

# CLORO Bioprocess

## Biotreatment of Chlorinated Hydrocarbons

### Problem description

A shallow aquifer is contaminated by unknown quantities of trichloroethylene (TCE) dumped during many years.

Recent ground water analysis indicates that cis-1,2-dichloroethylene (cis-DCE) is the principal contaminant.

Indigenous bacteria probably transformed the TCE to cis-DCE by the well known reductive dechlorination pathway. Since the groundwater is currently anoxic, further dechlorination is not possible naturally.



### MADEP solution

By the technique known as bio-augmentation, MADEP proposes to increase the population of pollutant degrading bacteria in the contaminated water by a factor greater than 1000. By significantly increasing the population of pollutant degrading microbes, biodegradation is enabled where absent and significantly accelerated where it is already occurring at a slow rate.

By the technique known as bio-stimulation, MADEP proposes to alter the physical and chemical characteristics of the aquifer to promote the biodegradation of cis-DCE.

The contaminated water is recirculated as described in the drawing below.

### Advantages

➤ Pollutant destruction and not pollutant transfer: The final products of biodegradation are biomass, CO<sub>2</sub> and Cl<sup>-</sup> ions and there are no added chemicals. Alternative treatment techniques often transfer the pollutant from one site to another and some techniques require chemical addition.

➤ Low cost: Compared to alternative techniques such as activated carbon adsorption, the equipment and consumables costs for bacterial production and application are low. Similarly to any other groundwater remediation technique, bio-augmentation requires the conception and installation of a water recirculation system consisting of wells and pumps.

➤ Rapid start-up: MADEP has several chlorinated hydrocarbon degrading bacteria in stock as well as processes for their large-scale, on-site production. The strains were isolated from Swiss sites. If requested, MADEP is ready to isolate chlorinated hydrocarbon degrading bacteria from the contaminated site and develop a production process in only a few months.

➤ Rapid completion: The treatment duration depends on the site characteristics such as pollutant identity and concentration and the aquifer volume, location and temperature. Nevertheless, the degradation rate of cis-DCE using MADEP strains in a static, shallow aquifer is approximately 100 µg cis-DCE per liter per day.

