



Natural Source Zone Depletion and the Activated Carbon Remedy: Friend or Foe

Mike Mazzaresse, AST Environmental

Natural Source Zone Depletion (NSZD) is a term of art that describes those processes that act to physically redistribute LNAPL to the aqueous or gaseous phase as well as processes that biologically diminish the contaminant source over time. In practice, NSZD is rarely employed as the sole remedy but is often a polishing step that follows one or more active remedies. Some active remedies are more supportive of NSZD than others. We will demonstrate that carbon-based injectates particularly support NSZD by presenting field data and laboratory showing that carbon-based injectates reduce LNAPL and provide data demonstrating that activated carbon facilitates biodegradation. We will further demonstrate that contaminants absorbed into the microporous structure of carbon are bioavailable and that biodegradation regenerates the adsorption capacity of the activated carbon. Thus, redistributing LNAPL into the carbon's pore structure is not limited by its initial adsorption capacity. Therefore, activated carbon supports a continuing, physical redistribution of LNAPL and supports biodegradation.

A laboratory study, employing various carbons, blends of commercially available microorganisms purported to degrade petroleum hydrocarbons, and numerous supplements and substrates, was structured to characterize the effects of these elements on gasoline and diesel LNAPL degradation. Three different controls were used to evaluate experimental losses and provide performance profiles for changes due to simple absorption by the activated carbon. GC/MS was used to quantify the products of LNAPL degradation. The data was then used to derive overall NAPL and compound-specific degradation rates. Field data illustrating these same principles will be presented.

The test program was structured to examine the individual carbons with the same set of organisms and substrates. The data demonstrate that organic compounds absorbed into the microporous structure of carbon are bioavailable. Extraction of absorbed fuel constituents from the carbon demonstrates LNAPL degradation. A proposed mechanism for LNAPL degradation is supported by the data. After applying a carbon-based injectate remedy, NSZD is supported through continued LNAPL redistribution and biodegradation.

Mike Mazzaresse

Mike has been involved with in-situ remediation for over twenty years and has worked in the remediation technology and environmental consulting communities his entire professional career. His role as Senior Engineer at AST involves project assessment and design, field implementation oversight, and post project data analysis for sites in the Western US, Canada, Europe, and Australia.