ORC Injection & HVME BTEX Remediation in Texas

Contaminants	Application Method	Soil Type	Groundwater Velocity
BTEX/TPH	ORC Injection	Sand	Unknown (high velocity)

Introduction

A leaking underground storage tank at a commercial petroleum retail site located in Haskell, Texas resulted in soil and groundwater petroleum hydrocarbon contamination. Contamination was released into a major aquifer, the Seymor Formation, which is unique in west central Texas due to relatively high groundwater velocity and shallow depth. This groundwater resource has been used as the domestic water supply for the city of Haskell and is currently used for domestic and agricultural irrigation. Contamination, including benzene, toluene, ethylbenzene, and total xylenes (BTEX), 13.86 ppm, and total petroleum hydrocarbons (TPH), 11.15 ppm, migrated down-gradient below a road and neighboring property. Access below the adjacent roadway was limited, and consultants sought a solution that would allow for simultaneous treatment of on-site and off-site sections of the plume.

Application

As a result of the presence of separate phase hydrocarbons (SPH), a high vacuum multi-phase extraction (HVME) was used to extract product vapor and contaminated groundwater in a limited area of the site. Oxygen Release Compound was applied in the dissolved section of the petroleum plume for treatment on-site and off-site. ORC was applied during two phases, with the majority being applied during the first phase. This type of application approach optimizes the operational flexibility that can be realized with the ORC technology. 3,232 pounds of ORC were injected into the aquifer via 70 direct-push points in the area downgradient of the USTs and existing dispenser islands (see Figure 1). To enhance degradation of the off-site plume, ORC was applied along the downgradient property boundary.

Results

Results following 8 months of treatment indicate average decrease in benzene, BTEX, and TPH concentrations of 92%, 76%, and 81%, respectively. Figures 2 through 4 illustrate the reduction in dissolved petroleum concentrations in selected individual monitoring wells over the eight month treatment period. Wells designated MW-16 and MW-17 are located at the downgradient property boundary, wells MW-6, MW-12 and MW-13 are located in the central section of the on-site plume. Figure 5 illustrates the increase in dissolved oxygen concentrations in selected individual monitoring wells over the eight month treatment period.

Cost Analysis

Implementation of a traditional remediation technology air sparging with soil vapor extraction (AS/SVE) at this site would have cost substantially more, as well as produced much greater property and operational disruption. The estimated cost savings in the application of ORC versus installation of an AS/SVE system is approximately $75,000. Given that the ORC application required no operations and maintenance costs after initial injection, a $25,000 savings was realized. Increasing the rate of contaminant degradation with ORC allowed for reduced frequency and extent of groundwater monitoring at the site, resulting in an estimated savings of $20,000. The total estimated cost savings for this project are approximately $120,000. If required, additional ORC applications will be designed to polish residual dissolved petroleum concentrations to closure limits following product recovery. To date, dissolved oxygen (DO) concentrations are sufficient in most of the treated area to support continued bioremediation.

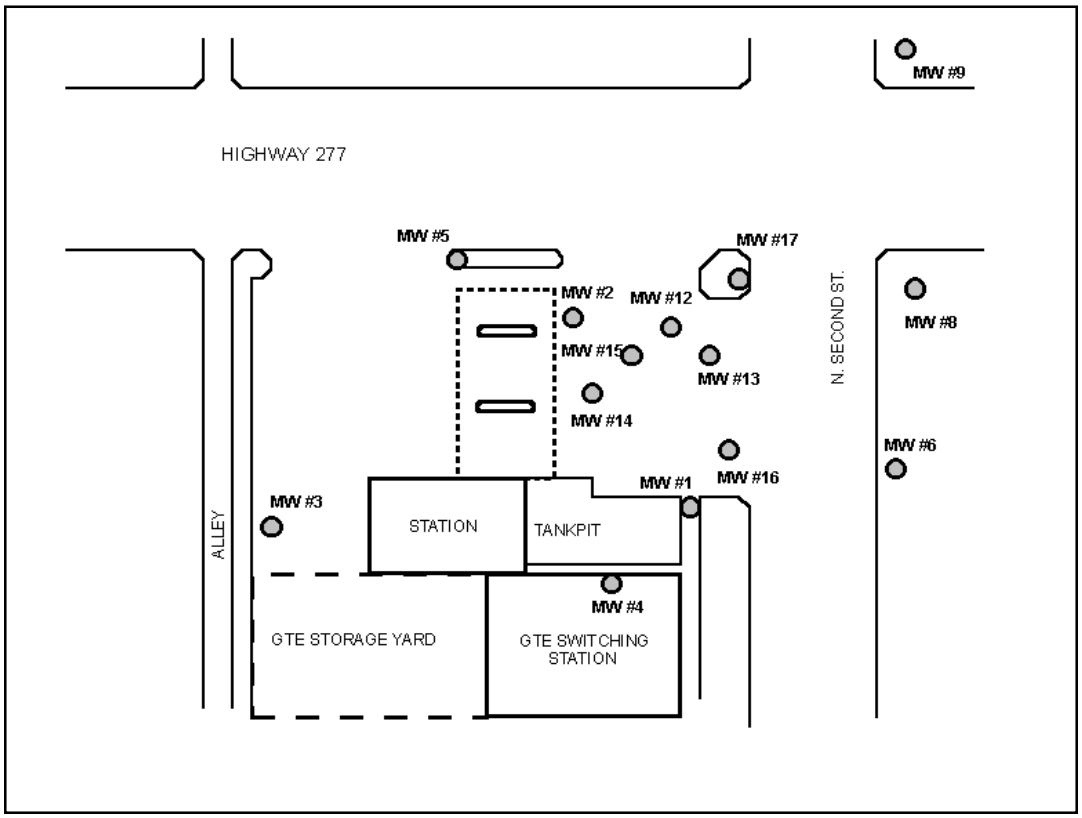

Figure 1

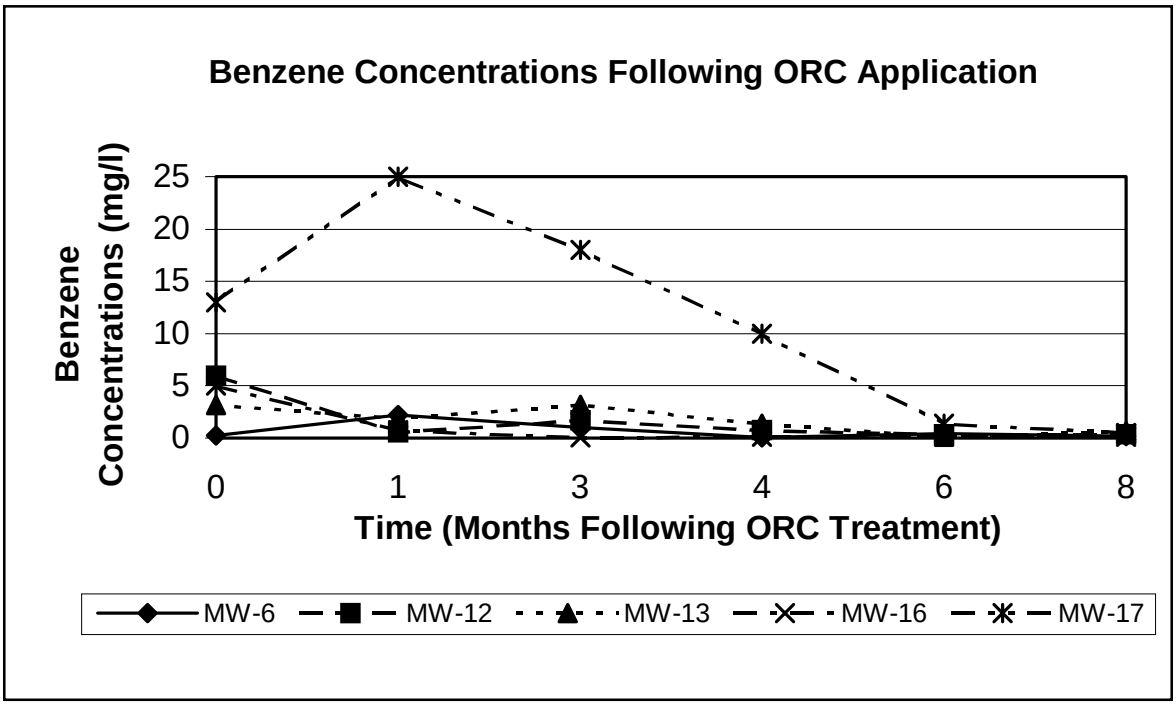

Figure 2

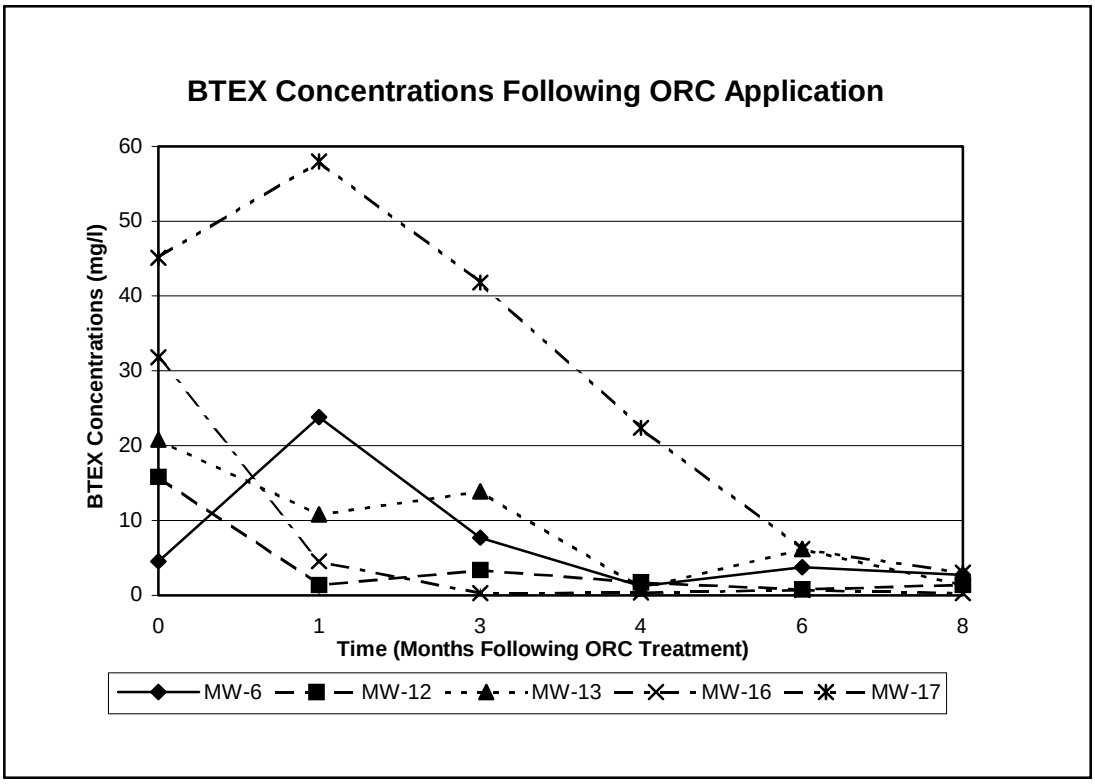

Figure 3

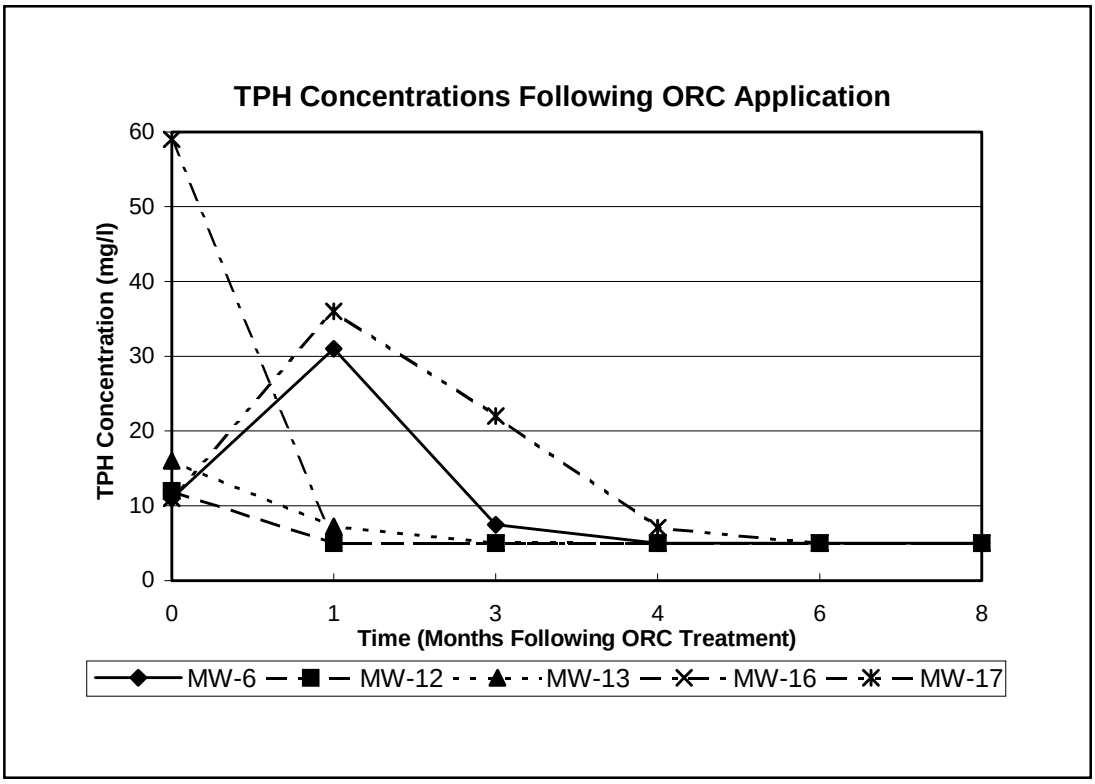

Figure 4

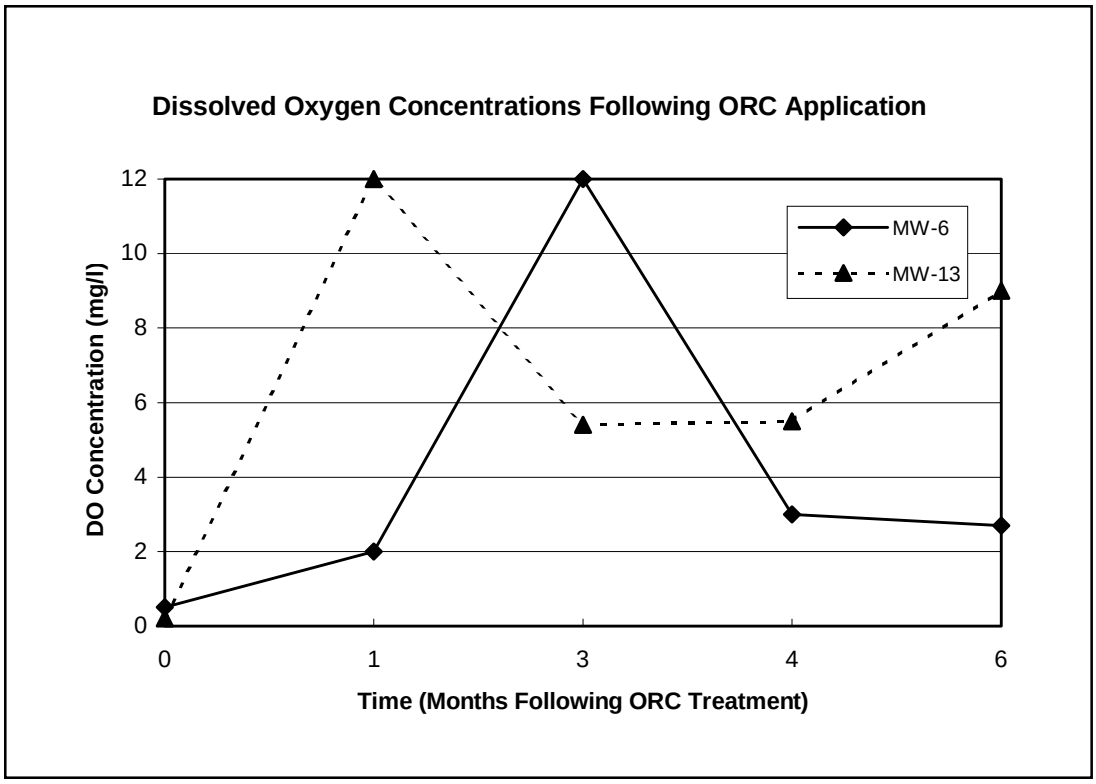

Figure 5

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