

PÍSEČNÁ SITE: CHALLENGING REMEDIATION OF DEEP CONTAMINATION PLUME NEAR TO THE DRINKING WATER SOURCE

Treatment of an old disposal site proved to be a challenging task due to its improper placement and insufficient ensuring. The site is located in a very complex geological environment and in imminence of the source of drinking water. Therefore, the soluble in-situ reagents cannot be applied here. NANOFER slurry was chosen by the remediation company AQUATEST for removal of chlorinated hydrocarbons (CHCs) from a deep aquifer in fractured rocks.

SITE CHARACTERISTICS

General

Name:	Písečná I
Location:	Letohrad, Czech Republic
Function:	waste disposal site
Contaminants:	CHCs (chlor. ethanes and ethenes)

Hydrogeology

Treatment Area:	2 000 m ²
Groundwater Table:	>10 m bgl
Groundwater Velocity:	0.1 m/day
Geological Profile:	permian sediments above proterozoic metamorphites

Extraction of deposited waste was accomplished during the first remediation phase. Pump and treat and venting started as the second stage in 2004, and these measures cannot be stopped because of the risk of the contamination of drinking water. In the third phase, nZVI slurry was applied in order to speed up CHCs removal and to achieve the required contamination limits.

REMEDIATION APPROACH

Remediation Objectives

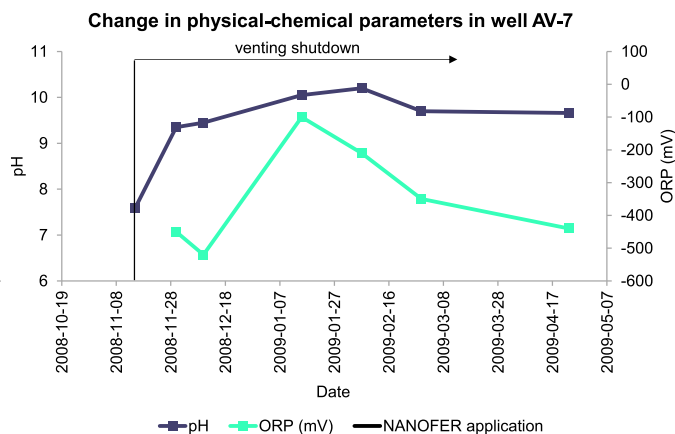
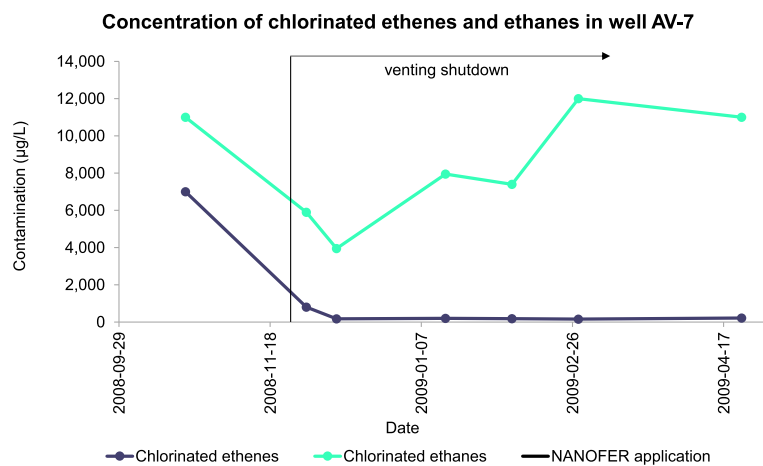
- Effective application of nZVI into complex crack environment
- Reaching of vertically distributed CHCs phase
- Avoid spreading of contamination towards the source of drinking water for Letohrad

Application Strategy

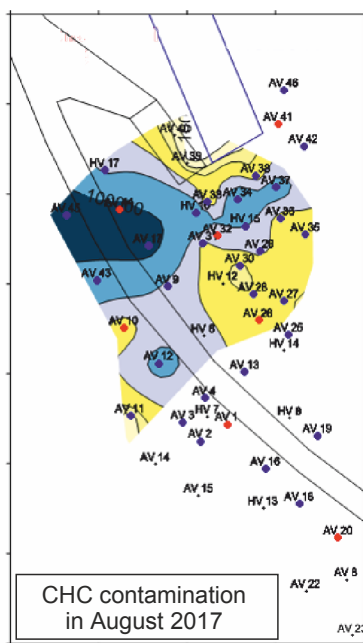
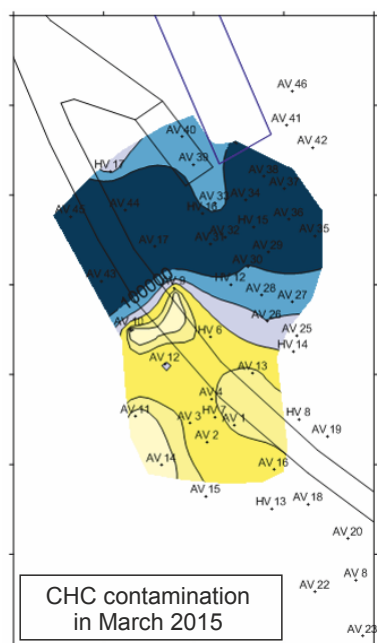
Application Type:	pressure injection through permanent wells
Products:	NANOFER 25S suspension, NANOFER STAR aqueous suspension
Total Quantity Applied:	2 660 kg / 6,000 lb in 8 application rounds



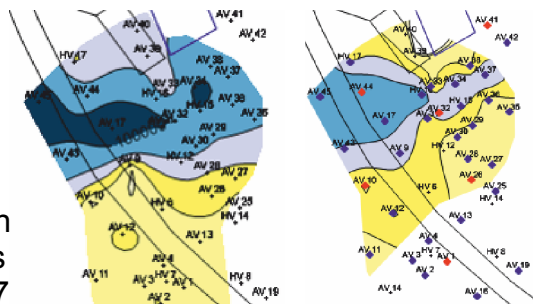
RESULTS OF A PILOT TEST



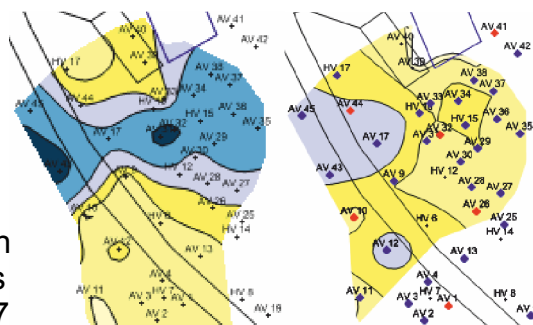
RESULTS OF A FULL-SCALE REMEDIATION



Change in PCE distribution over years 2015-2017



Change in TCE distribution over years 2015-2017



CONCLUSION

The results of a pilot test proved the ability of NANOFE zero-valent iron nanoparticles to remove CHCs efficiently and more permanently than RNIP particles (Toda Kogyo Corp.). The outcomes of the laboratory experiments, showing that chlorinated ethenes are degraded faster than chlorinated ethanes, were confirmed.

During the full-scale remediation, a significant decrease in CHCs concentration was achieved but also a new contamination plume, situated below a driveway to the disposal and doping the site by a fresh pollution, was discovered. Therefore, continuation of in-situ remediation at the site is needed, especially with regard to the risk of contamination of the source of drinking water located nearby.

We acknowledge AQUATEST a.s. remediation company and thanks to Jaroslav Nosek, who provided us data collected on site.