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System Specification for the Double-Shell Tank System

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Abstract:

This document establishes the functional, performance, design, development, interface and test requirements for the Double-Shell Tank System.

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SYSTEM SPECIFICATION FOR THE DOUBLE-SHELL TANK SYSTEM

April 2000

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FOREWORD

This revision of the *System Specification for the Double-Shell Tank (DST) System* (HNF-SD-WM-TRD-007, Rev. 0) is based on the DST System operation and utilization documented by Case 3, Project Planning, in the *Tank Waste Remediation System Operation and Utilization Plan to Support Waste Feed Delivery* (HNF-SD-WM-SP-012, Revision 1), that resulted from DOE Richland Operations Office (RL) planning guidance documented in "Contract DE-AC06-96RL13200 - Planning Guidance Revision for Development of Contract Deliverables Required by Performance Agreement TWR1.3.5", (99-AMPD-006). Additional planning guidance resulting from various programmatic changes and contract negotiations between DOE Office of River Protection (ORP) and British Nuclear Fuel Limited, Inc. (BNFL) have been received by the Tank Farm Contractor (TFC) and incorporated into the latest version of the *TFC Operation and Utilization Plan*, RPP-SD-WM-SP-012, Revision 2 (TFC O&UP). Upon acceptance of Revision 2 of the TFC O&UP, the DST System Specification will be updated to reflect the technical requirements associated with the DST System that is consistent with the latest planning guidance mentioned above. Foreseeable changes to the DST System Specification include deleting the requirements now present in the DST System to receive entrained solids and out-of-specification feed batches from the privatization contractor's facility. Other changes associated with waste transfers (e.g., size and duration) must be evaluated more closely once Revision 2 of the TFC O&UP is approved. Fiscal year 2001 planning includes tasking associated with studying the sensitivity or relationship between planning guidance changes and the DST System Specification performance requirements. Enveloping performance requirements will be selected, where feasible in an effort to decouple the DST System Specification requirements from future planning guidance changes.

This document is produced from the Hanford Site Technical Database (HSTD), an electronic database. Changes made to this document must be made via the change process for the River Protection Project (RPP) Technical Requirements Baseline and the Hanford Site Technical Database. See procedures RPP-PRO-533, "Change Control" and RPP-MD-004, "RPP Change Control" for guidance in making such changes.

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1.0 SCOPE

1.1 IDENTIFICATION

This specification establishes the functional, performance, design, development, interface, and test requirements for the Double-Shell Tank (DST) System segment, herein after referred to as the system or the DST System, located at the Hanford Site in Washington State. This version of the specification establishes system-level requirements for the DST System that are applicable to the first phase (Phase 1) of the River Protection Project (RPP) mission described in HNF-SD-WM-MAR-008, *Tank Waste Remediation System Mission Analysis Report.* Moreover, this specification does not specify requirements for the DST System for either the Phase 2 or the system closure period. The basis for Phase 2 and closure are expected to be developed over the next few years. This specification will be used as the basis for assessing the existing DST System against the needs of the Phase 1 mission and as the basis for developing subsystem/component specifications. The requirements of this specification will be allocated (in whole or in part) to subsystems and components as further analysis and system definition dictate. Further the Federal and state requirements, local ordinances, RPP procedures, and National Consensus Codes and Standards called-out herein will be tailored for use and applicability in the subsystem specifications created for line item project conceptual design activities. Notice that the DSTs, transfer associated structures (e.g., valve pits), and existing vaults/double-contained receiver tanks (DCRT) are considered constraining architecture (i.e., unchangeable) and will not be assessed for their compliance to construction codes and standards called-out herein.

The requirements contained in this document are a result of applying the engineering processes called-out in the *Tank Waste Remediation System Systems Engineering Managememt Plan* (HNF-SD-WM-SEMP-002). As a result of applying this process, the Tank Farm S/RID document was reviewed for requirements applicable to the DST System design. This activity consisted of culling from S/RIDs the administrative requirements that would not impact new designs or DST System upgrades needed for the Phase 1 RPP mission. The results of the culling activity are documented in HNF-2288, Rev. 0. The remaining S/RID requirements were grouped by functional area (e.g., Environmental Safety) and system-level requirements were constructed and allocated to the DST System. Traceability to the driving Federal/state law, order, or standard was maintained.

Some of the requirements contained herein are recommended values designated by the abbreviation, TBR (to be refined). The TBR requirements are based on technical assumptions that cannot be validated at this time. Factors preventing validation of assumptions include uncertainties in (1) the processing characteristics of individual tank wastes, (2) the engineering basis for requirements associated with rate of temperature change in waste and concrete, and (3) draft supporting documentation not yet released. Further, TBD (to be determined) requirements that pertain to the DST supernatant available for Single-Shell-Tank (SST) retrieval during Phase 1 also can be found in this specification. TBD requirements indicate unknowns in the Phase 1 waste-processing scheme.

These TBD/TBR requirements will be updated as additional information becomes available and as draft supporting documents are approved for release. Assumptions related to the

processing characteristics of the waste will be validated following the completion of Tank 241-AZ-101 mixer pump tests and laboratory-scale processing tests. Alternate calculations and thorough review of engineering basis documentation are required to validate the assumptions related to the DST waste and concrete rate-of-change requirements. Further analysis is required to determine the amount of DST supernatant available for Phase 1 SST retrieval.

The existing DST System will be used as the point of departure for the Phase 1 DST System design. An authorization basis (AB) governing the existing system has been approved and is contained in HNF-SD-WM-SAR-067, Rev. 1F, *Tank Waste Remediation System Final Safety Analysis Report*, and other documents. Design changes that support Phase 1 will be evaluated through the Unresolved Safety Question (USQ) process that is exercised on the emerging engineering system design baseline. When the USQ evaluation indicates that a system design activity is not compliant with the Authorization Basis (AB), one of two solutions can be pursued. Either the system design activity can be altered such that the altered design complies with the current AB, or an AB ammendment can be prepared and submitted to ORP.

1.2 DOUBLE-SHELL TANK SYSTEM SEGMENT OVERVIEW

1.2.1 Relationship to Hanford Site Missions

The primary mission of the Hanford Site is to safely clean up and manage the Site's wastes. This mission was broken down into a series of functions and requirements that were allocated to major facilities on the Hanford Site. A Hanford Site Technical Database (HSTD) was created in RDD-100 [TM] to manage these requirements and associated major facility definitions. See HNF-SD-TWR-CSUD-001, Rev. 0, *Tank Waste Remediation System Technical Baseline Database Manager Definition Document* and HNF-SD-WM-013, Rev. 0, *HSTD/Data Dictionary* for HSTD data structure information. This database forms one cornerstone for defining requirements for major Hanford Site projects such as the RPP. A major portion of the cleanup mission has been allocated to the RPP, as defined in HNF-SD-WM-MAR-008.

The primary functions of the RPP mission are to (1) store, prepare, immobilize, and package wastes already stored in the Tank Farm System, (2) accept new liquid wastes from specific Hanford Site waste generators, (3) permanently store immobilized low-activity waste (LAW), and (4) provide interim storage of immobilized high-level waste (HLW) before permanently storing it in a geologic repository. Eight of the major facilities identified in the HSTD have been allocated to the RPP to accomplish this mission. The major facilities that will perform the RPP mission are shown in Figure 1-1. The relationships among these major facilities are diagrammed in Figure 1-2. One of the major segments of the Tank Farm System is the DST System. This specification covers the DST System.

The HSTD identifies top-level functions down to the level where they are wholly performed by a major facility. Figure 1-3 shows the major facilities and functions allocated to each major facility shown. Functions allocated to each major facility are shown below the box representing those facilities. These functions provide the point where the system functions and the RPP work breakdown structure (WBS) coincide. Some of these functions were further decomposed and allocated to the Phase 1 DST System. Four Phase 1 DST functions are shown below the WBS

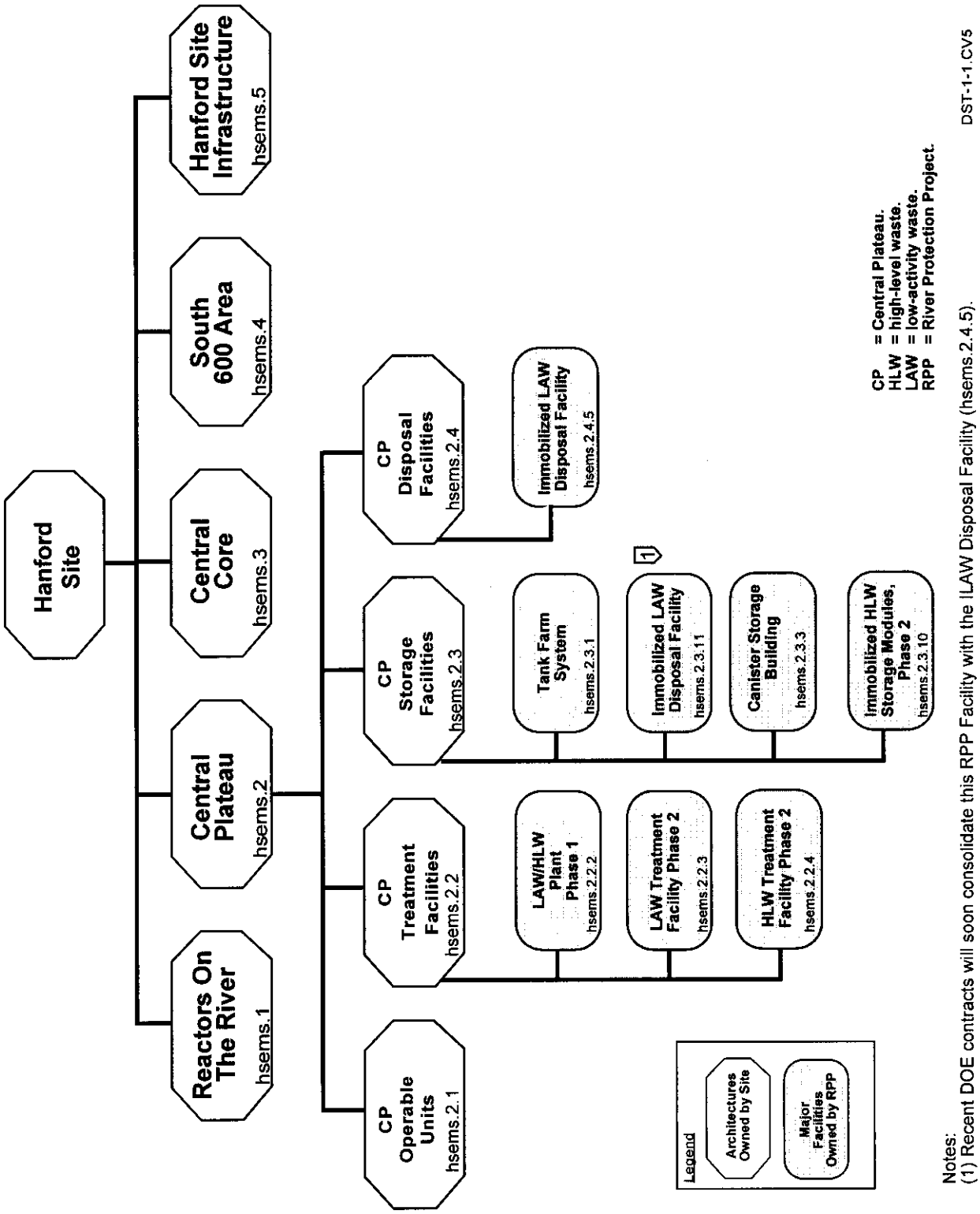
function boxes. They summarize the total required DST System functionality for Phase 1. The relationship among those four functions will be described in Section 3.1 of this specification. This specification collects only the Phase 1 requirements allocated to the DST System. A more complete discussion of this specification, its relationship to other basis documents, and how it ties to the HSTD is provided in the *Tank Waste Remediation System Systems Engineering Management Plan* (HNF-SD-WM-SEMP-002).

1.2.2 Double-Shell Tank System Purpose

The DST System performs a significant part of the RPP mission. The purpose of the DST System is to store tank waste already in the system, receive and store waste from the SST System and external waste generators, deliver DST supernatant to the SST System for retrieval, deliver HLW and LAW to the immobilization facility (i.e., LAW/HLW Plant, Phase 1) feed tank, and accept waste byproducts, out-of-specification feed, and emergency returns from that facility. The system will comply with appropriate Federal, state and Hanford Site regulations. A more detailed description of this system's functions is provided in Section 3.1.

The *Final Environmental Impact Statement for the Tank Waste Remediation System* (DOE/EIS-0189)/*Record of Decision for the Tank Waste Remediation System* Hanford Site, Richland, Washington (62 FR 8693) and HNF-SD-WM-MAR-008 divide the mission into two waste treatment phases, which are to be followed by tank farm closure. Phase 1 will demonstrate the capability to immobilize both LAW and HLW by processing a specified amount of waste from the DSTs. The DST System still will contain a significant quantity of waste when this portion of the RPP mission is completed. Phase 2 will include full-scale processing of the remaining underground storage tank waste, including that contained in DSTs, SSTs, and miscellaneous underground storage tanks (MUST). Phase 2 operations are planned to start several years after the start of Phase 1 and are not yet well defined. The functions and requirements defined in this specification support only Phase 1 waste feed delivery and the acceptance of additional waste from other Hanford Site waste generators as defined in *Tank Waste Remediation System Operational Waste Volume Projection* (HNF-SD-WM-ER-029).

Figure 1-1. Hanford Site Technical Baseline Major Facilities Allocated to the River Protection Project.



Notes:
(1) Recent DOE contracts will soon consolidate this RPP Facility with the ILAW Disposal Facility (hsems.2.4.5).

Figure 1-2. River Protection Project Major Facilities Relationships.

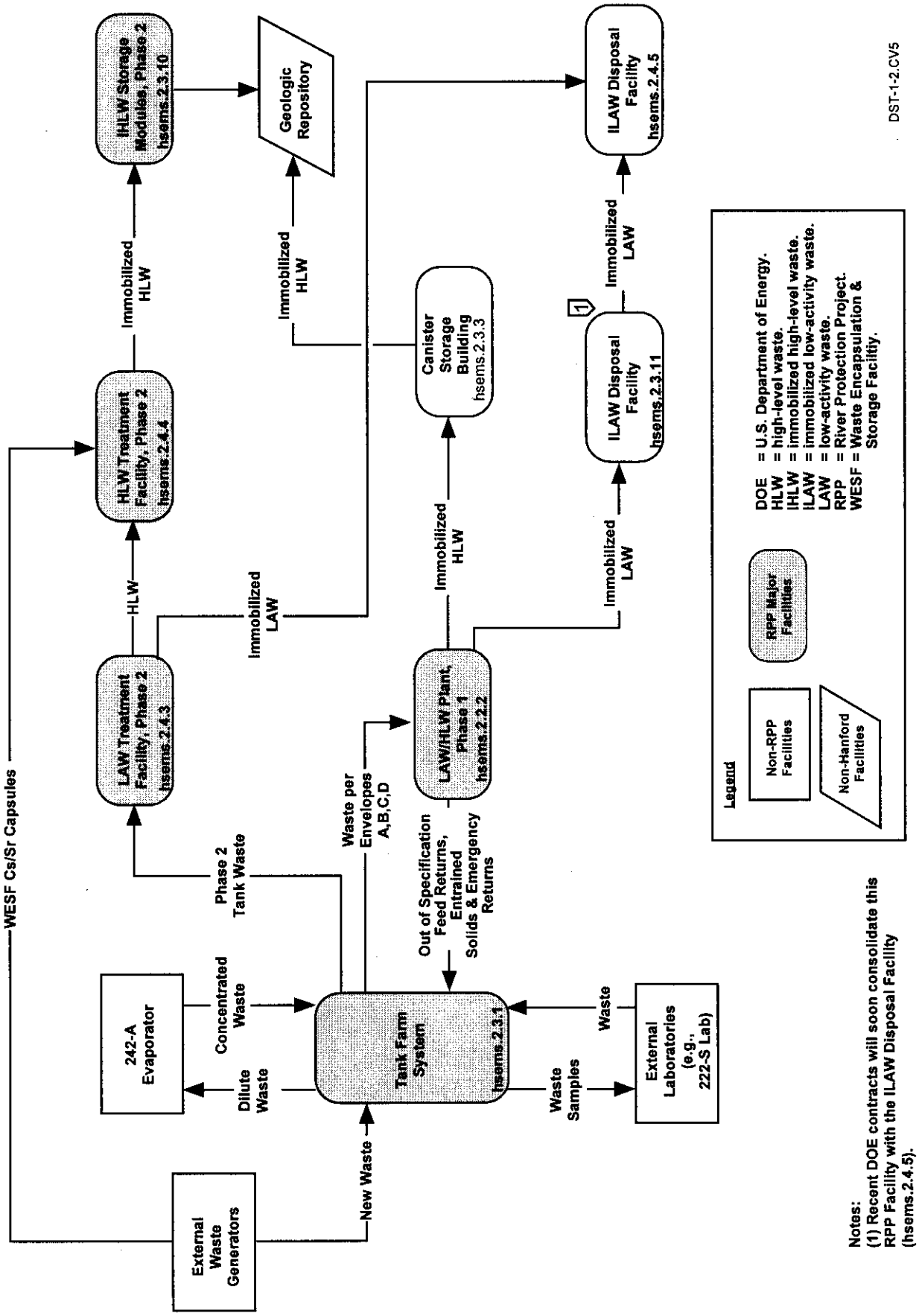
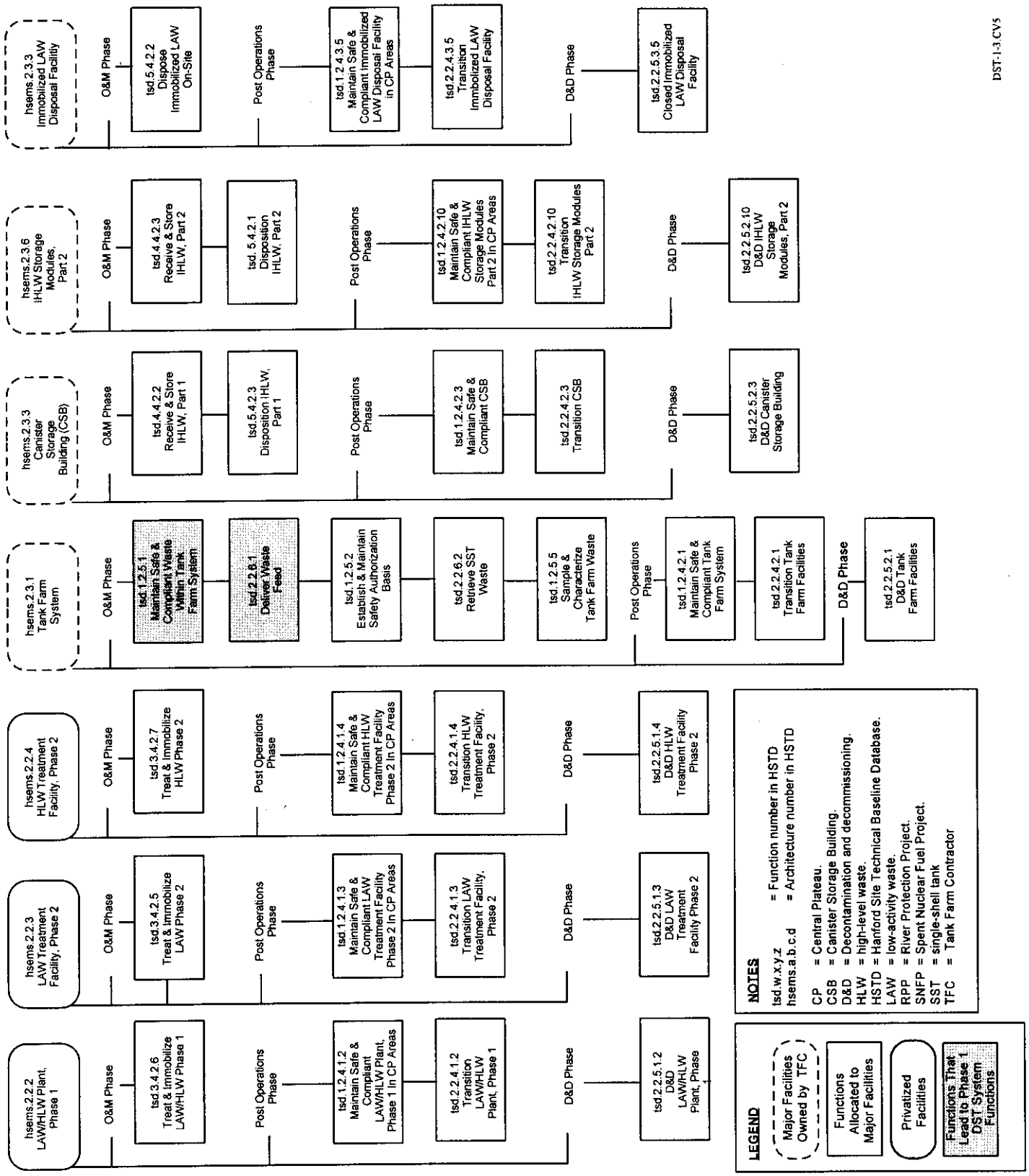


Figure 1-3. Functions Allocated to River Protection Project Major Facilities.



1.3 DOCUMENT OVERVIEW

This document is a technical specification containing system-level requirements and recommended values for the DST System. The document is organized as follows.

Section 1.0 identifies the system defined by this specification, provides a general description of the purpose of the system, and provides this document overview.

Section 2.0 identifies documents that form a part of this specification by reference. Documents listed in this section are cited in later sections of the specification as requirements. This section does not contain a complete list of all documents used to establish requirements but only those explicitly cited.

Section 3.0 provides a definition of the DST System and specifies the requirements that define and constrain the system. This section is divided into eleven major subsections. The subsections are described below.

- Section 3.1 defines the DST System, in terms of both its functional behavior and its system description. The behavior is diagrammed using functional flow block diagrams. The system architecture is represented in block diagrams. This high-level specification shows architecture at an abstract level and avoids assumptions of specific technical solutions for subsystems that have not yet been fully defined.

- Section 3.2 contains system characteristics (e.g., functional requirements based on the functional flow block diagrams); quantified performance levels for each function; interface requirements with other major facilities or systems external to the DST System; physical characteristics; constraints on system quality factors (e.g., reliability and design life); natural and induced environmental conditions that affect the system (e.g., earthquakes, weather, radiation); transportability; flexibility and expansion; and portability requirements that enable future system enhancements.

- Section 3.3 specifies design and construction requirements imposed on the system by external sources. These requirements apply to design and often are not directly derivable from the mission. These requirements will be either worked into the functionality of subsystems and components or passed down to the appropriate end-item specification to be incorporated into the design. Categories of requirements in this section include materials, processes, and design practice requirement;, electromagnetic radiation resistance; nameplates and product markings; workmanship; interchangeability; safety; human factors; security; and government-furnished property.

- Section 3.4 identifies required standards for documenting system design requirements.

- Section 3.5 specifies requirements to the system designer for maintaining and supporting the system.

- Section 3.6 identifies personnel and training requirements that must be integrated into system design.

- Section 3.7 identifies the subsystems and components that comprise the DST System. The purpose of each subordinate item, a description of its purpose, a description of the system capabilities, and inter-relationships among subordinate items are discussed. This section contains general information based on nontechnology-specific expectations.

- Section 3.8 specifies the order of precedence of documents cited by this specification and/or of the requirements within the specification. Guidance is provided to system developers regarding which requirements and/or sources take precedence over others in the event of a conflict among them.

- Section 3.9 states the specific tests under which specific conditions are to be used to verify that the system meets the requirements of this specification. This section is a companion to Section 4, which identifies which system capabilities shall be verified by test.

- Section 3.10, "Standard Sample," is not applicable to the DST System.

- Section 3.11, "Preproduction Standard," is not applicable to the DST System.

Section 4.0 identifies the required means for verifying that the system design will perform as specified in Section 3.0. The information in this section will be used to show acceptability of design before onsite construction.

Section 5.0 specifies requirements, if any, for packaging and handling system components for delivery to the Site.

Section 6.0 contains information helpful to understanding this document (e.g., important terminology definitions, major assumptions). This section contains no requirements.

Section 7.0 contains the appendix that provides supplemental information published separately to support document maintenance. This specification revision provides traceability to the reference source document for each requirement in this specification.

2.0 APPLICABLE DOCUMENTS

The requirements applicable to the DST System mission come from government and nongovernment source documents. These documents define requirements for the system's design, its products and effluents, and other interfaces for successful completion of the RPP mission. Each document identified in this section is referenced in this specification and represents a part of the specification.

2.1 GOVERNMENT SOURCES

U.S. Department of Energy (DOE) orders and regulatory documents, including those promulgated by the Federal and Washington State government, are the bases for parts of this specification to the extent specified herein. Documents that form a part of this specification are listed below.

Code of Federal Regulations (CFR)

10 CFR 20	*Standards for Protection Against Radiation*
40 CFR 191	*Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes*
40 CFR 264	*Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*
40 CFR 265	*Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*
49 CFR 174	*Carriage by Rail*
49 CFR 176	*Carriage by Vessel*
49 CFR 177	*Carriage by Public Highway*

DOE Documents

DOE Order 5820.2A	*Radioactive Waste Management*
DOE Order 6430.1A	*General Design Criteria*
DOE/RL-88-21	*Hanford Facility Dangerous Waste Part A Permit Application*
DOE/RL-96-109, Rev. 2	*Hanford Site Radiological Control Manual*

Washington Administrative Code (WAC)

WAC 173-303	*Dangerous Waste Regulations*
WAC 173-360	*Underground Storage Tank Regulations*
WAC 246-247	*Radiation Protection - Air Emissions*

Contracts

DE-AC06-96RL13308	*TWRS Privatization Contract, Amendment A005*

2.2 NONGOVERNMENT DOCUMENTS

The Hanford Site documents listed below form a basis for part of this specification to the extent specified herein. Note: The RPP-PROs implement Federal and state regulations and DOE orders. Before they are used, it is the responsibility of the designer to verify that these RPP-PROs remain compliant with the latest revision of their parent regulations and with the DOE orders imposed by contract.

Hanford Site Procedures

HNF-IP-0842, Vol. II, Sec 6.1, Rev. 0	*RPP Administration, "Tank Farms Operations Equipment Labeling"*
HNF-IP-0842, Vol. IX, Section 5.2, Rev. 0	*Fire Protection Design Criteria*
HNF-IP-1266, Rev. 2	*Tank Farms Operations Administrative Controls*
RPP-PRO-097, Rev. 0	*Engineering Design and Evaluation*
RPP-PRO-156, Rev. 0	*Nonradioactive Hazardous Materials/Hazardous Waste (HM/HW) Shipments*
RPP-PRO-1621, Rev. 0	*ALARA Decision - Making Methods*
RPP-PRO-1622, Rev. 0	*Radiological Design Review Process*
RPP-PRO-1819, Rev. 0	*Engineering Requirements*
RPP-PRO-222, Rev. 0	*Quality Assurance Records Standards*
RPP-PRO-224, Rev. 0	*Document Control Program Standards*
RPP-PRO-2364, Rev. 0	*Radioactive Airborne Effluent Sampling*
RPP-PRO-2595, Rev. 0	*Air Quality Program - Nonradioactive Emissions*

RPP-PRO-394, Rev. 0	*Physical Protection of Property and Facilities*
RPP-PRO-450, Rev. 0	*Air Quality - Radioactive Emissions*
RPP-PRO-451, Rev. 0	*Regulated Substance Management*
RPP-PRO-455, Rev. 0	*Solid Waste Management*
RPP-PRO-456, Rev. 0	*Water Quality Program*
RPP-PRO-700, Rev. 1	*Safety Analysis and Technical Safety Requirements*
RPP-PRO-702, Rev. 0	*Safety Analysis Process-Facility Change or Modification*
RPP-PRO-703, Rev. 0	*Safety Analysis Process-New Project*
RPP-PRO-704, Rev. 1	*Hazard and Accident Analysis Process*

Other

BNFL-5193-ID-19, Rev. 4	*Interface Control Document Between DOE and BNFL Inc. for Low-Activity Waste Feed*
BNFL-5193-ID-20, Rev. 4	*Interface Control Document Between DOE and BNFL Inc. for High-Level Waste Feed*
HNF-2004, Rev. 0	*Estimated Dose To In-Tank Equipment: Phase 1 Waste Feed Delivery*
HNF-2962, Rev. 0	*A List of EMI/EMC Requirements*
HNF-5183, Rev. 0	*Tank Farms Radiological Control Manual*
HNF-SD-ETF-WAC-001, Rev. 0	*Acceptance of Feed Streams for Treatment at the LERF/ETF Complex*
HNF-SD-GN-ER-501, Rev. 1	*Natural Phenomena Hazards, Hanford Site, Washington*
HNF-SD-WM-DQO-001, Rev. 3	*Data Quality Objectives for Tank Farms Waste Compatibility Program*
HNF-SD-WM-DQO-014, Rev. 2	*242-A Evaporator Data Quality Objectives*

HNF-SD-WM-DTR-046, Rev. 0	*Results of Dilution Studies with Waste from Tank 241-AN-105*
HNF-SD-WM-EV-053, Rev. 5	*Double-Shell Tank System Waste Analysis Plan*
HNF-SD-WM-HSP-002, Rev. 3	*Tank Farms Health and Safety Plan*
HNF-SD-WM-OCD-015, Rev. 2	*Tank Farm Waste Transfer Compatibility Program*
HNF-SD-WM-SAR-067, Rev. 1F	*Tank Waste Remedation System Final Safety Analysis Report*
HNF-SD-WM-SP-012, Rev. 1	*Tank Waste Remediation System Operation and Utilization Plan to Support Waste Feed Delivery*
NFPA 496	*Standard for Purged and Pressurized Enclosures for Electrical Equipment*
NFPA 70	*National Electrical Code*
NFPA 77	*Recommended Practice on Static Electricity*
OSD-T-151-00008, Rev. E-3	*Operating Specifications for the 204-AR Waste Unloading Facility.*
OSD-Z-184-00010, Rev. 1	*Operating Specification for the Plutonium Finishing Plant 241-Z Waste Facility, Rev. H-0*
RPP-5346, Rev.0 (Draft)	*Waste Feed Delivery Transfer System Analysis*
WHC-SD-W058-DRD-001, Rev. 0	*Preliminary Design Requirements Document for Project W-058 Replacement of the Cross-Site Transfer System*

3.0 DST WASTE RETRIEVAL SYSTEM FUNCTIONS AND REQUIREMENTS

3.1 SYSTEM DEFINITION

3.1.1 Functional Description - Double-Shell Tank System

The DST System operations and maintenance flow (Figure 3-1) shows the relationships among the Phase 1 DST System functions that are a direct result of decomposing the shaded functions of Figure 1-3. These Figure 1-3 functions, together with their subordinate functions, are listed in Table 3-1. The relationship among the subordinate functions is diagrammed in Figure 3-2, which illustrates the DST System functional behavior. The diagram shows how waste will flow from its sources through the DST System to the privatized LAW/HLW plant, and shows the emergency returns, entrained solids and out-of-specification feed waste flows returning from the plant back into the DST System.

Table 3-1. Phase 1, Double-Shell Tank System Functions.

Maintain Safe and Compliant Waste within the DST System
- Store Waste in West Area DSTs
- Store Waste in East Area DSTs
- Transfer Waste from 204-AR Waste Unloading Facility to East Area DSTs
- Receive New Liquid Waste into West Area DSTs
- Receive New Liquid Waste into East Area DSTs
- Receive Concentrated Waste from Evaporator
- Receive Emergency Purge from Evaporator
- Receive Emergency Returns from LAW/HLW Plant
- Receive Entrained Solids and Out of Specification Returns from LAW/HLW Plant
- Transfer Waste for Concentration

Remove Waste from DSTs, Phase 1
- Prepare Waste in West Area DSTs
- Transfer Waste Between West Area DSTs
- Transfer Waste Cross-Site
- Prepare Waste in East Area DSTs
- Transfer Waste Between East Area DSTs
- Transfer Waste to LAW Staging Tanks
- Transfer Waste to HLW Staging Tanks
- Transfer Supernatant to SST Retrieval System

Prepare LAW Feed for Phase 1 Treatment
- Prepare LAW in LAW Staging Tanks
- Transfer LAW Supernatants to LAW/HLW Plant

Prepare HLW Feed for Phase 1 Treatment
- Prepare HLW Sludges in HLW Staging Tanks
- Transfer HLW Sludge to LAW/HLW Plant

Distribute Utilities in DST System

Support DST System

DST = double-shell tank.
HLW = high-level waste.
LAW = low-activity waste.
SST = single-shell tank.

Figure 3-1. Double-Shell Tank System
Operations and Maintenance Flow, Phase 1.

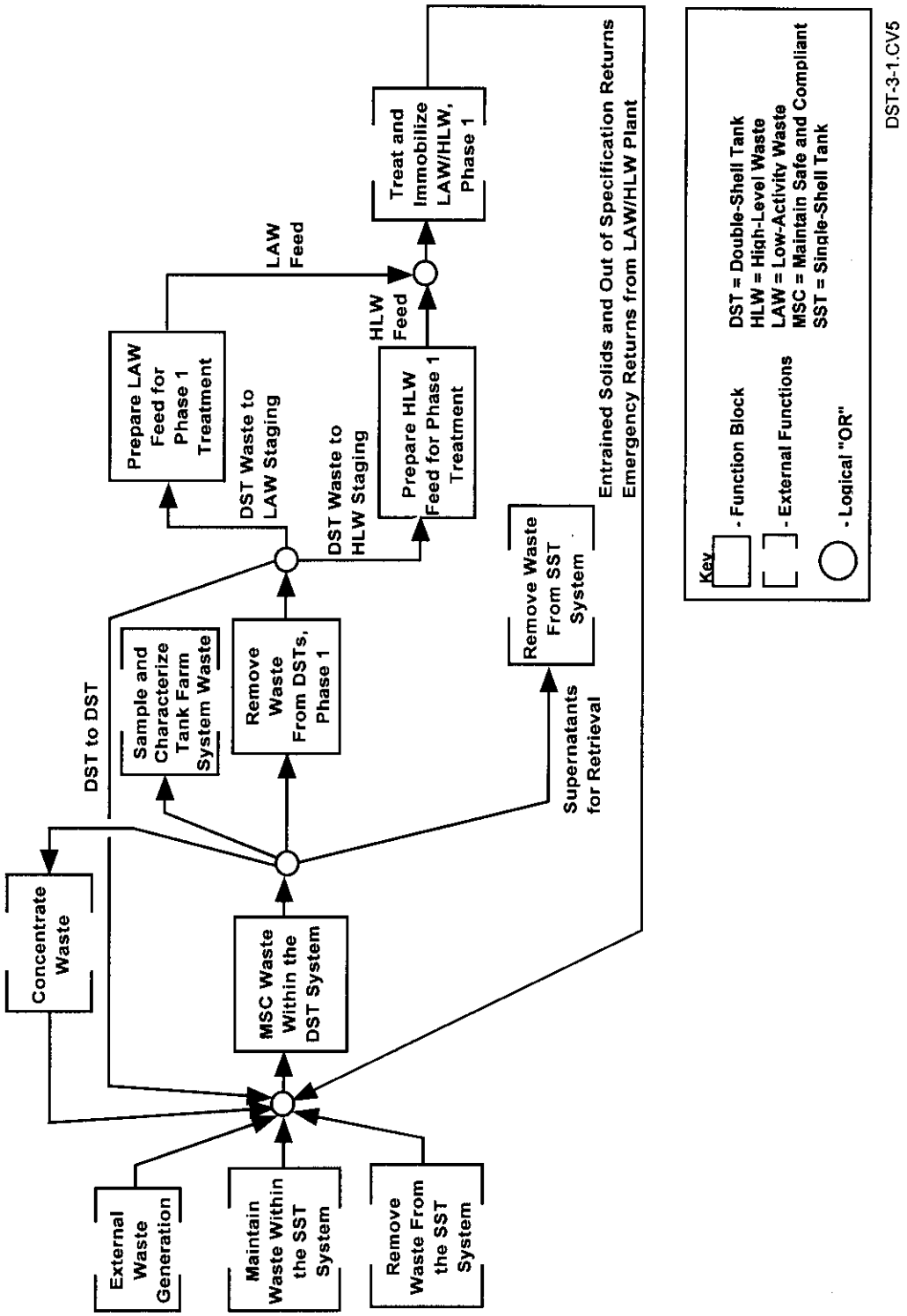
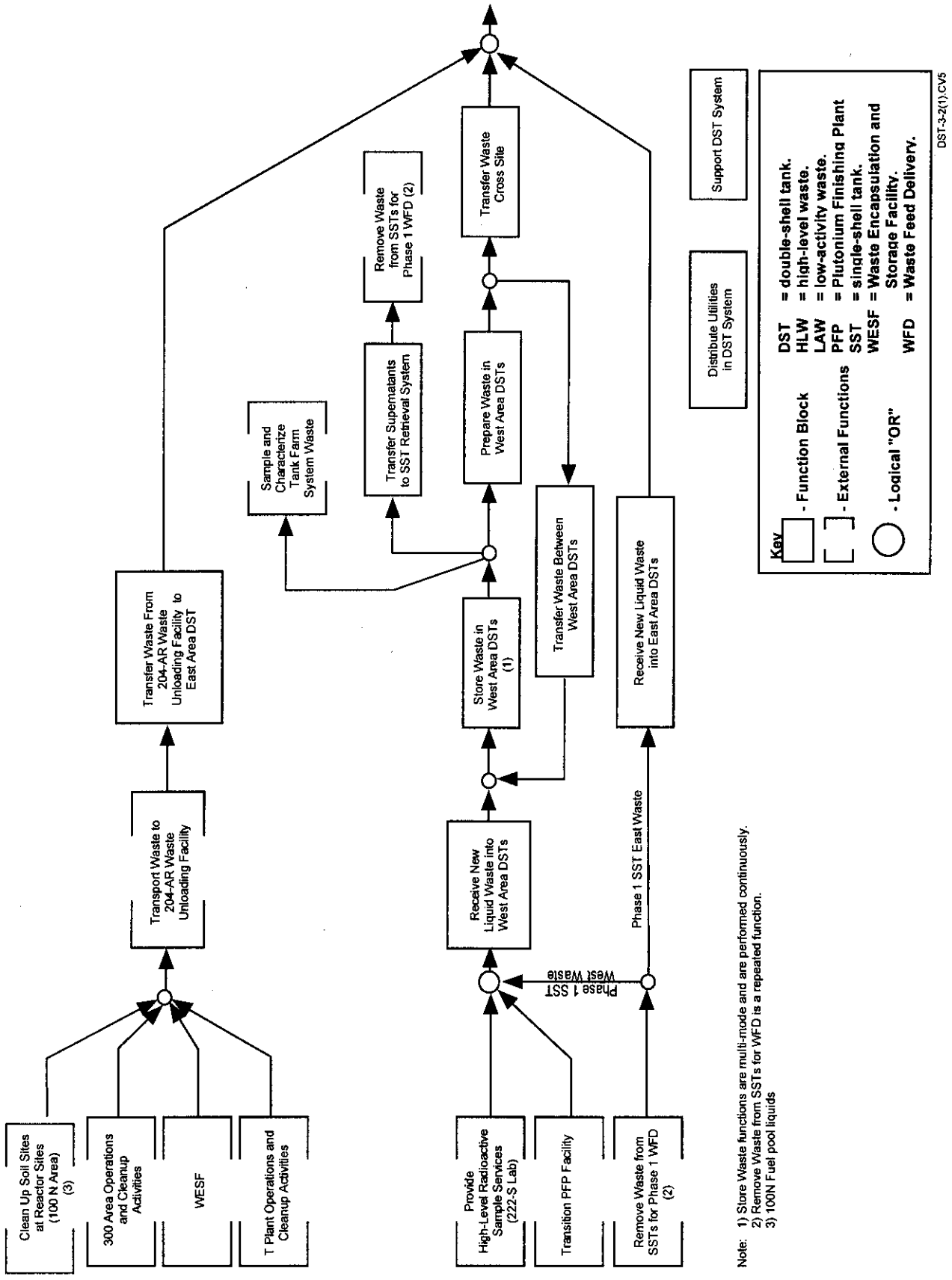
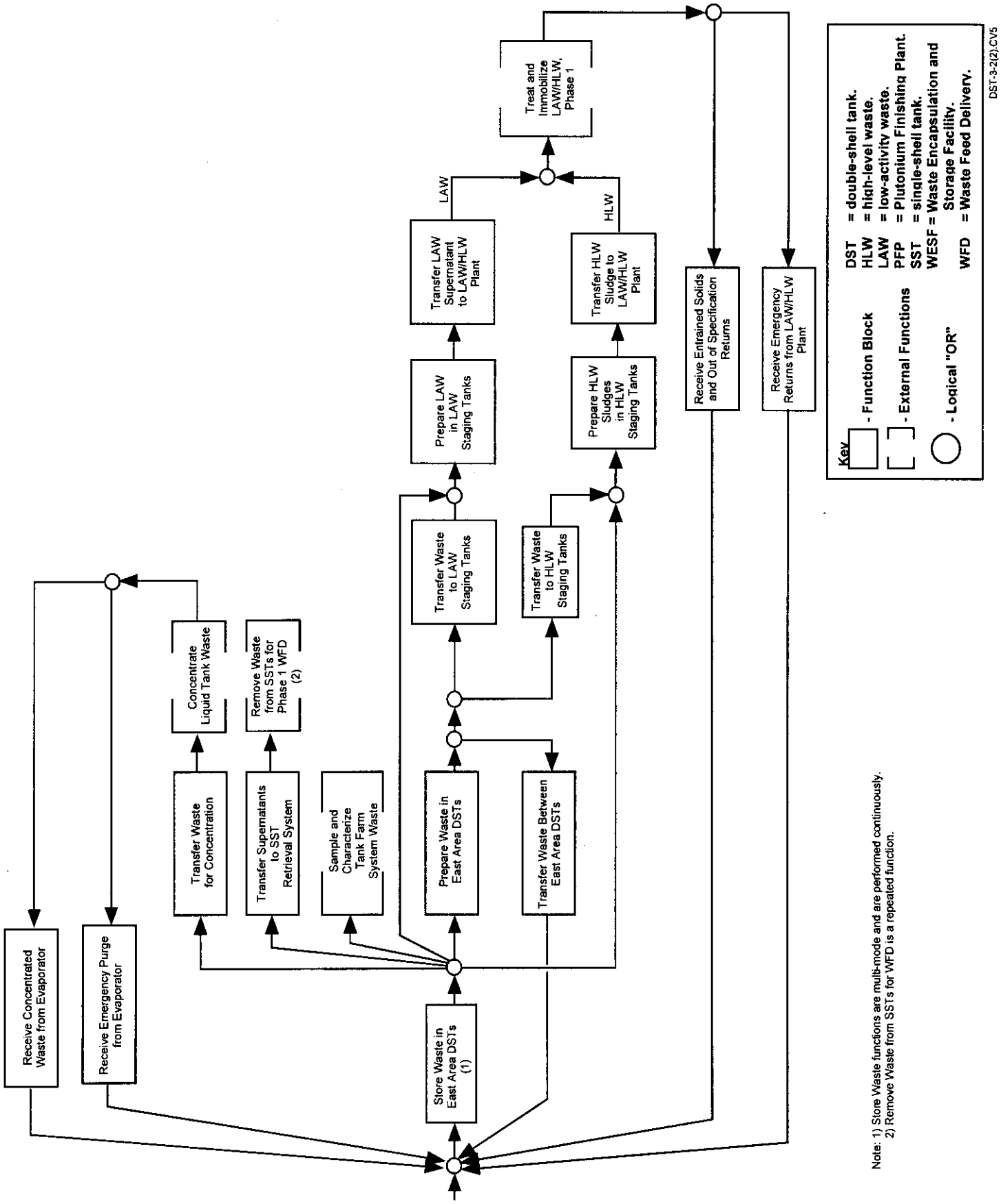


Figure 3-2. Double-Shell Tank System
Functional Flow Block Diagram . (Sheet 1 of 2)



Note: 1) Store Waste functions are multi-mode and are performed continuously.
2) Remove Waste from SSTs for WFD is a repeated function.
3) 100N Fuel pool liquids

Figure 3-2. Double-Shell Tank System
Functional Flow Block Diagram . (Sheet 2 of 2)



Note: 1) Store Waste functions are multi-mode and are performed continuously.
2) Remove Waste from SSTs for WFD is a repeated function.

3.1.2 System Description

The DST System is a major segment of the Tank Farm System that interfaces with other Hanford Site major facilities (Figure 3-3). The DST System stores existing waste; receives additional waste from the SST System and external waste generators; delivers waste to the evaporator, receives concentrated waste back from the evaporator; delivers DST supernatant to the SST System for retrieval; delivers waste to the LAW/HLW Plant, Phase 1; and receives waste byproducts, out-of-specification feed, and emergency returns back from this plant. The external laboratories (e.g., 222-S Laboratory) analyze waste samples from the DST System in support of safe storage, retrieval, and processing.

The existing DST System consists of the items listed in Table 3-2. Figure 3-4 shows the relationship among these elements. The system includes six tank farms containing 28 DSTs. Five of the tank farms are located in the 200 East Area; one is located in the 200 West Area. The four tanks in the 241-AY and 241-AZ tank farms are designed to store high heat or "aging" waste and have a design storage capacity of 3,800 cu. meters/tank (1,000,000 gal/tank) each. All other DSTs have a design capacity of 4,390 cu. meters/tank (1,160,000 gal/tank) each.

Table 3-2. Double-Shell Tank, Existing System Items.

<u>200 East Area</u>
241-AN Farm (seven tanks)
241-AP Farm (eight tanks)
241-AW Farm (six tanks)
241-AY Farm (two tanks/two diversion boxes)
241-AZ Farm (two tanks)
244-A Receiver Tank (DCRT)*
244-BX Receiver Tank (DCRT)*
244-AR Vault*
244-CR Vault*
East Area DST Transfer System
204-AR Waste Unloading Facility

<u>200 West Area</u>
241-SY Farm (three tanks)
244-TX Receiver Tank (DCRT)*
244-U Receiver Tank (DCRT)*
244-S Receiver Tank (DCRT)*
West Area DST Transfer System
Cross-Site Transfer System

* = Miscellaneous underground storage tanks assigned to the DST System.
DCRT = double-contained receiver tank.
DST = double-shell tank.

Waste is moved between the DSTs in each area by the transfer systems, using underground pipelines. These pipelines include diversion boxes and valve pits to direct waste to its destination. The system also has two cross-site transfer lines to move waste between the 200 West Area and the 200 East Area.

The 200 Areas contain MUST, used currently and historically (1) as catch tanks, neutralization tanks, settling tanks, and receiving vault tanks; (2) for waste handling in the tank farm system; (3) for uranium recovery support; or (4) to support waste handling from a specific facility. Responsibility for 36 inactive MUSTs and 12 active MUSTs has been assigned to the RPP (HNF-SD-WM-MAR-008). MUSTs that have been allocated to the DST System are included in Table 3-2. The remainder of MUSTs have been allocated to the SST System (see HNF-3912, Rev. 0, *System Specification for the Single-Shell Tank System*).

The 244-AR Vault was used (1) to condition waste from the Plutonium-Uranium Extraction (PUREX) Facility before the waste was transferred to a DST and (2) to prepare waste for processing in B Plant during campaigns to recover cesium and strontium from the waste. The 244-AR Vault has been shut down but still contains waste that must be removed before the vault can be closed. The 244-CR Vault was used to store sludge dissolved during the cesium and strontium recovery campaigns.

The 204-AR Waste Unloading Facility receives waste transported to the DST System by tank truck and transfers the waste to an East Area DST. Rail car transfers through this facility ceased during fiscal year 1998. This facility includes chemical adjustment capability.

Figure 3-4 shows three system elements that support all other DST System elements: the DST Monitor and Control Subsystem, the DST utilities subsystems, and the DST Maintenance and Recovery Subsystem. The DST utilities subsystems receive electrical power and water from the Site and distribute them throughout the DST System. Service air and instrument air are generated and distributed throughout the DST System by the DST utilities subsystems. The support services function provides offices, change rooms, and other facilities necessary for operation of the subsystems, training of personnel, and equipment for recovery from off-normal events.

Figure 3-3. Double-Shell Tank System Interface Diagram.

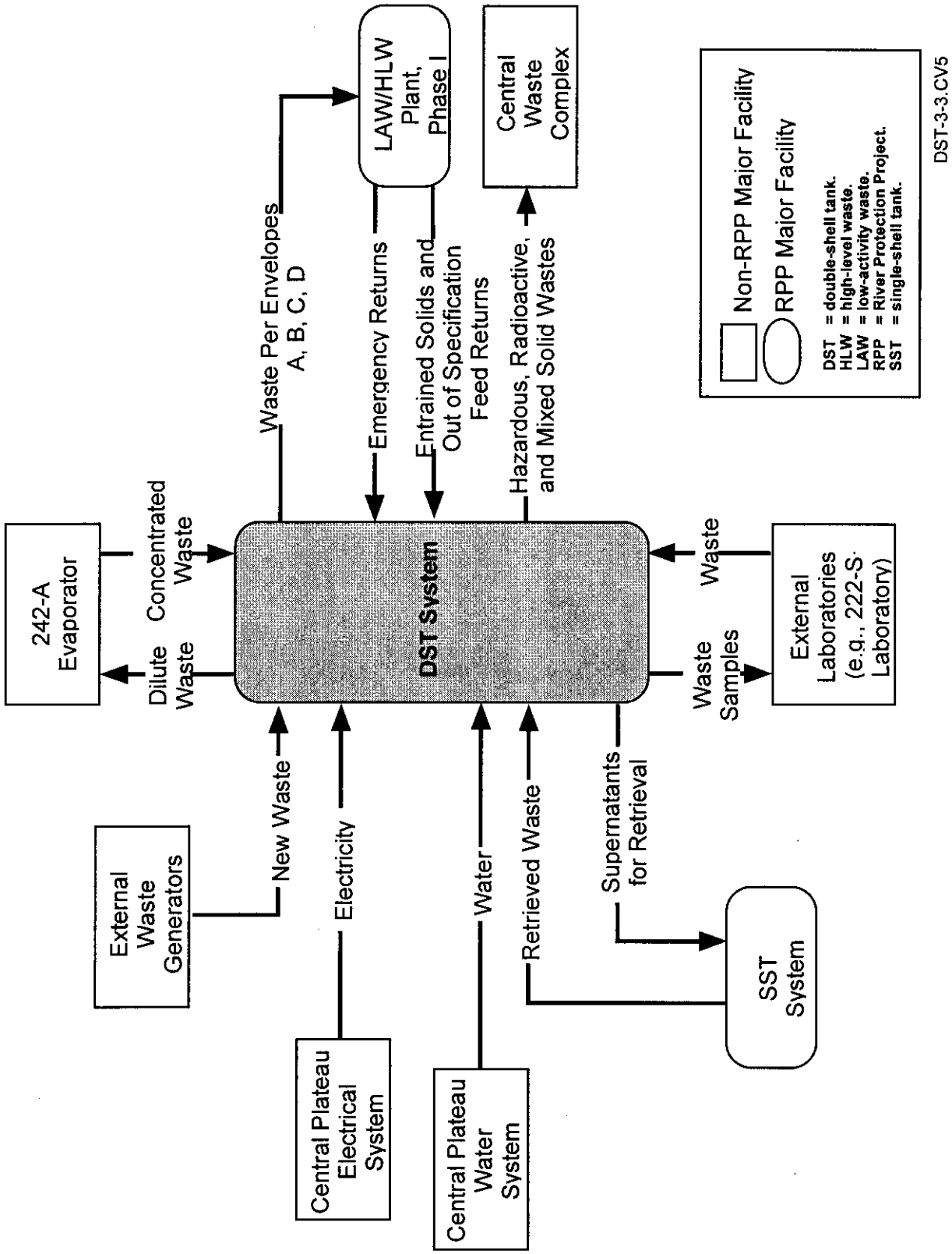
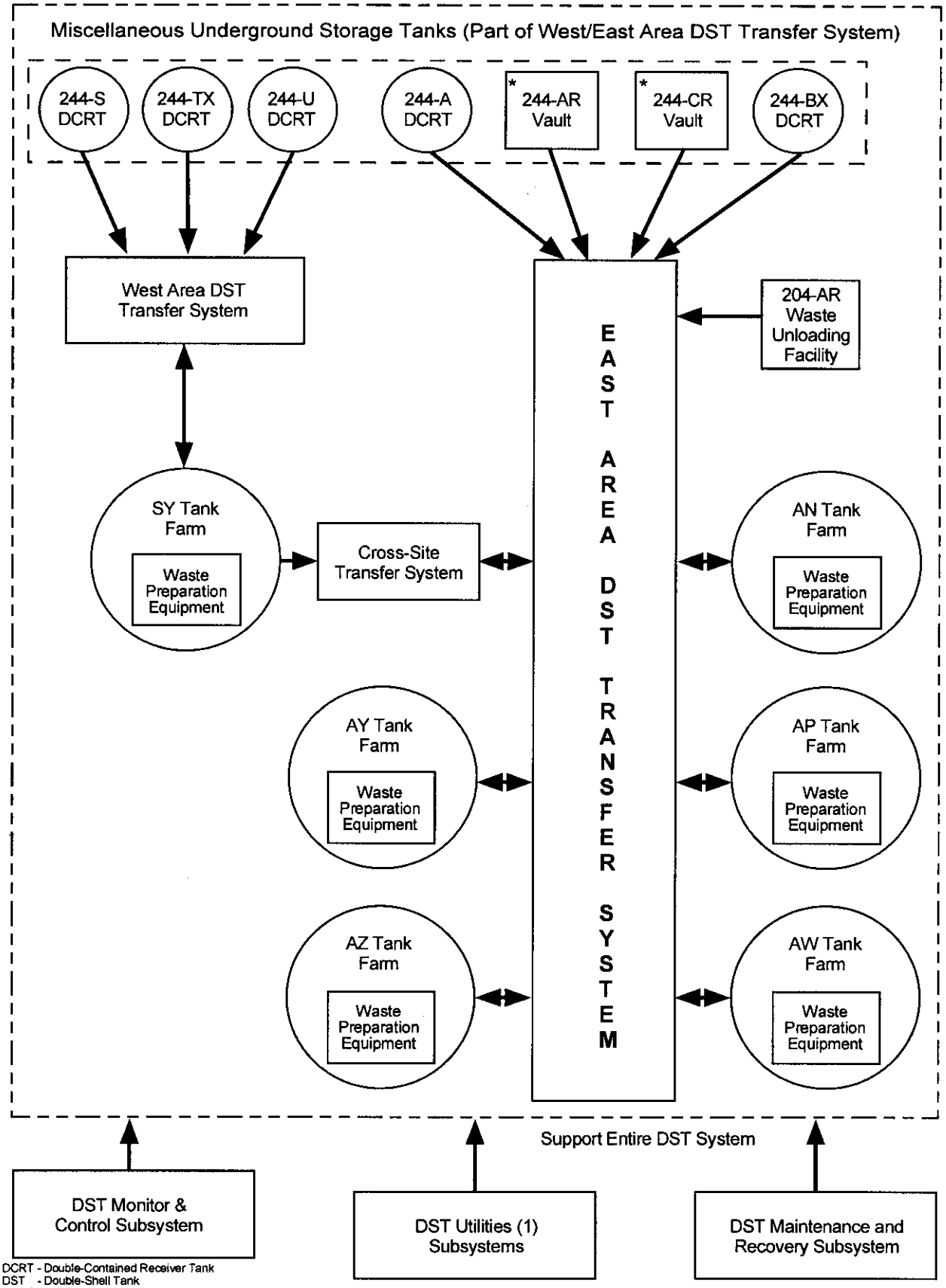


Figure 3-4. Phase 1 Double-Shell Tank System.



DCRT - Double-Contained Receiver Tank
DST - Double-Shell Tank
(1) DST utilities subsystem containes the DST Electrical Power, DST Raw Water, DST Potable Water, DST Service Air, and DST Instrument Air Subsystems.
* Inactive Facilities

DST-3-4.CV5

3.2 SYSTEM CHARACTERISTICS

The following sections specify the characteristics of the DST System.

3.2.1 Performance Characteristics

The system shall function to the levels specified below. Note that several of the below performance levels are specified as maximum annual volumes or maximim batch sizes. These requirements envelope peak demands that occur during the Phase 1 WFD mission.

3.2.1.1 Maintain Safe and Compliant Waste within the Double-Shell Tank System. The DST System shall (a) store existing tank waste and waste received from the SST System and external waste generators in DSTs and (b) transfer waste to the 242-A Evaporator during evaporator campaigns.

3.2.1.1.a Double-Shell Tank System Storage Capacity, Phase 1. The DST System shall provide at least 118,000 cu. meters (31,200,000 gal) of storage capacity through Phase 1.

3.2.1.1.1 Store Waste in West Area Double-Shell Tanks. The system shall store existing waste and waste received from the SSTs and waste generators in the 200 West Area.

3.2.1.1.1.a West Double-Shell Tank System Storage Capacity, Phase 1. The DST System shall provide at least 11,400 cu. meters (3,000,000 gal) of storage capacity in the 200 West Area DSTs.

3.2.1.1.2 Store Waste in East Area Double-Shell Tanks. The system shall store existing waste in the 200 East Area DSTs and waste received from the SSTs, the 200 West Area DSTs, 200 East Area generators, and other waste generators that use the 204-AR Waste Unloading Facility.

3.2.1.1.2.a East Double-Shell Tank System Storage Capacity, Phase 1. The DST System shall provide at least 107,000 cu. meters (28,200,000 gal) of storage capacity in the 200 East Area DSTs.

3.2.1.1.3 Transfer Waste From 204-AR Waste Unloading Facility to East Area DSTs. The system shall remove waste from tanker trucks and the LR-56 cask system at the 204-AR Waste Unloading Facility and shall transfer that waste to a 200 East Area DST for storage in accordance with the requirements of 3.2.3.1.

3.2.1.1.4 Receive New Liquid Waste into West Area Double-Shell Tanks. The system shall be capable of receiving waste from 200 West Area waste generators and route it to a 200 West Area DST.

3.2.1.1.4.a West Area Liquid Waste Annual Capacity. The system shall be capable of receiving a maximum of 17,000 cu. meters (4,500,000 gal) of liquid waste per year into West Area DSTs from 200 West Area waste generators through Phase 1.

3.2.1.1.4.b Waste Volumes Received -- West Area. The system shall be capable of receiving up to 2910 cu. meters (769,000 gal) of waste within 5 days into a West Area DST from 200 West Area waste generators.

3.2.1.1.5 Receive New Liquid Waste into East Area Double-Shell Tanks. The system shall be capable of receiving waste from 200 East Area waste generators and route that waste to a 200 East Area DST.

3.2.1.1.5.a East Area Liquid Waste Annual Capacity. The system shall be capable of receiving up to 7,190 cu. meters (1,900,000 gal) of liquid waste per year through Phase 1 into East Area DSTs, excluding waste transferred into East Area DSTs via cross-site transfers.

3.2.1.1.5.b Waste Volumes Received -- East Area. The system shall be capable of receiving up to 2560 cu. meters (676,000 gal) of waste within 4 days into East Area DSTs, excluding waste transferred into East Area DSTs via cross-site transfers.

3.2.1.1.6 Receive Concentrated Waste from Evaporator. The system shall route concentrated waste from the 242-A Evaporator to a 200 East Area DST for storage.

3.2.1.1.6.a Annual Volume of Concentrated Waste. The system shall be capable of receiving up to 3770 cu. meters (994,000 gal) of waste per year through Phase 1 from the 242-A Evaporator.

3.2.1.1.6.b Concentrated Waste Receipt Rate. The DST system shall be capable of continuously receiving evaporator slurry at a nominal 0.00189 to 0.00442 cu. meter/s (30 to 70 gal/min).

3.2.1.1.7 Receive Emergency Purge from Evaporator. The system shall receive waste from the 242-A Evaporator during an emergency purge event as specified in 3.2.3.5.c.

3.2.1.1.8 Receive Emergency Returns from LAW/HLW Plant. The system shall be capable of receiving waste returns from the LAW/HLW Plant, Phase 1 on an emergency basis as specified in 3.2.3.6.a.

3.2.1.1.9 Receive Entrained Solids and Out of Specification Returns from LAW/HLW Plant. The system shall be capable of receiving entrained solids and out of specification feed returned from the LAW/HLW Plant, Phase 1 as specified in 3.2.3.6.b.

3.2.1.1.10 Transfer Waste for Concentration. The system shall transfer waste from the 242-A Evaporator feed tank (241-AW-102) to the 242-A Evaporator for concentration.

3.2.1.1.10.a Evaporator Feed Annual Volume. The system shall provide the capability to deliver up to 9,090 cu. meters (2,400,000 gal) of waste per year for transfer from a DST to the 242-A Evaporator through the end of Phase 1.

3.2.1.1.10.b Evaporator Feed Rate. The system shall provide the capability to transfer waste to the evaporator within a range of 0.00442 to 0.00757 cu. meters/s (70 to 120 gal/min) for 2 months.

3.2.1.1.10.c Evaporator Feed Requirements. The system shall provide evaporator feed from a DST that satisfies the requirements in HNF-SD-WM-DQO-014, Rev. 2. In addition, the system shall provide evaporator feed that also satisfies both of the following requirements:

(1) No significant exotherm at a temperature below 168 degrees C (335 deg. F.) or an exotherm/exotherm ratio less than or equal to 1

(2) No total concentration in excess of the NaNO3/NaNO2 precipitation boundary.

3.2.1.2 Remove Waste from Double-Shell Tanks, Phase 1. The system shall remove waste from a DST and send it to another DST to support waste staging operations and for DST space management.

3.2.1.2.a Low-Activity Waste Staging Quantity, Phase 1. The system shall transfer a minimum of 43,900 cu. meters (11,600,000 gal) of LAW for Phase 1 to support LAW staging operations.

3.2.1.2.b High-Level Waste Staging Quantity, Phase 1. The system shall stage up to 30,400 cu. meters (8,020,000 gal) of waste slurry containing 2,910 metric tons (3,210 tons) of solids for Phase 1.

3.2.1.2.c Waste Properties. The system shall remove waste from the DSTs that has the following properties:

Supernatant
Density: 1-1.57 g/mL

pH: 8 to 14+

Sodium Molarity: Up to 14 Molar

Soluble Waste

Solubility: Soluble waste dissolves within 48 hours using the dissolution kinetics test as described in HNF-SD-WM-DTR-046, Rev. 0.

Shear Strength: 6.9 Pa at 300 s-1 (undiluted settled solids, 45 degrees C)

3.0 Pa at 300 s-1 (undiluted whole tank composite, 45 degrees C)

Apparent Viscosity: 10,000 to 10,000,000 cP (in situ, unmixed)

Yield Stress: <500 Pa (in situ, unmixed)

Insoluble Waste

Solubility: Insoluble waste does not dissolve within 48 hours using the dissolution kinetics test as described in HNF-SD-WM-DTR-046, Rev. 0.

Shear Strength: 210 to 5,360 Pa

3.2.1.2.1 Prepare Waste in West Area Double-Shell Tanks. The system shall prepare waste stored in the 200 West Area DSTs for transfer to another 200 West Area DST or cross-site to an East Area DST.

3.2.1.2.1.a Supernatant Preparation--West Area. The system shall adjust up to 4,230 cu. meters (1,120,000 gal) of supernatant to meet the transfer requirements of HNF-SD-WM-DQO-001, Rev. 3, and HNF-SD-WM-OCD-015, Rev. 2. In addition, the system may adjust the supernatant to achieve the waste characteristics identified in RPP-5346 (TBR), Appendix D.

3.2.1.2.1.b Soluble Waste Preparation--West Area. The system shall dissolve a selected quantity of soluble waste to satisfy the transfer requirements of HNF-SD-WM-DQO-001, Rev. 3 and HNF-SD-WM-OCD-015, Rev. 2. In addition, the system may adjust the waste to achieve the waste characteristics as identified in RPP-5346 (TBR), Appendix D. Soluble waste preparation of the selected quantity shall be completed within 82 days.

3.2.1.2.1.c Insoluble Waste Preparation--West Area. The system shall mobilize a selected quantity of insoluble waste and shall transform that waste to satisfy the transfer requirements of HNF-SD-WM-DQO-001, Rev. 3, and HNF-SD-WM-OCD-015, Rev. 2. In addition, the system shall adjust the waste to achieve the waste characteristics as identified in RPP-5346 (TBR), Appendix D within 14 days.

3.2.1.2.2 Transfer Waste Between West Area Double-Shell Tanks. The system shall transfer waste between West Area DSTs for storage.

3.2.1.2.2.a 200 West Area Waste Batch Transfer. The system shall transfer selected batches of up to 1730 cu. meters (456,000 gal) of prepared waste from a 200 West Area DST to another 200 West Area DST in 3 days.

3.2.1.2.2.b Waste Pumpability. The system shall adjust the selected waste as required to maintain the waste critical velocities as identified in RPP-5346 (TBR), Appendix D.

3.2.1.2.3 Transfer Waste Cross-Site. The system shall transfer waste from the West Area DSTs to the East Area DSTs.

3.2.1.2.3.a Cross-Site Transfer Annual Capacity. The system shall transfer up to 11,300 cu. meters (3,000,000 gal) of prepared waste annually from 200 West Area to a 200 East Area DST.

3.2.1.2.3.b Cross-Site Waste Transfer Volume. The system shall transfer selected batches of up to 4,230 cu. meters (1,120,000 gal) of prepared waste from 200 West Area to a 200 East Area DST in 6 days.

3.2.1.2.3.c Waste Pumpability. The system shall adjust waste to be transferred cross-site to meet the waste pumpability requirements of WHC-SD-W058-DRD-001, Rev. 0.

3.2.1.2.4 Prepare Waste In East Area Double-Shell Tanks. The system shall prepare waste stored in the 200 East Area DSTs for transfer to another East Area DST.

3.2.1.2.4.a Supernatant Preparation--East Area. The system shall adjust up to 6580 cu. meters (1,740,000 gal) of supernatant to meet the transfer requirements of HNF-SD-WM-DQO-001, Rev. 3 and HNF-SD-WM-OCD-015, Rev. 2. In addition, the system may adjust the supernatant to achieve the waste characteristics identified in RPP-5346 (TBR), Appendix D.

3.2.1.2.4.b Soluble Waste Preparation--East Area. The system shall dissolve a selected quantity of soluble waste to satisfy the transfer requirements of HNF-SD-WM-DQO-001, Rev. 3 and HNF-SD-WM-OCD-015, Rev. 2. In addition, the system shall adjust the waste to achieve the waste characteristics identified in RPP-5346 (TBR), Appendix D. Soluble waste preparation of the selected quantity shall be completed within 117 days.

3.2.1.2.4.c Insoluble Waste Preparation--East Area. The system shall mobilize a selected quantity of insoluble waste, shall transform that waste to satisfy the transfer requirements of HNF-SD-WM-DQO-001, Rev. 3 and HNF-SD-WM-OCD-015, Rev. 2, and may adjust the waste to achieve the waste characteristics identified in RPP-5346 (TBR) Appendix D. The waste preparation shall be completed within 14 days.

3.2.1.2.5 Transfer Waste Between East Area Double-Shell Tanks. The system shall transfer waste between East Area DSTs.

3.2.1.2.5.a 200 East Area Waste Batch Transfer. The system shall transfer selected batches of up to 3920 cu. meters (1,030,000 gal) of prepared waste from a 200 East Area DST to another 200 East Area DST within 9 days.

3.2.1.2.5.b Waste Pumpability. The system shall satisfy the waste pumpability requirements of Section 3.2.1.2.2.b.

3.2.1.2.6 Transfer Waste to Low-Activity Waste Staging Tanks. The system shall transfer operator-selected waste from the 200 East Area DSTs to the LAW staging tanks.

3.2.1.2.6.a Low-Activity Waste Staging Batch Volumes. The system shall transfer 1,590 to 3,790 cu. meters (419,000 to 995,000 gal) of prepared waste from East Area DSTs to the LAW feed staging tank in 3 to 7 days.

3.2.1.2.6.b Waste Pumpability. The system shall satisfy the waste pumpability requirements of Section 3.2.1.2.2.b.

3.2.1.2.7 Transfer Waste to High-Level Waste Staging Tanks. The system shall transfer operator-selected waste from the 200 East Area DSTs to the HLW staging tanks.

3.2.1.2.7.a High-Level Waste Staging Batch Volumes. The system shall transfer up to 1910 cu. meters (503,000 gal) of prepared waste from East Area DSTs to the HLW feed staging tank in 4 days.

3.2.1.2.8 Transfer Supernatant to Single-Shell Tank Retrieval System. The system shall transfer supernatant to the SST Retrieval System.

3.2.1.2.8.a Supernatant Volume for Phase 1 SST Waste Feed Delivery Retrieval. The system shall deliver supernatant from the DST System source tank to the SST System as specified below:

Supernatant Source Tank (DST)	Available Volume (cu. meters)	SST Requiring Supernatant
TBD	TBD	TBD

3.2.1.2.8.b Supernatant Volume for Phase 1 SST Retrieval Concurrent with Phase 1. The system shall deliver supernatant from the DST System source tank to the SST System as specified below:

Supernatant Source Tank (DST)	Available Volume (cu. meters)	SST Requiring Supernatant
TBD	TBD	TBD

3.2.1.2.8.c Supernatant Properties. The system shall adjust supernatant properties in accordance with TBD.

3.2.1.3 Prepare Low-Activity Waste Feed for Phase 1 Treatment. The system shall prepare and certify waste in the staging tanks as LAW feed and shall transfer that LAW feed to the LAW/HLW Plant.

3.2.1.3.a Low-Activity Waste Feed Composition, Phase 1. The system shall prepare independent batches of LAW feed, satisfying envelope A, B, or C. Envelope A, B, and C compositions shall be as defined in Table 3-3 and 3-4.

Table 3-3. LAW Chemical Composition, Soluble Fraction Only (Note: Values expressed in terms of a maximum ratio of moles of analyte to moles of sodium).

Chemical Analyte	Envelope A	Envelope B	Envelope C
Al	2.5E-01	2.5E-01	2.5E-01
Ba	1.0E-04	1.0E-04	1.0E-04
Ca	4.0E-02	4.0E-02	4.0E-02
Cd	4.0E-03	4.0E-03	4.0E-03
Cl	3.7E-02	8.9E-02	3.7E-02
Cr	6.9E-03	2.0E-02	6.9E-03
F	9.1E-02	2.0E-01	9.1E-02
Fe	1.0E-02	1.0E-02	1.0E-02
Hg	1.4E-05	1.4E-05	1.4E-05
K	1.8E-01	1.8E-01	1.8E-01
La	8.3E-05	8.3E-05	8.3E-05
Ni	3.0E-03	3.0E-03	3.0E-03
NO2	3.8E-01	3.8E-01	3.8E-01
NO3	8.0E-01	8.0E-01	8.0E-01
Pb	6.8E-04	6.8E-04	6.8E-04
PO4	3.8E-02	1.3E-01	3.8E-02
SO4	1.0E-02	7.0E-02	2.0E-02
TIC [1]	3.0E-01	3.0E-01	3.0E-01
TOC [2]	5.0E-01	5.0E-01	5.0E-01
U	1.2E-03	1.2E-03	1.2E-03

[1] Mole of total inorganic carbon atoms/mole sodium
[2] Mole of total organic carbon atoms/mole sodium

Table 3-4. LAW Radionuclide Content, Soluable Fraction Only.

Radionuclide	(Maximum ratio, radionuclide (Bq) to sodium (mole))		
	Envelope A	Envelope B	Envelope C
TRU*	4.8E+05	4.8E+05	3.0E+06
137Cs	4.3E+09	2.0E+10	4.3E+09
90Sr	4.4E+07	4.4E+07	8.0E+08
99Tc	7.1E+06	7.1E+06	7.1E+06
60 Co	6.1E+04	6.1E+04	3.7E+05
154Eu plus 155Eu	1.2E+06	1.2E+06	4.3E+06

*Note: TRU is defined in accordance with 10 CFR 61.55

3.2.1.3.b Low-Activity Waste Feed Solids Concentration. The LAW feed solids concentration shall be no more than 2 weight percent solids (dry basis).

3.2.1.3.c Low-Activity Waste Feed Sodium Concentration. The sodium concentration in the LAW feed shall be between 4 M and 10 M sodium, except for feed from Tanks 241-AZ-101 and AZ-102, where the allowable range shall be between 2 M and 5 M sodium.

3.2.1.3.d Low-Activity Waste Feed Cesium Concentration. The 137 Cs concentration in the LAW feed shall be less than 4 Ci/L.

3.2.1.3.e Low-Activity Waste Feed Visible Separate Organic Phase. The system shall prepare LAW feed to contain no visible separate organic phase.

3.2.1.3.f Low-Activity Waste Feed, Production Quantities, Phase 1. The system shall prepare and deliver at least 6,000 units of LAW (Envelopes A, B, and C). The quantity of Envelope C shall not exceed 2100 units. Units are defined in DE-AC06-96RL13308, Specification 7, *Low-Activity Waste Envelopes Definition*, for each envelope.

3.2.1.3.g Minimum Annual Low Activity Waste Feed Delivery. The system shall prepare and deliver a minimum of 800 units of LAW feed per year for the first 3 years, after which the rate will increase to 1100 units of LAW per year through Phase 1.

3.2.1.3.h Low-Level Waste Feed Certification. The system shall support LAW feed certification at least 30 days before batch transfer, in accordance with BNFL-5193-ID-19, Rev. 4, before the waste is transferred to the LAW/HLW Plant.

3.2.1.3.1 Prepare Low-Activity Waste in Low-Activity Waste Staging Tanks. The system shall prepare and certify waste in the LAW staging tanks as LAW feed to the LAW/HLW Plant.

3.2.1.3.1.a Low-Activity Waste Staging Batch Size, Phase 1. The system shall prepare and certify batches of LAW feed with a minimum of 306 units up to a maximum of 701 units within 114 days.

3.2.1.3.2 Transfer Low-Activity Waste Supernatant to LAW/HLW Plant. The system shall transfer certified LAW feed from the LAW staging tanks to the LAW/HLW Plant feed tank.

3.2.1.3.2.a Low-Activity Waste Feed Batches, Phase 1. The system shall transfer LAW feed from LAW staging tanks to the LAW/HLW Plant in batches of up to 3,030 cu. meters (800,000 gal) without interruption.

3.2.1.3.2.b Waste Pumpability. The system shall satisfy the waste pumpability requirements of Section 3.2.1.2.2.b.

3.2.1.4 Prepare High-Level Waste Feed for Phase 1 Treatment. The system shall prepare and certify waste in the staging tanks as HLW feed and shall transfer that HLW feed to the LAW/HLW Plant.

3.2.1.4.a High-Level Waste Feed Composition, Phase 1. The system shall prepare HLW feed that may contain a mixture of liquids (Envelope A, B, or C) and solids (Envelope D). The compositional range of the Envelope D solids shall be as defined in Tables 3-5, 3-6, 3-7 and 3-8. The compositional range of the liquid fraction is defined in Section 3.2.1.3.

NOTE: Waste composition limits are defined in terms of elemental or anion concentrations and radionuclide activities per 100 grams of equivalent nonvolatile waste oxides. The nonvolatile waste oxides include sodium oxide and silicon oxide.

Table 3-5. HLW Feed Composition (grams per 100 grams of nonvolatile waste oxides).

Nonvolatile Element	Maximum (g/100 g waste oxides)
As	0.16
B	1.3
Be	0.065
Ce	0.81
Co	0.45
Cs	0.58
Cu	0.48
Hg	0.1
La	2.6
Li	0.14
Mn	6.5
Mo	0.65

Nd	1.7
Pr	0.35
Pu	0.054
Rb	0.19
Sb	0.84
Se	0.52
Sr	0.52
Ta	0.03
Tc	0.26
Te	0.13
Th	0.52
TI	0.45
V	0.032
W	0.24
Y	0.16
Zn	0.42

Table 3-6. HLW Feed Unwashed Solids Maximum Volatile Component Composition (grams per 100 grams of nonvolatile waste oxide).

Volatile Components	Maximum (g/100 g nonvolatile waste oxides)
Cl	0.33
CO3(-2)	30
NO2	36 (total NO2/NO3)
NO3	
TOC	11
CN	1.6
NH3	1.6

Table 3-7. HLW Feed Unwashed Solids Maximum Radionuclide Composition (curies per 100 grams of nonvolatile waste oxides).

Isotope	Maximum (Ci/100 grams waste oxides)
H-3	6.5E-05
14C	6.5E-06
60Co	1.0E-02
90Sr	1.0E+01
99Tc	1.5E-02
125Sb	3.2E-02
126Sn	1.5E-04
129I	2.9E-07
137Cs	1.0E+01

152Eu	4.8E-04
154Eu	5.2E-02
155Eu	2.9E-02
233U	9.0E-07
235U	2.5E-07
237Np	7.4E-05
238Pu	3.5E-04
239Pu	3.1E-03
241Pu	2.2E-02
241Am	9.0E-02
243+244Cm	3.0E-03

Table 3-8. Additional HLW Feed Composition for Nonvolatile Components (grams per 100 grams of nonvolatile waste oxide).

Nonvolatile Element	Maximum (grams/100 grams waste oxides)
Ag	0.55
Al	14
Ba	4.5
Bi	2.8
Ca	7.1
Cd	4.5
Cr	0.68
F	3.5
Fe	29
K	1.3
Mg	2.1
Na	19
Ni	2.4
P	1.7
Pb	1.1
Pd	0.13
Rh	0.13
Ru	0.35
S	0.65
Si	19
Ti	1.3
U	14
Zr	15

3.2.1.4.b High-Level Waste Feed Solids Concentration. The HLW feed solids concentration shall be 10 (minimum) to 200 (maximum) grams of unwashed solids/liter, except for HLW feed from Tanks 241-AZ-101 and AZ-102.

3.2.1.4.c High-Level Waste Feed Sodium Concentration. The sodium concentration in the liquid fraction of the HLW slurry shall be between 0.1 M and 10 M sodium.

3.2.1.4.d High-Level Waste Feed Visible Separate Organic Phase. The system shall prepare the HLW feed to contain no visible separate organic phase.

3.2.1.4.e High-Level Waste Feed, Production Quantities, Phase 1. The system shall prepare HLW feed for delivery in quantities as needed to support the LAW/HLW Plant, Phase 1 filling a minimum of 600 canisters of HLW glass. The HLW glass is defined by DE-AC06-96RL13308, Specification 12, *Number of HLW Canisters Per Batch of Envelope D* and Specification 8, *High Level Waste Envelope Definition*, during Phase 1.

3.2.1.4.f Maximum Annual High Level Waste Feed Delivery. The system shall prepare HLW feed for delivery in quantities as needed to support the LAW/HLW Plant, Phase 1 filling a minimum of 100 canisters per year for the first 2 years of HLW feed delivery, after which the rate increases to 120 canisters per year of HLW glass (as defined in 3.4.1.e) during Phase 1.

3.2.1.4.g High-Level Waste Feed Certification. The system shall support HLW feed certification at least 30 days before batch transfer in accordance with BNFL-5193-ID-20, Rev. 4, before the waste is transferred to the LAW/HLW Plant.

3.2.1.4.1 Prepare High-Level Waste Sludges in HLW Staging Tanks. The system shall prepare and certify waste in the staging tanks as HLW feed to the LAW/HLW Plant.

3.2.1.4.1.a High-Level Waste Feed Batch Size, Phase 1. The system shall prepare a batch of HLW feed with a volume up to 600 cu. meters (158,000 gal) for transfer within a minimum of 11 days.

3.2.1.4.1.b High-Level Waste Feed Preparation, Phase 1. The system shall prepare and certify a batch group of HLW feed within a staging tank with a volume of between 2,750 and 4,050 cu. meters (714,000 and 1,070,000 gal) within 83 days.

3.2.1.4.2 Transfer High-Level Waste Sludge to LAW/HLW Plant. The system shall transfer HLW feed from HLW staging tanks to the LAW/HLW Plant.

3.2.1.4.2.a High-Level Waste Feed Batch Transfer Volume. The system shall transfer multiple batches of HLW feed, with each batch volume consisting of between 200 and 600 cu. meters (52,800 to 158,000 gal), from HLW staging tanks to the LAW/HLW Plant through Phase 1.

3.2.1.4.2.b High-Level Waste Transfer Rate. The system shall transfer up to 600 cu. meters (158,000 gal) of HLW feed per month from HLW staging tanks to the LAW/HLW Plant during Phase 1.

3.2.1.4.2.c High-Level Waste Feed Batch Transfer Frequency. The system shall complete HLW transfers between the HLW staging tanks and the LAW/HLW Plant within 30 days following notification by DOE.

3.2.1.4.2.d Waste Pumpability. The system shall adjust the HLW feed to satisfy the waste pumpability requirements of Section 3.2.1.2.2.b.

3.2.1.5 Distribute Utilities in Double-Shell Tank System. The system shall distribute electricity, raw water, potable water, service air, and instrument air to the DST System.

3.2.1.5.a Double Shell Tank Utility Requirements. The system shall comply with the requirements for the "Central Plateau Electrical System" (Section 3.2.3.7) and the "Central Plateau Water System" (Section 3.2.3.8).

3.2.1.6 Support Double-Shell Tank System. The system shall provide logistic support and problem resolution for the DST System during system operations. These activities include resolution of safety issues; resolution of operational failures; system maintenance; supply support; operational and maintenance training (including Integrated Safety Management training); support infrastructure maintenance; equipment storage, packaging, and transportation; equipment/clothing decontamination; storage/disposal of items consumed during operation; and other system-management activities.

3.2.2 Reserved

3.2.3 External Interface Requirements

3.2.3.1 External Waste Generators Using Surface Transport. The system shall accept new liquid waste transported by truck and the LR-56 cask system from external waste generators (e.g., T Plant, the 100 and 300 Areas) at the 204-AR Waste Unloading Facility.

3.2.3.1.a 204-AR Annual Capacity. The system shall have the capacity to transfer up to 277 cu. meters (73,200 gal) of waste annually through Phase 1 from the 204-AR Waste Unloading Facility to East Area DSTs.

3.2.3.1.b 204-AR Batch Transfer. The system shall be capable of unloading batches of up to 19 cu. meters (5,000 gal) within 1 day at the 204-AR Waste Unloading Facility.

3.2.3.1.c 204-AR Waste Receipt Properties. Waste received at the 204-AR Waste Unloading Facility shall meet the acceptance requirements contained in HNF-SD-WM-EV-053, Rev.5, HNF-SD-WM-OCD-015, Rev. 2, and OSD-T-151-00008, Rev. E-3.

3.2.3.1.d Properties of Waste for Direct Tank Input. The system shall provide the capability to accept waste from external waste generators via direct transfer from a transport truck into a tank.

3.2.3.2 Plutonium Finishing Plant. The system shall be capable of accepting new liquid waste from the Plutonium Finishing Plant (PFP).

3.2.3.2.a Plutonium Finishing Plant Waste Annual Volume. The system shall be capable of accepting up to 125 cu. meters (33,000 gal) of liquid waste per year from 1999 through 2012 from the PFP.

3.2.3.2.b Waste Properties. The PFP waste shall meet the chemical composition, radionuclide composition, and transfer requirements contained in OSD-Z-184-00010, Rev. 1.

3.2.3.3 222-S Laboratory. The system shall capable of accepting new liquid waste from the 222-S Laboratory.

3.2.3.3.a 222-S Laboratory Waste Annual Volume. The system shall capable of accepting up to 45 cu. meters (12,000 gal) of liquid waste per year through FY 2028 from the 222-S Laboratory.

3.2.3.3.b Waste Properties. The system shall capable of accepting waste satisfying the requirements of HNF-SD-WM-DQO-001, Rev. 3 and HNF-SD-WM-OCD-015, Rev. 2.

3.2.3.4 Single-Shell Tank System. The system shall capable of accepting liquid waste from the SST System.

3.2.3.4.a Single-Shell Tank Waste Retrieval Volume, Phase 1. The system shall capable of accepting at least 37,100 cu. meters (9,800,000 gal) of waste from the SST System through the end of Phase 1.

3.2.3.5 Evaporator. The system shall capable of accepting waste from the evaporator.

3.2.3.5.a Concentrated Waste Receipt Rate. The system shall have the capability to continuously receive evaporator slurry at a nominal 0.00189 to 0.00442 cu. meters/s (30 to 70 gal/m).

3.2.3.5.b Concentrated Waste Composition. The system shall accept waste that meets the flammable gas controls specified in Section 3.1 of HNF-SD-WM-OCD-015, Rev. 2.

3.2.3.5.c Emergency Transfer Volume from Evaporator. The DST System shall be capable of accepting an emergency transfer of less than or equal to 98 cu. meters (26,000 gal) of waste in approximately 12 minutes from the 242-A Evaporator.

3.2.3.6 Phase 1 Low-Activity Waste/High-Level Waste Plant. The system shall accept emergency returns and shall have the capability to accept entrained solids and out of specification feed returns as specified below.

3.2.3.6.a Emergency Return Volume. The DST System shall accept an emergency transfer of up to 3,790 cu. meters (1,000,000 gal) of waste returned from the LAW/HLW Plant on an emergency basis during Phase 1.

3.2.3.6.b Entrained Solids and Out of Specification Return Volume. The DST System shall have the capability of accepting up to TBD cu. meters (TBD gal) of entrained solids and out of specification feed returned from the LAW/HLW Plant during Phase 1.

3.2.3.7 Central Plateau Electrical System. The system shall obtain electricity from the Central Plateau Electrical System and shall distribute it throughout the DST System.

3.2.3.7.a DST System Electrical Power for Safe Storage and Waste Feed Delivery. The DST System shall demand no more than the projected electrical load during Phase 1 for each DST farm as specified in Table 3-9.

Table 3-9. 480 Volt Alternating Current Electrical Load Requirements.

Tank Farm	Projected (kVA)
AN	854 <TBR>
AP	924 <TBR>
AW	893 <TBR>
AY	1075.5 <TBR>
AZ	883.3 <TBR>
SY	2864 <TBR>

3.2.3.8 Central Plateau Water System. The system shall obtain water from the Central Plateau Water System and shall distribute the water throughout the DST System.

3.2.3.8.a Double-Shell Tank System Waste Feed Delivery Raw Water. The DST System shall demand no more than 3,45 L/min (910 gal/min) of raw water from the Central Plateau Water System to support Waste Feed Delivery Phase 1 activities.

3.2.4 Physical Characteristics

Not applicable.

3.2.5 System Quality Factors

3.2.5.1 Reliability, Availability, Maintainability. The integrated schedule risk created when considering Privatization Contract commitments, waste feed contengencies, and batch delivery processes associated with reliability, availability, and maintainability of the WDF portion of DST System shall not exceed 2 days per batch. (TBR)

3.2.5.2 Additional Quality Factors.

3.2.5.2.1 Design Life. The DST System shall be designed to be operable through 2028. The DST System shall be designed to provide containment through 2040.

3.2.6 Environmental Conditions

The system shall be designed to operate during exposure to the following natural and induced environments.

3.2.6.1 Natural Environments. The system shall be designed for the natural environmental conditions specified in HNF-SD-GN-ER-501, Rev. 1, and to withstand the wind, lightning, earthquake, ashfall, and combination loads per RPP-PRO-097 Rev. 0. In case of conflicts, the requirements in RPP-PRO-097, Rev. 0, will take precedence over HNF-SD-GN-ER-501, Rev. 1.

3.2.6.2 Induced Environments.

3.2.6.2.1 Chemical. Equipment installed in the tanks shall be designed to perform their intended function in the chemical environment of the tanks. This environment and its context is described in the HNF-SD-WM-SP-012, Rev. 1, Appendix C.

3.2.6.2.2 Radiation. Equipment installed in the tanks shall be designed to perform their intended function in the radiological environments specified in HNF-2004.

3.2.7 Transportability

Assemblies and components shall be designed to be handled, packaged, marked, and transported in accordance with 49 CFR 174, 49 CFR 176, and 49 CFR 177.

3.2.8 Flexibility and Expansion

The system shall comply with the flexibility and expansion requirements of DOE Order 6430.1A, 0110-3, Division 1.

3.2.9 Portability

Not applicable.

3.3 DESIGN AND CONSTRUCTION

The system design shall follow the general design guidelines provided in DOE Order 6430.1A and those derived from the *Resource Conservation and Recovery Act of 1976* (RCRA) permitting process and other such guidelines as may be authorized pursuant to the *Hanford Federal Facility Agreement and Consent Order*, DOE/RL-89-10 commonly called the Tri-Party Agreement.

3.3.1 Materials, Processes, and Design Practices

3.3.1.1 Toxic Products and Formulations. The system shall comply with the requirements of RPP-PRO-451, Rev. 0.

3.3.1.2 Dangerous Waste. The system shall incorporate dangerous waste storage and treatment design features that comply with the requirements of WAC 173-303.

3.3.1.3 Decontamination and Decommissioning. The system shall be designed for ease of decontamination during operation and for decommissioning at the end of system life in accordance with DOE Order 6430.1A, Sections 0110-99.0.1, 0205-2, and 1300-11.

3.3.1.4 Excess Storage Capacity. The system shall provide storage capacity beyond that required to perform the Phase 1 mission in accordance with DOE Order 5820.2A, Chapter I, Para. 3.b.(4)(d).

3.3.1.5 Double-Shell Tank Dangerous Waste Restrictions. The DST System shall not accept wastes other than those identified in DOE/RL-88-21.

3.3.2 Electromagnetic Radiation

The system shall comply with electromagnetic radiation emission requirements set forth in HNF-2962, Rev. 0.

3.3.3 Nameplates and Product Markings

The system nameplates and markings shall comply with the requirements of HNF-IP-0842, Vol. II, Section 6.1, Rev. 0.

3.3.4 Workmanship

Not applicable at the system level.

3.3.5 Interchangeability

The design shall enable interchangeability of parts among components of the same function, regardless of manufacturer, to the extent both practicable and cost-effective.

3.3.6 Safety

3.3.6.1 Personnel Safety.

3.3.6.1.1 Occupational Radiological Protection. The system shall be designed to protect workers from occupational radiation exposures in accordance with the requirements contained in HNF-5183, Rev. 0 and shall be designed to keep personnel exposures ALARA in accordance with RPP-PRO-1621 and RPP-PRO-1622.

3.3.6.1.2 Occupational Safety and Health Administration Standards. The system shall incorporate occupational safety and health design features that comply with the requirements of HNF-SD-WM-HSP-002, Rev. 3.

3.3.6.2 Equipment Protection.

3.3.6.2.1 Corrosion Prevention and Control. The system shall incorporate corrosion prevention and control features in accordance with WAC 173-303-640 (3) and 40 CFR 265.

3.3.6.2.1.1 Allowable Double-Shell Tank Corrosion. The maximum allowable corrosion for each primary DST steel liner shall be less than or equal to 1.3 mm (0.050 in.) (TBR) over the life of the tank.

3.3.6.2.2 Tank Temperature Limits. The system shall maintain waste temperatures in each DST within the design limits specified in Table 3-10.

Table 3-10. Double-Shell Tank Temperature Limits

VARIABLE	LIMITS
Waste Temperature in Tanks	less than or equal to 99 degrees C (210 degrees F) (AP) less than or equal to 124 degrees C (250 degrees F) (SY) less than or equal to 187 degrees C (350 degrees F) (AN, AW, AY, AZ) (Note: These DST design limits are higher than the operational limits specified in the AB, LCO 3.3.2.)
Rate of Temperature Change for Waste and Concrete	For temperature less than 78 degrees C (125 degrees F) (all farms)--less than or equal to 6.25 degrees C/h (10 degrees F/h) (TBR) For temperature greater than or equal to 78 degrees C (125 degrees F) (AP, AN, AW, SY) -- less than or equal to 12.5 degrees C/day (20 degrees F/day) (TBR)

	For temperature greater than or equal to 78 degrees C (125 degrees F) (AY, AZ) -- less than or equal to 1.9 degrees C/day (3 degrees F/day) or less than or equal to 15 degrees C/day (24 degrees F/day) provided the tank is kept less than or equal to 1.9 degrees C/day (3 degrees F/day) for 8 consecutive days thereafter (TBR)
Concrete Temperature	less than or equal to 116 degrees C (236 degrees F) (all DST Farms)
Concrete Temperature Gradient	less than or equal to 0.72 degrees C/cm (35 degrees F/ft) (AP, AW, AN, SY) less than or equal to 0.37 degrees C/cm (18 degrees F/ft) (AY, AZ)
Temperature Gradients of Waste in Tanks (waste and waste/vapor interface)	less than or equal to 113 degrees C/m (55 degrees F/ft) (all DST farms)

3.3.6.2.3 Double-Shell Tank Pressure Limits. The system shall maintain existing DSTs within the following design pressure limits:

Secondary Tanks:

-508 mm (20 in.) less than or equal to tank pressure less than or equal to +1524 mm (60 in.) water gauge (AP, AY farms)

-152 mm (6 in.) less than or equal to tank pressure less than or equal to +1524 mm (60 in.) water gauge (AN, AW, SY, AZ farms)

Primary Tanks:

-152 mm (6 in.) less than or equal to tank pressure less than or equal to +1524 mm (60 in.) water gauge (AP, AN, AW, SY, AY*, AZ* farms)

*See HNF-2317 for exceptions to -152 mm (6 in.) water gauge requirements for AY, AZ farms.

3.3.6.2.4 Dome Loading. Maximum dome loading on existing DSTs shall be in accordance with HNF-IP-1266, Rev.2.

3.3.6.2.5 Tank Hydrostatic Load. The system shall not exceed hydrostatic loads internal to existing DSTs within the limits specified in Table 3-11.

Table 3-11. Existing Double-Shell Tank Hydrostatic Load Limits.

Tank Farm	Hydrostatic Load
AN	Maximum hydrostatic load as exerted by 4410 cubic meters (1.16 Mgal) of fluid at 1.7 sp. gr. and a depth of 10.7 m (422 in.)
AW	Maximum hydrostatic load as exerted by 4410 cubic meters (1.16 Mgal) of fluid at 1.7 sp. gr. and a depth of 10.7 m (422 in.)
AP	Maximum hydrostatic load as exerted by 4410 cubic meters (1.16 Mgal) of fluid at 2.0 sp. gr. and a depth of 10.7 m (422 in.)
SY	Maximum hydrostatic load as exerted by 4330 cubic meters (1.14 Mgal) of fluid at 1.7 sp. gr. and a depth of 10.7 m (422 in.)
AY	Maximum hydrostatic load as exerted by 3790 cubic meters (0.998 Mgal) of fluid at 1.22 sp. gr. and a depth of 9.25 m (364 in.)
AZ	Maximum hydrostatic load as exerted by 3790 cubic meters (0.998 Mgal) of fluid at 1.22 sp. gr. and a depth of 9.25 m (364 in.)

3.3.6.2.6 Fire Protection. The system shall meet fire protection design requirements as defined in HNF-IP-0842, Vol. IX, Section 5.2.

3.3.6.3 Environmental Safety.

3.3.6.3.1 Secondary Containment and Leak Detection. The system shall incorporate secondary containment and leak-detection design features in accordance with 40 CFR 264.193, WAC-173-360 (for underground petroleum storage tanks only), and WAC 173-303-640 (4).

3.3.6.3.2 Spill Prevention and Controls. The system shall incorporate spill prevention and control design features in accordance with 40 CFR 264.193, WAC 173-303-630(7), and WAC 173-303-640(5). In the event of a conflict, the most stringent requirement shall take precedence.

3.3.6.3.3 Nonradioactive Airborne Emissions. The system shall be designed to comply with the nonradioactive airborne emissions requirements contained in RPP-PRO-2595, Rev. 0. Nonradioactive airborne emissions from other Hanford Site major facilities shall be considered when designing the system to be compliant with the above requirements.

Dangerous waste tank systems that may emit organic vapors are subject to the requirements in WAC 173-303-400 and 40 CFR 265, Subparts AA and BB (for SSTs and for DSTs before issuance of a final permit).

3.3.6.3.4 Radioactive Airborne Emissions. The system shall be designed to comply with the radioactive airborne emissions requirements contained in RPP-PRO-450, Rev. 0 and RPP-PRO-2364, Rev. 0. Also, radioactive airborne emissions from other Hanford Site major facilities shall be considered when designing the system to be compliant with the above requirements.

3.3.6.3.5 Monitoring of Liquid Effluent Discharges to the Environment. The system shall be designed to comply with the groundwater-monitoring requirements contained in HNF-PRO-456, Rev. 0.

3.3.6.3.6 Radiation Protection of the Public And Environment. The system shall be designed in accordance with the radiation release limits specified in 10 CFR 20, 40 CFR 191, and WAC 246-247.

3.3.6.3.7 Flammable Gas Ignition Controls. The portions of the system within the tanks that contact waste shall be designed and operated in accordance with the requirements of NFPA 70 (for Class 1, Division 1, Group B), NEC articles 500 and 501, NFPA 77, and NFPA 496 (Type X). The portions of the system within the tank vapor space that do not contact the waste shall be designed and operated in accordance with the same codes and standards, except that Class 1, Division 2, Group B applies (NFPA 70), as does Type Z (NFPA 496).

3.3.7 Human Engineering

System design shall comply with Section 1300-12, "Human Factors Engineering," of DOE Order 6430.1A.

3.3.8 Nuclear Safety

3.3.8.1 Criticality Safety. The system shall store radionuclides in a manner that prevents criticality in accordance with HNF-IP-1266, Section 5.7.

3.3.8.2 Nuclear Safety Classification. The subsystem and components of the DST System shall be designed in accordance with the safety classification for each. The safety classification shall be determined, using the process described in RPP-PRO-700, Rev. 0; RPP-PRO-702, Rev. 0; RPP-PRO-703, Rev. 0; and RPP-PRO-704, Rev. 1 based on the guidelines in HNF-SD-WM-SAR-067, Section 3.0.

3.3.9 System Security

3.3.9.1 General System and Information Security. The system shall be designed in accordance with RPP-PRO-394, Rev. 0, for general system and information security.

3.3.9.2 Radiation Area Security. The system shall be designed such that access controls to areas of high radiation meet the requirements of the DOE/RL-96-109, Rev. 2.

3.3.10 Government-Furnished Property Usage

This section is not applicable to this specification.

3.3.11 Computer Resource Reserve Capacity

Not applicable at the system level.

3.4 DOCUMENTATION

Record, document, and drawing control pertinent to design functions shall be in accordance with RPP-PRO-222, Rev. 0, and RPP-PRO-224, Rev. 0. Engineering document development shall be in accordance with RPP-PRO-1819, Rev. 0.

3.5 LOGISTICS

3.5.1 Maintenance and Operation

Remote, limited, or contact maintenance requirements shall be implemented with current regulatory requirements, policies, and procedures and shall incorporate a layer of principles. Operation shall be remote whenever possible to minimize exposure and contamination.

3.5.1.1 Calibration. Systems shall be designed to allow periodic calibration. Calibration cycles, methods, and equipment shall be established based on manufacturer's instruction, component and system reliability, environmental conditions, and Site-specific historical data.

3.5.2 Transportation Of Hazardous Materials

Subsystems used to ship hazardous materials shall be designed to comply with the requirements of RPP-PRO-156, Rev. 0.

3.5.3 Solid Waste

3.5.3.1 System-Generated Solid Waste. The SST/DST System shall comply with the requirements of RPP-PRO-455, Rev. 0, for solid waste generated as a result of system operations and maintenance.

3.5.4 Liquid Waste

3.5.4.1 Liquid Effluent Discharges to the Effluent Treatment Facility. The system shall comply with the liquid effluent physical, chemical and radionuclide concentration limit requirements given in HNF-SD-ETF-WAC-001, Rev. 0, when discharging liquid effluents to the Liquid Effluent Retention Facility or the Effluent Treatment Facility.

3.6 PERSONNEL AND TRAINING

Not applicable.

3.7 CHARACTERISTICS OF SUBELEMENTS

The elements below are the major DST System elements necessary for Phase 1 DST System operation.

3.7.1 Double-Shell Tank Storage System

New and existing equipment is used to store waste and/or provide containment during waste processing activities (Phase 1). Existing equipment includes the confinement vessel and ventilation systems associated with 25 DSTs, grouped into 5 tank farms (AN, AP, AW, AY, and AZ) located in the 200 East Area and 3 DSTs located in the 200 West Area (SY farm).

3.7.2 Double-Shell Tank Transfer System

New and existing equipment is used to receive and transfer wastes from external generators and to transfer wastes stored in the DST storage system during normal operations, waste removal, and waste processing. Existing equipment includes (a) the new and existing DST piping network (pipes, valves, valve pits, diversion boxes, etc.), (b) new and existing pumps installed in DSTs, (c) the waste receiving and unloading facility (204-AR), and (d) double-contained receiver tanks (DCRT) (244-TX, 244-BX, 244-U, 244-S, 244-A), vaults (244-CR and 244-AR), and other MUSTs supporting DST farm operations.

3.7.3 Double-Shell Tank Cross-site Transfer Subsystem

Existing equipment is used to transfer waste from 200 West Area DSTs (SY Farm) to 200 East Area DSTs in the A Farm complex. Existing equipment includes (a) a waste transfer pump installed in Tank 241-SY-102, (b) piping and valving that routes the waste from its source to its destination DST, (c) a booster pump, (d) a venting station that allows for proper system drainage, (e) a backup flushing system, and (f) local instrumentation and control.

3.7.4 Double-Shell Tank Waste Preparation Equipment

New equipment is used to mobilize/alter the physical and chemical properties of the wastes stored in the DST storage system. The DST waste preparation equipment consists of several subsystems that can be applied according to the DST waste type to be prepared. These subsystems include (a) mixer pumps, (b) supplemental retrieval system, (c) diluent addition and flush systems, and (d) the required associated local monitoring and control.

3.7.5 Double-Shell Tank Process Waste Sampling Subsystem

New and existing equipment is used to collect, handle, and transport waste samples from DSTs undergoing Phase 1 waste processing, to external laboratories (e.g., 222-S Laboratory). Existing equipment includes (a) core sampling hardware that captures solids, sludges, and highly viscous slurries, (b) grab sampling hardware that captures liquids and low-viscosity slurries in sample bottles lowered directly into the waste, (c) vapor sampling hardware that captures gases and vapors in the tank headspace, and (d) sample handling and transportation hardware that allows for sample transport to external laboratories for analysis. New hardware may include that required to (a) take samples in a DST undergoing mixing, (b) provide real-time analysis of the DST waste, (c) detect a visible floating organic layer within the DST, and (d) handle and transport a sample to an external laboratory in a temperature-controlled environment.

3.7.6 Double-Shell Tank Monitor and Control Subsystem

New and existing equipment is used to provide operators of the DST subsystems with unified monitor and control of the DST System. New equipment will provide operators with visibility into the status of all DST subsystem operations (e.g., utilization of the DST transfer system), and the ability to permit/shut down a given operation, as necessary. New equipment will interface with local monitoring and control systems, both within the DST System and to external systems (e.g., SSTs), to provide this unified monitor and control. This subsystem currently consists of the Tank Monitoring and Control System (TMACS) and the instrumentation and control associated with the DSTs (e.g., tank leak detectors, tank level pressure and temperature gauges, etc.). The DST Monitor and Control Subsystem will be expanded or replaced as necessary to meet future needs.

3.7.7 Double-Shell Tank Electrical Power Subsystem

New and existing equipment is used to transform and distribute electrical power throughout the DST System. Existing equipment includes 480/277 V ac, 240/120 V ac, and backup power distribution equipment (e.g., transformers, distribution panels, motor control centers, power cables, connectors, breakers, other protection devices). New equipment includes upgrades to the existing system to provide additional capacity for Phase 1 processing activities conducted within the DST System.

3.7.8 Double-Shell Tank Raw Water Subsystem

New and existing equipment is used to strain, filter, and distribute raw water throughout the DST System. Existing equipment includes valving, piping, strainers, filters, and backflow prevention devices. New equipment includes upgrades to the existing system to provide additional capacity for Phase 1 processing activities conducted within the DST System.

3.7.9 Double-Shell Tank Potable Water Subsystem

New and existing equipment is used to filter and distribute potable water to the DST Diluent and Flush Subsystem shower and eyewash stations. Existing equipment includes valving, piping, filters, and backflow prevention devices. New equipment includes upgrades to the existing system to provide additional capacity for Phase 1 processing activities conducted within the DST System.

3.7.10 Double-Shell Tank Service Air Subsystem

New and existing equipment is used to generate compressed air and distribute it throughout the DST System. Existing equipment includes air compressors, storage tanks, and air filters. New equipment includes upgrades to the existing system to provide additional capacity for Phase 1 processing activities conducted within the DST System.

3.7.11 Double-Shell Tank Instrument Air Subsystem

New and existing equipment is used to distribute regulated compressed air to the DST Monitor and Control Subsystem. Existing equipment includes air dryers, pressure regulators, and air filters. New equipment includes upgrades to the existing system to provide additional capacity for Phase 1 processing activities conducted within the DST System.

3.7.12 Double-Shell Tank Maintenance and Recovery Subsystem

This is a collection of systems that enable the logistical support of the DST System and the maintenance and recovery from abnormal circumstances (e.g., plugged lines, leaking waste into secondary containment). Requirements for this system will be derived from the operations and maintenance concept.

3.8 PRECEDENCE

The hierarchical relationship among requirements specified in Section 3 is as follows, excepting those instances where Washington State has been granted regulatory authority by the U.S. Government:

- Federal requirements (e.g., CFRs, DOE Orders)
- State requirements (e.g., *Revised Code of Washington*, as specified in *Washington Administrative Codes*)
- Local ordinances
- RPP procedures
- National consensus codes and standards.

The hierarchy is useful in establishing the relative order of precedence of the requirements documents levied in this specification.

3.9 QUALIFICATION

The system design shall be verified in accordance with HNF-PRO-1819, Rev. 0, *Engineering Requirements.*

3.10 STANDARD SAMPLE

Not applicable to this specification.

3.11 PREPRODUCTION STANDARD

Not applicable to this specification.

4.0 QUALITY ASSURANCE PROVISIONS

Quality assurance for the DST System shall be performed in accordance with HNF-IP-0842, Vol. XI, Section 1.0. Design Verifications, as defined in Section 4.3, shall be conducted during the design and development of the system to provide assurance of compliance with the requirements of this specification. Field verification, which takes place during the construction/turnover life-cycle phase, is not addressed in this specification. Field verification is addressed at the construction project level in operational test plans/procedures and acceptance test plans/procedures.

4.1 RESPONSIBILITY FOR INSPECTIONS

The design agent shall be responsible for the performance and documentation of all design verifications (see Section 4.3) for each system developed in accordance with this system specification. Design verifications shall be conducted at the design agent's facilities or the facilities of the design agent's choice with the approval of the sponsor organization. The sponsor organization reserves the right to witness the specified design verifications.

4.2 SPECIAL TESTS AND EXAMINATIONS

Not applicable.

4.3 DESIGN VERIFICATION

Design verification shall be performed on the DST System as represented in design drawings, prototypes, engineering models, etc., for the purposes of verifying that the design meets the requirements of this specification. Design verification is subject to the procedure identified in RPP-PRO-1819, Section 2.5.1. Inspection of the subsystem design to ensure compliance with the requirements of Section 3.0 shall be performed by one or more of the following methods: qualification testing, reviews, and/or alternate calculations. The verification method(s) that applies to each specification requirement is identified in Table 4-1. Definitions of qualification testing, reviews, and alternate calculations are as follows.

a. Qualification testing is a design verification method consisting of tests on hardware representative of the design being verified. Qualification testing can be subdivided into methods that consist of checking functional operation (Demonstration) and methods that consist of measuring specific hardware inputs/outputs (Test) to verify compliance of the design with requirements.

   i. Demonstration is a subcategory of the "qualification testing" design verification method. Demonstration is limited to readily observable functional operation to determine compliance with requirements. Demonstration does not require the use of special equipment or sophisticated instrumentation.

   ii. Test is another subcategory of the "qualification testing" design verification method. Test employs technical means including, but not limited to, the evaluation of

functional characteristics by use of special equipment or instrumentation and the application of established principles and procedures to determine compliance with requirements. The evaluation of data derived from test is an integral part of Test.

b. Review is a design verification method that consists of an investigation of the existing design information. This can be done via a simple review of the design media (Examination) or a rigorous analysis of the design, as represented in the design media (Analysis).

   i. Examination is a subcategory of the "review" design verification method. Examination consists of investigation without the use of special laboratory equipment or procedures to determine compliance with requirements. Examination can be performed on design media such as drawings, design reports, etc.

   ii. Analysis is a subcategory of the "review" design verification method. Analysis takes the form of processing accumulated results and conclusions, intended to provide proof that verification of a requirement has been accomplished. The analytical results may comprise a compilation/interpretation of existing information or may be obtained from lower level examination, tests, demonstrations, or analyses.

c. Alternate calculation is a verification of a calculation or analysis using alternate methods or procedures.

Field verification of DST System performance/design features and acceptance inspection of construction is called out in Section 2.5.2 of RPP-PRO-1819.

TABLE 4-1 Quality Conformance Inspection Matrix.

Section 3.0 Paragraph Number	Requirement Name	Level of Assembly	Inspection Element					
			Exam	Demo	Test	Anly	Alt Calc	N/A
3.2.1.1	Maintain Safe and Compliant Waste within the Double-Shell Tank System							X
3.2.1.1.a	Double-Shell Tank System Storage Capacity, Phase 1					X		
3.2.1.1.1	Store Waste in West Area Double-Shell Tanks							X
3.2.1.1.1.a	West Double-Shell Tank System Storage Capacity, Phase 1					X		
3.2.1.1.2	Store Waste in East Area Double-Shell Tanks							X
3.2.1.1.2.a	East Double-Shell Tank System Storage Capacity, Phase 1					X		
3.2.1.1.3	Transfer Waste From 204-AR Waste Unloading Facility to East Area DSTs							X
3.2.1.1.4	Receive New Liquid Waste into West Area Double-Shell Tanks							X
3.2.1.1.4.a	West Area Liquid Waste Annual Capacity					X		
3.2.1.1.4.b	Waste Volumes Received -- West Area					X		
3.2.1.1.5	Receive New Liquid Waste into East Area Double-Shell Tanks							X
3.2.1.1.5.a	East Area Liquid Waste Annual Capacity					X		
3.2.1.1.5.b	Waste Volumes Received -- East Area					X		
3.2.1.1.6	Receive Concentrated Waste from Evaporator							X
3.2.1.1.6.a	Annual Volume of Concentrated Waste					X		
3.2.1.1.6.b	Concentrated Waste Receipt Rate					X		

TABLE 4-1 Quality Conformance Inspection Matrix.

Section 3.0 Paragraph Number	Requirement Name	Level of Assembly	Inspection Element					
			Exam	Demo	Test	Anly	Alt Calc	N/A
3.2.1.1.7	Receive Emergency Purge from Evaporator							X
3.2.1.1.8	Receive Emergency Returns from LAW/HLW Plant							X
3.2.1.1.9	Receive Entrained Solids and Out of Specification Returns from LAW/HLW Plant							X
3.2.1.1.10	Transfer Waste for Concentration							X
3.2.1.1.10.a	Evaporator Feed Annual Volume					X		
3.2.1.1.10.b	Evaporator Feed Rate					X		
3.2.1.1.10.c	Evaporator Feed Requirements					X		
3.2.1.2	Remove Waste from Double-Shell Tanks, Phase 1							X
3.2.1.2.a	Low-Activity Waste Staging Quantity, Phase 1					X		
3.2.1.2.b	High-Level Waste Staging Quantity, Phase 1					X		
3.2.1.2.c	Waste Properties				X	X		
3.2.1.2.1	Prepare Waste in West Area Double-Shell Tanks							X
3.2.1.2.1.a	Supernatant Preparation--West Area					X		
3.2.1.2.1.b	Soluble Waste Preparation--West Area				X	X		
3.2.1.2.1.c	Insoluble Waste Preparation--West Area				X	X		
3.2.1.2.2	Transfer Waste Between West Area Double-Shell Tanks							X
3.2.1.2.2.a	200 West Area Waste Batch Transfer					X		
3.2.1.2.2.b	Waste Pumpability					X		
3.2.1.2.3	Transfer Waste Cross-Site							X
3.2.1.2.3.a	Cross-Site Transfer Annual Capacity					X		

TABLE 4-1 Quality Conformance Inspection Matrix.

Section 3.0 Paragraph Number	Requirement Name	Level of Assembly	Inspection Element					
			Exam	Demo	Test	Anly	Alt Calc	N/A
3.2.1.2.3.b	Cross-Site Waste Transfer Volume					X		
3.2.1.2.3.c	Waste Pumpability					X		
3.2.1.2.4	Prepare Waste In East Area Double-Shell Tanks							X
3.2.1.2.4.a	Supernatant Preparation--East Area					X		
3.2.1.2.4.b	Soluble Waste Preparation--East Area				X	X		
3.2.1.2.4.c	Insoluble Waste Preparation--East Area				X	X		
3.2.1.2.5	Transfer Waste Between East Area Double-Shell Tanks							X
3.2.1.2.5.a	200 East Area Waste Batch Transfer					X		
3.2.1.2.6	Transfer Waste to Low-Activity Waste Staging Tanks							X
3.2.1.2.6.a	Low-Activity Waste Staging Batch Volumes					X		
3.2.1.2.7	Transfer Waste to High-Level Waste Staging Tanks							X
3.2.1.2.7.a	High-Level Waste Staging Batch Volumes					X		
3.2.1.2.8	Transfer Supernatant to Single-Shell Tank Retrieval System							X
3.2.1.2.8.a	Supernatant Volume for Phase 1 SST Waste Feed Delivery Retrieval					X		
3.2.1.2.8.b	Supernatant Volume for Phase 1 SST Retrieval Concurrent with Phase 1					X		
3.2.1.2.8.c	Supernatant Properties					X		
3.2.1.3	Prepare Low-Activity Waste Feed for Phase 1 Treatment							X

TABLE 4-1 Quality Conformance Inspection Matrix.

Section 3.0 Paragraph Number	Requirement Name	Level of Assembly	Inspection Element					
			Exam	Demo	Test	Anly	Alt Calc	N/A
3.2.1.3.a	Low-Activity Waste Feed Composition, Phase 1					X		
3.2.1.3.b	Low-Activity Waste Feed Solids Concentration					X		
3.2.1.3.c	Low-Activity Waste Feed Sodium Concentration					X		
3.2.1.3.d	Low-Activity Waste Feed Cesium Concentration					X		
3.2.1.3.e	Low-Activity Waste Feed Visible Separate Organic Phase					X		
3.2.1.3.f	Low-Activity Waste Feed, Production Quantities, Phase 1					X		
3.2.1.3.g	Minimum Annual Low Activity Waste Feed Delivery					X		
3.2.1.3.h	Low-Level Waste Feed Certification					X		
3.2.1.3.1	Prepare Low-Activity Waste in Low-Activity Waste Staging Tanks							X
3.2.1.3.1.a	Low-Activity Waste Staging Batch Size, Phase 1					X		
3.2.1.3.2	Transfer Low-Activity Waste Supernatant to LAW/HLW Plant							X
3.2.1.3.2.a	Low-Activity Waste Feed Batches, Phase 1					X		
3.2.1.4	Prepare High-Level Waste Feed for Phase 1 Treatment							X
3.2.1.4.a	High-Level Waste Feed Composition, Phase 1					X		
3.2.1.4.b	High-Level Waste Feed Solids Concentration					X		
3.2.1.4.c	High-Level Waste Feed Sodium Concentration					X		

TABLE 4-1 Quality Conformance Inspection Matrix.

Section 3.0 Paragraph Number	Requirement Name	Level of Assembly	Inspection Element					
			Exam	Demo	Test	Anly	Alt Calc	N/A
3.2.1.4.d	High-Level Waste Feed Visible Separate Organic Phase					X		
3.2.1.4.e	High-Level Waste Feed, Production Quantities, Phase 1					X		
3.2.1.4.f	Maximum Annual High Level Waste Feed Delivery					X		
3.2.1.4.g	High-Level Waste Feed Certification					X		
3.2.1.4.1	Prepare High-Level Waste Sludges in HLW Staging Tanks							X
3.2.1.4.1.a	High-Level Waste Feed Batch Size, Phase 1				X	X		
3.2.1.4.1.b	High-Level Waste Feed Preparation, Phase 1				X	X		
3.2.1.4.2	Transfer High-Level Waste Sludge to LAW/HLW Plant							X
3.2.1.4.2.a	High-Level Waste Feed Batch Transfer Volume					X		
3.2.1.4.2.b	High-Level Waste Transfer Rate					X		
3.2.1.4.2.c	High-Level Waste Feed Batch Transfer Frequency					X		
3.2.1.5	Distribute Utilities in Double-Shell Tank System							X
3.2.1.6	Support DST System							X
3.2.3.1	External Waste Generators Using Surface Transport							X
3.2.3.1.a	204-AR Annual Capacity					X		
3.2.3.1.b	204-AR Batch Transfer					X		
3.2.3.1.c	204-AR Waste Receipt Properties					X		
3.2.3.1.d	Properties of Waste for Direct Tank Input					X		
3.2.3.2	Plutonium Finishing Plant							X

TABLE 4-1 Quality Conformance Inspection Matrix.

Section 3.0 Paragraph Number	Requirement Name	Level of Assembly	Inspection Element					
			Exam	Demo	Test	Anly	Alt Calc	N/A
3.2.3.2.a	Plutonium Finishing Plant Waste Annual Volume					X		
3.2.3.2.b	Waste Properties					X		
3.2.3.3	222-S Laboratory							X
3.2.3.3.a	222-S Laboratory Waste Annual Volume					X		
3.2.3.3.b	Waste Properties					X		
3.2.3.4	Single-Shell Tank System							X
3.2.3.4.a	Single-Shell Tank Waste Retrieval Volume, Phase 1					X		
3.2.3.5	Evaporator							X
3.2.3.5.a	Concentrated Waste Receipt Rate					X		
3.2.3.5.b	Concentrated Waste Composition					X		
3.2.3.5.c	Emergency Transfer Volume from Evaporator					X		
3.2.3.6	Phase 1 Low-Activity Waste/High-Level Waste Plant							X
3.2.3.6.a	Emergency Return Volume					X		
3.2.3.6.b	Entrained Solids and Out of Specification Return Volume					X		
3.2.3.7	Central Plateau Electrical System							X
3.2.3.7.a	DST System Electrical Power for Safe Storage and Waste Feed Delivery					X		
3.2.3.8	Central Plateau Water System							X
3.2.3.8.a	Double-Shell Tank System Waste Feed Delivery Raw Water					X		
3.2.5.1	Reliability, Availability, Maintainability					X		

TABLE 4-1 Quality Conformance Inspection Matrix.

Section 3.0 Paragraph Number	Requirement Name	Level of Assembly	Inspection Element					
			Exam	Demo	Test	Anly	Alt Calc	N/A
3.2.5.2.1	Design Life					X		
3.2.6.1	Natural Environments					X		
3.2.6.2.1	Chemical					X		
3.2.6.2.2	Radiation					X		
3.2.7	Transportability							X
3.2.8	Flexibility and Expansion					X		
3.3	DESIGN AND CONSTRUCTION					X		
3.3.1.1	Toxic Products and Formulations					X		
3.3.1.2	Dangerous Waste					X		
3.3.1.3	Decontamination and Decommissioning					X		
3.3.1.4	Excess Storage Capacity					X		
3.3.1.5	Double-Shell Tank Dangerous Waste Restrictions							
3.3.2	Electromagnetic Radiation		X					
3.3.3	Nameplates and Product Markings		X			X		
3.3.5	Interchangeability		X			X		
3.3.6.1.1	Occupational Radiological Protection					X		
3.3.6.1.2	Occupational Safety and Health Administration Standards					X		
3.3.6.2.1	Corrosion Prevention and Control		X					
3.3.6.2.1.1	Allowable Double-Shell Tank Corrosion					X		
3.3.6.2.2	Tank Temperature Limits		X					
3.3.6.2.3	Double-Shell Tank Pressure Limits					X		

TABLE 4-1 Quality Conformance Inspection Matrix.

Section 3.0 Paragraph Number	Requirement Name	Level of Assembly	Inspection Element					
			Exam	Demo	Test	Anly	Alt Calc	N/A
3.3.6.2.4	Dome Loading		X					
3.3.6.2.5	Tank Hydrostatic Load					X		
3.3.6.2.6	Fire Protection					X		
3.3.6.3.1	Secondary Containment and Leak Detection					X		
3.3.6.3.2	Spill Prevention and Controls					X		
3.3.6.3.3	Nonradioactive Airborne Emissions					X		
3.3.6.3.4	Radioactive Airborne Emissions					X		
3.3.6.3.5	Monitoring of Liquid Effluent Discharges to the Environment					X		
3.3.6.3.6	Radiation Protection of the Public And Environment					X		
3.3.6.3.7	Flammable Gas Ignition Controls				X	X		
3.3.7	Human Engineering					X		
3.3.8.1	Criticality Safety					X		
3.3.8.2	Nuclear Safety Classification					X		
3.3.9.1	General System and Information Security					X		
3.3.9.2	Radiation Area Security					X		
3.4	DOCUMENTATION					X		
3.5.1	Maintenance and Operation					X		
3.5.1.1	Calibration							X
3.5.2	Transportation Of Hazardous Materials		X					
3.5.3.1	System-Generated Solid Waste					X		

TABLE 4-1 Quality Conformance Inspection Matrix.

Section 3.0 Paragraph Number	Requirement Name	Level of Assembly	Inspection Element					
			Exam	Demo	Test	Anly	Alt Calc	N/A
3.5.4.1	Liquid Effluent Discharges to the Effluent Treatment Facility					X		
3.9	QUALIFICATION							X

5.0 PREPARATION FOR DELIVERY

Not applicable to this specification.

6.0 NOTES

6.1 INTENDED USE

6.1.1 Missions

The DST System shall provide safe storage and management of legacy and new wastes, pretreat and qualify LAW and HLW feed, and retrieve and deliver waste to the 242-A Evaporator and the waste processing facilities through Phase 1.

6.1.2 Special Hazards

6.1.2.1 High Radiation Levels. The pits, transfer boxes, and other equipment in the tank farms have high radiations levels. High radiation levels should be assumed until measurements indicate otherwise.

6.2 ASSUMPTIONS

1. Double-Shell Tank Storage Capacity. No new DSTs will be constructed in support of Phase 1 activities. Modeling to date shows that no additional DST storage space is required for Phase 1 (see HNF-SD-WM-ER-029, Rev. 25). A decision on DST storage space, however, has not been documented. If future modeling indicates that additional space is required, a new requirement will be added to the specification.

2. Transfer System. Waste will be moved within the DST System using a piping network. Several studies (e.g., PNNL-11718, Rev. 0) have indicated that a piping network is preferred for transferring waste around the Site.

3. Process Volume. Maximum-order waste quantities will be processed by Phase 1 contractors. Designing to the maximum requirements will ensure that the system will be capable of fulfilling Phase 1 mission objectives.

6.3 ACRONYMS & ABBREVIATIONS

AB	authorization basis
AGA	alternatives generation and analysis
ALARA	as low as reasonably achievable
AWF	aging waste facility
BNFL	British Nuclear Fuel Limited, Inc.
CFR	*Code of Federal Regulations*
CP	Central Plateau
CSB	Canister Storage Building
D&D	decontamination and decommissioning
DC	dilute, complexed
DCRT	double-contained receiver tank
DN	dilute, complexed

DOE	U.S. Department of Energy
DST	double-shell tank
EIS	environmental impact statement
HLW	high-level waste
hsems	Hanford Site Environmental Management System
HSTD	Hanford Site Technical Database
IHLW	immobilized high-level waste
ILAW	immobilized low-activity waste
LAW	low-activity waste
MSC	Maintain Safe and Compliant
MUST	miscellaneous underground storage tank
ORP	Office of River Protection
OSHA	Occupational Safety and Health Administration
PFP	Plutonium Finishing Plant
PUREX	Plutonium Uranium Extraction (Facility)
RCRA	*Resource Conservation and Recovery Act of 1976*
ROD	Record of Decision
RPP	River Protection Project
SNFP	Spent Nuclear Fuel Project
SSC	Systems, Structures, and Components
SST	single-shell tank
TBD	to be determined
TBR	to be refined
TFC	Tank Farm Comtractor
TIC	total inorganic carbon
TOC	total organic carbon
TRU	transuranic
tsd	treatment, storage, and disposal
USQ	Unresolved Safety Question
WAC	*Washington Administrative Code*
WBS	work breakdown structure
WESF	Waste Encapsulation and Storage Facility

6.4 DEFINITIONS

6.4.1 Architecture

The physical SSCs selected to perform the allocated functions. Architecture is selected through an analysis of alternative solutions, selecting the design approach that best meets decision criteria.

6.4.2 High-Level Waste (HLW)

High-level waste is defined as specified in Specification 8, *High-Level Waste Envelopes Definition* in the *TWRS Privatization Contract* (DE-AC06-96RL13308).

6.4.3 LAW/HLW Plant, Phase 1

The privatized facility that will treat and vitrify low-activity and high-level tank waste during Phase 1.

6.4.4 Low-Activity Waste (LAW)

Low-activity waste is defined as specified in Specification 7, *Low-Activity Waste Envelopes Definition* in the *TWRS Privatization Contract* (DE-AC06-96RL13308).

6.4.5 LR56 Cask

The LR56 Cask is a wheeled waste transport vehicle used for transporting radioactive liquid waste from the 300 Area to the 204-AR Waste Unloading Facility. For a more detailed description of the LR56 Cask System see WHC-SD-TP-SARP-009.

6.4.6 Systems, Structures, and Components (SSC)

This term refers to elements that comprise the total operating system. It does not imply any particular indenture, but rather is used as a general term for elements.

6.4.7 Units of Low-Activity Waste

Units of low-activity waste shall be defined as follows:

(a) Envelope A: The quantity of Waste Envelope A containing one metric ton of waste sodium shall equal one unit.

(b) Envelope B: The quantity of Waste Envelope B containing one metric ton of waste sodium shall be the lesser of the following number of units:

i. 2.6 units or

ii. X/Y units

where X is equal to 20 weight percent sodium oxide loading in the ILAW glass and Y is equal to the achievable waste sodium oxide loading, for the particular waste feed. The waste loading limitations shall be based solely on effects of chlorine, chromium, phosphate, and sulfate.

(c) Envelope C: The quantity of Waste Envelope C containing one metric ton of waste sodium shall be the lesser of the following number of units:

i. 1.15 units or

ii. X/Y units

where X and Y are defined above. The waste loading limitations shall be based solely on sodium additions required for cesium, technetium, strontium, and TRU removal from Envelope C for the particular waste feed.

6.5 REFERENCES

Documents listed below are cited in this specification. Those documents cited as requirements documents (i.e., those listed in Section 2) are not repeated here.

Acts

Resource Conservation and Recovery Act of 1976, as Amended, 42 USC 6901 et seq.

Code of Federal Regulations

10 CFR 61.55, "Licensing Requirements for Land Disposal of Radioactive Waste, Waste Classification".

Federal Register

62 FR 8693, 1977, "Record of Decision for the Tank Waste Remediation System, Hanford Site, Richland, Washington," *Federal Register*, Vol. 62, pp. 8693-8704 (February 26).

Hanford Site Procedures, CH2M Hill Hanford Group, Inc., Richland, Washington [RPP], and Fluor Hanford, Richland, Washington [HNF].

RPP-PRO-533, Rev. 0, *Change Control*, CH2M HILL Hanford Group, Inc., Richland, Washington.

Documents

DOE/EIS-0189, *Final Environmental Impact Statement for the Tank Waste Remediation System, Hanford Site, Richland, Washington,* 1996, U.S. Department of Energy and Washington State Department of Ecology, Washington, D.C.

Hanford Federal Facility Agreement and Consent Order, 89-10-Rev. 5, 1998, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

HNF-2168, Rev. 1, *Performance Requirements for the Double-Shell Tank System: Phase 1*, 2000, Numatec Hanford Corporation for Fluor Danikel Hanford, Inc., Richland, Washington.

HNF-2288, *Miscellaneous Supporting Information for: System Specification for the Double-Shell Tank System (HNF-SD-WM-TRD-007)*, 1998, Numatec Hanford Corporation for Fluor Daniel Hanford, Inc., Richland, Washington.

HNF-2919, Rev. 1, Constraints for System Specification for the Double-Shell and Single-Shell Tank Systems, 1999, COGEMA Engineering Corporation for Fluor Daniel Hanford, Inc., Richland, Washington.

HNF-3350, Rev. 0, *Engineering-Basis Document Review Supporting Double-Shell Tank System Specification Development*, 2000, Numatec Hanford Corporation for CH2M Hill Hanford Group, Inc., Richland, Washington.

HNF-3912, Rev. 0, System Specification for the Single-Shell Tank System, 1999, Lockheed Martin Hanford Corporation, Richland, Washington.

HNF-SD-TWR-CSUD-001, Rev. 0 *TWRS Technical Baseline Database Manager Definition Document*, 1997, Lockheed Martin Hanford Corporation for Fluor Daniel Hanford, Inc., Richland, Washington.

HNF-SD-WM-013, Rev. 0, *HSTD/Data Dictionary*, 1997, Fluor Daniel Hanford, Inc., Richland, Washington.

HNF-SD-WM-ER-029, Rev. 25, *Operational Waste Volume Projection*, 1999, Lockheed Martin Hanford Corporation, Richland, Washington.

HNF-SD-WM-MAR-008, Rev. 3, *Tank Waste Remediation System Mission Analysis Report*, 1998, Lockheed Martin Hanford Corporation for Fluor Daniel Hanford, Inc., Richland, Washington.

HNF-SD-WM-SEMP-002, Rev. 1, *Tank Waste Remediation System, Systems Engineering Management Plan*, 1998, Lockheed Martin Hanford Corporation for Fluor Daniel Hanford, Inc., Richland, Washington.

PNNL-11718, Rev. 0, *Decision Analysis for Mobilizing and Retrieving Sludge from Double-Shell Tanks,* 1997, Pacific Northwest National Laboratory for U.S. Department of Energy Richland Operations Office, Richland, Washington.

WHC-SD-TP-SARP-009, Rev. 0-A, *Safety Analysis Report for Packaging (onsite) LR56/Cask System*, 1998, Waste Management Federal Services, Inc., Richland, Washington.

7.0 APPENDICES

Appendix A REQUIREMENTS TRACEABILITY

Table A-1 shows the traceability and/or the requirement document(s) levied by the specification requirement for each specification requirement. The requirement traceability information is captured by reference to the document(s) that contain the technical basis for the specification requirement (see third column of Table A-1). If the specification requirement is linked to a higher level requirement in the Hanford Site Technical Database (HSTD), the document references in this column may be indented. The first indentation contains the reference document(s) linked directly to the specification requirement. Subsequent indentations provide the reference document(s) that are linked to the higher level requirement(s) to which the specification requirement is linked. The top-most HSTD requirement's source document is shown as the last indentation level in the third column of Table A-1. The fourth column shows all requirements documents levied within the text of the specification requirement and is consistent with the documents listed in Section 2.0 of this specification.

TableA-1. Requirement Sources and Invoked Documents.

Section 3.0 Paragraph Number	Requirement Name	Requirement Traceability (Source Document(s))	Documents Levied by Requirement (see Section 2.0)
3.2.1.1	Maintain Safe and Compliant Waste within the Double-Shell Tank System	HNF-2168, Rev. 1 ·DOE/RL-96-92	N/A
3.2.1.1.a	Double-Shell Tank System Storage Capacity, Phase 1	HNF-2168, Rev. 1	N/A
3.2.1.1.1	Store Waste in West Area Double-Shell Tanks	·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.1.1.a	West Double-Shell Tank System Storage Capacity, Phase 1	HNF-2168, Rev. 1	N/A
3.2.1.1.2	Store Waste in East Area Double-Shell Tanks	·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.1.2.a	East Double-Shell Tank System Storage Capacity, Phase 1	HNF-2168, Rev. 1	N/A
3.2.1.1.3	Transfer Waste From 204-AR Waste Unloading Facility to East Area DSTs	·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.1.4	Receive New Liquid Waste into West Area Double-Shell Tanks	·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.1.4.a	West Area Liquid Waste Annual Capacity	HNF-2168, Rev. 1	N/A
3.2.1.1.4.b	Waste Volumes Received -- West Area	HNF-2168, Rev. 1	N/A

TableA-1. Requirement Sources and Invoked Documents.

Section 3.0 Paragraph Number	Requirement Name	Requirement Traceability (Source Document(s))	Documents Levied by Requirement (see Section 2.0)
3.2.1.1.5	Receive New Liquid Waste into East Area Double-Shell Tanks	·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.1.5.a	East Area Liquid Waste Annual Capacity	HNF-2168, Rev. 1	N/A
3.2.1.1.5.b	Waste Volumes Received -- East Area	HNF-2168, Rev. 1	N/A
3.2.1.1.6	Receive Concentrated Waste from Evaporator	·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.1.6.a	Annual Volume of Concentrated Waste	HNF-2168, Rev. 1	N/A
3.2.1.1.6.b	Concentrated Waste Receipt Rate	HNF-2168, Rev. 1	N/A
3.2.1.1.7	Receive Emergency Purge from Evaporator	·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.1.8	Receive Emergency Returns from LAW/HLW Plant	·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.1.9	Receive Entrained Solids and Out of Specification Returns from LAW/HLW Plant	·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.1.10	Transfer Waste for Concentration	·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.1.10.a	Evaporator Feed Annual Volume	HNF-2168, Rev. 1	N/A

TableA-1. Requirement Sources and Invoked Documents.

Section 3.0 Paragraph Number	Requirement Name	Requirement Traceability (Source Document(s))	Documents Levied by Requirement (see Section 2.0)
3.2.1.1.10.b	Evaporator Feed Rate	HNF-2168, Rev. 1	N/A
3.2.1.1.10.c	Evaporator Feed Requirements	HNF-2168, Rev. 1	HNF-SD-WM-DQO-014, Rev. 2
3.2.1.2	Remove Waste from Double-Shell Tanks, Phase 1	HNF-2168, Rev. 1 ·DE-AC06-96RL13200 ·DOE/RL-96-92	N/A
3.2.1.2.a	Low-Activity Waste Staging Quantity, Phase 1	HNF-2168, Rev. 1 ·DE-AC06-96RL13200 ·DOE/RL-96-92	DE-AC06-96RL13308
3.2.1.2.b	High-Level Waste Staging Quantity, Phase 1	HNF-2168, Rev. 1	N/A
3.2.1.2.c	Waste Properties	HNF-2168, Rev. 1	HNF-SD-WM-DTR-046, Rev. 0
3.2.1.2.1	Prepare Waste in West Area Double-Shell Tanks	·DE-AC06-96RL13200 ·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.2.1.a	Supernatant Preparation--West Area	HNF-2168, Rev. 1	HNF-SD-WM-DQO-001, Rev. 3 RPP-5346, Rev.0 (Draft) HNF-SD-WM-OCD-015, Rev. 2
3.2.1.2.1.b	Soluble Waste Preparation--West Area	HNF-2168, Rev. 1	HNF-SD-WM-DQO-001, Rev. 3 RPP-5346, Rev.0 (Draft) HNF-SD-WM-OCD-015, Rev. 2
3.2.1.2.1.c	Insoluble Waste Preparation--West Area	HNF-2168, Rev. 1	HNF-SD-WM-DQO-001, Rev. 3 RPP-5346, Rev.0 (Draft) HNF-SD-WM-OCD-015, Rev. 2

TableA-1. Requirement Sources and Invoked Documents.

Section 3.0 Paragraph Number	Requirement Name	Requirement Traceability (Source Document(s))	Documents Levied by Requirement (see Section 2.0)
3.2.1.2.2	Transfer Waste Between West Area Double-Shell Tanks	·DE-AC06-96RL13200 ·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.2.2.a	200 West Area Waste Batch Transfer	HNF-2168, Rev. 1	N/A
3.2.1.2.2.b	Waste Pumpability	HNF-2168, Rev. 1	RPP-5346, Rev.0 (Draft)
3.2.1.2.3	Transfer Waste Cross-Site	·DE-AC06-96RL13200 ·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.2.3.a	Cross-Site Transfer Annual Capacity	HNF-2168, Rev. 1	N/A
3.2.1.2.3.b	Cross-Site Waste Transfer Volume	HNF-2168, Rev. 1	N/A
3.2.1.2.3.c	Waste Pumpability	HNF-2168, Rev. 1	WHC-SD-W058-DRD-001, Rev. 0
3.2.1.2.4	Prepare Waste In East Area Double-Shell Tanks	·DE-AC06-96RL13200 ·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.2.4.a	Supernatant Preparation--East Area	HNF-2168, Rev. 1	HNF-SD-WM-DQO-001, Rev. 3 RPP-5346, Rev.0 (Draft) HNF-SD-WM-OCD-015, Rev. 2
3.2.1.2.4.b	Soluble Waste Preparation--East Area	HNF-2168, Rev. 1	HNF-SD-WM-DQO-001, Rev. 3 RPP-5346, Rev.0 (Draft) HNF-SD-WM-OCD-015, Rev. 2

TableA-1. Requirement Sources and Invoked Documents.

Section 3.0 Paragraph Number	Requirement Name	Requirement Traceability (Source Document(s))	Documents Levied by Requirement (see Section 2.0)
3.2.1.2.4.c	Insoluble Waste Preparation--East Area	HNF-2168, Rev. 1	HNF-SD-WM-DQO-001, Rev. 3 RPP-5346, Rev.0 (Draft) HNF-SD-WM-OCD-015, Rev. 2
3.2.1.2.5	Transfer Waste Between East Area Double-Shell Tanks	·DE-AC06-96RL13200 ·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.2.5.a	200 East Area Waste Batch Transfer	HNF-2168, Rev. 1	N/A
3.2.1.2.6	Transfer Waste to Low-Activity Waste Staging Tanks	·DE-AC06-96RL13200 ·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.2.6.a	Low-Activity Waste Staging Batch Volumes	HNF-2168, Rev. 1	N/A
3.2.1.2.7	Transfer Waste to High-Level Waste Staging Tanks	·DE-AC06-96RL13200 ·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.2.7.a	High-Level Waste Staging Batch Volumes	HNF-2168, Rev. 1	N/A
3.2.1.2.8	Transfer Supernatant to Single-Shell Tank Retrieval System	·DE-AC06-96RL13200 ·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.2.8.a	Supernatant Volume for Phase 1 SST Waste Feed Delivery Retrieval	HNF-2168, Rev. 1	N/A

TableA-1. Requirement Sources and Invoked Documents.

Section 3.0 Paragraph Number	Requirement Name	Requirement Traceability (Source Document(s))	Documents Levied by Requirement (see Section 2.0)
3.2.1.2.8.b	Supernatant Volume for Phase 1 SST Retrieval Concurrent with Phase 1	HNF-2168, Rev. 1	N/A
3.2.1.2.8.c	Supernatant Properties	HNF-2168, Rev. 1	N/A
3.2.1.3	Prepare Low-Activity Waste Feed for Phase 1 Treatment	HNF-2168, Rev. 1 ·DOE/RL-96-92	N/A
3.2.1.3.a	Low-Activity Waste Feed Composition, Phase 1	HNF-2168, Rev. 1	N/A
3.2.1.3.b	Low-Activity Waste Feed Solids Concentration	HNF-2168, Rev. 1	N/A
3.2.1.3.c	Low-Activity Waste Feed Sodium Concentration	HNF-2168, Rev. 1	N/A
3.2.1.3.d	Low-Activity Waste Feed Cesium Concentration	HNF-2168, Rev. 1	N/A
3.2.1.3.e	Low-Activity Waste Feed Visible Separate Organic Phase	HNF-2168, Rev. 1	N/A
3.2.1.3.f	Low-Activity Waste Feed, Production Quantities, Phase 1	HNF-2168, Rev. 1	DE-AC06-96RL13308
3.2.1.3.g	Minimum Annual Low Activity Waste Feed Delivery	HNF-2168, Rev. 1	N/A
3.2.1.3.h	Low-Level Waste Feed Certification	HNF-2168, Rev. 1	BNFL-5193-ID-19, Rev. 4

TableA-1. Requirement Sources and Invoked Documents.

Section 3.0 Paragraph Number	Requirement Name	Requirement Traceability (Source Document(s))	Documents Levied by Requirement (see Section 2.0)
3.2.1.3.1	Prepare Low-Activity Waste in Low-Activity Waste Staging Tanks	·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.3.1.a	Low-Activity Waste Staging Batch Size, Phase 1	HNF-2168, Rev. 1	N/A
3.2.1.3.2	Transfer Low-Activity Waste Supernatant to LAW/HLW Plant	·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.3.2.a	Low-Activity Waste Feed Batches, Phase 1	HNF-2168, Rev. 1 ·HNF-2168, Rev. 1	N/A
3.2.1.4	Prepare High-Level Waste Feed for Phase 1 Treatment	HNF-2168, Rev. 1 ·DOE/RL-96-92	N/A
3.2.1.4.a	High-Level Waste Feed Composition, Phase 1	HNF-2168, Rev. 1 ·DOE/RL-96-92	N/A
3.2.1.4.b	High-Level Waste Feed Solids Concentration	HNF-2168, Rev. 1	N/A
3.2.1.4.c	High-Level Waste Feed Sodium Concentration	HNF-2168, Rev. 1	N/A
3.2.1.4.d	High-Level Waste Feed Visible Separate Organic Phase	HNF-2168, Rev. 1	N/A
3.2.1.4.e	High-Level Waste Feed, Production Quantities, Phase 1	HNF-2168, Rev. 1	DE-AC06-96RL13308
3.2.1.4.f	Maximum Annual High Level Waste Feed Delivery	HNF-2168, Rev. 1	N/A

TableA-1. Requirement Sources and Invoked Documents.

Section 3.0 Paragraph Number	Requirement Name	Requirement Traceability (Source Document(s))	Documents Levied by Requirement (see Section 2.0)
3.2.1.4.g	High-Level Waste Feed Certification	HNF-2168, Rev. 1	BNFL-5193-ID-20, Rev. 4
3.2.1.4.1	Prepare High-Level Waste Sludges in HLW Staging Tanks	·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.4.1.a	High-Level Waste Feed Batch Size, Phase 1	HNF-2168, Rev. 1 ·HNF-2168, Rev. 1	N/A
3.2.1.4.1.b	High-Level Waste Feed Preparation, Phase 1	HNF-2168, Rev. 1 ·HNF-2168, Rev. 1	N/A
3.2.1.4.2	Transfer High-Level Waste Sludge to LAW/HLW Plant	·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.4.2.a	High-Level Waste Feed Batch Transfer Volume	HNF-2168, Rev. 1 ·HNF-2168, Rev. 1	N/A
3.2.1.4.2.b	High-Level Waste Transfer Rate	HNF-2168, Rev. 1	N/A
3.2.1.4.2.c	High-Level Waste Feed Batch Transfer Frequency	HNF-2168, Rev. 1	N/A
3.2.1.5	Distribute Utilities in Double-Shell Tank System	·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.1.6	Support DST System	·DOE/RL-96-92 ·HNF-2168, Rev. 1	N/A
3.2.3.1	External Waste Generators Using Surface Transport	HNF-2168, Rev. 1	N/A
3.2.3.1.a	204-AR Annual Capacity	HNF-2168, Rev. 1	N/A
3.2.3.1.b	204-AR Batch Transfer	HNF-2168, Rev. 1	N/A

TableA-1. Requirement Sources and Invoked Documents.

Section 3.0 Paragraph Number	Requirement Name	Requirement Traceability (Source Document(s))	Documents Levied by Requirement (see Section 2.0)
3.2.3.1.c	204-AR Waste Receipt Properties	HNF-2168, Rev. 1	HNF-SD-WM-EV-053, Rev. 5 OSD-T-151-00008, Rev. E-3 HNF-SD-WM-OCD-015, Rev. 2
3.2.3.1.d	Properties of Waste for Direct Tank Input	HNF-3350, Rev. 0	N/A
3.2.3.2	Plutonium Finishing Plant	HNF-2168, Rev. 1	N/A
3.2.3.2.a	Plutonium Finishing Plant Waste Annual Volume	HNF-2168, Rev. 1	N/A
3.2.3.2.b	Waste Properties	HNF-2168, Rev. 1	OSD-Z-184-00010, Rev. 1
3.2.3.3	222-S Laboratory	HNF-2168, Rev. 1	N/A
3.2.3.3.a	222-S Laboratory Waste Annual Volume	HNF-2168, Rev. 1	N/A
3.2.3.3.b	Waste Properties	HNF-2168, Rev. 1	HNF-SD-WM-OCD-015, Rev. 2 HNF-SD-WM-DQO-001, Rev. 3
3.2.3.4	Single-Shell Tank System	HNF-2168, Rev. 1	N/A
3.2.3.4.a	Single-Shell Tank Waste Retrieval Volume, Phase 1	HNF-2168, Rev. 1	N/A
3.2.3.5	Evaporator	HNF-2168, Rev. 1	N/A
3.2.3.5.a	Concentrated Waste Receipt Rate	HNF-2168, Rev. 1	N/A
3.2.3.5.b	Concentrated Waste Composition	HNF-2168, Rev. 1	HNF-SD-WM-OCD-015, Rev. 2
3.2.3.5.c	Emergency Transfer Volume from Evaporator	HNF-2168, Rev. 1	N/A

TableA-1. Requirement Sources and Invoked Documents.

Section 3.0 Paragraph Number	Requirement Name	Requirement Traceability (Source Document(s))	Documents Levied by Requirement (see Section 2.0)
3.2.3.6	Phase 1 Low-Activity Waste/High-Level Waste Plant		N/A
3.2.3.6.a	Emergency Return Volume	HNF-2168, Rev. 1	N/A
3.2.3.6.b	Entrained Solids and Out of Specification Return Volume	HNF-2168, Rev. 1	N/A
3.2.3.7	Central Plateau Electrical System	HNF-2168, Rev. 1	N/A
3.2.3.7.a	DST System Electrical Power for Safe Storage and Waste Feed Delivery	HNF-2168, Rev. 1	N/A
3.2.3.8	Central Plateau Water System	HNF-2168, Rev. 1	N/A
3.2.3.8.a	Double-Shell Tank System Waste Feed Delivery Raw Water	HNF-2168, Rev. 1	N/A
3.2.5.1	Reliability, Availability, Maintainability	HNF-2288, Rev. 0	N/A
3.2.5.2.1	Design Life	DOE-RL-89-10, Rev. 4	N/A
3.2.6.1	Natural Environments	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	HNF-SD-GN-ER-501, Rev. 1 RPP-PRO-097, Rev. 0
3.2.6.2.1	Chemical	HNF-SD-WM-SP-012, Rev. 1	HNF-SD-WM-SP-012, Rev. 1
3.2.6.2.2	Radiation	HNF-2004, Rev. 0	HNF-2004, Rev. 0

TableA-1. Requirement Sources and Invoked Documents.

Section 3.0 Paragraph Number	Requirement Name	Requirement Traceability (Source Document(s))	Documents Levied by Requirement (see Section 2.0)
3.2.7	Transportability	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	49 CFR 174 49 CFR 176 49 CFR 177
3.2.8	Flexibility and Expansion	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	DOE Order 6430.1A
3.3	DESIGN AND CONSTRUCTION	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	DOE Order 6430.1A
3.3.1.1	Toxic Products and Formulations	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	RPP-PRO-451, Rev. 0
3.3.1.2	Dangerous Waste	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	WAC 173-303
3.3.1.3	Decontamination and Decommissioning	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	DOE Order 6430.1A
3.3.1.4	Excess Storage Capacity	HNF-3350, Rev. 0 ·HNF-SD-WM-MAR-008, Rev. 3	DOE Order 5820.2A
3.3.1.5	Double-Shell Tank Dangerous Waste Restrictions	HNF-2168, Rev. 1	DOE/RL-88-21
3.3.2	Electromagnetic Radiation	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	HNF-2962, Rev. 0
3.3.3	Nameplates and Product Markings	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	HNF-IP-0842, Vol. II, Sec 6.1, Rev. 0
3.3.5	Interchangeability	HNF-2288, Rev. 0	N/A

TableA-1. Requirement Sources and Invoked Documents.

Section 3.0 Paragraph Number	Requirement Name	Requirement Traceability (Source Document(s))	Documents Levied by Requirement (see Section 2.0)
3.3.6.1.1	Occupational Radiological Protection	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	RPP-PRO-1621, Rev. 0 HNF-5183, Rev. 0 RPP-PRO-1622, Rev. 0
3.3.6.1.2	Occupational Safety and Health Administration Standards	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	HNF-SD-WM-HSP-002, Rev. 3
3.3.6.2.1	Corrosion Prevention and Control	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	WAC 173-303-640 (3) 40 CFR 265
3.3.6.2.1.1	Allowable Double-Shell Tank Corrosion	HNF-3350, Rev. 0	N/A
3.3.6.2.2	Tank Temperature Limits	HNF-3350, Rev. 0	N/A
3.3.6.2.3	Double-Shell Tank Pressure Limits	HNF-3350, Rev. 0	N/A
3.3.6.2.4	Dome Loading	HNF-3350, Rev. 0	HNF-IP-1266, Rev. 2
3.3.6.2.5	Tank Hydrostatic Load	HNF-3350, Rev. 0	N/A
3.3.6.2.6	Fire Protection	·HNF-SD-WM-MAR-008, Rev. 3	HNF-IP-0842, Vol. IX, Section 5.2, Rev. 0
3.3.6.3.1	Secondary Containment and Leak Detection	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	40 CFR 265 WAC 173-360 WAC 173-303-640 (4) 40 CFR 264
3.3.6.3.2	Spill Prevention and Controls	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	WAC 173-303-640 (5) 40 CFR 265 WAC 173-303-630 (7) 40 CFR 264

TableA-1. Requirement Sources and Invoked Documents.

Section 3.0 Paragraph Number	Requirement Name	Requirement Traceability (Source Document(s))	Documents Levied by Requirement (see Section 2.0)
3.3.6.3.3	Nonradioactive Airborne Emissions	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	40 CFR 265 RPP-PRO-2595, Rev. 0 WAC 173-303
3.3.6.3.4	Radioactive Airborne Emissions	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	RPP-PRO-450, Rev. 0
3.3.6.3.5	Monitoring of Liquid Effluent Discharges to the Environment	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	RPP-PRO-456, Rev. 0
3.3.6.3.6	Radiation Protection of the Public And Environment	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	10 CFR 20 WAC 246-247 40 CFR 191
3.3.6.3.7	Flammable Gas Ignition Controls	HNF-3350, Rev. 0 HNF-2919, Rev. 1	NFPA 70 NFPA 77 NFPA 496
3.3.7	Human Engineering	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	DOE Order 6430.1A-1300-12
3.3.8.1	Criticality Safety	HNF-3350, Rev. 0 ·HNF-SD-WM-MAR-008, Rev. 3	HNF-IP-1266, Rev. 2
3.3.8.2	Nuclear Safety Classification	HNF-SD-WM-SAR-067, Rev. 1F HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	RPP-PRO-703, Rev. 0 RPP-PRO-700, Rev. 1 RPP-PRO-704, Rev. 1 HNF-SD-WM-SAR-067, Rev. 1F RPP-PRO-702, Rev. 0
3.3.9.1	General System and Information Security	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	RPP-PRO-394, Rev. 0

TableA-1. Requirement Sources and Invoked Documents.

Section 3.0 Paragraph Number	Requirement Name	Requirement Traceability (Source Document(s))	Documents Levied by Requirement (see Section 2.0)
3.3.9.2	Radiation Area Security	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	DOE/RL-96-109, Rev. 2
3.4	DOCUMENTATION	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	RPP-PRO-222, Rev. 0 RPP-PRO-1819, Rev. 0 RPP-PRO-224, Rev. 0
3.5.1	Maintenance and Operation	10 CFR 835 DOE Order 5820.2A	N/A
3.5.1.1	Calibration	DOE Order 6430.1A	N/A
3.5.2	Transportation Of Hazardous Materials	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	RPP-PRO-156, Rev. 0
3.5.3.1	System-Generated Solid Waste	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	RPP-PRO-455, Rev. 0
3.5.4.1	Liquid Effluent Discharges to the Effluent Treatment Facility	HNF-4047, Rev. 0	HNF-SD-ETF-WAC-001, Rev. 0
3.9	QUALIFICATION	HNF-2919, Rev. 1 ·HNF-SD-WM-MAR-008, Rev. 3	RPP-PRO-1819, Rev. 0

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