

Abstract

The U.S. Department of Energy's Hanford Site in southeastern Washington State was a weapons production facility from 1943 until the 1980s. During operations, process chemicals and radioactively contaminated water were released to the soil and migrated through the vadose zone to the groundwater. Groundwater flows to the Columbia River and is the primary exposure route for contaminants to reach human, environmental, and ecological receptors.

This report presents the results of groundwater monitoring at the Hanford Site during the 12-month period from January 1 through December 31, 2011. It describes monitoring results for *Resource Conservation and Recovery Act of 1976* (RCRA) treatment, storage, and disposal units, for *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) groundwater operable units where no active remediation is currently taking place, and for the *Atomic Energy Act of 1954* (AEA), as required by DOE orders. The results of ongoing groundwater and vadose zone remediation activities are summarized; and the status of well drilling, maintenance, and decommissioning is provided.

The Hanford Site is broadly divided into the "River Corridor" and "Central Plateau" regions. As the names imply, the River Corridor is the portion of the Site located along the Columbia River, and the Central Plateau is in the middle of the Site, at a higher elevation. The River Corridor includes the 100 Areas, where nine nuclear reactors operated, and the 300 Area, which was home to the fuel manufacturing operations at the Site as well as the experimental and laboratory facilities. The primary groundwater contaminants in the River Corridor are hexavalent chromium, strontium-90, nitrate, and tritium in the 100 Area, and uranium in the 300 Area. Other contaminants of concern in the 100 Area include carbon-14 and trichloroethene. More than 60 percent of the former liquid waste sites near the river have been remediated or are classified as not requiring remediation under interim records of decision. This cleanup has reduced the potential for future groundwater contamination. Cleanup of the remaining sites is underway. Groundwater remediation systems in the 100 Area are limiting the amount of contamination reaching the Columbia River and reducing the mass of contaminants in the groundwater.

When the Hanford Site was operating, irradiated fuel reprocessing, isotope recovery, and associated waste management activities occurred on the Central Plateau. Contaminant sources included unlined cribs, trenches, and ponds, and leakage from underground storage tanks. Groundwater contaminant plumes of tritium, iodine-129, and nitrate formed when the waste discharged to ponds and cribs reached the aquifer. These contaminants form regional plumes originating on the Central Plateau. The tritium and nitrate plumes have shrunk over the years because of dispersion and radioactive decay. A large carbon tetrachloride plume originated in 200 West Area. This plume is expanding at the edges, but the high-concentration core is contained by a pump-and-treat system. The remediation system is being enlarged in 2012 to capture more of the contamination. Other groundwater contaminants in the Central Plateau include technetium-99, uranium, strontium-90, trichloroethene, and cyanide.

Highlights for 2011 include the following:

- DOE continued to conduct intensive field studies in the River Corridor. Results will be used to select methods for final remediation of soil and groundwater.
- Pump-and-treat systems in the 100 Areas were expanded. Combined, these systems have removed 1,847 kilograms of hexavalent chromium since 1997.
- DOE expanded an in-situ remediation method in the 100-N Area, which decreases the amount of strontium-90 reaching the Columbia River.

- In the Central Plateau, groundwater and vadose zone remediation systems have removed more than 93,000 kilograms of carbon tetrachloride from groundwater since 1992. In 2011, DOE completed construction of a new treatment facility that will greatly expand the groundwater remediation system.

During 2011, drillers completed 89 new wells for monitoring, remediation, or characterization. One hundred eight wells that are no longer needed were decommissioned (filled with grout) in accordance with State regulations.

This report is available on the Internet through the Hanford Site Soil and Groundwater Remediation Project, available at: <http://www.hanford.gov/page.cfm/SoilandGroundwater>.