

Santa Susana Field Laboratory

GROUNDWATER PILOT STUDY

Bedrock Vapor Extraction (BVE)

NASA is committed to cleaning up the Santa Susana Field Laboratory (SSFL) in a manner that is protective of public health and the environment, and the site's natural and cultural resources. NASA continues to work with the California Department of Toxic Substances Control (DTSC) under the 2007 Consent Order to address the cleanup of groundwater in NASA-administered areas. NASA is conducting pilot studies to identify cleanup strategies that will be most effective given the unique site conditions, and aid in the development of final cleanup plans. One of the pilot studies, highlighted here, will test the effectiveness of bedrock vapor extraction (BVE) to clean up contamination in the underlying bedrock matrix beneath SSFL.

NASA's BVE Pilot Study

NASA is committed to using the best science and technology available in the cleanup of the Santa Susana Field Laboratory (SSFL). The SSFL is a geologically complex site, with an underlying bedrock matrix that contains a network of faults and fractures that can trap certain contaminants in the fractures and pore spaces. Site investigations and laboratory analysis of rock core samples have confirmed the presence of volatile organic compounds (VOCs) in the shallow bedrock matrix, located in the unsaturated (vadose) zone above the water table. NASA is conducting a pilot study using vapor extraction to remove VOCs from the bedrock matrix. During two short-term studies conducted in 2014 and 2015, NASA successfully used BVE to achieve significant mass removal of chlorinated VOCs in two separate areas. The present study expands on the earlier work and is evaluating the effectiveness of BVE on a much larger scale and for a longer duration. The 18-month study is taking place in the Alfa Test Area where there is a thick vadose zone with a significant bedrock fracture network and VOC concentrations.



NASA is conducting a BVE pilot study in the Alfa Test Area. This figure shows the pilot test area, including the location of the extraction well, the BVE system, conveyance piping connecting the extraction well with the BVE system, and the solar panels.



NASA's BVE system uses solar power and is portable so it can be used across multiple locations onsite.

Utilizing Green Engineering

Environmental stewardship is an important part of NASA's mission, and the environmental remediation team at SSFL is committed to using sustainable treatment technologies wherever possible to minimize impacts on the SSFL site's unique ecosystem and the natural environment. NASA's BVE pilot study system was designed with the Agency's green engineering and sustainability practices in mind. The system will operate solely on solar power as its energy source, optimizing energy efficiency and eliminating the need for the construction of additional power lines. In addition, the system was designed to be portable, minimizing materials use and waste and allowing for easy relocation and future use throughout the SSFL site to target various source areas.

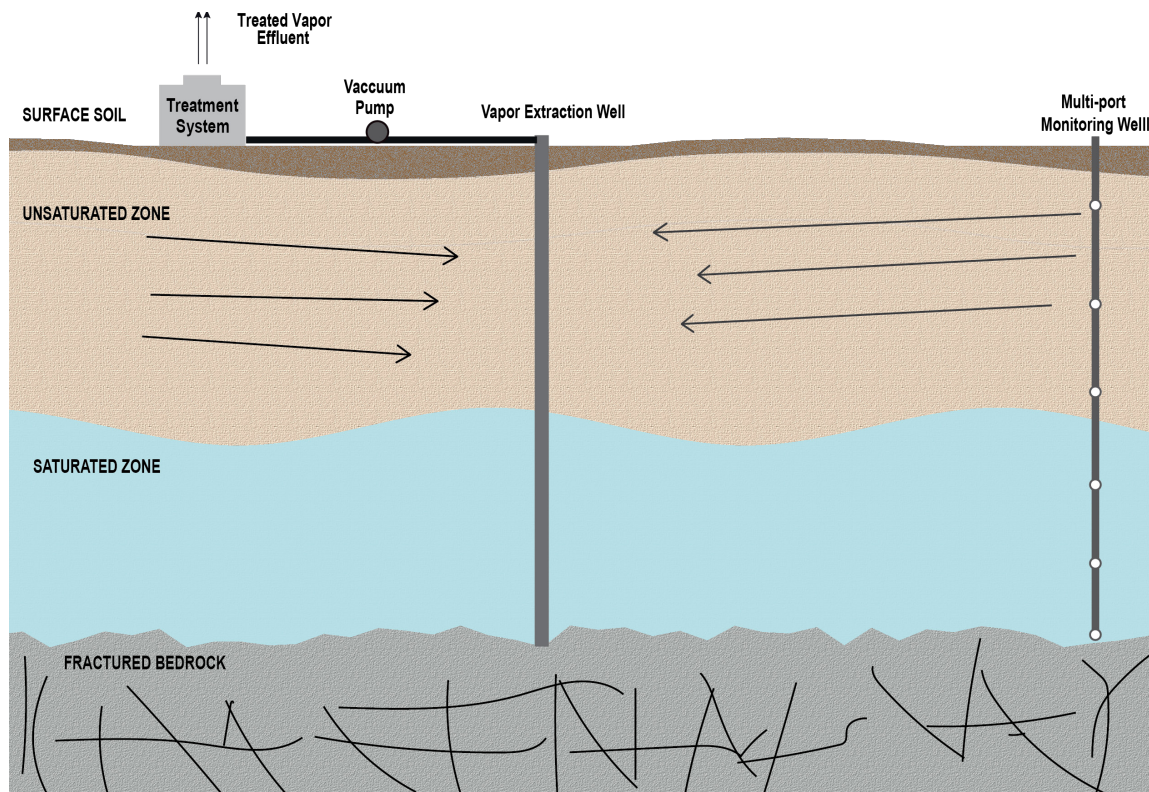
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How BVE Works

BVE is a treatment technology that applies a vacuum on a core hole, or well, and draws vapors from fractures in the bedrock above the subsurface water table. Air and vapors are pulled through the bedrock and up an open core hole to the ground surface. Vapor treatment occurs there by pumping the vapors through containers of activated carbon. VOCs are captured by the carbon filter and the treated air (effluent) exits to the atmosphere. When full, the filters are disposed of at a licensed facility and replaced with new, clean filters.



Cross-section illustration of NASA's bedrock vapor extraction treatment system.

Evaluating BVE Treatment Success

To track the effectiveness of the BVE treatment system, NASA will routinely sample from a network of wells and vapor piezometers in the Alfa Area. Samples will allow NASA to estimate the reduction in vadose zone VOC concentrations and to calculate the total mass removed from the subsurface. Field measurements of vacuum and vapor concentration will help identify the lateral extent of influence of the BVE System. Vapor piezometers are also used to track rebound in vapor concentrations (if any) after the operation has concluded. Data collected from each site will enable NASA to incorporate improvements in each successive BVE application.

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