Tank Waste Treatment News

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Why It Matters

The 586-square-mile Hanford Site is located in south-central Washington along the Columbia River. Hanford's mission included defense-related nuclear research, development, and weapons production activities from the early 1940s to approximately 1989. During that period, Hanford operated a **plutonium** production complex with nine nuclear reactors and associated processing facilities.

Today at Hanford, 177 **underground storage tanks** hold a total of 53 million gallons of dangerous waste. Some of these tanks have leaked, contributing to the 80 square miles of contaminated **groundwater** under Hanford. This tainted groundwater threatens the Columbia River and all life that depends upon it.

This quarterly newsletter provides the latest information about the treatment and long-term storage of Hanford's tank waste. Find out more by following the hyperlinks in the articles. Terms in **bold font** are defined in the glossary.

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What Do You Do with Millions of Gallons of High-Level Radioactive Chemical Waste?

The people of the Northwest have been asking that question for decades!

The waste at Hanford is an environmental legacy generated by this region's significant and critical contribution to winning World War II and the Cold War. Making weapons-grade **plutonium** for our nation's strategic security was a dirty business, resulting in hundreds of millions of gallons of waste. The worst of that waste is 53 million gallons of **mixed waste**. This waste is now stored in 177 large **underground storage tanks**. Sixty-seven of these tanks and their related systems have leaked one million gallons of waste to the soil, impacting the **groundwater** 200 feet below. The remaining waste must be removed from these tanks before more environmental impacts occur and the tanks are so old that waste removal becomes difficult or impossible.

What to do?

The short answer is to separate the **high-level waste** into one **waste stream**, **vitrify** it, and dispose of it in an off-site **deep geologic repository**. This vitrified waste form and the isolation in a deep geologic repository are what protect humans and the environment from this long-lasting, lethal waste stream. The high-level waste stream is about 10 percent of the total volume of 53 million gallons of waste in the tanks.

A second waste stream, containing most of the chemicals and some **radionuclides** (**low-activity waste**), would be vitrified and disposed in a near surface, on-site landfill. The glass waste form is necessary in this case to protect groundwater and the Columbia River from long-lasting mobile contaminants. We have planned on using of this robust waste form for the last 15 years. The low-activity waste stream is about 90 percent of the 53 million gallons.

Why does it take so long?

The answer to treating the tank waste involves two decades of designing, permitting, and constructing a one-of-a-kind treatment complex, with a price tag of $12 billion. Once this **Waste Treatment Plant** starts to operate, there will be several decades of pretreating and separating waste into the two waste streams. Then the waste will be vitrified in preparation for eventual final disposal. Currently, the primary Low-Activity Waste Vitrification Facility is under construction, but a second facility will be needed if all the waste is to be treated by 2047 and not 2080.

For more information about Hanford's tank waste, see the U.S. Department of Energy's draft Tank Farm Closure & Waste Management Environmental Impact Statement.

Blue Ribbon Commission on America's Nuclear Future Visits Eastern Washington

Photo courtesy of the Department of Energy

BRC members being briefed during their visit to Hanford's C Tank Farm. Pictured (left to right) are Allison Macfarlane, Chuck Hagel, Per Peterson, Brent Scowcroft, Lee Hamilton, Jonathan Lash, and John Rowe.

The Blue Ribbon Commission on America's Nuclear Future (BRC) was formed by the Obama administration in January 2010. The BRC's mission is to evaluate alternative approaches to a **deep geologic repository**, specifically **Yucca Mountain**, which is of great importance to Hanford's future.

Hanford currently houses several types of waste destined for a deep geologic repository. The wastes include **spent nuclear fuel**, **cesium** and **strontium** capsules, and the **high-level waste** from the **underground storage tanks**. These waste forms must be stored long-term in a deep geologic repository because the thick earthen barrier is needed to protect humans and wildlife from these highly radioactive wastes.

On July 14 and 15, the BRC came to Hanford to tour the site and record formal comments from tribal leaders and state and federal government officials. Public officials offering testimony for the State of Washington included Governor Chris Gregoire, Assistant Attorney General Mary Sue Wilson, Senators Maria Cantwell and Patty Murray, and Representative Doc Hastings.

The meeting agenda, transcripts, and videos are available on the BRC website. You can stay informed about this important issue affecting Hanford's future by visiting the BRC and the Department of Ecology's websites for updates.

Photo courtesy of the Department of Energy

Department of Energy Safeguards Engineer Glenn Konzek talks to BRC members about the Canister Storage Building during their tour of Hanford.

Glossary

Cesium: A soft, silvery-gold, radioactive alkali metal with the atomic number 55. Cesium-137 is a radioactive isotope resulting from the splitting of uranium atoms during a nuclear reaction.

Deep geologic repository: A long-term nuclear waste disposal site excavated underground, below 980 feet, in a stable geologic environment.

Groundwater: Water below the ground surface in a zone that is completely saturated.

High-level waste: Material resulting from the reprocessing of **spent nuclear fuel**. This includes liquid produced during reprocessing and solid material derived from this liquid waste that contains fission products in sufficient concentrations and other highly radioactive material that, by law, requires permanent isolation.

Low-activity waste: Waste that remains after as much radioactivity as is technically and economically practical has been separated from **high-level waste**. When immobilized in glass, it may be disposed of as low-level radioactive waste in a near-surface facility at Hanford.

Mixed waste: High-level radioactive waste mixed with dangerous chemicals.

Plutonium: A heavy, radioactive metallic element with the atomic number 94. Plutonium-239 is the radioactive isotope used in nuclear weapons.

Radionuclide: A nuclide that has artificial or natural origin and exhibits radioactivity.

Spent nuclear fuel: Fuel taken from a nuclear reactor that was never processed for **plutonium** separation.

Strontium: A soft, silver-white or yellowish radioactive alkaline earth metal with the atomic number 38. Strontium-90 is a radioactive isotope resulting from the splitting of uranium atoms during a nuclear reaction.

Underground storage tank: A tank that is entirely below the surface of and covered by the ground. At Hanford, there are two types of underground storage tanks with capacities ranging from 50,000 to one million gallons. The single-shell tanks have one steel liner encased in concrete, and the double-shell tanks have two steel liners encased in concrete.

Vitrification: A method used to immobilize waste (radioactive, hazardous, and mixed). This involves adding glass formers and waste to a vessel and melting the mixture into a glass form.

Waste stream: Segregated portion of the total waste.

Waste Treatment Plant: Facility designed and built to thermally treat and immobilize tank waste at Hanford.

Yucca Mountain: A Nevada mountain designated as the nation's **deep geologic repository** in 2002. As of early 2010, the Obama administration cut funding for this project and tasked the BRC with finding alternatives.