



The in situ reactive barriers are constructed from a series of wells installed along the barrier alignment. A controlled vertical fracture is initiated in each well at the required azimuth orientation and depth. Iron filings are injected into the wells in a highly viscous cross linked proprietary HPG gel, to form a continuous permeable iron reactive barrier. The barrier's geometry is monitored in real time by the active resistivity method to ensure the barrier is constructed as designed.

### In Situ Permeable Barriers

In situ reactive barriers, i.e. treatment walls, are replacing pump and treat remedies for contaminated groundwater with cost savings greater than 75%. Iron reactive permeable barriers remediate chlorinated solvent contaminated groundwater by abiotic degradation of the halogenated volatile organic compounds into harmless daughter products. Azimuth orientated vertical hydraulic fracturing is an alternate mode of placing iron reactive barriers in situ, resulting in significant cost savings and allows reactive barriers to be installed at greater depths than conventional technologies. Orientated vertical fracturing technology has installed permeable iron reactive barriers at a number of sites in highly permeable sands and gravel down to moderate depths and a number of cases greater than 100'



The advantages of orientated hydraulic fracture placed reactive barriers are:

- cost savings
- minimal site disturbance
- no excavation of contaminated material
- deep application of treatment technology
- minimal impact on groundwater flow regime

### Monitoring of Barrier Geometry

The reactive barrier installation is monitored in real time during injection to determine its geometrical extent and to ensure fracture coalescence or overlap occurs. The gel iron mixture is energized by a 100Hz low voltage source. Down hole resistivity receivers are monitored to detect changes in induced voltages by the propagation of the fracturing fluid. From these induced voltages and utilizing an incremental inverse integral method, the fracture geometry is displayed in real time during the installation process.

