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WHC-EP-0630

# Regulatory Analysis for Closure of a Treatment and Storage Tank as a Landfill

E. H. Smith

Date Published
March 1993

MAR 1993
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Prepared for the U.S. Department of Energy
Office of Environmental Restoration and
Waste Management

Westinghouse Hanford Company
P.O. Box 1970
Richland, Washington 99352

Hanford Operations and Engineering Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

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National Technical Information Service
5285 Port Royal Road
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(703) 487-4650

Printed in the United States of America

DISCLM-1.CHP (1-91)

Document Title: Regulatory Analysis for Closure of a Treatment and Storage Tank as a Landfill

Prepared by: Edward H Smith 2/24/93
E. H. Smith Date
Advanced Scientist

Approved by: Roger J. Landon 2/24/93
R. J. Landon, Manager Date
Regulatory Analysis

Approved by: F. A. Ruck III 2/25/93
F. A. Ruck III, Manager Date
RCRA Closures

Date Received 1-28-93 cw

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ID Number (include revision, volume, etc.): WHC-EP-0630

List attachments: N/A

Date Release Required: 2-12-93

Title: REGULATORY ANALYSIS FOR CLOSURE OF A TREATMENT AND STORAGE TANK AS A LANDFILL

Unclassified Category: UC-

Impact Level:

New or novel (patentable) subject matter? ☒ No ☐ Yes
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Title of Conference or Meeting: N/A

Group or Society Sponsoring: N/A

Date(s) of Conference or Meeting: N/A

City/State: N/A

Will proceedings be published? ☐ Yes ☐ No
Will material be handed out? ☐ Yes ☐ No

Title of Journal: N/A

## CHECKLIST FOR SIGNATORIES

| Review Required per WHC-CM-3-4 | Yes | No | Reviewer - Signature Indicates Approval: Name (printed) | Signature | Date |
|---|---|---|---|---|---|
| Classification/Unclassified Controlled Nuclear Information | ☐ | ☑ | | | |
| Patent-General Counsel | ☑ | ☐ | SW BERGLIN | SW Berglin | 2/3/93 |
| Legal-General Counsel | ☒ | ☐ | B.D. Williamson | BD Williamson | 2/4/93 |
| Applied Technology/Export Controlled Information or International Program | ☐ | ☑ | | | |
| WHC Program/Project | ☒ | ☐ | R.J. Landon | Roger J. Landon | 1/29/93 |
| Communications | ☐ | ☑ | | | |
| RL Program/Project | ☑ | ☐ | E.J. Senat | E J Senat | 2/10/93 |
| Publications Services | ☒ | ☐ | Loretta Orgill | Loretta Orgill | 2/19/93 |
| Other Program/Project | ☐ | ☐ | | | |

Information conforms to all applicable requirements. The above information is certified to be correct.

| | Yes | No |
|---|---|---|
| References Available to Intended Audience | ☒ | ☐ |
| Transmit to DOE-HQ/Office of Scientific and Technical Information | ☒ | ☐ |

Author/Requestor (Printed/Signature) Date
EDWARD H. SMITH Edward H. Smith 11/26/93

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BD-7600-062 (08/91)
Part 1

# REGULATORY ANALYSIS FOR CLOSURE OF A TREATMENT AND STORAGE TANK AS A LANDFILL

E. H. Smith

## ABSTRACT

*The Hanford Site single-shell tanks (SST) represent the most challenging waste remediation activity for the Hanford Site. Activities are currently underway to develop and demonstrate waste retrieval technologies to meet milestones established in the* Hanford Federal Facility Agreement and Consent Order[1] *and to ultimately accomplish closure of the SSTs. A closure plan, providing detailed information for closure of the SSTs, will be submitted to the State of Washington Department of Ecology (Ecology) by the year 2004. Because of the high radiation associated with SST waste and the technical difficulties associated with waste retrieval, a potential closure alternative for the SSTs may include leaving one or more of the tanks and residual waste in place and performing final closure in accordance with the closure and postclosure care requirements for a landfill.*

*This document provides an analysis of the regulatory requirements applicable to closing a hazardous waste treatment and storage tank system as a landfill. This analysis has been focused on the requirements applicable to treatment and storage tanks established pursuant to the* Resource Conservation and Recovery Act[2] *and Chapter 173-303 of the* Washington Administrative Code.[3]

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[1]*Hanford Federal Facility Agreement and Consent Order*, 1992, 2 vols., Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

[2]*Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq.*

*Additionally, this analysis provides information related to closure and postclosure care requirements that would be applicable if one or more of the SSTs were to be closed as a landfill. Three other U.S. Department of Energy sites have been surveyed to determine how closing their associated high-level waste tanks is being pursued. The results of that survey are also documented in this analysis.*

*The conclusion of this analysis, based upon a review of current regulations, guidance documentation, and preamble language contained in numerous* Federal Registers, *is that the U.S. Environmental Protection Agency (EPA) does allow a tank system to be closed as a landfill with waste remaining in place. Although Ecology is authorized to establish more stringent regulations than those issued by the EPA, they have not chosen to do so for regulations applicable to closing treatment and storage tank systems.*

*Ecology and EPA use different terminology when referring to regulated wastes. The EPA refers to regulated wastes as "hazardous" wastes while Ecology refers to regulated wastes as dangerous or extremely hazardous waste. To eliminate confusion, the term "hazardous" waste is used throughout this document when referring to regulated waste, irrespective of whether the associated regulation or guidance is issued by Ecology or EPA.*

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[3]WAC 173-303, 1990, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.

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## LIST OF TERMS

| | |
|---|---|
| AEA | *Atomic Energy Act of 1954* |
| ALARA | as low as reasonably achievable |
| ASTM | American Society for Testing and Materials |
| CERCLA | *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* |
| CFR | *Code of Federal Regulations* |
| D&D | decontamination and decommissioning |
| DHEC | Department of Health and Environmental Control |
| DOE | U.S. Department of Energy |
| DST | double-shell tank |
| Ecology | Washington State Department of Ecology |
| EIS | environmental impact statement |
| EPA | Environmental Protection Agency |
| FFTF | Fast Flux Test Facility |
| HLW | high-level waste |
| IDEQ | Idaho Department of Environmental Quality |
| INEL | Idaho National Engineering Laboratory |
| NRC | Nuclear Regulatory Commission |
| NYDEC | New York Department of Environmental Conservation |
| PFP | Plutonium Finishing Plant |
| PUREX | Plutonium-Uranium Extraction Facility |
| R&D | research and development |
| REDOX | reduction-oxidation |
| RCRA | *Resource Conservation and Recovery Act of 1976* |
| RFI | RCRA Facility Investigation |
| RL | U.S. Department of Energy, Richland Field Office |
| SRS | Savannah River Site |
| SST | single-shell tank |
| Tri-Party Agreement | *Hanford Federal Facility Agreement and Consent Order* |
| TSD | treatment, storage, and disposal |
| TWRS | Tank Waste Remediation System |
| WAC | *Washington Administrative Code* |
| WVNS | West Valley Nuclear Services |

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# REGULATORY ANALYSIS FOR CLOSURE OF A TREATMENT AND STORAGE TANK AS A LANDFILL

## 1.0 INTRODUCTION

This document provides a regulatory analysis of the requirements for closing a hazardous waste treatment and storage tank system as a landfill. This analysis has particular application with regard to closure of the single-shell tanks (SST). However, it has been limited in scope to regulations established by the *Resource Conservation and Recovery Act of 1976* (RCRA) and Chapter 173-303 of the *Washington Administrative Code* (WAC) that are applicable to hazardous waste treatment and storage tank systems. The U.S. Environmental Protection Agency (EPA) and Washington State Department of Ecology (Ecology) refer to regulated waste differently; the EPA defines regulated waste as "hazardous" waste while Ecology defines regulated waste as "dangerous" waste. To reduce confusion, the term "hazardous" waste has been used consistently throughout this document irrespective of reference to EPA or Washington State regulations.

Section 1.0 of this document provides background information on the Hanford Site SSTs. General information has been provided on the description of the Hanford Site, physical description of the SSTs, and current regulatory status of the SSTs.

Section 2.0 of this document provides information related to closing a hazardous waste treatment and storage tank system as a landfill. This section provides a summary of information contained in current regulations issued by the EPA and Ecology, guidance documents and preamble language contained in *Federal Registers* (FR) issued by the EPA, and language contained in the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1992) related to closing treatment, storage, and disposal (TSD) units.

Section 3.0 of this document provides information related to the general closure requirements applicable to all TSD units, as well as the specific closure and postclosure care requirements applicable to units that are closed as a landfill. Also included in this section is a discussion of requirements for owners and operators of hazardous waste tank systems that do not have secondary containment to prepare contingent closure plans addressing closure requirements for landfills.

Section 4.0 of this document proposes a limited number of alternative closure options that may be used to support a landfill closure option. Included in this section is a discussion of closure based upon the following: (1) classification as a miscellaneous unit, (2) requirements established in the *Atomic Energy Act of 1954* (AEA), and (3) amendments to the Tri-Party Agreement.

Section 5.0 of this document provides information regarding efforts underway at other U.S. Department of Energy (DOE) sites to close their

associated high-level waste (HLW) tanks. The DOE sites that were evaluated include the Idaho National Engineering Laboratory (INEL), West Valley Nuclear Services (WVNS), and the Savannah River Site Laboratory (SRS). Finally, conclusions reached in this document are presented in Section 6.0.

## 1.1 BACKGROUND

### 1.1.1 Hanford Site Description

In 1943, the U.S. Army Corps of Engineers selected the Hanford Site as the key location for producing nuclear materials, mainly plutonium, in support of the United States' World War II Manhattan Project effort. Since that time, this area has been dedicated to nuclear material production, diverse research, and waste management activities. The Hanford Site facilities were first built and operated by the U.S. Army Corps of Engineers and subsequently operated by the Atomic Energy Commission, the Energy Research and Development Administration, and finally by the DOE.

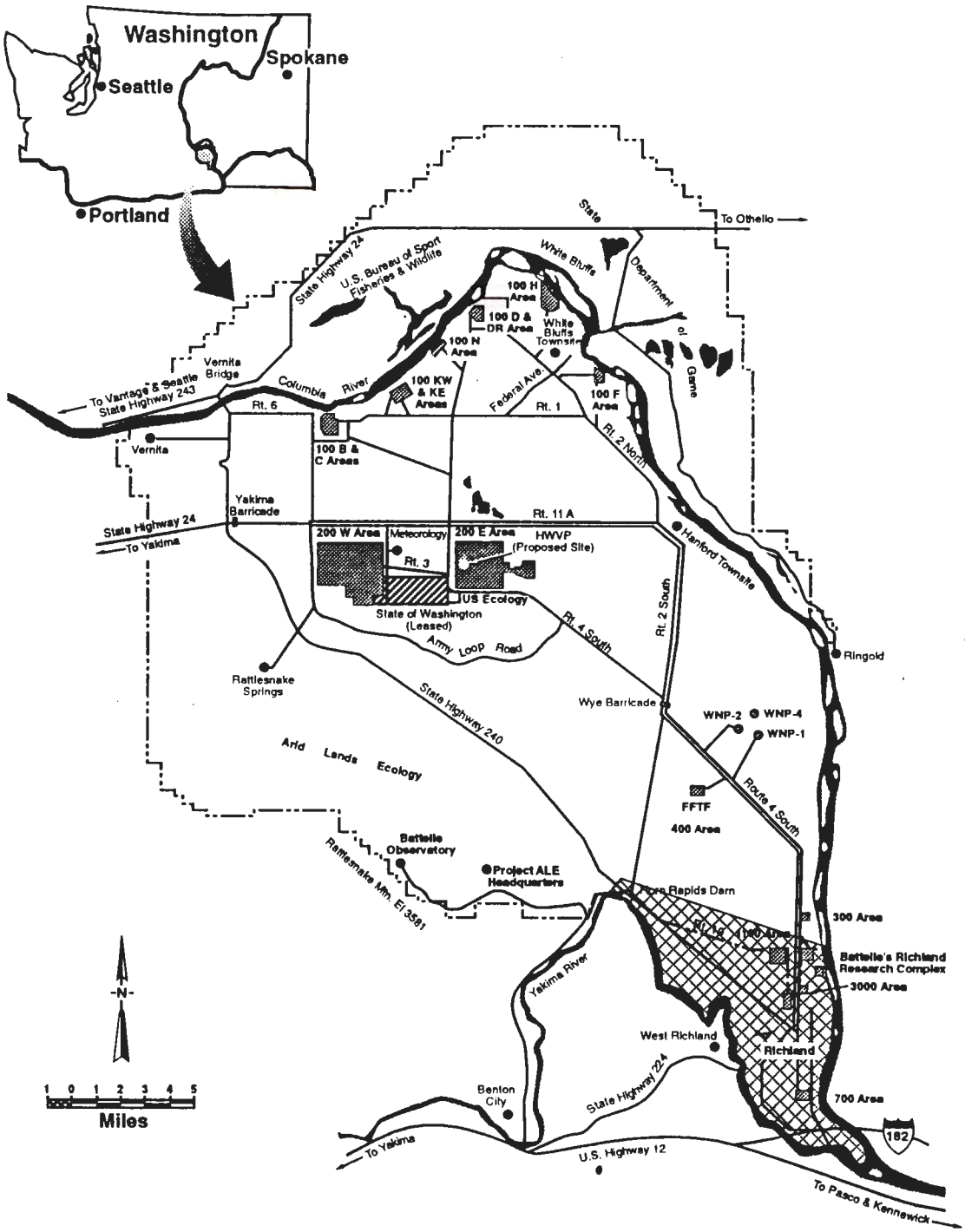
As illustrated in Figure 1, The Hanford Site is located in the semiarid part of southeastern Washington State and currently occupies 560 $mi^2$ (1,450 $km^2$) of land. The Hanford Site is divided into four major areas: 100, 200, 300, and 400. The 300 Area was used for the manufacturing of uranium fuel, which served as the fuel supply for nine production reactors located at the 100 Area. This area is now used for research and development (R&D) as well as analytical laboratory support activities. The Fast Flux Test Facility (FFTF) is located at the 400 Area of the Hanford Site. The FFTF is a liquid metal test reactor used for the high temperature testing of reactor fuels and development of reactor technology, among other things.

The 100 Area is located along the Columbia River on the north side of the Hanford Site. Nine production reactors are located at this area. These reactors used a once-through cooling system, with the exception of N Reactor, which used a closed-loop cooling system. All of these reactors have been shut down for future decontamination and decommissioning (D&D).

The 200 Area has been divided into the 200 East and 200 West Areas. The 200 East Area contains two chemical processing facilities: the Plutonium-Uranium Extraction (PUREX) Plant and B Plant. The B Plant was originally used as a bismuth phosphate recovery plant and was later used for recovery of strontium and cesium from the SSTs. Six SST tank farms (A, AX, B, BX, BY, and C) and five double-shell tank (DST) farms (AN, AP, AW, AY, and AZ) are located in the 200 East Area (Cruse et al. 1992).

The 200 West Area contains four process facilities: S, T, U, and Z Plant. The S Plant was used for the reduction-oxidation (REDOX) process, and T Plant was used as a bismuth phosphate recovery processing facility. The U Plant was used as a tributyl phosphate process for the recovery of uranium from certain tank wastes. The Z Plant houses the Plutonium Finishing Plant (PFP). Six SST tank farms (S, SX, T, TX, TY, and U) and one DST tank farm (SY) are located in the 200 West Area (Cruse et al. 1992).

Figure 1. Figure of the Hanford Site Depicting the 200 East and West Areas.

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### 1.1.2 Single-Shell Tank Physical Description

Between 1943 and 1964, 149 SSTs were built at the Hanford Site for the storage of radioactive and chemical wastes generated from the reprocessing of spent reactor fuel. These SSTs are located in 12 tank farms of 4 to 18 tanks each in the 200 East and West Areas. One hundred and thirty-three of the SSTs are 75 ft in diameter and 29.75 to 54 ft high (at their highest points) with nominal capacities of 500,000 to 1,000,000 gal. Sixteen of the tanks are smaller units of similar design and are 20 ft in diameter and 25.5 ft high with capacities of 55,000 gal. The various designs of the SSTs are depicted in Figure 2.

The SSTs are constructed of carbon steel, American Society for Testing and Materials (ASTM) A283 Grade C or ASTM A201 Grade C (241-AX Tank Farm), lining the bottom and sides of a reinforced concrete shell. The bottoms of most tanks are slightly concave. The tanks are belowgrade with at least 6 ft of soil cover providing shielding and minimizing radiation exposure to operating personnel. Inlet and overflow lines are located near the top of the liner for these tanks. Most of the 500,000 to 750,000-gal tanks were built in "cascades" of three or four tanks. Waste was transferred to the first tank of the cascade and allowed to overflow into successive tanks of the cascade through piping in the side walls to facilitate solids settling (Winters et al. 1990).

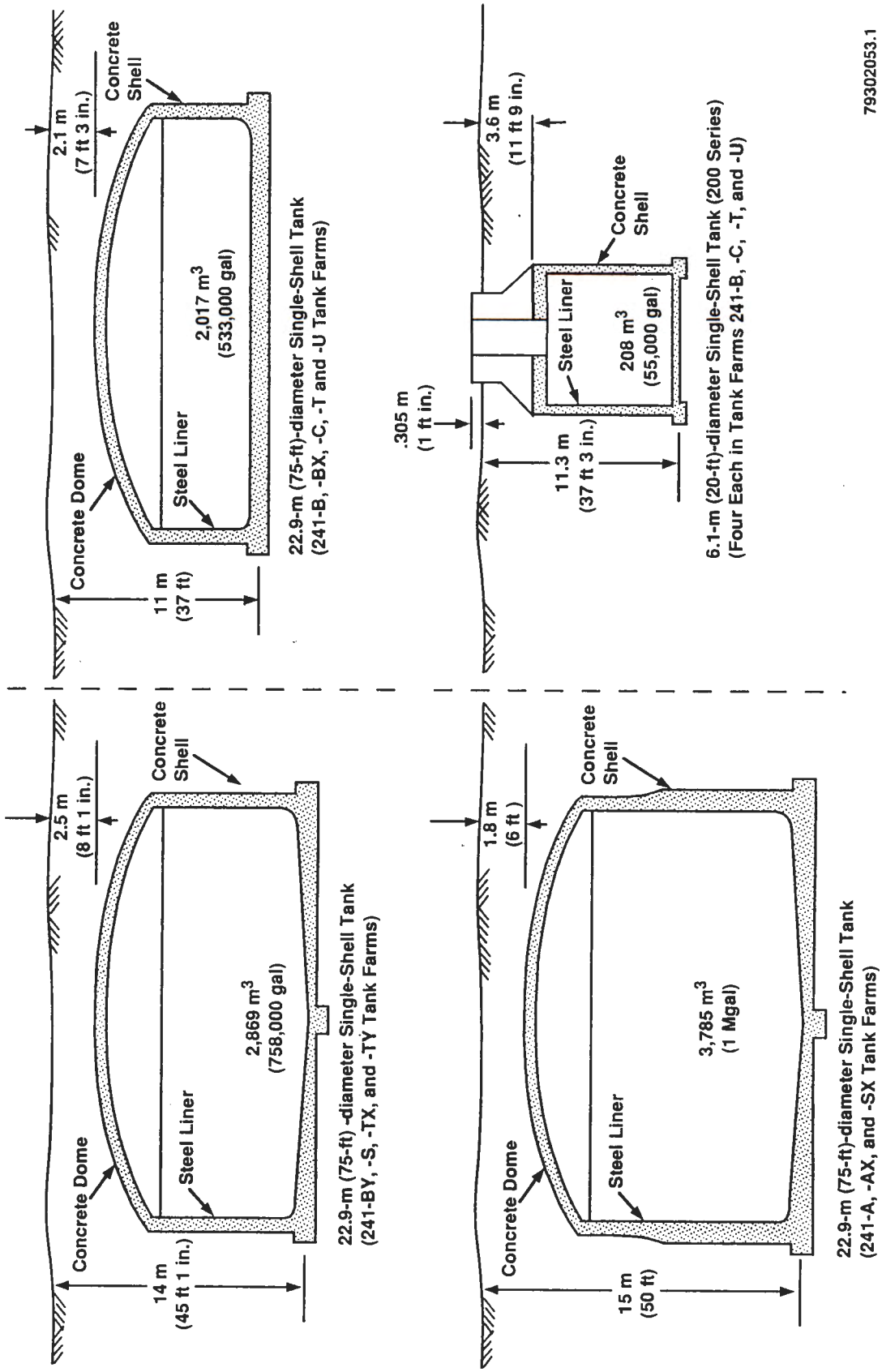
Interim stabilization and isolation activities for the SSTs are continuing. Interim stabilization involves the removal of supernate and interstitial liquid from the SSTs to minimize the spread of contamination if a tank were to leak. Liquid waste is pumped from the SSTs until no more than 50,000 gal of interstitial liquid or more the 5,000 gal of free-standing supernatant remains within a tank. Isolation of an SST involves physical modification to preclude the inadvertent addition of liquids to a given tank. Currently, the total inventory of radioactive mixed waste contained within the SSTs is approximately 37 million gal.

### 1.1.3 Regulatory Status of the Single-Shell Tanks

The RCRA establishes regulatory requirements for facilities involved in the TSD of hazardous waste. A TSD facility that was managing hazardous waste on the effective date of these regulations (i.e., November 19, 1980) was required to submit a Part A and Part B Permit application, in accordance with specified time frames, to continue operation of that facility. The SSTs have not received hazardous waste since the effective date of the RCRA. However, these units have been actively storing and treating hazardous waste since that time and, thus, are regulated by the WAC 173-303 as active treatment and storage tanks.

On August 19, 1987, Chapter 70.105.050 of the *State of Washington Hazardous Waste Management Act* was amended to allow Ecology to regulate the hazardous waste component of mixed waste. On November 23, 1987, Ecology received authorization from the EPA to regulate the hazardous waste component of mixed waste in the State of Washington. The DOE Richland Field Office (RL) submitted a Part A Permit application for the SSTs to Ecology on March 1,

Figure 2. Illustration of the Various Single-Shell Tanks.



1988, thus confirming that the SSTs are regulated as interim status units. Because the SSTs do not meet current interim status standards for treatment and storage tank systems, an agreement with Ecology has been made to proceed directly to closure rather than to upgrade and permit the SSTs for operation.

The Tank Waste Remediation System (TWRS) Program has been developed to coordinate waste remediation activities for the DSTs and the SSTs. One of the challenges faced by TWRS is developing waste retrieval technologies and defining acceptable pathways, from a regulatory perspective, to accomplish closure. Milestones established in the Tri-Party Agreement for closure of the SSTs have been written to imply that complete waste retrieval is required but does not necessarily eliminate a landfill or in situ closure option. However, correspondence from Ecology (see Appendix, R. Stanley letter) states that, "Ecology cannot approve a Single-Shell Tank closure plan which allows hazardous waste to remain in place after closure."

As discussed in the following sections, the EPA has determined that under limited circumstances, a treatment and storage tank system may be closed as a landfill with waste remaining in place.

# 2.0 LANDFILL CLOSURE ASSESSMENT

## 2.1 EXISTING REGULATORY FRAMEWORK FOR CLOSURE

According to WAC 173-303-400, interim status storage and treatment tank systems are subject to the *Code of Federal Regulations*, Title 40, Part 265 (40 CFR 265), Subpart J. Specifically, the closure standards for such tanks are identified in 40 CFR 265.197(a) and (b). The closure standards established under these sections read as follows:

(a) At closure of a tank system, the owner or operator must remove or decontaminate all waste residues, contaminated containment system components (liners, etc.), contaminated soils, and structures and equipment contaminated with waste, and manage them as hazardous waste, unless the waste is excluded from regulation per 40 CFR Part 261.3; and

(b) If the owner or operator demonstrates that not all contaminated soils can be practicably removed or decontaminated as required above, then the owner or operator must close the tank system and perform post-closure care in accordance with the closure and post-closure care requirements that apply to landfills.

When the above regulations were proposed, the EPA specified that, "At closure, all hazardous waste and hazardous waste residues must be removed from tanks, discharge control equipment, and discharge confinement structures." (FR Vol. 51, p. 25422 [51 FR 25422]). However, the proposed regulations failed to address removal or decontamination of contaminated soil resulting from leaking hazardous waste tanks. Recognizing this error, the EPA revised the proposed regulations by adding 40 CFR Part 265.197(b), and the final regulations were promulgated to include requirements for an owner or operator to address contaminated soil upon closing a hazardous waste tank system. At that time, the EPA also added a landfill closure option to address situations where contaminated soil and/or contaminated components and structures could not be removed or decontaminated at closure.

## 2.2 FEDERAL REGISTER LANGUAGE SUPPORTING A LANDFILL CLOSURE OPTION

The 51 FR 25422 states that, "EPA is requiring owners or operators of hazardous waste tank systems to provide adequate closure, and, if necessary, post-closure, care. All wastes and all contaminated components, soils, structures, and equipment must be decontaminated or removed from the site at closure. If all contaminated components, soils, structures, and equipment cannot be decontaminated or removed at closure, <u>or</u> if the groundwater is found to be contaminated, the site must be provided with post-closure care similar to that required for landfills." Thus, the EPA clarified that a landfill closure option is available where contaminated components cannot be removed or decontaminated and did not intend to limit the scope of this option to cases where contaminated soil alone could not be removed or decontaminated.

In establishing the closure requirements for storage and treatment tank systems, the EPA contemplated the possibility that such systems may require closure as a landfill by including 40 CFR Part 265.197(c). This section requires owners or operators of tank systems that do not have secondary containment to prepare contingent closure and postclosure plans to ensure that they have adequately planned for the possibility of closing the tank system as a landfill. While the EPA does not expect nor intend that many tank systems will be closed as a landfill, this option is being provided to address environmental contamination that may have resulted from leaking tank systems.

The 51 FR 25422 states that, "The owner or operator cannot decide unilaterally to close his tank system as a landfill. New closure and post-closure plans would have to be prepared and submitted to the Regional Administrator, and these modified plans must still comply with the general closure performance standard to protect human health and the environment. These plans would be used only if all contaminated residues and soils could not be practicably removed at closure."

### 2.2.1 Landfill Definition Revised to Include Tanks and Vaults

The concept of closing a tank system as a landfill was discussed in greater detail in 52 FR 46946. This FR redefines the definition of a landfill to include tanks and/or vaults used for disposal of hazardous waste. The EPA stated that, "Subpart J of 40 CFR Part 264 only regulates storage and treatment in tanks and the Agency to date has not developed specific standards for disposal of hazardous waste in tanks. However, under limited circumstances, the Subpart J standards do allow treatment and storage tanks that cannot remove all contamination at closure to close and to perform post-closure care in accordance with the closure and post-closure requirements for landfills. Disposal in tanks will be regulated under the Subpart N standards as a landfill because "landfills" and the disposal of hazardous waste in tanks raise similar human health and environmental concerns and because tanks are similarly placed on or in the land."

With issuance of the above clarification, the EPA has expanded the criteria under which closure of a tank system as a landfill may be accomplished. The 52 FR 46946 clearly states that a landfill closure may be accomplished if the hazardous waste will remain within a tank system at closure.

## 2.3 ENVIRONMENTAL PROTECTION AGENCY GUIDANCE SUPPORTING A LANDFILL CLOSURE OPTION

J. W. Porter (see Appendix) further clarifies the EPA's intention that a storage tank may be closed as a landfill when the removal or decontamination standard cannot be achieved. He states that, "The hazardous waste tank system standards require that the owner or operator, at closure of a tank system, remove or decontaminate all waste residues, contaminated soil, contaminated containment system components and structures/equipment contaminated with waste. If these materials cannot be removed or decontaminated, the site itself must be managed as a hazardous waste landfill in accordance with

40 CFR Part 264.310 or 265.310." Again, it is important to note that the EPA is not limiting the landfill closure option to those tank systems for which contaminated soils cannot be removed.

EPA (1986) discusses conditions under which an owner or operator may choose to abandon a tank in place. The following guidance considerations are based, in part, upon information contained in this EPA guidance document and the risk-based approach for obtaining a variance from secondary containment. Factors that may be important in supporting a landfill closure option include the following:

1. Tank Location: The depth at which the tank is buried, the type of surrounding soil, and overhead structures nearby will affect the ease or ability to remove the tank. The potential for damage to concrete or asphalt traffic surfaces and nearby utilities should also be considered.

2. Impacts to Environment: The potential adverse effects on groundwater, surface water, and land quality should be considered taking into account hydrogeologic characteristics of the surrounding land, potential for health risks caused by human exposure to the waste, and the potential adverse effects of a release on groundwater quality. Potential impacts to groundwater quality should consider the quantity and quality of groundwater and the direction of the groundwater flow, proximity and withdrawal rates of groundwater users, and current and future uses of groundwater in the area.

3. Projected Use of the Site after Closure: If site plans call for development that involves excavation or regrading to the level of the tank, the tank system may require removal. A determination on land use indicating that the 200 Area will not be released for public use may support a landfill closure option.

4. The Cost and Availability of Labor and Equipment: Tank system removal will require the use of heavy equipment, experienced labor, and considerable technology development. If the cost or use of this equipment or technology to achieve a decontamination standard is cost prohibitive, abandonment in place may be the preferred option.

5. Proximity of Disposal Sites: The proximity of the disposal site can also greatly affect the cost of tank system removal. Transportation costs could be prohibitive, making abandonment in place the preferred option.

6. Radiation Exposure Concerns: Closure of the SSTs must be performed in a manner ensuring that radiation exposure to workers is minimized consistent with the as low as reasonable achievable (ALARA) concept. Closure of the SSTs as a landfill may be supported if occupational exposures cannot be maintained consistent with the ALARA concept.

## 2.4 STATE AND TRI-PARTY AGREEMENT CLOSURE REQUIREMENTS

The Tri-Party Agreement (Ecology et al. 1992) states that closure of TSD units at the Hanford Site will be performed in accordance with WAC 173-303-610, irrespective of permit status. The WAC 173-303-610(2)(b) establishes the criteria that must be met to accomplish clean closure of a tank system. According to this section, clean closure will have been accomplished, and the "removal or decontamination" standard will have been successfully achieved, when the levels of hazardous waste do not exceed the following criteria:

- Background environmental levels, for any hazardous waste managed at the facility that is listed under WAC 173-303-081 or 173-303-082, or is designated by the characteristic of WAC 173-303-090

- At least designation limits of WAC 173-303-084, or 173-303-101 through 173-303-103, for any hazardous waste managed at the facility that is not designated as a listed or characteristic waste as described above.

The above regulations have been written to require an owner or operator of a TSD unit to achieve clean closure, whenever practicable. However, by definition, if the "remove or decontaminate" standard cannot be achieved, the owner or operator is required to complete closure of such unit and perform postclosure care in accordance with the requirements applicable to a landfill.

The above summary of the closure regulations is reiterated in Sections 6.3.1 and 6.3.2 of the Tri-Party Agreement (Ecology et al. 1992) for clean closure and closure as a land disposal unit, respectively. Section 6.3.1 specifies that under certain circumstances it may be possible to remove all hazardous wastes and constituents associated with a TSD unit and thereby achieve clean closure. However, any demonstration for clean closure of a disposal unit, or selected treatment or storage units as determined by the lead regulatory agency, must include a demonstration that groundwater and soils have not been adversely impacted by that TSD group or unit, as described in WAC 173-303-645. Section 6.3.2 specifies that if clean closure cannot be achieved, the TSD unit will be closed as a land disposal unit.

The preamble language referenced herein clearly indicates that, under limited circumstances, a tank system may be closed as a landfill with hazardous waste and contaminated components remaining in place. It is reasonable to assume that the EPA did not provide a detailed discussion of these "limited circumstances" because such circumstances would be negotiated through approval of the associated closure plan. Similarly, final closure of the SSTs, waste removal criteria, decontamination methods, and final barriers will be negotiated and finalized in a closure plan for the SSTs. Milestone M-08-00 of the Tri-Party Agreement (Ecology et al. 1992) states the following: "Decisions as to the appropriate disposal of wastes, tanks, contaminated piping, and soils will follow detailed characterization and regulatory agency approval as part of the closure process."

# 3.0 CLOSURE AND POSTCLOSURE CARE REQUIREMENTS

Closure of the SSTs as a landfill will require compliance with general closure and postclosure performance standards, as well as the unit specific closure and postclosure performance standards applicable to a landfill. The general and unit specific closure and postclosure standards were developed to compliment each other throughout the closure process and to ensure protection of human health and the environment. Therefore, both standards must be addressed at closure.

The EPA (1986) provides guidance to owners and operators of treatment and storage tanks used for the management of hazardous waste. This EPA guidance document clearly indicates that the EPA will allow a storage and treatment tank to be closed as a landfill. Among other things, EPA (1986) provides guidance to owners or operators of storage and treatment tank systems that are not equipped for secondary containment and where decontamination or removal <u>is not</u> practicable. In general terms, the closure and postclosure requirements that must be met for a tank system that cannot meet the removal or decontamination standard are identified below:

- General Closure Performance Standard and Postclosure Care
- Closure Care and Postclosure Care for Landfills
- Cost Estimates and Financial Assurance for Closure and Postclosure Care
- Contingent Closure Plans.

Section 5.3 of the Tri-Party Agreement (Ecology et al. 1992) states: "All TSD units that undergo closure, irrespective of permit status, shall be closed pursuant to the authorized State Dangerous Waste Program in accordance with WAC 173-303-610. Therefore, closure of the SSTs as a landfill would require compliance with the general closure and post-closure care requirements of WAC 173-303-610 as well as the specific closure and post-closure care requirements of WAC 173-303-665(6)." Each of the above regulatory requirements are discussed in greater detail in the following sections.

## 3.1 GENERAL CLOSURE PERFORMANCE STANDARD

The general closure performance standard requirements are identified in the WAC 173-303-610(2). The general closure performance standard requires that hazardous waste units be closed in a manner that will accomplish the following:

- Minimize the need for further maintenance
- Control, minimize, or eliminate to the extent necessary to protect human health and the environment, postclosure escape of hazardous waste, hazardous constituents, leachates, contaminated run-off, or hazardous waste decomposition products to the ground, surface water, groundwater, or atmosphere

- Return the land to the appearance and use of surrounding land areas to the degree possible given the nature of the previous hazardous waste activity.

The SST closure plan and contingent closure plan will address the actions necessary to close the SSTs in a manner that will meet the general closure performance standards identified above. During the closure period, the owner or operator must address hazardous waste as well as hazardous waste constituents. The EPA included the term "hazardous waste constituents," rather than just "hazardous waste," in the closure performance standard because of the need to ensure that all contamination is adequately addressed at closure. This approach is consistent with Section 3004(u) of RCRA, which requires corrective action for all releases of hazardous wastes or hazardous waste constituents from any solid waste management unit. However, by including this requirement, the EPA only intended for the closure plan to address soil contamination resulting from hazardous waste management activities conducted at the facility in question (51 FR 16421). Contamination resulting from other activities is not required to be addressed by the associated closure plan. A list of hazardous waste constituents is identified in WAC 173-303-9905.

## 3.2 GENERAL POSTCLOSURE CARE

The general postclosure care regulations apply to owners and operators of all hazardous waste disposal units. This includes landfills, land treatment areas, disposal surface impoundments, storage impoundments, waste piles, and tank systems that cannot be "clean closed" and must be closed as landfills (EPA 1987). Hazardous waste TSD units subject to these requirements must perform postclosure care for a period of 30 years. The general postclosure care requirements are identified in WAC 173-303-610(7) and require at least the following:

- Groundwater monitoring and reporting as applicable

- Maintenance and monitoring of waste containment systems as applicable.

According to WAC 173-303-610(7)(a), implementation of the postclosure care requirements must begin after completing closure of the unit in question and then continue for 30 years. However, Ecology may shorten the postclosure care period if all disposal units have been closed and a determination is made that the reduced period will ensure protection of human health and the environment. A determination to shorten the postclosure care period may be made if leachate or groundwater monitoring results or characteristics of the hazardous waste, among others, indicate that the hazardous waste management unit or facility is secure.

On the other hand, Ecology may extend the postclosure care period for the unit in question if a determination is made that the extended period is necessary to protect human health and the environment. Such a determination may be made if leachate or groundwater monitoring results indicate a potential for migration of hazardous waste at levels that may be harmful to human health and the environment.

## 3.3 CLOSURE PERFORMANCE STANDARD FOR LANDFILLS

If a treatment and storage tank cannot achieve compliance with the "remove or decontaminate" standard, the owner or operator is required to close the tank system as a landfill. However, the owner or operator is not required to meet the technical design standards for a landfill (i.e., double liner and leachate collection system). The owner or operator is directed only to ensure compliance with the closure and postclosure performance standards of WAC 173-303-665(6). Additionally, for the purposes of closure, postclosure, and financial responsibility, such a tank system is then considered to be a landfill, and the owner or operator must meet all of the requirements for landfills per WAC 173-303-610 and 173-303-620.

According to WAC 173-303-665(6)(a), upon closure of a landfill, the owner or operator must cover the landfill with a final cover. The final cover must be designed and constructed to accomplish the following:

- Provide long-term minimization of liquid migration through the closed landfill
- Function with minimum maintenance
- Promote drainage and minimize erosion or abrasion of the cover
- Accommodate settling and subsidence so that the cover's integrity is maintained
- Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.

## 3.4 POSTCLOSURE CARE FOR LANDFILLS

The unit specific postclosure care requirements applicable to landfills are identified in WAC 173-303-665(6)(b). These regulations provide for protection of human health and the environment for hazardous wastes that will remain within a disposal unit after closure of the unit. These regulations require maintenance and monitoring throughout the postclosure care period and require the owner or operator to do the following:

- Maintain and monitor the integrity and effectiveness of the final cover, including making repairs to the cap, as necessary, to correct the effects of settling, subsidence, erosion, or other events
- Maintain and monitor the leak detection system, where such a system is present between double liner systems
- Continue to operate the leachate collection and removal system until leachate is no longer detected
- Maintain and monitor the groundwater monitoring system

- Prevent run-on and runoff from eroding or otherwise damaging the final cover

- Protect and maintain surveyed benchmarks used to identify the location of the unit in question.

As discussed in Section 3.2, the postclosure care period is normally established for a period of 30 years. However, this period of time may be extended or shortened, depending upon the site specific circumstance at hand. In determining whether to shorten or extend the postclosure time period, the lead agency will consider the following:

- The likelihood of a release from the unit taking into account the design and effectiveness of the barrier and any other containment devices

- The effectiveness of the monitoring and release detection system and whether hazardous waste or hazardous waste constituents have been detected indicating migration from the unit

- The extent to which leachate will migrate from the unit and pose a threat to human health and the environment based upon environmental transport (i.e., groundwater discharge rates) and waste characteristics (e.g., adsorptivity and degradability)

- Overall risk and site specific technical factors including facility characteristics, waste type and characteristics, and environmental and health considerations (EPA 1987).

## 3.5 COST ESTIMATES AND FINANCIAL ASSURANCE FOR POSTCLOSURE CARE

The regulatory requirements for cost estimates and financial assurance will not be discussed in this analysis, as the applicability to the Hanford Site remains an unresolved issue at this time. The WAC 173-303-620(c) states that, "States and the federal government are exempt from the requirements of this section, except that operators of facilities who are under contract with the state or federal government must meet the requirements of this section." This language is more stringent than the corresponding language at 40 CFR Part 264.140(c), which simply states that states and the federal government are exempt from these requirements. The applicability of these requirements is undergoing evaluation through negotiation of the Part B Permit application for the Hanford Site.

## 3.6 CONTINGENT CLOSURE PLANS

Permitted and interim status treatment and storage tanks that do not have secondary containment are required to prepare closure plans that describe activities necessary to conduct closure under two sets of conditions. The first plan must describe how the unit will be closed by removing all hazardous wastes and hazardous waste constituents (i.e., accomplishing clean closure).

The second plan is a contingent closure plan that outlines the closure activities to be undertaken if the unit must be closed as a landfill.

In addition to developing a contingent closure plan, a contingent postclosure plan must be prepared. This plan must address the actions necessary to ensure protection of human health and the environment from waste disposed at the unit during the postclosure care period. The contingent closure and postclosure plans will only be used if all hazardous wastes and hazardous constituents, including hazardous residues, liners, and surrounding contaminated soils, cannot be removed or decontaminated during the closure process. The regulatory requirement for developing these contingent closure and postclosure plans for interim status treatment and storage tanks is 40 CFR 265.197(c).

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# 4.0 ALTERNATIVE CLOSURE APPROACHES

While the current regulatory framework allows for closure of a tank system with waste remaining in place, DOE may find it desirable to pursue an alternate approach to or supplement the current approach with one or more of the alternatives discussed below. It is recognized that the SSTs are currently identified on the associated Part A Permit as treatment and storage tanks. Therefore, closure is currently required in accordance with WAC 173-303-610, as discussed above. However, the complex nature of the waste in question, along with potentially high radiation exposure and technical difficulties associated with waste retrieval, may warrant special consideration for final closure determinations and the regulatory framework under which closure will be accomplished. Three areas proposed for consideration throughout development of closure options are discussed in the following sections.

## 4.1 CLOSURE AS A MISCELLANEOUS UNIT

WAC 173-303 discusses EPA's approach to regulating miscellaneous units that do not fit within the definition of those hazardous waste units defined in 40 CFR 260.10. The regulations applicable to miscellaneous units are identified in 40 CFR 264, Subpart X, and in WAC 173-303-680. Under limited circumstances, it may be possible to reclassify the SSTs as a miscellaneous unit to accomplish closure in a manner that would address the chemical and radiological hazards associated with SST waste. In particular, this may be an appropriate course of action for an in situ vitrification closure option or any other innovative technology that may alter the physical form of the SSTs during the closure process. Under these conditions, a closure of this type would constitute a significantly new type of onsite waste management activity, may be outside the scope of the current Part A Permit application, and may not fit within any RCRA or WAC 173-303 interim status process definition.

The use of 40 CFR 264, Subpart X, for limited closure options may provide flexibility to specify appropriate SST permit and closure conditions. Under this scenario, it is likely that Ecology would remain the lead regulatory agency, and appropriate postclosure permit conditions would remain applicable and could be specified in the associated postclosure permit. The authority to provide site-specific conditions in the associated postclosure permit could reassure the regulatory agencies that protection of human health and the environment will be met.

While reclassification of the SSTs to a miscellaneous unit may provide added flexibility, there are certain limitations associated with the Subpart X permitting process. WAC 173-303 indicates that a Subpart X permit cannot be issued in situations where existing regulations govern a specific waste management activity (i.e., tanks are normally not governed by Subpart X). Therefore, if Ecology determines that waste retrieval and closure can be accomplished within the existing tank regulations, use of the Subpart X regulations may not be a viable option. However, this approach may provide an innovative closure alternative allowing waste to remain in place at closure while ensuring protection of human health and the environment.

## 4.2 CLOSURE WITH CONSIDERATION OF THE ATOMIC ENERGY ACT

Closure of the SSTs to meet a strict interpretation of the "remove or decontaminate" criteria may not be feasible given resulting anticipated radiation exposures and technical issues associated with closure. If the DOE can demonstrate that a SST closure alternative is consistent and necessary to ensure compliance with the AEA, then deviation from regulatory requirements may be justified based upon a conflict of regulation. Section 1006(a) of RCRA specifies that, "Nothing in this Act shall be construed to apply to (or to authorize any State, interstate, or local authority to regulate) any activity or substance which is subject to...the Atomic Energy Act of 1954 except to the extent that such application is not inconsistent with the requirements of such Acts."

The focus of conflicting regulatory requirements would probably be the requirements of 40 CFR 265.197(a) for removal or decontamination of waste during closure of a treatment and storage tank system. Additionally, a conflict of regulation may be focussed on any supporting conditions established in the approved SST closure plan and/or associated postclosure permit. The results of a risk or performance assessment that quantifies the radiological hazards associated with complete waste retrieval may provide a basis for asserting a conflict of regulatory requirements.

## 4.3 MODIFY TRI-PARTY AGREEMENT TO INCLUDE IN SITU CLOSURE

Currently, the Tri-Party Agreement provides for closure of the SSTs as RCRA interim status TSD units, with some attention to State closure requirements. SST closure milestones emphasize complete waste retrieval and do not specifically address conditions under which a landfill closure option would be appropriate. The DOE could propose modifications to the Tri-Party Agreement, both to create additional flexibility for SST closure and to establish milestones for evaluating landfill closure options. Potential modifications may include the following:

- Provide equal status for landfill closure and retrieval alternatives in R&D programs by establishing appropriate milestones.

- Identify a schedule for identifying criteria that would aid in determining the closure of one or more of the SSTs as a landfill and for completing R&D that may be required to perform in situ stabilization or other treatment activities.

- Accelerate the schedule for submitting the SST environmental impact statement (EIS) and associated closure plan. These documents should address both a landfill closure option in conjunction with in situ treatment or stabilization and retrieval activities.

# 5.0 CLOSURE APPROACHES TAKEN AT OTHER U.S. DEPARTMENT OF ENERGY FACILITIES

At least three other DOE sites manage high-level mixed waste in underground storage tanks similar to those at the Hanford Site. Representatives from INEL, SRS, and WVNS were contacted to evaluate how closure of the associated tank systems at these facilities is being pursued. As discussed below, various approaches to accomplish closure have been proposed along with development of interagency agreements addressing closure of those units.

## 5.1 IDAHO NATIONAL ENGINEERING LABORATORY

The INEL has entered into an agreement with the Idaho Division of Environmental Quality (IDEQ) that includes an extended schedule for submitting Part B Permit applications for various TSD units at INEL. At this time, general information applicable to the entire site, such as security and training, has been submitted to IDEQ. However, submittal of unit specific information, including information associated with the HLW tank farms, will be submitted in accordance with an agreed upon schedule.

The HLW tank farm at the INEL consists of eleven 300,000 gal capacity stainless steel tanks and four special smaller tanks. The tank farm is designed to store HLW concentrate generated primarily from fuel reprocessing at the Idaho Chemical Processing Plant. At this time, tank farm-specific information required by the Part B Permit application and associated closure plans have not been submitted to IDEQ. The interagency agreement between INEL and IDEQ requires submittal of this unit-specific information by 1998. Although the closure plan has not yet been submitted, personnel from INEL indicated that the closure plan is expected to include a contingency closure option that will address closure of the tanks as a landfill. However, at this time, no determinations regarding this matter have been made from IDEQ.

## 5.2 WEST VALLEY NUCLEAR SERVICES

The WVNS was constructed as a commercial fuel reprocessing facility under the authority of the New York State Energy Research and Development Authority. As such, a license for this facility, including the four HLW tanks, has been secured under the authority of the Nuclear Regulatory Commission (NRC) and 10 CFR Part 50 in 1980.

There are four HLW tanks located at the WVNS, Two of these tanks have a capacity of 750,000 gal, and the other two tanks are smaller with a capacity of 15,000 gal. The tanks in question are storing mixed waste and are currently operating under interim status. A joint EIS between the DOE and the New York Department of Environmental Conservation (NYDEC) is scheduled to be

issued by 1995 that will address remediation of these tanks. This EIS will evaluate potential risks posed by the following alternatives:

1. In situ closure by removing waste from the tanks, filling the tank void space with cement, and completing closure as a landfill in accordance with the EIS

2. Complete waste removal, decontaminate the tank system, and remove the tank system for burial either onsite or offsite

3. Continued storage of waste (no action alternative).

Because the WVNS is operating under the authority of an NRC license, the NRC has responsibility for prescribing D&D criteria for the WVNS, including the four HLW tanks. The NRC license further requires development of a D&D plan that will actually serve as the closure plan for these four HLW tanks. The D&D plan will address D&D standards for radionuclides as well as hazardous waste constituents. Therefore, the NYDEC has not asserted their authority to impose RCRA closure standards on the tanks in question.

## 5.3 SAVANNAH RIVER SITE

There are 51 HLW tanks located at the SRS that can be categorized into four types of tanks based upon design type. The capacities of these tanks vary ranging from 750,000 to 1.3 million gal. At this time, all of the 51 HLW tanks are identified on a Part A Permit and are classified as interim status units. However, negotiations with the South Carolina Department of Health and Environmental Control (DHEC) are underway to reclassify the tanks in question. Those tanks that are known to have leaked will be remediated as past-practice units under the authority of Section 3004(u) of the RCRA. An RCRA Facility Investigation (RFI) work plan has been developed and submitted to DHEC for those tanks that are known to have had releases.

The remaining HLW tanks are proposed to be reclassified from RCRA interim status units to units subject to regulation under the authority of the Site's wastewater operating permit, which currently includes operation of the Defense Waste Processing Facility and the Low-Level Waste Saltstone Facility. Therefore, final remediation of these tanks will be in accordance with decisions reached through the RFI and Corrective Measures Study process and the conditions established in the Site's wastewater operating permit.

Conversations with personnel from SRS indicated that there are a number of smaller solvent waste tanks that are in the process of undergoing closure. These tanks were used for the storage of highly radioactive solvent wastes that were generated in the chemical separation areas. As a result, the ALARA principle precludes removal and complete decontamination of the units in question. A closure plan for these solvent waste tanks has been submitted to DHEC and proposes waste removal to within pumping capabilities followed by an in situ closure via filling with grout or cement. The final area is proposed to be closed in accordance with the closure standards applicable to a landfill.

# 6.0 CONCLUSION

As discussed in detail above, the current regulatory framework allows closure of a tank system with contaminated components and hazardous waste remaining in place. The amount of residual that may be left in place is not specified in the regulations, however, the Tri-Party Agreement indicates that waste retrieval will be successfully demonstrated when 95 percent removal efficiency is accomplished. DOE could initiate a number of actions that would force Ecology to make preliminary determinations regarding an in situ closure such as accelerating the schedule for submitting the SST closure plan and associated NEPA documentation, among others. Additionally, Ecology will most likely be interested in reviewing risk and/or performance assessments developed by DOE to address risks associated with an in situ closure option for the SSTs. As this information becomes available, it should be transmitted to Ecology for review and comment to lend credibility to the in situ closure option already discussed in the Draft Single-Shell Tank Closure and Corrective Action Work Plan.

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# 7.0 REFERENCES

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# APPENDIX

## LETTER REFERENCES

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY 9483.1987 331

APR 8 1987

Honorable Jim Jontz
House of Representatives
Washington, D.C. 20515

Dear Mr. Jontz:

Thank you for your March 10, 1987, letter in which you requested information regarding regulations on the disposal of storage tanks.

As you are probably aware, EPA regulates storage tanks under both Subtitle C and Subtitle I of the Resource Conservation and Recovery Act, as amended (RCRA). Tanks that are used for the storage or treatment of hazardous waste are regulated under Subtitle C of RCRA. On July 14, 1986, EPA promulgated revised standards for hazardous waste tank systems (51 FR 25422). A copy of these standards is enclosed for your convenience.

The hazardous waste tank system standards require that the owner or operator, at closure of a tank system, remove or decontaminate all waste residues, contaminated soil, contaminated containment system components and structures/equipment contaminated with waste. If these materials cannot be removed or decontaminated, the site itself must be managed as a hazardous waste landfill in accordance with §§264.310 or 265.310.

Tanks, piping and other parts of the tank system that do not contain hazardous waste are not subject to any further Subtitle C requirements. The owner or operator may do what he wants with this equipment. For example, it could be salvaged, used elsewhere on site for another purpose, or abandoned on-site.

EPA recently published and made available to the public a document "Technical Resource Document for Storage and Treatment of Hazardous Waste in Tanks System" (NTIS No. PB-87-134391) that provides information regarding compliance with the hazardous waste tank system standards. Chapter 12 of this document (a copy of which is enclosed) addresses closure and post-closure requirements. Among other things,

there is a discussion regarding the abandonment of tank systems in place. EPA recommends that the guidelines of the National Fire Protection Association (NFPA), as contained in "NFPA 30-Flammable and Combustible Liquids code, Appendix C. (Abandonment or Removal of Underground Tanks)" be followed. A copy of these guidelines is also enclosed.

Under Subtitle I of RCRA, EPA is currently developing separate standards for underground storage tanks containing "hazardous substances" as defined under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) or petroleum. These standards (which do not address storage of hazardous waste) are expected to be proposed in early April 1987, and will, like the Subtitle C rules, build upon the guidelines of NFPA 30.

If I can be of any further assistance, please let me know.

Sincerely,

J. Winston Porter
Assistance Administrator

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Mail Stop PV-11 • Olympia, Washington 98504-8711 • (206) 459-6000

December 16, 1988

Mr. R.D. Izatt, Director
Environmental Restoration Division
U.S. Department of Energy
Richland Operations Office
P.O. Box 550
Richland, WA 99352

Mr. R.E. Lerch, Manager
Environmental Division
Westinghouse Hanford Company
P.O. Box 1970
Richland, WA 99352

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Dear Messrs. Izatt and Lerch:

Re: Sorting Criteria and Closure Requirements for Tanks

This letter is provided you in order to clarify requirements for closure of tank systems under Washington State dangerous waste regulations, (chapter 173-303 WAC). These requirements will apply to closure of both single- and double-shell tanks, as well as to other tanks utilized for the management of hazardous waste at the Hanford site.

Both interim and final status tank standards require the removal or decontamination of all hazardous waste upon closure of a tank system. Please refer to 40 CFR 265.197(a) for interim status standards, and to chapter 173-303-640(5) WAC for final status standards.

I understand that members of your respective staffs are currently developing DOE-RL sorting criteria outlining conditions under which single-shell tank wastes must be retrieved and those under which it may be permissible to leave wastes in place. Please ensure that these developing

criteria incorporate these tank closure requirements (Ecology cannot approve a single-shell tank closure plan which allows hazardous waste to remain in place after closure). I would be happy to meet with you or appropriate staff if you have any further questions in this matter.

Sincerely,

Roger Stanley

Roger Stanley
Hanford Project Manager

cc: Charles Findley
Terry Husseman

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