

2014 ITRC PROJECT PROPOSAL



Porewater: Passive Sampling and Testing Techniques and Tools to Support Risk Assessment, Remedial Decision-Making and Monitoring of Aquatic Environments

PROPOSAL DATE: June 19, 2013

Proposal Contact

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Proposals Topical Area

CHAR – Site characterization, sampling and monitoring

Proposal Summary

Contaminated sediment within our aquatic ecosystems is recognized as an issue of national concern that has the potential to affect both wildlife and human health. Contaminated sediment impacts the uses of many water bodies and is a major contributing factor in the many fish and shellfish consumption advisories in place across the county. Significant advances have been made over the last forty years regarding the understanding of contaminants and their impact on sediments and the biological significance of known sediment contamination on aquatic systems.

As a result, the regulatory and scientific communities' knowledge of the major exposure routes of infaunal and epibenthic organisms to sediment impacts has increased substantially over the last two decades. Many sampling and bioassay methods have been and continue to be developed to help better characterize and assess sediment quality to support decisions regarding the direct impact on benthic life as well as the indirect impact on higher trophic level organisms. Given the cost implications of remedial decisions, the regulatory and scientific communities are beginning to rely more readily on bioavailability data to reduce uncertainty in risk characterization studies, including such things as pore water chemistry and the use of passive sampling.

The concept of passive sampling in the environment was first developed in the 1980's in laboratory settings. Field research studies were initiated in the 1990's, which was the first introduction of this technology for monitoring contaminant concentrations in the interstitial waters of sediment (i.e., porewater). As a result, a growing amount of scientific study and

documentation has occurred on the use of passive sampling as a measurement tool that can more accurately predict the amount of dissolved contaminant in sediment porewater that is bioavailable to aquatic organisms.

The ITRC Contaminated Sediments Bioavailability Team's guidance document discusses the use of porewater sampling as a tool to assess bioavailability and briefly discusses the advantages and disadvantages of the major tool, including passive sampling techniques. In November 2012, the Society of Environmental Toxicology and Chemistry (SETAC) issued a summary on a Technical Workshop designed to promote the understanding of passive sampling methods and provide recommendations for current and future use in contaminated sediment management decisions. SETAC identified that despite all the advances in development and application of passive sampling methods, broader regulatory acceptance and use of passive sampling technologies is necessary. Five deficiencies require action to encourage the use of Passive Sampling Methods **First**, key information about PSMs and their applicability to sediment sites must be made readily accessible to potential users (e.g., regulators, responsible parties). That is, a bridge from the research and development literature on PSMs to practical applications of PSMs at sediment sites for potential users must be developed. **Second**, guidance documents for users should be developed and issued by appropriate regulatory authorities. **Third**, training for users should be developed and offered. **Fourth**, successful applications/case studies of the uses of PSMs at contaminated sediment sites should be presented at well-attended conferences and made available through other outlets (e.g., webinars). **Fifth**, key stakeholders at specific sites where applications of PSMs are being considered should be engaged. Examples of region-specific recommendations on these actions are offered below.

Additionally, in December 2012, the USEPA released a Sediment Assessment and Monitoring Sheet (SAMS) which provided an introduction on the use of passive samplers at Superfund sediment sites contaminated with hydrophobic organic contaminants. The document briefly outlined the use of passive samplers. However, the document further identified a need for a guidance document that outlines the specific protocols on deployment and recovery.

As noted in the SETAC and USEPA documents, the *applicability of porewater sampling for sediment quality assessments is of critical importance for environmental assessment and monitoring programs throughout the U.S. and elsewhere*. While intensive research has been conducted on various issues related to porewater sampling in recent years, several issues associated with these procedures and their applications have yet to be fully resolved. To reach US audiences ITRC has been identified as an authoritative and respected outlet to encourage adoption of new environmental technologies and tools. As such they recommend "ITRC should be encouraged to develop a companion guidance document to *Incorporating Bioavailability Considerations into the Evaluation of Contaminated Sediment Sites* (ITRC 2011) on the use of passive sampling methods. To complement issuance of guidance documents and technical notes, training programs should be developed on the use of PSMs at sediment sites." For this reason, a Porewater sampling Technical and Regulatory Guidance is proposed to: 1) compile and review the existing methods and applications associated with porewater sampling and testing (more specifically passive technologies) and 2) develop a series of selection characteristics related to the use of these tools in sediment quality investigations, remedial decision

making, and long term performance monitoring programs designed to evaluate the potential for and/or reduction in bioavailability of contaminated sediments. The goal of this team will also be to facilitate the identification of future research needed and identify the advantages, disadvantages and uncertainties associated with porewater data collected with these sampling tools.

The objective of the technical and regulatory guidance document is to inform the regulatory and scientific communities on the applicability, value, and use of porewater data as an innovative tool in assessing and managing risks associated with contaminated sediments. Ultimately, the guidance document will serve as an information resource to the user that encompasses the following:

- a discussion on the concept of sediment partitioning and the importance of the environmental phases in aquatic environments,
- the types of frameworks in which porewater data is suitable,
- the important aspects of porewater evaluations,
- the role porewater evaluations may play in the assessment of ecological risk, remedial decision making and post-remedial performance monitoring of sediment,
- the application(s) of passive sampling and testing procedures,
- compilation of and comparison amongst the available passive sampling and testing technologies/tools,
- biological, chemical and ecological considerations for passive sampling and testing,
- consensus based recommendations on the most current available science on selection of passive sampling and testing methods, the most appropriate and reliable uses and applications of passive sampling and testing at contaminated sediment sites.

Proposed Project Schedule

- 2014 – Team building, collecting data and information using surveys, case studies, and literature reviews to identify and evaluate current state of the science (inventory of technologies, availability of the collection and assessment tools, advantages and limitations of porewater data, etc.), means and rational by which porewater is being assessed, considered and evaluated within sediment characterization and remediation projects and long-term performance monitoring studies.
- 2015 – Use this information and data to evaluate and provide an overview of passive porewater sampling and testing technologies including, but not limited to, polyethylene (PE), polyoxymethylene (POM) and solid phase micro-extraction (SPME).
- 2016 - Develop a Tech-Reg guidance document and associated internet-based training curriculum that describes the concepts, tools and value in using passive sampling and testing in remedial investigations and decision making.

Proposed Personnel

Personnel: Team Leaders: John Cargill (DNREC) and Greg Neumann (NJDEP)

Supporting State Members:

- Oregon** – Jennifer Sutter (Sediment Cleanup Sites PM); **New Jersey** (Greg Neumann (Research Scientist/Risk Assessor); **South Carolina** (Gregory Simmons (PG, Risk Assessor, Federal remediation Section); **New Hampshire** – Lori Siegel (PhD, PE, Ecological Risk Assessor); **Delaware** – John Cargill (PG, Environmental Scientist)

Following States have possible members if funded:

- Alabama, Connecticut, New York, Florida, California, New Hampshire, Washington

Skill mix of Team Members

- Scientific and Engineering – Biologists (marine and freshwater), Ecologists, Sedimentary Geologists, Hydrogeologists, Biogeochemists, Wetland Scientists, Environmental Engineers, Analytical Chemists
- Regulatory – Ecological Risk Assessors, Reviewers of Ecological Evaluations, Superfund Site Coordinators, Site Coordinators overseeing Sediment Investigation and Cleanup Sites

Sectors of Team Members (e.g., federal, state, community, regulated, regulator, etc.)

- SERDP and ESTCP Sediment Expert Panel – Industry reps. RETEC and Alcoa
- USACOE – Sediment Experts, EPA Superfund and Brownfields Divisions, EPA Great Lakes Sediment Committee, NOAA, USGS, Army Corp of Engineers, Navy, GORE, Community Stakeholders – Great Lakes Area, Tribal Communities

Summary of Deliverables (primary project product(s))

Targeted Users (who will use products generated by this project?)

Primary Products of this project includes

1. Technical & Regulatory Guidance document
2. Internet Based Training

Primary audience Includes:

State and federal regulators, practitioners, and other environmental and natural resource professionals engaged in contaminated sediment investigation, remediation and restoration activities.

Secondary audience includes:

Community stakeholders and members of the general public concerned with exposures to contaminated sediment, water resource agencies, state and federal fish and wildlife agencies, resource management agencies (mineral, wildlife and fisheries, forest and rangeland management).