

ABSTRACT

Kim, Yong Sang, Ph.D., Purdue University, December 2008. Evaluation of an *In-Situ* Permeable Sand Cap for Remediation of Coal Tar Impacted River Sediment. Major Professor: Chad T. Jafvert.

Sediment within the Grand Calumet River in Northwest Indiana, adjacent to a former Manufactured Gas plant (MGP) site contains significant amounts of coal tar, consisting largely of mono- and poly-cyclic aromatic hydrocarbons (MAHs and PAHs). A proposed remediation strategy for the impacted reach of the river is to remove the top portion of the sediment and to replace this material with a permeable sand layer (i.e., cap), in an attempt to prevent further contamination of the benthic zone and the river. In this study, the compressibility of the sediment was examined in the laboratory with a drained consolidation test (DCT). In addition, eight sand cap test cells, each with a diameter of 76 cm, were installed in the sediment of the river to evaluate capping as a remediation method. Piezometers were installed within and outside each cell, and water flow through each cell was periodically monitored with a seepage meter. Pore water samples were collected through sampling tubes installed in each cell, and the concentrations of 18 MAHs and PAHs were monitored over time with depth. The compressibility tests demonstrated that consolidation of the sediment increased almost linearly at lower pressures (< 13.8 kPa); however, as higher pressures were imposed (≤ 41.4 kPa), the ratio of consolidation per applied pressure decreased. In the field, the seepage meter measurements generally indicated groundwater discharge, as the sediment pore water generally flowed in the upward direction with Darcy velocities ranging from -0.9 to 3.2 cm/day. Sand cap pore water concentrations of MAHs and PAHs, monitored over a four month period after test cell installation, were significantly lower near the sand-water interface (i.e., in the new benthic zone) compared to concentrations at the same location in the original sediment.