Abstract

Groundwater and soil contamination by chlorinated hydrocarbons has recently become of increasing concern and extensive researches have been conducted to develop technologies for remediating both contaminated groundwaters and soils. In this framework *in-situ* technologies are promising for remediating contaminated groundwater in that they would keep the ecosystem largely undisturbed and would be cost effective.
The aim of the present study is the assessment of natural attenuation potential at a TCE-contaminated site in Northern Italy, near Milano, where contamination of aquifers by TeCA, PCE and TCE has been documented.
This site has a long history of contamination (approximately 50 years) mainly due to industrial activities.
The study illustrates the steps involved in implementing natural or enhanced attenuation screening protocols at this site and represent an outstanding example of effective coupling of process analysis and modeling. In fact microcosm studies properly integrated with modeling results might suggest the feasibility for enhancing *in-situ* reductive dechlorination at the investigated site in order to achieve the stringent legislation limits. Such promising results will be verified through a field test performance before implementing the process at full-scale.

In-situ enhanced anaerobic reductive dechlorination (RD) is a promising technology for remediation of chloroethane and chloroethene contaminated groundwater. Indeed it is ideally suited for integration into long-term site management programs to address chlorinated solvents dissolved in groundwater. That's because such contaminants often are encountered in the form of DNAPL, which is characterized by a slow release, thus requiring long-term decontamination activities. Consequently active processes (e.g., conventional groundwater pumping and treating) often result costly and quickly reach a point of diminishing returns.
In situ enhanced RD can be accomplished by either enhancing halo respiratory activity of native microbial dechlorinating population (e.g. through the addition of electron donors and/or nutrients to produce favorable reducing conditions), or by inoculating the aquifer with microorganisms that are capable of degrading the target pollutants.

The protocol to be developed will describe a phased-approach for the assessment of the feasibility of bioremediation, either enhanced or as a part of a natural attenuation objective, at a contaminated site. The "Technical protocol for evaluating natural attenuation of chlorinated solvents in ground water" (EPA/600/R-98/128) and the "Treat ability test for evaluating the potential applicability of the reductive anaerobic biological in situ treatment technology (RABITT) to remediate chloroethenes" (US Department of Defence) will be the reference reports for the implementation of this new protocol.
The phase-approach included chemical, hydrogeological, and microbiological characterization of the site, monitoring and modelling of the contamination plume, and field tests.