



CASE STUDY 1:

THE HANFORD TANK WASTE REMEDIATION PROGRAM

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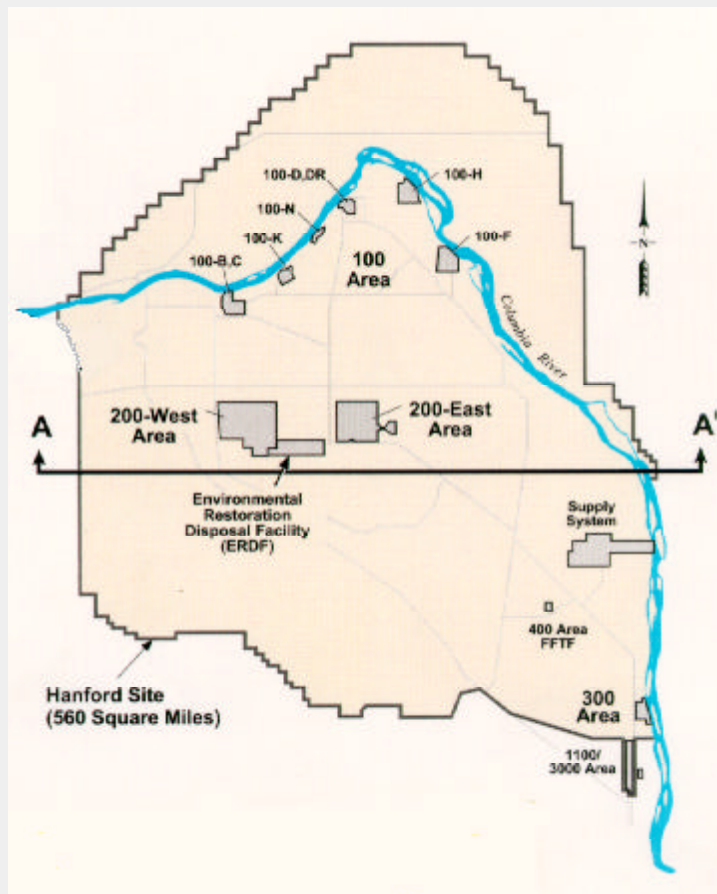
HANFORD BACKGROUND

The Hanford site occupies 560 square miles within the Columbia River Basin in the southeastern part of Washington State, near Richland. Beginning in the 1940s, the site has produced nuclear fuel and materials; its activities have included plutonium production and separations, advanced reactor design and testing, basic scientific research, and renewable energy technologies development. Now, the site's activities are focused on environmental restoration and waste management.

During its past production activities, the Hanford site generated high-level waste (HLW), transuranic (TRU) waste, low-level waste (LLW), and mixed LLW and mixed TRU waste.

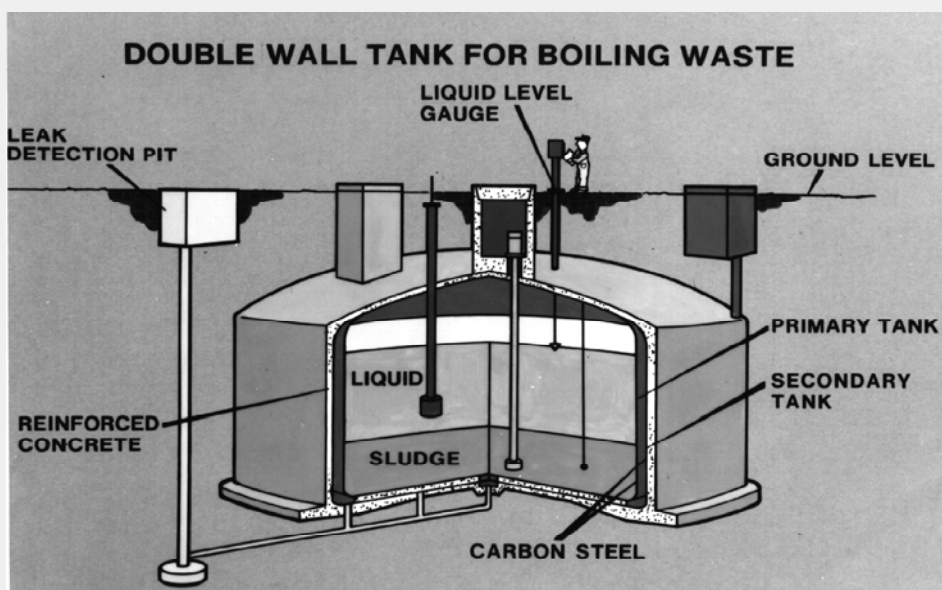
The HLW was stored underground in single- and double-walled tanks. The single-walled tanks are now isolated to ensure that no additional liquid may be routed to them. There is an ongoing program to transfer pumpable liquids from the single-walled tanks to double-walled tanks due to continuing concerns about single-walled tank leakage.

The HLW will be treated to separate the high activity fraction from the low activity fraction, both of which will then be immobilized. The high activity liquid will be mixed with borosilicate glass and heated to molten temperatures, then poured into





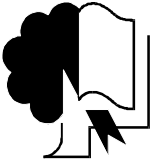
stainless steel canisters to cool and harden, thus immobilizing the HLW in the glass, which will then be transported to the high-level waste repository for disposal. The low-level fraction will be immobilized for on-site disposal.



THE HANFORD ENVIRONMENTAL IMPACT STATEMENT PROCESS

During the 1980s, an environmental impact statement (EIS) was prepared to evaluate and select alternatives for final disposal of Hanford's defense waste. This included evaluation of alternative tank waste disposal strategies.

Several previous documents addressed the environmental aspects associated with the management of defense waste at the Hanford site. The first comprehensive one, The Final Environmental Statement for Hanford Waste Management Operations (ERDA-1538), was issued in 1975. In that statement, waste management practices at Hanford were shown to protect the public health and safety and the environment on an interim basis. Those practices, however, were not intended as final solutions for long-term isolation and disposal of high-level, TRU, and tank wastes.



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In 1977, the Energy Research and Development Administration (ERDA) issued the report *Alternatives for Long-Term Management of Defense High-Level Radioactive Waste (ERDA-77-44)*, which included preliminary cost estimates and analyses of near-term risks associated with alternatives considered. The report examined 27 variations of 4 options for the processing and disposal of Hanford HLW and encompassed numerous final waste forms and storage and disposal modes.

In 1978, the National Research Council of the National Academies of Science and Engineering issued a report entitled *Radioactive Wastes at the Hanford Reservation: A Technical Review*. The report concluded that there had not been any significant radiation hazard to public health and safety from waste management operations at Hanford. The Council recommended that long-term isolation and disposal of Hanford HLW become the main focus of waste management research and development.

On April 1, 1983, the DOE published in the Federal Register (48 Fed. Reg. 14,029) a Notice of Intent (NOI) to prepare an EIS entitled *Disposal of Radioactive Defense High-Level and Transuranic Wastes at Hanford*.

Eighteen comment letters were received in response to the NOI. Ten of the letters only requested copies of the draft EIS (DEIS) when issued; eight contained comments regarding its preparation. The DEIS was published during March 1986, and its availability was published in the Federal Register on April 11 (51 Fed. Reg. 12,547). During the 120-day agency and public comment period, 243 letters were received that provided about 2,000 substantive comments on the DEIS. In addition, oral testimony was heard in public hearings held during July 1986 in Richland, Washington; Portland, Oregon; Seattle, Washington; and Spokane, Washington.

The Final EIS (FEIS) was published in December 1987 (DOE-EIS-0113, *Disposal of Hanford Defense High-Level, Transuranic, and Tank Wastes*). The FEIS addressed environmental impacts associated with the construction, operation, and decommissioning of waste treatment facilities that may be required to implement the waste disposal alternatives. The record of decision (ROD) was published in April 1988.

In accordance with the requirements of the National Environmental Policy Act (NEPA), as amended, and implementing regulations of the Council on Environmental Quality (CEQ), the FEIS and ROD were written early in the decision-making process



to ensure that environmental values and alternatives were fully considered before any decisions were made that might have led to adverse environmental impacts or limited the choice of reasonable alternatives.

Among other decisions, the ROD determined that the DOE would retrieve double-walled tank waste; pretreat the retrieved waste to separate it into high activity and low activity fractions; immobilize the low activity fraction in a cementitious grout form in vaults on the Hanford site; and build and operate a facility (the Hanford Waste Vitrification Plant [HWVP]) to immobilize the high activity fraction in a borosilicate glass waste form. The glass was to be stored at Hanford until the HLW repository could accept it for final disposal. Decisions concerning disposal of the single-walled tank waste were deferred until after preparation of a supplemental EIS. The deferral was partly due to the technical challenges presented by the single-walled tank waste.

A NEW PROPOSAL



Since publication of the ROD in 1988, there have been a series of developments that have prompted the DOE to reconsider some of its tank waste decisions, predominately:

- 1 Public concerns about the grout waste form.
- 1 Heightened concern about the potential for explosive mixtures in both single- and double-walled tanks (e.g., flammable gas generation, unstable ferrocyanide mixtures).



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- i A desire to accelerate treatment and disposal of single-walled tank waste.
- i Regulatory and stakeholder pressure to retrieve all waste from single-walled tanks rather than to treat and dispose in place.

These and other considerations factored into negotiations on a proposed major revision to the Tri-Party Agreement (TPA) (a Federal Facility Compliance Agreement between the DOE, the EPA, and the State of Washington). Proposed revisions were issued for public review in October 1993 and include agreements and associated milestones to:

- i Retrieve single- and double-walled tank waste.
- i Separate retrieved waste into LLW and HLW fractions (pretreatment).
- i Construct and operate a LLW vitrification facility.
- i Dispose the LLW glass on the Hanford site.
- i Construct and operate a HLW vitrification facility.
- i Store HLW borosilicate glass until it can be shipped to a Federal repository.

The revised TPA was signed by the three parties in early 1994. The TPA has subsequently been further revised, with specific milestones for tank waste removal and treatment established.

NEPA ASPECTS OF THE TRI-PARTY AGREEMENT AND TANK WASTE MANAGEMENT

When a compliance agreement, such as the TPA, is negotiated, DOE agrees to undertake or complete specific actions. However, NEPA requires that an analysis be performed for any of these actions that may be “major Federal actions”. Therefore, it was necessary to conduct a NEPA analysis (in this case an EIS) to assess the impacts of the TPA on tank waste disposition.



THE TANK WASTE EIS

This was accomplished under DOE/EIS-0189: Tank Waste Remediation System Environmental Impact Statement. The purpose was to determine the appropriate means to manage, treat, store, and dispose of existing and future high-level tank wastes stored at Hanford to reduce the overall risks posed by tank wastes. Because the State of Washington has a law analogous to NEPA (called the State Environmental Policy Act, or SEPA), the Washington State Department of Ecology was co-preparer of the EIS.

To assess the environmental impacts, a range of alternatives were developed and analyzed. These included the required “no action alternative,” as well as continued long-term maintenance of tanks, two in situ disposal options, and five waste removal (ex situ) options. Calculations were performed to enable comparison of alternatives, such as the number of accidents expected to occur during the implementation of each alternative, health effects that could result from radiation exposure during remediation, habitat disturbed by each alternative, long term impacts to potential inhabitants and the environment (such as future on-site farmer, industrial worker, recreational user, Native American user, or downriver user), potential long term impacts to the environment (such as ground water contamination), and other concerns, including cost, technical uncertainties, and the ability of each alternative to comply with environmental regulations.

The draft EIS was issued on April 12, 1996, and the public was invited to comment until May 28, 1996. More than 850 copies of all portions of the EIS (five volumes total) were distributed, and five public hearings and meetings were held to solicit public comments. Approximately 750 comments were received from more than 350 agencies, Tribal nations, and other stakeholders.

These comments were considered and addressed in the final EIS, which was issued August 30, 1996. The ROD, which included responses to comments on the draft EIS received after the final EIS was published, was issued in February 1997.

THE PREFERRED ALTERNATIVE

Based on the draft EIS analysis and the comments received, DOE decided to implement the preferred alternative identified in the Final EIS for the tank waste.



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Specifically, the ROD said:

“The selected tank waste alternative, Phased Implementation, consists of a phased approach to retrieval and immobilization of tank waste. Phase 1 involves construction of demonstration-scale facilities, including two low-activity waste separations and immobilization facilities and one HLW vitrification facility to operate for up to 10 years. These facilities will treat up to 30% of the tank waste by volume during the 10-year operating period. During Phase 2, DOE will construct larger capacity separation and immobilization facilities, retrieve the remaining waste, separate the waste into low-activity and HLW streams, immobilize the low-activity and HLW in separate facilities, and dispose of the low-activity waste on-site in near-surface vaults and the HLW off site at a geologic repository.”

Implementation of this approach is now underway at Hanford.