

TREATMENT – EXPANDING DREDGED MATERIAL MANAGEMENT ALTERNATIVES

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ABSTRACT

Sediments in the Great Lakes harbors often exhibit elevated levels of PCBs bioaccumulation, limiting their suitability for placement in open water and wetlands. Amending the sediment bioactive zone with activated carbon (AC) has the potential to provide bioaccumulation control (EPA 2013) and serve as a dredged material management alternative, permitting expanded open water placement and aquatic beneficial use where confined disposal facility (CDF) capacity is being exhausted. There is a need to determine the optimal AC sediment amendment dosage to achieve reduction of PCBs bioaccumulation. Current applications are typically 3 to 5% AC by dry weight or in excess of the total organic carbon (TOC) of the sediment (Patmont et al. 2015), but a reduced percentage would reduce material costs and effects on benthic organisms, and would be less likely to alter other sediment characteristics.

This report summarizes efforts to determine the smallest percent AC amendment that effectively manages PCBs bioaccumulation. This effort was accomplished by collecting and characterizing sediments from three locations (Buffalo River, Ashtabula Harbor, and Cleveland Harbor) and amending each with different amounts (dry weight percent) of AC. The sediments were mixed continuously for seven weeks to allow the amended sediment to approach equilibrium with the AC. The oligochaete *Lumbriculus variegatus* was then exposed to the carbon-amended and unamended sediments in accordance with a 28-day bioaccumulation test procedure (EPA Test Method 100.3, USEPA 2000; Method E1688, ASTM 2010). Tissue samples were collected at the end of the exposure time and % lipid and total tissue PCBs concentrations were determined. Tissue concentrations of the worms exposed to the amended and unamended sediments were compared to determine the reduction, if any, of PCBs bioaccumulation in the worms following carbon amendment and the smallest effective carbon dose as a function of sediment characteristics.

Greater than 50% reductions in PCBs bioaccumulation were obtained in the laboratory at dosages as low as 0.06% dw. A field demonstration of open water placement of amended dredged material conducted at Ashtabula Harbor verified the successful reduction of PCBs bioaccumulation, achieving greater than 75% reduction at an AC dosage of about 0.5%.

Keywords: Dredged material management, treatment, activated carbon, PCBs, effectiveness verification.

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