# In-Place Treatment of Persistent Organic Contaminants in Sediments Through Addition of Activated Carbon Sorbent

**Richard G. Luthy[1], Yeo-Myoung Cho[1], Elisabeth Marie-Louise Janssen[1], Jeanne E. Tomaszewski[1,2]**

[1]Department of Civil and Environmental Engineering
Stanford University, Stanford, CA 94305-4020
[2] currently, Swiss Federal Institute of Aquatic Science & Technology
ETH, Dübendorf, Switzerland 8600

Phone: +00-(1)-650-723-3921
E-mail: Luthy@Stanford.edu

**Current Studies:**
Polychlorinated biphenyls [PCBs] are a major sediment contamination problem. Research shows that the bioavailability and risk of PCBs depend on how strongly compounds like PCBs are bound to sediment. Our work suggests that by adding highly-sorbent activated carbon to sediment it is potentially feasible to sequester persistent, hydrophobic contaminants for in-place sediment treatment. Laboratory tests with carbon-amended sediments showed as much as 95% reduction in PCB bioaccumulation by clams and more than 99% reduction in aqueous PCBs depending on sediment composition. We are conducting field tests at a tidal mudflat adjacent to a former shipyard in San Francisco Bay in which activated carbon was mixed into the upper sediment layer to stabilize PCBs [1]. The objectives are to compare two mixing technologies, consider long-term treatment effects, assess sediment mixing and resuspension, measure PCB bioaccumulation in organisms, and evaluate the cost effectiveness. In related work, Alcoa Inc. is conducting a field evaluation of activated carbon deployment in the Grasse River, NY [2]. We expect ongoing field studies will demonstrate that activated carbon amendment is an effective, non-removal management strategy for reducing the bioavailability of PCBs in sediments. Activated carbon addition may be appropriate for in-situ stabilization of low-level contamination, including combination remedies with dredging to manage residuals or capping to form an active barrier.

Deleted: new

**The Path Forward:**
Current work shows the feasibility for mixing activated carbon into sediment under field conditions. However, questions remain on improving implementation and addressing engineering challenges on how best to: deploy activated carbon; enhance mass transfer under field conditions; model long-term treatment performance; evaluate effects of under-dosing or imperfect mixing; and more quickly monitor and manage activities in the field. Also, acceptance of in-situ treatment by activated carbon would be enhanced if it can be shown that carbon sequestration of PCBs still allows the potential for microbial dehalogenation.

Some topics appropriate for discussion at this conference include the ways in which current and future tests may address the following questions:

1. How does activated carbon dose affect performance in the field?
2. What are the effects of imperfect mixing and what are the advantages of re-mixing later?
3. What are the benefits of applying activated carbon twice, say each at 1/2 the target dose?
4. Are polyethylene or polyoxymethylene samplers the most robust, cost effective and practical way to measure PCB pore water concentrations in relative short time?
5. What are the most appropriate biological indicators of success, and how should that be implemented and modeled?
6. Does carbon treatment still allow intrinsic microbiological activity to dehalogenate native PCBs?
7. What is needed to advance regulatory acceptance of the technique?

**References:** [1] Cho et al., Field Methods for Amending Marine Sediment with Activated Carbon and Assessing Treatment Effectiveness, *Marine Environ. Res.* (64) 541-555, 2007; [2] Activated Carbon Applied to Sediment Potentially Reduces PCB Bioavailability, *Technology News and Trends*, US EPA Newsletter, Issue 31, July 2007.