Bioremediation Project Experience
Oil CompanyHydrocarbon Contaminated Soil

Project Description

Major oil companies extracted oil from the Santa Barbara Oil Fields on the Central Coast of California for more than 70 years. The crude oil produced within the oil field is very heavy, so a refined petroleum product called "diluent" was injected into the formation to enhance the recovery of the crude oil. Over the years, the diluent, which is similar to a mixture of kerosene and oil, was inadvertently released from the pipelines and storage tanks impacting the soils at the site. SSWM was selected from more than 70 technology demonstrators to bioremediate 1,000 yards of impacted soil to reduce diluent concentrations from approximately 10,000 mg/kg to less than 1,000 mg/kg.

The patented Bio-Raptor™ system was mobilized to the site to screen and inoculate with our microbial blend and nutrient solution. The impacted soil was process through the Bio-Raptor™ system at rates of up to 500 tons per hour. The inoculated soil was placed in a 3-foot deep pile and tilled and watered on a regular basis to maintain acceptable oxygen and moisture levels.

Remedial Time Frame

The demonstration program was started in July of 2000. Samples were collected every two weeks showing that the remediation goals were achieved in approximately six weeks.

Analytical Results

The diluent TPH concentrations were reduced by more than 90 percent to less than 1,000 mg/kg during the six-week treatment period. At the end of the test period, samples were also collected from the treated and the untreated material stockpiles so that plate counts could be performed to determine the type and quantity of microbes present in the samples.

Nutrient agar is a general agar, useful for enumerating both gram positive and gram negative bacteria. Plates were also prepared with nutrient agar and 6,000 mg/kg diesel to isolate hydrocarbon consuming bacteria. The results show that the treated soil contained 4.2 times the number of microbes the untreated soil sample had at the end of the treatment period. The microbial observation and colony morphology indicated that the microbes in the treated soil were varied and of the same type added by SSWM. In other words, SSWM's microbes out competed the indigenous population.

Microbial Counts (CFU's/g)

	Nutrient Agar Plate	Nutrient + Diesel Plate
Treated Soil	2.41×10^7	Heavy Growth
Untreated Soil	5.76×10^6	Light Growth

Guadalupe TPH Concentrations