

Richland ♦ Kennewick ♦ Pasco ♦ Franklin County ♦ Benton County ♦ Port of Benton

Background

The Hanford Site is a U.S. Department of Energy (USDOE) owned, contractor-operated facility located in the southeastern portion of Washington State near Richland. The 586-square mile site supports programs in waste management, environmental restoration and science and technology. For more than 40 years Hanford nuclear reactors and processing facilities were used to produce plutonium for America's nuclear defense program. Liquid wastes generated by the production mission were released into ponds, cribs, trenches, drains, wells and basins in addition to some spills and leaks to the soil. During this time scientists estimate that about 475 billion gallons of contaminated liquids were released to the ground at the Hanford Site. Some contaminants carried by these liquids remain in the vadose zone, the area between the top of the water table and the surface of the ground. Others have reached the groundwater under the Site, creating several large contamination plumes.

Groundwater Monitoring

Groundwater is water found under the earth's surface. At Hanford the groundwater typically moves toward the Columbia River. Crews are able to monitor what contaminants are in the water and where the groundwater is moving using thousands of wells drilled throughout the Hanford Site. These wells provide critical information to scientists who can then determine the most effective ways to deal with the contamination.

Groundwater Remediation and Treatment

USDOE and its prime contractor for monitoring and remediation of Hanford groundwater, CH2MHILL Plateau Remediation Company, are addressing one of the most complex and challenging environmental projects in history. The overall strategy is based on a holistic approach toward cleanup that integrates facility decommissioning and demolition; removal of radioactive sources from the soil column; and groundwater remediation. High priority is placed on cleanup along the Columbia River; treating the groundwater in the central areas of the Site; and slowing further movement of contamination toward the river. The groundwater strategy is part of the greater USDOE vision to shrink the Hanford Site cleanup footprint from 586 square miles to 75 square miles in the center of the Site by 2015.

Pump and Treat Technologies

USDOE and state and federal regulators share a commitment to protect the high quality of the Columbia River. Their goal is to restore Hanford groundwater so that it meets drinking water standards and is protective of aquatic species and the Columbia River. In the 1990s, USDOE, the United States Environmental Protection Agency and the Washington State Department of Ecology made the installation of interim groundwater remediation systems a priority in Hanford cleanup. Interim systems were installed near several of Hanford's former plutonium production reactors and near processing facilities in the center of the site. Currently, there are several interim remediation systems in operation including five pump and treat systems; two passive groundwater treatment systems along the Columbia River; and a pump and treat system and a soil vapor extraction unit on the Central Plateau. Over 40 millions of gallons of groundwater are treated every month with these interim systems. This has helped to contain contamination plumes and in some cases to shrink them.

New Pump and Treat Systems

Unlike the smaller interim treatment systems installed to contain contaminants, the new systems are larger and are considered final treatment systems. USDOE and CH2MHILL are installing systems with greater capacities either through expanding current facilities or constructing new ones. Construction of a new treatment system called the **100- DX Pump and Treat System** is underway near the **100-D and DR Reactors** next to the Columbia River. The \$20 million for the project is provided by federal stimulus funding. The new system, scheduled to begin operations in 2010, will pump water out of the ground, remove hexavalent chromium and reinject the clean water into the ground. The 100 Area runs along the Columbia River and contains Hanford's nine former production reactors. Sodium dichromate was added to the reactor cooling water to prevent corrosion. Through piping leaks and periodic discharges of the cooling water to soil near the reactors, the soil and groundwater became contaminated with chromium.

The new DX-100 Pump and Treat near D and DR reactors will be much larger than the system that it replaces. The current system has 10 wells to extract and reinject groundwater to treat 50 gallons of

contaminated water per minute. The new system will use 53 wells and treat 600 gallons of contaminated water per minute. Hanford officials believe the new pump and treat system will also provide another benefit. Using a new type of longer-lasting resin in the ion exchange process is expected to save at least \$20 million during system operation.

Last year work was done to expand pump and treat upriver near the **K and K West Reactors** and work will start on another pump and treat system to be built near the **H Reactor** just downriver. Together the treatment systems for the H Reactor and D Reactor areas will treat a plume of contamination that has spread between the D/DR and the H reactor areas. The two systems will use 100 wells and 100 miles of piping to treat 1,300 gallons of contaminated water per minute.

The **200 West Area Pump and Treat System**, to be built in 2011, will be the largest treatment system for contaminated groundwater to date. The treatment system will pump contaminated water from the ground and remove several chemical and radioactive contaminants including carbon tetrachloride, the primary contaminant of concern, which was used in plutonium processing. The 200 West Area Pump and Treat System will remove contamination and will also slow the movement of the contamination toward the river by pushing it back toward the Central Plateau.

The new systems will help USDOE meet aggressive new milestones for ground water cleanup outlined in the legally binding Tri-Party Agreement. Milestones call for containment of all chromium in groundwater by 2012 and reduction of chromium in groundwater to drinking water standards by 2020. The pump and treat systems would continue operation to 2025 to be sure that groundwater is thoroughly cleaned up.

Other Technologies

An injection technique called **Apatite Sequestration** was successfully used in the 100N Area to construct a barrier that “locks” strontium 90, a radioactive contaminant in place. As groundwater moves toward the river, apatite absorbs strontium 90 and prevents it from reaching the river. Strontium has a radioactive half-life of about 29 years, and the apatite binds the contaminant in place for the decades it takes to decay to harmless levels. CH2MHILL is using stimulus funding to expand the apatite barrier by 2,500 feet.

Treating the Deep Vadose Zone

The vadose zone is the area of soil between the earth’s surface and the top of the groundwater or aquifer. The vadose zone varies in thickness across the Hanford Site from nearly zero near the Columbia River to up to 400 feet in the Central Plateau.

When contamination is lodged deep in the soil, it is very difficult to access and not possible to treat with conventional methods such as excavation and removal of contaminated soil. USDOE and its contractors are investigating new techniques for treating deep vadose zone contamination through treatability tests in the laboratory and in the field. Using a screening process developed with Pacific Northwest National Laboratory (PNNL), scientists have identified several candidate sites for field tests. Treating the deep vadose zone is important in groundwater remediation because it addresses removal of a source of contamination.

Columbia River Monitoring

The Columbia River remains a Class A river that allows all uses—from recreation to drinking water for downstream communities. USDOE and state and federal regulators will continue to monitor the river to assure that it continues to meet high standards. Hundreds of routine samples of river shore soil, plants and wildlife, river water, bottom sediment and aquatic animal and plant life are collected and analyzed for radionuclides and hazardous chemicals. PNNL is contracted by USDOE to monitor radioactivity in the environment around the Hanford Site. The findings of this monitoring are presented in the “Hanford Site Environmental Report” at website <http://hanford-site.pnl.gov/envreport>.

The Washington State Department of Health (DOH) is also responsible for protecting human health and the environment from the effects of nuclear radiation. DOH collects samples from the environment such as soil, vegetation, food, water and air particulates. Scientists then analyze the samples for trace amounts of radioactive contaminants and use the results to determine whether the public and the environment are safe from hazards associated with exposure to radioactivity. Of particular interest is maintaining the water quality of the Columbia River where the public has the most potential to come into contact with radioactive contaminants released from the Hanford Site. The primary purpose of the DOH sample data is to determine the capability of each facility to correctly measure contamination. To do this the DOH collects a sample with each facility and splits the sample. The split samples are sent to each respective analytical laboratory for independent analysis and the results compared. Results of the DOH analyses are available on the USDOE website in “Hanford Environmental Oversight Program Data Summary Report”, a report published each year.

To find out how you can become more involved in this important regional issue, or to have a Hanford Communities speaker talk to your organization, contact the Hanford Communities at (509) 942-7348 or by fax at (509) 942-7379. Our website is www.ci.richland.wa.us.