Environmental Solutions

KLOZUR® KP
Case Study

Klozur® KP Reduces CVOC and BTEX Contamination Concentrations by >99% at a Former Industrial Site in Germany

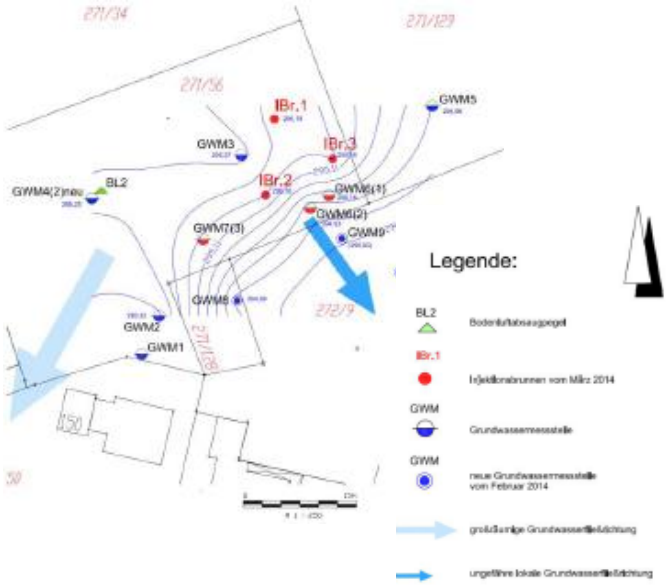
Summary

Consultant: Riskcom
Contractor: TOTERRA Ltd.

The drum storage area of a former industrial site in Germany was contaminated with naphthalene, BTEX, and CVOC's including tetrachloroethene (PCE), trichloroethene (TCE), and cis-1,2-dichloroethene (DCE). The contamination was found mainly in the low permeable sandstone up to 12 m (39.4 ft) below ground surface (bgs).
It was determined that pump & treat was not practical and that it was not possible to excavate, therefore the preferred approach was hydraulically placed Klozur® KP with a patented chelated iron activator[1].

Pilot Project

The pilot design targeted the areas with the highest levels of groundwater impacts; approximately between 7 – 11 m (23 – 36 ft) bgs. Three areas were targeted for treatment with 5 vertical injection intervals in each area via hydraulic fracturing technology.
Approximately 1,350 kg (2976 lbs) of Klozur KP was injected activated by 200 kg (441 lbs) of ferrous lactate.



Conclusions

The Klozur KP and activator were successfully distributed over a 200 m^2 (2,152 ft^2) throughout the three injection area locations. Post application monitoring 6 months after the injections showed that the activated Klozur KP resulted in up to 99% treatment of target contaminants of concern (COCs).

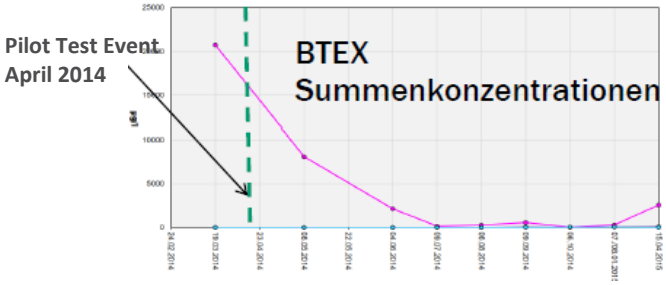


Figure 1 – BTEX Total Concentration after the Klozur KP injection event

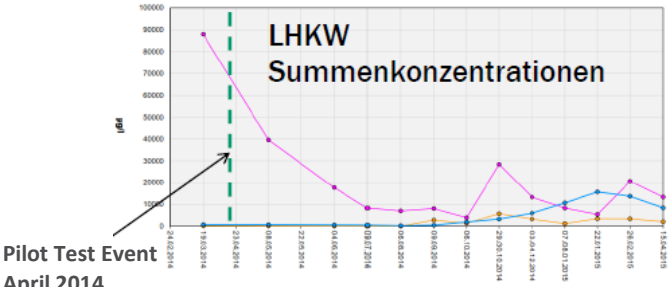


Figure 2 –CVOCs Total Concentration after the Klozur KP injection event

Above in Figures 1 and 2 it can be seen from the primary monitoring wells that the concentrations rapidly reduced post injection and the Klozur KP allowed for treatment over time as it slowly dissolved through the treatment area.

Table 1 shows most concentrations dropped to >99% reduction for most COC's within 6 months after the injection in the target area. After one year the PCE and TCE concentrations remained low while DCE, BTEX, and PAH concentrations increased. Secondary site parameters, including conductivity, indicate that this increase in concentration is due to upgradient contaminated groundwater moving back into the target interval of the pilot treatment area.

Date	Contaminant (µg/L)				
	PCE	TCE	cDCE	BTEX	PAH
3/19/2014	13,000	22,000	52,000	20,713	98
10/7/2014	8	23	3,800	47	5
Percent Reduction 6 months post application	**99.9%**	**99.9%**	**92.7%**	**99.8%**	**94.5%**
4/15/2015	4	6	13,000	2,570	104
Percent Reduction 12 months post application	**99.97%**	**99.97%**	**75.0%**	**87.6%**	**-5.3%**

Table 1 – Total Contaminant Concentration and reduction 6 to 12 months after the Klozur KP injection event

1. US patent 9,375,768 B2