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Successful Self-Activating ISCO/Enhanced Bioremediation for BTEX Remediation: Soil Mixing Brazil Site

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Background/Objectives. A former gas station site in São Paulo was contaminated by BTEX and acquired by a developer to construct residential condominiums. The project used Provect-OX® in situ chemical oxidant reagent for ISCO/enhanced bioremediation reagent that uses ferric iron (Fe III) as a safe and effective means of activating persulfate. A main reason for selecting this reagent was “ease of use” (the material ships as a pre-mixed, dry powder containing sodium persulfate and ferric oxide that can be easily applied via direct mixing). In addition, the technology manages rebound which avoids the need for repeat application (which was not practical for a development project). This is accomplished via the subsequent utilization of sulfate and iron as terminal electron acceptors for facultative reductive processes. Degradation intermediates generated during pollutant oxidation may act as electron shuttles, allowing the reduction of Fe (III) to Fe (II) in the redox cycling of iron. The iron used for persulfate activation brings additional benefits such as: i) does not generate excessive heat/off-gases; and ii) it will not mobilize heavy metals to generate secondary impact issues.

Approach/Activities. In April 2015 the USTs were excavated along with soil from a known source area. Approximately 2,000 kg of Provect-OX were mixed directly into the base of the excavation within an area measuring *ca*. 100 m^2. The hole was backfilled with cleaned soil and two new monitoring wells (PM-15A and PM-18A) were installed proximal to the treated area to monitor the groundwater plume. Performance monitoring consisted of routine analysis for BTEX and various biogeochemical parameters.

Results/Lessons Learned. Benzene represented the main constituent of interest with baseline concentrations varying between 615 and 809 mg/L, above the remediation target levels established to site (241 mg/L). The first sample event performed 20 days after application showed reduction above 70% and 80% at PM-15A and PM-18A, respectively. Subsequent sample events showed that the remedial objective was achieved within 90 days of treatment. Moreover, continuous monitoring showed further benzene reduction, and no rebound observed which supports the concept of sustained, long-term bioremediation processes. This combined remedy provides supplemental treatment mechanisms thereby allowing for more cost-efficient dosing of the product while supporting long-term, sustained, secondary bioremediation processes to manage residuals and prevent contaminant rebound effect.