AEHS 2016 Conference Paper Abstract

Co-Metabolism of TCE and 1,4-Dioxane by Methane Oxidizing Bacteria

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Paper Presented at the AEHS 2016 Conference

Following active remediation of an extensive TCE and 1,1-DCE plume in La Mirada (Los Angeles County), CA using pump and treat for 10 years, then followed by several chemical oxidation injection events, a final remedial strategy was sought to complete the remaining groundwater cleanup process. In pursuit of this final remedial strategy, evaluation of monitored natural attenuation (MNA) was implemented by collection and analysis of microbial populations and physical water quality parameters at the site.

The site groundwater exhibits a wide microbial diversity, with many types of aerobic and anaerobic bacteria, including the presence of low numbers of *Dehalococcoides* bacteria, which indicates the potential for complete reductive dechlorination of TCE and 1,1-DCE to occur at the site. In addition, key functional genes (such as TCE reductase and VC reductase) were identified at the site.

An unexpected discovery was the confirmation of a robust population of methane oxidizing bacteria (methanotrophs) which are causing the co-metabolism of TCE. Under aerobic conditions, methane oxidizing bacteria can co-metabolize or co-oxidize TCE, DCE and vinyl chloride. The presence of moderate amounts of soluble methane mono-oxygenase enzymes indicates that an increased rate of co-metabolism can be supported at this site. Based on the relative populations of methane oxidizing bacteria in comparison to DHC bacteria (up to 600 times greater), it is estimated that the co-oxidation degradation rates at the site are far greater than the reductive dechlorination rates.

Over the last five years (since 2011) of groundwater monitoring, the TCE and 1,1-DCE levels (up to 150 µg/ml) in 11 key monitoring wells have attenuated by 50% or more due to natural attenuation processes. Currently, JAG is in negotiation with the Los Angeles Water Quality Control Board to use natural attenuation as a strategy to obtain groundwater cleanup goals and obtain final site closure.