SUPERFUND BASIC RESEARCH PROGRAM

2009 SBRP External Advisory Panel:

Executive Summary
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1. EXECUTIVE SUMMARY

BACKGROUND

This report presents analyses and recommendations of the External Advisory Panel (EAP). The EAP was established to provide guidance for the future direction of the Superfund Basic Research Program (SBRP). The EAP was charged with analyzing and providing recommendations on key scientific issues that should frame SBRP research, and identifying emerging issues for future research. The SBRP also asked the EAP for input on the basic structure of the program as well as mechanisms to accelerate the application of research outcomes.

The SBRP has a demonstrable history of assembling interdisciplinary academic teams to address pressing basic research problems relevant to contamination of the environment at Superfund sites. The SBRP is likely the largest source of extramural research dollars that address these issues. The scientific programs funded to date have had measurable success in advancing scientific knowledge through high-quality research, as determined by bibliometrics (i.e., publications in high-impact, peer-reviewed scientific journals) and fulfillment of training goals. SBRP-funded research has addressed fundamental knowledge gaps in hazardous waste hazard, exposure and risk and has promoted development of hazardous waste management and remediation technology. Noteworthy examples include SBRP-funded research on complex mixtures, bioavailability, metal contaminants, sensors for site characterization and monitoring, and risk assessment tools. Some of this research has affected approaches to site monitoring and remediation and chemical assessments developed by regulatory agencies. Still, as is the case with related research programs (e.g., the Environmental Protection Agency's STAR Grants program), it is difficult to judge the extent to which SBRP research output is used in decision- and policy-making processes.

From the outset, the SBRP has emphasized multidisciplinary research. This is appropriate and should be continued and enhanced. Basic research programs can advance "science for science's sake", or they can advance knowledge to fulfill identified needs of stakeholders and decision-makers. The latter programs are at the interface of basic and applied research. This so-called translational aspect of the research carried out by programs like the SBRP appears to be highly valued by stakeholders and Superfund partner agencies. The emphasis on translation of basic science to application has always been a goal of SBRP. However, these efforts were enhanced substantially in 2004. It has taken the form of information dissemination and technology transfer activities in Multi-project Program Grants. While this is appropriate, it should be further refined in the context of a basic research program which supports direct application and problem solving. From this perspective, research translation has multiple phases, which feed into activities like validation, proof of concept, demonstrated application, and commercialization (where appropriate). Additional interaction with the Environmental Protection Agency (EPA), the Agency for Toxic Substances and Disease Registry (ATSDR), and stakeholders in communities affected by Superfund sites will be needed to fully realize the translational nature of the SBRP.

SBRP-funded research has a variety of audiences and users within EPA and ATSDR. For example, basic research that produces model parameters (e.g., mass transfer coefficients, reaction rate constants, or bioavailability measures) were acknowledged and valued by EPA Regional staff and consultants. Additionally, EPA's Office of Research and Development is a main and natural consumer of basic science output which is useful in risk assessment or in

understanding the mechanisms of toxicity for Superfund-related chemicals. The primary likely end-users of SBRP-funded engineering research are developers of remediation technologies or those who evaluate technology options at individual Superfund sites.

SBRP's quality research has increased knowledge, reduced uncertainty in risk assessment, and has helped incorporate scientific evidence into environmental policy and decision-making at Superfund sites. SBRP also provides an opportunity to connect emerging issues in managing and/or preventing exposure from releases of hazardous waste to the environment. Overall, SBRP activities fill an important niche in the science needs for site assessment and remediation, have had a positive impact on public health, and are worthy of continuation. However, increased interactions among the Superfund Agencies and key stakeholders are likely to increase the impact of this Program. Future resources for SBRP are likely to be highly scrutinized and accountability will be emphasized. External pressures to apply these resources to the most critical questions of our day are likely to increase. Therefore, it is even more important that SBRP demonstrates wise and efficient use of its resources in the future. Most importantly, SBRP should significantly advance efforts to identify and prioritize new (or ongoing) areas of emphasis and investigation.

The recommendations of the EAP, presented here, are based on a review of extensive written briefing materials provided by SBRP staff and contractors; a series of telephone Panel conferences; responses to Panel-generated questionnaires from grantees, agency, business, and community representatives; and finally on presentations and interviews with invited participants from those groups during a two-and-a-half day workshop with the Panel.

As detailed in the main body of the report, the EAP generated the following recommendations to guide future SBRP activities toward success:

1. Conduct a high-level strategic planning exercise to identify and promote research on emerging scientific issues critical for site assessment and remediation.
2. Increase level of program integration and promote interactions among grantees; this includes interactions between individual grantees and between individual grantees and Multi-project Grant programs.
3. Increase emphasis on translation of research towards remediation activities.
4. Promote effective and sensitive community outreach, especially as it pertains to communities affected by Superfund sites. This includes recognition of and sensitivity towards specific cultural identities and characteristics (e.g., the Indian Nation, its language and beliefs; challenges discussing sickness and death with translation of science; using different approaches for different communities; non-English speaking stakeholders).
5. Ensure critical review of continuously-funded, multi-project grants.
6. Develop and/or improve tools for assessing progress and achievements at the level of the individual grantee or Multi-project Grantee, and for the SBRP as a whole.
7. Develop metrics to assess the impact of SBRP research on the efficacy of site-remediation, decision making, and public policy. These metrics should be used to guide the future of research mechanisms and topics funded by the Program.

This Executive Summary and the following expanded report are organized into the following sections (in approximate order of priority): Strategic Planning, Priority Research Areas, Metrics, Portfolio Development, Communication and Collaboration, Data Dissemination, Translation, Community Outreach, and Training. Comments on the responsiveness of SBRP to the 2003 EAG report are also included.

A. Strategic Planning

There was consensus among EAP members that the time has come to initiate a high-level strategic planning effort. The extent and intensity of review and analysis and the resources required to achieve a strategic plan are beyond the scope of the current EAP review or that of the 2003 External Advisory Group.

Since the time the SBRP was created by the Superfund Amendments and Reauthorization Act (SARA) of 1986, science and technology have advanced substantially, and the landscape of relevant scientific research and expectations for community involvement has evolved. There is also a growing understanding of the importance of translational research - beginning with the basic research that leads to a key, important scientific understanding then stepping through the research needed to apply that understanding in the field or, in medicine, by the clinician. Therefore, the EAP strongly recommends that SBRP immediately initiate efforts to develop a strategic plan to provide for clear program goals and priorities in the context of an appropriately balanced portfolio. The goal should be the development of a strategic plan that identifies not only priority areas of investigation, but the process by which priorities are routinely reassessed and iteratively modified. This will provide strong interim guidance for the Program, transparency for the public, and a strong basis for future external evaluation and recommendations. An important consideration is how the SBRP fits into and leverages other related research efforts sponsored by the federal government and the private sector.

There are several well-established approaches to the strategic planning process (e.g., NRC/BEST commissioned reports; outside contractor/facilitator) which should be considered by SBRP management, prior to choosing and implementing one approach. Regardless of the chosen approach, the strategic planning process should engage a broad range of participants beyond traditional stakeholders such as EPA, Remedial Project Managers and community representatives. By including a broad group of participants, it may be possible to envision and implement important new priorities in the fields of remediation and environmental management. The strategic planning process should also include "gap analysis" and should attempt to identify and address limitations in the SBRP portfolio. Another goal would be to identify and prioritize research goals, include specific environmental chemicals and agents of concern, some of which may already be present at existing Superfund sites or other contaminated areas and some that are of emerging concern. Areas ripe for collaboration or expansion within and between funded SBRP programs should be identified, as well as opportunities to interact with non-SBRP programs, such as risk assessment programs at EPA. The strategic planning process should provide the framework upon which programmatic elements such as requests for applications (RFAs) and other research initiatives are developed within SBRP, and guide development of milestones and timelines which can be used to measure the success of SBRP as a whole, as well as its individual component programs. Transparency should be maintained in all aspects of the strategic planning process. Ultimately, strategic planning will accelerate research progress and translational application of research findings, and will allow SBRP and its stakeholders evaluate the overall impact of SBRP on environmental and human health.

B. Priority Research Areas

SBRP should carefully consider its research goals and objectives in the context of its strategic planning process, as described above. However, the SBRP 2009 EAP identified a number of important and compelling research areas, which it considers to be immediately relevant to future progress in environmental management, remediation and environmental health. In brief, these areas are: 1) emerging toxicants and novel compounds, agents or activities; 2) efficient remediation, waste reduction and energy efficiency (e.g., green technologies); 3) cumulative toxicity and risk assessments, including those for complex toxicant mixtures; 4) exposure assessments and modeling; and 5) identification of susceptible populations (children, the elderly, the immuno-compromised, those with limited access to health care, the impoverished). Discussion and rationale for research in these areas is included in the main body of the EAP report.

C. Metrics

There is continued need for appropriate, state-of-the-art bibliographic and non-bibliographic metrics for evaluating progress towards SBRP goals at the individual program level. Use of appropriate metrics is a mechanism to ensure reasonable progress toward pre-determined milestones on an acceptable timetable. Appropriate metrics are especially needed for translation and outreach/communication efforts to demonstrate impacts of the Program on public health outcomes in communities affected by Superfund as well as other communities. Development of such metrics should be an activity included in the strategic planning process.

D. Portfolio Development

SBRP should continue to develop its portfolio using appropriate grant mechanisms, including R01, P42, SBIR and STTR grants. Additional areas for consideration would be: P20 planning grants to facilitate the entry of new research teams into the program; and other mechanisms that promote coordination between individual grantees and/or grantee programs. In addition, the Panel suggested the need to facilitate increased interactions between grantees or grantee programs and cooperating agencies and institutions (i.e., EPA, ATSDR, CDC etc.) or among a combination of grantees, agencies, and/or affected communities.

E. Collaboration and Communication

The EAP felt that SBRP could potentially gain "added value" by promoting more synergy among its grantees and grantee programs. SBRP could promote synergistic interactions by establishing one or more pilot programs to complement and extend ongoing research in an SBRP Multi-project Grant program. SBRP Program staff could also require that each Multi-project Grantee develop at least one collaborative project with another Multi-project Grantee. Collaborations with cooperating agencies and communities should also be promoted, as described above.

F. Data Access and Dissemination

It is the responsibility of SBRP staff to mandate appropriate data access and dissemination practices by its grantees. There does not appear to be oversight or some mechanism to ensure that this is a routine and complete practice by grantees. Therefore, SBRP should immediately establish a mechanism, such as a committee, to improve and monitor data access and dissemination and to provide ongoing oversight of this process. The goal would be to ensure that SBRP grantees deposit annotated and raw data into appropriate repositories according to current protocols and guidelines within an acceptable time frame. For cases where formats

have not been standardized, the SBRP would provide guidance to grantees, either by providing a format or expressing expectations. Agency and public access to appropriate levels of information, and appropriate consideration of intellectual property issues should be guaranteed. The ethical and social implications of the released data, as well as economic impacts should also be carefully considered in developing guidelines for data release. To improve and facilitate compliance and prevent misuse of the data, database interfaces should be "user-friendly" and include the mechanism for facilitating the interpretation of data through annotation and consultation with SBRP scientists and Program staff. Access and dissemination of readily interpretable SBRP-funded data and information would result in a valuable legacy of this long-term Program.

G. Translation

Translational research, that is, science that begins with the basic research findings then moves all the way to the application (e.g., in remediation, risk assessments, policies and decisions), should be the ultimate goal for SBRP-funded research. This is not a simple matter, and the strategic planning exercise should provide recommendations in this area. Meanwhile, proposals to the SBRP should, at a minimum, identify potential translational outcomes, discuss appropriate timelines (which may vary for different types of research), and identify multi-disciplinary partners who may be needed to effect translation. In addition, the EAP recommends to SBRP that translation efforts at all levels be more proactive, that a continued emphasis be placed on the improvement of public health as an outcome, and that milestones and a timetable are specified when translational outcomes are described. The EAP acknowledges that SBRP results are often applicable in non-Superfund communities and encourages continuation of this effort. Depending on the nature of the research, this may require researchers to work closely with site managers and contractors doing site remediation. In other situations this will not be appropriate and interaction with organizations such as the National Center for Environmental Assessment within the EPA or ATSDR may more effective in achieving the research translation goal. Finally, certain research translation will best be achieved by actively engaging communities at existing Superfund sites.

H. Community Outreach

Community outreach programs should be designed around the collection of information on problems of importance to stakeholders at Superfund sites around the country. This should include community members and should guarantee effective dissemination of relevant research results to affected communities. This information collection activity can also provide a venue for expert input into communities regarding the state-of-the-science on emerging issues. However, these activities should be carefully coordinated with ATSDR, US EPA, and CDC Regional staff so that conflict and mis-communication are avoided. If implemented correctly, SBRP researchers in communities can provide both a source of information to the Program that will be valuable for Program planning purposes and can serve as scientific advisors to aid the communities who are grappling with difficult local and national Superfund scientific issues.

I. Training

Superfund science and engineering problems will continue to be priority environmental and public health issues for years to come. SBRP should make a concerted effort to expand the training of graduate students and post-docs in relevant disciplines. In addition, there is a need to train transdisciplinary researchers who understand, for example, both basic science and environmental / civil engineering, or both bioinformatics and toxicology. This could be

accomplished through a number of mechanisms including expansion of existing Multi-project Grants or establishment of research service awards and training grants for graduate students and post-docs requiring post-educational work in the Superfund and/or public health fields. Research service awards served a valuable role in the past and are coming back into favor. This form of training should be actively explored by the SBRP.

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