC subcommittee recommended that a conceptual model be developed to better link Long-Term Goals (LTG), Annual Performance Goals (APG), and Annual Performance Measures (APM). In addition, the subcommittee suggested that there is a need to incorporate a well-defined strategy for allocation of resources. Suggestions for the conceptual model include:

- Determining tasks that can be accomplished through extramural research based on availability of “resident” expertise in ORD and the likelihood of long-term needs
- Incorporation of potential partnerships in framing APGs

**Response:** The suggestion of a conceptual model for integrating the goals, resources, and capabilities is excellent. We have made an initial attempt to do this in the MYP and hope to refine it during the annual planning activities.

While the extramural research program serves to expand upon the expertise within ORD, it also provides a valuable opportunity to foster both innovative and emerging research endeavors. Therefore, we are reluctant to base decisions on extramural funding solely on the status of “resident” expertise within ORD.

**Recommendation 7** (page 9): The BOSC subcommittee recommended that goals and measures should be benchmarked against the results of other organizations that do similar work.

**Response:** We too are interested in developing useful metrics for ORD research programs and have funded a study, currently in progress, by the National Academies entitled *Evaluating the Efficiency of Research and Development Programs at the Environmental Protection Agency*. It is anticipated that the results from this study will help to identify potential approaches used by other organizations that have potential applications for improving ORD’s current approaches to evaluating and benchmarking its research.

**Recommendation 8** (page 9): The BOSC subcommittee suggested that there is a need for consistent approaches for fostering scientific leadership.

**Response:** We agree with the BOSC subcommittee about the importance of scientific leadership, and we are exploring mechanisms for addressing this issue throughout ORD including enhancing our mentoring programs, recruiting post-doctoral fellows, promoting visibility of research through publications in high impact journals, encouraging participation in Gordon Research conferences and similar venues, and hosting workshops to promote interactions and collaborations among STAR and ORD research teams.

**Recommendation 9** (page 9): The BOSC subcommittee emphasized the need for more interactions with other agencies.

**Response:** Efforts to collaborate with other agencies are ongoing. Currently collaborative activities exist with several federal agencies including the U.S. Geological Survey (USGS), the U.S. Department of Agriculture (USDA), the Centers for Disease Control and Prevention (CDC), the Food and Drug Administration (FDA), the U.S. Army Corps of Engineers, the Department of Homeland Security (DHS), and the Oak Ridge Institute for Science and Education (ORISE). Internationally, we participate in the Global Water Research Coalition and have collaborated with research groups in South Africa and China on specific research issues (e.g., cyanobacterial toxins). The DWRP also interacts with several research foundations including the American Water Works Association Research Foundation (AWWARF), the Water Environment Research Foundation (WERF), and the WaterReuse Foundation (WRF). Researchers also partner with numerous utilities, water agencies (e.g., Ohio River Valley Water Sanitation Commission (ORSANCO), states, and regions to address drinking water research issues. While many of the collaborative activities have developed on an *ad hoc* basis, efforts are on-going to foster these relationships, as time and resources permit. We will give greater emphasis to describing our interactions with other agencies in future reviews of the DWRP.

**Recommendation 10** (page 9): The BOSC subcommittee emphasized the importance of intra-Agency communication across laboratories, centers, and program offices.

**Response:** We agree that regular communication is critical to the success of the research program. We have several activities in place to foster such communication, including a monthly seminar series to highlight current research projects (intramural and extramural). These seminars are held in EPA headquarters and broadcast to EPA offices, regions, laboratories, and centers to provide a forum for discussion of research and dissemination of results. We also hosted and/or participated in topical workshops to promote dialog among researchers and to strategize on research needs. Past workshops have addressed innovative methods for microbial analysis, microbial risk assessment, and distribution system research needs.



**Recommendation 11** (page 10): The BOSC subcommittee suggested that specific strategies need to be developed to address important research areas such as climate change, nanotechnology, and water reuse.

**Response:** We agree and are working on a variety of approaches to integrate these critical topics into the drinking water research agenda. For example, we are developing cross-program research plans with the Global Change Research program to address drinking water issues associated with climate change. Currently, an American Association for the Advancement of Science Fellow (AAAS) is working collaboratively with the NPD for Drinking Water and the NPD for Global Change to identify these research needs. The initial emphasis of the cross-program effort is on geologic sequestration of carbon.

We hope to expand our coverage of other topics such as nanotechnology and water reuse over the lifespan of the MYP. We are also working with the Sustainability Program to incorporate drinking water issues into high priority topics such as biofuels. Current efforts to address water reuse topics are centered on source water protection, water availability, and potential contaminants associated with reclaimed water. Prioritization of these topics is somewhat challenging due to the lack of a direct connection to current regulatory frameworks (i.e., there are currently no federal regulations that address reclaimed water).

**Recommendation 12** (page 10): The BOSC subcommittee highlighted the value of collaborating with other ORD programs (Water Quality, Homeland Security), other federal agencies, and other organizations.

**Response:** We agree that collaborating and developing integrated research programs is important. Ongoing efforts are in place to foster collaboration both internally (with other research programs) and externally.

**Recommendation 13** (page 11): The BOSC subcommittee recommended integrating performance metrics into annual performance reviews to promote alignment with the Agency's goals.

**Response:** While performance metrics of ORD research programs are still evolving in response to feedback from the BOSC, SAB, and PART reviews, we agree that application of these metrics into research program reviews can help to strengthen the program. We continue to strive for performance metrics that best enable evaluation of the impact of our research programs.

With respect to the annual performance reviews of ORD scientists, lab and center managers are using performance metrics (e.g., contribution to an MYP APM) in performance evaluations.

**Recommendation 14** (page 11): The BOSC subcommittee cautioned about overreliance on bibliometric analyses and the need to establish reference values to facilitate accurate assessment and comparisons across disciplines and agencies. The subcommittee also recognized the need for the investment of time and resources to advance the use of bibliometric analyses.

**Response:** We appreciate the subcommittee's concern about overreliance on specific analyses and the need for dedicated resources to delineate effective performance metrics. We are currently working toward developing a comprehensive bibliographic database to facilitate analysis of research outcomes and to document research activities related to LTGs and APGs. As the subcommittee pointed out, some of these analyses can be resource intensive, so we hope to develop a systematic process for tracking research effectiveness.

**Recommendation 15** (page 11): The BOSC subcommittee suggested developing uniform metrics to track program progress over time.

**Response:** As mentioned previously, the development of metrics is an ongoing effort across ORD. Because of the diversity of research outputs (methods, models, publications, data, guidance documents), it is unlikely that a single metric can be universally applied. However, the utility of developing a time-series analysis to track progress will be explored in conjunction with the 2009 BOSC and 2010 PART reviews.

**Recommendation 16** (page 13): The BOSC subcommittee recommended that DWRP resources be leveraged through strategic use of cooperative agreements and collaborations, particularly to address emerging research issues.

**Response:** We agree with the subcommittee on the value of cooperative agreements and collaborations. While these mechanisms are widely used, there has not been a consistent approach to documenting their contributions to the research program. The role of existing and potential cooperative agreements and research collaborations will be more prominently articulated in the 2009 BOSC review of the DWRP.

**Drinking Water Research Program  
Summary of Recommendations and Proposed ORD Actions and Timelines**

<b>Recommendation</b>	<b>ORD Action</b>	<b>Timeline for Action</b>
<b>Recommendation 1:</b> Develop resource analysis matrix to facilitate prioritization and funding for the thematic research agenda.	<b>Response:</b> Work is in progress to improve research prioritization approaches	BOSC program review (2009)
<b>Recommendation 2:</b> Complete MYP	<b>Response:</b> Currently undergoing internal review	Mid-2008
<b>Recommendation 3:</b> Strategic planning	<b>Response:</b> On-going	BOSC program review (2009)
<b>Recommendation 4:</b> Further investigation, refinement, and application of the bibliometric and client document analysis and surveys for regularly assessing research programs.	<b>Response:</b> On-going	BOSC program review (2009)
<b>Recommendation 4a:</b> Discriminating between the contributions of extramural research (STAR) and intramural research	<b>Response:</b> The review process is based on an integrated evaluation of all program accomplishments.	No action needed
<b>Recommendation 4b:</b> Determining whether indices of high publication citation rates or impact factors are equivalent among disciplines and organizations.	<b>Response:</b> Not clear how this information will help in review, evaluation, and shaping the research program to meet priority needs	No action needed
<b>Recommendation 4c:</b> Enhancing partner diversity beyond EPA program offices.	<b>Response:</b> Meeting with various groups to define appropriate partners and stakeholders that can add value to the existing program structure	BOSC program review (2009)
<b>Recommendation 5:</b> Develop more consistency in intra-agency communication and evaluation procedures.	<b>Response:</b> On-going	BOSC program review (2009)
<b>Recommendation 6:</b> Develop a conceptual model to better link Long-Term Goals, Annual Performance Goals, Annual Performance Measures, and resource availability/allocation.	<b>Response:</b> On-going	BOSC program review (2009)
<b>Recommendation 7:</b> Benchmark goals and measures against the results of other organizations that do similar work.	<b>Response:</b> Will consider in the context of other ORD metrics that will be developed based on results of current National Academies study of research efficiency	BOSC program review (2009)
<b>Recommendation 8:</b> Need consistent approaches for fostering scientific leadership.	<b>Response:</b> On-going	BOSC program review (2009)
<b>Recommendation 9:</b> Need to develop more interactions with other agencies.	<b>Response:</b> On-going	BOSC program review (2009)
<b>Recommendation 10:</b> Need to ensure strong interagency communication among/between laboratories, centers, and program offices.	<b>Response:</b> On-going	BOSC program review (2009)
<b>Recommendation 11:</b> Develop specific strategies to address important research	<b>Response:</b> On-going through developing cross-program research	BOSC program review (2009)

areas such as climate change, nanotechnology, and water reuse.	teams. Need to develop approach for prioritizing cross-cutting topics.	
<b>Recommendation 12 :</b> Need to collaborate with other ORD programs (Water Quality, Homeland Security), other federal agencies, and other organizations.	<b>Response:</b> On-going	Underway.
<b>Recommendation 13:</b> Performance metrics should be incorporated into annual performance reviews to promote alignment with the Agency’s goals.	<b>Response:</b> Performance metrics of ORD research programs are evolving in response to feedback from the BOSC, SAB, and PART reviews. Performance metrics are used in annual performance reviews of EPA scientists.	BOSC program review (2009)
<b>Recommendation 14 :</b> Be cautious about over-reliance on bibliometric analyses.	<b>Response:</b> On-going	BOSC program review (2009)
<b>Recommendation 15 :</b> Develop uniform metrics to track program progress over time.	<b>Response:</b> On-going	BOSC program review (2009)
<b>Recommendation 16:</b> Leverage DWRP resources through strategic use of cooperative agreements and collaborations, particularly to address emerging research issues.	<b>Response:</b> On-going	BOSC program review (2009)