Four-year Oleophilic Bio-Barrier demonstration results

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Abstract. With the vision of mitigating the formation of hydrocarbon sheens due to upland releases of petroleum products, Colorado State University (CSU) has been researching the Oleophilic Bio-Barrier (OBB) as a low-cost alternative to traditional sheen remedies. This technology utilizes an oleophilic (oil-loving) plastic geocomposite which retains hydrocarbon contamination, remaining bioavailable for microbial degradation. A transmissive geonet core delivers oxygenated surface water and atmospheric air to the microbes to promote degradation on the OBB and in the underlying sediment. By utilizing both sorption and degradation, the OBB is not limited to a finite sorption capacity and can help mitigate sheen formation until the source zone is remediated. A field demonstration of this technology has been ongoing on the Hudson River for four years. The primary objective of this demonstration was to validate the use of an OBB to prevent the release of sheens to the surface water. In October of 2017, the demo barrier was removed, sampled, and replaced with a full-scale OBB. Removal of the demonstration OBB provided CSU the unique opportunity to analyze an OBB system after four years in the field. Sample analysis indicates that there was negligible sediment intrusion or biofouling in the geonet that would obstruct the flow of oxygen. Visual inspection of the geocomposite under both ultraviolet (UV) and ambient light suggests that no non-aqueous phase liquids (NAPL) permeated the top of the geocomposite. Furthermore, hydrocarbon analysis shows that the OBB system was at less than 0.1% retention capacity. Sheens were observed in holes dug below the OBB, suggesting that hydrocarbon contamination exists under the OBB and is being depleted via biological processes. Sediment from underneath this OBB system will also be used in a laboratory experiment designed to elucidate aerobic and anaerobic degradation rates. Columns loaded with the field sediment will be injected with NAPL at various loading rates to compare the breakthrough times for each column to estimate the biological degradation rates. Nine columns will undergo water cycling designed to mimic tidal fluctuations and establish aerobic degradation rates. Seven columns will have a constant water level to demonstrate anaerobic degradation.