

Using Environmental Molecular Diagnostics to Support a Rhizodegradation Closure Strategy at a Service Station Site

Jack Sheldon (jack.sheldon@anteagroup.com) (Antea Group, West Des Moines, IA, USA)
Jeff Friedman (jeff.friedman@anteagroup.com) (Antea Group, Long Beach, CA, USA)

Background/Objectives. Understanding the soil microbial profile in the root zone of vegetation intersecting a groundwater plume is a valuable component of the site conceptual model. The profile can also be an important parameter in evaluating natural attenuation of groundwater constituents. Environmental Molecular Diagnostics (EMD) and their accompanying sample collection methods have made microbial data collection easy and efficient. Increased use of EMD's and robust databases have also improved the value of collecting microbial data and comparing to other scenarios to maximize the use of the data.

Approach/Activities. This presentation will describe the soil microbial data collected in conjunction with other soil parameters in support of a closure strategy at a service station site. Following significant remediation of on-site and off-site groundwater constituents (TPH-gasoline, TPH-diesel and BTEX), there remained impacts in a downgradient well in proximity to a surface water body, a creek channel. A closure report was prepared and submitted to the regulatory agency. Only the impacted well at a distance of less than 100 ft. from the water body prevented closure from being granted. Additional data were collected post-closure denial and a site walk around the creek channel led to the realization that no impacts had ever been found in the creek water. The vegetation found consisted of oak trees, grasses, and shrubs and pointed to the potential that they could be key in preventing the groundwater impacts from reaching the creek channel. A series of borings were completed along the flow path and within the rhizosphere of the vegetation. Background samples were also collected. The samples were sent to various laboratories for soil nutrient/agronomic analyses and for microbial profiling. Soil samples were analyzed by a QuantArray Petro (DNA) method to develop the microbial profile.

Results/Lessons Learned. By comparing rhizosphere microbial profiles to background profiles, it was possible to determine types of active microbes and gene functions associated with biodegradation of the target constituents. When combined with field parameters, geochemical analysis, and agronomic analysis, a compelling base of evidence was established for rhizodegradation of groundwater constituents. The overall case study for the service station site and the closure strategy with an emphasis on the role of EMD's and phytoremediation will be presented.