



## CASE STUDY

# Anaerobic Bioremediation for Chlorinated Ethene Impacts in Fracture Rock Aquifer Campinas, Sao Paulo

## Background

<b>DURATION:</b>	19 months
<b>LOCATION:</b>	Campinas, Sao Paulo
<b>CLIENT:</b>	Industrial Facility
<b>PROJECT VALUE:</b>	4,530,000 reals

At an active industrial facility, historical spills of the chlorinated ethenes trichloroethene (TCE), resulted groundwater impacts to a fractured rock aquifer. Pump & treat remedial efforts by others were unsuccessful at reducing the TCE and its dechlorination daughter products cis 1,2 dichloroethene, and vinyl chloride to acceptable concentrations. ASR was retained by the site owner to develop an insitu remedial work plan that used chemical reduction and anaerobic bioremediation to address the dissolved phased plume. The remedial plan used focused low pressure, low volume injection techniques to deliver the remedial reagents to the injected plume.

## Approach

The owner of the industrial facility along with the owner's consultants worked with ASR to develop a remedial work plan that included installing multilevel wells and packer systems to better define the impacts and transport pathways. The updated conceptual site model (CSM) allowed ASR to develop a remedial plan that used chemical reduction and anaerobic bioremediation to reduce the contaminant mass within the aquifer to below the regulatory limits and eliminate risks to humans and the environment as well as limit liability associated with off site migration. The remedial plan was based on injecting a mixture of organic donors including fast and slow-release organic carbon along with micro and nano zero-valent iron to address any potential back and matrix diffusion issues.

InSitu Remediation Services Ltd. (IRSL) is one of Canada's most experienced remediation companies. Our team has designed, implemented, and optimized, soil and groundwater remediation programs in diverse geological environments in North, Central, and South America, Asia, Europe, and the Middle East.

We confidently implement innovative solutions, based on sound knowledge, using seasoned field staff. Our pragmatic, flexible approach reduces effort, cost to our clients, and environmental risk.



## Challenges

Several conditions at the site made this project challenging including:

- Large variation in aquifer variability
- Fractured rock
- Elevated TCE and daughter products greater than 25,000 ug/L
- Back and matrix diffusion concerns

## Results

The results of the chemical oxidation program included:

- Over 69,000 kg of remedial solution being injected over a 3-week period at low pressure
- Reduction of TCE concentrations of greater than 99.99 percent for a three-year period
- Reduction of 1,2 DCE concentrations greater than 99.99 percent for a three-year period
- Reduction of vinyl chloride concentrations greater than 99.99 percent for a three-year period

