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U.S. ARMY CORPS OF ENGINEERS

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Dec. 16, 2011

Debra Valine
256-895-1691
debra.valine@usace.army.mil

# FUDS team takes technical approach at site

By Charles Coyle
Environmental and Munitions Center of Expertise
U.S. Army Engineering and Support Center, Huntsville

The U.S. Army Corps of Engineers Omaha District project delivery team for the Atlas Site 10 Formerly Used Defense Sites is hosting an ongoing innovative technology demonstration for treatment of chloroethenes in the vadose zone, the shallow surface layer of soil from the surface to the water table.

The site was proposed for this Environmental Security Technology Certification Program-funded demonstration by the U.S. Army Engineering and Support Center, Huntsville, Environmental and Munitions Center of Expertise.

The technology demonstration was conceived and proposed by GSI Environmental Inc. GSI is developing the technology and overseeing the demonstration project.

Site 10 is the former “Atlas F” missile facility operated by the former Lincoln Air Force Base from 1960 to 1964, near York, Neb. Site 10 was deactivated and conveyed to a private individual in 1965.

The major structure at the site is the underground missile silo, 174 feet deep and 52 feet in diameter. Historic operations at the former missile silo have resulted in trichloroethylene contamination of soil and groundwater. TCE is the primary contaminant at the site, but dichloroethene is also present at some locations.

The new technology is being called “H2T”. The process involves injection of a gas mixture, primarily nitrogen, hydrogen and propane, for anaerobic, in-place bioremediation of chloroethenes in the vadose zone. Gas injection was initiated in June 2011 and will continue into January, at least.

The injected propane and hydrogen serve as a food source, electron donors, for soil microorganisms. The main purpose of the nitrogen is to displace oxygen, in order to try to drive conditions from aerobic to anaerobic in the pore space of the deep soils. If anaerobic conditions can be established and maintained, this should allow for growth of strains of naturally occurring, dechlorinating microorganisms such as Dehalococcoides ethogenes, also known as DHC. DHC are capable of using TCE and DCE for respiration, while using hydrogen as their food source.

Prior to the initiation of the H2T demonstration, a soil vapor extraction system had been installed at the site. The SVE system was operated from September 2008 until March 2011. The recovery rate of volatile organic compounds using

the SVE system had been in decline, and appeared to have nearly leveled off, before the H2T demonstration was initiated.

The decision was made by GSI that they would attempt to treat a portion of the vadose zone on the east side of the missile silo that had exhibited some of the highest levels of VOCs in soil. The VOCs appear to be hung up in the vadose zone and are also believed to be serving as a continuing source as they gradually leach downward into groundwater. The zone slated for the demonstration also happens to be very low permeability soil — an extremely challenging situation for in-place treatment.

In contrast to some of the other in-place treatment technologies for VOCs that are hung-up in deep, low-permeability soils; the H2T process appears to be a passive and low-cost approach. Other technologies that could be applied in this type of setting include in-situ thermal treatment, and deep soil mixing with a large diameter augur.

However, aggressive technologies such as in-place thermal and deep soil mixing are generally very expensive. At the conclusion of the study, soil boring samples will be collected and the soil gas monitoring data will be compiled. Then the data will be analyzed to determine whether or not the process was effective for cleaning up the TCE and DCE.

POC is Charles Coyle 402-697-2578, e-mail Charles.g.coyle@usace.army.mil. Coyle is an Environmental Engineer who works at the Environmental and Munitions Center of Expertise in Omaha, Neb.