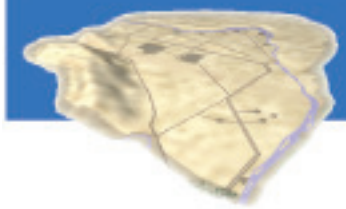
Overview



Tank Farms Vadose Zone Project

The WRPS Tank Farms Vadose Zone Project was established to understand the contamination in the soil beneath Hanford's underground waste storage tanks so action can be taken to protect public health and the environment. The storage tanks hold 53 million gallons of radioactive and chemical waste. The soil contamination is the result of earlier leaks from as many as 67 older single-shell tanks, as well as discharges to the soil from past site operations. The project focuses on contaminants in the vadose zone, which is the area of soil between the ground's surface and the water table. Information gained from the project will be integrated with data from other groundwater/vadose projects at the site, providing greater understanding of the site's surface contamination.

Technological Resources

WRPS is using advanced technologies, such as the Slant Borehole system, the Direct Push technique, and Subsurface Geophysical Exploration, to understand the nature and extent of contaminants in the soil beneath and around the tanks. With these and other innovative approaches, we can investigate areas that are difficult to reach with conventional techniques, and we can accurately characterize the contaminants and their locations and migration in the environment. The information is essential to develop strategies that will monitor and mitigate any risks to human and ecological health.

Slant Borehole

Hanford's 149 single-shell waste storage tanks are grouped into 18 "tank farms" and are buried more than ten feet underground. As such, the most difficult locations to investigate are underneath the tanks. The slant borehole is a safe technique that has been successfully tested and deployed at Hanford. It uses a pile driver (40,000 lbs of force) to drive what is known as a dual string casing into the ground at a 30 degree angle. No soil cuttings are generated because brute force displaces the soil away from the drive tip and the casing moves down the hole with the drive tip. This technique minimizes waste and protects our workers from potential exposure to contaminants.

Direct Push

Another major advancement is in the area of direct push technology. Because of the contamination in the soil, boreholes are very expensive to install. A new technique, using a hydraulic hammer, was developed and deployed, allowing us to get our work done faster and at less cost than expected. The hammer is light, agile and has a specialized head which allows it to bore past rock and compacted soil. This gives the device the ability to reach greater depths and improve our ability to characterize soil contamination. Because it is mounted on a light weight mobile backhoe, it has the ability to reach more locations inside tank farms than traditional drilling equipment.

Surface Geophysical Exploration

We are using an advanced geophysical technique to track and mitigate tank waste leaks into the surrounding soil. Surface Geophysical Exploration uses the electrical properties of the soil to map potential contamination plumes. This is accomplished by inserting metal probes (electrodes) in the soil in areas where a contamination plume is suspected and connecting the probes to a central computerized data collection system. A variation of the technique uses metal casings of existing wells as electrodes. Electric current is then applied to all combinations of probes and well casings, and the resistance of the soil between each electrode is measured. Because soil moistened with waste conducts electrical current better than dry uncontaminated soil, a plume can be identified and its boundaries mapped.

Slant borehole technology allows us to obtain soil characterization information while minimizing waste generation and protecting our workers from potential exposure to contaminants.

The Hydraulic Hammer is a light weight, mobile tool allowing us to characterize soil in our tank farms that has otherwise been beyond our reach.

Preventing the Spread of Contamination

While we have been characterizing the vadose zone, a great deal of work has been completed to prevent contamination from spreading further in the soil and reaching groundwater.

- All water lines going into the tank farms have been tested and either cut and capped outside of the farms, or repaired so they do not leak.
- Berms and gutters were constructed to divert rain water, snow melt, and accidental water discharges away from the tank farms.
- Approximately 800 boreholes, or drywells, have been drilled inside the tank farms so instruments can be inserted to detect leaks and measure moisture content of the soil, have been recapped, eliminating a potential pathway for liquids to reach the vadose zone.

Interim Barrier

A temporary barrier was installed in FY08 over one of Hanford's known tank leaks to demonstrate its effectiveness in preventing rain and snow from reaching the soil around the tanks and driving contamination further into the vadose zone. The barrier was made of polyurea and polyurethane, similar to the protective liners put into truck beds to prevent leakage and corrosion.

Pursuing Additional Technologies

Remediation of the contamination beneath Hanford's waste tanks will be one of the greatest challenges facing the site. New technologies are continually being explored that will provide a better understanding of the nature of the contamination, the extent to which it has spread and how best to deal with it. The program's goal is to reach final tank farm closure, including the remediation of the soil and infrastructure that meet the terms of the Tri-Party Agreement.

All of the progress is being coordinated with the Washington State Department of Ecology. WRPS is fully integrating its work with the Groundwater and Soil Remediation technical staff at the Department of Energy's Richland Operations Office and with other Hanford contractors to optimize the data collection and decision-making process across the Hanford Site.

Earthen berms have been placed around single-shell tank farms to prevent rain and snow melt from flooding the farms and driving soil contaminants deeper into the vadose zone.

Surface geophysical exploration uses the electrical properties of soil and moisture to detect and map contamination plumes in the soil.

A temporary barrier was installed in T Farm in FY08. Workers are shown applying the polyurea and polyurethane, (insert). Artist rendering, (background), shows finished barrier.

Contact:
Jerry Holloway, Manager, External Affairs
Washington River Protection Solutions
(509) 372-9953
jerry_n_holloway@rl.gov

http://www.wrpstoc.com/

washington river protection solutions