

State-Led Remediation of Manistique River and Harbor

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Background/Objectives. Manistique, on Lake Michigan in Michigan's Upper Peninsula, was historically a lumbering and papermaking town. Papermaking activities such as carbonless copy paper recycling led to wastewater discharge containing PCBs into the Manistique River and Harbor. PCBs have persisted in fish tissue despite multiple remedial actions. The papermill settled liability with the State and is now bankrupt. The Michigan Department of Environmental Quality (MDEQ) is leading remediation of this Great Lakes Area of Concern (AOC) site, applying Great Lakes Restoration Initiative (GLRI) funding in partnership with federal agencies, including the National Oceanic and Atmospheric Administration (NOAA) and USEPA Great Lakes National Program Office (GLNPO). One Operable Unit (OU) at the site was dredged and covered in 2016 and a second OU is slated for remediation in 2019. MDEQ is applying an Adaptive Management approach to incorporate findings of recent monitoring to confirm effective source control and to address residual contamination to spur recovery of PCBs in fish.

Approach/Activities. The remedial approach utilizes dredging and management of dredging residuals through placement of sand cover. Carbon-amended supplemental covers are being considered to further reduce exposure. Dredging was completed in OU1, which is comprised of a series of small inlets along the river leading to the harbor. Dredging removed 9,500 cy over 3+ acres and was followed by placement of a 6- or 12-inch sand cover based on residuals confirmation sampling. The cover was monitored in 2017 using bulk sediment samples, passive samplers and sediment traps. Results were used to evaluate residual PCB exposure (relative to reference areas) and determine whether recontamination was occurring because of deposition, thereby confirming control of nearby historical sources, or via pore water transport. Bioaccumulation modeling to evaluate protectiveness of residual contamination levels informed a larger decision-making step to determine whether to place a supplemental carbon-amended cover in OU1. Passive sampling and sediment trap sampling in OU2, the harbor, were collected to assess recontamination potential and inform residuals management for dredging design in OU2.

Results/Lessons Learned. Management of PCBs in dredging residuals is a key element of achieving exposure reduction and fish tissue goals. Dredging without residuals management may limit achievement of sediment PCB levels protective of fish tissue due to uncertainty in pre-design mapping of bottom of sediment contamination, practical limits on extent of removal, dredging efficiency, residuals generation, and fish fidelity, among other factors. The passive sampling and sediment trap sampling methods were successful in informing the adaptive management evaluations for supplemental residuals management steps. Those evaluations support use of carbon-amended covers as an added remedial measure in OU1 and potentially in OU2. Fish tracking studies indicate that remediation of the harbor alone may not achieve fish tissue goals for certain species due to fish mobility. Sediment trap results also suggest that mobility of PCBs in woody material (sawdust and fragments) may be a vector for some level of recontamination. This presentation will cover the remedial approach, the post-remediation monitoring, and adaptive management steps.