Savannah River Site

Citizens Advisory Board

Recommendation 236

Soil Vapor Extraction with Soil Fracturing

Background

DOE has release a Statement of Basis/Proposed Plan describing the proposed remedial actions for the M-Area Inactive Process Sewer Lines (MIPSL) Operable Unit (OU) at the Savannah River Site (SRS). The Statement of Basis/Proposed Plan was completed to meet the terms of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA), laws governing the investigation and cleanup of waste units. DOE has worked with EPA-Region 4 and SCDHEC to ensure the remedial approach is consistent with all applicable environmental requirements. The public comment period for the Statement of Basis/Proposed Plan is from June 15 – July 29, 2006.

From 1958 until 1985, several M-Area facilities (313-M, 320-M, and 321-M) manufactured reactor fuel and target assemblies, associated operations included support buildings, maintenance operations, laboratories, and infrastructure for managing waste. Effluents from M Area were transported through two separate networks of vitrified clay pipes. M-Area effluent wastes included chlorinated solvents (used for degreasing fuel and target assemblies), acids, caustics, heavy metals, and minor amounts of radioactive constituents. Specific constituents of interest include trichloroethylene (TCE), tetrachloroethylene (PCE), 1,1,1-trichloroethane (1,1,1-TCA), aluminum, copper, iron, lead, magnesium, manganese, mercury, nickel, zinc, and uranium.

The proposed remedial alternative for MIPSL is a phased soil vapor extraction (SVE) enhanced with soil fracturing, and institutional controls. This alternative involves the use of soil fracturing to increase permeability, allowing an SVE system to more effectively remove vapor phase contaminants. Low energy, microblower SVE systems would be deployed and passive operation with BaroBall™ wells would be used as a final polishing step for this alternative. Institutional controls will limit access to the area.

Fracturing is an enhancement technology designed to increase the efficiency of other in situ technologies in difficult soil conditions. Similar to techniques used for years in the oil industry, fracturing has been adopted to successfully increase contaminant extraction rates in low permeability soil vacuum extraction projects. The fracturing extends and enlarges existing fissures and introduces new fractures, primarily in the horizontal direction. When fracturing has been completed, the formation is then subjected to vapor extraction, either by applying a vacuum to all wells or by extracting from selected wells, while other wells are capped or used for passive air inlet or forced air injection.

Fracturing, under this alternative, would use a mixture of sand and viscous fluid (for example, guar gum) to create sand-filled fractures that stay open for a longer period of time than pneumatically induced fractures. Institutional controls would include grouting of the manholes for access control. Within low permeability areas, soil fracturing will be used to increase the permeability, increase SVE efficiency, and decrease the time required to achieve cleanup.

Tests at SRS have showed that soil fracturing increased flow rates and volatile organic compound (VOC) mass removal by at least one order of magnitude over SVE alone (Ref. 1).

Comment

The SRS CAB has been supportive of the continued development and implementation of innovative technologies at SRS that reduce both cost and time to achieve cleanup (Ref. 2 and Ref. 3). The Facilities Disposition and Site Remediation Committee first heard about the potential to use the soil fracturing technology in January 2006, when an update was given on soil and groundwater accomplishments in FY 05 and future plans for FY 06 (Ref. 4).

The use of the soil fracturing technology is a first for the SRS and the SRS CAB is very interested in its success, especially since the M-Area Inactive Process Sewer Lines (MIPSL) Operable Unit (OU) is the closest unit to the site boundary and easily accessible to the public. Therefore, the SRS CAB wants DOE to closely monitor this new technology to make sure that the fracturing does not open new pathways for the unwanted spread of contaminants. There is also a concern that pockets of low permeability soils with contamination may still remain after using this technology and spending over $5 million.

Recommendation

The SRS CAB supports the use of the proposed remedial alternative for the M-Area Inactive Process Sewer Lines (phased soil vapor extraction enhanced with soil fracturing, and institutional controls) and offers the following recommendations in order to assure its success:

1. DOE provide annual updates on the potential spread of contaminants from the M-Area Inactive Process Sewer Lines (MIPSL) Operable Unit (OU) and the amount of VOC mass removed by the remedial alternative.

2. DOE conduct an investigation into the likelihood that pockets of low permeability soils with contamination may exist after the remedial technology is deployed and report the findings to the SRS CAB during the annual updates.

References

1. Proposed Plan for the MIPSL Operable Unit, presentation to the FD&SR Committee by Rita Stubblefield, DOE and Ed McNamee, WSRC, July 18, 2006.

2. Citizens Advisory Board Recommendation No. 154 (adopted July 23, 2002), “Full-Scale Dynamic Underground Stripping (DUS)."

3. Citizens Advisory Board Recommendation No. 175 (adopted November 18, 2003), “Monitored Natural Attenuation and Enhanced Passive Remediation."

4. Facilities Disposition and Site Remediation (FD&SR) Committee meeting minutes, January 10, 2006.

Agency Responses
Department of Energy-SR