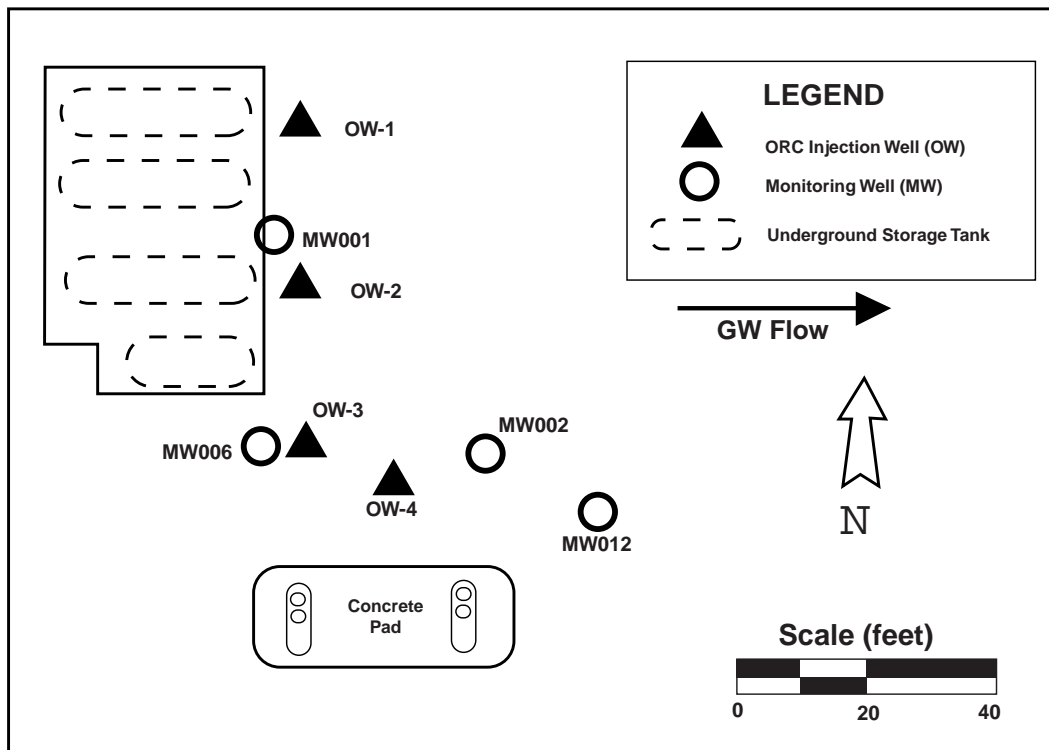


Risk Reduction BTEX Remediation Pilot Study in a Clay Aquifer in Michigan

Contaminants	Application Method	Soil Type	Groundwater Velocity
BTEX	Risk Reduction	Clay	0.08-1 ft/day

A major oil company performed a series of ORC barrier technology tests in Michigan designed to help define a protocol for its nationwide use. Two tests were carried out under diverse conditions—in clay (this Technical Bulletin) and sand (Technical Bulletin 3.2.5).

Site Description and Remedial Design



The affected aquifer is composed of clay and there is evidence for the presence of some higher conductivity stringers. The groundwater velocity is not well characterized but is between 1 inch and 1 foot per day. The water table is shallow at 6' below ground surface and the extent of the contaminated saturated zone is not known; it can be presumed to be 10 feet. High levels of contamination, on the order of 20 ppm are in the vicinity of MW006. Forty 3 3/8" diameter ORC socks were installed in OW 1 to OW 4. Data on oxygen and BTEX were taken at 7 days, 30 days, 90 days and 180 days after socks were inserted. The position of the ORC source wells and the monitoring well series are illustrated above. In addition to the analysis of individual well measurements, contouring with GOEAS was utilized to generate mass curves in the entire field.

Results

As noted in Figure 1, there was a slower increase in the oxygen mass in the first seven days relative to the sandy aquifer study (Technical Bulletin 3.2.5), which would be expected. Total oxygen mass in the system peaked at 5.2 X at 90 days and ended up at 3.4 X by Day 180. Total BTEX removal was 40% by Day 180. Figures 2 through 4 document the changes in D.O. and BTEX at MW-1 (8' from OW2), MW-2 (13' from OW4) and MW-12 (32' from OW4). BTEX levels were dramatically reduced in all the wells and did not rebound. MW-2 and MW-12 are at ND and MW-1 was reduced 99% to 10.3 ppb, which is barely above MCL.

Figure 1

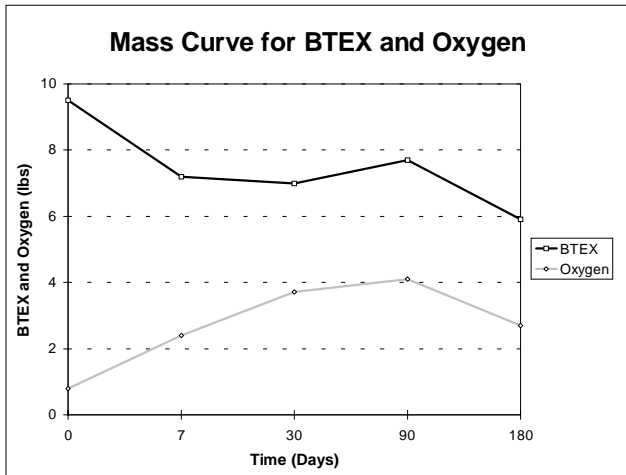


Figure 2

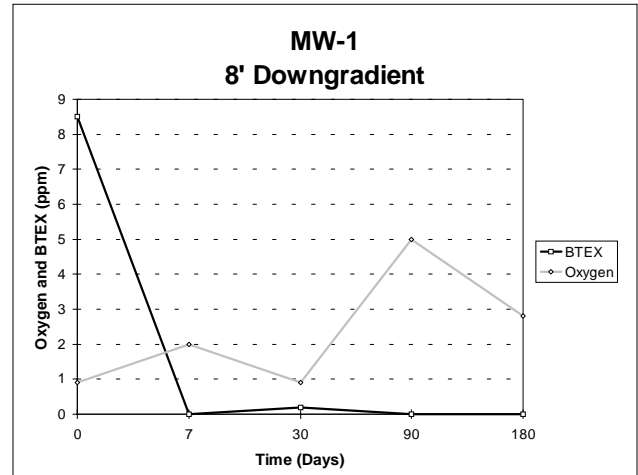


Figure 3

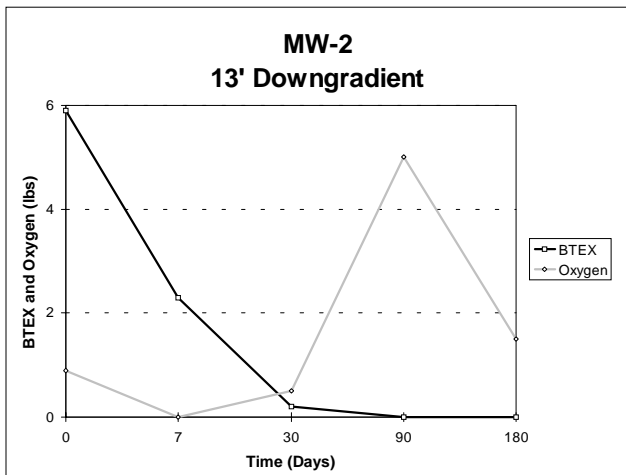


Figure 4

