



WASTE TREATMENT PLANT OVERVIEW

Waste Treatment Plant Project

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BACKGROUND

In early 1943, residents of a sparsely populated area in southeastern Washington state, now known as the Hanford Site, were suddenly evacuated, and the Manhattan Project moved in. The mission of the top-secret government project was to produce plutonium for a new weapon that promised to bring a swift end to World War II.

At its peak, there were more than 50,000 workers at the Hanford Site, most of who did not know what they were producing. In July 1945, Hanford plutonium was used in the world's first atomic blast, the Trinity Test, in Alamogordo, N.M. Weeks later, Hanford's secret became known following the detonation of the plutonium bomb over Nagasaki, Japan, and the end of World War II.

Hanford then played a key role during the decades-long Cold War era, as the site's mission to produce plutonium continued with varying intensity in support of national defense programs. At its peak, Hanford had nine operating nuclear production reactors and a massive network of chemical processing and other facilities. Plutonium production was finally halted in 1989 as the Cold War concluded.

CONSTRUCTION FACTS

- **Concrete:** 262,000 cubic yards, enough to fill 26,200 concrete trucks
- **Structural steel:** 36,500 tons, the equivalent of three Eiffel Towers
- **Heating and ventilation ductwork:** 2,100 tons
- **Piping:** 1,017,000 linear feet, if laid end-to-end, would stretch more than 193 miles
- **Electrical cable:** 4,762,000 feet, if laid end-to-end, would stretch more than 900 miles



WTP in July 2010

The Hanford Site, located in southeastern Washington state, was the largest of three defense production sites in the U.S. Over the span of 40 years, it was used to produce 64 metric tons of plutonium, helping bring an end to World War II and playing a major role in military defense efforts during the Cold War. However, as a result, 53 million gallons of radioactive and chemical wastes are now stored in 177 underground tanks on the Hanford Site.

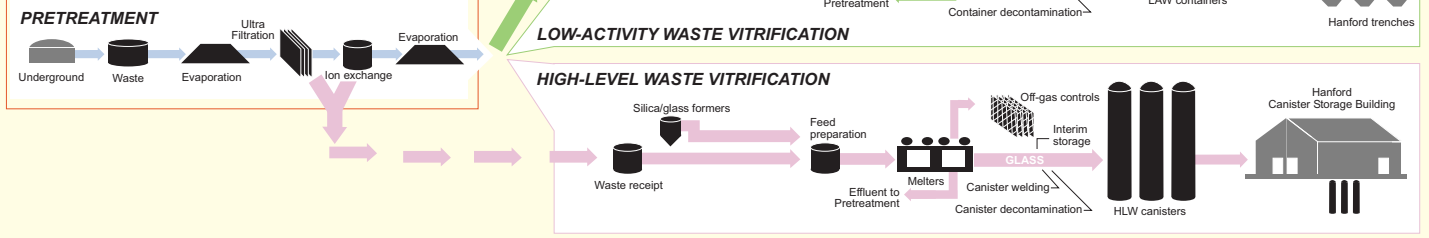
To address this problem, the U.S. Department of Energy contracted Bechtel National, Inc., to design and build the world's largest radioactive waste treatment plant. The Waste Treatment and Immobilization Plant (WTP), also known as the "Vit Plant," will use vitrification to immobilize most of Hanford's dangerous tank waste. Vitrification involves blending the waste with molten glass, heating it to high temperatures, then pouring it into stainless steel canisters. In this glass form, the waste is stable and impervious to the environment, and its radioactivity will dissipate over hundreds to thousands of years.



The WTP will cover 65 acres with four nuclear facilities – Pretreatment, Low-Activity Waste Vitrification, High-Level Waste Vitrification and Analytical Laboratory – as well as operations and maintenance buildings, utilities and office space. Site preparation began in October 2001, and the concrete for the first nuclear facility's foundation was placed in July 2002. The plant will be operational in 2019.



Waste Treatment Process Flow



PRETREATMENT

The first treatment step in the waste treatment process is pumping the waste from the underground storage tanks through a buried pipeline to the Pretreatment Facility. Pretreatment separates the low-activity radioactive waste from the high-level radioactive waste.

Low-activity waste is the liquid portion of the tank waste. It contains a relatively small amount of radioactivity in a large volume of material.

High-level waste is primarily in the solids of the tank waste. It contains most of the radioactivity in a relatively small volume of material.

During pretreatment, the waste is concentrated by removing water in an evaporator. Solids are filtered out, and remaining soluble highly radioactive isotopes are removed by ion exchange units.

LOW-ACTIVITY WASTE VITRIFICATION

The pretreated wastes go to separate Low-Activity Waste and High-Level Waste Vitrification Facilities. Handling the wastes separately speeds treatment because high volumes of low-activity waste can be processed faster than the high-level waste.

The waste goes into a melter preparation vessel where silica and other glass-forming materials are added and the mixture is fed into one of two melters. The mixture is heated to 2,100 degrees Fahrenheit by passing electricity through it, a process known as joule heating. The molten mixture is then poured into large stainless steel containers.

The filled low-activity waste containers are four feet in diameter, seven feet tall and weigh more than seven tons. The containers will be stored at Hanford in permitted trenches covered with soil.

HIGH-LEVEL WASTE VITRIFICATION

High-level waste from the Pretreatment Facility is mixed with glass-forming materials and vitrified in two melters of similar design to the low-activity waste melters.

High-level vitrified waste is poured into stainless steel canisters that are two feet in diameter and about 14 feet tall. The filled high-level waste canisters, each weighing more than four tons, will be temporarily stored at Hanford. Eventually, the high-level waste containers will be shipped to a federal geological repository deep underground for permanent disposal.



HLW and LAW stainless steel canisters