Office of Science
Notice DE-FG02-06ER06-16

Environmental Remediation Sciences Program
Integrated Field-Scale Subsurface Research Challenge

U.S. Department of Energy

Office of Science Financial Assistance Program Notice
DE-FG02-06ER06-16: Environmental Remediation Sciences Program - Integrated Field-Scale Subsurface Research Challenge

AGENCY: U.S. Department of Energy
Office of Science

ACTION: Notice inviting grant applications.

SUMMARY: The Office of Biological and Environmental Research (BER) within the Office of Science (SC), U.S. Department of Energy (DOE), hereby announces its interest in receiving applications for the establishment of integrated subsurface research teams under the auspices of the Environmental Remediation Sciences Division (ERSD). **The goal is to establish field research site(s) where integrated science teams manage and conduct field-site research over a five year period. These multidisciplinary science teams will be expected to undertake hypothesis-based field research on key processes influencing the subsurface transport, immobilization or remobilization of metal and radionuclide contaminants at DOE sites and to manage the field site(s). The Integrated Field-Scale Subsurface Research Challenge is intended to provide the necessary funding to enable large teams of interdisciplinary scientists to make significant advances in the understanding and simulation of subsurface processes affecting contaminant transport at the field scale as well as to provide short-term access and samples to other ERSD investigators interested in taking advantage of the site.** This solicitation challenges researchers to carefully identify major gaps in the understanding of subsurface contaminant transport and/or *in situ* remediation processes at the field scale, select an appropriate DOE site, assemble an interdisciplinary team and carry out a hypothesis-driven research plan that will advance the science of subsurface contaminant transport and resolve the previously identified knowledge gaps. Evaluations of novel *in situ* remediation processes and long term stewardship scenarios are of interest. The intent is to create multidisciplinary opportunities for field-scale hypothesis testing and quantitative description of processes affecting subsurface contaminant transport and/or novel *in situ* remediation techniques and to provide access and samples to other ERSD investigators. The environment of interest is the terrestrial subsurface below the zone of root influence including both the vadose zone (unsaturated) and the saturated zone (groundwater and sediments) on DOE property or lands for which DOE has cleanup responsibility. Investigations of phytoremediation research are not addressed in this notice. Contaminants of concern for this notice are DOE-relevant metals and radionuclides (listed below). Non-aqueous phase liquid (NAPLs) contaminants are not addressed in this notice.

DATES: Researchers **are required** to submit a preapplication for programmatic review. Preapplications should be submitted by May 11, 2006, to allow sufficient time for evaluation of programmatic relevance by DOE and for subsequent preparation of the full application. The preapplication narrative of
no more than 10 pages should consist of a description of the key science question(s) to be investigated, the proposed DOE site, the contaminant(s) of interest, the key hypotheses and a brief summary of the investigative approach and relevance to DOE needs. The preapplication should also include a list of the key investigators, their disciplines and their institutions using at most one page. An indication that the proposed site is available for *in situ* research is also requested along with contact information for an individual with site authority to permit such an investigation. More detail on the format for preapplications is provided below.

The deadline for receipt of formal applications is 8:00 PM., Eastern Time,
July 27, 2006, in order to be accepted for merit review and to permit timely consideration for award in Fiscal Year 2007.

ADDRESSES: Preapplications referencing Program Notice
DE-FG02-06ER06-16 should be sent via E-mail attachment to Kim.Laing@science.doe.gov. Use "Program Notice DE-FG02-06ER06-16" as the subject of the email.

Formal Applications

Applications submitted to the Office of Science must be submitted electronically through Grants.Gov to be considered for award. The Funding Opportunity Number is: DE-FG02-06ER06-16 and the CFDA Number for the Office of Science is 81.049. Instructions and forms are available on the Grants.gov website. Please see the information below and also refer to the "Funding Opportunity Announcement", Part IV - Application and Submission Information; H. Other Submission and Registration Requirements for more specific guidance on "Where to Submit" and "Registration Requirements." If you experience problems when submitting your application to Grants.gov, please visit their customer support website: http://www.grants.gov/CustomerSupport; email: support@grants.gov; or call 1-800-518-4726.

Registration Requirements: There are several one-time actions you must complete in order to submit an application through Grants.gov (e.g., obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number, register with the Central Contract Registry (CCR), register with the credential provider and register with Grants.Gov). See http://www.grants.gov/GetStarted. Use the Grants.gov Organization Registration Checklist to guide you through the process. Designating an E-Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in the CCR registration process. Applicants, who are not registered with CCR and Grants.gov, should allow at least 14 days to complete these requirements. It is suggested that the process be started as soon as possible.

VERY IMPORTANT - Download PureEdge Viewer: In order to download the application package, you will need to install PureEdge Viewer. This small, free program will allow you to

access, complete, and submit applications electronically and securely. For a free version of the software, visit the following Web site: http://www.grants.gov/DownloadViewer.

FOR FURTHER INFORMATION CONTACT: Dr. Robert T. Anderson of the Environmental Remediation Sciences Division (SC-23.4) within the Office of Science, U. S. Department of Energy at telephone: (301) 903-5549, E-mail: Todd.Anderson@science.doe.gov, fax: (301) 903-4154. The full text of Program Notice DE-FG02-06ER06-16 is available via the Internet using the following web site address: http://www.science.doe.gov/grants/.

BACKGROUND INFORMATION

The Department of Energy oversees some of the largest environmental cleanup operations in the world. Cold War Era processing of uranium for nuclear power and weapons has left an enduring legacy of over 6 billion cubic meters of contaminated soil, groundwater and other environmental media requiring innovative solutions to cleanup, manage and monitor contaminants found at DOE sites (NRC, 2000). The Environmental Remediation Sciences Division (ERSD) within the Office of Biological and Environmental Research (BER) is tasked with developing the fundamental scientific basis for understanding the fate and transport of contaminants in the subsurface. This task is guided by the ERSD long term performance measure to "provide (by 2015) sufficient scientific understanding to allow a significant fraction of DOE sites to incorporate coupled biological, chemical and physical processes into decision making for environmental remediation." In order to meet this measure the ERSD will fund multi-disciplinary research in a variety of science areas investigating key processes affecting the mobility of subsurface contaminants found at DOE sites. On October 1, 2005, ERSD's Natural and Accelerated Bioremediation Research (NABIR) program and the Environmental Management Science Program (EMSP) were merged to create the Environmental Remediation Sciences Program (ERSP), in accordance with Congressional direction. This solicitation from the new ERSP represents DOE's interest in continuing to support and build on the substantial research progress developed under the former NABIR and EMSP programs to address some of the nation's most difficult environmental problems.

Subsurface Contamination Research Needs

Legacy subsurface contamination at current and former processing and storage sites of radioactive materials presents an enormous technical, scientific and financial challenge for the Department of Energy and the nation as a whole. While technologies exist for dismantling and decommissioning physical surface structures such as contaminated buildings and former support structures, contaminants that have entered the subsurface are exceptionally difficult to clean up. This is particularly true for those contaminants spread over wide areas and whose potent toxicity and persistence requires removal to very low levels. Radionuclides, products of nuclear fuel and weapons manufacture, fall into this category of contaminants and are of particular concern to DOE cleanup operations in addition to other contaminant metals, nitrates, complexing agents and non-aqueous phase liquids (NAPLs) also found at DOE sites.

The projected performance of subsurface remediation techniques and long term stewardship strategies is often based on insufficient knowledge of the transport behavior of contaminants in

the subsurface and the mechanisms of contaminant transformation. As a result, many *in situ* strategies often do not meet performance expectations and exceed both cost and time schedule estimates. Consequently, it is likely that at many sites subsurface contamination will remain long after surface remediation measures have been completed (DOE, 2001; NRC, 2000). It is therefore imperative that DOE understand the factors that affect contaminant mobility and transformation within the subsurface in order to devise new remediation and long term monitoring strategies and to provide realistic assessments of the threat posed by subsurface contamination. These tasks will require significant advances in our understanding of key factors affecting the mobility and fate of contaminants in the subsurface. Additionally, these tasks will require the development of innovative tools for detecting, monitoring, modeling and stabilizing contaminants *in situ*, as well as novel techniques for removing contaminants from the subsurface.

Within the former NABIR and EMSP programs substantial progress has been made in evaluating the biogeochemical relationships among DOE relevant contaminants and the subsurface environment. Numerous applications of analytical techniques at the molecular scale have revealed previously unknown aqueous and solid phase-associated complexes of DOE-relevant contaminants, binding mechanisms to naturally-occurring minerals or organic matter and sequestration deep within pore structures of subsurface materials. At larger scales, applications of advanced subsurface detection techniques and isotope analyses have provided new insights into the location, mobility and speciation of subsurface contaminants. Mineral transformation studies have yielded a wealth of information on the potential for chemical additives and native microorganisms to transform geochemical conditions within subsurface materials to reduce, transform and/or sequester contaminants. These examples and many others have contributed to a growing body of literature on the speciation, transformation, sorption chemistry and precipitation/dissolution behavior of contaminants found in the subsurface at DOE sites. These analyses are crucial to understanding the transport behavior of contaminants under a variety of biogeochemical conditions likely to be found in the contaminated subsurface and have contributed new insights into potential techniques for immobilizing or transforming contaminants *in situ*. The ERSP will continue to support research activities that contribute to a better understanding of the biogeochemical nature of DOE relevant contaminants in the subsurface.

In addition to geochemical effects on transport, the activity of subsurface microbial communities can have a profound affect on the mobility of the contaminants in the subsurface. Many microorganisms are known to directly and/or indirectly facilitate the complexation, reduction, transformation, biomineralization and sequestration of DOE relevant contaminants. Stimulating microbial activity *in situ* is the basis for several promising subsurface remediation techniques (http://www.lbl.gov/NABIR/generalinfo/03_NABIR_primer.pdf). However, these techniques are still largely guided by empirical knowledge of the functioning of the subsurface microbial communities. While detailed physiological studies of subsurface isolates continue to provide new insights into the potential mechanisms of contaminant transformation by subsurface microorganisms much remains to be done. Recent advances in molecular biology continue to provide new insights into the genetic basis for microbially mediated subsurface processes and there is a need to understand the functioning of subsurface microbial communities from a more mechanistic perspective. Several projects associated with the former NABIR program are conducting detailed studies of the metabolism of metal-reducing bacteria in order to understand

and model the microbial respiration of insoluble metal oxides and radionuclides. Similar studies are being conducted with sulfate-reducing organisms found in the subsurface, which also are known to reduce metals and radionuclides, as well as fermentative organisms and organisms capable of respiring halogenated organics. These detailed physiological studies of microbes native to contaminated environments coupled with advanced techniques for detecting whole communities of organisms, or even a subset of targeted genes, are providing mechanistic descriptions of microbial processes in subsurface environments.

The application of these genome-enabled techniques to environmental processes at the field scale is an important link between the ERSP, the Genomics:GTL program (http://doegenomestolife.org/) and microbial genome sequencing efforts at the Joint Genome Institute (JGI, http://www.jgi.doe.gov/). Gene expression techniques coupled with genomic information and *in silico* modeling of multiple species could ultimately provide new tools to understand how microorganisms grow in the subsurface, how growth relates to contaminant transformation activity, nutrient limitations, stress responses, electron donor and acceptor utilization and a host of other metabolic processes likely to be important for understanding and modeling the biological impacts on subsurface contaminant fate and transport. The application of molecular biology and genomics-enabled techniques to a mechanistic understanding of microbially-mediated contaminant transformation processes within the contaminated subsurface will continue to be a focus of the new ERSP.

While understanding the functioning of subsurface microbial communities in the context of the DOE environmental remediation mission is of importance, that mission requires that the ERSP take a broad view of subsurface remediation science. Innovative physical/chemical processes to transform or stabilize DOE relevant contaminants *in situ*, as well as methods to monitor these processes have been a focus within the former EMSP program. Several projects have explored the potential of various oxidants, reductants and nano-sized materials to transform and/or immobilize contaminants of concern to DOE. Additional projects have investigated the fate and transport characteristics of contaminants under conditions of extreme pH, ionic strength and radioactivity found beneath leaking high level waste storage tanks. ERSP will continue to support innovative applications of physical/chemical-based remediation techniques and research that impacts the long term stewardship concerns associated with Legacy Management sites. Coupled projects involving combinations of physical/chemical processes and biological processes are also of interest whether configured together or sequentially. For those sites where contaminants have been stabilized, sequestered or transformed, assessment of the long term stability of contaminants is also of interest to the new program. Additionally, the ERSP will continue to facilitate development of characterization and monitoring techniques designed to track contaminant migration, delineate subsurface structure and monitor subsurface processes in the field. The intent is to foster close coordination among a diverse suite of subsurface science disciplines to address DOE's subsurface science needs and to meet the ERSD long term performance measure.

Coincident with an improved understanding of subsurface geochemical, biological physical/chemical processes affecting contaminant transport is the need to incorporate this knowledge into models of contaminant transport. Conceptual models, including computational simulation are important elements of the decision-making process for environmental remediation

and should reflect current state-of-the-science understanding of factors affecting subsurface fate and transport of contaminants. Additionally, conceptual and computational model development synthesizes current understandings of subsurface processes in a centralized manner and serves as a valuable research tool for exploring new hypotheses of contaminant mobility. Subsurface transport modeling has been a component within both the former EMSP and NABIR programs and will figure prominently in the new ERSP program. This will be particularly true for large, multi-disciplinary projects where the opportunity to synthesize concepts from many scientific disciplines at once is greatest. Recent workshops on reactive transport modeling (Davis et al., 2004) describe the need for multi-disciplinary research projects that incorporate modeling as an essential element of subsurface research. The ERSP portfolio maintains a diverse suite of projects ranging from molecular scale science to field scale investigations. This multi-disciplinary approach should facilitate diverse collaboration among subsurface researchers and advance our understanding of the critical processes that influence or control contaminant fate and transport at the field scale.

While both the former NABIR and EMSP programs made significant contributions to subsurface science and addressed DOE's needs in this area, major challenges remain. Of paramount importance is the linking of molecular scale processes to larger scale processes and ultimately, to processes occurring at the field scale. The ultimate goal of the ERSP is to provide DOE with field scale descriptions of subsurface processes affecting contaminant transport or transformation. This solicitation challenges researchers to conduct comprehensive investigations in the field to resolve major gaps in the understanding of subsurface transport of DOE relevant contaminants.

The preceding discussion is based on the draft ERSP Strategic Plan, which is available for comment on the ERSD website at http://www.sc.doe.gov/ober/ERSD_top.html.

CURRENT REQUEST FOR APPLICATIONS

Contaminants of Concern

Contaminants of concern across the DOE complex broadly include: radionuclides, metals, nitrate, complexing agents and nonaqueous phase liquids (NAPLs). Key contaminants (and their mixtures) of interest for the ERSP are:

- Radionuclides: plutonium, strontium-90, cesium-137, technetium-99, iodine-129, neptunium-237, and uranium.
- Non-Radioactive Metals: chromium(VI) and mercury;
- Nitrate and complexing agents as co-contaminants with the listed radionuclides or non-radioactive metals.
- NAPLs (i.e. carbon tetrachloride, trichloroethylene, dichloroethylene, tetrachloroethylene, chloroform, dichloromethane, and polychlorinated biphenyls) and complexing agents (such as EDTA) as co-contaminants with the listed radionuclides or non-radioactive metals. NAPL as primary contaminants are not addressed in this particular Notice.

A description of the nature and extent of contamination at the principal DOE sites is available at http://www.nap.edu/books/0309065496/html/index.html/. More detailed information is available in some cases from the major DOE sites: Hanford (http://www.hanford.gov, http://www.hanford.gov/cp/gpp/, http://www.hanford.gov/cp/gpp/science/sandt.cfm) Idaho National Laboratory (http://www.inl.gov/subsurface/environmentalissues/vadosezone.shtml) Oak Ridge Reservation (http://www.oakridge.doe.gov/External/Default.aspx?tabid=42) and Savannah River Site (http://www.srs.gov/general/srs-home.html, http://www.srs.gov/general/programs/soil/extpage.html).

Integrated Field-Scale Subsurface Research Challenge

The ERSD is committed to identifying the key processes controlling subsurface contaminant transport in order to develop science-based, long term stewardship strategies and *in situ* remediation techniques. While the ERSD supports an array of molecular scale science and laboratory-based research, concepts and processes investigated in the laboratory must ultimately be tested in the field in order to verify hypothesized conceptual models of contaminant transport and/or *in situ* remediation. A recent workshop sponsored by the Interagency Steering Committee on Multimedia Environmental Models (ISCMEM, http://www.iscmem.org/) highlighted many of the challenges facing the development of conceptual models of subsurface contaminant transport. Recommendations from this workshop, summarized in Davis et al. (2004, EOS, **85**[44]:449) and echoed in Steefel et al. (2005, *Earth and Planetary Science Letters* **240** [3-4]:539-558) stressed the need to conduct integrated, in depth studies of reactive transport processes, including biological processes, across different scales within a single experimental system in order to identify independent constraints on the components of coupled field scale reactive transport models. The coupling of small(er) scale processes investigated in the laboratory with the ability to test field scale effects in an *in situ* test plot where hydrologic and/or chemically transient conditions can be imposed are crucial to developing robust models of subsurface contaminant transport and/or biotransformation.

The goal is to establish field research site(s) where integrated science teams manage and conduct field-site research over a five year period. These multidisciplinary science teams will be expected to undertake hypothesis-based field research on key processes influencing the subsurface transport, immobilization or remobilization of metal and radionuclide contaminants at DOE sites and to manage the field site(s). The Integrated Field-Scale Subsurface Research Challenge is intended to provide the necessary funding to enable large teams of interdisciplinary scientists to make significant advances in the understanding and simulation of subsurface processes affecting contaminant transport at the field scale as well as to provide short-term access and samples to other ERSD investigators interested in taking advantage of the site. This announcement challenges researchers to carefully identify major gaps in the understanding of subsurface contaminant transport and/or *in situ* remediation processes at the field scale, select an appropriate DOE site, assemble an interdisciplinary team and carry out a hypothesis-driven research plan that will advance the science of subsurface contaminant transport and resolve the previously identified knowledge gaps. Projects funded as an Integrated Field-Scale Subsurface Research Challenge are to be fully self-contained in terms of the resources available for drilling and infrastructure needs as well as the necessary scientific expertise to accomplish the tasks proposed. **Leveraging of**

operations cost is encouraged to maximize the amount of funds spent on research. Site infrastructure should be kept to a minimum. The results of this research are expected to provide key insight into the major factors affecting contaminant transport or *in situ* remediation at a DOE site and provide a conceptual model of the processes involved.

In addition to larger potential budgets, a key feature distinguishing these Integrated Field Scale Subsurface Research Challenge teams from other projects funded within the ERSD will be the requirement to provide capabilities to collect, permit and ship environmental samples to laboratory-based ERSD investigators and to provide limited, short term site access to ERSD investigators interested in testing specific concepts or technologies/techniques relevant to the study of subsurface contaminant fate and transport.

Assembled field teams should be interdisciplinary and include a lead principal investigator (PI) with field experience, and team members with expertise in corresponding or supporting areas (e.g., microbiology/molecular biology, geochemistry, geophysics, hydrology and subsurface contaminant transport modeling). For collaborative proposals, a single investigator must be designated as the lead PI and a single institution or organization must submit the proposal and accept overall management responsibility. Proposed field site(s) must be located on DOE-owned or DOE-managed lands. To speed the National Environmental Policy Act (NEPA) review requirements, ERSD recommends that each applicant propose a plot(s) located on only one DOE site. Collaborating institutions must also provide Points of Contact (POC), scope, and budget information as appendices to the proposal. Communication and coordination among collaborators is viewed as extremely important in ensuring the success of the proposed work. All submissions should include a management approach to operate the site and facilitate interdisciplinary communication and collaboration among participating investigators. More information on expected research coordination, field site selection and operational management plans can be found below in the section entitled "Management and Cost Estimate" and "Operations Management of Proposed Field Site(s)." Applicants are encouraged to employ web-based, and other innovative systems to facilitate communication, sharing of results and coordination of tasks both within the group as well as for public dissemination of information.

The Scientific/Technical Approach (Project Narrative) section of submitted applications should identify and address:

1) The key science questions and/or gaps in understanding of subsurface contaminant transport and/or remediation processes at the field scale and the rationale for doing so in the context of DOE clean up needs.
2) The relevant target contaminant(s) to be investigated.
3) The chosen DOE site(s) for investigation and sufficient background material including remediation status and needs, regulatory and site ownership concerns and point of contact information for an individual with site authority.
4) The interdisciplinary research team including individual tasks/responsibilities.
5) A set of specific testable hypotheses to be investigated.
6) A set of clear *in situ* investigative approaches to sufficiently evaluate each hypothesis.
7) A plan for integrating multidisciplinary data into a unified subsurface conceptual/computational model.

8) Effective methods of coordinating data and communication among a highly inter-disciplinary group.
9) The potential impact of the results of the proposed investigation on contaminant transport and/or *in situ* remediation science in general and for DOE sites in particular.

Potential Research Areas of Interest

The current announcement seeks applications for field site investigations where subsurface processes relevant to long-term stewardship concerns or *in situ* remediation processes can be investigated. This announcement is intended to provide the necessary funding to enable large teams of interdisciplinary scientists to make significant advances in the understanding and simulation of subsurface processes affecting contaminant transport at the field scale. This announcement challenges researchers to carefully identify major gaps in the understanding of subsurface contaminant transport and/or *in situ* remediation processes at the field scale, select an appropriate DOE site, assemble an interdisciplinary team and carry out a hypothesis-driven research plan that will advance the science of subsurface contaminant transport and resolve the previously identified knowledge gaps.

Some potential areas of interest that could be addressed in multidisciplinary field investigations:

- Tracer techniques and/or geophysical techniques to evaluate and/or detect groundwater flow heterogeneities and quantitatively relate this information to subsurface processes affecting contaminant transport.
- Methods to identify, quantify and assess the stability of adsorptive sinks for contaminant metals and radionuclides in the subsurface including an assessment of the changes in sorption potential in subsurface environments due to variations in geochemical conditions (pH, redox, ionic strength, alkalinity, etc.).
- Investigations of the coupling and scaling of key physical and reactive processes affecting the transport, immobilization or remobilization of contaminant metals and radionuclides in the subsurface.
- Evaluation and quantification of the rates of mineral biotransformation in subsurface sediments and the effects of reduced minerals on the mobility of contaminant metals and radionuclides.
- Methods to assess, quantify and/or maintain the activity of key groups of subsurface microorganisms affecting the mobility of DOE relevant contaminants in the subsurface and incorporation of these methods into models of subsurface microbial metabolism.
- Quantitative assessments of the effect of co-contaminants on metal and radionuclide transport in the subsurface under varying geochemical conditions.

Technical Approach for Field Site Research

Descriptions of the chosen DOE field site should provide a detailed technical approach that includes: 1) establishing a defined (surface area and depth) experimental and control plot within the proposed contaminated field site, 2) a description of any manipulation of the experimental plot (both the vadose and/or saturated zone) by different amendments (tracers, reactants, microorganisms, chelators and potential contaminants or their analogs) to stimulate different

geochemical conditions *in situ* and 3) a five year timeline that outlines the expected annual activities. The technical approach must be described in phases such that completion of each phase could result in publishable results. A statistically robust sampling regimen to determine the efficacy of the manipulation should also be described. Moreover, the applicant must explain the technical feasibility of performing the proposed field research within the five year time frame.

Considerations for Field Site Selection

All proposed field sites must be located on DOE-owned or DOE-managed lands. ERSD expects that most applicants would propose field sites that would be government-owned, contractor-operated (GOCO) DOE sites.

The ideal contaminated field site would contain both a contaminated saturated zone and vadose zone. Contaminants of interest would need to occur below the zone of root influence, exclusive of the source term. The ideal contaminated field site should be large enough to accommodate areas for chemical, geological, hydrological, and microbiological characterization and sampling, and in-situ research.

A control field site with comparable hydrology and geology might be useful. The ideal control field site would be a nearby or adjacent uncontaminated area that would be representative of the contaminated field site conditions in a pre-contaminated state (or as representative as possible).

Hydrological control of the field site might be a useful field-related factor that would dictate the size/surface area of the proposed field site(s). Similarly, regulatory constraints on long-term (7 year) *in situ* research should be the primary compliance factor that would dictate the size/surface area of the proposed field site(s.)

The field site(s) would need to be of sufficient size/surface area to accommodate subsurface sampling and *in situ* research activities over a 7-year lifespan because ERSD expects site decommissioning may take two years.

Access to the contaminated field site should be controlled to accommodate ES&H concerns, but should be easily accessible to outside (non-DOE) researchers, including foreign nationals. Access by heavy equipment, e.g., subsurface drilling and other sampling/monitoring equipment, and year-round access are important.

In general, contaminants should not be of a type or at concentrations that would require clean up (i.e., clean up efforts that would interfere with operation of the site) within the next seven years, nor should they be of sufficient concentration to cause extensive health and safety problems for investigators or field sampling staff. Use of personal protective equipment at the contaminated field site should be expected.

ERSD suggests that if a source term(s) for the field site(s) is (are) still active, the source should be reasonably well defined, and consistent over a proposed 7-year life. A field site that receives periodic fluxes or slugs of contaminants or contaminated effluent to the surface soils might prove exceedingly difficult to characterize.

To minimize site characterization costs, applicants should consider proposing a field site(s) that has some level of baseline characterization. The availability of baseline characterization data on the contaminant plume(s), along with geologic and hydrologic maps/graphics, geophysical information, and surface maps showing existing boreholes and sampling points, should be explained.

Field Site Environmental, Safety and Health (ES&H) Review and Operating Requirements

Applicants proposing to conduct field research on DOE property will be required to conduct all aspects of the research operations safely and in an environmentally compliant manner. For example, while the proposed field site(s) should contain sufficient levels of contamination to require monitoring or eventual action (i.e., above "No Further Action" levels), radionuclide exposure levels for investigators and field sampling staff should not exceed 100 mrem per year, as specified in 10 CFR 835. Applicants will be required to adhere to all of the required Federal, state and local laws and requirements for environment, safety and health. Applications must demonstrate how the applicants will accomplish this. Applicants also are expected to provide information demonstrating an established line of communication with the appropriate DOE site office to ensure sufficient coordination for matters concerning environmental health and safety issues, waste disposal issues, drilling contracting/permit issues etc. The appropriate DOE **Site Office will need to be involved in the application preparation process to ensure that the proposed site and the envisioned *in situ* testing would meet local regulatory compliance measures.**

The proposed research to be undertaken over the five year effort must be evaluated in accordance with the requirements of the National Environmental Policy Act (NEPA). Although implementation of the NEPA process is the responsibility of DOE, applicants proposing to conduct field research are expected to provide sufficient information necessary for the DOE to conduct an appropriate NEPA review and statement of findings. To speed the NEPA review process, ERSD recommends that each responding organization propose only one (1) primary contaminated field site.

Applicants selected for funding should expect to provide NEPA-relevant information and data to the DOE Integrated Support Center (ISC) in Chicago, Illinois prior to receiving any funding so that the ISC can undertake and prepare the NEPA review document and statement of findings. NEPA-relevant information and data would include the size or footprint of the proposed field site(s), duration and total cost of the project, the location of the project with respect to the proximity of wetlands, historic sites, wilderness areas, threatened or endangered species or their habitat, or other environmentally sensitive resources as defined in the DOE NEPA regulations at 10 CFR 1021, Subpart D, Appendix B (4). Applicants also should expect to provide information on planned infrastructure such as wells or temporary buildings, electrical power etc. Applicants must be able to demonstrate that there are no extraordinary circumstances related to the proposed research on the DOE site, as per the definition in 10 CFR 1021.410(b)(2). **Communication with the appropriate DOE Site Office, and evidence of such, to address these matters is a requirement of this solicitation because the ISC will expect to coordinate the submission of NEPA-relevant data and information with the appropriate DOE Site Office.**

Program Funding

It is anticipated that up to $6M will be available for 1-3 awards to be made in Fiscal Year 2007, contingent on availability of appropriated funds for; 1) *in situ* research experiments and sampling, 2) planning, operation and maintenance of the field site(s) and associated infrastructure, including the development of strategic, management, Health and Safety, QA/QC, and Communications plans; drilling, sampling, sample analysis, sample archiving and distribution; web site maintenance and posting of characterization data/information, 3) management and ES&H compliance activities associated with operating the field site(s), and 4) characterization activities for the field site(s). Annual budgets for proposed projects should not exceed $3M/yr. Applicants may request project support for up to five years. **Budgets should separate operations costs (i.e. characterization, drilling, support services, routine analyses etc.) from research costs and be kept to a minimum.** Depending on funding availability and satisfactory performance, funding would be provided for three years with two one-year, non-competitive continuations. ERSD would review the research productivity and management activities prior to the end of the third year. Prior to the end of the fifth year, ERSD would undertake a comprehensive competitive review of all activities.

All applications should include letters of agreement to collaborate from potential collaborators. Teaming among national laboratories, M&O contractors, universities or other private sector organization is encouraged, provided that the field site(s) would be located at only one DOE site. Letters of collaboration should specify the contributions the collaborators intend to make if the application is accepted and funded. DOE may encourage collaboration among prospective investigators to promote joint applications or joint research projects by using information obtained through the preliminary applications or through other forms of communication. DOE is under no obligation to pay for any costs associated with the preparation or submission of applications if an award is not made.

Preapplication Review and Criteria

A preapplication must be submitted for programmatic review. On the cover sheet, the preapplication should identify:

a) the project title.

b) the lead institution and all participating institutions.

c) the names and areas of expertise of all team members, including the Principal and co-Investigator(s), the DOE Site Office point of contact and the point of contact with the contractor who has primary management accountability for the proposed DOE field site.

d) the addresses, telephone, fax and E-mail addresses of all team members.

The preapplication should consist of **up to 10 pages** of narrative and graphics, and should include the following sections: a description of the key science question(s) to be investigated, the proposed DOE site, the contaminant(s) of interest, the key hypotheses with a brief summary of

the investigative approach and relevance to DOE needs and an outline of a management plan. All preapplications should also include a brief coordination/management plan. The field site should be briefly described and should include the specific surface and subsurface boundaries of the site, the contaminant(s) of concern and any relevant preliminary or existing site characterization data. In addition to the 10 pages of narrative, applicants should submit brief (one-page) vitae for each investigator on the team, as well as a signed statement of support from a primary point of contact at the DOE Site Office with oversight responsibility for the DOE field site.

ERSD will screen preapplications against the following criteria:

1. The proposed field site(s) would be on DOE-owned or managed land and would be expected to be available for seven years,
2. The groundwater or vadose zone at the proposed contaminated field site(s) would be contaminated with radionuclides and/or heavy metals of interest to ERSD,
3. Pump testing of wells and tracer injection tests would be possible at the proposed field site(s),
4. Both sampling and *in situ* research by ERSD investigators would be possible at the proposed field site(s),
5. The availability of previously collected data on contamination at the proposed field site(s), and
6. Letters of commitment and support, or signatures, for all parties (i.e., appropriate DOE Site Office Manager, M&O host site and/or Environmental Restoration manager for the proposed field site(s), any subcontractors or consultants, etc., as appropriate) are included in the preapplication.

After reviewing each preapplication against these criteria, ERSD intends to respond to applicants. Applicants are encouraged to specifically address each of the screening criteria in their preapplication. The preapplications will be reviewed for responsiveness to the scope and research needs described in this notice. Please note that notification of a successful preapplication is not an indication that an award will be made in response to the formal application.

Proposal Review Process

The review process will consist of a merit review of the application, which may include a site visit, followed by a programmatic and administrative review of applications being considered for award.

Applications will be subjected to formal merit review (peer review) and will be evaluated against the following evaluation criteria which are listed in descending order of importance codified at 10 CFR 605.10(d):

1. Scientific and/or Technical Merit of the Project;
2. Appropriateness of the Proposed Method or Approach;
3. Competency of Applicant's Personnel and Adequacy of Proposed Resources;
4. Reasonableness and Appropriateness of the Proposed Budget; and

5. Management Approach, including DOE Site Office and relevant contractor relationships.

As part of the evaluation, program policy factors also become a selection priority. Note, external peer reviewers are selected with regard to both their scientific expertise and the absence of conflict-of-interest issues. Federal and non-federal reviewers will be used, and submission of an application constitutes agreement that this is acceptable to the investigator(s) and the submitting institution.

Relevance to Mission

A key consideration in the evaluation of research applications will be applicability to the Environmental Remediation Sciences Division (ERSD) mission of environmental remediation and long term stewardship of DOE sites. Applicants will need to identify specific areas of scientific need and make a strong case for the value of the proposed research in helping resolve those needs. The application should explain how resolution of these needs could improve capabilities in site stewardship and/or understanding/controlling subsurface contaminant fate and transport. Therefore, **all applications submitted in response to this Notice must explicitly state how the proposed research will support the accomplishment of the BER Long Term Measure "to provide sufficient scientific understanding to allow a significant fraction of DOE sites to incorporate coupled biological, chemical and physical processes into decision making for environmental remediation."** DOE will also consider, as part of the evaluation, program policy factors including balance among the program areas and research already in progress. Previous research solicitations, abstracts, and research reports of projects funded under the former EMSP can be viewed at: http://emsp.em.doe.gov/search.jsp. Previously funded projects and abstracts from the former NABIR program can be viewed at: http://www.lbl.gov/NABIR/researchprogram/awards/index.html.

Submission Information

Information about the development, submission of applications, eligibility, limitations, evaluation, the selection process, and other policies and procedures may be found in 10 CFR Part 605, and in the Application Guide for the Office of Science Financial Assistance Program. Electronic access to SC's Financial Assistance Application Guide is possible via the World Wide Web at: http://www.science.doe.gov/grants/grants.html.

In addition, for this notice, the research and management (Narrative) description must be **40 pages or less,** exclusive of attachments, and must contain an abstract or summary of the proposed research (to include the hypotheses being tested, the proposed experimental design, and the names of all investigators and their affiliations). Attachments should include short curriculum vitae (2 pages maximum), a listing of all current and pending federal support and letters of intent when collaborations are part of the proposed research or management team. Curriculum vitae should be submitted in a form similar to that of the National Institutes of Health (NIH) or the National Science Foundation (NSF). **Applications with Project Narratives longer than 40 pages will be returned to applicants and will not be merit reviewed or considered for award.**

The Office of Science, as part of its grant regulations, requires at 10 CFR 605.11(b) that a recipient receiving a grant and performing research involving recombinant DNA molecules and/or organisms and viruses containing recombinant DNA molecules shall comply with the NIH "Guidelines for Research Involving Recombinant DNA Molecules," which is available via the world wide web at: http://www.niehs.nih.gov/odhsb/biosafe/nih/rdna-apr98.pdf, (59 FR 34496, July 5, 1994,) or such later revision of those guidelines as may be published in the Federal Register. Grantees must also comply with other federal and state laws and regulations as appropriate; for example, the Toxic Substances Control Act (TSCA) as it applies to genetically modified organisms.

MANAGEMENT APPROACH

Long-Term Host Site and DOE Site Office Commitment

ERSD recognizes that because the proposed field site(s) would be on DOE lands that would be contaminated with, at minimum, radionuclides and heavy metals, there would be a number of interested and responsible parties involved in making decisions regarding activities to be conducted at the field site(s.) In addition, ERSD would like to ensure that the field site(s) remain available for sampling and *in situ* research for the long-term (7 years). To provide ERSD with some assurance that all interested and responsible parties are in agreement that the proposed field site(s) would be available for the long-term, applications should include input from:

- the DOE Site Office Manager (who has the authority to commit DOE lands as field sites for the duration),
- the NEPA support office within the applicant's proposing organization, and
- the Manager from the Environmental Restoration or appropriate contractor (who has direct responsibility for managing the proposed field site(s).

The management section of the application should provide ERSD with an understanding of the: 1) proposed organizational structure, qualifications and roles and responsibilities of each member on the proposed applicant's team, 2) the resources and facilities being proposed, and 3) the overall management approach for "operating" the field site(s).

Organizational Structure and Interactions, and Staff Roles, Responsibilities and Qualifications

Roles and Responsibilities

Applicants are requested to provide a proposed staffing and organizational structure chart for the management of the proposed field site(s), and a detailed description of the roles and responsibilities of each proposed member of the Field Site staff. Applicants must propose an on-site manager (Field Site Manager) who would be responsible for coordinating sampling and in situ research activities at the field site(s), ensuring ES&H compliance, and managing any field site staff and any field site-associated infrastructure.

This section of the application should delineate the anticipated time commitment for all proposed Field Site staff (e.g., full-time, part-time, or as needed). Responding organizations should identify the types of subcontractors that might be needed (e.g., those for drilling and coring activities), as well as any consultants that might be employed.

Proposed Staff Qualifications

For all key proposed staff, applicants are requested to provide a one-paragraph summary of the education and experience of each proposed staff member, and, in addition, a resume for the key staff that includes examples of technical and/or management experience in activities of a similar nature to that being proposed.

Resources and Facilities

Each applicant should describe their capability to provide appropriate types of resources, instrumentation and facilities to support the types of fundamental research activities that might be conducted at the field site(s). Specifically, a description of the appropriate on-site sample analysis and handling facilities and the existing physical infrastructure, including field sampling and heavy equipment is requested.

Applicants are requested to:

- list and describe chemical and microbial analysis instrumentation and facilities that would be available,
- list and describe sample handling equipment and facilities that would be available, and
- list and describe sample and archival storage facilities that would be available.

The description of the storage facilities should include a discussion of the capability to store groundwater, sediment, core and microbial samples that might be contaminated with radionuclides and/or heavy metals under aerobic and anaerobic conditions. Storage might be short-term or for archival purposes.

Physical infrastructure and heavy equipment

Applicants are requested to provide a listing/description/discussion of the potential use and availability of the following items:

- weather station,
- power (3 phase 440v, 240v, 120v),
- water,
- office space/trailers at the field site(s),
- sampling handling/preparation capabilities at the field site(s),
- subsurface sampling and monitoring equipment
- field site security,
- electronic (e-mail) and telephonic communication while in the field,
- restricted roads,

- field access vehicles for use by ERSD investigators, and
- year-round access by heavy vehicles (e.g., drill rigs).

Management and Operations Planning

As part of the start-up activities for the Integrated Research Field Sites, and prior to the initiation of any additional field site characterization or field site research activities, ERSD would expect the applicant (i.e., the Field Site Manager) to develop a set of documents to govern the operation of the field site(s). This activity might take several months to complete, and would include development of:

- a Management Plan for all field site activities,
- an overall Health and Safety Plan (HASP) tiered from the DOE host site HASP,
- a Quality Assurance/Quality Control (QA/QC) Plan,
- a Communications/Community Interaction Plan, and
- a Site Closure Outline (demobilization, field site stabilization, asset disposition).

Field site management plan

The overall Field Site Management Plan would be expected to include:

- an explanation of the roles and responsibilities of field site staff, along with an explanation of the oral, written, and electronic communication plans with ERSD management, team members, other ERSD PI's, the scientific oversight and ES&H staff from the appropriate DOE Site Office, stakeholder groups, and the interested public,
- an introduction to the management of the planned characterization and research campaign activities and plans,
- procedures for non-team PI's to follow to use the field sites for sampling and in situ research,
- procedures for archival storage and maintenance of excess sediment, water, cores and biological material from field samples,
- an explanation of the overall approach for environment, safety and health (ES&H) compliance (e.g., NEPA, permitting, site regulation compliance, U.S. Department of Transportation sample shipping requirements, radiation safety requirements, chain of custody, etc.),
- a data management plan to handle data generated from the characterization activities as well as from the research campaign activities (including procedures for reporting data),
- a policy for the use of associated laboratory resources (e.g., analytical facilities, etc.), storage of samples, and use of equipment (e.g., vehicles, drilling equipment, etc.), and
- a projected schedule of research activities.

Health and safety plan

In general, the Health and Safety Plan (HASP) would be expected to include:

- a listing of Field Site staff names, along with other named individuals allowed to undertake field operations activities and the level of safety training required of each,
- designation of one Field Site staff member for overall health and safety responsibility, and stop work authority,
- an explanation of the requirements, procedures, and guidelines for worker health and safety and for ERSD investigator health and safety during field operations,
- an explanation of drilling rig modification activities,
- identification and explanation of the potential human health and safety hazards and detailed procedures to mitigate those hazards,
- an explanation of the level of safety training expected of university faculty and students, and
- a explanation of the waste management approach for research campaign activities (to handle both contaminated and uncontaminated solid and liquid drilling/excavation wastes).

For individual research campaigns, the HASP should include:

- documentation procedures for on-site safety briefings prior to the initiation of activities,
- an explanation of control boundaries such as exclusion zones, the decontamination line, the contamination control zone, and clean areas, along with the designation of an individual responsible for those control areas,
- inventory lists and Material Safety Data Sheets (MSDS) for all chemicals and solutions on site,
- a description of personal protective equipment and levels of protection required for the different controlled areas,
- procedures for personnel decontamination, locations where decontamination may be performed, decontamination equipment needed,
- procedures (including immediate treatment) to be followed in the event of a fire, explosion, radioactivity exposure, along with points of contact for such situations,
- contact points for other on-site injury or illness, and
- a daily visitor and activity control log.

Quality assurance/quality control plan

ERSD is funding investigators at DOE national laboratories, at universities, and at private institutions. Many of the ERSD investigators are in need of samples from field sites, and the applicant would be expected to provide core/sediment, groundwater, and possibly microbiological samples to these investigators. Applicants would need to be capable, and would be expected, to ship contaminated as well as uncontaminated samples to ERSD investigators at universities and private laboratories. Shipment of contaminated samples would require appropriate documentation and permits, and ERSD recognizes that laboratories receiving contaminated samples would have to be appropriately permitted. Therefore, applicants should plan for ensuring chain of custody requirements.

In addition, to ensure that the applicant is obtaining research quality samples that could be sent to other ERSD investigators, applicants should plan to develop a Quality Assurance/Quality Control (QA/QC) Plan. The QA/QC Plan should include procedures for:

- maintaining chain-of-custody records for all samples and shipments,
- procedural controls such as written protocols and guidelines (e.g., for sample processing), including detailed logbooks such as an overall field activities logbook, a drilling/coring logbook, a sample logbook, and a photo logbook,
- decontamination procedures such as removing ground and airborne contaminants from coring/drilling equipment, sterilizing sample processing tools, wiping down glove bags with a bleach solution,
- establishing site layout plans to minimize airborne contamination of the drilling equipment, sampling tools, and sample processing facilities,
- inserting quality control "blanks" (e.g., deionized water in sample vials or blanks of control sediment materials that are packaged during glove bag procedures), or inserting deliberately "spiked" samples into the suite of samples taken during field operations,
- physically separating incompatible activities such as tracer mixing and sample processing,
- screening of samples for radioactivity and volatile organic compounds,
- obtaining records of temperature, pH, and redox conditions with calibrated instruments at the time of sampling,
- protocols for hazardous waste shipping,
- procedural controls for decontamination and radiation exposure mitigation, and
- any additional requirements imposed by permit limitations.

In addition to providing samples to ERSD investigators, ERSD would expect the applicant to be capable of archiving and storing at low temperature subsurface sediment, groundwater, core, and possibly microbial samples that might be contaminated with radionuclides. A capability to archive and store would be particularly important given the high cost that each sample would represent for ERSD.

Communications/community interaction plan

The Field Site Manager would be required to communicate and interact with a variety of different organizations and individuals. Although the level of interaction might vary during the course of any given year, in addition to internal communications described in the management plan, applicants should expect the Field Site Manager to interact with:

- ERSD program managers,
- the scientific community for communication of research results,
- DOE Site Office staff,
- DOE site contractors responsible for managing the proposed field site(s) and/or wastes,
- local stakeholders, and
- Federal, State, and other local regulators.

The Communications/Community Interaction Plan would include an approach for communicating/interacting with all organizations and stakeholders identified above. In addition, this plan should include a discussion of the following: site tours, creation of fact sheets about the field site(s), use of field sites as educational resources, and training students from local universities.

Site closure outline

Applications should provide a general plan for a site closure upon completion of investigations which should include estimated costs to remove equipment and/or infrastructure related to the in situ investigations.

Reporting Requirements

Quarterly conference calls and progress reports

The PI and Field Site Manager (if not one and the same) would be expected to participate in a quarterly conference call with the ERSD Program Manager. In addition, the PI and Field Site Manager would be expected to provide a written quarterly report of operational activities to the ERSD Program Manager. The quarterly progress report would be expected to include highlights of major scientific accomplishments for the quarter, a detailed listing and explanation of on-going projects (including sampling projects) as well as any projects anticipated during the next quarter, any other significant actions planned for the next quarter, a summary of Field Site operations expenditures tracked against annual projections, identification of any management issues, schedule status and variances, discussion of interactions with the public, staffing issues, and any general Field Site difficulties and actions taken.

Annual summary report

The annual summary report would be required 90 days prior to the anniversary of the initial funding date. The annual summary report would contain a summary of the information provided in the quarterly reports.

All reports would be submitted to the ERSD Program Manager.

COST ESTIMATE

The cost section of the application should cover four components: initial setup and infrastructure costs, sampling and *in situ* research costs (including the field site management costs), additional field site characterization and analysis costs and an estimate of site closure costs based on expected equipment installation and/or site improvements (ex. access road improvement, storage areas) that will require removal or restoration to pre-experimental conditions after completion of investigations. The site closure estimate is intended to provide ERSD and the peer reviewers with a rough idea of funding that would be needed to close out the project in the sixth or even seventh years.

Initial Setup and Infrastructure Costs

Applicants are requested to provide an estimate of the costs for initial purchase/leasing of:

- trailers at the field sites and/or nearby office space for Field Site staff,
- office equipment for Field Site staff (e.g., desks, computers, communications equipment, etc.),
- instrumentation and equipment for analysis of field samples,
- field sampling and monitoring instrumentation and equipment,
- safety and decontamination equipment, and
- other materials and supplies to operate.

Applicants are encouraged to identify any additional items that should be included in the initial setup costs.

Sampling and *in situ* Research Costs

Applicants are requested to provide a breakdown and explanation of variable costs for:

- staff salaries and benefits (to handle sample acquisition, processing, packaging, permit application preparation, web site maintenance, etc.),
- travel for staff,
- training for staff,
- drilling operations, including cost/foot/borehole or core diameter in contaminated and uncontaminated areas for wells, boreholes, and core,
- analysis of samples,
- offsite sample shipment and chain of custody tracking, and
- waste management (e.g., contaminated sediment and groundwater).

In addition, applications should provide a breakdown and explanation of fixed costs such as:

- office space chargeback or trailer rental/leasing,
- power, water, and networking,
- maintenance of facilities and field sites,
- field equipment and supplies, including rentals,
- new permit applications and revisions to existing permits, and
- microbial, core, or other sample archiving and storage costs.

Additional Field Site Characterization and Analyses Costs

Applicants are requested to provide an estimate of the costs for:

- obtaining and analyzing additional hydrologic and geochemical data for the vadose and saturated zones for the field site(s),
- obtaining and analyzing additional contaminant data (including distribution, types and concentrations) for the vadose and saturated zones for the contaminated field site,

- obtaining and analyzing baseline or additional microbiological data for the vadose and saturated zones of the field site(s), and
- waste management associated with additional characterization activities.

ADDITIONAL INFORMATION

Collaboration and Training

Multi-disciplinary and inter-institutional collaborations are strongly encouraged to enhance and strengthen research capabilities as needed. Collaboration could include institutions such as universities, industry, non-profit organizations, federal laboratories and Federally Funded Research and Development Centers (FFRDCs), including the DOE National Laboratories. All applications should include letters of agreement to collaborate from included collaborators. These letters should specify the specific contributions collaborators intend to make if the application is accepted and funded and how the collaboration will be integrated into the proposed project. The application should present a detailed management structure for integrating collaborating investigators. DOE may encourage collaboration among prospective investigators by promoting joint applications or joint research projects based on review of the preapplications or through other forms of communication. Involvement of students and post doctoral scientists is encouraged. Refer to http://www.science.doe.gov/grants/Colab.html for details.

Availability of User Facilities and Other Specialized Resources

The ERSD within the DOE Office of Biological and Environmental Research (http://www.science.doe.gov/ober/ERSD_top.html) has responsibility for programs and facilities that offer unique and complementary resources for the conduct of ERSP research. Potential applicants are encouraged to consider use of these programs/facilities in development of applications.

- The Environmental Molecular Science Laboratory (EMSL) at the Pacific Northwest National Laboratory, (http://www.emsl.pnl.gov), is operated by ERSD as a National Scientific User Facility with state-of-the-art instrumentation in environmental spectroscopy (http://www.emsl.pnl.gov/capabs/esbf.shtml), high field magnetic resonance spectroscopy (http://www.emsl.pnl.gov/capabs/hfmrf.shtml), high performance mass spectrometry (http://www.emsl.pnl.gov/capabs/hpmsf.shtml), high resolution electron microscopy (http://www.emsl.pnl.gov/capabs/insf.shtml), and high performance computing (http://www.emsl.pnl.gov/capabs/mscf.shtml).

  The EMSL's high performance supercomputer is available for computational research in the physical, chemical and biological sciences, including geochemistry, groundwater flow and transport simulations, molecular thermodynamics and kinetics, heavy element chemistry, geochemistry, and surface chemistry (http://www.emsl.pnl.gov/capabs/mscf.shtml).

  DOE also provides compute cycles to the scientific user community at other high performance computing centers. For example, the National Energy Research Scientific

Computing Center (NERSC) at the Lawrence Berkeley National Laboratory provides an 888 processor IBM cluster system plus extensive data storage capabilities (http://www.nersc.gov). NERSC usually solicits proposals for time allocations in June or July. Proposals are externally peer reviewed and time awards are announced in December. The National Center for Computational Sciences (NCCS) at the Oak Ridge National Laboratory has several supercomputers available to users, including the Cray X1E Phoenix system, the Cray XT3 Jaguar system, and an SGI Altix system (http://nccs.gov/). Proposals for time allocations on the various systems at the NCCS may be submitted throughout the year, but 95% of the awards are for "high-impact, grand challenge type projects" (see http://nccs.gov/accounts/index.html, for additional information.)

- ERSD (http://www.sc.doe.gov/ober/ober_top.html) provides user support for experiments at synchrotron light sources that are capable of providing structural and chemical information often unavailable with conventional sources of x-rays. DOE laboratories with synchrotrons supporting ERSD research and points of contact include: Argonne National Laboratory (http://www.aps.anl.gov/index.html), contact Ken Kemner (kemner@anl.gov); Brookhaven National Laboratory (http://www.nsls.bnl.gov/), contact Jeffrey Fitts (fitts@bnl.gov); Lawrence Berkeley National Laboratory (http://esd.lbl.gov/als_environmental_program/), contact Susan Hubbard (sshubbard@lbl.gov); and Stanford Synchrotron Radiation Laboratory (http://www-ssrl.slac.stanford.edu/mes/remedi/index.html), contact John Bargar, bargar@slac.stanford.edu). Use of the synchrotron light sources requires a separate approval process.

REFERENCES

Note: World Wide Web locations of these documents are provided where possible. For those without access to the World Wide Web, hard copies of these references may be obtained by contacting Robert T. Anderson at the electronic mail address listed in the FOR FURTHER INFORMATION CONTACT section.

National Research Council, 2000. Research Needs in Subsurface Science, U.S. Department of Energy's Environmental Management Science Program. National Academy Press, Washington, DC. http://www.nap.edu/browse.html

Department of Energy, 2001. A Report to Congress on Long-Term Stewardship. Office of Environmental Management. Washington, DC. http://www.lm.doe.gov/documents/3_pro_doc/lts_study/rpt_to_congress_vol_I.pdf

Davis, J.A.; S.B. Yabusaki; C.I. Steefel; J.M. Zachara; G.P. Curtis; G.D. Redden; L.J. Criscenti; B.D. Honeyman 2004. Assessing Conceptual Models for Subsurface Reactive Transport of Inorganic Contaminants EOS 85, 449-455.

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Martin Rubinstein
Director
Grants and Contracts Division
Office of Science

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