

AnoX

Enhanced Intrinsic Bioremediation for *In Situ* Groundwater Treatment

AnoX is an advanced treatment solution designed to greatly enhance the natural attenuation of petroleum hydrocarbon contamination in groundwater.

The **AnoX** approach takes advantage of aerobic and facultative metabolic pathways utilized by naturally occurring hydrocarbon degrading microorganisms to greatly enhance the bioassimilation of petroleum hydrocarbons within groundwater. **AnoX** works by balancing the nutrient regime within groundwater through the use of alternative electron acceptors (oxygen replacement) and other essential nutrients whose absence sorely limits the natural attenuation process. The result of using **AnoX** is a greatly enhanced remedial process at very low costs.

Typically, oxygen is either entirely absent or present at very low levels within the groundwater of contaminated sites. Increasing oxygen levels with solid oxygen delivery products is being promoted as a solution to successfully enhancing the remediation of contaminated sites. However, increasing oxygen levels within groundwater in this way is always an expensive proposition and, in reality, it is entirely unnecessary to accomplish treatment goals. Additionally, it is widely known that oxygen is expended in many wasteful ways within groundwater other than the intended use for remediating contaminants. In fact, there is convincing evidence that only a small percentage of the oxygen ever actually gets to the bacteria which consumes the contaminants, in addition to the fact that solid oxygen delivery products increase the pH of the groundwater to unacceptably high levels in the vicinity of the application.

The predominant naturally occurring petroleum degrading bacteria at nearly all contaminated sites are known to be facultative bacteria. This means that they typically prefer to utilize oxygen as an electron acceptor within their metabolism but can use alternatives to oxygen. The alternatives to expensive solid oxygen delivery products, like magnesium peroxide, are far easier and cheaper to dissolve into groundwater and, importantly, they are utilized by bacteria with surprising efficiency.

In addition to appropriate electron acceptors, the natural attenuation process is limited by several other nutrients. Nitrogen, for example, typically represents approximately 10% of the mass of a bacterium. Nitrogen sources within the groundwater are almost always so minimal that very little is available for satisfying the bacterial demand for this nutrient to degrade petroleum contamination. The result is a greatly diminished treatment rate for the contaminants present. Augmenting a site with sufficient amounts of nitrogen and other essential nutrients can take years off of a cleanup, saving the client significant amounts of money and time for site closure.

Using **AnoX** is simple. Packets of **AnoX** are simply placed into wells points which are strategically placed across the site. The ingredients of **AnoX** are left to disperse across the site with the natural flow of the groundwater. A correct dosage of **AnoX** can assure that all of the essential vitamin and mineral needs of the bacterial population are met. When this occurs, the remediation time line is dramatically reduced.