Bioavailability in Contaminated Soil - NEW

**Leads:** Claudio Sorrentino (Claudio.Sorrentino@dtsc.ca.gov) and Kathryn Durant (Kathryn.Durant@state.de.us)

**Project:** Research has shown that the potential risk and hazard associated with contaminants in soil are often less than if the contaminant is directly provided to organisms. Contaminants may be tightly bound to soil or sequestered within particles, greatly reducing the potential uptake by people (and other receptors) that are exposed to the soil. Consequently, if soil bioavailability is not considered, site-specific cleanup goals for soil can be set at levels higher than necessary to achieve the desired level of protection, driving up the costs. Lack of understanding, high cost of *in vivo* (whole organism) testing and the uncertainty associated with *in vitro* (test tube) assays are among the most common reasons why relative bioavailability is not considered. In the last decade, the cost of *in vitro* assays has decreased and their correlation to *in vivo* studies has improved. This team will bring together the leaders in soil bioavailability testing for inorganic (e.g., arsenic, lead) and organic contaminants (e.g., polycyclic aromatic hydrocarbons) to develop consensus-based regulatory and technical guidance on soil bioavailability. The goal of the project is to help regulators and practitioners select and properly use site-specific bioavailability testing, understand the pros and cons of different *in vivo* and *in vitro* methods, and determine which method is most appropriate for site conditions. An Internet-based training course will also be developed.

Characterization and Remediation in Fractured Rock - NEW

**Leads:** Naji Akladiss (naji.n.akladiss@maine.gov) and Michael Smith (michael.b.smith@state.vt.us)

**Project:** Many challenging remediation sites have contamination present in fractured and weathered crystalline and sedimentary bedrock. Characterizing and conducting environmental remediation in fractured bedrock is difficult because fate and transport is complex, especially as compared to the better understood fate and transport in typical soil and groundwater systems. The goal of this project is to provide technical and regulatory guidance and internet-based training for regulators, the regulated community, remediation practitioners, and other stakeholders that will aid in the selection of appropriate characterization tools and techniques (e.g., geologic, hydraulic, and chemical) and remediation technologies to remediate common and emerging contaminants in fractured bedrock.

DNAPL Site Characterization – open to current members only

**Leads:** Naji Akladiss (naji.n.akladiss@maine.gov) and Michael Smith (michael.b.smith@state.vt.us)

**Project:** Dense Non-Aqueous Phase Liquids (DNAPLs) are one of the most widespread and high-risk types of subsurface contamination. It is challenging to understand the behavior of DNAPL contaminants in the subsurface, making characterization of DNAPL contaminated sites difficult. Fortunately methods for higher resolution site characterization have evolved in the past few years. The goal of this project is to use an objectives-based approach to determine which emerging DNAPL site characterization tools and techniques are best for site conditions. This project will produce a web-based guidance document and Internet-based training course that will help environmental regulators, project managers, and stakeholders improve their understanding of DNAPL contaminant behavior in the subsurface and the tools available to adequately characterize the geology, hydrology and chemical characteristics of the subsurface.

Geophysical Classification for Munitions Response – open to current members only

**Leads:** Roman Racca (roman.racca@dtsc.ca.gov) and Tracie White (tracie.white@state.co.us)

**Project:** Hundreds of military or former military sites across the nation are contaminated with unexploded ordnance, discarded military munitions, and other munitions and explosives of concern. Cleanup of these sites is expected to cost $35 billion. Geophysical anomaly classification is a new, cutting-edge technology in which geophysical anomalies caused by buried metallic items (such as scrap metal or unexploded ordnance) are detected on a site, and then classified in place, using new instruments and advanced geophysics. After classification, a decision can be made whether or not the individual items should be excavated and removed. The goal of this project is to provide a guidance document for environmental professionals about the design and implementation of a geophysical classification project. This project will produce a web-based guidance document and Internet-based training course that describes the science behind geophysical classification, the latest instruments, the steps to be taken in the field and during data processing, and quality measures.
Geostatistics for Remediation Optimization

**Leads:** Ning-Wu Chang (nchang@dtsc.ca.gov) and Harold Templin (htemplin@idem.in.gov)

**Project:** Geostatistics include different methods that can be used to understand and interpret spatial and temporal environmental data. These methods are often used to estimate correlations and redundancy between sampling locations and events, as well as to identify areas and periods of high statistical uncertainty in a groundwater-monitoring network over time. Geostatistical approaches may be used in environmental project optimization, including reviewing site characterization data and groundwater or soil remediation performance data. Optimization can improve performance, increase monitoring efficiency, and justify contaminated site decisions. Geostatistics are often more informative for optimization than simple, deterministic decision flow charts that may not adequately account for complex site conditions. This project will develop a web-based guidance document and Internet-based training course on geostatistics to help state regulators and project managers, who will benefit by understanding and implementing geostatistical approaches for making better decisions at environmental projects across all project-life-cycle stages.

Long Term Contaminant Management Using Institutional Controls

**Leads:** Nick Swiger (swigern@michigan.gov) and Patricia Coppolino (Patricia.Coppolino@state.vt.us)

**Project:** At many contaminated sites, even those with active remediation, institutional controls (ICs) are used with the intention of minimizing the potential for human or ecological exposure to contaminants. Typically, ICs provide control over the use of the property and are aimed at protecting the integrity of a cleanup remedy. As more contaminated sites are managed using ICs, there is a need for a comprehensive guide on selecting, implementing, monitoring, and maintaining ICs at contaminated properties to ensure the ICs remain protective. This project will also address the advantages and limitations of various ICs, as well as identify critical success factors for an IC program. A web-based guidance document and associated Internet-based training course are planned.

Remediation Management of Complex Sites

**Leads:** Carl Spreng (carl.spreng@state.co.us) and John Price (john.price@ecy.wa.gov)

**Project:** Achieving restoration goals by applying conventional remediation approaches has been difficult at many contaminated sites. For example, remediation of groundwater to a condition allowing for unlimited use and unrestricted exposure remains a significant challenge at some sites. A variety of existing approaches can be applied at these challenging sites and a guidance describing the elements, tools, and options for successful remediation at complex sites is needed. Success at complex sites may ultimately depend on being able to integrate multiple remediation approaches, risk management strategies, and long-term monitoring and management. This project will produce a guidance document that provides a technical foundation for predictive analyses, for progressive remedy implementation, and for defining and achieving a successful remediation strategy at complex sites. Case studies will be included to help define complex sites. This document, along with an associated Internet-based training course, will help regulators and site managers develop protective approaches that have a strong scientific and technical foundation.