U.S. Department of Energy
Office of River Protection
P.O. Box 450
Richland, Washington 99352

03-ORP-005

JAN 21 2003

Mr. Todd Martin, Chair
Hanford Advisory Board
1933 Jadwin Avenue, Suite 135
Richland, Washington 99352

Dear Mr. Martin:

HANFORD ADVISORY BOARD (HAB) CONSENSUS ADVICE #140: NOTICE OF INTENT (NOI) TO PREPARE AN ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR RETRIEVAL, TREATMENT, AND DISPOSAL OF TANK WASTE AND CLOSURE OF SINGLE-SHELL TANKS AT THE HANFORD SITE

Thank you for your letter dated December 6, 2002, regarding the above-mentioned NOI.

The NOI has undergone significant revisions since we shared the draft with you back in November 2002. It was published in the Federal Register on January 8, 2003. I have attached a copy for your information.

As you will see when you read the final NOI, this version has added the specificity, detail and context, based directly on the comments we received from you and others on the earlier draft.

A draft primer has also been developed to help stakeholders and the general public to get a better understanding of the history of the Hanford Site and National Environmental Policy Act of 1969 processes, but more specifically to understand what input we are seeking from the public. The primer explains in more detail the immediate issues that the U.S. Department of Energy's Office of River Protection is facing and why we need to make decisional changes to the project. I have included a copy of the draft primer for your information as well. This primer was also shared in its draft form with the Tank Waste Committee on January 9, 2003.

We do understand that the draft EIS will be of strong interest to the stakeholders. I want you to know that we have heard your concerns about having enough time for comments and that we have agreed to a full 60-day public comment period beginning January 8 and concluding March 10, 2003.

If you have questions or comments, please feel free to contact me, or your staff may contact Erik Olds, Office of Communications, (509) 372-8656.

Sincerely,

Roy J. Schepens
Manager

ORP:SB

Attachments (2)

cc w/attachs:
M. S. Crosland, EM-11
W. W. Ballard, RL
K. A. Klein, RL
M. K. Marvin, RL
Tom Fitzsimmons, Ecology
Michael Wilson, Ecology
R. E. Siguenza, EnviroIssues
Michael Gearheard, EPA
John Iani, US EPA, Region 10

U.S. Senators (OR)
Gordon H. Smith
Ron Wyden

U.S. Senators (WA)
Maria Cantwell
Patty Murray

U.S. Representatives (OR)
Earl Blumenauer
Peter DeFazio
Darlene Hooley
Greg Walden
David Wu

U.S. Representatives (WA)
Brian Baird
Norm Dicks
Jennifer Dunn
Jay Inslee
Richard Hastings
Rick Larsen
Jim McDermott
George Nethercutt
Adam Smith

State Senators (WA)
Pat Hale
Mike Hewitt

State Representatives (WA)
Jerome Delvin
Shirley Hankins

Attachment 1

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Dated: January 6, 2003.

Rod Paige,

Secretary of Education.

[FR Doc. 03-386 Filed 1-7-03; 8:45 am]

BILLING CODE 4000-01-M

DEPARTMENT OF ENERGY

Notice of Intent To Prepare an Environmental Impact Statement for Retrieval, Treatment, and Disposal of Tank Waste and Closure of Single-Shell Tanks at the Hanford Site, Richland, WA

AGENCY: Department of Energy.

ACTION: Notice of intent.

SUMMARY: The U.S. Department of Energy (DOE) intends to prepare an environmental impact statement (EIS) on the proposed retrieval, treatment, and disposal of the waste being managed in the high-level waste (HLW) tank farms at the Hanford Site near Richland, Washington, and closure of the 149 single-shell tanks (SSTs) and associated facilities in the HLW tank farms. The HLW tanks contain both hazardous and radioactive waste (mixed waste).

This EIS will be prepared in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations (40 CFR parts 1500-1508 and 10 CFR part 1021). DOE's proposed action is to remove waste from the tanks to the extent that retrieval is technically and economically feasible, treat the waste through vitrification in the planned Waste Treatment Plant (WTP) and/or one of several other treatment processes such as bulk vitrification, grout, steam reforming and sulfate removal, depending on waste type and waste characteristics. DOE proposes to package the waste for offsite shipment and disposal or onsite disposal. The tanks would be filled with materials to immobilize the residual waste and prevent long-term degradation of the tanks and discourage intruder access.

The 149 underground SSTs and 28 underground double-shell tanks (DSTs) are grouped in 18 tank farms that are regulated under the Resource Conservation and Recovery Act of 1976 (RCRA) as treatment, storage, and disposal units that, for closure purposes, include tanks, associated ancillary equipment, and contaminated soils. DOE proposes to close the tanks in accordance with the Hanford Federal Facility Agreement and Consent Order (also known as the Tri-Party Agreement or TPA). DOE invites public comments on the proposed scope of this EIS.

DATES: The public scoping period begins with the publication of this Notice and concludes March 10, 2003. DOE invites Federal agencies, Native American tribes, State and local governments, and members of the public to comment on the scope of this EIS. DOE will consider fully all comments received by the close of the scoping period and will consider comments received after that date to the extent practicable.

Public meetings will be held during the scoping period. Meetings will be held in Seattle and Richland, Washington and in Portland and Hood River, Oregon on the following dates.

Richland: February 5, 2003.
Hood River: February 18, 2003.
Portland: February 19, 2003.
Seattle: February 20, 2003.

At least 15 days prior to the meetings, DOE will notify the public of the meeting locations and times and will provide additional information about each meeting through press releases, advertisements, mailings and other methods of encouraging public participation in the NEPA process. At these scoping meetings, DOE will provide information about the tank waste program and alternatives for retrieving, treating, and disposing of the waste, along with alternatives for closing the SSTs. The meetings will provide opportunities to comment orally or in writing on the EIS scope, including the alternatives and issues that DOE should consider in the EIS.

ADDRESSES: DOE invites public comment on the proposed scope of this EIS. Comments may be submitted by mail, electronic mail, fax, or voice mail and addressed as follows: Mary Beth Burandt, Document Manager, DOE Office of River Protection, U.S. Department of Energy, Post Office Box 450, Mail Stop H6-60, Richland, Washington, 99352, Attention: Tank Retrieval and Closure EIS, Electronic mail: *Mary_E_Burandt@rl.gov*, Fax: (509) 376-2002, Telephone and voice mail: (509) 373-9160.

FOR FURTHER INFORMATION CONTACT: To request information about this EIS and the public scoping workshops or to be placed on the EIS distribution list, use any of the methods identified in ADDRESSES above. For general information about the DOE NEPA process, contact: Carol M. Borgstrom, Director, Office of NEPA Policy and Compliance (EH-42), U.S. Department of Energy, 1000 Independence Avenue, SW, Washington, DC, 20585-0119, Fax: (202) 586-7031, Telephone: (202) 586-4600, Voice mail: (800) 472-2756.

SUPPLEMENTARY INFORMATION

Background

The Hanford Site defense activities related to nuclear weapons production created a wide variety of waste. Over 50 million gallons of waste are presently stored in the HLW tank farms, which are located in the 200 Area of the Site. The waste is stored in 149 underground SSTs (ranging in capacity from approximately 55,000 to 1 million gallons) and 28 underground DSTs (ranging in capacity from approximately one to 1.16 million gallons) grouped in 18 tank farms, and approximately 60 smaller miscellaneous underground storage tanks. This waste has been processed and transferred between tanks, and as a result, the chemical, physical (*i.e.*, liquid, solid and sludge) and radiological characteristics of the waste vary greatly among and within individual tanks. In addition, the tank waste contains chemicals or has characteristics classified as hazardous waste under RCRA regulations (40 CFR Parts 260-268 and Parts 270-272) and as dangerous waste under the Washington Administrative Code "Dangerous Waste Regulations" (WAC 173-303).

In 1996, DOE issued the Tank Waste Remediation System (TWRS) EIS (DOE/EIS-0189), which included analyses of alternatives for retrieving and treating (*e.g.*, immobilizing) the waste stored in the tank farms. Because sufficient data were not available to evaluate a range of closure actions, tank system closure alternatives were not evaluated in the TWRS EIS. Among the uncertainties were data regarding past leak losses from the SSTs and how retrieval technology would perform to meet retrieval objectives.

In 1997, DOE issued its Record of Decision (ROD, 62 FR 8693, February

26) in which DOE decided that it would proceed with tank waste retrieval and treatment. In the ROD and subsequent supplemental analyses, DOE acknowledged that there were substantial technical uncertainties that required resolution. Nevertheless, to make progress while resolving the technical uncertainties, DOE decided to implement waste treatment using a phased approach as identified in the TWRS ROD. During the initial phase (Phase I), DOE planned to design, construct and operate demonstration-scale waste treatment facilities. Following the demonstration phase, DOE would construct full-scale facilities to treat the remaining tank waste (Phase II).

DOE's decision in the TWRS ROD was consistent with modifications to the Tri-Party Agreement contained in the M-62, "Complete Pretreatment, Processing and Vitrification of Hanford High-level (HLW) and Low-activity (LAW) Tank Wastes" series of milestones. Accordingly, DOE proceeded with plans to design, construct, and operate facilities that would separate waste into high-level and low-activity waste streams, vitrify the high-level waste stream and vitrify or similarly immobilize the LAW stream. These facilities are now under construction and are collectively referred to as the "Waste Treatment Plant" or WTP.

DOE's strategy for retrieving, treating and disposing of the tank waste and closing the tank farms has continued to evolve, based on information becoming available since the TWRS ROD was issued. New information and proposed changes to DOE's strategy include the following:

- Design of and preliminary performance projections for the WTP support DOE's proposal to extend operations beyond the original plan to operate the WTP for a ten-year period and to enhance throughput compared to facilities planned for in the 1997 ROD.
- New information indicates that deployment of large-scale treatment facilities in approximately 2012 to immobilize waste not processed by the WTP currently under construction, as identified in the TWRS ROD, may be prohibitively expensive (DOE/EIS-0189-SA-3).
- Under DOE Order 435.1 (Radioactive Waste Management), as applicable, DOE may determine that some tank wastes should be managed as low-level waste (LLW) and transuranic (TRU) waste, which may result in changes in how DOE may treat and dispose of portions of the SST and DST wastes from the HLW tank farms.
- DOE wants to consider non-vitrification treatment technologies for LAW and LLW, if these wastes could be immobilized and disposed of onsite or offsite, while providing protection to the human environment comparable to LAW and LLW immobilized by vitrification.

In developing its Performance Management Plan for the Accelerated Cleanup of the Hanford Site (PMP, DOE/RL-2000-47, August 2002), DOE stated its intent to meet its commitments under the Tri-Party Agreement, and identified its plan to complete tank waste retrieval, treatment and disposal by 2028, and to close all of the tanks and associated facilities, including the WTP, by 2033. DOE's current plans call for closing all of the SSTs by 2028.

DOE stated in the PMP that to achieve these objectives, increased capacity will be needed for the WTP, along with additional treatment capacity provided by other waste immobilization technologies, referred to herein as "supplemental" technologies (bulk vitrification, containerized grout, steam reforming, or sulfate removal are examples). Also in the PMP and in the Supplement Analysis for the Tank Waste Remediation System (DOE/EIS-0189-SA3, 2001), DOE concluded that its evolving strategy for treating and disposing of the tank wastes by 2028 and closing the SSTs by 2028 requires NEPA analysis of proposed tank waste retrieval, treatment and disposal, and proposed tank closure actions.

Further, under the TPA Milestone M-45, "Complete Closure of All Single-Shell Tank (SST) Farms," DOE and the Washington State Department of Ecology (Ecology) have identified a process to start discussing how SST closure would occur. An important part of the process DOE and Ecology have defined for closing tank systems is compliance with Washington State Dangerous Waste regulations that require approval of a closure plan and modification of the Hanford Site Dangerous Waste Permit. Before Ecology can approve either a closure plan or modification of DOE's permit, the State of Washington must fulfill its State Environmental Policy Act (SEPA) requirements. As SEPA is very similar to NEPA, Ecology can adopt a NEPA document if it determines that the document is sufficient to meet SEPA requirements. Ecology has agreed to be a cooperating agency in preparing this EIS.

Need for Action

To meet its commitments under the Tri-Party Agreement and implement its plans to close the tank systems and associated facilities in a timely manner to reduce existing and potential future risk to the public, site workers, and the environment, DOE needs to complete waste retrieval, treatment and disposal of the waste from the SST and DST systems by 2028 and close all SST systems by 2028.

Although DOE is addressing safety and environmental issues posed by tank wastes to minimize current potential risks to human health and the environment, DOE must also implement long-term actions to safely manage and dispose of waste from the tank waste systems, including waste associated with inactive miscellaneous underground storage tanks, and close the SST systems to reduce permanently the potential risk to human health and the environment. These long-term actions also are needed to ensure compliance with applicable Federal requirements regulating the management and disposal of radioactive waste, as well as Federal and Washington State requirements regulating hazardous and mixed waste.

Proposed Action

DOE proposes to retrieve waste from the 149 SST and 28 DST systems and close the SST tank farms in a manner that complies with Federal and Washington State requirements and protects the human environment. (Closure of the DSTs and closure of the WTP are not part of the proposed action because they are active facilities needed to complete waste treatment. Closure of the DSTs and WTP would be addressed at a later date, after appropriate NEPA analysis.) DOE proposes to immobilize the retrieved waste in the WTP and through supplemental treatment technologies such as bulk vitrification, grout, steam reforming and sulfate removal, and to package the immobilized waste for offsite shipment and disposal in licensed and/or permitted facilities or disposal onsite. DOE proposes to close the SST farms (including tanks, ancillary equipment and soils) within the tank farm area by 2028. The tanks would be filled with materials to immobilize the residual waste and prevent long-term degradation of the tanks and discourage intruder access. Associated support buildings, structures, laboratories, and the treatment facilities would be decontaminated and decommissioned in a cost-effective, legally compliant, and environmentally sound manner. Under the proposed action, DOE would use existing, modified, or, if required, new systems to assure capability to store and manage waste during retrieval and treatment.

Background on Development of Alternatives

The proposed action could result in changes to DOE's tank waste management program with respect to waste storage, waste retrieval, waste treatment, waste disposal, and tank farm closure at the Hanford Site. These key variables were evaluated to develop the range of reasonable alternatives identified below. In terms of waste storage, the EIS would analyze the use of the existing waste storage systems and evaluate the need for new storage systems. With regard to waste retrieval, DOE would evaluate a range of timing of retrieval and the technologies used, from past-practice sluicing as analyzed in the TWRS EIS to dry retrieval. Treatment and disposal alternatives for portions of the SST and DST waste would be evaluated based on some volume of the waste being classified as LLW or TRU waste pursuant to DOE Order 435.1. The waste identified as LLW could be treated and packaged for onsite or offsite disposal. The waste identified as TRU waste could be treated and packaged for transport and disposal at the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico.

Unless a specific alternative identifies a waste type as LLW and/or TRU waste, the waste would be analyzed as HLW or LAW for the purposes of treatment and disposal. The alternatives for waste treatment include: 1) Treating all wastes via an enhanced WTP as vitrified waste; 2) treating HLW via the WTP and LAW via WTP or supplemental treatments; or 3) treating the waste as stated in #2 and/or supplemental treatment for LLW and TRU waste in the tank farms, in which case some waste would not be processed through the WTP. The options for waste disposal include disposing of the waste onsite using existing or new facilities, disposing of the waste at offsite government facilities (*e.g.*, a geological repository, WIPP, DOE's Nevada Test Site) or using onsite and offsite commercial facilities (such as Envirocare in Utah) for disposal of Hanford waste. Alternatives for tank closure would be evaluated based on broad closure strategies including clean closure (removal of the tanks, ancillary facilities, and contaminated soils) and landfill closure (residual waste left in place and post closure care).

Proposed Alternatives

Each of the six alternatives contains a waste storage, retrieval, treatment and disposal component. Alternatives 3 through 6 also include a tank closure component. The main differences among the alternatives include the extent of waste retrieval, the waste treatment and disposal approach, the tank closure approach, and timing to complete the necessary activities.

1. No Action

The Council on Environmental Quality NEPA Regulations (40 CFR parts 1500–1508), and the DOE NEPA Regulations (10 CFR part 1021) require analysis of a No Action alternative.

Storage: DOE would continue current waste management operations using existing storage facilities. Immobilized (*i.e.*, vitrified) High-level Waste (IHLW) would be stored onsite pending disposal at a geologic repository. Once WTP operations are completed, all tank waste system storage (SSTs and DSTs), treatment, and disposal facilities at the Hanford Site would be placed in a stand-by operational condition.

Retrieval: Waste would be retrieved to the extent required to provide waste feed to the WTP using currently available liquid-based retrieval and leak detection technologies (approximately 25–50% of the total waste volume would be retrieved).

Treatment: No new vitrification or treatment capacity beyond that anticipated in the WTP would be deployed. However, the WTP would be modified within parameters provided for in the TWRS ROD to increase throughput. The WTP would continue to operate until its design life ends in 2046.

Disposal: The residual waste in tanks and the waste remaining in tanks that had not been retrieved (approximately 50 to 75% of the total waste volume) would remain in the tank farm indefinitely. Immobilized Low Activity Waste (ILAW) (by vitrification) would be disposed of onsite. IHLW would be stored onsite pending disposal at a geological repository. For purposes of analysis, administrative control of the tank farms would end following a 100-year period.

Closure: Tank closure would not be addressed; under this alternative, some waste would be left in the tanks indefinitely.

2. Implement the 1997 Record of Decision (With Modifications)

This alternative would continue implementation of decisions made in the TWRS ROD and as considered in three supplement analyses completed through 2001. (*See* "RELATED NEPA DECISIONS AND DOCUMENTS" below for references.) Under these supplement analyses, DOE concluded that changes in the design and operation of the WTP, as defined in its contracts and program plans, were within the bounds of analysis of environmental impacts in the TWRS EIS. Among the key modifications that would occur under this alternative are: (1) Implementing the initial phase of waste treatment with one ILAW facility rather than two, (2) expanding the design capacity of the ILAW facility from 20 metric tons of glass per day to 30 metric tons of glass per day, and (3) extending the design life of the Phase I facilities from 10 years to 40 years. Under this alternative, no new actions would be taken beyond those previously described in the TWRS ROD and supplement analyses regarding the tank waste.

Storage: DOE would continue current waste management operations using existing storage facilities as described under No Action.

Retrieval: Waste would be retrieved to the Tri-Party Agreement goal (*i.e.*, residual waste would not exceed 360 cubic feet for 100 series tanks or 36 cubic feet for 200 series tanks, which would correspond to 99% retrieval) using currently available liquid-based retrieval and leak detection systems.

Treatment: The existing WTP would be modified to enhance throughput and supplemented with additional vitrification capacity, as needed, to complete waste treatment by 2028. Under this alternative, all waste retrieved from tanks (approximately 99%) would be vitrified.

Disposal: Retrieved and treated waste would be disposed of onsite (ILAW) or stored onsite pending disposal at a geologic repository (IHLW). Once operations are completed, all tank waste system waste storage, treatment, and disposal facilities at the Hanford Site would be placed in a stand-by operational condition. The residual waste would remain in the tank farm indefinitely. For purposes of analysis, DOE assumes under this alternative that it would cease to maintain administrative control after a 100-year period.

Closure: Tank closure would not be addressed under this alternative. Some waste would be left in the tanks indefinitely.

3.0 Landfill Closure of Tank Farms/ Onsite and Offsite Waste Disposal

Storage: DOE would continue current waste management operations using existing storage facilities.

Retrieval: Waste would be retrieved to the Tri-Party Agreement goal (*i.e.*, residual waste would not exceed 360 cubic feet for 100 series tanks or 36 cubic feet for 200 series tanks, which would correspond to 99% retrieval) using currently available liquid-based retrieval and leak detection systems.

Treatment: Retrieved waste would be treated with the WTP capacity based on enhanced and/or modified performance of operating systems (*e.g.*, modifications to melters to increase throughput). WTP capacity would be supplemented with additional waste treatment capacity to immobilize LAW using a non-vitrification technology. New non-vitrification supplemental treatment capacity would be developed external to the WTP to immobilize a portion of the tank waste that would be designated as LLW pursuant to DOE Order 435.1 and/or prepare a portion of the tank waste that would be designated as TRU waste for disposal. Waste treatment under this alternative would be completed in 2028 and all SST tank systems would be closed by 2028.

Disposal: ILAW immobilized via the WTP would be disposed of onsite or at offsite commercial (*e.g.*, U.S. Ecology of Washington or Envirocare of Utah) or DOE facilities (Nevada Test Site). IHLW would be stored onsite pending disposal at a national geologic repository. LLW immobilized external to the WTP would be disposed of onsite or at offsite commercial or DOE facilities. TRU waste would be packaged and stored onsite in an existing or new facility pending disposal at the Waste Isolation Pilot Plant (WIPP).

Closure: As operations are completed, SST waste system, waste storage, treatment and disposal facilities at the Hanford Site would be closed as a RCRA landfill unit under Dangerous Waste Regulations under WAC 173–303 and DOE Order 435.1, as applicable, or decommissioned (waste treatment facilities under DOE Order 430.1A). The tanks would be filled with materials to immobilize the residual waste and prevent long-term degradation of the tanks and discourage intruder access. Tanks, ancillary equipment, and contaminated soils would be remediated and remain in place and the closed tank systems would be covered with an engineered barrier that exceeds RCRA landfill requirements and is the more protective of the landfill options being evaluated (*i.e.*, Hanford barrier).

The main differences between this alternative and other alternatives involve: 1) Using a more robust barrier for closure of tank systems that would provide longer term protection from contaminant releases from closed tank systems and limit intrusion into the closed system compared to the barrier evaluated under Alternatives 5 and 6 (tanks would not be closed under Alternatives 1 and 2, thus no barriers would be used); and 2) Treatment and disposal of treated waste would be the same for Alternatives 3 through 5 allowing for a comparison of the impacts associated with deployment of systems to treat and dispose of transuranic waste (Alternatives 3 through 5) to treatment of waste via the WTP and subsequent management as ILAW and IHLW (Alternatives 2 and 6).

4.0 Clean Closure of Tank Farms/ Onsite and Offsite Waste Disposal

Storage: DOE would continue current waste management operations using existing storage facilities that would be modified, as needed, to support minimizing liquid losses from SSTs and accelerating SST waste retrieval into safer storage pending retrieval for treatment.

Retrieval: Waste would be retrieved using multiple waste retrieval campaigns using various retrieval technologies (*e.g.*, confined sluicing, crawlers), to the extent needed to support clean closure requirements (*i.e.*, 0.1% residual in the tanks or 99.9% waste retrieved from tanks) using liquid and non-liquid retrieval and enhanced in-tank and/or ex-tank leak detection systems.

Treatment: Retrieved waste would be treated with the WTP capacity based on enhanced and/or modified performance of operating systems (see Alternative 3). New alternative treatment capacity to immobilize LLW (*e.g.*, bulk vitrification, containerized grout, steam reforming, sulfate removal) and/or prepare TRU waste for disposition would be developed external to the WTP. Waste treatment under this alternative would be completed in 2028 and all SST tank systems would be closed by 2028.

Disposal: LAW immobilized via the WTP would be disposed of onsite or at offsite commercial or DOE facilities (see Alternative 3). IHLW would be stored onsite pending disposal at a national geologic repository. LLW immobilized external to the WTP would be disposed of onsite or at offsite commercial or DOE facilities (See Alternative 3). TRU waste would be retrieved from tanks, packaged in a new facility, and stored onsite in existing or new storage facilities pending shipment to and disposal at the WIPP.

Closure: Clean closure reflects minimal residual waste in tanks and ancillary equipment, and contaminated soils remediated in place and/or removed from the tank system to be treated and disposed of in accordance with RCRA requirements. As operations are completed, all SST system storage, treatment, and disposal facilities at the Hanford Site would be closed. Waste storage and disposal facilities would be closed in a manner that supported future use on an unrestricted basis and that did not require post-closure care.

The main differences between this alternative and the other alternatives are: 1) The greatest amount of waste is retrieved from tanks based on multiple technology deployments; and 2) tank systems would be closed to meet clean closure standards. Treatment and disposal of treated waste would be the same for Alternatives 3 through 5, allowing a comparison of the impacts associated with deployment of systems to treat and dispose of TRU waste (Alternatives 3 through 5) to treatment of TRU waste via the waste treatment plant (Alternatives 2 and 6).

5.0 Accelerated Landfill Closure/ Onsite and Offsite Waste Disposal

Storage: DOE would continue current waste management operations using existing storage facilities that would be modified or supplemented with new waste storage facilities, to support actions regarding near-term acceleration of tank waste retrieval and treatment. Under this alternative, some SSTs would be retrieved and closed by 2006, exceeding the existing TPA M–45 commitments.

Retrieval: Waste would be retrieved to the Tri-Party Agreement goal to the extent feasible using currently available liquid-based retrieval and leak detection systems (residual waste would correspond to 90–99% retrieval).

Treatment: Waste treatment would be completed no later than 2024 and SST systems would be closed by 2028. Retrieved waste would be treated with the WTP capacity based on enhanced and/or modified performance of operating systems, as described under Alternative 2. WTP capacity would be supplemented with new treatment capacity to immobilize LLW. New treatment capacity to immobilize LLW and/or prepare TRU waste for disposition would be developed external to the WTP.

Disposal: LAW immobilized via the WTP would be disposed of onsite or at offsite commercial or DOE facilities. IHLW would be stored onsite pending disposal at the proposed national geologic repository. LLW immobilized external to the WTP would be disposed of onsite or at offsite commercial or DOE facilities. Transuranic waste would be packaged and stored onsite pending disposal at the WIPP.

Closure: As operations are completed, SST tank waste system waste storage, treatment, and disposal facilities would be closed as a RCRA landfill unit under Dangerous Waste Regulations under WAC 173–303 and DOE Order 435.1, or decommissioned (waste treatment facilities under DOE Order 430.1A). Waste storage and disposal facilities would be closed as RCRA landfill units under applicable state Dangerous Waste Regulations (WAC 173–303). The tanks would be filled with materials to immobilize the residual waste and prevent long-term degradation of the tanks and discourage intruder access. Tank systems (tanks, ancillary equipment, and soils) would be closed in place and would be covered with a modified RCRA barrier (*i.e.*, a barrier with performance characteristics that exceed RCRA requirements for disposal of hazardous waste).

The main difference between this alternative and the other alternatives are (1) completion of some SST closure actions by 2006, completion of all waste treatment by 2024, and closure of all SST systems by 2028 in contrast to Alternatives 2, 3 and 6, which would complete waste treatment in 2028 and SST tank systems closure in 2028 and; (2) no remediation of ancillary equipment and contaminated soil, allowing a comparison with the more extensive remediation analyzed under Alternative 3. Another main difference between this alternative and Alternative 3 is the use of a modified RCRA barrier. Treatment and disposal of treated waste would be the same for Alternatives 3 through 5, allowing for a comparison of the impacts associated with deployment of systems to treat and dispose of transuranic waste (Alternatives 3 through 5) to treatment of transuranic waste via the WTP (Alternatives 2 and 6).

6.0 Landfill Closure/Onsite and Offsite Waste Disposal

Storage: DOE would continue current waste management operations using existing storage facilities that would be modified, as needed, to support SST waste retrieval and treatment.

Retrieval: Waste would be retrieved to the Tri-Party Agreement goal (*i.e.*, residual waste would not exceed 360 cubic feet for 100 series tanks or 36 cubic feet for 200 series tanks, which corresponds to retrieval of 99%) using liquid and non-liquid based retrieval and enhanced leak detection systems.

Treatment: Retrieved waste would be treated with the WTP capacity based on enhanced and/or modified performance of operating systems. Supplemental treatment technologies would be used to immobilize LLW. New non-vitrification treatment capacity to immobilize LLW for disposition would be developed external to the WTP. Waste treatment under this alternative would be completed in 2028, and all SST systems would be closed by 2028.

Disposal: ILAW immobilized via the WTP would be disposed of onsite or at offsite commercial or DOE facilities. IHLW would be stored onsite pending disposal at a national geologic repository. LLW immobilized external to the WTP would be disposed of onsite or at offsite commercial or DOE facilities.

Closure: As operations are completed, all tank waste system waste storage, treatment, and disposal facilities at the Hanford Site would be closed (tank farm systems) or decommissioned (waste treatment facilities). The tanks would be filled with materials to immobilize the residual waste and prevent long-term degradation of the tanks and discourage intruder access. Waste storage and disposal facilities would be closed as RCRA landfill units under applicable state Dangerous Waste Regulations (WAC 173–303). Residual waste in tanks, ancillary equipment, and contaminated soils would be remediated in place as needed in accordance with RCRA requirements, and the closed tank systems would be covered with a modified RCRA barrier.

The main difference between this alternative and the other alternatives is that under this alternative there would not be a separate TRU waste stream (Alternatives 3 through 5). As with Alternative 2, waste would be treated in the WTP and subsequently managed as either ILAW or IHLW.

Preliminary Identification of EIS Issues: The following issues have been tentatively identified for analysis in the EIS. The list is presented to facilitate comment on the scope of the EIS; it is not intended to be all-inclusive or to predetermine the potential impacts of any of the alternatives.

- Effects on the public and onsite workers from releases of radiological and nonradiological materials during normal operations and reasonably foreseeable accidents.
- Long-term risks to human populations resulting from waste disposal and residual tank system wastes.
- Effects on air and water quality from normal operations and reasonably foreseeable accidents, including long-term impacts on groundwater.
- Cumulative effects, including impacts from other past, present, and reasonably foreseeable actions at the Hanford Site.
- Effects on endangered species, archaeological/cultural/historical sites, floodplains and wetlands, and priority habitat.
- Effects from onsite and offsite transportation and from reasonably foreseeable transportation accidents.
- Socioeconomic impacts on surrounding communities.
- Disproportionately high and adverse effects on low-income and minority populations (Environmental Justice).
- Unavoidable adverse environmental effects.
- Short-term uses of the environment versus long-term productivity.
- Potential irretrievable and irreversible commitment of resources.
- The consumption of natural resources and energy, including water, natural gas, and electricity.
- Pollution prevention, waste minimization, and potential mitigative measures.

Related NEPA Decisions and Documents: The following lists DOE other NEPA documents that are related to this proposed Hanford Site Tank Retrieval and Closure EIS.

45 FR 46155, 1980, "Double-Shell Tanks for Defense High-Level Radioactive Waste Storage, Hanford Site, Richland, Washington; Record of Decision," Federal Register.

53 FR 12449, 1988, "Disposal of Hanford Defense High-Level Transuranic, and Tank Wastes, Hanford Site, Richland, Washington; Record of Decision," Federal Register.

60 FR 28680, 1995, "Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Program, Part III; Record of Decision," Federal Register.

60 FR 54221, 1995, "Final Environmental Impact Statement for the Safe Interim Storage of Hanford Tank Wastes at the Hanford Site, Richland, WA; Record of Decision," Federal Register.

60 FR 61687, 1995, "Record of Decision Safe Interim Storage of Hanford Tank Wastes, Hanford Site, Richland, Washington," Federal Register.

61 FR 3922, 1996, "Availability of the Final Environmental Impact Statement for Management of Spent Nuclear Fuel from the K Basins at the Hanford Site, Richland, WA; Notice of Availability of Final Environmental Impact Statement," Federal Register.

61 FR 10736, 1996, "Management of Spent Nuclear Fuel from the K Basins at the Hanford Site, Richland, WA. ACTION: Notice of Record of Decision," Federal Register.

62 FR 8693, 1997, "Record of Decision for the Tank Waste Remediation System, Hanford Site, Richland, Washington," Federal Register.

DOE/EA–0479, 1990, Collecting Crust Samples from Level Detectors in Tank

THE ACCELERATED RETRIEVAL, TREATMENT, AND DISPOSAL OF TANK WASTE AND CLOSURE OF TANKS AT THE HANFORD SITE ENVIRONMENTAL IMPACT STATEMENT:

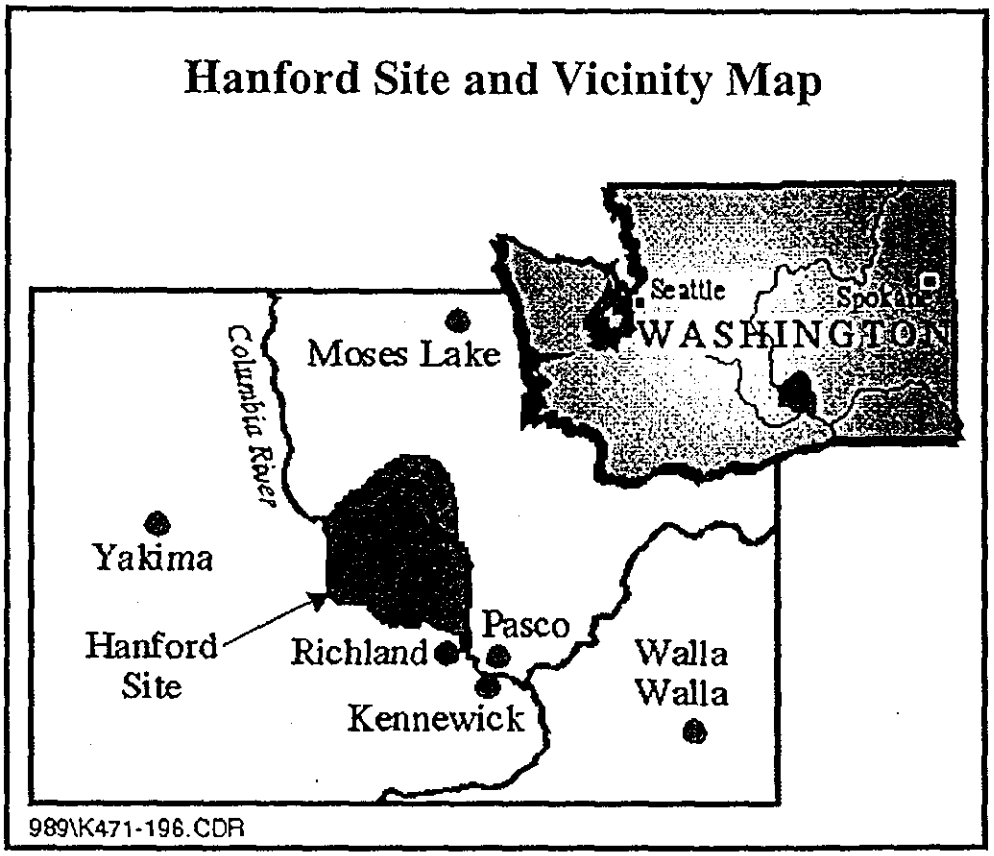
A GUIDE TO UNDERSTANDING THE ISSUES

Office of River Protection

CH2MHILL
Hanford Group, Inc.

EFFECTIVE DATE: JANUARY 8, 2003

The Hanford Site is a 560-square-mile site managed by the U. S. Department of Energy (DOE), formerly dedicated to the production of plutonium and other nuclear materials. The site is located in the southeastern part of Washington State just north of where the Snake and Yakima rivers meet with the Columbia River, about 25 miles north of the Oregon border.



Over the years of production (1943-1987), the site produced approximately 60% (73 tons) of DOE nuclear weapon and reactor-fuel-grade plutonium. The end product and associated *waste* generated from the manufacturing process were like those in no other industry. Approximately 110,000 tons of specially designed uranium metal were exposed to neutrons, or *irradiated* in nine nuclear reactors and reprocessed in four chemical plants. These operations created large volumes of waste, some of which was transferred to underground tanks for long-term storage.

Today, that *tank waste* is stored in 177 underground storage tanks. They are the focus of this guide. All together, they contain about 53 million gallons of waste. Half of the *radioactivity* currently at Hanford rests in these tanks. Most of the remaining half is in spent nuclear fuel now being transferred from a reactor site near the Columbia River to the Hanford plateau, several miles from the river.

Needed — Public Input

Many people are concerned about Hanford's tank waste because of the potential for tank leaks, near-term safety issues, and long-term needs for waste treatment, waste *disposal*, and *closure* of the tank systems. The tank wastes, if not properly treated and disposed, and the tank systems, if not properly closed, will have even longer-term impacts on the environment and health of future generations of residents of the surrounding area. Never before has a nuclear waste cleanup effort of this scale been attempted anywhere in the world. The work will be expensive and will take a long time. Cost estimates range upward to several billions of dollars, giving both the taxpayers and Congress a major reason to be interested in tank waste issues.

Public input is requested on decisions about how to deal with Hanford's tank wastes and tanks. Active public input and involvement are critical to those decisions. This input requires a basic understanding of the technical issues relating to tank waste retrieval, treatment, and disposal and to tank system closure itself.

What Is the Immediate Issue? Why Does DOE Need to Make Decisions?

The Department of Energy wants to begin a process that will lead to closing four waste tanks by the end of 2004, and all 177 tanks by 2033. Also, DOE decided in 1997 to build a large plant to immobilize the wastes from the tanks by making glass out of it, a process called "vitrification." But that plant, known as the Waste Treatment Plant (WTP), will at most be able to vitrify only about half of the wastes if it is allowed to run until 2046. DOE needs to decide how best to treat the remaining wastes by 2028, which is the completion date agreed to with the Washington State Department of Ecology in the Hanford Federal Facility Agreement and Consent Order, known as the Tri-Party Agreement. This could include supplemental technologies necessary to complete all waste treatment. The process to which you are here to contribute will address tank closure and supplemental waste treatment options and the environmental impacts of several alternatives for waste retrieval, treatment, and disposal, and tank system closure.

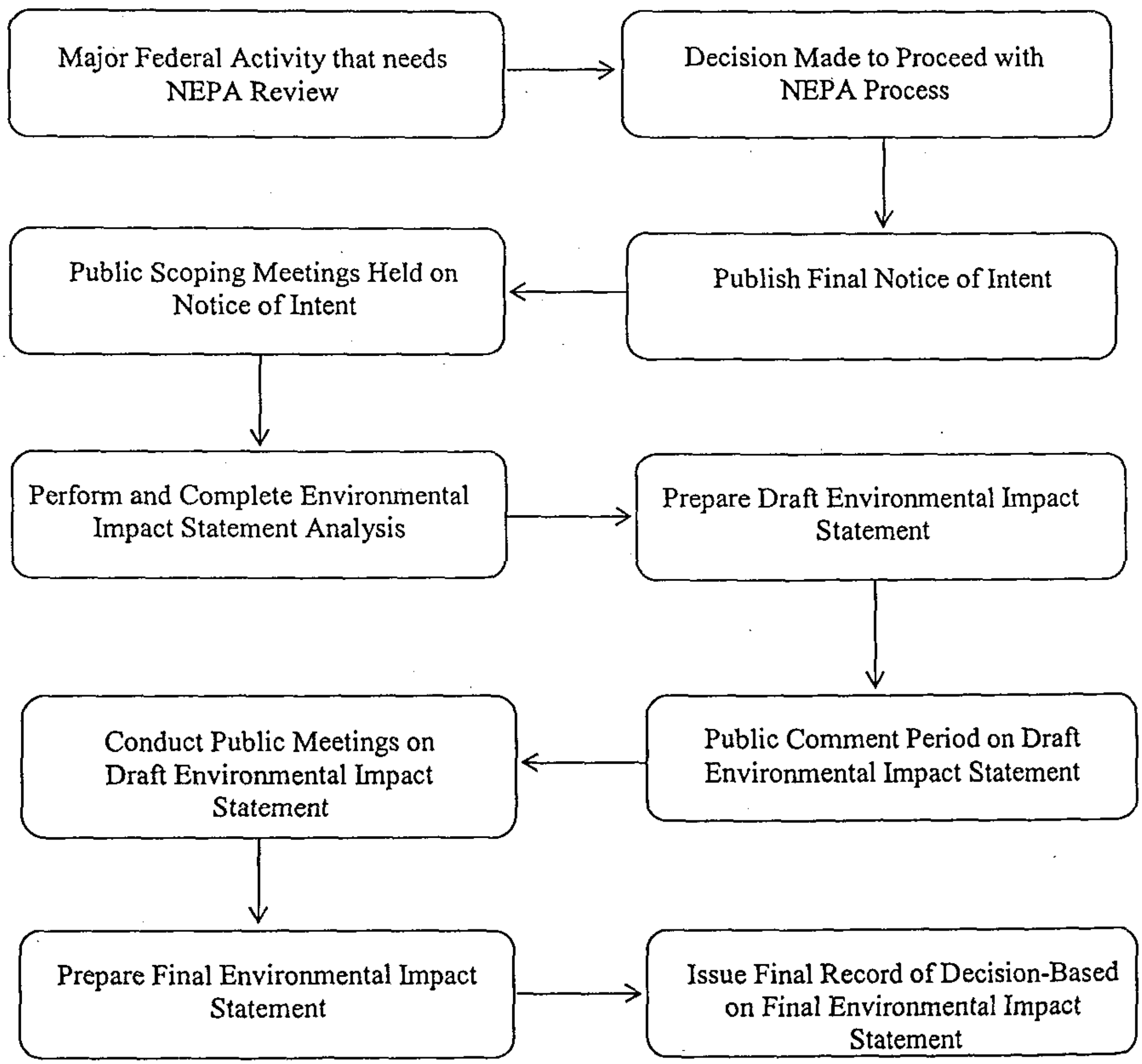
> **Why "Tank Systems"?**
>
> *We call them "tank systems" because we are dealing with not only tanks but also an elaborate complex of underground pipes, concrete pits, waste diversion boxes to move wastes from one pipe to another, smaller settling tanks, and lengthy transfer lines.*

The National Environmental Policy Act of 1969 (known as NEPA) requires federal agencies that propose to take actions affecting the quality of the human environment in a major way to prepare what is called an Environmental Impact Statement, or EIS. DOE's intention to close the waste storage tanks in the single-shell tank system at Hanford and to develop supplemental treatment of the tank wastes are major federal actions and require an EIS.

Words or terms in Italics are listed in the glossary, starting on page 17.

The purpose of an EIS is twofold. First, it gives managers the best available information and analysis about the proposed action, including action alternatives and cumulative impacts to both the environment and human health. Second, it allows involvement by the public in the development of alternatives and projected impacts. The EIS will support decisions made by DOE and regulatory agencies, such as the Washington State Department of Ecology. The actual decisions about waste treatment and tank closure will be made by DOE in a Record of Decision and by Ecology in permits issued under state environmental protection regulations.

A TYPICAL NEPA PROCESS



The first stage in an EIS is a public scoping effort. DOE issued a Notice of Intent (NOI) on January 8, 2003, which describes the proposed scope of the EIS. The NOI is available from DOE's Hanford website, www.hanford.gov/orp. Issuance of the NOI is followed by public scoping meetings. In those meetings DOE will solicit public input on the scope of the EIS and the alternatives to be considered as described in the NOI. DOE has already had internal meetings about the scope of this EIS with the Hanford Advisory Board, the Washington State Department of Ecology, and the U. S. Environmental Protection Agency (EPA). Ecology and EPA, along with DOE, are parties to the Tri-Party Agreement.

Using the input gained from the public scoping process, DOE will prepare a draft EIS document by the end of September 2003. DOE will conduct a second set of public meetings to get comments on that draft EIS document.

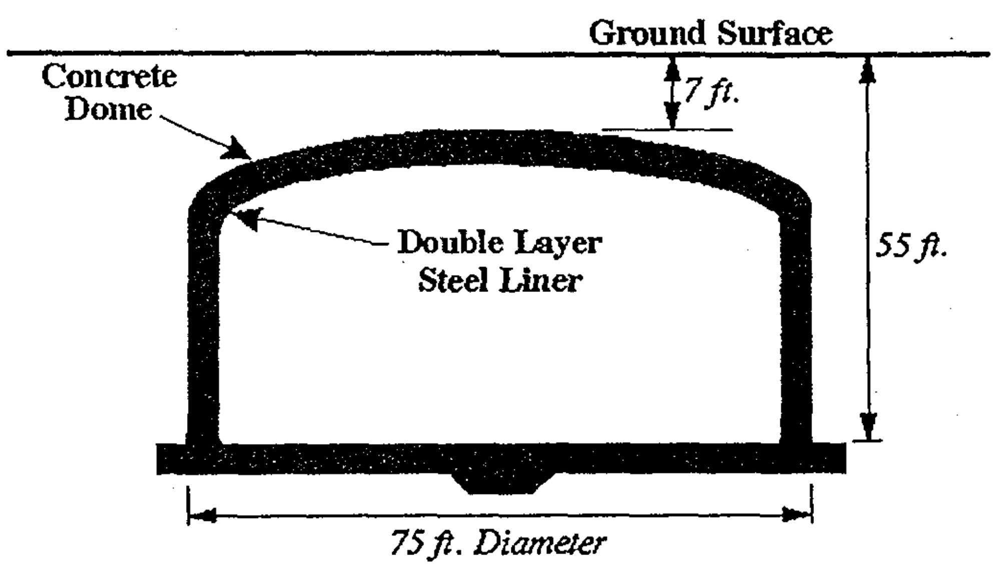
The current schedule calls for the final Accelerated Retrieval, Treatment, and Disposal of Tank Waste and Closure of Tanks at the Hanford Site EIS to be available by December 31, 2003 with a Record of Decision issued by April 2004. The Record of Decision will make clear DOE decisions and how DOE considered information from the EIS in reaching its decisions.

To put The Accelerated Retrieval, Treatment, and Disposal of Tank Waste and Closure of Tanks at the Hanford Site EIS in context, we have provided below general information about Hanford's waste storage tanks and tank systems.

The Tanks

Hanford's tanks are cylindrical reinforced concrete structures with inner carbon steel liners. Tanks are split into two groups based on their design: 149 *single-shell tanks* having a single carbon steel liner and constructed from World War II until the mid-1960's, and 28 *double-shell tanks* having two steel liners and built between 1968 and 1986. Both types of tanks are covered with about 10 feet of soil and gravel. They range from nearly empty to nearly full. The total amount of waste in the tanks is approximately 53 million gallons. About 23 million gallons are "saltcake" (moist, water-soluble salts), 12 million gallons are "sludge" (a peanut-butter-thick mixture of water and insoluble salts and salt-containing liquids), and the balance is liquid only. It is believed that at the bottom of some tanks there is "hard-heel" waste made up of many types of materials that may turn out to be more difficult to remove with existing retrieval technologies.

The tanks contain about 215 million *curies* of radioactivity. A curie is a unit of measure to describe the intensity, or strength, of radioactivity in a material. (A typical home smoke detector contains about 1 millionth of a curie of radioactivity.)



Of the 177 tanks at Hanford, 28 are double-shell tanks. The 149 single-shell tanks have only one steel liner. Both types of tanks have a concrete shell in addition to steel liners.

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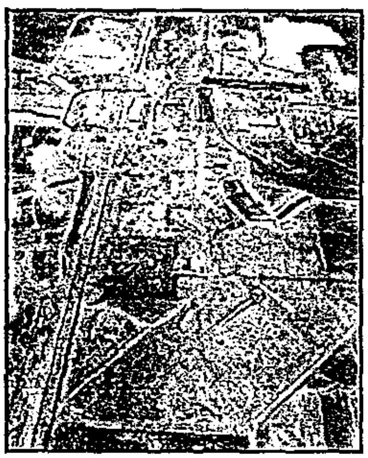
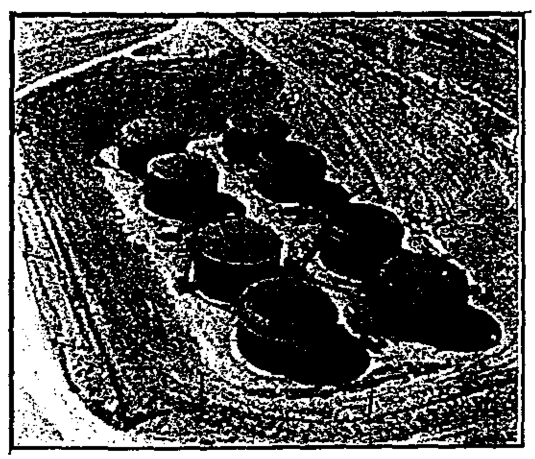
The radioactive and chemical contents of wastes in the overall tank systems are generally known. The knowledge we have of tank waste characteristics is based on tank operations records and tank samples taken over the past 50 years. Most tank waste was generated from the reprocessing of irradiated uranium (in nuclear fuel) to extract plutonium and recover uranium for recycling. The first and major step was the dissolution of the irradiated fuel elements with acid. This resulted in a highly acidic waste stream. The dissolution and extraction processes also added organic compounds and salts of various metals. Before the acidic waste was pumped to the tanks, it was neutralized with large quantities of sodium to prevent corrosion of the carbon steel tanks.

The 149 single-shell tanks built until the mid-1960's had a design life of only 10 to 20 years. Waste leakage from those tanks to the soils beneath them was suspected as early as 1956 and was confirmed in 1961. By the late 1980's, 67 of these tanks were known or suspected leakers. DOE estimates that about 1 million gallons of waste had been released to the soils in the tank farms.



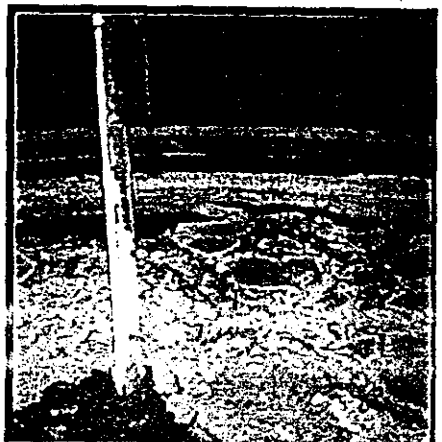
(left) An Aerial View of Hanford's Tank Farms

(right) Some of Hanford's Double-Shell Tanks Under Construction, 1984



Approximately 150 square miles of groundwater at Hanford is *contaminated* with chemicals and radionuclides. Some of this contamination may be attributed to the 1 million gallons of wastes believed to have leaked from the storage tanks. Most of the groundwater contamination was caused by intentional discharges of 120 million gallons of tank wastes to cribs and trenches on the Hanford plateau. Also, more than one hundred billions of gallons of slightly contaminated cooling water from eight of the production reactors were discharged to the ground. Less than 1% of the site's total radioactivity has been discharged or leaked to the ground. A portion of these contaminants was trapped in the sediments above the groundwater. Some reached the groundwater to create plumes of tritium, nitrate, carbon tetrachloride, chromium, iodine, and other contaminants that now exceed drinking water standards.

Groundwater moving from beneath the Hanford tank farms will eventually discharge to the Columbia River. Estimated groundwater travel time for the fastest moving contaminant plumes from beneath the tank farms to the river is 25 to 50 years.



Some tanks contain various radionuclides and chemicals that have separated into blended layers of liquids, slurries, sludges, and saltcake.

Liquids from the single-shell tanks are being pumped into the newer and more durable double-shell tanks. By 2004, the process of minimizing the liquid waste contents of all the single-shell tanks (usually by pumping) will be completed. What will remain in those tanks will be saltcakes and sludge.

Double-shell tanks at Hanford have a design life of several decades. No leaks from any of these tanks have been detected. Several have reached their design life and by 2033, when most are expected to be closed, most of them will have exceeded their design life.

Safety Risks Posed by the Tanks

For years, people have expressed concerns about the potential dangers Hanford tanks pose to workers, the public, and the environment. What conditions cause the safety problems? What has DOE done to manage those risks?

A decade ago, there were thought to be at least four types of safety risks posed by the tanks' contents:

- Hydrogen buildup in the tanks. Hydrogen gas is very flammable, and the concern in the late 1980's was that it could cause a tank explosion.

Accomplishments at the Hanford Tank Farms

Since 1996, when the last Hanford tanks EIS (known as the "Tank Waste Remediation System EIS") was published, much has happened at the tank farms:

- All four remaining tank safety issues were closed (see above).
- A flammable gas safety issue surrounding the most troublesome tank has been resolved.
- Pumping has been completed on 132 of the 149 aging single-shell tanks, and this effort is ahead of a Consent Decree schedule for completion in 2004.
- Waste storage system safety documentation, equipment, and instrumentation have been upgraded.
- All direct discharges of wastes from the tanks to the soils have been stopped.
- Construction has begun on the Waste Treatment Plant, designed to vitrify the tank wastes.

- Ferrocyanide igniting in the tanks. This chemical compound was added to the tank wastes in the 1950's to reduce the levels of cesium and strontium in tank wastes being discharged to cribs and trenches. There was concern at one time that it could catch fire if mixed with nitrates or nitrites in the tanks.

- High concentrations of organic chemicals igniting in the tanks. Millions of pounds of these chemicals were added to the wastes to separate out strontium, a radioactive element. The concern was that these chemicals could mix with nitrates and nitrites, and would catch fire.

- Plutonium in the tanks causing a chain reaction (criticality). Our best estimate is that the 53 million gallons of tank waste include about 1,200 pounds of plutonium. If enough plutonium were concentrated in a small enough area, it could cause a criticality.

Congress was so concerned about these perceived risks that in 1995 it placed 25 tanks on a "Watch List." Since then, through a process of research, study, experiments, and complex monitoring of the Watch List tanks, all of those tanks were removed from the Watch List in 2001 and the Tri-Party Agreement commitment to evaluate these tanks was met. DOE showed Congress that none of the four issues above presented a significant risk in the Hanford tank farms.

Waste Types in the Tank Farm System

High-level waste is a by-product of reprocessing spent nuclear fuel. This waste requires radiation shielding and special handling techniques. Its disposal requires special measures to isolate it permanently from humans and the environment.

Transuranic waste is material contaminated with radioactive elements with atomic numbers greater than uranium. This waste does not require as much isolation as high-level waste. However, it cannot be disposed of in a facility located at or just below ground level. DOE disposes of these wastes at the Waste Isolation Pilot Plant in Carlsbad, New Mexico.

Low-activity waste remains after separating as much radioactivity (consisting of key radionuclides) as technically and economically possible from high-level waste. Low-activity waste may be disposed of just as low-level waste (below) if certain additional requirements are met.

The least hazardous radioactive waste is **low-level waste.** It is all radioactive waste that is not high-level waste, transuranic waste, low-activity waste, spent nuclear fuel, or by-product material. It may be disposed of in a near-surface facility.

Hazardous waste is ignitable, corrosive, reactive, toxic, and persistent in the environment, exhibits dangerous characteristics, or appears on special lists published by the U.S. Environmental Protection Agency and the Washington State Department of Ecology. This waste may cause or contribute to an increase in health hazards when treated, stored, transported, or disposed of improperly.

Mixed waste is both hazardous or dangerous and radioactive.

Waste Retrieval: How Will the Waste Be Dislodged and Moved?

As part of the cleanup process, tank waste is planned to be removed from all 149 single-shell tanks. It will then be transported to processing facilities that may be located adjacent to or up to several miles from the tanks.

One issue to overcome during accelerated waste retrieval is having adequate space in the 28 double-shell tanks. The space issue is a delicate balance of retrieval and closure schedules for the single-shell tanks and limited WTP capacity for treating the waste. The plan is to stage the waste retrieved from the 149 single-shell tanks into the double-shell tanks whenever possible. From the double-shell tanks, the waste will either be pumped to the WTP to be made into glass or treated by a supplemental treatment technology. Double-shell tank space is very limited until treatment begins. Proposed solutions range from managing the retrieval sequence of the single-shell tanks or processing the double-shell tanks to a higher level to concentrating the wastes through evaporation, to finding different storage capacity.

Since we have not yet retrieved extensive amounts of waste, it is not clear that one single retrieval technology will be effective in getting 99% of the wastes out of the single-shell tanks. The saltcakes and sludge in the tanks are varied and are in many forms to yield to just one method. The most commonly used method in past retrieval efforts has been sluicing. Sluicing is the spraying of liquid at high pressures and volumes into the waste to break apart the solids for pumping out of the tank. The disadvantage of past-practice sluicing is that it puts large volumes of liquids into tanks that are known or suspected leakers, potentially causing more leakage into the soils beneath the tanks.

Another promising retrieval technology is called "saltcake dissolution." A solvent, primarily water, is poured into the tanks with this type of waste structure to dissolve the saltcakes. After the saltcake dissolves, the liquids are pumped out of the tank. This technology uses lower volumes of liquids and may cost less than older sluicing technologies.

A third retrieval technology combines confined sluicing and robotic technology. A robotic crawler vehicle, equipped with a mast carrying a vacuum system capable of sucking waste sludge out of the tank, would be put into a tank. The vehicle would also have mounted sluicing nozzles and would direct a low volume of high-pressure fluid onto the sludge, creating a slurry mixture that would be sucked through the mast out of the tank.

DOE is planning actual in-tank demonstrations of saltcake dissolution and robotic sluicing, as well as other promising technologies.

All of the discussion so far has focused on retrieval of the single-shell tank waste. That will require a complex infrastructure and miles of pipes, much of it already in place, for moving wastes across the site from west to east, from the single-shell tanks into the double-shell tanks.

Treating the Tank Wastes

After retrieval of the wastes, the next step in the tank waste cleanup process is waste treatment. The waste must be treated and packaged into a form that will minimize *radiation* and hazardous chemicals reaching the environment and coming into contact with humans at levels that exceed regulatory limits or pose risks to health.

The first step in preparing tank wastes for final treatment is called pretreatment. This is a critical step in the tank waste cleanup process because it is when key *radionuclides* are separated from the bulk of the chemicals and metals making up the waste. Pretreatment can save time and money, and reduce the volume of ***high-level waste*** to be later disposed of in the Yucca Mountain (Nevada) Geologic Repository.

After pretreatment, the tank waste must be converted into a durable, solid form before it is disposed. This is to minimize the threat of releasing radioactive and chemical materials into the environment. The low-activity portions of the tank waste can be turned into a waste form (some type of glass, grout, or dried and packaged material) and disposed of in a near-surface facility to allow later retrieval if needed. The high-level radioactive waste must be turned into a form that is safe for interim storage at Hanford until Yucca Mountain can receive the waste for permanent disposal deep beneath the earth's surface.

In 1988 DOE issued a plan to treat the tank wastes. It called for building a vitrification plant to treat the wastes in the 28 double-shell tanks. The plan was stopped in the early 1990's for two primary reasons. First, the plant as it was conceived did not have enough capacity to make glass out of the high-level waste fraction of the wastes in the required time frame. Second, the facility that would be used to pretreat the wastes, an old fuel processing plant at Hanford, was found to be inadequate for safety and cost reasons.

DOE examined a new waste treatment plan in 1996 in the Tank Waste Remediation System Environmental Impact Statement. This plan, selected in that EIS Record of Decision and known as "Phased Implementation," proposed a demonstration-scale (small-scale) WTP which would begin operations in 2002. The demonstration plant would serve as a way to gather information and reduce uncertainties before a decision to build a larger plant to treat the rest of the tank wastes.

The intent of DOE was to vitrify all the wastes, both high-level and low-activity contaminant streams, from all 177 tanks. However, the demonstration-scale WTP was designed to make glass of only 10 percent of the wastes by 2012. Following completion of the demonstration phase, DOE would have to expand the WTP or build a second, larger plant in order to treat all the wastes by 2028, the milestone date in the Tri-Party Agreement.

In 1998, DOE decided to make the Waste Treatment Plant a full-scale vitrification plant and to delay startup of the plant until approximately 2007. Under this new plan, the plant would have the capacity to treat about 10 percent of the tank waste by 2018. In that year the capacity of the plant would be doubled. Even with the added capacity to make glass, it still would have the capability to vitrify only about 50 percent of the wastes by the 2028 milestone date. DOE will need added treatment capability to supplement the WTP as it is planned now to meet that deadline. DOE is still committed to treating all tank wastes by 2028. The Accelerated Retrieval, Treatment, and Disposal of Tank Waste and Closure of Tanks at the Hanford Site EIS will look at several ways to do that.

One option is to make a number of changes to the existing design of the WTP. More pretreatment capacity, changes in high-level waste melter designs and capacities, and added *low-activity waste* treatment capacity would all increase the output of the plant. The added low-activity waste treatment capacity would be developed through expanded vitrification volume or through supplemental treatment technologies that would result in a waste form other than glass. This option could include adding treatment systems to supplement the capacity of the WTP.

A second option is to add sulfate-removal capability to the WTP. Sulfates in the low-activity waste stream make the waste more difficult to vitrify.

A third option is to use "supplemental" waste treatment technologies outside the WTP. One technology that will be evaluated is "containerized grout." This would be different from the previously proposed 1980's grout concept in several ways: the grout would be stored in easily retrievable containers; the more dangerous radionuclides would be separated from the waste before it is grouted; and more durable grout mixtures would be used.

Another supplemental treatment technology that may be evaluated is "bulk vitrification." Wastes would be made into glass outside the WTP in very large containers. The waste melter would itself be part of the container and disposed of after each use.

Finally, analysis may show that the wastes in about a dozen tanks could be classified as *transuranic* or *low-level wastes*. The transuranic wastes could be treated and packaged and transported to the Waste Isolation Pilot Plant in New Mexico. This would also free up additional WTP capacity for the high-level wastes that must be vitrified.

All of these options for increasing waste treatment capabilities and for re-designating wastes at Hanford are still in the conceptual stage. The Washington State Department of Ecology would have to approve permits and modifications to the Tri-Party Agreement to increase DOE capability to treat wastes before supplemental treatments could be implemented.

Disposing of the Treated Wastes

Once radioactive and hazardous tank wastes are converted into their final forms (some type of glass, grout, or dried and packaged material), they must be disposed of in a way that is safe for humans and the environment.

The high-level and low-activity waste forms will be disposed of differently. The high-level waste glass produced at the Waste Treatment Plant will be poured into large steel canisters. The canisters will probably be stored initially at Hanford, and then moved to the national repository at Yucca Mountain starting in 2015. Disposal at Yucca Mountain is meant to isolate the wastes from the environment for a very long time (thousands of years). It is possible that Yucca Mountain will not be ready for high-level waste storage on time or, in later years, will not have enough space for all of Hanford's high-level waste canisters. Some high-level waste glass may have to be stored for a very long time at Hanford.

Options for disposing of the treated low-activity wastes are being studied. The disposal site will likely be on the plateau at Hanford where the waste tanks are. The plateau's ground surface is 200 to 300 feet above the water table. The plateau is about six miles from the Columbia River at its nearest point.

Coming to Tank Closure

The name of the EIS that will be prepared is "The Accelerated Tank Retrieval, Treatment, and Disposal and Closure of Tanks at the Hanford Site EIS," and that says it all. After the wastes have been removed from the tanks, the tanks themselves must be "closed." Looking at what closure means and the environmental impacts of closure is a major purpose of this EIS.

The Tank Waste Remediation System EIS, published in 1997, did not examine tank system closure. When that EIS was prepared, DOE believed there was not enough information to be able to examine the impacts of tank closure. Before making decisions, DOE wanted to know more about how much tank waste would be retrieved and treated, how much would be left in the tanks, and how much contamination would be left in the related pipes and pits and converter boxes. In 1997 there was no real pressure to answer those questions.

Six years later, DOE does know more. The Department knows more about how contaminants that have leaked from tanks move in the soils and about tank retrieval methods. It knows more about processes for making glass from wastes. The Tri-Party Agreement now calls for beginning efforts to close several tanks in 2004 timeframe. It makes sense to evaluate the impacts of tank closure now.

Closure is the final step in the process of disposing of tanks' chemical and radioactive wastes. Federal and state laws describe two options for closing tanks. The meaning of "clean closure" can vary. It could mean that chemical and radioactive wastes associated with a tank and its supporting structures have been removed. The tanks would be filled with inert material such as sand, gravel, or cement to prevent collapse and the waste transfer pipes cleaned and plugged. Because the waste has been removed, the tanks may remain buried in place. Soils contaminated by tanks that have leaked approximately one million gallons of high-level wastes must be cleaned up, as well as miles of pipeline and other support equipment.

A more thorough clean closure approach would include tank removal. After wastes are retrieved from the tanks, the tanks would be broken apart. The tank pieces (and pieces of support structures) would be removed from the tank farms for treatment, disposal, and monitoring, probably at another location on the Hanford site. Removal of just the 149 single-shell tanks would be the equivalent of moving 21,000 tons of steel (enough to build 14,000 cars); 745,000 cubic yards of concrete (enough for the foundations of 30,000 1,200-square-foot homes); and 130,000 cubic yards of contaminated soil (enough to fill about 30 Olympic-sized swimming pools).

What Do Waste Treatment and Tank Closure Mean to You?

Tank waste treatment and disposal, and eventual tank closure, mean different things to different people. To some, the tanks and tank farms on the Hanford plateau will only be cleaned up when the tank farm areas are available for industrial or residential uses. At the other end of the spectrum, some people would settle for having the Hanford plateau be a "sacrifice zone" where a very long-term government presence would be needed to limit human access.

Each definition of tank cleanup—at either end of the spectrum and at points in between—would affect Hanford cleanup costs, schedules, human health risks, and technology needs in different ways. Some of the problems with Hanford's tanks wastes may only be handled, because of cost implications, by technologies that may have to be adapted to the complexities of Hanford's tank wastes.

Much remains unknown about tank waste cleanup. Different definitions of cleanup are accompanied by different risks, both during cleanup and for many years into the future, and different costs. This is why it is important to evaluate in this EIS the environmental consequences of various cleanup alternatives.

Taxpayers have different values and preferences about tank waste cleanup. What are your values and preferences for tank waste cleanup? How would you answer these questions?

- **What level of tank waste cleanup is necessary?**
- **How should the land on the Hanford plateau be used after cleanup?**
- **What should be the final waste forms for low-activity waste?**
- **What is an acceptable level of human health risk, both while the tanks are being cleaned up and in future generations?**
- **To what degree should tank waste cleanup decisions be consistent with other Hanford cleanup decisions?**

The Accelerated Tank Retrieval, Treatment, and Disposal of Tank Waste and Closure of Tanks at the Hanford Site EIS is the first study that will seriously look at what it means to finish cleaning up the most highly contaminated part of the Hanford site, the tanks and tank farms. It raises many questions about what nuclear waste cleanup means to the citizens of the United States.

Radiation *exposure* to workers doing the cleanup tasks would be high, even though most of the wastes and therefore most of the radioactivity already would have been retrieved from the tanks in the removal scenario. Both clean closure options would likely cost more and would require a higher level of exposure of workers to radioactively contaminated materials than the third alternative: landfill closure.

Landfill closure means leaving the emptied tank structures, with their residual contamination, contaminated soils, and support equipment in place. The tanks would be structurally strengthened against subsidence by filling them with sand, gravel, or cement. The tanks and surrounding contaminated soils may or may not be treated to reduce contamination or to create barriers against further spread of contamination. Aboveground barriers may be placed over the tanks. The barriers may be built of multiple layers of soil and rock, possibly with an asphalt sublayer. The sides of the barrier may be reinforced with rock to protect the barrier against wind and weather erosion.

The landfill option would likely cost less than either clean closure option. It would require less worker exposure to radioactive contaminants. At the same time, landfill closure would be less effective in the long term in preventing the spread of contaminants to the groundwater and to the Columbia River. More detailed evaluation of landfill and clean closure in the EIS may result in different answers.

The selection of a tank closure option will consider:

- The health risks and costs of decontaminating and/or removing tanks versus leaving them in place with residual contamination
- Available technical and regulatory options applied to both the clean closure and landfill closure alternatives
- Regulatory policy, as set by the Washington State Department of Ecology, and stakeholder preferences.

Land Use

One of the most important questions about Hanford tank waste cleanup is land use. The land currently occupied by the tank farms on the Hanford plateau might eventually be used for agriculture, for industry, or it might be withdrawn indefinitely from uses other than nuclear waste management. Each use would mean different near and long-term impacts to the environment. Each would require a different closure strategy and a different cost to the taxpayers. The need for cleanup standards tied to a long-term land use strategy is clear. This issue will have to be dealt with before the tank systems can be closed.

Furthermore, the land use strategy adopted as a basis for closing tank systems will need to consider land use decisions for the Hanford plateau areas surrounding the tank farms. The tank farms are surrounded by numerous waste disposal and hazardous and *mixed waste* sites that will be closed by other programs managed both by DOE and others at Hanford. The various long-term land use strategies on the Hanford plateau will have to match up or clean-up effectiveness will suffer.

Glossary

Closure – Actions that happen after tank wastes have been retrieved from the tanks. Those actions could include but not be limited to decontamination and/or removal of tanks and ancillary tank equipment, treatment or removal of contaminated soils beneath the tanks, placement of long-term barriers over tanks, and treatment of groundwater.

Contamination – Radioactive or hazardous chemical materials where they are not wanted or in a concentration that threatens human health or environmental health.

Curie – A unit of radioactivity defined as the quantity of any radioactive nuclide in which the number of disintegrations per second is 37 billion. It was originally defined as the amount of radioactivity in 1 gram of the isotope radium-226. A typical home smoke detector contains about 1 millionth of a curie of radioactivity.

Disposal – Removal of contamination or contaminated material from the human environment, although with provisions for monitoring, control, and maintenance.

Double-shell tank – A reinforced concrete underground vessel with two inner steel liners. Instruments are placed in the space between the liners (the annulus) to detect liquid waste leaks from the inner liner.

Exposure – The act of being exposed to a harmful agent, such as breathing air containing some hazardous agent like radioactive materials, smoke, lead, or germs; coming in contact with some hazardous agent (for example, getting radioactive material or poison ivy on the skin); being present in an energy field such as sunlight or other external radiation; or ingesting a hazardous agent.

High-level waste – Radioactive material (containing fission products, traces of uranium and plutonium, and other radioactive elements); it results from the initial chemical reprocessing of nuclear fuel used in nuclear reactors.

Irradiate – To expose uranium metals to neutrons to convert them to plutonium.

Low-activity waste – Waste that remains following the process of separating as much radioactivity as is technically and economically practicable from high-level waste. When additional requirements are met, low-activity waste may be disposed of as low-level waste in a near-surface facility.

Low-level waste – All radioactive waste that is not high-level waste, transuranic waste, spent nuclear fuel, or by-product material and may be disposed of in a near-surface facility.

Mixed waste – Waste that is both hazardous or dangerous and radioactive.

Radiation – Particles or energy waves emitted from an unstable element or nuclear reaction.

Radioactivity – Property possessed by some isotopes of elements of emitting radiation (alpha, beta, or gamma rays) spontaneously in their decay process.

Radionuclide – Radioactive atomic species or isotopes of an element.

Single-shell tank – An older-style underground vessel with a single steel wall liner surrounded by reinforced concrete. The domes of single-shell tanks are made of concrete without an inner covering of steel.

Tank waste – Radioactive mixed waste materials left over from the production of nuclear materials and stored in underground tanks.

Transuranic waste – Waste contaminated with alpha-emitting transuranic elements with half-lives of greater than 20 years in concentrations of more than 1 ten-millionth of a curie per gram (0.03 ounce) of waste.

Waste – Unwanted materials left over from production of nuclear materials. Waste was either stored in above or below ground structures or released into the environment.