Evaluating the Effectiveness of Commercial Bioremediation Products on Petroleum and Chlorinated Hydrocarbons in Soil and Groundwater Under Sequential Aerobic–Anaerobic Conditions

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Remediation of petroleum hydrocarbon (PHC) and organohalide compound (OHC) contamination in soil and groundwater remains a significant environmental challenge in Canada, particularly at brownfield and urban commercial sites. This study investigates the effectiveness of three commercially available amendments— BioLogix (bioaugmentation), TPHENHANCED, and ERDENHANCED (biostimulation) —in degrading benzene, toluene, and tetrachloroethene (PCE) under sequential aerobic-anaerobic conditions. Using microcosms prepared with field-sourced soil and groundwater from two contaminated sites in Edmonton, Alberta, we have undertaken a 16-month incubation involving an initial 4-month aerobic phase followed by a 12-month anaerobic phase. Treatments have been evaluated for contaminant degradation and microbial community shifts. Preliminary results demonstrate a reduction in target contaminants, particularly with combined biostimulation and bioaugmentation strategies. These findings offer insight into the optimization of in-situ remediation approaches and have direct application for sustainable and cost-effective site rehabilitation across Canada.

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Rachel Graham completed a BSc at Concordia University of Edmonton in Environmental Science in 2023. She has been the recipient of the NSERC Indigenous Student Ambassador and Undergraduate Student Research Awards, which shaped her decision to focus on soils. Currently, Rachel is an MSc student in the ALES department studying Remediation and Soil Science. Along with working on her Master's, Rachel also helps support Mikisew Cree First Nation's Government and Industry Relations division in Environmental Affairs. Her overall end goal is to help support her First Nation and others in moving forward in identifying contamination issues and helping develop plans to solve these.