

MTBE Case Study
***In Situ* Bioremediation at Cordray's Grocery, Ravenel, South Carolina**

Site Name: Cordray's Grocery

Site Location: Ravenel, SC

Contaminants: MTBE, BTEX, Naphthalene

Media: Groundwater

Technology: *In Situ* Bioremediation using ORC®

Technology Scale: Full

Type of Cleanup: RCRA UST

Period of Operation: April 1998 to July 2000 (data available through January 2000)

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Site History [1,2,4]:

The Cordray's site in Ravenel, SC had a gasoline service station. In 1987, leaks from a gasoline underground storage tank (UST) resulted in contamination of soil and groundwater at the site with MTBE, BTEX, and naphthalene. The highest concentrations of contaminants measured in groundwater at the site were benzene at 25,000 ug/L, toluene at 28,600 ug/L, ethylbenzene at 2,360 ug/L, xylenes at 1,160 ug/L, MTBE at 2,230 ug/L, and naphthalene at 134 ug/L. A 550-gallon UST was removed in 1987 and a Corrective Action Plan (CAP) was implemented in April 1998 under Subtitle I of the RCRA program. The CAP included excavation of soil and *in situ* bioremediation of groundwater using ORC®.

The soil at the site is clayey to fine-grained sand. The average depth to groundwater is 9 feet below ground surface (bgs). The average hydraulic gradient is 0.006 ft/ft with a calculated seepage velocity of 0.473 feet per year.

Technology Description [1,2,4]:

In situ bioremediation using ORC® was used to treat groundwater at the site. Figure 1 is a site map showing the location of source areas (excavations) and monitoring wells. A one time application of 140 lbs. of ORC® was injected in the excavated areas on August 31, 1998, with an injection depth of 20 - 25 feet (ft) below ground surface (bgs).

Technology Performance [1,2,4]:

Site-specific target levels (SSTLs) were established by SCDHEC for MTBE, BTEX constituents (benzene, toluene, ethylbenzene, and xylenes), and naphthalene. Tables 1 and 2 present data on the SSTLs and concentrations for each constituent in monitoring wells (MW)-0 and -5 in the groundwater at the start of the cleanup (April 1998) and in January 2000, when confirmation sampling was performed.

Table 1 - Summary of Groundwater Contaminant Concentration Data, MW-0 (ug/L) [4]

Contaminant	SSTL	April 1998	January 2000
MTBE	239	239	BDL
Benzene	4,150	18,900	920
Toluene	21,400	21,400	6,900
Ethylbenzene	1,700	1,700	1,280
Xylenes	11,700	11,700	9,280
Naphthalene	557	557	BDL

BDL - Below Detection Limit

Figure 1. Excavation and Injection Locations [4]

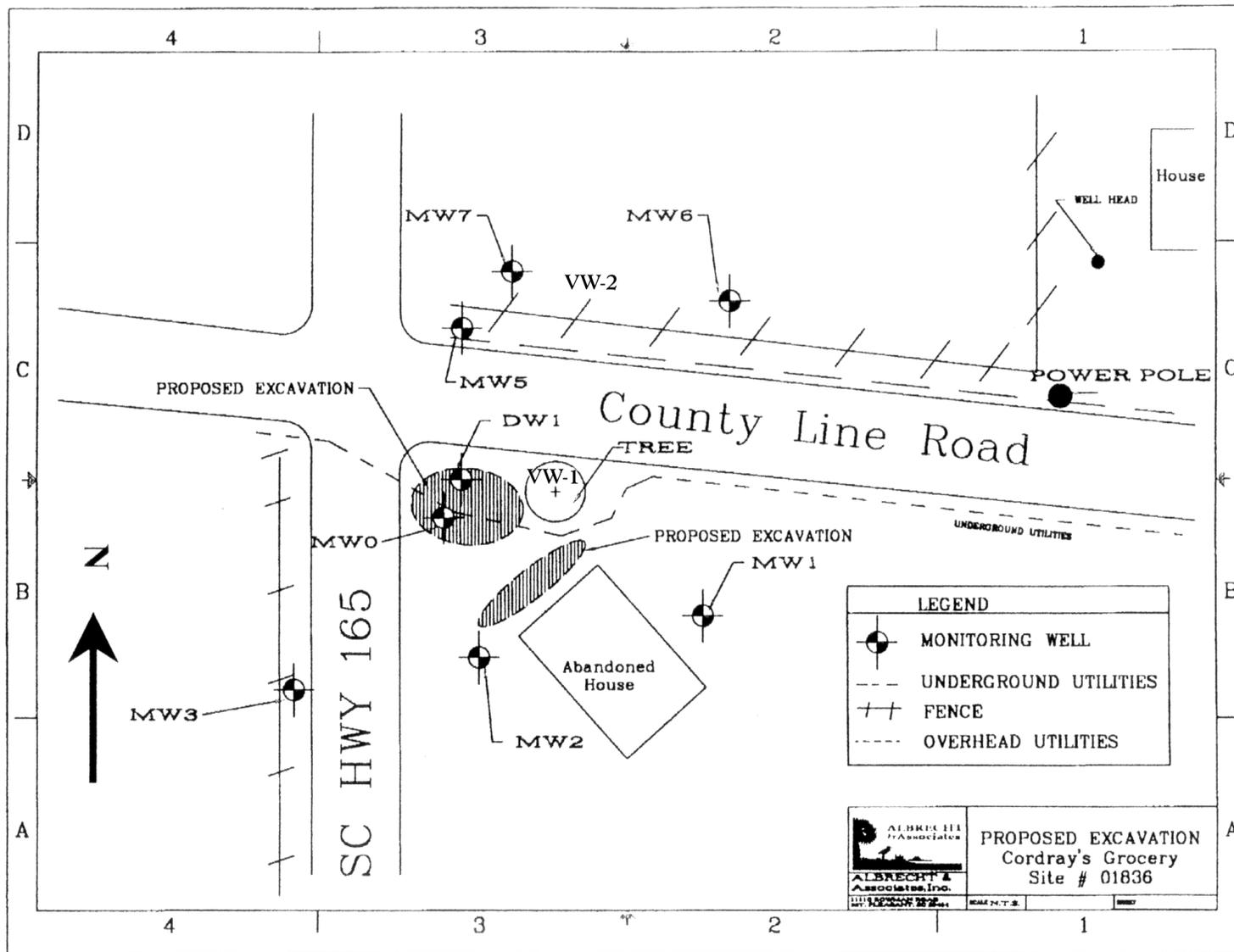


Table 2. Summary of Groundwater Contaminant Concentration Data, MW-5 (ug/L) [4]

Contaminant	SSTL	April 1998	January 2000
MTBE	115	115	BDL
Benzene	4,020	4,020	BDL
Toluene	2,900	2,900	1
Ethylbenzene	460	460	1
Xylenes	2,380	2,380	3
Naphthalene	170	170	BDL

According to SCDHEC, cleanup goals at the site were met in November 1998. Results of the January confirmation sampling (Tables 1 and 2) sampling event showed that the SSTLs had been met for MTBE, BTEX, and naphthalene in MW-0 and MW-5. Concentrations of MTBE and naphthalene were reduced to below detection limits in both wells. Concentrations of BTEX constituents were reduced by 99% in well MW-5, and by as much as 95% (benzene) in well MW-0. The SCDHEC reported that the corrective action was completed on July 24, 2000.

Technology Cost [2,3]:

The total cost for the cleanup at this site was \$21,000. The South Carolina Petroleum Cleanup Fund awarded the contract for the cleanup at this site as a fixed-price, lump sum with no change orders. No additional information on cost breakdown was available.

Observations and Lessons Learned [4]:

In situ bioremediation using ORC® achieved the cleanup goals for the site for MTBE, BTEX, and naphthalene within three months of the initial injection of ORC®.

According to SCDHEC, the cleanup was completed within the predicted time, and the use of a fixed price contract was less costly than a time and materials contract.

References:

1. Art Shrader, SCDHEC. E-mail to Richard Weisman, Tetra Tech EM Inc. MTBE Study. January 17, 2000.
2. Art Shrader, SCDHEC. E-mail to Richard Weisman, Tetra Tech EM Inc. MTBE Study - Cost Data. February 23, 2000.
3. Scott McInnis, SCDHEC. E-mail to Richard Weisman, Tetra Tech EM Inc. MTBE Study - Information about Cordray's Grocery. February 25, 2000.
4. Art Shrader, SCDHEC. E-mail to Doug Maddox, EPA. Feedback on Draft Case Study. October 30, 2000.