

Novel Approach to Remediate Free-Phase Contamination Using Bioaugmentation

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Background/Objectives. As a result of an accident, diesel being transported in a railroad was spilled over an area near the tropical forest contaminating 248 cubic meters of soil and groundwater. Pump and treatment of the groundwater was performed for the elimination of the free phase of diesel, resulting in a lasting free phase contamination with 3 cm of thickness. For the elimination of this persistent diesel layer and aiming to eliminate dissolved benzene, toluene, ethylbenzene and xylene, a blend of different species of bacteria were applied direct in the groundwater.

Approach/Activities. The geology of the contaminated area is predominantly clayey with diesel trapped in the saturated zone. The microbial blend with six different species of bacteria were selected to degrade diesel and dissolved TPH and BTEX. Those species were selected from a culture collection due to its capacity to grow in soil, produces surfactant and other hydrocarbon degrading enzymes. Injections wells were constructed 1.5 meters away from the monitoring wells and four applications were conducted with 20 days apart from each other as a pilot test. Besides analyses of TPH, BTEX and free phase, micronutrients and total organic carbon were measured in the baseline and 20 days after each application to evaluate how they would behave during the bioaugmentation process.

Results/Lessons Learned. During this pilot test, we detected a reduction of the free-phase with increase in TPH and BTEX concentration. With the subsequent applications a reduction of 23 -70% of the dissolved phase were achieved by the end of the four injections campaigns. In most of the wells we detected a reduction of nitrate concentration and an increase in nitrite and dissolved iron concentration. Redox potential and pH were measured during the process indication for reduction of pH and increase of ORP during the process.