DOE/EIS-0391

Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington

Reader's Guide

U.S. Department of Energy

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Cover Sheet

Responsible Agency: U.S. Department of Energy (DOE)

Cooperating Agency: Washington State Department of Ecology (Ecology)

Title: *Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington* (*TC & WM EIS*) (DOE/EIS-0391)

Location: Benton County, Washington

Contacts: For copies of this draft environmental impact statement (EIS), call toll-free 888-829-6347, or contact Mary Beth Burandt at the address below.

For additional information on this *Draft TC & WM EIS*, contact:

Mary Beth Burandt, Document Manager
Office of River Protection
U.S. Department of Energy
Post Office Box 1178
Richland, WA 99352
Attention: *TC & WM EIS*
Email: TC&WMEIS@saic.com
Fax: 1-888-785-2865
Telephone and voicemail: 888-829-6347

For general information on the DOE National Environmental Policy Act (NEPA) process, contact:

Carol M. Borgstrom, Director
Office of NEPA Policy and Compliance (GC-20)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585
Telephone: 202-586-4600, or leave a message at 800-472-2756

Abstract: The Hanford Site (Hanford), located in southeastern Washington State and situated along the Columbia River, is approximately 1,518 square kilometers (586 square miles) in size. Hanford's mission from the early 1940s to approximately 1989 included defense-related nuclear research, development, and weapons production activities. These activities created a wide variety of chemical and radioactive wastes. Hanford's mission now is focused on the cleanup of those wastes and ultimate closure of Hanford. To this end, several types of radioactive waste are being managed at Hanford: (1) high-level radioactive waste (HLW) as defined in DOE Manual 435.1-1; (2) transuranic (TRU) waste, which is waste containing alpha-particle-emitting radionuclides with atomic numbers greater than uranium (92) and half-lives greater than 20 years in concentrations greater than 100 nanocuries per gram of waste; (3) low-level radioactive waste (LLW), which is radioactive waste that is neither HLW nor TRU waste; and (4) mixed low-level radioactive waste (MLLW), which is LLW containing hazardous constituents as defined under the Resource Conservation and Recovery Act of 1976 (42 U.S.C 6901 et seq.). Thus, this *TC & WM EIS* analyzes the following three key areas:

1. **Retrieval, treatment, and disposal of waste from 149 single-shell tanks (SSTs) and 28 double-shell tanks (DSTs) and closure of the SST system.** In this *TC & WM EIS*, DOE proposes to retrieve and treat waste from 177 underground tanks and ancillary equipment and dispose of this waste in compliance with applicable regulatory requirements. At present, DOE is constructing a Waste Treatment Plant (WTP) in the 200-East Area of Hanford. The WTP would separate waste stored in Hanford's underground tanks into HLW and low-activity waste (LAW) fractions. HLW would be treated in the WTP and stored at Hanford until disposition decisions are made and implemented. (The analyses in this EIS are not affected by recent DOE plans to study alternatives for the disposition of the Nation's spent nuclear fuel and HLW because the EIS analysis shows that vitrified HLW can be stored safely at Hanford for many years.) LAW would

be treated in the WTP and disposed of at Hanford as decided in DOE's Record of Decision (ROD) issued in 1997 (62 FR 8693), pursuant to the *Tank Waste Remediation System, Hanford Site, Richland, Washington, Final Environmental Impact Statement* (DOE/EIS-0189, August 1996). DOE proposes to provide additional treatment capacity for the tank LAW that can supplement the planned WTP capacity in fulfillment of DOE's obligations under the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) as soon as possible. DOE would dispose of immobilized LAW and Hanford's (and other DOE sites') LLW and MLLW in lined trenches on site. These trenches would be closed in accordance with applicable regulatory requirements.

2. **Final decontamination and decommissioning of the Fast Flux Test Facility, a nuclear test reactor.** DOE proposes to determine the final end state for the aboveground, belowground, and ancillary support structures.

3. **Disposal of Hanford's waste and other DOE sites' LLW and MLLW.** DOE needs to decide where to locate onsite disposal facilities for Hanford's waste and other DOE sites' LLW and MLLW. DOE committed in the ROD (69 FR 39449) for the *Final Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement, Richland, Washington* (DOE/EIS-0286F, January 2004) that henceforth LLW would be disposed of in lined trenches. Specifically, DOE proposes to dispose of the waste in either the existing 200-East Area Integrated Disposal Facility (IDF) or the proposed 200-West Area IDF.

DOE has identified Preferred Alternatives for two of the three program areas and a range for the three key activities, as presented in this *TC & WM EIS*.

Public Comments: Comments on this draft EIS may be submitted during the 140-day comment period, which will begin when the U.S. Environmental Protection Agency publishes a Notice of Availability in the *Federal Register*. Public meetings on this EIS will be held during the comment period. The dates, times, and locations of these meetings will be published in a DOE *Federal Register* notice, and will also be announced by other means.

Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington (Draft TC & WM EIS)

Washington State Department of Ecology (Ecology) Foreword

Note: Ecology, as a cooperating agency, reviewed, provided comments on, and participated in the comment resolution process for the "preliminary draft" of this *Draft TC & WM EIS*. However, this foreword should be considered draft and subject to revision until Ecology has reviewed this *Draft TC & WM EIS* and, if necessary, supporting information.

Summary

Ecology believes that the U.S. Department of Energy (DOE) and its contractors have prepared a *Draft TC & WM EIS* that presents many important issues for discussion. Ecology's involvement to date shows that this document has benefitted from quality reviews and quality assurance procedures. The information in this document will help shed light on many key decisions that remain to be made about the Hanford Site (Hanford) cleanup.

Ecology expects DOE to consider our input through this foreword, as well as through any further comments made during the public comment process. We expect DOE to provide written responses to the major issues and comments prior to completion of the *Final TC & WM EIS*. Ecology will continue to work with DOE with the intent of helping to produce a final environmental impact statement (EIS) that fully informs future decisionmaking.

I. Introduction

Ecology has been a cooperating agency with DOE in the production of this *Draft TC & WM EIS*. DOE prepared this EIS to meet the requirements of the National Environmental Policy Act. In addition, Ecology will review this EIS to determine if it can be adopted in whole or in part to satisfy the requirements of the State Environmental Policy Act (SEPA). The information in this EIS will help inform Ecology and others about critical future cleanup decisions impacting Hanford's closure.

Ecology provides the following comments regarding this *Draft TC & WM EIS* to document areas of agreement or concern with this EIS and to assist the public in their review. Public and regulator input on this *Draft TC & WM EIS* are critical for the completion of an acceptable *Final TC & WM EIS*. Ecology encourages tribal nations, stakeholder groups, and the public to participate in the public comment process for this draft document.

When the *Final TC & WM EIS* is issued, Ecology will include a revised foreword to comment on the EIS conclusions. The foreword will also include the disposition of the comments we provided during the *Draft TC & WM EIS* review process.

II. Ecology's Role as a Cooperating Agency

Ecology is a cooperating agency in the preparation of this EIS. A state agency may be a cooperating agency on a Federal EIS when the agency has jurisdiction by law over, or specialized expertise concerning, a major Federal action under evaluation in the EIS.

As a cooperating agency, Ecology does not coauthor or direct the production of this EIS. Ecology does have access to certain data and information as this document is being prepared by DOE and its contractors. Our roles and responsibilities in this process are defined in a Memorandum of Understanding (MOU) between Ecology and DOE.

DOE retains responsibility for making final decisions in the preparation of the *Final TC & WM EIS*, as well as for determining the preferred alternative(s) presented in the EIS. However, Ecology's participation as a cooperating agency enables us to help formulate the alternatives presented in this *TC & WM EIS*.

Ecology's involvement as a cooperating agency—and the current scope of the *Draft TC & WM EIS*—is grounded in a series of events.

In February 2002, DOE initiated the "Environmental Impact Statement for Retrieval, Treatment, and Disposal of Tank Waste and Closure of Single-Shell Tanks at the Hanford Site, Richland, Washington," known as the "Tank Closure EIS." On March 25, 2003, Ecology became a cooperating agency for the "Tank Closure EIS." DOE and Ecology developed an MOU outlining respective agency roles and responsibilities.

While the "Tank Closure EIS" was being developed, another DOE EIS, the *Draft Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement, Richland, Washington (HSW EIS)*, was in the review stage. Among other matters, the HSW EIS examined the impacts of disposal at Hanford of certain volumes of radioactive waste and mixed radioactive and hazardous waste, including waste generated from beyond Hanford.

In March 2003, Ecology filed a lawsuit in the U.S. District Court seeking to prevent the importation and storage of certain offsite transuranic (TRU) and mixed TRU wastes that DOE had decided to send to Hanford prior to issuance of the *Final HSW EIS*. Ecology and intervening plaintiffs obtained a preliminary injunction against these shipments.

In January 2004, DOE issued the *Final HSW EIS*. Based on the *Final HSW EIS*, DOE amended a Record of Decision that directed offsite radioactive and hazardous wastes to Hanford (within certain volume limits) for disposal and/or storage. In response, Ecology amended its lawsuit to challenge the adequacy of the *HSW EIS* analysis.

In May 2005, the U.S. District Court expanded the existing preliminary injunction to enjoin a broader class of waste and to grant Ecology a discovery period to further explore issues with the *HSW EIS*.

In January 2006, DOE and Ecology signed a Settlement Agreement, ending litigation on the *HSW EIS* and addressing concerns found in the *HSW EIS* quality assurance review during the discovery period. The Settlement Agreement called for expanding the scope of the "Tank Closure EIS" to provide a single, integrated set of analyses of (1) tank closure impacts considered in the "Tank Closure EIS" and (2) the disposal of all waste types considered in the *Final HSW EIS*. The Settlement Agreement also called for an integrated cumulative impacts analysis.

Under the Settlement Agreement, the "Tank Closure EIS" was renamed the *TC & WM EIS*. Ecology's existing MOU with DOE was revised along with the Settlement Agreement so that Ecology remained a cooperating agency on the expanded *TC & WM EIS*.

The Settlement Agreement defined specific tasks to address concerns Ecology had with the *HSW EIS*. DOE has now revised information and implemented quality assurance measures used in this *TC & WM EIS* related to the solid waste portion of the analysis. Ecology has performed discrete quality

assurance reviews of that information to help confirm that the quality assurance processes of DOE's EIS contractor have been followed.

Based on Ecology's involvement to date, we believe that positive changes have been made to address data quality shortcomings in the *HSW EIS*. These specifically relate to the following:

- The data used in analyzing impacts on groundwater
- The integration of analyses of all waste types that DOE may dispose of at Hanford
- The adequacy of the cumulative impact analysis

Ecology will review this *Draft TC & WM EIS* to confirm that the terms of the Settlement Agreement have been addressed to our satisfaction.

III. Regulatory Relationships and SEPA

After this *TC & WM EIS* is finalized, Ecology will proceed with approving regulatory actions required to complete the Hanford cleanup. These include actions under the Hanford Federal Facility Agreement and Consent Order (HFFACO, or Tri-Party Agreement) and actions that require state permits or modifications to existing permits, such as the Hanford Sitewide Permit. This permit regulates hazardous waste treatment, storage, and disposal activity at Hanford, including actions such as tank closure and supplemental treatment for tank waste.

Ecology must comply with SEPA when undertaking permitting actions. It is Ecology's hope that the *Final TC & WM EIS* will be suitable for adoption in whole or in part to satisfy SEPA.

In addition, Ecology will have a substantial role in establishing standards and methods for the cleanup of contaminated soil and groundwater at Hanford. These include areas that are regulated under hazardous waste corrective action authority and/or under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) through a CERCLA Record of Decision. Information developed in this EIS will thus be useful in other applications for the cleanup of Hanford.

IV. Ecology Insights and Alternatives Considered

This *Draft TC & WM EIS* considers 17 alternatives. DOE has not identified a specific preferred alternative. However, for the many decisions that are addressed in this EIS, DOE has selected a set of preferred alternatives. Ecology understands that the selection of a smaller number of preferred alternatives, or of a specific preferred alternative from that set, will be considered by DOE throughout public review of the *Draft TC & WM EIS*. When the final EIS is prepared, a preferred alternative will be identified by DOE.

The alternatives and tank closure options considered in this draft EIS include the following key decision areas:

- Additional tank waste treatment options (in addition to the Hanford Waste Treatment Plant [WTP] as provided in the *Tank Waste Remediation System, Hanford Site, Richland, Washington, Final Environmental Impact Statement)*
- Tank farm closure options
- Waste management options for the Central Plateau (including disposal of offsite defense wastes)
- Fast Flux Test Facility (FFTF) decommissioning

Ecology will update this foreword in the *Final TC & WM EIS* and will express its agreement or disagreement with DOE's preferred alternative for specific decisions in the foreword. In the interim, Ecology's insights, technical perspectives, and legal and policy perspectives are provided below. Areas of agreement with DOE and points of concern are noted.

Single-Shell Tank Retrieval Options

Ecology believes that DOE has presented an appropriate range of alternatives for evaluating tank waste retrieval and tank closure impacts. However, based on the hazardous waste tank closure standards of the "Dangerous Waste Regulations" (WAC 173-303-610[2]) and the HFFACO requirements, Ecology supports only alternatives that involve the retrieval of 99 percent or more of the waste from each of the 149 single-shell tanks (SSTs).

High-Level Radioactive Waste Disposal

High-level radioactive waste (HLW) associated with the tank waste includes, but may not be limited to, immobilized high-level radioactive waste (IHLW) and HLW melters (both spent and failed). It has been DOE's longstanding plan to store these wastes at Hanford and then ship and dispose of them in a deep geologic repository. The idea was that the nature of the geology would isolate the waste and protect humans from exposure to these very long-lived, lethal radionuclides. The Nuclear Waste Policy Act indicates that these waste streams require permanent isolation. By contrast, the immobilized low-activity waste (ILAW) glass, and perhaps other waste streams, may not require deep geologic disposal due to the level of pretreatment resulting in radionuclide removal and the degree of immobilization provided for in the ILAW glass.

However, the final decision on HLW disposal has recently become an issue with significant uncertainty. The *Draft TC & WM EIS* contains the following statement:

> As indicated in the Administration's fiscal year 2010 budget request, the Administration intends to terminate the Yucca Mountain program while developing nuclear waste disposal alternatives. Notwithstanding the decision to terminate the Yucca Mountain program, DOE remains committed to meeting its obligations to manage and ultimately dispose of HLW and SNF. The Administration intends to convene a blue ribbon commission to evaluate alternative approaches for meeting these obligations. The commission will provide the opportunity for a meaningful dialogue on how best to address this challenging issue and will provide recommendations that will form the basis for working with Congress to revise the statutory framework for managing and disposing of HLW and SNF.

Ecology reminds the readers that the Nuclear Waste Policy Act requires permanent isolation of these most difficult waste streams. Leaving these wastes stored at Hanford indefinitely is not a legal option, nor an acceptable option to the State of Washington.

Ecology is concerned about the glass standards and canister requirements for the IHLW. These standards were developed based on what was acceptable to Yucca Mountain. Now that Yucca Mountain is no longer the assumed disposal location, Ecology is concerned about what standards for glass and canisters will be utilized by the WTP. Ecology insists that DOE implement the most conservative approach in these two areas to guarantee that the glass and canister configurations adopted at the WTP will be acceptable at the future deep geologic repository.

In addition, Ecology maintains that DOE should build and operate adequate interim storage capacity for the IHLW and the HLW melters in a manner that does not slow down the treatment of tank waste.

This *Draft TC & WM EIS* assumes that the used (both spent and failed) HLW melters are HLW and, therefore, should be disposed of in a deep geologic repository. This EIS also assumes that the used HLW melters will stay on site before shipment to such a repository. DOE has not requested, and Ecology has not accepted, long-term interim storage of failed or spent HLW melters at Hanford.

Ecology does not agree that the HLW melters will or should stay on site. We do agree with the final disposal in a deep geologic repository. The disposal pathway for both the failed and the spent melters will require further evaluation than is presented in this *Draft TC & WM EIS*. Ecology and DOE will need to reach a mutual understanding and agreement on the regulatory framework for disposal.

Pretreatment of Tank Waste

This *Draft TC & WM EIS* includes numerous alternatives that pretreat tank waste to separate the high-activity components and direct them to a HLW stream. The HLW stream will be vitrified, resulting in a glass waste product that will be sent to a deep geologic repository. However, this draft EIS has one alternative that provides no pretreatment for some portion of the waste in the 200-West Area.

As a legal and policy issue, Ecology does not agree with alternatives that do not require pretreatment of the tank waste. Such alternatives do not meet the intent of the Nuclear Waste Policy Act to remove as many of the fission products and radionuclides as possible to concentrate them in the HLW stream. For this reason, Ecology requests that DOE rule out any alternative that does not pretreat tank waste.

TRU Tank Waste

This *Draft TC & WM EIS* considers the option of treating and sending waste from specific tanks to the Waste Isolation Pilot Plant (WIPP) as mixed TRU waste. This draft EIS also considers WTP processing of the waste from these specific tanks.

Ecology has legal and technical concerns with any tank waste being classified as mixed TRU waste at this time. DOE must provide peer-reviewed data and a strong, defensible, technically and legally detailed justification for the designation of any tank waste as mixed TRU waste, rather than as HLW. DOE must also complete the WIPP certification process and assure Ecology that there is a viable disposal pathway (i.e., permit approval from the State of New Mexico) before Ecology will modify the Hanford Sitewide Permit to allow tank waste to be treated as mixed TRU waste.

Supplemental Treatment

In this *Draft TC & WM EIS*, DOE considers changes to the treatment processes that the WTP would use. Specifically, this draft EIS considers technologies to supplement the WTP's treatment of low-activity waste (LAW). The WTP as it is currently designed does not have the capacity to treat the entire volume of LAW in a reasonable timeframe.

Ecology agrees on the need to evaluate supplemental LAW treatment. An additional supplemental LAW treatment system is necessary to treat all the tank waste in a reasonable amount of time. Ecology fully supports the *Draft TC & WM EIS* alternative that assumes a second LAW Vitrification Facility would provide additional waste processing. Building a second LAW Vitrification Facility has consistently been Ecology's baseline approach. We would prefer a second LAW Vitrification Facility as the preferred alternative for the following reasons:

- LAW vitrification is a mature technology that is ready to be implemented with no further testing.
- LAW vitrification produces a well-understood waste form that is extremely protective of the environment (the bulk vitrification waste form is not as protective).

- Negative data from the last bulk vitrification experimental testing indicate waste form performance and technology implementation issues.
- There has been a lack of significant progress on advancing a bulk vitrification test facility for actual waste.
- The environmental results from the waste performance presented in this *Draft TC & WM EIS* indicate that LAW vitrification is superior to bulk vitrification.
- A recently published DOE report indicates that a second LAW Vitrification Facility would be preferable.

Consistent with the standard of HFFACO Milestone M-62-08, Ecology will analyze the information from the bulk vitrification alternative. From this analysis, Ecology will determine if the performance of the waste forms is comparable with WTP borosilicate glass. Ecology's measuring stick for a successful supplemental treatment technology has always been whether it is "as good as glass" (from the WTP).

As a technical issue, Ecology does not think that the waste treatment processes of steam reforming and cast stone would provide adequate primary waste forms for disposal of tank waste in onsite landfills. This has already been the subject of a previous DOE down-select process, in which Ecology and other participants rated these treatment technologies as low. This draft EIS shows that the waste form performance would be inadequate for both cast stone and steam reforming. These alternatives do not merit any further review.

Specifically related to the steam reforming alternative, Ecology has technical concerns about the *Draft TC & WM EIS's* assumptions for contaminant partitioning and its effects on waste form performance. It is inappropriate to assign the same assumptions to steam reforming as those used for bulk vitrification, given the different maturities of the two technologies.

Secondary Waste from Tank Waste Treatment

This *Draft TC & WM EIS* evaluates the impacts of disposing of secondary waste that results from tank waste treatment. Ecology agrees with DOE that secondary waste from the WTP and supplemental treatment operations would need additional mitigation before disposal. This assumption is not reflected in (and, in fact, is contradicted by) the current DOE baseline, which does not assume such additional mitigation. DOE has not determined what the secondary waste treatment would be, but DOE and its contractor are evaluating various treatment options.

Tank Waste Treatment Flowsheet

In preparing this *Draft TC & WM EIS*, some assumptions were made about highly technical issues such as the tank waste treatment flowsheet, which is a representation of how much of which constituent ends up in which waste form and in what amount.

Certain constituents such as technetium-99 and iodine-129 are significant risk drivers because they are mobile in the environment and have long half-lives. This draft EIS assumes that 20 percent of the iodine-129 from the tank waste would end up in vitrified glass and 80 percent in the grouted secondary waste. The same assumption is made for bulk vitrification and the WTP LAW Vitrification Facility.

Based on its review of the *Draft TC & WM EIS's* contaminant flowsheets for the WTP and bulk vitrification, Ecology has technical concerns with this approach. The design configuration for the WTP indicates that iodine-129 recycles past the melter multiple times, which leads to a higher retention in the glass and less in the secondary waste. Therefore, Ecology believes the retention rate of iodine-129 in the

ILAW glass may be higher than that in bulk vitrification glass. However, Ecology is aware that there is uncertainty in the actual glass retention results.

Through our cooperating agency interactions, DOE has agreed to run a sensitivity analysis to show the information under a different approach. The sensitivity analysis in this *Draft TC & WM EIS* shows that if recycling of iodine-129 is as effective as the WTP flowsheets indicate, then the WTP with a Bulk Vitrification Facility alternative would place 80 percent of iodine-129 in secondary waste (a less-robust waste form). This compares to an alternative that includes a second LAW Vitrification Facility in addition to the WTP, which would place 30 percent of the iodine-129 in secondary waste. This 50 percent difference in capture reinforces Ecology's opinion that choosing Tank Closure Alternative 2B, which would use the WTP and a second LAW Vitrification Facility, would be best from a tank waste treatment perspective.

Waste Release

This *Draft TC & WM EIS* models waste releases from several different types of final waste forms, including the following:

- ILAW glass
- Failed and spent LAW melters
- Waste in bulk vitrification boxes
- Steam reformed waste
- Grouted LAW from tank waste
- Grouted secondary waste
- Waste left in waste sites
- Grouted waste in the bottom of tanks
- Direct buried waste in landfills
- Waste that has been macroencapsulated

Ecology understands the methods and formulas used for the waste form release calculations (for all waste types). However, we will need to see the modeling results and complete our technical review before we can validate this portion of this EIS.

Offsite Waste

DOE is decades behind its legal schedule in retrieving tank waste from SSTs and years behind its legal schedule in completing construction of the WTP. DOE has not even begun treating Hanford's 200 million liters (53 million gallons) of tank waste.

At its current pace, DOE is in danger of falling years behind its legal schedule in processing contact-handled TRU waste for disposal at WIPP. DOE has not yet even completed planning for a facility to process remote-handled TRU waste for such disposal. Massive areas of Hanford's soil and groundwater are contaminated, and many of these areas will likely remain contaminated for generations to come, even after final cleanup remedies have been instituted.

The State of Washington is aware that under DOE's plans, more curies of radioactivity would leave Hanford (in the form of vitrified HLW and processed TRU waste) than would be added to Hanford through proposed offsite waste disposal. However, based on the current state of Hanford's cleanup and the analysis in this *Draft TC & WM EIS*, the State of Washington objects to the disposal at Hanford of additional wastes that have been generated from beyond Hanford.

As this *Draft TC & WM EIS* shows, disposal of the proposed offsite waste would significantly increase groundwater impacts to beyond acceptable levels. Such disposal would add to the risk term at Hanford today, at a time when progress on reducing the bulk of Hanford's existing risk term has yet to be realized. DOE should take a conservative approach to ensure that the impact of proposed offsite waste disposal,

when added to other existing Hanford risks, does not result in exceeding the "reasonable expectation" standard of DOE's own performance objectives (see DOE Manual 435.1-1, Section IV.P[1]) and of other environmental standards (e.g., drinking water standards).

The State of Washington supports a "no offsite waste disposal" alternative as its preferred alternative in the *Final TC & WM EIS*, to be adopted in a Record of Decision. DOE should forgo offsite waste disposal at Hanford (subject to the exceptions in the current *State of Washington v. Bodman* Settlement Agreement), at least until such time as it has made significant progress on SST waste retrieval and the tank waste treatment process. If DOE wishes to use Hanford as an offsite waste repository after that point, DOE should then re-evaluate the potential impacts of any proposed offsite waste disposal in light of the then-existing Hanford risk term.

Waste Disposal Location Alternatives

Ecology agrees with DOE that a preferred alternative locating the Integrated Disposal Facility in the 200-East Area appears better for long-term disposal of waste than in the 200-West Area because of the faster rate of groundwater flow in the 200-East Area.

Black Rock Reservoir

This *Draft TC & WM EIS* considers the groundwater impacts of locating Black Rock Reservoir upgradient of Hanford. This is noteworthy because leakage associated with the reservoir could have impacts on Hanford groundwater contamination. Ecology has reviewed the evaluation basis assumed in this draft EIS. On a technical basis, Ecology accepts that potential groundwater impacts of the proposed reservoir could (or likely would) adversely impact human health and the environment at Hanford.

Vadose Zone Modeling

This *Draft TC & WM EIS* uses the STOMP [Subsurface Transport Over Multiple Phases] modeling code for vadose zone modeling. Based on its current review, Ecology believes that the Hanford parameters used with this code are adequate for the purposes served by this EIS. Ecology notes that the *TC & WM EIS* STOMP modeling code parameters are based on a regional scale and may not be appropriate for site-specific closure decisions or other Hanford assessments. Use of STOMP in other assessments requires careful technical review and consideration of site-specific parameters. Further revisions of these STOMP parameters may be necessary.

Risk Assessment and Cumulative Impacts

This *Draft TC & WM EIS* evaluates risk under the alternatives and in the cumulative impact analyses. The risk assessment modeling presented in this draft EIS should not be interpreted as a Hanford sitewide comprehensive human health and ecological risk assessment, applied to the river corridor or other specific Hanford areas. Specific Hanford areas will require unique site parameters that are applicable to that area's specific use.

This *Draft TC & WM EIS* presents an evaluation of the cumulative environmental impacts of treatment and disposal of wastes at Hanford. The cumulative impact analyses allow DOE to consider the impacts of all cleanup actions it has taken or plans to take at Hanford.

V. Noteworthy Areas of Agreement

Ecology and DOE have discussed and reached agreement on the following significant issues and parameters for the purposes of this *Draft TC & WM EIS*:

- The manner in which DOE presents groundwater data and information (i.e. with pictures).

- The quality assurance requirements that DOE and Ecology identified in the *HSW EIS* (*State of Washington v. Bodman*) Settlement Agreement
- The Technical Guidance Document for *Tank Closure Environmental Impact Statement Vadose Zone and Groundwater Revised Analyses* Agreement, which focused on parameters shown to be important in groundwater analysis
- The location of calculation points for contaminant concentrations in groundwater
- The use of tank farm closure descriptions and alternative analysis
- The use of tank waste treatment descriptions and alternative analysis
- Inclusion of the US Ecology site and the cocooned reactors transported to the Central Plateau in the comprehensive cumulative impacts assessment
- Overall modeling approaches for vadose zone and groundwater
- The use of modeling assumptions for the double-shell tanks
- Alternative assumptions about how processes would treat existing wastes and generate other wastes during treatment processes, and how DOE would dispose of all of the wastes.
- The methods for evaluating and using waste inventory data
- Release mechanisms for contaminants from various waste forms
- An alternative in this *Draft TC & WM EIS* that evaluates impacts of treating and disposal of all tank waste and residue to meet the Resource Conservation and Recovery Act / Hazardous Waste Management Act HLW treatment standard of vitrification
- The inventory assumptions used for the pre-1970 burial grounds

Ecology's agreement on these issues and parameters is specifically for the purposes of this *Draft TC & WM EIS* and is based on Ecology's current knowledge and best professional judgment. Ecology's agreement should not be construed as applicable to any future documents, evaluations, or decisions at Hanford.

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List of Acronyms and Abbreviations

CERCLA	Comprehensive Environmental, Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CWC	Central Waste Complex
DOE	U.S. Department of Energy
DST	double-shell tank
EIS	environmental impact statement
FFTF	Fast Flux Test Facility
FR	*Federal Register*
Hanford	Hanford Site
HLW	high-level radioactive waste
IDF	Integrated Disposal Facility
IDF-East	200-East Area Integrated Disposal Facility
IDF-West	200-West Area Integrated Disposal Facility
IHLW	immobilized high-level radioactive waste
ILAW	immobilized low-activity waste
INL	Idaho National Laboratory
LAW	low-activity waste
LLBG	low-level radioactive waste burial ground
LLW	low-level radioactive waste
MFC	Materials and Fuels Complex
MLLW	mixed low-level radioactive waste
NEPA	National Environmental Policy Act
PPA	Property Protected Area
PPF	Preprocessing Facility
RCB	Reactor Containment Building
RCRA	Resource Conservation and Recovery Act
RH-SC	remote-handled special component
RPPDF	River Protection Project Disposal Facility
RTP	Remote Treatment Project
SST	single-shell tank
TC & WM EIS	*Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington*
TMC	theoretical maximum capacity
TPA	Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement)
TRU	transuranic
TWRS EIS	*Tank Waste Remediation System, Hanford Site, Richland, Washington, Final Environmental Impact Statement*

List of Acronyms and Abbreviations *(continued)*

WAC	*Washington Administrative Code*
WESF	Waste Encapsulation and Storage Facility
WIPP	Waste Isolation Pilot Plant
WRAP	Waste Receiving and Processing Facility
WRF	waste receiver facility
WTP	Waste Treatment Plant

Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington

READER'S GUIDE

INTRODUCTION

This Reader's Guide serves as an introduction and guide to the contents of the U.S. Department of Energy's (DOE's) *Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington (TC & WM EIS)* to highlight the key features of the reasonable alternatives and to help readers review the technical analyses presented in this environmental impact statement (EIS). Included here are descriptions of the proposed actions; the scope of this EIS; the alternatives evaluated; and the organization of this EIS itself. Readers are encouraged to use this guide to assist them in navigating through the complex information presented in this *TC & WM EIS*.

PROPOSED ACTIONS

The Hanford Site (Hanford), located in southeastern Washington State, has a waste inventory of about 206 million liters (54.5 million gallons) of mixed radioactive and chemically hazardous waste resulting from defense production activities conducted during the Cold War years. This waste is stored in 177 large and 61 smaller underground storage tanks and is a major potential risk to public health and the environment. DOE proposes to reduce this risk by updating its waste storage methodology and retrieving, treating, and disposing of key elements of this waste inventory. This EIS addresses the potential environmental impacts for three sets of proposed actions at Hanford: tank closure, Fast Flux Test Facility (FFTF) decommissioning, and waste management.

Figure 1 is a simplified process flow diagram displaying the general flow of waste from the single-shell tanks (SSTs) and double-shell tanks (DSTs) through the proposed treatment, interim storage, and disposal options. For the reader's ease, the flow diagram does not reflect a single alternative or set of alternatives; instead, the diagram displays all the options that were analyzed under the 17 proposed alternatives (11 for tank closure, 3 for FFTF decommissioning, and 3 for waste management). A distinction between current and proposed facilities is also made in Figure 1 to assist the reader in understanding which capabilities currently exist and which proposed additional capabilities were analyzed.

SCOPE

The scope of this *TC & WM EIS* includes analyses of the potential environmental impacts and relative cost consequences of proposed actions and reasonable alternatives for accomplishing the proposed actions. These analyses focused on three key elements:

1. Revising and updating the analyses of the August 1996 *Tank Waste Remediation System, Hanford Site, Richland, Washington, Final Environmental Impact Statement* (*TWRS EIS*), as well as subsequent supplement analyses, which addressed retrieval, treatment, and disposal of the tank waste, by also evaluating the impacts of different scenarios for final closure of Hanford's SST system.

2. Evaluating the potential environmental impacts of proposed activities to decommission FFTF, a nuclear test reactor, and associated auxiliary facilities at Hanford, including management of the waste generated by the decommissioning process (such as remote-handled special components [RH-SCs]) and disposition of Hanford's inventory of radioactively contaminated bulk sodium from FFTF and other onsite facilities.

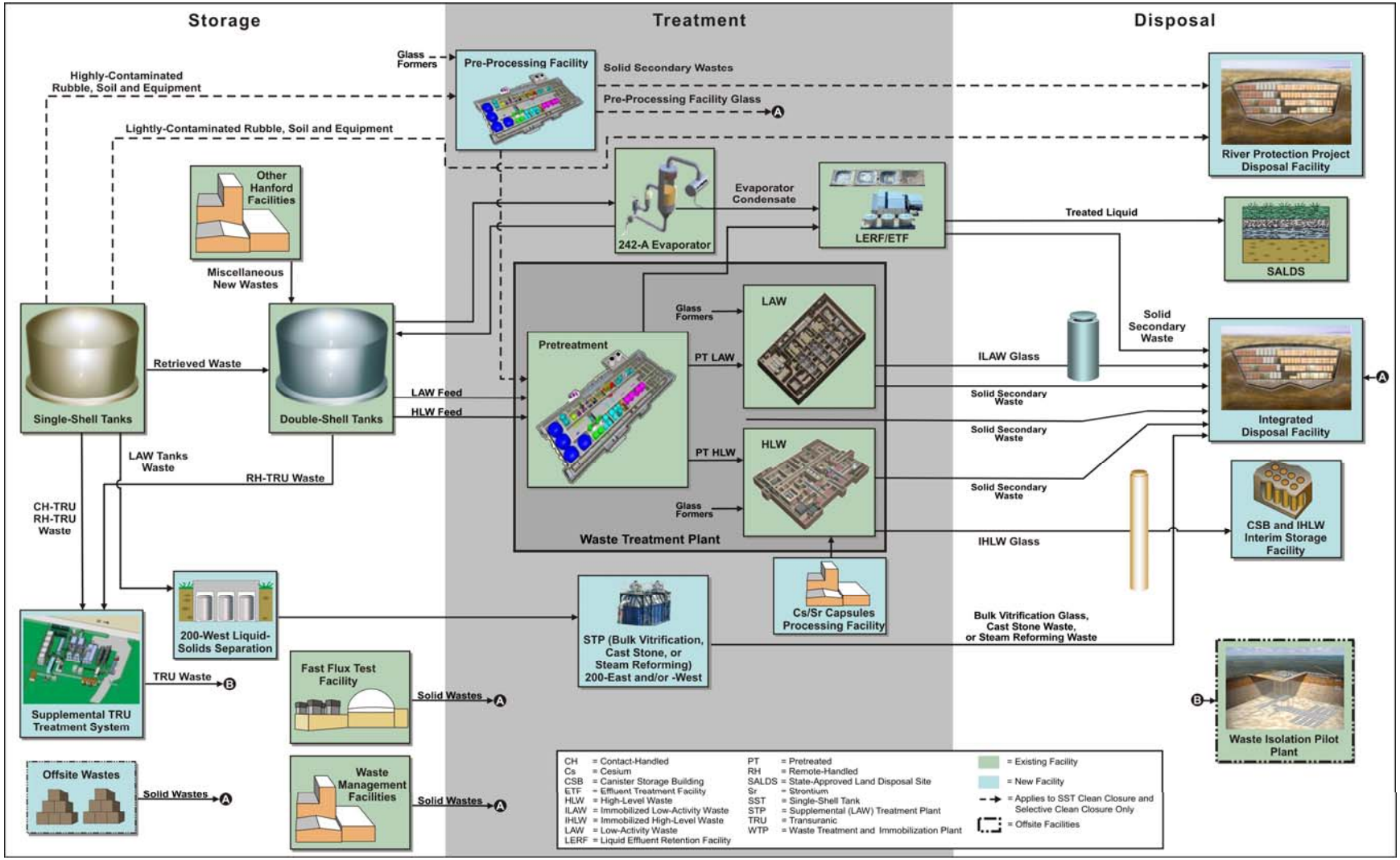

Figure 1. Simplified Process Flow Diagram

3. Evaluating the potential environmental impacts of ongoing solid waste management operations at Hanford, as well as the proposed disposal of Hanford low-level radioactive waste (LLW) and mixed low-level radioactive waste (MLLW) and a limited volume of LLW and MLLW from other DOE sites in an Integrated Disposal Facility (IDF) located at Hanford.

This *TC & WM EIS* was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended (42 *United States Code* 4321 et seq.); DOE implementing procedures for NEPA (*Code of Federal Regulations*, Title 10, Part 1021 [10 CFR 1021]); and Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500–1508). Further, this *TC & WM EIS* implements a Settlement Agreement signed on January 6, 2006, by DOE, the Washington State Department of Ecology, and the Washington State Attorney General's Office. The agreement settles NEPA claims made in the case *State of Washington v. Bodman* (Civil No. 2:03-cv-05018-AAM), which addressed the January 2004 *Final Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement, Richland, Washington*. The Washington State Department of Ecology is participating in this NEPA activity as a cooperating agency; as such, it is responsible for reviewing the content of this *TC & WM EIS* under the authority of Washington's State Environmental Policy Act to ensure it satisfies the State of Washington's requirements and supports its proposed action to issue permits under its hazardous waste program. The information provided in this *TC & WM EIS* will be considered, along with other pertinent information, in the decision process for DOE's proposed actions.

ALTERNATIVES

The following sections present the alternatives analyzed in this *TC & WM EIS*. More-detailed discussions of the alternatives are provided in Chapters 1 and 2 of this EIS.

TANK CLOSURE

DOE reviewed all comments generated during the scoping process for this EIS and determined that revision of the alternatives for tank closure proposed in the Notice of Intent was needed. Accordingly, DOE modified the alternatives as presented in the sections below. In creating and modifying the alternatives, emphasis was placed on including all reasonable component options to allow maximum flexibility in selecting the technologies, methods, time periods, and locations of the treatment and closure activities. The alternatives include combinations of the treatment and closure options under consideration.

Tank Closure Alternative 1: No Action

In the Council on Environmental Quality's "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations" (46 *Federal Register* [FR] 18026), two types of No Action Alternative are allowed. In one case, work is stopped and impacts are evaluated. In the second case, ongoing activities are evaluated as a "no change" and continuation of the present course of action.

In this EIS, DOE has chosen to show both types of no action. Under this alternative, the work would be stopped and impacts would be evaluated. Under Tank Closure Alternative 2A, DOE would evaluate retrieval from the tanks and treatment through the Waste Treatment Plant (WTP), in accordance with the *TWRS EIS* Record of Decision.

Storage: DOE would continue to store and monitor waste in the SSTs and DSTs for 100 years. Tanks showing signs of deterioration affecting their structural integrity would be filled with grout or gravel as a corrective action or emergency response. The cesium and strontium capsules would remain in storage in the Waste Encapsulation and Storage Facility (WESF).

Retrieval: Waste from the tanks would not be retrieved.

Treatment: No vitrification or treatment capacity would be built after 2008. Ongoing WTP construction would be terminated, and the WTP site would be isolated pending some future use, if any. No immobilized low-activity waste (ILAW) or immobilized high-level radioactive waste (IHLW) would be produced.

Disposal: The waste in the SST and DST systems would remain in the tank farms indefinitely.

Closure: Tank closure would not be addressed under this alternative. DOE would maintain security and management of the site for a 100-year administrative control period. During this period, DOE would continue to store and conduct routine monitoring of the waste in the SSTs, DSTs, and miscellaneous underground storage tanks.

Tank Closure Alternative 2: Implement the *Tank Waste Remediation System EIS* Record of Decision with Modifications

Tank Closure Alternative 2 would implement the decisions made in the Record of Decision for the *TWRS EIS* and considered in three supplement analyses completed through 2001. Under this alternative, all waste retrieved from the tanks would be vitrified, resulting in either an ILAW or IHLW glass product.

Tank Closure Alternative 2 consists of two subalternatives: (1) Tank Closure Alternative 2A: Existing WTP Vitrification; No Closure and (2) Tank Closure Alternative 2B: Expanded WTP Vitrification; Landfill Closure, as described below.

Tank Closure Alternative 2A: Existing WTP Vitrification; No Closure

Storage: DOE would continue current waste management operations using existing tank storage facilities. Because all of the DSTs will exceed their 40-year design life during the approximate 80-year period of waste retrieval, they would be replaced in a phased manner through 2054.

Retrieval: Using currently available liquid-based waste retrieval and leak detection systems, waste would be retrieved to the minimum goal of the Hanford Federal Facility Agreement and Consent Order, also known as the Tri-Party Agreement (TPA), i.e., residual waste would not exceed 10.2 cubic meters (360 cubic feet) for the 100-series tanks or 0.85 cubic meters (30 cubic feet) for the smaller 200-series tanks, corresponding to 99 percent retrieval. This approach would be the same under Tank Closure Alternative 2B.

Treatment: The existing WTP configuration (two high-level radioactive waste [HLW] melters and two low-activity waste [LAW] melters) would operate at a theoretical maximum capacity (TMC) of 6 metric tons of glass IHLW per day and 30 metric tons of glass ILAW per day. Treatment would start in 2018, and both HLW and LAW treatment would end in 2093. All of the waste streams routed to the WTP would be pretreated, although technetium-99 removal would not occur. The WTP would need to be replaced after 60 years due to design-life constraints. No supplemental or transuranic (TRU) waste treatment is proposed. The cesium and strontium capsules would be retrieved from the WESF, de-encapsulated, and treated in the WTP.

Disposal: LAW immobilized via the WTP would be disposed of on site in an IDF. IHLW would be stored on site until disposition decisions are made and implemented. This approach would be the same under Tank Closure Alternative 2B.

Closure: Tank closure would not be addressed under this alternative. For analysis purposes, administrative control of the tank farms would cease following a 100-year period ending in 2193.

Tank Closure Alternative 2B: Expanded WTP Vitrification; Landfill Closure

Storage: DOE would continue current waste management operations using existing tank storage facilities. No new DSTs would be required, but four new waste receiver facilities (WRFs), which are below-grade lag storage and minimal waste treatment facilities, would be constructed.

Retrieval: Using currently available liquid-based waste retrieval and leak detection systems, waste would be retrieved to the TPA minimum goal, i.e., residual waste would not exceed 10.2 cubic meters (360 cubic feet) for the 100-series tanks or 0.85 cubic meters (30 cubic feet) for the smaller 200-series tanks, corresponding to 99 percent retrieval. This approach would be the same under Tank Closure Alternative 2A.

Treatment: The existing WTP configuration (two HLW melters and two LAW melters) would be supplemented with expanded LAW vitrification capacity (an addition of four LAW melters) to provide a vitrification TMC of 6 metric tons of glass IHLW per day and 90 metric tons of glass ILAW per day. Treatment would start in 2018 and end in approximately 2040 (for HLW) and 2043 (for LAW). All of the waste streams routed to the WTP would be pretreated, including technetium-99 removal from the LAW stream. No facilities would need to be replaced. No supplemental or TRU waste treatment is proposed. The cesium and strontium capsules would be retrieved from the WESF, de-encapsulated, and treated in the WTP.

Disposal: LAW immobilized via the WTP would be disposed of on site in an IDF. IHLW would be stored on site until disposition decisions are made and implemented. This approach would be the same under Tank Closure Alternative 2A.

Closure: As operations are completed, the SST system at Hanford would be closed as a Resource Conservation and Recovery Act (RCRA) hazardous waste landfill unit under Section 173-303 of the *Washington Administrative Code* (WAC 173-303), "Dangerous Waste Regulations," and DOE Order 435.1, *Radioactive Waste Management*, as applicable, or it would be decommissioned under DOE Order 430.1B, *Real Property Asset Management*. The tanks and ancillary equipment would be filled with grout to immobilize the residual waste, prevent future tank subsidence, and discourage intruder access. Soil would be removed down to 4.6 meters (15 feet) at the BX and SX tank farms and replaced with clean soil from onsite sources. The removed contaminated soils and ancillary equipment would be disposed of on site in the River Protection Project Disposal Facility (RPPDF), a new facility similar to an IDF. The closed tank systems and six sets of adjacent cribs and trenches (ditches) would be covered with an engineered modified RCRA Subtitle C barrier. Postclosure care would continue for 100 years.

Tank Closure Alternative 3: Existing WTP Vitrification with Supplemental Treatment Technology; Landfill Closure

This alternative consists of three subalternatives: (1) Tank Closure Alternative 3A: Existing WTP Vitrification with Thermal Supplemental Treatment (Bulk Vitrification); Landfill Closure, (2) Tank Closure Alternative 3B: Existing WTP Vitrification with Nonthermal Supplemental Treatment (Cast Stone); Landfill Closure, and (3) Tank Closure Alternative 3C: Existing WTP Vitrification with Thermal Supplemental Treatment (Steam Reforming); Landfill Closure. These subalternatives would involve the use of either thermal or nonthermal treatment technologies to supplement the WTP treatment processes. TRU tank waste would be packaged and interim-stored pending shipment to the Waste Isolation Pilot Plant (WIPP) for disposal.

Tank Closure Alternative 3A: Existing WTP Vitrification with Thermal Supplemental Treatment (Bulk Vitrification); Landfill Closure

Storage: DOE would continue current waste management operations using existing tank storage facilities. No new DSTs would be required, but four new WRFs would be constructed. This approach would be the same under Tank Closure Alternatives 3B and 3C.

Retrieval: Using currently available liquid-based waste retrieval and leak detection systems, waste would be retrieved to the TPA minimum goal, i.e., residual waste would not exceed 10.2 cubic meters (360 cubic feet) for the 100-series tanks or 0.85 cubic meters (30 cubic feet) for the smaller 200-series tanks, corresponding to 99 percent retrieval. This approach would be the same under Tank Closure Alternatives 3B and 3C.

Treatment: The existing WTP configuration (two HLW melters and two LAW melters) would operate at a TMC of 6 metric tons of glass IHLW per day and 30 metric tons of glass ILAW per day. Treatment would start in 2018, and both HLW and LAW treatment would end in approximately 2040. All waste streams routed to the WTP would be pretreated, although technetium-99 removal would not occur as part of WTP pretreatment. WTP capacity would be supplemented with bulk vitrification treatment capacity to immobilize a portion of the LAW. Bulk vitrification supplemental treatment of the LAW would occur in both the 200-East and 200-West Areas. In the 200-East Area, the waste feed would be pretreated in the WTP, excluding technetium-99 removal. In the 200-West Area, the waste feed would be pretreated in a new Solid-Liquid Separations Facility. A separate portion of the tank waste (approximately 11.8 million liters [3.1 million gallons]) would be designated as mixed TRU waste and treated and packaged for disposal at WIPP.[1] The cesium and strontium capsules would be retrieved from the WESF, de-encapsulated, and treated in the WTP.

Disposal: LAW immobilized both via the WTP and external to the WTP would be disposed of on site in an IDF. IHLW would be stored on site until disposition decisions are made and implemented. Mixed TRU waste would be stored on site in a new storage facility, pending disposal at WIPP. This approach would be the same under Tank Closure Alternatives 3B and 3C.

Closure: As operations are completed, the SST system at Hanford would be closed as an RCRA hazardous waste landfill unit under WAC 173-303, "Dangerous Waste Regulations," and DOE Order 435.1, *Radioactive Waste Management*, as applicable, or it would be decommissioned under DOE Order 430.1B, *Real Property Asset Management*. The tanks and ancillary equipment would be filled with grout to immobilize the residual waste, prevent future tank subsidence, and discourage intruder access. Soil would be removed down to 4.6 meters (15 feet) at the BX and SX tank farms and replaced with clean soils from onsite sources. The removed contaminated soils and ancillary equipment would be disposed of on site in the RPPDF. The closed tank systems and six sets of adjacent cribs and trenches (ditches) would be covered with an engineered modified RCRA Subtitle C barrier. Postclosure care would continue for 100 years. This approach would be the same under Tank Closure Alternatives 3B and 3C.

[1] DOE believes there may be certain HLW storage tanks that it could demonstrate should be classified as TRU waste based on the origin of the waste. This *Draft TC & WM EIS* evaluates the environmental impacts of managing this waste as TRU waste because it assumes the historical processing data support this classification. For Alternatives 3 through 5, the EIS analyses evaluated treating the waste stream associated with the TRU waste portion as both TRU waste and HLW because this waste has not gone through the TRU waste confirmation and certification process.

Tank Closure Alternative 3B: Existing WTP Vitrification with Nonthermal Supplemental Treatment (Cast Stone); Landfill Closure

Storage: DOE would continue current waste management operations using existing tank storage facilities. No new DSTs would be required, but four new WRFs would be constructed. This approach would be the same under Tank Closure Alternatives 3A and 3C.

Retrieval: Using currently available liquid-based waste retrieval and leak detection systems, waste would be retrieved to the TPA minimum goal, i.e., residual waste would not exceed 10.2 cubic meters (360 cubic feet) for the 100-series tanks or 0.85 cubic meters (30 cubic feet) for the smaller 200-series tanks, corresponding to 99 percent retrieval. This approach would be the same under Tank Closure Alternatives 3A and 3C.

Treatment: The existing WTP configuration (two HLW melters and two LAW melters) would operate at a TMC of 6 metric tons of glass IHLW per day and 30 metric tons of glass ILAW per day. Treatment would start in 2018, and both HLW and LAW treatment would end in approximately 2040. All waste streams routed to the WTP would be pretreated, including technetium-99 removal from the LAW stream. WTP capacity would be supplemented with cast stone treatment capacity to immobilize a portion of the LAW. Cast stone supplemental treatment of the LAW would occur in both the 200-East and 200-West Areas. In the 200-East Area, the waste feed would be pretreated in the WTP, including technetium-99 removal. In the 200-West Area, the waste feed would be pretreated in a new Solid-Liquid Separations Facility. A separate portion of the tank waste (approximately 11.8 million liters [3.1 million gallons]) would be designated as mixed TRU waste and packaged for disposal at WIPP. The cesium and strontium capsules would be retrieved from the WESF, de-encapsulated, and treated in the WTP.

Disposal: LAW immobilized both via the WTP and external to the WTP would be disposed of on site in an IDF. IHLW would be stored on site until disposition decisions are made and implemented. Mixed TRU waste would be stored on site in a new storage facility, pending disposal at WIPP. This approach would be the same under Tank Closure Alternatives 3A and 3C.

Closure: As operations are completed, the SST system at Hanford would be closed as an RCRA hazardous waste landfill unit under WAC 173-303, "Dangerous Waste Regulations," and DOE Order 435.1, *Radioactive Waste Management*, as applicable, or it would be decommissioned under DOE Order 430.1B, *Real Property Asset Management*. The tanks and ancillary equipment would be filled with grout to immobilize the residual waste, prevent future tank subsidence, and discourage intruder access. Soil would be removed down to 4.6 meters (15 feet) at the BX and SX tank farms and replaced with clean soils from onsite sources. The removed contaminated soils and ancillary equipment would be disposed of on site in the RPPDF. The closed tank systems and six sets of adjacent cribs and trenches (ditches) would be covered with an engineered modified RCRA Subtitle C barrier. Postclosure care would continue for 100 years. This approach would be the same under Tank Closure Alternatives 3A and 3C.

Tank Closure Alternative 3C: Existing WTP Vitrification with Thermal Supplemental Treatment (Steam Reforming); Landfill Closure

Storage: DOE would continue current waste management operations using existing tank storage facilities. No new DSTs would be required, but four new WRFs would be constructed. This approach would be the same under Tank Closure Alternatives 3A and 3B.

Retrieval: Using currently available liquid-based waste retrieval and leak detection systems, waste would be retrieved to the TPA minimum goal, i.e., residual waste would not exceed 10.2 cubic meters (360 cubic feet) for the 100-series tanks or 0.85 cubic meters (30 cubic feet) for the smaller 200-series

tanks, corresponding to 99 percent retrieval. This approach would be the same under Tank Closure Alternatives 3A and 3B.

Treatment: The existing WTP configuration (two HLW melters and two LAW melters) would operate at a TMC of 6 metric tons of glass IHLW per day and 30 metric tons of glass ILAW per day. Treatment would start in 2018, and both HLW and LAW treatment would end in approximately 2040. All waste streams routed to the WTP would be pretreated, although technetium-99 removal would not occur as part of WTP pretreatment. WTP capacity would be supplemented with steam reforming treatment capacity to immobilize a portion of the LAW. The steam reforming supplemental treatment for the LAW would occur in both the 200-East and 200-West Areas. In the 200-East Area, the waste feed would be pretreated in the WTP, excluding technetium-99 removal. In the 200-West Area, the waste feed would be pretreated in a new Solid-Liquid Separations Facility. A separate portion of the tank waste (approximately 11.8 million liters [3.1 million gallons]) would be designated as mixed TRU waste and treated and packaged for disposal at WIPP. The cesium and strontium capsules would be retrieved from the WESF, de-encapsulated, and treated in the WTP.

Disposal: LAW immobilized both via the WTP and external to the WTP would be disposed of on site in an IDF. IHLW would be stored on site until disposition decisions are made and implemented. Mixed TRU waste would be stored on site in a new storage facility, pending disposal at WIPP. This approach would be the same under Tank Closure Alternatives 3A and 3B.

Closure: As operations are completed, the SST system at Hanford would be closed as an RCRA hazardous waste landfill unit under WAC 173-303, "Dangerous Waste Regulations," and DOE Order 435.1, *Radioactive Waste Management*, as applicable, or it would be decommissioned under DOE Order 430.1B, *Real Property Asset Management*. The tanks and ancillary equipment would be filled with grout to immobilize the residual waste, prevent future tank subsidence, and discourage intruder access. Soil would be removed down to 4.6 meters (15 feet) at the BX and SX tank farms and replaced with clean soils from onsite sources. The removed contaminated soils and ancillary equipment would be disposed of on site in the RPPDF. The closed tank systems and six sets of adjacent cribs and trenches (ditches) would be covered with an engineered modified RCRA Subtitle C barrier. Postclosure care would continue for 100 years. This approach would be the same under Tank Closure Alternatives 3A and 3B.

Tank Closure Alternative 4: Existing WTP Vitrification with Supplemental Treatment Technologies; Selective Clean Closure/Landfill Closure

This alternative involves the use of both thermal and nonthermal treatment technologies (bulk vitrification and cast stone, respectively) to supplement WTP treatment. This alternative also evaluates treatment of 99.9 percent of the waste volume in the tank farms, clean closure of two representative (BX and SX) tank farms, and landfill closure of the remaining tank farms.

Storage: DOE would continue current waste management operations using existing tank storage facilities. No new DSTs would be required, but four new WRFs would be constructed.

Retrieval: Using currently available liquid-based retrieval and leak detection systems and a final chemical wash step, waste would be retrieved to a volume corresponding to 99.9 percent retrieval, equal to residual tank waste of no more than 1 cubic meter (36 cubic feet) for the 100-series tanks or 0.08 cubic meters (3 cubic feet) for the smaller 200-series tanks.

Treatment: The existing WTP configuration (two HLW melters and two LAW melters) would operate at a TMC of 6 metric tons of glass IHLW per day and 30 metric tons of glass ILAW per day. Treatment would start in 2018, and both HLW and LAW treatment would end in approximately 2043, including

treatment of the highly contaminated waste stream resulting from clean closure of the BX and SX tank farms. All waste streams routed to the WTP would be pretreated, although technetium-99 removal would not occur as part of WTP pretreatment. WTP capacity would be supplemented with additional waste treatment capacity to immobilize a portion of the LAW. Supplemental treatment of the LAW would occur in both the 200-East and 200-West Areas and consist of a combination of cast stone treatment in the 200-East Area and bulk vitrification treatment in the 200-West Area. The waste stream feed for the 200-East Area cast stone supplemental treatment facility would be pretreated in the WTP, excluding technetium-99 removal. In the 200-West Area, the waste feed would be pretreated in a new Solid-Liquid Separations Facility. A separate portion of the tank waste (approximately 11.8 million liters [3.1 million gallons]) would be designated as mixed TRU waste and packaged for disposal at WIPP. The cesium and strontium capsules would be retrieved from the WESF, de-encapsulated, and treated in the WTP.

Disposal: LAW immobilized both via the WTP and external to the WTP would be disposed of on site in an IDF. IHLW would be stored on site until disposition decisions are made and implemented. Mixed TRU waste would be packaged and stored on site in an existing or new storage facility, pending disposal at WIPP.

Closure: As operations are completed, the SST system at Hanford, except the BX and SX tank farms, would be closed as an RCRA hazardous waste landfill unit under WAC 173-303, "Dangerous Waste Regulations," and DOE Order 435.1, *Radioactive Waste Management*, as applicable, or it would be decommissioned under DOE Order 430.1B, *Real Property Asset Management*. The tanks and ancillary equipment would be filled with grout to immobilize the residual waste, prevent long term degradation of the tanks, and discourage intruder access. The closed tank systems, except the BX and SX tank farms and six sets of adjacent cribs and trenches (ditches), would be covered with an engineered modified RCRA Subtitle C barrier. Postclosure care would continue for 100 years. The BX and SX tank farms would be clean-closed by removing the tanks, ancillary equipment, and soils to a depth of 3 meters (10 feet) below the tank base. The removed tanks, ancillary equipment, and soils would be treated, as appropriate, in the Preprocessing Facility (PPF), resulting in MLLW and a highly contaminated liquid waste stream. The MLLW would be disposed of on site, and the highly contaminated liquid waste stream would be processed as HLW in the WTP, resulting in additional IHLW. Where necessary, deep soil excavation would also be conducted to remove contamination plumes within the soil column. Highly contaminated soils from deep soil excavation would be treated in the PPF. This process would generate a contaminated liquid waste stream that would be processed as LAW in the WTP, resulting in additional ILAW. The washed soils would be disposed of in the RPPDF. The BX and SX tank farms would be backfilled with clean soil.

Tank Closure Alternative 5: Expanded WTP Vitrification with Supplemental Treatment Technologies; Landfill Closure

This alternative involves the use of both thermal and nonthermal treatment technologies (bulk vitrification and cast stone, respectively) to supplement the WTP treatment. This alternative also evaluates retrieval and treatment of 90 percent of the tank waste volume in the tank farms, but on an accelerated schedule, as well as landfill closure of the SST system.

Storage: DOE would continue current waste management operations using existing tank storage facilities. Four new DSTs and four WRFs would be constructed.

Retrieval: Using currently available liquid-based retrieval and leak detection systems, waste would be retrieved to a volume corresponding to 90 percent retrieval, less than the TPA Milestone M-45-00 minimum goal of 99 percent. Retrieval to 90 percent represents a programmatic risk analysis for the tank farms as defined by Appendix H of the TPA, "Single-Shell Tank Waste Retrieval Criteria Procedure."

The 90 percent retrieval level would be equal to residual tank waste of no more than 102 cubic meters (3,600 cubic feet) for the 100-series tanks or 8.5 cubic meters (300 cubic feet) for the smaller 200-series tanks.

Treatment: The existing WTP configuration (two HLW melters and two LAW melters) would be supplemented with expanded LAW vitrification capacity (an addition of one LAW melter) to provide a vitrification TMC of 6 metric tons of glass IHLW per day and 45 metric tons of glass ILAW per day. All waste streams routed to the WTP would be pretreated, although technetium-99 removal would not occur as part of WTP pretreatment. Treatment would start in 2018 and end in approximately 2034. This alternative considers implementation of a sulfate removal technology following WTP pretreatment that would potentially reduce the amount of glass produced in the WTP by increasing the waste loading in the ILAW glass. WTP capacity would be supplemented with additional waste treatment capacity to immobilize a portion of the LAW. Supplemental treatment of the LAW would occur in both the 200-East and 200-West Areas and consist of a combination of cast stone treatment in the 200-East Area and bulk vitrification treatment in the 200-West Area. The waste stream feed for the 200-East Area Cast Stone Facility would be pretreated in the WTP, excluding technetium-99 removal. In the 200-West Area, the waste feed would be pretreated in a new Solid-Liquid Separations Facility. A separate portion of the tank waste (approximately 11.8 million liters [3.1 million gallons]) would be designated as mixed TRU waste and packaged for disposal at WIPP. The cesium and strontium capsules would be retrieved from the WESF, de-encapsulated, and treated in the WTP.

Disposal: LAW immobilized both via the WTP and external to the WTP would be disposed of on site in an IDF. IHLW would be stored on site until disposition decisions are made and implemented. Mixed TRU waste would be packaged and stored on site in a new storage facility, pending disposal at WIPP.

Closure: As operations are completed, the SST system would be closed as an RCRA hazardous waste landfill unit under WAC 173-303, "Dangerous Waste Regulations," and DOE Order 435.1, *Radioactive Waste Management*, or it would be decommissioned under DOE Order 430.1B, *Real Property Asset Management*. The tanks and ancillary equipment would be filled with grout to immobilize the residual waste, prevent long-term degradation of the tanks, and discourage intruder access. The tank systems (tanks, ancillary equipment, and soils) and the six sets of adjacent cribs and trenches (ditches) would be closed in place and covered with the Hanford barrier (a barrier with performance characteristics that exceed RCRA requirements for disposal of hazardous waste). To support this schedule, SST system ancillary equipment outside the boundaries of the surface barriers would not be removed or decontaminated. Postclosure care would continue for 100 years.

Tank Closure Alternative 6: All Waste as Vitrified HLW[2]

This alternative consists of three subalternatives: (1) Alternative 6A: All Vitrification/No Separations; Clean Closure (Base and Option Cases), (2) Alternative 6B: All Vitrification with Separations; Clean Closure (Base and Option Cases), and (3) Alternative 6C: All Vitrification with Separations; Landfill Closure. These alternatives evaluate an all-vitrification case wherein all vitrified waste would be managed as HLW.

[2] Alternatives 6A, 6B, and 6C of this EIS evaluate management of tank waste as HLW combined with different closure scenarios. The purpose of Alternative 6A is to evaluate the bounding case for no-separation scenarios. The DOE Manual 435.1-1, "*Radioactive Waste Management Manual,*" waste incidental to reprocessing evaluation determination process is not required for treatment of the waste under these alternatives.

Tank Closure Alternative 6A: All Vitrification/No Separations; Clean Closure (Base and Option Cases)

Storage: DOE would continue current waste management operations using existing tank storage facilities that would be modified as needed to support SST waste retrieval and treatment. New DSTs would be required after the existing DSTs reach the end of their design life.

Retrieval: Using currently available liquid-based retrieval and leak detection systems and a final chemical wash step, waste would be retrieved to a volume corresponding to 99.9 percent retrieval, equal to residual tank waste of no more than 1 cubic meter (36 cubic feet) for the 100-series tanks or 0.08 cubic meters (3 cubic feet) for the smaller 200-series tanks. This approach would be the same under Tank Closure Alternative 6B.

Treatment: The existing WTP configuration would be modified to process all waste as HLW through expanded HLW vitrification capacity. This new WTP configuration (five HLW melters and no LAW melters) would provide a total vitrification TMC of 15 metric tons of glass IHLW per day. Treatment would start in 2018 and end in approximately 2163, requiring two WTP replacement facilities due to design-life constraints. There would be no pretreatment, LAW treatment, or technetium-99 removal. No supplemental or TRU waste treatment is proposed. The cesium and strontium capsules would be retrieved from the WESF, de-encapsulated, and treated in the WTP.

Disposal: IHLW canisters would be stored on site until disposition decisions are made and implemented. Replacement of the canister storage facilities would be required after a 60-year design life. The HLW debris from clean closure would be managed as HLW and stored on site.

Closure: Clean closure of all twelve 200-East and 200-West Area SST farms following deactivation would involve removal of all tanks, associated ancillary equipment, and contaminated soil to a depth of 3 meters (10 feet) directly beneath the tank base. These materials would be packaged as HLW for onsite storage in shielded boxes. Where necessary, deep soil excavation would also be conducted to remove contamination plumes within the soil column. The new PPF would process the highly contaminated deep soil to render it acceptable for onsite disposal. The liquid waste stream from the PPF soil washing would be thermally treated in the PPF and disposed of on site in an IDF. The washed soils would be disposed of in the RPPDF. Clean closure of the SST system would preclude the need for postclosure care. The six sets of adjacent cribs and trenches (ditches) would be covered with an engineered modified RCRA Subtitle C barrier (Base Case). Optional clean closure of these cribs and trenches (ditches) would occur under the Option Case. This approach would be the same under Tank Closure Alternative 6B.

Tank Closure Alternative 6B: All Vitrification with Separations; Clean Closure (Base and Option Cases)

Storage: DOE would continue current waste management operations using existing tank storage facilities. No new DSTs would be required, but four new WRFs would be constructed. This approach would be the same under Tank Closure Alternative 6C.

Retrieval: Using currently available liquid-based retrieval and leak detection systems and a final chemical wash step, waste would be retrieved to a volume corresponding to 99.9 percent retrieval, equal to residual tank waste of no more than 1 cubic meter (36 cubic feet) for the 100-series tanks or 0.08 cubic meters (3 cubic feet) for the smaller 200-series tanks. This approach would be the same under Tank Closure Alternative 6A.

Treatment: The existing WTP configuration (two HLW melters and two LAW melters) would be supplemented with expanded LAW vitrification capacity (an addition of four LAW melters) to provide a

vitrification TMC of 6 metric tons of glass IHLW per day and 90 metric tons of glass ILAW per day. Treatment would start in 2018 and end in approximately 2040 (for HLW) and 2043 (for LAW). All waste streams routed to the WTP would be pretreated, although technetium-99 removal would not occur as part of WTP pretreatment. No supplemental or TRU waste treatment is proposed. The cesium and strontium capsules would be retrieved from the WESF, de-encapsulated, and treated in the WTP. This approach would be the same under Tank Closure Alternative 6C.

Disposal: IHLW canisters would be stored on site until disposition decisions are made and implemented. ILAW glass canisters would be managed as HLW and stored on site. HLW debris from clean closure also would be managed as HLW and stored on site. This approach would be the same under Tank Closure Alternative 6C.

Closure: Clean closure of all twelve 200-East and 200-West Area SST farms following deactivation would involve removal of all tanks, associated ancillary equipment, and contaminated soil to a depth of 3 meters (10 feet) directly beneath the tank base. These materials would be packaged as HLW for onsite storage in shielded boxes. Where necessary, deep soil excavation would also be conducted to remove contamination plumes within the soil column. The new PPF would process the highly contaminated deep soil to render it acceptable for onsite disposal. The liquid waste stream from the PPF soil washing would be thermally treated in the PPF and disposed of on site in an IDF. The washed soils would be disposed of in the RPPDF. Clean closure of the SST system would preclude the need for postclosure care. The six sets of adjacent cribs and trenches (ditches) would be covered with an engineered modified RCRA Subtitle C barrier (Base Case). Optional clean closure of these cribs and trenches (ditches) would occur under the Option Case. This approach would be the same under Tank Closure Alternative 6A.

Tank Closure Alternative 6C: All Vitrification with Separations; Landfill Closure (Base and Option Cases)

Storage: DOE would continue current waste management operations using existing tank storage facilities. No new DSTs would be required, but four new WRFs would be constructed. This approach would be the same under Tank Closure Alternative 6B.

Retrieval: Using currently available liquid-based waste retrieval and leak detection systems, waste would be retrieved to the TPA minimum goal, i.e., residual waste would not exceed 10.2 cubic meters (360 cubic feet) for the 100-series tanks or 0.85 cubic meters (30 cubic feet) for the smaller 200-series tanks, corresponding to 99 percent retrieval.

Treatment: The existing WTP configuration (two HLW melters and two LAW melters) would be supplemented with expanded LAW vitrification capacity (an addition of four LAW melters) to provide a vitrification TMC of 6 metric tons of glass IHLW per day and 90 metric tons of glass ILAW per day. Treatment would start in 2018 and end in approximately 2040 (for HLW) and 2043 (for LAW). All waste streams routed to the WTP would be pretreated, although technetium-99 removal would not occur as part of WTP pretreatment. No supplemental or TRU waste treatment is proposed. The cesium and strontium capsules would be retrieved from the WESF, de-encapsulated, and treated in the WTP. This approach would be the same under Tank Closure Alternative 6B.

Disposal: IHLW canisters would be stored on site until disposition decisions are made and implemented. ILAW glass canisters would be managed as HLW and stored on site. This approach would be the same under Tank Closure Alternative 6B.

Closure: As operations are completed, the SST system would be closed as an RCRA hazardous waste landfill unit under WAC 173-303, "Dangerous Waste Regulations," and under DOE Order 435.1, *Radioactive Waste Management,* or it would be decommissioned under DOE Order 430.1B,

Real Property Asset Management. The tanks would be filled with grout to immobilize the residual waste, prevent long-term degradation of the tanks, and discourage intruder access. Soil would be removed down to 4.6 meters (15 feet) at the BX and SX tank farms and replaced with clean soils from onsite sources. The removed contaminated soils and ancillary equipment would be disposed of on site in the RPPDF. The closed tank systems and the six sets of adjacent cribs and trenches (ditches) would be covered with an engineered modified RCRA Subtitle C barrier. Postclosure care would continue for 100 years.

Table 1 compares each of the tank closure alternatives by component.

FFTF DECOMMISSIONING

In 2004, DOE published in the *Federal Register* a "Notice of Intent for the Environmental Impact Statement for the Decommissioning of the Fast Flux Test Facility at the Hanford Site, Richland, Washington" (69 FR 50176) that identified three alternatives for decommissioning FFTF and auxiliary facilities at Hanford. That EIS was not completed; however, the same alternatives—no action, entombment, and removal—were adopted for analysis in this *TC & WM EIS*.

FFTF Decommissioning Alternative 1: No Action

As previously stated, Council on Environmental Quality NEPA regulations (40 CFR 1500–1508) and DOE NEPA regulations (10 CFR 1021) require analysis of a "no action" alternative. The FFTF Decommissioning No Action Alternative includes completion of actions in accordance with previous DOE NEPA decisions. Final decommissioning of FFTF would not occur. Specifically, only deactivation activities for the FFTF complex and support buildings, as described in the 2006 *Environmental Assessment, Sodium Residuals Reaction/Removal and Other Deactivation Work Activities, Fast Flux Test Facility (FFTF) Project, Hanford Site, Richland, Washington* (DOE/EA-1547F), would be conducted. Deactivation activities would include removal and packaging of the four RH-SCs for storage in the 400 Area, as described in the Finding of No Significant Impact, dated March 31, 2006. The FFTF Reactor Containment Building (RCB) and the rest of the buildings within the 400 Area Property Protected Area (PPA) would be maintained through 2107 (for 100 years after the *TC & WM EIS* Record of Decision is published) under administrative controls such as site security and management. After 2107, administrative controls would cease and remaining waste is assumed to become available for release to the environment.

Table 1. Comparison of Tank Closure Alternatives

	Alternative 1: No Action	Alternative 2A: Existing WTP Vitrification; No Closure	Alternative 2B: Expanded WTP Vitrification; Landfill Closure	Alternative 3A: Existing WTP Vitrification with Thermal Supplemental Treatment (Bulk Vitrification); Landfill Closure	Alternative 3B: Existing WTP Vitrification with Nonthermal Supplemental Treatment (Cast Stone); Landfill Closure	Alternative 3C: Existing WTP Vitrification with Thermal Supplemental Treatment (Steam Reforming); Landfill Closure	Alternative 4: Existing WTP Vitrification with Supplemental Treatment Technologies; Selective Clean Closure/Landfill Closure	Alternative 5: Expanded WTP Vitrification with Supplemental Treatment Technologies; Landfill Closure	Alternative 6A: All Vitrification/No Separations; Clean Closure	Alternative 6B: All Vitrification with Separations; Clean Closure	Alternative 6C: All Vitrification with Separations; Landfill Closure
Storage											
Existing	✓										
New WRFs			✓	✓	✓	✓	✓	✓		✓	✓
New DSTs		✓						✓	✓		
Retrieval											
90 percent								✓			
99 percent		✓	✓	✓	✓	✓					✓
99.9 percent							✓		✓	✓	
Treatment											
WTP											
Existing vitrification only		✓		✓	✓	✓	✓				
Expanded LAW vitrification			✓					✓		✓	✓
Expanded HLW vitrification									✓		
Replacement of WTP		✓							✓		
Technetium-99 removal			✓		✓						
Sulfate removal								✓			
Cesium and strontium capsules		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Non-WTP											
Tank mixed TRU waste supplemental treatment				✓	✓	✓	✓	✓			
Thermal supplemental treatment				✓		✓	✓	✓			
Nonthermal supplemental treatment					✓		✓	✓			
Disposal (including post-treatment storage)											
On Site											
ILAW		✓	✓	✓	✓	✓	✓	✓		a	a
IHLW[b]		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Grouted sulfate								✓			
Contaminated soil			✓	✓	✓	✓	✓		✓	✓	✓
SSTs							c		d	d	
Off Site											
Tank mixed TRU waste to WIPP				✓	✓	✓	✓	✓			
Closure											
Clean closure									✓	✓	
Selective clean closure/landfill closure							✓				
Landfill closure			✓	✓	✓	✓		✓			✓
Modified RCRA Subtitle C barrier			✓	✓	✓	✓	✓		e	e	✓
Hanford barrier								✓			

a Under Alternatives 6B and 6C, ILAW glass would be interim-stored on site and managed as IHLW glass.

b Although disposition decisions have not been made and implemented, these alternatives do not assume the inventory in the IHLW canisters remains on site. However, the number of storage facilities needed to store all the IHLW is one more than the number of canister storage facilities analyzed under Tank Closure Alternative 2B.

c Under Alternative 4, SSTs at the BX and SX tank farms would be removed and treated in the Preprocessing Facility.

d Under Alternatives 6A and 6B, all SSTs would be removed and packaged in shielded boxes for onsite storage pending disposition.

e Base Case: Construct modified RCRA Subtitle C barrier over six sets of cribs and trenches (ditches) in the B and T Areas. Option Case: Remove six sets of cribs and trenches (ditches) in the B and T Areas and remediate their deep-soil plumes.

Key: DST=double-shell tank; HLW=high-level radioactive waste; IHLW=immobilized high-level radioactive waste; ILAW=immobilized low-activity waste; LAW=low-activity waste; RCRA=Resource Conservation and Recovery Act; SST=single-shell tank; TRU=transuranic; WIPP=Waste Isolation Pilot Plant; WRF=waste receiver facility; WTP=Waste Treatment Plant.

FFTF Decommissioning Alternative 2: Entombment

Facility Disposition: The Entombment Alternative consists of removing all aboveground structures within the 400 Area PPA and minimal removal of below-grade structures, equipment, and materials as required for compliance with regulatory standards. The RCB would be demolished and removed to grade, and the auxiliary facilities would be removed to 0.91 meters (3 feet) below grade. Equipment, piping, and components containing hazardous and radioactive materials would be removed from below-grade structures only as needed for treatment to meet regulatory requirements. Any other necessary treatment of equipment or components would occur in place (without removal from the facilities). After treatment, some of the components could be returned to below-grade spaces and grouted in place with the remaining structures and equipment to stabilize them and minimize void space. Most other equipment and materials removed from the facilities would be disposed of in the 200 Areas. An RCRA-compliant barrier would be constructed over the remains of the RCB and any other remaining below-grade structures (including the reactor vessel) that contain residual radioactive and treated hazardous materials. Equipment to be removed under this alternative would include the RH-SCs, which contain sufficient quantities of metallic sodium and radionuclides that they could not be treated and entombed in the RCB with the remaining materials.

Disposition of Remote-Handled Special Components: The RH-SCs consist of four large filter assemblies designed to remove radionuclides and other contaminants from the FFTF sodium coolant systems and the inert-cover gas systems. These components contain sufficient quantities of radionuclides to require remote handling and would require treatment to drain and stabilize residual metallic sodium prior to disposal. Removal and storage of the RH-SCs in the 400 Area are covered in a Finding of No Significant Impact dated March 31, 2006. It would be necessary to treat these components in a specialized facility that is equipped to handle hazardous reactive materials and components with high radiological dose rates. Such a facility does not currently exist within the DOE waste management complex; however, most other waste generated during facility decommissioning could be managed using existing or proposed capabilities. Therefore, DOE needs to decide on an approach for treating and disposing of the FFTF RH-SCs. The two options discussed below are being considered for managing these components.

- **Hanford Option.** The RH-SCs would be shipped to an onsite treatment facility. The capability to treat these components does not currently exist at Hanford, nor has such a capability been previously proposed, although construction of a facility to treat remote-handled and oversized MLLW or TRU waste was evaluated in a previous NEPA review. Following treatment, the components and residuals would be disposed of with other Hanford waste in the 200 Areas. DOE is considering this option for management of the FFTF RH-SCs in response to scoping comments that recommended minimizing offsite transportation of these components and treatment residuals.

- **Idaho Option.** The RH-SCs would be shipped to the proposed Remote Treatment Project (RTP) at Idaho National Laboratory's (INL's) Materials and Fuels Complex (MFC). The proposed RTP would treat remote-handled components containing comparable levels of radiological materials, as well as metallic sodium. An environmental assessment was prepared at INL to evaluate this proposed treatment and a Finding of No Significant Impact was issued on February 18, 2009. However, DOE will make a decision on the treatment of FFTF RH-SCs as part of the *TC & WM EIS* NEPA process. Following treatment at the RTP, the FFTF components and residuals would be disposed of with other INL waste at an offsite facility, or they could be returned to Hanford for disposal. DOE is considering this option for the FFTF RH-SCs to utilize the existing sodium management expertise at the MFC and to consolidate waste management activities within the DOE complex at existing or proposed facilities.

Disposition of Bulk Sodium: The Hanford radioactively contaminated bulk sodium inventory consists of approximately 1.1 million liters (300,000 gallons) of metallic sodium, including sodium from the Hallam Reactor and the Sodium Reactor Experiment, in addition to sodium drained from the FFTF cooling systems during deactivation. Hallam and Sodium Reactor Experiment sodium are currently stored in the Hanford 200-West Area Central Waste Complex (CWC). Sodium from FFTF is stored in the 400 Area within the RCB or adjacent storage facilities. The current DOE plan for this sodium is to convert it to a caustic for product reuse by the DOE Office of River Protection. The two options discussed below are being considered for managing the Hanford radioactively contaminated bulk sodium inventory.

- **Hanford Reuse Option.** The bulk sodium would be stored in its current locations until it is shipped to an onsite facility for processing into a caustic (sodium hydroxide). The capability to process the bulk sodium does not currently exist at Hanford. The treated caustic would be transferred to the 200-East Area for product reuse by the Office of River Protection for the WTP. DOE is considering this option for processing the Hanford bulk sodium inventory in response to scoping comments that recommended minimizing the need for offsite transportation of the bulk sodium and caustic.

- **Idaho Reuse Option.** The bulk sodium would be stored in its current locations until it is shipped to the MFC for processing. The capability to process bulk metallic sodium currently exists at the MFC Sodium Processing Facility, which was previously used to process metallic sodium from the Experimental Breeder Reactor II and other facilities. Following processing, the caustic would be returned to Hanford for use in the WTP. DOE is considering this option for processing the Hanford bulk sodium inventory to utilize existing sodium management expertise and facilities at the MFC.

FFTF Decommissioning Alternative 3: Removal

Facility Disposition: The Removal Alternative consists of removing all above-grade structures within the 400 Area PPA, as well as contaminated below-grade structures, equipment, and materials. The RCB would be demolished and removed to grade, and all auxiliary facilities would be removed to 0.91 meters (3 feet) below grade. Most equipment, piping, and components containing chemically hazardous and radioactive materials, including the reactor vessel, lead shielding, depleted uranium shielding, and asbestos, would be removed from below-grade structures. Most equipment and materials removed from the facilities would be disposed of in the 200 Areas. The remaining structures and equipment, consisting mainly of the external RCB structure and associated components, as well as uncontaminated below-grade portions of auxiliary facilities, would be backfilled or grouted to minimize void space. The PPA would be backfilled to grade, contoured, and revegetated as necessary to stabilize the ground surface or to prepare the site for future industrial use.

Disposition of Remote-Handled Special Components: The two options being considered under FFTF Decommissioning Alternative 2 are the same options being considered under FFTF Decommissioning Alternative 3 for disposition of the RH-SCs.

Disposition of Bulk Sodium: The two options being considered under FFTF Decommissioning Alternative 2 are the same options being considered under FFTF Decommissioning Alternative 3 for the disposition of the bulk sodium.

Table 2 outlines key activities under each of the three components (disposition of facilities, RH-SCs, and bulk sodium) and compares these parameters by alternative.

Table 2. Comparison of FFTF Decommissioning Alternatives

	Alternative 1: No Action	Alternative 2: Entombment	Alternative 3: Removal
Facility Disposition			
Facility equipment and components left in place under inert gas blanket	X		
Dismantlement of RCB and adjacent support buildings		X	X
Removal of reactor vessel (internal piping and equipment, attached depleted-uranium shield)			X
Onsite disposal of reactor vessel (internal piping and equipment, attached depleted-uranium shield)			X
Removal and onsite disposal of radioactive or chemical waste	X	X	X
Backfill and revegetation of ancillary facility areas		X	
Backfill and revegetation of Property Protected Area			X
Landfill barrier over RCB		X	
Administrative controls for 100 years	X		
Postclosure care and/or institutional controls for 100 years		X	X
Disposition of Remote-Handled Special Components			
Removal and storage on site per FONSI[a]	X	X	X
Treatment at the Hanford Site		X	X
Treatment at Idaho National Laboratory		X	X
Onsite disposal		X	X
Offsite disposal		X	X
Disposition of Bulk Sodium			
Onsite storage	X	X	X
Onsite conversion to caustic sodium hydroxide solution		X	X
Offsite conversion to caustic sodium hydroxide solution		X	X
Caustic sodium hydroxide solution shipped to the Waste Treatment Plant		X	X

[a] Per 2006 FONSI regarding *Environmental Assessment, Sodium Residuals Reaction/Removal and Other Deactivation Work Activities, Fast Flux Test Facility (FFTF) Project, Hanford Site, Richland, Washington* (DOE 2006b:Appendix B).

Key: FFTF=Fast Flux Test Facility; FONSI=Finding of No Significant Impact; RCB=Reactor Containment Building.

WASTE MANAGEMENT

The Waste Management alternatives evaluated in this *TC & WM EIS* address the expansion of waste disposal capacity at Hanford to dispose of both on- and offsite waste, thus facilitating cleanup of Hanford and other DOE sites. The major mission components include onsite storage and disposal of Hanford-generated and other sites' LLW and MLLW; onsite storage of Hanford-generated TRU waste; and eventual closure of the waste facilities.

Waste Management Alternative 1: No Action

Storage: LLW, MLLW, and TRU waste would be stored at the CWC until it is processed for disposal in low-level radioactive waste burial ground (LLBG) 218-W-5, trenches 31 and 34. Processing of waste prior to disposal would continue at existing facilities at the CWC, Waste Receiving and Processing Facility (WRAP), and T Plant. No offsite LLW, MLLW, or TRU waste would be received.

Disposal: Waste would be disposed of in LLBG 218-W-5, trenches 31 and 34, through 2035. Further construction of the 200-East Area IDF (IDF-East) would be discontinued in 2008, and IDF-East would be deactivated.

Closure: Administrative control would be implemented for 100 years.

Waste Management Alternative 2: Disposal in IDF, 200-East Area Only

Storage: LLW, MLLW, and TRU waste would be stored at the CWC until it is processed for disposal. Processing of waste prior to disposal would occur at existing and expanding facilities at the CWC, WRAP, and T Plant. No offsite TRU waste would be received. Offsite LLW and MLLW would be

received from other DOE sites. A total volume of 62,000 cubic meters (81,000 cubic yards) of LLW and 20,000 cubic meters (26,000 cubic yards) of MLLW was assumed to be received.

Disposal: LLBG 218-W-5, trenches 31 and 34, would continue to operate through 2050. Construction, operations, deactivation, closure, and postclosure care would take place at IDF-East. Waste from tank treatment operations, onsite sources not regulated under the Comprehensive Environmental, Response, Compensation, and Liability Act (CERCLA), FFTF decommissioning, waste management operations, and other DOE sites would be disposed of in IDF-East. Waste from tank farm cleanup operations would be disposed of in the RPPDF.

Closure: Disposal facilities would be covered with engineered modified RCRA Subtitle C barrier.

Waste Management Alternative 3: Disposal in IDF, 200-East and 200-West Areas

Storage: LLW, MLLW, and TRU waste would be stored at the CWC until it is processed for disposal. Processing of waste prior to disposal would occur at existing and expanding facilities at the CWC, WRAP, and T Plant. No offsite TRU waste would be received. Offsite LLW and MLLW would be received from other DOE sites. A total volume of 62,000 cubic meters (81,000 cubic yards) of LLW and 20,000 cubic meters (26,000 cubic yards) of MLLW was assumed to be received.

Disposal: LLBG 218-W-5, trenches 31 and 34, would continue to operate through 2050. Construction, operations, deactivation, closure, and postclosure care would take place in IDF-East and an IDF to be constructed in the 200-West Area (IDF-West). Waste from onsite non-CERCLA sources, FFTF decommissioning, waste management, and other DOE sites would be disposed of in IDF-West. Waste from tank farm cleanup operations would be disposed of in the RPPDF.

Closure: Disposal facilities would be covered with engineered modified RCRA Subtitle C barrier.

Table 3 outlines key activities by alternative for waste storage, treatment, and disposal, as well as facility closure.

Table 3. Comparison of Waste Management Alternatives

	Alternative 1: No Action	Alternative 2: Disposal in IDF, 200-East Area Only	Alternative 3: Disposal in IDF, 200-East and 200-West Areas
Storage			
Existing storage of LLW, MLLW, and TRU waste at CWC	X		
Expanded storage of LLW, MLLW, and TRU waste at CWC		X	X
Existing storage of LLW, MLLW, and TRU waste at WRAP and T Plant	X		
Expanded storage of LLW, MLLW, and TRU waste at WRAP and T Plant		X	X
Treatment			
Existing treatment of LLW, MLLW, and TRU waste at CWC	X		
Expanded treatment of LLW, MLLW, and TRU waste at CWC		X	X
Existing treatment of LLW, MLLW, and TRU waste at WRAP and T Plant	X		
Expanded treatment of LLW, MLLW, and TRU waste at WRAP and T Plant		X	X

Table 3. Comparison of Waste Management Alternatives *(continued)*

	Alternative 1: No Action	Alternative 2: Disposal in IDF, 200-East Area Only	Alternative 3: Disposal in IDF, 200-East and 200-West Areas
Disposal			
Continued disposal of onsite-generated non-CERCLA, nontank LLW and MLLW in onsite lined trenches	X	X	X
Construction of IDF-East terminated and facility deactivated	X		
Disposal of tank, onsite-generated non-CERCLA, FFTF decommissioning, waste management, and offsite-generated LLW and MLLW at IDF-East		X	
Disposal of tank waste only at IDF-East and onsite-generated non-CERCLA, FFTF decommissioning, waste management, and offsite-generated LLW and MLLW at IDF-West			X
Disposal of rubble, ancillary equipment, and soils (not highly contaminated) from closure activities at RPPDF		X	X
Closure			
None	X		
Landfill closure of IDF(s) and RPPDF		X	X
Administrative control for 100 years	X		
Postclosure care for 100 years		X	X

Key: CERCLA=Comprehensive Environmental Response, Compensation, and Liability Act; CWC=Central Waste Complex; FFTF=Fast Flux Test Facility; IDF=Integrated Disposal Facility; IDF-East=200-East Area Integrated Disposal Facility; IDF-West=200-West Area Integrated Disposal Facility; LLW=low-level radioactive waste; MLLW=mixed low-level radioactive waste; RPPDF=River Protection Project Disposal Facility; TRU=transuranic; WRAP=Waste Receiving and Processing Facility.

ROADMAPS TO THE ALTERNATIVES

Tables 4, 5, and 6 are roadmaps to the Tank Closure, FFTF Decommissioning, and Waste Management alternatives analyzed in this *TC & WM EIS*. Key features and potential issues regarding each alternative are identified, along with the sections of Chapters 2, 4, and 5 and Appendices D and E of this EIS where related discussions can be found. The potential issues listed in Tables 4, 5, and 6 are presented only to make readers of this *TC & WM EIS* aware of their existence. These issues are covered in greater detail in the chapters and appendices of this EIS. These tables are not meant to be all-inclusive, but are provided to help readers navigate through the document.

Table 4. Roadmap to the Tank Closure Alternatives

TANK CLOSURE ALTERNATIVE 1: No Action									
STORAGE		**RETRIEVAL**		**TREATMENT**		**DISPOSAL**		**CLOSURE**	
Key Features • 100-year administrative control		*Key Features* • No retrieval		*Key Features* • No treatment • Waste Treatment Plant construction terminated		*Key Features* • No disposal		*Key Features* • No closure	
Potential Issues • Waste remains in single-shell tanks and double-shell tanks beyond their design lives		*Potential Issues* • No retrieval of tank waste		*Potential Issues* • Waste Treatment Plant construction ends before completion • No treatment		*Potential Issues* • No disposal		*Potential Issues* • No closure of RCRA units	
Description • 2.2.1 • 2.2.2.1 • 2.5.2.1 • D.1 • E.1	*Impacts* • 4.1.4.1 AQ • 4.1.6.1 WR • 4.1.7.1 ER • 4.1.9.1 S • 4.1.10.1 NO • 4.1.11.1 FA • 4.1.15.1 IS • 5.1.1.1 GW • 5.1.2.1 HH • 5.1.3.1 LER	*Description* • 2.2.2.1 • 2.5.2.1	*Impacts* • None	*Description* • 2.2.2.2 • 2.5.2.1 • E.1	*Impacts* • 4.1.4.1 AQ • 4.1.7.1 ER • 4.1.9.1 S	*Description* • 2.2.2.3 • 2.5.2.1	*Impacts* • None	*Description* • 2.2.2.4 • 2.5.2.1	*Impacts* • None

Note: "Key Features" include alternative configurations, treatment dates, and assumptions. "Potential Issues" include topics that may be environmental impact drivers or are expected to be of interest to readers. "Description" identifies EIS Chapter 2 and Appendix D and E sections that further describe the Key Features, including the technologies evaluated. Chapter 2 provides an overview of the alternatives, while Appendix E provides more-detailed information. "Impacts" identify EIS Chapter 4 and 5 sections that describe the impacts of the Key Features and/or Potential Issues.

Key: AQ=Air Quality; EIS=environmental impact statement; ER=Ecological Resources; FA=Facility Accidents; GW=Groundwater; HH=Human Health; IS=Industrial Safety; LER=Long-Term Ecological Risk; NO=Normal Operations; RCRA=Resource Conservation and Recovery Act; S=Socioeconomics; WR=Water Resources.

Table 4. Roadmap to the Tank Closure Alternatives (*continued*)

TANK CLOSURE ALTERNATIVE 2A: Existing WTP Vitrification; No Closure									
STORAGE		**RETRIEVAL**		**TREATMENT**		**DISPOSAL**		**CLOSURE**	
Key Features • 28 replacement double-shell tanks • No waste receiver facilities		*Key Features* • 99 percent tank waste retrieval • Liquid-based retrieval technologies • Current leak detection technology • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank		*Key Features* • Waste treatment: 2018–2093 • 6 MTG/day (2 HLW melters) × 30 MTG/day (2 LAW melters) • No Tc-99 removal • No sulfate removal • No tank-derived TRU waste treatment		*Key Features* • ILAW disposal on site • IHLW storage includes CSB + 3 additional vaults		*Key Features* • No closure • 100-year administrative control	
Potential Issues • New double-shell tanks required		*Potential Issues* • Assumed retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank		*Potential Issues* • Waste Treatment Plant replacement • Extended operating period		*Potential Issues* • ILAW disposal on site • Tc-99 in ILAW • No waste acceptance criteria for HLW melters (stored indefinitely)		*Potential Issues* • No closure, 100-year administrative control only	
Description • 2.2.1 • 2.2.2.1 • 2.5.2.2.1 • D.1 • E.1	*Impacts* • 4.1.1.2 LR • 4.1.4.2 AQ • 4.1.7.2 ER • 4.1.9.2 S • 4.1.10.2 NO • 4.1.11.2 FA	*Description* • 2.2.2.1 • 2.5.2.2.1 • D.1 • E.1	*Impacts* • 4.1.4.2 AQ • 4.1.6.2 WR • 4.1.9.2 S • 4.1.10.2 NO • 4.1.11.2 FA • 5.1.1.2 GW • 5.1.2.2 HH • 5.1.3.2 LER	*Description* • 2.2.2.2 • 2.5.2.2.1 • D.1 • E.1	*Impacts* • 4.1.1.2 LR • 4.1.4.2 AQ • 4.1.6.2 WR • 4.1.7.2 ER • 4.1.9.2 S • 4.1.10.2 NO • 4.1.11.2 FA • 4.1.14.2 WM • 5.1.1.2 GW • 5.1.2.2 HH • 5.1.3.2 LER	*Description* • 2.2.2.3 • 2.5.2.2.1 • D.1 • E.1	*Impacts* • 4.1.1.2 LR • 4.1.4.2 AQ • 4.1.6.2 WR • 4.1.7.2 ER • 4.1.14.2 WM • 5.1.1.2 GW • 5.1.2.2 HH • 5.1.3.2 LER	*Description* • 2.2.2.4 • 2.5.2.2.1	*Impacts* • 4.1.4.2 AQ • 4.1.6.2 WR • 4.1.12.2 T • 5.1.1.2 GW • 5.1.2.2 HH • 5.1.3.2 LER

Note: "Key Features" include alternative configurations, treatment dates, and assumptions. "Potential Issues" include topics that may be environmental impact drivers or are expected to be of interest to readers. "Description" identifies EIS Chapter 2 and Appendix D and E sections that further describe the Key Features, including the technologies evaluated. Chapter 2 provides an overview of the alternatives, while Appendix E provides more-detailed information. "Impacts" identify EIS Chapter 4 and 5 sections that describe the impacts of the Key Features and/or Potential Issues.

Key: AQ=Air Quality; CSB=Canister Storage Building; EIS=environmental impact statement; ER=Ecological Resources; FA=Facility Accidents; GW=Groundwater; HH=Human Health; HLW=high-level radioactive waste; IHLW=immobilized high-level radioactive waste; ILAW=immobilized low-activity waste; LAW=low-activity waste; LER=Long-Term Ecological Risk; LR=Land Resources; MTG=metric tons of glass; NO=Normal Operations; S=Socioeconomics; T=Transportation; Tc-99=technetium-99; TRU=transuranic; WM=Waste Management; WR=Water Resources; WTP=Waste Treatment Plant.

Table 4. Roadmap to the Tank Closure Alternatives *(continued)*

TANK CLOSURE ALTERNATIVE 2B: Expanded WTP Vitrification; Landfill Closure									
STORAGE		**RETRIEVAL**		**TREATMENT**		**DISPOSAL**		**CLOSURE**	
Key Features • 4 waste receiver facilities • No new double-shell tanks		*Key Features* • 99 percent tank waste retrieval • Liquid-based retrieval technologies • Current leak detection technology • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank		*Key Features* • Waste treatment: 2018–2043 • 6 MTG/day (2 HLW melters) × 90 MTG/day (6 LAW melters) • Tc-99 removal • No sulfate removal • No tank-derived TRU waste treatment		*Key Features* • ILAW disposal on site • IHLW storage includes CSB + 4 additional vaults		*Key Features* • Landfill closure (modified RCRA Subtitle C barrier) • Upper 4.6 meters (15 feet) of soil in BX and SX tank farms and ancillary equipment removed • 100-year postclosure care	
Potential Issues • Construction of 4 waste receiver facilities		*Potential Issues* • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank		*Potential Issues* • Construction of expanded WTP		*Potential Issues* • ILAW disposal on site • No waste acceptance criteria for HLW melters (stored indefinitely)		*Potential Issues* • Landfill closure of all single-shell tank farms with 1 percent residual waste and adjacent cribs and trenches (ditches) • Benefit of removing upper 4.6 meters (15 feet) of soil in BX and SX tank farms	
Description • 2.2.1 • 2.2.2.1 • 2.5.2.2.2 • D.1 • E.1	*Impacts* • 4.1.1.3 LR • 4.1.4.3 AQ • 4.1.10.3 NO • 4.1.11.3 FA	*Description* • 2.2.2.1 • 2.5.2.2.2 • D.1 • E.1	*Impacts* • 4.1.4.3 AQ • 4.1.6.3 WR • 4.1.9.3 S • 4.1.10.3 NO • 4.1.11.3 FA • 5.1.1.3 GW • 5.1.2.3 HH • 5.1.3.3 LER	*Description* • 2.2.2.2 • 2.5.2.2.2 • D.1 • E.1	*Impacts* • 4.1.1.3 LR • 4.1.4.3 AQ • 4.1.6.3 WR • 4.1.7.3 ER • 4.1.9.3 S • 4.1.10.3 NO • 4.1.11.3 FA • 4.1.14 .3 WM • 5.1.1.3 GW • 5.1.2.3 HH • 5.1.3.3 LER	*Description* • 2.2.2.3 • 2.5.2.2.2 • D.1 • E.1	*Impacts* • 4.1.1.3 LR • 4.1.4.3 AQ • 4.1.6.3 WR • 4.1.7.3 ER • 4.1.11.3 FA • 4.1.12.3 T • 4.1.14.3 WM • 5.1.1.3 GW • 5.1.2.3 HH • 5.1.3.3 LER	*Description* • 2.2.2.4 • 2.5.2.2.2 • E.1	*Impacts* • 4.1.4.3 AQ • 4.1.6.3 WR • 4.1.10.3 NO • 4.1.14 .3 WM • 5.1.1.3 GW • 5.1.2.3 HH • 5.1.3.3 LER

Note: "Key Features" include alternative configurations, treatment dates, and assumptions. "Potential Issues" include topics that may be environmental impact drivers or are expected to be of interest to readers. "Description" identifies EIS Chapter 2 and Appendix D and E sections that further describe the Key Features, including the technologies evaluated. Chapter 2 provides an overview of the alternatives, while Appendix E provides more-detailed information. "Impacts" identify EIS Chapter 4 and 5 sections that describe the impacts of the Key Features and/or Potential Issues.

Key: AQ=Air Quality; CSB=Canister Storage Building; EIS=environmental impact statement; ER=Ecological Resources; FA=Facility Accidents; GW=Groundwater; HH=Human Health; HLW=high-level radioactive waste; IHLW=immobilized high-level radioactive waste; ILAW=immobilized low-activity waste; LAW=low-activity waste; LER=Long-Term Ecological Risk; LR=Land Resources; MTG=metric tons of glass; NO=Normal Operations; RCRA=Resource Conservation and Recovery Act; S=Socioeconomics; T=Transportation; Tc-99=technetium-99; TRU=transuranic; WM=Waste Management; WR=Water Resources; WTP=Waste Treatment Plant.

Table 4. Roadmap to the Tank Closure Alternatives *(continued)*

TANK CLOSURE ALTERNATIVE 3A: Existing WTP Vitrification with Thermal Supplemental Treatment (Bulk Vitrification); Landfill Closure									
STORAGE		**RETRIEVAL**		**TREATMENT**		**DISPOSAL**		**CLOSURE**	
Key Features • 4 waste receiver facilities • No new double-shell tanks		*Key Features* • 99 percent tank waste retrieval • Liquid-based retrieval technologies • Current leak detection technology • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank		*Key Features* • Waste treatment: 2018–2040 • 6 MTG/day (2 HLW melters) × 30 MTG/day (2 LAW melters) • Supplemental treatment (bulk vitrification) • No Tc-99 removal • No sulfate removal • Tank-derived TRU waste treatment		*Key Features* • ILAW disposal on site • IHLW storage includes CSB + 4 additional vaults		*Key Features* • Landfill closure (modified RCRA Subtitle C barrier) • Upper 4.6 meters (15 feet) of soil in BX and SX tank farms and ancillary equipment removed • 100-year postclosure care	
Potential Issues • Construction of 4 waste receiver facilities		*Potential Issues* • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank		*Potential Issues* • Construction in 200-East and 200-West Areas • Addition of bulk vitrification supplemental treatment capacity		*Potential Issues* • ILAW disposal on site • Tc-99 in ILAW and bulk vitrification • No waste acceptance criteria for HLW melters (stored indefinitely) • Tank-derived TRU waste disposal at WIPP		*Potential Issues* • Landfill closure of all single-shell tank farms with 1 percent residual waste and adjacent cribs and trenches (ditches) • Benefit of removing upper 4.6 meters (15 feet) of soil in BX and SX tank farms	
Description • 2.2.1 • 2.2.2.1 • 2.5.2.3.1 • D.1 • E.1	*Impacts* • 4.1.1.4 LR • 4.1.4.4 AQ • 4.1.10.4 NO • 4.1.11.4 FA	*Description* • 2.2.2.1 • 2.5.2.3.1 • D.1 • E.1	*Impacts* • 4.1.4.4 AQ • 4.1.6.4 WR • 4.1.9.4 S • 4.1.10.4 NO • 4.1.11.4 FA • 5.1.1.4 GW • 5.1.2.4 HH • 5.1.3.4 LER	*Description* • 2.2.2.2 • 2.5.2.3.1 • D.1 • E.1	*Impacts* • 4.1.1.4 LR • 4.1.4.4 AQ • 4.1.6.4 WR • 4.1.7.4 ER • 4.1.9.4 S • 4.1.10.4 NO • 4.1.11.4 FA • 4.11.14.4 WM • 5.1.1.4 GW • 5.1.2.4 HH • 5.1.3.4 LER	*Description* • 2.2.2.3 • 2.5.2.3.1 • D.1 • E.1	*Impacts* • 4.1.1.4 LR • 4.1.4.4 AQ • 4.1.6.4 WR • 4.1.7.4 ER • 4.1.11.4 FA • 4.1.12.4 T • 4.1.14.4 WM • 5.1.1.4 GW • 5.1.2.4 HH • 5.1.3.4 LER	*Description* • 2.2.2.4 • 2.5.2.3.1 • E.1	*Impacts* • 4.1.4.4 AQ • 4.1.6.4 WR • 4.1.10.4 NO • 4.1.14.4 WM • 5.1.1.4 GW • 5.1.2.4 HH • 5.1.3.4 LER

Note: "Key Features" include alternative configurations, treatment dates, and assumptions. "Potential Issues" include topics that may be environmental impact drivers or are expected to be of interest to readers. "Description" identifies EIS Chapter 2 and Appendix D and E sections that further describe the Key Features, including the technologies evaluated. Chapter 2 provides an overview of the alternatives, while Appendix E provides more-detailed information. "Impacts" identify EIS Chapter 4 and 5 sections that describe the impacts of the Key Features and/or Potential Issues.

Key: AQ=Air Quality; CSB=Canister Storage Building; EIS=environmental impact statement; ER=Ecological Resources; FA=Facility Accidents; GW=Groundwater; HH=Human Health; HLW=high-level radioactive waste; IHLW=immobilized high-level radioactive waste; ILAW=immobilized low-activity waste; LAW=low-activity waste; LER=Long-Term Ecological Risk; LR=Land Resources; MTG=metric tons of glass; NO=Normal Operations; RCRA=Resource Conservation and Recovery Act; S=Socioeconomics; T=Transportation; Tc-99=technetium-99; TRU=transuranic; WIPP=Waste Isolation Pilot Plant; WM=Waste Management; WR=Water Resources; WTP=Waste Treatment Plant.

Table 4. Roadmap to the Tank Closure Alternatives (*continued*)

TANK CLOSURE ALTERNATIVE 3B: Existing WTP Vitrification with Nonthermal Supplemental Treatment (Cast Stone); Landfill Closure									
STORAGE		**RETRIEVAL**		**TREATMENT**		**DISPOSAL**		**CLOSURE**	
Key Features • 4 waste receiver facilities • No new double-shell tanks		*Key Features* • 99 percent tank waste retrieval • Liquid-based retrieval technologies • Current leak detection technology • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank		*Key Features* • Waste treatment: 2018–2040 • 6 MTG/day (2 HLW melters) × 30 MTG/day (2 LAW melters) • Supplemental treatment (cast stone) • Tc-99 removal • No sulfate removal • Tank-derived TRU waste treatment		*Key Features* • ILAW disposal on site • IHLW storage includes CSB + 4 additional vaults		*Key Features* • Landfill closure (modified RCRA Subtitle C barrier) • Upper 4.6 meters (15 feet) of soil in BX and SX tank farms and ancillary equipment removed • 100-year postclosure care	
Potential Issues • Construction of 4 waste receiver facilities		*Potential Issues* • 120 liters (4,000 gallons) per single-shell tank		*Potential Issues* • Construction in 200-East and 200-West Areas • Addition of cast stone supplemental treatment capacity		*Potential Issues* • ILAW disposal on site • No waste acceptance criteria for HLW melters (stored indefinitely) • Tank-derived TRU waste disposal at WIPP		*Potential Issues* • Landfill closure of all single-shell tank farms with 1 percent residual waste and adjacent cribs and trenches (ditches) • Benefit of removing upper 4.6 meters (15 feet) of soil in BX and SX tank farms	
Description • 2.2.1 • 2.2.2.1 • 2.5.2.3.2 • D.1 • E.1	*Impacts* • 4.1.1.5 LR • 4.1.4.5 AQ • 4.1.10.5 NO • 4.1.11.5 FA	*Description* • 2.2.2.1 • 2.5.2.3.2 • D.1 • E.1	*Impacts* • 4.1.4.5 AQ • 4.1.6.5 WR • 4.1.9.5 S • 4.1.10.5 NO • 4.1.11.5 FA • 5.1.1.5 GW • 5.1.2.5 HH • 5.1.3.5 LER	*Description* • 2.2.2.2 • 2.5.2.3.2 • D.1 • E.1	*Impacts* • 4.1.1.5 LR • 4.1.4.5 AQ • 4.1.6.5 WR • 4.1.7.5 ER • 4.1.9.5 S • 4.1.10.5 NO • 4.1.11.5 FA • 4.1.14.5 WM • 5.1.1.5 GW • 5.1.2.5 HH • 5.1.3.5 LER	*Description* • 2.2.2.3 • 2.5.2.3.2 • D.1 • E.1	*Impacts* • 4.1.1.5 LR • 4.1.4.5 AQ • 4.1.6.5 WR • 4.1.7.5 ER • 4.1.11.5 FA • 4.1.12.5 T • 4.1.14 .5 WM • 5.1.1.5 GW • 5.1.2.5 HH • 5.1.3.5 LER	*Description* • 2.2.2.4 • 2.5.2.3.2 • E.1	*Impacts* • 4.1.4.5 AQ • 4.1.6.5 WR • 4.1.10.5 NO • 4.1.14.5 WM • 5.1.1.5 GW • 5.1.2.5 HH • 5.1.3.5 LER

Note: "Key Features" include alternative configurations, treatment dates, and assumptions. "Potential Issues" include topics that may be environmental impact drivers or are expected to be of interest to readers. "Description" identifies EIS Chapter 2 and Appendix D and E sections that further describe the Key Features, including the technologies evaluated. Chapter 2 provides an overview of the alternatives, while Appendix E provides more-detailed information. "Impacts" identify EIS Chapter 4 and 5 sections that describe the impacts of the Key Features and/or Potential Issues.

Key: AQ=Air Quality; CSB=Canister Storage Building; EIS=environmental impact statement; ER=Ecological Resources; FA=Facility Accidents; GW=Groundwater; HH=Human Health; HLW=high-level radioactive waste; IHLW=immobilized high-level radioactive waste; ILAW=immobilized low-activity waste; LAW=low-activity waste; LER=Long-Term Ecological Risk; LR=Land Resources; MTG=metric tons of glass; NO=Normal Operations; RCRA=Resource Conservation and Recovery Act; S=Socioeconomics; T=Transportation; Tc-99=technetium-99; TRU=transuranic; WIPP=Waste Isolation Pilot Plant; WM=Waste Management; WR=Water Resources; WTP=Waste Treatment Plant.

Table 4. Roadmap to the Tank Closure Alternatives *(continued)*

TANK CLOSURE ALTERNATIVE 3C: Existing WTP Vitrification with Thermal Supplemental Treatment (Steam Reforming); Landfill Closure									
STORAGE		**RETRIEVAL**		**TREATMENT**		**DISPOSAL**		**CLOSURE**	
Key Features • 4 waste receiver facilities • No new double-shell tanks		*Key Features* • 99 percent tank waste retrieval • Liquid-based retrieval technologies • Current leak detection technology • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank		*Key Features* • Waste treatment: 2018–2040 • 6 MTG/day (2 HLW melters) × 30 MTG/day (2 LAW melters) • Supplemental treatment (steam reforming) • No Tc-99 removal • No sulfate removal • Tank-derived TRU waste treatment		*Key Features* • ILAW disposal on site • IHLW storage includes CSB + 4 additional vaults		*Key Features* • Landfill closure (modified RCRA Subtitle C barrier) • Upper 4.6 meters (15 feet) of soil in BX and SX tank farms and ancillary equipment removed • 100-year postclosure care	
Potential Issues • Construction of 4 waste receiver facilities		*Potential Issues* • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank		*Potential Issues* • Construction in 200-East and 200-West Areas • Addition of steam reforming supplemental treatment capacity		*Potential Issues* • ILAW disposal on site • Tc-99 in ILAW and steam reforming • No waste acceptance criteria for HLW melters (stored indefinitely) • Tank-derived TRU waste disposal at WIPP		*Potential Issues* • Landfill closure of all single-shell tank farms with 1 percent residual waste and adjacent cribs and trenches (ditches) • Benefit of removing upper 4.6 meters (15 feet) of soil in BX and SX tank farms	
Description • 2.2.1 • 2.2.2.1 • 2.5.2.3.3 • D.1 • E.1	*Impacts* • 4.1.1.6 LR • 4.1.4.6 AQ • 4.1.10.6 NO • 4.1.11.6 FA	*Description* • 2.2.2.1 • 2.5.2.3.3 • D.1 • E.1	*Impacts* • 4.1.4.6 AQ • 4.1.6.6 WR • 4.1.9.6 S • 4.1.10.6 NO • 4.1.11.6 FA • 5.1.1.6 GW • 5.1.2.6 HH • 5.1.3.6 LER	*Description* • 2.2.2.2 • 2.5.2.3.3 • D.1 • E.1	*Impacts* • 4.1.1.6 LR • 4.1.4.6 AQ • 4.1.6.6 WR • 4.1.7.6 ER • 4.1.9.6 S • 4.1.10.6 NO • 4.1.11.6 FA • 4.1.14.6 WM • 5.1.1.6 GW • 5.1.2.6 HH • 5.1.3.6 LER	*Description* • 2.2.2.3 • 2.5.2.3.3 • D.1 • E.1	*Impacts* • 4.1.1.6 LR • 4.1.4.6 AQ • 4.1.6.6 WR • 4.1.7.6 ER • 4.1.11.6 FA • 4.1.12.6 T • 4.1.14 .6 WM • 5.1.1.6 GW • 5.1.2.6 HH • 5.1.3.6 LER	*Description* • 2.2.2.4 • 2.5.2.3.3 • E.1	*Impacts* • 4.1.4.6 AQ • 4.1.6.6 WR • 4.1.10.6 NO • 4.1.14.6 WM • 5.1.1.6 GW • 5.1.2.6 HH • 5.1.3.6 LER

Note: "Key Features" include alternative configurations, treatment dates, and assumptions. "Potential Issues" include topics that may be environmental impact drivers or are expected to be of interest to readers. "Description" identifies EIS Chapter 2 and Appendix D and E sections that further describe the Key Features, including the technologies evaluated. Chapter 2 provides an overview of the alternatives, while Appendix E provides more-detailed information. "Impacts" identify EIS Chapter 4 and 5 sections that describe the impacts of the Key Features and/or Potential Issues.

Key: AQ=Air Quality; CSB=Canister Storage Building; EIS=environmental impact statement; ER=Ecological Resources; FA=Facility Accidents; GW=Groundwater; HH=Human Health; HLW=high-level radioactive waste; IHLW=immobilized high-level radioactive waste; ILAW=immobilized low-activity waste; LAW=low-activity waste; LER=Long-Term Ecological Risk; LR=Land Resources; MTG=metric tons of glass; NO=Normal Operations; PPF=Preprocessing Facility; RCRA=Resource Conservation and Recovery Act; S=Socioeconomics; T=Transportation; Tc-99=technetium-99; TRU=transuranic; WIPP=Waste Isolation Pilot Plant; WM=Waste Management; WR=Water Resources; WTP=Waste Treatment Plant.

Table 4. Roadmap to the Tank Closure Alternatives *(continued)*

TANK CLOSURE ALTERNATIVE 4: Existing WTP Vitrification with Supplemental Treatment Technologies; Selective Clean Closure/Landfill Closure									
STORAGE		**RETRIEVAL**		**TREATMENT**		**DISPOSAL**		**CLOSURE**	
Key Features • 4 waste receiver facilities • No new double-shell tanks		*Key Features* • 99.9 percent tank waste retrieval • Liquid-based retrieval technologies and new retrieval technology • Current leak detection technology • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank		*Key Features* • Waste treatment: 2018–2043 • 6 MTG/day (2 HLW melters) × 30 MTG/day (2 LAW melters) • Supplemental treatment (bulk vitrification and cast stone) • No Tc-99 removal • No sulfate removal • Tank-derived TRU waste treatment		*Key Features* • ILAW disposal on site • IHLW storage includes CSB + 5 additional vaults		*Key Features* • Landfill closure (modified RCRA Subtitle C barrier) • Clean closure of representative (BX and SX) tank farms • 100-year postclosure care of 10 single-shell tank farms	
Potential Issues • Construction of 4 waste receiver facilities		*Potential Issues* • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank • Additional tank-cleaning process (chemical wash)		*Potential Issues* • Construction in 200-East and 200-West Areas • Addition of bulk vitrification and cast stone supplemental treatment capacity		*Potential Issues* • ILAW disposal on site • Tc-99 in ILAW, bulk vitrification, and cast stone • No waste acceptance criteria for HLW melters (stored indefinitely) • Onsite disposal of waste from clean closure of BX and SX tank farms • Tank-derived TRU waste disposal at WIPP		*Potential Issues* • Landfill closure of 10 single-shell tank farms with 0.1 percent residual waste and adjacent cribs and trenches (ditches)	
Description • 2.2.1 • 2.2.2.1 • 2.5.2.4 • D.1 • E.1	*Impacts* • 4.1.1.7 LR • 4.1.4.7 AQ • 4.1.10.7 NO • 4.1.11.7 FA	*Description* • 2.2.2.1 • 2.5.2.4 • D.1 • E.1	*Impacts* • 4.1.4.7 AQ • 4.1.6.7 WR • 4.1.9.7 S • 4.1.10.7 NO • 4.1.11.7 FA • 5.1.1.7 GW • 5.1.2.7 HH • 5.1.3.7 LER	*Description* • 2.2.2.2 • 2.5.2.4 • D.1 • E.1	*Impacts* • 4.1.1.7 LR • 4.1.4.7 AQ • 4.1.6.7 WR • 4.1.7.7 ER • 4.1.9.7 S • 4.1.10.7 NO • 4.1.11.7 FA • 4.1.14.7 WM • 5.1.1.7 GW • 5.1.2.7 HH • 5.1.3.7 LER	*Description* • 2.2.2.3 • 2.5.2.4 • D.1 • E.1	*Impacts* • 4.1.1.7 LR • 4.1.4.7 AQ • 4.1.6.7 WR • 4.1.7.7 ER • 4.1.11.7 FA • 4.1.12.7 T • 4.1.14 .7 WM • 5.1.1.7 GW • 5.1.2.7 HH • 5.1.3.7 LER	*Description* • 2.2.2.4 • 2.5.2.4 • E.1	*Impacts* • 4.1.4.7 AQ • 4.1.6.7 WR • 4.1.10.7 NO • 4.1.14.7 WM • 5.1.1.7 GW • 5.1.2.7 HH • 5.1.3.7 LER

Note: "Key Features" include alternative configurations, treatment dates, and assumptions. "Potential Issues" include topics that may be environmental impact drivers or are expected to be of interest to readers. "Description" identifies EIS Chapter 2 and Appendix D and E sections that further describe the Key Features, including the technologies evaluated. Chapter 2 provides an overview of the alternatives, while Appendix E provides more-detailed information. "Impacts" identify EIS Chapter 4 and 5 sections that describe the impacts of the Key Features and/or Potential Issues.

Key: AQ=Air Quality; CSB=Canister Storage Building; EIS=environmental impact statement; ER=Ecological Resources; FA=Facility Accidents; GW=Groundwater; HH=Human Health; HLW=high-level radioactive waste; IHLW=immobilized high-level radioactive waste; ILAW=immobilized low-activity waste; LAW=low-activity waste; LER=Long-Term Ecological Risk; LR=Land Resources; MTG=metric tons of glass; NO=Normal Operations; RCRA=Resource Conservation and Recovery Act; S=Socioeconomics; T=Transportation; Tc-99=technetium-99; TRU=transuranic; WIPP=Waste Isolation Pilot Plant; WM=Waste Management; WR=Water Resources; WTP=Waste Treatment Plant.

Table 4. Roadmap to the Tank Closure Alternatives *(continued)*

TANK CLOSURE ALTERNATIVE 5: Expanded WTP Vitrification with Supplemental Treatment Technologies; Landfill Closure									
STORAGE		**RETRIEVAL**		**TREATMENT**		**DISPOSAL**		**CLOSURE**	
Key Features • 4 waste receiver facilities • 4 new double-shell tanks		*Key Features* • 90 percent tank waste retrieval • Liquid-based retrieval technologies • Current leak detection technology • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank		*Key Features* • Waste treatment: 2009–2024 • 6 MTG/day (2 HLW melters) × 45 MTG/day (3 LAW melters) • Supplemental treatment (bulk vitrification and cast stone) • No Tc-99 removal • Sulfate removal • Tank-derived TRU waste treatment		*Key Features* • ILAW disposal on site • IHLW storage includes CSB + 5 additional vaults		*Key Features* • Landfill closure (Hanford barrier) • 100-year postclosure care	
Potential Issues • Construction of 4 waste receiver facilities • Construction of 4 new double-shell tanks		*Potential Issues* • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank • Reduced tank retrieval volume		*Potential Issues* • Construction of expanded Waste Treatment Plant • Construction in 200-East and 200-West Areas • Addition of bulk vitrification and cast stone supplemental treatment capacity		*Potential Issues* • ILAW disposal on site • Tc-99 in ILAW, bulk vitrification, and cast stone • No waste acceptance criteria for HLW melters (stored indefinitely) • Disposal of sulfate grout waste form on site • Tank-derived TRU waste disposal at WIPP		*Potential Issues* • Landfill closure of all single-shell tank farms and adjacent cribs and trenches (ditches) using improved barrier • Increased waste residues remaining in closed tanks (10 percent)	
Description • 2.2.1 • 2.2.2.1 • 2.5.2.5 • D.1 • E.1	*Impacts* • 4.1.1.8 LR • 4.1.4.8 AQ • 4.1.10.8 NO • 4.1.11.8 FA	*Description* • 2.2.2.1 • 2.5.2.5 • D.1 • E.1	*Impacts* • 4.1.4.8 AQ • 4.1.6.8 WR • 4.1.9.8 S • 4.1.10.8 NO • 4.1.11.8 FA • 5.1.1.8 GW • 5.1.2.8 HH • 5.1.3.8 LER	*Description* • 2.2.2.2 • 2.5.2.5 • D.1 • E.1	*Impacts* • 4.1.1.8 LR • 4.1.4.8 AQ • 4.1.6.8 WR • 4.1.7.8 ER • 4.1.9.8 S • 4.1.10.8 NO • 4.1.11.8 FA • 4.1.14.8 WM • 5.1.1.8 GW • 5.1.2.8 HH • 5.1.3.8 LER	*Description* • 2.2.2.3 • 2.5.2.5 • D.1 • E.1	*Impacts* • 4.1.1.8 LR • 4.1.4.8 AQ • 4.1.6.8 WR • 4.1.7.8 ER • 4.1.11.8 FA • 4.1.12.8 T • 4.1.14 .8 WM • 5.1.1.8 GW • 5.1.2.8 HH • 5.1.3.8 LER	*Description* • 2.2.2.4 • 2.5.2.5 • E.1	*Impacts* • 4.1.4.8 AQ • 4.1.6.8 WR • 4.1.10.8 NO • 4.1.14.8 WM • 5.1.1.8 GW • 5.1.2.8 HH • 5.1.3.8 LER

Note: "Key Features" include alternative configurations, treatment dates, and assumptions. "Potential Issues" include topics that may be environmental impact drivers or are expected to be of interest to readers. "Description" identifies EIS Chapter 2 and Appendix D and E sections that further describe the Key Features, including the technologies evaluated. Chapter 2 provides an overview of the alternatives, while Appendix E provides more-detailed information. "Impacts" identify EIS Chapter 4 and 5 sections that describe the impacts of the Key Features and/or Potential Issues.

Key: AQ=Air Quality; CSB=Canister Storage Building; EIS=environmental impact statement; ER=Ecological Resources; FA=Facility Accidents; GW=Groundwater; HH=Human Health; HLW=high-level radioactive waste; IHLW=immobilized high-activity radioactive waste; ILAW=immobilized low-activity waste; LAW=low-activity waste; LER=Long-Term Ecological Risk; LR=Land Resources; MTG=metric tons of glass; NO=Normal Operations; S=Socioeconomics; T=Transportation; Tc-99=technetium-99; TRU=transuranic; WIPP=Waste Isolation Pilot Plant; WM=Waste Management; WR=Water Resources; WTP=Waste Treatment Plant.

Table 4. Roadmap to the Tank Closure Alternatives *(continued)*

TANK CLOSURE ALTERNATIVE 6A: All Vitrification/No Separations; Clean Closure (Base and Option Cases)									
STORAGE		**RETRIEVAL**		**TREATMENT**		**DISPOSAL**		**CLOSURE**	
Key Features • 84 new double-shell tanks (replacements)		*Key Features* • 99.9 percent tank waste retrieval • Liquid-based retrieval technologies and new retrieval technology • Current leak detection technology • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank		*Key Features* • Waste treatment: 2018–2163 • 15 MTG/day (5 HLW melters) • No Tc-99 removal • No sulfate removal • No tank-derived TRU waste treatment • No supplemental treatment technology		*Key Features* • IHLW storage includes CSB + 65 additional vaults and 148 replacements • IHLW tank debris storage • PPF glass disposed of on site		*Key Features* • Clean closure of single-shell tank farms and landfill closure (modified RCRA Subtitle C barrier) of adjacent cribs and trenches (ditches) (option includes clean closure of adjacent cribs and trenches [ditches]) • Future use	
Potential Issues • Construction of 84 new double-shell tanks • Extended operating period		*Potential Issues* • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank • Additional tank-cleaning process (chemical wash)		*Potential Issues* • Construction of additional IHLW Waste Treatment Plant capacity and replacements • All waste treated as HLW; large number of HLW containers • Extended operating period		*Potential Issues* • No waste acceptance criteria for HLW melters (stored indefinitely) • No waste acceptance criteria for HLW resulting from clean closure activities		*Potential Issues* • Clean closure	
Description • 2.2.1 • 2.2.2.1 • 2.5.2.6.1 • D.1 • E.1	*Impacts* • 4.1.1.9 LR • 4.1.4.9 AQ • 4.1.7.9 ER • 4.1.9.9 S • 4.1.10.9 NO • 4.1.11.9 FA	*Description* • 2.2.2.1 • 2.5.2.6.1 • D.1 • E.1	*Impacts* • 4.1.4.9 AQ • 4.1.6.9 WR • 4.1.9.9 S • 4.1.10.9 NO • 4.1.11.9 FA • 5.1.1.9 GW • 5.1.2.9 HH • 5.1.3.9 LER	*Description* • 2.2.2.2 • 2.5.2.6.1 • D.1 • E.1	*Impacts* • 4.1.1.9 LR • 4.1.4.9 AQ • 4.1.6.9 WR • 4.1.7.9 ER • 4.1.9.9 S • 4.1.10.9 NO • 4.1.11.9 FA • 4.1.14.9 WM • 5.1.1.9 GW • 5.1.2.9 HH • 5.1.3.9 LER	*Description* • 2.2.2.3 • 2.5.2.6.1 • D.1 • E.1	*Impacts* • 4.1.1.9 LR • 4.1.4.9 AQ • 4.1.6.9 WR • 4.1.7.9 ER • 4.1.9.9 S • 4.1.11.9 FA • 4.1.12.9 T • 4.1.14.9 WM • 5.1.1.9 GW • 5.1.2.9 HH • 5.1.3.9 LER	*Description* • 2.2.2.4 • 2.5.2.6.1 • E.1	*Impacts* • 4.1.4.9 AQ • 4.1.6.9 WR • 4.1.9.9 S • 4.1.10.9 NO • 4.1.14.9 WM • 5.1.1.9 GW • 5.1.2.9 HH • 5.1.3.9 LER

Note: "Key Features" include alternative configurations, treatment dates, and assumptions. "Potential Issues" include topics that may be environmental impact drivers or are expected to be of interest to readers. "Description" identifies EIS Chapter 2 and Appendix D and E sections that further describe the Key Features, including the technologies evaluated. Chapter 2 provides an overview of the alternatives, while Appendix E provides more-detailed information. "Impacts" identify EIS Chapter 4 and 5 sections that describe the impacts of the Key Features and/or Potential Issues.

Key: AQ=Air Quality; CSB=Canister Storage Building; EIS=environmental impact statement; ER=Ecological Resources; FA=Facility Accidents; GW=Groundwater; HH=Human Health; HLW=high-level radioactive waste; IHLW=immobilized high-level radioactive waste; LER=Long-Term Ecological Risk; LR=Land Resources; MTG=metric tons of glass; NO=Normal Operations; PPF=Preprocessing Facility; RCRA=Resource Conservation and Recovery Act; S=Socioeconomics; T=Transportation; Tc-99=technetium-99; TRU=transuranic; WM=Waste Management; WR=Water Resources.

Table 4. Roadmap to the Tank Closure Alternatives *(continued)*

TANK CLOSURE ALTERNATIVE 6B: All Vitrification with Separations; Clean Closure (Base and Option Cases)									
STORAGE		**RETRIEVAL**		**TREATMENT**		**DISPOSAL**		**CLOSURE**	
Key Features • 4 waste receiver facilities • No new double-shell tanks		*Key Features* • 99.9 percent tank waste retrieval • Liquid-based retrieval technologies and new retrieval technology • Current leak detection technology • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank		*Key Features* • Waste treatment: 2018–2043 • 6 MTG/day (2 HLW melters) × 90 MTG/day (6 LAW melters) • No Tc-99 removal • No sulfate removal • No tank-derived TRU waste treatment • No supplemental treatment technology		*Key Features* • No ILAW disposal on site • ILAW storage facilities • IHLW storage includes CSB + 4 additional vaults • IHLW tank debris storage • PPF glass disposed of on site		*Key Features* • Clean closure of single-shell tank farms and landfill closure (modified RCRA Subtitle C barrier) of adjacent cribs and trenches (ditches) (option includes clean closure of adjacent cribs and trenches [ditches]) • Future use	
Potential Issues • Construction of 4 waste receiver facilities		*Potential Issues* • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank • Additional tank-cleaning process (chemical wash)		*Potential Issues* • Construction of expanded Waste Treatment Plant • All waste treated as HLW; large number of ILAW containers		*Potential Issues* • No waste acceptance criteria for HLW and LAW melters (stored indefinitely) • No waste acceptance criteria for HLW resulting from clean closure activities • No ILAW disposition		*Potential Issues* • Clean closure	
Description • 2.2.1 • 2.2.2.1 • 2.5.2.6.2 • D.1 • E.1	*Impacts* • 4.1.1.10 LR • 4.1.4.10 AQ • 4.1.7.10 ER • 4.1.9.10 S • 4.1.10.10 NO • 4.1.11.10 FA	*Description* • 2.2.2.1 • 2.5.2.6.2 • D.1 • E.1	*Impacts* • 4.1.4.10 AQ • 4.1.6.10 WR • 4.1.9.10 S • 4.1.10.10 NO • 4.1.11.10 FA • 5.1.1.10 GW • 5.1.2.10 HH • 5.1.3.10 LER	*Description* • 2.2.2.2 • 2.5.2.6.2 • D.1 • E.1	*Impacts* • 4.1.1.10 LR • 4.1.4.10 AQ • 4.1.6.10 WR • 4.1.7.10 ER • 4.1.9.10 S • 4.1.10.10 NO • 4.1.11.10 FA • 4.1.14.10 WM • 5.1.1.10 GW • 5.1.2.10 HH • 5.1.3.10 LER	*Description* • 2.2.2.3 • 2.5.2.6.2 • D.1 • E.1	*Impacts* • 4.1.1.10 LR • 4.1.4.10 AQ • 4.1.6.10 WR • 4.1.7.10 ER • 4.1.9.10 S • 4.1.11.10 FA • 4.1.12.10 T • 4.1.14.10 WM • 5.1.1.10 GW • 5.1.2.10 HH • 5.1.3.10 LER	*Description* • 2.2.2.4 • 2.5.2.6.2 • E.1	*Impacts* • 4.1.4.10 AQ • 4.1.6.10 WR • 4.1.9.10 S • 4.1.10.10 NO • 4.1.14.10 WM • 5.1.1.10 GW • 5.1.2.10 HH • 5.1.3.10 LER

Note: "Key Features" include alternative configurations, treatment dates, and assumptions. "Potential Issues" include topics that may be environmental impact drivers or are expected to be of interest to readers. "Description" identifies EIS Chapter 2 and Appendix D and E sections that further describe the Key Features, including the technologies evaluated. Chapter 2 provides an overview of the alternatives, while Appendix E provides more-detailed information. "Impacts" identify EIS Chapter 4 and 5 sections that describe the impacts of the Key Features and/or Potential Issues.

Key: AQ=Air Quality; CSB=Canister Storage Building; EIS=environmental impact statement; ER=Ecological Resources; FA=Facility Accidents; GW=Groundwater; HH=Human Health; HLW=high-level radioactive waste; IHLW=immobilized high-level radioactive waste; ILAW=immobilized low-activity waste; LAW=low-activity waste; LER=Long-Term Ecological Risk; LR=Land Resources; MTG=metric tons of glass; NO=Normal Operations; PPF=Preprocessing Facility; RCRA=Resource Conservation and Recovery Act; S=Socioeconomics; T=transportation; Tc-99=technetium-99; TRU=transuranic; WM=Waste Management; WR=Water Resources.

Table 4. Roadmap to the Tank Closure Alternatives *(continued)*

TANK CLOSURE ALTERNATIVE 6C: All Vitrification with Separations; Landfill Closure									
STORAGE		**RETRIEVAL**		**TREATMENT**		**DISPOSAL**		**CLOSURE**	
Key Features • 4 waste receiver facilities • No new double-shell tanks		*Key Features* • 99 percent tank waste retrieval • Liquid-based retrieval technologies • Current leak detection technology • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank		*Key Features* • Waste treatment: 2018–2043 • 6 MTG/day (2 HLW melters) × 90 MTG/day (6 LAW melters) • No Tc-99 removal • No sulfate removal • No tank-derived TRU waste treatment		*Key Features* • No ILAW disposal on site • ILAW storage facilities • IHLW storage includes CSB + 4 additional vaults		*Key Features* • Landfill closure (modified RCRA Subtitle C barrier) • Upper 4.6 meters (15 feet) of soil in BX and SX tank farms and ancillary equipment removed • 100-year postclosure care	
Potential Issues • Construction of 4 waste receiver facilities		*Potential Issues* • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank		*Potential Issues* • Construction of expanded Waste Treatment Plant • All waste treated as HLW; large number of ILAW containers		*Potential Issues* • No waste acceptance criteria for HLW and LAW melters (stored indefinitely) • No ILAW disposition		*Potential Issues* • Landfill closure of all single-shell tank farms with 1 percent residual waste	
Description • 2.2.1 • 2.2.2.1 • 2.5.2.6.3 • D.1 • E.1	*Impacts* • 4.1.1.11 LR • 4.1.4.11 AQ • 4.1.10.11 NO • 4.1.11.11 FA	*Description* • 2.2.2.1 • 2.5.2.6.3 • D.1 • E.1	*Impacts* • 4.1.4.11 AQ • 4.1.6.11 WR • 4.1.9.11 S • 4.1.10.11 NO • 4.1.11.11 FA • 5.1.1.11 GW • 5.1.2.11 HH • 5.1.3.11 LER	*Description* • 2.2.2.2 • 2.5.2.6.3 • D.1 • E.1	*Impacts* • 4.1.1.11 LR • 4.1.4.11 AQ • 4.1.6.11 WR • 4.1.7.11 ER • 4.1.9.11 S • 4.1.10.11 NO • 4.1.11.11 FA • 4.1.14.11 WM • 5.1.1.11 GW • 5.1.2.11 HH • 5.1.3.11 LER	*Description* • 2.2.2.3 • 2.5.2.6.3 • D.1 • E.1	*Impacts* • 4.1.1.11 LR • 4.1.4.11 AQ • 4.1.6.11 WR • 4.1.7.11 ER • 4.1.9.11 S • 4.1.11.11 FA • 4.1.12.11 T • 4.1.14 11WM • 5.1.1.11 GW • 5.1.2.11 HH • 5.1.3.11 LER	*Description* • 2.2.2.4 • 2.5.2.6.3 • E.1	*Impacts* • 4.1.4.11 AQ • 4.1.6.11 WR • 4.1.10.11 NO • 4.1.14.11 WM • 5.1.1.11 GW • 5.1.2.11 HH • 5.1.3.11 LER

Note: "Key Features" include alternative configurations, treatment dates, and assumptions. "Potential Issues" include topics that may be environmental impact drivers or are expected to be of interest to readers. "Description" identifies EIS Chapter 2 and Appendix D and E sections that further describe the Key Features, including the technologies evaluated. Chapter 2 provides an overview of the alternatives, while Appendix E provides more-detailed information. "Impacts" identify EIS Chapter 4 and 5 sections that describe the impacts of the Key Features and/or Potential Issues.

Key: AQ=Air Quality; CSB=Canister Storage Building; EIS=environmental impact statement; ER=Ecological Resources; FA=Facility Accidents; GW=Groundwater; HH=Human Health; HLW=high-level radioactive waste; IHLW=immobilized high-level radioactive waste; ILAW=immobilized low-activity waste; LAW=low-activity waste; LER=Long-Term Ecological Risk; LR=Land Resources; MTG=metric tons of glass; NO=Normal Operations; RCRA=Resource Conservation and Recovery Act; S=Socioeconomics; T=Transportation; Tc-99=technetium-99; TRU=transuranic; WM=Waste Management; WR=Water Resources.

Table 5. Roadmap to the FFTF Decommissioning Alternatives

<table>
<tr><th colspan="5">FFTF DECOMMISSIONING ALTERNATIVE 1:
No Action</th></tr>
<tr><th colspan="2">FACILITY DISPOSITION</th><th colspan="2">DISPOSITION OF REMOTE-HANDLED SPECIAL COMPONENTS</th><th>DISPOSITION OF BULK SODIUM</th></tr>
<tr><td colspan="2">Key Features
FFTF Reactor Containment Building and buildings in Property Protected Area maintained under administrative control
Reactor vessel, piping systems, special components, and tanks left in place</td><td colspan="2">Key Features
Remote-handled special components left in place</td><td>Key Features
Bulk sodium from FFTF deactivation activities stored as a solid in tanks in the Sodium Storage Facility
Hallam Reactor and Sodium Reactor Experiment sodium remain in storage</td></tr>
<tr><td colspan="2">Potential Issues
FFTF Reactor Containment Building not decommissioned as planned</td><td colspan="2">Potential Issues
No final disposition of remote-handled special components</td><td>Potential Issues
No final disposition of stored sodium</td></tr>
<tr><td>Description
2.3.1
2.3.2
2.3.3.1
2.5.3.1
D.2.2
E.2</td><td>Impacts
4.2.1.1 LR
4.2.4.1 AQ
4.2.6.1 WR
4.2.7.1 ER
4.2.10.1 NO
4.2.11.1 FA
5.2.1.1 GW
5.2.2.1 HH
5.2.3.1 LER</td><td>Description
2.3.3.2
2.5.3.1
D.2.2
E.2</td><td>Impacts
None</td><td>Description
2.3.3.3
2.5.3.1
D.2.2
E.2</td><td>Impacts
None</td></tr>
</table>

Note: "Key Features" include alternative configurations and assumptions. "Potential Issues" include topics that may be environmental impact drivers or are expected to be of interest to readers. "Description" identifies EIS Chapter 2 and Appendix D and E sections that further describe the Key Features, including the technologies evaluated. Chapter 2 provides an overview of the alternatives, while Appendix E provides more-detailed information. "Impacts" identify EIS Chapter 4 and 5 sections that describe the impacts of the Key Features and/or Potential Issues.

Key: AQ=Air Quality; EIS=environmental impact statement; ER=Ecological Resources; FA=Facility Accidents; FFTF=Fast Flux Test Facility; GW=Groundwater; HH=Human Health**;** LER=Long-Term Ecological Risk; LR=Land Resources; NO=Normal Operations; WR=Water Resources.

Table 5. Roadmap to the FFTF Decommissioning Alternatives (*continued*)

<table>
<tr><th colspan="5">FFTF DECOMMISSIONING ALTERNATIVE 2:
Entombment</th></tr>
<tr><th colspan="2">FACILITY DISPOSITION</th><th colspan="2">DISPOSITION OF REMOTE-HANDLED SPECIAL COMPONENTS</th><th>DISPOSITION OF BULK SODIUM</th></tr>
<tr><td colspan="2">Key Features
• FFTF Reactor Containment Building and buildings in Property Protected Area decommissioned
• All above-grade structures dismantled and filled
• Special components and small-diameter pipes removed
• Reactor vessel left in place and grouted
• Modified RCRA Subtitle C barrier placed over filled area</td><td colspan="2">Key Features
• Remote-handled special components removed and processed for disposal
• Idaho Option: processing of remote-handled special components at Remote Treatment Project proposed at Idaho National Laboratory’s Materials and Fuels Complex
• Hanford Option: processing of remote-handled special components occurs at a new facility at the Hanford Site</td><td>Key Features
• Bulk sodium from FFTF deactivation activities, Sodium Reactor Experiment sodium, and Hallam Reactor sodium converted to a caustic (sodium hydroxide) solution for use in the Waste Treatment Plant pretreatment process
• Idaho Reuse Option: conversion of sodium at the Sodium Processing Facility at Idaho National Laboratory’s Materials and Fuels Complex
• Hanford Reuse Option: conversion of sodium at a new facility at the Hanford Site</td></tr>
<tr><td colspan="2">Potential Issues
• Reactor vessel left in place
• Postclosure care required after placement of barrier (not released for unrestricted use)</td><td colspan="2">Potential Issues
• Transportation of special components to Idaho
• Building of new facility at the Hanford Site</td><td>Potential Issues
• Transportation of sodium to Idaho
• Building new facility at the Hanford Site</td></tr>
<tr><td>Description
• 2.3.1
• 2.3.2
• 2.3.3.1
• 2.5.3.2
• D.2.3
• E.2</td><td>Impacts
• 4.2.1.2 LR
• 4.2.4.2 AQ
• 4.2.6.2 WR
• 4.2.7.2 ER
• 4.2.9.2 S
• 4.2.10.2 NO
• 4.2.11.2 FA
• 4.2.12.2 T
• 4.2.14.2 WM
• 5.2.1.2 GW
• 5.2.2.2 HH
• 5.2.3.2 LER</td><td>Description
• 2.3.3.2
• 2.5.3.2
• D.2.3
• E.2</td><td>Impacts
• 4.2.1.2 LR
• 4.2.10.2 NO
• 4.2.11.2 FA
• 4.2.12.2 T
• 4.4.14.2 WM
• 5.2.1.2 GW
• 5.2.2.2 HH
• 5.2.3.2 LER</td><td>Description
• 2.3.3.3
• 2.5.3.2
• D.2.3
• E.2</td><td>Impacts
• 4.2.1.2 LR
• 4.2.6.2 WR
• 4.2.10.2 NO
• 4.2.11.2 FA
• 4.2.12.2 T
• 4.2.14.2 WM
• 5.2.1.2 GW
• 5.2.2.2 HH
• 5.2.3.2 LER</td></tr>
</table>

Note: “Key Features” include alternative configurations and assumptions. “Potential Issues” include topics that may be environmental impact drivers or are expected to be of interest to readers. “Description” identifies EIS Chapter 2 and Appendix D and E sections that further describe the Key Features, including the technologies evaluated. Chapter 2 provides an overview of the alternatives, while Appendix E provides more-detailed information. “Impacts” identify EIS Chapter 4 and 5 sections that describe the impacts of the Key Features and/or Potential Issues.

Key: AQ=Air Quality; EIS=environmental impact statement; ER=Ecological Resources; FA=Facility Accidents; FFTF=Fast Flux Test Facility; GW=Groundwater; HH=Human Health**;** LER=Long-Term Ecological Risk; LR=Land Resources; MTG=metric tons of glass; NO=Normal Operations; RCRA=Resource Conservation and Recovery Act; S=Socioeconomics; T=Transportation; WM=Waste Management; WR=Water Resources.

Table 5. Roadmap to the FFTF Decommissioning Alternatives (*continued*)

FFTF DECOMMISSIONING ALTERNATIVE 3: Removal					
FACILITY DISPOSITION		**DISPOSITION OF REMOTE-HANDLED SPECIAL COMPONENTS**		**DISPOSITION OF BULK SODIUM**	
Key Features • FFTF Reactor Containment Building and buildings in Property Protected Area decommissioned • Reactor Containment Building and support facilities demolished to 0.91 meters (3 feet) below grade • Remote-handled special components and small diameter pipes removed • Remaining portion of buildings backfilled and area revegetated		*Key Features* • Remote-handled special components removed and processed for disposal • Idaho Option: processing of remote-handled special components at Remote Treatment Project proposed at Idaho National Laboratory's Materials and Fuels Complex • Hanford Option: processing of remote-handled special components at a new facility at the Hanford Site		*Key Features* • Bulk sodium from FFTF deactivation activities, SRE sodium, and Hallam Reactor sodium converted to a caustic (sodium hydroxide) solution for use in the Waste Treatment Plant pretreatment process • Hanford Reuse Option: conversion of sodium at a new facility at the Hanford Site • Idaho Reuse Option: conversion of sodium at the Sodium Processing Facility at Idaho National Laboratory's Materials and Fuels Complex	
Potential Issues • Reactor vessel disposed of on site • Revegetated area may still require postclosure care		*Potential Issues* • Transportation of special components to Idaho • Building new facility at the Hanford Site		*Potential Issues* • Transportation of sodium to Idaho • Building new facility at the Hanford Site	
Description • 2.3.1 • 2.3.2 • 2.3.3.1 • 2.5.3.3 • D.2.4 • E.2	*Impacts* • 4.2.1.3 LR • 4.2.4.3 AQ • 4.2.6.3 WR • 4.2.7.3 ER • 4.2.9.3 S • 4.2.10.3 NO • 4.2.11.3 FA • 4.2.12.3 T • 4.2.14.3 WM • 5.2.1.3 GW • 5.2.2.3 HH • 5.2.3.3 LER	*Description* • 2.3.1 • 2.3.2.2 • 2.3.3.2 • 2.5.3.3 • D.2.4 • E.2	*Impacts* • 4.2.1.3 LR • 4.2.4.3 AQ • 4.2.9.3 S • 4.2.10.3 NO • 4.2.11.3 FA • 4.2.12.3 T • 4.2.14.3 WM • 5.2.1.3 GW • 5.2.2.3 HH • 5.2.3.3 LER	*Description* • 2.3.3.3 • 2.5.3.3 • D.2.4 • E.2	*Impacts* • 4.2.1.3 LR • 4.2.4.3 AQ • 4.2.9.3 S • 4.2.10.3 NO • 4.2.11.3 FA • 4.2.12.3 T • 4.2.14.3 WM • 5.2.1.3 GW • 5.2.2.3 HH • 5.2.3.3 LER

Note: "Key Features" include alternative configurations and assumptions. "Potential Issues" include topics that may be environmental impact drivers or are expected to be of interest to readers. "Description" identifies EIS Chapter 2 and Appendix D and E sections that further describe the Key Features, including the technologies evaluated. Chapter 2 provides an overview of the alternatives, while Appendix E provides more-detailed information. "Impacts" identify EIS Chapter 4 and 5 sections that describe the impacts of the Key Features and/or Potential Issues.

Key: AQ=Air Quality; EIS=environmental impact statement; ER=Ecological Resources; FA=Facility Accidents; FFTF=Fast Flux Test Facility; GW=Groundwater; HH=Human Health**;** LER=Long-Term Ecological Risk; LR=Land Resources; MTG=metric tons of glass; NO=Normal Operations; S=Socioeconomics; SRE=Sodium Reactor Experiment; T=Transportation; WM=Waste Management; WR=Water Resources.

Table 6. Roadmap to the Waste Management Alternatives

<table>
<tr><th colspan="5">WASTE MANAGEMENT ALTERNATIVE 1:
No Action</th></tr>
<tr><th colspan="2">STORAGE AND TREATMENT</th><th colspan="2">DISPOSAL</th><th>CLOSURE</th></tr>
<tr><td colspan="2">Key Features
Continued storage/treatment of LLW, MLLW, and TRU waste at the CWC to process for disposal
Continued storage/treatment of LLW, MLLW, and TRU waste at WRAP and the T Plant complex
No offsite shipments of TRU waste or LLW/MLLW</td><td colspan="2">Key Features
Continued disposal of LLW and MLLW in lined trenches 31 and 34 in burial ground 218-W-5
Discontinued construction of IDF-East</td><td>Key Features
Administrative control for 100 years after operations cease</td></tr>
<tr><td colspan="2">Potential Issues
No additional storage capacity for onsite waste</td><td colspan="2">Potential Issues
No additional disposal capacity for on- or offsite waste</td><td>Potential Issues
No issues</td></tr>
<tr><td>Description
2.4.1
2.4.2
2.5.4.1
D.3.2
E.3</td><td>Impacts
4.3.1.1 LR
4.3.4.1 AQ
4.3.6.1 WR
4.3.9.11 S
4.3.10.1 NO
4.3.11.1 FA
4.2.12.3 T
4.3.14.1 WM
5.3.1.1 GW
5.3.2.1 HH
5.3.3.1 LER</td><td>Description
2.4.1
2.4.2
2.5.4.1
E.3</td><td>Impacts
4.3.1.1 LR
4.3.4.1 AQ
4.3.6.1 WR
4.3.10.1 NO
4.3.11.1 FA
4.2.12.3 T
4.3.14.1 WM
5.3.1.1 GW
5.3.2.1 HH
5.3.3.1 LER</td><td>Description
2.4.2.5
2.5.4.1</td><td>Impacts
4.3.4.1 AQ
4.3.6.1 WR
4.2.12.3 T
4.3.14.1 WM
5.3.1.1 GW
5.3.2.1 HH
5.3.3.1 LER</td></tr>
</table>

Note: "Key Features" include alternative configurations, treatment dates, and assumptions. "Potential Issues" include topics that may be environmental impact drivers or are expected to be of interest to readers. "Description" identifies EIS Chapter 2 and Appendix D and E sections that further describe the Key Features, including the technologies evaluated. Chapter 2 provides an overview of the alternatives, while Appendix E provides more-detailed information. "Impacts" identify EIS Chapter 4 and 5 sections that describe the impacts of the Key Features and/or Potential Issues.

Key: AQ=Air Quality; CERCLA=Comprehensive Environmental Response, Compensation, and Liability Act; CWC=Central Waste Complex; EIS=environmental impact statement; ER=Ecological Resources; FA=Facility Accidents; FFTF=Fast Flux Test Facility; GS=Geology and Soil; GW=Groundwater; HH=Human Health**;** IDF=Integrated Disposal Facility; LER=Long-Term Ecological Risk; LLW=low-level radioactive waste; LR=Land Resources; MLLW=mixed low-level radioactive waste; NO=Normal Operations; RPPDF=River Protection Project Disposal Facility; S=Socioeconomics; T=Transportation; TRU=transuranic; WM=Waste Management; WR=Water Resources; WRAP=Waste Receiving and Processing Facility.

Table 6. Roadmap to the Waste Management Alternatives *(continued)*

<table>
<tr><th colspan="5">WASTE MANAGEMENT ALTERNATIVE 2:
Disposal in IDF, 200-East Area Only</th></tr>
<tr><th colspan="2">STORAGE AND TREATMENT</th><th colspan="2">DISPOSAL</th><th>CLOSURE</th></tr>
<tr><td colspan="2">Key Features
Continued storage/treatment of LLW, MLLW, and TRU waste at the CWC, WRAP, and T Plant
Construction of expansions of the CWC, WRAP, and T Plant complex
No offsite shipments of TRU waste
Offsite shipments of LLW and MLLW</td><td colspan="2">Key Features
Continued disposal of LLW and MLLW in lined trenches 31 and 34 in burial ground 218-W-5
IDF construction in 200-East Area for tank, onsite-generated non-CERCLA, FFTF decommissioning, waste management, and offsite LLW and MLLW
RPPDF construction in 200 Areas for lightly contaminated equipment and soils resulting from tank-related closure activities</td><td>Key Features
Modified RCRA Subtitle C barriers for IDF (200-East Area) and RPPDF and 100 years of postclosure care</td></tr>
<tr><td colspan="2">Potential Issues
Transportation of offsite waste</td><td colspan="2">Potential Issues
Disposal of offsite waste
Disposal of tank closure treated waste forms</td><td>Potential Issues
No issues</td></tr>
<tr><td>Description
2.4.1
2.4.2
2.5.4.2
D.3.3
E.3</td><td>Impacts
4.3.1.2 LR
4.3.4.2 AQ
4.3.5.2 GS
4.3.6.2 WR
4.3.7.2 ER
4.3.9.2 S
4.3.10.2 NO
4.3.11.2 FA
4.3.12.2 T
4.3.14.2 WM
5.3.1.2 GW
5.3.2.2 HH
5.3.3.2 LER</td><td>Description
2.4.1
2.4.2
2.5.4.2
E.3</td><td>Impacts
4.3.1.2 LR
4.3.4.2 AQ
4.3.5.2 GS
4.3.6.2 WR
4.3.7.2 ER
4.3.9.2 S
4.3.10.2 NO
4.3.11.2 FA
4.3.12.2 T
4.3.14.2 WM
5.3.1.2 GW
5.3.2.2 HH
5.3.3.2 LER</td><td>Description
2.4.2.5
2.5.4.2</td><td>Impacts
4.3.1.2 LR
4.3.4.2 AQ
4.3.5.2 GS
4.3.6.2 WR
4.3.7.2 ER
4.3.14.2 WM
5.3.1.2 GW
5.3.2.2 HH
5.3.3.3 LER</td></tr>
</table>

Note: "Key Features" include alternative configurations, treatment dates, and assumptions. "Potential Issues" include topics that may be environmental impact drivers or are expected to be of interest to readers. "Description" identifies EIS Chapter 2 and Appendix D and E sections that further describe the Key Features, including the technologies evaluated. Chapter 2 provides an overview of the alternatives, while Appendix E provides more-detailed information. "Impacts" identify EIS Chapter 4 and 5 sections that describe the impacts of the Key Features and/or Potential Issues.

Key: AQ=Air Quality; CERCLA=Comprehensive Environmental Response, Compensation, and Liability Act; CWC=Central Waste Complex; EIS=environmental impact statement; ER=Ecological Resources; FA=Facility Accidents; FFTF=Fast Flux Test Facility; GS=Geology and Soil; GW=Groundwater; HH=Human Health**;** IDF=Integrated Disposal Facility; LER=Long-Term Ecological Risk; LLW=low-level radioactive waste; LR=Land Resources; MLLW=mixed low-level radioactive waste; NO=Normal Operations; RCRA=Resource Conservation and Recovery Act; RPPDF=River Protection Project Disposal Facility; S=Socioeconomics; T=Transportation; TRU=transuranic; WM=Waste Management; WR=Water Resources; WRAP=Waste Receiving and Processing Facility.

Table 6. Roadmap to the Waste Management Alternatives (*continued*)

<table>
<tr><th colspan="5">WASTE MANAGEMENT ALTERNATIVE 3:
Disposal in IDF, 200-East and 200-West Areas</th></tr>
<tr><th colspan="2">STORAGE AND TREATMENT</th><th colspan="2">DISPOSAL</th><th>CLOSURE</th></tr>
<tr><td colspan="2">Key Features
Continued storage/treatment of LLW, MLLW, and TRU waste at the CWC, WRAP, and T Plant
Construction of expansions of the CWC, WRAP, and T Plant complex
No offsite shipments of TRU waste
Offsite shipments of LLW and MLLW</td><td colspan="2">Key Features
Continued disposal of LLW and MLLW in lined trenches 31 and 34 in burial ground 218-W-5
IDF construction in 200-East Area for tank waste
IDF construction in 200-West Area for onsite-generated non-CERCLA, FFTF decommissioning, waste management, and offsite LLW and MLLW
RPPDF construction in 200 Areas for lightly contaminated equipment and soils resulting from tank-related closure activities</td><td>Key Features
Modified RCRA Subtitle C barriers for IDF (200-East Area) and RPPDF and 100 years of postclosure care</td></tr>
<tr><td colspan="2">Potential Issues
Transportation of offsite waste</td><td colspan="2">Potential Issues
Two onsite disposal locations
Disposal of offsite waste
Disposal of tank closure treated waste forms</td><td>Potential Issues
No issues</td></tr>
<tr><td>Description
2.4.1
2.4.2
2.5.4.3
D.3.4
E.3</td><td>Impacts
4.3.1.2 LR
4.3.4.2 AQ
4.3.5.2 GS
4.3.6.2 WR
4.3.7.2 ER
4.3.9.2 S
4.3.10.2 NO
4.3.11.2 FA
4.2.12.2 T
4.3.14.2 WM
5.3.1.2 GW
5.3.2.2 HH
5.3.3.2 LER</td><td>Description
2.4.1
2.4.2
2.5.4.3
E.3</td><td>Impacts
4.3.1.12 LR
4.3.4.2 AQ
4.3.5.2 GS
4.3.6.2 WR
4.3.7.2 ER
4.3.9.2 S
4.3.10.2 NO
4.3.11.2 FA
4.2.12.2 T
4.3.14.2 WM
5.3.1.2 GW
5.3.2.2 HH
5.3.3.2 LER</td><td>Description
2.4.1
2.4.2
2.4.2.5
2.5.4.3</td><td>Impacts
4.3.1.12 LR
4.3.4.2 AQ
4.3.5.2 GS
4.3.6.2 WR
4.3.7.2 ER
4.3.14.2 WM
5.3.1.2 GW
5.3.2.2 HH
5.3.3.2 LER</td></tr>
</table>

Note: "Key Features" include alternative configurations, treatment dates, and assumptions. "Potential Issues" include topics that may be environmental impact drivers or are expected to be of interest to readers. "Description" identifies EIS Chapter 2 and Appendix D and E sections that further describe the Key Features, including the technologies evaluated. Chapter 2 provides an overview of the alternatives, while Appendix E provides more-detailed information. "Impacts" identify EIS Chapter 4 and 5 sections that describe the impacts of the Key Features and/or Potential Issues.

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ORGANIZATION OF THE *DRAFT TC & WM EIS*

This *Draft TC & WM EIS* is organized as described below.

- **Summary—**The Summary, a separate volume, summarizes the key information provided in this *TC & WM EIS* and includes background on, and regulatory history of, past activities at Hanford; the purpose and need for agency actions; a description and comparison of the alternatives; an overview of the tank farm systems, FFTF decommissioning activities, and solid waste operations complex; and a summary of potential short- and long-term impacts of the alternatives, key environmental findings, and costs of the alternatives.

- **Chapter 1—Proposed Actions: Background, Purpose, and Need.** Chapter 1 provides background information regarding preparation of this *TC & WM EIS*, including the purpose and need, for agency action regarding final waste disposition, SST system closure, and FFTF decommissioning; the anticipated decisions to be made based on the EIS analyses; a summary of the issues identified during scoping; the scope of this EIS, including brief summaries of the alternatives; the relationship of the proposed actions to other actions or programs; the cooperating agencies; and the organization of this *TC & WM EIS*.

- **Chapter 2—Proposed Actions and Alternatives.** Chapter 2 describes the alternatives evaluated in this EIS. This chapter also includes a description of the processes and facilities that could be used to implement each of the alternatives and a summary of the short- and long-term environmental impacts and cost estimates of each alternative.

- **Chapter 3—Affected Environment.** Chapter 3 describes the existing Hanford and INL environments that may be affected by the alternatives under consideration. In general, Hanford as a whole is described first, followed by the 200 and 400 Areas. The existing environments described include human, air, and surface and subsurface media that could be affected by activities related to tank waste retrieval, treatment, and disposal; SST system closure; interim storage, as applicable; FFTF decommissioning; and waste management.

- **Chapter 4—Short-Term Environmental Consequences.** Chapter 4 discusses the short-term environmental impacts associated with the various EIS alternatives for tank closure, FFTF decommissioning, and waste management. Impacts produced by construction, operations, decontamination, and decommissioning are considered.

- **Chapter 5—Long-Term Environmental Consequences.** Chapter 5 discusses the long-term environmental impacts associated with the various EIS alternatives for tank closure, FFTF decommissioning, and waste management, focusing on long-term environmental impacts on groundwater and human health, as well as ecological risks.

- **Chapter 6—Cumulative Impacts.** Chapter 6 discusses the cumulative impacts associated with the various EIS alternatives.

- **Chapter 7—Environmental Consequences Discussion.** Chapter 7 discusses possible measures to mitigate impacts identified in Chapters 4, 5, and 6; unavoidable adverse environmental impacts; the relationship between short-term use of the environment and long-term productivity; and any irreversible and irretrievable resource commitments.

- **Chapter 8—Potentially Applicable Laws, Regulations, and Other Requirements.** Chapter 8 describes the environmental laws, regulations, permits, and consultations that are potentially applicable to the various activities related to tank waste retrieval, treatment, and disposal and SST system closure; FFTF decommissioning; and waste management associated with the alternatives. Federal laws and regulations; Executive orders; DOE directives, orders, and guidance; and other compliance actions related to protection of the environment also are described.

- **Chapter 9—Glossary.** Chapter 9 contains definitions of important technical terms that may not be commonly used, including both discipline-specific and DOE- and Hanford-unique terms.

- **Chapter 10—List of Preparers.** Chapter 10 identifies the DOE and contractor preparers of this EIS. Information is provided for each preparer in the following areas: (1) name, (2) affiliation, (3) education, (4) experience, and (5) EIS responsibility.

- **Chapter 11—Distribution List.** Chapter 11 contains the external distribution list for this EIS, which includes Federal, state, and local elected and appointed officials and agencies; American Indian representatives; environmental and public interest groups; and organizations and individuals who requested/were sent a copy of the draft EIS.

- **Chapter 12—Index.** Chapter 12 contains the index of key words and terms found in this EIS.

In addition, the following appendices are provided to support these chapters:

- Appendix A—*Federal Register* and Other Public Notices
- Appendix B—Contractor and Subcontractor National Environmental Policy Act Disclosure Statements
- Appendix C—Cooperating Agency, Consultation, and Other Interaction Documentation
- Appendix D—Waste Inventories
- Appendix E—Descriptions of Facilities, Operations, and Technologies
- Appendix F—Direct and Indirect Impacts: Assessment Methodology
- Appendix G—Air Quality Analysis
- Appendix H—Transportation
- Appendix I—Workforce Estimates
- Appendix J—Environmental Justice
- Appendix K—Human Health Risk Analysis
- Appendix L—Groundwater Flow Field Development
- Appendix M—Release to Vadose Zone
- Appendix N—Vadose Zone Flow and Transport
- Appendix O—Groundwater Transport Analysis
- Appendix P—Ecological Resources and Risk Analysis
- Appendix Q—Human Health, Dose, and Risk Analysis
- Appendix R—Cumulative Impacts: Assessment Methodology

- Appendix S—Waste Inventories for Cumulative Impact Analyses
- Appendix T—Supporting Information for the Short-Term Cumulative Impact Analyses
- Appendix U—Supporting Information for the Long-Term Cumulative Impact Analyses
- Appendix V—Black Rock Reservoir Sensitivity Analysis

AVAILABILITY OF THE *DRAFT TC & WM EIS*

A complete copy of this *TC & WM EIS* and a list of reference documents are available in public reading rooms and other information locations. Copies can also be obtained as indicated below.

For copies of, or additional information regarding, this *Draft TC & WM EIS*, contact:

Mary Beth Burandt, Document Manager
Office of River Protection
U.S. Department of Energy
Post Office Box 1178
Richland, WA 99352
Attention: *TC & WM EIS*
Email: TC&WMEIS@saic.com
Fax: 509-372-7701
Telephone and voicemail: 888-829-6347

For general information regarding DOE's NEPA process, contact:

Carol M. Borgstrom, Director
Office of NEPA Policy and Compliance
(GC-20)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585
Telephone: 202-586-4600, or leave a message at 800-472-2756