Grasse River, New York GAC Treatment for PCB Bioavailability

Polymeric Sampling Devices—Polyoxymethylene (POM)

Summary

Media:	Water column, pore water
Study Type:	In situ (interface and water column) and ex situ (pore water)
Technology:	Equilibration
Peer Reviewed:	Yes
Publication Date:	June 2013

Study Description

- The study site was located about 5.6 kilometers downstream from a former industrial source of PCBs along the lower Grasse River.
- In 2006, granular activated carbon (GAC) at a target dose of 3.75% by dry weight was applied to the top ~15 cm of sediments (PCB concentrations ranging from 2.0 to 4.0 mg/kg, and average total organic carbon content of 5.8%).
- In situ POM passive samplers (55 µm thick) were deployed at the sediment–water interface (0 cm) and three heights (7.5 cm, 30 cm, and 60 cm) above the sediment bed for 14 days. Monitoring was conducted before GAC application in fall 2006 and at yearly monitoring events in 2007, 2008, and 2009 in background and treatment areas.
- Ex situ POM (30 days) was used to measure pore-water concentrations in 2009.
- POM-based results were not adjusted for disequilibrium.
- Ex situ POM pore-water concentrations were compared to in situ POM-water-column concentrations at 7.5 cm above the sediment bed to determine the PCB flux between sediment and water.

Remedial Phase

Feasibility study

Outcome

Following treatment of sediments with GAC, POM samplers were used to measure changes in PCB bioavailability and sediment-to-water flux in the Grasse River. After amendment, POM water column concentrations were similar across all sampling locations, indicating that the water column was well mixed and not significantly affected by the small footprint of the GAC-amended areas. In contrast, dissolved PCB concentrations at the sediment–water interface (0 cm) decreased significantly after treatment (by 62–91%), although some increase in PCBs was observed following the initial decrease. This is believed to be due to deposition of untreated sediments over the treated area. PCBs in sediment pore water in the treated area were also lower than overlying water concentrations, indicating that sediments acted as a sink of PCBs. The reduction in sediment pore water PCBs is consistent with reductions in PCB bioaccumulation in freshwater invertebrates. These observations indicate that GAC addition to sediment can limit contaminant exposure to benthic and pelagic food webs by reducing bioavailability and flux of PCBs into the water column. Passive samplers are suited to monitoring changes in bioavailability after remediation.

Case Study Reference

Beckingham, Barbara, and Upal Ghosh. 2011. Field-Scale Reduction of PCB Bioavailability with Activated Carbon Amendment to River Sediments. *Environmental Science & Technology* 45(24): 10567–10574. https://doi.org/10.1021/es202218p