

Report for 2001NJ1361B: Pilot Study on the Use of Hydrogen Release Compounds for PCE Enhanced Biodegradation in Fractured Rock Aquifers

- Articles in Refereed Scientific Journals:
 - Lee, K.Y., Transport of dissolved contaminants originating from a rectangular prism shaped multicomponent nonaqueous phase liquid source in saturated porous media, in press, Environmental Geology, 2002.
 - Stencel, J.R., and K. Y. Lee, Remediation options for PCE in a fractured rock aquifer, EOS, Transaction, American Geophysical Union, 91(48), 449, Fall 2000.

Report Follows:

Project Information:

The main objective of the overall project is not only to show remediation in a fractured rock aquifer using hydrogen as the electron donor, but to show that a compound, such as HRC[®] is a very cost-effective method to remediate in a timely manner some of the most frequently found contaminants in many types of groundwater systems. The intent is to tie together other pilot studies of NJDEP, the clay aquitard system presently undertaken by Rutgers and this new media of a fractured-rock aquifer. This will have benefits for all of New Jersey because of the expected application of this process to inhomogeneous aquifer scenarios. The entire northern portion of New Jersey is underlain by a fractured bedrock formation commonly called the Brunswick formation, though it is alternatively called the Passaic formation. Given the industrialization of this portion of the state and the wide use of chlorinated solvents for degreasing application in the middle part of the 20th century, it is clear that once developed, this technology will have a very wide application. There is commercial relevance to Brownfield redevelopment as well as aquifer remediation in industrial and residential neighborhoods. In New Jersey alone, there are thousands of sites that would benefit from this new remediation approach.

New and innovative relevance include:

- Innovative use of an *in-situ* reductive dechlorination bioprocess for bedrock aquifers.
- Commercial development and field application of the bioprocess.
- Invention of biostimulation product.
- Innovative application for DNAPL chlorinated solvents.

One overall objective of this research and development program will be to show that a cost-effective commercially viable remediation process can be made available for some of the most prevalent contaminants found in fractured bedrock groundwater systems, particularly the Brunswick formation. If successful, the program will show that anaerobic hydrogen technology can not only be cost effective, but will produce cleanups in shorter time frames, will not cause disruptive activities on the property undergoing the remediation, and can be effective in the fractured-rock aquifers which are found in New Jersey.

The available funding through NJWRRRI is not sufficient for this entire project, however, it provides needed funding to help in providing a necessary tracer study as part of the overall pilot project leading to an understanding of the data being collected and in projecting the success of the remediation process over the expanse of the aquifer being studied.

Methodology:

The methodology to be employed included the drilling of a well for introduction of a tracer such as sodium bromide into a well, and the use of either a natural flow to recovery well in the same strike, and/or the use of pumping at the second well if the distance was too great. Follow up injection would include a hydrogen release type compound to see if it would flow into fractures and show up at the recovery well.

Principal Findings and Significance:

Funding for the project was received late and in the process the funding crisis in New Jersey affected a planned supported well for the project by Rutgers University. A subsequent well drilled on a limited budget proved to be in an inadequate fracture-rock zone to be of use for the project.

While delayed, the project will continue and is schedule to utilize some other established wells within a fractured-rock settings later this year. The results will be reported upon when the data is obtained.