

Enhanced Attenuation of Dissolved Nickel during Percolation of Industrial Wash Water through Soil

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Background/Objectives. Laboratory treatability studies were conducted to evaluate the nickel stabilizing capacity of various soil amendments for the purpose of enhancing the attenuation of dissolved nickel from industrial wash water derived from operations at a power plant fired with Number 6 fuel oil. The wash water, containing an average nickel concentration of 10 mg/L, percolated through the base of a holding pond into groundwater. The ambient attenuation capacity of native soil was inadequate to attenuate the nickel concentration to less than the state groundwater protection standard of 0.1 mg/L. Studies were conducted to evaluate approaches to improve the attenuation capacity of the native soil with regard to nickel binding with the intent to modify the percolation pond to allow its operation for wash water disposal while also complying with groundwater quality requirements.

Approach. A series of tests were performed to identify and select appropriate metal binding reagents, evaluate the nickel binding capacity of the selected reagents, and test various mixtures of native soil and the reagent for removing nickel from wash water to below the groundwater standard. Tests were performed in flow-through columns to measure percolation rates and nickel removal under gravity-driven flow with relatively short contact times to simulate in situ infiltration through the percolation pond.

Results. Results indicated that a relatively small concentration (4% by weight) of EnviroBlend mixed to a depth of 12 inches into the native soil effectively attenuated nickel from the wash water and would continue to be effective for at least thirty wash cycles (up to at least 133 mg/kg of nickel loading) or approximately five years of normal operation. Synthetic Precipitation Leaching Procedure (SPLP) analyses performed on the amended soil samples exposed to the equivalent of 30 wash cycles of soluble nickel indicated the attenuated (bound) nickel did not leach from the soil at detectable concentrations.

The state regulatory agency approved the addition of the amendment to the soil in the bottom of the pond for the removal of nickel from the facility's industrial wash water. The amendment was spread in the bottom of pond during pond renovation and mixed to a depth of 12 inches. Following the placement of the amendment, wash water was discharged to the pond with no apparent effect to the percolation rate of the pond. The performance of the modified pond bottom with regard to nickel removal is being evaluated through shallow groundwater monitoring. This approach provided an initial cost savings of approximately \$250,000 over other water treatment alternatives and was operated with no ongoing O&M costs.