

**ITRC PROJECT PROPOSAL: Biowalls****PROPOSAL DATE:** 5/23/07**Proposal Contact:**

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**Problem Statement** (why is this project necessary?)

One of the promising emerging technologies for enhanced anaerobic bioremediation of contaminants in groundwater is biowalls, based on both biologic and biogeochemical mechanisms. Biowalls to date have been applied at 10 DoD locations as well as numerous commercial sites. Contaminants addressed include chlorinated solvents, RDX, perchlorate, and nitrate. Biowalls have the potential for application to dissolved metals (e.g., hexavalent chromium), chlorinated pesticides (e.g., chlordane), polychlorinated biphenyls (PCBs), and chlorinated cyclic hydrocarbons (e.g., pentachlorophenol). An in situ treatment system for contaminants in shallow groundwater that are subject to anaerobic degradation, biowalls have the advantage over other enhanced anaerobic bioremediation technologies in that they can be applied at sites with low to moderate permeability or with a high degree of heterogeneity. They also can be installed at one-fourth to one-third the cost of zero-valent iron permeable reactive barriers (PRBs) which use similar installation techniques, and have lower operation and maintenance (O&M) requirements than more engineered systems (e.g., biobarriers, pump-and-treat).

Although biowalls are not suitable for all sites (e.g., depth limitation), they are a promising technology with an increasing number of applications. However, to date, there is limited guidance on how to screen sites for their applicability to biowalls, and how to design, monitor, and sustain such systems. The AFCEE will be producing a biowall protocol in the summer of 2007 and providing training at several venues. However, biowalls remain off the radar for the regulators in the global perspective due to their greater emergence after the conclusion of the ITRC *Permeable Reactive Barriers: Lessons Learned/New Directions* (Feb 05). A lack of regulator knowledge of the technology has already caused delay in implementation at some sites. Therefore, an amendment is needed to the ITRC PRB document. The amendment would include a discussion of biowalls, applicable contaminants, remedial objectives, site screening, system design and installation, construction management, residuals management, sampling and analysis plans, data interpretation and reporting, long-term monitoring, comparative costs, and case studies. Such a document would facilitate the implementation of this cost-effective technology.

**Solution / Impact** (how will the project impact the environmental marketplace?)

Applicable members of the EACO ITRC team and interested former team members of the PRB Team will collaborate on this project. This will not be a new team; rather, it will be a partnership of two closed or closing teams. This effort will add to the available treatment media using barrier wall systems. It also expands the list of contaminants that a PRB can treat. By supplementing the existing ITRC barrier wall guides (i.e., PBW-2, PRB-3, and PRB-4), the regulatory community will become more familiar with the treatment applicability, performance, and mechanisms of biowalls. Treatment walls are very nearly, if not completely, a conventional treatment technology. By adding this new treatment material to the conventional treatment wall design, the market place will be more accommodating and accepting.

**Success Measures** (how you determine the project impact to the market place)

The ITRC's PRB project will be concluded at the end of this project and will not be tracked further.

- A PRB Project Completion Statement will be prepared.

The EACO Team leader will have developed an EACO Implementation Strategy and work plan. The strategy and work plan will be updated to include evaluation of biological treatment mechanisms in a wall (biowalls) configuration. The team leaders of EACO will track usage of the guidance, specific field application and the performance of the biowalls configuration to provide flow through *in situ* treatment. An increase in the rate of use of *in situ* biological treatment methods will indicate success of the guidance and a positive impact in the market place.

**Summary of Deliverables** (primary project outputs)

The deliverable of this proposed project is a supplement to the existing PRB Guidance (*i.e.*, PBW-2, PRB-3, or PRB-4). The team will have to make the final determination on which document(s) are referred to predominantly when scoping the supplement. The generation of the supplement will necessitate the revision and update of the existing PRB Internet-based training to emphasize the newly demonstrated mechanisms.

**Project Schedule**

2008 – The existing PRB Guidance document chosen by the team to be supplemented (*i.e.*, PBW-2, PBR-3, or PRB-4) will be reviewed, and the sections requiring the inclusion of discussion on biowalls will be supplemented appropriately using the AFCEE Protocol. The Appropriate supplement of the PRB Technical and Regulatory document will be completed and published by the end of 2008, including appropriate revision of the Internet-based training.

**Target Audience**

The primary audience for the updated Technical and Regulatory document and Internet-based training will be State and Federal regulators, environmental consultant and contractors, and federal agency environmental managers. The secondary audience for these deliverables will be community stakeholders. The primary means for their dissemination will be through the traditional ITRC channels, secondarily through AFCEE, the Naval Facilities and Engineering Services Center (NFESC), the Army Environmental Command (AEC), the US EPA (*e.g.*, TechDirect, CLU-In), and the Environmental Security Technology Certification Program (ESTCP)

**Resources Required****Personnel****Co-Team Leaders:**

- Judie Kean, FI;
- Kimberly Wilson, SC:
- Matt Turner, NJ

**Supporting State Potential Members:**

ME, SC, NC, CA, , WA, NM, LA, VA, MA, NJ, FL, and PA

**Skill Mix** of Team Members (*e.g.*, regulatory, engineering, scientific, etc.)

- Scientific – Microbiology, hydrogeology, engineering, biochemistry
- Regulatory - RCRA and CERCLA site managers
- Educational – Researchers at state and federal (*e.g.*, AFCEE, NFESC) institutions
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**Sectors** of potentially interested Team Members (*e.g.*, federal, state, community, regulated, regulator, etc.)

- Department of Defense
  - SERDP/ESTCP
  - AFCEE
  - NFESC
  - USACE
  - AEC
- Department of Energy
  - Office of Groundwater and Soil Remediation.
- USEPA
- Industry
  - Potential members from existing (EACO) and previous (PRB) ITRC teams ; GeoSyntec, TetraTech, Langdon Engineering and Environmental Services, Arcadis, Burns and McDonald, CH<sup>2</sup>MHill, Regenis, TRC Companies, URS Corp., JRW Bioremediation Products, Northwind, HAS Engineering Services, Fishbeck, Thompson, Carr & Huber, Inc, XCG Consultants Inc, Kleinfelder, Third Leg Consultants,
  - Also members of the AFCEE Biowalls team including Parsons, Environmental Alliance, GSI, Nsafe and others will be invited to join the IAP Program and participate on the team, etc.
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<b>Financial Resources - BioWalls – EACO/PRB</b>				
<b>Year</b>	<b>Team Travel</b>	<b>Contractor Support</b>	<b>Calls, Print, &amp; Materials</b>	<b>Project Totals</b>
<b>2008</b> <b>Review and Revise PRB Tech and Reg</b>	\$15,000	\$60,000	\$7,000	<b>\$82,000</b>
<b>2009</b> <b>Team Closeout</b> <b>Implementation (Included in EACO Implementation Strategy)</b>	\$10,000	\$5,000	\$500	\$15,500
<b>Project Total</b>	<b>\$16,000</b>	<b>\$65,000</b>	<b>\$7,500</b>	<b>\$97,000</b>

**Related Work:**

The work done by the PRB Team lead by Matt Turner contains much of the physical design criteria of PRBs in the existing ITRC guidance. This proposed project intends to supplement this existing guidance by adding a description of the site conditions appropriate for using biowalls, the media used in the wall, biowall configurations, the treatment mechanisms responsible for treatment of the contaminants, and any design, monitoring, and assessment particular to the application of biowalls.

The ITRC EACO team has evaluated the treatment mechanism and site conditions appropriate for using biologically based in situ treatment systems. The information from this evaluation can easily be included in the deliverables of this proposed project. Thus, the PRB-EACO combination proposed in this effort is a natural partnership to further the use of *in situ* biologically based treatment mechanisms. Additionally AFCEE is completing a protocol on the application of biowalls in the summer of 2007 and subsequent training related to the information in that protocol will assist the partnership in understanding the mechanisms and application of biowalls treatment. To support the effectiveness of biowalls for additional contaminants ESTCP is funding investigations of biowalls application for perchlorate and RDX, and the US EPA OSWER program is funding investigations of the performance and sustainability of biowalls.